

Structural Equation Modeling with LISREL

SOC 616:A1

Course Syllabus: Fall 2017

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Office Hours (Tory 4-21)
Wednesday 3:00-3:30
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Class:74253
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Sociology 616 is designed to provide students a working knowledge of structural equation modeling and the LISREL program. This program obtains estimates for the coefficients in structural equation models containing both measured and latent variables (indicators and concepts). It provides a χ^2 test of model fit and diagnostic information occasionally useful for improving initially ill-fitting models. It allows estimation of models containing researcher-specified coefficient values and constraints between coefficients. It can estimate models containing multiple groups, either with or without constraints between the groups. While means and intercepts can be incorporated to provide expected values for the latent/conceptual dependent variables, we will probably not be discussing these features in detail.

A working knowledge of basic statistics is assumed, and some familiarity with path analysis, factor analysis, and/or multiple regression is most helpful. *Class grades will be assigned entirely on the basis of my subjective evaluation of each participant's progress toward mastering the **thought processes** implicit in using the LISREL program. Each participant will be required to create a model for which sufficient data is available to allow model estimation. Each participant will also estimate their originally specified model, diagnose any problems with that model, and possibly create a new/revised model. Participants will write up a summary of the overall modeling attempts and the implications of the technical output obtained for the best/final model. This written summary is mandatory and a failing mark (not an incomplete) will be assigned if it is not submitted by the date the registrar would normally have scheduled a "final exam" for this class. This term, the **due date** is **2:00 PM Thursday December 14**. (Projects submitted late will be penalized 10% per day late.) Please provide **two** copies of the **written text and any figures**, but **one** copy of any relevant outputs (no copy of the raw data is required). One written copy and the outputs will be returned with comments, *if you provide a packet labelled with the appropriate return address*. Your working/marked-up copies of the LISREL syntax and output files (i.e. with marginal notes, highlighting, or whatever) are fine/acceptable. Auditors will be expected to participate to the same extent as other class members.*

The write-up of your project should include discussion of:

- 1) the data set employed
- 2) the academic context of your model (e.g. was it used by others?, a modification of a model used by others? your own theory?). Only a **very-brief** context statement is required and a few references *may* be required. If the model is “your own theory” no reference will be required.
- 3) difficulties in model specification (if relevant)
- 4) a model diagram (a carefully *hand-drawn diagram is acceptable*; **un-polished/rough diagram drafts** may be included to assist documenting and clarifying modeling difficulties/changes)
- 5) the most challenging and/or focal segments of the model
- 6) your initial/early modeling attempts and their consequences and diagnostics
- 7) your final model (estimation adequacy, fit, estimates, diagnostics, measurement, explained variance, selected interpretation, key features, overall consequences of the current estimates, remaining difficulties/challenges, and future possibilities). Models that fit, or that fail-to-fit, can both receive top marks if the modeling is conducted competently, assessed honestly, and reported clearly/appropriately, so beware making unreasonable/untenable/indefensible model modification to obtain a fitting model.
- 8) Imagine another researcher has a model/theory that uses the same indicators as your model, and fits about as well or poorly as your model, where that model: and has one latent variable your model does not have; has a few effects your model does not have; and does not have one effect your model currently reports as significant. Sketch a relevant model segment, and report on the research options open to a researcher confronting two such models.

It will assist your understanding and project write-up if, in addition to considering the details of your specific model output (as above), you consider the wider disciplinary issues raised by the published materials I will be providing. What are the bigger/wider issues you are confronting in your modeling, and how has your discipline responded to these issues? What might other researchers disagree about, criticize you for, or be criticized for, and what should you do with such disciplinary disagreements?

I will be discussing these features as we proceed, and you will probably find it most efficient to write up each feature as it is encountered during lectures, or during your model development or assessment.

Students usually complete specification of their model, and estimate it, about the middle of the term, or shortly thereafter. I usually review an entire LISREL output during the last lecture, to ensure relevant features are not skipped. Bringing your personal “final” output to that lecture will ensure you understand the relevant output segments. There is no required length of write-up, and formatting is up to you (both single and double spacing are acceptable, page numbers would be nice). Feel free to ask (at any time) about write-up in general, or how best to proceed with any unique modelling or write-up difficulties.

The required texts are:

L. Hayduk **Structural Equation Modeling with LISREL: Essentials and Advances**. Baltimore: Johns Hopkins University Press, 1987.

L. Hayduk **LISREL: Issues, Debates, and Strategies**. Baltimore: Johns Hopkins University Press, 1996.

Several additional materials will be distributed either via e-class or on paper, and discussed in class.

The following useful manual was previously available, but has now been replaced with LISREL reference material available made available on the internet by Scientific Software International – the supplier of LISREL.

K. Joreskog and D. Sorbom **LISREL-8 Users Reference Guide**. Scientific Software Inc., 1996.

<https://www.hightail.com/download/bXBhNU1JWIRsUitxV2NUQw>

(The LISREL 7, VI or V manuals are also helpful if you already own or can acquire one of these. The LISREL-IV or earlier manuals are too out of date to be helpful.)

This class will be conducted primarily in a lecture format but substantial class participation will be expected. It is also expected that all participants will have read the assigned materials **before** class, so that class discussions can be focused on confusing, incomplete, or additional topics.

If all the class members agree, I will attempt to video my lectures and make DVDs available for review purposes.

Exactly how LISREL will be made available will vary from student to student. Computing and network services has LISREL operational on a mainframe computer so that it is available to anyone with an appropriate access code (which I will obtain if necessary) but this is NOT efficient, and requires some file handling procedures you would have to master on your own with the assistance of computer centre staff. Most students do their work using PC's on which LISREL is available, such as on a computer in their research group. Others have used the free downloadable demonstration-version of LISREL (if their model is small enough – I believe this is currently limited to about 15 indicator variables. If you do not have access to a PC version of LISREL, please keep me apprised of any "lack of success" you might have in gaining access. Students usually need LISREL about the middle of the term, though it is advisable to arrange access to LISREL as soon as possible.

If you require assistance with running a LISREL program, or with other class material, feel free to email me (LHayduk@ualberta.ca), or call me at **780-492-2730**, or come to my office

(Tory 4-21) **whether it is office-hours OR not.** If you come to my office, **it will help if you bring your program commands (LISREL's syntax window) and covariance matrix on a stick so that I can help "find the bugs" by loading and running your program.**

Anyone encountering difficulty with the course content is encouraged to consult with me as soon as possible so that remedial steps can be taken.

Course Requirements, Grades, and Procedures

Grading

The final assignment will be graded and converted to a letter grade as indicated below.

Percentage	Letter Grade	Point Value
88-100	A+	4.0
84-87	A	4.0
80-83	A-	3.7
76-79	B+	3.3
72-75	B	3.0
68-71	B-	2.7
64-67	C+	2.3
60-63	C	2.0
56-59	C-	1.7
52-55	D+	1.3
50-51	D	1.0
0-49	Fail	0.0

Learning and Working Environment

The Faculty of Arts is committed to ensuring that all students, faculty and staff are able to work and study in an environment that is safe and free from discrimination and harassment. It does not tolerate behavior that undermines that environment. Anyone who feels that this policy is being violated is urged to:

- 1) Discuss the matter with the person whose behavior is causing concern; **OR**
- 2) If that discussion is unsatisfactory, or there is concern that direct discussion is inappropriate or threatening, discuss it with the Chair of the Department.

For additional advice or assistance regarding this policy you may contact the student ombudservice (<http://www.ombudservice.ualberta.ca/>). Information about the University of Alberta discrimination and harassment policy and procedures is listed in UAPPOL (University Policies and Procedures Online) at www.uappol.ualberta.ca.

Academic Honesty

“The University of Alberta is committed to the highest standards of academic integrity and honesty. Students are expected to be familiar with these standards regarding academic honesty and to uphold the policies of the University in this respect. Students are particularly urged to familiarize themselves with the provisions of the Code of Student Behaviour (online at <http://www.governance.ualberta.ca>) and avoid any behaviour that could potentially result in suspicions of cheating, plagiarism, misrepresentation of facts and/or participation in an offence. Academic dishonesty is a serious offence and can result in suspension or expulsion from the University.

Students are encouraged to consult the [Office of Student Judicial Affairs](#) website for useful resources about academic integrity, cheating and plagiarism.”

Outline Policy

“Policy about course outlines can be found in §23.4(2) of the University Calendar.”

Student Accessibility Services

If you have special needs that could affect your performance in this class, please let me know during the first week of the term so that appropriate arrangements can be made. If you are not already registered with Student Accessibility Services, contact their office immediately (1-800 SUB; email ssdsrec@ualberta.ca; phone 780-492-3381; web www.ssds.ualberta.ca).

Recording of Lectures

“Audio or video recording of lectures, labs, seminars or any other teaching environment by students is allowed only with the prior written consent of the instructor or as a part of an approved accommodation plan. Recorded material is to be used solely for personal study, and is not to be used or distributed for any other purpose without prior written consent from the content author(s).”

Attendance, Absences, and Missed Grades

Regular attendance is essential for optimal performance in this course. Absence should be considered only for reasons such as incapacitating illness, severe domestic affliction, or religious convictions.

I wish you a pleasant and instructive term.

Les Hayduk