Package 'pgam'

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Depends R (>= 3.0.0),stats,utils

Title Poisson-Gamma Additive Models

Description This work is an extension of the state space model for Poisson count data, Poisson-Gamma model, towards a semiparametric specification. Just like the generalized additive models (GAM), cubic splines are used for covariate smoothing. The semiparametric models are fitted by an iterative process that combines maximization of likelihood and backfitting algorithm.

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R topics documented:

`AIC.pgam` *AIC extraction*

Description

Method for approximate Akaike Information Criterion extraction.

Usage

```
## S3 method for class 'pgam'
AIC(object, k = 2, ...)
```

Arguments

`object`	object of class `pgam` holding the fitted model
`k`	default is 2 for AIC. If $k = \log(n)$ then an approximation for BIC is obtained. Important to note that these are merely approximations.
`...`	further arguments passed to method

Details

An approximate measure of parsimony of the Poisson-Gama Additive Models can be achieved by the expression

$$AIC = \left(D\left(y;\hat{\mu}\right) + 2gle\right) / \left(n - \tau\right)$$

where gle is the number of degrees of freedom of the fitted model and τ is the index of the first non-zero observation.

Value

The approximate AIC value of the fitted model.

Author(s)

Washington Leite Junger <wjunger@ims.uerj.br> and Antonio Ponce de Leon <ponce@ims.uerj.br>

References

Harvey, A. C., Fernandes, C. (1989) Time series models for count data or qualitative observations. Journal of Business and Economic Statistics, 7(4):407–417

Junger, W. L. (2004) Semiparametric Poisson-Gamma models: a roughness penalty approach. MSc Dissertation. Rio de Janeiro, PUC-Rio, Department of Electrical Engineering.

Hastie, T. J., Tibshirani, R. J.(1990) Generalized Additive Models. Chapman and Hall, London

See Also

pgam, deviance.pgam, logLik.pgam

Examples

```
library(pgam)
data(aihrio)
attach(aihrio)
form <- ITRESP5~f(WEEK)+HOLIDAYS+rain+PM+g(tmpmax,7)+g(wet,3)
m <- pgam(form,aihrio,omega=.8,beta=.01,maxit=1e2,eps=1e-4,optim.method="BFGS")

AIC(m)
```

---

aihrio *Sample dataset*

Description

This is a dataset for Poisson-Gamma Additive Models functions testing.

Usage

```
data(aihrio)
```

Format

A data frame with 365 observations on the following 33 variables.

DATE a factor with levels

TIME a numeric vector

ITRESP65 a numeric vector

ITCIRC65 a numeric vector

ITDPOC65 a numeric vector

ITPNM65 a numeric vector

ITAVC65 a numeric vector

ITIAM65 a numeric vector

ITDIC65 a numeric vector

ITTCA65 a numeric vector

ITRESP5 a numeric vector

ITPNEU5 a numeric vector

ITDPC5 a numeric vector

WEEK a numeric vector

MON a numeric vector

TUE a numeric vector

WED a numeric vector

THU a numeric vector

FRI a numeric vector

SAT a numeric vector

SUN a numeric vector

HOLIDAYS a numeric vector

MONTH a numeric vector

warm.season a numeric vector

tmpmed a numeric vector

tmpmin a numeric vector

tmpmax a numeric vector

wet a numeric vector

rain a numeric vector

rainy a numeric vector

PM a numeric vector

SO2 a numeric vector

CO a numeric vector

Details

This is a reduced dataset of those used to estimate possible effects of air pollution on hospital admissions outcomes in Universidade do Estado do Rio de Janeiro, Rio de Janeiro, Brasil.

Author(s)

Washington Leite Junger <wjunger@ims.uerj.br> and Antonio Ponce de Leon <ponce@ims.uerj.br>

Source

Secretary for the Environment of the Rio de Janeiro City, Brazilian Ministry of Defense and Brazilian Ministry of Health

coef.pgam *Coefficients extraction*

Description

Method for parametric coefficients extraction.

Usage

```
## S3 method for class 'pgam'
coef(object, ...)
```

Arguments

object	object of class pgam holding the fitted model
...	further arguments passed to method

Details

This function only retrieves the estimated coefficients from the model object returned by pgam.

Value

Vector of coefficients estimates of the model fitted.

Author(s)

Washington Leite Junger <wjunger@ims.uerj.br> and Antonio Ponce de Leon <ponce@ims.uerj.br>

References

Harvey, A. C., Fernandes, C. (1989) Time series models for count data or qualitative observations. Journal of Business and Economic Statistics, 7(4):407–417

Junger, W. L. (2004) Semiparametric Poisson-Gamma models: a roughness penalty approach. MSc Dissertation. Rio de Janeiro, PUC-Rio, Department of Electrical Engineering.

See Also

pgam, pgam.fit, predict.pgam

Examples

```
library(pgam)
data(aihrio)
attach(aihrio)
form <- ITRESP5~f(WEEK)+HOLIDAYS+rain+PM+g(tmpmax,7)+g(wet,3)
m <- pgam(form,aihrio,omega=.8,beta=.01,maxit=1e2,eps=1e-4,optim.method="BFGS")
```

```
coef(m)
```

`deviance.pgam` *Deviance extraction*

Description

Method for total deviance value extraction.

Usage

```
## S3 method for class 'pgam'
deviance(object, ...)
```

Arguments

`object`	object of class `pgam` holding the fitted model
`...`	further arguments passed to method

Details

See `predict.pgam` for further information on deviance extration in Poisson-Gamma models.

Value

The sum of deviance components.

Author(s)

Washington Leite Junger <wjunger@ims.uerj.br> and Antonio Ponce de Leon <ponce@ims.uerj.br>

References

Harvey, A. C., Fernandes, C. (1989) Time series models for count data or qualitative observations. Journal of Business and Economic Statistics, 7(4):407–417

Junger, W. L. (2004) Semiparametric Poisson-Gamma models: a roughness penalty approach. MSc Dissertation. Rio de Janeiro, PUC-Rio, Department of Electrical Engineering.

See Also

`pgam`, `pgam.fit`, `pgam.likelihood`

Examples

```
library(pgam)
data(aihrio)
attach(aihrio)
form <- ITRESP5~f(WEEK)+HOLIDAYS+rain+PM+g(tmpmax,7)+g(wet,3)
m <- pgam(form,aihrio,omega=.8,beta=.01,maxit=1e2,eps=1e-4,optim.method="BFGS")

deviance(m)
```

`envelope.pgam` *Normal plot with simulated envelope of the residuals.*

Description

A normal plot with simulated envelope of the residual is produced.

Usage

```
## S3 method for class 'pgam'
envelope(object, type = "deviance", size = 0.95,
rep = 19, optim.method = NULL, epsilon = 0.001, maxit = 100,
plot = TRUE, title="Simulated Envelope of Residuals", verbose = FALSE, ...)
```

Arguments

`object`	object of class `pgam` holding the fitted model
`type`	type of residuals to be extracted. Default is `deviance`. Options are described in `residuals.pgam`
`size`	value giving the size of the envelope. Default is `.95` which is equivalent to a 95% band
`rep`	number of replications for envelope construction. Default is `19`, that is the smallest 95% band that can be build
`optim.method`	optimization method to be passed to `pgam` and therefore to `optim`
`epsilon`	convergence control to be passed to `pgam`
`maxit`	convergence control to be passed to `pgam`
`plot`	if `TRUE` a plot of the envelope is produced
`title`	title for the plot
`verbose`	if `TRUE` a sort of information is printed during the running time
`...`	further arguments to `plot` function

Details

Method for the generic function envelope.

Sometimes the usual Q-Q plot shows an unsatisfactory pattern of the residuals of a model fitted and we are led to think that the model is badly specificated. The normal plot with simulated envelope indicates that under the distribution of the response variable the model is OK if only a few points fall off the envelope.

If `object` is of class `pgam` the envelope is estimated and optionally plotted, else if is of class `envelope` then it is only plotted.

Value

An object of class `envelope` holding the information needed to plot the envelope.

Author(s)

Washington Leite Junger <wjunger@ims.uerj.br> and Antonio Ponce de Leon <ponce@ims.uerj.br>

References

Atkinson, A. C. (1985) Plots, transformations and regression : an introduction to graphical methods of diagnostic regression analysis. Oxford Science Publications, Oxford.

See Also

pgam, predict.pgam, residuals.pgam

---

f *Utility function*

Description

Generate the partition of design matrix regarded to the seasonal factor in its argument. Used in the model formula.

Usage

```
f(factorvar)
```

Arguments

`factorvar`	variable with the seasonal levels

Value

List containing data matrix of dummy variables, level names and seasonal periods.

Note

This function is intended to be called from within a model formula.

Author(s)

Washington Leite Junger <wjunger@ims.uerj.br>

See Also

pgam, formparser

`fitted.pgam` *Fitted values extraction*

Description

Method for fitted values extraction.

Usage

```
## S3 method for class 'pgam'
fitted(object, ...)
```

Arguments

`object`	object of class `pgam` holding the fitted model
`...`	further arguments passed to method

Details

Actually, the fitted values are worked out by the function `predict.pgam`. Thus, this method is supposed to turn fitted values extraction easier. See `predict.pgam` for details on one-step ahead prediction.

Value

Vector of predicted values of the model fitted.

Author(s)

Washington Leite Junger <wjunger@ims.uerj.br> and Antonio Ponce de Leon <ponce@ims.uerj.br>

References

Harvey, A. C., Fernandes, C. (1989) Time series models for count data or qualitative observations. Journal of Business and Economic Statistics, 7(4):407–417

Junger, W. L. (2004) Semiparametric Poisson-Gamma models: a roughness penalty approach. MSc Dissertation. Rio de Janeiro, PUC-Rio, Department of Electrical Engineering.

See Also

pgam, pgam.fit, predict.pgam

Examples

```
library(pgam)
data(aihrio)
attach(aihrio)
form <- ITRESP5~f(WEEK)+HOLIDAYS+rain+PM+g(tmpmax,7)+g(wet,3)
m <- pgam(form,aihrio,omega=.8,beta=.01,maxit=1e2,eps=1e-4,optim.method="BFGS")

f <- fitted(m)
```

---

g *Utility function*

Description

Collect information to smooth the term in its argument. Used in the model formula.

Usage

```
g(var, df = NULL)
```

Arguments

var	variable to be smoothed
df	equivalent degrees of freedom to be passed to the smoother. If NULL, smoothing parameter is selected by cross-validation

Details

This function only sets things up for model fitting. The smooth terms are actually fitted by bkfsmooth.

Value

List containing the same elements of its argument.

Note

This function is intended to be called from within a model formula.

Author(s)

Washington Leite Junger <wjunger@ims.uerj.br>

References

Green, P. J., Silverman, B. W. (1994) Nonparametric Regression and Generalized Linear Models: a roughness penalty approach. Chapman and Hall, London

Hastie, T. J., Tibshirani, R. J.(1990) Generalized Additive Models. Chapman and Hall, London

Junger, W. L. (2004) Semiparametric Poisson-Gamma models: a roughness penalty approach. MSc Dissertation. Rio de Janeiro, PUC-Rio, Department of Electrical Engineering.

See Also

pgam, formparser

`logLik.pgam` *Loglik extraction*

Description

Method for loglik value extraction.

Usage

```
## S3 method for class 'pgam'
logLik(object, ...)
```

Arguments

`object`	object of class `pgam` holding the fitted model
`...`	further arguments passed to method

Details

See `pgam.likelihood` for more information on log-likelihood evaluation in Poisson-Gamma models.

Value

The maximum value achieved by the likelihood optimization process.

Author(s)

Washington Leite Junger <wjunger@ims.uerj.br> and Antonio Ponce de Leon <ponce@ims.uerj.br>

References

Harvey, A. C., Fernandes, C. (1989) Time series models for count data or qualitative observations. Journal of Business and Economic Statistics, 7(4):407–417

Junger, W. L. (2004) Semiparametric Poisson-Gamma models: a roughness penalty approach. MSc Dissertation. Rio de Janeiro, PUC-Rio, Department of Electrical Engineering.

See Also

pgam, pgam.fit, pgam.likelihood

Examples

```
library(pgam)
data(aihrio)
attach(aihrio)
form <- ITRESP5~f(WEEK)+HOLIDAYS+rain+PM+g(tmpmax,7)+g(wet,3)
m <- pgam(form,aihrio,omega=.8,beta=.01,maxit=1e2,eps=1e-4,optim.method="BFGS")

logLik(m)
```

---

periodogram *Raw Periodogram*

Description

A raw periodogram is returned and optionally plotted.

Usage

```
periodogram(y, rows = trunc(length(na.omit(y))/2-1), plot = TRUE, ...)
```

Arguments

y	time series
rows	number of rows to be returned. Default and largest is $n/2 - 1$, where n is the number of valid observations of the time series y
plot	if TRUE a raw periodogram is plotted
...	further arguments to plot function

Details

The raw periodogram is an estimator of the spectrum of a time series, it still is a good indicator of unresolved seasonality patterns in residuals of the fitted model. Check the function intensity for frequencies extraction.

This function plots a fancy periodogram where the intensities of the angular frequencies are plotted resembling tiny lollipops.

Value

Periodogram ordered by intensity.

Author(s)

Washington Leite Junger <wjunger@ims.uerj.br> and Antonio Ponce de Leon <ponce@ims.uerj.br>

References

Box, G., Jenkins, G., Reinsel, G. (1994) Time Series Analysis : Forecasting and Control. 3rd edition, Prentice Hall, New Jersey.

Diggle, P. J. (1989) Time Series : A Biostatistical Introduction. Oxford University Press, Oxford.

See Also

pgam

---

pgam *Poisson-Gamma Additive Models*

Description

Fit Poisson-Gamma Additive Models using the roughness penalty approach

Usage

```
pgam(formula, dataset, omega = 0.8, beta = 0.1, offset = 1, digits = getOption("digits"),
na.action="na.exclude", maxit = 100, eps = 1e-06, lfn.scale=1, control = list(),
optim.method = "L-BFGS-B", bkf.eps = 0.001, bkf.maxit = 100, se.estimation = "numerical",
verbose = TRUE)
```

Arguments

formula	a model formula. See formparser for details
dataset	a data set in the environment search path. Missing data is temporarily not handled
omega	initial value for the discount factor
beta	vector of initial values for covariates coefficients. If a sigle value is supplied it is replicated to fill in the whole vector
offset	default is 1. Other value can be supplied here
digits	number of decimal places for printing information out
na.action	action to be taken if missing values are found. Default is "na.exclude" and residuals and predictions are padded to fit the length of the data. If "na.fail" then the process will stop if missing values are found. If "na.omit" the process will continue without padding though. If "na.pass" the process will stop due to errors
maxit	convergence control iterations
eps	convergence control criterion
lfn.scale	scales the likelihood function and is passed to control in optim. Value must be positive to ensure maximization
control	convergence control of optim. See its help for details

optim.method	optimization method passed to optim. Different methods can lead to different results, so the user must attempt to the trade off between speed and robustness. For example, BFGS is faster but sensitive to starting values and L-BFGS-B is more robust but slower. See its help for details.
bkf.eps	convergence control criterion for the backfitting algorithm
bkf.maxit	convergence control iterations for the backfitting algorithm
se.estimation	if numerical numerical standard error of parameters are returned. If analytical then analytical extraction of the standard errors is performed. By setting it to none standard error estimation is avoided
verbose	if TRUE information during estimation process is printed out

Details

The formula is parsed by formparser in order to extract all the information necessary for model fit. Split the model into two parts regarding the parametric nature of the model. A model can be specified as following:

$$Y \; f\left(sf_r\right) + V1 + V2 + V3 + g\left(V4, df_4\right) + g\left(V5, df_5\right)$$

where sf_r is a seasonal factor with period r and df_i is the degree of freedom of the smoother of the i-th covariate. Actually, two new formulae will be created:

$$sf_1 + \ldots + sf_r + V1 + V2 + V3$$

and

$$V4 + V5$$

These two formulae will be used to build the necessary datasets for model estimation. *Dummy* variables reproducing the seasonal factors will be created also.

Models without explanatory variables must be specified as in the following formula

$$Y \; NULL$$

There are a lot of details to be written. It will be very soon.

Specific information can be obtained on functions help.

This algorithm fits fully parametric Poisson-Gamma model also.

Value

List containing an object of class pgam.

Author(s)

Washington Leite Junger <wjunger@ims.uerj.br> and Antonio Ponce de Leon <ponce@ims.uerj.br>

References

Junger, W. L. (2004) Semiparametric Poisson-Gamma models: a roughness penalty approach. MSc Dissertation. Rio de Janeiro, PUC-Rio, Department of Electrical Engineering.

Harvey, A. C., Fernandes, C. (1989) Time series models for count data or qualitative observations. Journal of Business and Economic Statistics, 7(4):407–417

Green, P. J., Silverman, B. W. (1994) Nonparametric Regression and Generalized Linear Models: a roughness penalty approach. Chapman and Hall, London

See Also

predict.pgam, formparser, residuals.pgam, backfitting

Examples

```
library(pgam)
data(aihrio)
attach(aihrio)
form <- ITRESP5~f(WEEK)+HOLIDAYS+rain+PM+g(tmpmax,7)+g(wet,3)
m <- pgam(form,aihrio,omega=.8,beta=.01,maxit=1e2,eps=1e-4,optim.method="BFGS")

summary(m)
```

---

plot.pgam *Plot of estimated curves*

Description

Plot of the local level and, when semiparametric model is fitted, the estimated smooth terms.

Usage

```
## S3 method for class 'pgam'
plot(x, rug = TRUE, se = TRUE, at.once = FALSE, scaled = FALSE, ...)
```

Arguments

x	object of class pgam holding the fitted model
rug	if TRUE a density rug is drawn on the bottom of the graphic
se	if TRUE error band is drawn around the fitted values
at.once	if TRUE each plot goes to a separate window, else the user is prompted to continue
scaled	if TRUE the same scale will be used for plots of smoothed functions
...	further arguments passed to method

Details

Error band of smooth terms is approximated.

Value

No value returned.

Author(s)

Washington Leite Junger <wjunger@ims.uerj.br> and Antonio Ponce de Leon <ponce@ims.uerj.br>

See Also

pgam, pgam.fit, pgam.likelihood

Examples

```
library(pgam)
data(aihrio)
attach(aihrio)
form <- ITRESP5~f(WEEK)+HOLIDAYS+rain+PM+g(tmpmax,7)+g(wet,3)
m <- pgam(form,aihrio,omega=.8,beta=.01,maxit=1e2,eps=1e-4,optim.method="BFGS")

plot(m,at.once=TRUE)
```

---

predict.pgam *Prediction*

Description

Prediction and forecasting of the fitted model.

Usage

```
## S3 method for class 'pgam'
predict(object, forecast = FALSE, k = 1, x = NULL, ...)
```

Arguments

object	object of class pgam holding the fitted model
forecast	if TRUE the function tries to forecast
k	steps for forecasting
x	covariate values for forecasting if the model has covariates. Must have the k rows and p columns
...	further arguments passed to method

Details

It estimates predicted values, their variances, deviance components, generalized Pearson statistics components, local level, smoothed prediction and forecast.

Considering a Poisson process and a gamma priori, the predictive distribution of the model is negative binomial with parameters $a_{t|t-1}$ and $b_{t|t-1}$. So, the conditional mean and variance are given by

$$E\left(y_t|Y_{t-1}\right) = a_{t|t-1}/b_{t|t-1}$$

and

$$Var\left(y_t|Y_{t-1}\right) = a_{t|t-1}\left(1+b_{t|t-1}\right)/b_{t|t-1}^2$$

Deviance components are estimated as follow

$$D\left(y;\hat{\mu}\right) = 2\sum_{t=\tau+1}^{n} a_{t|t-1}\log\left(\frac{a_{t|t-1}}{y_t b_{t|t-1}}\right) - \left(a_{t|t-1}+y_t\right)\log\frac{\left(y_t+a_{t|t-1}\right)}{\left(1+b_{t|t-1}\right)y_t}$$

Generalized Pearson statistics has the form

$$X^2 = \sum_{t=\tau+1}^{n} \frac{\left(y_t b_{t|t-1} - a_{t|t-1}\right)^2}{a_{t|t-1}\left(1+b_{t|t-1}\right)}$$

Approximate scale parameter is given by the expression

$$\hat{\phi} = fracX^2 edf$$

where edf is the number o degrees of reedom of the fitted model.

Value

List with those described in **Details**

Author(s)

Washington Leite Junger <wjunger@ims.uerj.br> and Antonio Ponce de Leon <ponce@ims.uerj.br>

References

Green, P. J., Silverman, B. W. (1994) Nonparametric Regression and Generalized Linear Models: a roughness penalty approach. Chapman and Hall, London

Harvey, A. C., Fernandes, C. (1989) Time series models for count data or qualitative observations. Journal of Business and Economic Statistics, 7(4):407–417

Junger, W. L. (2004) Semiparametric Poisson-Gamma models: a roughness penalty approach. MSc Dissertation. Rio de Janeiro, PUC-Rio, Department of Electrical Engineering.

Harvey, A. C. (1990) Forecasting, structural time series models and the Kalman Filter. Cambridge, New York

Hastie, T. J., Tibshirani, R. J.(1990) Generalized Additive Models. Chapman and Hall, London

McCullagh, P., Nelder, J. A. (1989). Generalized Linear Models. Chapman and Hall, 2nd edition, London

See Also

pgam, residuals.pgam

Examples

```
library(pgam)
data(aihrio)
attach(aihrio)
form <- ITRESP5~f(WEEK)+HOLIDAYS+rain+PM+g(tmpmax,7)+g(wet,3)
m <- pgam(form,aihrio,omega=.8,beta=.01,maxit=1e2,eps=1e-4,optim.method="BFGS")

p <- predict(m)$yhat
plot(ITRESP5)
lines(p)
```

---

print.pgam *Model output*

Description

Print model information

Usage

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

Arguments

x	object of class summary.pgam holding the fitted model information
digits	number of decimal places for output
...	further arguments passed to method

Details

This function only prints out the information.

Value

No value is returned.

Author(s)

Washington Leite Junger <wjunger@ims.uerj.br> and Antonio Ponce de Leon <ponce@ims.uerj.br>

See Also

pgam, predict.pgam

print.summary.pgam *Summary output*

Description

Print output of model information

Usage

```
## S3 method for class 'pgam'
print.summary(x, digits, ...)
```

Arguments

x	object of class summary.pgam holding the fitted model information
digits	number of decimal places for output
...	further arguments passed to method

Details

This function actually only prints out the information.

Value

No value is returned.

Author(s)

Washington Leite Junger <wjunger@ims.uerj.br> and Antonio Ponce de Leon <ponce@ims.uerj.br>

See Also

pgam, predict.pgam

residuals.pgam *Residuals extraction*

Description

Method for residuals extraction.

Usage

```
## S3 method for class 'pgam'
residuals(object, type = "deviance", ...)
```

Arguments

`object`	object of class `pgam` holding the fitted model
`type`	type of residuals to be extracted. Default is `deviance`. Options are described in **Details**
`...`	further arguments passed to method

Details

The types of residuals available and a brief description are the following:

`response`
These are raw residuals of the form $r_t = y_t - E(y_t|Y_{t-1})$.

`pearson`
Pearson residuals are quite known and for this model they take the form $r_t = (y_t - E(y_t|Y_{t-1}))/Var(y_t|Y_{t-1})$.

`deviance`
Deviance residuals are estimated by $r_t = sign(y_t - E(y_t|Y_{t-1})) * sqrt(d_t)$, where d_t is the deviance contribution of the *t*-th observation. See `deviance.pgam` for details on deviance component estimation.

`std_deviance`
Same as deviance, but the deviance component is divided by $(1 - h_t)$, where h_t is the *t*-th element of the diagonal of the pseudo hat matrix of the approximating linear model. So they turn into $r_t = sign(y_t - E(y_t|Y_{t-1})) * sqrt(d_t/(1 - h_t))$.
The element h_t has the form $h_t = \omega \exp(\eta_{t+1}) / \sum_{j=0}^{t-1} \omega^j \exp(\eta_{t-j})$, where η is the predictor of the approximating linear model.

`std_scl_deviance`
Just like the last one except for the dispersion parameter in its expression, so they have the form $r_t = sign(y_t - E(y_t|Y_{t-1})) * sqrt(d_t/\phi * (1 - h_t))$, where ϕ is the estimated dispersion parameter of the model. See `summary.pgam` for ϕ estimation.

Value

Vector of residuals of the model fitted.

Author(s)

Washington Leite Junger <wjunger@ims.uerj.br> and Antonio Ponce de Leon <ponce@ims.uerj.br>

References

Harvey, A. C., Fernandes, C. (1989) Time series models for count data or qualitative observations. Journal of Business and Economic Statistics, 7(4):407–417

Junger, W. L. (2004) Semiparametric Poisson-Gamma models: a roughness penalty approach. MSc Dissertation. Rio de Janeiro, PUC-Rio, Department of Electrical Engineering.

McCullagh, P., Nelder, J. A. (1989). Generalized Linear Models. Chapman and Hall, 2nd edition, London

Pierce, D. A., Schafer, D. W. (1986) Residuals in generalized linear models. Journal of the American Statistical Association, 81(396),977-986

See Also

pgam, pgam.fit, predict.pgam

Examples

```
library(pgam)
data(aihrio)
attach(aihrio)
form <- ITRESP5~f(WEEK)+HOLIDAYS+rain+PM+g(tmpmax,7)+g(wet,3)
m <- pgam(form,aihrio,omega=.8,beta=.01,maxit=1e2,eps=1e-4,optim.method="BFGS")

r <- resid(m,"pearson")
plot(r)
```

---

summary.pgam *Summary output*

Description

Output of model information

Usage

```
## S3 method for class 'pgam'
summary(object, smo.test = FALSE, ...)
```

Arguments

object	object of class pgam holding the fitted model
smo.test	Approximate significance test of smoothing terms. It can take long, so default is FALSE
...	further arguments passed to method

Details

Hypothesis tests of coefficients are based o t distribution. Significance tests of smooth terms are approximate for model selection purpose only. Be very careful about the later.

Value

List containing all the information about the model fitted.

Author(s)

Washington Leite Junger <wjunger@ims.uerj.br> and Antonio Ponce de Leon <ponce@ims.uerj.br>

References

Harvey, A. C., Fernandes, C. (1989) Time series models for count data or qualitative observations. Journal of Business and Economic Statistics, 7(4):407–417

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Hastie, T. J., Tibshirani, R. J.(1990) Generalized Additive Models. Chapman and Hall, London

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See Also

pgam, predict.pgam

Examples

```
library(pgam)
data(aihrio)
attach(aihrio)
form <- ITRESP5~f(WEEK)+HOLIDAYS+rain+PM+g(tmpmax,7)+g(wet,3)
m <- pgam(form,aihrio,omega=.8,beta=.01,maxit=1e2,eps=1e-4,optim.method="BFGS")

summary(m)
```

---

tbl2tex *LaTeX table exporter*

Description

Export a data frame to a fancy LaTeX table environment.

Usage

```
tbl2tex(tbl, label = "tbl:label(must_be_changed!)",
caption = "Table generated with tbl2tex.", centered = TRUE,
alignment = "center", digits = getOption("digits"), hline = TRUE,
vline = TRUE, file = "", topleftcell = "   ")
```

Arguments

tbl	object of type data frame or matrix
label	label for LaTeX cross reference
caption	caption for LaTeX tabular environment
centered	logical. TRUE for centered cells
alignment	alignment of the object on the page
digits	decimal digits after decimal point
hline	logical. TRUE for horizontal borders
vline	logical. TRUE for vertical borders
file	filename for outputting. If none is provided, LaTeX code is routed through the console
topleftcell	text for the top-left cell of the table

Details

This is a utility function intended to ease convertion of *R* objects to LaTeX format. It only exports data frame or data matrix nonetheless.

Value

LaTeX code is routed through file or console for copying and pasting.

Note

For now, it handles only numerical data.

Author(s)

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See Also

pgam

Examples

```
library(pgam)
data(aihrio)
m <- aihrio[1:10,4:10]
tbl2tex(m,label="tbl:r_example",caption="R example of tbl2tex",digits=4)
```

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