

Package ‘simstandard’

October 22, 2020

Title Generate Standardized Data

Version 0.5.0

Description

Creates simulated data from structural equation models with standardized loading. Data generation methods are described in Schneider (2013) <doi:10.1177/0734282913478046>.

Depends R (>= 3.4.0)

License CC0

Encoding UTF-8

Language en-US

LazyData true

RoxygenNote 7.1.1

Imports lavaan, mvtnorm, tibble, stats, magrittr, rlang, purrr

Suggests knitr, rmarkdown, ggplot2, dplyr, tidyr, forcats, stringr, testthat, covr, badger

VignetteBuilder knitr

URL <https://github.com/wjschne/simstandard>

BugReports <https://github.com/wjschne/simstandard/issues>

Maintainer W. Joel Schneider <w.joel.schneider@gmail.com>

NeedsCompilation no

Author W. Joel Schneider [aut, cre] (<<https://orcid.org/0000-0002-8393-5316>>)

Repository CRAN

Date/Publication 2020-10-22 12:50:02 UTC

R topics documented:

add_composite_scores	2
add_factor_scores	3
fixed2free	4
lav2ram	4

matrix2lavaan	5
model_complete	6
sim_standardized	7
sim_standardized_matrices	8

Index	10
--------------	-----------

add_composite_scores *Add composite scores to observed data*

Description

Add composite scores to observed data

Usage

```
add_composite_scores(d, m, ...)
```

Arguments

d	A data.frame with observed data in standardized form (i.e, z-scores)
m	A character string with lavaan model
...	parameters passed to simstandardized_matrices

Value

data.frame with observed data and estimated factor scores

Examples

```
library(simstandard)
# lavaan model
m = "
X =~ 0.9 * X1 + 0.8 * X2 + 0.7 * X3
"

# Make data.frame for two cases
d <- data.frame(
  X1 = c(1.2, -1.2),
  X2 = c(1.5, -1.8),
  X3 = c(1.8, -1.1))

# Compute factor scores for two cases
add_composite_scores(d, m)
```

add_factor_scores *Add factor scores to observed data*

Description

Add factor scores to observed data

Usage

```
add_factor_scores(d, m, CI = FALSE, p = 0.95, ...)
```

Arguments

d	A data.frame with observed data in standardized form (i.e, z-scores)
m	A character string with lavaan model
CI	Add confidence intervals? Defaults to 'FALSE'. If 'TRUE', For each factor score, a lower and upper bound of the confidence interval is created. For example, the lower bound of factor score 'X' is 'X_LB', and the upper bound is 'X_UB'.
p	confidence interval proportion. Defaults to 0.95
...	parameters passed to simstandardized_matrices

Value

data.frame with observed data and estimated factor scores

Examples

```
library(simstandard)
# lavaan model
m = "
X =~ 0.9 * X1 + 0.8 * X2 + 0.7 * X3
"

# Make data.frame for two cases
d <- data.frame(
  X1 = c(1.2, -1.2),
  X2 = c(1.5, -1.8),
  X3 = c(1.8, -1.1))

# Compute factor scores for two cases
add_factor_scores(d, m)
```

fixed2free	<i>Remove fixed parameters from a lavaan model</i>
------------	--

Description

Remove fixed parameters from a lavaan model

Usage

```
fixed2free(m)
```

Arguments

`m` Structural model represented by lavaan syntax

Value

character string representing lavaan model

Examples

```
library(simstandard)
# lavaan model with fixed parameters
m = "
Latent_1 =~ 0.9 * Ob_11 + 0.8 * Ob_12 + 0.7 * Ob_13
Latent_2 =~ 0.9 * Ob_21 + 0.6 * Ob_22 + 0.4 * Ob_23
"
# Same model, but with fixed parameters removed.
m_free <- fixed2free(m)
cat(m_free)
```

lav2ram	<i>Extract standardized RAM matrices from a lavaan object</i>
---------	---

Description

Extract standardized RAM matrices from a lavaan object

Usage

```
lav2ram(fit)
```

Arguments

`fit` An object of class lavaan

Value

list of RAM matrices A (asymmetric paths), S (symmetric paths), and F (filter matrix)

matrix2lavaan	<i>Create lavaan model syntax from matrix coefficients</i>
---------------	--

Description

Create lavaan model syntax from matrix coefficients

Usage

```
matrix2lavaan(  
  measurement_model = NULL,  
  structural_model = NULL,  
  covariances = NULL  
)
```

Arguments

measurement_model	A matrix or data.frame with measurement model loadings. Column names are latent variables. Row names or the first column of a data.frame are indicator variables.
structural_model	A matrix or data.frame with structural model coefficients (i.e., regressions). Column names are "causal" variables. Row names or the first column of a data.frame are "effect" variables.
covariances	A matrix or data.frame with model covariances. Column names must match the row names. If a data.frame, row variable names can be specified in the first column.

Value

a character string with lavaan syntax

Examples

```
library(simstandard)  
# Specifying the measurement model:  
# For a data.frame, the column names are latent variables,  
# and the indicators can be specified as rownames.  
m <- data.frame(X = c(0.7,0.8,0,0),  
                Y = c(0,0,0.8,0.9))  
rownames(m) <- c("A", "B", "C", "D")  
# Indicator variables can also be specified  
# as the first column variable  
# with subsequent column names as latent variables  
m <- data.frame(Indicators = c("A", "B", "C", "D"),  
                X = c(0.7,0.8,0,0),  
                Y = c(0,0,0.8,0.9))
```

```

# Alternately, a matrix can be used:
m <- matrix(c(0.7,0.8,0,0,
             0,0,0.8,0.9),
           ncol = 2,
           dimnames = list(c("A", "B", "C", "D"),
                          c("X", "Y")))

# Specifying the structural coefficients:
# The regression coefficients of the structural model can be
# specified as either a data.frame or a matrix. Column names
# are the predictors and row names are the criterion variables.
# With a data.frame, criterion variables can alternately be
# specified with as the first column.
s <- matrix(0.5, nrow = 1, ncol = 1, dimnames = list("Y", "X"))
# The covariance matrix must be symmetric. Can also be specified
# as a data. frame.
Sigma <- matrix(c(1, 0.3,
                 0.3, 1),
              nrow = 2,
              ncol = 2,
              dimnames = list(c("B", "C"),
                             c("B", "C")))
model <- matrix2lavaan(measurement_model = m,
                      structural_model = s,
                      covariances = Sigma)

cat(model)

```

model_complete	<i>Function that takes a lavaan model with standardized paths and loadings and returns a complete lavaan model syntax with standardized variances</i>
----------------	---

Description

Function that takes a lavaan model with standardized paths and loadings and returns a complete lavaan model syntax with standardized variances

Usage

```
model_complete(m)
```

Arguments

m Structural model represented by lavaan syntax

Value

character string representing lavaan model

Examples

```

library(simstandard)
# lavaan model
m = "
Latent_1 =~ 0.9 * Ob_11 + 0.8 * Ob_12 + 0.7 * Ob_13
Latent_2 =~ 0.9 * Ob_21 + 0.6 * Ob_22 + 0.4 * Ob_23
Latent_2 ~ 0.6 * Latent_1
"

# Same lavaan syntax, but with standardized variances
m_complete <- model_complete(m)
cat(m_complete)

```

sim_standardized *Generates simulated data with standardized parameters.*

Description

This function takes a lavaan model with standardized parameters and simulates latent scores, errors, disturbances, and observed scores.

Usage

```

sim_standardized(
  m,
  n = 1000,
  observed = TRUE,
  latent = TRUE,
  errors = TRUE,
  factor_scores = FALSE,
  composites = FALSE,
  matrices = FALSE,
  ...
)

```

Arguments

m	Structural model represented by lavaan syntax
n	Number of simulated cases
observed	Include observed variables
latent	Include latent variables
errors	Include observed error and latent disturbances variables
factor_scores	Include factor score variables
composites	Include composite variables
matrices	Include matrices as attribute of tibble
...	Arguments passed to 'simstandardized_matrices'

Details

This function supports the ‘~’ operator for regressions, the ‘~~’ for covariances (but not variances), and the ‘=~’ latent variable loadings. It does not support intercepts (e.g. ‘y ~ 1’), thresholds, scaling factors, formative factors, or equality constraints.

Value

tibble with standardized data

Examples

```
library(simstandard)
# Lavaan model
m = "Latent_1 =~ 0.8 * Ob_1 + 0.7 * Ob_2 + 0.4 * Ob_3"

# simulate 10 cases
sim_standardized(m, n = 10)
```

sim_standardized_matrices

Return model characteristics

Description

Function that takes a lavaan model with standardized parameters and returns a list with model characteristics

Usage

```
sim_standardized_matrices(m, max_iterations = 100, composite_threshold = NULL)
```

Arguments

m Structural model represented by lavaan syntax

max_iterations Maximum number of iterations before the algorithm fails

composite_threshold Loadings with absolute values less than this threshold will not be counted as composite indicators

Details

This function supports the ‘~’ operator for regressions, the ‘~~’ for covariances (but not variances), and the ‘=~’ latent variable loadings. It does not support intercepts (e.g. ‘y ~ 1’), thresholds, scaling factors, formative factors, or equality constraints.

Value

list of path and covariance coefficients

Examples

```
library(simstandard)
# lavaan model
m = "Latent_1 =~ 0.8 * Ob_1 + 0.7 * Ob_2 + 0.4 * Ob_3"

sim_standardized_matrices(m)
```

Index

`add_composite_scores`, 2

`add_factor_scores`, 3

`fixed2free`, 4

`lav2ram`, 4

`matrix2lavaan`, 5

`model_complete`, 6

`sim_standardized`, 7

`sim_standardized_matrices`, 8