Package 'sasLM'

June 4, 2020

Version 0.1.4

Title 'SAS' Linear Model

Description This is a core implementation of 'SAS' procedures for linear models - GLM, REG, and ANOVA. Some packages provide type II and type III SS. However, the results of nested and complex designs are often different from those of 'SAS.' Different results does not necessarily mean incorrectness. However, many wants the same results to SAS. This package aims to achieve that.
Reference: Littell RC, Stroup WW, Freund RJ (2002, ISBN:0-471-22174-0).

Depends R (>= 3.0.0)

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Repository CRAN

URL https://cran.r-project.org/package=sasLM

NeedsCompilation no

Date/Publication 2020-06-04 15:00:02 UTC

R topics documented:

`sasLM-package` *'SAS' Linear Model*

Description

This is a core implementation of 'SAS' procedures for linear models - GLM, REG, and ANOVA. Some packages provide type II and type III SS. However, the results of nested and complex designs are often different from those of 'SAS'. Different results does not necessarily mean incorrectness. However, many wants the same results to 'SAS'. This package aims to achieve that. Reference: Littell RC, Stroup WW, Freund RJ (2002, ISBN:0-471-22174-0).

Details

This will serve those who want SAS PROC GLM, REG, and ANOVA in R.

Author(s)

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`af` *Convert some columns of a data.frame to factors*

Description

Conveniently convert some columns of data.frame into factors.

Usage

```
af(DataFrame, Cols)
```

Arguments

`DataFrame`	a `data.frame`
`Cols`	column names or indices to be converted

Details

It performs conversion of some columns in a `data.frame` into factors conveniently.

Value

Returns a `data.frame` with converted columns.

Author(s)

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`ANOVA` *Analysis of Variance similar to SAS PROC ANOVA*

Description

Analysis of variance with type I, II, and III sum of squares.

Usage

```
ANOVA(Formula, Data, eps=1e-8)
```

Arguments

`Formula`	a conventional formula for a linear model.
`Data`	a `data.frame` to be analyzed
`eps`	Less than this value is considered as zero.

Details

It performs the core function of SAS PROC ANOVA.

Value

The result is comparable to that of SAS PROC ANOVA.

`ANOVA`	ANOVA table for the model
`Type I`	Type I sum of square table
`Type II`	Type II sum of square table
`Type III`	Type III sum of square table

Author(s)

Kyun-Seop Bae k@acr.kr

Examples

```
ANOVA(uptake ~ Plant + Type + Treatment + conc, CO2)
```

aov1 *ANOVA with Type I SS*

Description

ANOVA with Type I SS.

Usage

```
aov1(Formula, Data, eps=1e-8)
```

Arguments

Formula	a conventional formula for a linear model.
Data	a data.frame to be analyzed
eps	Less than this value is considered as zero.

Details

It performs the core function of SAS PROC ANOVA.

Value

The result table is comparable to that of SAS PROC ANOVA.

Df	degree of freedom
Sum Sq	sum of square for the set of contrasts
Mean Sq	mean square
F value	F value for the F distribution
Pr(>F)	proability of larger than F value

Author(s)

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Examples

```
aov1(uptake ~ Plant + Type + Treatment + conc, CO2)
```

aov2 *ANOVA with Type II SS*

Description

ANOVA with Type II SS.

Usage

```
aov2(Formula, Data, eps=1e-8)
```

Arguments

Formula	a conventional formula for a linear model.
Data	a data.frame to be analyzed
eps	Less than this value is considered as zero.

Details

It performs the core function of SAS PROC ANOVA.

Value

The result table is comparable to that of SAS PROC ANOVA.

Df	degree of freedom
Sum Sq	sum of square for the set of contrasts
Mean Sq	mean square
F value	F value for the F distribution
Pr(>F)	proability of larger than F value

Author(s)

Kyun-Seop Bae k@acr.kr

Examples

```
aov2(uptake ~ Plant + Type + Treatment + conc, CO2)
```

aov3 *ANOVA with Type III SS*

Description

ANOVA with Type III SS.

Usage

```
aov3(Formula, Data, eps=1e-8)
```

Arguments

Formula	a conventional formula for a linear model.
Data	a data.frame to be analyzed
eps	Less than this value is considered as zero.

Details

It performs the core function of SAS PROC ANOVA.

Value

The result table is comparable to that of SAS PROC ANOVA.

Df	degree of freedom
Sum Sq	sum of square for the set of contrasts
Mean Sq	mean square
F value	F value for the F distribution
Pr(>F)	proability of larger than F value

Author(s)

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Examples

```
aov3(uptake ~ Plant + Type + Treatment + conc, CO2)
```

cSS *Sum of Square with a Given Contrast Set*

Description

Calculates sum of squares of a contrast from a `lfit` result.

Usage

```
cSS(K, rx, eps=1e-8)
```

Arguments

`K`	contrast matrix. Each row is a contrast.
`rx`	a result of `lfit` function
`eps`	Less than this value is considered as zero.

Details

It calculates sum of squares with given a contrast matrix and a `lfit` result. It corresponds to SAS PROC GLM CONTRAST.

Value

Returns sum of square and its F value and p-value.

`Df`	degree of freedom
`Sum Sq`	sum of square for the set of contrasts
`Mean Sq`	mean square
`F value`	F value for the F distribution
`Pr(>F)`	proability of larger than F value

Author(s)

Kyun-Seop Bae k@acr.kr

Examples

```
x = ModelMatrix(uptake ~ Type, CO2)
y = model.frame(uptake ~ Type, CO2)[,1]
rx = lfit(x, y)
cSS(t(c(0, -1, 1)), rx) # sum of square
ANOVA(uptake ~ Type, CO2) # compare with the above
```

e1 *Get a Contrast Matrix for Type I SS*

Description

Makes a contrast matrix for type I SS using forward Doolittle method.

Usage

```
e1(Formula, Data, eps=1e-8)
```

Arguments

Formula	a conventional formula for a linear model
Data	a data.frame to be analyzed
eps	Less than this value is considered as zero.

Details

It makes a contrast matrix for type I SS.

Value

A contrast matrix for type I SS.

Author(s)

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Examples

```
round(e1(uptake ~ Plant + Type + Treatment + conc, CO2), 12)
```

e2 *Get a Contrast Matrix for Type II SS*

Description

Makes a contrast matrix for type II SS.

Usage

```
e2(Formula, Data, eps=1e-8)
```

Arguments

Formula	a conventional formula for a linear model
Data	a data.frame to be analyzed
eps	Less than this value is considered as zero.

Details

It makes a contrast matrix for type II SS.

Value

Returns a contrast matrix for type II SS.

Author(s)

Kyun-Seop Bae k@acr.kr

Examples

```
round(e2(uptake ~ Plant + Type + Treatment + conc, CO2), 12)
```

---

e3 *Get a Contrast Matrix for Type III SS*

Description

Makes a contrast matrix for type III SS.

Usage

```
e3(Formula, Data, eps=1e-8)
```

Arguments

Formula	a conventional formula for a linear model
Data	a data.frame to be analyzed
eps	Less than this value is considered as zero.

Details

It makes a contrast matrix for type III SS.

Value

Returns a contrast matrix for type III SS.

Author(s)

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Examples

```
round(e3(uptake ~ Plant + Type + Treatment + conc, CO2), 12)
```

---

est *Estimate Linear Contrast*

Description

Estimates Linear Contrast(s) with a given GLM result.

Usage

```
est(L, rx)
```

Arguments

L	a matrix of linear contrast rows to be tested
rx	a result of `lfit` function

Details

It tests rows of linear contrast. It corresponds to SAS PROC GLM ESTIMATE.

Value

Returns a table of expectations, t values and p-values.

Estimate	point estimate of the input linear constrast
Std. Error	standard error of the point estimate
t value	value for t distribution
Pr(>|t|	probability of larger than absolute t value from t distribution with residual's degree of freedom

Author(s)

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Examples

```
x = ModelMatrix(uptake ~ Type, CO2)
y = model.frame(uptake ~ Type, CO2)[,1]
rx = lfit(x, y)
est(t(c(0, -1, 1)), rx) # Quevec - Mississippi
t.test(uptake ~ Type, CO2) # compare with the above
```

GLM *General Linear Model similar to SAS PROC GLM*

Description

GLM is the main function of this package.

Usage

```
GLM(Formula, Data, eps=1e-8)
```

Arguments

Formula	a conventional formula for a linear model.
Data	a data.frame to be analyzed
eps	Less than this value is considered as zero.

Details

It performs the core function of SAS PROC GLM.

Value

The result is comparable to that of SAS PROC GLM.

ANOVA	ANOVA table for the model
Type I	Type I sum of square table
Type II	Type II sum of square table
Type III	Type III sum of square table
Parameter	Parameter table with standard error, t value, p value

Author(s)

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Examples

```
GLM(uptake ~ Plant + Type + Treatment + conc, CO2)
```

`lfit` *Linear Fit*

Description

Fits a least square linear model.

Usage

```
lfit(x, y, eps=1e-8)
```

Arguments

`x`	a result of ModelMatrix
`y`	a column vector of response, dependent variable
`eps`	Less than this value is considered as zero.

Details

Minimum version of least square fit of a linear model

Value

`coeffcients`	beta coefficients
`g2`	g2 inverse
`rank`	rank of the model matrix
`DFr`	degree of freedom for the residual
`SSE`	sum of square error

Author(s)

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See Also

`ModelMatrix`

ModelMatrix *Model Matrix*

Description

This model matrix is similar to `model.matrix`. But it does not omit unnecessary columns.

Usage

```
ModelMatrix(Formula, Data, NOINT=FALSE, KeepOrder=FALSE)
```

Arguments

`Formula`	a conventional formula for a linear model
`Data`	a `data.frame` to be analyzed
`NOINT`	If NOINT is TRUE, no intercept model will be used. Always -1 or +0 will be ignored in the formula.
`KeepOrder`	If `KeepOrder` is `TRUE`, terms in `Formula` will be kept. This is for Type I SS.

Details

It makes the model(design) matrix for `GLM`.

Value

Model matrix and attributes similar to the output of `model.matrix`.

`X`	design matrix, i.e. model matrix
`terms`	detailed information about terms such as formula and labels
`termsIndices`	term indices
`assign`	assignemnt of columns for each terms in order, different way of expressing term indices

Author(s)

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REG *Regression of Linear Least Square*

Description

REG is similar to SAS PROC REG.

Usage

```
REG(Formula, Data, NOINT=FALSE, eps=1e-8, summarize=TRUE)
```

Arguments

Formula	a conventional formula for a linear model.
Data	a data.frame to be analyzed
NOINT	If NOINT is TRUE, no intercept model will be used. Always -1 or +0 will be ignored in the formula.
eps	Less than this value is considered as zero.
summarize	If this is FALSE, REG returns just lfit result.

Details

It performs the core function of SAS PROC REG.

Value

The result is comparable to that of SAS PROC REG.

Estimate	point estimate of parameters, coefficients
Std. Error	standard error of the point estimate
t value	value for t distribution
Pr(>|t|	probability of larger than absolute t value from t distribution with residual's degree of freedom

If summarize=FALSE, REG returns;

coeffcients	beta coefficients
g2	g2 inverse
rank	rank of the model matrix
DFr	degree of freedom for the residual
SSE	sum of square error

Author(s)

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Examples

```
REG(uptake ~ Plant + Type + Treatment + conc, CO2)
```

SS *Sum of Square*

Description

Sum of squares with ANOVA.

Usage

```
SS(x, rx, L, eps=1e-8)
```

Arguments

x	a result of ModelMatrix containing design information
rx	a result of lfit
L	linear hypothesis, a full matrix matching the information in x
eps	Less than this value is considered as zero.

Details

It calculates sum of squares and completes the ANOVA table.

Value

ANOVA table	a classical ANOVA table without the residual(Error) part.

Author(s)

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See Also

ModelMatrix, lfit,

Index