

SC705: ADVANCED STATISTICS

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COURSE DESCRIPTION

This applied course is designed for graduate students with a prior background in statistics at the level of SC703: Multivariate Statistics (or its equivalent). This means that students should have considerable experience with multiple regression and an ability to conduct such analyses using some statistical software. The major topics of the course will include hierarchical linear modeling and structural equation modeling. We will use HLM 6 and LISREL 8.7 to perform the analyses.

The goals of the course are to develop the skills necessary to critically evaluate contemporary social research using advanced quantitative methods and to identify an appropriate technique, estimate models, and interpret results for independent research. The course will be applied in the sense that we will focus on estimating models and interpreting the results, rather than understanding in detail the mathematics behind the techniques. I hope that the course will provide you with a solid foundation in advanced quantitative methods, which is in high demand in many fields, both in and out of academia. For those of you in the Sociology Department, the course can also provide a foundation for the “Advanced Quantitative Methods” area examination.

COURSE POLICIES

For each topic in the course, I will give a lecture focusing on the reasoning behind the techniques and an interactive review of the syntax used to do analyses and the generated output. We will also discuss and critically evaluate published research based on the various techniques. You are strongly encouraged to ask questions and discuss the material in class. I also encourage collaboration among the students when working on the assignments. Please feel free to help each other when running analyses for your assignments. However, everyone must turn in their own statistical output and write-up.

I also would like to stress that you are always welcome to come and see me with any additional questions. If I am not in my office, email is the best way to get in touch with me – I check my email very often. You are also welcome to call me either in my office or at home (any time between 9 AM and 10 PM); however, be prepared to leave your name and number if I am not available to pick up the phone. Also, please check the course website regularly: typically, each week I will post course notes for you to print out. And make sure to check your email, too – from time to time I may send some announcements.

Finally, a note on feedback. I would like to know how I could make this course experience as useful and interesting as possible. Therefore, every week in the end of class I will ask you to submit a sheet of paper with the date and at least one sentence of reaction to that class meeting,

indicating what you learned, or something you liked or did not like, found interesting or controversial, found clear or too simplistic, or found confusing and in need of further (or better) explanation. You may also submit comments on the course in general.

MATERIALS:

Required:

1. Luke, Douglas A. 2004. *Multilevel Modeling*. Thousand Oaks, CA: Sage Publications.
2. Kline, Rex B. 2005. *Principles and Practice of Structural Equation Modeling*. 2nd edition. New York: The Guilford Press.
3. Additional required articles and chapters are available on the electronic library reserve.

Recommended:

1. Raudenbush, Stephen W. et al. 2004. *HLM 6: Hierarchical Linear and Nonlinear Modeling*. Scientific Software International, Inc.
2. Jöreskog, Karl G & Sörbom, Dag. 1996. *PRELIS 2 User's Reference Guide*. Scientific Software International, Inc.
3. Jöreskog, Karl G & Sörbom, Dag. 1996. *LISREL 8 User's Reference Guide*. Scientific Software International, Inc.

COURSE REQUIREMENTS AND GRADING:

There will be two assignments for the course, each worth 50% of your grade. Assignment 1 covers HLM, and assignment 2 covers SEM. These assignments will involve explaining a technique, running analyses, and summarizing findings. I will provide data, although I am open to you using your own data if they are appropriate for the technique (please see me in advance).

Each assignment will consist of two drafts, to be submitted electronically. The first draft for each assignment will involve running all the statistical analyses and providing brief interpretation of the findings as a running commentary. If you turn in this first draft by the due date, I will comment on it and return it to you. At that point, we will also discuss in class the common problems and mistakes. You will then submit the final draft, which will include a revised version of all the analyses plus the journal style write-up. Based on this draft, I will assign the final grade for that assignment. However, if you are interested in resubmitting a revised version of the write-up, you can do so within a week of receiving your final grade for that assignment.

The letter grades for the assignments will be determined as follows:

93-100	A
90-92	A-
87-89	B+
83-86	B
80-82	B-
60-79	C
0-59	F

COURSE OUTLINE.

January 23: Introduction to the Course and to Hierarchical Linear Modeling (HLM)

January 30: Two-level HLM Models

Luke, Douglas A. 2004. Chapters 1 and 2 (pp.1-26) in *Multilevel Modeling*. Thousand Oaks, CA: Sage.

February 6: HLM Diagnostics and Model Building Strategies

Luke, Douglas A. 2004. Chapter 2 (pp.26-53) in *Multilevel Modeling*. Thousand Oaks, CA: Sage.

Huffman, Matt L. 2004. "More Pay, More Inequality? The Influence of Average Wage Levels and The Racial Composition Of Jobs On The Black-White Wage Gap." *Social Science Research*, 33, 498-520.

February 13: HLM Models for Categorical and Count Data

Luke, Douglas A. 2004. Chapter 3, pp.53-58 in *Multilevel Modeling*. Thousand Oaks, CA: Sage.
Litwin, Kenneth J. 2004. "A Multilevel Multivariate Analysis of Factors Affecting Homicide Clearances." *Journal of Research in Crime and Delinquency*, 41, 327-351.

February 20: Growth Curve Modeling using HLM

Luke, Douglas A. 2004. Chapter 3, pp.59-72 in *Multilevel Modeling*. Thousand Oaks, CA: Sage.
Farkas, George, and Kurt Beron. 2004. "The Detailed Age Trajectory of Oral Vocabulary Knowledge: Differences By Class And Race." *Social Science Research*, 33, 464-497.

February 27: Three-level HLM Models and Missing Data Models in HLM

*****Assignment 1 first draft due*****

Raudenbush, Stephen, and Anthony Bryk. 2002. Pp.336-350 from *Hierarchical Linear Models: Applications and Data Analysis Methods. 2nd edition*. Thousand Oaks, CA: Sage.
Yasumoto, Jeffrey Y., Kazuaki Uekawa, and Charles E. Bidwell. 2001. "The Collegial Focus and High School Students' Achievement." *Sociology of Education*, 74, 181-209.

March 6: No class, Spring Break

March 13: Introduction to Structural Equation Modeling (SEM) and LISREL

Kline, Rex B. 2005. Chapters 1-4 from *Principles and Practice of Structural Equation Modeling. 2nd edition*. New York: The Guilford Press.

Byrne, Barbara M. 1998. Using LISREL, PRELIS, and SIMPLIS. Chapter 2 (pp.43-87) from *Structural Equation Modeling with LISREL, PRELIS, and SIMPLIS*. Mahwah, NJ: Erlbaum.

March 20: Path Analysis

Kline, Rex B. 2005. Chapters 5-6 from *Principles and Practice of Structural Equation Modeling. 2nd edition*. New York: The Guilford Press.

Hochstetler, Andy, Daniel S. Murphy, and Ronald L. Simons. 2004. "Damaged Goods: Exploring Predictors of Distress in Prison Inmates." *Crime & Delinquency*, 50(3), 436-457.

March 27: Measurement Model and Confirmatory Factor Analysis

Assignment 1 final draft due

Kline, Rex B. 2005. Chapter 7 from *Principles and Practice of Structural Equation Modeling*. 2nd edition. New York: The Guilford Press.

Gouveia, Valdiney V., Miguel Clemente, and Pablo Espinosa. 2003. "The Horizontal and Vertical Attributes of Individualism and Collectivism in a Spanish Population." *The Journal of Social Psychology*, 4i(1), 43-63.

April 3: SEM with Latent Variables: Diagnostics and Model Building Strategies

Kline, Rex B. 2005. Chapter 8, 12 from *Principles and Practice of Structural Equation Modeling*. 2nd edition. New York: The Guilford Press.

Hoyle, Rick H. and Abigail T. Panter. 1995. "Writing about Structural Equation Models." Chapter 9 from Rick H. Hoyle (editor), *Structural Equation Modeling: Concepts, Issues, and Applications*. Thousand Oaks, CA: Sage Publications.

Beth A. Kotchick, Shannon Dorsey, and Laurie Heller. 2005. "Predictors of Parenting among African American Single Mothers: Personal and Contextual Factors." *Journal of Marriage and Family*, 67, 448-460.

April 10: Multigroup SEM

Kline, Rex B. 2005. Chapter 11 from *Principles and Practice of Structural Equation Modeling*. 2nd edition. New York: The Guilford Press.

Rick Kosterman, Kevin P. Haggerty, Richard Spoth, and Cleve Redmond. 2004. "Unique Influence of Mothers and Fathers on Their Children's Antisocial Behavior." *Journal of Marriage and Family*, 66: 762-778.

April 17: No class, Patriot's Day

Assignment 2 first draft due

April 24: Nonrecursive and Longitudinal SEM models

Kline, Rex B. 2005. Chapter 9 from *Principles and Practice of Structural Equation Modeling*. 2nd edition. New York: The Guilford Press.

Maruyama, Geoffrey M. 1998. Chapter 6 from *Basics of Structural Equation Modeling*. Thousand Oaks, CA: Sage Publications.

Johnson, L. M, Ronald L. Simons, Rand D. Conger. 2004. "Criminal Justice System Involvement and Continuity of Youth Crime: A Longitudinal Analysis." *Youth & Society*, 36, 3-29.

May 1: Mean Structures and Latent Growth Models

Kline, Rex B. 2005. Chapter 10 from *Principles and Practice of Structural Equation Modeling*. 2nd edition. New York: The Guilford Press.

Wright, John Paul, David E. Carter, and Francis T. Cullen. 2005. "A Life-Course Analysis of Military Service in Vietnam." *Journal of Research in Crime and Delinquency*, 42(1), 55-83.

May 8: No class

Assignment 2 final draft due

ADDITIONAL RESOURCES

HLM:

- Anderton, Douglas L. and Deborah E. Sellers. 1989. A Brief Review of Contextual-Effect Models and Measurement. *Historical Methods*, 22, 3, pp. 106-115.
- DiPrete, Tomas A. and Jerry D. Forristal. 1994. Multilevel Models: Methods and Substance. *Annual Review of Sociology*, 20, pp. 331-357.
- Eversen, Gudmund R. 1991. *Contextual Analysis*. Newbury Park, CA: Sage Publications.
- Heck, Ronald and Scott Thomas. 2000. *An Introduction to Multilevel Modeling Techniques*. Mahwah, NJ: Erlbaum.
- Hox, Joop. 2002. *Multilevel Analysis: Techniques and Applications*. Mahwah, NJ: Lawrence Erlbaum.
- Kreft, Ita and Jan de Leeuw. 1998. *Introducing Multilevel Modeling*. London: Sage Publications.
- Raudenbush, Stephen and Anthony Bryk. 2002. *Hierarchical Linear Models: Applications and Data Analysis Methods. 2nd edition*. Newbury Park, CA: Sage Publications.
- Snijders, Tom A. B. and Roel J. Bosker. 1999. *Multilevel Analysis: An Introduction to Basic and Advanced Multilevel Modeling*. Thousand Oaks, CA: Sage Publications.
- Wong, George Y. and William Mason. 1985. The Hierarchical Logistic Regression Model for Multilevel Analysis. *Journal of the American Statistical Association*, 80, 391, pp. 513-524.

SEM:

- Bollen, Kenneth A. 1989. *Structural Equations with Latent Variables*. New York: John Wiley & Sons.
- Byrne, Barbara. 1998. *Structural Equation Modeling with LISREL, PRELIS, and SIMPLIS: Basic Concepts, Applications, and Programming*. Mahwah, NJ: Erlbaum.
- Barbara M. Byrne. 2001. *Structural Equation Modeling With Amos: Basic Concepts, Applications, and Programming*. Mahwah, NJ: Erlbaum.
- Du Toit, M. and S. du Toit. 2001. *Interactive LISREL: User's Guide*. Lincolnwood, IL: Scientific Software International.
- Finkel, Steven E. 1995. *Causal Analysis with Panel Data*. Thousand Oaks, CA: Sage Publications.
- Hayduk, Leslie. 1987. *Structural Equation Modeling with LISREL: Essentials and Advances*. Baltimore: The John Hopkins University Press.
- Hoyle, Rick H (Editor). 1995. *Structural Equation Modeling: Concepts, Issues, and Applications*. Thousand Oaks, CA: Sage Publications.
- Jöreskog, K. G. and D. Sörbom. 1993. LISREL 8: Structural Equation Modeling with the SIMPLIS Command Language. Hillsdale, NJ: Lawrence Earlbaurn Associates, 1993.
- Kaplan, David. 2000. *Structural Equation Modeling: Foundations and Extensions*. Thousand Oaks, CA: Sage Publications.
- Maruyama, Geoffrey M. 1998. *Basics of Structural Equation Modeling*. Thousand Oaks, CA: Sage Publications.
- Schumacker, Randall E. and George A. Marcoulides (eds.) 1998. *Interaction and Nonlinear Effects in Structural Equation Modeling*. Mahwah, MJ: Erlbaum.

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