Course Syllabus
USP 656 Advanced Data Analysis: Multilevel Regression
Winter 2011, Thurs 1:00-3:50

Instructor
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Text

Recommended Text

Optional (not at the PSU bookstore)

Overview
This course is intended to introduce students to multilevel regression techniques (also known as hierarchical linear models or random coefficient models) and will cover the fundamental concepts and application of the techniques. By the end of the course, students should be able to apply, write about, critique applications of, and read methodological articles about multilevel regression analysis.

Prerequisites
This course assumes that students have taken a graduate statistics course that covers simple and multiple regression.

Readings and Commentaries
There will be two to three readings assigned each week taken from the text and other articles. Readings will typically include at least one didactic article and at least one example article. Students will be required to turn in a one-page commentary on the readings for that week on each Thurs by 10 am. The commentaries should be an informal set of questions, comments, or summary information (summarize only if you cannot think of anything else to say) about the articles. The purpose of the commentaries are to make sure the class is prepared for discussion and to help the instructor identify discussion topics and sources of confusion in the readings.

Homeworks
There will be three homework assignments consisting of data analysis and reporting of multilevel regression problems using SPSS Mixed or the student version of the multilevel package, HLM 6 (Raudenbush, Bryk, Cheong, Congdon, & du Toit, 2004; Scientific Software International). The student version of HLM can be downloaded from the following internet site: http://www.ssicentral.com/hlm/student.html. It is unlikely that you will need to refer to the manual, but much of the information is available under the help function of the package.

Homework due dates are: Thurs 2/3, Thurs 2/24, Thurs 3/14
Grades
Grades are based on an average of the three homework assignments, completion of reading commentaries, and satisfactory participation in class.

Other Resources
There are several useful electronic links on the class website. Of particular note is a website devoted to multilevel analysis with links to software and other useful information is at http://www.cmm.bristol.ac.uk/links/index.shtml. I also suggestion you subscribe to the multilevel email discussion list, see http://www.nursing.teaching.man.ac.uk/staff/mcampbell/multilevel.html or https://www.jiscmail.ac.uk/cgi-bin/webadmin?A0=multilevel. A great deal can be learned from seeing questions and answers from other researchers wrestling with multilevel analysis issues.

Disabilities
If you have a disability and are in need of academic accommodations, please notify me immediately to arrange needed supports.

Comments on Learning Statistics
Statistics of any kind is very difficult topic to learn. In general, my emphasis is on concepts more than math, practical knowledge of statistics, or software. If you focus on getting the concepts, facts, practical details, and interpreting software output will all fall into place. However, keeping in mind the following points learning statistics, should greatly facilitate your learning in this course.

- **It's not like math, it is like math.** Statistics is considerably different from mathematics. In fact, the math required for this course is no more complex than what is needed to balance a check book. 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. You may need to read and apply the material several times. **So, don't wait until the last minute!**

- **It's like a foreign language.** Statistics does, however, use a lot of symbols like Greek letters, and for this reason it is a bit like learning a foreign language. Think of the symbols as a foreign language vocabulary that has to be learned in order to understand the sentences.

- **It's like other courses.** In this course, there will also be a great deal of practical, conceptual, and other substantive information that will have to be learned; so, you will also have to read the text material, study concepts, and do some memorization like other substantive courses.

- **It's progressive.** Everything builds on everything else. Don't let any misunderstandings slip through the cracks, or it will snowball on you.

- **It's weird.** Statistics is a unique and unusual topic involving some very abstract and weird ideas. The peculiar nature of the subject makes the material very difficult to learn and retain. Despite its seemingly abstract nature, statistics are extremely useful tools that will make you a highly skilled and valued researcher.
Course Readings
USP 656 Advanced Statistics:  Multilevel Regression
Winter 2011

1/13 Regression Review & Overview of Multilevel Regression


• Hox, Chapter 1.

• Kreft & de Leeuw, pp.  1-8

1/20 Random vs. Fixed Coefficients, Random Intercept Models, Intraclass Correlation Coefficient
• Kreft & de Leeuw, pp.  10-12.

• Raudenbush & Bryk, pp. 23-27.

• Snijders & Bosker, Chapter 4, pp. 38-45


• Snijders & Bosker, Chapter 3, pp. 16-26

• Snijders & Bosker, Chapter 4, pp.  45-66


1/27 Full Multilevel Regression Models, Part I:  Varying Slopes, Hypothesis Tests, & Explained Variance
• Hox, Chapter 2, pp.  11-23.

• Hox, Chapter 3, pp. 45-53.


2/3 Homework 1 Due

2/3 Full Multilevel Regression Models, Part II: Model building, Centering, & Cross-level Interactions
• Hox, Chapter 4.


2/10 Estimation Methods, Assumptions, & Diagnostics
   • Hox, Chapter 3, pp. 40-45. (Estimation)
   • Raudenbush & Bryk pp. 51-56. (Estimation)
   • Hox, Chapter 2, pp. 23-32. (Assumptions & Diagnostics)
   • Raudenbush & Bryk, pp. 266-280 (Assumptions & Diagnostics)

2/17 Growth Curve Models, Part I: Linear Growth
   • Singer & Willett, Chapter 2 & 3.
   • Hox, Chapter 5, pp. 79-99

2/24 Homework 2 Due

2/24 Growth Curve Models, Part II: Nonlinear Growth
   • Hox, Chapter 5, pp. 99-111
   • Raudenbush & Bryk, pp. 169-185.

3/3 Sample Size Issues & Power
   • Hox, Chapter 10

3/10 Binary and Noncontinuous Outcomes
   • Hox, Chapters 6 & 7.

3/14 (Monday) Homework 3 Due 5 PM

Book Sources
