Syllabus: ICPSR Summer Program, 21 July – 15 August 2013
Empirical Modeling for Theory Evaluation

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Description: This is a course in the specification, estimation, interpretation, and presentation of empirical models appropriate for the context-conditionality, the over-time and cross-unit (inter-) dependence, and the ubiquitous endogeneity that characterizes modern, sophisticated social-science theory. As theory advances, the implications for empirical outcomes tend to grow correspondingly richer. In modern social-science theories, for instance, the effects of most causal factors are not constant but rather vary depending on many features of the contexts in which those factors occur. Also, the outcomes in some spatial units at some times depend, according to our modern theoretical & substantive understandings, on those in other units and/or other times. And, we now understand better, just about everything in social reality causes & is caused by (i.e., is endogenous to) just about everything else. The class emphasizes how best to specify empirical models that reflect these complex substantive-theoretical understandings, and then how to estimate, interpret, & present the results of such models.

        Students are encouraged to bring their own ideas, data, and projects for possible use in the course. We will try to incorporate class time for instruction & practice aimed toward the furthering of these projects. Models and methods to be covered will vary depending on student interests and projects and on the availability of exemplary extant research building closely from theory through empirical-model specification, estimation, interpretation, and presentation. For certain, though, students will learn how to specify, estimate, interpret, and present empirical models that reflect the (1) interaction effects and context conditionality, (2) the temporal, spatial, and spatiotemporal dynamics and interdependence, and (3) the ubiquitous joint endogeneity of modern theories of domestic, comparative, and international political and social science. The specific empirical models and methods covered will span three broad areas:

(1) *interaction & heterogeneous-parameter models*, such as multiplicative-interactive models, nonlinear least-squares for additive-separable nonlinear models, maximum likelihood for non-separable nonlinear models, & multilevel (*a.k.a.* hierarchical, random-effect/coefficient, error-component, …) models;

(2) *temporal, spatial, & spatiotemporal dynamic models*, such as time-serial, event-history, panel/TSCS, transition/switching, and spatial-econometric models, possibly including context-conditional dynamics;

(3) *strategies for causal-parameter estimation given ubiquitous endogeneity*, some example specific models and methods for which may include systems-of-equations, instrumental-variables, vector-autoregression, discontinuity, matching, and difference-in-difference designs.

Our intent is also to cover all 3 areas for both continuous and limited &/or qualitative dependent-variable cases.

        The course has no prerequisites. All methods to be employed will be thoroughly, albeit quickly, introduced *en route*. A prior course in Linear Regression and in Qualitative-Data Analysis/Maximum-Likelihood Estimation would be helpful and is recommended, however. (Representative background would be a course in linear regression and beginning qualitative-dependent-variable analysis at the level of, for example, Gujarati, *Basic Econometrics* or Wooldridge, *Introductory Econometrics*.)

EITM certification is available for graded course completion.

Recommended Texts:
[Your favorite introductory regression & basic MLE for qualitative/limited dependent-variables text, such as Gujarati, *Basic Econometrics* or Wooldridge, *Introductory Econometrics* or Kmenta, *Elementary Econometrics*.]
Kam, C. & R. Franzese, *Modeling & Interpreting Interactive Hypotheses in Regression Analysis*, UMich Press (2007).
King, G. *Unifying Political Methodology*, UMich Press (Reprint edition 1998).
Ward, M.D., Gleditsch, K.S. 2008. *Spatial Regression Models*. Sage.

Course Structure, Readings, & Lab Sessions:

Week 1: Introduction & Review – Base Applications

MON: Introductions & Motivation: The Centrality of Model Specification to Empirical Analysis
> *Readings:* Franzese, R.J. 2007. "Multi-Causality, Context Conditionality, and Endogeneity" in C. Boix and S. Stokes, eds., *Oxford Handbook of Comparative Politics*, Oxford University Press, pp. 27-72.

TUE: Review: Classical & Generalized Linear-Regression Models.
> *Readings:* [From your preferred introductory/basic econometrics text].

WED: Lab Session–Regression Review, stressing Intuitions & good theoretically driven Applications

THU: Review: Maximum Likelihood & Nonlinear/Qualitative/Limited Dependent-Variable Models
> *Readings:* King, Chs. 1-5, pp. 3-132.

FRI: Lab Session–*QualDep* Models & MLE Review, again stressing intuitions & theoretically driven app's.

Week 2: Modeling Context Conditionality & Parameter Heterogeneity

MON: The Centrality of Model Specification to Empirical Analysis: Reprise
> Franzese, R.J. 2007. "Multi-Causality, Context Conditionality, and Endogeneity" in C. Boix and S. Stokes, eds., *Oxford Handbook of Comparative Politics*, Oxford University Press, pp. 27-72.

> Linear-Interaction Models:
> > Kam & Franzese, Chs. 1-4, pp. 1-102.

TUE: Linear-Interaction Models continued, & Lab Session – Theoretically Specified Linear-Interaction Models, Interpretation & Presentation, stress on theoretically driven applications.

WED: Nonlinear Interaction Models: Nonlinear Least-Squares for additive-separable models
> Franzese, R.J. 1999. "Partially Independent Central Banks, Politically Responsive Governments, and Inflation," *American Journal of Political Science* 43(3): 681-706.

> Franzese, R.J. 2003. "Multiple Hands on the Wheel: Empirically Modeling Partial Delegation and Shared Control of Monetary Policy in the Open and Institutionalized Economy," *Political Analysis* 11(4):445-74, 2003.

> Franzese, R.J. 2010. "The Multiple Effects of Multiple Policymakers: Veto Actors Bargaining in Common Pools." *Rivista italiana di scienza politica* 40(3):341-70.

> Lab Session – Nonlinear-Interaction Models

THU: Nonlinear Interaction Models: Interactions in *QualDep* Models
> Kam & Franzese, Chs. 5.2, pp. 111-123.

> Norton, E.C. and Wang, H. and Ai, C. 2004. "Computing Interaction Effects and Standard Errors in Logit and Probit Models," *Stata Journal* 4(2):154-167.

> Ai, C., Norton, E.C. 2003. "Interaction Terms in Logit and Probit Models," *Economics Letters* 80(1):123-9.

> Lab Session – Nonlinear-Interaction Models

FRI: Multilevel Interaction Models
> Franzese, R.J. 2005. "Empirical Strategies for Various Manifestations of Multilevel Data," *Political Analysis* 13(4):430-46.

> Kedar, Orit. 2005. "When moderate voters prefer extreme parties: Policy balancing in parliamentary elections." *American Political Science Review* 99(2):185-99.

> Steenbergen, M.R., Jones, B.S. 2002. "Modeling Multilevel Data Structures," *American Journal of Political Science* 46(1):218-37.

> Zorn, C.J.W. 2001. "Generalized Estimating Equation Models for Correlated Data: A Review with Applications," *American Journal of Political Science* 45(2): 470-490.

Week 3: Temporally, Spatially, & Spatiotemporally Dynamic Models

MON & TUE: Temporally Dynamic Models, including Lab with Applications
> Beck, N. 1991. "Comparing Dynamic Specifications: The Case of Presidential Approval," *Political Analysis* 3(1):51-87.

> Keele, L.J., Kelly, N.J. 2006. "Dynamic Models for Dynamic Theories: The Ins and Outs of LDVs," *Political Analysis* 14(2):186-205.

> Keele, L.J., DeBoef, S. 2008. "Taking Time Seriously," *American Journal of Political Science* 52(1):184-200.

Hibbs, D. 1987. *The American Political Economy*, "Macroeconomic Performance and Mass Political Support for the President," Ch. 5, pp. 142-184.

Franzese, R.J. 2002. *Macroeconomic Policies of Developed Democracies*, "Financing the Commitments: Public Debt," Ch. 3, pp. 126-195.

<u>*WED & THU*</u>*:* Spatially & Spatiotemporally Dynamic Models, including Lab with Applications

Ward, M.D., Gleditsch, K.S. 2008. *Spatial Regression Models*. Sage.

Franzese, R.J., Hays, J.C. 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.J., Hays, J.C. 2008. "Empirical Models of Spatial Interdependence," in J. Box-Steffensmeier, H. Brady, & D. Collier, eds., *Oxford Handbook of Political Methodology*, Oxford University Press, pp. 570-604. Please note that this version contains the corrections to the published chapter noted separately in this errata file: http://www-personal.umich.edu/~franzese/Oxford_Handbook_Corrections.pdf

Steinwand, M.C. 2011. "Estimating Free-Riding Behavior: The StratAM Model," *Political Analysis* 19(4):488-502.

<u>*FRI*</u>*:* Temporally, Spatially, & Spatiotemporally Dynamic Qualitative-Dependent-Variable Models, including Lab with Applications

Cook, S.D., Hays, J.C., Franzese, R.J. 2014. "Spatial- and Spatiotemporal-Autoregressive Probit Models of Interdependent Binary Outcomes," forthcoming in *Political Science Research & Method*.

Week 4: Strategies for Causal-Parameter Estimation given Ubiquitous Endogeneity

<u>*MON*</u>*:* Strategies

Chapters in *Oxford Handbook of Political Methodology* on Causation by H. Brady, on Neyman-Rubin & Matching by J. Sekhon, on Experimentation by Morton & Williams, on Field & Natural Experiments by Gerber & Green. We may also discuss FIML, LIML, and Bayesian options.

<u>*TUE*</u>*:* System-of-Equations and Instrumental-Variables Estimation, with Lab Applications

Hanushek & Jackson, Chs.8-9, pp. 217-281.

Jackson, J.E. "Endogeneity and Structural Equation Estimation in Political Science," in J. Box-Steffensmeier, H. Brady, & D. Collier, eds., *Oxford Handbook of Political Methodology*, Oxford University Press, pp. 404-431.

<u>*WED*</u>*:* Bayesian, Structural, Vector Auto-Regression, with Lab Application

Brandt, P,T., Freeman, J.R. 2006. "Advances in Bayesian time series modeling and the study of politics: Theory testing, forecasting, and policy analysis." *Political Analysis* 14(1):1-36.

Brandt, P.T., Colaresi, M., Freeman, J.R. 2008. "The dynamics of reciprocity, accountability, and credibility." *Journal of Conflict Resolution* 52(3):343-74.

Sattler, T., Freeman, J.R., Brandt, P.T. 2008. "Political accountability and the room to Maneuver a search for a causal chain." *Comparative Political Studies* 41(9): 1212-39.

Brandt, P.T., Freeman, J.R. "Modeling macro-political dynamics." *Political Analysis* 17(2):113-42.

<u>*THU*</u>*:* Empirical Models of Strategic Interdependence, with Lab Applications

Signorino, C.S. 1999. "Strategic interaction and the statistical analysis of international conflict," *American Political Science Review* 93:279-98.

Carson, J.L. 2003. "Strategic interaction and candidate competition in US house elections: Empirical applications of probit and strategic probit models." *Political Analysis* 11(4):368-80.

<u>*FRI*</u>*:* Nonlinear Endogenous Systems, with Lab Applications.

Franzese, R.J., Hays, J.C. 2008. "Inequality & Unemployment, Redistribution & Insurance, and Participation: A Theoretical Model & an Empirical System of Endogenous Equations," in P. Beramendi and C. Anderson, eds., *Democracy, Inequality, & Representation*, Russell Sage, pp. 232-77.

Franzese, R.J., Hays, J.C., Kachi, A. 2010. "A Spatial Model Incorporating Dynamic, Endogenous Network Interdependence: A Political Science Application" (w/ Jude C. Hays and Aya Kachi), *Statistical Methodology* 7(3): 406-28, 2010.

Hays, J.C., Kachi, A., Franzese, R.J. 2012. "Modeling History Dependence in Network-Behavior Coevolution," *Political Analysis* 20(2): 175-190.

Hays, J.C. 2009. *Bucking the System*. Cross-Unit & Cross-Equation Interdependence & Endogeneity.