Rutgers, The State University of New Jersey
School of Social Work
Advanced Statistical Methods I:
Applied Regression Analysis
19:910:638, Fall 2019

Class
Instructor: Lenna Nepomnyaschy, Associate Professor
Email: lennan@ssw.rutgers.edu
Time: Wednesdays, 9:30 – 12:10
Location: 120 Albany St. Classroom A

Required Lab
Instructor: Alexandra Haralampoudis, Doctoral Student
Email: alexandra.haralampoudis@rutgers.edu
Time: Wednesdays, 2:00 – 3:30
Location: 120 Albany St. Classroom A

Course Overview
This course, the first of the statistics sequence for social work doctoral students, will focus on applied regression analysis and related multivariate methods. Linear regression will be covered in depth, including regression assumptions, model specification, diagnostics, and interactions (moderation) effects. Analysis of dichotomous outcomes will also be introduced using linear probability models. Students will learn to use the Stata statistical package for all analyses and class assignments. Each homework assignment will build on the previous, with the final product being the back end of a journal-quality empirical paper for publication.

Required Software:
This course requires that students learn and use the Stata Statistical Software Package for hands-on data analysis and statistics applications for class assignments.

- Stata is available for all employees (GRAs, staff, faculty) for free download from the OIRT software portal: https://software.rutgers.edu/
- Stata is available to all students in any Rutgers computer lab as well as the Doctoral Student Computer lab in the SSW Annex
- Students may also purchase their own version of Stata at discounted rates through the Rutgers Office of Instructional Technology: http://www.stata.com/order/new/edu/gradplans/gp-direct.html
- **BEFORE MAKING ANY SOFTWARE PURCHASE, CONTACT PROFESSOR**

Required Texts (2)
(LB) Lewis-Beck, C. & Lewis-Beck, M. 2016. *Applied Regression: An Introduction (2nd edition)*. Newbury Park, CA: Sage Publications. *Very cheap to purchase BUT also available for free online through Rutgers Libraries.* https://dx-doi-org.proxy.libraries.rutgers.edu/10.4135/9781483396774

(MJ) Mehmetoglu, M. & Jakobsen, T.G. 2016. *Applied Statistics Using Stata: A Guide for the Social Sciences*. Sage Publishing. *Need to purchase*.
Student Resources (access with Rutgers Netid): https://study-sagepub-com.proxy.libraries.rutgers.edu/mehmetogluandjakobsen/student-resources

(SW) Stock, J. H. & Watson, M.W. 2011. *Introduction to Econometrics*, 3rd edition. Boston, MA: Addison-Wesley. (*2nd edition free online – do not purchase)*
https://econometricsweb.files.wordpress.com/2016/11/stock-watson-econometrics-3rd-edition-ilovepdf-compressed.pdf

Suggested Supplementary Resources and Texts

Writing about Quantitative Analysis

Miller, Jane E., 2013. *The Chicago Guide to Writing about Multivariate Analysis (2nd Edition)*. The Chicago Guides to Writing, Editing, and Publishing. University of Chicago Press.
Study guide: http://www.press.uchicago.edu/books/miller/multivariate/index.html
THIS IS SUPER HELPFUL
See Jane Miller's website for pdfs, videos and other material:
http://policy.rutgers.edu/faculty/miller/

More In-Depth Applied Regression & Introductory Econometrics Texts

Wooldridge, J. 2006. *Introductory Econometrics: A Modern Approach*, 3rd edition. Mason, OH: Thompson. (*The Bible of econometrics*)

Fox, John. 2016. *Applied Regression Analysis & Generalized Linear Models (3rd edition).* Thousand Oaks, CA: Sage Publications. (*more complex treatment*)

Specialized Regression Topics

Jaccard, J. & Turrisi, R. 2003. *Interaction Effects in Multiple Regression* (2nd Edition). Thousand Oaks, CA: Sage Publications. ISBN: 0761927425. (*Highly useful)*
Available through Rutgers Libraries:
https://methods-sagepub-com.proxy.libraries.rutgers.edu/book/interaction-effects-in-multiple-regression?fromsearch=true

Hardy, Melissa. 1993. *Regression with Dummy Variables*. Newbury Park, CA: Sage Publications. Available online through Rutgers Libraries:
https://dx-doi-org.proxy.libraries.rutgers.edu/10.4135/9781412985628

General Stata Books

Hamilton, L.C. 2006. *Statistics with Stata*, 6th edition. Cengage.

Long, S.J. 2009. *The Workflow of Data Analysis Using Stata*. College Station, TX: Stata Press.

Kohler, U. & Kreuter, F. 2009. *Data Analysis Using Stata* (2nd ed). College Station, TX: Stata Press.

Mitchell, M. 2010. *Data Management Using Stata: A Practical Handbook*. College Station, TX

Course Requirements

Students' work will be evaluated on the following course requirements (detailed instructions to follow).

Homework Assignments (4 total) = 50%

There will be **FOUR (4)** homework assignments, which will be based on the skills and concepts introduced during class and lab and on the required readings. Assignments will include hands-on application of statistical formulas to basic data, writing syntax to create Stata output from a dataset, creating tables and graphs from output, interpreting output, and writing up methods and results of analyses. Assignments will build on one another leading to the mid-term and final assignment that will include most of the previous elements.

Homework #1: Univariate descriptive analysis & bivariate regression

Estimating, interpreting, and writing up results from descriptive tables and bivariate regression models

Homework #2: Multiple Regression

Writing a methods section and estimating, interpreting, and writing up results from a series of multiple regression models

Homework #3: Interaction Effects

Estimating, interpreting, and writing up results from interaction effects (moderation) models with continuous dependent variables

Homework #4: Linear Probability Regression Models for Binary Outcomes

Estimating, interpreting, and writing up results from linear probability models with a binary dependent variable

Final Assignment = 40%

The final assignment will consist of a complete data analysis project which will build on all the prior homework assignments. Analyses will include estimation of multiple linear regression models, interaction effects models with a continuous outcome, and models with binary dependent variables. The written assignment will take the form of the ***Methods, Results, and*** (brief) ***Discussion*** sections of a journal-style quantitative empirical paper. Students will describe their data, sample, measures, and analytic strategy, describe the sample characteristics, interpret results from their bivariate and multivariate models, and provide a brief discussion of the answer to their question and of the limitations of the analyses related to violations of regression assumptions.

Presentation of Final Assignment = 5%

Students will present a working draft of their final assignment to the class in a PowerPoint presentation in order to provide (for peers) and receive feedback as to final steps (10 minutes maximum, similar to a conference presentation).

Peer-reviewed article submission and discussion = 5%

Each student will find and submit several peer-reviewed scholarly articles that utilize multiple regression estimation for the class to discuss. Students are expected to read the articles to discuss in a specific class. Articles will be submitted one week prior to discussion date.

It goes without saying that students are expected to attend every class, arrive on time and participate in class discussions and exercises. While there is not specific course credit associated with attendance and participation, absences, being late to class, and lack of participation and preparation will substantially impact students' overall grades.

Grading

Grade cut-offs are as follows (scores of .5 and above will be rounded up):

A	92-100
B+	87-91
B	82-86
C+	77-81
C	70-76
F	0-69

Applied Regression, Fall 2019: Outline of Class & Lab Topics & Homework Due Dates		
Week & Date	**Topic**	**HW Dates & Topic**
Week 1: Sept 4	***Special Time:*** Class & Lab combined (2:00-4:00): Intro to Stata	
Week 2: Sept 11	Class: Intro to Quantitative Analyses	
	Lab: Data Librarian -(Ryan Womack)- Searching for Data, Continue Intro to Stata	
Week 3: Sept 18	Class: Intro to Bivariate Regression	*HW #1: Assigned: Univariate Statistics & Bivariate Regression*
	Lab: Variable construction & descriptive statistics	
Week 4: Sept 25	Class: Bivarate Regression Cont'd	
	Lab: Cont'd construction & bivariate regression	
Week 5: Oct 2	Class: Dummy Variables & Intro to Multiple Regression	HW# 2 Assigned: Multiple regression
	Lab: Bivariate regression	
Week 6: Oct 9	Class: Multiple Regression Cont'd	***HW # 1 Due***
	Lab: Mutliple Regression	
Week 7: Oct 16	Class: Multiple Regression Cont'd	
	Lab: Multiple Regression	
Week 8: Oct 22	Class: Interaction Effects	HW# 3 Assigned: Interaction effects
	Lab: Interaction effects	
Week 9: Oct 30	Class: Interaction Effects	***HW # 2 Due***
	Lab: interaction Effects	
Week 10: Nov 6	Class: Interaction Effects	
	Lab: Interaction Effects	
Week 11: Nov 13	Class: Intro to Binary Outcomes	HW #4 Assigned: Binary Outcomes
	Lab: Interaction Effects	
Week 12: Nov 20	Binary Outcomes Cont'd	***HW #3 Due***
	Binary Outcomes	
THANKSGIVING BREAK - NO CLASS - NOVEMBER 27		
Week 13: Dec 4	Class: Student Presentations	
	Lab: Binary Outcomes	
Week 14: Dec 11	Class: Student Presentations	***HW #4 Due***
	Lab : Review for Final Assignment	
Week 15: Dec 18	Class: Wrap-Up, Intro to Adv. Methods	***Final Assignment Due (12/21)***
	Lab: Review for Final Assignment	

Detailed Course Outline

***Please note**: In addition to the required readings for each week, there are sample empirical articles listed (some TBA). I will be adding (or substituting) relevant peer-reviewed empirical papers that use the various methods that we are covering as we go, including those submitted by students. Thus, each week there will be alternate journal articles that students will be required to read.*

Week 1: September 4, 2019 – SHORTENED CLASS 2:00-4:00 pm

Topics: Intro to Stata & to Course

- Have Stata downloaded on your laptops

Required Reading:

MJ: Chapter 1: Research and Statistics, (p. 1-15)

MJ: Chapter 2: Introduction to Stata, (p. 17-33), Just **SKIM** so you are slightly familiar with Stata interface

Read One (or more) of the Following for Discussion over the next two weeks:

Social Science Replication Crisis – most recent updates

- Psychology's replication crisis has made the field better. Dec. 6, 2018. Five Thirty Eight. https://fivethirtyeight.com/features/psychologys-replication-crisis-has-made-the-field-better/

OR

- More social science studies just failed to replicate. Here's why this is a good thing. Aug. 27, 2018. Vox.com https://www.vox.com/science-and-health/2018/8/27/17761466/psychology-replication-crisis-nature-social-science

OR

- Replication crisis spurs reforms in how science studies are done. 2018. Science News. https://www.sciencenews.org/blog/science-public/replication-crisis-psychology-science-studies-statistics

OR

- The Truth Wears Off. 2010. The New Yorker. – also for Quant. Research class https://www.newyorker.com/magazine/2010/12/13/the-truth-wears-off

Week 2: September 11, 2019

Topics: Introduction to quantitative data & analysis

- Overview of course
- Concepts, Examples, Terminology, Data, Types of Variables

Required Reading:

Wooldridge, Jeffrey. Chapter 1: The Nature of Econometrics and Economic Data (p. 1-21)

Gordon, Chapter 5: Basic Descriptive Statistics, Types of Variables (p. 97 – 123)

Sample Papers:

- Read abstracts to understand the questions the studies are asking
- What are the dependent & independent variables
- Draw out a conceptual diagram
    - Nepomnyaschy & Waldfogel, 2007
    - Gold & Nepomnyaschy, 2018
    - O'Connor & Nepomnyaschy, 2019

Suggested Reading:

Reviews of Probability and Inferential Statistics (this should all be a review from your summer stats course)

Stock & Watson, Chapter 2: Review of Probability & Chapter 3: Review of Statistics
Online pdf: https://econometricsweb.files.wordpress.com/2016/11/stock-watson-econometrics-3rd-edition-ilovepdf-compressed.pdf

Week 3: September 18, 2019

Topics: Introduction to Bivariate Regression

- Introduction and overview of regression analysis
- Calculating bivariate regression coefficients

In-class exercise: Calculating bivariate regression coefficients

HW #1 Assigned: Descriptive & Bivariate Regression Analyses, Due: Week 6

Required Readings:

LB: Chapter 1: Bivariate Regression: Fitting a Straight Line (***p. 1 – 22***)

MJ: Chapter 3: Simple Bivariate Regression (***p. 45 – 54 ONLY***)

Sample papers

- Read sample description sections and explore the descriptive Tables, usually Table 1
    - Nepomnyaschy & Waldfogel, 2007
    - Gold & Nepomnyaschy, 2018
    - O'Connor & Nepomnyaschy, 2019

Suggested Readings:

- SW: Chapter 4: Linear Regression w/One Regressor (***p. 107 – 122 ONLY***)

Week 4: September 25, 2019

Topics: Bivariate regression continued

- Interpreting bivariate regression coefficients
- Hypothesis Testing
- Predictions w/bivariate regression

Required Readings:
LB: Chapter 2: Bivariate Regression: Assumptions and Inferences: (***2nd part: p. 29 – 53 ONLY).***

MJ: Chapter 3: Simple Bivariate Regression (***Rest of chapter: p. 54 – 65 ONLY***)

SW: Chapter 5: Regression with a Single Regressor: Hypothesis Tests and Confidence Intervals (***p. 144 – 153 ONLY***).

McShane, Gal, Gelman, Robert & Tackett. 2019. Abandon Statistical Significance. *The American Statistician* 70:S1 (p. 235-241 ***ONLY)***
https://www.tandfonline.com/doi/full/10.1080/00031305.2018.1527253

Sample papers: TBA

- Read Methods section: Data, Sample, Measures, Analytic Strategy

Suggested Readings:
Studenmund, Chapter 5: Hypothesis Testing ***(p. 121 – 150).***

Week 5: October 2, 2019

Topic: Regression w/Dummy Variables & Multiple Regression

- Binary & categorical independent variables (dummy variables)
- Introduction to multiple regression

HW #2 Assigned: Multiple Regression, Due: Week 9

Required Readings:
MJ: Chapter 5: Regression with Dummy Variables

MJ: Chapter 4: Multiple Regression

LB: Chapter 3: Multiple Regression (p**. 55 – 74**).

Moksony, Ferenc. 1999. Small is Beautiful. The Use and Interpretation of R-Squared in Social Science Research. *Review of Sociology*.

Why we don't really care about the Rsquared in Social Science Research? July 3, 2018. The Medium.
https://medium.com/@vince.shields913/why-we-dont-really-care-about-the-r-squared-in-econometrics-social-science-593e2db0391f

Sample papers: TBA

Suggested Readings:
Hardy, M. 1993. *Regression with Dummy Variables*, Chapters 1, 2, and 3 (p. 1 – 28)

Week 6: October 9, 2019

Topic: Multiple Regression Continued

- Regression Assumptions
- Nonlinear Relationships
- Rescaling and transforming variables for interpretation
- Magnitude of effects

HOMEWORK #1: DUE

Required Readings

MJ, Chapter 7: Linear Regression Assumptions & Diagnostics

LB, Chapter 2: Bivariate Regression: Assumptions and Inferences, ***(1st PART ONLY, p. 23 – 29).***

Gelman & Hill. Chapter 4: Linear Models: Before and After Fitting the Model (transformation) (p. 53-74).

Sample papers: TBA

Suggested Readings

Studenmund, Chapter 4: The Classical Model (p. 93 – 110).
Gordon, Chapter 12: Nonlinear Relationships (p. 434 – 456)
Gordon, Chapter 14: Outliers, Heteroskedasticity, and Multicollinearity (p. 481-520).

Week 7: October 16, 2019

Topic: Multiple Regression continued

- Regression Diagnostics
- Model specification
- Mediation & Confounding
- Presenting Findings (predictions)

Required Readings:

(LB) Lewis-Beck. Chapter 4: Multiple Regression: Special Topics (p. 75-95)

Gordon, Chapter 13: Indirect Effects and Omitted Variable Bias (p. 461 – 480)

Miller, Chapter 9: Quantitative Comparisons for Multivariate Models (***p. 193 – 199 ONLY***)

Miller, Chapter 10: The Goldilocks Problem in Multivariate Regression (***p. 211 – 229***)

Studenmund, Chapter 11: Running Your Own Regression Project, Practical Advice for Your Project (p. 383 – 393).
AND A Regression User's Checklist and Guide, (p. 395 – 400).

Sample Papers: TBA

Week 8: October 23, 2019

Topic: Introduction to Interaction Effects (moderation)

HW #3 Assigned: Interaction effects w/continuous outcomes, DUE: Week 12

Required Readings over next 3 weeks (week 8, 9, 10)

MJ: Chapter 6: Interaction/Moderation Effects Using Regression

Miller, Chapter 16: Writing About Interactions (p. 339 – 365).

White, L. 2005. Writes of Passage: Writing an Empirical Journal Article. *Journal of Marriage and Family* 69: 791-798.

J.E. Miller and Y.V. Rodgers, 2008. "Economic Importance and Statistical Significance: Guidelines for Communicating Empirical Research." *Feminist Economics*. 14(2):117-149.

Sample papers: TBA

Supplementary Reading:

Jaccard & Turrisi, *Interaction Effects in Multiple Regression*: Chapters 1 and 2, (p. 1 - 43). *very helpful – strongly recommended*

Gordon, Chapter 11: Interaction Effects.

Week 9: October 30, 2019

Topic: Interaction Effects cont'd

HOMEWORK #2 DUE

Sample papers: TBA

Week 10: November 6, 2019

Topic: Interaction effects (cont'd)

Sample papers: TBA

Week 11: November 13, 2019

Topic: Intro to Binary Outcomes

- Dichotomous dependent variables

- frequency tables
- linear probability models

Homework #4 Assigned: Binary Outcomes, Due: Week 14

Required Readings for next 2 weeks (weeks 11, 12):
Gordon, Chapter 16: Dichotomous Outcomes (p. 552 – 563).

SW: Chapter 11: Regression with a Binary Dependent Variable (**p. 381-387 ONLY**)

Wooldridge, Chapter 7: Multiple Regression Analysis with Qualitative Information (**p. 252-257 ONLY**)

Sample papers: TBA

Week 12: November, 20, 2019
Topic: Binary Outcomes

HOMEWORK #3 DUE

Sample Papers: TBA

THANKSGIVING BREAK – NO CLASS – NOVEMBER 27, 2019

Week 13: December 4, 2019
STUDENT PRESENTATIONS OF FINAL ASSIGNMENT

Week 14: December 11, 2019
STUDENT PRESENTATIONS OF FINAL ASSIGNMENT

Week 15: December 18, 2019
Topic: Intro to Advanced Topics & Wrap Up

Final Assignment Due – December 20, 2019