

## MARKETING 854 Spring 2015

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**Class Hours:** 9:40-12:50, Monday

**Room:** DMSB 110

**Class Website:** on Blackboard

**Office Hours:** Monday 1:00-2:30; before class; or by appointment

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### **Textbook**

Kline, R. B. (2010). *Principles and practice of structural equation modeling (3<sup>rd</sup> Edition)*. New York, NY: Guilford Press.

### **Optional Textbook (not required)**

Schumacker, R. E., & Lomax, R. G. (2010). *A beginner's guide to structural equation modeling (3<sup>rd</sup> Edition)*. Mahwah, NJ: Lawrence Erlbaum Associates.

### **Course Objectives**

This course provides an fairly detailed introduction to Structural Equation Modeling (SEM) and all of its related models (confirmative factor analysis, latent growth, etc). These statistical models are powerful when used appropriately and are helpful for answering a variety of substantive questions. For example, if we want to evaluate the properties of our measures, test theories involving mediating processes, or examine models of method bias, the appropriate model is SEM.

This course is oriented towards scholars who want to be informed users of SEM. The class is therefore designed to be very applied. We will not go into great detail about the technical underpinnings of the various models, but will keep our focus on how they are used in practice. I will demonstrate how to use the various methods, and refer to the readings to emphasize certain points. It is important you read the articles/chapters *before* coming to class. Even though the readings may not make much sense before lecture, I have found students learn better because they know what questions they want to ask during lecture. There will be several articles/chapters assigned each week, but these may be adapted/edited depending on how the class is going.

This goes without saying, but I expect perfect attendance except for good reasons (e.g., conference attendance). Class will also start and end promptly, so please show up a few minutes early. Be polite and turn your cell phones off. Whenever possible, please give advance notice if you will not be able to attend a class.

### **Learning Outcomes**

Students will complete the course with:

- Knowledge of SEM methods and applications.

- Knowledge of SEM software packages and research procedures.
- Skill in analyzing data using SEM, working with databases, and reporting results.
- Skill in presenting complex statistical information in simpler terms.
- Skill in making methods presentations.
- Ability to think critically about data and results.

## Grades

Grades will be assigned according to the traditional cut-offs used at USC. Specifically, a 90 or greater is an A, 87 up to 90 is a B+, 80 up to 87 is a B. A grade of C (or lower) will be given to those who receive less than 80 percent of the available points. Grades are based on the following points:

	<u>Points</u>
5 Homework Projects	15 (3 points each)
SEM Research Project	30
Class Presentation	30
Class Participation	<u>25</u>
Total	100

You'll notice that there is no exam. So long as everyone does the readings and contributes to the class discussions, I see no need for an exam. If either of these becomes problematic, a midterm/final exam may be necessary. Please do not miss the deadlines stated in the class schedule—they are real and important!

**Homework Projects.** There are multiple homework projects; the tentative start dates are noted in the course schedule. These projects are designed to give you experience applying the techniques we discuss in class. They will be completed on your own outside of class (although we will discuss and review them in class). They should be fairly straightforward and not demand too much of your time.

You can work on these projects in groups if you would like. However, the write-up of the projects must be on your own. This class has a zero-plagiarism policy and any indication of it will be dealt with in a harsh manner.

**SEM Research Project.** In addition to the homework projects, you will be expected to complete an *independent* research project using SEM. I want you to obtain your own dataset and use SEM (as appropriate) to analyze a series of substantively interesting, theoretically-driven research questions. I would really like you to tackle something that could result in a journal-quality submission. This may be your own data, that of an advisor/colleague, etc. If you simply cannot find any such data, ask around or I might have something to interest you.

You need to speak with me about this project and have it approved *before* you begin. The deadline for the project is shown in the course outline.

**Presentation.** At the end of the semester, each student will give a presentation describing their research project. Although the focus will be on methodology, it is expected the presentation will also provide theory, hypotheses, and implications. More detail on this presentation and how it will be graded will be provided at the appropriate time.

**Class Participation.** My teaching philosophy is that learning occurs best when it is part of a collective,

shared experience that is created through interaction and collaboration. This means I expect lots of class discussion and interaction. Further, we will often work on analyses in class that will require your active participation.

### **Late Projects and Homework**

One point will be deducted for every day a project or homework is turned in late, unless you have received advanced permission from me to turn it in late.

### **University of South Carolina Honor Code & Attendance Policy**

“It is the responsibility of every student at the University of South Carolina Columbia to adhere steadfastly to truthfulness and to avoid dishonesty, fraud, or deceit of any type in connection with any academic program. Any student who violates this Honor Code or who knowingly assists another to violate this Honor Code shall be subject to discipline.” For more information, go to:

<http://www.sc.edu/academicintegrity/>

I follow the University’s policy on attendance. It states: “Absence from more than 10 percent of the scheduled class sessions, whether excused or unexcused, is excessive and the instructor may choose to exact a grade penalty for such absences.” The policy may be viewed here:

<http://www.sc.edu/bulletin/ugrad/acadregs.html#class%20atten>

### **A Note About the Course Schedule**

Although we will try to stick to the course schedule, I feel it’s important that we devote sufficient time to review and ensure understanding. Therefore, I’ve designed some slack into the course schedule. The course schedule dates are therefore tentative. We may also add/drop readings as the class evolves (you’ll receive notice of this in advance). The sequence of topics is unlikely to change, however.

**Tentative Course Schedule**  
**(subject to change and revision)**

**1. January 12: Review of Correlation/Regression; Introduction to Theory & Methods**

Cohen, J., Cohen, P., West, S. G., & Aiken, L. S. (2003). Chapters 2 & 3. *Applied multiple regression/correlation analysis for the behavioral sciences*. 3rd Edition. Lawrence Erlbaum Associates.

Edwards, J. R., & Berry, J. W. (2010). The presence of something or the absence of nothing: Increasing theoretical precision in management research. *Organizational Research Methods, 13*, 668-689.

Schumacker, R. E., & Lomax, R. G. (2010). Chapter 3. *A beginner's guide to structural equation modeling*. Mahwah, NJ: Lawrence Erlbaum Associates.

Skim (focus on measurement and analysis sections):

Edwards, J. R. (2010). Reconsidering theoretical progress in organizational and management research. *Organizational Research Methods, 13*, 615-619.

Ployhart, R. E. (2008). Work motivation methods, measures, and assessment strategies. In R. Kanfer, G. Chen, & R. Pritchard (Eds.), *Work motivation: Past, present, and future*, pp. 17-61. Mahwah, NJ: Lawrence Erlbaum Associates.

**2. January 19 (no class; MLK Holiday)**

**3. January 26: Introduction to SEM & Software**

Byrne, B. M. (1998). Chapters 1 & 2. *Structural equation modeling with LISREL, PRELIS, and SIMPLIS*. Mahwah, NJ: Lawrence Erlbaum Associates.

Iacobucci, D. (2009). Everything you always wanted to know about SEM (structural equation modeling) but were afraid to ask. *Journal of Consumer Psychology, 19*, 673-680.

Kline, R. B. (2010). Chapters 1-3. *Principles and practice of structural equation modeling (3<sup>rd</sup> Edition)*. New York, NY: Guilford Press.

Raykov, T., & Marcoulides, G. A. (2006). Chapters 1 & 2. *A First Course in Structural Equation Modeling (2<sup>nd</sup> edition)*. New York, NY: Taylor & Francis.

Schumacker, R. E., & Lomax, R. G. (2010). Chapter 4. *A beginner's guide to structural equation modeling*. Mahwah, NJ: Lawrence Erlbaum Associates.

Skim:

Joreskog, K. G., & Sorbom, D. (1989). Chapter 1. *LISREL 7: A guide to the program and applications*. Chicago, IL: SPSS Inc.

#### **4. February 2: CFA Models (First & Second Order); Classical Test Theory**

- Byrne, B. M. (1998). Chapters 3, 4, & 5. *Structural equation modeling with LISREL, PRELIS, and SIMPLIS*. Mahwah, NJ: Lawrence Erlbaum Associates.
- Kline, R. B. (2006). Reverse arrow dynamics. In G. R. Hancock & R. O. Mueller (Eds.), *Structural equation modeling: A second course* (pp. 43-68). Greenwich, CT: Information Age Publishing.
- Kline, R. B. (2010). Chapter 9. *Principles and practice of structural equation modeling (3<sup>rd</sup> Edition)*. New York, NY: Guilford Press.
- Lance, C. E., & Vandenberg, R. J. (2002). Confirmatory factor analysis. In F. Drasgow & N. Schmitt (Eds.), *Measuring and analyzing behavior in organizations: Advances in measurement and data analysis*. Jossey-Bass.

**\*Class HW #1: Perform 1<sup>st</sup> and 2<sup>nd</sup> Order CFA models**

**\*Must Obtain SEM Project Approval**

#### **5. February 9: Identification, Estimation, Model Fit, and Model Comparisons**

- Chou, C. P., & Bentler, P. M. (1995). Estimates and tests in structural equation modeling. In R. H. Hoyle (Ed.), *Structural equation modeling: Concepts, issues, and applications* (pp. 37-55). Thousand Oaks, CA: Sage.
- Hu, L. I., & Bentler, P. M. (1995). Evaluating model fit. In R. H. Hoyle (Ed.), *Structural equation modeling: Concepts, issues, and applications* (pp. 76-99). Thousand Oaks, CA: Sage.
- Kline, R. B. (2010). Chapters 5-8. *Principles and practice of structural equation modeling (3<sup>rd</sup> Edition)*. New York, NY: Guilford Press.
- Schumacker, R. E., & Lomax, R. G. (2010). Chapter 5. *A beginner's guide to structural equation modeling*. Mahwah, NJ: Lawrence Erlbaum Associates.
- Tanaka, J. S. (1993). Multifaceted conceptions of fit. In K. A. Bollen & J. S. Long (Eds.), *Testing structural equation models*. Thousand Oaks, CA: Sage.

#### **6. February 16: Identification, Estimation, Model Fit, and Model Comparisons; Continued**

- Hershberger, S. L. (2006). The problem of equivalent structural models. In G. R. Hancock & R. O. Mueller (Eds.), *Structural equation modeling: A second course* (pp. 13-41). Greenwich, CT: Information Age Publishing.
- MacCallum, R. C., Browne, M. W., & Cai, L. (2006). Testing differences between nested covariance structure models: Power analysis and null hypotheses. *Psychological Methods, 11*, 19-35.

Marsh, H. W., Hau, K. T., Balla, J. R., & Grayson, D. (1998). Is more ever too much? The number of indicators per factor in confirmatory factor analysis. *Multivariate Behavioral Research*, 33, 181-220.

Sharma, S., Mukherjee, S., Kumar, A., & Dillon, W. R. (2005). A simulation study to investigate the use of cutoff values for assessing model fit in covariance structure analysis. *Journal of Business Research*, 58, 935-943.

Skim:

Barrett, P. (2007). Structural equation modeling: Adjudging model fit. *Personality and Individual Differences*, 42, 815-824.

Note: This is the lead article to a special issue that contains many responses from leading methodologists.

Heene, M., Hilbert, S., Draxler, C., Zeigler, M., & Buhner, M. (2011). Masking misfit in confirmatory factor analysis by increasing unique variances: A cautionary note on the usefulness of cutoff values of fit indices. *Psychological Methods*, 16, 319-336.

Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling*, 6, 1-55.

Nye, C. D., & Drasgow, F. (2011). Assessing goodness of fit: Simple rules of thumb simply do not work. *Organizational Research Methods*, 14, 548-570.

West, S. G., Finch, J. F., & Curran, P. J. (1995). Structural equation models with nonnormal variables: Problems and remedies. In R. H. Hoyle (Ed.), *Structural Equation Modeling: Concepts, Issues, and Applications* (pp. 56-75). Thousand Oaks: Sage.

Williams, L. J., & O'Boyle, E. (2011). The myth of global fit indices and alternatives for assessing latent variable relations. *Organizational Research Methods*, 14, 350-369.

## **7. February 23: Path Analysis and SEM**

Notes provided from a workshop on how to use the SAS system for CFA/SEM; Ployhart, 2009.

Byrne, B. M. (1998). Chapter 7. *Structural equation modeling with LISREL, PRELIS, and SIMPLIS*. Mahwah, NJ: Lawrence Erlbaum Associates.

Cole, D. A., & Preacher, K. J. (2014). Manifest variable path analysis: Potentially serious and misleading consequences due to uncorrected measurement error. *Psychological Methods*, 19, 300-315.

Kline, R. B. (2010). Chapter 10. *Principles and practice of structural equation modeling (3<sup>rd</sup> Edition)*. New York, NY: Guilford Press.

## **\*Class HW#2: Conduct Path Analysis and SEM**

## **8. March 2: Review/Open Topic Day**

## **9. March 9: Spring Break-no class**

## **10. March 16: Multiple Groups Analysis, Invariance, and Latent Means (MACS)**

Meade, A. W., Johnson, E. C., & Braddy, P. W. (2008). Power and sensitivity of alternative fit indices in tests of measurement invariance. *Journal of Applied Psychology, 93*, 568-592.

Ployhart, R. E., & Oswald, F. L. (2004). Applications of mean and covariance structure analysis: Integrating correlational and experimental approaches. *Organizational Research Methods, 7*, 27-65.

Schmitt, N., & Kuljanin, G. (2008). Measurement invariance: Review of practice and implications. *Human Resources Management Review, 18*, 210-222.

Sharma, S., Srinivas, S., & Ployhart, R. E. (2012). The analysis of mean differences using mean and covariance structure analysis: Effect size estimation and error rates. *Organizational Research Methods, 15*, 75-102.

Vandenberg, R.J., & Lance, C.E. (2000). A review and synthesis of the measurement invariance literature: Suggestions, practices, and recommendations for organizational research. *Organizational Research Methods, 3*, 4-69.

### **\*Class Project #3: Conduct MGCFA and MGSEM**

## **11. March 23: Method Bias Models and MTMM**

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of marketing research, 39*-50.

Marsh, H. W., Grayson, D. (1995). Latent variable models of multitrait-multimethod data. In R. H. Hoyle (Ed.), *Structural equation modeling: Concepts, issues, and applications* (pp. 177-198). Thousand Oaks, CA: Sage.

Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology, 88*, 879-903.

Schmitt, N. (1994). Method bias: The importance of theory and measurement. *Journal of Organizational Behavior, 15*, 393-398

Skim:

Brannick, M. T., Chan, D., Conway, M. M., Lance, C. E., & Spector, P. E. (2010). What is method variance and how can we cope with it? A panel discussion. *Organizational Research Methods,*

13, 407-420.

Lance, C. E., Noble, C. L., & Scullen, S. E. (2002). A critique of the correlated trait-correlated method and correlated uniqueness models for multitrait-multimethod data. *Psychological Methods, 7*, 228-244.

Williams, L. J., & Anderson, S. E. (1994). An alternative approach to method effects by using latent-variable models: Applications in organizational behavior research. *Journal of Applied Psychology, 79*, 323-331.

## **12. March 30: Moderation & Mediation**

Cortina, J. M., & Chen, G., et al. (2001). Testing interaction effects in LISREL: Examination and illustration of available procedures. *Organizational Research Methods, 4*, 324-360.

Edwards, J. R., & Lambert, L. S. (2007). Methods for integrating moderation and mediation: A general analytical framework using moderated path analysis. *Psychological Methods, 12*, 1-22.

James, L. R., Mulaik, S. A., & Brett J. M. (2006). A tale of two methods. *Organizational Research Methods, 9*, 233-244.

Kline, R. B. (2010). Chapter 12. *Principles and practice of structural equation modeling (3<sup>rd</sup> Edition)*. New York, NY: Guilford Press.

Lau, R. S., & Cheung, G. W. (2012). Estimating and comparing specific mediation effects in complex latent variable models. *Organizational Research Methods, 15*, 3-16.

Marsh, H. W., Wen, Z., Hau, K. (2004). Structural equation models of latent interactions: Evaluation of alternative estimation strategies and indicator construction. *Psychological Methods, 9*, 275-300.

Preacher, K. J., & Kelley, K. (2011). Effect size measures for mediation models: Quantitative strategies for communicating indirect effects. *Psychological Methods, 16*, 93-115.

Preacher, K. J., Zyphur, M. J., & Zhang, Z. (2010). A general multilevel SEM framework for assessing multilevel mediation. *Psychological Methods, 15*, 209-233.

Skim:

Malhotra, M. K., Singhal, C., Shang, G., & Ployhart, R. E. (2014). A critical evaluation of alternative methods and paradigms for conducting mediation analysis in operations management research. *Journal of Operations Management, 32*, 127-137.

## **\*Class Project #4: Conduct Mediation Models**

## **13. April 6: Latent Growth Modeling; Longitudinal Modeling**



Notes provided from Center for Advancement of Research Methods and Analysis (CARMA) Workshop, Ployhart, 2010.

Chan, D. (1998). The conceptualization and analysis of change over time: An integrative approach incorporating longitudinal mean and covariance structures analysis (LMACS) and multiple indicator latent growth modeling (MLGM). *Organizational Research Methods, 1*, 421-483.

Kline, R. B. (2010). Chapter 11. *Principles and practice of structural equation modeling (3<sup>rd</sup> Edition)*. New York, NY: Guilford Press.

Ployhart, R. E., & Vandenberg, R. J. (2010). Longitudinal research: The theory, design, and analysis of change. *Journal of Management, 36*, 94-120.

Roe, R. A. (2008). Time in applied psychology: The study of “what happens” rather than “what is.” *European Psychologist, 13*, 37-52.

Willett, J. B., & Sayer, A. G. (1994). Using covariance structure analysis to detect correlates and predictors of individual change over time. *Psychological Bulletin, 116*, 363-381.

#### **\*Class Project #5: Conduct LGM**

#### **14. April 13: Longitudinal Modeling, Continued**

Maxwell, S. E., & Cole, D. A. 2007. Bias in cross-sectional analyses of longitudinal mediation. *Psychological Methods, 12*: 23-44.

Wu, W., West, S. G., & Taylor, A. B. (2009). Evaluating model fit for growth curve models: Integration of fit indices from SEM and MLM frameworks. *Psychological Methods, 14*, 183-201.

Skim:

Biesanz, J. C., Deeb-Sossa, N., Papadakis, A. A., Bollen, K. A., & Curran, P. J. (2004). The role of coding time in estimating and interpreting growth models. *Psychological Methods, 9*, 20-52.

Kuljanin, G., Braun, M. T., & DeShon, R. P. (2011). A cautionary note on modeling growth trends in longitudinal data. *Psychological Methods, 16*, 249-264.

#### **15. April 20: Class Presentations**

#### **16. April 27 (last day of class): Class Presentations**