Structural Equation Modeling: Introductory and Intermediate Topics

Workshop
Organised by Prof. Hans-Peter Blossfeld
Speaker: Prof. Tenko Raykov (Michigan State University)

Date: 20 - 21 April 2015
Seminar Room 2, Badia Fiesolana
European University Institute, Florence

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Workshop Outline

This 2-day workshop consists of two parts. Part 1 deals with introductory and intermediate aspects of the increasingly popular methodology of structural equation modeling (SEM; latent variable modeling, LVM) in the political, social, and behavioral sciences. In this part, a coherent introduction to the basics of the methodology is provided, including model identification issues, implied covariance and mean structure, parameter estimation, (robust) maximum likelihood estimation and (asymptotically) distribution-free estimation, as well as model fit evaluation.

Part 2 of the workshop is focused on longitudinal data analysis and modeling using the SEM/LVM framework. This part is concerned specifically with fitting unconditional and conditional (covariate-based) models to data from repeated measure studies, which are increasingly popular in the social sciences. Frequently arising empirical issues in longitudinal designs, such as incomplete data, nesting of subjects (of special relevance and frequency in industrial/organizational settings) as well as non-normality of longitudinally followed measures, are also addressed in this part of the workshop.

Throughout the workshop, multiple empirical examples are provided, as well as input and output files of the highly popular SEM package Mplus are discussed in detail (a self-study booklet on using Stata for SEM is also provided to the participants). The workshop is primarily application oriented and provides instrumental skills and assistance to students and faculty engaged in empirical research in the political and social sciences.

***Keywords**:* covariance structure modeling, incomplete data set, longitudinal analysis, latent variable modeling, non-normality, structural equation modeling, subject clustering/nesting and clustering/nesting effect.

~Requirements for credits: 2 - day attendance and submission of computer exercises~

Literature (copies of the journal articles will be provided to the attendees):

Raykov, T. (2007). Longitudinal analysis with regressions among random effects: A latent variable modeling approach. *Structural Equation Modeling, 14,* 146-169.

Raykov, T., & Marcoulides, G. A. (2006). *A first course in structural equation modeling*. Mahwah, NJ: Erlbaum.

Raykov, T., & Marcoulides, G. A. (2008). *An introduction to applied multivariate analysis*. New York: Taylor & Francis (chapters 12 and 13).

Raykov, T., & Zajacova, A. (2012). On model choice in longitudinal modeling. *Structural Equation Modeling, 19,* 228-239.

Raykov, T., & Penev, S. (2014). Models Selection in Repeated Measure Studies: The Potential of Individual Case Residuals. *Structural Equation Modeling, 21,* 20-30.

Plan of Workshop

(by topic)

***Day* 1**:

1. What is structural equation modeling (SEM), and why is it so popular in the political, social, and behavioral sciences?

2. SEM as an extension of regression analysis to the case of fallible predictors and explanatory variables – can we do without SEM, and what would the price be?

3. Implied covariance matrix, implied means, model identification, fit function – how do we fit models and evaluate their fit in SEM?

4. General principles of developing structural equation models, and the issue of equivalent models.

5. Introduction to the SEM software Mplus – a highly user-friendly package.

6. Path analysis models – models without 'proper' latent variables and how we can fit them within the SEM framework.

7. Confirmatory factor analysis models – how we can proceed when evaluating construct correlations and developing measuring instruments.

***Day* 2**:

1. Structural regression models – relating dependent and explanatory latent variables.

2. The beginnings of longitudinal data modeling – the unconditional intercept and slope model, and the unconditional level and shape model.

3. Extending unconditional models to conditional models.

4. A brief introduction to clustering effects, incomplete data sets, and complex sample design issues in longitudinal modeling.

5. Recent advances in longitudinal data modeling and analysis – confidence intervals of R-squared indexes for dependent variables and of individual case residuals.

6. Longitudinal modeling and model choice in action in messy data settings – how to deal with clustering effect, complex sample designs, and incomplete data, all at once.

7. Conclusion.

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