

Course Syllabus Winter 2024 Psy 522/622 Multiple Regression and Multivariate Quantitative Methods

Instructor

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Meeting Times and Location

Class: Tu-Th 10:00–11:50 AM, 307 Cramer Hall. Lab: Wed 2:00-3:05 PM, Fariborz Maseeh Hall B155.

Lab Instructor/Teaching Assistant

Kristina Tucker. Email: krtucker@pdx.edu. Office hours: remote by appointment. Lab materials are on Canvas at: <https://canvas.pdx.edu/courses/81079>

Required Text

Cohen, J., Cohen, P., West, S.G., & Aiken, L.S. (2003). *Applied multiple regression/correlation analysis in the behavioral sciences (Third Edition)*. Mahwah, NJ: Erlbaum. ISBN: 0-8058-2223-2. Electronic copy available through the library <https://ebookcentral.proquest.com/lib/psu/detail.action?docID=1222653>.

Overview

This course is designed to give students the necessary skills to analyze research projects. Together with the first course (Psy 521/621 Univariate Quantitative Methods offered Fall term), this course will be a thorough and reasonably comprehensive introduction to understanding, critically evaluating, conducting, and writing about analyses for most studies in behavioral and social science-related disciplines.

Readings

Readings are from the required text and from supplemental articles and chapters. See attached schedule to be used as a guideline for when the readings should be completed. Note that you will get more out of class lecture if the readings are complete prior to each class meeting. Some students also prefer to revisit the readings after lectures, and I think this is a good strategy.

Grades

Grades are based on an average of the three homework assignments with total percentages assigned the following grades: ≥ 90 = A, 85-89.9 = B+, 80-84.9 = B, 75-79.9 = C+, 70-74.9 = C. Your course grade will be based on three homework assignments (45%), two exams (45%), and ten brief lab reports (10%) **Exams** are at home during class period, open book, and with limited duration. They will include short answer (paragraph length), multiple choice, and computations/output interpretation. I will give you a one-page "review sheet" (just a list of topics and a larger set of short answer questions) one week prior to the exam. **Homework assignments** will include computer assignments, result summaries and interpretation, reading an example journal article, and some hand calculation problems. Homework assignments will be due at the beginning of class on the dates indicated on the schedule. **Brief lab reports** are due at the beginning of lab the following week and will involve fairly minimal work outside of lab. Each will be worth 5 points. The purpose of these assignments is simply to demonstrate you participated and to spend a little time reflecting on the purposes of the lab. Late assignments are not accepted without penalty (10% per day late), except for cases of illness or family emergencies. Please contact me ahead of time if you are going to miss the deadline for any reason.

Software

The labs and assignments for this course will use SPSS (Statistical Package for the Social Sciences) but will and R, the free statistical software package. R can be downloaded from <https://www.r-project.org/> and SPSS can be obtained through the Psychology Department at present. SPSS and R are also available in most graduate computer labs on campus. No manual or book for either software program is required. If you would like an additional reference, there are several useful guides to using SPSS or R that are good. For SPSS, I have some preference for the book by Samuel B. Green & Neil J. Salkind. *Using SPSS for Windows and Macintosh, Books a la Carte, 8th Edition*. ISBN: 0134319885, and, for R, I have some preference for the book by D. W. Gerbing *R Data Analysis without Programming*. Routledge: New York. ISBN: 0415657202. You may be able to acquire one of the last couple of editions of the SPSS book for less money, which will work just fine. For more detailed R reference for regression analysis, I suggest Fox, J. & Weisberg, S. (2019). *An R*

Companion to Applied Regression, Third Edition. Thousand Oaks: Sage. Don't spend a lot of time getting stuck on software implementation--either Stephanie or I can provide additional assistance. **Don't be afraid to ask.**

Calculator

Although there will be a lot of hand computation this quarter, you should have access to a calculator that has a natural log (\log_e or \ln) and exponential key (e).

Web Page Material

The website for the class, <http://web.pdx.edu/~newsomj/mvclass>, will have handouts and many overheads in pdf format (only after they are covered in class), the syllabus, supplemental readings (password provided in class), and links to useful statistics sites. Under "Stats Notes," there is also some additional lecture information on most of the topics covered in the course, although the material is discussed in less depth.

My Teaching Philosophy

In general, I work very hard at teaching, and so I expect students to work very hard at learning. This course will be a lot of work, but I think that you will find, in the end, you will learn a great deal. I have a heavy emphasis on concepts. To me, the concepts and theoretical constructs in statistics are fundamental to understanding and using statistics well—they are also the part I love most about it (ok, maybe "love" is too strong). Understanding the concepts and the big picture first will help you remember many more details. Don't worry about ever having to memorize formulas; you can always look those up in a book if you need to. And what I'd like you to avoid is a recipe approach where you follow steps to get a result without understanding what you are doing. If you follow a menu-driven recipe for getting through an Analysis of Variance, without understanding why you are conducting the test, how to interpret it when it's completed, and when to use it, I've failed miserably in my job. Despite my bias toward conceptual aspects of statistics, I also believe that the practical applications are extremely important. We will do as much application as possible, a great deal of which will involve real data sets.

Keeping a couple of things in mind about the nature of statistics and the strategies for learning statistics will help you a great deal in this course. **Statistics is not math.** Only a very rudimentary math knowledge (eighth grade algebra probably!) is needed for understanding statistics, even at a fairly deep level. Statistics is like mathematics, however, in that it must be practiced to be learned. One has to work on exercises, analyze different problems, and get experience with different analytic situations in order to absorb the information. Do not think that you can just read through the material and remember everything. Learning statistics is also **like learning a foreign language** in that nearly all concepts are represented by Roman or Greek letters. Each represents an important concept, and, if you do not keep up with that "vocabulary," soon you will not be able to translate any longer, leading you to fall behind. Do not lose sight of the fact that learning statistics also is **like learning other subjects** (psychology, biology, history etc.), because there are a variety of terms and practical details you that will need to *memorize*. Statistical analyses are valuable practical tools, but they are based on some rather **weird concepts**, making learning statistics different from any other subject. Approaching the subject with an open mind, reconsidering your assumptions and past learning strategies will take you much further. Finally, I am quite aware that many of you may have **high anxiety** about this course or learning statistics, but I want to assure you that I am here to help in any way I can. I firmly believe that each one of you are not only capable of learning and doing well in this subject, but I know from many years of experience that even those who start out the most anxious about the course wind up doing very well and many are surprised to find they have a real knack and affinity for the topic. **Please don't be afraid to ask for help!**

Disabilities

I am happy to make any necessary arrangements with students who have a disability and are in need of academic accommodations. If you have not done so already, please contact the Disability Resource Center, 116 Smith Memorial Student Union, <https://www.pdx.edu/disability-resource-center/>, Email: drc@pdx.edu, for assistance and any testing arrangements. I would appreciate it if you would check with me as soon as possible to discuss any needed accommodations and to make sure that I have received a faculty notification letter. If any aspects of instruction or course design result in barriers to your inclusion or learning, please let me know.

Diversity, Equity, and Inclusion

Portland State University's Department of Psychology is fully committed to diversity, equity, and inclusion. Our department fosters a vibrant intellectual environment in which human diversity is recognized and valued in all its forms. We support

learning, research, and outreach activities that promote the values of diversity, equity, and inclusion. My goal is to create a learning environment that is accessible, equitable, inclusive, and welcoming. I am committed to fostering mutual respect and full participation for all students. If there are any incidents or conditions that you feel do not conform to these goals, please discuss them with me.

Sexual Harassment, Sexual Violence, and Discrimination

As an instructor, one of my responsibilities is to help create a safe learning environment for my students and for the campus as a whole. Please be aware that as a faculty member, I have the responsibility to report any instances of sexual harassment, sexual violence and/or other forms of prohibited discrimination. If you would rather share information about sexual harassment, sexual violence or discrimination to a confidential employee who does not have this reporting responsibility, you can find a list of those individuals or contact a confidential advocate at the Women's Resource Center <https://www.pdx.edu/womens-resource-center/contact/contact> and 503-725-5672. For more information about Title IX please see <https://www.pdx.edu/diversity/title-ix>.

Course Schedule

There will also be a few supplemental readings, which are listed below (*) and are available for download from the course website (secured by password). In addition to these topics, a number of other practical topics will be covered in class along the way, including issues related to using SPSS and R, data entry, data cleaning, data management, research design issues, and interpreting printouts.

All readings are from Cohen, Cohen, West, & Aiken (2003), except supplemental readings as indicated by *. When a main section number, such as 6.3, is listed as optional reading, this implies that subsections under the heading are also optional. For example, Sections 6.3.1 and 6.3.2 are also optional if Section 6.3 is listed. All boxed material in the Cohen et al. text is optional.

General Topic	Date	Reading Assignments	Optional Sections/Pages
Correlation & Simple Regression Review	1/9	<ul style="list-style-type: none"> Chapter 1. Introduction (sections 1.1.1-1.2.2 only) Chapter 2 Bivariate Correlation and Regression Chapter 4 Data visualization, exploration, and assumptions (sections 4.1-4.2 only) 	<p>none</p> <p>2.2.2; pp. 45-47, p. 49; 2.9; 2.10.5</p> <p>None</p>
Lab 1 Review correlation and simple regression	1/10		
Multiple regression I: Partial relationships	1/11, 1/16	<ul style="list-style-type: none"> *Darlington (1991) Chapter 1 Basic concepts (Statistical Control: pp. 1-6) Chapter 3 Multiple Regression/Correlation with Two or More Independent Variables *[optional reading] Pedhazur, <i>Appendix A: Matrix Algebra: An Introduction</i> *[optional reading] Pedhazur, Chapter 6: General Method of Matrix Regression Analysis: Matrix Operations 	<p>none</p> <p>3.3.3, 3.5.4-3.5.6, 3.6.4, 3.7.3, 3.8.3-3.8.4</p> <p>all pages</p> <p>all pages</p>
Lab 2 Multiple regression with continuous predictors	1/17		
Multiple regression II: Dummy coding & ANCOVA	1/18, 1/23	<ul style="list-style-type: none"> Chapter 8 Categorical or Nominal Independent Variables *Tabachnick & Fidell (2013) Chapter 6 Analysis of Covariance (pp.197-244 only) 	<p>p. 310, 314-315, 8.2.6, 8.3-8.4, 8.5.1-8.5.5, 8.6, 8.7.4</p> <p>6.5.4.2</p>
Lab 3 Multiple regression with categorical predictors and ANCOVA	1/24		
Multiple regression III: assumptions, multicollinearity, diagnostics	1/25, 1/30	<ul style="list-style-type: none"> Chapter 4 Data Visualization, Exploration, and Assumption Checking: Diagnosing and Solving Regression Problems I (sections 4.3-4.6 only) Chapter 10 Outliers and Multicollinearity: Diagnosing and Solving Regression Problems II 	<p>none</p> <p>none</p>
Lab 4 Diagnostics	1/31		
Multiple regression IV Interactions & curvilinear effects Homework 1 Due Tuesday, Feb 6	2/1, 2/6	<ul style="list-style-type: none"> Chapter 6 Quantitative Scales, Curvilinear Relationships, and Transformations Chapter 7 Interactions Among Continuous Variables *[optional reading] Newsom, Prigerson, Schulz, & Reynolds (2003). Investigating Moderator Hypotheses in Aging Research: Statistical, Methodological, and Conceptual Difficulties with Comparing Separate Regressions, <i>International Journal of Aging and Human Development</i>, 57, 119-150. [optional reading] Chapter 9 Interactions with Categorical Variables 	<p>6.2.6-6.2.8, 6.3, 6.4.9-6.4.12</p> <p>7.8-7.10</p> <p>all pages</p> <p>all pages</p>
Lab 5 Interactions and curvilinear effects	2/7		

Multiple regression V: Correlation, causation, & mediation	2/8,2/13	<ul style="list-style-type: none"> • Chapter 12 Multiple Regression/Correlation and Causal Models (sections 12.1-12.2 only) • Chapter 15 Longitudinal Regression Methods (sections 15.1 and 15.2 only) • *Frazier, P. A., Tix, A. P. & Barron, K. E. (2004). <i>Testing moderator and mediator effects in counseling psychology research. Journal of Counseling Psychology</i>, 51, 115-134. • * MacKinnon, D. P., Fairchild, A. J., & Fritz, M. S. (2007). Mediation analysis. <i>Annual Review of Psychology</i>, 58, 593-614. 	<p>none</p> <p>none</p> <p>none</p> <p>none</p>
Lab 6 Mediation	2/14		
Logistic regression Midterm Exam Tuesday, Feb 20	2/15,2/20	• Chapter 13 Alternative Regression Models: Logistic, Poisson Regression, and the Generalized Linear Model (sections 13.1-13.2.16 only)	none
Lab 7 Chi-square and simple logistic regression	2/21		
Multiple Logistic regression and ordinal regression models	2/22,2/27	<ul style="list-style-type: none"> • Chapter 13 Alternative Regression Models: Logistic, Poisson Regression, and the Generalized Linear Model (sections 13.2.17-13.2.19 only) • Chapter 13 Alternative Regression Models: Logistic, Poisson Regression, and the Generalized Linear Model (sections 13.3-13.6 only) <i>[optional]</i> Cox, S., West, S.G., & Aiken, L.S. (2009). The Analysis of Count Data: A Gentle Introduction to Poisson Regression and Its Alternatives. <i>Journal of Personality Assessment</i>, 91, 121–136. 	<p>none</p> <p>none</p> <p>all</p>
Lab 8 Multiple logistic regression and ordinal regression	2/28		
Multivariate statistics Homework 2 Due Tuesday, Mar 5	2/29,3/5	•*Chapter 4 Pituch & Stevens (2016) Two-Group Multivariate Analysis of Variance (pp. 142-161,170-174)	<p>none</p> <p>none</p>
Lab 9 MANOVA	3/6		
Multivariate statistics	3/7,3/12	<ul style="list-style-type: none"> •*Chapter 5 Pituch & Stevens (2016) K-Group MANOVA: A priori and post hoc procedures (pp. 175-198, 208-214) •*Chapter 3 Everitt (2005) Principal Components Analysis (pp. 41-49 only) 	pp. 161-169
Lab10 canceled	3/13		
Homework 3 Due Thursday, Mar 14	3/14		pp. 199-207
			pp. 50-64
Final Exam, Tues., March 19 10:15-12:05			