The University of Texas at Austin
ECO 394M (Master's Econometrics)
Prof. Stephen Donald
Fall 2024

SYLLABUS

ECO 394M is an introductory Master's level course in econometrics. The course will cover a lot of ground, focusing on both the theoretical underpinnings of the econometric methods and the application of these methods to actual data. Topics will include (as time permits): linear regression model, asymptotic (large-sample) and bootstrap inference, model specification, hypothesis testing, instrumental variables (IV), general method of moments (GMM) estimation, quantile regression, panel data, nonlinear models (binary choice, count data, etc) and MLE estimation, time series models.

Meeting Time: Tuesday and Thursday 11am-12:30pm (BRB 1.118)

Lecture Recordings: Lectures will be recorded using Lectures Online and will be made available after class in Canvas.

Sharing of Course Materials is Prohibited

No materials used in this class, including, but not limited to, lecture hand-outs, videos, assessments (quizzes, exams, papers, projects, homework assignments), in-class materials, review sheets, and additional problem sets, may be shared online or with anyone outside of the class unless you have my explicit, written permission. Unauthorized sharing of materials is a violation of the University's Student Honor Code and an act of academic dishonesty.

FERPA and Class Recordings

Class recordings are reserved only for students in this class for educational purposes and are protected under FERPA. The recordings should not be shared outside the class in any form. Violation of this restriction by a student could lead to Student Misconduct proceedings.

COVID Guidance

https://www.healthyhorns.utexas.edu/uhs/covid-19.html

Mandatory Reporting

Beginning January 1, 2020, Texas Senate Bill 212 requires all employees of Texas universities, including faculty, report any information to the Title IX Office regarding sexual harassment, sexual assault, dating violence and stalking that is disclosed to them. Texas law requires that all employees who witness or receive any information of this type (including, but not limited to, writing assignments, class discussions, or one-on-one conversations) must be reported. If you would like to speak with someone who can provide support or remedies without making an official report to the university, please email advocate@austin.utexas.edu. For more information about reporting options and resources, visit http://www.titleix.utexas.edu/,contact the Title IX Office via email at titleix@austin.utexas.edu, or call 512-471-0419.

Although graduate teaching and research assistants are not subject to Texas Senate Bill 212, they are still mandatory reporters under Federal Title IX laws and are required to report a wide range of behaviors we refer to as sexual misconduct, including the types of sexual misconduct covered under Texas Senate Bill 212.The Title IX office has developed supportive ways to respond to a survivor and compiled campus resources to support survivors.

Contact information: Please contact me by email (stephen.g.donald@utexas.edu) with any questions about the course. I will hold a weekly office hour via Zoom 2-3pm Wednesday and probably hold additional office hours prior to exams.

Teaching assistants: Jungmin Woo (jy24858@utexas.edu). Jungmin will lead a weekly review section (Friday, 10:30-11:30am). Jungmin will hold weekly office hours (time/day on Canvas).

Prerequisities: Knowledge of probability and statistics (at the level of ECO 394D) and multivariable calculus and linear algebra (at the level of ECO 394C) will be assumed.

Textbook: Although the lecture notes will contain the crucial course material, students will be asked to read *Introductory Econometrics: A Modern Approach* by Jeffrey Wooldridge. This textbook is intended for an undergraduate econometrics course, and we will cover the material in class at a more advanced and rigorous level. The textbook provides excellent intuition behind most of the topics that we will cover in class and, therefore, serves as very nice complement to the lectures. The textbook is now in its 7th Edition, but students may also use the earlier (cheaper) 5th or 6th Editions. Please note that we will also cover topics in lecture (for example, GMM and the bootstrap) that are not covered in the textbook. For interested students, more advanced treatments of some of the course's topics can be found in *Econometric Analysis of Cross Section and Panel Data* by Jeffrey Wooldridge, *Econometrics* by Bruce Hansen (available in pdf form in Canvas), and *Time Series Analysis* by James Hamilton (for time-series topics).

Course materials: All course materials and non-textbook readings will be posted on the Canvas site. Lecture notes will be posted as pdf files prior to class.

Grading: Grades will be based on a midterm (20%) (Oct. 17 in class), problem sets (45%), and a final (35%) (Dec. 12 3:30pm-5:30pm).

Software: Students are encouraged to use STATA for the empirical homework exercises and also to "practice" applying the econometric methods. The department has a site license for STATA so you will be able to install it on your laptop. An excellent set of Stata resources is maintained by UCLA at https://stats.idre.ucla.edu/stata/ (including their "web books" on regression and logistic regression at https://stats.idre.ucla.edu/stata/webbooks/). The STATA website also has a list of useful links at https://www.stata.com/links/resources-for-learning-stata/.

List of topics:

(W indicates suggested background reading in Wooldridge; * indicates a topic that is largely <u>not</u> covered in the book.)

- Linear regression: model and estimation (W 1, 2, 3, 6.1-6.2, 7.1-7.4)

  - Model: structural versus statistical views
  - Model parameters and interpretation
  - Model specification: polynomials, interactions, indicator variables, functional form (logs)
  - OLS estimation: fitted values, residuals, R-squared

- Statistical inference (W 4, 5, 6.4)

  - Asymptotic (large-sample) theory: consistency, asymptotic normality, variance formulas, standard errors, confidence intervals, functions of parameters, multi-collinearity, forecasts
  - Hypothesis testing: z-test (asymptotic "t" test), Wald test (asymptotic "F" test)
  - Bootstrap inference

- Other issues (W 8.1-8.4, 9.4, 16.1-16.2)

  - Heteroskedasticity: testing, weighted least squares (sidebar on nonlinear least squares), forecasts
  - Serial correlation: more later
  - Failures of exogeneity

- *Quantile regression (W 9.6)

  - Conditional quantile models
  - Least absolute deviations (LAD) and general quantile estimation

- *Generalized method of moments (GMM) estimation (W 15)

  - Simple examples
  - Instrumental variables (IV) model and estimation

- Panel data (W 13, 14)

  - Fixed effects model: strict exogeneity, within and first-difference estimation
  - Failure of strict exogeneity: dynamic models, *feedback effects, *GMM solutions

- Nonlinear models (W 7.5, 17)

    – Binary-choice model: MLE, partial effects
    – Count data model
    – Other models: censored data, corner-solution data (as time permits)

- Time series (as time permits) (W 10, 11, 12, 18)

    – Simple model features: finite distributed lags, trends, seasonality
    – Autoregressive models
    – Other issues: Stationarity vs non-stationarity, cointegration