

Package ‘lmerPerm’

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Type Package

Title Perform Permutation Test on General Linear and Mixed Linear Regression

Version 0.1.9

Description We provide a solution for performing permutation tests on linear and mixed linear regression models. It allows users to obtain accurate p-values without making distributional assumptions about the data. By generating a null distribution of the test statistics through repeated permutations of the response variable, permutation tests provide a powerful alternative to traditional parameter tests (Holt et al. (2023) <[doi:10.1007/s10683-023-09799-6](https://doi.org/10.1007/s10683-023-09799-6)>). In this early version, we focus on the permutation tests over observed t values of beta coefficients, i.e. original t values generated by parameter tests. After generating a null distribution of the test statistic through repeated permutations of the response variable, each observed t values would be compared to the null distribution to generate a p-value. To improve the efficiency, a stop criterion (Anscombe (1953) <[doi:10.1111/j.2517-6161.1953.tb00121.x](https://doi.org/10.1111/j.2517-6161.1953.tb00121.x)>) is adopted to force permutation to stop if the estimated standard deviation of the value falls below a fraction of the estimated p-value. By doing so, we avoid the need for massive calculations in exact permutation methods while still generating stable and accurate p-values.

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Encoding UTF-8

Imports lmerTest,stats

RoxygenNote 7.2.3

NeedsCompilation no

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lmerp	<i>This function is used for permutation test for general and mixed linear regression</i>
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Description

perform general and mixed linear regression by lm function in R base or lmer function in lmer/lmerTest package and permutation tests on observed t values of beta coefficients

Usage

```
lmerp(formula, data, thresh, R, mixed, minimum)
```

Arguments

formula	Regression formula in the form 'y~x1+x2+x3' for general linear function or 'y~x1+x2+x3+(1 x4)' or 'y~x1+x2+x3+(x3 x4)' for mixed linear function
data	A data frame specifying the data to be analysed
thresh	Threshold to stop iteration, default value is 0.1
R	The maximum number of iteration, default value is 1000
mixed	A logic value indicates if you desire to perform mixed linear model or not. Default value is FALSE.
minimum	The minimum number of iteration, default value is 50

Value

A list contains 2 items: Results and T_perm, the former contains results of original parameter test and results of permutation test including adjusted confidence interval (Ci_perm), p values (P_perm), iteration number(Iteration), the latter contains a list contains all t values generated in each permutation

Examples

```
formula<-mpg~cyl
data<-mtcars
my_perm<-lmerp(formula,data)
```

permute_fun	<i>This function defines the permutation strategy</i>
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Description

perform permutation on response variable i.e. y, using the stop criterion suggested by Anscombe

Usage

```
permute_fun(data, mle)
```

Arguments

data	A data frame specifying the data to be analysed.
mle	A string that indicated response variable

Value

A data frame containing the data with a permuted y.

Examples

```
data<-mtcars
permute<-permute_fun(data=data,mle='mpg')
```

s1	<i>Return t values of general linear model</i>
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Description

perform mixed linear regression in lmer/lmertest package for getting observed t values or permutation test

Usage

```
s1(data, formula)
```

Arguments

data	A dataframe specifying the data to be analysed
formula	A formula in the form like 'y~x1+x2+x3 in lm function

Value

An object of class "lm"

Examples

```
data<-mtcars
formula<-mpg~cyl
s1(data=data, formula=formula)
```

s2

Estimate t values of mixed linear model

Description

perform mixed linear regression in lmerTest package for getting observed t values or permutation test

Usage

```
s2(data, formula)
```

Arguments

data	A dataframe specifying the data to be analysed
formula	A formula in the form like 'y~x1+x2+x3+(1 x4) or like 'y~x1+x2+x3 +(x3 x4) in lmer function

Value

An object of class "lmerTest"

Examples

```
data<-mtcars
formula<-mpg~cyl+(1|gear)
statistic<-s2(data=data, formula=formula)
```

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