Package 'flipscores'

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Title Robust Score Testing in GLMs, by Sign-Flip Contributions

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Description Provides robust tests for testing in GLMs, by sign-flipping score contributions. The tests are robust against overdispersion, heteroscedasticity and, in some cases, ignored nuisance variables. See Hemerik, Goeman and Finos (2020) <doi:10.1111/rssb.12369>.

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flipscores-package *Robust Score Testing in GLMs, by Sign-Flip Contributions*

Description

It provides robust tests for testing in GLMs, by sign-flipping score contributions. The tests are often robust against overdispersion, heteroscedasticity and, in some cases, ignored nuisance variables.

Author(s)

Livio Finos, Jelle Goeman and Jesse Hemerik, with contribution of Vittorio Giatti.

Examples

```
set.seed(1)
dt=data.frame(X=rnorm(20),
   Z=factor(rep(LETTERS[1:3],length.out=20)))
dt$Y=rpois(n=20,lambda=exp(dt$X))
mod=flipscores(Y~Z+X,data=dt,family="poisson",score_type = "effective")
summary(mod)

# Anova test
anova(mod)
# or
mod0=flipscores(Y~Z,data=dt,family="poisson",score_type = "effective")
anova(mod0,mod)
# and
mod0=flipscores(Y~X,data=dt,family="poisson",score_type = "effective")
anova(mod0,mod)
```

anova.flipscores *anova.flipscores*

Description

This is the anova method for `flipscores` object. Importantly it allow for type III deviance decomposition as in `car::Anova`.

Usage

```
## S3 method for class 'flipscores'
anova(
  object,
  model1 = NULL,
  score_type = "orthogonalized",
  n_flips = 5000,
  type = 3,
```

```
  id = NULL,
  ...
)
```

Arguments

object	(the object) glm (or flipscores) object with the model under the null hypothesis (i.e. the covariates, the nuisance parameters).
model1	a glm (or flipscores) or a matrix (or vector). If it is a glm object, it has the model under the alternative hypothesis. The variables in model1 are the same variables in object plus one or more variables to be tested. Alternatively, if model1 is a matrix, it contains the tested variables column-wise.
score_type	The type of score that is computed. It can be "orthogonalized", "effective" or "basic". Default is "orthogonalized". "effective" and "orthogonalized" take into account the nuisance estimation.
n_flips	The number of random flips of the score contributions. When n_flips is equal or larger than the maximum number of possible flips (i.e. n^2), all possible flips are performed. Default is 5000.
type	type of test, "I", "III", 1, or 3. Roman numerals are equivalent to the corresponding Arabic numerals.
id	a vector identifying the clustered observations. If NULL (default) observations are assumed to be independent. NOTE: if object is a flipscores and model$id is not NULL, this is considered in the inference.
...	other parameters allowed in stats::anova.

Examples

```
set.seed(1)
dt=data.frame(X=rnorm(20),
   Z=factor(rep(LETTERS[1:3],length.out=20)))
dt$Y=rpois(n=nrow(dt),lambda=exp(dt$X*(dt$Z=="C")))
mod0=flipscores(Y~Z+X,data=dt,family="poisson",score_type = "effective")
summary(mod0)
anova(mod0)

mod1=flipscores(Y~Z*X,data=dt,family="poisson",score_type = "effective")
anova(mod0,model1 = mod1)
```

---

compute_scores *compute_scores*

Description

Same usage as anova.glm. The parameter id is used too, if present in model0 (with priority) or in model1.

Usage

```
compute_scores(model0, model1, score_type = "orthogonalized")
```

Arguments

model0	a glm object with the model under the null hypothesis (i.e. the covariates, the nuisance parameters).
model1	a glm or a matrix (or vector). If it is a glm object, it has the model under the alternative hypothesis. The variables in model1 are the same variables in model0 plus one or more variables to be tested. Alternatively, if model1 is a matrix, it contains the tested variables column-wise.
score_type	The type of score that is computed. It is "orthogonalized", "effective" or "basic". Default is "orthogonalized". "effective" and "orthogonalized" take into account the nuisance estimation.

Author(s)

Jesse Hemerik, Vittorio Giatti, Jelle Goeman and Livio Finos

Examples

```
Z=rnorm(20)
X=Z+rnorm(20)
Y=rpois(n=20,lambda=exp(Z+X))
mod0=glm(Y~Z,family="poisson")
(scr0=compute_scores(model0 = mod0, model1 = X, score_type = "effective"))
```

---

flipscores *Robust testing in GLMs, by sign-flipping score contributions*

Description

Provides robust tests for testing in GLMs, by sign-flipping score contributions. The tests are often robust against overdispersion, heteroscedasticity and, in some cases, ignored nuisance variables.

Usage

```
flipscores(formula, family, data, score_type,
n_flips=5000, alternative ="two.sided", id = NULL, ...)
```

Arguments

formula	see glm function.
family	see glm function.
data	see glm function.

score_type	The type of score that is computed. It can be "orthogonalized", "effective" or "basic". Both "orthogonalized" and "effective" take into account the nuisance estimation and they provide the same test statistic. In case of small samples "effective score" might have a slight anti-conservative behaviour. "orthogonalized effective score" gives a solution for this issue. Note that in case of a big model matrix, the "orthogonalized" may take a long time.
n_flips	The number of random flips of the score contributions. When n_flips is equal or larger than the maximum number of possible flips (i.e. n^2), all possible flips are performed.
alternative	It can be "greater", "less" or "two.sided" (default)
id	a vector identifying the clustered observations. If NULL (default) observations are assumed to be independent.
...	see glm function.

Details

flipscores borrow the same parameters from function glm (and glm.nb). See these helps for more details about parameters such as formula, data, family. Note: in order to use Negative Binomial family, family reference must have quotes (i.e. family="negbinom").

Value

glm class object with sign-flip score test. See also the related functions (summary.flipscores, anova.flipscores, print.flipscores).

Author(s)

Livio Finos, Vittorio Giatti, Jesse Hemerik and Jelle Goeman

References

"Robust testing in generalized linear models by sign-flipping score contributions" by J.Hemerik, J.Goeman and L.Finos.

See Also

anova.flipscores, summary.flipscores, flip

Examples

```
set.seed(1)
dt=data.frame(X=rnorm(20),
   Z=factor(rep(LETTERS[1:3],length.out=20)))
dt$Y=rpois(n=20,lambda=exp(dt$Z=="C"))
mod=flipscores(Y~Z+X,data=dt,family="poisson",score_type = "effective")
summary(mod)
```

`flipscores-method` *Methods for flipscores objects*

Description

Methods for `flipscores` objects. The following are methods to extract and manipulate relevant information from a `flipscores` object.

Usage

```
## S3 method for class 'flipscores'
print(x, ...)

## S3 method for class 'flipscores'
summary(object, ...)
```

Arguments

`x`	a flipscores object
`...`	additional arguments to be passed
`object`	a flipscores object

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