

Package ‘AOV1R’

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Type Package

Title Inference in the Balanced One-Way ANOVA Model with Random Factor

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Description Provides functions to perform statistical inference in the balanced one-way ANOVA model with a random factor: confidence intervals, prediction interval, and Weerahandi generalized pivotal quantities. References: Burdick & Graybill (1992, ISBN-13: 978-0824786441); Weerahandi (1995) <[doi:10.1007/978-1-4612-0825-9](https://doi.org/10.1007/978-1-4612-0825-9)>; Lin & Liao (2008) <[doi:10.1016/j.jspi.2008.01.001](https://doi.org/10.1016/j.jspi.2008.01.001)>.

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Encoding UTF-8

LazyData true

Depends R (>= 2.10)

Imports cellranger, purrr, stats, data.table, lazyeval, utils

RoxygenNote 7.1.1

Suggests knitr, rmarkdown

VignetteBuilder knitr

NeedsCompilation no

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`aov1r`*One-way random effect ANOVA*

Description

Fits a one-way random effect ANOVA model.

Usage

```
aov1r(formula, data = NULL)

## S3 method for class 'aov1r'
summary(object, ...)

## S3 method for class 'summary.aov1r'
print(x, ...)
```

Arguments

<code>formula</code>	a formula of the form $y \sim \text{group}$
<code>data</code>	optional dataframe
<code>object</code>	an <code>aov1r</code> object (output of an <code>aov1r</code> call)
<code>...</code>	ignored
<code>x</code>	output of summary

Value

`aov1r` returns an object of class `aov1r`;

Examples

```
dat <- simAOV1R(I=2, J=3, mu=10, sigmab=1, sigmaw=1)
fit <- aov1r(y ~ group, data=dat)
summary(fit)
```

`confint.aov1r`*Confidence intervals*

Description

Confidence intervals for the one-way random effect ANOVA.

Usage

```
## S3 method for class 'aov1r'
confint(object, parm, level = 0.95, SDs = TRUE, ...)

## S3 method for class 'confint.aov1r'
print(x, ...)
```

Arguments

object	an output of <code>aov1r</code>
parm	ignored
level	confidence level
SDs	logical, whether to return confidence intervals about the standard deviations or about the variances
...	ignored
x	an output of <code>confint</code> applied to an <code>aov1r</code> object

Value

A dataframe providing the bounds of the confidence intervals.

References

Richard K. Burdick, Franklin A. Graybill. *Confidence Intervals on Variance Components*. CRC Press; 1st edition (1992). ISBN-13: 978-0824786441.

Examples

```
dat <- simAOV1R(I=2, J=3, mu=10, sigmab=1, sigmaw=1)
fit <- aov1r(y ~ group, data=dat)
confint(fit)
```

 KM41

Krishnamoorthy & Mathew's example 4.1

Description

The dataset used in Krishnammoorthy & Mathew's example 4.1.

Usage

```
data(KM41)
```

Format

A data frame with 25 rows and 2 columns.

References

Krishnamoorthy and Mathew, Statistical Tolerance Regions, Wiley 2009.

Examples

```
data(KM41)
str(KM41)
table(KM41$Batch)
```

predict.aov1r	<i>Prediction interval for one-way random effect ANOVA</i>
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Description

Prediction interval for the one-way random effect ANOVA model, based on a Satterthwaite approximation of the degrees of freedom.

Usage

```
## S3 method for class 'aov1r'
predict(object, level = 0.95, ...)
```

Arguments

object	an output of <code>aov1r</code>
level	confidence level
...	ignored

Value

A vector of length two, the bounds of the prediction interval.

References

T. Y. Lin, C. T. Liao. *Prediction intervals for general balanced linear random models*. Journal of Statistical Planning and Inference 138 (2008), 3164 – 3175. <doi:10.1016/j.jspi.2008.01.001>

Examples

```
dat <- simAOV1R(I=2, J=3, mu=10, sigmab=1, sigmaw=1)
fit <- aov1r(y ~ group, data=dat)
predict(fit)
```

rGPQ *Generalized pivotal quantities*

Description

Simulates from the generalized pivotal quantities.

Usage

```
rGPQ(fit, n = 10000)
```

Arguments

fit	an aov1r object
n	number of simulations

Value

The simulations in a dataframe.

References

Samaradasa Weerahandi. *Exact Statistical Methods for Data Analysis*. Springer, New York, NY (1995). <doi:10.1007/978-1-4612-0825-9>

Examples

```
dat <- simAOV1R(I=20, J=5, mu=10, sigmab=1, sigmaw=1)
fit <- aov1r(y ~ group, data=dat)
nsims <- 20000
pivsims <- rGPQ(fit, nsims)
pivsims$GPQ_sigma2tot <- pivsims$GPQ_sigma2b + pivsims$GPQ_sigma2w
# Generalized confidence intervals:
lapply(pivsims, quantile, probs = c(0.025, 0.975))
# compare with the frequentist confidence intervals:
confint(fit, SDs = FALSE)
# Generalized prediction interval:
with(
  pivsims,
  quantile(rnorm(nsims, GPQ_mu, sqrt(GPQ_sigma2tot)),
           probs = c(0.025, 0.975))
)
# compare with the frequentist prediction interval:
predict(fit)
```

`simAOV1R`*Simulation of one-way random effect ANOVA*

Description

Simulates a balanced one-way random effect ANOVA model.

Usage

```
simAOV1R(I, J, mu, sigmab, sigmaw)
```

Arguments

<code>I</code>	integer, number of groups
<code>J</code>	integer, number of replicates per group
<code>mu</code>	numeric, overall mean
<code>sigmab</code>	positive number, the between standard deviation
<code>sigmaw</code>	positive number, the within standard deviation

Value

A dataframe.

Examples

```
simAOV1R(I=2, J=3, mu=10, sigmab=1, sigmaw=1)
```

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