

## **Political Science 509: The Linear Model**

Emory University, Spring 2013

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### **Course Description & Objectives**

This course covers basic techniques in quantitative political analysis. It introduces students to widely-used procedures for regression analysis, and provides intuitive, applied, and formal foundations for regression and more advanced methods treated later in the course sequence. This course will use rudimentary calculus and matrix algebra rather intensively. The course covers model assumptions and techniques for addressing violations of those assumptions (e.g., heteroskedasticity, autocorrelation, multicollinearity), as well as issues of model specification, functional forms, measurement error, endogeneity and time-series cross-sectional data. This course builds on the prior efforts of Chris Zorn (a former faculty member now at Penn State) and Eric Reinhardt.

### **Requirements**

Grades in the course will be based on the following items:

- **50%** — Homework. Eleven assignments, typically with a week from distribution to due date. Turn these in by the start of class. You may *talk* about the problems with your fellow students, but *do not copy* another person's homework; your submission must contain your own work. Please hand in homeworks in hard copy, rather than emailing them, unless otherwise approved. Please also include your syntax used for each of the assignments. Please do not just copy and paste the tables from Stata into your word processor, but make sure they are formatted to concisely and neatly present the information needed.
- **50%** — Methods paper, 15-20 pages. This paper will demonstrate your technical mastery of the practical aspects of OLS regression in the context of a specific research problem of your own formulation. Choose a topic, develop a hypothesis, and test it quantitatively. The only twist here is that your dependent variable should be continuous rather than discrete, so that it is suitable for the kinds of techniques we will be learning in class. The format should be similar to a "research note" in *APSR* or *JOP*, but with greater emphasis on the technical details. A one-page synopsis describing the hypothesis to be tested and the dataset to be used is due on February 5.
- **The final paper is due May 10.**

## Course Policies

Late assignments will be penalized. Each day the assignment is late will result in a drop of a letter grade, e.g., A to B, etc. Homeworks and the final paper will be graded on a 16-point scale as follows:

[15-16] -- A  
[14-15) -- A-  
[13-14) -- B+  
[11-13) -- B  
[10-11) -- B-  
[9-10) -- C+  
[7-9) -- C  
[6-7) -- C-  
[2-6) -- D  
[0-2) -- F

The honor code is in effect throughout the semester. By taking this course, you affirm that it is a violation of the code to cheat on assignments, to plagiarize, to deviate from the teacher's instructions about collaboration on work that is submitted for grades, to give false information to a faculty member, and to undertake any other form of academic misconduct. You also affirm that if you witness others violating the code you have a duty to report them to the honor council.

## Reading Materials

Statistics texts are expensive, but they are the kind of book that you'll find yourself referring to frequently throughout your graduate years and beyond. We will rely on the textbook by Jeffrey M. Wooldridge, *Introductory Econometrics: A Modern Approach*, 5<sup>th</sup> edition. 3rd and 4<sup>th</sup> editions of this text will match up very closely and are fine substitutes. This text offers clear step-by-step descriptions and instructions. You may also want to purchase the following two textbooks, to supplement your reading: William Greene, *Econometric Analysis*, 5<sup>th</sup> ed. (Prentice Hall, 2003), and Damodar N. Gujarati, *Basic Econometrics*, 4<sup>th</sup> ed. (New York: McGraw-Hill, 2003). The former is quite technical, and a favorite among political methodologists, while the latter is stronger on the intuition.

This course will rely on *Stata* as our chief statistical software. You can buy your own personal *Stata* license if you wish. Specify that you are part of the "GradPlan III" for Emory University. If you prefer R for your assignments, that is fine.

## Course Outline

- Jan 15&17: Introduction: Stata tutorial & Math refresher
- Wooldridge, Appendices A.1-C.3
- Jan 22&24: The regression model: estimation
- Wooldridge, Chapters 1-3
  - HW 1 assigned
- Jan 29 & 31: The regression model: properties, and estimation in matrix form
- Wooldridge, Chapter 5, Appendices D & E

- HW 2 assigned
- Feb 5, 7 & 12: The regression model: inference, dummy variables and interactions
- Wooldridge, Chapters 4 & 7.
  - Thomas Brambor, William Roberts Clark and Matt Golder, “Understanding Interaction Models: Improving Empirical Analyses,” *Political Analysis* 14 (2006), 63-82
  - HW 3 assigned
- Feb 14 & 19: Model fit and outliers.
- Wooldridge, Chapter 6.
  - Michael S. Lewis-Beck and Andrew Skalaban, “When to Use R-Squared,” *The Political Methodologist* 3:2 (1990), 9-11.
  - Gary King, “When *Not* to Use R-Squared,” *The Political Methodologist* 3:2 (1990), 11-12.
  - Robert C. Luskin, “R-Squared Encore,” *The Political Methodologist* 4:1 (1991), 21-23.
  - HW 4 assigned
- Feb 21 & 26: Multicollinearity and Heteroskedasticity. The problem & diagnosis. GLS and robust SEs.
- Wooldridge, Chapter 8.
  - George W. Downs and David M. Roche, “[Interpreting Heteroscedasticity](#),” *American Journal of Political Science* 23:4 (November 1979), 816-828.
  - HW 5 assigned
- Feb 28 & March 5: Model specification.
- Wooldridge, Chapter 9
  - Christopher H. Achen, “Let’s Put Garbage-Can Regressions and Garbage-Can Probits Where They Belong,” *Conflict Management and Peace Science* 22 (2005), 327-339.
  - Keven A. Clarke, “The Phantom Menace: Omitted Variable Bias in Econometric Research,” *Conflict Management and Peace Science* 22 (2005), 341-352.
  - HW 6 assigned
- March 7 & 19: Autocorrelation and Stationarity
- Wooldridge, Chapters 10 – 12
  - HW 7 assigned
- March 21: **No Class (Beardsley will be at UVA)**
- March 26 & 28: Time-series cross-sectional data
- Wooldridge, Chapters 13 & 14
  - Drew Linzer & Tom Clark, “Should I Use Random Effects or Fixed Effects?”
  - HW 8 assigned
- April 2 & 9: Nonstationarity and forecasting
- Wooldridge, Chapter 18
  - De Boef, Suzanna and Luke Keele. 2008. “Taking time seriously.” *American Journal of Political Science* 52(1): 184-200.
  - HW 9 assigned
- April 4: **No Class (Beardsley will be at ISA)**

- Apr 11 & 16: PCSEs, spatial econometrics.
- Beck, Nathaniel and Jonathan N. Katz. 1995. "What to do (and not to do) with time-series cross-section data." *American Political Science Review* 89 (3): 634-647.
  - Nathaniel Beck, Kristian Skredre Gleditsch and Kyle Beardsley, "Space is More than Geography: Using Spatial Econometrics in the Study of Political Economy," *International Studies Quarterly* 50:1 (2006), 27-44.
  - HW 10 assigned
- Apr 18 & 23: Endogeneity. Instrumental variables and simultaneous equations
- Wooldridge, Chapters 15 & 16
  - HW 11 assigned
- Apr 25: Selection bias and the Heckman selection model.
- Wooldridge, Sections 17.4 & 17.5.
  - Jeffrey A. Dubin and Douglas Rivers, "Selection Bias in Linear Regression, Logit and Probit Models," *Sociological Methods and Research* 18 (November 1989/February 1990), 360-390.
- May 10: **Paper due by 5:00p.**