## Package ‘walrus’

**Type**: Package  
**Title**: Robust Statistical Methods  
**Version**: 1.0.3  
**Author**: Jonathon Love, Patrick Mair  
**Maintainer**: Jonathon Love <jonthon.cc>  
**Description**: A toolbox of common robust statistical tests, including robust descriptives, robust t-tests, and robust ANOVA. It is also available as a module for ‘jamovi’ (see <https://www.jamovi.org> for more information). Walrus is based on the WRS2 package by Patrick Mair, which is in turn based on the scripts and work of Rand Wilcox. These analyses are described in depth in the book 'Introduction to Robust Estimation & Hypothesis Testing'.

**License**: GPL-3  
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**LazyData**: true  
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**Suggests**: MASS  
**RoxygenNote**: 6.0.1  
**URL**: https://github.com/jamovi/walrus

**BugReports**: https://github.com/jamovi/walrus/issues  
**NeedsCompilation**: no  
**Repository**: CRAN  
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### R topics documented:

- walrus-package ................................................................. 2  
- ranova ................................................................. 3  
- rdesc ................................................................. 4  
- rplots ................................................................. 6  
- rttestIS ................................................................. 7  
- rttestPS ................................................................. 9
Index

walrus-package Walrus

Description

A toolbox of common robust statistical tests, including robust descriptives, robust t-tests, and robust ANOVA. It is also available as a module for 'jamovi' (see www.jamovi.org for more information). Walrus is based on the WRS2 package by Patrick Mair, which is in turn based on the scripts and work of Rand Wilcox. These analyses are described in depth in the book Introduction to Robust Estimation & Hypothesis Testing.

Details

- Box & Violin Plots: `rplots()`
- Robust Descriptives: `rdesc()`
- Robust Independent Samples T-Test: `rttestIS()`
- Robust Paired Samples T-Test: `rttestIS()`
- Robust ANOVA: `ranova()`

Ravi:

"Should we create a logo for walrus?"

Jonathon:

"Yeah, I guess. Maybe a walrus, or a skewed distribution? Bonus points if it somehow contains both."

Ravi gets bonus points

See Also

Useful links:

- https://github.com/jamovi/walrus
- Report bugs at https://github.com/jamovi/walrus/issues
# ranova

## Robust ANOVA

### Description

Robust Analysis of Variance

### Usage

```r
given_data dep factors = NULL method = "trim", ph = FALSE, tr = 0.2, est = "mom", nboot = 599, dist = "proj")
```

### Arguments

- **data**: the data as a data frame
- **dep**: a string naming the dependent variable from data; the variable must be numeric
- **factors**: a vector of strings naming the fixed factors from data
- **method**: 'median', 'trim' (default) or 'boot'; the method to use, median, trimmed means, or bootstrapped
- **ph**: TRUE or FALSE (default), provide post hoc tests
- **tr**: a number between 0 and 0.5, (default: 0.2), the proportion of measurements to trim from each end, when using the trim and bootstrap methods
- **est**: 'onestep', 'mom' (default) or 'median', the M-estimator to use; One-step, Modified one-step or Median respectively
- **nboot**: a number (default: 599) specifying the number of bootstrap samples to use when using the bootstrap method
- **dist**: 'maha' or 'proj' (default), whether to use Mahalanobis or Projection distances respectively

### Value

A results object containing:

```r
results$main the table of ANOVA results
results$phs the table of posthoc tests
```

Tables can be converted to data frames with asDF or `as.data.frame`. For example:

```r
results$main$asDF
as.data.frame(results$main)
```

### Examples

```r
data('goggles', package='WRS2')
```
```r
ranova(goggles, 
  dep = 'attractiveness', 
  factors = c('gender', 'alcohol'), 
  ph = TRUE)

# # ROBUST ANOVA
# # Robust ANOVA
# # --------------------------
# Q   p
# --------------------------
# gender 1.67 0.209
# alcohol 48.28 0.001
# gender:alcohol 26.26 0.001
# --------------------------
# Note. Method of trimmed means,
# trim level 0.2
# # # POST HOC TESTS
# # Post Hoc Tests - gender
# # --------------------------
# psi-hat p   Lower   Upper
# --------------------------
# Female Male 10.0 0.209 -6.00 26.0
# --------------------------
# # # Post Hoc Tests - alcohol
# # --------------------------
# psi-hat p   Lower   Upper
# --------------------------
# None 2 Pints -3.33 0.611 -20.5 13.8
# None 4 Pints 35.83 < .001   19.3 52.3
# 2 Pints 4 Pints 39.17 < .001  22.5 55.9
# --------------------------
# 
# 
```

---

**rdesc**  

**Robust Descriptives**

**Description**

Robust Descriptives
Usage

rdesc(data, vars, splitBy = NULL, mean = TRUE, trim = TRUE, tr = 0.2,
      win = FALSE, wl = 0.2, mest = FALSE, bend = 1.28, med = FALSE)

Arguments

data  the data as a data frame
vars  a vector of strings naming the variables in data of interest
splitBy  a string naming the variable in data to split the data by
mean  TRUE (default) or FALSE, provide a 'normal' arithmetic mean
trim  TRUE (default) or FALSE, provide a trimmed mean
tr  a number between 0 and 0.5 (default: 0.2); the proportion of measurements to
    trim from each end when producing trimmed means
win  TRUE or FALSE (default), provide a 'Winsorized' mean
wl  a number between 0 and 0.5 (default: 0.2); the level of 'winsorizing' when
    producing winsorized means
mest  TRUE or FALSE (default), provide an 'M-estimated' value
bend  a number (default: 1.28), the bending constant to use when using M-estimators
med  TRUE or FALSE (default), provide medians

Value

A results object containing:

results$table  the table of descriptives

Tables can be converted to data frames with asDF or as.data.frame. For example:

results$table$asDF
as.data.frame(results$table)

Examples

data('eurosoccer', package='WRS2')

SpainGermany <- subset(eurosoccer, eurosoccer$League == 'Spain' | eurosoccer$League == 'Germany')
SpainGermany <- droplevels(SpainGermany)

walrus::rdesc(
  data = SpainGermany,
  vars = "GoalsGame",
  splitBy = "League",
  med = TRUE)
rplots

Box & Violin Plots

Description

Box & Violin Plots

Usage

rplots(data, vars, splitBy = NULL, violin = TRUE, boxplot = FALSE, 
dot = TRUE, dotType = "stack")

Arguments

data the data as a data frame
vars a vector of strings naming the variables in data of interest
splitBy a string naming the variable in data to split the data by
violin TRUE (default) or FALSE, provide violin plots
boxplot TRUE or FALSE (default), provide box plots
dot TRUE (default) or FALSE, plot each measurement as a dot
dotType 'jitter' or 'stack' (default); whether data dots are jittered or stacked

Value

A results object containing:

results$plots an array of images
rttestIS

Examples

data('eurosoccer', package='WRS2')

# violin plots
walrus::rplots(
  data = eurosoccer,
  vars = "GoalsGame",
  splitBy = "League")

# box plots
walrus::rplots(
  data = eurosoccer,
  vars = "GoalsGame",
  splitBy = "League",
  violin = FALSE,
  boxplot = TRUE,
  dot = FALSE)

dr

rttestIS Robust Independent Samples T-Test

Description
Robust Independent Samples T-Test

Usage

rttestIS(data, deps, group, yuen = TRUE, tr = 0.2, mest = FALSE,
method = "mom", yuenbt = FALSE, nboot = 599, md = FALSE, ci = FALSE,
es = FALSE, esci = FALSE)

Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>data</td>
<td>the data as a data frame</td>
</tr>
<tr>
<td>deps</td>
<td>a vector of strings naming the dependent variables in data</td>
</tr>
<tr>
<td>group</td>
<td>a string naming the grouping variable in data; must have 2 levels</td>
</tr>
<tr>
<td>yuen</td>
<td>TRUE (default) or FALSE, use the Yuen's trim method</td>
</tr>
<tr>
<td>tr</td>
<td>a number between 0 and 0.5, (default: 0.2), the proportion of measurements to trim from each end, when using the trim and bootstrap methods</td>
</tr>
<tr>
<td>mest</td>
<td>TRUE or FALSE (default), use an M-estimator</td>
</tr>
<tr>
<td>method</td>
<td>'onestep', 'mom' (default) or 'median', the M-estimator to use; One-step, Modified one-step or Median respectively</td>
</tr>
</tbody>
</table>
rttestIS

yuenbt  TRUE or FALSE (default), use the Yuen’s bootstrap method
nboot    a number (default: 599) specifying the number of bootstrap samples to use when using the bootstrap method
md       TRUE or FALSE (default), provide the mean difference
ci       TRUE or FALSE (default), provide a 95% confidence interval on the mean difference
es       TRUE or FALSE (default), provide the effect-size
esci     TRUE or FALSE (default), provide a 95% confidence interval on the effect-size

Value

A results object containing:

```r
results$ttest  the table of t-test results
```

Tables can be converted to data frames with `asDF` or `as.data.frame`. For example:

```r
results$ttest$asDF
as.data.frame(results$ttest)
```

Examples

```r
data('eurosoccer', package='WRS2')

SpainGermany <- subset(eurosoccer, eurosoccer$League == 'Spain' | eurosoccer$League == 'Germany')
SpainGermany <- droplevels(SpainGermany)

rttestIS(SpainGermany,
    dep = 'GoalsScored',
    group = 'League',
    yuen = TRUE,
    mest = TRUE)

# # ROBUST INDEPENDENT SAMPLES T-TEST
# # Robust Independent Samples T-Test
# # -----------------------------------------------
# #                                  t    df    p
# # -----------------------------------------------
# # GoalsScored   Yuen's test   0.297  17.3  0.770
# #                M-estimator  -0.933  0.993
# # -----------------------------------------------
# ```
Robust Paired Samples T-Test

Description

Robust Paired Samples T-Test

Usage

rttestps(data, pairs, tr = 0.2, md = FALSE, es = FALSE, ci = FALSE)

Arguments

data the data as a data frame
pairs a list of lists specifying the pairs of measurement in data
tr a number between 0 and 0.5, (default: 0.2), the proportion of measurements to
trim from each end, when using the trim and bootstrap methods
md TRUE or FALSE (default), provide means and standard errors
es TRUE or FALSE (default), provide effect sizes
ci TRUE or FALSE (default), provide confidence intervals

Value

A results object containing:

results$ttest the table of t-test results

Tables can be converted to data frames with asDF or as.data.frame. For example:

results$ttest$asDF
as.data.frame(results$ttest)

Examples

data(anorexia, package='MASS')
anorexiaFT <- subset(anorexia, subset = Treat == "FT")

rttestPS(anorexiaFT,
   pairs = list(
       list(i1 = 'Prewt', i2 = 'Postwt')))

# # ROBUST PAIRED SAMPLES T-TEST
# # Robust Paired Samples T-Test
# # ---------------------------------------------------------------
<table>
<thead>
<tr>
<th>Prewt</th>
<th>Postwt</th>
<th>t</th>
<th>df</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>-3.83</td>
<td>10.0</td>
<td>0.003</td>
</tr>
</tbody>
</table>

#
Index

as.data.frame, 3, 5, 8, 9
ranova, 2, 3
rdesc, 2, 4
rplots, 2, 6
rttestIS, 2, 7
rttestPS, 9

walrus (walrus-package), 2
walrus-package, 2