

ECON 8331 — ECONOMETRICS II, 2023

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Hours: You can contact me any time (except right before classes) with short questions and you can email me to set up Zoom/Team meetings.

University Required Notes:

Mental Health and Wellness Resources:

The University of Houston has a number of resources to support students mental health and overall well-being. The Student Health Center offers a Psychiatry Clinic for enrolled UH students. Call 713-743-3841. The A.D. Bruce Religion Center offers spiritual support and a variety of programs centered on faith and community. Need Support Now?

If you or someone you know is struggling or in crisis, help is available. Call CAPS crisis support at 713-743-3841.

Academic Honesty Policy:

High ethical standards are critical to the integrity of any institution, and bear directly on the quality of education.

Title IX/Sexual Misconduct:

Per the UHS Sexual Misconduct Policy, your instructor is a responsible employee for reporting any sexual harassment or misconduct.

Reasonable Academic Adjustments/Auxiliary Aids:

The University of Houston is committed to providing an academic environment and educational opportunities that are accessible to all students.

Excused Absence Policy:

Regular class attendance, participation, and engagement in coursework are important contributors to student success.

Recording of Class

Students may not record all or part of class, livestream all or part of class, or make/distribute recordings of class.

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. The class is less coherent than Econometrics I because some of the important topics have not yet found their final form yet in the literature. (“Importance” means that if you do empirical work, you are expected to know this stuff.)

Readings:

Posted on class website. May be updated during the semester.

Textbooks:

I use notes. Everything you are expected to know is posted on the webpage. In places, I somewhat follow Davidson and MacKinnon: “Econometric Theory and Methods” Oxford University Press 2004, but I do not follow the book exactly and you are expected to know what I teach, not what is in the book. One of the reasons that I don’t always follow the book, apart from some idiosyncracies of D&M, is that they often do too many side-bars, while I try to teach exactly what you have to know (so do not focus on the book, unless you want alternative coverage, you will get sidetracked). Occasionally, some material is better covered in Greene than in Davidson-MacKinnon or you might prefer Greene. (When I read Greene, I tend to get distracted by the too-many examples, but fell free to like Greene better.) Bruce Hansen’s text is excellent. However, let me stress that I do not assume that you have read any of those books and it will not help you to read stuff in those books that I did not cover. I will post notes of my own and some supplementary papers or links. 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. This makes a less smooth and coherent package, but this is what you will encounter in your own research and in seminars. I have no current plans of updating the material from last year, so look at last years WEB-page to see what was covered. (If new surveys come out in recent material, I may switch to those. We may also adjust on the margin what is covered.)

Note: Some of the material may seem hard. In econometrics II, I cannot make it even. The class covers “what every applied economist should now” (and far from all of it), so we have to take

it as the material is currently developed. If you make sure you understand all the Matlab exercises, you will be in good shape going forward. (In order to use a method, you need not be able to prove why it works, but you have to be able to interpret it. However, the more you understand, the less likely you are to mis-use a method, so we will do a lot of derivations.)

Notes, homeworks, information, etc. will be posted on the class webpage. The class webpage will be accessible from my home page as are previous years' if you want more old exams to solve. **Material covered:** (Some of the material is covered in Econometrics I or Statistics. But in the past, almost all students benefitted from having it covered again.)

- 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 Poisson Model. (If we have time.)
- Testing. Likelihood Ratio, Wald, and ML tests. (In detail for the ML case.)
- 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.
- 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. New paper by Moreira.
- 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?"

These are potential topics that we likely will not get to (maybe one of them).

- 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).
- 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.
- Be able to demonstrate the issue of Local Average Treatment Effect using the simple example in my Quantitative Economics article.