

Applied Correlation and Regression Analysis

Psychology 367, Spring 2006

TTh 10:05-11:20, 319 Soc/Psych; W 1:15-4:05, 229 Social Sciences

Course Web site: <http://www.duke.edu/~rhoyle/teaching/psy367/>

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Readings

Cohen, J., Cohen, P., West, S. G., & Aiken, L. S. (2003). *Applied multiple regression/correlation analysis for the behavioral sciences* (3rd ed). Mahwah, NJ: Erlbaum.

Primary Goals of the Course

- to present computational details of various applications of correlation analysis to research questions in psychology and related disciplines;
- to present multiple regression analysis as a general approach to research design and data analysis in psychology and related disciplines;
- to present computational details critical to an understanding of simple, multiple, and hierarchical multiple regression analysis;
- to establish the criteria associated with decisions to be made at each phase of hierarchical multiple regression analysis;
- to provide opportunities to interpret and critique results of correlation and multiple regression analysis from published examples and analyses completed as part of the course;
- to provide sufficient instruction in the use of statistical software to enable students to execute and interpret the output from typical correlation and regression analyses;
- to facilitate the application of correlation and multiple regression analysis to a set of data and the completion of a detailed report of the results.

Elements of the Course

Readings

The readings for the course come from a single textbook, a revised and updated edition of a classic that can be found among the reference books owned by many social and behavioral science researchers. We will cover all of the material in six of the 16 chapters and much of the information in two others. It is essential that you spend significant time reading in the textbook before each class meeting. Most of the time, reading through the assigned material once will not be sufficient. Read it; read it again; take notes on it; discuss it with fellow class members; prepare questions about it to raise in class or lab meeting. In short, to succeed in this course you must commit yourself to significant preparation time for each class meeting.

Lab Meetings

Lab meetings are scheduled for a two-hour block each Wednesday afternoon. Attendance at lab meetings is mandatory. (Three or four unexcused absences from lab meetings will result in a reduction of one letter grade for the course. Five or more unexcused absences will result in an F for the course.) The purpose of lab meetings is fourfold: (1) to provide opportunities for deeper exploration of material covered in regular class meetings; (2) to provide training in the use of SAS for correlation and regression analyses; (3) to prepare for examinations through discussion of homework assignments; (4) for administration of exams. Lab meetings will be convened by the teaching assistants.

Homework

During the semester, you will complete eight homework assignments. Conscientious completion of the homework assignments is essential for mastery of the course material. As a rule, the homework assignments will reference material covered in the previous two class meetings. You will be expected to have completed the homework assignment by the beginning of the next lab meeting. Bring a photocopy of each completed homework assignment to submit to one of the teaching assistants, who, for accountability purposes, will verify that you completed the assignment. The teaching assistants will devote time during lab meetings to answering questions and addressing issues associated with the homework assignments. The grade reflecting the degree to which you completed the homework assignments will count 5% toward your grade for the course.

Exams

You will complete two written examinations during the course; the first exam (February 15), which covers Chapters 1, 2, and 3, will contribute 20%, and the second exam (March 29), on Chapters 5, 6, and 8, will contribute 25% toward your grade for the course. The exams will include multiple choice and short answer items as well as a section requiring you to interpret or manipulate information from computer output.

Presentation

You will give an 8-10 minute presentation in which you describe and evaluate a published application of multiple regression analysis. You are to choose an article published since 2000 in a major journal in your field of interest. The article you choose to present must be approved by the course instructor or a teaching assistant. In the presentation, you are to do the following:

1. State the primary research question.
2. Describe the data (e.g., N , missing data problems, measures, distributions).
3. Describe how multiple regression analysis was used to address the primary research question.
4. Critique the presentation of the results (e.g., tables, figures, details about the analyses).
5. State whether, in your opinion, multiple regression analysis was appropriately chosen and why. Note any alternative analyses not described in the article that might shed additional light on the primary research question.

You will present on either April 11 or April 13; your grade on the presentation will contribute 10% toward your grade for the course.

Research Report

The primary product of the course will be a written report of a multiple regression analysis you conduct on data of your choosing. Reports are to include the following (additional details will be provided in a handout):

1. a brief statement of the research question and hypotheses,
2. a detailed Method section,
3. a detailed Results section,
4. a short Conclusion section.

About one-third of the way into the course you will be asked to pinpoint a data set that you will analyze and write up for the course. Near the midpoint of the course you will be asked to prepare a document in which you specify the names and characteristics of the variables your analysis will include and the strategy you will use in applying multiple regression analysis to your data. About two-thirds of the way into the course you will be asked to meet outside of class with another member of the class to discuss your data and plan of analysis and to exchange feedback on your projects. Two weeks before the write-ups are due, Tuesday, April 18, you will provide a copy of a draft to two members of the class, and you will receive copies of two drafts from other class members. You will provide written reviews (details will be provided in a handout) for the authors of the two drafts you receive (and copies for me); you will receive two reviews of your draft. The reviews, which will be graded and contribute 5% toward your grade for the course, are due one week later, Tuesday, April 25, one week before the report is due. The final draft of the research report is due before noon on Tuesday, May 2. The research report will count 35% toward your grade for the course.

Course Grade

To summarize, course grades will be based on the average percentage of points obtained from six sources, weighted as follows:

Exam 1: 20%
Exam 2: 25%
Homework: 5%
Presentation: 10%
Reviews: 5%
Research report: 35%

Grades will be distributed according to the following scale: *

A: 89.5%-100%
B: 79.5%-89.4%
C: 69.5%-79.4%
F: < 69.5%

* This grade distribution assumes no more than two unexcused absences from lab meetings.

Course Outline

Thu, Jan 12 introduction and overview

Unit 1

Tue, Jan 17 chapter 1: overview of correlation/regression
 Thu, Jan 19 sections 2.1-2.3: bivariate correlation
 Tue, Jan 24 sections 2.4-2.7: simple regression
 Thu, Jan 26 section 2.8: tests for significance of r and B
 Tue, Jan 31 sections 2.9-2.10: precision and power in simple regression
 Thu, Feb 2 sections 3.1-3.4: multiple regression—two predictors
 Tue, Feb 7 section 3.5: multiple regression— k predictors
 Thu, Feb 9 section 3.6: tests of significance in multiple regression
 Tue, Feb 14 section 3.7: precision and power in multiple regression
 Thu, Feb 16 section 3.8: forecasting

Unit 2

Tue, Feb 21 section 5.4: introduction to hierarchical analysis
 Thu, Feb 23 section 5.5 tests of significance for sets
 Tue, Feb 28 section 5.6: power analysis for sets
 Thu, Mar 2 section 5.7: strategy and inference in multiple regression
 Tue, Mar 7 sections 6.1-6.3: polynomial regression
 Thu, Mar 9 section 6.4: nonlinear transformations
 Tue, Mar 21 sections 8.1-8.2: dummy variable coding
 Thu, Mar 23 sections 8.3-8.5: effects and contrast coding
 Tue, Mar 28 section 8.7: coding in the presence of continuous predictors
 Thu, Mar 30 review of chapters 5, 6, and 8

Unit 3

Tue, Apr 4 supplemental reading; handling missing data
 Thu, Apr 6 sections 7.1-7.2, 9.1-9.3: interaction effects in multiple regression
 Tue, Apr 11 **round 1 of presentations**
 Thu, Apr 13 **round 2 of presentations**
 Tue, Apr 18 sections 7.3-7.7, 7.10-7.11: interpreting interactions;
 rough draft of research report due
 Tue, Apr 25 **reviews of draft research reports due by noon**
 Tue, May 2 **research reports due by noon**

Lab Schedule

Jan 11 no lab meeting.

Unit 1

Jan 18 **Lab 1:** bivariate correlation and simple regression; **Homework #1 due**

Jan 25 **Lab 2:** significance tests of r and B ; **Homework #2 due**

Feb 1 **Lab 3:** multiple regression

Feb 8 **Lab 4:** significance tests in multiple regression; **Homework #3/4 due**

Feb 15 **Lab 5: Exam 1** (Chapters 1, 2, and 3)

Unit 2

Feb 22 **Lab 6:** review of Exam 1; hierarchical multiple regression

Mar 1 **Lab 7:** sets; **Homework #5 due**

Mar 8 **Lab 8:** polynomial contrasts in multiple regression

Mar 22 **Lab 9:** dummy coding in multiple regression; **Homework #6 due**

Mar 29 **Lab 10: Exam 2** (Chapters 5, 6, and 8)

Unit 3

Apr 5 **Lab 11:** review of Exam 2; graphical presentation of regression results

Apr 12 **Lab 12:** handling missing data; **Homework #7 due**

Apr 19 **Lab 13:** tests of interaction in multiple regression; **Homework #8 due**
