Package ‘Lambda4’

February 19, 2015

Type Package

Title Collection of Internal Consistency Reliability Coefficients.

Version 3.0

Date 2013-07-30

Author Tyler Hunt <tyler@psychoanalytix.com>

Maintainer Tyler Hunt <tyler@psychoanalytix.com>

Description Currently the package includes 14 methods for calculating internal consistency reliability but is still growing. The package allows users access to whichever reliability estimator is deemed most appropriate for their situation.

LazyData true

License GPL-2

Suggests mice, GPArotation, testthat

BugReports https://github.com/JackStat/Lambda4/issues

Collate 'angoff.R' 'bin.combs.R' 'cov.lambda4.R' 'impute.cov.R' 'kristof.R' 'lambda1.R' 'lambda2.R' 'lambda3.R' 'lambda5.R' 'lambda6.R' 'omega.tot.R' 'print.Lambda4.pkg.R' 'quant.lambda4.R' 'raju.R' 'user.lambda4.R' 'guttman.R'

NeedsCompilation no

Repository CRAN

Date/Publication 2013-07-30 21:12:51

R topics documented:

`angoff` *Compute Angoff Coefficient*

Description

Angoff's coefficient is most appropriately used for estimating reliability in tests that can be split into two parts with unequal lengths. The calculation corrects for the inequality of length in the splits. Angoff's coefficient is also believed to handle congeneric test structures relatively well.

Usage

```
angoff(x, split.method = "even.odd",
  missing = "complete", standardize = FALSE)
```

Arguments

`x`	Can be either a data matrix or a covariance matrix
`split.method`	Specify method for splitting items?
`missing`	How to handle missing values.
`standardize`	When TRUE Results are standardized by using the correlation matrix instead of the covariance matrix for computation.

Value

`angoff`	The estimate of reliability.
`Split`	The split half key used to calculate angoff's coefficient.

Author(s)

Tyler Hunt <tyler@psychoanalytix.com>

References

Feldt, L. S., & Charter, R. A. (2003). Estimating the reliability of a test split into two parts of equal or unequal length. Psychological Methods, 8(1), 102-109.

Sedere, M. U. And Feldt, L. S. (1977), The Sampling Distributions Of The Kristof Reliability Coefficient, The Feldt Coefficient, And Guttman's Lambda-2. Journal Of Educational Measurement, 14: 53-62.

Feldt, L. S. (1975). Estimation of the reliability of a test divided into two parts of unequal length. Psychometrika, 40, 557-561.

Angoff, W. H. (1953). Test reliability and effective test length. Psychometrika, 18, 1-14.

Examples

```
angoff(Rosenberg, split.method="even.odd", missing="complete", standardize=FALSE)
```

`bin.combs` *Generate Unique Binary Combinations*

Description

Provides all of the unique binary combinations for the cov.lambda4 function. It should be noted that this function does not provide all combinations but only ones that are unique for the cov.lambda4 function. That is a vector coded c(0,1,0,1) is equivalent to a vector c(1,0,1,0) and only one of them is generated.

Usage

```
bin.combs(p)
```

Arguments

`p`	The number of items in the test.

Value

Function returns a matrix of binary combinations coded as either -1 or 1.

Author(s)

Tyler Hunt <tyler@psychoanalytix.com>

Examples

```
bin.combs(4)
```

---

cong1f *One-Factor Congeneric Covariance Matrix*

Description

This Covariance matrix was used as the population model for one set of simulations. It was used to represent a congeneric data structure in which the factor loadings are set at .5, .6, .7, .8, .5, .6, .7, and .8. The error variances were set at .6^2, .7^2, .8^2, .9^2, .6^2, .7^2, .8^2, and .9^2.

Usage

```
data(cong1f)
```

Format

A covariance matrix of 8 theoretical items.

Examples

```
###---Loadings
fx<-t(matrix(c(
.5,
.6,
.7,
.8,
.5,
.6,
.7,
.8), nrow=1))

###--Error Variances
err<-diag(c(.6^2,.7^2,.8^2,.9^2,
   .6^2,.7^2,.8^2,.9^2))

###---matrix of factor covariances
phi<-matrix(1, nrow=1)

###---Reliability Calculation---###
t1<-matrix(c(rep(1,8)), nrow=1)
t1t<-matrix(c(rep(1,8)), ncol=1)

(fx%*%phi%*%t(fx)+err)
```

cong3f — *Three-Factor Congeneric Covariance Matrix*

Description

This covariance matrix was used as the population model for one set of simulations. It was used to represent a congeneric data structure in which the factor loadings are set at .5, .6, .7, .8, .5, .6, .7, and .8. The error variances were set at .6^2, .7^2, .8^2, .9^2, .6^2, .7^2, .8^2, and .9^2. The correlations between the latent variables was fixed to .3.

Usage

```
data(cong3f)
```

Format

A covariance matrix of 12 theoretical items.

Examples

```
###---Loadings
fx<-t(matrix(c(
.5,0,0,
.6,0,0,
.7,0,0,
.8,0,0,
0,.5,0,
0,.6,0,
0,.7,0,
0,.8,0,
0,0,.5,
0,0,.6,
0,0,.7,
0,0,.8), nrow=3))

###--Error Variances
err<-diag(c(.6^2,.7^2,.8^2,.9^2,
   .6^2,.7^2,.8^2,.9^2,
.6^2,.7^2,.8^2,.9^2))

###---3x3 matrix of factor covariances
phi<-matrix(c(rep(.3, 9)), nrow=3)
diag(phi)<-1

###---Reliability Calculation---###
t1<-matrix(c(rep(1,12)), nrow=1)
t1t<-matrix(c(rep(1,12)), ncol=1)

(fx%*%phi%*%t(fx)+err)
```

cong5f *Five-Factor Congeneric Covariance Matrix*

Description

This Covariance matrix was used as the population model for one set of simulations. It was used to represent a congeneric data structure in which the factor loadings are set at .5, .6, .7, .8, .5, .6, .7, and .8. The error variances were set at .6^2, .7^2, .8^2, .9^2, .6^2, .7^2, .8^2, and .9^2. The correlations between the latent variables was fixed to .3.

Usage

```
data(cong5f)
```

Format

A covariance matrix of 20 theoretical items.

Examples

```
fx<-t(matrix(c(
.5,0,0,0,0,
.6,0,0,0,0,
.7,0,0,0,0,
.8,0,0,0,0,
0,.5,0,0,0,
0,.6,0,0,0,
0,.7,0,0,0,
0,.8,0,0,0,
0,0,.5,0,0,
0,0,.6,0,0,
0,0,.7,0,0,
0,0,.8,0,0,
0,0,0,.5,0,
0,0,0,.6,0,
0,0,0,.7,0,
0,0,0,.8,0,
0,0,0,0,.5,
0,0,0,0,.6,
0,0,0,0,.7,
0,0,0,0,.8), nrow=5))

###--Error Variances
err<-diag(c(.6^2,.7^2,.8^2,.9^2,
   .6^2,.7^2,.8^2,.9^2,
.6^2,.7^2,.8^2,.9^2,
.6^2,.7^2,.8^2,.9^2,
.6^2,.7^2,.8^2,.9^2))

###---5x5 matrix of factor covariances
```

```
phi<-matrix(c(rep(.3, 25)), nrow=5)
diag(phi)<-1

###---Reliability Calculation---###
t1<-matrix(c(rep(1,20)), nrow=1)
t1t<-matrix(c(rep(1,20)), ncol=1)

(fx%*%phi%*%t(fx)+err)
```

`cov.lambda4` *Compute Covariance Maximized Lambda4*

Description

This code estimates maximized lambda4, a split-half reliability estimate. The function splits the halves by specifying a two column list of paired inter-item covariances in descending order. It then calculates Guttman's lambda4 on every possible split-half while preserving the inter-item pairings. The function then returns a list of the Lambda4s and then takes the minimum, maximum, median, and mean of the list. This calculation is most appropiately applied to tests with multiple factors.

Usage

```
cov.lambda4(x, method = "Hunt", missing = "complete",
  show.lambda4s = FALSE, show.splits = FALSE,
  standardize = FALSE)
```

Arguments

`x`	Can be either a data matrix or a covariance matrix.
`method`	Can specify either "Hunt" or "Osburn".
`missing`	How to handle missing values.
`show.lambda4s`	If TRUE then the estimates for each split are included in the output.
`show.splits`	If TRUE then a binary matrix is exported that describes the ways the items were split.
`standardize`	When TRUE results are standardized by using the correlation matrix instead of the covariance matrix for computation.

Value

`estimates`	The mean, median, max, and min of the split-half reliabilities.
`lambda4s`	A vector of maximized split-half reliabilities.
`method`	The method chosen. Either "Hunt" or "Osburn".
`Analysis.Details`	Returns the number of variables and the number of split-half reliabilities.
`Splits`	The binary indicators of the splits for the min, max, and median split-half reliability.
`show.splits`	Logical argument selected to show the splits.
`show.lambdas4s`	Logical argument selected to show the split-half reliabilities.

Author(s)

Tyler Hunt <tyler@psychoanalytix.com>

Examples

```
cov.lambda4(Rosenberg, method="Hunt")
cov.lambda4(Rosenberg, method="Osburn")
```

Feldt1989 — *Feldt's Numerical Example With 4 Items*

Description

This covariance matrix was used as a numerical example in Feldt and Brennans' chapter in Educational Measurement titled *Reliability*.

Usage

```
data(Feldt1989)
```

Format

A covariance matrix of 4 items.

---

guttman — *Guttman's 6 Lambda Coefficients*

Description

Calculates all 6 of Guttman's lambda coefficients.

Usage

```
guttman(x, missing = "complete", standardize = FALSE)
```

Arguments

x	Can be either a data matrix or a covariance matrix
missing	How to handle missing values.
standardize	When TRUE Results are standardized by using the correlation matrix instead of the covariance matrix for computation.

Value

Lambda1	Guttman's Lambda1 estimate of reliability.
Lambda2	Guttman's Lambda2 estimate of reliability.
Lambda3	Guttman's Lambda3 estimate of reliability. Also known as Cronbach's alpha or coefficient alpha.
Lambda4	Guttman's maximimal Lambda4 estimate of reliability.
Lambda5	Guttman's Lambda5 estimate of reliability.
Lambda6	Guttman's Lambda6 estimate of reliability.

Note

The estimate for Lambda4 is maximized.

Author(s)

Tyler Hunt <tyler@psychoanalytix.com>

References

Guttman L (1945). "A Basis for Analyzing Test-Retest Reliability." Psychometrika, 10, 255-282.

Examples

```
guttman(Rosenberg)
```

---

impute.cov *Compute Covariance Matrix*

Description

Implements various missing data techniques and generates a covariance matrix.

Usage

```
impute.cov(x, missing = c("complete", "pairwise", "mi"))
```

Arguments

x	A data matrix
missing	how to handle missing values.

Author(s)

Tyler Hunt <tyler@psychoanalytix.com>

kristof *Compute Kristof Coefficient*

Description

A reliability coefficient used for tests that are easily split into three parts.

Usage

```
kristof(x, split.method = "triplet",
  missing = "complete", standardize = FALSE)
```

Arguments

`x`	Can be either a data matrix or a covariance matrix
`split.method`	Specify method for splitting items?
`missing`	How to handle missing values.
`standardize`	When TRUE Results are standardized by using the correlation matrix instead of the covariance matrix for computation.

Value

`kristof`	The Kristof estimate of reliability.
`Split`	The split used to obtain the reliability estimate.

Author(s)

Tyler Hunt <tyler@psychoanalytix.com>

References

Kristof, W. (1974). Estimation of reliability and true score variance from a split of a test into three arbitrary parts. Psychometrika, 39(4), 491-499.

Examples

```
kristof(Rosenberg, split.method="triplet")
```

lambda1 — *Compute Guttman's Lambda 1 Coefficient*

Description

Compute Guttman's Lambda 1 Coefficient

Usage

```
lambda1(x, missing = "complete", standardize = FALSE)
```

Arguments

`x`	an object that you can compute the covariance of
`missing`	how to handle missing values.
`standardize`	Results are standardized by using the correlation matrix instead of the covariance matrix for computation.

Author(s)

Tyler Hunt <tyler@psychoanalytix.com>

References

Guttman L (1945). "A Basis for Analyzing Test-Retest Reliability." Psychometrika, 10, 255-282.

Examples

```
lambda1(Rosenberg)
```

lambda2 — *Compute Guttman's Lambda 2 Coefficient*

Description

Compute Guttman's Lambda 2 Coefficient

Usage

```
lambda2(x, missing = "complete", standardize = FALSE)
```

Arguments

`x`	Can be either a data matrix or a covariance matrix
`missing`	how to handle missing values.
`standardize`	Results are standardized by using the correlation matrix instead of the covariance matrix for computation.

Author(s)

Tyler Hunt <tyler@psychoanalytix.com>

References

Guttman L (1945). "A Basis for Analyzing Test-Retest Reliability." Psychometrika, 10, 255-282.

Examples

```
lambda2(Rosenberg)
```

---

lambda3 *Compute Guttman's Lambda 3 Coefficient (Coefficent Alpha)*

Description

Often recognized as Cronbach's alpha, Guttman's Lambda 3 can be used to estimate reliability when the data can be split in parallel forms.

Usage

```
lambda3(x, item.stats.max = 12, missing = "complete")
```

Arguments

`x`	Can be either a data matrix or a covariance matrix
`item.stats.max`	items statistics shown if the number of items are less than this value.
`missing`	how to handle missing values.

Value

`lambda3`	The unstandardized and standardized lambda3 estimate.
`item.stats`	If the input data was a covariance matrix then this is a table of reliability estimates if an item was dropped. If the input data is a data frame then the mean, standard deviation, and number of observations are also included.
`items`	The number of items.
`item.stats.max`	The maximum number of item to display the item.stats table (user specified).

Author(s)

Tyler Hunt <tyler@psychoanalytix.com>

References

Cronbach L (1951). "Coefficient Alpha and the Internal Structure of Tests." Psychometrika, 16, 297-334. Guttman L (1945). "A Basis for Analyzing Test-Retest Reliability." Psychometrika, 10, 255-282.

Examples

```
lambda3(Rosenberg)
```

`Lambda4` *Collection of Internal Consistency Reliability Coefficients.*

Description

Currently the package includes 14 methods for calculating internal consistency reliability but is still growing. The package allows users access to whichever reliability estimator is deemed most appropriate for their situation.

Functions

- `angoff`: Compute Angoff Coefficient
- `bin.combs`: Generate Unique Binary Combinations
- `cov.lambda4`: Compute Covariance Maximized Lambda4
- `impute.cov`: Compute Covariance Matrix
- `kristof`: Compute Kristof Coefficient
- `lambda1`: Compute Guttman's Lambda 1 Coefficient
- `lambda2`: Compute Guttman's Lambda 2 Coefficient
- `lambda3`: Compute Guttman's Lambda 3 Coefficient (Coefficent Alpha)
- `lambda5`: Compute Guttman's Lambda 5 Coefficient
- `lambda6`: Compute Guttman's Lambda 6 Coefficient
- `lambdas`: Compute Guttman's Lambda Coefficients
- `omega.tot`: Compute McDonald's Omega Total
- `quant.lambda4`: Compute Quantile Lambda 4
- `raju`: Compute Raju's Coefficient
- `user.lambda4`: Compute User Specified Lambda 4 (Split-Half)

Author(s)

Tyler Hunt `<tyler@psychoanalytix.com>`

References

Cronbach L (1951). "Coefficient Alpha and the Internal Structure of Tests." Psychometrika, 16, 297-334.

Guttman L (1945). "A Basis for Analyzing Test-Retest Reliability." Psychometrika, 10, 255-282.

Callender J, Osburn H (1977). "A Method for Maximizing and Cross-Validating Split-Half Reliability Coefficients." Educational and Psychological Measurement, 37, 819-826.

Callender J, Osburn H (1979). "An Empirical Comparison of Coefficient Alpha, Guttman's Lambda2 and Msplit Maximized Split-Half Reliability Estimates." Journal of Educational Measurement, 16, 89-99.

Sijtsma K (2009). "On the Use, Misuse, and Very Limited Usefulness of Cronbach's Alpha." Psychometrika, 74(1), 107-120.

---

lambda5 *Compute Guttman's Lambda 5 Coefficient*

Description

Compute Guttman's Lambda 5 Coefficient

Usage

```
lambda5(x, missing = "complete", standardize = FALSE)
```

Arguments

x	Can be either a data matrix or a covariance matrix.
missing	how to handle missing values.
standardize	Results are standardized by using the correlation matrix instead of the covariance matrix for computation.

Author(s)

Tyler Hunt <tyler@psychoanalytix.com>

References

Guttman L (1945). "A Basis for Analyzing Test-Retest Reliability." Psychometrika, 10, 255-282.

Examples

```
lambda5(Rosenberg)
```

`lambda6` *Compute Guttman's Lambda 6 Coefficient*

Description

Compute Guttman's Lambda 6 Coefficient

Usage

```
lambda6(x, missing = "complete", standardize = FALSE)
```

Arguments

`x`	Can be either a data matrix or a covariance matrix.
`missing`	how to handle missing values.
`standardize`	Results are standardized by using the correlation matrix instead of the covariance matrix for computation.

Author(s)

Tyler Hunt <`tyler@psychoanalytix.com`> lambda6(Rosenberg)

References

Guttman L (1945). "A Basis for Analyzing Test-Retest Reliability." Psychometrika, 10, 255-282.

`omega.tot` *Compute McDonald's Omega Total*

Description

McDonald proposed Omega Total as a method for estimating reliabilty for a test with multiple factors.

Usage

```
omega.tot(x, factors = 1, missing = "complete")
```

Arguments

`x`	Can be either a data matrix or a covariance matrix
`missing`	how to handle missing values. mi.
`factors`	The number of latent factors.

Value

`omega.tot` Omega total reliability estimate.

Author(s)

Tyler Hunt <tyler@psychoanalytix.com>

References

McDonald, R. P. (1999). Test Theory: Aunified Treatment. Psychology Press.

Examples

```
omega.tot(Rosenberg, factors=1)
```

---

par1f *One Factor Parallel Covariance Matrix*

Description

This Covariance matrix was used as the population model for one set of simulations. It was used to represent a parallel data structure in which all factor loadings and error variances are set at .6.

Usage

```
data(par1f)
```

Format

A covariance matrix of 8 theoretical items.

Examples

```
###---Loadings
fx<-t(matrix(c(
.6,
.6,
.6,
.6,
.6,
.6,
.6,
.6), nrow=1))

###--Error Variances
err<-diag(c(.6^2,.6^2,.6^2,.6^2,
   .6^2,.6^2,.6^2,.6^2))

###---matrix of factor covariances
```

```
phi<-matrix(1, nrow=1)

###---Reliability Calculation---###
t1<-matrix(c(rep(1,8)), nrow=1)
t1t<-matrix(c(rep(1,8)), ncol=1)

(fx%*%phi%*%t(fx)+err)
```

---

par3f *Three-Factor Parallel Covariance Matrix*

Description

This Covariance matrix was used as the population model for one set of simulations. It was used to represent a parallel data structure in which all factor loadings and error variances are set at .6 and the latent variables are correlated at .3.

Usage

```
data(par3f)
```

Format

A covariance matrix of 12 theoretical items.

Examples

```
###---Loadings
fx<-t(matrix(c(
.6,0,0,
.6,0,0,
.6,0,0,
.6,0,0,
0,.6,0,
0,.6,0,
0,.6,0,
0,.6,0,
0,0,.6,
0,0,.6,
0,0,.6,
0,0,.6), nrow=3))

###--Error Variances
err<-diag(c(  .6^2,.6^2,.6^2,.6^2,
.6^2,.6^2,.6^2,.6^2,
.6^2,.6^2,.6^2,.6^2))

###---3x3 matrix of factor covariances
phi<-matrix(c(rep(.3, 9)), nrow=3)
diag(phi)<-1
```

```
###---Reliability Calculation---###
t1<-matrix(c(rep(1,12)), nrow=1)
t1t<-matrix(c(rep(1,12)), ncol=1)

(fx%*%phi%*%t(fx)+err)
```

---

par5f *Five-Factor Parallel Covariance Matrix*

Description

This Covariance matrix was used as the population model for one set of simulations. It was used to represent a parallel data structure in which all factor loadings and error variances are set at .6 and the latent variables are correlated at .3.

Usage

```
data(par5f)
```

Format

A covariance matrix of 20 theoretical items.

Examples

```
###---Loadings
fx<-t(matrix(c(
.6,0,0,0,0,
.6,0,0,0,0,
.6,0,0,0,0,
.6,0,0,0,0,
0,.6,0,0,0,
0,.6,0,0,0,
0,.6,0,0,0,
0,.6,0,0,0,
0,0,.6,0,0,
0,0,.6,0,0,
0,0,.6,0,0,
0,0,.6,0,0,
0,0,0,.6,0,
0,0,0,.6,0,
0,0,0,.6,0,
0,0,0,.6,0,
0,0,0,0,.6,
0,0,0,0,.6,
0,0,0,0,.6,
0,0,0,0,.6), nrow=5))

###--Error Variances
```

```
err<-diag(c(.6^2,.6^2,.6^2,.6^2,
   .6^2,.6^2,.6^2,.6^2,
.6^2,.6^2,.6^2,.6^2,
.6^2,.6^2,.6^2,.6^2,
.6^2,.6^2,.6^2,.6^2))

###---5x5 matrix of factor covariances
phi<-matrix(c(rep(.3, 25)), nrow=5)
diag(phi)<-1

###---Reliability Calculation---###
t1<-matrix(c(rep(1,20)), nrow=1)
t1t<-matrix(c(rep(1,20)), ncol=1)

(fx%*%phi%*%t(fx)+err)
```

`quant.lambda4` *Compute Quantile Lambda 4*

Description

Quantile maximize lambda4 is a statistic that can be used in most measurement situations. In particular this function generates a vector t of length equal to the number of items. Each value in the vector consists of either a +1 or -1 (randomly generated). Next, in a random order each value in the t-vector is switched. The value kept (+1 or -1) is the value that resulted in the highest reliability estimate. This procedure is repeated by default 1000 times but can also be user specified. The user can then specify the quantile of this vector but it defaults to .5.

Usage

```
quant.lambda4(x, starts = 1000, quantiles = 0.5,
  missing = "complete", show.lambda4s = FALSE,
  standardize = FALSE)
```

Arguments

`x`	Can be either a data matrix or a covariance matrix
`starts`	How many split-half reliability estimates used
`quantiles`	The quantiles of the generated splits. It defaults to .5 because it makes the most sense at this time. (The simulation manuscript is under review).
`missing`	How to handle missing values.
`show.lambda4s`	If TRUE then Shows the vector of lambda4s if FALSE then the vector is hidden
`standardize`	Results are standardized by using the correlation matrix instead of the covariance matrix for computation.

Value

`lambda4.quantile`
: The user specified quantile value of the vector of maximized split-reliability

`lambda4.optimal`
: Maximum split-half reliability (Maximized Lambda4

`l4.vect`
: A vector of lambda4 (split-half reliability) calculations

Author(s)

Tyler Hunt <tyler@psychoanalytix.com>

References

Guttman L (1945). "A Basis for Analyzing Test-Retest Reliability." Psychometrika, 10, 255-282.

Callender J, Osburn H (1977). "A Method for Maximizing and Cross-Validating Split-Half Reliability Coefficients." Educational and Psychological Measurement, 37, 819-826.

Callender J, Osburn H (1979). "An Empirical Comparison of Coefficient Alpha, Guttman's Lambda2 and Msplit Maximized Split-Half Reliability Estimates." Journal of Educational Measurement, 16, 89-99. Guttman L (1945). "A Basis for Analyzing Test-Retest Reliability." Psychometrika, 10, 255-282.

Callender J, Osburn H (1977). "A Method for Maximizing and Cross-Validating Split-Half Reliability Coefficients." Educational and Psychological Measurement, 37, 819-826.

Callender J, Osburn H (1979). "An Empirical Comparison of Coefficient Alpha, Guttman's Lambda2 and Msplit Maximized Split-Half Reliability Estimates." Journal of Educational Measurement, 16, 89-99.

Sijtsma K (2009). "On the Use, Misuse, and Very Limited Usefulness of Cronbach's Alpha." Psychometrika, 74(1), 107-120.

Examples

```
quant.lambda4(Rosenberg, starts=1000, quantile=c(.05,.5,.95))
```

---

raju *Compute Raju Coefficient*

Description

Compute Raju Coefficient

Usage

```
raju(x, split.method = "even.odd", missing = "complete",
  standardize = FALSE)
```

Arguments

`x`	Can be either a data matrix or a covariance matrix
`split.method`	Specify method for splitting items.
`missing`	How to handle missing values.
`standardize`	When TRUE Results are standardized by using the correlation matrix instead of the covariance matrix for computation.

Author(s)

Tyler Hunt `<tyler@psychoanalytix.com>`

Examples

```
raju(Rosenberg, split.method="even.odd")
```

`Rosenberg` *Rosenberg Self-Esteem*

Description

The data set was collected in Southern Utah in the Fall of 2010. The investigation sought responses from high school and college students. It should be noted that the reverse coded items have been flipped.

Usage

```
data(Rosenberg)
```

Format

A data frame with 837 observations on the following 10 variables.

`SEFailureR` All in all, I am inclined to feel that I am a failure.

`SENoGoodR` At times I think I am no good at all.

`SEAble` I am able to do things as well as most other people.

`SEUselessR` I certainly feel useless at times.

`SENoProudR` I feel I do not have much to be proud of.

`SEGoodQualities` I feel that I have a number of good qualities.

`SEWorth` I feel that I am a person of worth, at least on an equal plane with others.

`SEPositive` I take a positive attitude toward myself.

`SERespectR` I wish I could have more respect for myself.

`SESatisfied` On the whole, I am satisfied with myself.

Examples

```
data(Rosenberg)
```

tau1f — *One-Factor Tau-Equivalent Covariance Matrix*

Description

This covariance matrix was used as the population model for one set of simulations. It was used to represent a tau equivalent data structure in which the factor loadings are set at .6. The error variances were set at .6^2, .7^2, .8^2, .9^2, .6^2, .7^2, .8^2, and .9^2.

Usage

```
data(tau1f)
```

Format

A covariance matrix of 8 theoretical items.

Examples

```
###---Loadings
fx<-t(matrix(c(
.6,
.6,
.6,
.6,
.6,
.6,
.6,
.6), nrow=1))

###--Error Variances
err<-diag(c(.6^2,.7^2,.8^2,.9^2,
   .6^2,.7^2,.8^2,.9^2))

###---matrix of factor covariances
phi<-matrix(1, nrow=1)

###---Reliability Calculation---###
t1<-matrix(c(rep(1,8)), nrow=1)
t1t<-matrix(c(rep(1,8)), ncol=1)

(fx%*%phi%*%t(fx)+err)
```

tau3f — *Three-Factor Tau-Equivalent Covariance Matrix*

Description

This covariance matrix was used as the population model for one set of simulations. It was used to represent a tau equivalent data structure in which the factor loadings are set at .6. The error variances were set at .6^2, .7^2, .8^2, .9^2, .6^2, .7^2, .8^2, and .9^2. The correlations between the latent variables was fixed to .3.

Usage

```
data(tau3f)
```

Format

A covariance matrix of 12 theoretical items.

Examples

```
###---Loadings
fx<-t(matrix(c(
.6,0,0,
.6,0,0,
.6,0,0,
.6,0,0,
0,.6,0,
0,.6,0,
0,.6,0,
0,.6,0,
0,0,.6,
0,0,.6,
0,0,.6,
0,0,.6), nrow=3))

###--Error Variances
err<-diag(c(.6^2,.7^2,.8^2,.9^2,
   .6^2,.7^2,.8^2,.9^2,
.6^2,.7^2,.8^2,.9^2))

###---3x3 matrix of factor covariances
phi<-matrix(c(rep(.3, 9)), nrow=3)
diag(phi)<-1

###---Reliability Calculation---###
t1<-matrix(c(rep(1,12)), nrow=1)
t1t<-matrix(c(rep(1,12)), ncol=1)

(fx%*%phi%*%t(fx)+err)
```

tau5f *Five-Factor Tau-Equivalent Covariance Matrix*

Description

This covariance matrix was used as the population model for one set of simulations. It was used to represent a tau equivalent data structure in which the factor loadings are set at .6. The error variances were set at .6^2, .7^2, .8^2, .9^2, .6^2, .7^2, .8^2, and .9^2. The correlations between the latent variables was fixed to .3.

Usage

```
data(tau5f)
```

Format

A covariance matrix of 20 theoretical items.

Examples

```
###---Loadings
fx<-t(matrix(c(
.6,0,0,0,0,
.6,0,0,0,0,
.6,0,0,0,0,
.6,0,0,0,0,
0,.6,0,0,0,
0,.6,0,0,0,
0,.6,0,0,0,
0,.6,0,0,0,
0,0,.6,0,0,
0,0,.6,0,0,
0,0,.6,0,0,
0,0,.6,0,0,
0,0,0,.6,0,
0,0,0,.6,0,
0,0,0,.6,0,
0,0,0,.6,0,
0,0,0,0,.6,
0,0,0,0,.6,
0,0,0,0,.6,
0,0,0,0,.6), nrow=5))

###--Error Variances
err<-diag(c(.6^2,.7^2,.8^2,.9^2,
   .6^2,.7^2,.8^2,.9^2,
.6^2,.7^2,.8^2,.9^2,
.6^2,.7^2,.8^2,.9^2,
.6^2,.7^2,.8^2,.9^2))
```

```
###---5x5 matrix of factor covariances
phi<-matrix(c(rep(.3, 25)), nrow=5)
diag(phi)<-1

###---Reliability Calculation---###
t1<-matrix(c(rep(1,20)), nrow=1)
t1t<-matrix(c(rep(1,20)), ncol=1)

(fx%*%phi%*%t(fx)+err)
```

TenBerge2004 *De Leeuw (1983) Political Survey Items*

Description

Six political survey items, N = 119, and unidensional.

Usage

```
data(TenBerge2004)
```

Details

This is a covariance matrix that comes De Leeuw (1983) and represents six political survey items. These items are based on N = 119 members of parliament and are supposed to measure the same trait and be unidensional.

Source

Ten Berge, J. M., & Socan, G. (2004). The greatest lower bound to the reliability of a test and the hypothesis of unidimensionality. Psychometrika, 69(4), 613-625.

References

De Leeuw, J. (1983). Models and methods for the analysis of correlation coefficients. Journal of Econometrics, 22, 113-137.

Examples

```
data(TenBerge2004)
```

user.lambda4 — *Compute User Specified Lambda 4 (Split-Half)*

Description

Compute User Specified Lambda 4 (Split-Half)

Usage

```
user.lambda4(x, split.method = "even.odd",
  item.stats = FALSE, missing = "complete")
```

Arguments

`x`	Can be either a data frame or a covariance matrix.
`split.method`	Specify method for splitting items.
`item.stats`	If TRUE then item statistics are provided in the output.
`missing`	How to handle missing values.

Author(s)

Tyler Hunt <tyler@psychoanalytix.com>

References

Guttman L (1945). "A Basis for Analyzing Test-Retest Reliability." Psychometrika, 10, 255-282.

Examples

```
user.lambda4(Rosenberg)
user.lambda4(Rosenberg, c(0, 1, 1, 0, 1, 1, 0, 1, 0, 0))
```

WAIS1955 — *Wechsler Adult Intellegence Scale (1955)*

Description

Data comes from Warner, Meeker, and Eels (1960) and is a multidimensional scale of composite scores of social class.

Usage

```
data(WAIS1955)
```

Details

This is a covariance matrix of the 11 subtests of the WAIS based on N = 300. The subtests include: comprehension, arithmetic, similarities, digit span, vocabulary, digit symbol, picture completion, block design, picture arrangement, and object assembly. These data have been used by Bentler (1972) to show the stark difference between alpha and the glb.

Source

Bentler, PM (1972). "A Lower-Bound Method for the Dimension-Free Measurement of Internal Consistency" 1(4), 343-357.

References

Wechsler, D. (1955), "Manual for the Wechsler Adult Intelligence Scale," The Psychological Corporation, New York

Examples

```
data(WAIS1955)
```

`Warner1960` *Warner 1960 Social Class Data*

Description

Data comes from Warner, Meeker, and Eels (1960) and is a multidimensional scale of composite scores of social class.

Usage

```
data(Warner1960)
```

Format

The format is: num [1:6, 1:6] 1 0.87 0.76 0.71 0.7 0.77 0.87 1 0.82 0.81 ...

Details

The components were averaged and then the averages were used for the covariance matrix. The factors are: occupation, amount of income, source of income, house type, dwelling area, and education. These data have been used by Bentler (1972) to show the stark difference between alpha and the glb.

Source

Bentler, PM (1972). "A Lower-Bound Method for the Dimension-Free Measurement of Internal Consistency" 1(4), 343-357.

References

Warner WL, Meeker M, and Eels K. (1960), "Social Class in America" Harper and Row:New York.

Examples

```
data(Warner1960)
```

Index