Package 'choplump'

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Type Package

Title Permutation Test for Some Positive and Many Zero Responses

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Depends R (>= 2.5.0), stats

Suggests coin, survival

Description Calculates permutation tests that can be powerful for comparing two groups with some positive but many zero responses (see Follmann, Fay, and Proschan <DOI:10.1111/j.1541-0420.2008.01131.x>).

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R topics documented:

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choplump-package   *Permutation Test for Some Positive and Many Zero Responses*

Description

This package has basically one important function, [choplump](#) for performing the choplump test, which is for comparing two groups with some positive response and many zero responses. These tests can often be more powerful than simpler permutation tests. Exact and approximation methods are available for calculating p-values.

Details

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See example below. There is also two vignettes. The vignette computation (see `vignette("choplumpComputation")`) gives computational details, and the vignette validation (see `vignette("choplumpValidation")`) details the way we have validated the function.

Author(s)

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References

Follmann, DA, Fay, MP, and Proschan, MA. (2009) "Chop-lump tests for Vaccine trials" Biometrics 65: 885-893. (see /doc/choplump.pdf)

Examples

```
set.seed(13921)
Ntotal<-200
Mtotal<-54
Z<-rep(0,Ntotal)
Z[sample(1:Ntotal,Ntotal/2,replace=FALSE)]<-1
test<-data.frame(W=c(rep(0,Ntotal-Mtotal),abs(rnorm(Mtotal))),Z=Z)
## defaults to asymptotic approximation if the number
## of calculations of the test statistic
## is >methodRuleParms=10^4
choplump(W~Z,data=test,use.ranks=TRUE,exact=FALSE)
```

---

chooseMatrix   *Create an (n choose m) by n matrix with unique rows.*

Description

Create a choose(n,m) by n matrix. The matrix has unique rows with m ones in each row and the rest zeros.

Usage

```
chooseMatrix(n, m)
```

Arguments

n	an integer
m	an integer<=n

Value

A matrix with choose(n,m) rows n columns. The matrix has unique rows with m ones in each row and the rest zeros.

Note

Used for exact test method for [choplump](#)

Author(s)

M.P.Fay

Examples

```
chooseMatrix(5,2)
```

---

choplump   *Choplump Test*

Description

The choplump test is a two-sample permutation test, that is used when there are many responses that are zero with some positive.

Usage

```
choplump(x, ...)

## Default S3 method:
choplump(x, y, alternative = c("two.sided", "less", "greater"),
            use.ranks=TRUE, exact = NULL, method=NULL,
            methodRule=methodRule1, methodRuleParms=c(10^4),
            nMC=10^4-1,seed=1234321, printNumCalcs=TRUE, ...)

## S3 method for class 'formula'
choplump(formula, data, subset, na.action, ...)
```

Arguments

x	a numeric vector of responses in first group, or a formula. Should have some zeros and the rest positive.
y	numeric vector of responses in second group
alternative	a character string specifying the alternative hypothesis, must be one of "two.sided" (default), "greater" or "less".
use.ranks	a logical indicating whether to use ranks for the responses
exact	a logical indicating whether an exact p-value should be computed (see details)
method	a character value, one of 'approx','exact','exactMC'. If NULL method chosen by methodRule
methodRule	a function used to choose the method (see details). Ignored if method is not NULL
methodRuleParms	
	a vector of parameters passed to methodRule. Ignored if method is not NULL
nMC	number of Monte Carlo replications, used if method='exactMC', ignored otherwise
seed	value used in set.seed if method='exactMC', ignored otherwise
printNumCalcs	logical, print number of calculations of test statistic for exact tests
formula	a formula of the form lhs~rhs where lhs is a numeric variable giving the data values and rhs a factor with two levels giving the corresponding groups.
data	an optional matrix or data frame containing the variables in the formula
subset	an optional vector specifying a subset of observations to be used.
na.action	a function which indicates what should happen when the data contain NAs. Defaults to getOption("na.action").
...	further arguments to be passed to or from methods.

Details

Consider a randomized trial where one wants to compare the responses in two groups, but there are many zeros in both groups. For example, in an HIV vaccine trial the response could be level of virus in the blood and very many in both groups will have zero values for the response. In order to gain

power, the choplump test removes the same proportion of zeros from both groups, and compares the standardized means between the values left. The test can use ranks to obtain a Wilcoxon-like test. The choplump is a formal permutation test (in other words for each permutation, the chopping is redone) so the type I error is less than the nominal significance level either exactly (for exact methods) or approximately (for the approximate method).

There are a choice of 3 different methods to calculate the p-values: approx, an approximation method, see vignette("choplumpComputation"); exact, an exact method, see vignette("choplumpComputation"); exactMC, exact method using Monte Carlo resampling with nMC resamples.

The associated functions for the above methods (choplumpApprox, choplumpExact, choplumpExactMC), are internal and not to be called directly.

A methodRule function has 4 input values: W (a vector of all responses), Z (a vector of 0 or 1 denoting group membership), exact (a logical value, same as exact in the choplump call), and parms (the vector of parameters, same as methodRuleParms in the choplump call). The methodRule function returns a character vector with one of the allowed methods. The default method rule is methodRule1. It gives a result of 'approx' if either exact=FALSE or exact=NULL and there are more than parms calculations of the test statistic. It gives a result of 'exact' if there are less than methodRuleParms calculations of the test statistic, and it gives a result of 'exactMC' if exact=TRUE and there are more than methodRuleParms calculations of the test statistic.

Value

A htest object, a list with elements

p.value	p value associated with alternative
alternative	description of alternative hypothesis
p.values	a vector giving lower, upper, and two-sided p-values
METHOD	a character vector describing the test
data.name	a character vector describing the two groups

Author(s)

M.P. Fay

References

Follmann, DA, Fay, MP, and Proschan, MA. (2009) "Chop-lump tests for Vaccine trials" Biometrics 65: 885-893. (see /doc/choplump.pdf)

Examples

```
set.seed(1)
Ntotal<-200
Mtotal<-12
Z<-rep(0,Ntotal)
Z[sample(1:Ntotal,Ntotal/2,replace=FALSE)]<-1
test<-data.frame(W=c(rep(0,Ntotal-Mtotal),abs(rnorm(Mtotal))),Z=Z)
## defaults to asymptotic approximation if
## the number of calculations of the test
```

```
## statistic is greater than parms
## see help for methodRule1
choplump(W~Z,data=test,use.ranks=TRUE)
## alternate form
cout<-choplump(test$W[test$Z==0],test$W[test$Z==1],use.ranks=TRUE,exact=TRUE)
cout
cout$p.values
```

---

choplumpGeneral   *General choplump test*

Description

This function does a general choplump test. For simple difference in standardized means (on the responses or on the ranks), use the much faster [choplump](#) function.

Usage

```
choplumpGeneral(W, Z, testfunc=testfunc.wilcox.ties.general)
```

Arguments

W	numeric vector of responses, some should be zero
Z	numeric vector of group membership, values either 0 or 1
testfunc	test function, inputs a data frame with two columns labeled W and Z, outputs test statistic

Value

Returns a p-value vector of length 3, with 3 named values: p.lower, p.upper, p.2sided.

Examples

```
### compare speed and results using two different functions
W<-c(0,0,0,0,0,0,0,0,2,4,6)
Z<-c(0,0,0,0,1,1,1,1,0,1,1)
Testfunc<-function(d){
    W<-d$W
    Z<-d$Z
    N<-length(Z)
    sqrt(N-1)*(sum(W*(1-Z)) - N*mean(W)*mean(1-Z) )/
      sqrt(var(W)*var(1-Z))
}
time0<-proc.time()
choplumpGeneral(W,Z,Testfunc)
time1<-proc.time()
choplump(W~Z,use.ranks=FALSE)$p.values
time2<-proc.time()
time1-time0
time2-time1
```

---

methodRule1 *Rule for determining method for choplump function*

Description

This is the default function which determines which method to use in choplump.

Usage

```
methodRule1(W,Z, exact, parms)
```

Arguments

W   numeric vector of response scores, usually many zeros and the rest positive

Z   group membership vector, values all 0 (control) or 1 (treated)

exact   logical, TRUE=exact method, FALSE=approximate method, NULL=see below

parms   numeric value of maximum number of calculations of test statistic, if number of
           calculations greater than parms then use Monte Carlo for exact method

Details

This function determines which of several methods will be used in choplump; see that help for
description of methods.

When exact=FALSE then returns 'approx'. When exact=TRUE then returns either 'exact' if the
number of calculations of the test statistic is less than or equal to parms or 'exactMC' otherwise.
When exact=NULL then returns either 'exact' if the number of calculations of the test statistic is
less than or equal to parms or or 'approx' otherwise.

Value

a character vector with one of the following values: "approx","exact","exactMC"

See Also

choplump

wilcox.manyzeros.exact

Wilcoxon Rank Sum Test

Description

This function gives exact p-values for the Wilcoxon rank sum. This algorithm is designed for the case when the responses are either positive or zero, and there are many zero responses. Its purpose is mostly for the validation of the choplump function (see vignette("choplumpValidation")).

Usage

```
wilcox.manyzeros.exact(W, Z)
```

Arguments

W   a vector of responses, should have some zeros and all rest positive

Z   a vector of group membership, should be either 0 or 1

Value

A vector of three types of p-values: p.lower, p.upper, and p.2sided.

Author(s)

M.P. Fay

See Also

choplump

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