

# POLS 571 Longitudinal Data Analysis

## Spring 2009

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This course covers quantitative methods of time series, panel, time-series-cross-section, and event history (duration) data. I have three major goals for the course. First, I hope to cultivate a broad set of tools so that you can be more conversant with your colleagues and better engage the published material across the discipline. The methods covered in this course are used frequently, and your understanding for the cutting edge research will improve as you can better follow the empirical methodology. Second, I hope you will have a firm foundation on which you can further explore the topics that interest you in greater depth. In the limited class periods, I will be unable to cover everything as deeply as you might like, but I hope to at least expose you to the techniques and point you in the right direction for further exploration. Third, I hope that you will be able to use the methods in your own research. If your research questions call for the methods covered in this course, then you should be able to use them with confidence and analytic rigor.

### **Structure**

Most topics covered will span two class periods and will unfold in three parts. First, I will lecture on the assigned topics. The lectures will combine mathematical principles from the readings with general intuition on how it all applies to political science research. This will take up an entire class period.

The second class period given to a topic will focus on application and extensions. You will take turns presenting an article from the literature for class discussion. Your presentation will include a summary of the article and a detailed assessment of how the methods used apply to the course concepts. One fruitful avenue of discussion from these presentations is how we can (and should) use the methods in the discussed paper in applications outside of the paper's context (i.e., our own research). I expect all students in the class to have read the papers being presented in advance.

Lastly, we will spend time exploring the course concepts in a laboratory environment. We will primarily use Stata, but I will also teach some of the applications in R. By the third week of the course, each student will have obtained data with 1) a time series of at least 50 observations, 2) a panel/TSCS dataset with  $N > 10$  and  $T > 50$ , and 3) a data set that can be used for duration analysis. The data should be clean and ready to use in class. It is possible that a single dataset could meet all these requirements.

### **Assignments**

- Class Participation (10%)  
Students are expected to come prepared to each class ready to discuss the assigned reading. Students will also lead part of the class once or twice during the semester, as described above.

- **Problem Sets (50%)**  
Students will complete five assignments during the semester. The assignments will ask the students to demonstrate their mastery of the course material. Each assignment will have some questions related to the mathematical foundations of the course topics, some requiring the methods to be used, and some demanding an intuitive interpretation of the findings. Late problem sets will lose one point (out of ten) per day late, starting at the moment that the assignments are collected.
- **Final Project (40%)**  
Students will complete a 15-20 page methods paper on a topic of their choosing, using longitudinal data. The paper can be a replication paper of a major work in the literature, or it can be a paper related to an ongoing research project. No more than 20% of the paper can be copied and pasted from an existing research project. In the papers, the students should present the hypotheses tested and a brief overview of why the hypotheses are both interesting and justified. The bulk of the paper will be on the research design and results, with a brief conclusion to sum up the findings. The point is to demonstrate mastery of the course concepts, so the students should explore many different facets of the appropriate methods. The write-up should be clear and concise, with all tables formatted neatly. On the third week of class, each student will turn in a one-page summary of the research project, along with the data set he/she intends to use for the project. Late projects will lose one letter grade per day late.

### **Books**

Enders, Walter. 2004. *Applied Econometric Time Series*. Hoboken, NJ: Wiley.

Wooldridge, Jeffrey M. 2002. *Econometric Analysis of Cross Section and Panel Data*. Cambridge, MA: MIT Press.

Box-Steffensmeier, Janet M. and Bradford S. Jones. *Event History Modeling: A Guide for Social Scientists*. New York: Cambridge University Press.

### **Schedule**

1/15: Introduction to the Course

1/20: Math overview & finite differences  
Enders, Ch. 1 (you may skip Section 8)

1/22&1/27: ARMA, ARCH & GARCH  
Enders, Chs. 2 & 3 (you may skip Sections 8 &9)

Application and Extension: Lebo, Matthew J. and Janet M. Box-Steffensmeier. 2008. "Dynamic conditional correlations in political science. *American Journal of Political Science* 52 (3):688-704.

1/29&2/3: Unit roots and VAR

Enders, Chs. 4 (you may skip Section 10) & 5 (you may skip Sections 10-13).

Application and Extension: Enders, Walter, and Todd Sandler. 1993. The effectiveness of antiterrorism policies: A vector-autoregression-intervention analysis. *American Political Science Review* 87(4): 829-844.

Optional: Freeman, John R., John T. Williams, and Tse-min Lin. 1989. Vector autoregression and the study of politics. *American Journal of Political Science* 33(4):842-877.

2/5&2/10: Error correction models

Enders, Ch. 6

De Boef, Suzanna and Luke Keele. 2008. Taking time seriously. *American Journal of Political Science* 52(1): 184-200.

Beck, Nathaniel. 1993. The methodology of cointegration. *Political Analysis* 4: 237-248.

Application and Extension: Discuss: Lebo, Matthew J. and Will H. Moore. 2003. Dynamic foreign policy behavior. *Journal of Conflict Resolution* 47(1): 13-32.

2/12: Panel & TSCS data

**No Class on 2/17**

Wooldridge, 128-132, Ch. 7

Wilson, Sven E. and Daniel M. Butler. 2007. A lot more to do: The sensitivity of time-series cross-section analyses to simple alternative specifications. *Political Analysis* 15(2): 101-123.

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.

2/19&2/24: Random Effects and Fixed Effects

Wooldridge, Chs. 10 & 11

Plumper, Thomas and Vera E. Troeger. 2007. Efficient estimation of time invariant and rarely changing variables in finite sample panel analyses with unit fixed effects. *Political Analysis* 15(2): 124-139.

Application and Extension: Hood III, M.V., Quentin Kidd and Irwin L. Morris. 2008. Two sides of the same coin? Employing granger causality tests in a time series cross-section framework. *Political Analysis* 16 (3): 324-344

2/26&3/3: Random Coefficient Models & Dynamic Panel Data

- Beck, Nathaniel and Jonathan N. Katz. 2007. Random coefficient models for time-series—cross-section data. *Political Analysis* 15(2): 182-195.
- Wawro, Gregroy. 2002. Estimating dynamic panel data models in political science. *Political Analysis* 10(1): 25-48.
- Application and Extension: Plumper, Thomas, Vera E. Troeger and Philip Manow. 2005. Panel data analysis in comparative politics: Linking method to theory. *European Journal of Political Research* 44: 327-354.
- 3/5&3/17: Binary Responses & Nonrandom Sample Selection  
Wooldridge, 482-497, 551-571, 577-590
- Application and Extension: Green, Donald P., Soo Yeon Kim and David H. Yoon. 2001. Dirty pool. *International Organization* 55(2):441-468.
- 3/19&3/24: Spatial Autocorrelation & GEE  
Franzese, Robert J. and Jude C. Hays. 2007. Spatial econometric models of cross-sectional interdependence in political science panel and time-series-cross-section data. *Political Analysis* 15(2): 140-164.
- Zorn, Christopher. 2001. Generalized estimating equation models for correlated data: A review with applications. *American Journal of Political Science* 45(2): 470-90.
- Application and Extension: Ward, Michael D. and Kristian Skrede Gleditsch. 2002. Location, location, location: An MCMC approach to modeling the spatial context of war and peace. *Political Analysis* 10(3): 244-260.
- 3/26&3/31: Overview of Event History Models  
Wooldridge, Ch. 20
- Box-Steffensmeier and Jones, Chs. 1-4
- Application and Extension: Alt, James E. and Gary King. 1994. Transfers of governmental power: The meaning of time dependence. *Comparative Political Studies* 27(2):190-210.
- 4/2&4/7: Discrete-Time Models  
Box-Steffensmeier and Jones, Ch. 5
- Beck, Nathaniel, Jonathan N. Katz and Richard Tucker. 1998. Taking time seriously: time-series-cross-section analysis with a binary dependent variable. *American Political Science Review* 42(4): 1260-1288.
- Carter, David B. and Curtis S. Signorino. 2007. Back to the Future: Modeling Time Dependence in Binary Data. Working paper.

Application and Extension: Kyle Beardsley. 2008. Agreement without peace? International mediation and time inconsistency problems. *American Journal of Political Science* 52 (4): 723-740.

**4/9: No class, work on papers**

4/14&4/16: Event History Model Selection and Specification  
Box-Steffensmeier and Jones, Chs. 6-8

Application and Extension: Box-Steffensmeier, Janet M., Dan Reiter, and Christopher Zorn. 2003. Nonproportional hazards and event history analysis in international relations. *Journal of Conflict Resolution* 47(1): 33-53.

4/21&4/23: Frailty and Variance-Corrected Models  
Box-Steffensmeier and Jones, Chs. 9&10

Box-Steffensmeier, Janet M., Suzanna De Boef, and Kyle A. Joyce. 2007. Event dependence and heterogeneity in duration models: The conditional frailty model. *Political Analysis* 15: 237-256.

Application and Extension: Darmofal, David. 2009. Bayesian survival models for political event processes. *American Journal of Political Science* 53(1): 241-257.

Optional: Jones, Bradford S. and Regina P. Branton. 2005. Beyond logit and probit: Cox duration models of single, repeating, and competing events for state policy adoption. *State Politics and Policy Quarterly* 5: 420-43.