

Political Science 8125

**Dynamic Analysis (Time Series
Modeling in Politics, Part I & II)**

Electronic Classroom, Rarig Hall [U.of MN];
3136 Derby Hall [OSU]; The Pyle Center [U. of W];
Room 103, 508 S. 6th Street [U. of Illinois]
Spring Semester 2004
11:00-1:00 CST, Fridays

John R. Freeman
1414 Social Sciences
University of Minnesota
(612) 624-4144
freeman@polisci.umn.edu

Jon Pevehouse
416 North Hall
University of Wisconsin
(608) 262-4839
pevehous@polisci.wisc.edu

Jan Box-Steffensmeier
2010 Derby Hall
Ohio State University
(614) 292-9642
Steffensmeier.2@osu.edu

This course considers statistical techniques to evaluate social processes occurring through time. The course introduces students to time series methods and to the applications of these methods in political science. After a brief review of the calculus of finite differences and other estimation techniques, we study stationary ARMA models. In the next section of the course, we examine a number of important topics in time series analysis including "reduced form" methods (granger causality and vector autogression), unit root tests, near-integration, fractional integration, cointegration, and error correction models. Time series regression is also discussed (including pooling cross-sectional and time series data). We learn not only how to construct these models but also how to use them in policy analysis.

We expect students to have a firm grounding in probability and regression analysis and to bring to the course some interesting questions about the dynamics of political processes. The emphasis throughout the course will be on application, rather than on statistical theory. However, the focus of most lectures will be statistical theory. Homework will revolve as much as possible around the time series you are interested in understanding. To that end, students will need to gather time serial data for analysis during the first week of class (these data need not be used throughout the term, though that would make your life easier). The length of the series should be at least 40 time points; longer series are better than shorter ones.

This is the first part of a fourteen-week seminar team-taught by Professors John Freeman, Janet Box-Steffensmeier, and Jon Pevehouse. Students are strongly encouraged to take both parts of the course.

Required Texts

Students should purchase:

Enders, Walter. 2003. *Applied Econometric Time Series*. 2nd ed. N.Y.: Wiley.

Enders, Walter. 1996. *RATS Handbook for Econometric Time Series*. N.Y.: Wiley.

Recommended Texts

Other books that will be used during the course and/or serve as excellent references include:

Chatfield, C. 1989. *The Analysis of Time Series: An Introduction, Fourth Edition*. New York: Chapman and Hall.

Goldberg, S. 1958. *Introduction to Difference Equations*. New York: John Wiley and Sons, Inc.

Gottman, R.E. 1981. *Time Series Analysis: A Comprehensive Guide for Social Scientists* NY: Cambridge University Press.

Gujarati, Damodar. 1995. *Basic Econometrics, 3rd Edition*. New York: McGraw-Hill

Hamilton, J.D. 1994. *Time Series Analysis*. Princeton, NJ: Princeton University Press.

Huckfeldt, R. Robert, C.W. Kohfeld, and T.W. Likens. 1982. *Dynamic Modeling: An Introduction* Beverly Hills, CA.: Sage.

McCleary, R. and R.A. Hay, Jr. 1980. *Applied Time Series Analysis for the Social Sciences* Beverly Hills, CA.: Sage.

Maddala, G.S., and In-Moo Kim. 2000. *Unit Roots, Cointegration, and Structural Change*. Cambridge, MA: Cambridge University Press.

Mills, Terence C. 1990. *Time Series Techniques for Economists*. New York: Cambridge University Press.

Patterson, K.D. 2000. *Introduction to Applied Econometrics: A Time Series Approach*. New York: Palgrave.

Pindyck, R.S. and D.L. Rubinfeld. 1991. *Econometric Models and Economic Forecasts Third Edition*. NY: McGraw-Hill.

Software

Regression Analysis and Time Series (RATS) is the statistical package that will be used. The RATS Handbook (available for purchase) and the RATS manual (available in each department) will be very useful for completing the data analyses. The RATS/Estima website is:

<http://www.estima.com/>

Written Work

Students will complete five assignments for Parts I & II of the course.

Part I: The first is a short problem set on the calculus of finite differences. This problem set will be graded pass/fail. Students will write a short critical evaluation of the Sprague article in week three of the syllabus. They will construct and apply an ARMA model for a data set of their choosing. This data set should contain series with at least forty time points. The data set need not be the same one students use in part two of the course. However, it is permissible to use the

same data set for both parts of the class. Faculty will work with students to help identify (construct) time series of high pedagogical value.

Part II: The second portion of the class will involve two short (8-10 page) papers analyzing a substantive problem using time series data and techniques. The first paper will consist of a series of univariate diagnostic tests including assessment of serial correlation and unit root hypotheses. The second paper will be a multivariate analysis using Vector Autoregression and Error Correction techniques.

COURSE OUTLINE AND READING ASSIGNMENTS

Items denoted by an asterisk (*) are available from JSTOR (www.jstor.org). [Conduct searches in political science, economics, and statistics journals.] The remaining books and articles will be made available.

January 23: Introduction

REQUIRED

*Brunner, R. D. and K. Liepelt. 1972. "Data Analysis, Process Analysis, and System Change" *Midwest (American) Journal of Political Science [AJPS]* 17 (1): 538-569.

Goldberg, S. 1958. *An Introduction to Difference Equations*. N.Y.: Wiley: Chaps. 1,2

Patterson, K. 2000. *An Introduction to Applied Econometrics: A Time Series Approach* NY: St. Martins: Chap 2.

Recommended

Cortes, et. al. 1974. *Systems Analysis for Social Scientists*. NY: Wiley: Chap. 1

Hamilton, J. 1994. *Time Series Analysis*, Princeton, NJ: Princeton University Press: Chaps. 1,2

January 30 & February 6: The Calculus of Finite Differences

REQUIRED

Enders, Chap. 1

Huckfeldt et. al. 1982. *Dynamic Modeling: An Introduction*. Beverly Hills, CA: Sage: Chaps. 3, 5, 6

Przeworski, A. and J. Sprague. 1986. *Paper Stones: A History of Electoral Socialism*. Chicago, IL: University of Chicago Press: pps. 1-11, 57-99, 187-201.

Richards, D. 2000. *Political Complexity: Nonlinear Models of Politics*. Ann Arbor: University of Michigan Press. Chap. 1 in "Nonlinear Modeling: All Things Suffer Change.": pps.1-19

Sprague, J. 1981. "One Party Dominance in Legislatures." *Legislative Studies Quarterly* 6(2): pps. 259-285.

Recommended

Freeman, J. and D. Snidal. 1982. "Diffusion, Development and Democratization in Western Europe." *Canadian Journal of Political Science* 15 (2): 299-329.

Goldberg, chp. 3.

Hamilton, chp. 5.

Huckfeldt et. al., chps. 1, 2, 4.

* Richards, D. 1993. "A Chaotic Model of Power Concentration in the International System." *International Studies Quarterly* 37: 55-72.

* Zinnes, D.A. and R.G. Muncaster. 1984. "The Dynamics of Hostile Activity and the Prediction of War." *Journal of Conflict Resolution* 28 (2): 187-229.

Feb 13, 20: *Identifying, estimating and using stationary ARMA models.*

REQUIRED

Enders, chp. 2.

McCleary and Hay. 1980. *Applied Time Series Analysis for the Social Sciences* Beverley Hills, CA,: Chps 2, 6.

* MacKuen, M., R. Erickson, and J. Stimson. 1989. "Macropartisanship." *American Political Science Review* 83(December): 1125-42.

* Green, D., B. Palmquist, and E. Schickler 1998. "Macropartisanship: A Replication and Critique." *American Political Science Review* 92(4): 883-899.

* Quinn, D.P. and R. Jacobson. 1989. "Industrial Policy Through Restrictions on Capital Flows." *American Journal of Political Science* 33(3): 700-736.

Recommended

Hamilton, Chapters 2, 3.

* Li, R. P. 1976. "A Dynamic Comparative Analysis of Presidential and House Elections." *AJPS* 20: 670-691.

* Haynie, S. 1992. "Leadership and Consensus on the U.S. Supreme Court." *Journal of Politics [JOP]* 54(4): 1158-1169.

* Li, R. P. and W. R. Thompson. 1978. "The Stochastic Process of Alliance Formation Behavior." *American Political Science Review* 72(4): 1288-1303.

February 27: Unit Roots, Near Integration, and Fractal Integration

REQUIRED

* Box-Steffensmeier, Janet M., and Renee M. Smith. 1998. "Investigating Political Dynamics Using Fractional Integration Methods." *American Journal of Political Science* 42(2): 661-89.

* Box-Steffensmeier, Janet M., and Renee M. Smith. 1996. "The Dynamics of Aggregate Partisanship." *The American Political Science Review* 90(3): 567-80.

* DeBoef, Suzanna, and Jim Granato. 1997. "Near-Integrated Data and the Analysis of Political Relationships." *American Journal of Political Science* 41(2): 619-40.

Enders, Walter. 1995. *Applied Econometrics Time Series*. New York: John Wiley & Sons, Inc. Chapter 6.

Lebo, Matthew, and Harold D. Clarke. 2000. "Modelling Memory and Volatility: Recent Advances in the Analysis of Political Time Series." *Electoral Studies*, Vol. 19, No. 2. (March): 1-7.

Lebo, Matthew, Robert W. Walker, and Harold D. Clarke. 2000. "You Must Remember This: Dealing with Long Memory in Political Analyses." *Electoral Studies*, Vol. 19, No. 2. (March): 31-48.

Recommended

* Freeman, John, Daniel Houser, Paul M. Kellstedt, and John T. Williams. 1998. "Long-Memored Processes, Unit Roots, and Causal Inference in Political Science." *American Journal of Political Science*, Vol. 42, No. 4. (Oct.): 1289-1327.

Brooks, Chris, Melvin J. Hinich, and Robert E. Molyneux. 1999. "Episodic Nonlinear Event Detection: Political Epochs in Exchange Rates." in *Political Complexity*, ed., Diana Richards. University of Michigan Press.

* Durr, R. "What Moves Policy Sentiments?" *American Political Science Review* 87:1: 158-172.

+Lebo, M. and W. Moore. 2003. "Dynamic Foreign Policy Behavior." *Journal of Conflict Resolution* 47 (1): 13-32.

Hamilton, J.D. 1994. *Time Series Analysis*. Princeton, NJ: Princeton University Press: Chapters 15-20.

Maddala, G.S., and In-Moo Kim. 2000. *Unit Roots, Cointegration, and Structural Change*. Cambridge: Cambridge University Press: Chapters 4, 6, 9.

* Chambers, Marcus J. 1998. "Long Memory and Aggregation in Macroeconomic Time Series." *International Economic Review* 39 (4): 1053-1072.

* Rossana, Robert J. and John Seater. 1992. "Aggregation, Unit Roots, and the Time Series Structure of Manufacturing Real Wages." *International Economic Review* 33 (1): 159-179.

March 5: *Nonstationarity, seasonality, and the decomposition of time series; intervention analysis and policy evaluation with ARIMA models*

REQUIRED

Enders, pps. 165-195.

McCleary and Hay, Chapter 3,4.

* Alt, J. 1986. "Political Parties, World Demand, and Unemployment." *American Political Science Review* 79(4): 1016-1040.

* Hibbs, D. 1977. "Political Parties and Macroeconomic Performance." *American Political Science Review* 71(4): 1467-1479.

* Suzuki, Motoshi and Henry W. Chappell Jr. 1996. "The Rationality of Economic Voting Revisited." *Journal of Politics* 58(1): 224-236.

Recommended

- * Box, G.E.P. and G. C. Tiao. 1975. "Intervention Analysis with Applications to Economic and Environmental Problems." *Journal of the American Statistical Association* 70: 70-79.
- * Rasler, Karen. 1986. "War, Accommodation, and Violence in the United States, 1890-1970." *American Political Science Review* 80: 921-945.
- * Rasler, K. and W. Thompson, 1985. "War and the Economic Growth of the Major Powers." *American Journal of Political Science* 29(3): 513-538.
- * Wood, B. Dan. 1988. "Principals, Bureaucrats, and Responsiveness in Clean Air Enforcements." *American Political Science Review* 82(1): pp. 213-236.
- * Wood, B. Dan and R. W. Waterman. 1991. "The Dynamics of Control of Bureaucracy" *American Political Science Review* 85(3): 801-828.
- * Flemming, R., J. Bohte, B. D. Wood. 1997. "One Voice Among Many: The Supreme Court's Influence on Attentiveness to Issues in the US, 1947-92." *AJPS* 41(4): 1224-50.
- * Yantek, T. 1988. "Polity and Economy Under Extreme Economic Conditions: A Comparative Study of The Reagan and Thatcher Experiences." *AJPS* 32(1): 196-216.

March 12: *Systematic Sampling and Temporal Aggregation*

REQUIRED

Freeman, John R. 1990. "Systematic Sampling, Temporal Aggregation and the Study of Political Relationships." *Political Analysis* 1.

* Goldstein, Joshua S. 1991. "Reciprocity in Superpower Relations: An Empirical Analysis." *International Studies Quarterly* 35: 195-209.

+ Robertson, John C. and Ellis W. Tallman. 1998. "Data Vintages and Measuring Forecast Model Performance." *Economic Review* Atlanta, GA: Federal Reserve Bank of Atlanta, Fourth Quarter: 4-20.

Granger, Clive W.J. 1990. "Aggregation of Time-Series Variables: A Survey." *Disaggregation in Econometric Modeling*: 17-34.

Recommended

* Tiao, G.C. and W. Wei. 1976. "Effect of Temporal Aggregation on the Dynamic Relationship of Two Time Series Variables." *Biometrika* 63(3): 513-523.

* Zellner, A. and C. Montemarquette. 1971. "A Study of Some Aspects of Temporal Aggregation Problems in Econometric Analysis." *Review of Economics and Statistics* 53: 335-342.

Georgoutsos, D.A., G.P. Kouretas, D.E. Tserkezos. 1998. "Temporal Aggregation in Structural VAR Models." *Applied Stochastic Models and Data Analysis* 14: 19-34.

+ Granger, Clive W.J. and P.R. Sikklos. 1995. "Systematic Sampling, Temporal Aggregation, Seasonal Adjustment, and Cointegration: Theory and Evidence." *Journal of Econometrics* 66: 357-369.

TIME SERIES MODELING IN POLITICS, PART II

April 2: "Reduced Form" Methods

REQUIRED

Enders, Walter. 1995. *Applied Econometrics Time Series*. New York: John Wiley & Sons, Inc. Chapter 5, sections 4 to 11.

* Freeman, J. 1983. "Granger Causality and the Time Series Analysis of Political Relationships" *American Journal of Political Science*: 327-358.

* Freeman, J. Williams, and T. Lin. 1989. "Vector Autoregression and the Study of Politics." *American Journal of Political Science*: 842-877.

Recommended

Freeman, J. and J. Alt. 1994. "The Politics of Public and Private Investment in Britain" *The Comparative Political of the Welfare State*: 136-168.

+ Goldstein, J. S., J. Pevehouse, D. Gerner, and S. Telhami. 2001. "Dynamics of Middle East Conflict and U.S. Influence, 1979-1997." *Journal of Conflict Resolution* 45 (5): 594-620.

* Goldstein, J. and J. Pevehouse. 1997. "Reciprocity, Bullying, and International Cooperation: Time-series Analysis of the Bosnian Conflict." *American Political Science Review* 91 (3): 515-529.

Goldstein, J. and J. Freeman. 1990. *Three Way Street: Strategic Reciprocity in World Politics* Chicago: University of Chicago Press.

Gujarati, Damodar. 1995. *Basic Econometrics, 3rd Edition*. New York: McGraw-Hill: 746-53.

Hamilton, J.D. 1994. *Time Series Analysis*. Princeton, NJ: Princeton University Press: Chapters 10-11.

Mills, Terence C. 1990. *Time Series Techniques for Economists*. New York: Cambridge University Press: Chapter 14.

* Williams, J. 1990. "The Political Manipulation of the Macroeconomic Policy." *American Political Science Review* 84(3): 767-795.

April 9: *ARCH, GARCH, FIGARCH, and Changes in Regime*

REQUIRED

Brehm, John and Paul Gronke. 2002. "History, Heterogeneity, and Presidential Approval: A Modified ARCH Approach." *Electoral Studies* 21 (3): 425-452.

* Caldeiera, Greg and Christopher, J. W. Zorn. 1998. "Of Time and Consensual Norms in the Supreme Court." *American Journal of Political Science* 42: 874-902.

Enders, Walter. 1995. *Applied Econometrics Time Series*. New York: John Wiley & Sons, Inc.: Chapter 3 and Section 6 in Chapter 4.

* Freeman, John, Jude C. Hays, Helmut Stix. 2000. "Democracy and Markets: The Case of Exchange Rates." *American Journal of Political Science*, (July): 449-468.

Maddala, G.S., and In-Moo Kim. 2000. *Unit Roots, Cointegration, and Structural Change*. Cambridge: Cambridge University Press: Chapter

Recommended

J.C.Hays, J.R. Freeman and H. Nesseth. 2003. "Exchange Rate Volatility and Democratization in Emerging Market Countries." *International Studies Quarterly* 47: 203-288.

Maestas, Cherie and Robert R. Preuhs. 2000. "Modeling Volatility in Political Time Series." *Electoral Studies* 19: 95-110.

April 23: *Cointegration and Error Correction*

REQUIRED

Box-Steffensmeier, Janet M., and Andrew R. Tomlinson. 2000. "Fractional Integration Methods in Political Science." *Electoral Studies* 19 (1, March): 63-76.

* Clarke, Harold D., and Marianne C. Stewart. 1994. "Prospections, Retrospections, and Rationality: The "Bankers" Model of Presidential Approval Reconsidered." *American Journal of Political Science* 38(4, Nov.): 1104-23.

+ DeBoef, Suzanna. 2001. "Modeling Equilibrium Relationships: Error Correction Models with Strongly Autoregressive Data." *Political Analysis* 9 (1): 78-94.

Enders, Walter. 1995. *Applied Econometrics Time Series*. New York: John Wiley & Sons, Inc.: Chapter 6.

* Murray, Michael P. 1994. "A Drunk and Her Dog: An Illustration of Cointegration and Error Correction." *The American Statistician* 48:37-9.

Ostrom, Charles W. and Renee M. Smith. 1993. "Error Correction, Attitude Persistence and Executive Rewards and Punishments: A Behavioral Theory of Presidential Approval." *Political Analysis* 4: 127-184.

Recommended

Beck, Nathaniel. 1993. "The Methodology of Cointegration." *Political Analysis* 4: 237-248.

Durr, Robert. 1993. "An Essay on Cointegration and Error Correction Models" *Political Analysis* 4: 185-228.

Durr, Robert. 1993. "Of Forest and Trees." *Political Analysis* 4: 255-258.

* Engle, R.F. and Clive W.J. Granger. 1987. "Cointegration and Error Correction: Representation, Estimation, and Testing." *Econometrica* 55:251-276.

Engle, R.F. and Clive W.J. Granger. 1991. *Long Run Economic Relationships: Readings in Cointegration*. New York: Oxford University Press.

Greene, William H. 1993. *Econometric Analysis, 2nd Edition*: Sections 19.3 - 19.6.

* Krause, George A. 1997. "Voters, Information Heterogeneity, and the Dynamics of Aggregate Economic Expectations." *American Journal of Political Science* 41 (4 Oct.): 1170-1200.

Smith, Robert. 1993. "Error Correction, Attractions, and Cointegration." *Political Analysis* 4: 249-254.

Williams, John. 1993. "What Goes Around, Comes Around: Unit Root Tests and Cointegration." *Political Analysis* 4: 229-236.

April 30: Time Series Regression Principles

REQUIRED

Pindyck, R.S. and D.L. Rubinfeld. 1991. *Econometric Models and Economic Forecasts Third Edition*. NY: McGraw-Hill: Sections 6.2 and 9.1.

* Wood, B. Dan. 2000. "Weak Theories and Parameter Instability." *American Journal of Political Science* 44 (3, July).

+ Brandt, Patrick T., and John T. Williams. 2001. "A Linear Poisson Autoregressive Model: The Poisson AR(p) Model." *Political Analysis* 9 (2, July): 164-84.

* Brandt, Patrick T., John T. Williams, Benjamin O. Fordham, and Brian Pollins. 2000. "Dynamic Modeling for Persistent Event-Count Time Series." *American Journal of Political Science* (October): 823-43.

Recommended

Beck, N. 1985. "Estimating Dynamic Models is not Merely a Matter of Technique." *Political Methodology* 11 (1-2): 71-90.

Beck, Nathaniel. 1991. "Comparing Dynamic Specifications: The Case of Presidential Approval." *Political Analysis* 3: 51-88.

Box-Steffensmeier, Janet M. and Tse-Min Lin. 1995. "A Dynamic Model of Campaign Spending in Congressional Campaigns." *Political Analysis* 6

* Grier, K. B. 1989. "On the Existence of a Political Monetary Cycle." *American Journal of Political Science* 33 (2): 376-389.

Gujarati, Damodar. 1995. *Basic Econometrics, 3rd Edition*. New York: McGraw-Hill: Chapter 17.

Hamilton, J.D. 1994. *Time Series Analysis*. Princeton, NJ: Princeton University Press: Chapter 8.

Hibbs, D. 1973-4. "Problems of Statistical Estimation and Causal Inference in Time Series Regression Models." *Sociological Methodology*: Chapter 10 (especially 252-307).

+ Krause, G. 2000. "Testing for the Strong Form of Rational Expectations with Heterogeneously Informed Agents." *Political Analysis* 8(3): 285-305.

+ Mitchell, S. M. and W. Moore. 2002. "Presidential Uses of Force During the Cold War: Aggregation, Truncation, and Temporal Dynamics." *American Journal of Political Science* 46 (2): 438-453.

May 7: Pooling Cross-Sectional and Time Series Data

REQUIRED

Beck, Nathaniel and Jonathan Katz. 1996. "Nuisance vs. Substance: Specifying and Estimating Time Series-Cross Section Models." *Political Analysis* (6).

* Beck, Nathaniel and Jonathan Katz. 1995. "What to do (and not to do) With Time Series-Cross-Section Data." *American Political Science Review*.

Kittel, Bernard. 1999. "Sense and Sensitivities in Pooled Analysis of Political Data." *European Journal of Political Research* 35: 225-53.

* Beck, N., J. N. Katz, and R. Tucker. 1998. "Taking Time Seriously: Time-Series Cross-Section Analysis with a Binary Dependent Variable." *American Journal of Political Science* 42(4):1260 – 88.

* Stimson, J. 1985. "Regression in Space and Time: A Statistical Essay." *American Journal of Political Science* 29(4): 914-947.

Recommended

* Alvarez, M., P. Lange, and G. Grant. 1991. "Government Partisanship, Labor Organizations and Macroeconomic Performance" *American Political Science Review* 85(2): 539-556.

* Blais, Andre, Donald Blake, and Stephane Dion. 1996. "Do Parties Make a Difference: A Reappraisal." *American Journal of Political Science* 40: 514-20.

* Eichenberg, R. and R. Dalton. 1993. "Europeans and the European Community: The Dynamics of Public Support for European Integration." *International Organization* 47 (4): 507-34.

* Hicks, A. and D. Swank. 1993. "Politics, Institutions and Welfare Spending in Industrialized Democracies" *American Political Science Review* 86(3): 658-674.

Kittel, Bernard, and Hannes Winner. 2001. *How Reliable is Pooled Analysis in Political Economy? The Globalization-Welfare State Nexus Revisited*. Max Planck Institute for the Study of Societies, Cologne, Germany.

Mebane, W. 1991. "Problems of Time and Causality in Survey Cross Section." *Political Analysis VII*: 75-96.

+ Green, D. S. Kim, & H. Yoon. 2001. "Dirty Pool. " *International Organization* 55 (2): 441-468.

+ Beck, N. and J. Katz. 2001. "Throwing out the Baby with the Bathwater." *International Organization* 55(2): 487-95.

+ King, G. 2001. "Proper Nouns and Methodological Propriety: Pooling Dyads in International Relations Data." *International Organization* 55(2): 497-507.