POL676
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Advanced Topics: Methods

Measurement, Scaling and Covariance Structure Models

This course will consider major contemporary approaches to social and political measurement, with extensions to deal with issues like multi-level and longitudinal data. Topics will include classical measurement theory, estimation of reliability, item response theory, factor analysis and the analysis of covariance structures (structural equation modeling). The lectures and readings will examine the statistical models, substantive applications, and the practical problems of applying these models to data (including the software available in each case).

Grades for the course will be based upon your application of these methods to data of your choosing. The nature of the data analysis projects must be discussed with me and **approved** before you proceed. The course requirements could be satisfied by a single paper or by multiple papers. You will need to use a significant number of the methods we cover in the class in your analyses. Whether these are best done in one paper or several will be determined on an individual basis. Papers should include a discussion of the statistical theory as well as the empirical analysis. There will be no exams or short assignments. Readings will reinforce and extend the lectures. I expect them to be completed before each class.

Books that should be purchased:

R.J. de Ayala, *The Theory and Practice of Item Response Theory*

David Kaplan, *Structural Equation Modeling, 2ⁿᵈ Ed.*

Other readings will be drawn from journal articles that you can find online and various chapters and web resources that will be made available on Blackboard. (Some journal articles that are not available through the SB library will also be on Blackboard.)

Course Topics and Readings:

1/26   **Introduction to Social Measurement**

2/2   **Latent Variable Models and Factor Analysis**

Read: Ledyard Tucker and Robert MacCallum, *Exploratory Factor Analysis*, chs. 1, 3, 4. (Available at http://www.unc.edu/~rcm/book/factornew.htm) and on Blackboard.

Read: J. Scott Armstrong, Derivation of theory by means of factor analysis or Tom Swift and his electric factor analysis machine. *American Statistician* (1967): 75-96.

Read: Steven Reise, Niels Waller, and Andrew Comrey, Factor analysis and scale revision. *Psychological Assessment* 12 (2000): 287-297.

Read: Lee Fabrigar et al., Evaluating the use of exploratory factor analysis in psychological research. *Psychological Methods* 4 (1999): 272-299.

2/9   **Exploratory Factor Analysis: Factor Extraction and Rotation**

Read: Ledyard Tucker and Robert MacCallum, *Exploratory Factor Analysis,* chs. 6, 7, 8 (intro, 8.1, 8.2, and 8.5 only), 11

Read: W.R. Zwick and W.F. Velicer, Comparison of five rules for determining the number of components to retain. *Psychological Bulletin* 99 (1986): 432-442.

Read: Robert Jennrich and Peter Bentler, Exploratory bi-factor analysis. *Psychometrika*, 76 (2011): 537-549.

2/16   **Covariance Structure Models**

Read: Kaplan, chs. 1-3

Read: Lawrence Raffalovich and George Bohnstedt, Common, specific, and error variance components of factor models. *Sociological Methods and Research* 15 (1987): 385-405.

Read: Efren Perez, The origins and implications of language effects in multilingual surveys: A MIMIC approach with application to Latino political attitudes. *Political Analysis* 19 (2011): 434-454.

Read: Kenneth Bollen, et al., BIC and alternative Bayesian information criteria in the selection of structural equation models. *Structural Equation Modeling* 21 (2014): 1-19.

2/23   **Covariance Structure Models: Estimation and Model Fit**

Read: Kaplan, ch. 4 (pp. 61-69), ch. 5 (except 5.2), ch. 6
        J. S. Tanaka, Mulifacited conceptions of fit in structural equation models. In
              Kenneth Bollen and J. Scott Long (eds), *Testing Structural Equation
              Models*, pp. 10-39.
        Xitao Fan, Bruce Thompson, and Lin Wang, Effects of sample size, estimation
              methods, and model specification on structural equation modeling fit
              indexes. *Structural Equation Modeling* 6 (1999): 56-83.
        Willem Saris, Albert Satorra, and William van der Veld, Testing structural
              equation models or detection of misspecification? *Structural Equation
              Modeling* 16 (2009): 561-583.

3/2   **Classical Measurement Theory and Reliability**

Read: Personality Project, An introduction to psychometric theory with applications in
              R, ch. 7: Reliability
        de Ayala, ch. 1
        H. G. Osburn, Coefficient alpha and related internal consistency reliability
              coefficients. *Psychological Methods* 5 (2000): 343-355.
        Vernon Greene and Edward Carmines, Assessing the reliability of linear
              composites. *Sociological Methodology* (1980): 160-175.
        David Wiley and James Wiley, The estimation of measurement error in panel
              data. *American Sociological Review* 35 (1970): 112-117.

3/23   **Item Response Theory: Models**

Read: de Ayala, chs. 2, 5-8
        David Thissen and Lynne Steinberg, Data analysis using item response theory.
              Psychological Bulletin 104 (1988): 385-395.
        Akihito Kamata and Daniel Bauer, A note on the relation between factor analytic
              and item response theory models. *Structural Equation Modeling* 15
              (2008): 136-153.
        Anthony McGann, Estimating the political center from aggregate data: An item
              response theory alternative to the Stimson dyad ratios algorithm.
              Political Analysis 22 (2014): 115-129.

3/30   **Item Response Theory: Estimation and Goodness-of-Fit**

Read: de Ayala, chs. 3, 4, 9, appendices A, B, C

Joshua Clinton, Simon Jackman, and Douglas Rivers, The statistical analysis of legislative behavior. *American Political Science Review* 98 (2004): 355-370.

Shawn Trier and Simon Jackman, Democracy as a latent variable. *American Journal of Political Science* 52 (2008): 201-217.

Daniel, Pemstein, Stephen Meserve, and James Melton, Democratic compromise: A latent variable analysis of ten measures of regime type. *Political Analysis* 18 (2010): 426-449.

4/6   **Differential Item Functioning and Non-Parametric IRT Models**

Read: de Ayala, ch. 12

Carol Woods, Empirical selection of anchors for tests of differential item functioning. *Applied Psychological Measurement*, 33 (2009): 42-57.

Ching-Lin Shih and Wen-Chung Wang, Differential item functioning detection using the multiple indicators, multiple causes method with a pure short anchor. *Applied Psychological Measurement* 33 (2009): 184-199.

Robert Mokken and Charles Lewis, A nonparametric approach to the analysis of dichotomous item responses. *Applied Psychological Measurement* 6 (1982): 75-96.

K. Sijtsma, P. Debets, and I.W. Molenaar, Mokken scale analysis for polychotomous items. *Quality and Quantity* 24 (1989): 173-188.

L. Andries van der Ark, Mokken scale analysis in R. *Journal of Statistical Software* 20 (2007): 1-18.

William Jacoby, The structure of ideological thinking in the American electorate. *American Journal of Political Science* 39 (1995): 314-335.

4/13   **Covariance Structure Models for Non-Random Measurement Error**

Read: Donald Green, Susan Goldman, and Peter Salovey, Measurement error masks bipolarity in affect ratings. *Journal of Personality and Social Psychology*, 64 (1993): 1029-1041.

Herbert Marsh, Barbara Byrne, and Rhonda Craven, Overcoming problems in confirmatory factor analyses of MTMM data. *Multivariate Behavioral Research* 27 (1992): 489-507.

Willem Saris, Albert Sartorra, and Germa Coenders, A new approach to evaluating the quality of measurement instruments: The split-ballot MTMM design. *Sociological Methodology* 34 (2004): 311-347.

Beth LaGrange and David Cole, An expansion of the trait-occasion model: Accounting for shared measurement variance. *Structural Equation Modeling* 15 (2008): 241-271.

Laura Castro-Schilo, Keith Widaman, and Kevin Grimm, Neglect the structure of multitrait-multimethod data at your peril. *Structural Equation Modeling* 20 (2013): 181-207.

4/20   **Multi-level and Multiple Group (Measurement Invariance) Models**

Read**:**   Kaplan, ch. 4.4-4.8, ch. 7
        Eldad Davidov, Measurement equivalence of nationalism and constructive
            patriotism in the ISSP: 34 countries in a comparative perspective.
            Political Analysis 17 (2009):64–82.
        Dario Spini, Measurement equivalence of 10 value types from the Schwartz
            value survey across 21 countries. *Journal of Cross-Cultural Psychology*,
            34 (2003): 3-23.
        Daniel Oberski, Evaluating sensitivity of parameters of interest to measurement
            invariance in latent variable models. *Political Analysis* 22 (2014): 22-45.
        Paras Metha and Michael Neale, People are variables too: Multilevel structural
            equations modeling. *Psychological Methods* 10 (2005): 259-284.
        Oliver Ludtke, et al., The multilevel latent covariate model: A new, more reliable
            approach to group-level effects in contextual studies. *Psychological
            Methods* 13 (2008): 203-229.

4/27   **Measurement Models for Longitudinal and Missing Data**

Read: Kaplan, ch. 5.2, 8
        Paul Allison, Estimation of linear models with incomplete data. *Sociological
            Methodology* 1987: 71-103.
        Christian Geiser et al., Distinguishing state variability from trait change in
            longitudinal data: The role of measurement (non) invariance in latent
            state-trait analyses. *Behavior Research Methods* (2014): 1-32.
        Jesus Rosel and Ian Plewis, Longitudinal data analysis with structural equations.
            *Methodology: European Journal of Research Methods for the Behavioral
            & Social Sciences* 4 (2008): 37-50.
        Gary Burkholder and Lisa Harlow, An illustration of a longitudinal cross-lagged
            design for larger structural equation models. *Structural Equation
            Modeling* 10 (2003): 465-486.
        Carol Galias and Andre Blais, Beyond rationalization: Voting out of duty or
            expressing duty after voting? *International Political Science Review*
            (2014): 1-17.

5/4   **Latent Class and Mixture Models**

Read: Kaplan, ch. 9

Jacques A. Hagenaars and Loek C. Halman, Searching for ideal types: The potentialities of latent class analysis. *European Sociological Review* 5 (1989): 81-96.

Eric Loken and Peter Molenaar, Categories or continua? The correspondence between mixture models and factor models. In Gregory Hancock and Karen Samuelsen (eds.), *Latent Variable Mixture Models*, pp. 277-297.

Shaunna Clark et al., Models and strategies for factor mixture analysis: An example concerning the structure underlying psychological disorders. *Structural Equation Modeling* 20 (2013): 681-703.

Gitta Lubke and Bengt Muthén. Investigating population heterogeneity with factor mixture models. *Psychological Methods*, 10, (2005): 21-39.

Benjamin Bagozzi and Bumba Mukherjee, A mixture model for middle category inflation in ordered survey responses. *Political Analysis* 20 (2012): 369-386.