

Package ‘Rfit’

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Type Package

Title Rank-Based Estimation for Linear Models

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Description Rank-based (R) estimation and inference for linear models. Estimation is for general scores and a library of commonly used score functions is included.

License GPL (>= 2)

LazyLoad yes

LazyData yes

Depends methods

Suggests testthat

NeedsCompilation yes

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Rfit-package *Rank-Based Estimates and Inference for Linear Models*

Description

Package provides functions for rank-based analyses of linear models. Rank-based estimation and inference offers a robust alternative to least squares.

Details

Package: Rfit
 Type: Package
 Version: 0.24.2
 Date: 2019-12-18
 License: GPL (version 2 or later)
 LazyLoad: yes

Author(s)

John Kloke, Joesph McKean
Maintainer: John Kloke <johndkloke@gmail.com>

References

Hettmansperger, T.P. and McKean J.W. (2011), *Robust Nonparametric Statistical Methods, 2nd ed.*, New York: Chapman-Hall.

Jaeckel, L. A. (1972). Estimating regression coefficients by minimizing the dispersion of residuals. *Annals of Mathematical Statistics*, 43, 1449 - 1458.

Jureckova, J. (1971). Nonparametric estimate of regression coefficients. *Annals of Mathematical Statistics*, 42, 1328 - 1338.

Examples

```
data(baseball)
data(wscores)
fit<-rfit(weight~height,data=baseball)
summary(fit)
plot(fitted(fit),rstudent(fit))

### Example of the Reduction (Drop) in dispersion test ###
y<-rnorm(47)
x1<-rnorm(47)
x2<-rnorm(47)
fitF<-rfit(y~x1+x2)
fitR<-rfit(y~x1)
drop.test(fitF,fitR)
```

allscores

All Scores

Description

An object of class scores which includes the score function and it's derivative for rank-based regression inference.

Usage

```
data(wscores)
```

Format

The format is: Formal class 'scores' [package ".GlobalEnv"] with 2 slots ..@ phi :function (u) ..@ Dphi: function (u)

Details

Using Wilcoxon (linear) scores leads to inference which has ARE of 0.955 to least squares (ML) when the data are normal. Wilcoxon scores are optimal when the underlying error distribution is logistic. Normal scores are optimal when the data are normally distributed. Log-rank scores are optimal when the data are from an exponential distribution, e.g. in a proportional hazards model. Log-Generalized F scores can also be used in the analysis of survival data (see Hettmansperger and McKean p. 233).

bentscores1 are recommended for right-skewed distributions. bentscores2 are recommended for light-tailed distributions. bentscores3 are recommended for left-skewed distributions. bentscores4 are recommended for heavy-tailed distributions.

References

Hettmansperger, T.P. and McKean J.W. (2011), *Robust Nonparametric Statistical Methods, 2nd ed.*, New York: Chapman-Hall.

Examples

```
u <- seq(0.01,0.99,by=0.01)
plot(u,getScores(wscores,u),type='l',main='Wilcoxon Scores')
plot(u,getScores(nscores,u),type='l',main='Normal Scores')

data(wscores)
x<-runif(50)
y<-rlogis(50)
rfit(y~x,scores=wscores)

x<-rnorm(50)
y<-rnorm(50)
rfit(y~x,scores=nscores)
```

baseball

Baseball Card Data

Description

These data come from the back-side of 59 baseball cards that Carrie had.

Usage

```
data(baseball)
```

Format

A data frame with 59 observations on the following 6 variables.

height Height in inches

weight Weight in pounds

bat a factor with levels L R S

throw a factor with levels L R

field a factor with levels 0 1

average ERA if the player is a pitcher and his batting average if the player is a fielder

Source

Hettmansperger, T.P. and McKean J.W. (2011), *Robust Nonparametric Statistical Methods, 2nd ed.*, New York: Chapman-Hall.

Examples

```
data(baseball)
wilcox.test(height~field,data=baseball)
rfit(weight~height,data=baseball)
```

bbsalaries

Baseball Salaries

Description

Salaries of 176 professional baseball players for the 1987 season.

Usage

```
data(bbsalaries)
```

Format

A data frame with 176 observations on the following 8 variables.

logYears Log of the number of years experience

aveWins Average wins per year

aveLosses Average losses per year

era Earned Run Average

aveGames Average games pitched in per year

aveInnings Average number of innings pitched per year

aveSaves Average number of saves per year

logSalary Log of the base salary in dollars

Source

<http://lib.stat.cmu.edu/datasets/baseball.data>

References

Hettmansperger, T.P. and McKean J.W. (2011), *Robust Nonparametric Statistical Methods, 2nd ed.*, New York: Chapman-Hall.

Examples

```
data(bbsalaries)
summary(rfit(logSalary~logYears+aveWins+aveLosses+era+aveGames+aveInnings+aveSaves,data=bbsalaries))
```

BoxCox

Box and Cox (1964) data.

Description

The data are the results of a 3 * 4 two-way design, where forty-eight animals were exposed to three different poisons and four different treatments. The design is balanced with four replications per cell. The response was the log survival time of the animal.

Usage

```
data(BoxCox)
```

Format

A data frame with 48 observations on the following 3 variables.

logSurv log Survival Time

Poison a factor indicating poison level

Treatment a factor indicating treatment level

Source

Box, G.E.P. and Cox, D.R. (1964), An analysis of transformations, *Journal of the Royal Statistical Society, Series B, Methodological*, 26, 211-252.

References

Hettmansperger, T.P. and McKean J.W. (2011), *Robust Nonparametric Statistical Methods, 2nd ed.*, New York: Chapman-Hall.

Examples

```
data(BoxCox)
with(BoxCox, interaction.plot(Treatment,Poison,logSurv,median))
raov(logSurv~Poison+Treatment,data=BoxCox)
```

CardioRiskFactors	<i>Cardiovascular risk factors</i>
-------------------	------------------------------------

Description

Data from a study to investigate association between uric acid and various cardiovascular risk factors in developing countries (Heritier et. al. 2009). There are 474 men and 524 women aged 25-64.

Usage

```
data(CardioRiskFactors)
```

Format

A data frame with 998 observations on the following 14 variables.

age Age of subject
bmi Body Mass Index
waisthip waist/hip ratio(?)
smok indicator for regular smoker
choles total cholesterol
trig triglycerides level in body fat
hdl high-density lipoprotien(?)
ldl low-density lipoprotein
sys systolic blood pressure
dia diastolic blood pressure(?)
Uric serum uric
sex indicator for male
alco alcohol intake (mL/day)
apoa apoprotein A

Details

Data set and description taken from Heritier et. al. (2009) (c.f. Conen et. al. 2004).

Source

Heritier, S., Cantoni, E., Copt, S., and Victoria-Feser, M. (2009), *Robust Methods in Biostatistics*, New York: John Wiley and Sons.

Conen, D., Wietlisbach, V., Bovet, P., Shamlaye, C., Riesen, W., Paccaud, F., and Burnier, M. (2004), Prevalence of hyperuricemia and relation of serum uric acid with cardiovascular risk factors in a developing country. *BMC Public Health*.

Examples

```

data(CardioRiskFactors)
fitF<-rfit(Uric~bmi+sys+choles+ldl+sex+smok+alco+apoa+trig+age,data=CardioRiskFactors)
fitR<-rfit(Uric~bmi+sys+choles+ldl+sex,data=CardioRiskFactors)
drop.test(fitF,fitR)
summary(fitR)

```

confintadjust

Confidence interval adjustment methods

Description

Returns the critical value to be used in calculating adjusted confidence intervals. Currently provides methods for Bonferroni and Tukey for confidence interval adjustment methods as well as no adjustment.

Usage

```
confintadjust(n, k, alpha = 0.05, method = confintadjust.methods, ...)
```

Arguments

n	sample size
k	number of comparisons
alpha	overall (experimentwise) type I error rate
method	one of confintadjust.methods
...	Additional arguments. Currently not used.

Details

Returns critical value based on one of the adjustment methods.

Value

cv	critical value
method	the method used

Author(s)

Joseph McKean, John Kloke

References

Hettmansperger, T.P. and McKean J.W. (2011), *Robust Nonparametric Statistical Methods, 2nd ed.*, New York: Chapman-Hall.

See Also[oneway.rfit](#)

disp*Jaekel's Dispersion Function*

Description

Returns the value of Jaekel's dispersion function for given values of the regression coefficients.

Usage

```
disp(beta, x, y, scores)
```

Arguments

beta	p by 1 vector of regression coefficients
x	n by p design matrix
y	n by 1 response vector
scores	an object of class scores

Details

Returns the value of Jaekel's dispersion function evaluated at the value of the parameters in the function call. That is, $\sum_{i=1}^n a(R(e_i)) * e_i$ where R denotes rank and $a(1) \leq a(2) \leq \dots \leq a(n)$ are the scores. The residuals (e_i $i=1, \dots, n$) are calculated $y - x \text{ beta}$.

Author(s)

John Kloke, Joseph McKean

References

Hettmansperger, T.P. and McKean J.W. (2011), *Robust Nonparametric Statistical Methods, 2nd ed.*, New York: Chapman-Hall.

Jaekel, L. A. (1972). Estimating regression coefficients by minimizing the dispersion of residuals. *Annals of Mathematical Statistics*, 43, 1449 - 1458.

See Also[rfit](#) [drop.test](#) [summary.rfit](#)

 drop.test

Drop (Reduction) in Dispersion Test

Description

Given two full model fits, this function performs a reduction in dispersion test.

Usage

```
drop.test(fitF, fitR = NULL)
```

Arguments

fitF	An object of class rfit. The full model fit.
fitR	An object of class rfit. The reduced model fit.

Details

Rank-based inference procedure analogous to the traditional (LS) reduced model test.

The full and reduced model dispersions are calculated. The reduction in dispersion test, or drop test for short, has an asymptotic chi-sq distribution. Simulation studies suggest using F critical values. The p-value returned is based on a F-distribution with df1 and df2 degrees of freedom where df1 is the difference in the number of parameters in the fits of fitF and fitR and df2 is the residual degrees of freedom in the fit fitF.

Both fits are based on a minimization routine. It is possible that resulting solutions are such that the fitF\$disp > fitRdisp. We recommend starting the full model at the reduced model fit as a way to avoid this situation. See examples.

Checks to see if models appear to be proper subsets. The space spanned by the columns of the reduced model design matrix should be a subset of the space spanned by the columns of the full model design matrix.

Value

F	Value of the F test statistic
p.value	The observed significance level of the test (using an F quantile)
RD	Reduced model dispersion minus Full model dispersion
tauhat	Estimate of the scale parameter (using the full model residuals)
df1	numerator degrees of freedom
df2	denominator degrees of freedom

Author(s)

John Kloke, Joseph McKean

References

Hettmansperger, T.P. and McKean J.W. (2011), *Robust Nonparametric Statistical Methods, 2nd ed.*, New York: Chapman-Hall.

See Also

[rfit](#)

Examples

```
y<-rnorm(47)
x1<-rnorm(47)
x2<-rnorm(47)
fitF<-rfit(y~x1+x2)
fitR<-rfit(y~x1)
drop.test(fitF,fitR)

## try starting the full model at the reduced model fit ##
fitF<-rfit(y~x1+x2,yhat0=fitR$fitted)
drop.test(fitF,fitR)
```

ffa

Free Fatty Acid Data

Description

The response variable is level of free fatty acid in a sample of prepubescent boys. The explanatory variables are age (in months), weight (in lbs), and skin fold thickness.

Usage

```
data(ffa)
```

Format

A data frame with 41 rows and 4 columns.

age age in years

weight weight in lbs

skin skin fold thickness

ffa free fatty acid

Source

Morrison, D.F. (1983), *Applied Linear Statistical Models*, Englewood Cliffs, NJ:Prentice Hall.

References

Hettmansperger, T.P. and McKean J.W. (2011), *Robust Nonparametric Statistical Methods, 2nd ed.*, New York: Chapman-Hall.

Examples

```
data(ffa)
summary(rfit(ffa~age+weight+skin,data=ffa)) #using the default (Wilcoxon scores)
summary(rfit(ffa~age+weight+skin,data=ffa,scores=bentscores1))
```

getScores-methods *~~ Methods for Function getScores ~~*

Description

~~ Methods for function getScores ~~ Calculates the centered and scaled scores as used in rank-based analysis.

Methods

```
signature(object = "scores")
```

See Also

[rfit](#)

getScoresDeriv-methods *~~ Methods for Function getScoresDeriv ~~*

Description

~~ Methods for function getScoresDeriv ~~ This derivative is used in the estimate of the scale parameter tau.

Methods

```
signature(object = "scores")
```

See Also

[rfit](#)

gettau	<i>Estimate of the scale parameter tau</i>
--------	--

Description

An estimate of the scale parameter tau is needed for the standard errors of the coefficients in rank-based regression.

Usage

```
gettau(ehat, p, scores = Rfit::wscores, delta = 0.8, hparm = 2, ...)
```

Arguments

ehat	full model residuals
p	number of regression coefficients
scores	object of class scores, defaults to Wilcoxon scores
delta	confidence level
hparm	Joe's hparm
...	additional arguments. currently unused

Details

This is the confidence interval type estimate of the scale parameter tau developed by Koul, Sievers, and McKean (1987). This estimate is also discussed in Section 3.7.1 of Hettmansperger and McKean (1998). One of these functions is called in `rfit`. The default is to use the faster FORTRAN version. The R version can be more precise in small samples, but also can be much slower especially when sample sizes are large.

Value

Length one numeric object.

Author(s)

Joseph McKean, John Kloke

References

Hettmansperger, T.P. and McKean J.W. (2011), *Robust Nonparametric Statistical Methods, 2nd ed.*, New York: Chapman-Hall.

Koul, H.L., Sievers, G.L., and McKean, J.W. (1987) An estimator of the scale parameter for the rank analysis of linear models under general score functions, *Scandinavian Journal of Statistics*, 14, 131-141.

See Also[rfit](#)

`grad`*Calculate the Gradient of Jaeckel's Dispersion Function*

Description

Calculate the Gradient of Jaeckel's Dispersion Function

Usage

```
grad(x, y, beta, scores)
```

Arguments

<code>x</code>	n by p design matrix
<code>y</code>	n by 1 response vector
<code>beta</code>	p by 1 vector of regression coefficients
<code>scores</code>	an object of class scores

Value

The gradient evaluated at beta.

Author(s)

John Kloke

References

Hettmansperger, T.P. and McKean J.W. (2011), *Robust Nonparametric Statistical Methods, 2nd ed.*, New York: Chapman-Hall.

Jaeckel, L. A. (1972). Estimating regression coefficients by minimizing the dispersion of residuals. *Annals of Mathematical Statistics*, 43, 1449 - 1458.

Jureckova, J. (1971). Nonparametric estimate of regression coefficients. *Annals of Mathematical Statistics*, 42, 1328 - 1338.

See Also[disp](#)

Examples

```
## The function is currently defined as
function (x, y, beta, scores)
{
  x <- as.matrix(x)
  e <- y - x %*% beta
  r <- rank(e, ties.method = "first")/(length(e) + 1)
  -t(x) %*% scores@phi(r)
}
```

jaeckel

*Function to Minimize Jaeckel's Dispersion Function***Description**

Uses the built-in function `optim` to minimize Jaeckel's dispersion function.

Usage

```
jaeckel(x, y, beta0 = lm(y ~ x)$coef[2:(ncol(x) + 1)],
        scores = Rfit::wscores, control = NULL, ...)
```

Arguments

<code>x</code>	n by p design matrix
<code>y</code>	n by 1 response vector
<code>beta0</code>	initial estimate
<code>scores</code>	object of class 'scores'
<code>control</code>	control passed to fitting routine
<code>...</code>	additional arguments to be passed to fitting routine

Details

Function uses `optim` with method set to BFGS to minimize Jaeckel's dispersion function. If `control` is not specified at the function call, the relative tolerance (`reltol`) is set to `.Machine$double.eps^(3/4)` maximum number of iterations is set to 200. See `optim`.

Value

Results of `optim` are returned.

Author(s)

John Kloke

References

- Hettmansperger, T.P. and McKean J.W. (2011), *Robust Nonparametric Statistical Methods, 2nd ed.*, New York: Chapman-Hall.
- Jaeckel, L. A. (1972), Estimating regression coefficients by minimizing the dispersion of residuals. *Annals of Mathematical Statistics*, 43, 1449 - 1458.
- Kapenga, J. A., McKean, J. W., and Vidmar, T. J. (1988), *RGLM: Users Manual*, Statist. Assoc. Short Course on Robust Statistical Procedures for the Analysis of Linear and Nonlinear Models, New Orleans.

See Also

[optim](#), [rfit](#)

Examples

```
## This is a internal function. See rfit for user-level examples.
```

kwayr

Internal Functions for K-Way analysis of variance

Description

These are internal functions used to construct the robust anova table. The function raov is the main program.

Usage

```
kwayr(levs, data)
cellx(X)
khmat(levsind,permh)
pasteColsRfit(x,sep="")
redmod(xmat,amat)
subsets(k)
```

Arguments

levs	vector of levels corresponding to each of the factors
data	data matrix in the form y, factor 1,..., factor k
X	n x k matrix where the columns represent the levels of the k factors.
levsind	Internal parameter.
permh	Internal parameter.
x	n x k matrix where the columns represent the levels of the k factors.
xmat	n x p full model design matrix
amat	Internal parameter.
k	Internal parameter.
sep	Seperator used in pasteColsRfit

Note

Renamed pasteCols of library plotrix written by Jim Lemon et. al. June 2011 under GPL 2

Author(s)

Joseph McKean, John Kloeke

References

Hettmansperger, T.P. and McKean J.W. (2011), *Robust Nonparametric Statistical Methods, 2nd ed.*, New York: Chapman-Hall.

Hocking, R. R. (1985), *The Analysis of Linear Models*, Monterey, California: Brooks/Cole.

See Also

[raov](#)

oneway.rfit

Rank-based Oneway Analysis of Variance

Description

Carries out a robust analysis of variance for a one factor design. Analysis is based on the R estimates.

Usage

```
oneway.rfit(y, g, scores = Rfit::wscores, p.adjust = "none")
```

Arguments

y	n by 1 response vector
g	n by 1 vector representing group membership
scores	an object of class 'scores'
p.adjust	adjustment to the p-values, argument passed to p.adjust

Details

Carries out a robust one-way analysis of variance based on full model r fit.

Value

fit	full model fit from rfit
est	Estimates
se	Standard Errors
I	First Index
J	Second Index
p.value	p-values
y	response vector
g	vector denoting group membership

Author(s)

Joseph McKean, John Kloke

References

Hettmansperger, T.P. and McKean J.W. (2011), *Robust Nonparametric Statistical Methods, 2nd ed.*, New York: Chapman-Hall.

See Also

[rfit](#)

Examples

```
data(quail)
oneway.rfit(quail$ldl, quail$treat)
```

param-class

Class "param"

Description

Internal class for use with score functions.

Objects from the Class

A virtual Class: No objects may be created from it.

Methods

No methods defined with class "param" in the signature.

Author(s)

John Kloke

See Also[scores](#)**Examples**

```
showClass("param")
```

print.rfit

Rfit Internal Print Functions

Description

These functions print the output in a user-friendly manner using the internal R function `print`.

Usage

```
## S3 method for class 'rfit'  
print(x, ...)  
## S3 method for class 'summary.rfit'  
print(x, digits = max(5, .Options$digits - 2), ...)  
## S3 method for class 'drop.test'  
print(x, digits = max(5, .Options$digits - 2), ...)  
## S3 method for class 'oneway.rfit'  
print(x, digits = max(5, .Options$digits - 2), ...)  
## S3 method for class 'summary.oneway.rfit'  
print(x, digits = max(5, .Options$digits - 2), ...)  
## S3 method for class 'raov'  
print(x, digits = max(5, .Options$digits - 2), ...)
```

Arguments

<code>x</code>	An object to be printed
<code>digits</code>	number of digits to display
<code>...</code>	additional arguments to be passed to <code>print</code>

Author(s)

John Kloke

See Also[rfit](#), [summary.rfit](#), [drop.test](#)

quail

Quail Data

Description

Thirty-nine quail were randomized to one of four treatments for lowering cholesterol.

Usage

```
data(quail)
```

Format

A data frame with 39 observations on the following 2 variables.

treat a factor with levels 1 2 3 4

ldl a numeric vector

Source

Hettmansperger, T.P. and McKean J.W. (2011), *Robust Nonparametric Statistical Methods, 2nd ed.*, New York: Chapman-Hall.

Examples

```
data(quail)
boxplot(ldl~treat, data=quail)
```

raov

R ANOVA

Description

Returns full model fit and robust ANOVA table for all main effects and interactions.

Usage

```
raov(f, data = list(), ...)
```

Arguments

f an object of class formula
data an optional data frame
... additional arguments

Details

Based on reduction in dispersion tests for testing main effects and interaction. Uses an algorithm described in Hocking (1985).

Value

table	Description of 'compl'
fit	full model fit returned from rfit
residuals	the residuals, i.e. y-yhat
fitted.values	yhat = x betahat
call	Call to the function

Author(s)

Joseph McKean, John Kloke

References

Hettmansperger, T.P. and McKean J.W. (2011), *Robust Nonparametric Statistical Methods, 2nd ed.*, New York: Chapman-Hall.

Hocking, R. R. (1985), *The Analysis of Linear Models*, Monterey, California: Brooks/Cole.

See Also

[rfit](#), [oneway.rfit](#)

Examples

```
raov(logSurv~Poison+Treatment,data=BoxCox)
```

rfit

Rank-based Estimates of Regression Coefficients

Description

Minimizes Jaeckel's dispersion function to obtain a rank-based solution for linear models.

Usage

```
rfit(formula, data = list(), ...)
```

```
## Default S3 method:
```

```
rfit(formula, data, subset, yhat0 = NULL,
scores = Rfit::wscores, symmetric = FALSE, TAU = "F0", ...)
```

Arguments

formula	an object of class formula
data	an optional data frame
subset	an optional argument specifying the subset of observations to be used
yhat0	an n by vector of initial fitted values, default is NULL
scores	an object of class 'scores'
symmetric	logical. If 'FALSE' uses median of residuals as estimate of intercept
TAU	version of estimation routine for scale parameter. F0 for Fortran, R for (slower) R, N for none
...	additional arguments to be passed to fitting routines

Details

Rank-based estimation involves replacing the L2 norm of least squares estimation with a pseudo-norm which is a function of the ranks of the residuals. That is, in rank estimation, the usual notion of Euclidean distance is replaced with another measure of distance which is referred to as Jaeckel's (1972) dispersion function. Jaeckel's dispersion function depends on a score function and a library of commonly used score functions is included. e.g. linear (Wilcoxon) and normal (Gaussian) scores. If an initial fit is not supplied (i.e. yhat0 = NULL) then initial fit is based on a LS fit.

Value

coefficients	estimated regression coefficients with intercept
residuals	the residuals, i.e. y-yhat
fitted.values	yhat = x betahat
xc	centered design matrix
tauhat	estimated value of the scale parameter tau
taushat	estimated value of the scale parameter tau_s
betahat	estimated regression coefficients
call	Call to the function

Author(s)

John Kloke, Joesph McKean

References

- Hettmansperger, T.P. and McKean J.W. (2011), *Robust Nonparametric Statistical Methods, 2nd ed.*, New York: Chapman-Hall.
- Jaeckel, L. A. (1972). Estimating regression coefficients by minimizing the dispersion of residuals. *Annals of Mathematical Statistics*, 43, 1449 - 1458.
- Jureckova, J. (1971). Nonparametric estimate of regression coefficients. *Annals of Mathematical Statistics*, 42, 1328 - 1338.

See Also

[summary.rfit](#) [drop.test](#) [rstudent.rfit](#)

Examples

```
data(baseball)
data(wscores)
fit<-rfit(weight~height,data=baseball)
summary(fit)

### set the starting value
x1 <- runif(47); x2 <- runif(47); y <- 1 + 0.5*x1 + rnorm(47)
# based on a fit to a sub-model
rfit(y~x1+x2,yhat0=fitted.values(rfit(y~x1)))
```

rstudent.rfit

Studentized Residuals for Rank-Based Regression

Description

Returns the Studentized residuals based on rank-based estimation.

Usage

```
## S3 method for class 'rfit'
rstudent(model,...)
```

Arguments

model	an object of class rfit
...	additional arguments. currently not used.

Author(s)

John Kloke, Joseph McKean

References

Hettmansperger, T.P. and McKean J.W. (2011), *Robust Nonparametric Statistical Methods, 2nd ed.*, New York: Chapman-Hall.

See Also

[rfit](#)

Examples

```
x<-runif(47)
y<-rcauchy(47)
qqnorm(rstudent(fit<-rfit(y~x)))
plot(x,rstudent(fit)) ; abline(h=c(-2,2))
```

scores-class

Class "scores"

Description

A score function and its corresponding derivative is required for rank-based estimation. This object puts them together.

Objects from the Class

Objects can be created by calls of the form `new("scores", ...)`.

Slots

phi: Object of class "function" the score function
Dphi: Object of class "function" the first derivative of the score function
param: Object of class "param"

Author(s)

John Kloke

References

Hettmansperger, T.P. and McKean J.W. (2011), *Robust Nonparametric Statistical Methods, 2nd ed.*, New York: Chapman-Hall.

See Also

[param](#)

Examples

```
showClass("scores")
```

`serumLH`*Serum Level of luteinizing hormone (LH)*

Description

Hollander and Wolfe (1999) discuss a 2 by 5 factorial design for a study to determine the effect of light on the release of luteinizing hormone (LH). The factors in the design are: light regimes at two levels (constant light and 14 hours of light followed by 10 hours of darkness) and a luteinizing release factor (LRF) at 5 different dosage levels. The response is the level of luteinizing hormone (LH), nanograms per ml of serum in blood samples. Sixty rats were put on test under these 10 treatment combinations, six rats per combination.

Usage

```
data(serumLH)
```

Format

A data frame with 60 observations on the following 3 variables.

`serum` a numeric vector

`light.regime` a factor with levels Constant Intermittent

`LRF.dose` a factor with levels 0 10 1250 250 50

Source

Hollander, M. and Wolfe, D.A. (1999), *Nonparametric Statistical Methods*, New York: Wiley.

References

Hollander, M. and Wolfe, D.A. (1999), *Nonparametric Statistical Methods*, New York: Wiley.

Examples

```
data(serumLH)
raov(serum~light.regime + LRF.dose + light.regime*LRF.dose, data = serumLH)
```

`signedrank`*Signed-Rank Estimate of Location (Intercept)*

Description

Returns the signed-rank estimate of intercept with is equivalent to the Hodges-Lehmann estimate of the residuals.

Usage`signedrank(x)`**Arguments**

`x` numeric vector

Value

Returns the median of the Walsh averages.

Author(s)

John Kloke, Joseph McKean

References

Hettmansperger, T.P. and McKean J.W. (2011), *Robust Nonparametric Statistical Methods, 2nd ed.*, New York: Chapman-Hall.

Hollander, M. and Wolfe, D.A. (1999), *Nonparametric Statistical Methods*, New York: Wiley.

See Also

[walsh](#)

Examples

```
## The function is currently defined as
function (x)
median(walsh(x))
```

summary.oneway.rfit *Provides a summary for the oneway anova based on an R fit.*

Description

Provides a summary for the oneway anova based on an R fit including a test for main effects as tests for pairwise comparisons.

Usage

```
## S3 method for class 'oneway.rfit'
summary(object, alpha=0.05,method=confintadjust.methods,...)
```

Arguments

object	an object of class 'oneway.rfit', usually, a result of a call to 'oneway.rfit'
alpha	Experimentwise Error Rate
method	method used in confidence interval adjustment
...	additional arguments

Author(s)

John Kloke, Joseph McKean

References

Hettmansperger, T.P. and McKean J.W. (2011), *Robust Nonparametric Statistical Methods, 2nd ed.*, New York: Chapman-Hall.

Examples

```
data(quail)
oneway.rfit(quail$ldl,quail$treat)
```

summary.rfit *Summarize Rank-Based Linear Model Fits*

Description

Provides a summary similar to the traditional least squares fit.

Usage

```
## S3 method for class 'rfit'
summary(object,overall.test,...)
```

Arguments

object an object of class 'rfit', usually, a result of a call to 'rfit'
 overall.test either 'wald' or 'drop'
 ... additional arguments

Details

Provides summary statistics based on a rank-based fit. A table of estimates, standard errors, t-ratios, and p-values are provided. An overall test of the explanatory variables is provided; the default is to use a Wald test. A drop in dispersion test is also available in which case a robust R^2 is provided as well.

Author(s)

John Kloke

References

Hettmansperger, T.P. and McKean J.W. (2011), *Robust Nonparametric Statistical Methods, 2nd ed.*, New York: Chapman-Hall.

Examples

```
data(baseball)
fit<-rfit(weight~height,data=baseball)
summary(fit)
summary(fit,overall.test='drop')
```

taufuncs

Internal Functions for Estimating tau

Description

These are internal functions used for calculating the scale parameter tau necessary for estimating the standard errors of coefficients for rank-regression.

Usage

```
hstarreadyscr(ehat,asc,ascpr)
hstar(abdord, wtord, const, n, y)
looptau(delta, abdord, wtord, const, n)
pairup(x,type="less")
```

Arguments

ehat	Full model residuals
delta	Window parameter (proportion) used in the Koul et al. estimator of tau. Default value is 0.80. If the ratio of sample size to number of regression parameters (n to p) is less than 5, larger values such as 0.90 to 0.95 are more appropriate.
y	Argument of function hstar
abdord	Ordered absolute differences of residuals
wtord	Standardized (by const) ordered absolute differences of residuals
const	Range of score function
n	Sample size
x	Argument for pairup
type	Argument for the function pairup
asc	scores
ascpr	derivative of the scores

Author(s)

Joseph McKean, John Kloke

References

Hettmansperger, T.P. and McKean J.W. (2011), *Robust Nonparametric Statistical Methods, 2nd ed.*, New York: Chapman-Hall.

Koul, H.L., Sievers, G.L., and McKean, J.W. (1987) An estimator of the scale parameter for the rank analysis of linear models under general score functions, *Scandinavian Journal of Statistics*, 14, 131-141.

See Also

[gettau](#), [rfit](#)

taustar

Estimate of the Scale Parameter taustar

Description

An estimate of the scale parameter $\text{taustar} = 1/(2*f(0))$ is needed for the standard error of the intercept in rank-based regression.

Usage

`taustar(e, p, conf = 0.95)`

Arguments

e n x 1 vector of full model residuals
 p is the number of regression coefficients (without the intercept)
 conf confidence level of CI used

Details

Confidence interval estimate of taustar. See, for example, Hettmansperger and McKean (1998) p.7-8 and p.25-26.

Value

Length-one numeric object containing the estimated scale parameter taustar.

Author(s)

Joseph McKean, John Kloke

References

Hettmansperger, T.P. and McKean J.W. (2011), *Robust Nonparametric Statistical Methods, 2nd ed.*, New York: Chapman-Hall.

See Also

[rfit](#)

Examples

```
## This is an internal function. See rfit for user-level examples.
```

telephone

Telephone Data

Description

The number of telephone calls (in tens of millions) made in Belgium from 1950-1973.

Usage

```
data(telephone)
```

Format

A data frame with 24 observations on the following 2 variables.

year years since 1950 AD

calls number of telephone calls in tens of millions

Source

Rousseeuw, P.J. and Leroy, A.M. (1987), *Robust Regression and Outlier Detection*, New York: Wiley.

References

Hettmansperger, T.P. and McKean J.W. (2011), *Robust Nonparametric Statistical Methods, 2nd ed.*, New York: Chapman-Hall.

Examples

```
data(telephone)
plot(telephone)
abline(rfit(calls~year,data=telephone))
```

vcov.rfit

Variance-Covariance Matrix for Rank-Based Regression

Description

Returns the variance-covariance matrix of the regression estimates from an object of type rfit.

Usage

```
## S3 method for class 'rfit'
vcov(object, intercept = NULL,...)
```

Arguments

object	an object of type rfit
intercept	logical. If TRUE include the variance-covariance estimates corresponding to the intercept
...	additional arguments

Author(s)

John Kloke

References

Hettmansperger, T.P. and McKean J.W. (2011), *Robust Nonparametric Statistical Methods, 2nd ed.*, New York: Chapman-Hall.

See Also

[rfit](#)

wald.test.overall *Overall Wald test*

Description

Conducts a Wald test of all regression parameters are zero

Usage

```
wald.test.overall(fit)
```

Arguments

fit result from a rfit

Author(s)

John Kloke

References

Hettmansperger, T.P. and McKean J.W. (2011), *Robust Nonparametric Statistical Methods, 2nd ed.*, New York: Chapman-Hall.

Examples

```
x <- rnorm(47)
y <- rnorm(47)
wald.test.overall(rfit(y~x))
```

walsh *Walsh Averages*

Description

Given a list of n numbers, the Walsh averages are the *latex* pairwise averages.

Usage

```
walsh(x)
```

Arguments

x A numeric vector

Value

The Walsh averages.

Author(s)

John Kloke, Joseph McKean

References

Hettmansperger, T.P. and McKean J.W. (2011), *Robust Nonparametric Statistical Methods, 2nd ed.*, New York: Chapman-Hall.

Hollander, M. and Wolfe, D.A. (1999), *Nonparametric Statistical Methods*, New York: Wiley.

See Also

[signedrank](#)

Examples

```
median(walsh(rnorm(100))) # Hodges-Lehmann estimate of location

## The function is currently defined as
function (x)
{
  n <- length(x)
  w <- vector(n * (n + 1)/2, mode = "numeric")
  ind <- 0
  for (i in 1:n) {
    for (j in i:n) {
      ind <- ind + 1
      w[ind] <- 0.5 * (x[i] + x[j])
    }
  }
  return(w)
}
```

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