Package: rlme (via r-universe)

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Type Package

Title Rank-Based Estimation and Prediction in Random Effects Nested Models

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Description Estimates robust rank-based fixed effects and predicts robust random effects in two- and three- level random effects nested models. The methodology is described in Bilgic & Susmann (2013) <https://journal.r-project.org/archive/2013/RJ-2013-027/>.

License GPL (>= 2)

Imports MASS, quantreg, nlme, mgcv, stringr, magic, robustbase, Rcpp, stats, utils, graphics

Suggests testthat

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Contents

`rlme-package` *rlme*

Description

An R package for rank-based robust estimation and prediction in random effects nested models

Details

Package:	rlme
Type:	Package
Version:	0.2
Date:	2013-07-07
License:	GPL (>= 2)

Author(s)

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Maintainer: Yusuf Bilgic <bilgic@geneseo.edu> or <yusuf.k.bilgic@gmail.com>

See Also

rlme

Examples

```
library(rlme)
data(schools)
formula = y ~ 1 + sex + age + (1 | region) + (1 | region:school)
rlme.fit = rlme(formula, schools)
summary(rlme.fit)
```

---

beta_var *Estimate fixed-effect variance for Joint Rank Method (JR) in three-level nested design.*

Description

Fixed effect variance estimation for Joint Rank Method (JR). It assumes Compound Symmetric (CS) structure of error terms. For k-level design, there are k-1 intra/inter-class parameters to place in a correlation matrix of errors.

Usage

```
beta_var(x, school, tauhat, v1, v2, v3, section, mat)
```

Arguments

x	Data frame of covariates.
school	A vector of cluster.
tauhat	This is obtained from Rank-based fitting. tauhat here~~
v1	This is 1, main diagonal element for correlation matrix of observations. Correlation of an observation with itself is 1.
v2	Intra-cluster correlation coefficient.
v3	Intra-subcluster correlation coefficient.
section	A vector of subclusters, nx1.
mat	A matrix of numbers of observations in subclusters. Dimension is Ixmax(number ofsubclusters). Each row indicates one cluster.

Details

Correlation coefficients are obtained using Moment Estimates. See Klole et. al (2009), Bilgic (2012) and HM (2012)

Value

var	The variance of fixed estimated.

Author(s)

Yusuf Bilgic

References

Y. K. Bilgic. Rank-based estimation and prediction for mixed effects models in nested designs. 2012. URL http://scholarworks.wmich.edu/dissertations/40. Dissertation.

J. Kloke, J. W. McKean and M. Rashid. Rank-based estimation and associated inferences for linear models with cluster correlated errors. Journal of the American Statistical Association, 104(485):384-390, 2009.

T. P. Hettmansperger and J. W. McKean. Robust Nonparametric Statistical Methods. Chapman Hall, 2012.

---

compare.fits *Compare Fits*

Description

Compares two model fits. It returns tdbeta value and cfits values of two fits. The function uses the fixed effects estimates from fit 1 and fit 2 along with the covariance of the rank-based fit.

Usage

```
compare.fits(x, fit1, fit2)
```

Arguments

x	Matrix of covariates
fit1	A class of type rlme.
fit2	A class of type rlme.

Value

Returns tdbeta and cfits values.

See Also

fitdvcov

Examples

```
data(schools)
model = y ~ 1 + sex + age + (1 | region) + (1 | region:school)

# Extract covariants into matrix
cov = as.matrix(data.frame(schools[,"sex"], schools[,"age"]))

# Fit the models using each method
reml.fit = rlme(model, schools, method="reml")
gr.fit = rlme(model, schools, method="gr")

compare.fits(cov, reml.fit, gr.fit)
```

---

dispvar *Rank-based dispersion estimate.*

Description

This is an unbiased estimator with a correction factor for standard deviation when normal errors.

Usage

```
dispvar(x, score = 1)
```

Arguments

x	vector
score	score type - 1 or 2

References

T. P. Hettmansperger and J. W. McKean. Robust Nonparametric Statistical Methods. Chapman Hall, 2012.

---

fitdvcov *Fitdvcov*

Description

Obtains measurement for the fits based on estimates beta1, beta2 and covariance matrix from a rank based methods.

Usage

```
fitdvcov(x1, beta1, beta2, vcw)
```

Arguments

x1	data
beta1	model 1 beta estimate
beta2	model 2 beta estimate
vcw	variance matrix

See Also

compare.fits

Examples

```
# Compare GR and JR methods

data(schools)

model = y ~ 1 + sex + age + (1 | region) + (1 | region:school)

# Extract covariants into matrix
cov = as.matrix(data.frame(schools[,"sex"], schools[,"age"]))

# Fit the models using each method
jr.fit = rlme(model, schools, method="jr")
gr.fit = rlme(model, schools, method="gr")

# Extract beta estimates, ignoring the intercept
jr.beta = jr.fit$fixed.effects$Estimate[c(2, 3)]
gr.beta = gr.fit$fixed.effects$Estimate[c(2, 3)]

# Extract beta variance matrix
var.b = jr.fit$var.b

fitdvcov(cov, jr.beta, gr.beta, var.b)
```

GEER_est *GEER: General Estimating Equation Rank-Based Estimation Method*

Description

The package rlme calls this function for gee method, one of the methods proposed in Bilgic's study (2012). Also see Kloke et al. (2013). concise (1-5 lines) description of what the function does. ~~

Usage

```
GEER_est(x, y, I, sec, mat, school, section, weight = "wil",
  rprpair = "hl-disp", verbose = FALSE)
```

Arguments

x	Design matrix, pxn, without intercept.
y	Response vector of nx1.
I	Number of clusters.
sec	A vector of subcluster numbers in clusters.
mat	A matrix of numbers of observations in subclusters. Dimension is Ixmax(number ofsubclusters). Each row indicates one cluster.
school	A vector of clusters, nx1.
section	A vector of subclusters, nx1.
weight	When weight="hbr", it uses hbr weights in GEE weights. By default, ="wil", it uses Wilcoxon weights. See the theory in the references.
rprpair	By default, it uses "hl-disp" in the random prediction procedure (RPP). Also, "med-mad" would be an alternative.
verbose	Boolean indicating whether to print out diagnostic messages.

Value

theta	Fixed effect estimates.
ses	Standard error for the fixed esimates.
sigma	Variances of cluster, subcluster, and residual.
ehat	Raw error.
ehats	Independence error from last weighted step.
effect_sch	Cluster random error.
effect_sec	Subcluster random error.
effect_err	Epsilon error.

Author(s)

Yusuf K. Bilgic, yekabe@hotmail.com

References

Y. K. Bilgic. Rank-based estimation and prediction for mixed effects models in nested designs. 2012. URL http://scholarworks.wmich.edu/dissertations/40. Dissertation.

A. Abebe, J. W. McKean, J. D. Kloke and Y. K. Bilgic. Iterated reweighted rank-based estimates for gee models. 2013. Submitted.

See Also

rlme, GR_est, JR_est, rprmeddisp

Examples

```
# See the rlme function.
```

getgrstplot *Q-Q Plot and Standardized Residual Plot for the GR fit.*

Description

It gets Q-Q Plot and Standardized Residual Plot of residuals.

Usage

```
getgrstplot(rlme.fit)
```

Arguments

rlme.fit	RLME fit object

Details

The fit is obtained from rlme()

See Also

rlme

getlmestplot *Q-Q Plot and Standardized Residual Plot for the REML or ML fit.*

Description

It gets Q-Q Plot and Standardized Residual Plot of residuals. concise (1-5 lines) description of what the function does.

Usage

```
getlmestplot(rlme.fit)
```

Arguments

rlme.fit	The fit is obtained from rlme()

See Also

rlme

GR_est *GR Method*

Description

Fits a model using the GR method

Usage

```
GR_est(x, y, I, sec, mat, school, section, rprpair = "hl-disp",
  verbose = FALSE)
```

Arguments

x	Covariate matrix or data frame.
y	Response matrix or data frame.
I	Number of clusters
sec	A vector of subcluster numbers in clusters.
mat	A matrix of numbers of observations in subclusters. Dimension is Ixmax(number ofsubclusters). Each row indicates one cluster.
school	A vector of clusters, nx1.
section	A vector of subclusters, nx1.
rprpair	By default, it uses "hl-disp" in the random prediction procedure (RPP). Also, "med-mad" would be an alternative.
verbose	Boolean indicating whether to print out messages from the algorithm.

Value

theta	Fixed effect estimates.
ses	Standard error for the fixed esimates.
sigma	Variances of cluster, subcluster, and residual.
ehat	Raw error.
ehats	Independence error from last weighted step.
effect_sch	Cluster random error.
effect_sec	Subcluster random error.
effect_err	Epsilon error.

Author(s)

Yusuf Bilgic

Examples

```
# See rlme function
```

hbrwts_gr *HBR Weight*

Description

Calculates hbr weights for the GEER method. This turns a vector of weights for a vector of errors. Used to make factor space more robust, up to 50% breakdown. See HM (2012) and Terpstra and McKean (2005) for details. The ww package produces this weights as well.

Usage

```
hbrwts_gr(xmat, y, percent = 0.95, intest = ltsreg(xmat, y)$coef)
```

Arguments

xmat	Design matrix, pxn, without intercept.
y	Response vector in nx1.
percent	This is 0.95.
intest	This is obtained from myltsreg(xmat, y)$coef

Details

The ww package explains how it is obtained.

Author(s)

J. W. McKean

References

T. P. Hettmansperger and J. W. McKean. Robust Nonparametric Statistical Methods. Chapman Hall, 2012.

J. T. Terpstra and J. W. McKean. Rank-based analysis of linear models using R. Journal of Statistical Software, 14(7):1 - 26, 7 2005. ISSN 1548-7660. URL http://www.jstatsoft.org/v14/i07.

See Also

GEER_est

`instruction` *Instruction*

Description

A data frame on school instruction results.

Format

A data frame with 1190 observations on the following 13 variables.

X a numeric vector

girl a numeric vector

minority a numeric vector

mathkind a numeric vector

mathgain a numeric vector

ses a numeric vector

yearstea a numeric vector

mathknow a numeric vector

housepov a numeric vector

mathprep a numeric vector

classid a numeric vector identifying the class within school

schoolid a numeric vector identifying the school

childid a numeric vector

Source

West, B., Welch, K. B., & Galecki, A. T. (2006). Linear mixed models: a practical guide using statistical software. Chapman & Hall/CRC.

Examples

```
# The following code takes a few minutes to run.
# In the interest of saving CRAN's example testing time,
# it has been commented out. If you want to use it,
# just uncomment and run.

# data(instruction)
# attach(instruction)

# data = data.frame(
#   y = mathgain,
#   mathkind = mathkind,
#   girl = girl,
#   minority = minority,
```

```
#   ses = ses,
#   school = factor(schoolid),
#   section = factor(classid))


# fit.rlme = rlme(y ~ 1 + mathkind + girl + minority + ses + (1 | school) + (1 | school:section),
#  data = data,
#  method = "gr")

# summary(fit.rlme)
```

JR_est *JR Method*

Description

Fit a model using the JR method

Usage

```
JR_est(x, y, I, sec, mat, school, section, rprpair = "hl-disp",
  verbose = FALSE)
```

Arguments

x	Covariate matrix or data frame
y	Response matrix or data frame
I	Number of clusters.
sec	A vector of subcluster numbers in clusters.
mat	A matrix of numbers of observations in subclusters. Dimension is Ixmax(number ofsubclusters). Each row indicates one cluster. mat here~~
school	A vector of clusters, nx1.
section	A vector of subclusters, nx1.
rprpair	By default, it uses "hl-disp" in the random prediction procedure (RPP). Also, "med-mad" would be an alternative.
verbose	Boolean indicating whether to print out diagnostic messages.

Value

theta	Fixed effect estimates.
ses	Standard error for the fixed esimates.
sigma	Covariate variance estimates using RPP (Groggel and Dubnicka's procedure).
ehat	Raw error.
effect_sch	Cluster random error.
effect_sec	Subcluster random error.
effect_err	Epsilon error.

Author(s)

Yusuf Bilgic

See Also

rlme

`lmr` *Rank Based Fixed Effect Regression*

Description

Computes rank based regression estimates for fixed effect models.

Usage

```
lmr(f, data, se = FALSE, method = "L-BFGS-B")
```

Arguments

`f`	A model formula
`data`	Data to use for model fitting
`se`	Boolean indicating whether or not to calculate standard errors for intercept and slope estimates
`method`	Optimization method to use. Will accept any method usable by optim, e.g. one of c("Nelder-Mead", "BFGS", "CG", "L-BFGS-B", "SANN", "Brent"). "BFGS" or "L-BFGS-B" are reccomended. "L-BFGS-B" should be used for large datasets to conserve memory.

Value

`fixed.effects`	Fixed effect estimates
`ehat`	Residuals from model

Author(s)

Herb Susmann

See Also

rlme, optim

Examples

```
# load schools data
data(schools)

# Fit fixed effects model with lmr
lmr.fit = lmr(y ~ age + sex, data=schools)

summary(lmr.fit)

# Fit with lmr and calculate standard errors
lmr.fit = lmr(y ~ age + sex, data=schools, se=TRUE)

summary(lmr.fit)
```

`LM_est` *Linear Model Estimation using the nlme package.*

Description

This gets the REML or ML estimates and predictions of random effects from the nlme package. function does.

Usage

```
LM_est(x, y, dat, method = "REML")
```

Arguments

`x`	Design matrix, (p+1)xn, with intercept.
`y`	Response vector of nx1.
`dat`	Data frame
`method`	Character string indicating method to use, either "ML" or "REML" (defaults to REML).

Value

`theta`	Fixed effects esimates.
`ses`	Standard error for fixed effects.
`varb`	Variances.
`sigma`	Error.
`ehat`	Raw residuals
`standr.lme`	Standardized residual
`effect_sch`	Cluster random error.
`effect_sec`	Subcluster random error.
`effect_err`	Epsilon error.

Author(s)

Yusuf Bilgic

References

J. Pinheiro, D. Bates, S. DebRoy, D. Sarkar and R Development Core Team. nlme linear and nonlinear mixed effects models. The R Journal, 2011. URL http://CRAN.R-project.org/package=nlme. R package version 3.1-98.

See Also

rlme

---

minimize_dispersion *Minimize Dispersion Function*

Description

Uses optim to find regression estimates which minimize dispersion function on X and Y input matrices

Usage

```
minimize_dispersion(X, Y, method = "BFGS", init.guess = "quantreg",
  verbose = FALSE, se = TRUE)
```

Arguments

X	Input matrix
Y	Response vector
method	Method optim should use - one of "Nelder-Mead", "BFGS", "CG", "L-BFGS-B", "SANN", or "Brent".
init.guess	How to calculate the first regression estimate. Defaults to using quantile regression.
verbose	Whether to print out verbose messages.
se	Whether or not to calculate standard errors of regression estimates.

Value

theta	Regression parameter estimates
ehat	Regression residuals

Author(s)

Herb Susmann

plot.rlme *Plot rlme Fit*

Description

Generates Normal Q-Q plot of residuals from rlme fit

Usage

```
## S3 method for class 'rlme'
plot(x, ...)
```

Arguments

x	A list of class rlme. Store as fit.rlme.
...	not used

Examples

```
data(schools)
rlme.fit = rlme(y ~ 1 + sex + age + (1 | region) + (1 | region:school), schools, method="gr")
plot(rlme.fit)
```

rhosch *Cluster Correlation Coefficient Estimate*

Description

Moment estimate version of correlation coefficient in a cluster in a three-level nested design.

Usage

```
rhosch(ahat, school, section)
```

Arguments

ahat	A vector of scores. Wilcoxon scores are used in the package.
school	A vector of clusters.
section	A vector of subclusters.

References

Y. K. Bilgic. Rank-based estimation and prediction for mixed effects models in nested designs. 2012. URL http://scholarworks.wmich.edu/dissertations/40. Dissertation.

rhosect *Subcluster Correlation Coefficient Estimate*

Description

Moment estimate version of correlation coefficient in a subcluster in a three-level nested design.

Usage

```
rhosect(ahat, school, section)
```

Arguments

ahat	A vector of scores. Wilcoxon scores are used in the package.
school	A vector of clusters.
section	A vector of subclusters.

References

Y. K. Bilgic. Rank-based estimation and prediction for mixed effects models in nested designs. 2012. URL http://scholarworks.wmich.edu/dissertations/40. Dissertation.

rlme *Rank-based Estimates for Mixed-Effects Nested Models*

Description

This function estimates fixed effects and predicts random effects in two- and three-level random effects nested models using three rank-based fittings (GR, GEER, JR) via the prediction method algorithm RPP.

Usage

```
rlme(f, data, method = "gr", print = FALSE, na.omit = TRUE,
  weight = "wil", rprpair = "hl-disp", verbose = FALSE)
```

Arguments

f	An object of class formula describing the mixed effects model. The syntax is same as in the lme4 package. Example: y ~ 1 + sex + age + (1 | region) + (1 | region:school) - sex and age are the fixed effects, region and school are the nested random effects, school is nested within region.
data	The dataframe to analyze. Data should be cleaned prior to analysis: cluster and subcluster columns are expected to be integers and in order (e.g. all clusters and subclusters)

method	string indicating the method to use (one of "gr", "jr", "reml", and "geer"). defaults to "gr".
print	Whether or not to print a summary of results. Defaults to false.
na.omit	Whether or not to omit rows containing NA values. Defaults to true.
weight	When weight="hbr", it uses hbr weights in GEE weights. By default, ="wil", it uses Wilcoxon weights. See the theory in the references.
rprpair	By default, it uses "hl-disp" in the random prediction procedure (RPP). Also, "med-mad" would be an alternative.
verbose	Boolean indicating whether to print out diagnostic messages.

Details

The iterative methods GR and GEER can be quite slow for large datasets; try JR for faster analysis. If you want to use the GR method, try using rprpair='med-mad'. This method avoids building a NxN covariance matrix which can quickly become unwieldly with large data.

Value

The function returns a list of class "rlme". Use summary.rlme to see a summary of the fit.

formula	The model formula.
method	The method used.
fixed.effects	Estimate of fixed effects.
random.effects	Estimate of random effects.
standard.residual	Residuals.
intra.class.correlations	Intra/inter-class correlationa estimates obtained from RPP.
t.value	t-values.
p.value	p-values.
location	Location.
scale	Scale.
y	The response variable y.
num.obs	Number of observations in provided dataset.
num.clusters	The number of clusters.
num.subclusters	The number of subclusters.
effect.err	Effect from error.
effect.cluster	Effect from cluster.
effect.subcluster	Effect from subcluster.
var.b	Variances of fixed effects estimate (Beta estimates).
xstar	Weighted design matrix with error covariance matrix.
ystar	Weighted response vector with its covariance matrix.
ehat	The raw residual.
ehats	The raw residual after weighted step. Scaled residual.

Author(s)

Yusuf Bilgic <yekabe@hotmail.com> and Herb Susmann <hps1@geneseo.edu>

References

Y. K. Bilgic. Rank-based estimation and prediction for mixed effects models in nested designs. 2012. URL http://scholarworks.wmich.edu/dissertations/40. Dissertation.

T. P. Hettmansperger and J. W. McKean. Robust Nonparametric Statistical Methods. Chapman Hall, 2012.

See Also

summary.rlme, plot.rlme, compare.fits

Examples

```
data(schools)

rlme.fit = rlme(y ~ 1 + sex + age + (1 | region) + (1 | region:school), schools, method="gr")
summary(rlme.fit)

# Try method="geer", "reml", "ml" and "jr" along with
# rprpair="hl-disp" (not robust), and "med-mad" (robust),
# weight="hbr" is for the gee method.
```

---

rpr *Cluster and Subcluster effects*

Description

Partitions model residuals into cluster and subcluster effects using RPP algorithm.

Usage

```
rpr(f, resd, data, rprpair = "hl-disp")
```

Arguments

f	A model formula which specifices the random effects (see example)
resd	The residuals from the fitted model
data	The data the model was fitted on
rprpair	Character string indicating the location and scale parameters to use. Default to "hl-disp", but may also be "med-mad". See Bilgic (2012).

Value

siga2	Variance from cluster
sigw2	Variance from subcluster
sigmae2	Remaining variance not accounted for by variance of cluster and subcluster

Author(s)

J. W. McKean and Y. K. Bilgic

References

Y. K. Bilgic. Rank-based estimation and prediction for mixed effects models in nested designs. 2012. URL http://scholarworks.wmich.edu/dissertations/40. Dissertation.

See Also

rprmeddis, dispvar

Examples

```
# Load school data
data(schools)

# Fit fixed effects model with lmr
lmr.fit = lmr(y ~ age + sex, data=schools)

# Three level design
# Partition residuals into school and region effects with rpp algorithm
rpr(y ~ age + sex + (1 | school) + (1 | school:region), lmr.fit$ehat, schools)

# Two level design
# Estimate variance in residuals from school
rpr(y ~ age + sex + (1 | school), lmr.fit$ehat, schools)
```

---

rprmeddis *Rprmeddis*

Description

Robust rank-based prediction algorithm that gets predictions for random errors in three-level nested design. It needs one location and scale estimators. Hodges-Lehmann location estimate and dispersion functional estimate pair is called with rprpair="hl-disp" -by default- ; median and MAD pair is called with rprpair="med-mad" in rlme().

Usage

```
rprmeddis(I, sec, mat, ehat, location, scale, rprpair = "hl-disp")
```

Arguments

I	Number of clusters.
sec	A vector of subcluster numbers in clusters.
mat	A matrix of numbers of observations in subclusters. Dimension is Ixmax(number ofsubclusters). Each row indicates one cluster.
ehat	The residuals that inherits random effects and error effect to be predicted.
location	If location = scale = 1 then use Median and MAD in RPP If location = scale = 2 then use HL & Dispvar in RPP Note: this is deprecated. You should specify the location & scale parameters by using the rprpair parameter.
scale	1 means mad, 2 means disp as scale estimators
rprpair	Character string indicating the location and scale parameters to use. Default to "hl-disp", but may also be "med-mad". See Bilgic (2012).

Details

The rprmeddisp() function yields predictions of random effects and errors vectors along with scale estimates in each level. This function was designed for three-level nested design. See rprmeddisp2() in the package, this is for two-level nested design.

Author(s)

Yusuf Bilgic <yekabe@hotmail.com>

References

Y. K. Bilgic. Rank-based estimation and prediction for mixed effects models in nested designs. 2012. URL http://scholarworks.wmich.edu/dissertations/40. Dissertation.

See Also

rpr dispvar

---

schools *PISA Literacy Data*

Description

The data in Program for International Assessment (PISA) on academic proficiency in schools around the world.

Format

A data frame with 334 observations on the following 6 variables.

y a numeric vector indicating student literacy

socio a numeric vector

sex a numeric vector

age a numeric vector

region a numeric vector indicating four regions

school a numeric vector indicating the schools within region

References

OECD (2010). PISA 2009 Results. http://www.oecd.org/

Examples

```
#
# The example takes a few seconds to run, so in order to
# save CRAN's testing time it has been commented out.
# To run, simply uncomment and execute.
#

# data(schools)
# rlme.fit = rlme(y ~ 1 + sex + age + (1 | region) + (1 | region:school),
# schools, method="gr")
# summary(rlme.fit)
```

---

stanresidgr *Calculate Standard Residuals*

Description

Standardizes the residuals obtained from the GR fitting.

Usage

```
stanresidgr(x, y, resid, delta = 0.8, param = 2, conf = 0.95)
```

Arguments

x	Design matrix.
y	Response vector.
resid	Residuals obtained from the rank-based fitting.
delta	See HM (2012).
param	See HM (2012).
conf	See HM (2012).

Author(s)

J. W. McKean

References

T. P. Hettmansperger and J. W. McKean. Robust Nonparametric Statistical Methods. Chapman Hall, 2012.

Y. K. Bilgic. Rank-based estimation and prediction for mixed effects models in nested designs. 2012. URL http://scholarworks.wmich.edu/dissertations/40. Dissertation.

`summary.rlme` *rlme Summary*

Description

Summarizes a model fit from the rmle function

Usage

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

Arguments

`object`	A list of class rlme
`...`	not used

Author(s)

Herb Susmann <hps1@geneseo.edu>

See Also

`rlme` `plot.rlme`

wilonestep *Wilcoxon estimate for independent linear models*

Description

This function gets weighted rank based fittings.

Usage

```
wilonestep(y, x)
```

Arguments

y	Response vector of nx1.
x	Design matrix, pxn, without intercept.

References

J. T. Terpstra and J. W. McKean. Rank-based analysis of linear models using R. Journal of Statistical Software, 14(7) 1 – 26, 7 2005. ISSN 1548-7660. URL http://www.jstatsoft.org/v14/i07.

wilstep *Wilcoxon One Step Rank-based Estimate in GR Method*

Description

Gets weighted rank based fittings for nested designs.

Usage

```
wilstep(I, sec, mat, init = F, y, x, sigmaa2 = 1, sigmaw2 = 1,
  sigmae2 = 1, thetaold = c(0), eps = 1e-04, iflag2 = 0,
  rprpair = "hl-disp")
```

Arguments

I	Number of clusters.
sec	A vector of subcluster numbers in clusters.
mat	A matrix of numbers of observations in subclusters. Dimension is Ixmax(number ofsubclusters). Each row indicates one cluster.
init	boolean
y	Response vector of nx1.
x	Design matrix, pxn, without intercept.
sigmaa2	Initial sigma for cluster in three-level design.

sigmaw2	Initial sigma for subcluster in three-level design.
sigmae2	Initial sigma for error in three-level design.
thetaold	Initial input.
eps	Epsilon value
iflag2	y or n
rprpair	Either 'hl-disp' or 'med-mad'

Details

Initial inputs are from the independent model.

Author(s)

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References

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