Package 'silp'

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Title Conditional Process Analysis (CPA) via SEM Approach

Version 1.0.3

Description Utilizes the Reliability-Adjusted Product Indicator (RAPI) method to
estimate effects among latent variables, thus allowing for more precise definition and analysis of
mediation and moderation models. Our simulation studies reveal that while 'silp' may exhibit
instability with smaller sample sizes and lower reliability scores (e.g., N = 100, 'omega' = 0.7),
implementing nearest positive definite matrix correction and bootstrap confidence interval
estimation can significantly ameliorate this volatility. When these adjustments are applied,
'silp' achieves estimations akin in quality to those derived from LMS. In conclusion, the 'silp'
package is a valuable tool for researchers seeking to explore complex relational structures between
variables without resorting to commercial software.
Cheung et al.(2021)<doi:10.1007/s10869-020-09717-0>
Hsiao et al.(2018)<doi:10.1177/0013164416679877>.

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Encoding UTF-8

RoxygenNote 7.3.2

Imports Matrix, methods, lavaan, MASS, purrr, semTools, stats, stringr

NeedsCompilation no

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Depends R(>= 4.1.0)

URL https://github.com/TomBJJJ/silp

BugReports https://github.com/TomBJJJ/silp/issues

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Repository CRAN

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Contents

generate_data   *generate_data*

Description

Generates data based on the simulation settings provided by Cheung et al. (2021). Note that the reliability used here is omega.

Usage

```
generate_data(
  n_obs = 100,
  corr = 0.3,
  effect = 0.42,
  ld = c(1, 1, 1, 1),
  alp = 0.9,
  effect_x = 0.4,
  effect_z = 0.2
)
```

Arguments

n_obs	Integer. The number of observations.
corr	Numeric. The correlation of the latent variables.
effect	Numeric. The effect of the moderator.
ld	Numeric. The factor loading of the latent variable to its indicators.
alp	Numeric. The reliability of the latent variable.
effect_x	Numeric. The direct effect of x.
effect_z	Numeric. The direct effect of z.

Value

A dataset simulated from the argument settings.

Examples

```
n_obs = 100
corr = 0.1
effect = 0.12
ld = c(1,1,1,1)
alp = 0.9
generate_data(n_obs, corr, effect, ld, alp)
```

---

resilp	*resilp*

Description

An extended function from `silp`, applying the bootstrap method to obtain standard error estimation. Note: When using `silp` with the nearest positive definite matrix (npd = TRUE), this function should be used to obtain reliable inference.

Usage

```
resilp(fit, R = 2000, progress = T, max_try = 100)
```

Arguments

`fit`	A result object from `silp`.
`R`	Integer. The number of bootstrap samples. Default is 2000.
`progress`	Logical. Whether to display a progress bar. Default is `FALSE`.
`max_try`	Maximum resampling attempts per bootstrap sample.

Value

An object of class "Silp".

Examples

```
n_obs = 100
corr = 0.1
effect = 0.12
ld = c(1,1,1,1)
alp = 0.9
data = generate_data(n_obs, corr, effect, ld, alp)
model = "
  fy =~ y1 + y2 + y3 + y4
  fx =~ x1 + x2 + x3 + x4
  fz =~ z1 + z2 + z3 + z4
  fy ~  fx + fz + fx:fz
"
fit = silp(model, data)
resilp(fit, R = 10)
```

---

silp   *silp*

Description

This function extends the `lavaan` function, allowing users to define moderation effects using the symbol ":". The RAPI method is used to estimate moderation effects.

Usage

```
silp(model, data, center = "double", tau.eq = F, npd = F, ...)
```

Arguments

model   A lavaan syntax model with extension. The notation ":" implies interaction between two variables (see Example).

data   The dataset for `lavaan` SEM.

center   Character. Whether single or double mean centering is used for the product indicator. Default is "double".

tau.eq   Logical. Specifies the type of reliability used to estimate error variance. If `TRUE`, Cronbach's alpha reliability is used. If `FALSE`, omega reliability is used. Default is `FALSE`.

npd   Logical. Specifies the type of input used in `lavaan` SEM. Default is `FALSE` for raw data or `TRUE` for a covariance matrix. Applying a covariance matrix can resolve problems of a non-positive definite covariance matrix. If `TRUE`, `resilp` should be used to obtain reliable inference.

...   Other parameters passed to the `lavaan` SEM function.#'

Value

An "Silp" class object.

Examples

```
n_obs = 100
corr = 0.1
effect = 0.12
ld = c(1,1,1,1)
alp = 0.9
data = generate_data(n_obs, corr, effect, ld, alp)
model = "
  fy =~ y1 + y2 + y3 + y4
  fx =~ x1 + x2 + x3 + x4
  fz =~ z1 + z2 + z3 + z4
  fy ~  fx + fz + fx:fz
"
silp(model, data)
```

`Silp-class`   *Define silp class*

Description

Define silp class

Slots

`raw_model` The user-specified `lavaan` syntax model.

`rapi_model` The revised model with the RAPI method.

`time` The operation time for `silp` (in seconds).

`npd` Logical. Whether the nearest positive definite matrix is used.

`raw_data` The input data.

`fa` An object of class `lavaan` representing the CFA result.

`reliability` The reliability index.

`composite_data` The composite data for RAPI.

`pa` The result of `silp`.

`boot` The results of `resilp` from R bootstrap samples.

`origine` The original `silp` estimation.

`time_resilp` The operation time for `resilp` (in seconds).

`tech` detail of `resilp` operation

`summary-methods`   *Methods for Class* `Silp` *in Package* **silp**

Description

Summary Methods for Class `Silp` in Package **silp**.

Methods

signature(object = "Silp", method = "Bootstrap") Returns the summary result of 'silp' or 'resilp'. This method is for 'resilp' only. If `method = "Bootstrap"`, the percentile bootstrap result is presented. If `method = "BC_b"`, the bias-corrected bootstrap result is presented.

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