Package 'silp'

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Title Conditional Process Analysis (CPA) via Structural Equation Modeling (SEM) Approach

Version 1.0.0

Description Provides 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 latent moderated structural equations (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.
Hsiao et al.(2018)<doi:10.1177/0013164416679877>
Kline & Moosbrugger(2000)<doi:10.1007/BF02296338>
Cheung et al.(2021)<doi:10.1007/s10869-020-09717-0>.

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Encoding UTF-8

RoxygenNote 7.3.2

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

NeedsCompilation no

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

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

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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 = TRUE)
```

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`.

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", alp = FALSE, npd = FALSE, ...)
```

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".
alp	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).

`alp` type of reliability used.

`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).

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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