Political Science 8125 & 867
Dynamic Analysis (Time Series Modeling in Politics)
Electronic Classrooms
Spring Semester 2012
11:00-1:00 CST/12:00-2:00 EST, Fridays
Office hours for all by mutual arrangement.

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This course studies statistical techniques used to analyze social processes occurring through time. The course introduces students to time series methods and to the applications of these methods in political science. We begin by discussing social problems that are inherently dynamic in nature and also how time series are measured. We then review the calculus of finite differences. We move next to the study stationary ARMA models. In the following section of the course, we examine a number of important topics in time series analysis including "reduced form" methods (granger causality and vector aut regression), unit root tests, near-integration, fractional integration, cointegration, and error correction models. Time series regression also is discussed. We learn not only how to construct these models but also how to use time series models in social science analyses.

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 is on application, rather than on statistical theory. However, the focus of most lectures will be statistical theory. Homework focuses as much as possible on the time series you are interested in understanding. To that end, students will need to gather time serial data for analysis. It is strongly recommended that this be done 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 a 12-week seminar team-taught by the 3 J’s: Jan, John, and Jon.

Schedule
We expect to cover the following topics in the weeks and dates indicated, though we may adjust slightly as the course progresses and as needed based on class interaction. Professor indicated will take the lead that day. She or he also will prioritize the reading (one week ahead of her or his session)

Topic 1: Motivation, Measurement & Intro to Difference Equations – Freeman
Topic 2: The Calculus of Finite Differences - Freeman
Topic 3: ARIMA Models–Box-Steffensmeier
Topic 4: Unit Roots, Near Integration and Fractional Integration –Box-Steffensmeier
Topic 5: Intervention Analysis & Changes in Regimes – Pevehouse
Topic 6: ARCH, GARCH, FIGARCH Models – Pevehouse
Topic 7: Time Series Regression Analysis – Box-Steffensmeier
Topic 8: VAR/Reduced Form Methods – Freeman
Topic 9: Cointegration & ECMs – Pevehouse
Topic 10: Guest Speaker Heather Ondercin!! and Intro to Cointegration & ECMs continued – Pevehouse
Topic 11: Bayesian Time Series Analysis - Freeman
Topic 12: Forecasting, DCC Models, Time Series Count Models & Sendoff - Box-Steffensmeier

Note. In some cases the Topic material is broken into two parts even though it is presented in a single week.

Required Texts
Students should purchase:


Stata. *Time-Series Reference Manual*. College Station, Texas: Stata Press.  (likely in your depts. and there is significant online help).

Work in Progress

The instructors are writing a textbook on the subject of the course. In some weeks, draft chapters of this book will be assigned. The book is tentatively titled *Time Series Analysis for the Social Sciences*. We denote this title by TSASS.

Recommended Texts

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


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1 Students may use the Second Edition of Enders book. But the reading assignments use the page numbers in the Third Edition.
Software
STATA is the primary statistical package that will be used. The STATA website is: http://www.stata.com/ You are welcome to use RATS, R, or other software, but please inform the instructors first.

Course Assignments

Students will complete four written assignments and give a short (approximately 15 minutes) oral presentation/critique for the course, for a total of 200 points. See also the Assignment links on the website for more details.

1) The presentation should be on one of the listed articles on the syllabus or another application chosen in consultation with the instructor. Many of the articles on the syllabus are applications. These applications are essential to rounding out your understanding of the methods. No more than 5 minutes of your presentation should be summary of the article. Most of your 15 minutes should be devoted to critique and to leading class discussion. There will typically be 2 students presenting any one article and usually from different universities. Another option for presentations is camtasia (or alternative video recording program). If you choose this option, your presentation will be posted on the class website and discussed online through the Discussion Tab of the class website. The presentation is worth 35 points.

2) Problem set. A short problem set on the calculus of finite differences will be required. The problem set is worth 25 points.

3) Short paper. Students have two options for the short paper. The first is a critique of the article presented in item 1. The second option is a critical evaluation of the Sprague article from the
assigned readings in week II (Topic 2). The short paper is worth 25 points. It should be about 5 pages in length.

4) The next assignment is considerably larger in scope. Students will estimate and apply an ARIMA model for a data set of their choosing. This data set should contain at least forty time points. The data set need not be the same one students use for the next assignment, however, we recommend it. Students are welcome to use their own original data, use data from the Time Series of Social Scientists (link on the website), or use and replicate other existing data sets. There is a limit of 8 pages (not including computer output). The ARIMA assignment is worth 55 points.

5) Finally, a short (approximately 8 pages, not including computer output) paper analyzing a substantive problem using time series data and techniques is required. Either Vector Autoregression or Error Correction techniques should be used. Emphasis should be on explaining the methods and interpretation of the results. The assignment is worth 60 points.

**COURSE OUTLINE**

We expect to have required readings available from the course website, which is through the OSU Carmen system.

**Topic 1 [January 27]: Motivation, Measurement, and Introduction to Difference Equations - Freeman**

The motivation for time series analysis
(a) Significant social problems that are about dynamics
(b) The pitfalls of cross-sectional analysis and the usefulness of time series
(c) Forecasting for theory validation and policy analysis
(d) Time series measurement
(e) Introduction to difference equations

**REQUIRED**

“Modeling Social Dynamics” Chapter 1 in TSASS

**Recommended**


Topic 2 [Feb 3] & See Below for Continuation: The Calculus of Finite Differences - Freeman

Time series measurement problems

(a) Deterministic and stochastic difference equations
(b) The concept of equilibration
(c) Systems of difference equations

**REQUIRED**

Enders Chapter 1

“Modeling Social Dynamics” Chapter 2 in TSASS,


Sprague, John. 1982. “One Party Dominance in Legislatures” *Legislative Studies Quarterly*

**Recommended**


VAR Models.” *Applied Stochastic Models and Data Analysis* 14: 19-34.

in Econometric Modeling:* 17-34.

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.

Robertson, John C. and Ellis W. Tallman. “Data Vintages and Measuring Forecast Model
Performance.” *Economic Review* Atlanta, GA: Federal Reserve Bank of Atlanta, Fourth Quarter,


Freeman, J. and D. Snidal. 1982. “Diffusion, Development and Democratization in Western

Hamilton, chp. 5.


*International Studies Quarterly* 37: 55-72.

**Topic 3 [February 10]:** Identifying, estimating and using models of single time series—Box-Steffensmeier

Univariate time series models

(a) Stationary ARMA models – includes a discussion of ARIMA and ARFIMA

(c) ARCH models – includes a discussion of FIGARCH

(d) Dynamic Conditional Correlations

(e) Structural change

(f) Illustration: Demographic change in the U.S. and Europe

(g) Illustration: European Public Opinion/Government Spending

**REQUIRED**

Enders, chp. 2.

“Univariate Time Series Models” Chapter 3 in TSASS.

**Recommended**


Hamilton, Chapters 2, 3.


**Topic 4 [February 17]:** Unit Roots, Near Integration, and Fractal Integration – Box-Steffensmeier

Univariate time series models continued
REQUIRED


Enders, Chapter 6.


“Univariate Time Series Models” Chapter 8 (most likely) in TSASS.

Recommended


**Topic 5 [Feb 24]: Intervention Models and Changes in Regime – Pevehouse**

Univariate time series models continued
REQUIRED


Enders’ video presentation – see website.


Recommended


McCleary and Hay, Chapter 3,4.


Topic 6 [March 2]: ARCH, GARCH, FIGARCH, and Changes in Regime - Pevehouse
Univariate time series models continued

REQUIRED


Enders, Chapter 3 and Section 8 in Chapter 4.


**Recommended**


**TIME SERIES MODELING IN POLITICS, PART II**

**Topic 7 [March 9]:** *Time Series Regression Principles + Perhaps an Intro to VAR – Box-Steffensmeier*

Multiple time series – Regression and VAR
(a) Time series regression
(b) Granger causality
(c) Vector autoregression
(d) Illustration: Reciprocity in international relations

**REQUIRED**


**Recommended**


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**March 16 – No Class**

**Topic 8 [March 23]: VAR/“Reduced Form” Methods - Freeman**

Multiple time series – Regression and VAR continued

**REQUIRED**

Enders, Chapter 5, sections 4 to 10.


**Recommended**


**Topic 9 [March 30]: Cointegration and Error Correction - Pevehouse**

Multiple time series – Cointegration and ECMs

(a) Cointegration
(b) error correction models
(c) Illustration: Presidential approval and the economy

**REQUIRED**


Enders: Chapter 6.


“Cointegration” Chapter in TSASS.

Recommended


April 6 – No Class

April 13 – No Class, Meet at MPSA Conference Friday Night Pizza Dinner


See readings from Topic 9

Topic 11 [April 30]: Bayesian Time Series - Freeman
(a) Frequentist vs. Bayesian approaches to statistics in general and to time series analysis in particular
(b) The Minnesota Prior
(c) Illustration: Macropartisanship revisited
REQUIRED


Brandt, Patrick T., Michael Colaresi, and John R. Freeman 2008 “The Dynamics of Reciprocity, Accountability, and Credibility.” Journal Conflict Resolution 52(3): 343-379


RECOMMENDED


Sattler, Thomas, John R. Freeman, and Patrick Brandt. 2008 “Political Accountability And the Room to Maneuver: A Search for a Causal Chain.” Comparative Political Studies. 41(9): 1212-1239 [Corrigendum, 42(1): 125-131.]


TOPIC 12 [May 4]: Forecasting Social Series – Box-Steffensmeier
(a) Forecasting as model validation and as policy analysis
(b) Forecasting with univariate models
(c) Forecasting with multivariate models
(d) Illustrations: Forecasting crime in the U.S., election outcomes, and relations between India and Pakistan

And more … DCC Models, Time Series Count Models and Go Forth Speech.

We will summarize our principal arguments, revisit some of the issues raised regarding the relevance of time series methods for social science, look briefly at some extensions and connections to other kinds of dynamic models, and make some recommendations regarding the implementation of time series methods.

REQUIRED for Forecasting


“Forecasting” Chapter 7 in TSASS.

**REQUIRED** for DCC & Time Series Count Models


**Recommended for Forecasting**


Clements and Hendry, “Evaluating Forecast Accurancy” Chapter Three in Forecasting Economic Time Series pps. 52-78.


Symposia and articles on forecasting particular elections in the U.S. and the American States by year of election:

- 2008, PS: Political Science & Politics 61(4) 2008

  *PS: Political Science & Politics* 37(4), 2004: 733-768, 813-821


  *PS: Political Science & Politics* 26, 1993: 17-23

Recommended for DCC & Time Series Count Models


Video presentation by Matt Lebo – see website.