Package ‘DBR’

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Type Package

Title Discrete Beta Regression

Version 1.4.1

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Description Bayesian Beta Regression, adapted for bounded discrete responses, commonly seen in survey responses.
Estimation is done via Markov Chain Monte Carlo sampling, using a Gibbs wrapper around univariate slice sampler
(Neal (2003) <DOI:10.1214/aos/1056562461>), as implemented in the R package MfUSampler
(Mahani and Sharabiani (2017) <DOI:10.18637/jss.v078.c01>).

License GPL (>= 2)

Depends R (>= 3.5.0)

Imports MfUSampler, methods, coda

NeedsCompilation no

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coda_wrapper *Utility function to call MCMC diagnostic functions in the coda package*

Description

Utility function to call MCMC diagnostic functions in the coda package

Usage

```
coda_wrapper(dbr_obj, coda_function, ...)
```

Arguments

`dbr_obj`	An object of class `dbr`, typically the output of the function `dbr`.
`coda_function`	A function in the **coda** package, with first argument being an `mcmc` object.
`...`	Arguments to be passed to `coda_function`.

Value

The output of `coda_function`.

Author(s)

Mansour T.A. Sharabiani, Alireza S. Mahani

Examples

```
library("DBR")
library("coda")
data("pain")
est <- dbr(
  interference ~ severity + age
  , pain
  , control = dbr.control(
    nsmp = 50
    , nburnin = 25
  )
)
coda_wrapper(est, autocorr, lag = c(0, 5))
```

dbr *Discretised Beta Regression for Survey-Response Analysis*

Description

Discretised Beta Regression for Survey-Response Analysis

Usage

```
dbr(
  formula
  , data
  , control = dbr.control()
  , yunique = NULL
  , wghts = rep(1, nrow(data))
)
dbr.control(
  nsmp = 100
  , nburnin = 50
  , estimate_left_buffer = FALSE
  , estimate_right_buffer = FALSE
  , buffer_max = 5.0
)
```

Arguments

`formula` Standard `R` formula describing the response variable and predictors.

`data` Data frame containing response and predictors as described in `formula`.

`control` List of parameters for controlling the MCMC estimation.

`yunique` Vector of values/levels that the response variable can assume. If not specified, this will be extracted from the `data` according to the `formula`.

`wghts` Vector of weights to be applied during model estimation. Default is a uniform weight vector.

`nsmp` Number of MCMC samples to collect, including the burnin phase.

`nburnin` Number of initial MCMC samples to discard before calculating parameter estimates.

`estimate_left_buffer`
Boolean flag indicating whether to estimate a left buffer from the data.

`estimate_right_buffer`
Boolean flag indicating whether to estimate a right buffer from the data.

`buffer_max` Maximum size of left/right buffer, only used if above flags are set to TRUE.

Value

An object of class `dbr`, which is a list containing the following fields:

`formula` Same as input.

`control` Same as input.

`yunique` Same as input.

`wghts` Same as input.

`est` An internal object containing estimation results. Should not be accessed directly by user. Use `summary` and `predict` instead.

`data` Same as input.

Author(s)

Mansour T.A. Sharabiani, Alireza S. Mahani

See Also

`summary.dbr`, `predict.dbr`

Examples

```
library("DBR")
data("pain")
est <- dbr(
  interference ~ severity + age
  , pain
  , control = dbr.control(
    nsmp = 50
    , nburnin = 25
  )
)
```

`pain` *Pain Data*

Description

Based on a survey of nearly 10,000 patients in UK health clinics during 2010-2014 to assess the quality of care they received.

Usage

```
data("pain")
```

Format

A data frame with 1318 observations on the following 3 variables.

`severity` Average of 4 responses, each on a 0-10 scale (11 levels). They measure patients' perception of pain severity - over the 7 days leading up to the survey - at (1) its worst, (2) at its least, (3) on average, and (4) right now.

`interference` Average of 7 scores, each on a 0-10 scale (11 levels). These questions measure - over the 7 days leading up to the survey - the level of interference of pain in patient's life along the following dimensions: (1) general activity, (2) mood, (3) walking ability, (4) normal work (outside of home and housework), (5) relations with other people, (6) sleep and (7) enjoyment of life.

`age` Age of respondents, in years.

`predict.dbr` *Predict method for Discretised Beta Regression Fits*

Description

Predict method for Discretised Beta Regression Fits

Usage

```
## S3 method for class 'dbr'
predict(
  object
  , newdata = NULL
  , type = c("sample", "point")
  , ...
)
```

Arguments

`object`	Standard `R` formula describing the response variable and predictors.
`newdata`	Data frame containing the predictors, matching the `dbr` call.
`type`	Whether to make point predictions or generate sample from the predictive distribution.
`...`	Further arguments passed to or from other methods.

Value

If `type` is 'point', this will be a vector of same length as `nrow(newdata)`, with unique values consistent with the `dbr` call. If `type` is 'sample', this will be a 2D array of size `nrow(data)` x `nsmp`.

Author(s)

Mansour T.A. Sharabiani, Alireza S. Mahani

Examples

```
## Not run:

library("DBR")

data("pain")
est <- dbr(
  interference ~ severity + age
  , pain
  , control = dbr.control(
    nsmp = 200
    , nburnin = 100
  )
)

predict(est, type = "point")


## End(Not run)
```

S3 methods *Summary, print, plot and coef methods for Discretised Beta Regression Fits*

Description

Summary, print, plot and coef methods for Discretised Beta Regression Fits

Usage

```
## S3 method for class 'dbr'
coef(
  object
  , prob = c(0.025, 0.5, 0.975)
  , ...
)
## S3 method for class 'dbr'
print(
  x
  , ...
)
## S3 method for class 'dbr'
summary(
  object
  , context
  , make_plot = TRUE
  , ...
)
## S3 method for class 'dbr'
plot(x, ...)
```

Arguments

object	Result of call to dbr.
x	Result of call to dbr.
prob	Vector of probabilities at which to calculate the posterior quantiles of model parameters.
make_plot	Whether to generate the context-dependent plots in the summary method.
context	Dataframe with a single row, containing all columns needed for prediction. These values are used for producing pseudo-coefficient plots in the summary method.
...	Further arguments passed to the functions.

Value

For coef, a 2D array of size length(prob) x nVar, where nVar is the number of model parameters. The latter itself is composed of left and right buffers, precision parameter of beta distribution, and covariate coefficients. Note that if left and/or right buffers were not estimated by dbr, their confidence interval will be identical to the point estimate. The print method prints the formula used to call dbr.

Author(s)

Mansour T.A. Sharabiani, Alireza S. Mahani

Examples

```
library("DBR")
data("pain")
est <- dbr(
  interference ~ severity + age
  , pain
  , control = dbr.control(
    nsmp = 50
    , nburnin = 25
  )
)
print(est)
plot(est)
coef(est, prob = c(0.05, 0.5, 0.95))
summary(est, context = pain[2, ])
```

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