Syllabus

POLI 786: Time Series Analysis
Fall, 2007

Gardner 104, T-Th 3:30-4:45

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: All students are required to complete a research paper. This should represent a contribution to knowledge (although not necessarily *methodological* knowledge) and 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[1] or even a paper already written which 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

[1]The norm for this case is that both professors need to be aware of the arrangement.

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 40% of the course grade—along with 40% for the 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 course assumes 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. 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

(1. Aug 21-23) 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. Note: Our normal two meetings per week will be divided, very roughly, between lecture on Tuesdays and workshop sessions on Thursdays. The workshop sessions will combine attention to hands-on analyses as well as student proposals for research papers and later presentations

of findings. Some will be missed for university holidays or professional travel.

No prior reading assignment

1.1 Building Blocks: Univariate ARIMA Models of Error Aggregation

(2. Aug 28) 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)

APSA meeting Aug 30, no class.

Sep 4–6 No class meeting. Instructor travel to ECPR meetings. Students work on proposals due Sep 11.

(3. Sep 11-13) 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

(4. Sep 18–20) 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.

(5. Sep 25–27) 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.

(6. Oct 2–4) 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.

(7. Oct 9–11) 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

(8. Oct 16) Introduction to Time Series Regression
Read: Granger, C.W. J. and P. Newbold. 1974. Spurious Regressions in Econometrics. *Journal of Econometrics*. 2: 111-120.

No class Oct 18, Fall Break

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

(9. Oct 23–25) 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. *Political Analysis*. 14:186–205.

(10. Oct 30–Nov 1) 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.

Beck introduction to special issue of *Political Analysis* (Volume 15, Number 2, Spring, 2007).

Wilson, Sven E. and Daniel M. Butler, A Lot More to Do: The Sensitivity of Time-Series Cross-Section Analyses to Simple Alternative Specifications. *Political Analysis* 15:101–123.

Plümper, Thomas and Vera Troger, Efficient Estimation of Time-Invariant and Rarely Changing Variables in Finite Sample Panel Analyses with Unit Fixed Effects. *Political Analysis* 15:124–139.

(11. Nov 6) Causality Tests
Read: Freeman, John R. 1983. Granger Causality and Time Series Analysis of Political Relationships. *American Journal of Political Science*. 27: 327-358.

No class Nov 8: instructor travel to Oxford conference

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.

(12. Nov 13–15) 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.

(13. Nov 20) Cointegration and Error Correction
Read: Enders 4.1-4.7 and 6.1-6.5

No class Nov 24, Thanksgiving

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.

(14. Nov 27–29) 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* 47:411-426.

(15. Dec 4) TBA

2 Office Information

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Hours: Tue-Th 4:45-5:30

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, Neal, 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.

Beck, Neal, Jonathan N. Katz & Richard Tucker. 1999. "Erratum: Taking Time Seriously: Time-Series-Cross-Section Analysis with a Binary Dependent Variable." *American Journal of Political Science* p. 978.

Box-Steffensmeier, Janet, Kathleen Knight & Lee Sigelman. 1998. "The Interplay of Macroideology and Macropartisanship: A Time Series Analysis." *Journal of Politics* 60:131–149.

Chanley, Virginia A., Thomas Rudolph & Wendy M. Rahn. 2000. "The Origin and Consequences of Public Trust in Government: A Time Series Analysis." *Public Opinion Quarterly* 64:239–257.

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.

Durr, Robert H. 1993. "What Moves Policy Sentiment?" *American Political Science Review* 87:158–170.

Durr, Robert H., Andrew D. Martin & Christina Wolbrecht. 1993. "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.

Edwards, George C., III & B. Dan Wood. 1999. "Who Influences Whom? The President, Congress, and the Media." *American Political Science Review* 93:327–344.

Eichenberg, Richard C. & Russell J. Dalton. 1993. "Europeans and the European Community: The Dynamics of Public Support for European Integration." *International Organization* 47:507–836.

Enders, Walter & Todd Sandler. 1993. "The Effectiveness of Antiterrorism Policies: A Vector-Autoregression–Intervention Analysis." *American Political Science Review* 87:829–844.

Enders, Walter & Todd Sandler. 1999. "Transnational Terrorism in the Post-Cold War Era." *International Studies Quarterly* 43:145–167.

Enders, Walter & Todd Sandler. 2000. "Is Transnational Terrorism Becoming More Threatening? A Time-Series Investigation." *Journal of Conflict Resolution* 44:307–332.

Flemming, Roy B. & B. Dan Wood. 1997. "The Public and the Supreme Court: Individual Justice Responsiveness to American Policy Moods." *American Journal of Political Science* 41:468–498.

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.

Keele, Luke J. & Nathan J. Kelly. 2006. "Dynamic Models for Dynamic Theories: The Ins and Outs of Lagged Dependent Variables." *Political Analysis* 14:186–205.

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.

McGuire, Kevin T. & James A. Stimson. 2004. "The Least Dangerous Branch Revisited: New Evidence on Supreme Court Responsiveness to Public Preferences." *Journal of Politics* 66:1018–1035.

Mishler, William & Reginald S. Sheehan. 1993. "The Supreme Court as aCountermajoritarian Institution? The Impact of Public Opinion on SupremeCourt Decisions." *The American Political Science Review* 999:999.

Norpoth, Helmut. 1996. "Politics and the Prospective Voter." *Journal of Politics* 58:776–792.

Oatley, Thomas. 1999. "How Constraining is Capital Mobility? The Partisan Hypothesis in an Open Economy." *American Journal of Political Science* 43:1003–1027.

Plümper, Thomas & Vera Troger. 2007. "Efficient Estimation of Time-Invariant and Rarely Changing Variables in Finite Sample Panel Analyses with Unit Fixed Effects." *Political Analysis* 15:124–139.

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.

Wilson, Sven E. & Daniel M. Butler. 2007. "A Lot More to Do: The Sensitivity of Time-Series Cross-Section Analyses to Simple Alternative Specifications." *Political Analysis* 15:101–123.

Wlezien, Christopher. 1995. "The Public as Thermostat: Dynamics of Preferences for Spending." *American Journal of Political Science* 39(4):981–1000.

Wood, B. Dan. 1992. "Modeling Federal Implementation as a System: The Clean Air Case." *American Journal of Political Science* 36:40–67.

Wood, B. Dan. 2000. "The Federal Balanced Budget Force: Modeling Variations from 1904 to 1996." *Journal of Politics* 62:817–845.

Wood, B. Dan & Angela Hinton Andersson. 1998. "The Dynamics of Senatorial Representation, 19521991." *Journal of Politics* 60:705–736.