Package ‘SEMModComp’

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Author Roy Levy
Maintainer Roy Levy <Roy.Levy@asu.edu>
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**SEMModComp-package**

Conduct tests of difference in fit for mean and covariance structure models as in structural equation modeling (SEM)

Description

Chi-squared and normal theory likelihood ratio tests for mean and covariance structure models as in structural equation modeling (SEM). Used to statistically compare models in accordance with the framework described by Levy and Hancock (2007).

Details

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Type: Package
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License: GPL (version 3 or later)
LazyLoad: yes

Author(s)

Roy Levy <Roy.Levy@asu.edu>

References


ChiSquaredLRTest

Conduct Chi-Squared Likelihood Ratio Test for Mean and Covariance Structure Models

Description

ChiSquaredLRTest

Usage

ChiSquaredLRTest(x, model.1.mean.vector, model.1.cov.matrix,
model.1.df, model.2.mean.vector,
model.2.cov.matrix, model.2.df)

Arguments

x
The raw data arranged with subjects as rows and measured variables as columns.

model.1.mean.vector
The model-implied mean vector from model 1, the more restricted (nested) model. If no value is supplied, will employ the mean vector from the sample.

model.1.cov.matrix
The model-implied covariance matrix from model 1, the more restricted (nested) model. If no value is supplied, will employ the covariance matrix from the sample.

model.1.df
The degrees of freedom for model 1, the more restricted (nested) model. If no value is supplied, will set equal to 0.

model.2.mean.vector
The model-implied mean vector from model 2, the more general model. If no value is supplied, will employ the mean vector from the sample.

model.2.cov.matrix
The model-implied covariance matrix from model 2, the more general model. If no value is supplied, will employ the covariance matrix from the sample.

model.2.df
The degrees of freedom for model 2, the more general model. If no value is supplied, will set equal to 0.

Details

The test is used to test for distinguishability and difference in fit between two models that are hierarchically related (i.e., nested) via referring -2* the likelihood ratio to a central chi-squared distribution with degrees of freedom equal to the difference in degrees of freedom for the two models. The test may also be used to conduct the chi-squared test of model fit for an individual model by not employing arguments for model 2. The test is also used (twice) to test for distinguishability in partially overlapping models See Levy, R., & Hancock, G. R. (2007). A framework of statistical tests for comparing mean and covariance structure models. Multivariate Behavioral Research, 42, 33-36. The function will perform listwise deletion in order to analyze a data set with no missing data. If the mean vector(s) and/or covariance matrix(ies) are not supplied for the models, the program will employ the estimates from the sample. If the number of degrees of freedom is not supplied for a model the program will employ a value of 0.

Value

a list containing:

N Total number of subjects in the data set
N.complete.data Number of subjects with complete data used in the analysis
ChiSquaredLRTest

LR The value of the likelihood ratio statistic
chi.sq.stat The test statistic. Under the null hypothesis of no difference in fit
df.test The degrees of freedom of the test, evaluated as (model.1.df-model.2.df)
p The p-value for the observed test statistic

Author(s)

Roy Levy <Roy.Levy@asu.edu>

References


Examples

# Load the data, model-implied moments, and degrees of freedom for the # comparison of Model A to Model C (the BFPD-C) in Levy and Hancock (2007) data(cigandalc.dat) data(model.A.mean.vector) data(model.A.cov.matrix) data(model.A.df) data(model.C.mean.vector) data(model.C.cov.matrix) data(model.C.df)

# Conduct the chi-squared difference LR test for the comparison of Model A # to Model C (the BFPD-C) in Levy and Hancock (2007) LR.model.A.to.model.C <- ChiSquaredLRTest( x = cigandalc.dat, model.1.mean.vector = model.C.mean.vector, model.1.cov.matrix = model.C.cov.matrix, model.1.df = model.C.df, model.2.mean.vector = model.A.mean.vector, model.2.cov.matrix = model.A.cov.matrix, model.2.df = model.A.df )

# Conduct the chi-squared LR test for Model A in Levy and Hancock (2007) # Illustrates the use of the function to evaluate a single model # (equivalently, in comparison to a saturated model) LR.model.A <- ChiSquaredLRTest( x = cigandalc.dat, model.1.mean.vector = model.A.mean.vector, model.1.cov.matrix = model.A.cov.matrix, model.1.df = model.A.df )
cigandalc.dat

Raw data on cigarette and alcohol use

Description

Values from 1204 subjects on 8 variables related to cigarette and alcohol use

Usage

data(cigandalc.dat)

Format

A data frame with 1204 observations on 8 variables.

Source


References


model.A.cov.matrix

Model A’s model-implied covariance matrix

Description


Usage

data(model.A.cov.matrix)

Source

References


---

**model.A.df**  
*Model A's degrees of freedom*

**Description**


**Usage**

```
data(model.A.df)
```

**Source**


---

**model.A.mean.vector**  
*Model A's model-implied mean vector*

**Description**


**Usage**

```
data(model.A.mean.vector)
```

**Source**

References


---

**Model B’s model-implied covariance matrix**

Description


Usage

data(model.B.cov.matrix)

Source


---

**Model B’s degrees of freedom**

Description


Usage

data(model.B.df)

Source

References


model.B.mean.vector

Model B’s model-implied mean vector

Description


Usage

data(model.B.mean.vector)

Source


References


model.C.cov.matrix

Model C’s model-implied covariance matrix

Description


Usage

data(model.C.cov.matrix)

Source

References


---

**model.C.df**

### Model C’s degrees of freedom

**Description**

The number 26, the degrees of freedom for Model C (the BFPD-C) in the illustration in Levy, R., & Hancock, G. R. (2007). A framework of statistical tests for comparing mean and covariance structure models. Multivariate Behavioral Research, 42, 33-36.

**Usage**

```r
data(model.C.df)
```

**Source**


---

**model.C.mean.vector**

### Model C’s model-implied mean vector

**Description**


**Usage**

```r
data(model.C.mean.vector)
```

**Source**

References


NormalTheoryLRTest

Conduct Normal Theory Likelihood Ratio Test for Mean and Covariance Structure Models

Description


Usage

NormalTheoryLRTest(x, model.1.mean.vector, model.1.cov.matrix,
model.2.mean.vector, model.2.cov.matrix)

Arguments

x
The raw data arranged with subjects as rows and measured variables as columns.

model.1.mean.vector
The model-implied mean vector from model 1. If no value is supplied, will employ the mean vector from the sample.

model.1.cov.matrix
The model-implied covariance matrix from model 1. If no value is supplied, will employ the covariance matrix from the sample.

model.2.mean.vector
The model-implied mean vector from model 2. If no value is supplied, will employ the mean vector from the sample.

model.2.cov.matrix
The model-implied covariance matrix from model 2. If no value is supplied, will employ the covariance matrix from the sample.

Details

The test is used to test for difference in fit between two models that are (a) partially overlapping and distinguishable with unique best fitting probability distributions (BFPDs), or (b) completely nonoverlapping (and therefore distinguishable with unique BFPDs). See Levy, R., & Hancock, G. R. (2007). A framework of statistical tests for comparing mean and covariance structure models. Multivariate Behavioral Research, 42, 33-36; especially equations 19, 7, and 10. The function will perform listwise deletion in order to analyze a data set with no missing data. If the mean vector(s) and/or covariance matrix(ies) are not supplied for the models, the program will employ the estimates from the sample.
NormalTheoryLRTest

Value

a list containing:

N Total number of subjects in the data set
N.complete.data Number of subjects with complete data used in the analysis
LR The value of the likelihood ratio statistic
Omega.hat The estimated standard deviation involved in the T statistic
T The test statistic. Under the null hypothesis of no difference in fit, T is asymptotically \( \sim N(0,1) \)
p The 2-tailed p-value for the observed test statistic T

Author(s)

Roy Levy <Roy.Levy@asu.edu>

References


Examples

# Load the data and model-implied moments for the comparison of Model A to Model B in Levy and Hancock (2007)
data(cigandalc.dat)
data(model.A.mean.vector)
data(model.A.cov.matrix)
data(model.B.mean.vector)
data(model.B.cov.matrix)

# Conduct the normal theory LR test for the comparison of Model A to Model B in Levy and Hancock (2007)
LR.model.A.to.model.B <- NormalTheoryLRTest(
x = cigandalc.dat,
model.1.mean.vector = model.A.mean.vector,
model.1.cov.matrix = model.A.cov.matrix,
model.2.mean.vector = model.B.mean.vector,
model.2.cov.matrix = model.B.cov.matrix
)

ReadSymMatrixFromTriangle

*Read in a symmetric matrix from a data file containing the triangle of the matrix and the main diagonal*

**Description**

Produces a symmetric matrix (e.g., a covariance matrix) from a file that contains the triangle of the matrix and the main diagonal. Structural equation modeling (SEM) programs often report model-implied covariance matrices by reporting the lower triangle (containing covariances) and the diagonal (containing variances).

**Usage**

`ReadSymMatrixFromTriangle(file, n.vars)`

**Arguments**

- **file**: Path to data file containing the triangle and main diagonal of the matrix.
- **n.vars**: The number of rows and columns in the matrix (i.e., the number of variables).

**Value**

A symmetric matrix with `n.vars` rows and `n.vars` columns.

**Author(s)**

Roy Levy <Roy.Levy@asu.edu>
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