

# Package ‘PSIndependenceTest’

May 7, 2026

**Title** Independence Tests for Two-Way, Three-Way and Four-Way  
Contingency Tables

**Version** 0.0.1

**Description** Presentation two independence tests for two-way, three-way and four-way contingency tables. These tests are: the modular test and the logarithmic minimum test. For details on this method see: Sulewski (2017) <[doi:10.18778/0208-6018.330.04](https://doi.org/10.18778/0208-6018.330.04)>, Sulewski (2018) <[doi:10.1080/02664763.2018.1424122](https://doi.org/10.1080/02664763.2018.1424122)>, Sulewski (2019) <[doi:10.2478/bile-2019-0003](https://doi.org/10.2478/bile-2019-0003)>, Sulewski (2021) <[doi:10.1080/00949655.2021.1908286](https://doi.org/10.1080/00949655.2021.1908286)>.

**Depends** R (>= 3.5.0)

**License** GPL-3

**Language** en-US

**Encoding** UTF-8

**RoxygenNote** 7.2.3

**Suggests** testthat, knitr, rmarkdown

**VignetteBuilder** knitr

**LazyData** true

**NeedsCompilation** no

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**Repository** CRAN

**Date/Publication** 2023-09-14 19:10:06 UTC

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---

GenTab2

*Two-way contingency table r x c - generation*


---

**Description**

Generating a two-way contingency table r x c

**Usage**

GenTab2(pi<sub>j</sub>, n)

**Arguments**

pi <sub>j</sub>	a numeric matrix with non-negative probability values of the two-way contingency table
n	a sample size

**Details**

Generating a two-way contingency table  $r \times c$  using the probability matrix  $p_{ij}$ . If  $H_0$  is true then  $p_{ij}$  equals  $1 / r / c$ .

**Value**

The function returns the two-way contingency table  $r \times c$

**Author(s)**

Piotr Sulewski, <piotr.sulewski@apsl.edu.pl>, Pomeranian University in Slupsk.

**References**

Sulewski, P. (2016). *Moc testów niezależności w tablicy dwudzielczej większej niż  $2 \times 2$* , Przegląd statystyczny 63(2), 190-210

**Examples**

```
r = 6; c = 2
GenTab2(array(1 / r / c, dim = c(r, c)), 93)
GenTab2(matrix(c(0.125,0.25,0.25,0.375), nrow=2), 100)
```

---

GenTab3

*Three-way contingency table  $r \times c \times t$  - generation*

---

**Description**

Generating a three-way contingency table  $r \times c \times t$ .

**Usage**

```
GenTab3(pijt, n)
```

**Arguments**

<code>pijt</code>	a numeric matrix with non-negative probability values of the three-way contingency table
<code>n</code>	a sample size

**Details**

Generating a three-way contingency table  $r \times c \times t$  using the probability matrix  $p_{ijt}$ . If  $H_0$  is true then  $p_{ijt}$  equals  $1 / r / c / t$ .

**Value**

The function returns the three-way contingency table  $r \times c \times t$

**Author(s)**

Piotr Sulewski, <piotr.sulewski@apsl.edu.pl>, Pomeranian University in Slupsk.

**References**

Sulewski, P. (2018). *Power Analysis Of Independence Testing for the Three-Way Con-tingency Tables of Small Sizes*. Journal of Applied Statistics 45(13), 2481-2498

**Examples**

```
r = 2; c = 3; t = 4
GenTab3(array(1 / (r * c * t), dim = c(r, c, t)),250)
table = GenTab3(array(0.125, dim = c(2, 2, 2)), 100)
GenTab3(prop.table(table),100)
```

---

 GenTab4

---

*Four-way contingency table r x c x t x u - generation*


---

**Description**

Generating a four-way contingency table r x c x t x u.

**Usage**

```
GenTab4(pijtu, n)
```

**Arguments**

pijtu	a numeric matrix with non-negative probability values of the four-way contingency table
n	a sample size

**Details**

Generating a four-way contingency table r x c x t x u using the probability matrix pijtu. If  $H_0$  is true then pijtu equals  $1 / r / c / t / u$ .

**Value**

The function returns the four-way contingency table r x c x t x u

**Author(s)**

Piotr Sulewski, <piotr.sulewski@apsl.edu.pl>, Pomeranian University in Slupsk.

**References**

Extension of the information contained in Sulewski, P. (2018). *Power Analysis Of Independence Testing for the Three-Way Con-tingency Tables of Small Sizes*. Journal of Applied Statistics 45(13), 2481-2498

**Examples**

```
r = 2; c = 2; t = 2; u = 3
GenTab4(array(1 / (r * c * t * u), dim = c(r, c, t, u)),150)
table = GenTab4(array(1/16, dim = c(2, 2, 2, 2)), 200)
GenTab4(prop.table(table),200)
```

---

Lms2.cv

---

*Logarithmic Minimum Test for Independence in Two-Way Contingency Table*


---

**Description**

Calculates the critical values of the logarithmic minimum test.

**Usage**

```
Lms2.cv(nr, nc, n, alfa, B = 10000)
```

**Arguments**

nr	a number of rows
nc	a number of columns
n	a sample size
alfa	a significance level
B	an integer specifying the number of replicates used in the Monte Carlo test (optional)

**Details**

The Critical value of the logarithmic minimum test for independence in  $r \times c$  contingency table,

**Value**

The function returns the critical value of the logarithmic minimum test.

**Author(s)**

Piotr Sulewski, <piotr.sulewski@apsl.edu.pl>, Pomeranian University in Slupsk.

## References

Sulewski, P. (2019). *The LMS for Testing Independence in Two-way Contingency Tables*. Biometrical Letters 56(1), 17-43 #'

## Examples

```
Lms2.cv(2, 2, 40, 0.05, B = 1e3)
```

```
Lms2.cv(2, 3, 60, 0.1, B = 1e2)
```

---

Lms2.pvalue	<i>Logarithmic Minimum Test for Independence in Two-Way Contingency Table</i>
-------------	---

---

## Description

Calculates the p-value of the logarithmic minimum test.

## Usage

```
Lms2.pvalue(stat, nr, nc, n, B = 10000)
```

## Arguments

stat	a logarithmic minimum statistic value
nr	a number of rows
nc	a number of columns
n	a sample size
B	an integer specifying the number of replicates used in the Monte Carlo test (optional)

## Details

The p-value of the logarithmic minimum test for independence in  $r \times c$  contingency table, 

## Value

The function returns the p-value of the logarithmic minimum test.

## Author(s)

Piotr Sulewski, <piotr.sulewski@apsl.edu.pl>, Pomeranian University in Slupsk.

## References

Sulewski, P. (2019). *The LMS for Testing Independence in Two-way Contingency Tables*. Biometrical Letters 56(1), 17-43

**Examples**

```
Lms2.pvalue(Lms2.stat(table1), 2, 2, 40, B = 1e3)
Lms2.pvalue(Lms2.stat(table2), 2, 3, 60, B = 1e2)
```

---

Lms2.stat	<i>Logarithmic Minimum Test for Independence in Two-Way Contingency Table</i>
-----------	---

---

**Description**

Calculates the logarithmic minimum statistics (see Sulewski P. (2019)).

**Usage**

```
Lms2.stat(nij)
```

**Arguments**

nij	a numeric matrix with non-negative values of the two-way contingency table cells
-----	--

**Details**

The statistic of the logarithmic minimum test for independence in  $r \times c$  contingency table, see formula (4) and example 3 in the article.

**Value**

The function returns the value of the logarithmic minimum test statistic

**Author(s)**

Piotr Sulewski, <piotr.sulewski@aps1.edu.pl>, Pomeranian University in Slupsk.

**References**

Sulewski, P. (2019). *The LMS for Testing Independence in Two-way Contingency Tables*. Biometrical Letters 56(1), 17-43

**Examples**

```
Lms2.stat(table1)
Lms2.stat(table2)
```

---

Lms2.test	<i>Logarithmic Minimum Test for Independence in Two-Way Contingency Table</i>
-----------	---

---

### Description

Calculates the test statistic and p-value of the logarithmic minimum test.

### Usage

```
Lms2.test(nij, B = 10000)
```

### Arguments

<code>nij</code>	a numeric matrix with non-negative values of the two-way contingency table cells
<code>B</code>	an integer specifying the number of replicates used in the Monte Carlo test (optional)

### Details

The test statistic and p-value of the logarithmic minimum test for independence in  $r \times c$  contingency table,

### Value

The function returns values of the test statistic and p-value of the logarithmic minimum test.

### Author(s)

Piotr Sulewski, <piotr.sulewski@aps1.edu.pl>, Pomeranian University in Slupsk.

### References

Sulewski, P. (2019). *The LMS for Testing Independence in Two-way Contingency Tables*. *Biometrical Letters* 56(1), 17-43

### Examples

```
Lms2.test(GenTab2(matrix(1/6, nrow = 2, ncol = 3), 50), B = 1e2)
Lms2.test(table2, B = 1e3)
```

---

Lms3.cv	<i>Logarithmic minimum test for independence in three-way contingency table</i>
---------	---

---

### Description

Calculates the critical value of the Logarithmic minimum test for independence in three-way contingency table (see Sulewski P. (2018)).

### Usage

```
Lms3.cv(nr, nc, nt, n, alfa, B = 10000)
```

### Arguments

nr	a number of rows
nc	a number of columns
nt	a number of tubes
n	a sample size
alfa	a significance level
B	an integer specifying the number of replicates used in the Monte Carlo test (optional)

### Details

The Critical value of the Logarithmic minimum test for independence in  $r \times c \times t$  contingency table,

### Value

The function returns the critical value of the logarithmic minimum test.

### Author(s)

Piotr Sulewski, <piotr.sulewski@apsl.edu.pl>, Pomeranian University in Slupsk.

### References

Sulewski, P. (2021). *Logarithmic Minimum Test for Independence in Three Way Con-tingency Table of Small Sizes*, Journal of Statistical Computation and Simulation 91(13), 2780-2799

### Examples

```
Lms3.cv(2, 2, 2, 80, 0.05, B = 1e2)  
Lms3.cv(2, 2, 2, 80, 0.1, B = 1e3)
```

---

Lms3.pvalue	<i>Logarithmic minimum test for independence in three-way contingency table</i>
-------------	---

---

**Description**

Calculates the p-value of the Logarithmic minimum test for independence in three-way contingency table

**Usage**

```
Lms3.pvalue(stat, nr, nc, nt, n, B = 10000)
```

**Arguments**

stat	a Logarithmic minimum statistic value
nr	a number of rows
nc	a number of columns
nt	a number of tubes
n	a sample size
B	an integer specifying the number of replicates used in the Monte Carlo test (optional)

**Details**

The Critical value of the modular test for independence in  $r \times c \times t$  contingency table,

**Value**

The function returns the p-value of the logarithmic minimum test.

**Author(s)**

Piotr Sulewski, <piotr.sulewski@aps1.edu.pl>, Pomeranian University in Slupsk.

**References**

Sulewski, P. (2021). *Logarithmic Minimum Test for Independence in Three Way Con-tingency Table of Small Sizes*, Journal of Statistical Computation and Simulation 91(13), 2780-2799

**Examples**

```
tab1 = GenTab3(array(0.125, dim = c(2, 2, 2)), 100)
Lms3.pvalue(Lms3.stat(tab1), 2, 2, 2, 100, B=1e2)
Lms3.pvalue(Lms3.stat(table4), 2, 2, 2, 80, B = 1e3)
```

---

Lms3.stat	<i>Logarithmic minimum test for independence in three-way contingency table</i>
-----------	---

---

### Description

Calculates the statistic of the Logarithmic minimum test for independence in three-way contingency table (see Sulewski P. (2018)).

### Usage

```
Lms3.stat(nijt)
```

### Arguments

nijt	a numeric matrix with non-negative values of the three-way contingency table cells
------	--

### Details

The statistic of Logarithmic minimum test for independence in  $r \times c \times t$  contingency table, see formula (6) in the article.

### Value

The function returns the value of the logarithmic minimum test statistic.

### Author(s)

Piotr Sulewski, <piotr.sulewski@apsl.edu.pl>, Pomeranian University in Slupsk.

### References

Sulewski, P. (2021). *Logarithmic Minimum Test for Independence in Three Way Con-tingency Table of Small Sizes*, Journal of Statistical Computation and Simulation 91(13), 2780-2799

### Examples

```
Lms3.stat(table3)
Lms3.stat(GenTab3(array(1/12, dim=c(2,2,3)), 120))
```

---

Lms3.test	<i>Logarithmic minimum test for independence in three-way contingency table</i>
-----------	---

---

### Description

Calculates the test statistic and p-value of the Logarithmic minimum test for independence in three-way contingency table

### Usage

```
Lms3.test(nijt, B = 10000)
```

### Arguments

nijt	a numeric matrix with non-negative values of the three-way contingency table cells
B	an integer specifying the number of replicates used in the Monte Carlo test (optional)

### Details

The test statistic and p-value of the Logarithmic minimum test for independence in  $r \times c \times t$  contingency table,

### Value

The function returns values of the test statistic and p-value of the logarithmic minimum test.

### Author(s)

Piotr Sulewski, <piotr.sulewski@aps1.edu.pl>, Pomeranian University in Slupsk.

### References

Sulewski, P. (2021). *Logarithmic Minimum Test for Independence in Three Way Contingency Table of Small Sizes*, Journal of Statistical Computation and Simulation 91(13), 2780-2799

### Examples

```
Lms3.test(GenTab3(array(0.125, dim = c(2, 2, 2)), 80), B = 1e2)
Lms3.test(table4, B = 1e3)
```

---

Lms4.cv	<i>Logarithmic minimum test for independence in four-way contingency table</i>
---------	--

---

**Description**

Calculates the critical value of the Logarithmic minimum test for independence in four-way contingency table

**Usage**

```
Lms4.cv(nr, nc, nt, nu, n, alfa, B = 10000)
```

**Arguments**

nr	a number of rows
nc	a number of columns
nt	a number of tubes
nu	a number of tubes
n	a sample size
alfa	a significance level
B	an integer specifying the number of replicates used in the Monte Carlo test (optional)

**Details**

The Critical value of the Logarithmic minimum test for independence in  $r \times c \times t$  contingency table,

**Value**

The function returns the critical value of the logarithmic minimum test.

**Author(s)**

Piotr Sulewski, <piotr.sulewski@aps1.edu.pl>, Pomeranian University in Slupsk.

**References**

Extension of the information contained in Sulewski, P. (2021). *Logarithmic Minimum Test for Independence in Three Way Con-tingency Table of Small Sizes*, Journal of Statistical Computation and Simulation 91(13), 2780-2799

**Examples**

```
Lms4.cv(2, 2, 2, 2, 160, 0.05, B = 1e2)  
Lms4.cv(2, 2, 2, 2, 160, 0.1, B = 1e3)
```

---

Lms4.pvalue	<i>Logarithmic minimum test for independence in four-way contingency table</i>
-------------	--

---

### Description

Calculates the p-value of the Logarithmic minimum test for independence in four-way contingency table

### Usage

```
Lms4.pvalue(stat, nr, nc, nt, nu, n, B = 10000)
```

### Arguments

stat	a Logarithmic minimum statistic value
nr	a number of rows
nc	a number of columns
nt	a number of tubes
nu	a number of
n	a sample size
B	an integer specifying the number of replicates used in the Monte Carlo test (optional)

### Details

The Critical value of the modular test for independence in  $r \times c \times t \times u$  contingency table,

### Value

The function returns the p-value of the logarithmic minimum test.

### Author(s)

Piotr Sulewski, <piotr.sulewski@aps1.edu.pl>, Pomeranian University in Slupsk.

### References

Extension of the information contained in Sulewski, P. (2021). *Logarithmic Minimum Test for Independence in Three Way Con-tingency Table of Small Sizes*, Journal of Statistical Computation and Simulation 91(13), 2780-2799

### Examples

```
data = GenTab4(array(1/16, dim = c(2, 2, 2, 2)), 160)
Lms4.pvalue(Lms4.stat(data), 2, 2, 2, 2, 160, B=1e3)
Lms4.pvalue(Lms4.stat(table6), 2, 2, 2, 2, 160, B = 1e2)
```

---

Lms4.stat	<i>Logarithmic minimum test for independence in four-way contingency table</i>
-----------	--

---

**Description**

Calculates the statistic of the Logarithmic minimum test for independence in four-way contingency table

**Usage**

```
Lms4.stat(nijtu)
```

**Arguments**

nijtu            a numeric matrix with non-negative values of the four-way contingency table cells

**Details**

The statistic of Logarithmic minimum test for independence in  $r \times c \times t \times u$  contingency table,

**Value**

The function returns the value of the logarithmic minimum test statistic.

**Author(s)**

Piotr Sulewski, <piotr.sulewski@apsl.edu.pl>, Pomeranian University in Slupsk.

**References**

Extension of the information contained in Sulewski, P. (2021). *Logarithmic Minimum Test for Independence in Three Way Con-tingency Table of Small Sizes*, Journal of Statistical Computation and Simulation 91(13), 2780-2799

**Examples**

```
Lms4.stat(GenTab4(array(1/16, dim = c(2, 2, 2, 2)), 160))  
Lms4.stat(table5)
```

---

Lms4.test	<i>Logarithmic minimum test for independence in four-way contingency table</i>
-----------	--

---

### Description

Calculates the test statistic and p-value of the Logarithmic minimum test for independence in four-way contingency table

### Usage

```
Lms4.test(nijtu, B = 10000)
```

### Arguments

nijtu	a numeric matrix with non-negative values of the four-way contingency table cells
B	an integer specifying the number of replicates used in the Monte Carlo test (optional)

### Details

The test statistic and p-value of the Logarithmic minimum test for independence in  $r \times c \times t \times u$  contingency table,

### Value

The function returns values of the test statistic and p-value of the logarithmic minimum test.

### Author(s)

Piotr Sulewski, <piotr.sulewski@apsl.edu.pl>, Pomeranian University in Slupsk.

### References

Extension of the information contained in Sulewski, P. (2021). *Logarithmic Minimum Test for Independence in Three Way Con-tingency Table of Small Sizes*, Journal of Statistical Computation and Simulation 91(13), 2780-2799

### Examples

```
Lms4.test(GenTab4(array(1/16, dim = c(2, 2, 2, 2)), 160), B = 1e2)
Lms4.test(table6, B = 1e3)
```

---

`Mod2.cv`*Modular test for independence in two-way contingency table*

---

**Description**

Calculates the critical value of the modular test for independence in two-way contingency table see formula (9) in the article.

**Usage**

```
Mod2.cv(nr, nc, n, alfa, B = 10000)
```

**Arguments**

<code>nr</code>	a number of rows
<code>nc</code>	a number of columns
<code>n</code>	a sample size
<code>alfa</code>	a significance level
<code>B</code>	an integer specifying the number of replicates used in the Monte Carlo test (optional)

**Details**

The Critical value of the modular test for independence in  $r \times c$  contingency table, see formula (2) in the article.

**Value**

The function returns the critical value of the modular test.

**Author(s)**

Piotr Sulewski, <piotr.sulewski@apsl.edu.pl>, Pomeranian University in Slupsk.

**References**

Sulewski, P. (2016). *Moc testów niezależności w tablicy dwudzielczej większej niż  $2 \times 2$* , Przegląd statystyczny 63(2), 190-210

**Examples**

```
Mod2.cv(2, 2, 40, 0.05, B = 1e2)
Mod2.cv(2, 3, 60, 0.1)
```

---

`Mod2.pvalue`*Modular test for independence in two-way contingency table*

---

**Description**

Calculates the p-value of the modular test for independence in two-way contingency table

**Usage**

```
Mod2.pvalue(stat, nr, nc, n, B = 10000)
```

**Arguments**

<code>stat</code>	a modular statistic value
<code>nr</code>	a number of rows
<code>nc</code>	a number of columns
<code>n</code>	a sample size
<code>B</code>	an integer specifying the number of replicates used in the Monte Carlo test (optional)

**Details**

The p-value of the modular test for independence in  $r \times c$  contingency table,

**Value**

The function returns the p-value of the modular test.

**Author(s)**

Piotr Sulewski, <piotr.sulewski@apsl.edu.pl>, Pomeranian University in Slupsk.

**References**

Sulewski, P. (2016). *Moc testów niezależności w tablicy dwudzielczej większej niż  $2 \times 2$* , Przegląd statystyczny 63(2), 190-210

**Examples**

```
pij=matrix(1/4, nrow = 2, ncol = 2)
tab4=GenTab2(pij, 30)
Mod2.pvalue(Mod2.stat(tab4), 2, 2, 30, B=1e3)
Mod2.pvalue(2.5, 3, 2, 60)
```

---

`Mod2.stat`*Modular test for independence in two-way contingency table*

---

**Description**

Calculates the statistic of the modular test for independence in two-way contingency table (see Sulewski P. (2016)).

**Usage**

```
Mod2.stat(nij)
```

**Arguments**

`nij` a numeric matrix with non-negative values of the two-way contingency table cells

**Details**

The statistic of the modular test for independence in  $r \times c$  contingency table, see formula (2) in the article.

**Value**

The function returns the value of the modular test statistic.

**Author(s)**

Piotr Sulewski, <piotr.sulewski@apsl.edu.pl>, Pomeranian University in Słupsk.

**References**

Sulewski, P. (2016). *Moc testów niezależności w tablicy dwudzielczej większej niż  $2 \times 2$* , Przegląd statystyczny 63(2), 190-210

**Examples**

```
tab5=GenTab2(matrix(1/12, nrow = 3, ncol = 4), 60)
Mod2.stat(tab5)
Mod2.stat(table1)
```

---

`Mod2.test`*Modular test for independence in two-way contingency table*

---

**Description**

Calculates the test statistic and p-value of the modular test for independence in two-way contingency table

**Usage**

```
Mod2.test(nij, B = 10000)
```

**Arguments**

<code>nij</code>	a numeric matrix with non-negative values of the two-way contingency table cells
<code>B</code>	an integer specifying the number of replicates used in the Monte Carlo test (optional)

**Details**

The test statistic and p-value of the modular test for independence in  $r \times c$  contingency table,

**Value**

The function returns values of the test statistic and p-value of the modular test.

**Author(s)**

Piotr Sulewski, <piotr.sulewski@apsl.edu.pl>, Pomeranian University in Słupsk.

**References**

Sulewski, P. (2016). *Moc testów niezależności w tablicy dwudzielczej większej niż  $2 \times 2$* , Przegląd statystyczny 63(2), 190-210

**Examples**

```
pij=matrix(1/4, nrow = 2, ncol = 2)
Mod2.test(GenTab2(pij, 50), B = 1e3)
Mod2.test(table1, B = 1e2)
```

---

`Mod3.cv`*Modular test for independence in three-way contingency table*

---

**Description**

Calculates the critical value of the modular test for independence in three-way contingency table (see Sulewski P. (2018)).

**Usage**

```
Mod3.cv(nr, nc, nt, n, alfa, B = 10000)
```

**Arguments**

<code>nr</code>	a number of rows
<code>nc</code>	a number of columns
<code>nt</code>	a number of tubes
<code>n</code>	a sample size
<code>alfa</code>	a significance level
<code>B</code>	an integer specifying the number of replicates used in the Monte Carlo test (optional)

**Details**

The Critical value of the modular test for independence in  $r \times c \times t$  contingency table,

**Value**

The function returns the critical value of the modular test.

**Author(s)**

Piotr Sulewski, <piotr.sulewski@apsl.edu.pl>, Pomeranian University in Slupsk.

**References**

Sulewski, P. (2018). *Power Analysis Of Independence Testing for the Three-Way Con-tingency Tables of Small Sizes*. Journal of Applied Statistics 45(13), 2481-2498

**Examples**

```
Mod3.cv(2, 2, 2, 80, 0.05, B = 1e2)
Mod3.cv(2, 2, 2, 80, 0.1, B = 1e3)
```

---

`Mod3.pvalue`*Modular test for independence in three-way contingency table*

---

**Description**

Calculates the p-value of the modular test for independence in three-way contingency table

**Usage**

```
Mod3.pvalue(stat, nr, nc, nt, n, B = 10000)
```

**Arguments**

<code>stat</code>	a modular statistic value
<code>nr</code>	a number of rows
<code>nc</code>	a number of columns
<code>nt</code>	a number of tubes
<code>n</code>	a sample size
<code>B</code>	an integer specifying the number of replicates used in the Monte Carlo test (optional)

**Details**

The Critical value of the modular test for independence in  $r \times c \times t$  contingency table,

**Value**

The function returns the p-value of the modular test.

**Author(s)**

Piotr Sulewski, <piotr.sulewski@aps1.edu.pl>, Pomeranian University in Slupsk.

**References**

Sulewski, P. (2018). *Power Analysis Of Independence Testing for the Three-Way Con-tingency Tables of Small Sizes*. *Journal of Applied Statistics* 45(13), 2481-2498

**Examples**

```
data = GenTab3(array(0.125, dim = c(2, 2, 2)), 80)
Mod3.pvalue(Mod3.stat(data), 2, 2, 2, 80, B = 1e2)
Mod3.pvalue(Mod3.stat(table4), 2, 2, 2, 80, B = 1e3)
```

---

`Mod3.stat`*Modular test for independence in three-way contingency table*

---

**Description**

Calculates the statistic of the modular test for independence in three-way contingency table (see Sulewski P. (2018)).

**Usage**

```
Mod3.stat(nijt)
```

**Arguments**

`nijt` a numeric matrix with non-negative values of the three-way contingency table cells

**Details**

The statistic of the modular test for independence in  $r \times c \times t$  contingency table, see formula (6) in the article.

**Value**

The function returns the value of the modular test statistic.

**Author(s)**

Piotr Sulewski, <piotr.sulewski@apsl.edu.pl>, Pomeranian University in Slupsk.

**References**

Sulewski, P. (2018). *Power Analysis Of Independence Testing for the Three-Way Con-tingency Tables of Small Sizes*. Journal of Applied Statistics 45(13), 2481-2498

**Examples**

```
Mod3.stat(GenTab3(array(0.125, dim = c(2, 2, 2)), 100))  
Mod3.stat(table4)
```

---

`Mod3.test`*Modular test for independence in three-way contingency table*

---

**Description**

Calculates the test statistic and p-value of the modular test for independence in three-way contingency table

**Usage**

```
Mod3.test(nijt, B = 10000)
```

**Arguments**

<code>nijt</code>	a numeric matrix with non-negative values of the three-way contingency table cells
<code>B</code>	an integer specifying the number of replicates used in the Monte Carlo test (optional)

**Details**

The test statistic and p-value of the modular test for independence in  $r \times c \times t$  contingency table,

**Value**

The function returns values of the test statistic and p-value of the modular test.

**Author(s)**

Piotr Sulewski, <piotr.sulewski@apsl.edu.pl>, Pomeranian University in Slupsk.

**References**

Sulewski, P. (2018). *Power Analysis Of Independence Testing for the Three-Way Contingency Tables of Small Sizes*. *Journal of Applied Statistics* 45(13), 2481-2498

**Examples**

```
Mod3.test(GenTab3(array(0.125, dim = c(2, 2, 2)), 80), B = 1e3)
Mod3.test(table4, B = 1e3)
```

---

`Mod4.cv`*Modular test for independence in four-way contingency table*

---

**Description**

Calculates the critical value of the modular test for independence in four-way contingency table

**Usage**

```
Mod4.cv(nr, nc, nt, nu, n, alfa, B = 10000)
```

**Arguments**

<code>nr</code>	a number of rows
<code>nc</code>	a number of columns
<code>nt</code>	a number of tubes
<code>nu</code>	a number of tubes
<code>n</code>	a sample size
<code>alfa</code>	a significance level
<code>B</code>	an integer specifying the number of replicates used in the Monte Carlo test (optional)

**Details**

The Critical value of the Logarithmic minimum test for independence in  $r \times c \times t$  contingency table,

**Value**

The function returns the critical value of the modular test.

**Author(s)**

Piotr Sulewski, <piotr.sulewski@apsl.edu.pl>, Pomeranian University in Slupsk.

**References**

Extension of the information contained in Sulewski, P. (2018). *Power Analysis Of Independence Testing for the Three-Way Con-tingency Tables of Small Sizes*. Journal of Applied Statistics 45(13), 2481-2498

**Examples**

```
Mod4.cv(2, 2, 2, 2, 160, 0.05, B = 1e2)
Mod4.cv(2, 2, 2, 2, 160, 0.1, B = 1e3)
```

---

 Mod4.pvalue

*MOdular test for independence in four-way contingency table*


---

**Description**

Calculates the p-value of the modular test for independence in four-way contingency table

**Usage**

```
Mod4.pvalue(stat, nr, nc, nt, nu, n, B = 10000)
```

**Arguments**

stat	a Logarithmic minimum statistic value
nr	a number of rows
nc	a number of columns
nt	a number of tubes
nu	a number of
n	a sample size
B	an integer specifying the number of replicates used in the Monte Carlo test (optional)

**Details**

The Critical value of the modular test for independence in  $r \times c \times t \times u$  contingency table,

**Value**

The function returns the p-value of the modular test.

**Author(s)**

Piotr Sulewski, <piotr.sulewski@apsl.edu.pl>, Pomeranian University in Slupsk.

**References**

Extension of the information contained in Sulewski, P. (2018). *Power Analysis Of Independence Testing for the Three-Way Con-tingency Tables of Small Sizes*. Journal of Applied Statistics 45(13), 2481-2498

**Examples**

```
Mod4.pvalue(Mod4.stat(table6), 2, 2, 2, 2, 160, B = 1e2)
Mod4.pvalue(Mod4.stat(table6), 2, 2, 2, 2, 160, B = 1e3)
```

---

Mod4.stat	<i>Modular test for independence in four-way contingency table</i>
-----------	--

---

**Description**

Calculates the statistic of the modular test for independence in four-way contingency table

**Usage**

```
Mod4.stat(nijtu)
```

**Arguments**

nijtu	a numeric matrix with non-negative values of the four-way contingency table cells
-------	---

**Details**

The statistic of Logarithmic minimum test for independence in  $r \times c \times t \times u$  contingency table,

**Value**

The function returns the value of the modular test statistic.

**Author(s)**

Piotr Sulewski, <piotr.sulewski@apsl.edu.pl>, Pomeranian University in Slupsk.

**References**

Extension of the information contained in Sulewski, P. (2018). *Power Analysis Of Independence Testing for the Three-Way Con-tingency Tables of Small Sizes*. Journal of Applied Statistics 45(13), 2481-2498

**Examples**

```
Mod4.stat(GenTab4(array(1/16, dim = c(2, 2, 2, 2)), 100))  
Mod4.stat(table6)
```

---

`Mod4.test`*Modular test for independence in four-way contingency table*

---

**Description**

Calculates the test statistic and p-value of the modular test for independence in four-way contingency table

**Usage**

```
Mod4.test(nijtu, B = 10000)
```

**Arguments**

<code>nijtu</code>	a numeric matrix with non-negative values of the four-way contingency table cells
<code>B</code>	an integer specifying the number of replicates used in the Monte Carlo test (optional)

**Details**

The test statistic and p-value of the modular test for independence in  $r \times c \times t \times u$  contingency table,

**Value**

The function returns values of the test statistic and p-value of the modular test.

**Author(s)**

Piotr Sulewski, <piotr.sulewski@aps1.edu.pl>, Pomeranian University in Slupsk.

**References**

Extension of the information contained in Sulewski, P. (2018). *Power Analysis Of Independence Testing for the Three-Way Con-tingency Tables of Small Sizes*. Journal of Applied Statistics 45(13), 2481-2498

**Examples**

```
Mod4.test(GenTab4(array(1/16, dim = c(2, 2, 2, 2)), 160), B = 1e2)
Mod4.test(table6, B = 1e2)
```

---

PSIndependenceTest      *The list of package functions and their demonstration*

---

### **Description**

The **PSIndependenceTest** package puts into practice the modular and logarithmic minimum tests for independence in two-way, three-way and four-way contingency tables. Statistic value, cv value and p-value are calculated. This package also includes three table generation functions and six data sets. The list of package functions is as follows:

### **Data sets in the package and generating two-way, three-way and four-way contingency tables**

table1  
table2  
table3  
table4  
table5  
table6  
GenTab2  
GenTab3  
GenTab4

### **Functions for the modular independence test and two-way contingency table**

Mod2.stat  
Mod2.cv  
Mod2.pvalue  
Mod2.test

### **Functions for the modular independence test and three-way contingency table**

Mod3.stat  
Mod3.cv  
Mod3.pvalue  
Mod3.test

### **Functions for the modular independence test and four-way contingency table**

Mod4.stat  
Mod4.cv  
Mod4.pvalue  
Mod4.test

**Functions for the logarithmic minimum independence test and two-way contingency table**

Lms2.stat  
Lms2.cv  
Lms2.pvalue  
Lms2.test

**Functions for the logarithmic minimum independence test and three-way contingency table**

Lms3.stat  
Lms3.cv  
Lms3.pvalue  
Lms3.test

**Functions for the logarithmic minimum independence test and four-way contingency table**

Lms4.stat  
Lms4.cv  
Lms4.pvalue  
Lms4.test

---

table1

*First data set as two-way contingency table 2 x 2*

---

**Description**

The first data set from Sulewski, P. (2017) *A new test for independence in 2x2 contingency tables*, Acta Universitatis Lodzianensis. Folia Oeconomica, 4(330), 55–75 consist of 40 observations described the effect of a treatment for rheumatoid arthritis vs. a placebo. See Table 17 in the paper.

**Usage**

table1

**Format**

two-way contingency table 2 x 2

---

table2	<i>Second data set as two-way contingency table 2 x 3</i>
--------	---

---

**Description**

The second data set obtained using the Monte Carlo method consist of 60 observations when  $H_0$  is true, i.e. all probabilities equal  $1/6$

**Usage**

table2

**Format**

two-way contingency table 2 x 3

---

table3	<i>Third data set: three-way contingency table 3 x 3 x 2</i>
--------	--

---

**Description**

The third data set from Sulewski, P. (2021). *Logarithmic Minimum Test for Independence in Three Way Con-tingency Table of Small Sizes*. Journal of Statistical Computation and Simulation 91(13), 2780-2799 consist of 695 observations described the frequency of watching videos at home or at friends' homes for young people between 7 and 15 years of age, cross-classified according to age and sex. See Table 10 in the paper.

**Usage**

table3

**Format**

three-way contingency table 3 x 3 x 2

---

table4	<i>Fourth data set: three-way contingency table 2 x 2 x 2</i>
--------	---

---

**Description**

The fourth data set obtained using the Monte Carlo method consist of 80 observations when  $H_0$  is true, i.e. all probabilities equal  $1/8$ .

**Usage**

table4

**Format**

three-way contingency table 2 x 2 x 2

---

table5	<i>Fifth data set: four-way contingency table 4 x 2 x 2 x 2</i>
--------	---

---

**Description**

The fifth data set provides information on the fate of 2201 passengers on the fatal maiden voyage of the ocean liner 'Titanic', summarized according to economic status (class), sex, age and survival.

**Usage**

table5

**Format**

four-way contingency table 4 x 2 x 2 x 2

---

table6	<i>Sixth data set: four-way contingency table 2 x 2 x 2 x 2</i>
--------	---

---

**Description**

The sixth data set obtained using the Monte Carlo method consist of 160 observations when  $H_0$  is true, i.e. all probabilities equal  $1/16$ .

**Usage**

table6

**Format**

four-way contingency table 2 x 2 x 2 x 2

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