Package 'multipleOutcomes'

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Title Asymptotic Covariance Matrix of Regression Models for Multiple Outcomes

Version 0.2

Description Regression models can be fitted for multiple outcomes simultaneously. This package computes estimates of parameters across fitted models and returns the matrix of asymptotic covariance. Various applications of this package, including CUPED (Controlled Experiments Utilizing Pre-Experiment Data), multiple comparison adjustment, are illustrated.

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Encoding UTF-8

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Imports dplyr, ggplot2, mvtnorm, tidyr

Suggests knitr, rmarkdown

VignetteBuilder knitr

NeedsCompilation no

Author Han Zhang [aut, cre]

Maintainer Han Zhang <zhangh.ustc@gmail.com>

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coef.multipleOutcomes *Extract Model Coefficients*

Description

Extract Model Coefficients

Usage

```
## S3 method for class 'multipleOutcomes'
coef(object, model_index = NULL, ...)
```

Arguments

object	an object returned by multipleOutcomes().
model_index	NULL if displaying coefficients of all fitted models; otherwise, an integer indicating the fitted model.
...	for debugging only

Value

a vector of coefficient estimates

multipleOutcomes *Fitting Regression Models for Multiple Outcomes and Returning the Matrix of Covariance*

Description

Fitting Regression Models for Multiple Outcomes and Returning the Matrix of Covariance

Usage

```
multipleOutcomes(..., family, data, data_index = NULL, score_epsilon = 1e-06)
```

Arguments

...	formulas of models to be fitted.
family	a character vector of families to be used in the models. Currently only gaussian and binomial are supported. cox for time-to-event data with potential censoring and long for longitudinal data may be supported in the future. family can be of length 1 if all models are fitted in the same family; otherwise family should be specified for each of the models in ....

data	a data frame if all models are fitted on the same dataset; otherwise a list of data frames for fitting models in .... Note that a dataset can be used to fit multiple models, thus, length(data) is unnecessary to be equal to the number of models in .... The row names in a data frame are treated as sample IDs. Consequently, for any two records in different data frames that correspond to the same sample, their row names should be consistent.
data_index	NULL if data is a data frame; otherwise, a vector in integer specifying mapping a model in ... to a data frame in data (a list).
score_epsilon	whatever.

Value

It returns an object of class "multipleOutcomes", which is a list containing the following components:

coefficients	an unnamed vector of coefficients of all fitted models. Use id_map for variable mapping.
mcov	a unnamed matrix of covariance of coefficients. Use id_map for variable mapping.
id_map	a list mapping the elements in coefficients and mcov to variable names.
n_shared_sample_sizes	a matrix of shared sample sizes between datasets being used to fit the models.
call	the matched call.

Examples

```
## More examples can be found in the vignettes.
library(mvtnorm)
genData <- function(seed = NULL){

  set.seed(seed)
  n <- 400
  sigma <- matrix(c(1, .6, .6, 1), 2)
  x <- rmvnorm(n, sigma = sigma)
  gam <- c(.1, -.2)
  z <- rbinom(n, 1, plogis(1-1/(1+exp(-.5+x%*%gam+.1*rnorm(n)))))

  bet <- c(-.2,.2)
  #y <- rbinom(n, 1, plogis(1-1/(1+exp(-.5+x%*%bet + .2*z-.3*rnorm(n)))))
  y <- -.5+x%*%bet + .2*z-.3*rnorm(n)

  data.frame(y = y, z = z, x1 = x[, 1], x2 = x[, 2])

}

dat <- genData(123456)
dat1 <- head(dat,200)
dat2 <- tail(dat,200)
```

```
## fitting four models simultaneously.
fit <-
  multipleOutcomes(
    y ~ z + x1 - 1,
    z ~ x1 + x2,
    z ~ x1 - 1,
    y ~ x2,
    ## z can be fitted with a linear or logistic regression
    family = c('gaussian', 'binomial', 'gaussian','gaussian'),
    data = list(dat1, dat2),
    ## each dataset is used to fit two models
    data_index = c(1, 1, 2, 2)
  )

  ## unnamed coefficients of all model parameters
  coef(fit)

  ## named coefficients of a specific model
  coef(fit, 2)

  ## unnamed covariance matrix of all model parameters
  vcov(fit)

  ## named covariance matrix of a specific model
  vcov(fit, 1)

  ## summary of all parameter estimates
  summary(fit)

  ## summary of parameters in a specific model
  summary(fit, 4)
```

`print.summary.multipleOutcomes` *Title*

Description

Title

Usage

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

Arguments

`x`	an object returned by `multipleOutcomes()`.
`...`	for debugging only.

Value

an invisible object.

Examples

```
## no example
```

`summary.multipleOutcomes` *Object Summaries*

Description

Object Summaries

Usage

```
## S3 method for class 'multipleOutcomes'
summary(object, model_index = NULL, ...)
```

Arguments

`object`	an object returned by `multipleOutcomes()`.
`model_index`	`NULL` if displaying summary of all fitted models; otherwise, an integer indicating the fitted model.
`...`	for debugging only

Value

a list

`vcov.multipleOutcomes` *Calculate Variance-Covariance Matrix for a Fitted Model Object*

Description

Calculate Variance-Covariance Matrix for a Fitted Model Object

Usage

```
## S3 method for class 'multipleOutcomes'
vcov(object, model_index = NULL, ...)
```

Arguments

`object`	an object returned by `multipleOutcomes()`.
`model_index`	`NULL` if displaying covariance matrix of all fitted models; otherwise, an integer indicating the fitted model.
`...`	for debugging only

Value

a matrix of covariance of all estimates

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