Package 'longMI'

December 11, 2023

Title Longitudinal Measurement Invariance

Version 1.0.0

Description Fits longitudinal measurement invariance models using the 'lavaan' package.
For a thorough exposition of testing measurement invariance,
see Millsap (2011) <doi:10.4324/9780203821961>.

URL https://github.com/ijapesigan/longMI,
https://ijapesigan.github.io/longMI/

BugReports https://github.com/ijapesigan/longMI/issues

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Encoding UTF-8

LazyData true

Roxygen list(markdown = TRUE)

Depends R (>= 3.5.0)

Imports lavaan

Suggests knitr, rmarkdown, testthat

RoxygenNote 7.2.3

NeedsCompilation no

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R topics documented:

`Comparison` *Comparison Measurement Invariance Models*

Description

Comparison Measurement Invariance Models

Usage

```
Comparison(configural = NULL, weak = NULL, strong = NULL, strict = NULL, ...)
```

Arguments

`configural`	Fitted configural invariance model.
`weak`	Fitted weak invariance model.
`strong`	Fitted strong invariance model.
`strict`	Fitted strict invariance model.
`...`	Additional arguments to pass to `lavaan::lavTestLRT()`.

Author(s)

Ivan Jacob Agaloos Pesigan

See Also

Other Longitudinal Measurement Invariance Functions: `Configural()`, `Invariance()`, `Strict()`, `Strong()`, `Weak()`

Examples

```
data("osbornesudick1972", package = "longMI")
configural_fit <- Configural(
  data = osbornesudick1972,
  time_points = c(1, 6),
  factor_loadings = list(
    c(1, 2, 3, 4)
  )
)
weak_fit <- Weak(
  data = osbornesudick1972,
  time_points = c(1, 6),
  factor_loadings = list(
    c(1, 2, 3, 4)
  )
)
strong_fit <- Strong(
  data = osbornesudick1972,
```

```
  time_points = c(1, 6),
  factor_loadings = list(
    c(1, 2, 3, 4)
  )
)
strict_fit <- Strict(
  data = osbornesudick1972,
  time_points = c(1, 6),
  factor_loadings = list(
    c(1, 2, 3, 4)
  )
)
mi <- Comparison(
  configural = configural_fit,
  weak = weak_fit,
  strong = strong_fit,
  strict = strict_fit
)
print(mi)
summary(mi)
```

`Configural` *Configural Invariance Model*

Description

Configural Invariance Model

Usage

```
Configural(
  data,
  time_points,
  factor_loadings,
  covariances = FALSE,
  model_add = NULL,
  ...
)
```

Arguments

`data`	Dataframe. The function assumes that the data is in the wide format and the variables are named as follows: `paste0("y", time_point, "_", item_number)`. For example, for the item 1 from the first time point, the variable name should be `y1_1`.
`time_points`	Numeric vector of discrete time points.
`factor_loadings`	List with length equal to the number of factors. Each element of the list is the item number of items for the specific factor.

covariances	Logical. If covariance = TRUE, model the covariances of the measurement error.
model_add	Additional specification added to the lavaan model syntax.
...	Additional arguments to pass to lavaan::cfa().

Author(s)

Ivan Jacob Agaloos Pesigan

See Also

Other Longitudinal Measurement Invariance Functions: Comparison(), Invariance(), Strict(), Strong(), Weak()

Examples

```
data("osbornesudick1972", package = "longMI")
configural_fit <- Configural(
  data = osbornesudick1972,
  time_points = c(1, 6),
  factor_loadings = list(
    c(1, 2, 3, 4)
  )
)
library(lavaan)
summary(configural_fit)
```

Invariance *Test Longitudinal Measurement Invariance*

Description

Test Longitudinal Measurement Invariance

Usage

```
Invariance(
  data,
  time_points,
  factor_loadings,
  covariances = FALSE,
  model_add_configural = NULL,
  model_add_weak = NULL,
  model_add_strong = NULL,
  model_add_strict = NULL,
  ...
)
```

Arguments

`data`	Dataframe. The function assumes that the data is in the wide format and the variables are named as follows: `paste0("y", time_point, "_", item_number)`. For example, for the item 1 from the first time point, the variable name should be `y1_1`.
`time_points`	Numeric vector of discrete time points.
`factor_loadings`	List with length equal to the number of factors. Each element of the list is the item number of items for the specific factor.
`covariances`	Logical. If `covariance = TRUE`, model the covariances of the measurement error.
`model_add_configural`	Additional specification added to the lavaan model syntax for the configural invariance model.
`model_add_weak`	Additional specification added to the lavaan model syntax for the weak invariance model.
`model_add_strong`	Additional specification added to the lavaan model syntax for the strong invariance model.
`model_add_strict`	Additional specification added to the lavaan model syntax for the strict invariance model.
`...`	Additional arguments to pass to `lavaan::cfa()`.

Author(s)

Ivan Jacob Agaloos Pesigan

See Also

Other Longitudinal Measurement Invariance Functions: `Comparison()`, `Configural()`, `Strict()`, `Strong()`, `Weak()`

Examples

```
data("osbornesudick1972", package = "longMI")
mi <- Invariance(
  data = osbornesudick1972,
  time_points = c(1, 6),
  factor_loadings = list(
    c(1, 2, 3, 4)
  )
)
print(mi)
summary(mi)
```

osbornesudick1972 *Wechsler Intelligence Scale for Children Data from Osborne and Sudick (1972)*

Description

Wechsler Intelligence Scale for Children Data from Osborne and Sudick (1972)

Usage

```
osbornesudick1972
```

Format

The data set has the following variables:

id ID

y1_1 Time 1 Information

y1_2 Time 1 Comprehension

y1_3 Time 1 Similarities

y1_4 Time 1 Vocabulary

y6_1 Time 6 Information

y6_2 Time 6 Comprehension

y6_3 Time 6 Similarities

y6_4 Time 6 Vocabulary

References

Osborne, R. T., & Suddick, D. E. (1972). A longitudinal investigation of the intellectual differentiation hypothesis. *The Journal of Genetic Psychology: Research and Theory on Human Development*, *121*(1), 83–89. doi:10.1080/00221325.1972.10533131.

print.longmi *Print Method for an Object of Class* longmi

Description

Print Method for an Object of Class longmi

Usage

```
## S3 method for class 'longmi'
print(x, digits = 4, ...)
```

Arguments

x	Object of class longmi.
digits	Digits to print.
...	additional arguments.

Value

Returns a matrix of selected fit measures.

Author(s)

Ivan Jacob Agaloos Pesigan

Examples

```
data("osbornesudick1972", package = "longMI")
mi <- Invariance(
  data = osbornesudick1972,
  time_points = c(1, 6),
  factor_loadings = list(
    c(1, 2, 3, 4)
  )
)
print(mi)
```

Strict *Strict Invariance Model*

Description

Strict Invariance Model

Usage

```
Strict(
  data,
  time_points,
  factor_loadings,
  covariances = FALSE,
  model_add = NULL,
  ...
)
```

Arguments

`data`	Dataframe. The function assumes that the data is in the wide format and the variables are named as follows: `paste0("y", time_point, "_", item_number)`. For example, for the item 1 from the first time point, the variable name should be `y1_1`.
`time_points`	Numeric vector of discrete time points.
`factor_loadings`	List with length equal to the number of factors. Each element of the list is the item number of items for the specific factor.
`covariances`	Logical. If `covariance = TRUE`, model the covariances of the measurement error.
`model_add`	Additional specification added to the lavaan model syntax.
`...`	Additional arguments to pass to `lavaan::cfa()`.

Author(s)

Ivan Jacob Agaloos Pesigan

See Also

Other Longitudinal Measurement Invariance Functions: `Comparison()`, `Configural()`, `Invariance()`, `Strong()`, `Weak()`

Examples

```
data("osbornesudick1972", package = "longMI")
strict_fit <- Strict(
  data = osbornesudick1972,
  time_points = c(1, 6),
  factor_loadings = list(
    c(1, 2, 3, 4)
  )
)
library(lavaan)
summary(strict_fit)
```

`Strong` *Strong Invariance Model*

Description

Strong Invariance Model

Usage

```
Strong(
  data,
  time_points,
  factor_loadings,
  covariances = FALSE,
  model_add = NULL,
  ...
)
```

Arguments

data	Dataframe. The function assumes that the data is in the wide format and the variables are named as follows: `paste0("y", time_point, "_", item_number)`. For example, for the item 1 from the first time point, the variable name should be `y1_1`.
time_points	Numeric vector of discrete time points.
factor_loadings	List with length equal to the number of factors. Each element of the list is the item number of items for the specific factor.
covariances	Logical. If `covariance = TRUE`, model the covariances of the measurement error.
model_add	Additional specification added to the lavaan model syntax.
...	Additional arguments to pass to `lavaan::cfa()`.

Author(s)

Ivan Jacob Agaloos Pesigan

See Also

Other Longitudinal Measurement Invariance Functions: `Comparison()`, `Configural()`, `Invariance()`, `Strict()`, `Weak()`

Examples

```
data("osbornesudick1972", package = "longMI")
strong_fit <- Strong(
  data = osbornesudick1972,
  time_points = c(1, 6),
  factor_loadings = list(
    c(1, 2, 3, 4)
  )
)
library(lavaan)
summary(strong_fit)
```

summary.longmi *Summary Method for an Object of Class* longmi

Description

Summary Method for an Object of Class longmi

Usage

```
## S3 method for class 'longmi'
summary(object, ...)
```

Arguments

object	Object of class longmi.
...	additional arguments.

Value

Returns a list of likelihood ratio tests.

Author(s)

Ivan Jacob Agaloos Pesigan

Examples

```
data("osbornesudick1972", package = "longMI")
mi <- Invariance(
  data = osbornesudick1972,
  time_points = c(1, 6),
  factor_loadings = list(
    c(1, 2, 3, 4)
  )
)
summary(mi)
```

Weak *Weak Invariance Model*

Description

Weak Invariance Model

Usage

```
Weak(
  data,
  time_points,
  factor_loadings,
  covariances = FALSE,
  model_add = NULL,
  ...
)
```

Arguments

`data`	Dataframe. The function assumes that the data is in the wide format and the variables are named as follows: `paste0("y", time_point, "_", item_number)`. For example, for the item 1 from the first time point, the variable name should be `y1_1`.
`time_points`	Numeric vector of discrete time points.
`factor_loadings`	List with length equal to the number of factors. Each element of the list is the item number of items for the specific factor.
`covariances`	Logical. If `covariance = TRUE`, model the covariances of the measurement error.
`model_add`	Additional specification added to the lavaan model syntax.
`...`	Additional arguments to pass to `lavaan::cfa()`.

Author(s)

Ivan Jacob Agaloos Pesigan

See Also

Other Longitudinal Measurement Invariance Functions: `Comparison()`, `Configural()`, `Invariance()`, `Strict()`, `Strong()`

Examples

```
data("osbornesudick1972", package = "longMI")
weak_fit <- Weak(
  data = osbornesudick1972,
  time_points = c(1, 6),
  factor_loadings = list(
    c(1, 2, 3, 4)
  )
)
library(lavaan)
summary(weak_fit)
```

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