

Political Science 597c: Tools for Time Series and Cross-Sectional Data

Tuesday 1:25-3:25pm Pond 236
Wednesday or Friday to be determined

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1 Overview

This course presents a set of methods and techniques that are commonly required, or are of particular use to work in comparative politics and international relations, but are not covered in the standard sequence.

Both comparative politics and international relations, by their very eponyms, looks across systems or countries. However, very commonly political datasets also look at these sets of countries across time, and the first measure of this class will be dedicated to dealing with the complications and departures from least squares methods created by the dynamics of time. Time-series and time-series cross-sectional (TSCS) methods often assume that time has more weight in the data set than the cross section. That is, there are more observations at different times than at different countries (T is greater than N). While such models are well developed in the econometrics literature, more common in politics is to have fewer observations across time than one has across countries (N greater than T). We will look at methods appropriate for both types of problems. The third general class of problems we will look at is methods to deal with endogeneity between variables, problems arising from model misspecification, and their intersection.

A typical universe of observations in comparative politics and international relations is to have a cross-section of countries, maybe a hundred, each observed yearly, for some moderate period, say thirty years. That will be the running example of the class, although obviously these techniques expands to lots of other possible cross-sections and time intervals, and lengths of time. The class will assume statistics training with the linear regression model, and a little generalized least squares and generalized linear models (GLS & GLM) work, such as would be seen in PLSC 503. Although many students will have also seen maximum likelihood theory, my attempt will be to not make any material dependent on PLSC 504, while occasionally making asides to those following directly out of the fall version of this class. Likewise, the coursework can be completed either in Stata or R.

As near as is possible, I want to keep the methods discussed grounded in the political science literature. Therefore, replication will be a key focus of the problem sets and also the final project (see below). The pragmatic student of politics should constantly ask what the payoff is of these methods. That is, how often, and to what degree should we expect results to be changed by using more correct compared to simpler, familiar methods.

2 Assignments

There will be a series of problem sets, approximately every two weeks. Problem sets should be worked on in pairs. Write-ups should summarize the approach used in the problem as well as any results. A good write-up should read like the third quarter of a journal article. Any statistics presented should be explained and interpreted. Graphs should have titles, captions and axis labels. Digressions are encouraged.

Additionally with each problem set all code should be submitted electronically to tercer@psu.edu in one zip file. Students using R or Stata should submit `.r` or `.do` files respectively.

3 Final Project

As a final project in this course I would like you to take an article in political science and [1] replicate the analysis, [2] judge how sensitive the model is to alternate models and specifications [3] decide if the empirical results are strengthened or weakened by whatever model you judge to be correct. Although replication is not easy work, this should not be considered a full length paper. Five pages including tables should be sufficient.

Some good places to start looking for replication data:

ICPSR Publication Replication Archive

<http://www.icpsr.umich.edu/prs/index.html> The Dataverse Network Project

<http://thedata.org> Journal of Peace Research

<http://www.prio.no/Research-and-Publications/Journal-of-Peace-Research/Replication-Data/>

Journal of Conflict Analysis

<http://jcr.sagepub.com/>

A very good idea is to find a paper that interests or irks you, that you believe should be done differently or for which there are obvious further additional questions to be answered in the data. Check the ICPSR for a replication dataset, check the author's website or email the author. Replications with additional improvements or developments are excellent topics for future papers. Even replications with minimal extensions are publishable items if you choose an article that is important. For example, Political Analysis publishes replications and cross validations. For details see:

http://www.oxfordjournals.org/our_journals/polana/for_authors/notes_replicationsextensions.html

4 Chronology of Topics

1. Time Series Models
 - Lagged dependent variables
 - Aggregation over time
 - Autoregressive (AR) and Moving Average (MA) processes
 - Kalman Filters
2. Cross Section and Panel Models
 - Random and Fixed effects
 - Semi-parametric approaches to misspecification
 - Hierarchical and Massively Interactive models
3. The TSCS hybrid
 - Park's Estimator
 - Panel Corrected Standard Errors
 - Stein Estimators
 - Complications with discrete dependent variables
4. Endogeneity and Misspecification
 - Instruments and 2-stage Least Squares
 - Selection models
 - Missing Data
 - Matched Case design and Propensity Scores

5 Texts

A bit of everything:

Frees, Edward W. 2004. *Longitudinal and Panel Data: Analysis and Applications in the Social Sciences*, Cambridge University Press.

A general econometric encyclopedic work:

Greene, William H. 2007 *Econometric Analysis, 6/e*, Prentice Hall.

A encyclopedic time series work:

Hamilton, James Douglas. 2001. *Time Series Analysis*, Princeton University Press.

A book with a strong cross sectional focus:

Wooldridge, Jeffrey M. 2001. *Econometric Analysis of Cross Section and Panel Data*, MIT Press.

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All course work by students is to be done on an individual basis unless an instructor clearly states that an alternative is acceptable. Any reference materials used in the preparation of any assignment must be explicitly cited. Students uncertain about proper citation are responsible for checking with their instructor.

In an examination setting, unless the instructor gives explicit prior instructions to the contrary, whether the examination is in class or take home, violations of academic integrity shall consist but are not limited to any attempt to receive assistance from written or printed aids, or from any person or papers or electronic devices, or of any attempt to give assistance, whether the one so doing has completed his or her own work or not. Lying to the instructor or purposely misleading any Penn State administrator shall also constitute a violation of academic integrity.

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