Package 'covTestR'

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Title Covariance Matrix Tests

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License GPL-2

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R topics documented:

`covTestR-package` *Covariance Matrix Testing Functions*

Description

Testing functions for Covariance Matrices. These tests include high-dimension homogeneity of covariance matrix testing described by Schott (2007) 10.1016/j.csda.2007.03.004 and high-dimensional one-sample tests of covariance matrix structure described by Fisher, et al. (2010) 10.1016/j.jmva.2010.07.004. Covariance matrix tests use C++ to speed performance and allow larger data sets.

`Ahmad2015` *Tests for Structure of Covariance Matrices*

Description

Performs Tests for the structure of covariance matrices.

Usage

```
Ahmad2015(x, Sigma = "identity", ...)

Chen2010(x, Sigma = "identity", ...)

Fisher2012(x, Sigma = "identity", ...)

LedoitWolf2002(x, Sigma = "identity", ...)

Nagao1973(x, Sigma = "identity", ...)

Srivastava2005(x, Sigma = "identity", ...)

Srivastava2011(x, Sigma = "identity", ...)
```

Arguments

`x`	data as a list of matrices
`Sigma`	Population covariance matrix as a matrix
`...`	other options passed to covTest method

Value

A list with class "htest" containing the following components:

`statistic`	the value of equality of covariance test statistic
`parameter`	the degrees of freedom for the chi-squared statistic
`p.value`	the p=value for the test
`estimate`	the estimated covariances if less than 5 dimensions
`null.value`	the specified hypothesized value of the covariance difference
`alternative`	a character string describing the alternative hyposthesis
`method`	a character string indicating what type of equality of covariance test was performed
`data.name`	a character string giving the names of the data

References

Ahmad, M. R. and Rosen, D. von. (2015). Tests for High-Dimensional Covariance Matrices Using the Theory of U-statistics. Journal of Statistical Computation and Simulation, 85(13), 2619-2631. 10.1080/00949655.2014.948441

Chen, S., et al. (2010). Tests for High-Dimensional Covariance Matrices. Journal of the American Statistical Association, 105(490):810-819. 10.1198/jasa.2010.tm09560

Fisher, T. J. (2012). On Testing for an Identity Covariance Matrix when the Dimensionality Equals or Exceeds the Sample Size. Journal of Statistical Planning and Infernece, 142(1), 312-326. 10.1016/j.jspi.2011.07.019

Ledoit, O., and Wolf, M. (2002). Some Hypothesis Tests for the Covariance Matrix When the Dimension Is Large Compared to the Sample Size. The Annals of Statistics, 30(4), 1081-1102. 10.1214/aos/1031689018

Nagao, H. (1973). On Some Test Criteria for Covariance Matrix. The Annals of Statistics, 1(4), 700-709

Srivastava, M. S. (2005). Some Tests Concerning the Covariance Matrix in High Dimensional Data. Journal of the Japan Statistical Society, 35(2), 251-272. 10.14490/jjss.35.251

Srivastava, M. S., Kollo, T., and Rosen, D. von. (2011). Some Tests for the Covariance Matrix with Fewer Observations then the Dimension Under Non-normality. Journal of Multivariate Analysis, 102(6), 1090-1103. 10.1016/j.jmva.2011.03.003

See Also

Other Testing for Structure of Covariance Matrices: `structureCovariances`

Examples

```
Chen2010(as.matrix(iris[1:50, 1:3]))
```

Ahmad2017 *Tests for Homogeneity of Covariance Matrices*

Description

Performs tests for homogeneity of 2 and k covariance matrices.

Usage

```
Ahmad2017(x, ...)

BoxesM(x, ...)

Chaipitak2013(x, ...)

Ishii2016(x, ...)

Schott2001(x, ...)

Schott2007(x, ...)

Srivastava2007(x, ...)

Srivastava2014(x, ...)

SrivastavaYanagihara2010(x, ...)
```

Arguments

x	data as a list of matrices
...	other options passed to covTest method

Value

A list with class "htest" containing the following components:

statistic	the value of homogeneity of covariance test statistic
parameter	the degrees of freedom for the chi-squared statistic
p.value	the p=value for the test
estimate	the estimated covariances if less than 5 dimensions
null.value	the specified hypothesized value of the covariance difference
alternative	a character string describing the alternative hyposthesis

`method`	a character string indicating what type of homogeneity of covariance test was performed
`data.name`	a character string giving the names of the data

References

Ahmad, R. (2017). Location-invariant test of homogeneity of large-dimensional covariance matrices. Journal of Statistical Theory and Practice, 11(4):731-745. 10.1080/15598608.2017.1308895

Chaipitak, S. and Chongcharoen, S. (2013). A test for testing the equality of two covariance matrices for high-dimensional data. Journal of Applied Sciences, 13(2):270-277. 10.3923/jas.2013.270.277

Ishii, A., Yata, K., and Aoshima, M. (2016). Asymptotic properties of the first pricipal component and equality tests of covariance matrices in high-dimesion, low-sample-size context. Journal of Statistical Planning and Inference, 170:186-199. 10.1016/j.jspi.2015.10.007

Schott, J (2001). Some Tests for the Equality of Covariance Matrices. Journal of Statistical Planning and Inference. 94(1), 25-36. 10.1016/S0378-3758(00)00209-3

Schott, J. (2007). A test for the equality of covariance matrices when the dimension is large relative to the sample sizes. Computational Statistics & Data Analysis, 51(12):6535-6542. 10.1016/j.csda.2007.03.004

Srivastava, M. S. (2007). Testing the equality of two covariance matrices and independence of two sub-vectors with fewer observations than the dimension. InInternational Conference on Advances in InterdisciplinaryStistics and Combinatorics, University of North Carolina at Greensboro, NC, USA.

Srivastava, M., Yanagihara, H., and Kubokawa T. (2014). Tests for covariance matrices in high dimension with less sample size. Journal of Multivariate Analysis, 130:289-309. 10.1016/j.jmva.2014.06.003

Srivastava, M. and Yanagihara, H. (2010). Testing the equality of several covariance matrices with fewer observation that the dimension. Journal of Multivariate Analysis, 101(6):1319-1329. 10.1016/j.jmva.2009.12.010

See Also

Other Testing for Homogeneity of Covariance Matrices: `homogeneityCovariances`

Examples

```
irisSpecies <- unique(iris$Species)

iris_ls <- lapply(irisSpecies,
    function(x){as.matrix(iris[iris$Species == x, 1:4])}
                 )

names(iris_ls) <- irisSpecies

Ahmad2017(iris_ls)
```

homogeneityCovariances *Test Wrapper for Homogeneity of Covariance Matrices*

Description

Performs 2 and k sample homogeneity of covariance matrices test using test, 'covTest.'

Usage

```
homogeneityCovariances(x, ..., covTest = BoxesM)
```

Arguments

x	data as a data frame, list of matrices, grouped data frame, or resample object
...	other options passed to covTest method
covTest	homogeneity of covariance matrices test method

Details

The homogeneityCovariances function is a wrapper function that formats the data for the specific covTest functions.

Value

A list with class "htest" containing the following components:

statistic	the value of homogeneity of covariance test statistic
parameter	the degrees of freedom for the chi-squared statistic
p.value	the p=value for the test
estimate	the estimated covariances if less than 5 dimensions
null.value	the specified hypothesized value of the covariance difference
alternative	a character string describing the alternative hyposthesis
method	a character string indicating what type of homogeneity of covariance test was performed
data.name	a character string giving the names of the data

See Also

Other Testing for Homogeneity of Covariance Matrices: Ahmad2017

Examples

```
homogeneityCovariances(iris, group = Species)
```

`structureCovariances` *Test Wrapper for Structure of a Covariance Matrices*

Description

Performs a structure of a covariance matrix test.

Usage

```
structureCovariances(x, Sigma = "identity", ..., covTest = Nagao1973)
```

Arguments

`x`	data
`Sigma`	Population covariance matrix
`...`	other options passed to covTest method
`covTest`	structure of covariance matrix test method

Details

The `structureCovariances` function is a wrapper function that formats the data for the specific `covTest` functions.

Value

A list with class "htest" containing the following components:

`statistic`	the value of equality of covariance test statistic
`parameter`	the degrees of freedom for the chi-squared statistic
`p.value`	the p=value for the test
`estimate`	the estimated covariances if less than 5 dimensions
`null.value`	the specified hypothesized value of the covariance difference
`alternative`	a character string describing the alternative hyposthesis
`method`	a character string indicating what type of equality of covariance test was performed
`data.name`	a character string giving the names of the data

See Also

Other Testing for Structure of Covariance Matrices: Ahmad2015

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