

# Syllabus

## POLI 284: Time Series Analysis Spring, 2005

**Text:** Walter Enders, *Applied Economic Time Series*, Second Edition, Wiley, 2004.

Not assigned, but for deeper reference, James D. Hamilton, *Time Series Analysis*, Princeton University Press, Princeton, NJ, 1994.

We'll have more or less weekly assignments which will typically be computer applications. These will be treated on a pass/fail basis, with credit given for completion simply because it is important that the activity take place. I take the view that statistical knowledge that is not accompanied by hands-on experience with real data and real software is almost never put to any professional use. So it is particularly important to *do* time-series analysis, not merely learn it. It would be nice if there were software that was useful for the diverse applications of the course, but there is not. I will emphasize Stata and R for classroom demonstrations and for homework and RATS (classroom only) for certain applications that other packages cannot handle. As things stand, Stata is the more capable package for time series applications, but R (an open source package) is open-ended and likely to dominate future applications. Because visual evidence plays a crucial role in time series analysis, all students will be required to do modelling exercises on a spreadsheet. I will assume Excel as the standard.

Computer exercises are much more satisfying when performed on data that you care about. So students are encouraged to produce their own data for weekly exercises for some ongoing research interest, either for this course or outside of it. But I will provide example series for those who need it.

**Research Paper:** I have ordinarily structured this course around a research paper requirement. But with 25 students enrolled, I am not up to the feedback that technically sophisticated work requires. Thus the paper is optional this term. What that means is that students who do a paper will have its evaluation included in grading, whereas others will be graded mainly by a final examination. A paper is not extra credit. I encourage you to do one if you have an ongoing research project that would benefit from time series analysis or if you have the desire to start one.

The paper, if you do one, should be in the format of a journal article. (That is, fully ready to be sent for submission, needing only a cover letter. See me for formatting standards *before* you start writing.) Because this is a methods course, it will often make sense to choose a project that is ongoing in another course<sup>1</sup> or even a paper already written which

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<sup>1</sup>The norm for this case is that both professors need to be aware of the arrangement.

could use a methodologically sophisticated reanalysis. It should be written exactly as it would be for journal submission. That entails two things in particular, (1) that it be written for a journal audience and not for the professor of a methods course, and (2) that it not concentrate unduly on methodological issues. The burden of (1) is to explain that which needs explanation to a political science professional audience and not that which does not, often a pretty tough call. On (2) I recommend a relatively low tech paper, which often will display little knowledge of the course materials, on which you can add a technical appendix full of geek talk to impress the professor. The purpose, of course, is that journal readers will not want to read an excess of geek talk just because you need to prove that you can speak it (a lesson usually learned after several painful rejections). If you lack a substantive paper on which you wish to work, you might consider a monte carlo analysis of an estimator or methodological choice of interest to your research program. (For a fine example see the Keele and Kelly paper below.)

We will have a conventional final examination, which will constitute about 80% of the course grade—or 40% with a paper—and the rest by homework and seminar participation. All assigned reading is to be completed *before* the topic is dealt with in class. Students who come unprepared should expect to be penalized for lack of preparation—the evidence of non-preparation always being more obvious to the instructor than students think is the case. Material of this density needs to be read at least twice, and one of those readings should include careful working through of key equations. If you are in the habit of ignoring equations and just reading the text, break it.

**Prerequisites:** This courses assume no prior knowledge of any aspect of time series analysis. But students will need to be generally comfortable with statistical inference and with the basic regression model from the cross sectional tradition. In this department that is POLI 281–282. Students who have particular interest or aptitude will have no trouble with these materials if they have taken 282 or an equivalent course on regression techniques or are taking 282 simultaneously with this course. The Enders text makes very occasional use of the calculus, but such background is not essential for understanding and such materials will not be emphasized in the course.

**Web Site:** The course web site is **blackboard.unc.edu**. If you are (1) registered for the course, and (2) have a UNC onyen, access is automatic. Those (i.e., Duke students) without an onyen or UNC students not registered should see me so that I can manually add you to the site list. The site will be used for shared materials such as lecture notes, data sets and readings, so everybody must have access.

# 1 Topics and Readings

**(Jan 13)** First Class. Subtopics are (1) introduction to the special problems of time series, and (2) a methodological primer on creating time series from common political data

No prior reading assignment

## 1.1 Building Blocks: Univariate ARIMA Models of Error Aggregation

**(Jan 20)** Difference Equations and Introduction to ARIMA: The Box-Jenkins Modeling Strategy

**Read:** Enders Chapter 1 (Sections 1.5 through 1.8 and appendices need not be mastered)

**(Jan 27)** ARIMA Estimation

**Read:** Enders Chapter 2 (seasonality and forecasting issues do not play a large role in political science applications of time series analysis)

## 1.2 Transfer Functions for Testing Theory

**(Feb 3)** Intervention Analysis

**Read:** Enders section 5.1.

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: pp. 70-79.

Hibbs, Douglas A. Jr. 1977. Political Parties and Macroeconomic Policy. *American Political Science Review*. 71: 1467-1479.

Wood, B. Dan. 1988. Principals, Bureaucrats, and Responsiveness. *American Political Science Review*. 82: 213-234.

**(Feb 10)** Final Intervention Analysis

**Read:** Hibbs, Douglas A. Jr. 1977. Political Parties and Macroeconomic Policy. *American Political Science Review*. 71: 1467-1479.

**Application:** Stimson, *Tides of Consent*, pp. 58-76.

**(Feb 17)** Regular Transfer Functions: Identification and Estimation Issues

**Read:** Enders 5.2

Norpoth, Helmut. *Transfer Function Analysis*. New Tools for Social Scientists. W.D. Berry and Michael Lewis-Beck eds. Sage Publications: Beverly Hills.

Carmines, Edward G. and James A. Stimson. 1986. On the Structure and Sequence of Issue Evolution. *American Political Science Review*. 80: 901-920, or a revised version in chapter. 7 of Carmines and Stimson, *Issue Evolution*, Princeton University Press, 1989.

**(Feb. 24)** Regular Transfer Functions: Estimation and Diagnosis / (Unrelated) ARCH and GARCH Conditional Heteroscedasticity Models

**Read:** Enders pp. 5.3 and 5.4 and 3.1-3.4

### 1.3 Time Series in the Econometric Tradition

**(Mar 3)** Introduction to Time Series Regression

**Read:** Granger, C.W. J. and P. Newbold. 1974. Spurious Regressions in Econometrics. *Journal of Econometrics*. 2: 111-120.

Hibbs, D. 1974. Problems of Statistical Estimation and Causal Inference in Time-Series Regression Models. *Sociological Methodology*, 252-307.

**(Mar 10)** Regression Models for Dynamic Causation

**Read:** Beck, Nathaniel. 1985. Estimating Dynamic Models Is Not Merely A Matter Of Technique. *Political Methodology*. 11: 71- 89.

Luke Keele and Nathan Kelly, Dynamic Models for Dynamic Theories: The Ins and Outs of Lagged Dependent Variables (unpublished).

**(Mar 24)** Pooling Cross Sections of Time Series (Panel) Models

**Read:** Stimson, James A. 1985. Regression Models in Space and Time: A Statistical Essay. *American Journal of Political Science*, 29: 914-947.

Beck, Nathaniel and Jonathan N. Katz. 1995. What to do (and not to do) with Time Series Cross-Section Data. *American Political Science Review*, 89:634-647.

**(Mar 31)** Causality Tests

**Read:** Freeman, John R. 1983. Granger Causality and Time Series Analysis of Political Relationships. *American Journal of Political Science*. 27: 327-358.

Sheehan, Richard G. and Robin Grieves. Sunspots and Cycles: A Test Of Causation. *Southern Economic Journal*. 1982: 775-77.

Thurman, W., and M. Fisher. 1988. Chickens, Eggs, and Causality, or Which Came First? *American Journal of Agricultural Economics*, 237-238.

**(Apr 7)** Vector Autoregression

**Read:** Enders 5.5-5.9.

Freeman, J., T. Lin, and J. Williams. 1989. Vector Autoregression and the Study of Politics. *American Journal of Political Science* 33: 842-877.

**(Apr 14)** Cointegration and Error Correction

**Read:** Enders 4.1-4.7 and 6.1-6.5

Ostrom, Charles W., Jr. and Renee M. Smith. 1994. Cointegration and Error Correction in Multiple Time Series Analysis: Presidential Approval and the Quality of Life Equilibrium Hypothesis. *Political Analysis*. Volume 4: 127-184.

and follow-ups by: Durr, Robert. 185-228, Williams, John, 229-236, Beck, Nathaniel. 237-248.

DeBoef, Suzanna and Jim Granato. 2000. Testing for Cointegrating Relationships with Near Integrated Data. *Political Analysis*. 8: 99-117.

Box-Steffensmeier, Janet M. and Renée M. Smith. 1996. The Dynamics of Aggregate Partisanship. *American Political Science Review*. 90: 567-580.

**Two Classics for reference (not required):**

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

MacKinnon, James G. 1991. Critical Values for Cointegration Tests. *Long Run Economic Relationships: Readings in Cointegration*. New York: Oxford University Press.

**(Apr 21)** Duration Models

**Read:** Box-Steffensmeier, Janet M. and Bradford S. Jones. 1997. Time is of the Essence: Event History Models in Political Science. *American Journal of Political Science* 41(October):1336-1383.

Peterson, David A. M., Lawrence J. Grossback, James A. Stimson, & Amy Gangl. 2003. Congressional Response to Mandate Elections. *American Journal of Political Science* 47:411-

(Apr 28) Final Exam

## 2 Office Information

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Hours: Mon, 11:00-2:00

Articles in the reference list below are mainly recent applications of time series methods to political science issues, with a tilt toward American politics.

## References

- Beck, Nathaniel, Jonathan N. Katz & Richard Tucker. 1998. "Taking Time Seriously: Time-Series-Cross-Section Analysis with a Binary Dependent Variable." *American Journal of Political Science* 42:1260–1288.
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- Clarke, Harold D. & Marianne C. Stewart. 1994. "Prospections, Retrospections and Rationality: The 'Bankers' Model of Presidential Approval Reconsidered." *American Journal of Political Science* 38:1104–1123.
- Cohen, Jeffrey E. 1995. "Presidential Rhetoric and the Public Agenda." *American Journal of Political Science* 39:87–107.
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- Durr, Robert H., Andrew D. Martin & Christina Wolbrecht. 2000. "Ideological Divergence and Public Support for the Supreme Court." *American Journal of Political Science* 44:768–776.
- Durr, Robert H., John B. Gilmour & Christina Wolbrecht. 1997. "Explaining Congressional Approval." *American Journal of Political Science* 41:175–207.
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- Enders, Walter & Todd Sandler. 2000. "Is Transnational Terrorism Becoming More Threatening? A Time-Series Investigation." *Journal of Conflict Resolution* 44:307–332.
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- George C. Edwards, III & B. Dan Wood. 1999. "Who Influences Whom? The President, Congress, and the Media." *American Political Science Review* 93:327–344.
- Haller, H. Brandon & Helmut Norpoth. 1997. "Reality Bites: News Exposure and Economic Opinion." *Public Opinion Quarterly* 61:555–575.
- Jackman, Simon. 2000. "Estimation and Inference via Bayesian Simulation: An Introduction to Markov Chain Monte Carlo." *American Journal of Political Science* 44:375–404.
- Kellstedt, Paul M. 2000. "Media Framing and the Dynamics of Racial Policy Preferences." *American Journal of Political Science* 44:245–260.
- Krause, George A. 1997. "Voters, Information Heterogeneity, and the Dynamics of Aggregate Economic Expectations." *American Journal of Political Science* 41:1170–1200.

- Leblang, David A. 1997. "Political Democracy and Economic Growth: Pooled Cross-Sectional and Time-Series Evidence." *British Journal of Political Science* 27:453–466.
- Meffert, Michael F., Helmut Norpoth & Anirudh V. S. Ruhil. 2001. "Realignment and Macropartisanship." *American Political Science Review* 95:953–962.
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- Smith, Mark A. 1999. "Public Opinion, Elections, and Representation within a Market Economy: Does the Structural Power of Business Undermine Popular Sovereignty?" *American Journal of Political Science* 43:842–863.
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- Wood, B. Dan. 2000b. "Weak Theories and Parameter Instability: Using Flexible Least Squares to Take Time Varying Relationships Seriously." *American Journal of Political Science* 44:603–618.
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