Package ‘npbootprmFBar’

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 ‘npbootprmFBar’ 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.

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Encoding UTF-8

RoxygenNote 7.3.1

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

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

Imports fGarch, lmPerm, npbootprm, restriktor

Suggests testthat (>= 3.0.0)

Config/testthat/edition 3

NeedsCompilation no

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Describes 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

```r
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.
- `TsA, TsB, TsF`: Bootstrap test statistics.
- `modelo`: The linear model object.
- `ihto`: The initial iht computation result.
References


Examples

```r
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)
```

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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

```r
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


Examples

```r
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)
```
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