Package ‘easyanova’

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**easyanova-package**

**Analysis of variance and other important complementary analyzes**

### Description

Perform analysis of variance and other important complementary analyzes. The functions are easy to use. Performs analysis in various designs, with balanced and unbalanced data.

### Details

Package: easyanova  
Type: Package  
Version: 4.0  
Date: 2014-09-08  
License: GPL-2

### Author(s)

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### References


See Also
e1, ea2, ec

Examples

# Kaps and Lamberson(2009)
data(data1)
data(data2)
data(data3)
data(data4)

# analysis in completely randomized design
r1<-ea1(data1, design=1)
names(r1)

r1

# analysis in randomized block design
r2<-ea1(data2, design=2)

# analysis in latin square design
r3<-ea1(data3, design=3)

# analysis in several latin squares design
r4<-ea1(data4, design=4)

r1[1]
r2[1]
r3[1]
r4[1]

# analysis in unbalanced randomized block design
response<-ifelse(data2$Gain>850, NA, data2$Gain)
ndata<-data.frame(data2[-3], response)
ndata

r5<-ea1(ndata, design=2)

r5

# multivariable response (list argument = TRUE)
t<-c(’a’,’a’,’b’,’b’,’b’,’c’,’c’,’c’)
r1<-c(10,12,12.8,4,6,8,14,15,16)
data1 <- c(102, 105, 106, 125, 123, 124, 99, 95, 96)
results <- data.frame(t(data1), r1, r2, r3)

r2 <- c(560, 589, 590, 658, 678, 629, 369, 389, 378)

results <- results[, design = 1, list = TRUE)
names(results)
results
results[[1]][[1]]
names(results[[1]][[1]])

---

data1: Kaps and Lamberson(2009): page 252

**Description**

The experiment compared three diets for pigs in a completely randomized design.

**Usage**

data(data1)

**Format**

A data frame with 15 observations on the following 2 variables.

- **Diet** a factor with levels d1 d2 d3
- **Gain** a numeric vector

**References**


**Examples**

data(data1)
summary(data1)
**data10**

**data10: Kaps and Lamberson (2009): page 395**

**Description**

Completely randomized design with a covariate. The effect of three diets on daily gain of steers was investigated. The design was a completely randomized design. Weight at the beginning of the experiment (initial weight) was recorded, but not used in the assignment of animals to diet.

**Usage**

data(data10)

**Format**

A data frame with 15 observations on the following 4 variables.

- **Diets** a factor with levels A B C
- **Initial_weight** a numeric vector
- **Repetitions** a numeric vector
- **Gain** a numeric vector

**References**


**Examples**

data(data10)
summary(data10)

---

**data11**

**data11: Pimentel Gomes and Garcia (2002): page 199**

**Description**

Incomplete block design

**Usage**

data(data11)
Format

A data frame with 56 observations on the following 4 variables.

- treatments a numeric vector
- rep a numeric vector
- blocks a numeric vector
- yield a numeric vector

References


Examples

```r
data(data11)
summary(data11)
```

---

data12


Description

Incomplete block design

Usage

```r
data(data12)
```

Format

A data frame with 42 observations on the following 4 variables.

- treatments a numeric vector
- rep a numeric vector
- blocks a numeric vector
- yield a numeric vector

References


Examples

```r
data(data12)
summary(data12)
```
data13

**Description**

Incomplete block design

**Usage**

data(data13)

**Format**

A data frame with 23 observations on the following 3 variables.

- **genotypes** a factor with levels `f1 f10 f11 f12 f13 f14 f2 f3 f4 f5 f6 f7 f8 f9 test1 test2 test3`
- **blocks** a factor with levels `b1 b2 b3`
- **yield** a numeric vector

**References**


**Examples**

```r
data(data13)
summary(data13)
```

data14

**Description**

Incomplete block design in animals

**Usage**

data(data14)
Format
A data frame with 28 observations on the following 4 variables.
treatment a factor with levels A B C D E F G
animal  a factor with levels A1 A2 A3 A4 A5 A6 A7
period a factor with levels P1 P2 P3 P4
response a numeric vector

References

Examples
data(data15)
summary(data15)

---

Description
Lattice design

Usage
data(data15)

Format
A data frame with 48 observations on the following 4 variables.
treatments a numeric vector
rep a numeric vector
blocks a numeric vector
yield a numeric vector

References

Examples
data(data15)
summary(data15)
**data16**

*data16: Sampaio (2010): page164*

---

**Description**

Switchback design

**Usage**

data(data16)

**Format**

A data frame with 36 observations on the following 4 variables.

- **treatment** a factor with levels A B C
- **period** a numeric vector
- **animal** a numeric vector
- **gain** a numeric vector

**References**


**Examples**

data(data16)
summary(data16)

---

**data17**

*data17: Sanders and Gaynor (1987)*

---

**Description**

Switchback design

**Usage**

data(data17)
Format
A data frame with 36 observations on the following 5 variables.

- treatments  a numeric vector
- blocks  a factor with levels b1 b2 b3
- period  a numeric vector
- animal  a numeric vector
- gain  a numeric vector

References

Examples
```r
data(data18)
summary(data18)
```

---

data18: Ramalho et al. (2005): page 115

Description
Repetition of experiments in block design

Usage
data(data18)

Format
A data frame with 60 observations on the following 4 variables.

- treatments  a numeric vector
- experiments  a numeric vector
- blocks  a numeric vector
- response  a numeric vector

References

Examples
```r
data(data18)
summary(data18)
```
data19

data19: Sampaio (2010): page 155

Description

Repetition of latin square design

Usage

data(data19)

Format

A data frame with 32 observations on the following 5 variables.

- treatments: a factor with levels A B C D
- squares: a factor with levels 1 2
- rows: a factor with levels 1 2 3 4
- columns: a factor with levels 1 2 3 4
- response: a numeric vector

References


Examples

data(data19)
summary(data19)

data2

data2: Kaps and Lamberson (2009): page 313: randomized block design

Description

Complete randomized block design to determine the average daily gain of steers

Usage

data(data2)
Format

A data frame with 12 observations on the following 3 variables.

Treatments a factor with levels t1 t2 t3
Blocks a factor with levels b1 b2 b3 b4
Gain a numeric vector

References


Examples

data(dataRI
summary(dataRI

data3: Kaps and Lamberson (2009): page 347

Description

Latin square design for test four different treatments on hay intake of fattening steers

Usage

data(data3)

Format

A data frame with 16 observations on the following 4 variables.

treatment a factor with levels A B C D
period a factor with levels p1 p2 p3 p4
steer a factor with levels a1 a2 a3 a4
response a numeric vector

References


Examples

data(data3)
summary(data3)
data4

**Description**

Two latin squares design for test four different treatments on hay intake of fattening steers

**Usage**

```r
data(data4)
```

**Format**

A data frame with 32 observations on the following 5 variables.

- **diet**: a factor with levels A B C D
- **square**: a numeric vector
- **steer**: a numeric vector
- **period**: a numeric vector
- **response**: a numeric vector

**References**


**Examples**

```r
data(data4)
summary(data4)
```

data5

**Description**

Factorial in randomized design for testing two vitamins in feed of pigs

**Usage**

```r
data(data5)
```
Format

A data frame with 20 observations on the following 3 variables.

Vitamin_1 a numeric vector
Vitamin_2 a numeric vector
Gains a numeric vector

References


Examples

data(dataUI
summary(dataUI

---


Description

Factorial in randomized block design

Usage

data(data6)

Format

A data frame with 16 observations on the following 4 variables.

factor1 a numeric vector
factor2 a numeric vector
block a numeric vector
yield a numeric vector

References


Examples

data(data6)
summary(data6)
Description

The aim of this experiment was to test the difference between two treatments on gain of kids. A sample of 18 kids was chosen, nine for each treatment. One kid in treatment 1 was removed from the experiment due to illness. The experiment began at the age of 8 weeks. Weekly gain was measured at ages 9, 10, 11 and 12 weeks.

Usage

data(data7)

Format

A data frame with 68 observations on the following 4 variables.

- treatment: a character vector
- rep: a numeric vector
- week: a character vector
- gain: a numeric vector

References


Examples

data(data7)
summary(data7)

Description

Split-plot Design. Main Plots in Randomized Blocks. An experiment was conducted in order to investigate four different treatments of pasture and two mineral supplements on milk yield. The total number of cows available was 24. The experiment was designed as a split-plot, with pasture treatments (factor A) assigned to the main plots and mineral supplements (factor B) assigned to split-plots. The experiment was replicated in three blocks.
Usage
data(data8)

Format
A data frame with 24 observations on the following 4 variables.
pasture a factor with levels p1 p2 p3 p4
block  a numeric vector
mineral a factor with levels m1 m2
milk   a numeric vector

References

Examples
data(data8)
summary(data8)

data9


Description
Factorial design to evaluate egg quality according to the lineage of chicken, packaging and storage time.

Usage
data(data9)

Format
A data frame with 120 observations on the following 5 variables.
lineage  a factor with levels A B
packing  a factor with levels Ce Co S
time     a numeric vector
repetitions a numeric vector
response a numeric vector
References

Examples
```r
data(data9)
summary(data9)
```

---

**Analysis of variance in simple designs**

**Description**
Perform analysis of variance and other important complementary analyzes. The function are easy to use. Performs analysis in various simples designs, with balanced and unbalanced data. Too performs analysis the kruskal-Wallis and Friedman (designs 14 and 15).

**Usage**
```r
eal(data, design = 1, alpha = 0.05, list = FALSE, p.adjust=1, plot=2)
```

**Arguments**
- `data`: data is a data.frame
- `design`: see how the input data in the examples
- `design`: 1 = completely randomized design
- `design`: 2 = randomized block design
- `design`: 3 = latin square design
- `design`: 4 = several latin squares
- `design`: 5 = analysis with a covariate (completely randomized design)
- `design`: 6 = analysis with a covariate (randomized block design)
- `design`: 7 = incomplete blocks type I and II
- `design`: 8 = incomplete blocks type III or augmented blocks
- `design`: 9 = incomplete blocks type III in animal experiments
- `design`: 10 = lattice (intra-block analysis)
- `design`: 11 = lattice (inter-block analysis)
- `design`: 12 = switchback design
- `design`: 13 = switchback design in blocks
- `design`: 14 = Kruskal-Wallis rank sum test
- `design`: 15 = Friedman rank sum test
- `alpha`: significance level for multiple comparisons
list          FALSE = a single response variable
              TRUE = multivariable response
p.adjust      1="none"; 2="holm"; 3="hochberg"; 4="hommel"; 5="bonferroni"; 6="BH",
              7="BY"; 8="fdr"; for more details see function "p.adjust"
plot          1 = box plot for residuals; 2 = standardized residuals vs sequence data; 3 =
              standardized residuals vs theoretical quantiles

Details

The response variable must be numeric. Other variables can be numeric or factors.

Value

Returns analysis of variance, means (adjusted means), multiple comparison test (tukey, snk, duncan, t and scott knott) and residual analysis. Too returns analysis the kruskal-Wallis and Friedman (designs 14 and 15).

Author(s)

Emmanuel Arnhold <emmanuelarnhold@yahoo.com.br>

References

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SANDERS W.L. and GAYNOR, P.J. Analysis of switchback data using Statistical Analysis System,
PIMENTEL-GOMES, F. and GARCIA C.H. Estatistica aplicada a experimentos agronomicos e
florestais: exposicao com exemplos e orientacoes para uso de aplicativos. Editora Fealq, v.11,

See Also

ea2, ec

Examples

# Kaps and Lamberson(2009)
data(data1)
data(data2)
data(data3)
data(data4)
# analysis in completely randomized design
r1 <- ea1(data1, design=1)

names(r1)

r1

# analysis in randomized block design
r2 <- ea1(data2, design=2)

# analysis in latin square design
r3 <- ea1(data3, design=3)

# analysis in several latin squares design
r4 <- ea1(data4, design=4)

r1[1]
r2[1]
r3[1]
r4[1]

# analysis in unbalanced randomized block design
response <- ifelse(data2$Gain > 850, NA, data2$Gain)
ndata <- data.frame(data2[-3], response)
ndata

r5 <- ea1(ndata, design=2)

r5

# multivariable response (list argument = TRUE)
t <- c('a', 'a', 'a', 'b', 'b', 'b', 'b', 'c', 'c', 'c')
r1 <- c(10, 12, 12.8, 4, 6, 8, 14, 15, 16)
r2 <- c(102, 105, 106, 125, 123, 124, 99, 95, 96)
r3 <- c(560, 589, 590, 658, 678, 629, 369, 389, 378)

d <- data.frame(t, r1, r2, r3)
results <- ea1(d, design=1, list=TRUE)
names(results)
results

results[1][[1]]

names(results[1][[1]])

# analysis with a covariate
# Kaps and Lamberson (2009)
data(data10)

# analysis in completely randomized design
r6<-eal(data10[-3], design=5)

r6

# incomplete blocks type I and II
# Pimentel Gomes and Garcia (2002)
data(data11)
data(data12)

#r7<-eal(data11, design=7)
#r8<-eal(data12, design=7)

#r7;r8

# incomplete blocks type III or augmented blocks
# Cruz and Carneiro (2006)
data(data13)

#r9<-eal(data13, design=8)
#r9

# incomplete blocks type III in animal experiments
# Sampaio (2010)
data(data14)

r10<-eal(data14, design=9)
r10

# lattice
# Pimentel Gomes and Garcia (2002)
data(data15)

#r11<-eal(data15, design=10) # intra-block analysis
#r12<-eal(data15, design=11) # inter-block analysis

#r11
#r12

# switchback design
# Sampaio (2010)
data(data16)
r13<-eal(data16, design=12)
r13

# switchback design in blocks
# Sanders and Gaynor (1987)
data(data17)
r14<-eal(data17, design=13)
r14
ea2

Analysis of variance in factorial and split plot

Description

Perform analysis of variance and other important complementary analyzes in factorial and split plot scheme, with balanced and unbalanced data.

Usage

```
ea2(data, design = 1, alpha = 0.05, cov = 4, list = FALSE, p.adjust=1, plot=2)
```

Arguments

- **data**: data is a data.frame
  
- **design**: see how the input data in the examples
  
- **alpha**: significance level for multiple comparisons
  
- **cov**: for split plot designs
  
- **list**: joint analysis of repetitions of latin squares (hierarchical rows and columns)
  
- **p.adjust**: joint analysis of repetitions of latin squares (hierarchical rows and columns)
  
- **plot**: joint analysis of repetitions of latin squares (hierarchical rows and columns)
list
FALSE = a single response variable
TRUE = multivariable response

p.adjust
1="none"; 2="holm"; 3="hochberg"; 4="hommel"; 5="bonferroni"; 6="BH",
7="BY"; 8="fdr"; for more details see function "p.adjust"

plot
1 = box plot for residuals; 2 = standardized residuals vs sequence data; 3 =
standardized residuals vs theoretical quantiles

Details
The response variable must be numeric. Other variables can be numeric or factors.

Value
Returns analysis of variance, means (adjusted means), multiple comparison test (tukey, snk, duncan,
t and scott knott) and residual analysis.

Author(s)
Emmanuel Arnhold <emmanuelarnhold@yahoo.com.br>

References
KAPS, M. and LAMBERSON, W. R. Biostatistics for Animal Science: an introductory text. 2nd
SAMPAIO, I. B. M. Estatistica aplicada a experimentacao animal. 3nd Edition. Belo Horizonte:
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PIMENTEL-GOMES, F. and GARCIA C.H. Estatistica aplicada a experimentos agronomicos e
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RAMALHO, M. A. P.; FERREIRA, D. F. and OLIVEIRA, A. C. Experimentacao em Genetica e

See Also
ea1, ec

Examples

# double factorial

# completely randomized design
data(data5)
rl=ea2(data5, design=1)
rl

# randomized block design
data(data6)
r2=ea2(data6, design=2)
r2

names(r1)

names(r2)

# triple factorial

# completely randomized design
data(data9)
r3=ea2(data9[,-4], design=7)
r3[1]

# split plot

# completely randomized design
data(data7)
r4=ea2(data7, design=4)
r4

# randomized block design
data(data8)
r5=ea2(data8, design=5)
r5

# hierarchical blocks
# Ramalho et al. (2005)
data(data18)
data18
#r6=ea2(data18, design=11)
#r6

# hierarchical latin squares
# Sampaio (2010)
data(data19)
data19
#r7=ea2(data19, design=12)
#r8=ea2(data19, design=13)

# hierarchical rows
#r7

# hierarchical rows and columns
#r8

----------------------------------------

Easy contrast
Description

Performs contrasts of means

Usage

ec(mg1, mg2, sdg1, sdg2, df)

Arguments

mg1 Means of the group 1
mg2 Means of the group 2
sdg1 Standard error of the group 1
sdg2 Standard error of the group 2
df Degree of freedom from error

Value

Returns t test for contrast

Author(s)

Emmanuel Arnhold <emmanuelarnhold@yahoo.com.br>

References


See Also

ea1,ea2

Examples

# Kaps and Lamberson(2009, pg 254)

data(data1)

r<-ea1(data1, design=1)
r[2]

# first contrast
mg1=312; mg2=c(278, 280); sdg1=7.7028; sdg2=c(7.7028, 7.7028); df=12
ec(mg1, mg2, sdg1, sdg2, df)

# second contrast
mg1=280; mg2=278; sdg1=7.7028; sdg2=7.7028; df=12
ec(mg1, mg2, sdg1, sdg2, df)
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