Package 'npboottprmFBar'

February 22, 2024

Title Informative Nonparametric Bootstrap Test with Pooled Resampling

Version 0.1.1

Description Sample sizes are often small due to hard to reach target populations,
rare target events, time constraints, limited budgets, or ethical considerations.
Two statistical methods with promising performance in small samples are the
nonparametric bootstrap test with pooled resampling method, which is the
focus of Dwivedi, Mallawaarachchi, and Alvarado (2017) <doi:10.1002/sim.7263>,
and informative hypothesis testing, which is implemented in the 'restriktor'
package. The 'npboottprmFBar' package uses the nonparametric bootstrap test
with pooled resampling method to implement informative hypothesis testing.
The bootFbar() function can be used to analyze data with this method and the
persimon() function can be used to conduct performance simulations on type-one
error and statistical power.

License MIT + file LICENSE

Encoding UTF-8

RoxygenNote 7.3.1

URL https://github.com/mightymetrika/npboottprmFBar

BugReports https://github.com/mightymetrika/npboottprmFBar/issues

Imports fGarch, lmPerm, npboottprm, restriktor

Suggests testthat (>= 3.0.0)

Config/testthat/edition 3

NeedsCompilation no

Author Mackson Ncube [aut, cre],
mightymetrika, LLC [cph, fnd]

Maintainer Mackson Ncube <macksonncube.stats@gmail.com>

Repository CRAN

Date/Publication 2024-02-22 16:00:05 UTC

R topics documented:

---

bootFbar	*Nonparametric Bootstrap Test with Pooled Resampling for Informative Hypothesis Testing*

Description

Performs a nonparametric bootstrap test with pooled resampling based on the methods described by Dwivedi et al. (2017) and using the `restriktor::iht` function as proposed by Vanbrabant and Rosseel (2020).

Usage

```
bootFbar(
  data,
  formula,
  grp,
  constraints,
  nboot = 1000,
  conf.level = 0.95,
  seed = NULL,
  na_rm = FALSE
)
```

Arguments

data	A data frame containing the dataset for analysis.
formula	An object of class `"formula"` (or one that can be coerced to that class): a symbolic description of the model to be fitted.
grp	A string specifying the grouping variable in the data.
constraints	A matrix or data frame of constraints for the hypothesis test.
nboot	An integer indicating the number of bootstrap resamples (default is 1000).
conf.level	A numeric value specifying the confidence level for the interval (default is 0.95).
seed	An optional integer setting the seed for random number generation (default is NULL).
na_rm	A logical value indicating whether NA values should be removed (default is FALSE).

Value

A list containing the following components:

-pvalueA, pvalueB, pvalueF: P-values for the different test types.

-ciA, ciB, ciF: Confidence intervals for the test statistics.

-TsA, TsB, TsF: Bootstrap test statistics.

-modelo: The linear model object.

-ihto: The initial iht computation result.

References

Dwivedi, A. K., Mallawaarachchi, I., & Alvarado, L. A. (2017). Analysis of small sample size studies using nonparametric bootstrap test with pooled resampling method. Statistics in Medicine, 36(14), 2187–2205. https://doi.org/10.1002/sim.7263

Vanbrabant, L., & Rosseel, Y. (2020). An Introduction to Restriktor: Evaluating informative hypotheses for linear models. In R. van de Schoot & M. Miocevic (Eds.), Small Sample Size Solutions: A Guide for Applied Researchers and Practitioners (1st ed., pp. 157 -172). Routledge. https://doi.org/10.4324/9780429273872-14

Examples

```
bootFbar(data = iris, formula = Sepal.Length ~ -1 + Species,
         grp = "Species",
         constraints = 'Speciessetosa < Speciesversicolor < Speciesvirginica',
         nboot = 10, conf.level = 0.95, seed = NULL, na_rm = FALSE)
```

| persimon | *Performance Simulation On Type I Error or Statistical Power* |

Description

Simulates performance (Type I Error or Statistical Power) for a range of statistical tests, including bootFbar, default setting restriktor::iht, and parametric bootstrap restriktor::iht. The function is set up to replicate the table structure in Dwivedi et al. (2017) Supplemental Tables 2 & 3.

Usage

```
persimon(
  M1 = 5,
  S1 = 1,
  M2 = 5,
  S2 = 1,
  M3 = 5,
  S3 = 1,
  Sk1 = NULL,
  Sk2 = NULL,
  Sk3 = NULL,
  n1 = c(2, 3, 4, 5, 6, 7, 8, 9, 10, 15),
  n2 = c(2, 3, 4, 5, 6, 7, 8, 9, 10, 15),
  n3 = c(2, 3, 4, 5, 6, 7, 8, 9, 10, 15),
  n_simulations = 10000,
  nboot = 1000,
  conf.level = 0.95
)
```

Arguments

M1	Mean value for group 1.
S1	Standard deviation for group 1.
M2	Mean value for group 2.
S2	Standard deviation for group 2.
M3	Mean value for group 3.
S3	Standard deviation for group 3.
Sk1	Skewness parameter for group 1; NULL for normal distribution.
Sk2	Skewness parameter for group 2; NULL for normal distribution.
Sk3	Skewness parameter for group 3; NULL for normal distribution.
n1	Vector of sample sizes for group 1.
n2	Vector of sample sizes for group 2.
n3	Vector of sample sizes for group 3.
n_simulations	Number of simulations to run (default is 10000).
nboot	Number of bootstrap samples (default is 1000).
conf.level	Confidence level for the tests (default is 0.95).

Details

The persimon function generates data for three groups with specified mean, standard deviation, and skewness, and then applies a range of statistical tests to this data, simulating the process across a specified number of iterations to assess performance in terms of Type I Error or Statistical Power. The output mirrors the format of the supplemental tables in Dwivedi et al. (2017).

Value

A list of data frames. One with the proportions of rejecting the null hypothesis for each test and sample size combination, and the other with the number of models which did not produce errors for each combination.

References

Dwivedi, A. K., Mallawaarachchi, I., & Alvarado, L. A. (2017). Analysis of small sample size studies using nonparametric bootstrap test with pooled resampling method. Statistics in Medicine, 36(14), 2187–2205. https://doi.org/10.1002/sim.7263

Examples

```
set.seed(135)
persimon(M1 = 5, S1 = 1, M2 = 5, S2 = 1, M3 = 5, S3 = 1,
         n1 = 6, n2 = 6, n3 = 6, n_simulations = 2, nboot = 4,
         conf.level = 0.95)
```

Index