

**THE UNIVERSITY OF HONG KONG
GRADUATE SCHOOL**

Workshop Outline
Structural Equation Modelling
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This workshop introduces structural equation modelling as a tool for examining latent constructs and for analysing structural relationships between (latent) variables. The goals of the workshop are to help students (1) acquire an understanding of latent variable modelling; (2) gain an understanding of the aims of confirmatory factor analysis; (3) understand the differences between path analysis and latent variable regression; (4) learn to implement, examine and interpret confirmatory factor analysis and latent regression models using a software package; and (5) develop an awareness of common problems in structural equation models.

Aims of the workshop

- (a) Provide students with the knowledge that will allow them to properly build different structural equation models;
- (b) Enable students to differentiate between exploratory and confirmatory factor analytical models;
- (c) Provide students with the knowledge about appropriate procedures for building reliable scales;
- (d) Enable students with the knowledge that will allow them to differentiate between path analysis and latent regression models;
- (e) Provide students with the skills that will allow them to implement a software package that performs different structural equation models.

Workshop organization

The workshop will consist of lectures and hands-on activities during which students will have the opportunity to implement the introduced procedures using the software package Amos. Students can use the computers in the classroom or bring their own laptops with Amos readily installed prior to the workshop (a 14-day trial version of SPSS Amos is available from the IBM website; see reference materials below).

The workshop will be split into two afternoon sessions from 2:00 pm to 5:00 pm on 31 May and 1 June 2018. The first day (31 May 2018) introduces the foundations of structural equation modelling (SEM). It will discuss reliability and validity in the context of SEM, distinguish between manifest and latent variables, and examine how to define a latent construct. The second part of this session introduces the measurement model. Students will acquire knowledge of confirmatory factor analysis (CFA) and the parameters involved. It discusses how to specify models, model identification, as well as parameter estimation and the evaluation of model fit.

The second day (1 June 2018) focusses on the structural model and advanced issues in SEM. It introduces path analysis and latent regression. The concepts of direct and indirect effects, together with how these are implemented in path analysis and latent regression, will be discussed. The second part of this session discusses pitfalls, problems and dangers of SEM. It also offers an outlook on more advanced topics in SEM (e.g. multigroup analysis, mean structures, measurement invariance).

Pre-requisite training/knowledge

Basic statistical concepts such as “correlation” and “covariance” are essential to the course. Knowledge of analysis of variance and of simple linear regression is also required to follow the workshop. Basic knowledge of exploratory factor analysis may be helpful but is not required prior to attending the workshop.

Reference materials

- Bandalos, Deborah L.; Finney, Sara J. (2010): Factor analysis. Exploratory and confirmatory. In: Gregory R. Hancock and Ralph O. Mueller (Eds.): *The Reviewer's Guide to Quantitative Methods in the Social Sciences*. New York, NY: Routledge, pp. 93–114.
- Brown, Timothy A. (2015): *Confirmatory Factor Analysis for Applied Research*. 2nd ed. New York, NY: The Guilford Press. [incl. datasets and command files: <http://sites.bu.edu/tabrown/cfabook/>]
- Byrne, Barbara M. (2016): *Structural Equation Modeling with AMOS. Basic Concepts, Applications, and Programming*. 3rd ed. New York, NY: Routledge. [incl. datasets: www.routledge.com/9781138797031]
- Hoyle, Rick H. (Ed.) (2012): *Handbook of Structural Equation Modeling*. New York, NY: The Guilford Press. [incl. companion files: <http://www.handbookofsem.com/>]
- Hu, Li-tze; Bentler, Peter M. (1999): Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling* 6(1), pp. 1–55.
- Keith, Timothy Z. (2015): *Multiple Regression and Beyond. An Introduction to Multiple Regression and Structural Equation Modeling*. 2nd ed. New York, NY: Routledge. [incl. datasets and command files: <http://tzkeith.com/data-files/>]
- Kline, Rex B. (2016): *Principles and Practice of Structural Equation Modeling*. 4th ed. New York, NY: The Guilford Press. [incl. companion files: <https://www.guilford.com/companion-site/Principles-and-Practice-of-Structural-Equation-Modeling-Fourth-Edition/9781462523344>]
- Lomax, Richard G. (2010): Structural equation modeling. Multisample covariance and mean structures. In: Gregory R. Hancock and Ralph O. Mueller (Eds.): *The Reviewer's Guide to Quantitative Methods in the Social Sciences*. New York, NY: Routledge, pp. 385–395.
- MacKinnon, David P. (2008): *Introduction to Statistical Mediation Analysis*. London, UK: Lawrence Erlbaum Associates.
- Mueller, Ralph O.; Hancock, Gregory R. (2010): Structural equation modeling. In: Gregory R. Hancock and Ralph O. Mueller (Eds.): *The Reviewer's Guide to Quantitative Methods in the Social Sciences*. New York, NY: Routledge, pp. 371–383.
- Raykov, Tenko; Marcoulides, George A. (2006): *A First Course in Structural Equation Modeling*. 2nd ed. Mahwah, NJ: Lawrence Erlbaum Associates.
- SPSS Amos [14-day trial for version IBM® SPSS® Amos 22.0 via: https://www-01.ibm.com/marketing/iwm/iwmdocs/tnd/data/web/en_US/trialprograms/G556357A25118V85.html]
- Structural Equation Modeling: A Multidisciplinary Journal* [journal publishes articles on current issues related to SEM: <https://www.tandfonline.com/toc/hsem20/current>]