ECON 8331 — ECONOMETRICS II

Material covered Fall 2020:

Programs: Be able to understand Matlab programs similar to those you used in the homeworks. I will ask you about a missing line or to add something—it is not important to get it correct in Matlab notation.

- Basic Maximum Likelihood and the trinity of tests were covered in Econometrics I. In this class we looked further at:
  - The information matrix and asymptotic variance estimation. Outer product estimator of the asymptotic information matrix.
  - Normal autoregressive (be able to find distribution of the first observations, or condition, in which case it is least squares)
  - Normal moving average (we did this for small samples, where we can invert the variance matrix, for higher dimensions you will use the Kalman Filter (not covered) for ML, or GMM).
  - Logit and Probit Models. Ordered logit, sequential logit (univariate in detail, multivariate less detailed).
  - Selectivity: ML and and Heckman correction (inverse Mill's ratio). Discrete-continuous models (not in detail).
  - Duration models.
- Systems of equations. SURE (including VAR), 2SLS, and (briefly) 3SLS. Make sure you can derive the results that SURE estimators are identical to equation-by-equation OLS when the regressors are identical using Kronecker products.
- Bootstrapping standard errors: simplest case. The parametric bootstrap. The block bootstrap in a panel with large N and small T.
- Weak Instruments. Know the Monte Carlo example of Nelson and Startz (*Journal of Business*) up until Figure 1. Know the Stock et al. rule of thumb for first stage F-tests. Be ready to repeat the derivation on pp. 326-327 in the Davidson-MacKinnon book. Know the approximate formula for the bias of the two-stage least-squares estimator on p. 123 in Michael Murray's article in the *Journal of Economic Perspectives*. We showed by simulation that the LIML estimator is less biased when many weak instruments are used.
- GMM estimation (including an introduction to non-parametric variance estimation using the Newey-West estimator). Know the famous Hansen-Singleton application (be able to explain how the GMM program works, and why it is consistent, for this example).

- Panel data. Fixed effects and Frisch-Waugh application to fixed effects (be aware that demeaning to remove more than one fixed effect is not correct in unbalanced panels). Bias of order $\frac{1}{T}$ in short dynamic panels in the absence of strict exogeneity and the Arellano-Bond GMM estimator to deal with this issue.

- Clustering of standard errors. Know the basic formula and know the broad conclusions of the papers by Moulton and Bertrand, Dufflo, and Mullainathan. Be aware of the relation to the Newey-West estimator and the White robust standard errors.

- Brief introduction to unit roots. Be able to derive the limiting distribution in terms of Brownian motions for the simplest case of a pure random walk. The Augmented Dickey-Fuller test.

- Brief introduction to GMM.