"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."

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 central theme of the course consists in applying quantitative methods to explore and evaluate political science theories.

My goal in this class is provide this basic familiarity with statistics and econometrics for studying politics, and to lay a solid foundation for further coursework for those who choose to pursue quantitative analysis in more depth.

Thus, 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. The course will include some mathematical content; however, no math beyond high school algebra is assumed before you begin.

Course Requirements
Requirements for this 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) 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 consist 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, anyone auditing the course is strongly encouraged to attend consistently and to complete the reading and homework assignments.

The statistical software we will use is Stata. 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 ITC 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 platforms at a discount through ITC. See http://www.itc.virginia.edu/research/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 of the Wonnacott and Wonnacott book are also readily available on-line at a substantial discount.


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.


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 each Thursday, due in class the following Thursday. The first assignment will be distributed on September 5, due September 12.
Course Schedule and Outline

August 27: Introduction to the Course

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

September 6 & 10: Probability Distributions and Random Variables
Wonnacott & Wonnacott, chapters 4-5

September 12 & 17: Sampling and Point Estimation & Introduction to Statistical Computing using Stata
Wonnacott & Wonnacott, chapters 6-7
Pollock, chapters 1-3
Optional: Stata Documentation; in particular Getting Started with Stata and selections from the Stata User's Manual

September 19 & 24: Interval Estimation and Hypothesis Testing
Wonnacott & Wonnacott, chapters 8-9
Pollock, chapter 6


September 26 & October 1: Univariate & Bivariate Data analysis
Wonnacott & Wonnacott, section 2-7

October 3: Tabular Data Analysis, Chi-Square; Multivariate Analysis
Wonnacott & Wonnacott, chapter 17
Pollock, chapters 4, 5, & 7

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 8: Review, catch up, etc.

October 10: Midterm Exam in class

October 15: UVa Reading Day (no class)

October 17 & 22: 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
Pollock, chapter 8

October 24 & 29: Bivariate Regression II: Topics
Wonnacott & Wonnacott, 12-3 through 12-5
Achen, pages 37-51
Kelejian & Oates, pages 89-104 & 123-131

October 31 & November 5: Multiple Regression I
Wonnacott & Wonnacott, chapter 13
Kelejian & Oates, chapter 4 (134-161) and 200-202

November 7 & 12: Multiple regression II

November 14: Regression Topics: colinearity/micronumerosity, dummy variables, interaction terms
Achen, pages 51-79
Kelejian & Oates, pages 205-211 and 178-186
Pollock, chapter 9

November 19, 21, & 26: Regression Topics: non-linear relationships, outliers, model specification
Wonnacott & Wonnacott, chapters 14
Kelejian & Oates, pages 251-256
Pollock, chapter 3

December 3: Regression, matching, and “causal inference”

December 5: Review, catch up, and “where do we go from here?”
Stata Journal Articles of Interest

Tables of estimation results


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


Graphing


Model Interpretation