Package 'vartest'

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Type Package

Title Tests for Variance Homogeneity

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Imports stats, SuppDists, psych

Suggests testthat

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Description Performs 20 omnibus tests for testing the composite hypothesis of variance homogeneity.

License GPL (>= 2)

NeedsCompilation no

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Contents

`adjusted.taha.test` *Adjusted Taha Test*

Description

`adjusted.taha.test` performs Adjusted Taha variance homogeneity test.

Usage

```
adjusted.taha.test(formula, data, alpha = 0.05, na.rm = TRUE, verbose = TRUE)
```

Arguments

`formula`	a formula of the form `lhs ~ rhs` where `lhs` gives the sample values and `rhs` the corresponding groups.
`data`	a tibble or data frame containing the variables in `formula`.
`alpha`	the level of significance to assess variance homogeneity. Default is set to alpha = 0.05.
`na.rm`	a logical value indicating whether NA values should be stripped before the computation proceeds.
`verbose`	a logical for printing output to R console.

Details

Prior to testing for variance homogeneity, the data within each group are centered by their corresponding group median to eliminate the confounding effects of location parameters.

Value

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

`statistic`	the corresponding test statistic.
`parameter`	the parameter(s) of the approximate chi-squared distribution of the test statistic.
`p.value`	the p-value of the test.
`method`	the character string "Adjusted Taha Test".
`data`	a data frame containing the variables in which NA values (if exist) are removed.
`formula`	a formula of the form `lhs ~ rhs` where `lhs` gives the sample values and `rhs` the corresponding groups.

Author(s)

Gozde Cosar and Osman Dag

References

Conover, W.J., Iman, R.L.(1978). Some Exact Tables For The Squared Ranks Test. *Communications in Statistics - Simulation and Computation*, **B7(5)**, 491-513.

Fligner, M.A., Killeen, T.J.(1976). Distribution-Free Two-Sample Tests for Scale. *Journal of the American Statistical Association*, **71:353**, 210-213.

Examples

```
library(vartest)

adjusted.taha.test(Sepal.Length ~ Species, data = iris)

out <- adjusted.taha.test(Sepal.Length ~ Species, data = iris, verbose = FALSE)
summary(out)
```

---

ansari.test *Ansari Bradley Test*

Description

`ansari.test` performs Ansari Bradley variance homogeneity test.

Usage

```
ansari.test(formula, data, alpha = 0.05, na.rm = TRUE, verbose = TRUE)
```

Arguments

formula	a formula of the form lhs ~ rhs where lhs gives the sample values and rhs the corresponding groups.
data	a tibble or data frame containing the variables in formula.
alpha	the level of significance to assess variance homogeneity. Default is set to alpha = 0.05.
na.rm	a logical value indicating whether NA values should be stripped before the computation proceeds.
verbose	a logical for printing output to R console.

Details

Prior to testing for variance homogeneity, the data within each group are centered by their corresponding group median to eliminate the confounding effects of location parameters.

Value

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

statistic	the corresponding test statistic.
parameter	the parameter(s) of the approximate chi-squared distribution of the test statistic.
p.value	the p-value of the test.
method	the character string "Ansari Bradley Test".
data	a data frame containing the variables in which NA values (if exist) are removed.
formula	a formula of the form lhs ~ rhs where lhs gives the sample values and rhs the corresponding groups.

Author(s)

Gozde Cosar and Osman Dag

References

Conover, W.J., Johnson, M.E., Johnson, M.M. (1981). A Comparative Study of Tests for Homogeneity of Variances, with Applications to the Outer Continental Shelf Bidding Data. *Technometrics*, **23:4**, 351-361.

See Also

ansari_test

Examples

```
library(vartest)

ansari.test(Sepal.Length ~ Species, data = iris)

out <- ansari.test(Sepal.Length ~ Species, data = iris)
summary(out)
```

`bartletts.test` *Bartlett's Test*

Description

`bartletts.test` performs Bartlett variance homogeneity test.

Usage

```
bartletts.test(formula, data, alpha = 0.05, na.rm = TRUE, verbose = TRUE)
```

Arguments

`formula`	a formula of the form `lhs ~ rhs` where `lhs` gives the sample values and `rhs` the corresponding groups.
`data`	a tibble or data frame containing the variables in `formula`.
`alpha`	the level of significance to assess variance homogeneity. Default is set to alpha = 0.05.
`na.rm`	a logical value indicating whether NA values should be stripped before the computation proceeds.
`verbose`	a logical for printing output to R console.

Value

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

`statistic`	the corresponding test statistic.
`parameter`	the parameter(s) of the approximate chi-squared distribution of the test statistic.
`p.value`	the p-value of the test.
`method`	the character string "Bartlett's Test".
`data`	a data frame containing the variables in which NA values (if exist) are removed.
`formula`	a formula of the form `lhs ~ rhs` where `lhs` gives the sample values and `rhs` the corresponding groups.

Author(s)

Gozde Cosar and Osman Dag

References

Lee, H.B., Katz, G.S., Restori, A.F. (2010). A Monte Carlo Study of Seven Homogeneity of Variance Tests. *Journal of Mathematics and Statistics*, **6:3**, 359-366.

Conover, W.J., Johnson, M.E., Johnson, M.M. (1981). A Comparative Study of Tests for Homogeneity of Variances, with Applications to the Outer Continental Shelf Bidding Data. *Technometrics*, **23:4**, 351-361.

See Also

`bartlett.test`

Examples

```
library(vartest)

bartletts.test(Sepal.Length ~ Species, data = iris)

out <- bartletts.test(Sepal.Length ~ Species, data = iris, verbose = FALSE)
summary(out)
```

`capon.test` *Capon Test*

Description

`capon.test` performs Capon variance homogeneity test.

Usage

```
capon.test(formula, data, alpha = 0.05, na.rm = TRUE, verbose = TRUE)
```

Arguments

`formula`	a formula of the form `lhs ~ rhs` where `lhs` gives the sample values and `rhs` the corresponding groups.
`data`	a tibble or data frame containing the variables in `formula`.
`alpha`	the level of significance to assess variance homogeneity. Default is set to alpha = 0.05.
`na.rm`	a logical value indicating whether NA values should be stripped before the computation proceeds.
`verbose`	a logical for printing output to R console.

Details

Prior to testing for variance homogeneity, the data within each group are centered by their corresponding group median to eliminate the confounding effects of location parameters.

Value

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

`statistic`	the corresponding test statistic.
`parameter`	the parameter(s) of the approximate chi-squared distribution of the test statistic.
`p.value`	the p-value of the test.
`method`	the character string "Capon Test".
`data`	a data frame containing the variables in which NA values (if exist) are removed.
`formula`	a formula of the form `lhs ~ rhs` where `lhs` gives the sample values and `rhs` the corresponding groups.

Author(s)

Gozde Cosar and Osman Dag

References

Capon, J. (1961). Asymptotic Efficiency of Certain Locally Most Powerful Rank Tests. *The Annals of Mathematical Statistics*, **32:1**, 88-100.

Conover, W.J., Johnson, M.E., Johnson, M.M. (1981). A Comparative Study of Tests for Homogeneity of Variances, with Applications to the Outer Continental Shelf Bidding Data. *Technometrics*, **23:4**, 351-361.

Examples

```
library(vartest)

capon.test(Sepal.Length ~ Species, data = iris)

out <- capon.test(Sepal.Length ~ Species, data = iris)
summary(out)
```

`cochrans.test` *Cochran's C Test*

Description

`cochrans.test` performs Cochran's C variance homogeneity test.

Usage

```
cochrans.test(formula, data, alpha = 0.05, na.rm = TRUE, verbose = TRUE)
```

Arguments

formula	a formula of the form lhs ~ rhs where lhs gives the sample values and rhs the corresponding groups.
data	a tibble or data frame containing the variables in formula.
alpha	the level of significance to assess variance homogeneity. Default is set to alpha = 0.05.
na.rm	a logical value indicating whether NA values should be stripped before the computation proceeds.
verbose	a logical for printing output to R console.

Value

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

statistic	the corresponding test statistic.
parameter	the parameter(s) of the approximate F distribution of the test statistic.
p.value	the p-value of the test.
method	the character string "Cochran's C Test".
data	a data frame containing the variables in which NA values (if exist) are removed.
formula	a formula of the form lhs ~ rhs where lhs gives the sample values and rhs the corresponding groups.

Author(s)

Gozde Cosar and Osman Dag

References

Wang, Y., Gil, P.R., Chen, Y.H., Kromrey, J.D., Kim, E.S., Pham, T., Nguyen, D., Romano, J.L. (2017). Comparing the Performance of Approaches for Testing the Homogeneity of Variance Assumption in One-Factor Anova Models. *Educational and Psychological Measurement*, **77:2**, 305-329.

Cochran, W.G. (1941). The Distribution of The Largest of a set of Estimated Variances as a Fraction of Their Total. *Annals of Eugenics*, **11:1**, 47-52.

See Also

cochran.test

Examples

```
library(vartest)

cochrans.test(Sepal.Length ~ Species, data = iris)

out <- cochrans.test(Sepal.Length ~ Species, data = iris, verbose = FALSE)
summary(out)
```

`david.barton.test` *David Barton Test*

Description

`david.barton.test` performs David Barton variance homogeneity test.

Usage

```
david.barton.test(formula, data, alpha = 0.05, na.rm = TRUE, verbose = TRUE)
```

Arguments

`formula`	a formula of the form `lhs ~ rhs` where `lhs` gives the sample values and `rhs` the corresponding groups.
`data`	a tibble or data frame containing the variables in `formula`.
`alpha`	the level of significance to assess variance homogeneity. Default is set to alpha = 0.05.
`na.rm`	a logical value indicating whether NA values should be stripped before the computation proceeds.
`verbose`	a logical for printing output to R console.

Details

Prior to testing for variance homogeneity, the data within each group are centered by their corresponding group median to eliminate the confounding effects of location parameters.

Value

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

`statistic`	the corresponding test statistic.
`parameter`	the parameter(s) of the approximate chi-squared distribution of the test statistic.
`p.value`	the p-value of the test.
`method`	the character string "David Barton Test".
`data`	a data frame containing the variables in which NA values (if exist) are removed.
`formula`	a formula of the form `lhs ~ rhs` where `lhs` gives the sample values and `rhs` the corresponding groups.

Author(s)

Gozde Cosar and Osman Dag

References

Gibbons, J.D., Chakraborti, S. (2010). Nonparametric Statistical Inference. *CRC Press*, **5th Ed.**, 316-320.

Barton, D.E., David, F.N. (1958). A Test For Birth Order Effect. *Annals of Human Genetics*, **22:3**, 250-257.

Conover, W.J., Johnson, M.E., Johnson, M.M. (1981). A Comparative Study of Tests for Homogeneity of Variances, with Applications to the Outer Continental Shelf Bidding Data. *Technometrics*, **23:4**, 351-361.

Examples

```
library(vartest)

david.barton.test(Sepal.Length ~ Species, data = iris)

out <- david.barton.test(Sepal.Length ~ Species, data = iris)
summary(out)
```

---

duran.test *Duran Test*

Description

`duran.test` performs Duran variance homogeneity test.

Usage

```
duran.test(formula, data, alpha = 0.05, na.rm = TRUE, verbose = TRUE)
```

Arguments

`formula`	a formula of the form `lhs ~ rhs` where `lhs` gives the sample values and `rhs` the corresponding groups.
`data`	a tibble or data frame containing the variables in `formula`.
`alpha`	the level of significance to assess variance homogeneity. Default is set to alpha = 0.05.
`na.rm`	a logical value indicating whether NA values should be stripped before the computation proceeds.
`verbose`	a logical for printing output to R console.

Details

Prior to testing for variance homogeneity, the data within each group are centered by their corresponding group median to eliminate the confounding effects of location parameters.

Value

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

`statistic`	the corresponding test statistic.
`parameter`	the parameter(s) of the approximate chi-squared distribution of the test statistic.
`p.value`	the p-value of the test.
`method`	the character string "Duran Test".
`data`	a data frame containing the variables in which NA values (if exist) are removed.
`formula`	a formula of the form `lhs ~ rhs` where `lhs` gives the sample values and `rhs` the corresponding groups.

Author(s)

Gozde Cosar and Osman Dag

References

Conover, W.J., Iman, R.L.(1978). Some Exact Tables For The Squared Ranks Test. *Communications in Statistics - Simulation and Computation*, **B7(5)**, 491-513.

Examples

```
library(vartest)

duran.test(Sepal.Length ~ Species, data = iris)

out <- duran.test(Sepal.Length ~ Species, data = iris)
summary(out)
```

---

f.test *Fisher's Test*

Description

`f.test` performs Fisher's variance homogeneity test.

Usage

```
f.test(formula, data, alpha = 0.05, na.rm = TRUE, verbose = TRUE)
```

Arguments

formula	a formula of the form lhs ~ rhs where lhs gives the sample values and rhs the corresponding groups.
data	a tibble or data frame containing the variables in formula.
alpha	the level of significance to assess variance homogeneity. Default is set to alpha = 0.05.
na.rm	a logical value indicating whether NA values should be stripped before the computation proceeds.
verbose	a logical for printing output to R console.

Value

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

statistic	the corresponding test statistic.
parameter	the parameter(s) of the approximate F distribution of the test statistic.
p.value	the p-value of the test.
method	the character string "Fisher's Test".
data	a data frame containing the variables in which NA values (if exist) are removed.
formula	a formula of the form lhs ~ rhs where lhs gives the sample values and rhs the corresponding groups.

Author(s)

Gozde Cosar and Osman Dag

References

Gorbunova, A.A., Lemeshko, B.Y. (2012). Application of Parametric Homogeneity of Variances Tests under Violation of Classical Assumption. *2nd Stochastic Modeling Techniques and Data Analysis International Conference*, **5:8**, 253-260.

Examples

```
library(vartest)

f.test(Sepal.Length ~ Species, data = iris)

out <- f.test(Sepal.Length ~ Species, data = iris)
summary(out)
```

`fk.test` *Fligner-Killeen Test*

Description

`fk.test` performs Fligner-Killeen variance homogeneity test.

Usage

```
fk.test(formula, data, alpha = 0.05, na.rm = TRUE, verbose = TRUE)
```

Arguments

`formula`	a formula of the form `lhs ~ rhs` where `lhs` gives the sample values and `rhs` the corresponding groups.
`data`	a tibble or data frame containing the variables in `formula`.
`alpha`	the level of significance to assess variance homogeneity. Default is set to alpha = 0.05.
`na.rm`	a logical value indicating whether NA values should be stripped before the computation proceeds.
`verbose`	a logical for printing output to R console.

Details

Prior to testing for variance homogeneity, the data within each group are centered by their corresponding group median to eliminate the confounding effects of location parameters.

Value

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

`statistic`	the corresponding test statistic.
`parameter`	the parameter(s) of the approximate chi-squared distribution of the test statistic.
`p.value`	the p-value of the test.
`method`	the character string "Fligner-Killeen Test".
`data`	a data frame containing the variables in which NA values (if exist) are removed.
`formula`	a formula of the form `lhs ~ rhs` where `lhs` gives the sample values and `rhs` the corresponding groups.

Author(s)

Gozde Cosar and Osman Dag

References

Fligner, M.A., Killeen, T.J.(1976). Distribution-Free Two-Sample Tests for Scale. *Journal of the American Statistical Association*, **71:353**, 210-213.

Conover, W.J., Johnson, M.E., Johnson, M.M. (1981). A Comparative Study of Tests for Homogeneity of Variances, with Applications to the Outer Continental Shelf Bidding Data. *Technometrics*, **23:4**, 351-361.

See Also

`fligner_test`

Examples

```
library(vartest)

fk.test(Sepal.Length ~ Species, data = iris)

out <- fk.test(Sepal.Length ~ Species, data = iris)
summary(out)
```

---

g.test *G Test*

Description

`g.test` performs G variance homogeneity test.

Usage

```
g.test(formula, data, alpha = 0.05, na.rm = TRUE, verbose = TRUE)
```

Arguments

`formula`	a formula of the form `lhs ~ rhs` where `lhs` gives the sample values and `rhs` the corresponding groups.
`data`	a tibble or data frame containing the variables in `formula`.
`alpha`	the level of significance to assess variance homogeneity. Default is set to alpha = 0.05.
`na.rm`	a logical value indicating whether NA values should be stripped before the computation proceeds.
`verbose`	a logical for printing output to R console.

Value

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

`statistic`	the corresponding test statistic.
`parameter`	the parameter(s) of the approximate F distribution of the test statistic.
`p.value`	the p-value of the test.
`method`	the character string "G Test".
`data`	a data frame containing the variables in which NA values (if exist) are removed.
`formula`	a formula of the form `lhs ~ rhs` where `lhs` gives the sample values and `rhs` the corresponding groups.

Author(s)

Gozde Cosar and Osman Dag

References

UE't Lam, R. (2010). Scrutiny of Variance Results for Outliers: Cochran's Test Optimized. *Analytica Chimica Acta*, **659(1-2)**, 68-84.

Wang, Y., Gil, P.R., Chen, Y.H., Kromrey, J.D., Kim, E.S., Pham, T., Nguyen, D., Romano, J.L. (2017). Comparing the Performance of Approaches for Testing the Homogeneity of Variance Assumption in One-Factor Anova Models. *Educational and Psychological Measurement*, **77:2**, 305-329.

Examples

```
library(vartest)

g.test(Sepal.Length ~ Species, data = iris)

out <- g.test(Sepal.Length ~ Species, data = iris, verbose = FALSE)
summary(out)
```

`hartley.test` *Hartley's Maximum F-Ratio Test*

Description

`hartley.test` performs Hartley's Maximum F-Ratio variance homogeneity test.

Usage

```
hartley.test(formula, data, size = "mean", alpha = 0.05, na.rm = TRUE, verbose = TRUE)
```

Arguments

formula	a formula of the form lhs ~ rhs where lhs gives the sample values and rhs the corresponding groups.
data	a tibble or data frame containing the variables in formula.
size	a character string to define how to number of group observation. "mean": mean, "harmonic": harmonic mean, "maxn": maximum n, and "minvar": minimum variance.
alpha	the level of significance to assess variance homogeneity. Default is set to alpha = 0.05.
na.rm	a logical value indicating whether NA values should be stripped before the computation proceeds.
verbose	a logical for printing output to R console.

Value

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

statistic	the corresponding test statistic.
parameter	the parameter(s) of the maximum F-ratio distribution of the test statistic.
p.value	the p-value of the test.
method	the character string "Hartley's Maximum F-Ratio Test".
data	a data frame containing the variables in which NA values (if exist) are removed.
formula	a formula of the form lhs ~ rhs where lhs gives the sample values and rhs the corresponding groups.

Author(s)

Gozde Cosar and Osman Dag

References

Gorbunova, A.A., Lemeshko, B.Y. (2012). Application of Parametric Homogeneity of Variances Tests under Violation of Classical Assumption. *2nd Stochastic Modeling Techniques and Data Analysis International Conference*, **5:8**, 253-260.

Bhandary, M., Dai, H. (2008). An Alternative Test for the Equality of Variances for Several Populations When the Underlying Distributions are Normal. *Communications in Statistics-Simulation and Computation*, **38:1**, 109-117.

See Also

hartleyTest

Examples

```
library(vartest)

hartley.test(Sepal.Length ~ Species, data = iris, size = "mean")

out <- hartley.test(Sepal.Length ~ Species, data = iris, size = "mean")
summary(out)
```

`klotz.test` *Klotz Test*

Description

`klotz.test` performs Klotz variance homogeneity test.

Usage

```
klotz.test(formula, data, alpha = 0.05, na.rm = TRUE, verbose = TRUE)
```

Arguments

`formula`	a formula of the form `lhs ~ rhs` where `lhs` gives the sample values and `rhs` the corresponding groups.
`data`	a tibble or data frame containing the variables in `formula`.
`alpha`	the level of significance to assess variance homogeneity. Default is set to alpha = 0.05.
`na.rm`	a logical value indicating whether NA values should be stripped before the computation proceeds.
`verbose`	a logical for printing output to R console.

Details

Prior to testing for variance homogeneity, the data within each group are centered by their corresponding group median to eliminate the confounding effects of location parameters.

Value

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

`statistic`	the corresponding test statistic.
`parameter`	the parameter(s) of the approximate chi-squared distribution of the test statistic.
`p.value`	the p-value of the test.
`method`	the character string "Klotz Test".
`data`	a data frame containing the variables in which NA values (if exist) are removed.
`formula`	a formula of the form `lhs ~ rhs` where `lhs` gives the sample values and `rhs` the corresponding groups.

Author(s)

Gozde Cosar and Osman Dag

References

Conover, W.J., Johnson, M.E., Johnson, M.M. (1981). A Comparative Study of Tests for Homogeneity of Variances, with Applications to the Outer Continental Shelf Bidding Data. *Technometrics*, **23:4**, 351-361.

Klotz, J. (1962). Nonparametric Tests for Scale. *The Annals of Mathematical Statistics*, **33:2**, 498-512.

See Also

klotz_test

Examples

```
library(vartest)

klotz.test(Sepal.Length ~ Species, data = iris)

out <- klotz.test(Sepal.Length ~ Species, data = iris)
summary(out)
```

---

levene.test *Levene's Test*

Description

`levene.test` performs Levene variance homogeneity test.

Usage

```
levene.test(formula, data, center = "mean", deviation = "absolute",
  trim.rate = 0.25, alpha = 0.05, na.rm = TRUE, verbose = TRUE)
```

Arguments

`formula`	a formula of the form `lhs ~ rhs` where `lhs` gives the sample values and `rhs` the corresponding groups.
`data`	a tibble or data frame containing the variables in `formula`.
`center`	a character string to define how to center. "mean": mean, "median": median, and "trim.mean": trimmed mean.
`deviation`	a character string to define how to specify the deviation. "absolute": absolute deviation and "squared": squared deviation.
`trim.rate`	the rate of observations trimmed from each tail of the distribution. Default is set to 0.25.

alpha	the level of significance to assess variance homogeneity. Default is set to alpha = 0.05.
na.rm	a logical value indicating whether NA values should be stripped before the computation proceeds.
verbose	a logical for printing output to R console.

Value

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

statistic	the corresponding test statistic.
parameter	the parameter(s) of the approximate F distribution of the test statistic.
p.value	the p-value of the test.
method	the character string "Levene's Test".
data	a data frame containing the variables in which NA values (if exist) are removed.
formula	a formula of the form lhs ~ rhs where lhs gives the sample values and rhs the corresponding groups.

Author(s)

Gozde Cosar and Osman Dag

References

Wang, Y., Gil, P.R., Chen, Y.H., Kromrey, J.D., Kim, E.S., Pham, T., Nguyen, D., Romano, J.L. (2017). Comparing the Performance of Approaches for Testing the Homogeneity of Variance Assumption in One-Factor Anova Models. *Educational and Psychological Measurement*, **77:2**, 305-329.

Brown, M.B., Forsythe, A.B. (1974). Robust Tests for the Equality of Variances. *Journal of the American Statistical Association*, **69:346**, 364-367.

See Also

leveneTest

Examples

```
library(vartest)

levene.test(Sepal.Length ~ Species, data = iris, center="median", deviation="absolute")
levene.test(Sepal.Length ~ Species, data = iris, center="median", deviation="squared")
levene.test(Sepal.Length ~ Species, data = iris, center="mean", deviation="absolute")
levene.test(Sepal.Length ~ Species, data = iris, center="mean", deviation="squared")
levene.test(Sepal.Length ~ Species, data = iris, center="trim.mean", deviation="absolute")
levene.test(Sepal.Length ~ Species, data = iris, center="trim.mean", deviation="squared")

out <- levene.test(Sepal.Length~Species, data=iris, center="median", deviation="absolute")
summary(out)
```

mood.test *Mood Test*

Description

mood.test performs Mood variance homogeneity test.

Usage

```
mood.test(formula, data, alpha = 0.05, na.rm = TRUE, verbose = TRUE)
```

Arguments

formula	a formula of the form lhs ~ rhs where lhs gives the sample values and rhs the corresponding groups.
data	a tibble or data frame containing the variables in formula.
alpha	the level of significance to assess variance homogeneity. Default is set to alpha = 0.05.
na.rm	a logical value indicating whether NA values should be stripped before the computation proceeds.
verbose	a logical for printing output to R console.

Details

Prior to testing for variance homogeneity, the data within each group are centered by their corresponding group median to eliminate the confounding effects of location parameters.

Value

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

statistic	the corresponding test statistic.
parameter	the parameter(s) of the approximate chi-squared distribution of the test statistic.
p.value	the p-value of the test.
method	the character string "Mood Test".
data	a data frame containing the variables in which NA values (if exist) are removed.
formula	a formula of the form lhs ~ rhs where lhs gives the sample values and rhs the corresponding groups.

Author(s)

Gozde Cosar and Osman Dag

References

Conover, W.J., Johnson, M.E., Johnson, M.M. (1981). A Comparative Study of Tests for Homogeneity of Variances, with Applications to the Outer Continental Shelf Bidding Data. *Technometrics*, **23:4**, 351-361.

Mood, A.M. (1954). On the Asymptotic Efficiency of Certain Nonparametric Two-Sample Tests. *The Annals of Mathematical Statistics*, **25:3**, 514-522.

See Also

mood_test

Examples

```
library(vartest)

mood.test(Sepal.Length ~ Species, data = iris)

out <- mood.test(Sepal.Length ~ Species, data = iris)
summary(out)
```

---

mzv.test *Modified Z Variance Test*

Description

`mzv.test` performs Modified Z Variance variance homogeneity test.

Usage

```
mzv.test(formula, data, alpha = 0.05, na.rm = TRUE, verbose = TRUE)
```

Arguments

`formula`	a formula of the form `lhs ~ rhs` where `lhs` gives the sample values and `rhs` the corresponding groups.
`data`	a tibble or data frame containing the variables in `formula`.
`alpha`	the level of significance to assess variance homogeneity. Default is set to alpha = 0.05.
`na.rm`	a logical value indicating whether NA values should be stripped before the computation proceeds.
`verbose`	a logical for printing output to R console.

Value

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

`statistic`	the corresponding test statistic.
`parameter`	the parameter(s) of the approximate F distribution of the test statistic.
`p.value`	the p-value of the test.
`method`	the character string "Modified Z Variance Test".
`data`	a data frame containing the variables in which NA values (if exist) are removed.
`formula`	a formula of the form `lhs ~ rhs` where `lhs` gives the sample values and `rhs` the corresponding groups.

Author(s)

Gozde Cosar and Osman Dag

References

Wang, Y., Gil, P.R., Chen, Y.H., Kromrey, J.D., Kim, E.S., Pham, T., Nguyen, D., Romano, J.L. (2017). Comparing the Performance of Approaches for Testing the Homogeneity of Variance Assumption in One-Factor Anova Models. *Educational and Psychological Measurement*, **77:2**, 305-329.

Overall, J.E., Woodward, J.A. (1974). A Simple Test for Heterogeneity of Variance in Complex Factorial Designs. *Psychometrika*, **39:3**, 311-318.

Examples

```
library(vartest)

mzv.test(Sepal.Length ~ Species, data = iris)

out <- mzv.test(Sepal.Length ~ Species, data = iris)
summary(out)
```

---

obrien.test *O'Brien Test*

Description

`obrien.test` performs O'Brien variance homogeneity test.

Usage

```
obrien.test(formula, data, center = "mean", trim.rate = 0.25, alpha = 0.05,
  na.rm = TRUE, verbose = TRUE)
```

Arguments

formula	a formula of the form lhs ~ rhs where lhs gives the sample values and rhs the corresponding groups.
data	a tibble or data frame containing the variables in formula.
center	a character string to define how to center. "mean": mean, "median": median, and "trim.mean": trimmed mean.
trim.rate	the rate of observations trimmed from each tail of the distribution. Default is set to 0.25.
alpha	the level of significance to assess variance homogeneity. Default is set to alpha = 0.05.
na.rm	a logical value indicating whether NA values should be stripped before the computation proceeds.
verbose	a logical for printing output to R console.

Value

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

statistic	the corresponding test statistic.
parameter	the parameter(s) of the approximate F distribution of the test statistic.
p.value	the p-value of the test.
method	the character string "O'Brien Test".
data	a data frame containing the variables in which NA values (if exist) are removed.
formula	a formula of the form lhs ~ rhs where lhs gives the sample values and rhs the corresponding groups.

Author(s)

Gozde Cosar and Osman Dag

References

O'Brien, R.G. (1981). A Simple Test for Variance Effects in Experimental Designs. *Psychological Bulletin*, **89:3**, 570-574.

Gorbunova, A.A., Lemeshko, B.Y. (2012). Application of Parametric Homogeneity of Variances Tests under Violation of Classical Assumption. *2nd Stochastic Modeling Techniques and Data Analysis International Conference*, **5:8**, 253-260.

Examples

```
library(vartest)

obrien.test(Sepal.Length ~ Species, data = iris, center = "mean")

out <- obrien.test(Sepal.Length ~ Species, data = iris, center = "mean")
summary(out)
```

print.summary.vht *Print Method for Summary of Variance Homogeneity Test Results*

Description

Prints the formatted summary of a vht object to the console.

Usage

```
## S3 method for class 'summary.vht'
print(x, ...)
```

Arguments

x	An object returned by summary.vht().
...	Additional arguments.

Author(s)

Merve Kasikci, Osman Dag

See Also

summary.vht

Examples

```
out <- bartletts.test(Sepal.Length ~ Species, data = iris, verbose = FALSE)
summary(out)
```

siegel.tukey.test *Siegel Tukey Test*

Description

siegel.tukey.test performs Siegel Tukey variance homogeneity test.

Usage

```
siegel.tukey.test(formula, data, alpha = 0.05, na.rm = TRUE, verbose = TRUE)
```

Arguments

formula	a formula of the form lhs ~ rhs where lhs gives the sample values and rhs the corresponding groups.
data	a tibble or data frame containing the variables in formula.
alpha	the level of significance to assess variance homogeneity. Default is set to alpha = 0.05.
na.rm	a logical value indicating whether NA values should be stripped before the computation proceeds.
verbose	a logical for printing output to R console.

Details

Prior to testing for variance homogeneity, the data within each group are centered by their corresponding group median to eliminate the confounding effects of location parameters.

Value

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

statistic	the corresponding test statistic.
parameter	the parameter(s) of the approximate chi-squared distribution of the test statistic.
p.value	the p-value of the test.
method	the character string "Siegel Tukey Test".
data	a data frame containing the variables in which NA values (if exist) are removed.
formula	a formula of the form lhs ~ rhs where lhs gives the sample values and rhs the corresponding groups.

Author(s)

Gozde Cosar and Osman Dag

References

Gibbons, J.D., Chakraborti, S. (2010). Nonparametric Statistical Inference. *CRC Press*, **5th Ed.**, 316-320.

Siegel, S., Tukey, J.W. (1960). A Nonparametric Sum of Ranks Procedure for Relative Spread in Unpaired Samples. *Journal of the American Statistical Association*, **55:291**, 429-445.

See Also

GSTTest

Examples

```
library(vartest)

siegel.tukey.test(Sepal.Length ~ Species, data = iris)

out <- siegel.tukey.test(Sepal.Length ~ Species, data = iris)
summary(out)
```

`summary.vht` *Summary Method for Variance Homogeneity Test Results*

Description

Provides a concise summary of the results from a variance homogeneity test in the package.

Usage

```
## S3 method for class 'vht'
summary(object, ...)
```

Arguments

`object`	An object of class `vht`, typically returned by variance homogeneity tests.
`...`	Additional arguments.

Details

This method is specifically designed for objects of class `vht`. It prints test method, dependent variable, grouping variable, test statistic, degrees of freedom, and p-value.

Value

Prints a summary to the console.

Author(s)

Merve Kasikci, Osman Dag

Examples

```
out <- bartletts.test(Sepal.Length ~ Species, data = iris, verbose = FALSE)
summary(out)
```

taha.test *Taha Test*

Description

taha.test performs Taha variance homogeneity test.

Usage

```
taha.test(formula, data, alpha = 0.05, na.rm = TRUE, verbose = TRUE)
```

Arguments

formula	a formula of the form lhs ~ rhs where lhs gives the sample values and rhs the corresponding groups.
data	a tibble or data frame containing the variables in formula.
alpha	the level of significance to assess variance homogeneity. Default is set to alpha = 0.05.
na.rm	a logical value indicating whether NA values should be stripped before the computation proceeds.
verbose	a logical for printing output to R console.

Details

Prior to testing for variance homogeneity, the data within each group are centered by their corresponding group median to eliminate the confounding effects of location parameters.

Value

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

statistic	the corresponding test statistic.
parameter	the parameter(s) of the approximate chi-squared distribution of the test statistic.
p.value	the p-value of the test.
method	the character string "Taha Test".
data	a data frame containing the variables in which NA values (if exist) are removed.
formula	a formula of the form lhs ~ rhs where lhs gives the sample values and rhs the corresponding groups.

Author(s)

Gozde Cosar and Osman Dag

References

Conover, W.J., Iman, R.L.(1978). Some Exact Tables For The Squared Ranks Test. *Communications in Statistics - Simulation and Computation*, **B7(5)**, 491-513.

Taha, M.A.H. (1964). Rank Test for Scale Parameter for Asymmetrical One-Sided Distributions. *Annales de l'ISUP*, **13:3**, 169-180.

See Also

taha_test

Examples

```
library(vartest)

taha.test(Sepal.Length ~ Species, data = iris)

out <- taha.test(Sepal.Length ~ Species, data = iris)
summary(out)
```

---

talwar.gentle.test *Talwar and Gentle Test*

Description

`talwar.gentle.test` performs Talwar and Gentle variance homogeneity test.

Usage

```
talwar.gentle.test(formula, data, alpha = 0.05, na.rm = TRUE, verbose = TRUE)
```

Arguments

`formula`	a formula of the form `lhs ~ rhs` where `lhs` gives the sample values and `rhs` the corresponding groups.
`data`	a tibble or data frame containing the variables in `formula`.
`alpha`	the level of significance to assess variance homogeneity. Default is set to alpha = 0.05.
`na.rm`	a logical value indicating whether NA values should be stripped before the computation proceeds.
`verbose`	a logical for printing output to R console.

Details

Prior to testing for variance homogeneity, the data within each group are centered by their corresponding group median to eliminate the confounding effects of location parameters.

Value

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

`statistic`	the corresponding test statistic.
`parameter`	the parameter(s) of the approximate chi-squared distribution of the test statistic.
`p.value`	the p-value of the test.
`method`	the character string "Talwar and Gentle Test".
`data`	a data frame containing the variables in which NA values (if exist) are removed.
`formula`	a formula of the form `lhs ~ rhs` where `lhs` gives the sample values and `rhs` the corresponding groups.

Author(s)

Gozde Cosar and Osman Dag

References

Conover, W.J., Johnson, M.E., Johnson, M.M. (1981). A Comparative Study of Tests for Homogeneity of Variances, with Applications to the Outer Continental Shelf Bidding Data. *Technometrics*, **23:4**, 351-361.

Talwar, P.P., Gentle, J.E. (1976). A Robust Test for the Homogeneity of Scales. *Communications in Statistics - Theory and Methods*, **6:4**, 363-369.

Examples

```
library(vartest)

talwar.gentle.test(Sepal.Length ~ Species, data = iris)

out <- talwar.gentle.test(Sepal.Length ~ Species, data = iris, verbose = FALSE)
summary(out)
```

---

zv.test *Z Variance Test*

Description

`zv.test` performs Z variance homogeneity test.

Usage

```
zv.test(formula, data, alpha = 0.05, na.rm = TRUE, verbose = TRUE)
```

Arguments

formula	a formula of the form lhs ~ rhs where lhs gives the sample values and rhs the corresponding groups.
data	a tibble or data frame containing the variables in formula.
alpha	the level of significance to assess variance homogeneity. Default is set to alpha = 0.05.
na.rm	a logical value indicating whether NA values should be stripped before the computation proceeds.
verbose	a logical for printing output to R console.

Value

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

statistic	the corresponding test statistic.
parameter	the parameter(s) of the approximate F distribution of the test statistic.
p.value	the p-value of the test.
method	the character string "Z Variance Test".
data	a data frame containing the variables in which NA values (if exist) are removed.
formula	a formula of the form lhs ~ rhs where lhs gives the sample values and rhs the corresponding groups.

Author(s)

Gozde Cosar and Osman Dag

References

Gorbunova, A.A., Lemeshko, B.Y. (2012). Application of Parametric Homogeneity of Variances Tests under Violation of Classical Assumption. *2nd Stochastic Modeling Techniques and Data Analysis International Conference*, **5:8**, 253-260.

Wang, Y., Gil, P.R., Chen, Y.H., Kromrey, J.D., Kim, E.S., Pham, T., Nguyen, D., Romano, J.L. (2017). Comparing the Performance of Approaches for Testing the Homogeneity of Variance Assumption in One-Factor Anova Models. *Educational and Psychological Measurement*, **77:2**, 305-329.

Overall, J.E., Woodward, J.A. (1974). A Simple Test for Heterogeneity of Variance in Complex Factorial Designs. *Psychometrika*, **39:3**, 311-318.

Examples

```
library(vartest)

zv.test(Sepal.Length ~ Species, data = iris)

out <- zv.test(Sepal.Length ~ Species, data = iris, verbose = FALSE)
summary(out)
```

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