

# Package ‘MultinomialCI’

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**BugReports** <https://ccia.ugr.es/~pjvi/>

**Title** Simultaneous Confidence Intervals for Multinomial Proportions  
According to the Method by Sison and Glaz

**Type** Package

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**Description** An implementation of a method for building simultaneous confidence intervals for the probabilities of a multinomial distribution given a set of observations, proposed by Sison and Glaz in their paper:

Sison, C.P and J. Glaz. Simultaneous confidence intervals and sample size determination for multinomial proportions. Journal of the American Statistical Association, 90:366-369 (1995).

The method is an R translation of the SAS code implemented by May and Johnson in their paper: May, W.L. and W.D. Johnson. Constructing two-sided simultaneous confidence intervals for multinomial proportions for small counts in a large number of cells. Journal of Statistical Software 5(6) (2000).

Paper and code available at <[DOI:10.18637/jss.v005.i06](https://doi.org/10.18637/jss.v005.i06)>.

**Version** 1.2

**URL** <https://ccia.ugr.es/~pjvi/>

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**Depends** R (>= 2.15.0)

**Collate** 'aux-fn.R' 'sison.R'

**RoxygenNote** 7.1.1

**NeedsCompilation** no

**Repository** CRAN

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`multinomialCI`*Simultaneous Confidence Intervals for Multinomial Proportions*

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### Description

Simultaneous confidence intervals for multinomial proportions, calculated according to the method of Sison and Glaz

### Usage

```
multinomialCI(x, alpha, verbose = FALSE)
```

### Arguments

- |                      |  |
|----------------------|--|
| <code>x</code>       | A vector of positive integers representing the number of occurrences of each class. The total number of samples equals the sum of such elements. |
| <code>alpha</code>   | The significance level for the confidence intervals. Must be a real number in the interval [0, 1].   |
| <code>verbose</code> | A boolean flag indicating whether details should be printed to screen during the execution of the method. Defaults to FALSE.                     |

### Details

Given a vector of observations with the number of samples falling in each class of a multinomial distribution, this function builds simultaneous confidence intervals for the multinomial probabilities according to the method proposed by Sison and Glaz (1995). The R code has been translated from the SAS code written by May and Johnson (2000).

### Value

A  $k \times 2$  real matrix, with  $k$  being the number of classes, which matches the length of the input vector  $x$ . Row  $i$  of the matrix contains the lower bound (first column) and upper bound (second column) defining the confidence interval for the probability of the  $i$ -th class, which corresponds to the  $i$ -th position of the input vector.

### References

- Sison, C.P and J. Glaz. Simultaneous confidence intervals and sample size determination for multinomial proportions. *Journal of the American Statistical Association*, 90:366-369 (1995).
- Glaz, J. and Sison, C.P. Simultaneous confidence intervals for multinomial proportions. *Journal of Statistical Planning and Inference* 82:251-262 (1999).

**Examples**

```
# Multinomial distribution with 3 classes, from which 79 samples
# were drawn: 23 of them belong to the first class, 12 to the
# second class and 44 to the third class. Punctual estimations
# of the probabilities from this sample would be 23/79, 12/79
# and 44/79 but we want to build 95% simultaneous confidence intervals
# for the true probabilities
m = multinomialCI(c(23,12,44), 0.05)
print(paste("First class: [", m[1,1], m[1,2], "]"))
print(paste("Second class: [", m[2,1], m[2,2], "]"))
print(paste("Third class: [", m[3,1], m[3,2], "]"))
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