Econometrics I

Chris Conlon

Fall 2025

Lecture: Thursday 2:00-5:00pm in KMC 7-191
Office hours: KMC 7-76, by appointment
`https://calendly.com/ctc5-stern/30min`
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Course Description

This is an econometrics course for first-year PhD students who are interested in doing quantitative research in the social sciences. The aim of the course is to teach you to use popular applied econometric methods while developing your theoretical understanding of those methods.

Topics include least squares, asymptotic theory, hypothesis testing, instrumental variables, difference-in-differences, regression discontinuity, treatment effects, panel data, maximum likelihood, discrete choice models, and structural estimation. Professor Chris Conlon will teach Econometrics II in the spring.

Prerequisites

I will assume you are proficient in calculus, basic probability and statistics, and linear algebra.

I also assume proficiency in mathematical programming, which you will need to complete the assignments. You may use any software you like for the assignments. I recommend `R` or Python (both open source) for those who aren't already committed to something else. The course will not involve programming instruction, but I will give some examples of working code in `R`.

All of the assignments can (should?) be done using either `fixest` in `R` or `pyfixest` in Python.

If you aren't already familiar, now is a good time to learn to compose work in `LaTeX`. It's also worth looking into applications that faciliate both composing and presenting code such as RMarkdown and Jupyter.

Materials

You should own at least one econometrics textbook, and the suggested textbook for this course is Hansen's Econometrics. It used to be free as a PDF but now is for sale on Amazon and other bookstores.

Suggested textbook: The calendar below lists chapters from Hansen corresponding to the lecture material.

Other useful textbooks:

- *Econometric Analysis* (8th edition) by William Greene.
- Angrist and Pischke, *Mostly Harmless Econometrics*: great as a complement to Greene or Hansen, but I don't recommend it as your primary econometrics reference.
- Wooldridge, *Econometric Analysis of Cross Section and Panel Data*: somewhat more advanced, a very useful reference.

Other references:

- Sargent and Stachurski's Quantitative Economics with Python (`https://python.quantecon.org/intro.html`)

Assignments and Grading

Your grade will be based on four individual assignments (10% each), two quizzes (10% each), and a final research project (40%).

Assignments will have a mixture of theoretical questions and data-based questions. For each assignment, you should turn in (1) a PDF document presenting your results (and showing your work), and (2) your code. You are encouraged to discuss assignments with your classmates and work together (learning from your peers is very important during your

PhD), but you must turn in your own work (including your own code). Assignments should be submitted through Brightspace.

Late assignments will receive partial credit with penalties in proportion to how late they are. Assignments more than one week late will not receive credit.

The group project will consist of three deliverables:

1. A short description of your proposed project (up to three pages), submitted in the middle of the semester.
2. A presentation of your results during the final class session.
3. A research paper, turned in at the end of the semester (along with your code).

Your team for the final project should consist of 1-3 students. The project can be on any topic (subject to my approval).

For the final project, I suggest choosing a published paper to reproduce, and in addition to reproducing the results, find at least one new way to test, extend, or improve on the paper's econometric analysis. I encourage you to look beyond incredibly famous papers with many thousands of citations for two reasons. First, there is usually a large subsequent literature – too large for you to become an expert on just for this project. Second, these term projects can eventually become (or lead to things that will become) parts of your dissertation or published papers. That's more likely to happen if you take on a topic that hasn't already been over-studied.

Any regrade requests should be submitted in writing.

Getting Help

My office hours are by appointment – please do not hesitate to contact me to set up a meeting.

Also feel free to send me smaller questions by email, and I will try to respond within 48 hours.

Tentative Outline

Session	Date	Chapters (Hansen)	Topics and deliverables
1	9/4	2,6	Probability and Statistics
2	9/11	3-4	Linear Regression
3	9/18	3-4,7	Linear Regression
4	9/25	6,7,9	Inference, Standard Errors, Testing ***Assignment 1 due***
5	10/2	18	(Quasi-)Experiments, Endogeneity, Treatment Effects
6	10/9	12	Instrumental Variables, Simultaneity ***Assignment 2 due***
7	10/16	12	Instrumental Variables, Simultaneity ***In-class quiz***
8	10/23	17	Panel Data, Fixed and Random Effects
9	10/30	5	Maximum Likelihood, Heckman Selection Correction ***Final project proposals due***
10	11/6	22	Binary and Discrete Choice ***Assignment 3 due***
11	11/13	22, 23	Count Data, Model Selection and Machine Learning
12	11/20		Introduction to Structural Estimation ***In-class quiz*** ***Assignment 4 due***
	11/27		No class - Thanksgiving
13	12/4		***Final project presentations***
	12/11		***Final projects due***