Econometrics
ECO 394M

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1 Course Description

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.

2 Administrative Info

- The class meets on Tue and Thu 11:00 AM - 12:30 PM in BRB 1.118.
- Contact information

email	`jbalat@utexas.edu`
Office Hours	TBA

- Teaching assistant: Jungmin Yoo

email	`jy24858@utexas.edu`
Sessions	Fri 9-10 am in BRB 1.118 (on 8/29 and 9/5 will meet in BRB 2.136)
Office Hours	Fri 11 am – 12 pm in TBD

- 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. It is your responsibility to frequently check the course webpage on Canvas for announcements, assignments, and other material.

- ◇ Prerequisites: 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.
- ◇ Any part of this syllabus is subject to change.

3 Textbooks

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 8th Edition, but students may also use the earlier (cheaper) 6th or 7th 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 (on-line at `https://www.ssc.wisc.edu/~bhansen/econometrics/`), and *Time Series Analysis* by James Hamilton (for time-series topics).

4 Grading

Grades will be based on a midterm (20%), problem sets (45%), and a final (35%). Exam dates will be announced as soon as they are known.

The problem sets will be posted on the course web page and will be administered via *Gradescope*. You are responsible for regularly checking the course website and being aware of the problem set deadlines.

Late submissions are not accepted. However, the problem set with the lowest grade will be dropped when computing the course grade.

Students are encouraged to form small study groups. At the stage when you are figuring out how to do a homework problem, you are welcome to discuss with others how to set up the problem, and the strategy for solving it. Once you've solved the problem, you are welcome to compare your answer with those of others, and to discuss the sources of any differences between your answers. However, each student is expected to write up their own answers independently. If your answer(s) and those of another student are identical or too similar, this may be taken as evidence that you have not written up your answers independently. Should "copying" occur, both the student who copied work from another student and the student who gave material to

be copied will receive a zero for the entire homework assignment, and failure of the course and University disciplinary action may be involved. Permissible collaboration should never involve one student having possession of another student's answers.

Your final course score will be computed as a weighted average of your scores on the above components. A letter grade will be assigned based on your final score relative to the distribution of scores in the class. This approach allows me to assign letter grades without an absolute scale, and to adjust the percentages of the class receiving different letter grades (within limits). The percentage of students receiving any particular letter grade is not predetermined. It is possible for all students to get a C or above, and for the large majority to receive an A or a B. However, lower grades will be assigned to students who do not demonstrate proficiency or mastery of the material. Pluses and minuses will be used.

5 Software

Students are encouraged to use Stata for the empirical homework exercises and also to "practice" applying the econometric methods.

The Department of Economics will provide a complimentary STATA 18.5 subscription to Econ graduate students. You can find instructions on how to install your copy on the "2025-26 MA Economics Cohort" Canvas website.

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/`.

6 Student Accommodations

Students with a documented disability have the right to request appropriate academic accommodations from the Division of Diversity and Community Engagement, Services for Students with Disabilities, 512-471-6259 (voice) or 1-866-329-3986 (video phone). `http://ddce.utexas.edu/disability/about/`

- ◇ Please request a meeting as soon as possible to discuss any accommodations
- ◇ Please notify me as soon as possible if the material being presented in class is not accessible
- ◇ Please notify me if any of the physical space is difficult for you

7 Academic Integrity

The strength of the university depends on academic and personal integrity. Each student in the course is expected to abide by the University of Texas Honor Code:

> As a student of The University of Texas at Austin, I shall abide by the core values of the University and uphold academic integrity.

This means that work you produce on assignments, tests and exams is all your own work, unless it is assigned as group work. I will make it clear for each test, exam or assignment whether collaboration is encouraged or not.

Always cite your sources. If you use words or ideas that are not your own (or that you have used in previous class), you must make that clear otherwise you will be guilty of plagiarism and subject to academic disciplinary action, including failure of the course. You are responsible for understanding UT's Academic Honesty Policy which can be found at the following web address: `https://deanofstudents.utexas.edu/conduct/`

7.1 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 promotes cheating. It is a violation of the University's Student Honor Code and an act of academic dishonesty.

I am well aware of the sites used for sharing course materials, and any materials found online that are associated with you, or any suspected unauthorized sharing of materials, will be reported to Student Conduct and Academic Integrity in the Office of the Dean of Students. These reports can result in sanctions, including failure in the course.

8 Course Outline

This outline is tentative and, if time permits, we will be able to cover all topics in the order that follows.

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

1. Linear regression: model and estimation

Topics: 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

Readings: (W) Chapters 1, 2, 3, 6.1-6.2, 7.1-7.4

2. Statistical inference

Topics: Asymptotic (large-sample) theory: consistency, asymptotic normality, variance formulas, standard errors, confidence intervals, functions of parameters, multicollinearity, forecasts

Hypothesis testing: z-test (asymptotic "t" test), Wald test (asymptotic "F" test)

Bootstrap inference

Readings: (W) Chapters 4, 5, 6.4

3. Other issues

Topics: Heteroskedasticity: testing, weighted least squares (sidebar on nonlinear least squares), forecasts

Serial correlation: more later

Failures of exogeneity

Readings: (W) Chapters 8.1-8.4, 9.4, 16.1-16.2

4. [*] Quantile regression

Topics: Conditional quantile models

Least absolute deviations (LAD) and general quantile estimation

Readings: (W) Chapter 9.6

5. [*] Generalized method of moments (GMM) estimation

Topics: Simple examples

Instrumental variables (IV) model and estimation

Readings: (W) Chapter 15

6. Panel data

Topics: Fixed effects model: strict exogeneity, within and first-difference estimation

Failure of strict exogeneity: dynamic models, *feedback effects, *GMM solutions

Readings: (W) Chapters 13, 14

7. Nonlinear models

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

Readings: (W) Chapters 7.5, 17

8. Time series (as time permits)

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

Readings: (W) Chapters 10, 11, 12, 18