Package ‘TVMM’

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Type Package
Title Multivariate Tests for the Vector of Means
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Description This is a statistical tool interactive that provides multivariate statistical tests that are more powerful than traditional Hotelling T2 test and LRT (likelihood ratio test) for the vector of normal mean populations with and without contamination and non-normal populations (Henrique J. P. Alves & Daniel F. Ferreira (2019) <DOI: 10.1080/03610918.2019.1693596>).
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Description

A graphical user interface (GUI) of the package TVMM to perform more general hypothesis tests on the vector of multivariate population means.

https://rpubs.com/Henriqueufla/617206 for more details.

Usage

guiTVMM(gui = TRUE)

Arguments

gui Logical argument, TRUE or FALSE. The default is TRUE

Value

guiTVMM A graphical user interface (GUI) for performing tests on the vector of multivariate population means.

References


Examples

library(TVMM)
if(interactive()){
  guiTVMM(gui=FALSE)
}

**LRTTBoot**

The likelihood ratio parametric bootstrap with trace test (TLRPBT).
This test is more powerful.

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**Description**

An parametric bootstrap alternative test version of the Likelihood ratio test (LRT) to test the hypotheses about a vector of population averages. This test has the advantage of being valid for high dimension data (n < p). This test should be preferred by the user, as it controlled the type I error and had greater power in all scenarios evaluated.

**Usage**

LRTTBoot(X, mu0, B)

**Arguments**

- **X**: a matrix n x p containing n observations and p variables. It should not contain missing values (NA).
- **mu0**: a vector containing the mean population to be tested.
- **B**: the number of resamples bootstrap parametric which must be at least equal to 2000.

**Value**

the numerical value and the p-value of the test statistic.

**Examples**

```r
set.seed(0)
library(MASS)
n <- 30
p <- 2
rho <- 0.9
delta <- 0.9
mu <- rep(0, times = p)
Sigma <- (1 - rho) * diag(p) + rho * matrix(1, p, p)
mu0 <- rep(0.3271, times = p)
B <- 200
X <- mvrnorm(n, mu, Sigma)
LRTTBoot(X=X, mu0=mu0, B=B)
```
The likelihood ratio test with trace (TLRT)

Description
An asymptotic version of the Likelihood ratio test (LRT) to test the hypotheses about a vector of population averages. This test has the advantage of being valid for high dimension data (n < p).

Usage
LRTTrace(X, mu0)

Arguments
- X: a matrix n x p containing n observations and p variables. It should not contain missing values (NA).
- mu0: a vector containing the mean population to be tested.

Value
the numerical value and the p-value of the test statistic.

Examples
```r
cat("set.seed(0)\nlibrary(MASS)\nn <- 30\np <- 2\nrho <- 0.9\ndelta <- 0.9\nmu <- rep(0, times = p)\nSigma <- (1 - rho) * diag(p) + rho * matrix(1, p, p)\nmu0 <- rep(0.3271, times = p)\nX <- mvrnorm(n, mu, Sigma)\nLRTTrace(X=X, mu0=mu0)\n```

The robust likelihood ratio test parametric bootstrap with trace test (RTLPBRT).

Description
An robust alternative test version of the likelihood ratio test (LRT) parametric bootstrap with trace (RTLPBRT) to test the hypotheses about a vector of population averages using the comedian robust estimator. This test has the advantage of being valid for high dimension data (n < p).
**T2Boot**

**Usage**

\[ \text{LRTTRBoot}(X, \mu_0, B) \]

**Arguments**

- **X**
  - A matrix \( n \times p \) containing \( n \) observations and \( p \) variables. It should not contain missing values (NA).
- **\( \mu_0 \)**
  - A vector containing the mean population to be tested.
- **\( B \)**
  - The number of resamples bootstrap parametric which must be at least equal to 2000.

**Value**

The numerical value and the p-value of the test statistic.

**Examples**

```r
set.seed(0)
library(MASS)
n <- 30
p <- 2
rho <- 0.9
delta <- 0.9
mu <- rep(0, times = p)
Sigma <- (1 - rho) * diag(p) + rho * matrix(1, p, p)
mu0 <- rep(0.3271, times = p)
B <- 200
X <- mvrnorm(n, mu, Sigma)
LRTTRBoot(X=X, mu0=mu0, B=B)
```

---

**T2Boot**

The parametric bootstrap T2 test (T2Boot).

**Description**

The parametric bootstrap version of the traditional T2 test.

**Usage**

\[ \text{T2Boot}(X, \mu_0, B) \]

**Arguments**

- **X**
  - A matrix \( n \times p \) containing \( n \) observations and \( p \) variables. It should not contain missing values (NA).
- **\( \mu_0 \)**
  - A vector containing the mean population to be tested.
- **\( B \)**
  - The number of resamples bootstrap parametric which must be at least equal to 2000.
T2O

Value

the numerical value and the p-value of the test statistic.

References


Examples

set.seed(0)
library(MASS)
n <- 30
p <- 2
rho <- 0.9
delta <- 0.9
mu <- rep(0, times = p)
Sigma <- (1 - rho) * diag(p) + rho * matrix(1, p, p)
mu0 <- rep(0.3271, times = p)
B = 2000
X <- mvrnorm(n, mu, Sigma)
T2Boot(X=X, mu0=mu0, B=2000)

T2O

The traditional T2 test (T2).

Description

The traditional T2 test (T2).

Usage

T2O(X, mu0)

Arguments

X a matrix n x p containing n observations and p variables. It should not contain missing values (NA).
mu0 a vector containing the mean population to be tested.

Value

the numerical value and the p-value of the test statistic.

References

T2RobustBoot

Examples

```r
set.seed(0)
library(MASS)
n <- 30
p <- 2
rho <- 0.9
delta <- 0.9
mu <- rep(0, times = p)
Sigma <- (1 - rho) * diag(p) + rho * matrix(1, p, p)
mu0 <- rep(0.3271, times = p)
X <- mvrnorm(n, mu, Sigma)
T2O(X=X, mu0=mu0)
```

---

T2RobustBoot  

The T2 robust parametric bootstrap test (T2RPB).

Description

The robust parametric bootstrap version of the traditional T2 test using the comedian robust estimator.

Usage

```r
T2RobustBoot(X, mu0, B)
```

Arguments

- **X**: a matrix n x p containing n observations and p variables. It should not contain missing values (NA).
- **mu0**: a vector containing the mean population to be tested.
- **B**: the number of resamples bootstrap parametric which must be at least equal to 2000.

Value

the numerical value and the p-value of the test statistic.

References

Examples

```r
set.seed(0)
library(MASS)
n <- 30
p <- 2
rho <- 0.9
delta <- 0.9
mu <- rep(0, times = p)
Sigma <- (1 - rho) * diag(p) + rho * matrix(1, p, p)
mu0 <- rep(0.3271, times = p)
B <- 200
X <- mvrnorm(n, mu, Sigma)
T2RobustBoot(X=X, mu0=mu0, B=B)
```
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