Course Website: https://bcourses.berkeley.edu/

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Course Description

The goal of this course is for students to learn a set of statistical tools and research designs that are useful in conducting high-quality empirical research on topics in applied microeconomics and related fields. Since most applied economic research examines questions with direct policy implications, this course will focus on methods for estimating causal effects. This course differs from many other econometrics courses in that it is oriented towards applied practitioners rather than future econometricians. It therefore emphasizes research design (relative to statistical technique) and applications (relative to theoretical proofs), though it covers some of each.

Prerequisites

Students should be familiar with basic probability and statistics, matrix algebra, and the classical linear regression model at the level of ARE 212 (in Economics the equivalent level of preparation would be some strange combination of ECON 140, 141, 240A, and 240B).

Assignments and Grading

We will assign 5 to 6 problem sets during the course of the semester. You should work cooperatively on the problem sets in groups of up to 3. There will also be a final examination. Grades will be based on performance on problem sets (50%), final exam (45%), and class participation (5%). Late problem sets will incur a penalty of –10% per day late. The last problem set must be submitted on-time; it will not be accepted if late.
Information regarding the schedule and location of the final exam will be available at [http://schedule.berkeley.edu](http://schedule.berkeley.edu). Please do not ask me or the GSI when or where the final is. We assume no responsibility for erroneous information if you ask us when/where the final is, as any information we give you on this matter can only be weakly less accurate than what is on [http://schedule.berkeley.edu](http://schedule.berkeley.edu).

**Statistical Software**

You may use any software that you wish, but solutions for problem sets will be handed out in Stata and R. Demonstrations during lectures will also be conducted in Stata or R. In the long run, if you are doing applied microeconometrics, you will almost surely end up using one of these two packages. However, in some problem sets it will be recommended that you use Stata’s or R’s more primitive commands, or the Mata language, rather than the “canned” commands.

**Textbooks and Notes**

The course is not based on any one text, but Guido Imbens’ formal econometrics notes (both from a previous iteration of ARE 213 and from a NBER econometrics course) will form a core reference. The course will also make reference to the three textbooks listed below. At a minimum, I recommend purchasing the *Mostly Harmless Econometrics* text. It is mostly harmless.


**Course Outline**

I. Introduction

A. Ordinary Least Squares and Agnostic Regression

*CT* Chapters 4.1 - 4.5.

*JW* Chapter 2.

*AP* Chapter 3.1.


B. Introduction to Causality and Research Design

CT Chapter 2.

AP Chapters 1 - 2.

WNE Lecture 1, Section 2.


C. Cautionary Notes


II. Selection on Observables Designs

A. Regression Adjustment and Nonparametric Regression


B. The Propensity Score and Dimensionality Reduction

*CT Chapter 25.4.*

*AP Chapter 3.3.*

*WNE Lecture 1, Sections 3.2 - 3.4 and 5 - 7.*

*JW Chapter 18.3.2.*


III. Selection on Unobservables Designs

A. Linear Panel Data Models

1. Fixed Effects Models and Differences-in-Differences

   *CT Chapters 21 and 22.*

   *AP Chapter 5.1 - 5.2.*
WNE Lecture 10.

JW Chapter 10.


2. Case Studies with Synthetic Controls


B. Instrumental Variables Models

1. The IV Estimator


AP Chapter 4.1 - 4.3.
2. Heterogeneous Treatment Effects


3. 2SLS and Weak Instruments


C. Regression Discontinuity Designs


IV. The Problem of Statistical Inference

A. Panel Data and Clustering


B. Randomization Inference


C. Resampling

CT Chapter 11.


D. Multiplicity Adjustment

V. Introduction to Advanced Topics

A. Maximum Likelihood Estimation

*CT* Chapters 5.1 - 5.3, 5.6, 5.7.

*JW* Chapter 13.

B. Duration Models

*CT* Chapter 17.

*JW* Chapter 20.


C. GMM

*CT* Chapters 5.4, 6.1 - 6.5.

*WNE Lecture 15.*

*JW* Chapter 14.

D. Limited Dependent Variables Models and Selection Models

*CT* Chapters 14.1 - 14.5.

*JW* Chapter 15.


*CT* Chapter 16.

*JW* Chapter 16.

E. Discrete Choice
CT Chapter 15.

WNE Lecture 11.

JW Chapter 15.9.