Programme 2: An Introduction To Multivariate Statistics
From The Perspective Of Latent Variables

Topics will include:

- Recent developments in multivariate analysis
- The general linear model
- Measurement models and confirmatory factor analysis
- Path analysis
- The full LISREL model
- Methods for the analysis of change
- Psychometric models for measurement evaluation

Workshops presented by:

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The analysis of data within the behavioural and social sciences has undergone many changes during the past 50 years. Major shifts have occurred in how research is designed and especially analysed. It is now readily accepted that all measurement contains error and that this needs to be controlled. There is a ready recognition that a distinction should be made between variables that are observed (manifest) and the concept of which the observed measure is a manifestation. Further, there is the recognition that statistical control, as exemplified in multivariate statistical models, can be used as an effective means of control. Hence, since the 1950s we have witnessed the demise of the single variable model and associated bivariate statistics in favour of statistical methods where multiple variables can be controlled, rather than placing a total reliance on experimental controls. Multivariate approaches are now well developed for use with both continuous and discrete measures. Modern multivariate approaches to data analysis allow greater flexibility in model specification, the assessment of model fit, and the control of measurement error. In addition the incorporation of mean structures into the general linear model allows for the formulation of ANOVA type models without the associated restrictive distributional assumptions being imposed.

These workshops are intended as an introduction to LISREL based statistical methods that are becoming increasingly popular in the socio-behavioural sciences. The course will cover many of the main uses of SEM such as confirmatory factor analysis, path analysis (with and without error), and modelling the relationships between latent variables. Each day will be comprised of a taught component, a practical session, and a question and answers session. No experience of the LISREL software is required.

Suggested reading:


Multivariate Statistics From The Perspective Of Latent Variables:
Course Outline

Day 1  The history and foundations of structural equation modelling and measurement models.

The LISREL model, or more generally structural equation modelling, emerged from distinct statistical traditions. SEM incorporates the factor analytic and econometric type models into a more flexible general linear model. This workshop will examine the historical and statistical foundations of SEM, and introduce the ideas associated with measurement models and confirmatory factor analysis (CFA). The specification, estimation and interpretation of CFA’s will be demonstrated. In addition the use of PRELIS, a pre-processor for LISREL, will be demonstrated. Many statistical models can be specified and estimated using PRELIS. Non-traditional models for the evaluation of measurement quality will be described and their application demonstrated.

Day 2  Path analysis

Path analysis is a very flexible class of models that allow complex hypotheses to be tested. Path analysis extends the basic multiple regression type model by allowing the specification of mediating variables and multiple outcome variables. Tests of model fit are available. This workshop will deal with issues relating to the effects of measurement error in path analysis and propose ways to reduce its deleterious effects. A series of models will be specified and tested using the LISREL software.

Days 3  The full LISREL model

The full LISREL model incorporates aspects of factor analysis and path analysis. It allows the estimation of relationships at the latent, rather than observed, level. SEM is a largely confirmatory, rather than exploratory, technique and the various approaches to modelling data will be addressed. Extensions to the LSIREL model will be introduced, such as multiple group analysis, mimic models, and latent growth curves.

The course will be delivered by means of lectures and hands-on practical work. The final session of each day will include a question and answers session. There will be an opportunity for everyone to discuss his or her own research interests.