

Syllabus: Texas A&M Workshop, 5-8 July 2011

Empirical Analysis of Time-Series-Cross-Section Data

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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 course begins by discussing the nature of pooled data and the ways they deviate from the assumptions associated with the classic linear regression model. We then address a number of issues typically associated with TSCS data: fixed or stochastic cross-unit heterogeneity, complex error structures, and temporal and spatial correlation and dynamics. We consider a variety of methodological strategies for confronting these issues effectively, such as: fixed or random-effect models and associated tests; feasible-generalized-least-squares (FGLS); consistent coefficient-estimate variance-covariance (HAC) estimators (i.e., 'robust' standard errors); and temporal- and spatial-lag models. The course concludes with a brief overview of TSCS models for non linear-continuous dependent variables.

NOTES:

No TEXTBOOKS are required, and all articles and papers are available online. The syllabus will suggest readings from [Greene, *Econometric Analysis*](#), but students may easily substitute equivalent sections from any standard econometrics textbook they may own that covers time-series-cross-section or panel data methods ([Wooldridge, *Econometric Analysis of Cross Section and Panel Data*](#) or [Cameron & Trivedi, *Microeconometrics*](#) are two very appropriate alternatives). We will also cover [Kam & Franzese, *Modeling & Interpreting Interactive Hypothesis in Regression Analysis*](#) in its entirety, but students are not required to buy a copy (although if one wishes to do so... ☺).

The LAB SESSIONS will include discussion of the brief daily HOMEWORKS, which will also be available online and are due by 9:00 AM the following day, by email attachment to Ling Zhu & Rob.

TEACHING ASSISTANT: Ling Zhu (lingzhu@politics.tamu.edu). Office: 979-458-0140.

All **LECTURE NOTES, LAB MATERIALS, DATA, and other COURSE MATERIALS** will be available for download from: <http://www.umich.edu/~franzese>.

Background Introduction & Review

OVERVIEW: TSCS Analysis – Where we have been & where we are

- [Stimson, J. 1985. "Regression in Space and Time: A Statistical Essay." *American Journal of Political Science* 29:914-947.](#)
- [Beck, N. 2001. "Time-Series Cross-Section Data: What Have We Learned in the Past Few Years?" *Annual Review of Political Science* Vol. 4: 271-93.](#)

[This surveys most of material intended for the workshop; not intended that students would necessarily fully follow all the material at this point.]

REFRESHER: Matrix Algebra, Calculus, Probability & Statistics, Estimation & Inference

- [Greene, W. 2008. *Econometric Analysis, 6th Edition*.](#) Pearson-Prentice Hall, Appendices A-D, or equiv.

REFRESHER: The Classical (Normal) Linear-Regression Model

- [Greene, W. 2008. *Econometric Analysis, 6th Edition*.](#) Pearson-Prentice Hall, NJ – Chs. 2-7, or equiv.

REFRESHER: The Generalized (Normal) Linear-Regression Model and Maximum-Likelihood Estimation of Logit/Probit Models of Binary Outcomes

- [Greene, W. 2008. *Econometric Analysis, 6th Edition*.](#) Pearson-Prentice Hall, NJ – Ch. 8, Sect. 9.6, or equiv.

REFRESHER: Lab 1 – Introductory Exercises

TUESDAY, 5 July 2011 – TSCS and Cross-Unit Heterogeneity

9:30–10:00 Introduction

10:00–10:45 From the C&G(N)LRM to Models for TSCS & Heterogeneity in TSCS

- [Greene, W. 2008. *Econometric Analysis, 6th Edition*.](#) Pearson-Prentice Hall, NJ–Sects. 9.1-9.2, or equiv.

10:45–11:30 Heterogeneity & the Least-Squares Dummy-Variable (Fixed-Effect) Models

- [Greene, W. 2008. *Econometric Analysis, 6th Edition*.](#) Pearson-Prentice Hall, NJ – Ch. 9.3-9.4, or equiv.

11:30-12:45 Lunch

12:45-2:15 Heterogeneity & Interaction (Fixed-Coefficient) Models

- [Kam, C. & Franzese, R. 2007. *Modeling & Interpreting Interactive Hypothesis in Regression Analysis*.](#) Ann Arbor: University of Michigan Press.

2:15–2:30 Break

2:30–3:30 Lab: Fixed Effects & Interaction Models

WEDNESDAY, 6 July 2011–Random-Effect & -Coefficient Models

9:30–10:15 Heterogeneity in the Stochastic Term: Consistent Estimated-Coefficient Variance-Covariance (HAC) and Feasible Generalized-Least-Squares (FGLS) Estimation

- [Franzese, R. 2005. "Empirical Strategies for Various Manifestations of Multilevel Data," *Political Analysis* 13\(4\):430-46.](#)
- [Greene, W. 2008. *Econometric Analysis, 6th Edition*. Pearson-Prentice Hall, NJ – Ch. 9.6 or equiv.](#)

10:15–11:45 Random-Effect Models

- [Greene, W. 2008. *Econometric Analysis, 6th Edition*. Pearson-Prentice Hall, NJ – Ch. 9.5, or equiv.](#)

11:45–1:00 Lunch

1:00–2:15 Random-Coefficient Models

- [Greene, W. 2008. *Econometric Analysis, 6th Edition*. Pearson-Prentice Hall, NJ – Ch. 9.8, or equiv.](#)
- [Beck, N.; Katz, J. 2007. "Random Coefficient Models for Time-Series-Cross-Section Data: Monte Carlo Experiments," *Political Analysis* 15: 182-195.](#)

2:15–2:45 Extensions, Hybrids, and Testing

- [Greene, W. 2008. *Econometric Analysis, 6th Edition*. Pearson-Prentice Hall, NJ – Ch. 9.7, or equiv.](#)
- [Troeger, V. 2008. "Problematic Choices: Testing for Correlated Unit Specific Effects in Panel Data." Paper presented at PolMeth XXV.](#)
- [Plümper, T.; Troeger, V.. 2007. "Efficient Estimation of Time-Invariant and Rarely Changing Variables in Finite Sample Panel Analyses with Unit Fixed Effects," *Political Analysis* 15: 124-139.](#)
 - [Critique & Discussion of XTFEVD](#) (Breusch et al. & Greene) in *Political Analysis* 19(2), 2011, pp. 119-72.

2:45–3:00 Break

3:00–4:00 Lab: Random-Effects and Random-Coefficients Models

THURSDAY, 7 July 2011 – Temporally & Spatially Dynamic Models

9:30–10:45 (Time-)Dynamic Models

- [Beck, N. 1991. "Comparing Dynamic Specifications," *Political Analysis* 3\(1\):51-87.](#)
 - [De Boef, S.; Keele, L. 2008. "Taking Time Seriously," *American Journal of Political Science* 52\(1\):184-200.](#)
 - [Achen, C.H. 2000. "Why Lagged Dependent Variables Can Suppress the Explanatory Power of Other Independent Variables." Paper presented at PolMeth XVII.](#)
 - [Keele, L.; Kelly, N.J. 2006. "Dynamic Models for Dynamic Theories: The Ins and Outs of Lagged Dependent Variables," *Political Analysis* 14\(2\): 186-205.](#)

10:45–12:00 (Time-)Dynamic Panel-Data Models

- [Greene, W. 2008. *Econometric Analysis, 6th Edition*. Pearson-Prentice Hall–9.9 & 12.4, 12.8-9 or equiv.](#)

- [Wawro, G. 2002. "Estimating Dynamic Panel Data Models in Political Science," *Political Analysis* 10\(1\):25-48.](#)
- [Beck, N.; Katz, J. 2009. "Modeling Dynamics in Time-Series-Cross-Section Political-Economy Data." California Institute of Technology Social Science Working Paper 1304, June 2009.](#)

12:00–1:15 Lunch

1:15–2:15 Lab: Temporal Dynamics and Dynamic Panel-Data Models

2:15–3:45 Spatial and Spatiotemporal Interdependence in TSCS Data

- [Franzese, R., Hays, J. 2008. "Empirical Models of Spatial Interdependence," in Box-Steffensmeier, Brady, Collier \(eds.\): *Oxford Handbook of Political Methodology*.](#)
 - [Franzese, R.; Hays, J. 2008. "Interdependence in Comparative Politics: Substance, Theory, Empirics, Substance," *Comparative Political Studies* 41\(4/5\):742-80, 2008.](#)
 - [Franzese, R.; Hays, J. 2007. "Spatial-Econometric Models of Cross-Sectional Interdependence in Political-Science Panel and Time-Series-Cross-Section Data," *Political Analysis* 15\(2\):140-64.](#)
 - [Franzese, R.; Hays, J. 2006. "Strategic Interaction among EU Governments in Active-Labor-Market Policymaking: Subsidiarity and Policy Coordination under the European Employment Strategy" *European Union Politics* 7\(2\):167-89.](#)

3:45–4:30 Lab: Spatial and Spatiotemporal Dynamics

5:30–7:30 Social function at [Dudley's Draw](#) or other TBD (determined by some democratic means at the end of the academic day).

FRIDAY, 8 July 2011 –Qualitative Dependent-Variables in TSCS Data

9:30–11:15 Qualitative Dependent-Variable Models in TSCS Data

- [Beck, N., Katz, J., Tucker, R. 1998. "Taking Time Seriously: Time-Series-Cross-Section Analysis with a Binary Dependent Variable," *American Journal of Political Science* 42\(4\):1260-88.](#)
- [Carter, D.B.; Signorino, C.S. 2010. "Back to the Future: Modeling Time Dependence in Binary Data," *Political Analysis* 18\(3\):271-92. \(Plus Reply from Beck, and Rejoinder from C&S\)](#)
- [Zorn, C. 2001. "Generalized Estimating Equation Models for Correlated Data: A Review with Applications" *American Journal of Political Science* 45\(2\):470-90.](#)
- [Greene, W. 2008. *Econometric Analysis, 6th Edition*–Ch. 11.7, 23.5, 23.10.3, 23.11.8, 24.4, 25.3 or equiv.](#)
 - **Additional Readings on Interdependence in Nonlinear/QualDep Models:** [Franzese, R., Hays, J., Schaffer, L., 'Spatial & Spatiotemporal Probit' EPSA2011;](#) [Franzese, R., Hays, J. 'Spatial Count' PolMeth 2009;](#) [Hays, J., Kachi, A., 'Spatial Duration' APSA 2009;](#) [Hays, J., 'Systems of QualDep Equations,' SLAMM \(St. Louis Area Methods Meetings\) 2009;](#) [Hays, J., Kachi, A., Franzese, R., 'm-STAR,' *Statistical Methodology* 2010;](#) [Hays, Kachi, Franzese, 'Coevolution' PolMeth 2010.](#)

11:15–11:30 Break

11:30–12:30 Lab