Latent trait and latent class analysis for cross-national surveys

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Short Biography – Irini Moustaki

Irini Moustaki is a professor of Social Statistics at the London School of Economics and Political Science and was Head of the Statistics Department from January 2010 to December 2012. She has developed methodology for the analysis of categorical and mixed type data collected in Social and Health related Surveys. She is in expert in latent variable models and structural equation models that are widely used in Social Sciences and Educational Testing for measuring and connected unobserved constructs such as attitudes, health status, behaviours, intelligence, performance, etc. Her methodological work includes treatment of missing data, longitudinal data, detection of outliers, goodness-of-fit tests and advanced estimation methods. Furthermore, she has made methodological and applied contributions in the areas of comparative cross-national studies and epidemiological studies on rare diseases.

In 2008 she co-authored the book, Analysis of Multivariate Social Science Data with Bartholomew, Steele and Galbraith that provides a non-mathematical treatment of advanced statistical techniques for social scientists and in 2011 she joined as a co-author and published the third edition of the seminal book on Latent Variable Models and Factor Analysis: a unified Approach with Bartholomew and Knott. She has been the Editor in Chief of Psychometrika since November 2014. She was awarded an honorary doctorate in Statistics from the Faculty of Social Sciences, University of Uppsala in 2013.

Course description

Latent variable models are a broad family of models that can be used to capture abstract concepts by means of multiple indicators. Social scientists know them best in the form of factor analysis and structural equation models, in which continuous latent variables are captured by means of continuous observed variables. However, social surveys and many other applications often yield observed variables that are categorical instead of continuous. In this case, the appropriate latent variable models are latent trait (or item response theory) models for continuous latent variables and latent class models for categorical latent variables.

These methods can also be used to compare the distributions of latent variables between different groups. A common example is comparison of countries using data from cross-national surveys. Before doing so, we should also assess the extent to which we have measured the same concept in the same way across groups. Ignoring this question means that we cannot be confident about making valid comparisons of like with like. This question of "measurement equivalence" or "differential item functioning" can also be examined within the models.

This workshop aims to introduce participants to latent trait and latent class models (Days 1-2), and to multiple group latent trait analysis (Day 3). It provides training in the use of the Mplus programme to carry out the analyses.

Software
Mplus and R. Prior knowledge of either Mplus or R is not required.

Prerequisites
Participants should be familiar with logistic regression modelling. Familiarity with factor analysis and structural equation modelling would be an advantage, but is not essential.

Schedule

June 26, 2016

Time	Topic
9:00-11:00	Introduction to latent variable models Latent trait models for single groups
11:00-11:15	Break
11:15-13:00	Computer Practical

June 27, 2016

Time	Topic
9:00-11:00	Latent trait models for single groups Latent class models for single group**s**
11:00-11:15	Break
11:15-13:00	Computer Practical

June 28, 2016

Time	Topic
9:00-11:00	Latent trait models with a group covariate: differential item functioning in latent trait models.
11:00-11:15	Break
11:15-13:00	Computer Practical

References

Bartholomew, D.J, Steele, F., Moustaki, I. and Galbraith, J. (2008) Analysis of Multivariate Social Science Data (2nd ed.) Chapman and Hall/CRC.

Online material can be downloaded from
http://www.lse.ac.uk/statistics/research/Social-Statistics/Multivariate-Data-Analysis/Second-Edition.aspx

Draft Day timetable:

Monday 26th June and Tuesday 27th June

Introduction to latent variable models
Real examples will be presented to illustrate their use and their ability to address various research questions. Latent variable modelling can be used for constructing scales, measuring unobserved constructs such as values, attitudes and knowledge from observed indicators (items) as well as for testing social theories using observational studies and for data reduction.

Latent trait models for single groups
In this module we will present models that assume a continuous latent variable, factor analysis type models (continuous latent variables) for categorical (binary, nominal, ordinal) observed responses (items) for a single population. Emphasis will be given on the model specification, model assumptions and interpretation of parameters. Goodness-of-fit test statistics and measures as well as model selection criteria will be discussed. Scoring of the sampled members on the identified latent dimensions will be presented.

Tuesday 27th June

Latent class models for single groups
In this module we will present models that assume a discrete latent variable (latent class). Latent class models can be considered as an equivalent to a model-based cluster analysis. Observed indicators will be categorical (binary, nominal, ordinal). Emphasis will be given to the model specification, model assumptions and interpretation of parameters. Goodness-of-fit test statistics and measures as well as model selection criteria will be discussed.

Wednesday 28th June

Latent trait models with a group covariate: differential item functioning in latent trait models.
We now extend the models to account for multiple groups such as different countries in cross-national survey research. When the same model is fitted simultaneously in all groups, we are usually most interested in comparing levels of the latent variables across the groups. Before we do that, however, we should also examine   measurement invariance of the measuring instruments (items). In practice measuring instruments can be found to behave differently in different groups, which limits our ability to make comparisons of the latent distributions across groups. This is known as differential item functioning which implies that an item is characterised by different parameters in each group. Model selection criteria for choosing

among models with different levels of invariance will be discussed as well as the implication of differential item functioning in comparative cross-national studies.

Practical sessions

The lectures will be accompanied by practical sessions. The practical sessions will introduce participants to latent variable modelling in Mplus software via a number of examples of latent trait models. The example data will be taken from known Social Surveys such as the Eurobarometer and European Social Surveys.