PLS 900: Advanced Methods for Political Science

Fall 2010
Thursday 6-9PM
Room: S. Kedzie 104/222

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Course Description

The goal of this course is to provide you with a firm understanding of likelihood as a mode of statistical inference and successfully applying maximum likelihood models within political science research. To do so, we will often cover various topics related to probability, statistics, political analysis, and computer programming as well.

Those who successfully complete this course should have a sound working knowledge of maximum likelihood techniques that is on par with the best graduate programs in political science. More advanced techniques and topics will also be briefly introduced to help facilitate your interaction and education on topics that may be more specific to your research interests.

Course Prerequisites

Students should have already taken a course on basic probability and linear regression analysis (i.e., PLS 801 and 802).

Course Materials

Required Book

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

Recommended Books

Comprehensive Books: You do not have to have these books to take this course. However, if you intend on doing quantitative research in the future you should probably have one or more of these comprehensive textbooks on your bookshelf. Each has its strength and weaknesses. Search the Internet, go to the library, or come to my office and read them if you are interested in knowing which one to buy:

- Cameron, A. Colin, and Pravin K. Trivedi. 2005. *Microeconometrics: Methods and Applications* New York: Cambridge University Press.
- Greene, William H. 2007. *Econometric Analysis* 6th Edition. Upper Saddle River, NJ: Prentice Hall.
- Wooldridge, Jeffrey M. 2002. *Econometric Analysis of Cross Section and Panel Data* Cambridge, MA: MIT Press.

Software-Specific Books: Most often you have the choice to complete class assignments in R or in Stata. While the code to estimate such models in both programs will be covered in class, you are certain to come across problems and questions with each program during your own estimation. In such cases I suggest you consider one or both of the following:

- Long, J. Scott and Jeremy Freese. 2006. *Regression Models for Categorical Dependent Variables Using Stata* College Station, TX: Stata Press.
- Faraway, Julian J. 2006. *Extending the Linear Model with R* Boca Raton, FL: Chapman & Hall/CRC - really only goes over logit and probit.

Computing Resources

Most class assignments will allow you to use either R or Stata for completion, however others might require you to use a method only available within one program. If you are unfamiliar with either program I would recommend you familiarize yourself with it in this class. It is your responsibility to make sure you have adequate access to a computer for class assignments.

Requirements and Grading

Your grade will be comprised of the following components:

1. Assignments (40%): Assignments will often require you to estimate various models and perform diagnostics using a statistical software program. Along with answers, students need to include annotated copy of the code they used to develop their answers.

2. Presentations (10%): Starting mid-semester, each week a student will discuss an article published in a top-tier journal that applies or extends a method we will cover in this class. Students are encouraged to find substantive papers of interest that apply or extend course methods (some appropriate application/extension articles are listed below). You will need to give a 10-minute presentation in which you critically summarize the paper, evaluate its application, and lead us in discussion. You need to get pre-approval from me on whether an unlisted article is sufficient for presentation.

3. Article Replication/Extension (30%): You will need to find an article and corresponding data set, preferably within your substantive area of interest, to perform a replication and/or modification using techniques learned in this class. The replication should showcase your ability to use course methods to address substantive questions. You will then need to write up a description and presentation of your analysis in a paper which will be due before the end of the semester. For data of papers to replicate go to the ICPSR website (http://icpsr.org/) or Harvard's Dataverse website (http://dvn.iq.harvard.edu/dvn/).

4. Final (20%): Around exam week, students must complete a take-home examination of course material. For methods minors the format will

be different and require completion in 9 hours in an effort to prepare you for the methods comprehensive exam process.

Grading in this class follows typical graduate school conventions. A 4.0 represents very good work, a 3.5 represents adequate completion of the course, and a 3.0 or lower generally indicates less than adequate or worse performance.

Note: For your benefit, I do not favor giving out incompletes. I also do not accept late assignments.

Schedule

Most of the journal articles are found on Jstor or alternative library databases. For those readings not available, electronic copies are available on the class website.

1. Introduction, Notation, Software, and Other Basics
2. Likelihood Theory and Inference

   Required Reading:

   - Long Ch. 1
   - Pawitan p. 1-29

3. Calculating Likelihoods and Maximizing Them
   (a) Properties (NICE)
   (b) Model Fit: LR, Wald, and LM tests
   (c) The Normal Model and Extensions

   Required Reading:

   - Long Ch. 2
   - Pawitan p. 29-48
   - King Ch. 4

- Franklin, Charles H. 1991. "Eschewing Obfuscation? Campaigns and the Perceptions of U.S. Senate Incumbents." *American Political Science Review* 85: 1193-213.

4. Dichotomous Dependent Variables
   (a) Logit
   (b) Probit
   (c) Extensions: Rare Events, Neural Networks, Scobit, ...

   Required Reading:

   - Long Ch. 3

   Applications/Extensions:

   - Achen, Christopher H. 2006. "Expressive Bayesian Voters, their Turnout Decisions, and Double Probit: Empirical Implications of a Theoretical Model." Presented at the 2006 Annual Summer Political Methodology Meeting. Davis, CA. (online)
   - Alvarez, R. Michael and John Brehm. 1995. "American Ambivalence Towards Abortion Policy: Development of a Heteroskedastic Probit Model of Competing Values." *American Journal of Political Science* 39: 1055-1082.
   - Bartels, Larry M. 2000. "Partisanship and Voting Behavior, 1952-1996." *American Journal of Political Science* 44:35-50.
   - Beck, Nathanial, Gary King, and Langche Zeng. 2000. "Improving Quantitative Studies of International Relations: A Conjecture." *American Political Science Review* 94: 21-35.
   - De Marchi, Scott, Christopher Gelpi, and Jeffrey D. Grynaviski. 2004. "Untangling Neural Nets." *American Political Science Review* 98: 371-378.
   - King, Gary and Langche Zeng. 2001. "Explaining Rare Events in International Relations." *International Organization* 55: 693-715. see also
   - Nagler, Jonathan. 1994. "Scobit: An Alternative Estimator to Logit and Probit." *American Journal of Political Science* 38: 230-255.

- Zorn, Christopher. 2005. "A Solution to Separation in Binary Response Models." Political Analysis 13: 157-70.

5. Getting the Substance from MLE and Avoiding Common Mistakes

   (a) Goodness of Fit

   (b) Predicted Probabilities

   (c) Average Partial Effects

   (d) Interactions

   (e) Standard Errors and Bootstrapping

   Required Reading:

   - Long Ch. 4
   - King, Gary, Michael Tomz, and Jason Wittenberg. 2001. "Making the Most of Statistical Analyses: Improving Interpretation and Presentation." *American Journal of Political Science* 44: 347-361.
   - King, Gary, and Langche Zent. 2006. "The Dangers of Extreme Counterfactuals" *Political Analysis* 14: 131-159.
   - Norton, Edward C., Hua Wang, and Chunrong Ai. 2004. "Computing Interaction Effects and Standard Errors in Logit and Probit Models." *The Stata Journal* 4: 154-167 (online).
   - Freedman, David A. 2006. "On the So-Called 'Huber Sandwich Estimator' and 'Robust Standard Errors.'" *The American Statistician* 60: 299-302.
   - Mooney, Christopher Z. "Bootstrap Statistical Inference: Examples and Evaluations for Political Science." *American Journal of Political Science* 40: 570-602.

   Applications/Extensions:

   - Adler, E. Scott and John S. Lapinski. 1997. "Demand-Side Theory and Congressional Committee Composition: A Constituency Characteristics Approach." 41: 895-918.

- Clarke, Kevin. 2001. "Testing Nonnested Models of International Relations: Reevaluating Realism." *American Journal of Political Science* 45: 724-44.
- Nagler, Jonathan. 1991. "The Effect of Registration Laws and Education on U.S. Voter Turnout." *American Political Science Review* 85: 1393-1405.

6. Ordinal Dependent Variables
   (a) Ordered Logit
   (b) Ordered Probit

   Required Reading:

   - Long Ch. 5

   Applications/Extensions:

   - Gelpi, Christopher. 1997. "Crime and Punishment: The Role of Norms in Crisis Bargaining." *American Political Science Review* 91: 339-60.
   - Sanders, Mitchell S. 2001. "Uncertainty and Turnout." Political Analysis 9:45-57.
   - Bartels, Larry. 1991. "Constituency Opinion and Congressional Policy Making: The Reagan Defense Buildup." *American Political Science Review* 85: 457-74.
   - 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.
   - Jones, Bradford S., and Michael E. Sobel. 2000. "Modeling Direction and Intensity in Semantically Balanced Ordinal Scales: An Assessment of Congressional Incumbent Approval." *American Journal of Political Science* 44:174-85.
   - Krehbeil, Keith and R. Douglas Rivers. 1988. "The analysis of Committee Power: An Application of Senate Voting on the Minimum Wage." *American Journal of Political Science* 32: 1151-74.

7. Polychotomous Dependent Variables

(a) Multinomial Logit

(b) Multinomial Probit

(c) Mixed/Random Parameters Logit

(d) Extensions: Nested Logit, QRE, Adjacent, Stereotype Logit

Required Reading:

- Long Ch. 6
- Lacy, Dean and Barry Burden. 1999. "The Vote-Stealing and Turnout Effects of Ross Perot in the 1992 U.S. Presidential Election." *American Journal of Political Science* 43: 233-55.
- Glasgow, Garrett. 2001. "Mixed Logit Models for Multiparty Elections." *Political Analysis* 9: 116-36.

Applications/Extensions:

- Carson, Jamie L. 2005. "Strategy, Selection, and Candidate Competition in U.S. House and Senate Elections." *Journal of Politics* 67: 1-28.
- Dow, Jay K. and James W. Endersby. 2004. "Multinomial Probit and Multinomial Logit: A Comparison of Choice Models for Voting Research." *Electoral Studies* 23: 107-22.
- 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: 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: 698-713.
- Signorino, Curtis S. 1999 "Strategic Interaction and the Statistical Analysis of International Conflict." *American Political Science Review* 93: 279-297.

8. Limited Dependent Variable Models

(a) Censoring and Tobit

(b) Truncated regression

Required Reading:

- Long Ch. 7

Applications/Extensions:

- Crisp, Brian F. and Scott W. Desposato. 2001."Constituency Building in Multimember Districts: Collusion or Conflict?" *Journal of Politics* 66: 136-155.
- Grier, Kevin B., Michael C. Munger, and Brian E. Roberts. 1994. "The Determinants of Industry Political Activity, 1978-1986" *American Political Science Review* 88: 911-926

9. Multivariate Models

(a) Bivariate Probit/Logit

(b) Heckman Models

Required Reading:

- Durbin, Jeffrey A. and Douglas Rivers. 1989. "Selection Bias in Linear Regression, Logit and Probit Models." *Sociological Methods and Research* 18: 360-390.
- Sigelman, Lee and Langche Zeng. 1999. "Analyzing Censored and Sample-Selected Data with Tobit and Heckit Models." *Political Analysis* 8: 167-182.

Applications/Extensions:

- Achen, Christopher H. 2008. "Registration and Voting under Rational Expectations: The Econometric Implications." Presented at the Annual Summer Conference of the Society for Political Methodology. Ann Arbor, MI. (online)
- Berinsky, Adam J. 1999. "The Two Faces of Public Opinion The Two Faces of Public Opinion." *American Journal of Political Science* 43: 1209-1230.

- Goodliffe, Jay. "The Effect of War Chests on Challenger Entry in U.S. House Elections The Effect of War Chests on Challenger Entry in U.S. House Elections." *American Journal of Political Science* 45: 830-44.
- Timpone, Richard J. 1998. "Structure, Behavior, and Voter Turnout in the United States." *American Political Science Review* 92: 145-158.
- Zorn, Christopher J.W. 2002. "U.S. Government Litigation Strategies in the Federal Appellate Courts U.S. Government Litigation Strategies in the Federal Appellate Courts." *Political Research Quarterly* 55: 145-166.

10. Counting Distributions

    (a) Poisson

    (b) Negative Binomial

    (c) Hurdle and Zero-Inflated Models

    Required Reading:

    - Long Ch. 8
    - Zorn, Christopher J.W. 1998. "An Analytic and Empirical Examination of Zero-Inflated and Hurdle Poisson Specifications." *Sociological Methods and Research* 26: 368-400.

    Applications/Extensions:

    - Gowa, Joanne. 1998. "Politics at the Water's Edge: Parties, Voters and the Use of Force Abroad." *International Organization* 52: 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: 838-63.
    - Sheingate, Adam D. "Structure and Opportunity: Committee Jurisdiction and Issue Attention in Congress." *American Journal of Political Science* 50: 844-859.

11. Duration Distributions (Event History)

    (a) Exponential, Weibull, Log-logistic, ...

    (b) The Cox Proportional Hazards Model

    (c) Discrete Time Formulations

    (d) Extensions

    Required Reading:

    - Box-Steffensmeier, Janet M. and Bradford S. Jones. 2004. *Event History Modeling: A Guide for Social Scientists* (selected chapters)
    - Alt, James, and Gary King. 1994. "Transfers of Governmental Power: The Meaning of Time Dependence." *Comparative Political Studies* 27: 190-210.
    - Beck, Nathaniel, Jonathan N. Katz, and Richard Tucker. 1998. "Taking Time Seriously: Time-Series-Cross-Section Analysis with a Binary Dependent Variable" *American Journal of Political Science* 43: 1260-1288. (also note Erratum for Figure 1).

    Applications/Extensions:

    - Bennett, D. Scott. 1999. "Parametric models, duration dependence, and time-varying data revisited." *American Journal of Political Science* 43: 25670
    - Bennett, D. Scott and Allan C. Stam. 1996. "The Duration of Interstate Wars, 1816-1985." *American Political Science Review* 90: 239-257.
    - Binder, Sarah A. and Forrest Maltzman. 2002. "Senatorial Delay in Confirming Federal Judges, 1947-1998." *American Journal of Political Science* 46: 190-199.
    - Box-Steffensmeier, Janet M., Dan Reiter, and Christopher J.W. Zorn. 2003. "Nonproportional Hazards and Event History Analysis in International Relations." *Journal of Conflict Resolution*
    - Gordon, Sanford C. 2002. "Stochastic dependence in competing risks." *American Journal of Political Science* 46: 20017.

- Hegre, Havard, Tanja Ellingsen, Scott Gates, and Nils Petter Gleditsch. 2001. "Toward a Democratic Civil Peace? Democracy, Political Change, and Civil War, 1816-1992." *American Political Science Review* 95: 33-48.
- Huber, John D. and Cecilia Martinez-Gallardo. 2008. "Replacing Cabinet Ministers: Patterns of Ministerial Stability in Parliamentary Democracies." *American Political Science Review* 102: 169-180.
- Katz, Jonathan N. and Brian R. Sala. 1996. "Careerism, Committee Assignments, and the Electoral Connection." *American Political Science Review* 90: 21-33.
- Zorn, Christopher J.W. 2000. "Modeling Duration Dependence" *Political Analysis* 8:36780.

12. Beyond:
    - GLMs and Proportions
    - Panel/Multilevel Methods
    - Bayesian Methods
    - Class Suggestions?

A Couple Last Things

Group Work and Academic Misconduct

I recognize that working in groups is essential to scientific progress. You are allowed to collaborate with others to complete the assignment portion of this class. However, you will then also need to submit answers to that assignment together, with all your names on a single document, such that you will all be graded as a group. Working in groups is not allowed for the other requirements of this class.

Academic misconduct will not be tolerated. Cheating or plagiarism is an insult to me, your peers, and yourself; it is not to be tolerated. Instances of cheating will be handled according the school's policy on integrity of scholarship and grades.

Electronic Submissions

As a general rule, students should always submit their work in paper form. If, under special circumstances, you are submitting a document electronically, then you need to submit it in an archival format. This means no modifiable Word/Text documents (.doc, .txt, .rtf) and instead formats where content is fixed (.pdf, .ps, but not that new Vista archive format - I do not have Vista).