Package 'Bayesrel'

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Type Package

Title Bayesian Reliability Estimation

Version 0.6.1

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Description Functionality for the most common single test reliability estimates is provided:
Coefficient alpha, 'Guttman's' lambda-2/-4/-6, the greatest lower bound and coefficient omega.
The Bayesian estimates are provided with credible intervals.
The frequentist estimates are provided with bootstrapped confidence intervals
The method for the Bayesian estimates, except for omega,
is sampling from the posterior inverse 'Wishart' for the covariance matrix based measures.
See 'Murphy' (2007) <https://www.seas.harvard.edu/courses/cs281/papers/murphy-2007.pdf>.
In the case of omega it is 'Gibbs' Sampling from the joint conditional distributions of a single factor model.
See 'Lee' (2007, <doi:10.1002/9780470024737>).
The glb method is adjusted code from the 'Rcsdp' package by 'Hector Corrada Bravo',
<https://CRAN.R-project.org/package=Rcsdp>;
lambda-4 is from 'Benton' (2015) <doi:10.1007/978-3-319-07503-7_19>;
the principal factor analysis for the frequentist omega is from 'Schlegel' (2017)
<https://www.r-bloggers.com/iterated-principal-factor-method-of-factor-analysis-with-r/>;
and the analytic alpha interval is from 'Bonett' and 'Wright' (2014) <doi:10.1002/job.1960>.

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Encoding UTF-8

LazyData true

Imports LaplacesDemon, Rcsdp, MASS, ggplot2, ggridges, lavaan,
plotrix, coda, methods, stats, graphics, Rdpack

RdMacros Rdpack

RoxygenNote 7.0.2

Depends R (>= 2.10)

Suggests testthat (>= 2.1.0)

NeedsCompilation no

Repository CRAN

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R topics documented:

`asrm` *5-Item questionnaire data from Nicolai (2018)*

Description

A dataset consisting of 78 participants who filled out the 5-item Altman Self-Rating Mania Scale, rating from 1 to 5 on a Likert scale

Usage

```
asrm
```

Format

The format is a 5-column datamatrix containing 78 observations

Source

article

References

Nicolai, J., & Moshagen, M. (2018). Pathological buying symptoms are associated with distortions in judging elapsed time. Journal of Behavioral Addictions, 7(3), 752-759.

cavalini *8-Item Questionnaire Data from Cavalini (1992)*

Description

A dataset consisting of eight item questionnaire data. It's likert scaled from 0-3. It is data measuring how annoyed people were by malodors

Usage

```
cavalini
```

Format

The format is a 8-column datamatrix containing 828 observations

Source

Doctoral Dissertation

References

Cavalini, P. M. (1992). It's an ill wind that brings no good: Studies on odour annoyance and the dispersion of odorant concentrations from industries. Rijksuniversiteit Groningen.

omega_fit *graphical posterior predictive check for the 1-factor omega model, based on covariance matrix eigenvalues*

Description

gives posterior predictive check for the 1-factor model: comparison between model implied covariance matrix and sample covariance matrix also displays frequentist fit indices

Usage

```
omega_fit(x)
```

Arguments

x	A strel output object (list)

Examples

```
omega_fit(strel(asrm, "omega"))
```

plot_strel *plot function for an single test reliability estimate's posterior sample*

Description

gives posterior and prior distribution and pie plots input is the main reliability estimation object and the estimate to be plotted

Usage

```
plot_strel(
  x,
  estimate,
  blackwhite = FALSE,
  criteria = TRUE,
  cuts = c(0.7, 0.8)
)
```

Arguments

x	A strel output object (list)
estimate	A character string indicating what estimate to plot from the strel output object
blackwhite	A logical indicating if the plot should be in black and white
criteria	A logical indicating if cutoff criteria should be drawn
cuts	A two element vector indicating what the cutoffs should be

Examples

```
plot_strel(strel(asrm, "lambda2"), "lambda2")
```

plot_strel_id *plots posterior distributions of chosen estimate and the item-dropped cases in one plot*

Description

gives posterior densities of original dataset together with the the posteriors of datasets with items deleted. Can be ordered for the change item deleting brings about

Usage

```
plot_strel_id(x, estimate, ordering = FALSE)
```

Arguments

x	A strel output object (list)
estimate	A character string indicating what estimate to plot from the strel output object
ordering	A logical indicating if the densities in the plot should be ordered

Examples

```
plot_strel_id(strel(asrm, "lambda2", item.dropped = TRUE), "lambda2")
```

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p_strel *prior and posterior probability of estimate being bigger than threshold*

Description

takes a mcmc posterior sample of any of the single test reliability estimates and calculates the prior and posterior probability of the estimate being bigger or smaller than an arbitrary value (priors are stored in the package)

Usage

```
p_strel(x, estimate, low.bound)
```

Arguments

x	A strel output object (list)
estimate	A character string indicating what estimate to plot from the strel output object
low.bound	A number for the threshold to be tested against

Examples

```
p_strel(strel(asrm, "lambda2"), "lambda2", .80)
```

strel *calculate single test reliability estimates*

Description

calculate Bayesian and frequentist single test reliability measures. Reported are Bayesian credible intervals (HDI) and frequentist confidence intervals (non parametric or parametric bootstrap). The estimates supported are Cronbach alpha, lambda2/4/6, the glb, and Mcdonald omega. Beware of lambda4 with many indicators, the computational effort is considerable

Usage

```
strel(
  x,
  estimates = c("alpha", "lambda2", "glb", "omega"),
  interval = 0.95,
  n.iter = 1000,
  n.burnin = 50,
  n.boot = 1000,
  omega.freq.method = "cfa",
  n.obs = NULL,
  alpha.int.analytic = FALSE,
  freq = TRUE,
  Bayes = TRUE,
  para.boot = FALSE,
  item.dropped = FALSE,
  missing = "listwise"
)
```

Arguments

x	A dataset or covariance matrix
estimates	A character vector containing the estimands, we recommend using lambda4 with only a few items due to the computation time
interval	A number specifying the uncertainty interval
n.iter	A number for the iterations of the Gibbs Sampler
n.burnin	A number for the burnin in the Gibbs Sampler
n.boot	A number for the bootstrap samples
omega.freq.method	A character string for the method of frequentist omega, either "pfa" or "cfa"
n.obs	A number for the sample observations when a covariance matrix is supplied and the factor model is calculated
alpha.int.analytic	A logical for calculating the alpha confidence interval analytically
freq	A logical for calculating the frequentist estimates

`Bayes`	A logical for calculating the Bayesian estimates
`para.boot`	A logical for calculating the parametric bootstrap, the default is the non-parametric
`item.dropped`	A logical for calculating the if-item-dropped statistics
`missing`	A string specifying the way to handle missing data

References

Murphy KP (2007). "Conjugate Bayesian analysis of the Gaussian distribution." University of British Columbia. Lee S (2007). *Structural equation modeling: A Bayesian approach*, volume 711. John Wiley \& Sons.

Examples

```
summary(strel(asrm, estimates = "lambda2"))
summary(strel(asrm, estimates = "lambda2", item.dropped = TRUE))
```

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