

**The University of Calgary
Faculty of Social Sciences
Department of Sociology**

Selected Topics in
Advanced Quantitative Analysis I
Sociology 711.01
Winter, 2010
Course Outline

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Course Objectives

This quarter course represents the first half of a course designed to survey a variety of specific modeling techniques within the generalized linear model that currently dominates quantitative sociological research. In this first part of the course we will examine both structural equation models with measured variables and measurement models before synthesizing them into structural equation models with latent variables, commonly known as LISREL models, though LISREL is just one software package capable of estimating them. Our approach will be mainly applied and involves reading both technical work and a substantive application on each technique, as well as learning to use computer software to estimate each category of model. The emphasis will be on choosing an appropriate modeling strategy based on theoretical, design, and measurement considerations and the interpretation of parameter estimates and fit statistics.

Required Texts

Jae-On Kim and Charles W. Mueller, *Factor Analysis: What It Is and How To Do It*. Thousand Oaks, California: Sage, 1978.

Paul E. Spector, *Summated Rating Scale Construction*. Thousand Oaks, California: Sage, 1991.

In addition, a number of articles and book excerpts treating specialized topics will be distributed. To supplement the readings on statistical and methodological topics, for each unit we will also read and discuss a substantive article from a recent journal using the techniques taught in the course.

A Note on Software

The main statistical software package to be used in this course is Stata. It is rapidly becoming the standard for sociologists, economists, and other social scientists, as well as biomedical researchers, who are doing serious data analysis. It's main virtue is that, because it is programmable, much of it is designed by users themselves. This means that state-of-the-art statistical procedures are generally available first in Stata. While SPSS or SAS can do many of the procedures discussed in this course, they will not be supported in the lectures or labs. For full credit, all lab exercises, except for those using other software, must include Stata output.

Some Web Resources

The following are web pages that have substantial amounts of information about Stata and LISREL. The UCLA page in particular is an important tool for learning to use Stata.

www.stata.com

www.ats.ucla.edu/stat/stata/

www.ssicentral.com/lisrel/mainlis.htm

Grading

Your mark for the course will be based upon an article critique and a paper in which you will be asked to carry out a secondary analysis of some data in a substantive area of interest to you. The paper will comprise 60 percent of your final grade and the article critique 20 percent. In addition, each unit of the course will be accompanied by a computer exercise utilizing statistical software such as Stata, or LISREL. The computer exercises will be worth 20 percent of your final mark. These exercises will be marked on a "pass-fail" basis, with a pass awarded if all questions are attempted. Unsubmitted or incomplete exercises will be awarded a "fail." Exercises are due on the day of the lab to which they apply. None will be accepted late. While you are encouraged to consult with the instructor, lab assistant, and other students in the course in carrying out the labs, *each student must submit his or her own work for marking*. Under this system, you will receive an 'A' for 20 percent of your mark by simply submitting the completed exercises on time. Four percent will be deducted for each exercise not received on time.

Lab Fee

Due to the extensive nature of the handouts in this course, a lab fee of \$20 (cheques payable to the Department of Sociology) will be assessed to defray partially the cost of copying. This will cover not only the lab exercises and supplementary technical readings, but also the substantive articles mentioned above and excerpts from the Stata manuals.

TENTATIVE CALENDAR

1 Introduction: Theory, Model, and Design; Statistical Software

Reading

Pedhazur, E.J. 1997. *Multiple Regression in Behavioral Research* (Third Edition). Toronto: Harcourt Brace College Publishers, pp. 765-769

*Adrian E. Raftery. 2001. "Statistics in Sociology, 1950-2000: A Selective Review." *Sociological Methodology* 2001 31:1-45.

Lab Exercise and Reference

Stata orientation; multiple regression review exercise

J.S. Long and J. Freese. 2006. *Regression Models for Categorical Dependent Variables Using Stata (Second Edition)*. College Station, Texas: Stata Press. (Chapter 2: Introduction to Stata)

2 Recent Developments in Statistical Inference: Bayesian Model Selection and Robust Standard Errors

Technical Reading

Adrian E. Raftery. 1995. "Bayesian Model Selection in Social Research." *Sociological Methodology* 25: 111-163.

Stata 9 User's Guide pp. 275-280. (section on robust standard errors)

Substantive Example

R. A. Wanner. 2005. "Twentieth-Century Trends in Occupational Attainment in Canada" *Canadian Journal of Sociology* 30: 441-469.

3 Structural Equation Models with Observed Variables: Path Analysis

Technical Readings

Pedhazur, pp. 765-807

D.F. Alwin and R.M. Hauser. 1975. "The Decomposition of Effects in Path Analysis." *American Sociological Review* 40:37-47.

Substantive Examples

Terry Boswell and William J. Dixon. 1990. "Dependency and Rebellion: A Cross-National Analysis." *American Sociological Review* 55:540-559.

*Peter S. Li and Brian D. MacLean. 1989. "Changes in the Rural Elderly Population and Their Effects on the Small Town Economy: The Case of Saskatchewan, 1971-1986." *Rural Sociology* 54: 213-226.

Lab Exercise and Reference

Estimation of a path model using Stata regress

Stata 11.0 Base Reference Manual pp. 1514-1538 (entry for regress)

4 Exploratory Factor Analysis

Technical Readings

Kim and Mueller, *Introduction to Factor Analysis*

*Kim and Mueller, *Factor Analysis: Statistical Models and Practical Issues*

*A.C. Rencher. 1995. *Methods of Multivariate Analysis*. New York: John Wiley. Chapters 12 and 13.

*G.D. Garson. "Factor Analysis."

<http://faculty.chass.ncsu.edu/garson/PA765/factor.htm>

Substantive Example

Alfred A. Hunter and Michael C. Manley. 1986. "On the Task Content of Work."
Canadian Review of Sociology and Anthropology 23: 47-71.

Lab Exercise and Reference

Estimation of alternative factor models using Stata factor
Stata 11.0 Multivariate Statistics Manual pp. 292-333 (entry for factor)

5 Measurement and Scaling*Technical Readings*

Paul E. Spector, *Summated Rating Scale Construction*.

Thomas Piazza. 1980. "The Analysis of Attitude Items." *American Journal of Sociology* 86 : 594-603.

*A. Bryman and D. Cramer. 2004. "Constructing Variables." Pp. 17-34 in M. Hardy and A. Bryman (eds.) *Handbook of Data Analysis*. Thousand Oaks, Calif.: Sage.

Substantive Example

J. Phelen, B.G. Link, A. Stueve, and R.E. Moore. 1995. "Education, Social Liberalism, and Economic Conservatism: Attitudes Toward Homeless People." *American Sociological Review* 60: 126-140.

Lab Exercise and Reference

Scale construction using Stata factor and alpha
Stata 11.0 Base Reference Manual Vol. 1 pp. 11-17 (entry for alpha)

6 Structural Equation Models with Latent Variables*Technical Readings*

G.M. Maruyama, *Basics of Structural Equation Modeling*, Chapters 8-10

*J.B. Ullman and P.M. Bentler. 2004. "Structural Equation Modeling." Pp. 431-458 in M. Hardy and A. Bryman (eds.) *Handbook of Data Analysis*. Thousand Oaks, Calif.: Sage.

*L.A. Hayduk. 1996. *LISREL Issues, Debates, and Strategies* (Second Edition). Baltimore: Johns Hopkins University Press.

*G.D. Garson. "Structural Equation Modeling."
<http://faculty.chass.ncsu.edu/garson/PA765/structur.htm>

Substantive Example

P. Wilk. 2001 "Women's Employment Transitions and Changes in Psychological Distress." *Canadian Studies in Population* 28: 513-533

Lab Exercise

Estimating a structural equation model using LISREL
LISREL Reference Manual Chapter 2 (Detailed Instructions for the Problem Run)

7 Some Practical Data Analysis Topics: Bootstrapping, Imputing Missing Values, and Correcting Sample Selection Bias*Technical Readings*

*C.Z. Mooney and R.D. Duval. 1993. *Bootstrapping: A Nonparametric Approach to Statistical Inference*. Thousand Oaks, California: Sage.

*P.D. Allison. 2002. *Missing Data*. Thousand Oaks, California: Sage.

*Stata 11.0 Multiple Imputation Manual, pp. 1-13

*V. Kang Fu, C. Winship, and R.D. Mare. 2004. "Sample Selection Bias Models." Pp. 409-430 in M. Hardy and A. Bryman (eds.) *Handbook of Data Analysis*. Thousand Oaks, California: Sage.