ICPSR: Spatial Econometrics for Contagion, Diffusion, and Interdependence (13-17 July 2015)

Instructor: Robert (Rob) J. Franzese, Jr. (franzese@umich.edu; www.umich.edu/~franzese)

Description & Objectives: Spatial interdependence is ubiquitous across the social sciences (and beyond). For examples: The likelihood and outcomes of demonstrations, riots, coups, and revolutions in one country almost certainly depend in substantively crucial ways on such occurrences in other countries (e.g., through demonstration effects or snowballing). Election outcomes and candidate qualities or strategies in some contests surely depend on those in others, and representatives’ votes in legislatures certainly depend on others’ votes or expected votes. In international relations, states’ entry decisions in wars, alliances, and organizations, e.g., heavily depend on how many and who else enters and how. In comparative and international political economy, globalization, i.e., international economic integration, implies strategic (and non-strategic) interdependence in national-level macroeconomic policymaking. In public health, public policy, and public administration, policies and strategies adopted and their efficacy in one jurisdiction depend critically on those in neighboring, competing, or otherwise related jurisdictions. In individual micro-behavioral research across the social and health sciences, long-standing and recently surging interest in contextual or network effects often refers to effects on each individual’s behavior or opinion from sets of other individuals’ opinions or behaviors; e.g., a respondent’s opinion on some policy likely depends on the opinions of her state, district, community, or social group. Such interdependence is obviously a central focus of epidemiology and of some parts of geography, and in analogous ways in many other disciplines such as criminology and in urban, regional, real-estate, and natural-resource economics, as well.

This course introduces spatial and spatiotemporal econometric models for continuous and limited dependent variables that directly address such interdependence, with an emphasis on social-science applications.

The main objective of this course is to teach students how to incorporate the interdependence implied by most social scientific theories into their empirical analysis. Students will learn inter alia how to 1) diagnose spatial patterns in their data, 2) estimate the structural parameters of spatial and spatiotemporal regression models, 3) calculate and present spatial and spatiotemporal effects, 4) use spatial modeling to discriminate between the multiple sources of spatial correlation—common exposure, interdependence, and selection—and, where applicable, to distinguish and estimate the relative strengths of the behavioral sources of the interdependence (strategic responses, free-riding, learning, coercion, etc.) among units of observation.

Daily Schedule: Our typical day will begin with a morning session starting around 9:30am (after light-refreshments courtesy of ICPSR). We will break for lunch around 11:30am, resuming with our afternoon session around 1pm. We will take a 15-30 minute break around 2:45-3:00pm (also with catered refreshments, enrollments permitting), and resume for lab from around 3:00 or 3:15 to around 4:30-5:00.

Prerequisites & Background: Students should have understandings of basic matrix algebra, calculus, probability, statistics, and regression analysis at levels commensurate with successful completion of a second graduate course in empirical methods in the social sciences, as well as some familiarity with a software package that can be used for spatial analysis (e.g., Stata, R, or MatLab for instance).

Course Materials: We do not use a textbook, but Anselin (2006), Anselin et.al. (2013), and Franzese & Hays (2008) overview most topics covered. Ward & Gleditsch (2008) provides good introductory textbook overview; fuller, intermediate to advanced textbooks include LeSage & Pace (2009), with a Bayesian focus, Bivand et al. (2013), with a geospatial statistics focus, or Elhorst (2013), with a spatiotemporal focus. The foundational classic is Anselin (1988).

Course Outline with Readings and Lab Plans

Session 1 (Monday, July 13th, Morning):
Introductory Stuff, Theoretical and Empirical Models of “Spatial” Interdependence


Session 2 (Monday, July 13th, Afternoon):
Diagnosing Spatial Association in Raw Data and/or in OLS Residuals


********** Lab 1 Exercises: Measures & Diagnostics**********

Session 3 (Tuesday, July 14th, Morning):
Spatial Lag, Error, and Mixed Models I: A Typology of Structural Models


Session 4 (Tuesday, July 14th, Afternoon):
Spatial Lag, Error, and Mixed Models II: Estimation


**********Lab 2 Exercises: SAR & STAR Models**********
Session 5 (Wednesday, July 15th, Morning):
Spatial Lag, Error, and Mixed Models III: Calculating and Presenting Spatial Effects


Session 6 (Wednesday, July 15th, Afternoon):
Spatiotemporal Models: Estimation & Interpretation


**********Lab 3 Exercises: More SAR & STAR Models**********

NOTE: Three options for Sessions 7,8,9,(10):
(a) to proceed next to Spatial QualDep Models and return to multiple/conditional-W (m-STAR) models for the last session, as syllabus currently configured;
(b) to continue next with m-STAR, then S-Probit, then other S-QualDep & Systems;
or (c) to order these modules 1. S-Probit, 2. m-STAR, 3. S-QualDep & Systems.

Session 7 (Thursday, July 16th, Morning):
Limited & Qualitative DepVars I: Spatial-Probit Model


Session 8a (Thursday, July 16th, Afternoon):
Continue: Spatial QualDep I: Spatial-Probit Model.


**********Lab 4 Exercises: Spatial Probit**********
Session 8b (Thu., 16th, Afternoon: Cont.): S-QualDep II: S-Duration & S-Simultaneous-Equations Models


Session 9a (Friday, July 17th, Morning):  Spatial QualDep III: Spatial-Count Models.


**********Lab 5 Exercises: Spatial-Duration & Count **********

Session 9b-10 (Friday, July 17th, Morning-Afternoon):
Multiparametric and Context-Conditional Spatial-Lag Models, plus Network-Behavior Coevolution


**********Lab 6 Exercises: m-STAR Model**********