PLAD 7100
Political Research With Quantitative Methods
Fall 2015

Statistics component	Math component
Monday & Wednesday 11:30–12:45	Wednesday 10:00–10:50
New Cabell Hall 594	New Cabell Hall 066
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& by appointment	

"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/
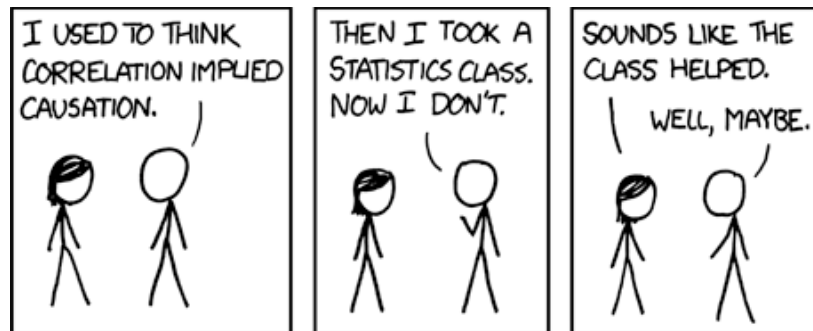
PLAD7100 includes two semi-autonomous components: statistics and math. The statistics component of this course will introduce you to some basic theory and methods for conducting quantitative analyses in political science, with a focus on statistics and econometrics. The mathematics component will introduce 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. 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 (front only) for the midterm, and two pages (i.e., front and back of a single sheet, or front of two sheets) 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.

Because the material in this course is cumulative, 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.* 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. (*Note that the student version of Stata, so-called "small Stata," will not be sufficient to analyze the data sets for some of the problem sets; you will need the standard IC ("Intercooled") version of Stata.*)

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. 2014. *A Gentle Introduction to Stata.* Rev. 4th ed. College Station, Texas: Stata Press. ISBN 1597181420 (Note errata on the Stata Press website: http://www.stata-press.com/books/errata/acock4.html.)

   Wonnacott, Thomas H. and Ronald J. Wonnacott. 1990. *Introductory Statistics for Business and Economics.* Fourth Edition. New York: John Wiley & Sons.

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 26: Welcome & Introduction to the Course

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

September 7 & 9: Probability Distributions and Random Variables
 Wonnacott & Wonnacott, chapters 4-5

September 14 & 16: 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 21 & 23: 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 28 & 30: 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 5: UVa Reading Day (no class)

October 7: 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 12: Review, catch up, etc.

October 14: **Midterm Exam in class**

October 19 & 21: 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 26 & 28: 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

November 2 & 4: Multiple Regression I
    Wonnacott & Wonnacott, chapter 13

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

    Acock, chapter 10

November 9 & 11: 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 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 18, 23: 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 25: No class (Thanksgiving)

November 30 & December 2: 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 7: Review, catch up, and "where do we go from here?"

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