Package 'qif'

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Title Quadratic Inference Function

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Depends R (>= 3.5.0)

Description Developed to perform the estimation and inference for regression coefficient parameters in longitudinal marginal models using the method of quadratic inference functions. Like generalized estimating equations, this method is also a quasi-likelihood inference method. It has been showed that the method gives consistent estimators of the regression coefficients even if the correlation structure is misspecified, and it is more efficient than GEE when the correlation structure is misspecified. Based on Qu, A., Lindsay, B.G. and Li, B. (2000) <doi:10.1093/biomet/87.4.823>.

Imports MASS

License GPL-2

Encoding UTF-8

LazyData true

BugReports https://github.com/umich-biostatistics/qif/issues

RoxygenNote 6.1.1

NeedsCompilation yes

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Contents

`epil` *Seizure Counts for Epileptics*

Description

The data set consists of seizure counts for 59 individuals with epilepsy. Counts were recorded for four two-week periods (8 weeks total). Age is the only covariate.

Usage

```
epil
```

Format

A `data.frame` with 236 rows and 9 variables (columns):

y the count for the 2-week period.

trt treatment, "placebo" or "progabide".

base the counts in the baseline 8-week period.

age subject's age, in years.

V4 0/1 indicator variable of period 4.

subject subject number, 1 to 59.

period period, 1 to 4.

lbase log-counts for the baseline period, centred to have zero mean.

lage log-ages, centred to have zero mean.

Source

Thall, P. F. and Vail, S. C. (1990) Some covariance models for longitudinal count data with over-dispersion. Biometrics 46, 657–671.

References

Venables, W. N. and Ripley, B. D. (2002) Modern Applied Statistics with S. Fourth Edition. Springer.

exacerb *MS data*

Description

MS data

Usage

```
exacerb
```

Format

An object of class `data.frame` with 765 rows and 14 columns.

Source

Thal

References

Venab

print.qif *Print Function for qif Object*

Description

Print a `qif` model object.

Usage

```
## S3 method for class 'qif'
print(x, digits = NULL, quote = FALSE, prefix = "",
  ...)
```

Arguments

`x`	the `qif` model object.
`digits`	number of digits to print.
`quote`	logical, indicating whether or not strings should be printed with surrounding quotes.
`prefix`	string, only `""` is implemented.
`...`	further arguments passed to or from other methods.

Value

The invisible object from the arguments.

Author(s)

Zhichang Jiang, Alberta Health Services, and Peter X.K. Song, University of Michigan.

See Also

print qif

`print.summary.qif` *Print the Summary of qif Object*

Description

Prints the summary of a `qif` object.

Usage

```
## S3 method for class 'summary.qif'
print(x, digits = NULL, quote = FALSE,
  prefix = "", ...)
```

Arguments

`x`	the `qif` model object.
`digits`	number of digits to print.
`quote`	logical, indicating whether or not strings should be printed with surrounding quotes.
`prefix`	string, only `""` is implemented.
`...`	further arguments passed to or from other methods.

Value

The invisible object from the arguments.

The invisible object from the arguments.

Author(s)

Zhichang Jiang, Alberta Health Services, and Peter X.K. Song, University of Michigan.

See Also

summary qif

qif *Function to Solve a Quadratic Inference Function Model*

Description

Produces an object of class "qif" which is a Quadratic Inference Function fit of the balanced longitudinal data.

Usage

```
qif(formula = formula(data), id = id, data = parent.frame(),
  b = NULL, tol = 1e-08, maxiter = 1000, family = gaussian,
  corstr = "independence", invfun = "finv")
```

Arguments

formula	a formula expression as for other regression models, of the form response ~ predictors. See the documentation of lm and formula for details.
id	a vector which identifies the clusters. The length of id should be the same as the number of observations. Data are assumed to be sorted so that observations on a cluster are contiguous rows for all entities in the formula.
data	an optional data frame in which to interpret the variables occurring in the formula, along with the id variables.
b	an initial estimate for the parameters.
tol	the tolerance used in the fitting algorithm.
maxiter	the maximum number of iterations.
family	a family object: a list of functions and expressions for defining canonical link and variance functions. Families supported in qif are gaussian, binomial, poisson, and gamma; see the glm and formula documentation. Some links are not currently available: probit link for binomial family and log link for gamma family.
corstr	a character string specifying the correlation structure. The following are permitted: "independence", "exchangeable", "AR-1" and "unstructured".
invfun	a character string specifying the matrix inverse function. The following are permitted: "finv" and "ginv".

Details

qif provides two options of computing matrix inverses. The default is from Fortran math library, and the other one is generalized inverse "ginv" given in R package MASS. You can call option "ginv" through argument "invfun" in "qif()".

Value

A list containing:

- `title`: name of qif
- `version`: the current version of qif
- `model`: analysis model for link function, variance function and correlation struture
- `terms`: analysis model for link function, variance function and correlation struture
- `iteration`: the number of iterations
- `coefficients`: beta esitmates value
- `linear.perdictors`: linear predictor value
- `fitted.value`: fitted value of y
- `x`: the perdicted matrix
- `y`: the response
- `residuals`: y-mu
- `pearson.resi`: pearson residuals
- `scale`: the scale of fitted model
- `family`: the type of distribution
- `id`: model fitted value
- `max.id`: max number of each steps
- `xnames`: the values are X name of qif
- `statistics`: The qif statistics
- `Xnames`: the name X matrix in qif
- `parameter`: parameter estimates
- `covariance`: Covariance of coefficients

Note

This R package is created by transplanting a SAS macro QIF developed originally by Peter Song and Zhichang Jiang (2006). This is version 1.5 of this user documentation file, revised 2019-07-02.

Author(s)

Zhichang Jiang, Alberta Health Services, and Peter X.K. Song, University of Michigan.

References

Qu A, Lindsay BG, Li B. Improving generalized estimating equations using quadratic inference functions. Biometrika 2000, 87 823-836.

Qu A, Song P X-K. Assessing robustness of generalised estimating equations and quadratic inference functions. Biometrika 2004, 91 447-459.

Qu A, Lindsay BG. Building adaptive estimating equations when inverse of covariance estimation is difficult. J. Roy. Statist. Soc. B 2003, 65, 127-142.

See Also

glm, lm, formula.

Examples

```
## Marginal log-linear model for the epileptic seizures count data
## (Diggle et al., 2002, Analysis of Longitudinal Data, 2nd Ed., Oxford Press).

# Read in the epilepsy data set:
data(epil)

# Fit the QIF model:
fit <- qif(y ~ base + trt + lage + V4, id=subject, data=epil,
                                       family=poisson, corstr="AR-1")

# Alternately, use ginv() from package MASS
fit <- qif(y ~ base + trt + lage + V4, id=subject, data=epil,
                      family=poisson, corstr="AR-1", invfun = "ginv")

# Print summary of QIF fit:
summary(fit)

## Second example: MS study
data(exacerb)

qif_BIN_IND<-qif(exacerbation ~ treatment + time + duration + time2, id=id,
                        data=exacerb, family=binomial, corstr="independence")
qif_BIN_AR1<-qif(exacerbation ~ treatment + time + duration + time2, id=id,
                        data=exacerb, family=binomial, corstr="AR-1")
qif_BIN_CS<-qif(exacerbation ~ treatment + time + duration + time2, id=id,
                        data=exacerb, family=binomial, corstr="exchangeable")
qif_BIN_UN<-qif(exacerbation ~ treatment + time + duration + time2, id=id,
                        data=exacerb, family=binomial, corstr="unstructured")

summary(qif_BIN_CS)

qif_BIN_CS$statistics

qif_BIN_CS$covariance
```

`summary.qif` *Summary of a qif Object*

Description

Procuce a summary of a `qif` object.

Usage

```
## S3 method for class 'qif'
summary(object, correlation = TRUE, ...)
```

Arguments

object	an object for which a summary is desired.
correlation	binary, include correlation.
...	additional arguements to be passed to summary.

Value

The summary.qif object.

Author(s)

Zhichang Jiang, Alberta Health Services, and Peter X.K. Song, University of Michigan.

See Also

qif

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