

Package ‘ExpDes’

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Description Package for analysis of simple experimental designs (CRD,RBD and LSD), experiments in double factorial schemes (in CRD and RBD), experiments in a split plot in time schemes (in CRD and RBD), experiments in double factorial schemes with an additional treatment (in CRD and RBD), experiments in triple factorial scheme (in CRD and RBD) and experiments in triple factorial schemes with an additional treatment (in CRD and RBD), performing the analysis of variance and means comparison by fitting regression models until the third power (quantitative treatments) or by a multiple comparison test, Tukey test, test of Student-Newman-Keuls (SNK), Scott-Knott, Duncan test, t test (LSD) and Bonferroni t test (protected LSD) - for qualitative treatments.

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ExpDes-package*Experimental Designs package*

Description

Package for analysis of simple experimental designs (CRD, RBD and LSD), experiments in double factorial schemes (in CRD and RBD), experiments in a split plot in time schemes (in CRD and RBD), experiments in double factorial schemes with an additional treatment (in CRD and RBD), experiments in triple factorial scheme (in CRD and RBD) and experiments in triple factorial schemes with an additional treatment (in CRD and RBD), performing the analysis of variance and means comparison by fitting regression models until the third power (quantitative treatments) or by a multiple comparison test, Tukey test, test of Student-Newman-Keuls (SNK), Scott-Knott, Duncan test, t test (LSD), Bonferroni t test (protected LSD) and bootstrap multiple comparison's test - for qualitative treatments.

Details

Package:	ExpDes
Type:	Package
Version:	1.0
Date:	2010-11-09
License:	GPL 2
LazyLoad:	yes

Author(s)

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FERREIRA, E. B.; CAVALCANTI, P. P. Funcao em codigo R para analisar experimentos em DIC simples, em uma so rodada. In: REUNIAO ANUAL DA REGIAO BRASILEIRA DA SOCIEDADE INTERNACIONAL DE BIOMETRIA, 54o SIMPOSIO DE ESTATISTICA APLICADA

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ccboot	<i>Multiple comparison: Bootstrap</i>
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Description

Performs the Ramos and Ferreira (2009) multiple comparison bootstrap test.

Usage

```
ccboot(y, trt, DError, SError, alpha = 0.05, group = TRUE, main = NULL, B = 1000)
```

Arguments

y	Numeric or complex vector containing the response variable.
trt	Numeric or complex vector containing the treatments.
DError	Error degrees of freedom.
SError	Error sum of squares.
alpha	Significance of the test.
group	TRUE or FALSE
main	Title
B	Number of bootstrap resamples.

Value

Multiple means comparison for the bootstrap test.

Author(s)

Patricia de Siqueira Ramos
Daniel Furtado Ferreira
Eric Batista Ferreira

References

RAMOS, P. S., FERREIRA, D. F. Agrupamento de medias via bootstrap de populacoes normais e nao-normais, Revista Ceres, v.56, p.140-149, 2009.

Examples

```
data(ex1)
attach(ex1)
crd(trat, ig, quali = TRUE, mcomp='ccboot', sigF = 0.05)
```

crd

One factor Completely Randomized Design

Description

Analyses balanced experiments in Completely Randomized Design under one single factor, considering a fixed model.

Usage

```
crd(treat, resp, quali = TRUE, mcomp = "tukey", sigT = 0.05, sigF = 0.05)
```

Arguments

treat	Numeric or complex vector containing the treatments.
resp	Numeric or complex vector containing the response variable.
quali	Logic. If TRUE (default), the treatments are assumed qualitative, if FALSE, quantitatives.
mcomp	Allows choosing the multiple comparison test; the <i>default</i> is the test of Tukey, however, the options are: the LSD test ('lsd'), the LSD test with Bonferroni protection ('lsdb'), the test of Duncan ('duncan'), the test of Student-Newman-Keuls ('snk'), the test of Scott-Knott ('sk') and bootstrap multiple comparison's test ('ccboot').
sigT	The significance to be used for the multiple comparison test; the default is 5%.
sigF	The significance to be used for the F test of ANOVA; the default is 5%.

Details

The arguments sigT and mcomp will be used only when the treatment are qualitative.

Value

The output contains the ANOVA of the CRD, the Shapiro-Wilk normality test for the residuals of the model, the fitted regression models (when the treatments are quantitative) and/or the multiple comparison tests (when the treatments are qualitative).

Author(s)

Denismar Alves Nogueira

Eric Batista Ferreira

Portya Piscitelli Cavalcanti

References

BANZATTO, D. A.; KRONKA, S. N. Experimentacao Agricola. 4 ed. Jaboticabal: Funep. 2006. 237 p.

FERREIRA, E. B.; CAVALCANTI, P. P. Funcao em codigo R para analisar experimentos em DIC simples, em uma so rodada. In: REUNIAO ANUAL DA REGIAO BRASILEIRA DA SOCIEDADE INTERNACIONAL DE BIOMETRIA, 54./SIMPOSIO DE ESTATISTICA APLICADA A EXPERIMENTACAO AGRONOMICA, 13., 2009, Sao Carlos. Programas e resumos... Sao Carlos, SP: UFSCar, 2009. p. 1-5.

See Also

For more examples, see: fat2.crd, fat3.crd, split2.crd, split2.ad.crd and fat3.ad.crd.

Examples

```
data(ex1)
attach(ex1)
crd(trat, ig, quali = FALSE, sigF = 0.05)
```

duncan

Multiple comparison: Duncan test

Description

Performs the test of Duncan for multiple comparison of means.

Usage

```
duncan(y, trt, DFerror, SSerror, alpha = 0.05, group = TRUE, main = NULL)
```

Arguments

y	Numeric or complex vector containing the response variable.
trt	Numeric or complex vector containing the treatments.
DFerror	Error degrees of freedom.
SSerror	Error sum of squares.
alpha	Significance level.
group	TRUE or FALSE
main	Title

Value

Returns the multiple comparison of means according to the test of Duncan.

Author(s)

Denismar Alves Nogueira
 Eric Batista Ferreira
 Portya Piscitelli Cavalcanti

est21Ad	<i>Stink bugs in corn: additional treatment</i>
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Description

Additional treatment response variable (height of corn plants) of the experiment on stink bugs.

Usage

```
data(est21Ad)
```

Format

The format is: num [1:4] 32.5 32.1 30.3 29.8

Examples

```
data(est21Ad)
## maybe str(est21Ad) ; plot(est21Ad) ...
```

ex	<i>Vines: Split-Plot in Randomized Blocks Design</i>
----	--

Description

Experiment about vines (not published) where one studied the effects of different fertilizers and harvest dates on the pH of grapes.

Usage

```
data(ex)
```

Format

A data frame with 24 observations on the following 4 variables.

trat a factor with levels A B
 dose a numeric vector
 rep a numeric vector
 resp a numeric vector

Examples

```
data(ex)
## maybe str(ex) ; plot(ex) ...
```

ex1

*Yacon: CRD***Description**

Experiment aiming to evaluate the influence of the yacon flour consumption on the glicemic index.

Usage

```
data(ex1)
```

Format

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

trat a numeric vector

ig a numeric vector

References

RIBEIRO, J. de A. Estudos Quimicos e bioquimicos do Yacon (*Samallanthus sonchifolius*) in natura e Processado e Influencia do seu Consumo sobre Niveis Glicemicos e Lipideos Fecais de Ratos. 2008. 166p. Dissertation (Master in Food Science) - Universidade Federal de Lavras, UFLA, Lavras, 2008.

Examples

```
data(ex1)
## maybe str(ex1) ; plot(ex1) ...
```

ex2

*Food bars: RBD***Description**

Sensory evaluation of food bars where panelists (blocks) evaluated their appearance.

Usage

```
data(ex2)
```

Format

A data frame with 350 observations on the following 3 variables.

provador a numeric vector

trat a factor with levels A B C D E

aparencia a numeric vector

References

PAIVA, A. P. de. Estudos Tecnologicos, Quimico, Fisico-quimico e Sensorial de Barras Alimenticias Elaboradas com Subprodutos e Residuos Agoindustriais. 2008. 131p. Dissertation (Master in Food Science) - Universidade Federal de Lavras, UFLA, Lavras, 2008.

Examples

```
data(ex2)
## maybe str(ex2) ; plot(ex2) ...
```

ex3

Forage: LSD

Description

Data from an experiment aiming to select forage for minimizing the intake problem of feeding cattle in the sub-region of Paiaguas.

Usage

```
data(ex3)
```

Format

A data frame with 49 observations on the following 4 variables.

trat a factor with levels A B C D E F G

linha a numeric vector

coluna a numeric vector

resp a numeric vector

References

COMASTRI FILHO, J. A. Avaliacao de especies de forrageiras nativas e exoticas na sub-regiao dos paiaguas no pantanal mato-grossense. Pesq. Agropec. Bras., Brasilia, v.29, n.6, p. 971-978, jun. 1994.

Examples

```
data(ex3)
## maybe str(ex3) ; plot(ex3) ...
```

ex4*Composting: Doble Factorial scheme in CRD*

Description

Field experiment to test the composting of coffee husk with or without cattle manure at different revolving intervals.

Usage

```
data(ex4)
```

Format

A data frame with 24 observations on the following 11 variables.

revol a numeric vector

esterco a factor with levels c s

rep a numeric vector

c a numeric vector

n a numeric vector

k a numeric vector

p a numeric vector

zn a numeric vector

b a numeric vector

ca a numeric vector

cn a numeric vector

References

REZENDE, F. A. de. Aproveitamento da Casca de Cafe e Borra da Purificacao de Gorduras e Oleos Residuarios em Compostagem. 2010. 74p. Thesis (Doctorate in Agronomy/Fitotecny) - Universidade Federal de Lavras, UFLA, Lavras, 2010.

Examples

```
data(ex4)
## maybe str(ex4) ; plot(ex4) ...
```

ex5

Food bars: Double Factorial scheme in RBD

Description

Data adapted from a sensorial experiment where panelists of different genders evaluated the taste of food bars.

Usage

```
data(ex5)
```

Format

A data frame with 160 observations on the following 4 variables.

trat a factor with levels 10g 15g 15t 20t

genero a factor with levels F M

bloco a numeric vector

sabor a numeric vector

References

MOREIRA, D. K. T. Extrudados Expandidos de Arroz, Soja e Gergelim para Uso em Barras Alimenticias. 2010. 166p. Dissertation (Master in Food Science) - Universidade Federal de Lavras, UFLA, Lavras, 2010.

Examples

```
data(ex5)
## maybe str(ex5) ; plot(ex5) ...
```

ex6

Fictional data 1

Description

Data simulated from a standard normal distribution for an experiment in triple factorial scheme.

Usage

```
data(ex6)
```

Format

A data frame with 24 observations on the following 5 variables.

fatorA a numeric vector

fatorB a numeric vector

fatorC a numeric vector

rep a numeric vector

resp a numeric vector

Examples

```
data(ex6)
## maybe str(ex6) ; plot(ex6) ...
```

ex7

Height of corn plants 21 days after emergence.

Description

We evaluated the height of corn plants 21 days after emergence under infestation of stink bugs (*Dichelops*) at different times of coexistence (period) and infestation levels (level). Additional treatment is period zero and level zero.

Usage

```
data(ex7)
```

Format

Data frame with 80 observations on the following 4 variables.

periodo a factor with levels 0-7DAE 0-14DAE 0-21DAE 7-14DAE 7-21DAE

nivel a numeric vector

bloco a numeric vector

est21 a numeric vector

References

RODRIGUES, R. B. Danos do percevejo-barriga-verde *Dichelops melacanthus* (Dallas, 1851) (Hemiptera: Pentatomidae) na cultura do milho. 2011. 105f. Dissertacao (Mestrado em Agronomia - Universidade Federal de Santa Maria, Santa Maria, 2011.

Examples

```
data(ex7)
```

ex8	<i>Composting: double factorial scheme plus one additional treatment in CRD.</i>
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Description

Experiment in greenhouses to observe the performance of the obtained composting for fertilizing sorghum.

Usage

```
data(ex8)
```

Format

A data frame with 24 observations on the following 5 variables.

inoculante a factor with levels esterco mamona

biodiesel a numeric vector

vaso a numeric vector

fresca a numeric vector

seca a numeric vector

References

REZENDE, F. A. de. Aproveitamento da Casca de Cafe e Borra da Purificacao de Gorduras e Oleos Residuarios em Compostagem. 2010. 74p. Thesis (Doctorate in Agronomy/Fitotecny) - Universidade Federal de Lavras, UFLA, Lavras, 2010.

Examples

```
data(ex8)
## maybe str(ex8) ; plot(ex8) ...
```

ex9	<i>Vegetated: Split-plot in CRD</i>
-----	-------------------------------------

Description

Subset of data from an experiment that studied the effect on soil pH of cover crops subjected to trampling by cattle predominantly under continuous grazing system, analyzed at different depths.

Usage

```
data(ex9)
```

Format

A data frame with 48 observations on the following 4 variables.

cobertura a factor with levels T1 T2 T3 T4 T5 T6

prof a numeric vector

rep a numeric vector

pH a numeric vector

References

GUERRA, A. R. Atributos de Solo sob Coberturas Vegetais em Sistema Silvipastoril em Lavras - MG. 2010. 141p. Dissertation (Master in Forest Engineering) - Universidade Federal de Lavras, UFLA, Lavras, 2010.

Examples

```
data(ex9)
## maybe str(ex9) ; plot(ex9) ...
```

fat2.ad.crd

Double factorial scheme plus one additional treatment in CRD

Description

Analyses experiments in balanced Completely Randomized Design in double factorial scheme with an additional treatment, considering a fixed model.

Usage

```
fat2.ad.crd(factor1, factor2, repet, resp, respAd, quali = c(TRUE, TRUE), mcomp = "tukey", fac.names = c
```

Arguments

factor1	Numeric or complex vector containing the factor 1 levels.
factor2	Numeric or complex vector containing the factor 2 levels.
repet	Numeric or complex vector containing the replications.
resp	Numeric or complex vector containing the response variable.
respAd	Numeric or complex vector containing the additional treatment.
quali	Logic. If TRUE (default), the treatments are assumed qualitative, if FALSE, quantitatives.
mcomp	Allows choosing the multiple comparison test; the <i>default</i> is the test of Tukey, however, the options are: the LSD test ('lsd'), the LSD test with Bonferroni protection ('lsdb'), the test of Duncan ('duncan'), the test of Student-Newman-Keuls ('snk'), the test of Scott-Knott ('sk') and bootstrap multiple comparison's test ('ccboot').

fac.names	Allows labeling the factors 1 and 2.
sigT	The significance to be used for the multiple comparison test; the default is 5%.
sigF	The significance to be used for the F test of ANOVA; the default is 5%.

Details

The arguments sigT and mcomp will be used only when the treatment are qualitative.

Value

The output contains the ANOVA of the referred CRD, the Shapiro-Wilk normality test for the residuals of the model, the fitted regression models (when the treatments are quantitative) and/or the multiple comparison tests (when the treatments are qualitative).

Author(s)

Denismar Alves Nogueira

Eric Batista Ferreira

Portya Piscitelli Cavalcanti

References

HEALY, M. J. R. The analysis of a factorial experiment with additional treatments. *Journal of Agricultural Science, Cambridge*, v. 47, p. 205-206. 1956.

FERREIRA, E. B.; CAVALCANTI, P. P.; NOGUEIRA D. A. Funcao para analisar experimentos em fatorial duplo com um tratamento adicional, em uma so rodada. In: CONGRESSO DE POS-GRADUACAO DA UNIVERSIDADE FEDERAL DE LAVRAS, 19., 2010, Lavras. Resumos... Lavras: UFLA, 2010.

See Also

For more examples, see: fat2.crd, fat2.rbd, fat3.crd, fat3.rbd, fat2.ad.rbd, fat3.ad.crd and fat3.ad.rbd.

Examples

```
data(ex8)
attach(ex8)
data(secaAd)
fat2.ad.crd(inoculante, biodiesel, vaso, seca, secaAd, quali = c(TRUE,FALSE), mcomp = "tukey", fac.names = c("Inocu
```


fat2.ad.rbd

*Double factorial scheme plus one additional treatment in RBD***Description**

Analyses experiments in balanced Randomized Blocks Designs in double factorial scheme with an additional treatment, considering a fixed model.

Usage

```
fat2.ad.rbd(factor1, factor2, block, resp, respAd, quali = c(TRUE, TRUE), mcomp = "tukey", fac.names = c)
```

Arguments

factor1	Numeric or complex vector containing the factor 1 levels.
factor2	Numeric or complex vector containing the factor 2 levels.
block	Numeric or complex vector containing the blocks.
resp	Numeric or complex vector containing the response variable.
respAd	Numeric or complex vector containing the additional treatment.
quali	Logic. If TRUE (default), the treatments are assumed qualitative, if FALSE, quantitatives.
mcomp	Allows choosing the multiple comparison test; the <i>default</i> is the test of Tukey, however, the options are: the LSD test ('lsd'), the LSD test with Bonferroni protection ('lsdb'), the test of Duncan ('duncan'), the test of Student-Newman-Keuls ('snk'), the test of Scott-Knott ('sk') and bootstrap multiple comparison's test ('ccboot').
fac.names	Allows labeling the factors 1 and 2.
sigT	The significance to be used for the multiple comparison test; the default is 5%.
sigF	The significance to be used for the F test of ANOVA; the default is 5%.

Details

The arguments sigT and mcomp will be used only when the treatment are qualitative.

Value

The output contains the ANOVA of the referred RBD, the Shapiro-Wilk normality test for the residuals of the model, the fitted regression models (when the treatments are quantitative) and/or the multiple comparison tests (when the treatments are qualitative).

Author(s)

Denismar Alves Nogueira
Eric Batista Ferreira
Portya Piscitelli Cavalcanti

References

HEALY, M. J. R. The analysis of a factorial experiment with additional treatments. Journal of Agricultural Science, Cambridge, v. 47, p. 205-206. 1956.

See Also

For more examples, see: fat2.crd, fat2.rbd, fat3.crd, fat3.rbd, fat2.ad.crd, fat3.ad.crd and fat3.ad.rbd.

Examples

```
data(ex7)
attach(ex7)
data(est21Ad)
fat2.ad.rbd(periodo, nivel, bloco, est21, est21Ad, quali = c(TRUE, FALSE), mcomp = "sk", fac.names = c("Period", "L
```

fat2.crd	<i>Double factorial scheme in CRD</i>
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Description

Analyses experiments in balanced Completely Randomized Design in double factorial scheme, considering a fixed model.

Usage

```
fat2.crd(factor1, factor2, resp, quali = c(TRUE, TRUE), mcomp = "tukey", fac.names = c("F1", "F2"), sigT
```

Arguments

factor1	Numeric or complex vector containing the factor 1 levels.
factor2	Numeric or complex vector containing the factor 2 levels.
resp	Numeric or complex vector containing the response variable.
quali	Logic. If TRUE (default), the treatments are assumed qualitative, if FALSE, quantitatives.
mcomp	Allows choosing the multiple comparison test; the <i>default</i> is the test of Tukey, however, the options are: the LSD test ('lsd'), the LSD test with Bonferroni protection ('lsdb'), the test of Duncan ('duncan'), the test of Student-Newman-Keuls ('snk'), the test of Scott-Knott ('sk') and bootstrap multiple comparison's test ('ccboot').
fac.names	Allows labeling the factors 1 and 2.
sigT	The significance to be used for the multiple comparison test; the default is 5%.
sigF	The significance to be used for the F test of ANOVA; the default is 5%.

Details

The arguments sigT and mcomp will be used only when the treatment are qualitative.

Value

The output contains the ANOVA of the referred CRD, the Shapiro-Wilk normality test for the residuals of the model, the fitted regression models (when the treatments are quantitative) and/or the multiple comparison tests (when the treatments are qualitative).

Author(s)

Denismar Alves Nogueira

Eric Batista Ferreira

Portya Piscitelli Cavalcanti

References

BANZATTO, D. A.; KRONKA, S. N. Experimentacao Agricola. 4 ed. Jaboticabal: Funep. 2006. 237 p.

See Also

For more examples, see: fat2.rbd, fat3.crd, fat3.rbd, fat2.ad.crd, fat2.ad.rbd, fat3.ad.crd and fat3.ad.rbd.

Examples

```
data(ex4)
attach(ex4)
fat2.crd(revol, esterco, zn, quali=c(FALSE,TRUE), mcomp="tukey", fac.names=c("Revolving","Manure"), sigT = 0.05,
```

fat2.rbd

Double factorial scheme in RBD

Description

Analyses experiments in balanced Randomized Blocks Designs in double factorial scheme, considering a fixed model.

Usage

```
fat2.rbd(factor1, factor2, block, resp, quali = c(TRUE, TRUE), mcomp = "tukey", fac.names = c("F1", "F2"))
```

Arguments

factor1	Numeric or complex vector containing the factor 1 levels.
factor2	Numeric or complex vector containing the factor 2 levels.
block	Numeric or complex vector containing the blocks.
resp	Numeric or complex vector containing the response variable.
quali	Logic. If TRUE (default), the treatments are assumed qualitative, if FALSE, quantitatives.

mcomp	Allows choosing the multiple comparison test; the <i>default</i> is the test of Tukey, however, the options are: the LSD test ('lsd'), the LSD test with Bonferroni protection ('lsdb'), the test of Duncan ('duncan'), the test of Student-Newman-Keuls ('snk'), the test of Scott-Knott ('sk') and bootstrap multiple comparison's test ('ccboot').
fac.names	Allows labeling the factors 1 and 2.
sigT	The significance to be used for the multiple comparison test; the default is 5%.
sigF	The significance to be used for the F test of ANOVA; the default is 5%.

Details

The arguments sigT and mcomp will be used only when the treatment are qualitative.

Value

The output contains the ANOVA of the referred RBD, the Shapiro-Wilk normality test for the residuals of the model, the fitted regression models (when the treatments are quantitative) and/or the multiple comparison tests (when the treatments are qualitative).

Author(s)

Denismar Alves Nogueira

Eric Batista Ferreira

Portya Piscitelli Cavalcanti

References

BANZATTO, D. A.; KRONKA, S. N. Experimentacao Agricola. 4 ed. Jaboticabal: Funep. 2006. 237 p.

See Also

For more examples, see: fat2.crd, fat3.crd, fat3.rbd, fat2.ad.crd, fat2.ad.rbd, fat3.ad.crd and fat3.ad.rbd.

Examples

```
data(ex5)
attach(ex5)
fat2.rbd(trat, genero, bloco, sabor ,quali=c(TRUE,TRUE), mcomp="lsd", fac.names=c("Samples","Gender"), sigT = 0.0
```

fat3.ad.crd

*Triple factorial scheme plus an additional treatment in CRD***Description**

Analyses experiments in balanced Completely Randomized Design in triple factorial scheme with an additional treatment, considering a fixed model.

Usage

```
fat3.ad.crd(factor1, factor2, factor3, repet, resp, respAd, quali = c(TRUE, TRUE, TRUE), mcomp = "tukey")
```

Arguments

factor1	Numeric or complex vector containing the factor 1 levels.
factor2	Numeric or complex vector containing the factor 2 levels.
factor3	Numeric or complex vector containing the factor 3 levels.
repet	Numeric or complex vector containing the replications.
resp	Numeric or complex vector containing the response variable.
respAd	Numeric or complex vector containing the additional treatment.
quali	Logic. If TRUE (default), the treatments are assumed qualitative, if FALSE, quantitatives.
mcomp	Allows choosing the multiple comparison test; the <i>default</i> is the test of Tukey, however, the options are: the LSD test ('lsd'), the LSD test with Bonferroni protection ('lsdb'), the test of Duncan ('duncan'), the test of Student-Newman-Keuls ('snk'), the test of Scott-Knott ('sk') and bootstrap multiple comparison's test ('ccboot').
fac.names	Allows labeling the factors 1, 2 and 3.
sigT	The significance to be used for the multiple comparison test; the default is 5%.
sigF	The significance to be used for the F test of ANOVA; the default is 5%.

Details

The arguments sigT and mcomp will be used only when the treatment are qualitative.

Value

The output contains the ANOVA of the referred CRD, the Shapiro-Wilk normality test for the residuals of the model, the fitted regression models (when the treatments are quantitative) and/or the multiple comparison tests (when the treatments are qualitative).

Author(s)

Denismar Alves Nogueira
Eric Batista Ferreira
Portya Piscitelli Cavalcanti

References

HEALY, M. J. R. The analysis of a factorial experiment with additional treatments. Journal of Agricultural Science, Cambridge, v. 47, p. 205-206. 1956.

See Also

For more examples, see: fat2.crd, fat2.rbd, fat3.crd, fat3.rbd, fat2.ad.crd, fat2.ad.rbd and fat3.ad.rbd.

Examples

```
data(ex6)
attach(ex6)
data(respAd)
fat3.ad.crd(fatorA, fatorB, fatorC, rep, resp, respAd, quali = c(TRUE, TRUE, TRUE), mcomp = "duncan", fac.names = c("A", "B", "C"))
```

fat3.ad.rbd	<i>Triple factorial scheme plus an additional treatment in RBD</i>
-------------	--

Description

Analyses experiments in balanced Randomized Blocks Designs in triple factorial scheme with an additional treatment, considering a fixed model.

Usage

```
fat3.ad.rbd(factor1, factor2, factor3, block, resp, respAd, quali = c(TRUE, TRUE, TRUE), mcomp = "tukey")
```

Arguments

factor1	Numeric or complex vector containing the factor 1 levels.
factor2	Numeric or complex vector containing the factor 2 levels.
factor3	Numeric or complex vector containing the factor 3 levels.
block	Numeric or complex vector containing the blocks.
resp	Numeric or complex vector containing the response variable.
respAd	Numeric or complex vector containing the additional treatment.
quali	Logic. If TRUE (default), the treatments are assumed qualitative, if FALSE, quantitatives.

mcomp	Allows choosing the multiple comparison test; the <i>default</i> is the test of Tukey, however, the options are: the LSD test ('lsd'), the LSD test with Bonferroni protection ('lsdb'), the test of Duncan ('duncan'), the test of Student-Newman-Keuls ('snk'), the test of Scott-Knott ('sk') and bootstrap multiple comparison's test ('ccboot').
fac.names	Allows labeling the factors 1, 2 and 3.
sigT	The significance to be used for the multiple comparison test; the default is 5%.
sigF	The significance to be used for the F test of ANOVA; the default is 5%.

Details

The arguments sigT and mcomp will be used only when the treatment are qualitative.

Value

The output contains the ANOVA of the referred RBD, the Shapiro-Wilk normality test for the residuals of the model, the fitted regression models (when the treatments are quantitative) and/or the multiple comparison tests (when the treatments are qualitative).

Author(s)

Denismar Alves Nogueira

Eric Batista Ferreira

Portya Piscitelli Cavalcanti

References

HEALY, M. J. R. The analysis of a factorial experiment with additional treatments. Journal of Agricultural Science, Cambridge, v. 47, p. 205-206. 1956.

See Also

For more examples, see: fat2.crd, fat2.rbd, fat3.crd, fat3.rbd, fat2.ad.crd, fat2.ad.rbd and fat3.ad.crd.

Examples

```
data(ex6)
attach(ex6)
data(respAd)
fat3.ad.rbd(fatorA, fatorB, fatorC, rep, resp, respAd, quali = c(TRUE, TRUE, TRUE), mcomp = "snk", fac.names = c("F", "B", "C"))
```

fat3.crd

*Triple factorial scheme in CRD***Description**

Analyses experiments in balanced Completely Randomized Design in triple factorial scheme, considering a fixed model.

Usage

```
fat3.crd(factor1, factor2, factor3, resp, quali = c(TRUE, TRUE, TRUE), mcomp = "tukey", fac.names = c("F1", "F2", "F3"))
```

Arguments

factor1	Numeric or complex vector containing the factor 1 levels.
factor2	Numeric or complex vector containing the factor 2 levels.
factor3	Numeric or complex vector containing the factor 3 levels.
resp	Numeric or complex vector containing the response variable.
quali	Logic. If TRUE (default), the treatments are assumed qualitative, if FALSE, quantitatives.
mcomp	Allows choosing the multiple comparison test; the <i>default</i> is the test of Tukey, however, the options are: the LSD test ('lsd'), the LSD test with Bonferroni protection ('lsdb'), the test of Duncan ('duncan'), the test of Student-Newman-Keuls ('snk'), the test of Scott-Knott ('sk') and bootstrap multiple comparison's test ('ccboot').
fac.names	Allows labeling the factors 1, 2 and 3.
sigT	The significance to be used for the multiple comparison test; the default is 5%.
sigF	The significance to be used for the F test of ANOVA; the default is 5%.

Details

The arguments sigT and mcomp will be used only when the treatment are qualitative.

Value

The output contains the ANOVA of the referred CRD, the Shapiro-Wilk normality test for the residuals of the model, the fitted regression models (when the treatments are quantitative) and/or the multiple comparison tests (when the treatments are qualitative).

Author(s)

Denismar Alves Nogueira

Eric Batista Ferreira

Portya Piscitelli Cavalcanti

References

BANZATTO, D. A.; KRONKA, S. N. Experimentacao Agricola. 4 ed. Jaboticabal: Funep. 2006. 237 p.

See Also

For more examples, see: fat2.crd, fat2.rbd, fat2.ad.crd, fat2.ad.rbd, fat3.rbd, fat3.ad.crd and fat3.ad.rbd.

Examples

```
data(ex6)
attach(ex6)
fat3.crd(fatorA, fatorB, fatorC, resp, quali = c(TRUE, TRUE, TRUE), mcomp = "lsdb", fac.names = c("Factor A", "Factor B", "Factor C"))
```

fat3.rbd	<i>Triple factorial scheme in RBD</i>
----------	---------------------------------------

Description

Analyses experiments in balanced Randomized Blocks Designs in triple factorial scheme, considering a fixed model.

Usage

```
fat3.rbd(factor1, factor2, factor3, block, resp, quali = c(TRUE, TRUE, TRUE), mcomp = "tukey", fac.names = c("Factor A", "Factor B", "Factor C"))
```

Arguments

factor1	Numeric or complex vector containing the factor 1 levels.
factor2	Numeric or complex vector containing the factor 2 levels.
factor3	Numeric or complex vector containing the factor 3 levels.
block	Numeric or complex vector containing the blocks.
resp	Numeric or complex vector containing the response variable.
quali	Logic. If TRUE (default), the treatments are assumed qualitative, if FALSE, quantitatives.
mcomp	Allows choosing the multiple comparison test; the <i>default</i> is the test of Tukey, however, the options are: LSD test ('lsd'), the LSD test with Bonferroni protection ('lsdb'), the test of Duncan ('duncan'), the test of Student-Newman-Keuls ('snk'), the test of Scott-Knott ('sk') and bootstrap multiple comparison's test ('ccboot').
fac.names	Allows labeling the factors 1, 2 and 3.
sigT	The significance to be used for the multiple comparison test; the default is 5%.
sigF	The significance to be used for the F test of ANOVA; the default is 5%.

Details

The arguments sigT and mcomp will be used only when the treatment are qualitative.

Value

The output contains the ANOVA of the referred RBD, the Shapiro-Wilk normality test for the residuals of the model, the fitted regression models (when the treatments are quantitative) and/or the multiple comparison tests (when the treatments are qualitative).

Author(s)

Denismar Alves Nogueira
Eric Batista Ferreira
Portya Piscitelli Cavalcanti

References

BANZATTO, D. A.; KRONKA, S. N. Experimentacao Agricola. 4 ed. Jaboticabal: Funep. 2006. 237 p.

See Also

For more examples, see: fat2.crd, fat2.rbd, fat2.ad.crd, fat2.ad.rbd, fat3.crd, fat3.ad.crd and fat3.ad.rbd.

Examples

```
data(ex6)
attach(ex6)
fat3.rbd(fatorA, fatorB, fatorC, rep, resp, quali = c(TRUE, TRUE, TRUE), mcomp = "tukey", fac.names = c("Factor A",
```

ginv

Generalized inverse

Description

Calculates the Moore-Penrose generalized inverse of a matrix X.

Usage

```
ginv(X, tol = sqrt(.Machine$double.eps))
```

Arguments

X	Matrix for which the Moore-Penrose inverse is required.
tol	A relative tolerance to detect zero singular values.

Value

A MP generalized inverse matrix for X.

References

Venables, W. N. and Ripley, B. D. (1999) Modern Applied Statistics with S-PLUS. Third Edition. Springer. p.100.

See Also

See also: solve, svd, eigen.

Examples

```
## Not run:
# The function is currently defined as
function(X, tol = sqrt(.Machine$double.eps))
{
  ## Generalized Inverse of a Matrix
  dnx <- dimnames(X)
  if(is.null(dnx)) dnx <- vector("list", 2)
  s <- svd(X)
  nz <- s$d > tol * s$d[1]
  structure(
    if(any(nz)) s$v[, nz] %*% (t(s$u[, nz])/s$d[nz]) else X, dimnames = dnx[2:1])
}

## End(Not run)
```

lastC

Setting the last character of a chain

Description

A special function for the group of treatments in the multiple comparison tests. Use order.group.

Usage

```
lastC(x)
```

Arguments

x letters

Value

x character

Author(s)

Denismar Alves Nogueira
Eric Batista Ferreira
Portya Piscitelli Cavalcanti
(Adapted from Felipe de Mendiburu - GPL)

See Also

order.group

Examples

```
x<-c("a","ab","b","c","cd")
lastC(x)
# "a" "b" "b" "c" "d"
```

latsd	<i>Latin Square Design</i>
-------	----------------------------

Description

Analyses experiments in balanced Latin Square Design, considering a fixed model.

Usage

```
latsd(treat, row, column, resp, quali = TRUE, mcomp = "tukey", sigT = 0.05, sigF = 0.05)
```

Arguments

treat	Numeric or complex vector containing the treatments.
row	Numeric or complex vector containing the rows.
column	Numeric or complex vector containing the columns.
resp	Numeric or complex vector containing the response variable.
quali	Logic. If TRUE (default), the treatments are assumed qualitative, if FALSE, quantitatives.
mcomp	Allows choosing the multiple comparison test; the <i>default</i> is the test of Tukey, however, the options are: the LSD test ('lsd'), the LSD test with Bonferroni protection ('lsdb'), the test of Duncan ('duncan'), the test of Student-Newman-Keuls ('snk'), the test of Scott-Knott ('sk') and bootstrap multiple comparison's test ('ccboot').
sigT	The significance to be used for the multiple comparison test; the default is 5%.
sigF	The significance to be used for the F test of ANOVA; the default is 5%.

Details

The arguments `sigT` and `mcomp` will be used only when the treatment are qualitative.

Value

The output contains the ANOVA of the LSD, the Shapiro-Wilk normality test for the residuals of the model, the fitted regression models (when the treatments are quantitative) and/or the multiple comparison tests (when the treatments are qualitative).

Author(s)

Denismar Alves Nogueira
Eric Batista Ferreira
Portya Piscitelli Cavalcanti

References

GOMES, F. P. Curso de Estatística Experimental. 10a ed. Piracicaba: ESALQ/USP. 1982. 430.
FERREIRA, E. B.; CAVALCANTI, P. P.; NOGUEIRA D. A. Funcao em codigo R para analisar experimentos em DQL simples, em uma so rodada. In: CONGRESSO DE POS-GRADUACAO DA UNIVERSIDADE FEDERAL DE LAVRAS, 18., 2009, Lavras. Annals... Lavras: UFLA, 2009.

See Also

For more examples, see: `crd` and `rbd`

Examples

```
data(ex3)
attach(ex3)
latsd(trat, linha, coluna, resp, quali=TRUE, mcomp="snk", sigT=0.05, sigF=0.05)
```

lsd

Multiple comparison: Least Significant Difference test

Description

Performs the t test (LSD) for multiple comparison of means.

Usage

```
lsd(y, trt, DError, SError, alpha = 0.05, group = TRUE, main = NULL)
```

Arguments

y	Numeric or complex vector containing the response variable.
trt	Numeric or complex vector containing the treatments.
DFerror	Error degrees of freedom.
SSerror	Error sum of squares.
alpha	Significance level.
group	TRUE or FALSE
main	Title

Value

Returns the multiple comparison of means according to the LSD test.

Author(s)

Denismar Alves Nogueira
 Eric Batista Ferreira
 Portya Piscitelli Cavalcanti

 lsdb

Multiple comparison: Bonferroni's Least Significant Difference test

Description

Performs the t test (LSD) with Bonferroni's protection, for multiple comparison of means

Usage

```
lsdb(y, trt, DFerror, SSerror, alpha = 0.05, group = TRUE, main = NULL)
```

Arguments

y	Numeric or complex vector containing the response variable.
trt	Numeric or complex vector containing the treatments.
DFerror	Error degrees of freedom.
SSerror	Error sum of squares.
alpha	Significance level.
group	TRUE or FALSE
main	Title

Value

Returns the multiple comparison of means according to the LSDB test.

Author(s)

Denismar Alves Nogueira
 Eric Batista Ferreira
 Portya Piscitelli Cavalcanti

 order.group

Ordering the treatments according to the multiple comparison

Description

Orders the groups os means.

Usage

```
order.group(trt, means, N, MSerror, Tprob, std.err, parameter = 1)
```

Arguments

trt	Treatments
means	Means of treatment
N	Replications
MSerror	Mean square error
Tprob	minimum value for the comparison
std.err	standard error
parameter	Constante 1 (Sd), 0.5 (Sx)

Value

trt Factor means Numeric N Numeric MSerror Numeric Tprob value between 0 and 1 std.err Numeric parameter Constant

Author(s)

Denismar Alves Nogueira
 Eric Batista Ferreira
 Portya Piscitelli Cavalcanti
 (Adapted from Felipe de Mendiburu - GPL)

See Also

order.stat

order.stat.SNK	<i>Grouping the treatments averages in a comparison with a minimum value</i>
----------------	--

Description

Orders the groups of means according to the test of SNK.

Usage

```
order.stat.SNK(treatment, means, minimum)
```

Arguments

treatment	treatment
means	means of treatment
minimum	minimum value for the comparison

Value

trt Factor means Numeric minimum Numeric

Author(s)

Denismar Alves Nogueira
 Eric Batista Ferreira
 Portya Piscitelli Cavalcanti
 (Adapted from Felipe de Mendiburu - GPL)

See Also

order.group

rbd	<i>Randomized Blocks Design</i>
-----	---------------------------------

Description

Analyses experiments in balanced Randomized Blocks Designs under one single factor, considering a fixed model.

Usage

```
rbd(treat, block, resp, quali = TRUE, mcomp = "tukey", sigT = 0.05, sigF = 0.05)
```


Arguments

<code>treat</code>	Numeric or complex vector containing the treatments.
<code>block</code>	Numeric or complex vector containing the blocks.
<code>resp</code>	Numeric or complex vector containing the response variable.
<code>quali</code>	Logic. If TRUE (default), the treatments are assumed qualitative, if FALSE, quantitatives.
<code>mcomp</code>	Allows choosing the multiple comparison test; the <i>default</i> is the test of Tukey, however, the options are: the LSD test (<code>'lsd'</code>), the LSD test with Bonferroni protection (<code>'lsdb'</code>), the test of Duncan (<code>'duncan'</code>), the test of Student-Newman-Keuls (<code>'snk'</code>), the test of Scott-Knott (<code>'sk'</code>) and bootstrap multiple comparison's test (<code>'ccboot'</code>).
<code>sigT</code>	The significance to be used for the multiple comparison test; the default is 5%.
<code>sigF</code>	The significance to be used for the F test of ANOVA; the default is 5%.

Details

The arguments `sigT` and `mcomp` will be used only when the treatment are qualitative.

Value

The output contains the ANOVA of the RBD, the Shapiro-Wilk normality test for the residuals of the model, the fitted regression models (when the treatments are quantitative) and/or the multiple comparison tests (when the treatments are qualitative).

Author(s)

Denismar Alves Nogueira
Eric Batista Ferreira
Portya Piscitelli Cavalcanti

References

BANZATTO, D. A.; KRONKA, S. N. Experimentacao Agricola. 4 ed. Jaboticabal: Funep. 2006. 237 p.
FERREIRA, E. B.; CAVALCANTI, P. P.; NOGUEIRA D. A. Funcao em codigo R para analisar experimentos em DBC simples, em uma so rodada. In: JORNADA CIENTIFICA DA UNIVERSIDADE FEDERAL DE ALFENAS-MG, 2., 2009, Alfenas. Annals... ALfenas: Unifal-MG, 2009.

See Also

For more examples, see: `fat2.rbd`, `fat3.rbd`, `split2.rbd`, `split2.ad.rbd` and `fat3.ad.rbd`.

Examples

```
data(ex2)
attach(ex2)
rbd(trat, provador, aparencia, quali = TRUE, mcomp='lsd', sigT = 0.05, sigF = 0.05)
```

reg.poly	<i>Polinomial Regression</i>
----------	------------------------------

Description

Fits sequential regression models until the third power.

Usage

```
reg.poly(resp, treat, DFerror, SSerror, DFtreat, SStreat)
```

Arguments

resp	Numeric or complex vector containing the response variable.
treat	Numeric or complex vector containing the treatments.
DFerror	Error degrees of freedom
SSerror	Error sum of squares
DFtreat	Treatments' degrees of freedom
SStreat	Treatments' sum of squares

Value

Returns coefficients, significance and ANOVA of the fitted regression models.

Author(s)

Denismar Alves Nogueira
Eric Batista Ferreira
Portya Piscitelli Cavalcanti

References

GOMES, F. P. Curso de Estatística Experimental. 10a ed. Piracicaba: ESALQ/USP. 1982. 430.

respAd	<i>Fictional data: additional treatment</i>
--------	---

Description

Response variable form the additional treatment.

Usage

```
data(respAd)
```

Format

The format is: num [1:3] 10.6 10.6 10.4

Examples

```
data(respAd)
## maybe str(respAd) ; plot(respAd) ...
```

scottknott	<i>Multiple comparison: Scott-Knott test</i>
------------	--

Description

Performs the test of Scott-Knott, for multiple comparison of means

Usage

```
scottknott(y, trt, DFerror, SSerror, alpha = 0.05, group = TRUE, main = NULL)
```

Arguments

y	Numeric or complex vector containing the response variable.
trt	Numeric or complex vector containing the treatments.
DFerror	Error degrees of freedom.
SSerror	Error sum of squares.
alpha	Significance level.
group	TRUE or FALSE
main	Title

Value

Returns the multiple comparison of means according to the test of Scott-Knott.

Author(s)

Denismar Alves Nogueira
 Eric Batista Ferreira
 Portya Piscitelli Cavalcanti
 (Adapted from Laercio Junio da Silva - GPL(>=2))

References

RAMALHO, M. A. P.; FERREIRA, D. F.; OLIVEIRA, A. C. de. Experimentacao em Genetica e Melhoramento de Plantas. 2a ed. Lavras: UFLA. 2005. 300p.

 secaAd

Composting: additional treatment

Description

Response variable (dry biomass) of the additional treatment of the experiment about composting.

Usage

```
data(secaAd)
```

Format

The format is: num [1:3] 0.13 0.1 0.1

Examples

```
data(secaAd)
## maybe str(secaAd) ; plot(secaAd) ...
```

 snk

Multiple comparison: Student-Newman-Keuls test

Description

Performs the test of SNK, for multiple comparison of means.

Usage

```
snk(y, trt, DFerror, SSError, alpha = 0.05, group = TRUE, main = NULL)
```

Arguments

y	Numeric or complex vector containing the response variable.
trt	Numeric or complex vector containing the treatments.
DFerror	Error degrees of freedom.
SSerror	Error sum of squares.
alpha	Significance level.
group	TRUE or FALSE
main	Title

Value

Returns the multiple comparison of means according to the test of SNK.

Author(s)

Denismar Alves Nogueira
Eric Batista Ferreira
Portya Piscitelli Cavalcanti

split2.crd

Split-plots in CRD

Description

Analyses experiments in Split-plot scheme in balanced Completely Randomized Design, considering a fixed model.

Usage

```
split2.crd(factor1, factor2, repet, resp, quali = c(TRUE, TRUE), mcomp = "tukey", fac.names = c("F1", "F2"))
```

Arguments

factor1	Numeric or complex vector containing the factor 1 levels.
factor2	Numeric or complex vector containing the factor 2 levels.
repet	Numeric or complex vector containing the replications.
resp	Numeric or complex vector containing the response variable.
quali	Logic. If TRUE (default), the treatments are assumed qualitative, if FALSE, quantitatives.
mcomp	Allows choosing the multiple comparison test; the <i>default</i> is the test of Tukey, however, the options are: the LSD test ('lsd'), the LSD test with Bonferroni protection ('lsdb'), the test of Duncan ('duncan'), the test of Student-Newman-Keuls ('snk'), the test of Scott-Knott ('sk') and bootstrap multiple comparison's test ('ccboot').

fac.names	Allows labeling the factors 1 and 2.
sigT	The significance to be used for the multiple comparison test; the default is 5%.
sigF	The significance to be used for the F test of ANOVA; the default is 5%.

Details

The arguments sigT and mcomp will be used only when the treatment are qualitative.

Value

The output contains the ANOVA of the referred CRD, the Shapiro-Wilk normality test for the residuals of the model, the fitted regression models (when the treatments are quantitative) and/or the multiple comparison tests (when the treatments are qualitative).

Author(s)

Denismar Alves Nogueira
Eric Batista Ferreira
Portya Piscitelli Cavalcanti

References

BANZATTO, D. A.; KRONKA, S. N. Experimentacao Agricola. 4 ed. Jaboticabal: Funep. 2006. 237 p.

Examples

```
data(ex9)
attach(ex9)
split2.crd(cobertura, prof, rep, pH, quali = c(TRUE, TRUE), mcomp = "lsd", fac.names = c("Cover", "Depth"), sigT = 0
```

split2.rbd	<i>Split-plots in RBD</i>
------------	---------------------------

Description

Analyses experiments in Split-plot scheme in balanced Randomized Blocks Design, considering a fixed model.

Usage

```
split2.rbd(factor1, factor2, block, resp, quali = c(TRUE, TRUE), mcomp = "tukey", fac.names = c("F1", "F
```

Arguments

factor1	Numeric or complex vector containing the factor 1 levels.
factor2	Numeric or complex vector containing the factor 2 levels.
block	Numeric or complex vector containing the blocks.
resp	Numeric or complex vector containing the response variable.
quali	Logic. If TRUE (default), the treatments are assumed qualitative, if FALSE, quantitatives.
mcomp	Allows choosing the multiple comparison test; the <i>default</i> is the test of Tukey, however, the options are: the LSD test ('lsd'), the LSD test with Bonferroni protection ('lsdb'), the test of Duncan ('duncan'), the test of Student-Newman-Keuls ('snk'), the test of Scott-Knott ('sk') and bootstrap multiple comparison's test ('ccboot').
fac.names	Allows labeling the factors 1 and 2.
sigT	The significance to be used for the multiple comparison test; the default is 5%.
sigF	The significance to be used for the F test of ANOVA; the default is 5%.

Details

The arguments sigT and mcomp will be used only when the treatment are qualitative.

Value

The output contains the ANOVA of the referred RBD, the Shapiro-Wilk normality test for the residuals of the model, the fitted regression models (when the treatments are quantitative) and/or the multiple comparison tests (when the treatments are qualitative).

Author(s)

Denismar Alves Nogueira
Eric Batista Ferreira
Portya Piscitelli Cavalcanti

References

BANZATTO, D. A.; KRONKA, S. N. Experimentacao Agricola. 4 ed. Jaboticabal: Funep. 2006. 237 p.

See Also

split2.crd

Examples

```
data(ex)
attach(ex)
split2.rbd(trat, dose, rep, resp, quali = c(TRUE, FALSE), mcomp = "tukey", fac.names = c("Treatment", "Dose"), sig
```

tapply.stat	<i>Statistics of data grouped by factors</i>
-------------	--

Description

This process lies in finding statistics which consist of more than one variable, grouped or crossed by factors. The table must be organized by columns between variables and factors.

Usage

```
tapply.stat(y, x, stat = "mean")
```

Arguments

y	data.frame variables
x	data.frame factors
stat	Method

Value

y Numeric
 x Numeric
 stat method = "mean", ...

Author(s)

Denismar Alves Nogueira
 Eric Batista Ferreira
 Portya Piscitelli Cavalcanti
 (Adapted from Felipe de Mendiburu - GPL)

tukey	<i>Multiple comparison: Tukey's test</i>
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Description

Performs the test of Tukey, for multiple comparison of means.

Usage

```
tukey(y, trt, DError, SError, alpha = 0.05, group = TRUE, main = NULL)
```


Arguments

y	Numeric or complex vector containing the response variable.
trt	Numeric or complex vector containing the treatments.
DFerror	Error degrees of freedom.
SSerror	Error sum of squares.
alpha	Significance level.
group	TRUE or FALSE
main	Title

Details

It is necessary first makes a analysis of variance.

Value

y Numeric trt factor DFerror Numeric MSerror Numeric alpha Numeric group Logic main Text

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References

Principles and procedures of statistics a biometrical approach Steel and Torry and Dickey. Third Edition 1997

See Also

LSD.test, waller.test

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