

## ECON 8331 — ECONOMETRICS II

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**Hours:** You can usually drop by anytime, sometimes I am out Thursday-Friday and sometimes I work home in the morning, so email for an appointment if you want to be sure (email is better than talking to me, I use my inbox to keep track of appointments).

### **Obligatory Notices:**

*Students with Disabilities: The University of Houston System complies with Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990, pertaining to the provision of reasonable academic adjustments/auxiliary aids for students with a disability. In accordance with Section 504 and ADA guidelines, the University of Houston strives to provide reasonable academic adjustments/auxiliary aids to students who request and require them. Students seeking accommodation in this course should contact the instructor after obtaining the appropriate documentation through the UH Center for Students with Disabilities.*

*Counseling and Psychological Services (CAPS) can help students who are having difficulties managing stress, adjusting to college, or feeling sad and hopeless. You can reach CAPS ([www.uh.edu/caps](http://www.uh.edu/caps)) by calling 713-743-5454 during and after business hours for routine appointments or if you or someone you know is in crisis. No appointment is necessary for the Let's Talk program, a drop-in consultation service at convenient locations and hours around campus. See:*

[http://www.uh.edu/caps/outreach/lets\\_talk.html](http://www.uh.edu/caps/outreach/lets_talk.html)

### **Learning Outcomes:**

- Students will learn, through lectures, homeworks, and TA-sessions, to master econometric tools at a level that, in conjunction with other core-classes, enables the students to perform statistical analysis of economic models.
- Students will develop their technical skills as a background for doing empirical work to the level expected in graduate economics programs. For this purpose, student will learn to use the econometric software to estimate models on actual economic data.
- Students will learn the basic ideas of advanced econometrics with a focus on empirically relevant issues.

## Course Description

The topics you should know for the exam is what is taught in class. It is usually not helpful to read further material, but it is often very helpful to read an alternative presentation of the same material.

### Readings:

#### *Textbooks:*

I plan to use Davidson and MacKinnon: “Econometric Theory and Methods” Oxford University Press 2004. However, as we go along I may find some material better covered in Hamilton’s Time Series book or in Greene. I will also likely post some supplementary papers or links and some notes of my own. Some of the material covered (clustering, weak instruments) are extremely important in empirical work, but does not yet have a clear treatment in textbooks, so we have to gather the material from several sources (I may try and write it up myself, but I cannot promise.)

Notes, homeworks, information, etc. will be posted on the class WEB-page. The class WEB-page will be accessible from my home page.

### Material covered:

- Maximum Likelihood
- Information matrix and estimation of the variance of the parameters.
- You should be able to find the score, Hessian, ML-estimator, etc. for any (simple) model but, in particular, well known ones such as
  - Normal with regressors
  - Normal autoregressive
  - Normal moving average
  - Exponential
  - Bernoulli
  - Logit and Probit Models (univariate in detail, multivariate less detailed).
- The Newton Algorithm. (Theory or practical examples.)
- Panel data. Fixed effects and Frisch-Waugh application to fixed effects (be aware that de-meaning 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.
- Selectivity: ML and Heckman correction (inverse Mill’s ratio).
- Duration models, briefly.
- Testing. Likelihood Ratio, Wald, and ML tests. (In detail for the ML case.)

- 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.
- Clustering of standard errors. Know the basic formula and know the broad conclusions of the papers by Moulton and Bertrand, Dufflo, and Mullainathan.
- Bootstrapping standard errors: simplest case. The parametric bootstrap.
- Weak Instruments. Know the Monte Carlo example of Nelson and Startz and the empirical issues with the Angrist-Krueger paper (or "Does compulsory school affect..". QJE 1991) . 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.
- Be able to demonstrate the issue of Local Average Treatment Effect using the simple example in my Quantitative Economics article.
- Structural VARs. Be able to find the impulse response function and variance decomposition (theoretical or in a simple application, like a two-variable AR(1) or AR(2) process) and explain how people identify the model by triangularizing the variance matrix and "ordering" the data).

For the following topics, I only scratched the surface of the areas, but people expect that economists at least know roughly what these topics are about.

- Unit Roots. Superconsistency. Direction of bias if the data is a random walk and we estimate an AR(1). The Augmented Dickey-Fuller test. Make sure about what regression we typically run to test for a unit root with drift against a stationary model with trend, and what is the null hypothesis tested.
- GMM estimation. The general setup of minimization problem. Wald testing, the J-test for overidentifying restrictions, the Likelihood Ratio type test (when is it valid?).
- Non-parametric variance estimation. What is the Newey-West (Bartlett) kernel and how is it used. What is a "bandwidth."