

COURSE TITLE: Structural Equation Modeling (SEM)

INSTRUCTOR: Levente Littvay

CONTACT DETAILS

Department of Political Science

Central European University

FT 805

Nador u. 9.

Budapest, H-1051

Hungary

E-mail: littvayl@ceu-budapest.edu / **Twitter/Skype/Facebook:** Littvay

COURSE DESCRIPTION

The method is designed to test causal structures that go beyond one dependent and multiple independent variables of regression models. It allows for the assessment of complex multivariate relationships between observed variables with the inclusion of latent variable models. For example, causal structures are becoming increasingly important when testing relationships that are mediated. Latent variable models are useful when multiple indicators of the same underlying construct are measured. Such models allow for a more measurement error free estimation of relationships. The course instructs both the theoretical foundations (online) and the applied use (on-campus) of structural equation models discussing both the powers and limitations of the method. Solid knowledge of multivariate regression and basic knowledge of factor analysis is a non-negotiable pre-requisite for the course.

Aims

Online: The course offers a complete introduction to structural equation modeling (SEM).

On-campus: The On-CAMPUS component of the course offers a computer laboratory workshop to the course where examples of path, confirmatory factor and full structural models will be presented. After this, people will have the opportunity to work on, present and refine their own research projects using SEM.

Learning outcomes

Online: After the completion of the course people will be able to understand applied research papers using structural equation models. They will have the ability to pick up a SEM software's user manual and start applying the theoretically based knowledge to real life research.

On-campus: After the completion of the workshop people will have the ability to run structural equation models (including path models, confirmatory factor models and full structural models) in a statistical software. Additionally people will gain invaluable experience through the practice of both developing and refining their own research using structural equation models and reviewing, assessing and commenting on others' work.

Assessment

Online: Online Learning Checks (100%)

On-campus: Computer Based Exercises (30%)

Presentation (30%)

Final Research Paper (40% due September 5)

Schedule

Online

Videos will be available from 10 May, 2014 onwards.

On-campus

June 24 – 27, 2014

Pre-requisites

A solid understanding of linear regression that goes beyond knowing how to run a regression in the software and interpret the results. An in depth understanding of how multiple regression works and what are its assumptions. The knowledge level does NOT have to include the understanding of mathematical proofs related to the OLS estimator as this is mainly an applied statistics course. Basic understanding of maximum likelihood estimation is a plus but we will also go through it. Information necessary for this class is described well in the following texts. Michael Lewis-Beck. (1980). *Applied Regression: An Introduction*. Newbury Park, CA: Sage and John Fox. (1991) *Regression Diagnostics*. Newbury Park, CA: Sage (Both books are from the Quantitative Applications in the Social Science, aka. little green books, series.)

If you wish to attend the On-CAMPUS component (or for maximum utility) of the course, you should also be comfortable to conduct basic data management, import and export and the analyses described in the listed books in at least one statistical package of your choice. You also need to be open to learning other statistical packages.

Target group

Anyone with a solid knowledge of regression analysis who wish to take their knowledge beyond into the realm of Structural Equation Modeling and wish to apply the method to their research. Course can be useful for anyone from early career graduate student to late career researchers with these goals.

List of the disciplines the course may be connected to

Course content is applicable to all fields of empirical research including both natural and social sciences. Since examples will come from a wide range of research scenarios, some level of flexibility and effort is required from the participants to understand straightforward examples from disciplines other than their own.

Application requirements

Short CV including education, academic activity and a 150-word summary of research interest.

Statement of Purpose.

Brief summary of relevant prior training in quantitative methods.

ON-CAMPUS: Project Proposal (No more than 1200 words including a paragraph on why the participant believes SEM the appropriate method of analysis.)

Background readings

Michael Lewis-Beck. (1980). *Applied Regression: An Introduction*. Newbury Park, CA: Sage

John Fox. (1991) *Regression Diagnostics*. Newbury Park, CA: Sage

Jae-On Kim, Charles W. Mueller (1978) *Factor Analysis: Statistical Methods and Practical Issues*, Newbury Park, CA: Sage

(All three cited books are from the SAGE Quantitative Applications in the Social Science, which are also known as little green books, series.)

Schedule

Online component

May 10 - June 23, 2014

	Topic title	Mandatory Readings
Intro	Course overview	
1	Introduction to what SEM is and Review of Relevant Statistical Concepts	Kline Ch 1-3
2	Model Specification	Kline Ch 5
3	Model Identification	Kline Ch 6
4	Estimation and Hypothesis Testing	Kline 7-8
5	Recursive and Non-recursive Path Models and Model Modification: (Examples: Path Models, Mediation and Panel Causation)	
6	Confirmatory Factor Models	Kline Ch 9
7	Full Structural Models (including multi-step and one step modeling)	Kline Ch 10
8	Introduction to Advanced Techniques I: Mean Structures, Latent Growth Missing Data Correction, Generalized SEM with Link Functions	Kline Ch 11
9	Introduction to Advanced Techniques II: Multiple Group Analysis, Invariance, Mixture and Multilevel SEM	Kline Ch 12
10	Pitfalls and Fair Warning	Kline Ch 13

Mandatory Reading:

Rex B. Kline (2011) *Principles and Practice of Structural Equation Modeling (Third Edition)*. Guilford Press.

Additional Optional Readings Will Be Cited in the Presentations

(These should be read for additional context, if needed, only after the presentation.)

On-campus component

June 24 - 27, 2014

Day	Topics (estimate about 5hrs of work)
1 Intensive Workshop	Data Management, Path Models, Confirmatory Factor Models, Full Structural Models
2 Project Presentations	Individual Presentations with Discussion
3 Project Development	Small Group Work on Project Improvement