Package 'MonteCarloSEM'

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Type Package

Title Monte Carlo Data Simulation Package

Version 0.0.3

Description Monte Carlo simulation allows to test different conditions given to the correct structural equation models. This package runs Monte Carlo simulations under different conditions (such as sample size or normality of data). Within the package data sets can be simulated and run based on the given model.
First, continuous and normal data sets are generated based on the given model. Later Fleishman's power method (1978) <DOI:10.1007/BF02293811> is used to add non-normality if exists. When data generation is completed (or when generated data sets are given) model test can also be run.

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R topics documented:

`fcors.value` *This function specifies correlation matrix between the factors.*

Description

The user specifies the correlation matrix between the factors. The values entered should be between -1 and +1. The values can be given by column or row but should be given in an order. Please see the example for a correlation among three-factors. In case there is only one factor fallowing line should be entered "cors.value(nf=1, cors=c(1,1,1))"

Usage

```
fcors.value(nf, cors)
```

Arguments

`nf`	the number of factor/s.
`cors`	vector of the correlations.

Value

The function returns factor correlation matrix. This is a symmetric matrix, which shows the correlation values among the factors in the model.

Author(s)

Fatih Orcan

Examples

```
# This example represents a three-factor CFA model
#
fcors.value(nf=3, cors=c(1,.5,.6,.5,1,.4,.6,.4,1))
```

`fit.simulation` *This function runs a model for simulated data by using lavaan package.*

Description

Generated data sets (Generated by sim.skewed() or sim.normal() functions) will be fitted to pre-specified model. The lavaan package is used to fit the model. After running the model, fit indices and parameters estimated with their standard errors will be printed to a Comma Separated Values (csv) file. The name of the output file is "All_Results.csv". Each line in the file represents results of a simulation. The columns are self explanatory but the second column (named Notes) needs more detailed explanation. This column shows if the model convergency. If the model is converged without any problem the value will be "CONVERGE" If it is not converged the value will be "NON-CONVERGE" and all the values in the line will be "NA" If there are some kind of warning (such as negative variance) during the model run the value will be "WARNING" and based on the warning type some of the values might me "NA". To run the simulation previously generated data sets and the list of the data sets (Data_List.dat) should be located into the same folder at the working directory.

Usage

```
fit.simulation(model, PEmethod = "ML", dataList = "Data_List.dat", f.loc)
```

Arguments

model	Lavaan model
PEmethod	Parameter estimation method. The default is ML.
dataList	List of the names of data sets generated earlier.
f.loc	File location. It indicates where the simulated data sets are located.

Author(s)

Fatih Orcan

Examples

```
lavaanM<-'
#CFA Model
f1 =~ NA*x1 + x2 + x3
f2 =~ NA*x4 + x5 + x6
f3 =~ NA*x7 + x8
#Factor Correlations
f1 ~~ f2
f1 ~~ f3
f2 ~~ f3
#Factor variance
f1 ~~ 1*f1
f2 ~~ 1*f2
f3 ~~ 1*f3
'
dl<-"Data_List.dat"  # should be located in the working directory.

fit.simulation(model=lavaanM, PEmethod="MLR", dataList=dl, f.loc=tempdir())
```

loading.value *This function specifies factor loading values.*

Description

The user specifies the factor loadings as a matrix. The values should be given by column for each factor. Columns represent factors and rows represent items. The values entered should be larger than 0 and smaller then 1. Please see the example for a loading matrix for three-factor model.

Usage

```
loading.value(nf, fl.loads)
```

Arguments

nf	the number of factor/s.
fl.loads	vector of factor loadings

Value

The function returns factor loading matrix. The number of column shows the number of factor in the model. The rows show number of items

Author(s)

Fatih Orçan

Examples

```
# This example represents a three-factor CFA model
#  where the factors are indicated by 3, 3 and 2 items respectively.
#
loading.value(nf=3, fl.loads=c(.6,.6,.6,0,0,0,0,0,0,0,0,.7,.7,.7,0,0,0,0,0,0,0,0,.8,.8))
```

sim.categoric *This function simulates (generates) categorical data sets by given a Confirmatory Factor Analysis model.*

Description

Based on a given Confirmatory Factor Analysis model, this function simulates data sets. In each data file, the first column shows sample numbers. The second and other columns show actual simulated data sets for each item. If the model have 2 factor and each factor as 3 items, for example, column names will be something like "ID, F1_x1, F1_x2,F1_x3,F2_x1,F2_x2,F2_x3". On the other hand, number of rows shows the sample number of the data. Besides, there will be two more files saved in the folder. First of them is "Model_Info.dat". This file includes factor correlation and factor loading matrices. The second is "Data_List.dat". The file includes names of the data sets which were generated.

Usage

```
sim.categoric(nd = 10, ss = 100, fcors, loading, f.loc, threshold)
```

Arguments

nd	Number of data set, an integer.
ss	Sample Size, an integer and larger than 10.
fcors	Factor correlation matrix, a symmetric matrix. If one factor model is used this should be matrix(1,1,1).
loading	Factor loading matrix. Column represent factors and non zero row represents number of items under each factor.
f.loc	File location. Generated data sets will be saved at the user defined location.
threshold	threshold values

Author(s)

Fatih Orçan

Examples

```
fc<-fcors.value(nf=3, cors=c(1,.5,.6,.5,1,.4,.6,.4,1))
fl<-loading.value(nf=3, fl.loads=c(.5,.5,.5,0,0,0,0,0,0,0,0,.6,.6,.6,0,0,0,0,0,0,0,0,.4,.4))
tres<-c(-Inf, -1.645, -.643, .643, 1.645, Inf) # five categories

sim.categoric(nd=100, ss=1000, fcors=fc,loading=fl, f.loc=tempdir(), threshold = tres)
```

---

sim.normal *This function simulates (generates) data sets by given a Confirmatory Factor Analysis model.*

Description

Based on a given Confirmatory Factor Analysis model, this function simulates data sets. In each data file, the first column shows sample numbers. The second and other columns show actual simulated data sets for each item. If the model have 2 factor and each factor as 3 items, for example, column names will be something like "ID, F1_x1, F1_x2,F1_x3,F2_x1,F2_x2,F2_x3". On the other hand, number of rows shows the sample number of the data. Besides, there will be two more files saved in the folder. First of them is "Model_Info.dat". This file includes factor correlation and factor loading matrices. The second is "Data_List.dat". The file includes names of the data sets which were generated.

Usage

```
sim.normal(nd = 10, ss = 100, fcors, loading, f.loc)
```

Arguments

nd	Number of data set, an integer.
ss	Sample Size, an integer and larger than 10.
fcors	Factor correlation matrix, a symmetric matrix. If one factor model is used this should be matrix(1,1,1).
loading	Factor loading matrix. Column represent factors and non zero row represents number of items under each factor.
f.loc	File location. Generated data sets will be saved at the user defined location.

Author(s)

Fatih Orçan

Examples

```
fc<-fcors.value(nf=3, cors=c(1,.5,.6,.5,1,.4,.6,.4,1))
fl<-loading.value(nf=3, fl.loads=c(.5,.5,.5,0,0,0,0,0,0,0,0,.6,.6,.6,0,0,0,0,0,0,0,0,.4,.4))

sim.normal(nd=10, ss=1000, fcors=fc, loading<-fl,  f.loc=tempdir())
```

---

sim.skewed *Simulates Data sets by given a Confirmatory Factor Analysis model.*

Description

Based on a given Confirmatory Factor Analysis model, this function simulates data sets. In each data file, the first column shows sample numbers. The second and other columns show actual simulated data sets for each item. If the model have 2 factor and each factor as 3 items, for example, column names will be something like "ID, F1_x1, F1_x2,F1_x3,F2_x1,F2_x2,F2_x3". On the other hand, number of rows shows the sample number of the data. Besides, there will be two more files saved in the folder. First of them is "Model_Info.dat". This file includes factor correlation and factor loading matrices, a vector showing nonnormal items and values of B, C and D for Fleishman's power method. The second is "Data_List.dat". The file includes names of the data sets which were generated.

Usage

```
sim.skewed(
  nd = 10,
  ss = 100,
  fcors,
  loading,
  nonnormal = NULL,
  Fleishman = NULL,
  f.loc
)
```

Arguments

nd	Number of data set, an integer.
ss	Sample Size, an integer and larger than 10.
fcors	Factor correlation matrix, a symmetric matrix. If one factor model is used this should be matrix(1,1,1).
loading	Factor loading matrix. Column represents number of factors and non zero row represents number of items under each factor.
nonnormal	vector of 0 and 1s. 0 indicates normal, 1 indicates non-normal data generation. If nonnormal is not indicated a normal data will be generated.
Fleishman	B, C and D values from Fleishman's power method. A = -C.
f.loc	File location. Generated data sets will be saved at the user defined location.

Author(s)

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Examples

```
fc<-fcors.value(nf=3, cors=c(1,.5,.6,.5,1,.4,.6,.4,1))
fl<-loading.value(nf=3, fl.loads=c(.5,.5,.5,0,0,0,0,0,0,0,0,.3,.3,.3,0,0,0,0,0,0,0,0,.4,.4))
ifN<-c(1,1,1,0,0,0,0,0)
fleis<-c(1.0174852, .190995, -.018577) # The values for skewness=1 and kurtosis=1

sim.skewed(nd=10, ss=100, fcors=fc,loading=fl, nonnormal = ifN, Fleishman = fleis, f.loc=tempdir())
```

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