PLAD 7100
Political Research With Quantitative Methods
Fall 2017

Statistics component
Tuesday & Thursday
11:00am–12:15pm
Nau Hall 142

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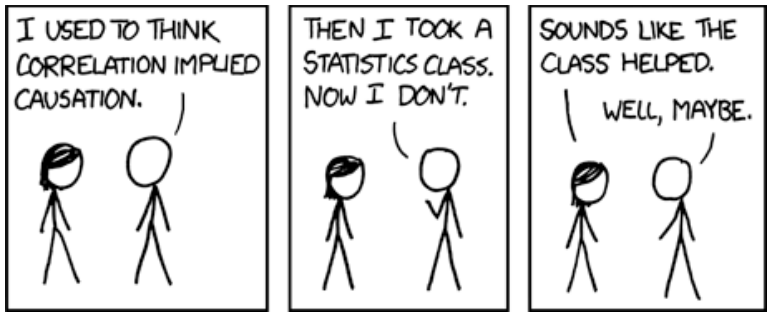
Office hours: TBA & by appointment

Math component
Monday
9:00am-10:15am
TBD

Jon Kropko

"Inductive logic is unlike deductive or symbolic logic. In deductive reasoning, when you have true premises and a valid argument, the conclusion must be true too. Valid deductive arguments do not take risks. Inductive logic takes risks. You can have true premises, a good argument, but a false conclusion. Inductive logic uses probability to analyse that kind of risky argument."
— Ian Hacking. 2001. *An Introduction to Probability and Inductive Logic*, xi.



http://xkcd.com/552/

PLAD7100 includes two semi-autonomous components: statistics and math. The statistics component of this course will introduce you to some basic theory and methods for conducting quantitative analyses in political science, with a focus on statistics and data analysis. The mathematics component will introduce you to the mathematical background that will be used (to some extent) in this course and that will be assumed in future quantitative methodology courses. The primary goals are to give you tools to begin applying quantitative methods to explore and evaluate political science theories, to prepare you for further coursework, and to situate statistics within the broader endeavor of data analysis (and that within the broader endeavor of research).

Thus, in the statistics component we will begin at the beginning—with basic probability theory—then move through single-variable statistical analysis, and conclude with regression analysis. The lectures and problem sets will include a moderate amount of statistical theory, because I believe strongly that familiarity with the underlying theory is critical to the smart application of statistical techniques, but will emphasize the relevance of that theory to data analysis. The later problem sets will shift the emphasis toward application and data analysis.

There are no prerequisites for the course.

Both components are required; that is, you may not take one without the other.

This document describes the statistics component; see the separate math component syllabus for information on that component.

Course Requirements
Requirements for the course include lectures, reading, homework assignments, a midterm exam, and a final exam.

The midterm will be held in class as noted on the syllabus below. The final will be a timed take-home. You will be allowed one page of notes (8½ by 11, front only) for the midterm, and two pages for the final.

Understanding statistics requires learning by doing, and for that reason there are a number of homework assignments—about one a week. The early assignments will consists of "paper-and-pencil" exercises to help solidify your understanding of basic concepts and procedures; the later assignments will ask you to conduct analysis of real political science data that I provide. I encourage group work on homework assignments, although each student should write up and turn in his or her own set of answers.

This year I will experiment with "flipping the classroom," so in some cases you will be required to watch videotaped lectures in advance of class, and then work on exercises in-class.

Because the material in this course is cumulative, and because the in-class exercises will be critical to your learning, attending class consistently and staying current on the reading and homework is absolutely vital for your success. *Therefore, no incompletes will be given in this course*, barring extraordinary circumstances. In addition, I do not recommend auditing, though I don't forbid it. If you audit the course, I strongly encourage you to attend consistently and to complete the reading and homework assignments.

The statistical software we will use is Stata (http://www.stata.com). The software and documentation are available on the computers in the Politics Department computer lab in Gibson Hall, as well as on some computers in other ITS computer labs (see http://www.itc.virginia.edu/labs/listSoftLocations.php?soft_title_id=125 for a listing). Stata is also available through the "UVa Hive," a virtual computer lab that you can connect to remotely. See http://itc.virginia.edu/hive/ for details on installing the appropriate software on your computer (and your iPad!) to access the Hive.

Though you do not need to purchase your own copy of Stata, you may wish to do so, especially if you anticipate further empirical work beyond this course. It is available for Windows, Mac, and Unix/Linux platforms at a discount through ITS. See http://statlab.library.virginia.edu/research-software-support/stata/ for purchase information; also note, though, that prices for student are slightly lower, here: https://www.stata.com/order/new/edu/gradplans/student-pricing/. (A*ny of the "flavors" of Stata—IC, SE, or MP—will be sufficient to analyze the data sets for this class.)*

Readings
There are several required books for this course. They should be available from the campus bookstore; used copies—especially of the Wonnacott and Wonnacott book—are readily available on-line at a substantial discount.

Abelson, Robert P. 1995. *Statistics as Principled Argument*. Hillsdale, NJ: L. Erlbaum Associates. ISBN 0805805281

Achen, Christopher H. 1982. *Interpreting and Using Regression*. Thousand Oaks, CA: Sage. ISBN 0803919158

Acock, Alan C. 2016. *A Gentle Introduction to Stata*. Rev. 5th ed. College Station, Texas: Stata Press. ISBN 978-1-59718-185-3.

Wonnacott, Thomas H. and Ronald J. Wonnacott. 1990. *Introductory Statistics for Business and Economics*. Fourth Edition. New York: John Wiley & Sons. ISBN 978-0471615170.
You should be able to find this book online at substantially less than the new and used copies at the bookstore. I will make the first several chapters available on the course web site so you have time to order it.

In addition, we will read substantial portions of the following book, which is unfortunately out of print. I will make available copies of the relevant sections.

Kelejian, Harry H. and Wallace E. Oates. 1989. *Introduction to Econometrics: Principles and Applications.* Third Edition. New York: Harper and Row.

Copies of assigned articles and other readings will be available on-line.

Note: At the end of the syllabus I include a set of references to *Stata Journal* articles, most written by Nicholas Cox, that explain some tips, tricks, and useful techniques for managing data, creating analysis graphs, and presenting model results. These are all supplementary (and optional) but they contain a wealth of useful Stata lore.

Homework schedule
A homework assignment will be posted in the "Resources" section of the Collab site weekly, due in class the following week.

Course Schedule and Outline

August 22: Welcome & Introduction to the Course

August 24: No class

August 29 & 31: Basic Probability & Descriptive Statistics
Wonnacott & Wonnacott, skim chapter 1, read sections 2-1, 2-2, 2-3 & 2-6; chapter 3

September 5 & 7: Probability Distributions and Random Variables
Wonnacott & Wonnacott, chapters 4-5

September 12 & 14: Sampling and Point Estimation & Introduction to Statistical Computing using Stata
Wonnacott & Wonnacott, chapters 6-7

Abelson, chapter 1

Acock, chapters 1-3

Optional: Stata Documentation; in particular *Getting Started with Stata* and selections from the *Stata User's Manual*

September 19 & 21: Interval Estimation and Hypothesis Testing
Wonnacott & Wonnacott, chapters 8-9

Abelson, chapter 2

Acock, chapters 4, 7

Cohen, Jacob. 1994. "The Earth is Round (p<.05)" *American Psychologist* 49(12):997-1003.
Available from Collab.

September 26 & 28: Univariate & Bivariate Data analysis
Wonnacott & Wonnacott, section 2-7

Abelson, chapter 3

Kastellec, Jonathan P., and Eduardo L. Leoni. 2007. "Using Graphs Instead of Tables in Political Science." *Perspectives on Politics* 5(4), **pages 755-763**.

Schwabish, Jonathan A. 2014. "An Economist's Guide to Visualizing Data." *Journal of Economic Perspectives* 28 (1):209-34.

Acock, chapter 5

Optional supplementary readings

Epstein, Lee, Andrew D. Martin, and Matthew M. Schneider. 2006. "On the Effective Communication of the Results of Empirical Studies, Part I." *Vanderbilt Law Review* 59(6):1811-71.

Epstein, Lee, Andrew D. Martin, and Christina L. Boyd. 2007. "On the Effective Communication of the Results of Empirical Studies, Part II." *Vanderbilt Law Review* 60(3), **pages 801-31**.

Healey, Christopher G., and J. T. Enns. 2012. "Attention and Visual Memory in Visualization and Computer Graphics." *Visualization and Computer Graphics, IEEE Transactions on* 18 (7):1170-88.

October 3: UVa Reading Day (no class)

October 5: Tabular Data Analysis, Chi-Square; Multivariate Analysis
Wonnacott & Wonnacott, chapter 17

Abelson, chapter 4

Acock, chapter 6

Murnane, Richard J. and John B. Willett. "Reducing Observed Bias by the Method of Stratification." In *Methods Matter: Improving Causal Inference in Educational and Social Science Research,* 286-304

October 10 & 12: Bivariate Regression I
Wonnacott & Wonnacott, chapter 11 and 12-1, 12-2

Achen, pages 1-37

Kelejian & Oates, pages 1-9, 25-33, and 43-86

Acock, chapter 8

October 17: Review, catch up, mustard

October 19: **Midterm Exam in class (material through 10/5)**

October 24 & 26: Bivariate Regression II: Topics
Wonnacott & Wonnacott, 12-3 through 12-5

Achen, pages 37-51

Kelejian & Oates, pages 89-104 & 123-131

Abelson, chapter 5

Optional supplement if you ever read work in social psychology: Acock, chapter 9

October 31 & November 2: Multiple Regression I
Wonnacott & Wonnacott, chapter 13

Kelejian & Oates, chapter 4 (134-161) and 200-202

Acock, chapter 10

November 7 & 9: Multiple regression II
Kastellec, Jonathan P., and Eduardo L. Leoni. 2007. "Using Graphs Instead of Tables in Political Science." *Perspectives on Politics* 5(4), **pages 763-768**.

Epstein, Lee, Andrew D. Martin, and Christina L. Boyd. 2007. "On the Effective Communication of the Results of Empirical Studies, Part II." *Vanderbilt Law Review* 60(3), **pages 831-46**.

Abelson, chapter 6

November 14 & 16: Regression Topics: colinearity/micronumerosity, dummy variables, interaction terms
Achen, pages 51-79

King, Gary. 1986. "How Not to Lie With Statistics: Avoiding Common Mistakes in Quantitative Political Science." *American Journal of Political Science* 30(3):666-87.
Available from Collab; also from http://links.jstor.org/sici?sici=0092-5853%28198608%2930%3A3%3C666%3AHNTLWS%3E2.0.CO%3B2-3.

Kelejian & Oates, pages 205-211 and 178-186

Abelson, chapter 7

November 21: Regression Topics: non-linear relationships, outliers, model specification
Wonnacott & Wonnacott, chapters 14

Bartels, Larry M. 1990. "Five Approaches to Model Specification." *Political Methodologist* 3(2):2-6.

Kelejian & Oates, pages 251-256

Abelson, chapter 8

November 23: No class (Thanksgiving)

November 28 & 30: Regression, matching, and "causal inference"
Miller, Michael K. 2013. "The Uses and Abuses of Matching." Working Paper, George Washington University.
https://sites.google.com/site/mkmtwo/Miller-Matching.pdf

Justin Esarey's blog comments on Miller, and the ensuing discussion, at
http://politicalmethodology.wordpress.com/2013/07/25/matching-madness-causal-inference-in-political-methodology/

Abelson, chapter 9

December 5: Review, catch up, and "where do we go from here?"

Final exam will be a closed-book, timed, take-home exam taken within a 48-hour window after classes end. Precise timing TBA.

Stata Journal Articles of Interest

Tables of estimation results

Gallup, John Luke. 2012. "A New System for Formatting Estimation Tables." *Stata Journal* 12(1):3-28.

Cox, Nicholas J. 2012. "Speaking Stata: Output to Order." *Stata Journal* 12(1):147-158.

Newson, Roger B. 2012. "From Resultssets to Resultstables in Stata." *Stata Journal* 12(2):191-213.

In addition, see my handout, "Producing Presentation-Quality Tables and Figures for Regression Models," which describes my own command, mktab, as well as a few other options.

Data management and tabulation

Cox, Nicholas J. 2011. "Speaking Stata: Compared With ..." *Stata Journal* 11(2):305-314.

Baum, Christopher F. and Nicholas J. Cox. 2007. "Stata Tip 45: Getting Those Data Into Shape." *Stata Journal* 7(2):268-271. http://www.stata-journal.com/sjpdf.html?articlenum=dm0031

Cox, Nicholas J. 2003. "Speaking Stata: Problems with tables, Part I" *Stata Journal* 3(3):309-324. http://www.stata-journal.com/sjpdf.html?articlenum=pr0010

Graphing

Cox, Nicholas J. 2010. "Speaking Stata: Graphing Subsets" *Stata Journal* 10(4):670-681.

Cox, Nicholas J. 2010. "Speaking Stata: The statsby Strategy" *Stata Journal* 10(1):143-151.

Buis, Maarten L. and Martin Weiss. 2009. "Stata Tip 81: A Table of Graphs." *Stata Journal* 9(4):643-647.

Cox, Nicholas J. 2009. "Speaking Stata: Paired, Parallel, or Profile Plots for Changes, Correlations, and Other Comparisons." *Stata Journal* 9(4):621-639.

Cox, Nicholas J. 2008. "Speaking Stata: Between Tables and Graphs." *Stata Journal* 8(2):269-289. http://www.stata-journal.com/sjpdf.html?articlenum=gr0034

Cox, Nicholas J. 2008. "Stata tip 27: Classifying data points on scatter plots." *Stata Journal* 5(4):604-606. http://www.stata-journal.com/sjpdf.html?articlenum=gr0023

Cox, Nicholas J. 2008. "Speaking Stata: Graphing Categorical and Compositional Data." *Stata Journal* 4(2):190-215. http://www.stata-journal.com/sjpdf.html?articlenum=gr0004

Model Interpretation

Williams, Richard. 2012. "Using the margins Command to Estimate and Interpret Adjusted Predictions and Marginal Effects." *Stata Journal* 12(2):308-331.

Jann, Ben. 2013. Plotting regression coefficients and other estimates in Stata. University of Bern Social Sciences Working Papers Nr. 1. Available from http://ideas.repec.org/p/bss/wpaper/1.html