

# POLI 803: “Research Methods in Political Science”

Spring 2007

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Wednesday 3:30-6:00 p.m.

Gambrell Hall, Room 353

## Description

This course presents an overview of some regression-based methods widely used in political science today. The emphasis of the course is on models where the traditional assumptions of ordinary least-squares regression are violated, primarily in a cross-sectional context and because the dependent variable is non-continuous. The course will focus on maximum likelihood estimation of models of various kinds of limited-dependent and qualitative response variables. Specific topics covered include binary logit and probit, multinomial logit and probit, ordered logit and probit, and Poisson and other models for event counts. In addition, students will apply these methods to a series of computer lab exercises, and to original research in their own area of specialization.

Despite this course’s title, these models are among the most widely used in political science today. It is not possible to function as an empirical political researcher without at least a passing familiarity with these models; moreover, given the rapid and increasing rate at which more advanced models are being adopted in political science, these techniques increasingly represent a minimal level of statistical competence necessary to do publishable-quality quantitative work. Put more briefly: knowing these models, and using them appropriately and well, can increase your odds of landing a job, publishing books and articles, being granted tenure, and generally leading a happier and more fulfilling professional life.

Much of the material in this course is fairly technical. While we have chosen readings that present the models as clearly and with as little jargon as possible, most of the readings will still require several readings to fully comprehend. POLI 706 (“Advanced Methods of Political Analysis”) is a prerequisite for this class. Additionally, students are expected to have a nodding acquaintance with basic differential and integral calculus, linear algebra, and distribution theory. At the same time, it is impossible to learn statistics by reading books or articles and attending lectures. Because of this incontrovertible fact, students will be required to complete lab exercises nearly every week. Most of these exercises will be computer-based and use either **Stata** 9.1 or **R** 2.4.1 and data I provide; some will replicate recent published work. Be advised that, in addition to its myriad other faults, **SPSS** is simply incapable of estimating most of the models covered in this course, and so will be essentially useless to you during this semester.

## Course Readings

### Text

Long, J. Scott. 1997. *Regression Models for Categorical and Limited Dependent Variables*. Thousand Oaks, CA: Sage Publications.

Additional readings as necessary, all of which will be available on Blackboard.<sup>TM</sup>

### Other Useful/Recommended Readings

Agresti, Alan. 2002. *Categorical Data Analysis*, 2nd Ed. New York: Wiley.

Aldrich, John H., and Forrest D. Nelson. 1984. *Linear Probability, Logit and Probit Models*. Beverly Hills, CA: Sage.

Borooah, Vani K. 2001. *Logit and Probit: Ordered and Multinomial Models*. Newbury Park, CA: Sage.

Cameron, A. Colin, and Pravin K. Trivedi. 1998. *Regression Analysis of Count Data*. New York: Cambridge University Press.

Cramer, J. S. 1986. *Econometric Applications of Maximum Likelihood Methods*. New York: Cambridge.

DeMaris, Alfred. 1992. *Logit Modeling: Practical Applications*. Newbury Park, CA: Sage.

Eliason, S. R. 1993. *Maximum Likelihood Estimation: Logic and Practice*. Newbury Park, CA: Sage.

Fahrmeier, L., and G. Tutz. 2000. *Multivariate Statistical Modelling Based on Generalized Linear Models*. Berlin: Springer-Verlag.

Gill, Jeff. 2000. *Generalized Linear Models: A Unified Approach*. Thousand Oaks, CA: Sage Publications.

*Getting Started with Stata for Windows, Release 9*. 2005. College Station, TX: Stata Press.

Gourieroux, Christian. 2000. *Econometrics of Qualitative Dependent Variables*. New York: Cambridge University Press.

- Gourieroux, Christian, and Alain Monfort. 1995. *Statistics and Econometric Models*, Vols. 1 and 2. New York: Cambridge University Press.
- Greene, William H. 2003. *Econometric Analysis*, 5th Ed. Upper Saddle River, NJ: Prentice-Hall.
- Hosmer, David W. Jr., and Stanley Lemeshow. 2000. *Applied Logistic Regression*, 2nd Ed. New York: Wiley.
- King, Gary. 1989. *Unifying Political Methodology: The Likelihood Theory of Statistical Inference*. Ann Arbor: University of Michigan Press. Originally published by Cambridge University Press.
- Liao, Tim Futing. 1994. *Interpreting Probability Models: Logit, Probit and Other Generalized Linear Models*. Thousand Oaks, CA: Sage.
- Lindsey, James K. 2002. *Modelling Frequency and Count Data*. New York: Oxford University Press.
- Lloyd, Chris A. 1999. *Statistical Analysis of Categorical Data*. New York: Wiley.
- Maddala, G. S. 1983. *Limited-Dependent and Qualitative Variables in Econometrics*. New York: Cambridge University Press.
- McCullagh, P., and J. A. Nelder. 1989. *Generalized Linear Models*, 2nd Ed. New York: Chapman and Hall.
- Nagler, Jonathan. 1996. "Coding Style and Good Computing Practices." *The Political Methodologist* 6(2):2-8.
- Powers, Daniel, and Yu Xie. 1999. *Statistical Methods for Categorical Data Analysis*. San Diego, CA: Academic Press.
- Simonoff, Jeffrey S. 2006. *Analyzing Categorical Data*. New York: Springer.
- Venables, W. N., and B. D. Ripley. 2002. *Modern Applied Statistics with S*, 4th Ed. Berlin: Springer-Verlag.
- Winkelmann, Rainer. 2005. *Econometric Analysis of Count Data*, 4th Ed. Berlin: Springer-Verlag.

## Grading

Grading will be based on a total of 1000 points, divided as follows:

- Eight homework assignments, worth 50 points each.
- A final paper/project, worth 500 points.
- Class attendance/participation, worth 100 points.

Homework exercises will generally involve using the **Stata**<sup>TM</sup> statistical software, though you're welcome to adopt whatever other software you care to use (**S-Plus**<sup>TM</sup> and **R** are also very good; **SAS** is flexible, but bloated). Details for the homeworks and the final project will be announced in class.

## Some Other Useful Resources

The **Inter-University Consortium for Political and Social Research** (ICPSR), at the University of Michigan, maintains an extensive archive of data in the social and behavioral sciences. Much of it is accessible via their homepage (<http://www.icpsr.umich.edu>).

The **Political Methodology Section** of the American Political Science Association was created to provide APSA members with an interest in political methodology with a forum in which to meet and discuss ideas. The section publishes a quarterly newsletter (*The Political Methodologist*), a quarterly journal on political methodology (*Political Analysis*), conducts a discussion list on topics relating to political methodology, and maintains an extensive electronic archive of papers, accessible via their homepage (at <http://polmeth.wustl.edu>).

The **Stata**<sup>TM</sup> homepage (<http://www.stata.com>) is a valuable resource for questions about the **Stata** statistical software. Beyond that, there is an excellent **Stata** “help page” sponsored by UCLA, at <http://www.ats.ucla.edu/STAT/stata/>.

Similarly, the **Comprehensive R Archive Network** (CRAN) (<http://cran.r-project.org/>) is the go-to spot for all things R-related. Jeff Gill has a nice third-party collection of links related to **S** and **R**, at <http://psblade.ucdavis.edu/s-language.help.html>.

Finally, a sample of courses similar to this one include those taught by:

- Chris Adolph (University of Washington), <http://faculty.washington.edu/cadolph/log/log.pdf>.
- Fred Boehmke (University of Iowa), <http://myweb.uiowa.edu/fboehmke/Classes/polisci306/306syllabus.pdf>.
- John Brehm (University of Chicago), <http://home.uchicago.edu/~jjbrehm/syl1431.ps>.

- Charles Franklin (University of Wisconsin), <http://www.polisci.wisc.edu/~franklin/Content/MLE/MLE.htm>.
- Matt Golder (Florida State), [http://homepages.nyu.edu/%7Emrg217/methods\\_syllabus1.pdf](http://homepages.nyu.edu/%7Emrg217/methods_syllabus1.pdf).
- Gary King (Harvard University), <http://gking.harvard.edu/g2001syl/syl.html>.
- Andrew Martin (Washington University), <http://adm.wustl.edu/courses/ps582.pdf>.
- Shawn Trier (University of Minnesota), <http://www.polisci.umn.edu/courses/fall2006/8160/004/kiosk/Treier8160F06.pdf>.
- Mike Ward (University of Washington), <http://faculty.washington.edu/mdw/pdfs/510syllabus.pdf>.

## Course Schedule

### January 17: Introduction to Maximum Likelihood.

- **Readings**
  - *Required:*
    - Long, Chapter 2 (esp. pp. 25-33).
  - *Recommended:*
    - Eliason (1993), pp. 1-28.
    - King (1989), pp. 1-94.
    - Greene (2003), pp. 468-91.
- **Exercise 1: Use MLE to estimate the parameters of a linear regression model.**

### January 24: Binary Response Models, I

- **Readings**
  - *Required:*
    - Long, pp. 34-60.
  - *Recommended:*

- Aldrich and Nelson (1984), pp. 9-30.
- Eliason, pp. 39-45.
- Greene (2003), pp. 665-680.
- King (1989), pp. 97-114.
- Nagler, Jonathan. 1994. "Scobit: An Alternative Estimator to Logit and Probit." *American Journal of Political Science* 38(1):230-55.

## January 31: Binary Response Models, II

### • Readings

#### ○ *Required:*

- Long, pp. 61-112.

#### ○ *Recommended:*

- Hagle, Timothy M., and Glenn E. Mitchell. 1992. "Goodness of Fit Measures for Probit and Logit." *American Journal of Political Science* 36(August):762-84.
- Herron, Michael C. 2000. "Postestimation Uncertainty in Limited Dependent Variable Models." *Political Analysis* 8(Winter): 83-98.
- King, Gary, Michael Tomz, and Jason Wittenberg. 2000. "Making the Most of Statistical Analyses: Improving Interpretation and Presentation." *American Journal of Political Science* 44(April):347-61.
- Liao (1994), pp. 10-25.

### • Exercise 2: Estimate and interpret binary logit and probit models.

## February 7: Binary Response Models, III

### • Readings

#### ○ *Required:*

- Greene (2003) §21.4.4.b.
- Greene (2003) §21.6.1-21.6.3.
- King, Gary and Langche Zeng. 2001. "Logistic Regression in Rare Events Data." *Political Analysis* 9(Spring): 137-63.

#### ○ *Recommended:*

- Alvarez, R. Michael and John Brehm. 1995. "American Ambivalence Toward Abortion Policy: A Heteroskedastic Probit Method for Assessing Conflicting Values." *American Journal of Political Science* 39:1055-82.
  - Eliason (1992), pp. 56-62.
  - King, Gary and Langche Zeng. 2001. "Explaining Rare Events in International Relations." *International Organization* 55(Summer):693-715.
  - Zorn, Christopher. 2002. "U.S. Government Litigation Strategies in the Federal Appellate Courts." *Political Research Quarterly* 55(March):145-66.
- **Exercise 3: Estimate and interpret heteroskedastic and bivariate probit models.**

## February ♡: Ordered Response Models, I

- **Readings**
  - *Required:*
    - Long, pp. 114-127.
  - *Recommended:*
    - Liao (1994), pp. 25-41.
    - Winship, Christopher, and R. D. Mare. 1984. "Regression Models with Ordinal Variables." *American Sociological Review* 49:512-25.

## February 21: Ordered Response Models, II

- **Readings**
  - *Required:*
    - Long, pp. 127-145.
  - *Recommended:*
    - Alvarez. R. Michael, and John Brehm. 1998. "Speaking in Two Voices: American Equivocation about the Internal Revenue Service." *American Journal of Political Science* 42:418-52.
    - Gelpi, Christopher. 1997. "Crime and Punishment: The Role of Norms in Crisis Bargaining." *American Political Science Review* 91(2):339-60.
    - Liao (1994), pp. 41-47.
    - Sanders, Mitchell S. 2001. "Uncertainty and Turnout." *Political Analysis* 9(Winter):45-57.
- **Exercise 4: Estimate and interpret an ordered logit and probit models.**

## February 28: Multinomial Choice Models, I

- **Readings**

- *Required:*

- Long, pp. 148-178.

- *Recommended:*

- Liao (1994), pp. 48-59.
- Maddala (1983), pp. 34-46.
- Whitten, Guy B., and Harvey Palmer. 1996. "Heightening Comparativists' Concerns for Model Choice: Voting Behavior in Great Britain and the Netherlands." *American Journal of Political Science* 40:231-60.
- Sellers, Patrick. 1998. "Strategy and Background in Congressional Campaigns." *American Political Science Review* 92(March):159-71.

## March 7: Multinomial Choice Models, II

- **Readings**

- *Required:*

- Long, pp. 178-182.

- *Recommended:*

- Liao (1994), pp. 59-69.
- Greene (2003), pp. 723-24.
- Maltzman, Forrest, and Paul J. Wahlbeck. 1996. "May it Please the Chief? Opinion Assignments in the Rehnquist Court." *American Journal of Political Science* 40(May):421-43.

- **Exercise 5: Estimate and interpret multinomial and conditional logit models.**

## March 13: NO CLASS – SPRING BREAK.

## March 21: Multinomial Choice Models, III

### • Readings

#### ◦ *Required:*

- Long, pp. 182-186.
- Dow, Jay K., and James W. Endersby. 2004. "Multinomial Probit and Multinomial Logit: A Comparison of Choice Models for Voting Research." *Electoral Studies* 23(March):107-22.
- Glasgow, Garrett. 2001. "Mixed Logit Models for Multiparty Elections." *Political Analysis* 9(Spring):116-36.
- Greene (2003), pp. 724-28.

#### ◦ *Recommended:*

- Alvarez, R. Michael, and Jonathan Nagler. 1998. "When Politics and Models Collide: Estimating Models of Multiparty Elections." *American Journal of Political Science* 42(January):55-97.
- Quinn, Kevin M., Andrew D. Martin, and Andrew B. Whitford. 1999. "Voter Choice in Multi-Party Democracies: A Test of Competing Theories and Models." *American Journal of Political Science* 43(October):1231-47.
- Rudolph, Thomas J. 2003. "Who's Responsible for the Economy? The Formation and Consequences of Responsibility Attributions." *American Journal of Political Science* 47(October):698-713.

- **Exercise 6: Estimate and interpret some alternative multinomial choice models.**

## March 28: Event Count Models, I

### • Readings

#### ◦ *Required:*

- Long, pp. 217-230.

#### ◦ *Recommended:*

- Cameron and Trivedi (1998), Chapter 3.
- Gowa, Joanne. 1998. "Politics at the Water's Edge: Parties, Voters and the Use of Force Abroad." *International Organization* 52(Spring):307-24.
- King, Gary. 1988. "Statistical Models for Political Science Event Counts: Bias in Conventional Procedures and Evidence for the Exponential Poisson Regression Model." *American Journal of Political Science* 32(3):838-63.
- Liao (1994), pp. 70-79.

## April 4: Event Count Models, II

- Readings

- *Required:*

- Long, pp. 230-238.

- *Recommended:*

- King, Gary. 1989. "Variance Specification in Event Count Models: From Restrictive Assumptions to a Generalized Estimator." *American Journal of Political Science* 33(August):762-84.

- King, Gary, and Curtis Signorino. 1996. "The Generalization in the Generalized Event Count Model, With Comments on Achen, Amato, and Londregan." *Political Analysis* 6:225-52.

- **Exercise 7: Estimate and compare Poisson and negative binomial models.**

## April 11: NO CLASS – MPSA IN CHICAGO.

## April 18: Event Count Models, III

- Readings

- *Required:*

- Long, pp. 239-250.

- Zorn, Christopher. 1998. "An Analytic and Empirical Examination of Zero-Inflated and Hurdle Poisson Specifications." *Sociological Methods and Research* 26(February):368-400.

- *Recommended:*

- King, Gary. 1989. "Event Count Models for International Relations: Generalizations and Applications." *International Studies Quarterly* 33:123-47.

- Sheingate, Adam D. 2006. "Structure and Opportunity: Committee Jurisdiction and Issue Attention in Congress." *American Journal of Political Science* 50(October):844-59.

- **Exercise 8: Estimate and interpret a "zero-inflated" event count model.**

## April 25: Bringing It All Together: Generalized Linear Models

- Readings

- *Required:*

- Long, pp. 257-58.
- McCullagh and Nelder (1989), pp. 26-43.

- *Recommended:*

- Gill (2000).

May 2: Final Projects Due.