

Package ‘covTestR’

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Title Covariance Matrix Tests

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

License GPL-2

LazyData TRUE

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URL <https://covtestr.bearstatistics.com>

BugReports <https://github.com/BenBarnard/covTestR/issues>

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covTestR-package	<i>Covariance Matrix Testing Functions</i>
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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	<i>Tests for Structure of Covariance Matrices</i>
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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](#)
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- 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 than 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]))
```

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 principal component and equality tests of covariance matrices in high-dimension, low-sample-size context. *Journal of Statistical Planning and Inference*, 170:186-199. [10.1016/j.jspi.2015.10.007](#)
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- 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](#)
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- 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 than 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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