PSY 610: STRUCTURAL EQUATION MODELING
Fall 2007, Mon 9-12, Straub 180

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Straub 327
Office hours: Wed 11-12 or by appointment

This course is an introduction to structural equation modeling (SEM). SEM is a general framework for testing theory-driven models of data. SEM can be used to test hypotheses about causation, measurement, and change over time. Specific techniques that are part of SEM include path analysis, confirmatory factor analysis, and causal models with latent variables. SEM is useful in a wide variety of research applications, including experiments and interventions, observational designs, and designs with repeated measurements (such as within-subjects experiments, longitudinal studies, and multiple time series).

The course will begin with an accelerated review of multiple regression, with an emphasis on a model-comparison approach. The majority of the course will cover conceptual underpinnings and "classical" SEM applications like confirmatory factor analysis and causal modeling of cross-sectional data. Time permitting, we will also cover topics relevant to the analysis of data from repeated measures and longitudinal designs, such as growth curve modeling. Class meetings will include both classroom lectures and hands-on practice in the computer lab.

Prerequisites: Completion of PSY 613 or permission of instructor.

Software

All examples and exercises in class will be done using Mplus, which is installed on the computers in Straub 180. Students can purchase a discounted copy of Mplus online (see www.statmodel.com).

Readings

Required text:

Kline, R. B. (2005). *Principles and practice of structural equation modeling* (2nd ed.). New York: Guilford.

Optional text:

Bollen, K.A. (1989). *Structural equations with latent variables.* New York: Wiley-Interscience.

In addition to these texts, you will be assigned several required articles and chapters. See the section labeled "Schedule and Readings" for a list.

Grading and course requirements

40%   Participation, in-class exercises, and homework
60%   Final project (<u>due Tuesday, December 4</u>)

Final project. For the final project, you will have a choice of submitting either a *proposal* or a *data analysis writeup.* If you do a proposal, you will propose an application of SEM in a dataset that you might conduct in the future. (This may be already-existing data, or it may be data that you would collect.) In a data analysis writeup, you will actually analyze some data and write up what you did and found out. More details will be given in class. Before you start your project, you should read:

McDonald, R. P., & Moon-Ho, R. H. (2002). Principles and practice in reporting structural equation analyses. *Psychological Methods, 7,* 64-82.

Disabilities

If you have a documented disability and anticipate needing accommodations in this course, please make arrangements to meet with me as soon as possible.

Changes

Topics, readings, course requirements, or other aspects of this course may be changed at the instructor's discretion. Changes will be announced in class or on the course website.

SCHEDULE AND READINGS

Always complete readings <u>before</u> the class meeting where we cover a topic. Dates are estimates; depending on the pace of our class meetings, our actual progress may be faster or slower.

<u>Topic 1 – Sep 24</u>
Introduction; principles of causal inference

Kline, ch. 1-4

Bollen (1989) chapter 3. (The full book is "optional," but this chapter is required.)

Holland, P. W. (1986). Statistics and causal inference. *Journal of the American Statistical Association, 81,* 945-960.

<u>Topic 2 – Oct 1</u>
Regression as statistical modeling

Judd, C. M. (2000). Everyday data analysis in social psychology: Comparisons of linear models. In H. T. Reis & C. M. Judd (Eds.), *Handbook of research methods in personality and social psychology* (pp. 370-392). New York: Cambridge.

<u>Topic 3 – Oct 8</u>
Models with observed variables (path analysis)

Kline, ch. 5-6

Shrout, P. E., & Bolger, N. (2002). Mediation in experimental and nonexperimental studies: New procedures and recommendations. *Psychological Methods, 7,* 422-445.

Schafer, J. L., & Graham, J. W. (2002). Missing data: Our view of the state of the art. *Psychological Methods, 7,* 147-177.

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Topic 4 – Oct 15
Measurement models (a.k.a. confirmatory factor analysis)

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Kline, ch. 7

John, O. P., & Benet-Martinez, V. (2000). Measurement: Reliability, construct validation, and scale construction. In H. T. Reis & C. M. Judd (Eds.), *Handbook of research methods in personality and social psychology* (pp. 339-369). New York: Cambridge.

Edwards, J. R., & Bagozzi, R. P. (2000). On the nature and direction of relationships between constructs and measures. *Psychological Methods, 5,* 155-174.

Little, T. D., Cunningham, W. A., Shahar, G., & Widaman, K. F. (2002). To parcel or not to parcel: Exploring the questions, weighing the merits. *Structural Equation Modeling, 9,* 151-173.

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Topic 5 – Oct 22
Structural models with latent variables

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Kline, ch. 8

Anderson, J. C., & Gerbing, D. W. (1988). Structural equation modeling in practice: A review and recommended two-step approach. *Psychological Bulletin, 103,* 411-423.

Rigdon, E. E. (1995). A necessary and sufficient identification rule for structural models estimated in practice. *Multivariate Behavioral Research, 30,* 359-383.

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Topic 6 – Oct 29
Modifying and comparing models

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MacCallum, R. C., Roznowski, M., & Necowtiz, L. B. (1992). Model modifications in covariance structure analysis: The problem of capitalization of chance. *Psychological Bulletin, 111*, 490-504.

MacCallum, R. C., Wegener, D. T., Uchino, B. N., & Fabrigar, L. R. (1993). The problem of equivalent models in applications of covariance structure analysis. *Psychological Bulletin, 114,* 185-199.

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Topic 7 – Nov 5
Causal loops

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Kline, ch. 9

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Topic 8 – Nov 12
Growth curve models

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Kline, ch. 10

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Topic 9 – Nov 19
Other models for repeated and longitudinal data

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Bollen, K. A., & Curran, P. J. (2004). Autoregressive latent trajectory (ALT) models: A synthesis of two traditions. *Sociological Methods and Research, 32,* 336-383.

Biesanz, J. C., West, S. G., & Kwok, O. M. (2003). Personality over time: Methodological approaches to the study of short-term and long-term development and change. *Journal of Personality, 71,* 905-942.

Kenny, D. A., & Zautra, A. (1995). The trait–state–error model for multiwave data. *Journal of Consulting and Clinical Psychology, 63,* 52-59.

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Topic 10 – Nov 26
Multiple groups models

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Kline, ch. 11-12