

Syllabus: ICPSR Summer School 5-day Session, 18-22 May 2009

Empirical Models for Time-Series-Cross-Section Data

Professor Robert (Rob) J. Franzese, Jr.

franzese@umich.edu <http://www.umich.edu/~franzese>

Political Science Department, University of Michigan

COURSE DESCRIPTION: Time-series cross-section (TSCS) data harness both cross-temporal and cross-spatial variation to maximize empirical leverage for theory evaluation. However, this powerful data structure also requires careful consideration of temporal and spatial (cross-unit) heterogeneity, temporal and spatial dynamic processes, and potentially complex stochastic error structures. This course covers specification, estimation, interpretation, and presentation of empirical models that are appropriate for TSCS data. The workshop begins by discussing the nature of pooled data and the ways that they deviate from the assumptions associated with the classic linear regression model. The course then addresses a number of issues that are typically associated with TSCS data: fixed or stochastic unit-heterogeneity, complex error structures, and temporal/spatial correlation and dynamics. We consider a variety of methodological strategies for confronting these issues in an effective manner, such as: fixed or random-effect models and associated tests; feasible-generalized-least-squares (FGLS); consistent coefficient-estimate variance-covariance (HAC) estimators; and temporal and spatial-lag models. The course concludes with a brief overview of TSCS models for non linear-continuous dependent variables.

STUDENTS ARE ENCOURAGED TO BRING THEIR OWN PANEL AND TIME-SERIES-CROSS-SECTION DATASETS FOR EXPLORATION IN LAB EXERCISES (STATA FORMAT).

MONDAY, 18 May 2009 Introduction & Review

09:00 – 09:30 Introductions; Advantages & Challenges of TSCS Data

- Nuamah, Nicholas N.N.N. 1986. “Pooling Cross Section and Time Series Data.” *The Statistician* 35:345-351.

09:30 – 10:50 Review: Classical (Normal) Linear-Regression Model

- **BACKGROUND:** Wooldridge, Jeffrey M. 2002. *Econometric Analysis of Cross Section and Panel Data*, MIT Press, Cambridge, Chs. 4-6, or equivalent.

10:50 – 11:10 Break

11:10 – 12:30 Review: Generalized (Normal) Linear-Regression Model

- **BACKGROUND:** Wooldridge, Jeffrey M. 2002. *Econometric Analysis of Cross Section and Panel Data*, MIT Press, Cambridge, Chs. 7-9, or equivalent.

12:30 – 13:45 Lunch

13:45 – 15:00 C&G(N)LRM and Time-Series-Cross-Section Data

- Stimson, J. 1985. “Regression in Space and Time: A Statistical Essay.” *American Journal of Political Science* 29:914-947.

15:00 – 15:20 Break

15:20 – 16:00 Introduce & discuss own projects

16:00 – 17:00 Lab

TUESDAY, 19 May 2009 TSCS and Heterogeneity

A Note on Readings for the Fixed-Effect/Random-Effect, etc., Material: Most textbooks do not treat these topics sequentially quite the way we introduce them here, so the recommended textbook reading for the next two days really arises in one lump, although I try to apportion it:

- Wooldridge, Jeffrey M. 2002. *Econometric Analysis of Cross Section and Panel Data*, MIT Press, Cambridge, Chs. 10-11, or equivalent.

09:00 – 09:30 Heterogeneity across units and over time

09:30 – 10:50 Heterogeneity and Least-Squares Dummy-Variable (Fixed-Effect) Models

- Wooldridge, 10.5-10.6, or equivalent.

10:50 – 11:10 Break

11:10 – 12:30 Lab

12:30 – 13:45 Lunch

13:45 – 15:30 Heterogeneity and Interaction Models

- Kam, Cindy D. & Franzese, Robert J., Jr. 2007. *Modeling & Interpreting Interactive Hypothesis in Regression Analysis*, University of Michigan Press.
- Franzese. 2005. “Empirical Strategies for Various Manifestations of Multilevel Data,” *Political Analysis* 13(4):430-46.

15:30 – 15:50 Break

15:50 – 17:00 Lab

WEDNESDAY, 20 May 2009 Random-Effect and Random-Coefficient Models

09:00 – 10:50 Random-Effect and Random-Coefficient Models

- Wooldridge, 10.4 & 11.2, or equivalent.
- Beck, Nathaniel; Katz, Jonathan N. 2007. “Random Coefficient Models for Time-Series-Cross-Section Data: Monte Carlo Experiments: *Political Analysis* 15: 182-195.

10:50 – 11:10 Break

11:10 – 12:30 Lab

12:30 – 13:45 Lunch

13:45 – 15:30 Fixed-Effects/Coefficients, Random-Effects/Coefficients, Hybrids, and Testing

- Wooldridge, 10.7 & 11.1, 11.3-4, or equivalent.
- Plümper, Thomas, Vera E. Troeger. 2007. “Efficient Estimation of Time-Invariant and Rarely Changing Variables in Finite Sample Panel Analyses with Unit Fixed Effects,” *Political Analysis* 15: 124-139.
- Troeger. 2008. [“Problematic Choices: Testing for Correlated Unit Specific Effects in Panel Data.”](#) (Paper presented at PolMeth XXV: [download paper](#))

15:30 – 15:50 Break

15:50 – 17:00 Lab

19:00 – 21:00 Office Hours (Perry Building, Summer Program bay, 2nd Floor)

THURSDAY, 21 May 2009 (Time-)Dynamic Models

09:00 – 10:30 (Time-)Dynamic Models

- Beck, N. 1991. “Comparing Dynamic Specifications,” *Political Analysis* 3(1):51-87.

10:30 – 10:50 Break

10:50 – 12:00 Lab

12:00 – 13:15 Lunch

13:15 – 14:45 (Time-)Dynamic Panel-Data Models

- Wawro, Gregory. 2002. “Estimating Dynamic Panel Data Models in Political Science,” *Political Analysis* 10(1):25-48.

[14:45 – 17:00 Break, Lab (on own), Course Evaluations (specific time & place TBA).]

19:00 – 21:00 Office Hours (Perry Building, Summer Program bay, 2nd Floor)

FRIDAY, 22 May 2009 Spatial-Interdependence; and Qualitative Dependent-Variables

09:00 – 10:45 Spatial and Spatiotemporal Interdependence in TSCS Data

- Franzese, R., & Jude C. Hays. 2008. “Empirical Models of Spatial Interdependence,” in Box-Steffensmeier, Brady, Collier (eds.): *Oxford Handbook of Political Methodology*.

10:45 – 11:15 Break

11:15 – 12:30 Lab

12:30 – 13:45 Lunch

13:45 – 15:30 Qualitative Dependent-Variable Models in TSCS Data

- Beck, N., Katz, J., and Richard Tucker. 1998. “Taking Time Seriously: Time-Series-Cross-Section Analysis with a Binary Dependent Variable,” *American Journal of Political Science* 42(4):1260-88.
- Zorn, Christopher J. W. 2001. “Generalized Estimating Equation Models for Correlated Data: A Review with Applications,” *American Journal of Political Science* 45(2):470-90.
- Wooldridge, Ch. 15. (further QualDep models: Chs. 16-17,19).

15:30 – 15:45 Break

15:45 – 17:00 Lab

19:00 – 21:00 “Office” Hours (Venue TBA)