Package 'MIIPW'

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Type Package

Title IPW and Mean Score Methods for Time-Course Missing Data

Version 0.1.1

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Description Contains functions for data analysis of Repeated measurement using GEE. Data may contain missing value in response and covariates. For parameter estimation through Fisher Scoring algorithm, Mean Score and Inverse Probability Weighted method combining with Multiple Imputation are used when there is missing value in covariates/response.
Reference for mean score method, inverse probability weighted method is
Wang et al(2007)<doi:10.1093/biostatistics/kxl024>.

Imports mice,Matrix,MASS

License GPL-3

Encoding UTF-8

LazyData true

Depends R (>= 2.10)

RoxygenNote 7.2.3

NeedsCompilation no

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Repository CRAN

Suggests knitr, rmarkdown

VignetteBuilder knitr

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R topics documented:

`AIPW` *Fit a geeglm model using AIPW*

Description

provides augmented inverse probability weighted estimates of parameters for GEE model of response variable using different covariance structure

Usage

```
AIPW(
  data,
  formula,
  id,
  visit,
  family,
  init.beta = NULL,
  init.alpha = NULL,
  init.phi = NULL,
  tol = 0.001,
  weights = NULL,
  corstr = "independent",
  maxit = 50,
  m = 2,
  pMat,
  method = NULL
)
```

Arguments

`data`	longitudinal data set where each subject's outcome has been measured at same time points and number of visits for each patient is similar. Covariance structure of the outcome variable like "unstructured","independent","AR-1" ,"exchangeable"

formula	formula for the response model
id	column name of id of subjects in the dataset
visit	column name of timepoints of visit in the dataset
family	name of the distribution for the response variable, For more information on how to use family objects, see family
init.beta	initial values for the regression coefficient of GEE model
init.alpha	initial values for the correlation structure
init.phi	initial values for the csale parameter for
tol	tolerance in calculation of coefficients
weights	A vector of weights for each observation. If an observation has weight 0, it is excluded from the calculations of any parameters. Observations with a NA anywhere (even in variables not included in the model) will be assigned a weight of 0. Weights are updated as the mentioned the details.
corstr	a character string specifying the correlation structure. It could "independence", "exchangeable", "AR-1", "unstructured"
maxit	maximum number iteration for newton-raphson
m	number of imputation used to update the missing score function value due incomplete data.
pMat	predictor matrix as obtained in mice
method	method option for mice model,for information see mice

Details

AIPW

It uses the inverse probability weighted method to reduce the bias due to missing values in GEE model for longitudinal data. The response variable $\mathbf{Y}$ is related to the coariates as $g(\mu) = \mathbf{X}\beta$, where g is the link function for the glm. The estimating equation is

$$\sum_{i=1}^{k}\sum_{j=1}^{n}(\frac{\delta_{ij}}{\pi_{ij}}S(Y_{ij},\mathbf{X}_{ij},\mathbf{X}'_{ij}) + (1-\frac{\delta_{ij}}{\pi_{ij}})\phi(\mathbf{V}=\mathbf{v})) = 0$$

where $\delta_{ij} = 1$ if there is missing value in covariates and 0 otherwise, $\mathbf{X}$ is fully observed all subjects and $\mathbf{X}'$ is partially missing, where $\mathbf{V} = (Y, \mathbf{X})$. The missing score function values due to incomplete data are estimated using an imputation model through mice which we have considered as $\phi(\mathbf{V} = \mathbf{v})$).

Value

A list of objects containing the following objects

call details about arguments passed in the function

beta estimated regression coeffictient value for the response model

niter number of iteration required

betalist list of beta values at different iteration

weight estimated weights for the observations

mu mu values according glm

phi etsimated phi value for the `glm` model

hessian estimated hessian matrix obtained from the last iteration

betaSand sandwich estimator value for the variance covariance matrix of the beta

Author(s)

Atanu Bhattacharjee, Bhrigu Kumar Rajbongshi and Gajendra Kumar Vishwakarma

References

Wang, C. Y., Shen-Ming Lee, and Edward C. Chao. "Numerical equivalence of imputing scores and weighted estimators in regression analysis with missing covariates." Biostatistics 8.2 (2007): 468-473.

Seaman, Shaun R., and Stijn Vansteelandt. "Introduction to double robust methods for incomplete data." Statistical science: a review journal of the Institute of Mathematical Statistics 33.2 (2018): 184.

Vansteelandt, Stijn, James Carpenter, and Michael G. Kenward. "Analysis of incomplete data using inverse probability weighting and doubly robust estimators." Methodology: European Journal of Research Methods for the Behavioral and Social Sciences 6.1 (2010): 37.

See Also

SIPW,miSIPW,miAIPW

Examples

```
 ## Not run:
##
formula<-C6kine~ActivinRIB+ActivinRIIA+ActivinRIIAB+Adiponectin+AgRP+ALCAM
pMat<-mice::make.predictorMatrix(srdata1[names(srdata1)%in%all.vars(formula)])
m1<-AIPW(data=srdata1,
formula<-formula,id='ID',
visit='Visit',family='gaussian',init.beta = NULL,
init.alpha=NULL,init.phi=1,tol=.00001,weights = NULL,
corstr = 'exchangeable',maxit=50,m=3,pMat=pMat)
##

## End(Not run)
```

MeanScore *Fit a geeglm model using meanScore*

Description

provides mean score estimates of parameters for GEE model of response variable using different covariance structure

Usage

```
MeanScore(
  data,
  formula,
  id,
  visit,
  family,
  init.beta = NULL,
  init.alpha = NULL,
  init.phi = NULL,
  tol = 0.001,
  weights = NULL,
  corstr = "independent",
  maxit = 50,
  m = 2,
  pMat,
  method = NULL
)
```

Arguments

data	longitudinal data set where each subject's outcome has been measured at same time points and number of visits for each patient is similar. Covariance structure of the outcome variable like "unstructured","independent" ,"AR-1","exchnageable"
formula	formula for the response model
id	column name of id of subjects in the dataset
visit	column name of timepoints of visit in the dataset
family	name of the distribution for the response variable, For more information on how to use family objects, see family
init.beta	initial values for the regression coefficient of GEE model
init.alpha	initial values for the correlation structure
init.phi	initial values for the scale parameter
tol	tolerance in calculation of coefficients

weights	A vector of weights for each observation. If an observation has weight 0, it is excluded from the calculations of any parameters. Observations with a NA anywhere (even in variables not included in the model) will be assigned a weight of 0. Weights are updated as the mentioned the details.
corstr	a character string specifying the correlation structure. It could "independence", "exchangeable", "AR-1", "unstructured"
maxit	maximum number iteration for newton-raphson
m	number of imputation used to update the missing score function value due incomplete data.
pMat	predictor matrix as obtained in mice
method	method option for mice model,for information see mice

Details

meanScore

It uses the mean score method to reduce the bias due to missing covariate in GEE model.The response variable $\mathbf{Y}$ is related to the coariates as $g(\mu) = \mathbf{X}\beta$, where g is the link function for the glm. The estimating equation is

$$\sum_{i=1}^{k}\sum_{j=1}^{n}(\delta_{ij}S(Y_{ij},\mathbf{X}_{ij},\mathbf{X}'_{ij}) + (1-\delta_{ij})\phi(\mathbf{V}=\mathbf{v})) = 0$$

where $\delta_{ij} = 1$ if there is missing value in covariates and 0 otherwise, $\mathbf{X}$ is fully observed all subjects and $\mathbf{X}'$ is partially missing, where $\mathbf{V} = (Y, \mathbf{X})$. The missing score function values due to incomplete data are estimated using an imputation model through mice which we have considered as $\phi(\mathbf{V} = \mathbf{v}))$. The estimated value $\phi(\mathbf{V} = \mathbf{v}))$ is obtained through multiple imputation.

Value

A list of objects containing the following objects

call details about arguments passed in the function

beta estimated regression coeffictient value for the response model

niter number of iteration required

betalist list of beta values at different iteration

weight estimated weights for the observations

mu mu values according glm

phi etsimated phi value for the glm model

hessian estimated hessian matrix obtained from the last iteration

betaSand sandwich estimator value for the variance covariance matrix of the beta

Author(s)

Atanu Bhattacharjee, Bhrigu Kumar Rajbongshi and Gajendra Kumar Vishwakarma

References

Wang, C. Y., Shen-Ming Lee, and Edward C. Chao. "Numerical equivalence of imputing scores and weighted estimators in regression analysis with missing covariates." Biostatistics 8.2 (2007): 468-473.

Seaman, Shaun R., and Stijn Vansteelandt. "Introduction to double robust methods for incomplete data." Statistical science: a review journal of the Institute of Mathematical Statistics 33.2 (2018): 184.

Vansteelandt, Stijn, James Carpenter, and Michael G. Kenward. "Analysis of incomplete data using inverse probability weighting and doubly robust estimators." Methodology: European Journal of Research Methods for the Behavioral and Social Sciences 6.1 (2010): 37.

See Also

SIPW,miSIPW,miAIPW

Examples

```
 ## Not run:
##
formula<-C6kine~ActivinRIB+ActivinRIIA+ActivinRIIAB+Adiponectin+AgRP+ALCAM
pMat<-mice::make.predictorMatrix(srdata1[names(srdata1)%in%all.vars(formula)])
m1<-MeanScore(data=srdata1,
formula<-formula,id='ID',
visit='Visit',family='gaussian',init.beta = NULL,
init.alpha=NULL,init.phi=1,tol=.00001,weights = NULL,
corstr = 'exchangeable',maxit=50,m=2,pMat=pMat)
##

## End(Not run)
```

`miAIPW` *Fit a geeglm model using miAIPW*

Description

provides augmented inverse probability weighted estimates of parameters for GEE model of response variable using different covariance structure. The augmented terms are estimated by using multiple imputation model.

Usage

```
miAIPW(
  data,
  formula,
  id,
  visit,
  family,
```

```
  init.beta = NULL,
  init.alpha = NULL,
  init.phi = NULL,
  tol = 0.001,
  weights = NULL,
  corstr = "independent",
  maxit = 50,
  m = 2,
  pMat,
  method = NULL
)
```

Arguments

data	longitudinal data set where each subject's outcome has been measured at same time points and number of visits for each patient is similar. Covariance structure of the outcome variable like "unstuctured","independent","AR1" ,"Exchageable"
formula	formula for the response model
id	column name of id of subjects in the dataset
visit	column name of timepoints of visit in the dataset
family	name of the distribution for the response variable, For more information on how to use family objects, see family
init.beta	initial values for the regression coefficient of GEE model
init.alpha	initial values for the correlation structure
init.phi	initial values for the csale parameter for
tol	tolerance in calculation of coefficients
weights	A vector of weights for each observation. If an observation has weight 0, it is excluded from the calculations of any parameters. Observations with a NA anywhere (even in variables not included in the model) will be assigned a weight of 0. Weights are updated as the mentioned the details.
corstr	a character string specifying the correlation structure. It could "independent", "exchangeable", "AR-1", "unstructured"
maxit	maximum number iteration for newton-raphson
m	number of imputation used to update the missing score function value due incomplete data.
pMat	predictor matrix as obtained in mice
method	method option for mice model,for information see mice

Details

miAIPW

It uses the augmented inverse probability weighted method to reduce the bias due to missing values in GEE model for longitudinal data. The response variable $\mathbf{Y}$ is related to the coariates as $g(\mu) =$

$\mathbf{X}\beta$, where g is the link function for the glm. The estimating equation is

$$\sum_{i=1}^{k}\sum_{j=1}^{n}(\frac{\delta_{ij}}{\pi_{ij}}S(Y_{ij},\mathbf{X}_{ij},\mathbf{X}'_{ij})+(1-\frac{\delta_{ij}}{\pi_{ij}})\phi(\mathbf{V}=\mathbf{v}))=0$$

where $\delta_{ij}=1$ if there is missing value in covariates and 0 otherwise, $\mathbf{X}$ is fully observed all subjects and $\mathbf{X}'$ is partially missing, where $\mathbf{V}=(Y,\mathbf{X})$. The missing score function values due to incomplete data are estimated using an imputation model through mice which we have considered as $\phi(\mathbf{V}=\mathbf{v}))$. The estimated value $\phi(\mathbf{V}=\mathbf{v}))$ is obtained through multiple imputation.

Value

A list of objects containing the following objects

call details about arguments passed in the function

beta estimated regression coeffictient value for the response model

niter number of iteration required

betalist list of beta values at different iteration

weight estimated weights for the observations

mu mu values according glm

phi etsimated phi value for the `glm` model

hessian estimated hessian matrix obtained from the last iteration

betaSand sandwich estimator value for the variance covariance matrix of the beta

Author(s)

Atanu Bhattacharjee, Bhrigu Kumar Rajbongshi and Gajendra Kumar Vishwakarma

References

Wang, C. Y., Shen-Ming Lee, and Edward C. Chao. "Numerical equivalence of imputing scores and weighted estimators in regression analysis with missing covariates." Biostatistics 8.2 (2007): 468-473.

Seaman, Shaun R., and Stijn Vansteelandt. "Introduction to double robust methods for incomplete data." Statistical science: a review journal of the Institute of Mathematical Statistics 33.2 (2018): 184.

Vansteelandt, Stijn, James Carpenter, and Michael G. Kenward. "Analysis of incomplete data using inverse probability weighting and doubly robust estimators." Methodology: European Journal of Research Methods for the Behavioral and Social Sciences 6.1 (2010): 37.

See Also

SIPW,miSIPW,miAIPW

Examples

```
 ## Not run:
##
formula<-C6kine~ActivinRIB+ActivinRIIA+ActivinRIIAB+Adiponectin+AgRP+ALCAM
pMat<-mice::make.predictorMatrix(srdata1[names(srdata1)%in%all.vars(formula)])
m1<-miAIPW(data=srdata1,
formula<-formula,id='ID',
 visit='Visit',family='gaussian',init.beta = NULL,
init.alpha=NULL,init.phi=1,tol=.00001,weights = NULL,
corstr = 'exchangeable',maxit=4,m=2,pMat=pMat)
##

## End(Not run)
```

`miSIPW` *Fit a geeglm model using miSIPW*

Description

provides simple inverse probability weighted estimates of parameters for GEE model of response variable using different covariance structure, missing values in covariates are multiply imputed for those subjects whose response is observed.

Usage

```
miSIPW(
  data,
  formula,
  id,
  visit,
  family,
  init.beta = NULL,
  init.alpha = NULL,
  init.phi = NULL,
  tol = 0.001,
  weights = NULL,
  corstr = "independent",
  maxit = 50,
  m = 2,
  pMat,
  method = NULL
)
```

Arguments

`data`	longitudinal data set where each subject's outcome has been measured at same time points and number of visits for each patient is similar. Covariance structure of the outcome variable like "unstuctured","independent","AR-1" ,"exchageable"

formula	formula for the response model
id	column name of id of subjects in the dataset
visit	column name of timepoints of visit in the dataset
family	name of the distribution for the response variable, For more information on how to use family objects, see family
init.beta	initial values for the regression coefficient of GEE model
init.alpha	initial values for the correlation structure
init.phi	initial values for the scale parameter
tol	tolerance in calculation of coefficients
weights	A vector of weights for each observation. If an observation has weight 0, it is excluded from the calculations of any parameters. Observations with a NA anywhere (even in variables not included in the model) will be assigned a weight of 0. Weights are updated as the mentioned the details.
corstr	a character string specifying the correlation structure. It could "independence", "exchangeable", "AR-1", "unstructured"
maxit	maximum number iteration for newton-raphson
m	number of imputation used to update the missing score function value due incomplete data.
pMat	pMat predictor matrix as obtained in mice
method	method option for mice model,for information see mice

Details

miSIPW

It uses the simple inverse probability weighted method to reduce the bias due to missing values in GEE model for longitudinal data. The response variable $\mathbf{Y}$ is related to the coariates as $g(\mu) = \mathbf{X}\beta$, where g is the link function for the glm. The estimating equation is

$$\sum_{i=1}^{k}\sum_{j=1}^{n}\frac{\delta_{ij}}{\pi_{ij}}S(Y_{ij}, \mathbf{X}_{ij}, \mathbf{X}'_{ij})$$

=0 where $\delta_{ij} = 1$ if there is missing no value in covariates and 0 otherwise. $\mathbf{X}$ is fully observed all subjects and $\mathbf{X}'$ is partially missing.

Value

A list of objects containing the following objects

call details about arguments passed in the function

beta estimated regression coeffictient value for the response model

niter number of iteration required

betalist list of beta values at different iteration

weight estimated weights for the observations

mu mu values according glm

phi etsimated phi value for the `glm` model

hessian estimated hessian matrix obtained from the last iteration

betaSand sandwich estimator value for the variance covariance matrix of the beta

Author(s)

Atanu Bhattacharjee, Bhrigu Kumar Rajbongshi and Gajendra Kumar Vishwakarma

References

Wang, C. Y., Shen-Ming Lee, and Edward C. Chao. "Numerical equivalence of imputing scores and weighted estimators in regression analysis with missing covariates." Biostatistics 8.2 (2007): 468-473.

Seaman, Shaun R., and Stijn Vansteelandt. "Introduction to double robust methods for incomplete data." Statistical science: a review journal of the Institute of Mathematical Statistics 33.2 (2018): 184.

Vansteelandt, Stijn, James Carpenter, and Michael G. Kenward. "Analysis of incomplete data using inverse probability weighting and doubly robust estimators." Methodology: European Journal of Research Methods for the Behavioral and Social Sciences 6.1 (2010): 37.

See Also

SIPW,AIPW,miAIPW

Examples

```
 ## Not run:
##
formula<-C6kine~ActivinRIB+ActivinRIIA+ActivinRIIAB+Adiponectin+AgRP+ALCAM
pMat<-mice::make.predictorMatrix(srdata1[names(srdata1)%in%all.vars(formula)])
m1<-miSIPW(data=srdata1,
formula=formula,id='ID',
visit='Visit',family='gaussian',init.beta = NULL,
init.alpha=NULL,init.phi=1,tol=0.001,weights = NULL,
corstr = 'exchangeable',maxit=50,m=2,pMat=pMat)
##

## End(Not run)
```

`print_ipw` *print method for ipw*

Description

print method for ipw

Usage

```
print_ipw(x, ...)
```

Arguments

x	ipw object
...	further argument can be passed

Value

print result for ipw object

---

print_meanscore *print method for meanscore*

Description

print method for meanscore

Usage

```
print_meanscore(x, ...)
```

Arguments

x	meanscore object
...	further argument can be passed

Value

print result for meanscore object

QICmiipw *Model Selection criteria QIC*

Description

It provides model selection criteria such as quasi-likelihood under the independence model criterion (QIC), an approximation to QIC under large sample i.e QICu and quasi likelihood

Usage

```
QICmiipw(model.R, model.indep, family)
```

Arguments

model.R	fitted object obtained from GEE model MeanScore,SIPW,AIPW,miSIPW,miAIPW with correlation struture other than "independent"
model.indep	same fitted object as in model.indep with "independent" correlation struture
family	currently we have inlcuded "poisson","binomial","gaussian"

Details

QICmiipw

Value

returns a list containing QIC,QICu,Quasi likelihood

References

Pan, Wei. "Akaike's information criterion in generalized estimating equations." Biometrics 57.1 (2001): 120-125.

Examples

```
## Not run:
 ##
 formula<-C6kine~ActivinRIB+ActivinRIIA+ActivinRIIAB+Adiponectin+AgRP+ALCAM
 pMat<-mice::make.predictorMatrix(srdata1[names(srdata1)%in%all.vars(formula)])
 m1<-MeanScore(data=srdata1,
             formula<-formula,id='ID',
             visit='Visit',family='gaussian',init.beta = NULL,
             init.alpha=NULL,init.phi=1,tol=.00001,weights = NULL,
             corstr = 'exchangeable',maxit=50,m=2,pMat=pMat)
 m11<-MeanScore(data=srdata1,
             formula<-formula,id='ID',
             visit='Visit',family='gaussian',init.beta = NULL,
             init.alpha=NULL,init.phi=1,tol=.00001,weights = NULL,
            corstr = 'independent',maxit=50,m=2,pMat=pMat)
QICmiipw(model.R=m1,model.indep=m11,family="gaussian")
##

## End(Not run)
```

SIPW *Fit a geeglm model using SIPW*

Description

provides simple inverse probability weighted estimates of parameters for GEE model of response variable using different covariance structure

Usage

```
SIPW(
  data,
  formula,
  id,
  visit,
  family,
  init.beta = NULL,
  init.alpha = NULL,
  init.phi = NULL,
  tol = 0.001,
  weights = NULL,
  corstr = "independent",
  maxit = 10,
  maxvisit = NULL
)
```

Arguments

data	longitudinal data set where each subject's outcome has been measured at same time points and number of visits for each patient is similar. Covariance structure of the outcome variable like "unstructured","independent" ,"exchangeable"
formula	formula for the response model
id	column name of id of subjects in the dataset
visit	column name of timepoints of visit in the dataset
family	name of the distribution for the response variable, For more information on how to use family objects, see family
init.beta	initial values for the regression coefficient of GEE model
init.alpha	initial values for the correlation structure
init.phi	initial values for the scale parameter
tol	tolerance in calculation of coefficients
weights	A vector of weights for each observation. If an observation has weight 0, it is excluded from the calculations of any parameters. Observations with a NA anywhere (even in variables not included in the model) will be assigned a weight of 0. Weights are updated as the mentioned the details.
corstr	a character string specifying the correlation structure. It could "independence", "exchangeable", "AR-1", "unstructured"
maxit	maximum number of iteration
maxvisit	maximum number of visit

Details

SIPW

It uses the simple inverse probability weighted method to reduce the bias due to missing values in GEE model for longitudinal data.The response variable $\mathbf{Y}$ is related to the coariates as $g(\mu) = \mathbf{X}\beta$, where g is the link function for the glm. The estimating equation is

$$\sum_{i=1}^{k}\sum_{j=1}^{n}\frac{\delta_{ij}}{\pi_{ij}}S(Y_{ij},\mathbf{X}_{ij},\mathbf{X}'_{ij})$$

=0 where $\delta_{ij} = 1$ if there is missing no value in covariates and 0 otherwise. $\mathbf{X}$ is fully observed all subjects and $\mathbf{X}'$ is partially missing.

Value

A list of objects containing the following objects

call details about arguments passed in the function

beta estimated regression coeffictient value for the response model

niter number of iteration required

betalist list of beta values at different iteration

weight estimated weights for the observations

mu mu values according glm

phi etsimated phi value for the `glm` model

hessian estimated hessian matrix obtained from the last iteration

betaSand sandwich estimator value for the variance covariance matrix of the beta

Author(s)

Atanu Bhattacharjee, Bhrigu Kumar Rajbongshi and Gajendra Kumar Vishwakarma

References

Wang, C. Y., Shen-Ming Lee, and Edward C. Chao. "Numerical equivalence of imputing scores and weighted estimators in regression analysis with missing covariates." Biostatistics 8.2 (2007): 468-473.

Seaman, Shaun R., and Stijn Vansteelandt. "Introduction to double robust methods for incomplete data." Statistical science: a review journal of the Institute of Mathematical Statistics 33.2 (2018): 184.

Vansteelandt, Stijn, James Carpenter, and Michael G. Kenward. "Analysis of incomplete data using inverse probability weighting and doubly robust estimators." Methodology: European Journal of Research Methods for the Behavioral and Social Sciences 6.1 (2010): 37.

See Also

AIPW,miSIPW,miAIPW

Examples

```
 ## Not run:
##
formula<-C6kine~ActivinRIB+ActivinRIIA+ActivinRIIAB+Adiponectin+AgRP+ALCAM
m1<-SIPW(data=srdata1,formula<-formula,id='ID',
visit='Visit',family='gaussian',corstr = 'exchangeable',maxit=5)
##

## End(Not run)
```

`srdata1` *protein data*

Description

Repeated measurement dataset, for each id we have four visit observations

Usage

```
data(srdata1)
```

Format

A dataframe with 164 rows and 9 columns

ID ID of subjects

Visit Number of times observations recorded

C6kine,.....,GFRalpha4 These are covariates

Examples

```
data(srdata1)
```

`summary_ipw` *summary method for ipw*

Description

summary method for ipw

Usage

```
summary_ipw(object, ...)
```

Arguments

object	ipw object
...	further argument can be passed

Value

summary of ipw object

---

summary_meanscore *summary method for meanscore*

Description

summary method for meanscore

Usage

```
summary_meanscore(object, ...)
```

Arguments

object	meanscore object
...	further argument can be passed

Value

summary of meanscore object

---

updateALpha *internal function for updating alpha*

Description

internal function for updating alpha

Usage

```
updateALpha(y, x, vfun, mu, w, phi, corstr, ni, mv = NULL, id, visit)
```

Arguments

y	response value for GEE model
x	model matrix for the GEE model
vfun	variance function for the GLM
mu	mu vector for the GLM
w	weight matrix
phi	scale parameter
corstr	correlation structure
ni	list of visits per subject
mv	NULL
id	id column
visit	visit column

Details

arguments are from Fisher Scoring Algorithm

---

updateBeta *internal function for updating beta through Fisher Scoring*

Description

internal function for updating beta through Fisher Scoring

Usage

```
updateBeta(y, x, vfun, mu, w, D, Ralpha, beta)
```

Arguments

y	response value for GEE model
x	model matrix for the GEE model
vfun	variance function for the GLM
mu	mu vector for the GLM
w	weight matrix
D	derivation of the inverse link function
Ralpha	correlation matrix
beta	vector of beta value for GEE model

UpdatePhi *internal function for updating scale parameter*

Description

internal function for updating scale parameter

Usage

```
UpdatePhi(y, x, vfun, mu, w)
```

Arguments

y	response value for GEE model
x	model matrix for the GEE model
vfun	variance function for the GLM
mu	mu vector for the GLM
w	weight matrix

updateSandW *internal function for sandwich estimator*

Description

internal function for sandwich estimator

Usage

```
updateSandW(y, x, vfun, mu, w, D, Ralpha, beta, hessmat, blockdiag)
```

Arguments

y	response value for GEE model
x	model matrix for the GEE model
vfun	variance function for the GLM
mu	mu vector for the GLM
w	weight matrix
D	derivation of the inverse link function
Ralpha	correlation matrix
beta	vector of beta value for GEE model
hessmat	hessian matrix
blockdiag	vector containing the dim of block matrix for block diagonal matrix

Details

arguments are required for obtaining Sandwich Estimator for variance matrix of regression coefficient of GEE model

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