Course Syllabus
USP 655 Advanced Data Analysis: Structural Equation Modeling
Winter 2015, Thurs 1:00-3:50 pm

Instructor
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Text

Optional Text

Also Recommended (not in bookstore)


Prerequisites
I assume that students have taken a graduate statistics course that covers simple and multiple regression analysis.

Overview
This course is intended to introduce students to structural equation modeling. Structural equation modeling (sometimes referred to as covariance structural analysis) is a regression-based technique that incorporates elements of path analysis and confirmatory factor analysis. The general goal is to provide a thorough background in the conceptual aspects, statistical underpinnings, and application of this method rather than a tutorial on a specific software package. At the end of the course, I expect students to have a solid, conceptual foundation of structural modeling issues, be able to analyze data using any SEM package, critically evaluate professional articles, and write-up SEM results.

Readings and Commentaries
There will be several readings assigned each week taken from the text and supplemental sources. Supplemental readings will be available for download from the class website. The readings will usually include an example article that applies SEM Please read the material prior to class and be prepared for discussion. 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 is 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 which will primarily consist of data analysis and write-ups of SEM problems using the demo version of the statistical program, Mplus (Muthen & Muthen,1998-2012), and the lavaan package in R. Mplus and lavaan have very simple syntax, allowing us to focus more on statistical and applied issues rather than debugging programs or other software headaches. I will also provide some examples using Amos in class and discuss other software briefly. Some data preparation and descriptive analysis using SPSS or R may be required (let me know if this will be an inconvenience for some reason). The
demo version of Mplus Version 7.3 can be downloaded from the following internet site: http://www.statmodel.com/demo.shtml. The demo version has no limitations on analysis types but allows no more than six dependent variables and two independent variables. R software is available at http://www.r-project.org/. Although you should not need it, the Mplus users guide can also be downloaded from the Mplus website (http://www.statmodel.com). The lavaan package is installed by running install.packages("lavaan", dependencies=TRUE) the command line. More information is available at http://lavaan.ugent.be/.

Homework due dates are: 1/29/15, 2/19/15, 3/17/15 (4 PM Tue finals week). Late assignments are not accepted unless there are extenuating circumstances, such as illness or family emergency. Please let me know if there are extenuating circumstances as early as possible.

Grades
Grades are based on an average of the three homework assignments, completion of weekly commentaries, and satisfactory class attendance and participation.

Other Resources
There are several internet sites devoted to SEM that may be of use. Dave Kenny has a great website with introductory material on most SEM topics at http://davidakenny.net/cm/causalm.htm (including a free pdf copy of his book, Correlation and Causation). Ed Rigdon has an excellent site that serves as a gateway to most of the SEM sites on the web at http://www.gsu.edu/~mkteer/. There is a SEM discussion list called SEMNET which you can subscribe to (I think it would be a great idea if everyone would subscribe during this term) through the following site http://www.gsu.edu/~mkteer/semnet.html. The Mplus website has lots of example programs and an Mplus discussion section http://www.statmodel.com/. Finally, I have compiled a list of hundreds of articles and books on SEM organized by topic at my website http://www.upa.pdx.edu/IOA/newsom/.

Disabilities
If you have a disability and are in need of academic accommodations, please notify me immediately to arrange needed supports.
Course Readings
USP 655 Advanced Statistics: Structural Equation Modeling
Winter 2015


1/15 Overview and History of SEM and Matrix Algebra
Maruyama, Chapter 2, “History and logic of structural equation modeling”


1/22 Path Analysis
Maruyama, Chapter 3, “The basics: Path analysis and partitioning of variance.”


Maruyama, Chapter 5, “Effects of random and nonrandom error on path models.”


1/29 Confirmatory Factor Analysis I: Theory, Model Fitting Concepts, and Software
Maruyama, Chapter 7, “Introducing the logic of factor analysis and multiple indicators to path modeling”


2/5 Confirmatory Factor Analysis II: Model Comparisons and Fit indices
Maruyama, Chapter 10, “Logic of alternative models and significance tests”


2/12 Full Structural Models I: Practical Issues, Model Modifications, & Missing Data


2/19 Full Structural Models II: Nonnormality & Categorical Variables


2/26 Multigroup Structural Models and Second-Order Factor Models
Maruyama, Chapter 11, "Variations on the basic latent variable structural equation model".


Example article

3/5 Issues of Causality and Longitudinal Modeling

Maruyama, Chapter 6, "Recursive and longitudinal models: Where causality goes in more than one direction and where data are collected over time" (pp. 99-108 only)


3/12 Growth Curve Models


Example article:

Finals Week: Reporting Results and Limitations of SEM (readings only, no class meeting, no exam)


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