Poli 204b: Quantitative Methods 1

Instructor: D. Alex Hughes
Lab Instructor: David Lindsey
Dates: 7 October – 23 December 2014
Room: SSB 104 & SSB Computing Lab

Introduction and Course Objectives

This course provides an introduction to the use of quantitative methods in the study of political actions. By the end of this course, you will be able to do everything necessary to conduct basic quantitative research and communicate your findings to your peers and colleagues. You will be equipped to conduct quantitative work, including establishing a sampling framework, method of estimation, and interpretation of results. We will learn the statistical programming language R which will enable you to access, create, prepare, analyze, report, present and explain your results.

Reasons to take this course

1. You have to.
2. No matter your field of study, understanding quantitative methods can likely improve your own work and your ability to read colleagues' work. Nearly every first-year PhD student in political science in the United States will be taking a course like this one.
3. The skills you will learn in this course are absolutely essential for your success in graduate school and academia. They will let you conduct the research that will get you an academic job.
4. Finally, believe it or not: this stuff is fun. I love it, and I'll try and share that with you.

Study Methods

Work hard, work often, and work together.

This course will be challenging. The content is challenging, and inherently cumulative. We will move fast. If you do not keep up, you will quickly find yourself too far behind to catch up. Hence you should not expect to be able to blow off this class until the week before the final, unless you are trying to fail (in which case I will be happy to oblige you). I suggest that you review your class notes frequently and try to apply the methods we learn in class immediately, both "by hand" with pencil and paper, and using statistical software.

Working together on assignments will help. If nothing else, misery loves company. But students frequently learn a great deal from each other.

I will work with you to achieve your goals. Contact me with questions. Come to my office hours. If you can't make office hours, we will schedule another option. I want you to "get this" and to succeed now and with your careers.

Meetings

We will meet Tuesdays from 12:00pm to 2:50pm. Most of that time will be lecture, focusing on the intuition and theory behind core concepts. We will also have some student presentations, and we may have some computer lab time.

David Lindsey, the teaching assistant, will organize an open and optional lab/section meeting. Section will focus on statistical computing – programming in R, typesetting in LaTeX, although he will also review concepts covered in lecture. He will work with you to set a time that works.

Evaluation

- Assignments: 50%

  There will be weekly homework assignments that will include traditional "pencil and paper" assignments, as well as statistical computing exercises. I encourage you to work together on all homework assignments, but your final product must be your own.

  A paper copy of homework assignments are due at the beginning of each class. In addition, for computing assignments, you will submit a copy of your code electronically to David and I. This will allow us to give you precise feedback.

  In the second half of the course, assignments will include your own data analysis projects and class presentations of your findings.

  David will not grade any assignment that requires him to *search* through hundres of pages of printout for an answer. Late assignments will not be accepted and will receive 0 points.

- Final Exam: 50%

  The final is scheduled for Friday, 19 December, 2014 from 11:30am – 2:30pm. Yes, this is suboptimal. No, we will not be working around your flights unless you have a *really* compelling reason.

Policy on Academic Integrity

Students are expected to maintain the highest standards of academic integrity. Cheating, plagiarism and other forms of academic dishonesty will not be tolerated and will be subject to disciplinary action consistent with University rules and regulations. Students are expected to familiarize themselves with University regulations regarding plagiarism and academic dishonesty. If you have any doubt as to what is expected in these regards, please ask.

Textbooks

John Fox's *Applied Regression Analysis and Generalized Linear Models* should be available at the University bookstore. Additionally, there are many copies available around the 4^{th} floor of SSB.

The Fox regression book is fairly challenging and assumes significant prior knowledge. If you are very uncomfortable with the material, you may wish to review a supplemental texts. A basic statistics textbook will provide more examples and intuition, and might be a useful complement

to Fox. One that I like is De Veaux, Velleman and Bock's *Intro Stats*. For basic math skills, two possible supplemental texts are (1) Alpha Chiang's *Fundamental Methods of Mathematical Economics*; and, (2) Simon & Blume's, *Mathematics for Economics*, which we used in POL270.

There are many (so many) hypothesis tests out there. Gopal K. Kanji's *100 Statistical Tests* has, well 100 of them.

Normal Matloff's *The Art of R Programming* is an exceptionally well liked introduction to R.

Additional Readings

In addition to the required text, there are some articles that you will probably be asked to read, depending on how our schedule evolves. They are listed below, and scheduled in the course outline later in this syllabus.

- Beck, Neal. 2006. "Is Causal-Process 'Observation' an Oxymoron?". *Political Analysis*. 14(3): 347-352.
- Collier, David, Henry E. Brady and Jason Seawright. 2012. "Outdated Views of Qualitative Methods: Time to Move On". *Political Analysis*. 18:506-513.
- Jacobson, Gary C. "The Marginals Never Vanished: Incumbency and Competition in Elections to the U.S. House of Representatives, 1952-82" American Journal of Political Science, Vol. 31, No. 1. (Feb., 1987), pp. 126-141.
- Mahoney, James and Gary Goertz. 2006. "A tale of two cultures: contrasting quantitative and qualitative research". *Political Analysis*. 14(3): 227-249.
- Mayhew, David R. "Congressional Elections: The Case of the Vanishing Marginals" Polity, Vol. 6, No. 3. (Spring, 1974), pp. 295-317.
- Schrodt, Philip A. 2010. "Seven Deadly Sins of Contemporary Quantitative Political Analysis"

Software

We will primarily learn to use R this quarter, although if there is enough interest, we will also cover Stata.

R is a free, open-source statistical computing package available online at: http://cran.r-project.org. R is incredibly versatile, affordable (free!), and will allow you to easily estimate your own models and create custom graphs. David Lindsey is a *very* skilled programmer, a good teacher, and he and I see eye-to-eye on how scientific research should be conducted. We are going to force this on you as well.

Avoid the Excel trap at all costs. Some of the assignments in this course *can* be completed in excel, though you will probably do most of them wrong. In addition, if you avoid learning a "real" package you will regret it for the rest of your career.

If you are already well-trained in another package, SPSS or SAS for example, resist the urge to fall back on what you already know. Although the more "multilingual" you are in statistical software the easier your research will be, I would encourage you to use this quarter as an intensive study in R.

The Syllabus

The syllabus and course outline is intended to provide an overview of the course. You cannot claim any rights from it. In particular, scheduling and dates may change. Although the syllabus should be a fairly reliable guide for the course, official announcements are always those made in class.

New This Quarter / Caveats

As time allows, I will work in some new topics this quarter, including heteroscedasticity, time-series, missing data imputation, matching, regression discontinuity, small and large-sample non-parametric, and an overview of Bayesian methods. That's ALOT of material, but if I can give you an intuitive understanding of some of these topics you'll be in great shape after just a quarter.

We'll also at least partly use the university's online course resources, all at ted.ucsd.edu. If you are not enrolled in the course, I'll need to get you access - please remind me. The site is most useful for massive undergraduate courses, but two things might be especially useful for us: the online discussion forums and the online gradebook. We'll give it a shot; please let me know if you have any suggestions.

Assigments and Lectures

Week	Topic	Reading
1	Introduction, Visualizing Data, Summary Statistics Probability (reprise)	Fox 1,3, D1-D4 Opt: Schrodt.
2	Hypothesis Tests & Competing Approaches to Inference	DeGroot 8 Opt: Goertz, Beck,
3	Introduction to Regression	Fox 2, 5.1
4	Multiple Regression and Matrix Algebra	Fox B.1, 5.2
5	Assumptions & Inference: Gauss-Markov, when, & why regression is *"good"*	Fox 6
6	Extensions: Dummy Variables and Interactions Analysis of Variance, F-tests and Model Fit	Fox 7 Fox 8
7	Diagnostic Tools and Fixes: What's wrong, & how bad is it?	Fox 11,13
8	Relaxing & Violating Assumptions, Getting Standard Errors "Right"	Fox 9, Fox 12.2
9	Conditional Expectation, Potential Outcomes Student Presentations	A & P Chs 1-3
10	Potential Outcomes and Regression for Treatment Effects	A & P Chs 1-3