CAUSAL ANALYSIS/ADVANCED MODELING IN TIME SERIES

Polit Sci 786
14445-0
TUESDAY AND THURSDAY
3:30-5:18
FALL 1997

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This 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 of certain estimation techniques, we study stationary ARMA models. We learn not only how to construct such models but also how to use them in political forecasting and in policy analysis. Time series regression then is reviewed; small-scale simultaneous equation set-ups are included in this survey. From here we proceed to a look at important topics in time series analysis including simulation method, pooling cross-sectional and time series data, “reduced form” methods (granger causality and vector autogression), unit root test and error correction models, and finally, fractional integration and other state-of-the-art time series methods.

Texts

Students should purchase the following book. It is available at campus bookstores.


Students are strongly urged to purchase as well:


The Hamilton book will be supplemental reading in most weeks. Since it is one of the most up-to-date texts on the topic, it is important that students eventually own it.
Other books which will be used during the course include:


Copies of required articles are available from Cop-Ez in the basement of Bricker Hall (#060).

**Requirements and Expectations**

Students are expected to do all the assigned reading and to attend all classes. Students are expected to complete one problem set, one article critique, and write three relatively short (8-10 pages) data analysis papers. Assignments will be docked one full letter grade for each week that the assignment is overdue. Students are urged to use their own time series data for the papers. More specifically, it is hoped that students can not only master time series methods in the course, but also perform their own research over the course of the quarter, hopefully with the goal of submitting the paper for presentation at a conference or for publication. The instructor will work closely with students to ensure that this happens, while maintaining high expectations.

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 for 2 hour checkout from the 3rd floor lab) will be very useful for completing the data analysis assignments.

**COURSE OUTLINE**

This is tentative, and will be adjusted according to individual class needs.

I. Introduction and overview of some important methodological debates.
II. Linear difference equations and the corresponding models of political processes.

III. Nonlinear difference equations, models of this variety, and the principles of nonlinear estimations.

IV. ARIMA Models, Part One: Stationarity, integration and differencing; the autocovariance, autocorrelation and partial autocorrelation functions.

V. ARIMA Models, Part Two: Building Arima models--model identification and estimation; applications.

VI. ARIMA Models, Part Three: Seasonality and forecasting.

VII. Intervention Analysis--Policy evaluation with ARIMA models.


IX. Time series regression, Part Two: Simultaneous Equation set-ups.

X. Topic: Simulation and calibration.

XI. Topic: Pooling cross-sectional and time series data.

XII. Topic: “Reduced form” method, Granger Causality and VAR.

XIII. Topic: Unit Roots, Cointegration, and the Error Correction Model.

XIV. Review and retrospectives.

COURSE OUTLINE AND READING ASSIGNMENTS

I. Introduction and Overview

REQUIRED


II. Linear Difference Equations and Some Formal Models of Political Processes

REQUIRED

Goldberg, Chapters 1-2.

Huckfeldt, et al., Chapters 1, 2, and 4.


RECOMMENDED


Hamilton, Chapters 1-2.

III. Nonlinear Difference Equations; Nonlinear Estimation

REQUIRED

Huckfeldt, Chapters 3, 5, 6.

Pindyck and Rubenfeld, Sections 5.1 and 9.5.


RECOMMENDED

Goldberg, Chapter 3.


Hamilton, Chapter 5.

IV. ARIMA Models, Part One

REQUIRED

McCeary and Hay, Chapter 2.

Pindyck and Rubenfeld, Chapters 14, 15, 16.

Recommended

Chatfield, Chapters 2-3.


Gottman, Chapters 7-9.

Hamilton, Chapter 3.

V. ARIMA Models, Part Two

REQUIRED

McCeary and Hay, Chapters 3, 6.

Pindyck and Rubenfeld, Chapter 17.


**Recommended**

Chatfield, Chapter 4.

Gottman, Chapters 10-14, 19-20, 22.

Hamilton, Chapter 3.


**VI. ARIMA Models, Part Three: Seasonality and Forecasting**

**REQUIRED**

McCeary and Hay, chapter 3 (re-read).

Pindyck and Rubenfeld, Chapter 18.


**Recommended**

Chatfield, Chapter 5.

Gottman, Chapter 21.

Hamilton, Chapter 4.

**VII. Intervention Analysis and Policy Evaluation with ARIMA Models**

**REQUIRED**

McCeary and Hay, Chapter 4.


**Recommended**


**VIII. Time Series Regression, Part One: Principles**

**REQUIRED**

Hamilton, Chapter 8.

Pindyck and Rubenfeld, Sections 6.2 and 9.1.


**Recommended**

Beck, N., “Estimating Dynamic Models is not Merely a Matter of Technique” *Political*


IX. Time Series Regression, Part Two: Simultaneous Equations

REQUIRED

Hamilton, Chapter 9.

Pindyck and Rubenfeld, Chapter 11.


Recommended


X. Simulation and Calibration

REQUIRED

Pindyck and Rubenfeld, Chapters 12-13.


XI. Pooling Cross-Sectional and Time Series Data

REQUIRED


---------(forthcoming), “What to do (and not to do) With Time Series-Cross-Section Data” APSR.


Recommended


XII. “Reduced Form” Methods

**REQUIRED**

Hamilton, Chapters 10-11.


**Recommended**


XIII. Unit Roots, Cointegration, and Error Correction Models

**REQUIRED**


**Recommended**
Hamilton, Chapters 15-20.


XIV. Review and Retrospectives

REQUIRED

Re-Read materials from Week I