27:202:641
QUANTITATIVE METHODS FOR PANEL DATA
Fall 2020 Syllabus

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Class Location: Virtual via Zoom
Lab Location: Virtual via Zoom
Class Time: Thursday, 6:00 to 8:40
Office Hours: TBD

COURSE DESCRIPTION

This is a course in quantitative analysis of longitudinal data, and will provide coverage of panel data methods in which units are subjected to repeated measurements over time. In some circles, panel models are known as growth curve models. There are special statistical challenges associated with the analysis of panel data, including serial correlation and so-called unobserved heterogeneity, as well as peculiar terminology such as "random effects" and "fixed effects" and "mixed effects." Yet there are also unique opportunities that arise with panel data which are not typical of cross-sectional designs. For example, panel data provide the ability to theorize about and test hypotheses concerning how some phenomenon unfolds over time. Panel data also allow for the study of how interventions or transitions can modify long-term "trajectories" of behavior, by eliminating a class of omitted variables as a source of bias.

Each topic will be presented as a workshop designed to introduce students to a specific type of panel model or research application. Weekly class meetings will comprise three substantive topics: (1) statistical theory to motivate the use of a panel model, (2) data analysis to provide concrete applications of key concepts, and (3) discussion based on research reported in peer-review journal articles. While the applications will draw heavily from examples in criminology and criminal justice, the discussions will cover broader applications from education, psychology, sociology, political science, and economics. Time permitting, other advanced topics will be considered, including event history analysis, structural equation models for panel data, and multiple time series models, among others.

Course Objectives

- Understanding of growth curve language and the statistical challenges which inhere in the analysis of panel data.
- Working knowledge of statistical models for the analysis of panel data, including their underlying assumptions, data requirements, implementation, and interpretation.
- Familiarity with the use of Stata statistical software for a wide range of research applications involving panel data.
- Compilation of a database of research studies which employ panel methodology.

Course Prerequisite

It is assumed that students have completed at least two semesters of graduate-level statistics, and have an intermediate level of understanding of computer-based statistical programs (e.g., SPSS,

SAS, Limdep, Stata, R). For doctoral students in the School of Criminal Justice, the prerequisites include passing grades in Introductory Statistics (27:202:542), Intermediate Statistics (27:202:543), and Research Methods (27:202:640). For doctoral students from other programs, this includes full coverage of linear regression analysis and at least some exposure to maximum likelihood estimation (e.g., logistic regression analysis).

Course Delivery

This course will be administered remotely via Zoom. The instructor will e-mail a link to the course account, which students may use to log in during the weekly meeting time. These meetings will be recorded and made available afterward for students who are unable to attend in person but would like to access the material.

COURSE MATERIALS

The course will rely heavily on the statistical program, Stata, for in-class data analysis. Students are not required to purchase the program, although Rutgers doctoral students are entitled to a free annual Stata license (specifically, Stata MP2 16 for Linux, Mac, or Windows) through the university's software portal (https://software.rutgers.edu). Alternatively, special prices and licenses for students are also available on the software website (http://www.stata.com). Students who do not wish to purchase the software or are not entitled to a university license will have access to it in the School of Criminal Justice computer lab (Center for Law and Justice, Room 567).

Stata is a very flexible statistical program, and students are highly encouraged to invest some time in familiarizing themselves with its features and functionality. Some class time each week will be devoted to Stata-related issues, but students will largely be expected to learn the ins and outs of the program on their own or in small groups.

Course Handouts

Detailed slides and notes for the topics considered in this course will be made available by the instructor. These are intended to provide in-depth treatment of the statistical rationale underlying each model, in addition to concrete applications that walk students through Stata commands. The notes and accompanying datasets will be posted on the course Twitter account (@CrimAdvStats). Students are free to keep the slides and notes for their own personal use and to refer to them as needed, but please respect the fact that they are the intellectual property of the instructor and are to be used strictly for educational purposes.

Recommended Textbooks

There are no required textbooks for this course, but students who wish to have good resources for their own use are encouraged to obtain the following books:

- Rabe-Hesketh, S., & Skrondal, A. (2008). *Multilevel and Longitudinal Modeling Using Stata* (2nd ed.). College Station, TX: Stata Press
- Singer, J. D., & Willett, J. B. (2003). *Applied Longitudinal Data Analysis: Modeling Change and Event Occurrence*. New York: Oxford University Press.
- Wooldrige, J. M. (2010). *Econometric Analysis of Cross Section and Panel Data* (2nd ed.). Cambridge, MA: MIT Press.

COURSE GRADING

Course grading will be based on the following criteria, described in more detail below:

Class Preparation	50%
Journal Articles	50%
	100%

The grading scale that will be used for the final semester grades is as follows:

A	90.0% or higher	(Above Average)
B	80.0% to 89.9%	(Average)
C	70.0% or 79.9%	(Below Average)
F	69.9% or lower	(Failing)

Class Preparation (50%)

Students are expected to attend each class meeting and to have read and to be conversant with (to the extent possible) all of the required reading material. Some of this material will be of a technical nature, so the goal of the class meetings will be to help students understand what they have read (both conceptually and mathematically), and to work through empirical applications of key concepts. The weekly class meetings will also be an opportunity for students to bring their own questions or data challenges to the attention of the instructor and their classmates. Since the course will be focused on applied research, this is the perfect setting to have in-depth discussions about research design and statistical analysis.

Participation will also be evaluated on the basis of students' activity on the course Twitter account (@RutgersSCJ641). The instructor will actively monitor the account, and students will be expected to create their own Twitter accounts and to "follow" the course account. This will provide a venue for commentary and discussion of course material, as well as an opportunity for students to make their classmates (and the instructor) aware of resources related to quasi-experimental methods. It might include, for example, links to user-written Stata commands, journal articles, online tutorials, statistical humor, etc.

Journal Articles (50%)

In anticipation of each new course topic, students will be required to conduct a search for a peer-reviewed journal article that has applied the model of interest to a research problem. Articles published in high-quality journals are expected, and journal articles outside of criminology and criminal justice are especially desired. Students will be expected to link their articles to the course Twitter account (@CrimAdvStats) and to provide short commentary, which will then be retweeted by the instructor so that all followers will have access to it. The goal will be to have compiled, by the end of the semester, a database of research articles covering each of the models considered in this course. These articles will be exemplars of specific longitudinal analyses, to which students can refer in the future for guidance concerning their own use of the methods.

COURSE POLICIES

Class Announcements: As needed, e-mail will be utilized to post course announcements (e.g., class cancellation due to inclement weather) as well as to occasionally provide links to items that are relevant for the topics covered in this course (e.g., newspaper articles, journal articles).

Classroom Climate: Disruptive behavior in the classroom cheats other students of the opportunity to learn. Examples include arriving late to class, leaving and re-entering the classroom during the seminar, talking excessively, using cell phones, eating, reading outside material, and persisting in speaking without being recognized. The instructor reserves the right to ask disruptive students to leave the classroom.

Academic Integrity: The instructor will uphold Rutgers University policies concerning ethical behavior and academic integrity, and students are expected to familiarize themselves with these policies. The relevant principles, policies, and disciplinary procedures can be accessed from the university's website at http://academicintegrity.rutgers.edu.

ACCOMMODATION AND SUPPORT STATEMENT

Rutgers University Newark (RU-N) is committed to the creation of an inclusive and safe learning environment for all students and the University as a whole. RU-N has identified the following resources to further the mission of access and support:

For Individuals with Disabilities: The Office of Disability Services (ODS) is responsible for the determination of appropriate accommodations for students who encounter barriers due to disability. Once a student has completed the ODS process (registration, initial appointment, and submitted documentation) and reasonable accommodations are determined to be necessary and appropriate, a Letter of Accommodation (LOA) will be provided. The LOA must be given to each course instructor by the student and followed up with a discussion. This should be done as early in the semester as possible as accommodations are not retroactive. More information can be found at ods.rutgers.edu. Contact ODS at (973)353-5375 or via email at ods@newark.rutgers.edu.

For Individuals who are Pregnant: The Office of Title IX and ADA Compliance is available to assist with any concerns or potential accommodations related to pregnancy. Students may contact the Office of Title IX and ADA Compliance at (973) 353-1906 or via email at TitleIX@newark.rutgers.edu.

For Absence Verification: The Office of the Dean of Students can provide assistance for absences related to religious observance, emergency or unavoidable conflict (e.g., illness, personal or family emergency, etc.). Students should refer to University Policy 10.2.7 for information about expectations and responsibilities. The Office of the Dean of Students can be contacted by calling (973) 353-5063 or emailing deanofstudents@newark.rutgers.edu.

For Individuals with temporary conditions/injuries: The Office of the Dean of Students can assist students who are experiencing a temporary condition or injury (e.g., broken or sprained limbs, concussions, or recovery from surgery). Students experiencing a temporary condition or injury should submit a request using the following link: https://temporaryconditions.rutgers.edu.

For English as a Second Language (ESL): The Program in American Language Studies (PALS) can support students experiencing difficulty in courses due to English as a Second Language (ESL) and can be reached by emailing PALS@newark.rutgers.edu to discuss potential supports.

For Gender or Sex-Based Discrimination or Harassment: The Office of Title IX and ADA Compliance can assist students who are experiencing any form of gender or sex-based discrimination or harassment, including sexual assault, sexual harassment, relationship violence, or stalking. Students can report an incident to the Office of Title IX and ADA Compliance by calling (973) 353-1906 or emailing TitleIX@newark.rutgers.edu. Incidents may also be reported by using the following link: tinyurl.com/RUNReportingForm. For more information, students should refer to the University's Student Policy Prohibiting Sexual Harassment, Sexual Violence, Relationship Violence, Stalking and Related Misconduct located at http://compliance.rutgers.edu/title-ix/about-title-ix/title-ix-policies/.

For support related to interpersonal violence: The Office for Violence Prevention and Victim Assistance can provide any student with confidential support. The office is a confidential resource and does not have an obligation to report information to the University's Title IX Coordinator. Students can contact the office by calling (973) 353-1918 or emailing run.vpva@rutgers.edu. There is also a confidential text-based line available to students; students can text (973) 339-0734 for support.

For Crisis and Concerns: The Campus Awareness Response and Education (CARE) Team works with students in crisis to develop a support plan to address personal situations that might impact their academic performance. Students, faculty and staff may contact the CARE Team by using the following link: tinyurl.com/RUNCARE or emailing careteam@rutgers.edu.

For Stress, Worry, or Concerns about Well-being: The Counseling Center has confidential therapists available to support students. Students should reach out to the Counseling Center to schedule an appointment: counseling@newark.rutgers.edu or (973) 353-5805. If you are not quite ready to make an appointment with a therapist but are interested in self-help, check out TAO at Rutgers-Newark for an easy, web-based approach to self-care and support: https://tinyurl.com/RUN-TAO.

For emergencies, call 911 or contact Rutgers University Police Department (RUPD) by calling (973) 353-5111.

COURSE SCHEDULE

This schedule is subject to change depending on time demands, and odds are that it will indeed change because some topics will probably require more than the allotted time.

Week – Class Date	Class Topic
1 – Thu, Sep 3	Course Introduction
2 – Thu, Sep 10	Visualizing and Pooling Trajectories
3 – Thu, Sep 17	Linear Mixed Effects Models, Part I
4 – Thu, Sep 24	Linear Mixed Effects Models, Part II
5 – Thu, Oct 1	(Lab Exercises or Catch Up)
6 – Thu, Oct 8	Fixed Effects and Hybrid Models, Part I
7 – Thu, Oct 15	Fixed Effects and Hybrid Models, Part II

8 – Thu, Oct 22   Nonlinear Mixed Effects Models, Part I

9 – Thu, Oct 29   Nonlinear Mixed Effects Models, Part II

10 – Thu, Nov 5   (Lab Exercises or Catch Up)

11 – Thu, Nov 12   Dynamic Mixed Effects Models

12 – Thu, Nov 19   Imputation of Incomplete Panel Data

13 – Thu, Nov 26   NO CLASS – THANKSGIVING RECESS

14 – Thu, Dec 3   Item Response Models

15 – Thu, Dec 10   Finite Mixture Models