Package 'ROlogit'

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Type Package

Title Fit Rank-Ordered Logit (RO-Logit) Model

Version 0.1.3

Description Implements the rank-ordered logit (RO-logit) model for stratified analysis of continuous outcomes introduced by Tan et al. (2017) <doi:10.1177/0962280217747309>. Model diagnostics based on the heuristic residuals and estimates in linear scales are available from the package, and outcomes with ties are supported.

Depends R (>= 3.1.0)

Imports survival (>= 2.41-3), evd (>= 2.3-2)

License LGPL-3

Encoding UTF-8

LazyData true

RoxygenNote 7.3.2

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Contents

hresid *Obtain the heuristic residuals.*

Description

Obtain the heuristic residuals.

Usage

```
hresid(y, svar, design.mat, o, initial.res.par = c(0, 0), ...)
```

Arguments

y	vector of numeric. The outcomes.
svar	vector of numeric. The strata variable.
design.mat	matrix. The design matrix including intercept term.
o	matrix. Contains the estimated coefficients of the RO-logit and their SEs.
initial.res.par	The initial values of the intercept and log(scale), to be passed to the optim function. The default values are set to c(0, 0), yet users are recommended to try a few initial values to make sure global optimum is reached.
...	Other parameters to be passed to the optim function. See optim for details.

Value

Returns a list containing the estimated intercept and log(scale), the covariance matrix of these two parameters, convergence status from optim, and the heuristic residuals.

inpat_bg *Inpatient blood glucose data for 2487 patients*

Description

A simulated dataset containing inpatient point-of-care blood glucose (BG) measurements from 2487 non-critical care adult patients above 40 years old. Data was simulated based on real data.

Usage

```
inpat_bg
```

Format

A data frame with 2487 rows and 13 variables:

bg_mean Mean BG readings within each episode, in mmol/L.

bg_sd Standard deviation of BG readings within each episode.

sex Gender of patients.

ward Whether each patient is in the medical ward (`ward = 0`) or surgical ward (`ward = 1`).

age_group Patient group defined based on the median age.

los_group Patient group defined based on the median of duration of monitoring episode.

bg_freq_group Patient group defined based on the median of daily BG monitoring frequency.

age Patients' age.

los Patients' duration of monitoring episode.

bg_freq Patients' daily BG monitoring frequency.

References

Tan CS, Støer NC, Chen Y, Andersson M, Ning Y, Wee HL, Khoo EY, Tai ES, Kao SL, Reilly M. A stratification approach using logit-based models for confounder adjustment in the study of continuous outcomes. Statistical methods in medical research. 2017 Jan 1:0962280217747309.

`loglikhresid` *The negative log likelihood function for obtaining heuristic residuals*

Description

Compute the negative log-likelihood for obtaining heuristic residuals.

Usage

```
loglikhresid(par, y, x, par1)
```

Arguments

`par`	vector of numeric. Contain the intercept, first entry, and coefficient of log(sigma), second entry.
`y`	vector of numeric. Centered outcomes within each stratum.
`x`	matrix. The design matrix including intercept term.
`par1`	vector of numeric. The estimated coefficients from RO-logit model.

qqplot.EVT1 *Make Q-Q plot for residual diagnostics.*

Description

Make Q-Q plot for residual diagnostics.

Usage

```
qqplot.EVT1(hresid, scale)
```

Arguments

hresid	vector of numeric. The heuristic residuals.
scale	numeric. The scale parameter.

Examples

```
## Not run:
hresid <- evd::rgumbel(n = 100, loc = 0, scale = 3)
qqplot.EVT1(hresid = hresid, scale = 3)

## End(Not run)
```

rologit *Fit RO-logit model and obtain heuristic residuals*

Description

Fit RO-logit model and obtain heuristic residuals

Usage

```
rologit(
  yvar,
  evar,
  cfdr = NULL,
  emod = NULL,
  svar,
  dat,
  method = "efron",
  initial.res.par = c(0, 0),
  plot = TRUE,
  ...
)
```

Arguments

yvar	string. Name of outcome variable.
evar	string (or vector of strings). Name of exposure(s).
cfdr	string (or vector of strings). Names of confounder(s). Default is NULL.
emod	string (or vector of strings). Name of effect modifier(s). Default is NULL.
svar	string. Name of stratum variable. Use NULL to fit model without stratification.
dat	data.frame. Contains all the variables needed for the analysis.
method	string. Use Efron ("efron") or Breslow ("breslow") method for handling ties in the outcome. The default is "efron". See coxph for details.
initial.res.par	The initial values of the intercept and log(scale), to be passed to the optim function. The default values are set to c(0, 0), yet users are recommended to try a few initial values to make sure global optimum is reached.
plot	logic. To plot the Q-Q plot for the heuristic residuals. Default is TRUE.
...	Other parameters to be passed to the optim function for the second stage analysis.

Value

Returns a list containing obj (the RO-Logit model fitted using coxph), hresid (the vector of heuristic residuals), logscale (log of scale parameter of the heuristic residuals), and coefficients (a data.frame with estimated coefficients before and after scaling).

References

- Allison PD, Christakis NA. Logit-models for sets of ranked items. Sociological Methodology 1994, Vol 24. 1994;24:199-228.
- Beggs S, Cardell S, Hausman J. Assessing the Potential Demand for Electric Cars. J Econometrics. 1981;17:1-19.
- Tan CS, Støer NC, Chen Y, Andersson M, Ning Y, Wee HL, Khoo EY, Tai ES, Kao SL, Reilly M. A stratification approach using logit-based models for confounder adjustment in the study of continuous outcomes. Statistical methods in medical research. 2017 Jan 1:0962280217747309.
- Therneau TM, Grambsch PM. Modeling Survival Data: Extending the Cox Model: Springer New York; 2000.

Examples

```
# Fit an RO-logit model to determine whether the glycaemic control of
# patients differs between medical and surgical wards.
data(inpat_bg)
# Divide patients into strata based on age, gender, duration of monitoring
# episodes, and frequency of daily BG measurements.
inpat_bg$group <- paste(inpat_bg$age_group, inpat_bg$sex, inpat_bg$los_group,
                        inpat_bg$bg_freq_group, sep = "|")
# Fit an RO-logit model with mean BG reading as the outcome and ward as the
# exposure:
```

```
obj <- rologit(yvar = "bg_mean", evar = "ward", svar = "group",
               dat = inpat_bg, initial.res.par = c(2, 2))
summary(obj)
```

`rologit.coxph` *Fit RO-logit model using Cox-PH*

Description

Fit RO-logit model using Cox-PH

Usage

```
rologit.coxph(design.mat, y, svar = NULL, method = "efron")
```

Arguments

`design.mat`	The design matrix without intercept term.
`y`	vector of numeric. The outcomes.
`svar`	vector of numeric. The strata variable.
`method`	string. Use Efron (`"efron"`) or Breslow (`"breslow"`) method for handling ties in the outcome. The default is `"efron"`. See `coxph` for details.

Value

Returns the model fitted using `coxph`.

`summary.rologit` *Summarise RO-Logit Model*

Description

Prints the estimated coefficients of an RO-Logit model.

Usage

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

Arguments

`object`	Model object fitted using `rologit`.
`...`	Additional arguments affecting the summary produced.

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