

**POL676**  
Spring 2021  
Email: stanley.feldman@stonybrook.edu

Stanley Feldman  
Office: SBS S-715

### **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 measurement invariance (multiple group and cross-national data), and longitudinal data. Topics will include classical measurement theory, estimation of reliability, item response theory, factor analysis, and general latent variable models (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). Empirical examples in class will demonstrate the utility of various R packages and other major software for estimating measurement models.

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 and provide substantive examples of the application of these models to political and social data. I expect them to be completed before each class.

The course will be taught synchronously (in real time) via Zoom. Most of each class session will be devoted to lectures covering the topic of that week. I will post pdf's of the lecture on Blackboard each week. Code and data files for the empirical examples presented in class will also be posted on Blackboard. Questions are welcomed during the class session and more extensive questions as well as office hours are available on Zoom by request.

#### **Books that should be purchased:**

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

David Kaplan, *Structural Equation Modeling, 2<sup>nd</sup> Ed.*

W. Holmes Finch and Brian French, *Latent Variable Modeling with R*

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. Introduction to Social Measurement

Read: Personality Project (<https://www.personality-project.org/r/book/>), Chapter 2: A Theory of Data.

### 2. Latent Variable Models and Factor Analysis

Read: Ledyard Tucker and Robert MacCallum, *Exploratory Factor Analysis*, chs. 1, 3, 4. (Available at [http://inis.jinr.ru/sl/M\\_Mathematics/MV\\_Probability/MVas\\_Applied%20statistics/Tucker%20L.R.,%20MacCallum%20R.C.%20Exploratory%20factor%20analysis%20\(1997\)\(459s\).pdf](http://inis.jinr.ru/sl/M_Mathematics/MV_Probability/MVas_Applied%20statistics/Tucker%20L.R.,%20MacCallum%20R.C.%20Exploratory%20factor%20analysis%20(1997)(459s).pdf)) and on Blackboard.

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

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

### 3. Exploratory Factor Analysis: Factor Extraction and Rotation

Read: Personality Project (<https://www.personality-project.org/r/book/>), Chapter 6: Constructs, Components, and Factor Models.

Finch and French, ch 2

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.

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

### 4. Covariance Structure Models

Read: Kaplan, chs. 1-3

Finch and French, ch. 3

Frank Schneider, et al. Measuring traits and states in public opinion research: A latent state-trait analysis of political efficacy. *International Journal of Public Opinion Research* 26 (2014): 202-223.

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.

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

**5. Covariance Structure Models: Estimation and Model Fit**

- Read: Kaplan, ch. 4 (pp. 61-69), ch. 5 (except 5.2), ch. 6  
Finch and French, ch. 4  
J. S. Tanaka, Multifaceted 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.

**6. Classical Measurement Theory and Reliability**

- Read: Personality Project (<https://www.personality-project.org/r/book/>), 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.

**7. 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.  
Shawn Trier and Simon Jackman, Democracy as a latent variable. *American  
Journal of Political Science* 52 (2008): 201-217.  
Xiang Zhou, Hierarchical item response models for analyzing public  
opinion. *Political Analysis* 27, no. 4 (2019): 481-502.

## 8. Item Response Theory: Estimation and Goodness-of-Fit

- Read: de Ayala, chs. 3, 4, 9, appendices A, B, C  
Finch and French, ch. 9  
Youn-Jeng Choi and Abdullah Asilkalkan. R packages for item response theory analysis: Descriptions and features. *Measurement: Interdisciplinary Research and Perspectives* 17, no. 3 (2019): 168-175.  
Joshua Clinton, Simon Jackman, and Douglas Rivers, The statistical analysis of legislative behavior. *American Political Science Review* 98 (2004): 355-370.  
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.  
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.

## 9. Differential Item Functioning and Non-Parametric IRT Models

- Read: de Ayala, ch. 12  
Finch and French, ch. 10  
Carol Woods, Empirical selection of anchors for tests of differential item functioning. *Applied Psychological Measurement*, 33 (2009): 42-57.  
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.

## 10. 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.

## 11. Multiple Group (Measurement Invariance) and Multi-level Models

- Read: Kaplan, ch. 4.4-4.8, ch. 7  
Finch and French, ch 5
- Eldad Davidov, Measurement equivalence of nationalism and constructive patriotism in the ISSP: 34 countries in a comparative perspective. *Political Analysis* 17 (2009):64–82.
- Dubravka Svetina, Leslie Rutkowski, and David Rutkowski. "Multiple-group invariance with categorical outcomes using updated guidelines: an illustration using M plus and the lavaan/semtools packages." *Structural Equation Modeling: A Multidisciplinary Journal* 27, no. 1 (2020): 111-130.
- Daniel Oberski, Jereon Vermut, and Guy Moors, Evaluating Measurement Invariance in Categorical Data Latent Variable Models with the EPC-Interest. *Political Analysis* 23 (2015): 550-563.
- 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.

## 12. Measurement Models for Longitudinal Data

- Read: Kaplan, ch. 5.2, 8  
Finch and French, ch. 7  
Jason Prenoveau, Specifying and Interpreting Latent State-Trait Models with Autoregression: An Illustration. *Structural Equation Modeling* 23 (2016): 731-749.  
Elen Hamaker, Rebecca M. Kuiper, and Raoul PPP Grasman. "A critique of the cross-lagged panel model." *Psychological methods* 20, no. 1 (2015): 102.  
John J. McArdle. Latent variable modeling of differences and changes with longitudinal data. *Annual review of psychology* 60 (2009): 577-605.  
Paolo Ghisletta and John J. McArdle. "Latent curve models and latent change score models estimated in R." *Structural equation modeling: a multidisciplinary journal* 19, no. 4 (2012): 651-682.  
Carol Galias and Andre Blais, Beyond rationalization: Voting out of duty or expressing duty after voting? *International Political Science Review* (2014): 1-17.

## 13. Latent Class and Mixture Models

- Read: Kaplan, ch. 9  
Finch and French, ch. 8  
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.

## 14. Discussion of Research Papers