Econometrics

J. Angrist (angrist@mit.edu)

Spring 2014

My aim is to help you to understand modern applied econometric methods and foster the skills needed to plan and execute your own empirical projects. Topics include randomized trials, regression, differences-in-differences, instrumental variables, regression-discontinuity designs, and simultaneous equations models. We study many examples and do a fair amount of number crunching ourselves.

Prerequisites

Students should be familiar with basic concepts in probability and statistics. The course includes a brief stats refresher just in case.

Course requirements

*Eighty percent of success is showing up – Woody Allen*

Classroom work:

Two lectures (TTH 9:00-10:30; E25-117) and a weekly recitation (F 9:00 E25-117).

As an incentive to show up, we take roll. There are also four (4) in-class pop quizzes to check reading comprehension.

Other work:

You’ll finish with a workman’s familiarity with the tools of probability and statistics, facility with data handling and statistical programming, and, oh yes, an understanding of the models and methods of applied econometrics. That’s a lot to learn, so plan your time accordingly. There are 6 graded problem sets and ungraded review problem sets at the beginning and end of the course. The problem sets have both analytical and computer-exercise components. *Stata* is our default programming language for problem sets and in recitation. Classes focus on concepts and econometric applications. Help for new *Stata* users will be given in recitation and by our grader.

Grades

Showing up is 80% of success, but it’s only 20% of your grade. Grades are computed as follows: a total of 125 points, 30 points for problem sets [EITHER 5 OR 6 PTS EACH, SEE BELOW], 30 points for the midterm, 40 points for the final, and 25 bonus points awarded as follows:

5 for attending at least 21 classes (on-time arrival required)
5 each for 4 pop quizzes (absent or late counts as zero)

Five problem sets are mandatory and solutions must be submitted on time to receive credit. *Stata* logs are to be submitted with solution sets. A grade of 75% or better on at least 4 problem sets is required in order to be eligible to take the final. **Consult with classmates on problem sets if you get stuck, but solutions must be your own work.**
Comportment

Econometrics requires focus and attention to stay on course (not unlike the rest of our lives). I therefore ask you not to bring food to class and to leave electronics and other toys shut off and put away once the cabin door is closed (this prohibition includes but is not limited to: laptops, tablets, ipods, phones, Wii, Xbox, Playstation consoles, and inflatable love dolls). Airplane mode not allowed.

Texts and readings


For those who want to dig deeper:


Journal articles and selected additional readings are posted on our Stellar web site (http://stellar.mit.edu/S/course/14/sp14/14.32/).

Lecture notes will be distributed in class.

Computer work

For the purposes of this course, you’ll be given access to cloud-based *Stata* to run on your own laptop or the computer of your choice. Please check with our TAs for info on set-up.
Course outline for 14.32

The Big Picture

We start with a stats review based on my notes. Look ahead by reading:

   MHE, Chapter 1
   MM, Intro

A. Statistical Tools

Lecture Note 1: Expectation and Moments

   SW, Chapter 2
   MM, Chapter 1 Appendix

B. Review of Statistical Inference

Lecture Note 2: Sampling Distributions and Inference
Lecture Note 3: Approximate [Asymptotic] Distribution of the Sample Mean
Lecture Note 4: Confidence Intervals

   SW, Chapter 3
   MM, Chapter 1 Appendix

C. Analysis and Interpretation of Randomized Trials

Lecture Note 5: Experiments and Potential Outcomes

   MM, Chapter 1
   MHE, Chapter 2


D. Regression I: Why and How?

Lecture Note 6: Bivariate Regression
Lecture Note 7: Sampling Distribution of Regression Estimates
Lecture Note 8: Residuals, Fitted Values, and Goodness of Fit
Lecture Note 9: Introduction to Multivariate Regression
Lecture Note 10: Multivariate Regression (cont.) – Omitted Variables, Short vs. Long

SW, Chapters 4-7 and 17.1-17.4
MM, Chapter 2
MHE, Sections 3.1 (through 3.1.3), 3.2 (through 3.2.2), and 3.4.3


-- approximate midterm date --

E. Regression II: Using Multivariate Regression

Lecture Note 11: Dummy Variables, Interactions, F-Tests

SW, Chapters 8-9
MM, Chapter 2 Appendix
MHE, Section 3.1.4


Lecture Note 12: Differences-in-Differences and Natural Experiments

SW Chapters 10 and 13.1-13.4
MM, Chapter 5
MHE, Section 5.2


F. Inference Problems in Asymptopia; Heteroskedasticity and Serial Correlation

Lecture Note 13: Asymptotic Distribution Theory
Lecture Note 14: Heteroskedasticity, Linear Probability Models
Lecture Note 15: Serial Correlation

SW, Chapters 14.1-14.3, 15.4, 17.5
MHE, Section 3.4.1
MM, Chapter 2 Appendix

G. Instrumental Variables

Lecture Note 16: Instrumental Variables and Two-Stage Least Squares for Omitted-Variables Problems
Lecture Note 17: Sampling Variance of 2SLS Estimates; 2SLS mistakes

SW, Chapter 12, 13.5-13.7, and Appendices to Chapter 13
MM, Chapters 3 and 6
MHE, Sections 4.1 and 4.6.1


H. Simultaneous Equations Models

Lecture Note 18: Simultaneous Equations Models -- Motivation and Identification
Lecture Note 19: Simultaneous Equations Models -- Estimation


I. Regression Discontinuity Designs

Lecture Note 20: RD in Action

SW, Section 13.4-13.5
MM, Chapter 4
MHE, Chapter 6
