

# Covariance Based Structural Equation Modeling Using R Workshop Outline

## Covariance and Covariance Algebra

- Covariance
- Zero Centering Values
- Example 1
- Example 2

## Basic SEM Modeling

- Model Parameters
- Typical Modeling Rules
- What the Model Does Allow
- What the Model Does Not Allow
- Different SEM Models

## Modeling in R

- Installing R
- Loading Packages
- SEM Modeling in R
- A Simple Example
- Reading the Model
- A CFA Example
- A Structural Example

## Model Identification & Parameter Aliasing

- Identification Rules

## Model Estimation

- Estimating  $\mathbf{S}$  and  $\Sigma$
- Adjusting the Model and  $\Sigma$
- Gradient Method
- Modification Indices
- Significance Test
- The CHI Square Test
- Fit  $\neq$  Specification
- Explained Variance
- Standardized Coefficients
- Validity and Reliability
- Example 1
- Example 2
- Example 3
- Convergence Failure
- Supplying Initial Values
- Example 3a
- Supplying Estimated Parameter Size
- Example 4
- SEM Diagnostics
- Modification Indices in R
- Examples 5 – 9

Formative versus Reflective Indicators

Mis-specification

Alternative Conceptualization

Summary of Model Testing

Testing Models

Fit and “Correctness”

Publishing SEM

Covariance Based SEM and PLS

Objectives

Common Myths

Advanced Topics

SEM and Sample Size

Sample Size Issues

Sample Size and CHI Square

Simulation

Statistical Power

RMSEA Power in R

Sample Size in R

Multivariate Normality

MV Normality Tests

Mardia’s Coefficient

MV Shapiro Test

Non-Normal Data

Bootstrapping

Robust Parameter Estimates

Categorical Variables

Polychoric Correlations

Multiple Group Analysis

Measurement/Factorial Invariance

Multiple Groups in R

Adjusting DF in R

Missing Values

ML-based Methods

Imputation with EM

More Advanced Topics

Resources