Package ‘Barnard’

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Type Package

Title Barnard’s Unconditional Test

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Description Barnard’s unconditional test for 2x2 contingency tables.

License GPL-2

LazyLoad yes

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Description

This package implements the barnardw.test function for performing Barnard’s unconditional test of superiority. This is a more powerful alternative of Fisher’s exact test for 2x2 contingency tables. The test, in its current implementation, uses Wald statistics as a measure of difference between two binomial proportions.

Author(s)

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References


Usage

barnardw.test(n1, n2, n3, n4, dp = 0.001, verbose = FALSE)

Arguments

- n1, n2, n3, n4: Elements of the 2x2 contingency table
- dp: The resolution to search for the nuisance parameter
- verbose: Extended output with 'wald.statistic.table' and 'nuisance.matrix'
For a 2x2 contingency table, such as $X = [a, b; c, d]$, the normalized difference in proportions between the two categories, given in each column, can be written as

$$T(X) = \frac{b - a}{\sqrt{a + b + c + d}} - \frac{\sqrt{(a+b)(c+d)}}{a + c + b + d}$$

This is referred to as the Wald statistic. The probability of observing $X$ is

$$P(X) = \frac{(a + c)!(b + d)!}{a!b!c!d!} \pi^{a+b}(1 - \pi)^{c+d}$$

where $\pi$ is the unknown nuisance parameter.

Barnard’s test considers all tables with category sizes $a + c$ and $b + d$ for a given $\pi$. The p-value is the sum of probabilities of the tables having Wald statistics in the rejection region, e.g. having significantly large difference in proportions for a two-sided test. The p-value of the test is the maximum p-value calculated over all $\pi$ between 0 and 1.

**Value**

- **wald.statistic.table**
  - The contingency tables considered in the analysis represented by 'n1' and 'n2', their Wald statistics, and whether they are included in the one-sided (1), two-sided (2) tests, or not included at all (0)

- **nuisance.matrix**
  - Nuisance parameters and the corresponding p-values for both one- and two-sided tests

- **dp**
  - The resolution of the search space for the nuisance parameter

- **contingency.matrix**
  - The observed 2x2 contingency table

- **alternative**
  - One Sided or Two Sided

- **wald.statistic**
  - The standardized difference between the observed proportions

- **nuisance.parameter**
  - The nuisance parameter where the p-value is maximized

- **p.value**
  - The p-value for the observed contingency table

**Note**

I am indebted to Peter Calhoun for helping to test the performance and the accuracy of the code. The accuracy has been tested with respect to the existing MATLAB and R implementations as well as the results of StatXact. I have largely been influenced by the works of Trujillo-Ortiz etal. (2004), Cardillo G. (2009), and Galili T. (2010).

**Author(s)**

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References

   URL http://www.mathworks.com/matlabcentral/fileexchange/25760
6. Trujillo-Ortiz, A., R. Hernandez-Walls, A. Castro-Perez, L. Rodriguez-Cardozo N.A. Ramos-

Examples

barnardw.test(8,14,1,3)

bt<-barnardw.test(8,14,1,3,verbose=TRUE)
plot(bt$nuisance.matrix[,1:2],t="l",xlab="nuisance parameter",ylab="p-value")

bt<-barnardw.test(4/zero.noslash,14,1/zero.noslash,3/zero.noslash,verbose=TRUE)$wald.statistic.table
plot(bt[,1],bt[,2],col=hsv(bt[,4]/4,1,1),t="p",xlab="n1",ylab="n2")
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