

POLS 500c, Advanced Statistical Methods, Fall 2009

Department of Political Science
Southern Illinois University

1 Instructor Information

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Office: FANER 3178
Office Hours: 9:00-11:00 AM MWF
Class Location: FANER 3075
Course Time: 8:15-9:30 AM T/TH

2 Course Description

This course is the third part of a methods sequence that aims to provide you the tools necessary to be social researchers. The primary focus of the course is multiple regression analysis. We explore the assumptions underlying the model, what happens when the assumptions are violated, and how to deal with these problems. Specifically, we examine what happens to the standard regression model in the context of multicollinearity, nonlinearity, heteroscedasticity, nonadditivity, measurement error and specification error. Beyond what is often called OLS regression, we discuss regression techniques related to limited dependent variables and times series/panel data.

While some courses on this topic are primarily devoted to mathematical exposition of these techniques, our course is for the applied researcher. We will occasionally delve into math, but the main goal is to help you develop the skills necessary to evaluate hypotheses in a large N context. Additionally, we will spend considerable time learning and utilizing statistical software. While there are a host of different software packages, we will use Stata as it is powerful, flexible, and is used by many quantitative political scientists.

3 Course Objectives

I have three main objectives for this course. First, the course should help you gain the skills necessary to produce an original quantitative project. Second, you should gain the skills necessary to read and critique quantitative work that appears in peer-reviewed political science journals. Third, the course should serve as a basis for the acquisition of more advanced quantitative methods as your professional needs require.

4 Requirements

Required Books

1. Gujarati, Damodar. 2003. *Basic Econometrics 4th ed.* New York: McGraw-Hill. ISBN 0-07233542-4.
2. Kennedy, Peter. 2003. *A Guide to Econometrics 5th ed.* Cambridge: MIT Press. ISBN 0-262-61183-X.
3. Pollock, Philip H. 2006. *A Stata Companion to Political Analysis* Washington DC: CQ Press. ISBN 0-87289-305-7

Recommended Books

1. Baum, Christopher F. 2006. *An Introduction to Modern Econometrics Using Stata*. College Station: Stata Press. 1-59718-013-0
2. Berry, William and Mitchell Sanders. 2000. *Understanding Multivariate Regression*. Boulder: Westview Press. ISBN 0-8133-9971-8.
3. Greene, William. 2003. *Econometric Analysis 5th ed*. New York: Pearson. 0-13513-245-2
4. Gelman, Andrew and Jennifer Hill. 2007. *Data Analysis Using Regression and Multi-level/Hierarchical Models* New York: Cambridge University Press. 0-521-68689-X
5. Kohler, Ulrich and Frauke Kreuter. 2005. *Data Analysis Using Stata* College Station: Stata Press. 1-59718-007-6
6. Knoke, David, George Bohrnstedt and Alisa Potter Mee. 2002. *Statistics for Social Data Analysis* Belmont: Thomson/Wadsworth. 0-87581-448-4
7. Lewis-Beck, Michael S. 1980. *Applied Regression: An Introduction* Beverly Hills: Sage.
8. Tarling, Roger. 2009. *Statistical Modelling for Social Researchers: Principles and Practices* New York: Routledge. 978-0-415-44840-6

All of the books are available at the bookstore and online. You can find them on Amazon.com or Addall.com at a reduced price. Since advanced statistics is not always easy, it is helpful to have multiple treatments of the same topic. I find that some books are more useful for understanding certain topics than others. The recommended books provide either more sophisticated or more simplistic treatment of most of the topics we cover. Buying them and using them in conjunction with the required texts would be helpful but not necessary. If you plan to pursue a dissertation that utilizes quantitative methods, then purchasing some/all of these books may be something to consider.

Many of the articles for the class will be on reserve at the library. You can also find most of the journal articles on JSTOR (www.jstor.org). I will also place readings on blackboard that are not available on JSTOR, and these are noted in the syllabus (*).

Assessment

1. **Attendance and Participation (20%)**—I expect that you will be prepared to discuss all of the readings each week. I will assign a grade for your participation each week based on the following scale:
 - A (outstanding) your comments were insightful and contributed to collective understanding of the material across the readings
 - A- (strong) your comments were sometimes insightful and sometimes average but were not consistent across the readings
 - B+ (good) your comments demonstrated that you understood the material but did not extend the discussion or offer new insights
 - B (average) you participated but did not seem to fully grasp the material

B- (poor) you spoke, but your comments were not germane to the material

C (unacceptable) you didn't say anything...

2. **Problem Sets (10%)**—You will have problem sets that relate to applied research throughout the semester. You will use Stata for all of these assignments.
3. **Exams (30%)**—The midterm and final exams are take-home exams that ask essay questions and involve applied regression techniques in Stata.
4. **Conference Presentation (10%)**—At the end of the term, you will give a 10-15 minute presentation on your research. You will be on a panel of 3-4 papers with a chair and discussant. The presentation must include a powerpoint (or equivalent program) presentation. Later in the term, we will discuss how to present your research effectively. You will also be graded on how well you respond to questions from the discussant and audience.
5. **Research Paper (30%)**—Your research paper must be an original, quantitative paper that incorporates material from the course.

The research paper must be 20-25 pages (including references, tables, graphs, etc). The quality of the paper, however, is more important than the quantity. The paper should have the format as outlined by Barry Weingast here:

http://www.stanford.edu/~weingast/caltech_rules.html

While this is not the *only* way to write a great paper in Political Science, it is a *great* way.

You will present your research in a

These papers also makes useful suggestions for writing a graduate paper that is potentially publishable:

- (a) Wolfinger, Raymond E. 1993. "Tips for Writing Papers." *PS: Political Science* Vol. 26, No. 1. 87-88.
- (b) Van Cott, Donna Lee. 2005. "A Graduate Student's Guide to Publishing Scholarly Journal Articles," *PS: Political Science & Politics*, 38(4):741-743.
- (c) Thunder, David. 2004. "Back to Basics: Twelve Rules for Writing a Publishable Article," *PS: Political Science & Politics* 37(3): 493-495.
- (d) King, Gary. 2006. "Publication, Publication." *PS: Political Science and Politics* 39(1): 119-125.

This paper by King is also useful for quantitative researchers:

Gary King. 1995. "Replication, Replication." *PS: Political Science and Politics* 28(3): 444-452.

5 *Tentative* Course Schedule

The Regression Model

Tues. Aug. 25—Introduction, Review of Statistical Concepts

- Introductions
- Discussion
- Gujarati, Appendix A
- Kennedy, Chapters 1 & 2

Thurs. Aug. 27—The Bivariate Regression Model

- Gujarati, Chapters 2-5, pgs. 164-175
- *Berry & Sanders, Chapter 2
- BRING SOME CONCEPTS**—Bring a list of concepts that are of interest to you. For example, you may be interested in the relationship between democracy and terrorism or party ideology and economic growth.

Tues. Sept. 1—Stata Lab #1

- Read Pollock, Chapters 1 & 2
- Do exercises from Chapters 1 & 2 in lab

Thurs. Sept. 3—Multiple Regression: Estimation

- Gujarati, pp. 202-23, 229-33
- Kennedy, Chapter 3
- BRING A RESEARCH QUESTION**—We will discuss each person's question and offer suggestions and potential readings.

Tues. Sept. 8—Multiple Regression: Inference

- Gujarati, Chapter 8
- Kennedy, Chapter 4

Thurs. Sept. 10—Multiple Regression: Dummy Variables

- Gujarati, pp.297-306
- Kennedy Chapter 14

Tues. Sept. 15—Stata Lab #2

- Read Pollock, Chapters 3, 4, 5
- Do exercises from Chapters 3, 4, & 5 in lab

Violations of Regression Assumptions

Thurs. Sep. 17—Heteroskedasticity

- Gujarati, Chapter 11
- Kennedy, Chapter 8
- Downs, George and David Rocke. 1979. “Interpreting Heteroskedasticity.” *American Journal of Political Science* 23: 816-828.

Tues. Sept. 22—Stata Lab #3

- Read Pollock, Chapters 8
- Do exercises from Chapters 8 in lab

Thurs. Sept. 24—NO CLASS, START Conference

Tues Sept. 29—Project/Paper Workshop

- Bring research question, outline, and data** for paper

Thurs. Oct. 1—Multicollinearity

- Gujarati, Chapter 10
- Kennedy, Chapter 11
- Lemieux, Peter H. 1978. “A Note on the Detection of Multicollinearity.” *American Journal of Political Science* 22 (1): 183-186.

Tues. Oct. 6—Stata Lab #4

- Multicollinearity/Specification Lab

Thurs. Oct. 8—Specification

- Gujarati, pp. 215-217, 506-524
- Kennedy, Chapter 5
- Achen, Christopher. 2002. “Toward a New Political Methodology: Microfoundations and ART.” *Annual Review of Political Science* 5: 423-450.
- Clarke, Kevin. 2005. “The Phantom Menace: Omitted Variable Bias in Econometric Research.” *Conflict Management & Peace Science* 22(4): 341-352.
- Ray, James Lee. 2005. “Constructing Multivariate Analyses (of Dangerous Dyads),” *Conflict Management & Peace Science* 22(4): 277-292.

Tues. Oct. 13—Exam #1

Thurs. Oct. 15—Interactions

- Brambor, Thomas, William Roberts Clark, and Matt Golder. 2006. Understanding Interaction Models: Improving Empirical Analyses. *Political Analysis* 14(1):63-82.
- Friedrich, Robert J. 1982. In Defense of Multiplicative Terms in Multiple Regression Equations. *American Journal of Political Science* 26 (November): 797-833.
- Braumoeller, Bear. 2004. “Hypothesis Testing and Multiplicative Interaction Terms.” *International Organization* 58(4): 807-820.

Tues. Oct. 20—Stata Lab #5

- Interactions
- Read Chapter 9, Pollock
- Do exercises from Chapter 9
- Guided exercise

Thurs. Oct. 22—Autocorrelation and Measurement Error

- Gujarati, Chapter 12, pp. 524-528
- *Carmines and Zeller, pp. 1-16, 29-32, 37-51
- Kennedy, Chapter 9

Tues. Oct. 27—Panel Data

- Gujarati, Chapter 16
- Kennedy, Chapter 17
- Beck, Nathaniel and Jonathan Katz. 1995. What To Do (and Not To Do) with Time-Series Cross-Section Data. *American Political Science Review* 89: 634-647.
- Kennedy, Chapter 9

Thurs. Oct. 29—Panel Data II

- Zorn, Christopher. 2001. Estimating Between- and Within-Cluster Covariate Effects, with an Application to Models of International Disputes. 2001. *International Interactions* 27 (4): 433-45.
- Zorn, Christopher. 2001. Generalized Estimating Equation Models for Correlated Data: A Review with Applications. *American Journal of Political Science* 45 (April): 470-90.
- Wawro, Gregory. 2002. Estimating Dynamic Panel Data Models in Political Science. *Political Analysis* 10 (1): 25-48.

Limited Dependent Variables & Time Series

Tues. Nov. 3—Limited Dependent Variables

- Gujarati, Chapter 15
- Kennedy, Chapters 15-16

Thurs. Nov. 5—Specification Logit Models

- Read Logistic Regression Diagnostics

Tues. Nov. 10—Stata Lab #6

- Logistic Regression
- Read Chapter 10, Pollock
- Do exercises from Chapter 10 in lab

Thurs. Nov. 12—NO CLASS, CONFERENCE

Tues. Nov. 17—Stata Lab #7

-Extracting and Displaying Quantities of Interest

-Learning Clarify and SPOST

-King, Gary, Michael Tomz, and Jason Wittenberg. 2000. “Making the Most of Statistical Analyses: Improving Interpretation and Presentation. *American Journal of Political Science* 44(2):347-361.

-Kastellec, Jonathan P., and Eduardo Leoni. 2007. Using Graphs Instead of Tables to Improve the Presentation of Empirical Results in Political Science. *Perspectives on Politics* 5(4):755-771.

Thurs. Nov. 19—Introduction to Time Series

-Gujarati, Chapters 21-22

-Kennedy, Chapters 18-19

-Granato, Jim and Renee M. Smith. “Exogeneity, Inference, and Granger Causality: Part 1, The Stationary Case.” *The Political Methodologist* 5(2): 24-28.

-Granato, Jim and Renee M. Smith. “Exogeneity, Inference, and Granger Causality: Part 2, The Case of Integrated Regressors.” *The Political Methodologist* 6 (1): 23-26.

-Granato, Jim. “An Agenda for Econometric Model Building.” *Political Analysis* 3: 123- 154.

-Keele, Luke J. and Nathan J. Kelly. 2006. “Dynamic Models for Dynamic Theories: The Ins and Outs of LDVs.” *Political Analysis*. 14:2, 186-205.

-Keele, Luke J. and Suzanna DeBoef. 2008. “Taking Time Seriously: Dynamic Regression.” *American Journal of Political Science* 52:(1): 184-200.

-Beck, N. and Katz, J.N. and Tucker, R. 1998. “Beyond ordinary logit: Taking time seriously in binary time-series-cross-section models.” *American Journal of Political Science* 42(4):1260-1288.

Nov. 23 – Nov. 27.—NO CLASS—THANKSGIVING

Tues. Dec. 1—Stata Lab #8

-Final Help with Model Estimation/Presentation

Thurs. Dec. 3—Paper Presentations (1st group)

Tues. Dec. 8—Paper Presentations (2nd group)

Thurs. Dec. 10—Final Exam (Final Papers Due)