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.
  In the case of omega it is 'Gibbs' Sampling from the joint conditional distributions of a single factor model.
  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)
License GPL-3
Encoding UTF-8
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  plotrix, coda, methods, stats, graphics, Rdpack
RdMacros Rdpack
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\textbf{R topics documented:}

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\textbf{asrm} & 5-Item questionnaire data from Nicolai (2018)  
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\textbf{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

\textbf{Usage}

\texttt{asrm}

\textbf{Format}

The format is a 5-column datamatrix containing 78 observations

\textbf{Source}

article

\textbf{References}

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

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)
**p_strel**

**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**

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

---

**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**

```r
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**

```r
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

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