MACROECONOMETRICS, Spring 2022

Homework 3. Due Wednesday February 16.

1. Download (or re-use) 3 series from the BEA and test if your variables are co-integrated (best to choice something like income, consumption, exports, that should have cointegrating vectors). The best solution uses the Johansen estimator (you can adapt the attached Gauss code), but a less ambitious uses the Engle-Granger test (see, e.g., Hamilton for critical values) and the least ambitious impose a coefficient of say unity (depends on your data whether that makes sense) and check if the residual has a unit root.

2. Simulate a normal random walk and call the data x_t. Then draw a vector of iid normal variables e_t of the same length T and generate the series $y_t = \alpha x_t + e_t$. Do this like 50 times (more if CPU-time is not a constraint).

i) For any non-zero value of α, y_t is a unit root process. Try and test for unit roots in y_t for $\alpha = 0.1$ and 1.0, respectively. Test for a unit root. Does the test correctly identify non-stationarity in each case (do a number of iterations and show the distribution)? (For this construction, α would be "size" of the unit root.

ii) Regress y_t on x_t and also regress Δy_t on $Deltax_t$. In either case, the coefficient is α. Do this for $T = 50$ and for $T = 500$. Can you see the super-consistency kick in? (Print the mean, variance, and skewness, and a frequency plot would also be nice).