

Economics 717
Applied Econometrics
Chris Taber and Matt Wiswall
Mon. and Wed., 1-2:15 pm, SS6240

	Taber	Wiswall
Email:	taber@ssc.wisc.edu	matt.wiswall@gmail.com
Website:	https://www.ssc.wisc.edu/~ctaber/	https://sites.google.com/site/mattwiswall
Office:	SS6446	SS7442
Office Hours:	Tuesday 2-3, or by appointment	By appointment on Google Doc

Course Overview

The goal of this course is to link students' preparation in formal Econometrics to data. We will cover a number of topics that are important in applied research.

Schedule

- Wednesday, January 24th to Monday, March 12th (Taber, Part 1, 14 lectures)
- Wednesday, March 14th to Wednesday, March 21st (Wiswall, Part 2, 3 lectures)
- Monday, March 26th and Wednesday, March 28th (Spring Break, No Class)
- Monday, April 2nd to Wednesday, May 2nd (Wiswall, Part 2 continued, 10 lectures)

Evaluation

The requirements of the class are problem sets (10% of grade) and an applied paper (90%). We are flexible about the type of paper for the class. For students who do not have previous experience writing papers it would probably help if the paper for this class was closely linked to a previous paper, for example applying the same ideas and estimator to a different data set and then extending in some non-trivial way using the ideas in the class. Of course original papers are fine as well, and more appropriate for students who are beyond their second year in the PhD program. Work on what might become your field paper is also fine. We are not going to force you to talk to us, but expect you to schedule appointments periodically to discuss your plans for the paper.

Students may work in groups of up to three. A proposal for the paper is due on Feb. 28 in class. We are anticipating for most students this will be roughly 2 pages describing what you plan to do-and can include more than one idea if you haven't made up your mind yet.

We require that you type all of your written materials using the Latex typesetting system. We will provide you with template files and instruction. You can create Latex documents using Scientific Word/Workplace, Lyx (<http://www.lyx.org>), or by directly typing Latex code using various editors (TexStudio is one). Latex is free and the main components can be downloaded from miktex.org. We also highly recommend the book *Latex: A Document Preparation System* by Leslie Lamport.

Office Hours

In terms of office hours, please do not use Taber's regular office hours to discuss the paper. His experience is that these conversations can be long and lead to a long queue of people waiting to talk. He would rather you schedule an appointment to talk to me. He will be flexible about times. Office hours are intended for people questions directly about material discussed in the lectures.

Wiswall will be setting up a shared Google Doc for office hours sign up. This document is shared among all of his students (undergraduates and graduates). You can select a 10, 20, or 30 minute length appointment. You must sign up for office hours at least 24 hours in advanced. If you cannot make your appointment, please delete your name from the Doc as soon as possible in order to allow other students to use this slot

Textbooks to Consider

For general applied econometrics: Angrist and Pischke (2009) *Mostly Harmless Econometrics*, Wooldrige (2010) *Econometric Analysis of Cross Section and Panel Data*, and Cameron and Trivedi (2005), *Microeconometrics: Methods and Applications*.

For numerical and simulation methods, we also recommend: Judd (1998) *Numerical Methods in Economics*, Miranda, Fackler (2002) *Applied Computational Economics and Finance*, Train (2003) *Discrete Choice Methods with Simulation*, and Gourieroux and Monfort (1996) *Simulation-Based Econometric Methods*.

Credits

This is a three credit course

This class meets for two 75-minute class periods each week over the semester and carries the expectation that students will work on course learning activities (reading, writing, problem sets, meeting with faculty, etc.) for about 3 hours out of classroom for every class period.

Learning Outcomes

At the end of the course students will be able to:

- read and understand empirical papers in micro-economics. This means understanding precisely how the empirical work was executed.
- critically evaluate this work. This involves understanding the crucial assumptions behind the result and being able to judge the consequences of these assumptions on the estimates.
- execute these tools on real data using Stata or another package.
- write a high quality empirical paper in micro-economics

Outline of Taber's Part of the Course

1. Treatment Effects
2. Instrumental Variables
 - (a) OLS/IV as GMM
 - (b) Simultaneous Equations
 - (c) Measurement Error
 - (d) IV with Heterogenous Treatment Effects
3. Panel Data and Difference in Differences
4. Matching
 - (a) Selection on Observables

- (b) Propensity Score Matching
- (c) Synthetic Controls
- 5. Regression Discontinuity
- 6. Using Selection on Observables to think about Selection on Unobservables

Outline of Wiswall's Part of the Course

- Lectures 1-4: Parametric Models
identification and estimation, standard and generalized Roy model, two step versus full information estimation
- Lectures 5-6: Computation in Economics
approximation and computation errors, numerical derivatives, quadrature methods
- Lectures 7-10: Simulation Methods
drawing univariate, multivariate, and truncated random numbers; method of simulated moments; simulated maximum likelihood; indirect inference; refinements (e.g. control variates, antithetics, and other quasi-Monte Carlo methods); importance sampling; smooth simulators (e.g. GHK simulator)
- Lectures 11-12: Optimization
gradient based methods (e.g. Newton-Raphson), Nelder-Mead simplex, stochastic based methods (e.g. simulated annealing), parameter constraints, objective function constraints, parallel computing
- Lecture 13: Simulation Based Inference (Bootstrap)
non-parametric and parametric bootstrap, cluster/block/panel bootstrap