ECONOMETRICS II, FALL 2024

Homework 4. Due Wednesday September 18.

1. a) Use the updated Matlab panel data program posted and run it without fixed effects, but with clustered standard errors, clustered by state, and report the t-statistics calculated from the program. (Note, that you are not to use any of the built-in Matlab commands for this.)

b) Simplify the code to calculate White standard errors, then run the program, report the t-statistics and compare to a) .

c) Include state fixed effects and repeat questions a) and b).

d) Now assume that the errors are clustered by time (year), rather than by state. Modify the program and run it again. Report the t-statistics. Do this with or without time fixed effects.

2. Verify formula (3) in Moulton's article for the simple case of m=3. Assume the matrix of regressors is

$$X = \begin{pmatrix} x_1 \\ x_1 \\ x_1 \\ x_2 \\ x_2 \\ x_2 \end{pmatrix},$$

and the error variance matrix is

$$V = \sigma^2 \begin{pmatrix} 1 & \rho & \rho & 0 & 0 & 0 \\ \rho & 1 & \rho & 0 & 0 & 0 \\ \rho & \rho & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & \rho & \rho \\ 0 & 0 & 0 & \rho & 1 & \rho \\ 0 & 0 & 0 & \rho & \rho & 1 \end{pmatrix}.$$

3. Calculate the variance and all covariance for an MA(1) model.

4. Using posted program, simulate and estimate MA models.

- Run the "Moving Average Maximum Likelihood" program, that I posted, 10 times. What is the mean estimated MA-parameter and what is the empirical standard deviation. Compare to the estimated standard deviation.

- Try and set the initial value for the MA value to 2.0. Run the program 10 times and describe what happens to the estimates. (You can also try other "crazy" values, the more you play around with the computer exercises, the better "feel" for the material you will acquire.)
- Change the model to an MA(2) process and estimate the parameters (try a few times if it won't converge).

Note: The purpose of this exercise is partly to highlight that maximum likelihood in principle maximizes the likelihood of a vector of observations and not a sum of marginal likelihoods, even if that is what you most often see. It likely also shows you that initial values matter for convergence of the Newton algorithm. (This is usually not a problem—if it converges to different solutions, that is a problem.)