

New York University
Wilf Family Department of Politics
Summer 2023

Quantitative Research in Political Science I (POL-GA 1250)

May 23 - July 6, 2023

Summer intensive course for pre-Ph.D. track students in the NYU Politics M.A. program

Professor Patrick Egan

The goals of this class is to prepare you for a lifetime of research and scholarship on politics using quantitative analysis. The course is designed with the fact in mind that the pre-Ph.D. track of NYU's master's program requires that you understand sophisticated political science literatures and conduct your own high-level research in a relatively short span of time.

The objectives of this class are therefore to provide you with a thorough grounding in the basic tools of quantitative analysis as used by political scientists so that you can begin to (1) properly conduct your own research; (2) read and evaluate research conducted by other political scientists; and (3) prepare for the additional training you will need in order to answer questions about politics you find interesting and worthwhile. The purpose of the course is to get you up and running as a practitioner, and so at times our approach will emphasize applications at the expense of deep theory.

Logistics

Class meetings. We will meet on Tuesdays and Thursdays from 10 a.m. to 12:30 p.m. Eastern Time via Zoom. Although lectures will be recorded as a resource for your future reference, synchronous attendance is mandatory. There will also be a recitation ("lab") session held on Mondays and Wednesdays from 11:30 a.m. to 1:30 p.m. via Zoom.

Contact. I will not hold formal office hours but am available anytime. Email me with questions or to set up a time to talk: patrick.egan@nyu.edu.

Teaching assistant. Justin Melnick (melnickj@nyu.edu), who is in his fourth year of NYU's Politics Ph.D. program, is our teaching assistant. He will handle problem sets and is your resource for understanding what we cover together in class. He will also conduct the recitation section and is your resource for learning R, the statistical software program on which we will be training you this semester.

Course website. Assignments, resources and datasets will be posted on our Brightspace site.

Course requirements and grading

Your grade will be determined as follows:

Problem sets	40%
Midterm exam	25%
Final exam and lab report	35%

Problem sets will typically be distributed on Wednesday (due Friday) and Friday (due Sunday). Problem sets must be typeset in LaTeX; our first recitation meeting will cover the basics of using the LaTeX system.

Texts

Econometrics. This course will not follow any particular econometrics text, but I encourage you to become familiar with at least one. I will recommend readings from the following three texts, which range from the simplest to most sophisticated treatments. (Note that sophisticated does not necessarily imply better; you will learn more quickly and deeply if you start with a text that is at your level.)

- James H. Stock and Mark W. Watson, *Introduction to Econometrics*. (“S&W”)
 - Chapter references here are to the latest (4th) edition, although most material is covered in earlier (less expensive) editions, too.
- Jeffrey Wooldridge, *Introductory Econometrics: A Modern Approach*. (“W”)
 - Chapter references here are to the 6th edition, although most material is covered in earlier (less expensive) editions, too.
- Bruce E. Hansen, *Probability and Statistics for Econometrics* and *Econometrics*. (“PSE” and “E,” respectively)

Statistical Computing. There are many free resources available on the web for learning R. We will provide them to you as the course progresses.

Research Design. Our final few classes will provide a brief introduction to the challenges of drawing causal inferences in studies with observational data. Stephen L. Morgan and Christopher Winship’s *Counterfactuals and Causal Inference* (2nd edition) (“M&W”) will serve as a supplementary text. This book is available electronically via NYU Libraries (link); I’ll point you to specific selections as we cover these topics.

Helpful information about accessing NYU Libraries electronic resources from off campus may be found here: <https://library.nyu.edu/services/computing/off-campus/>.

Schedule of topics

- Lecture 1 (Tues May 23). *What We’ll Learn Together. Estimators and Probability Basics/Refresher.*
 - Readings:
 - * S&W Ch. 2.
 - * W Appendix B.
 - * SPE Chs. 1-5.
 - Lab 1 (Weds May 24). Introduction to LaTeX; Introduction to R.
- Lecture 2 (Thurs May 25). *Statistics Basics/Refresher.*
 - Readings:
 - * S&W Ch. 3.
 - * W Appendix C.
 - * PSE Chs. 6-9, 13-14.
 - Lab 2 (**Rescheduled for Fri May 26**). Using R to analyze data.

- **No lab** Monday, May 29.
- Lecture 3 (Tues May 30). *Relationships between two variables: Chi-squares, correlations, and regression coefficients.*
 - Readings:
 - * S&W Ch. 4.
 - * W Ch. 2.
 - * E Chs. 2, 3, 4.
 - Lab 3 (Weds May 31). Descriptive Statistics and Basic Inference with R.
- Lecture 4 (Thurs June 1). *OLS: Mathematical properties; associated statistics; variable transformation; inference.*
 - Readings:
 - * S&W Ch. 5.
 - * W Ch 2.
 - * E Chs. 5 and 7.
 - Lab 4 (Mon June 5). Scatterplots and regression lines in R. Interpreting bivariate OLS in R. Variable transformation in R.
- Lecture 5 (Tues June 6). *OLS: Hypothesis testing; heteroskedasticity; binary x ; when it's BLUE.*
 - Readings:
 - * S&W Ch. 5.
 - * W Ch 2, 7, 8.
 - * E Ch. 9.
 - Lab 5 (Weds June 7). Linear regression in R: hypothesis testing, heteroskedasticity-robust standard errors, and other topics. Exporting publication-ready tables from R into LaTeX.
- Lecture 6 (Thurs June 8). *Examining bivariate relationships agnostically with lowess. The threat of confounding and why we control. Multiple regression.*
 - Readings:
 - * S&W Ch. 6.
 - * W Chs. 5, 6.
 - * revisit E Chs. 2, 3-5, 7, 9.
 - Lab 6 (Mon June 12). Lowess smoothing in R. Interpreting multiple regression in R. Matrix algebra basics.
 - * Parts I, II and III of “(Just about) Everything You’ll Ever Need to Know About Matrix Algebra to Understand OLS in Matrix Form” here.

- Lecture 7 (Tues June 13). *A brief tour of OLS in matrix form. Measures of fit. Multicollinearity. Categorical regressors.*

- Readings:

- * Part IV of “(Just about) Everything You’ll Ever Need to Know About Matrix Algebra to Understand OLS in Matrix Form” here.
- * S&W Ch. 8, Ch 19.
- * W Ch 7; Appendix D and E.
- * Revisit E Chs. 2, 3-5, 7, 9.

- Lab 7 (Weds June 14). Multiple regression in R: advanced topics.

- Lecture 8 (Thurs June 15). *Polynomial and interaction regressors. Joint hypothesis tests.*

- Readings:

- * S&W Ch. 8.
- * W Ch 7.
- * Revisit E Chs. 2, 3-5, 7, 9.

- Lab 8 (**Rescheduled for Friday June 16**). Midterm examination review.

*****Weekend of Fri June 16 through Mon June 19: Self-Administered Midterm Examination*****

- **No lab** Monday June 19.

- Lecture 9 (Tues June 20). *OLS odds and ends, including average predictive margins, influential observations, “partialling out,” and OLS with survey weights (“WLS”).*

- Readings:

- * Penn State STAT 462. “Influential Points.” Skim.
- * Pew Research Center, “For Weighting Opt-In Samples, What Matters Most?” Read pp. 1 -14, skim the rest.
- * CRAN, “An introduction to ‘margins’”

- Lab 9 (Mon June 21). Average predictive margins, influential observations, and survey weights in R.

- Lecture 10 (Thurs June 22). *Regression with Limited and Count Dependent Variables.*

- Readings:

- * S&W Ch. 11.
- * W Ch 17.
- * E Ch. 25.

- Lab 10 (Mon June 26). Regression with Limited and Count Dependent Variables in R.

- Lecture 11 (Tues June 27). *Causal Graphs. The Experimental Ideal. The Causal Inference Toolkit. Instrumental Variables (IV) Estimators.*
 - Readings:
 - * M&W Chs 1, 3, 4, 9.
 - * S&W Chs. 12 and 13.
 - * W Ch. 15.
 - * E Ch. 12.
 - Lab 11 **Prerecorded and released Thurs June 28.** Analysis of IV Designs with R.
- Lecture 12 (Thurs June 29). *Regression Discontinuity (RD) Estimators. Difference-in-Differences (D-in-D) Estimators.*
 - Readings:
 - * S&W Chs. 10 and 13.
 - * W Chs 13 and 14.
 - * E Chs. 18 and 21.
 - * M&W Ch. 11.
 - * Cattaneo, Idrobo, and Titiunik, *A practical introduction to regression discontinuity designs: Foundations*. NYU Libraries link [here](#).
 - Lab 12 (to be scheduled around Fri June 30). Analysis of RD and D-in-D designs with R. Review for final exam.

*****End-of-Semester Take-Home Exam and Lab Report Due Friday, July 6*****