

New York University
Robert F. Wagner Graduate School of Public Service

P11.2172

Advanced Empirical Methods
Wednesday 6:45 pm – 8:25 pm
60 5th Avenue, Room 250

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Office Hours

Wednesday 3:45 pm-5:00 pm
By appointment: <https://goo.gl/Z2Jf5S>

Course Description and Objectives

The goal of this course is to provide students with an introduction to advanced empirical methods. We begin by discussing the strengths and limitations of multiple regression analysis and the relationship between regression and causal modeling. We then develop a sequence of extensions and alternatives, including: randomized trials, regression discontinuity, matching methods, difference-in-differences and panel data, and instrumental variables. We will learn both the techniques and how to apply them using large-scale data sets from domestic and international policy settings. Skills students will acquire in this course include: the capacity to reason causally and empirically, the ability critically to assess empirical work, knowledge of advanced quantitative tools, and experience in working with large data sets.

How this course relates to other courses

Advanced Empirical Methods is a course offered for students interested in developing quantitative skills and experience with data analysis. Statistics and multiple regression are prerequisites for this course. Depending on their interests, students may wish to take both this course and Estimating Impacts or just one of these courses. Estimating Impacts covers selected analytic and design issues that are relevant to program evaluation. Advanced Empirical Methods instead focuses on learning empirical techniques and working with large real-world data sets.

Grading

The course will be evaluated through five problem sets (15 points each), two pop quizzes (up to one bonus point each), and one larger take-home assignment (25%). All problem sets will make use of Stata, so please ensure you are familiar with how to access this program at NYU.

Late Policy

Assignments are due prior to 6:45 pm on the dates indicated below on NYU classes. Late submission of problem sets will lead to a two-point reduction for missing the deadline, another one-point reduction for a one-week delay, and zero thereafter. Late submission of the take-home assignment will lead to a three-point reduction for missing the deadline, two additional points for a one-week delay, and zero thereafter. Any waivers due to emergencies must be discussed with Student Affairs, who will then communicate with all relevant faculty.

Course Structure

The class includes lectures, readings, and independent computer lab work. You are strongly encouraged to relate the general material of the course to your specific policy interests throughout the course. Class attendance is critical as interaction within the classroom is an essential aspect of this course and the learning process associated with it.

Expectations

Reading e-mail: I will communicate to you through your NYU e-mail. I'm assuming you read it at least once a day.

Preparation before class: come prepared for each class having read the required material carefully. Given the nature of the material, you may find your first pass at a required article challenging; the first time through focus on the concepts and intuition (often found in the introduction).

Absenteeism, punctuality, and in-class conduct: You are expected to attend all classes, and arrive **on time**. Systematic tardiness, disruptive behavior (including side conversations, use of your cell phone, or using your computer for anything other than note taking) will negatively impact your grade. If you miss a class due to unavoidable circumstances, please contact another member of the class and ask him or her what was covered in class.

Books

There is no textbook for this course. The assigned readings (mainly articles) and lecture notes together will provide a self-contained treatment.

An introductory level book that covers similar material is:

Joshua Angrist and Jörn-Steffan Pischke, *Mastering Metrics*. Princeton: Princeton University Press, 2015.

This book blends an introduction to econometrics with the basic tools of causal inference we discuss in this course.

Two more technical references are:

Guido Imbens and Donald Rubin, *Causal Inference for Statistics, Social and Biomedical Sciences: An Introduction*. Cambridge: Cambridge University Press 2015. Many chapters will be assigned as supplemental reading.

Joshua Angrist and Jörn-Steffan Pischke, *Mostly Harmless Econometrics*. Princeton: Princeton University Press, 2009.

These books are more technically advanced than the material of our course, so are useful for students who wish to get a flavor of more advanced material or have an advanced reference at hand.

Schedule

- 6 September: Preliminaries and review
- 13 September: Introduction to causality
- 20 September: Randomized controlled trials: basics
- 27 September: Randomized controlled trials: advanced
- 4 October: Introduction to Stata and discussion of PS 1
- 11 October: Instrumental variables, a (re-)introduction, and **problem set 1 due**
- 18 October: Instrumental variables: advanced
- 25 October: Regression discontinuity, introduction, and OH for PS 2, 8.30 – 9.00 pm, after class
- 1 November: Regression discontinuity, advanced, and **problem set 2 due**
- 8 November: Matching, basics, and OH for PS 3, 8.30 – 9.00 pm, after class
- 15 November: Class discussion and tutorial for replication exercise, and **problem set 3 due.**
- 23 November: No class - Thanksgiving
- 29 November: Matching, advanced.
- 6 December: Difference-in-differences, OH for PS 4 8.30 – 9.00 pm, and **problem set 4 due.**
- 13 December: Take-home assignment and PS 5 discussion.
- 18 December: No class: **Problem set 5 and replication assignments due.**

Note: These due dates are tentative; they will be postponed if we have not covered the necessary material. Weekly office hours are 3.00 – 4.00 pm, by appointment, in 3004 Puck. The office hours listed above are special in- and after-class sessions that have been earmarked for the topics as indicated.

Readings

* denotes required, # denotes an advanced reading where you should only skim the non-technical portions. IR denotes chapters from Imbens-Rubin. MM denotes chapters from Angrist-Pischke's *Mastering Metrics*.

Topic 1: Causality and the Treatment Effect

*Holland, P. (1986), "Statistics and Causal Inference" (with discussion), *Journal of the American Statistical Association*, 81, 945-970.

IR, chapter 1.

James Heckman, "Causal Parameters and Policy Analysis in Economics: A Twentieth Century Perspective," *Quarterly Journal of Economics*, February 2000.

Topic 2: Introduction to Randomized

MM, Chapter 1.

* Joshua Angrist and Victor Lavy, "The Effect of High School Matriculation: Evidence from Randomized Trials," NBER Working Paper No. 9389.

* Esther Duflo and Emmanuel Saez, "The Role of Information and Social Interactions in Retirement Savings Decisions: Evidence from a Randomized Experiment," *Quarterly Journal of Economics*, August 2003

Cox, The Planning of Experiments, selected chapters (currently unavailable online; check the library if you are interested in this topic).

Topic 3: Randomized Experiments, Advanced Issues

IR, Chapters 4-7 and 9-11.

Cornish, Rosie (2006), "Statistics: An Introduction to Sample Size Calculations," manuscript.

Jones, S.R., S. Carley, and M. Harrison, "An Introduction to Power and Sample Size Estimation," *Emergency Medicine Journal*, Volume 21, Number 126, pp. 453-458.

Topic 4: Instrumental Variables, A Re-Introduction

#Angrist, J., G. Imbens, and D. Rubin, "Identification of Causal Effects Using Instrumental Variables" (with discussion), *Journal of the American Statistical Association*, 91, 444-72.

* Angrist, J., and William Evans, "Childrens and Their Parents' Labor Supply: Evidence from Exogenous Variation in Family Size," *American Economic Review* 88 (3), June 1998, pp. 450-77.

MM, Chapter 3.

Topic 5: Instrumental Variables, Advanced Topics

Imbens, Guido, and Jeffrey Wooldridge (2009), “Instrumental Variables with Treatment Effect Heterogeneity: Local Average Treatment Effects,” manuscript.

AR, Chapters 23-25.

Topic 6: Regression Discontinuity, Introduction

*Trochim, William, “The Regression-Discontinuity Design: An Introduction”, manuscript.

MM, Chapter 4.

Berk, Richard (2008), “Recent Perspectives on the Regression Discontinuity Design,” manuscript, Department of Statistics, University of Pennsylvania.

van der Klaauw W. (2002) ‘Estimating the Effect of Financial Aid Offers on College Enrollment: A Regression–Discontinuity Approach’, *International Economic Review* 43(4): 1249–1287.

Topic 7: Regression Discontinuity, Advanced Topics

Imbens, Guido, and Thomas Lemieux (2007), “Regression Discontinuity Designs: A Guide to Practice,” National Bureau of Economic Research, Technical Working Paper No. 337.

Catherine Hausman and David Rapson (2017), “Regression Discontinuity in Time: Consideration for Empirical Analysis,” NBER Working Paper 23602.

Topic 8: Matching, Introduction

* Stuart, Elizabeth (2009), “Matching Methods for Causal Inference: A Review and a Look Forward,” manuscript, Department of Biostatistics, Johns Hopkins University

* Abadie, Alberto, David Drukker, Jane Leber Herr, and Guido Imbens (2001), “Implementing Matching Estimators for Average Treatment Effects in Stata,” *The Stata Journal*, Volume 1, Number 1, pp. 1-18.

AR, Chapter 18.

Topic 9: Matching, Advanced Topics

Abadie, Alberto, and Guido Imbens, "Large Sample Properties of Matching Estimators for Average Treatment Effects," *Econometrica*, Volume 74 (No. 1, January 2006), pp. 235-267.

Matias Busso, John DiNardo, and Justin McCrary, "New Evidence on the Finite Sample Properties of Propensity Score Reweighting and Matching Estimators," manuscript.

Crump, Richard, Joseph Hotz, Guido Imbens, and Oscar Mitnik, "Dealing with Limited Overlap in Estimation of Average Treatment Effects," *Biometrika*, Volume 96 (No. 1, January 2009), pp. 187-199.

AR, Chapters 12-17.

Topic 10: Difference-in-Differences

* Meyer, Bruce, Kip Viscusi, and David Durbin (1995), “Workers’ Compensation and Injury Duration: Evidence from a Natural Experiment,” *American Economic Review*, Volume 85, Number 3, pp. 322-340.

MM, Chapter 5.