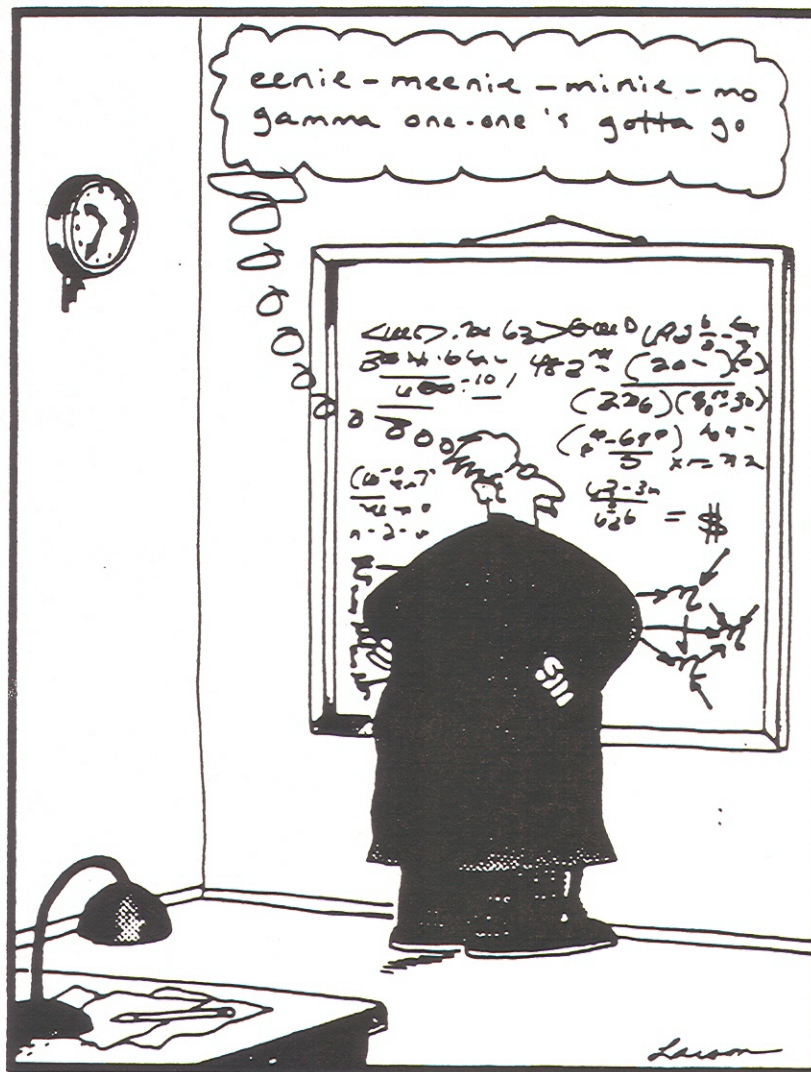


Annenberg School for Communication
University of Southern California

Syllabus for COMM 556:
Structural Equation Modeling
Fall 2004; Mondays, 3:30 - 6:30; ANSC 225

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Einstein discovers that time is actually money.

Overview

COMM 556 is an advanced graduate seminar in structural equation modeling. For the most part this means that the focus of the course is on the analysis of multiple equation systems. LISREL (LInear Structural RELations) will be taught as a method for analyzing data for structural equation models, though students are free to use EQS, AMOS, or any other appropriate data analytic system for lab work. The course begins with a brief overview of ordinary least squares regression in the context of LISREL. Next, we will examine recursive systems and the problems associated with multiple equation analysis, primarily decomposition of variance and the fundamental problem of identification. We will then study nonrecursive systems and examine models that contain feedback loops. The next major topic centers on measurement models and confirmatory factor analysis. We will then focus on combining measurement models with specified theoretical relations. Additional topics include analysis with nominal and ordinal data, panel designs, and multilevel data.

Prerequisites

You should have taken a good course in statistics with some concentration on regression and some familiarity with matrix algebra. Or, we should talk and reach agreement that you have sufficient background to cover the material in the course.

Evaluation

Evaluation in this class is based on a research paper that includes a SEM and a LISREL/PRELIS data analysis. You should write that paper in a theoretical area that interests you. The paper should be of journal article or convention presentation quality. It should contain four sections: Theory, Method, Results, and Discussion. In the first section you should develop the theory on the basis of both current theorizing and the latest, relevant research literature. The theory should then be translated into an appropriate LISREL model that includes the research hypotheses for the study. The Method section should include four subsections: Participants (sample), Measurements, Procedures, and Analysis. These latter two subsections should include descriptions of measurement models, if any, and a description of the LISREL procedures used to analyze the data. The Results section should contain three sections: Preliminary analysis, Primary analysis, and Post Hoc analyses. The Preliminary analysis subsection should report any preprocessing of the data and any measurement models analyzed apart from an integrated model. The Primary Analyses subsection should report the tests of the hypotheses, the significance of the coefficients, all goodness-of fit tests, etc., and indicate which of the hypotheses has been supported and how well the model as a whole fits the observed data. The Post Hoc section reports any subsequent revisions to the model and any further tests on a holdout sample or new data. The final section of the paper is the Discussion section. It should include a summary of the main findings of the research, a critique of the strengths and weaknesses of the research, including modifications to the model suggested by the analysis, and should conclude with suggestions for future research.

The paper should be prepared according to the specifications of the journal to which you would like to submit the finished manuscript, such as Journal of Communication or Academy of Management Journal. Most social science journals use the Publication Manual of the American Psychological Association, 5th ed., as their style manual, often with some customization. If you cannot collect original data during the semester, you may use secondary data in your paper, that is, data you have already collected or data collected by someone else. A three-page paper proposal is due on October 11. Class presentations of the paper are due on December 6. The final paper is due at the time of Final Exams, December 13. You should submit it via email as an attached Word file (or equivalent format); a paper version is not required. You are welcome to submit early drafts for comments and feedback at any time during the semester.

Homework and Labs

Regular homework and/or lab exercises will be given out in class. These will not be graded but must be completed successfully prior to the end of the class.

Required Texts

- Bollen, K. A. (1989). *Structural equations with latent variables*. New York: John Wiley.
- Byrne, B. M. (1998). *Structural equation modeling with LISREL, PRELIS, and SIMPLIS*. Mahwah, NJ: Lawrence Erlbaum Associates.
- Joreskog, K.G., & Sorbom, D. (1996). *LISREL 8: User's Reference Guide*. Chicago, IL: Scientific Software International.
- Joreskog, K.G., & Sorbom, D. (1996). *PRELIS 2: User's Reference Guide*. Chicago, IL: Scientific Software International.
- du Toit, S., du Toit, M., & Hawkins, D. (2001). *Interactive LISREL: User's Guide*. Chicago, IL: Scientific Software International.

Recommended Texts

- Joreskog, K.G., & Sorbom, D. (1993). *LISREL 8: Structural Equation Modeling with the SIMPLIS Command Language..* Chicago, IL: Scientific Software International.
- Joreskog, K.G., Sorobom, D., du Toit, S., & du Toit, M., (1999). *LISREL 8: New Statistical Features*. Chicago, IL: Scientific Software International

Class Schedule and Activities

August 23: Introduction

Get acquainted
Review statistical backgrounds
Review syllabus
Review books, manuals, and LISREL programs
Hand out "Algebra of Expectations"

Discussion topics:
History of SEM
Review of Regression

Assignments for August 30:
Read Bollen, Cps. 1, 2
Study Bollen, Appendix A
Read L8URG, Cp. 1
Study "Algebra of Expectations"
Read Byrne, Cp. 1

August 30: Overview of LISREL

Discussion Topics
Overview of SEM
Types of models
Hand out "Types of Models"
Review of matrix algebra I, Bollen Appendix A
Writing LISREL equations
Handout "Writing LISREL equations"
Review L8URG, Pp. 5-8
Notation conventions
Hayduk handout
Review Bollen, Tables 2.1, 2.2, & 2.6
Discuss L8URG, Pp. 8-16, LISREL submodels and parameters

Assignments for Sept. 13:
Read Bollen, Cp. 3

September 6: Labor Day

September 13: Causality and Causal Models

Discussion topics:

- Discuss L8URG, Pp 8-16, LISREL submodels and parameters
- Discuss paper topics
- Review of Matrix Algebra II
- Discuss Bollen, Cp. 3
 - What are the components of causality?
 - What does it mean to isolate effects?

Assignments for Sept. 20:

- Read Bollen, Cp. 4 (pp. 80-88)
- Read L8URG, Cps. 2, 4
- Lab 1: Matrix Algebra (Due September 20)

September 20: Decomposition and Reproduction of Variance

Discussion Topics:

- Decomposition & Reproduction of Variance
- Instrumental variables
- Recursive LISREL models
- Running LISREL models

LISREL demonstrations

- Examples: EX41.LS8, EX42.LS8, EX44.LS8.

Assignment for Sept. 27:

- Read Bollen, Cp. 4 (pp. 88-104)
- Read Interactive LISREL User's Guide. Cps. 1-3
- Lab 2: Running a single equation (regression) model (Due September 27)

September 27: Reduced Form Equations and Identification I

Discussion topics:

- Identification I lecture
- Reduced form equations
- Typical simple LISREL run

LISREL demonstrations

- Ex44.LS8, EX45.LS8 & add MI

Assignments for Oct. 4:

- Read Bollen, Cp. 4 (pp. 104-131)

Work on paper proposal
Lab 3: Solve for gamma 12 (Due October 4)

October 4: Identification II & Estimation

Discussion topics:

Review lab exercises:

Solve for gamma 12

Identification status of $x \rightarrow y \rightarrow y$ with correlated zetas

Identification II:

What to do if underidentified?

Bollen Table 4.1

Reduced form equations

Instrumental variables

Nonrecursive models

LISREL Demonstrations

EX44.LS8 changes + (Nonrecursive model)

EX45a.LS8 + add MI; EX45b.LS8

Discuss Research Proposal Expectations

Assignments for Oct. 11:

Read Schmitz and Fulk

Prepare Paper Proposal

Lab 4: Solve for correlated zetas and nonrecursive models (Due October 11)

October 11: Hypothesis Testing

Discuss Lab 4

Lecture: The Logic of Hypothesis Testing

Modification Indices

Handouts

LISREL Demo: EX53a,b,c.LS8

Describe paper proposals

Discuss Schmitz & Fulk

Paper Proposals Due

Assignments for Oct. 18:

Read Bollen, Cp. 5, 6

Read Fink & Monge, 1985

Read L8URG, Cp. 3

Lab 5: Hypothesis testing: Run Schmitz & Fulk Models and critique (Due October 18)

October 18: Measurement Models I

Return paper proposals
Discuss Lab 5: Hypothesis testing: Schmitz & Fulk LISREL runs
Lecture: Essentials of measurement models
Discuss Fink and Monge

LISREL demos: EX31a,b,c; EX32a,b

Assignments for Oct. 25:

Read Bollen, Cp. 7
Read Monge, et al, 1982
Read L8URG, Cp. 6.1-6.3
Read Byrne, Cp. 3

October 25: Measurement Models II & Confirmatory Factor Analysis

Lecture: Identification in Measurement Models
Discuss Monge, et al., 1982

Assignments for November 1:

Read Bollen, Cp. 8, pp. 318-355
Read L8URG, Cp. 5
Read Interactive LISREL Manual
Read Byrne, Cp. 7
Lab 6: Measurement models (Due November 1)

November 1: The General Model & Interactive LISREL

Discuss Interactive LISREL

LISREL demos:

Ex 5.5 Peer Influences on Ambition
Ex 5.6 Performance and satisfaction

Assignments for Nov. 8:

Continue to read Interactive LISREL manual
Read Bollen, Cp. 8, pp. 355-394
Read L8URG, Cp. 9
Read Finkelstein & Boyd
Recommended, Byrne, Cp. 9

November 8: Multiple Group Analysis

Discuss Finkelstein & Boyd
Discuss Bollen, Cp. 8, pp. 355-394

LISREL Demos:

Ex 9.1, 9.3, 9.4
Ex 5.6 Performance and satisfaction

Assignment for Nov. 15:

Read PRELIS2 URG
Read Byrne, Cp. 2
Do Lab 7: Rerun Monge et al data to test differences and similarities (Due
November 18)

November 15: Nominal and Ordinal data with PRELIS

Discuss Lab 7: Monge et al test of equality runs
Review Computer Exs. PRELIS. 107, 115
Do Computer Ex. 7.1

Assignments for Nov. 28:

Read Byrne, Cp. 12
L8URG, Cp. 6.4 & 6.5
Read L8NSF, Cp. 2
Read Hom, et al 1992
Lab 8: Do Computer Exs. P. 107, 115 (Due November 22)

November 22: Panel Designs and Longitudinal Models

Discuss Lab 8
Discuss Panel designs
Discuss Hom, et al, 1992

LISREL Demos: Ex 6.4 & 6.5

Assignments for Dec. 5:

Prepare Class presentations and Paper
Lab 9: Panel Designs (Due December 29)

December 29: Work on Paper Day

Discuss papers with me or work independent
Discuss Lab 9 (optional)

December 6: Paper presentations

Paper presentations due

Assignment:
Prepare presentations and paper

December 13: Presentations

**Paper Presentations
Research papers due**

References

Fink, E. L., & Monge, P. R. (1985). An exploration of confirmatory factor analysis. In B. Dervin & M. J. Voight (Eds.), *Progress in Communication Sciences* (Vol. 6). (pp. 167-197). Norwood, NJ: Ablex.

Finklestein, S., & Boyd, B.

Monge, P. R., Bachman, S. G., Dillard, J. P., & Eisenberg, E. M. (1982). Communication competence in the workplace: Model testing and scale development. In M. Burgoon (Ed.), *Communication Yearbook 5* (pp. 505-528). New Brunswick, NJ: Transaction Books.

Schmitz, J., & Fulk, J. (1991). Organizational colleagues, media richness, and electronic mail: A test of the social influence model of technology use. *Communication Research*, 18, 487-523.

Hom et al.