Political Science 8125 & 7788

**Dynamic Analysis (Time Series Modeling in Politics)**

Electronic Classrooms  
Spring Semester 2016  
11:00-1:00 CST/12:00-2:00 EST, Fridays  
Office hours, skype, google circles, etc by appointment.

*Jan Box-Steffensmeier*  
2049S Derby Hall  
Ohio State University  
(614) 975-5812 (cell)  
steffensmeier.2@osu.edu

*John R. Freeman*  
1414 Social Sciences  
University of Minnesota  
(612) 624-6018  
freeman@umn.edu

*Jon Pevehouse*  
110 North Hall, 1050 Bascom Mall  
University of Wisconsin-Madison  
(608) 263-2414  
pevehous@polisci.wisc.edu

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 autogression), 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 scientific 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 must gather time serial data for their analyses. It is strongly recommended that this task be completed in the first or second 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 on the dates indicated, though we may adjust the schedule slightly as the course progresses. The professor indicated for each topic will take the lead on the respective 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 lead, Jan. 22
Topic 2: The Calculus of Finite Differences – Freeman lead, Jan. 29
Topic 3: ARIMA Models – Box-Steffensmeier lead, Feb. 5
Topic 4: Unit Roots, Near Integration and Fractional Integration – Pevehouse lead, Feb. 12
Topic 5: Intervention Analysis & Changes in Regimes – Pevehouse lead, Feb. 19
Topic 6: ARCH, GARCH, FIGARCH Models – Box-Steffensmeier lead, Feb.26
Topic 7: Forecasting, DCC Models, Time Series Count Models - Box-Steffensmeier lead, March 4
Topic 8: Time Series Regression Analysis – Pevehouse lead, March 11
Topic 9: VAR/Reduced Form Methods – Freeman lead, April 1
Topic 10: Cointegration & ECMs – Box-Steffensmeier lead, April 15
Topic 11: Cointegration & ECMs continued – Pevehouse lead April 22
Topic 12: Bayesian Time Series Analysis & Sendoff – Freeman lead April 29

Required Text

Box-Steffensmeier, Janet M. John R. Freeman, Matthew P. Hitt, and Jon C. W. Pevehouse. 2015. *Time Series Analysis for the Social Sciences*. Cambridge: Cambridge University Press. **We denote the book by TSASS.**

Recommended Text

We will reference the following book a fair amount during the course. Students may find it helpful to own this book as well. Alternatively, copies of assigned chapters can be found on the class website.


Other Recommended Texts:

Other books that serve as excellent references include:


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1 Students may use the Fourth Edition of Enders book. However this syllabus uses page numbers in Enders’ Third Edition.


**Software**

STATA is the primary statistical package we will use. The STATA website is: http://www.stata.com/

You are welcome to use RATS, R, or other software as well, but please inform the instructors first.

**Course Assignments**

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

1) The presentation should be on one of the 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 the class understanding of the methods. The applications also serve catalysts for discussion. 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 you will facilitate and encourage online discussion. Jon Pevehouse will be coordinating the presentations so please email him your preferences about which article you want to present. The presentation is worth 35 points.

2) Problem set. A problem set on the calculus of finite differences must be completed. The problem set is worth 25 points.

3) Short paper. Students have two options for the short paper. The first is a critique of any application article on the syllabus. 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 interpret an ARIMA model of their data. Again, the data set for this assignment must be composed of at least 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, data from the website for TASS (https://sites.google.com/site/timeseriesanalysissososci/home), or another existing data set. There is a limit of 8 pages (not including computer output). The ARIMA assignment is worth 55 points.

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

The required readings are available on the course website which is located on the OSU Carmen system.

Topic 1 [January 22]: Motivation, Measurement, and an Introduction to Time Series & Difference Equations - Freeman

REQUIRED

“Modeling Social Dynamics” Chapter 1 in TSASS

Recommended (Motivation)


Recommended (Time Series Measurement)


**Topic 2 [January 29]: The Calculus of Finite Differences; Difference Equations** - Freeman

**Required**

“Time Series Models as Difference Equations” Appendix in TASS.


**Recommended**


**Topic 3 [February 5]: ARIMA Models – Box-Steffensmeier**

**REQUIRED**

“Univariate Time Series Models” Chapter 2 in TSASS.


**Recommended**


Hamilton, Chapters 2, 3.


**Topic 4 [February 12]: Unit Roots, Near Integration, and Fractional Integration – Pevehouse**

**REQUIRED**

“Univariate, Non-Stationary Processes: Tests and Modeling” Chapter 5 in TSASS.

“Selections on Time Series Analysis” Chapter 7 in TSASS, specifically 7.1 Fractional Integration


**Recommended**


**Topic 5 [February 19]**: *Intervention Models and Changes in Regime – Pevehouse*

**REQUIRED**

“Univariate Time Series Models” Chapter 2 in TSASS (previously assigned).

Enders, Third edition: Sections 4.8 (reread) and 5.1 (pps. 273-280)

Enders’ video presentation – see website.


**Recommended**


McCleary and Hay, Chapter 3,4.


**Topic 6 [February 26]: ARCH, GARCH, FIGARCH, and Changes in Regime – Box-Steffensmeier**

**REQUIRED**

“Selections on Time Series Analysis” Chapter 7 in TSASS, specifically 7.2 and 7.4.


Enders, Third Edition, Sections 3.1-3.9 and Section 4.8 (reread)


**Recommended**


There is a new body of work in econometrics which aims to detect financial crises. An example is:

Topic 7 [March 4]: Forecasting, DCC Models, Time Series Count Models – Box-Steffensmeier

REQUIRED for Forecasting

“Selections on Time Series Analysis” Chapter 7 in TSASS, particularly 7.3 Forecasting.


REQUIRED for DCC & Time Series Count Models

“Selections on Time Series Analysis” Chapter 7 in TSASS, particularly 7.2 Incorporating Heterogeneity


Recommended for Forecasting


Clements and Hendry, “Evaluating Forecast Accuracy” 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:


*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.

**Topic 8 [March 11]: Time Series Regression Principles – Pevehouse**

**REQUIRED**

“Dynamic Regression Models” – Chapter 3 in TSASS


**Recommended**


**Topic 9 [April 1]: VAR//“Reduced Form” Methods - Freeman**

**REQUIRED**

“Modeling the Dynamics of Social Systems” – Chapter 4 in TSASS

Enders, Edition, Sections 5.4-5.9.


**Recommended**


**April 8 – No Class, Meet at MPSA Conference Friday Night Pizza Dinner**

**Topic 10 [April 15] – Cointegration and Error Correction (Part One) – Box-Steffensemeir**

**REQUIRED (Part One)**

“Cointegration and Error Correction Models” Chapter 6 in TSASS.


**Recommended**

See Recommended Readings at Topic 11
Cointegration and Error Correction Continued--Pevehouse

Required

Enders, Third Edition, Chapter 6

A new symposium on this topic is forthcoming in Political Analysis, Winter 2016. Read the articles by Box-Steffensmeier and Helgason, Keele at al. and Grant and Lebo. The other pieces are recommended.

*Box-Steffensmeier, J. and A. Helgason, “Introduction to Symposium on Time Series Error Correction Models in Political Science”

*Grant, T. and M. Lebo, “Error Correction Methods with Political Time Series”

“Keele, L. , S. Linn, and C. Webb, “Taking Time with All Due Seriousness’

Esarey, J. “Fractionally Integrated Data and the Auto Distributed Lag Model: Results From a Simulation Study”

Freeman, J. Progress in the Study of Nonstationary Political Time Series?

Helgason, A. “Fractional Integration Methods and Short Time Series: Evidence From A Simulation Study.”


Additional Recommended Reading on Cointegration and Error Correction


Ramirez, M. 2009. ”The Dynamics of Partisan Conflict on Congressional Approval. AJPS 53 (3): 681-694.


**Topic 11 [April 29]: Bayesian Time Series & Sendoff - Freeman**

**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**


Brandt, Patrick et al. See recommended reading Topic 7.

Montgomery et al. See recommended readings Topic 7.

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.]
