

POL 204b: Quantitative Methods I

Fall 2015

MW 9:00-? SSB104

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Introduction and Course Objectives

This course provides an introduction to the use of quantitative methods in the study of political phenomenon. By the end of this course, you will be able to do everything necessary to conduct basic quantitative research. You will properly and present explain a variety of statistics, both graphical and numerical. You will be equipped to critically analyze others' quantitative work, including their sample framework, methods, and analysis. You will also learn how to use two (or more) statistical software programs, and be able to access and create datasets, prepare them for analysis, and produce, present, and explain results. These skills will be useful in reading, understanding, and conducting research in political science, as well as in many other disciplines.

Reasons to take this course

You have to.

Nearly every first-year PhD student in political science in the United States will be taking a course like this one. Regardless of your field of study, quantitative methods can probably be applied to your research questions of interest. Most of you will use statistics to write course papers, conference papers, Masters' Theses, and Dissertations while at the University of California. Most of you will also use these methods in your professional career. The skills you will learn in this course are absolutely essential for your success in graduate school and academia. They will help you understand the logic of science, read and understand current research, and, ultimately, make it more likely that you will get a good academic job.

If you have absolutely no interest whatsoever in the use of statistics to answer political questions, you should still take this class. You will need the skills in this class (and its sequels) to communicate with and critique the work of other scholars. Also, should you choose to leave academia, solid quantitative skills are very marketable and may help you find employment.

If you are not yet convinced, wait and see. Many anti-quantitative students change their opinions after a few courses on statistics, when they see how powerful these skills can be for answering real and very important questions.

Finally, believe it or not: this stuff is fun.

Preparation

One of the challenges in planning a course like this one is the diversity of the target audience. Some of you already have advanced quantitative training; others haven't seen algebra since high school. My goal is to help everyone in this course become a solid applied statistician.

That said, this course is targeted to an audience with no previous experience in statistics. You should have reasonable math skills, AND be willing to work hard. Calculus is NOT required, but more math is always better. The stronger your math skills, the easier it will be for you to grasp the concepts in this class.

That said, math skills won't guarantee success, and a lack of recent practice won't guarantee failure. Often the most technically skilled students have

difficulty keeping their theoretical feet on the ground, and the least technically skilled students prove the most able to link methods to real questions.

Study Methods

Work hard, work often, and work together.

This course will be challenging. The subject is hard, and we will move fast. The material covered in this course is inherently cumulative. 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.

Meetings

The class meets for a lecture on Tuesday from 9:00 am to 11:50 am, and during an additional lab section which will be scheduled at your convenience. Lecture will explore the intuition and theory behind core concepts. We will also have some student presentations, and we may have some computer lab time. Lab meetings will focus on statistical software, homework assignments, and addressing any other questions you have.

Evaluation

- Assignments: 50%

There will be weekly homework assignments that will include traditional “pencil and paper” assignments, as well as statistical computing exercises. If the assignments are short, these will be fully graded. For longer problem sets, we may grade only a sample of the problems. Half the points will be given for simply completing the assignment, the other half for completing it correctly. I encourage you to work together on all homework assignments, but your final product must be your own.

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

Homework assignments will be due at the beginning of each class. Electronic submissions will not be accepted, unless specifically requested in that format.

- Final Exam: 50%

There will be a cumulative final exam as scheduled by the university. According to the schedule of classes, the exam will be Thursday, December 10th, 2015, from 8:00 to 11:00.

Late assignments will not be accepted and will receive 0 points.

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.

Additional Information

This syllabus is also posted on the course “TED” website. Assignments, updates, and other information will be posted there during the quarter.

Materials

Textbooks

The following textbook should be purchased:

Fox, John. *Applied Regression Analysis and Generalized Linear Models*

The Fox book has a number of additional resources available online. There is a website for the book, which includes errata, datasets, and appendices (some of which are assigned): <http://socserv.mcmaster.ca/jfox/Books/Applied-Regression-2E/index.html>

To supplement the text, there is a website at UCLA which has computer programs written for Stata, SAS, and SPSS to reproduce the analysis in each chapter: <http://www.ats.ucla.edu/stat/examples/ara/>

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 and Velleman: *Intro Stats*.

This book sometimes comes bundled with “Activstats” which comes with a number of additional multimedia resources and software tools, including a student version of DataDesk (see below).

For basic math skills, two possible supplemental texts are:

Chiang, Alpha, *Fundamental Methods of Mathematical Economics*

or

Simon & Blume, *Mathematics for Economics*, which is usually used in POL270.

I used to suggest that students peruse the following, but the entire content is now accessible online:

Kanji, Gopal K. 2006. *100 Statistical Tests*. Sage Publications: Thousand Oaks.

If you want a basic and intuitive introduction to some of the more advanced methods, consider:

Kennedy, Peter. 2003. *A Guide to Econometrics*. The MIT Press: Cambridge.

More technical is the following by William Greene. This text is/was widely used in first-year courses in “econometrics”, which is what economists like to call statistics. Many economics departments will have their first-year PhD students cover the entire text over the course of their first year.

Greene, William. 2003. *Econometric Analysis*. Prentice Hall..

Those of you that remember the age of the dinosaurs may be curious and wish to see the following. The comments on the volume’s Amazon page are particularly amusing.

The Rand Corporation. 2001. *A Million Random Digits with 100,000 Normal Deviates*

You may wish to purchase the following as well, an exceptionally well-liked introduction to R. However, you can probably learn quite a bit of R on your own using web resources.

Matloff, Normal. 2011. *The Art of R Programming*

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.

Cleveland, William W. and Robert McGill. "Graphical Perception and Graphical Methods for Analyzing Scientific Data" *Science* (New Series). 229:4716(August 30, 1985). 828-833.

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"

James O. Berger and Donald A. Berry. 1988. Statistical Analysis and the Illusion of Objectivity *American Scientist* Vol. 76, No. 2 (March-April 1988), pp. 159-165

Software

We will learn the basics of two statistical packages this fall: Stata and R.

R is a free, open-source statistical computing package available online at: <http://cran.r-project.org>. Learning R is challenging, and sometimes a bit of a headache. But it is incredibly powerful, affordable (free!), and will allow you to easily estimate your own models and create custom graphs. Think of it as the workshop or laboratory equipment.

Stata is a commercial, but relatively inexpensive software package. It is probably the most-used software package by political scientists today. It includes "canned" routines for most estimation procedures, and can be pro-

grammed to estimate any custom function. It is available in the labs. You may wish to purchase it under your academic discount. It comes with a getting started manual. There are extensive online resources, most notably at UCLA's statistical consulting website:

"<http://www.ats.ucla.edu/stat/stata/sk/default.htm>". In addition, online courses are available from Stata's website, "www.stata.com"; consider spending \$150 or so to take one or two next summer.

Stata's strengths include ease of use, a wide range of estimation procedures and some nice graphics. It has some limitations in advanced data management, is missing some advanced statistics, and Stata has the annoying habit of making subtle changes in syntax and file formats across versions. Think of Stata as the minivan of packages. It may not be the best for certain applications, but it will do almost anything. But don't try an engine swap.

Stata now comes in four versions: Small (mostly for small datasets used in undergraduate courses), IC (Intercooled, the base model), SE (Special Edition, handles bigger datasets), and MP (big datasets and parallel processing). If you KNOW you will be working with big datasets right away, consider Stata/SE or Stata/MP. If you aren't sure yet, get Stata/IC and use a lab computer (or your colleagues' computers) if you exceed IC's capabilities.

Why learn two packages? To be honest, two won't be enough. Although some will tell you otherwise, there is no perfect statistical package - all have their strengths and weaknesses. Learning both packages will give you more power and flexibility to accomplish basic statistical computing. Having familiarity with three or four packages will assure you give you the flexibility to work across platforms, co-authors, and computing problems.

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.

There are two other widely used statistical software programs (SAS and SPSS) and many other specialized programs (Limdep, BUGS, Gauss, Xlisp-stat, and so on). We can discuss their utility during the course.

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.

Other

We'll 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.

Assignments and Lectures

All reading should be completed before class. I may call on individual students to participate in discussions. I reserve the right to adjust the lecture and reading schedule as needed. Weekly topics and readings are listed below.

Week	Topic	Reading
1	Introduction, Visualizing Data, Basic Statistics, Probability Review	Fox 1,3 Opt: Schrodtt.
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	Inference and Regression Gauss-Markov	Fox 6
6	Extensions: Dummy Variables and Interactions Analysis of Variance, F-Tests, and Model Fit	Fox 7, 8
7	Diagnostic Tools and Fixes Student Presentations	Fox 11,13
8	Relaxing Regression Assumptions: Problems and Solutions Student Presentations	Fox 12, 4 Fox 14
9	Causal Inference and Potential Outcomes Student Presentations	A&P 1-3
10	Maximum Likelihood and Friends Student Presentations	