Package 'mreg'

February 20, 2015

Type Package

Title Fits regression models when the outcome is partially missing.

Version 1.1

Date 2007-06-24

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Description Implements the methods described in Bond S, Farewell V, 2006, Exact Likelihood Estimation for a Negative Binomial Regression Model with Missing Outcomes, Biometrics

License GPL

NeedsCompilation no

Repository CRAN

Date/Publication 2013-11-13 15:35:12

R topics documented:

`mreg-package` *Implements the techniques of exact likelihood when the discrete outcome can be missing in a regression model.*

Description

Implements the methods described in Bond S, Farewell V, 2006, Exact Likelihood Estimation for a Negative Binomial Regression Model with Missing Outcomes, Biometrics, Submitted. The main function is `mreg`.

Details

Package:	mreg
Type:	Package
Version:	1.1
Date:	2007-06-24
License:	GPL version 2

Author(s)

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References

Bond S, Farewell V, 2007, Exact Likelihood Estimation for a Negative Binomial Regression Model with Missing Outcomes

`internals` *Internal functions for the mreg package*

Description

These are functions internal to the mreg package, and should not be directly invoked by the user: `chop` `densityfn` `form.add` `invlinkfn` `linkfn` `logLik` `logLik2` `minimand` `minimand2` `randfn`

Note

The main routine in the mreg package is `mreg`.

Author(s)

Simon Bond, <simon.bond@mrc-bsu.cam.ac.uk>

See Also

mreg

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mreg *To perform regression when discrete outcome variables are missing*

Description

This software was created for the paper referred to below. If a longitudinal data base has regularly updated explanatory variables, but whose outcome variable is only intermittently collected then we can still perform exact maximum likelihood estimation of a regression model if the outcome variable is discrete.

Usage

```
mreg(formula, data, patid, start.theta = NULL, modify = unity, modify.p = 0,
 mod.formula = ~1, density.name = negbin, link = log,
iterlim = 100, gradtol = 1e-06, steptol = 1e-06, na.action = NULL,
print.level = 2, zero.start = FALSE)
```

Arguments

formula	This is a formula object e.g. Y~A+B to describe the location parameter
data	This is a dataframe in which the variables are recorded
patid	In a longitudinal context this indexes the individuals. Note that the observations within each patient is assumed to be ordered according the timing of the observations.
start.theta	Optional vector of starting values for location and nuisance parameters
modify	We may wish to let the location depend on functions of the previous outcomes. Since these may be missing, we have to provide a function that can cope with all the potential values the outcome may have taken. See paper and unity for examples .
modify.p	This is the dimension of the parameters associated with the modify function.
mod.formula	If we require other variables to interact with the previous observation we must create a set of variables to use. This is a one-sided formula e.g. ~X+Z, if we wanted to use those variables.
density.name	This is the density the increment in outcome is assumed to follow. It can be one of three values: negbin, poisson, geometric.
link	This is the link function $g(\mu) = \eta$. Where η is a linear combination of covariates, and μ is the expected value of the outcome. The link function can be one of four values: identity, log, logit, hyper.

iterlim	The maximum number of iterations allowed for the nlm function.
gradtol	The parameter gradtol for the nlm function.
steptol	The parameter steptol for the nlm function
na.action	Parameter is not used: If any covariates are missing the function will return an error.
print.level	The parameter print.level for the nlm function. Set to the maximum, verbose level.
zero.start	It may be the case that it is known that the first value of the outcome was zero for all individuals, in which case invoke this TRUE/FALSE option.

Value

It returns an object of class mreg which is similar to a lm object. It has print and summary methods to display the fitted parameters and standard errors.

Author(s)

Simon Bond <simon.bond@mrc-bsu.cam.ac.uk>

References

Bond S, Farewell V, 2006, Exact Likelihood Estimation for a Negative Binomial Regression Model with Missing Outcomes, Biometrics, Submitted

See Also

print.mreg, summary.mreg, paper, unity

Examples

```
data(public)
T<-TRUE; F<-FALSE
## Not run:

mod1 <- mreg( damaged~offset(log(intervisit.time))+esr.init,
data=public,patid=ptno,print.level=2, iterlim=1000 )


mod.ncar <-mreg(damaged ~ offset(log(intervisit.time)) + esr.init +
    tender + effused + clinic.time, data = public, patid = ptno,
    modify = paper, modify.p = 5, mod.formula = ~art.dur.init,
    density.name = "negbin.ncar", iterlim = 1000, print.level = 2)



## End(Not run)
```

paper *An example of a function to calculate the effect on the location that depends on previous outcome in an mreg model*

Description

In a regression model one may want to let the linear predictor depend on previous values of the outcome variable in longitudinal data. When the outcome variable is missing we can still do this but we have to create a function that calculates a vector of linear predictors with one element for each of the possible preceding values of the outcome.

Usage

```
paper(x, y, mod.Z)
```

Arguments

x	is a vector of possible values the previous value of the reponse could take.
y	is an vector of the coefficients. Its lenght is specified in the mreg function by the argument modify.p.
mod.Z	vector of observed covariates that may interact with the unobserved preceding outcome corresponding to the observation. It is taken from the model.frame produced by the mod.formula argument in mreg.

Details

This is an example function that was used in the paper referred to below. The user may write their own function as long as it takes the arguments specified above and returns a vector the same length as x that will be added to the linear predictor. It is up to the user to ensure that their function identifies the correct column of mod.Z using indices ([] that correspond to the desired variables in mod.formula.

If any function other than unity (which does nothing to the linear predictor) is used then it is not possible to produce fitted values or residuals.

Value

A numeric vector the same length as x that will be added to the linear predictor.

It also has two subsidiary attributes: par.names names to be used to label the associated coefficients, and par.dim the length of this vector of coefficients.

Author(s)

Simon Bond <simon.bond@mrc-bsu.cam.ac.uk>

References

Bond S, Farewell V, 2006, Exact Likelihood Estimation for a Negative Binomial Regression Model with Missing Outcomes

See Also

unity, mreg

Examples

```
## The function is currently defined as
function(x,y, mod.Z){
  #x is the imputed response
  #y is the set of parameters
  #mod.Z is a VECTOR/matrix of explanatory variables
  rad.type <- cut(x, breaks=c(-1,0,4,9,50))
  if( is.vector(mod.Z)){
    arthdur.first <- rep(mod.Z[2],length(x))
  }
  else{
    arthdur.first <- rep(mod.Z[1,2], length(x))
  }
  X <- model.matrix( ~rad.type+I(x==0):arthdur.first)
  structure( X[,-1, drop=FALSE]%*%y, par.names= colnames( X)[-1],par.dim=dim(X)[2]-1)
  }
```

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print.mreg *Prints the coefficients from an mreg object*

Description

Similar to `print.lm`, it prints the coefficients from an mreg regression model

Usage

```
## S3 method for class 'mreg'
print(x, digits = max(3, getOption("digits") - 3), ...)
```

Arguments

x	An mreg object
digits	number of digits to print decimals to.
...	further arguments to the function `print.lm`

Author(s)

Simon Bond, <simon.bond@mrc-bsu.cam.ac.uk>

See Also

mreg, summary.mreg

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public *Subset of Arthritis Data*

Description

This is a subset of 100 patients and variables from the clinical data used in the paper below. *Not to be used in publications without permission of the authors.*

Usage

```
data(public)
```

Format

A data frame with 943 observations on the following 8 variables.

`damaged` The number of radiologically damaged joints

`intervisit.time` Time between clinic visits

`esr.init` The first ESR measurment

`art.dur.init` The duration of arthritis at first clinic visit

`tender` Count of the number of tender joints

`effused` Count of the number of effused joints

`ptno` Anonymous patient number

`clinic.time` Total time spend under clinical care

Author(s)

Vern Farewell, <vern.farewell@mrc-bsu.cam.ac.uk>;

Simon Bond, <simon.bond@mrc-bsu.cam.ac.uk>

Source

Bond S, Farewell V, 2006, Exact Likelihood Estimation for a Negative Binomial Regression Model with Missing Outcomes

Examples

```
data(public)
## maybe str(public) ; plot(public) ...
```

summary.mreg *Prints a summary of an mreg object*

Description

Similar to summary.glm, it prints the coefficients, standard erros, Wald tests, residuals (if available) and dispersion from an mreg object.

Usage

```
## S3 method for class 'mreg'
summary(object, digits = max(3, getOption("digits") - 3),
symbolic.cor = object$symbolic.cor,
signif.stars = getOption("show.signif.stars"), ...)
```

Arguments

object	An mreg object
digits	number of digits to print decimals to.
symbolic.cor	see summary.lm
signif.stars	Whether or not to print the star coding of statistical significance
...	further argument

Author(s)

Simon Bond, <simon.bond@mrc-bsu.cam.ac.uk>

See Also

mreg, print.mreg

unity *The default value of 'modify' function in 'mreg'*

Description

If the location term in a regression model does not depend on any previously observed values of the outcome in a longitudinal data set, then we obtain simplication in our estimation procedure when the outcomes can be missing. Using the default value of unity for the argument modify in the mreg function does this.

Usage

```
unity(x, y, mod.Z)
```

Arguments

x	is a vector of possible values the previous value of the reponse could take.
y	is an vector of the coefficients. Its lenght is specified in the mreg function by the argument modify.p. For this function, unity, it is not used and modify.p=1.
mod.Z	vector of observed covariates that may interact with the unobserved preceding outcome corresponding to the observation. It is taken from the mode.frame produced by the mod.formula argument in mreg. For this function unity there are no such covariates. A default value for mod.formula is ~1.

Details

This function is the default value for the argument modify for mreg. It does nothing to the linear predictor term.

Value

A vector of zeroes the same length is the argument x.

Author(s)

Simon Bond <simon.bond@mrc-bsu.cam.ac.uk>

References

Bond S, Farewell V, 2006, Exact Likelihood Estimation for a Negative Binomial Regression Model with Missing Outcomes

See Also

paper, mreg

Examples

```
##---- Should be DIRECTLY executable !! ----
##-- ==>  Define data, use random,
##--or do  help(data=index)  for the standard data sets.

## The function is currently defined as
function(x,y,mod.Z){

 structure( rep(0,length(x)), par.names=NULL, par.dim=0    )
  }
```

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