

**PS2701**  
**ADVANCED METHODOLOGY: LONGITUDINAL ANALYSIS**

Wednesday 6-8:30 PM, 4801 Posvar Hall

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**Course Description**

This course aims to provide students with an overview of statistical methods appropriate for the analysis of longitudinal data, or data collected on multiple units (individuals, states, dyads, countries) at more than one point in time. The majority of the course will focus on models for the analysis of “panel data,” which (by convention) is used to describe data with relatively large number of units and relatively few time points. Shorter sections focus on models for “time-series-cross-section data” (fewer units and many time points) and “event history analysis,” which is used to model whether and when certain events occur (e.g. war, cabinet dissolution, Senate confirmation of Supreme Court justices).

The emphasis throughout the class will be on taking advantage of the benefits that longitudinal data provide the researcher in making inferences about causal dynamics, while at the same time being sensitive to the specific problems and complexities that emerge when conducting longitudinal analyses. On the benefits side, longitudinal data provides the researcher with increased ability to:

- 1) model directly individual-level change and growth in dependent variables;
- 2) test alternative lag structures and models of reciprocal causality between variables;
- 3) estimate causal effects after controlling for the confounding effects of measurement error;
- 4) estimate models that control for unmeasured unit-specific effects or “unobserved heterogeneity;”
- 5) estimate models that specify and account for variation in individual-level intercepts, slopes and/or rates of change over time; and
- 6) estimate the “hazard” of an event occurring at given points in time, and the factors that influence the hazard over time.

Obstacles in achieving these goals abound however, and are made more difficult by several problems that are commonly found in longitudinal analyses, such as autocorrelated disturbances, missing data and panel attrition. We will consider all of these issues as we progress through the course.

A note on the level of mathematical/statistical difficulty in the course: This is not formally a “statistics” class; that is, there will not be an emphasis on derivations of appropriate statistical estimators and so forth. Rather, the emphasis will be on grasping the underlying logic of the various models, understanding how, when and why to use them to achieve the goals specified above in your own research, and learning how to profit from, and to critique, published works in the discipline that make use of these techniques. There will be a reasonable amount of mathematics, formulae, etc. that will be needed to understand the various models and methods, but all of it will be presented in ways that, ideally, will help guide your own research endeavors. I am assuming only that you have had basic courses in regression and the linear model, some exposure to maximum likelihood estimation, and perhaps to structural equation modeling as well.

**Texts**

Finkel, Steven E. 1995. *Causal Analysis with Panel Data*. Thousand Oaks, Ca.: Sage Publications.

Kaplan, David. 2000. *Structural Equation Modeling: Foundations and Extensions*. Thousand Oaks, Ca.: Sage Publications.

Singer, Judith D. and John B. Willett. 2003. *Applied Longitudinal Data Analysis: Modeling Change and Event Occurrence*. New York: Oxford University Press.

**Supplemental References:**

Frees, Edward W. 2004. *Longitudinal and Panel Data: Analysis and Application in the Social Sciences*. London: Cambridge University Press.

Raudenbush, Stephen W., and Anthony S. Bryk. 2002. *Hierarchical Linear Models*. Thousand Oaks, Ca.: Sage Publications.

Stata Press. 2005. *Longitudinal/Panel Data Reference Manual, Release 9*.

Cleves, Mario A., William W. Gould, and Roberto G. Gutierrez. 2004. *An Introduction to Survival Analysis Using Stata*. College Station, Tx.: Stata Press.

## **Requirements**

Grades will be based on a 20-25 page research paper (40%), three homework exercises which relate to specific statistical methods and problems we will discuss (15% each), and an oral presentation (with Power Point and/or related materials) of your research paper on December 7 (15%). The paper will be a quantitative analysis of longitudinal panel data using methods from this course of data that you will collect or access from social science archives or other sources. The paper should have some substantive interest to you or be relevant to your studies in the graduate program; ideally, you can think of it as the first draft of a convention paper or possible journal publication (see King, Gary. 2005. "Publication, Publication." *PS: Political Science and Politics*). The paper will discuss your basic theoretical framework, your hypotheses, statistical models, results, possible problems with the analysis and what you may have done to correct or account for these problems. It will conclude with a discussion of the relevance of your findings for the general topic and for future research. The final version of the paper should also incorporate the comments, critiques, and suggestions from your presentation the class. The paper will be due on December 12.

The homework exercises will be periodic problems or data to analyze and will illustrate aspects of the statistical techniques being covered in class.

## **Course Outline**

The course is organized by units and then topics within units. We will maintain a certain amount of flexibility with the schedule, so that we can spend more time on some topics/units and scale back on others as circumstances warrant.

### **[NOTE: SEPTEMBER 7 CLASS TO BE RESCHEDULED]**

**August 31: Course Introduction**

**UNIT 1: Structural Equation Panel Models (September 14, 21, 28)**

1. Review of Structural Equation Modeling and Introduction to (or Review of) LISREL  
Kaplan, David, *Structural Equation Modeling*, chapters 1-2, 6.

2. Cross-Lagged and Synchronous Effects Models  
Finkel, chapters 1-3.

*Application:*

Paxton, Pamela. 2002. "Social Capital and Democracy: An Interdependent Relationship." *American Sociological Review* 67: 254-277.

Hetherington, Marc, and Suzanne Globetti. 2002. "Political Trust and Racial Policy Preferences." *American Journal of Political Science* 46: 253-275.

3. Measurement Error

Finkel, chapter 4.

Raffalovich, Lawrence E., and George W. Bohrnstedt. 1987. "Common, Specific, and Error Variance Components of Factor Models." *Sociological Methods and Research* 15: 385-405.

Kaplan, David, *Structural Equation Modeling*, chapter 3-4.

*Application:*

Green, Donald and Bradley Palmquist. 1990. "Of Artifacts and Partisan Instability." *American Journal of Political Science* 34: 872-902.

Jackson, John E. 1983. "The Systematic Beliefs of the Mass Public: Estimating Policy Preferences with Survey Data." *Journal of Politics* 45: 838-865.

Bartels, Larry. 1993. "Messages Received: The Political Impact of Media Exposure." *American Political Science Review* 87: 267-285.

**HOMEWORK 1 HANDED OUT SEPTEMBER 28, DUE OCTOBER 5**

**UNIT 2: Unobserved Heterogeneity and Dynamic Panel Models  
(October 5, October 11)**

1. Fixed and Random Effects Models

Gujarati, Damodar. 2003. "Panel Data Regression Models." Chapter 16 in *Basic Econometrics*. New York: McGraw Hill.

Johnson, David R. 1995. "Alternative Methods for the Quantitative Analysis of Panel Data in Family Research: Pooled Time-Series Models." *Journal of Marriage and the Family* 57: 1065-1077.

Allison, Paul. 1994. "Using Panel Data to Estimate the Effect of Events." *Sociological Methods and Research* 23: 179-199.

Teachman, Jay, Greg Duncan, W. Jean Yeung, and Dan Levy. 2001. "Covariance Structure Models for Fixed and Random Effects." *Sociological Methods and Research* 30: 271-288.

Stata Commands and Descriptions of: XT, TSSET, XTDES, XTREG, XTLOGIT, CLOGIT

*Application:*

Green, Donald P., Soo Yeon Kim, and David H. Yoon. 2001. "Dirty Pool." *International Organization* 55: 441-468.

Beck, Nathaniel, and Jonathan Katz. 2001. "Throwing Out the Baby with the Bath Water: A Comment on Green, Kim and Yoon." *International Organization* 55: 487-495.

Alderson, Arthur S. 1999. "Explaining Deindustrialization: Globalization, Failure, or Success?" *American Sociological Review* 64: 701-721.

2. Dynamic Panel Models and Endogenous Regressors

Wawro, Gregory. 2002. "Estimating Dynamic Panel Models in Political Science." *Political Analysis* 10: 25-48.

Stata Commands and Descriptions of: XTABOND, XTIVREG, XTREGAR

*Application:*

Green, Donald P., and David Yoon. 2002. "Reconciling Individual and Aggregate Evidence Concerning Partisan Stability: Applying Time-Series Models to Panel Survey Data." *Political Analysis* 10: 1-24.

Rajan, Raghuram, and Arvind Subramanian. 2005. "Aid and Growth: What Does the Cross-Country Evidence Really Show?" *International Monetary Fund Working Paper*.

**UNIT 3: Hierarchical, Random Coefficient and Latent Growth Models  
(October 12, 19, 25\*)**

1. Multilevel (Hierarchical) Longitudinal Models

Singer, Judith D. and John B. Willett, *Applied Longitudinal Data Analysis*, chapters 1-7.

Raudenbush, Stephen W., and Anthony S. Bryk. 2002. *Hierarchical Linear Models*, Chapter 6, "Applications to the Study of Individual Change."

SPSS, Inc. 2005. *Linear Mixed-Effects Modeling in SPSS: An Introduction to the MIXED Procedure*.

*Application:*

Western, Bruce. 1998. "Causal Heterogeneity in Comparative Research: A Bayesian Hierarchical Approach." *American Journal of Political Science* 42: 1233-1259.

2. Hierarchical Generalized Linear Models (for Binary and other Non-Continuous DVs)

Raudenbush, Stephen W., and Anthony S. Bryk. 2002. *Hierarchical Linear Models*, Chapter 10, "Hierarchical Generalized Linear Models."

Stata Commands and Descriptions of: XTPROBIT, XTGEE

*Application:*

Plutzer, Eric. 2002. "On Becoming a Habitual Voter." *American Political Science Review* 96: 41-56.

3. Latent Growth Models

Singer and Willett, *Applied Longitudinal Data Analysis*, chapter 8.  
Kaplan, *Structural Equation Modeling*, chapter 7.

#### 4. Missing Data

Kaplan, David, *Structural Equation Modeling*, chapter 5.

Ferrer, Emilio. 2004. "Modeling Latent Growth Curves With Incomplete Data Using Different Types of Structural Modeling and Multilevel Software." *Structural Equation Modeling* 11: 452-483.

Duncan, Terry E., Susan C. Duncan, Lisa A. Stryker, Fuzhong Li, and Alpert Anthony. 1999. *An Introduction to Latent Variable Growth Curve Modeling: Concepts, Issues, Applications*. New York: Lawrence Erlbaum Associates. Chapter 8.

### **HOMEWORK 2 HANDED OUT OCTOBER 19, DUE OCTOBER 25**

#### **UNIT 4: Event History Analysis (November 2, 9, 16)**

Singer and Willett, *Applied Longitudinal Data Analysis*, chapters 9-15.

Box-Steffensmeier, Janet, and Bradford Jones. 1997. "Time is of the Essence: Event History Models in Political Science." *American Journal of Political Science* 41: 1414-1461.

#### *Application:*

Caul, Miki. 2001. "Political Parties and the Adoption of Candidate Gender Quotas: A Cross-National Analysis." *Journal of Politics* 63: 1214-1229.

Arvid Raknerud; Havard Hegre. 1997. "The Hazard of War: Reassessing the Evidence for the Democratic Peace." *Journal of Peace Research* 34: 385-404.

Pevehouse, Jon C. 2002. "With a Little Help from My Friends? Regional Organizations and the Consolidation of Democracy." *American Journal of Political Science* 46: 611-626.

Warwick, Paul V. 1992. "Rising Hazards: An Underling Dynamic of Parliamentary Government." *American Journal of Political Science* 36: 857-876.

### **HOMEWORK 3 HANDED OUT NOVEMBER 16, DUE NOVEMBER 30**

#### **UNIT 5: Models for Time-Series Cross-Section Data (i.e. Larger T, smaller N) (November 30)**

Stimson, James. 1985. Regression in Space and Time: A Statistical Essay." *American Journal of Political Science* 29: 914-47.

Beck, Nathaniel. 2001. "Time-Series-Cross-Section Data: What Have We Learned in the Past Few Years?" *Annual Review of Political Science* 4: 271-93.

Beck, Nathaniel, and Jonathan Katz. 1995. "What to do (and Not to Do) with Time-Series-Cross-Section Data." *American Political Science Review* 89: 634-47.

Stata Commands and Descriptions of: XTGLS, XTPCSE

#### *Application:*

Huber, Evelyn, and John D. Stephens. 2000. "Partisan Governance, Women's Employment, and the Social Democratic Service State." *American Sociological Review* 65: 323-342.

Poe, Steven C., and Neal Tate. 1994. "Repression of Human Rights to Personal Integrity in the 1980s: A Global Analysis." *American Political Science Review* 88: 853-872.

Radcliffe, Benjamin, and Patricia Davis. 2000. "Labor Organization and Electoral Participation in Industrial Democracies." *American Journal of Political Science* 44: 132-41.

#### **December 7: Paper Presentations**

### **PAPERS DUE DECEMBER 12**