27:202:641
QUANTITATIVE METHODS FOR PANEL DATA
Fall 2024 Syllabus

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Class Location:	Center for Law and Justice, Room 574
Class Time:	Tuesday, 4:00-6:40
Office Hours:	By appointment

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 one class of omitted variables as a source of bias—those that are not subject to change over the period under study.

Each topic will be presented in a workshop format designed to introduce students to a specific type of panel model, along with research application. Class discussion will be based on research reported in peer-review journal articles, and data analysis will provide concrete, step-by-step application of key methods. While applications will draw heavily from examples in criminology and criminal justice, the course material will cover broader applications and recommended practices from education, psychology, sociology, political science, economics, and public policy. Time permitting, other advanced topics will be considered, including event history analysis and multiple time series models, among others.

All statistical analyses in the course will be performed using R and RStudio. Prior versions of the course have been taught using Stata, so students wishing to have Stata materials will be able to obtain them from the instructor.

Course Objectives

- Understand the language of growth curve models and the statistical challenges that inhere in the analysis of panel data.
- Obtain working knowledge of a variety of statistical models for the analysis of panel data, including their underlying assumptions, data requirements, implementation, and interpretation.
- Acquire familiarity with the use of R and RStudio for a wide range of research applications involving panel data.

Course Prerequisite

The goal of this course is to make students knowledgeable consumers (and perhaps users) of the panel data methods that will be covered, under the assumption that one or more of the methods will be applicable to students' own research projects (e.g., comprehensive exam, dissertation, other empirical paper). The material will include readings as well as exercises in data analysis. Because the readings can often be of a technical nature, students are expected to have successfully completed doctoral-level courses in introductory and intermediate statistics and research methods, and to be comfortable with the use of some statistical program (R, Stata). 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 as well as maximum likelihood estimation (e.g., logistic regression analysis).

COURSE MATERIALS

In this course, we will use R and RStudio. Students are strongly encouraged to bring a laptop with them to class each week, because time will be devoted each week to data analysis. Before the start of the course, they should download and install the latest versions of R (https://cran.r-project.org) and RStudio Desktop (https://www.rstudio.com) compatible with their operating system. Because these are open-source programs, there will be no need to purchase any software licenses. Students who already have R and RStudio loaded on their laptop are advised to update them before the start of the course. Although Stata will not be used, notes on Stata (from previous iterations of this course) will be available for all of the designs and statistical models in the course, for students who wish to have them.

Powerpoint slides covering weekly material will be made available by the instructor, along with the data files and R scripts used for in-class exercises. Students should print up the slides before each class and use them for notetaking purposes, and have the data files and R scripts loaded onto their laptops and ready for analysis.

COURSE GRADING

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

Class Preparation	25%
Do It Yourself	75%
	100%

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

A	90.0% or higher
B	80.0% to 89.9%
C	70.0% or 79.9%
F	69.9% or lower

Class Preparation (25%)

Students are expected to attend each class meeting and to be engaged and ask questions. Some of this material will be of a technical nature, so the goal of the class meetings will be to help students

understand the methods (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.

Do It Yourself (75%)

Each week, a short assignment requires students to expand on work performed during class, using the same dataset and design. These tasks might entail including an alternative set of variables, or estimating an alternative model, for example. Students will write up a short memo with relevant commands and output from the assignment, along with a brief narrative description of the findings. These are expected to be no more than 1-2 pages in length.

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 – Tue, Sep 3	Introduction to Panel Data
	Growth Curve Models
2 – Tue, Sep 10	Visualizing and Pooling Trajectories
3 – Tue, Sep 17	Random Effects (Part 1)
4 – Tue, Sep 24	Random Effects (Part 2)
5 – Tue, Oct 1	Random Effects (Part 3)
6 – Tue, Oct 8	Fixed Effects (Part 1)
7 – Tue, Oct 15	Fixed Effects (Part 2)
8 – Tue, Oct 22	Nonlinear Mixed Effects (Part 1)
9 – Tue, Oct 29	Nonlinear Mixed Effects (Part 2)
	Special Topics
10 – Tue, Nov 5	Two-Way Fixed Effects for Policy Evaluation (Part 1)
11 – Tue, Nov 12	Two-Way Fixed Effects for Policy Evaluation (Part 2)
12 – Tue, Nov 19	Imputation of Incomplete Panel Data (Part 1)
13 – Tue, Nov 26	NO CLASS – THANKSGIVING RECESS
14 – Tue, Dec 3	Imputation of Incomplete Panel Data (Part 2)
15 – Tue, Dec 10	TBA

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 Experiencing Disability: The Office of Disability Services (ODS) works with students with medical, physical, and/or mental conditions who encounter disabling barriers in order to determine reasonable and appropriate accommodations for access. Students who have completed the process with ODS and have approved accommodations are provided a Letter of Accommodation (LOA) specific to each course. To initiate accommodations for their course students must both provide the LOA to and have a conversation with the course instructor about the accommodations. This should occur as early in the semester as possible. More information can be found at the RU-N ODS website (ods.newark.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 Short-Term Absence Verification: The Office of the Dean of Students can provide assistance for absences related to religious observance, emergency or unavoidable conflict (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 (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 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 Title IX Policy and Grievance Procedures located at https://uec.rutgers.edu/wp-content/uploads/60-1-33-current-1.pdf.

For Support Related to Interpersonal Violence: The Office for Violence Prevention and Victim Assistance (VPVA) can provide any student with confidential support. The office does not have a reporting obligation to Title IX. Students can contact the office by calling (973) 353-1918 or emailing run.vpva@rutgers.edu. There is also a confidential text-based helpline available to students; students can text (973) 339-0734 for support. Students do not need to be a victim/survivor of violence; any student can receive services, information and support.

For Crisis and Concerns: The Campus Awareness Response and Education (CARE) Team works with students in crisis to develop a plan of support plan and address personal situations that might impact their academic performance. Connect with 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.

Additional support is available to any RU-N student through Uwill services:

- Umatch: Teletherapy with flexible scheduling, starting with a free account.
- Uhelp: Crisis support at 833-646-1526 (available 24/7/365).
- Urise: Wellness-based video collection with a free account.

Access Uwill@RUN at https://my.rutgers.edu using your netid. Services are confidential and free.

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