BS84 2016

**SEM in R**

Lecture Times: Monday 10:45-12:30, in SP A 01.14

Practicum Times: Monday 13:45-15:30, in SP A -1.55A&B

Coordinator: William Burk (w.burk@psych.ru.nl)

Instructor: William van der Veld

**Required Text**

See reading list (page 2)

**Objectives**

Upon successful completion of the course, students will be able to apply a variety of statistical techniques utilizing structural equation models to address specific research questions. Students will be able to recognize, evaluate and interpret various types of parameter estimates, and be able to judge the appropriateness of the use of structural equation models presented in the scientific literature. Most importantly, students who successfully complete the course will be able to describe the theoretical underpinnings of structural equation models, and utilize these methods in their subsequent research.

**Structure**

Topics will be covered in the sequence indicated on the schedule (page 3). Selected articles/chapters are to be read BEFORE each class. Additional material will also be introduced in lectures. Some lectures require more preparation (reading) time than others.

The course is divided into lecture-based and laboratory-based components. In the first part, instructors will present the topic and provide examples. In the second part, the computer laboratory will be used to obtain hands-on experience by completing homework assignments and the midterm exam.

**Evaluation**

Your course grade will be based on the midterm (45%) and final exams (45%), with the remaining 10% based on homework assignments. The midterm exam will be given after the third lecture, and students will be provided three weeks to perform the appropriate set of statistical analyses and writing the results in APA style. The final exam will be given at the conclusion of the course (June 27). The four homework assignments are graded as pass/fail. The schedule of homework assignments and due dates is in the attached table.

Homework assignments and the take-home portion of the exam are individual assignments. No two assignments (exams) may be identical. If two assignments are identical or almost identical, both assignments will receive a score of 0. There will be no discussion about such a decision and there will be no opportunity to make up the assignment.

Standard Rules

A minimum of a 6 must be achieved for both exams. If you have passed a grading component, retaking that (part of the) course examination is not allowed without permission of the Examination Board. You can only use the second opportunity if 1) you have taken the first opportunity and failed or 2) if you missed the first opportunity due to illness or other special personal circumstances. Not handing in an assignment or exam on time (without notice beforehand) will mean that you failed the first opportunity.

**Reading list**

**Missing Values**

**(1)** Chapter by Newman (see BB). Missing data techniques and low response rates: The role of systematic nonresponse parameters

**(2)** Jon Starkweather’s summary of R packages: <http://www.unt.edu/rss/class/Jon/Benchmarks/MissingValueImputation_JDS_Nov2010.pdf>

**SEM basics**

**(3)** Chapter 14 in T&F on SEM by Ullman **AND/OR** Ullman, J. B. (2006). Structural equation modeling: Reviewing the basics and moving forward. *Journal of Personality Assessment, 87*(1), 35-50

**R packages for SEM (required)**

**(4)** Rosseel, Y. (2012). lavaan: A R package for structural equation modeling. *Journal of*

*Statistical Software, 48*(2), 1-36.There is also a tutorial and manual (Rosseel, 2013) available on the Lavaan Project website: <http://lavaan.ugent.be/>

(5) Epskamp, S. (2015). semPlot: Unified visualizations of structural equation models, *Structural Equation Modeling: A Multidisciplinary Journal*, DOI: 10.1080/10705511.2014.937847

**R packages for SEM (optional)**

(6) Boker, S. Neale, M., Maes, H., Wilde, M., Speigel, M., Brick, T. etal. (2011). openMx: An open source extended structural equation modeling framework. *Psychometrika, 76* (2), 306-317.

(7) Fox, J. (2006) TEACHER'S CORNER: Structural equation modeling with the sem package in R. *Structural Equation Modeling: A Multidisciplinary Journal, 13*(3), 465-486.

**Advanced topics**

**(8)** Saris, W.E., Satorra, A., & Van der Veld, W.M. (2009) Testing structural equation models or detection of misspecifications? *Structural Equation Modeling: A Multidisciplinary Journal*, *16*(4), 561-582.

**(9)** Marsh, H.W., Hau, K-T. & Wen, Z. (2004). In search of golden rules: Comment on hypothesis-testing approaches to setting cutoff values for fit indexes and dangers in overgeneralizing Hu and Bentler's (1999) findings. *Structural Equation Modeling: A Multidisciplinary Journal, 11*(3), 320-341.

**(10)** Van de Schoot , R., Lugtig, P. & Hox, J. (2012). A checklist for testing measurement

invariance. *European Journal of Developmental Psychology, 9*(4), 486-492.

**(11)** Bollen, K.A., & Pearl, J. (2012). Eight myths about causality and structural equation models. In S.L. Morgan (Ed.), *Handbook of Causal Analysis for Social Research* (pp. 301-328). Springer.

**Exploratory factor analysis**

**(12)** Chapter 17 in FMF (Exploratory Factor Analysis)

**(13)** Chapter 13 in T&F (Principal Components and Factor Analysis)

BS84 2016

Course Schedule

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Class # | Date | | Instructor | Topic | Reading | Assignments | Assignments Due |
| 1 | 11-4 | | WvdV/WB | Model estimation, specification, and testing; Missing values |  | HW1 & HW2 |  |
| 2 | 18-4 | | WvdV/WB | Model improvement and evaluation; Confirmatory factor analysis | 1-5 | HW3 | HW2 |
|  | | **BREAK (2 week)** | | | | | |
| 3 | 9-5 | | WB/WvdV | Problems in estimation and testing: Trouble-shooting | 8-9 | Take-home exam | HW3 |
|  | | **BREAK (1 week)** | | | | | |
| 4 | 23-5 | | WB/WvdV | Moderation, multiple group analysis, measurement invariance | 10 |  |  |
| 5 | 30-5 | | WvdV/WB | Causal modeling (mediation) | 11 | HW4 | Take-home exam |
| 6 | 6-6 | | WvdV/WB | Longitudinal modeling (autoregression) |  |  | HW4 |
| 7 | 13-6 | | WB/WvdV | Exploratory factor analysis | 12-13 | HW5 | HW1 |
|  | 27-6 | |  | Exam |  |  |  |

Note. WB = William Burk; WvdV = William van den Veld