Package 'TVMM'

October 7, 2020

Type Package

Title Multivariate Tests for the Vector of Means

Version 3.2

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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>).

Depends R (>= 3.1.0)

Imports tcltk, ggplot2, robustbase, tcltk2, tkrplot, gridExtra, stats,
utils, MASS, grDevices, DescToolsAddIns

License GPL-2

Encoding UTF-8

LazyData TRUE

RoxygenNote 7.1.1

NeedsCompilation no

Repository CRAN

Date/Publication 2020-10-07 12:40:10 UTC

R topics documented:

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guiTVMM *A graphical user interface (GUI) of the package TVMM*

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

Henrique J. P. Alves & Daniel F. Ferreira (2019): Proposition of new alternative tests adapted to the traditional T2 test, Communications in Statistics - Simulation and Computation, DOI: 10.1080/03610918.2019.1693596

Examples

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

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

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

```
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)
```

LRTTrace — *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

```
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)
LRTTrace(X=X, mu0=mu0)
```

LRTTRBoot — *The robust likelihood ratio test parametric bootstrap with trace test (RTLRPBT).*

Description

An robust alternative test version of the likelihood ratio test (LRT) parametric bootstrap with trace (RTLPBT) 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)

Usage

```
LRTTRBoot(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

```
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

```
T2Boot(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

Henrique J. P. Alves & Daniel F. Ferreira (2019): Proposition of new alternative tests adapted to the traditional T2 test, Communications in Statistics - Simulation and Computation, DOI: 10.1080/03610918.2019.1693596

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

Henrique J. P. Alves & Daniel F. Ferreira (2019): Proposition of new alternative tests adapted to the traditional T2 test, Communications in Statistics - Simulation and Computation, DOI: 10.1080/03610918.2019.1693596

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)
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

```
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

Henrique J. P. Alves & Daniel F. Ferreira (2019): Proposition of new alternative tests adapted to the traditional T2 test, Communications in Statistics - Simulation and Computation, DOI: 10.1080/03610918.2019.1693596

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 <- 200
X <- mvrnorm(n, mu, Sigma)
T2RobustBoot(X=X, mu0=mu0, B=B)
```

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