Package 'ELmethodVar'

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Title Empirical Likelihood Inference of Variance Components in Linear Mixed-Effects Models

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Depends R (>= 3.5.0)

Description Provides empirical likelihood-based methods for the inference of variance components in linear mixed-effects models.

License GPL (>= 2)

URL https://github.com/jingru-zhang/ELmethod

NeedsCompilation no

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beta.all — *A Matrix Representing Fixed Effects*

Description

This is a p by T matrix. Each column is the fixed effects at time t.

ELmethodVar — *Empirical Likelihood Inference of Variance Components in Linear Mixed-Effects Models*

Description

This package provides empirical likelihood-based methods for the inference of variance components in linear mixed-effects models.

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References

Zhang J., Guo W., Carpenter J.S., Leroux A., Merikangas K.R., Martin N.G., Hickie I.B., Shou H., and Li H. (2022). Empirical likelihood tests for variance components in linear mixed-effects models.

See Also

ELvar GELvar

ELvar — *Empirical Likelihood Inference of a Local Variance Component*

Description

This function provides an empirical likelihood method for the inference of a local variance component in linear mixed-effects models.

Usage

```
ELvar(X,Y,Philist,theta0=0,beta=NA,other=FALSE)
```

Arguments

X	design matrix for all observations, in which each row represents a p-dimentional covariates.
Y	response vector.
Philist	list of design matrices of variance components. Its i-th element is an ni by ni*d matrix that combines design matrices of variance components by columns for the i-th subject.
theta0	value of the first variance component under the null. Its default value is 0.
beta	fixed effects. Its default value is NA (unknown fixed effects).
other	logical; if TRUE, the function gives auxiliary terms. Its default value is FALSE.

Value

stat	value of the test statistic.
pvalue	approximated p-value based on asymptotic theory.
Zi, Di, Mi, nv1sq	auxiliary terms if other=TRUE.

References

Zhang J., Guo W., Carpenter J.S., Leroux A., Merikangas K.R., Martin N.G., Hickie I.B., Shou H., and Li H. (2022). Empirical likelihood tests for variance components in linear mixed-effects models.

See Also

GELvar

Examples

```
# Datasets "exampleNE0" and "exampleNE1" contain normal distributed longitudinal data.
# Datasets "exampleTE0" and "exampleTE1" contain t distributed longitudinal data.
# The fist variance components in the datasets "exampleNE0" and "exampleTE0" are zero.
# The fist variance components in the datasets "exampleNE1" and "exampleTE1" are
# nonzero at the 24, 25, 26, 27 time points.

# X is an N by p matrix with N being the number of all observations and p being
# the dimension of covariates.
# Y.all is an N by T matrix with T being the number of time points.
# Philist is an n list of design matrices of variance components with n being the
# number of subjects. Its $i$th element Philist[[i]] is an $n_i$ by $n_id$ matrix
# that combines design matrices of variance components by columns for the $i$th
# subject, where $n_i$ is the number of repeated measures for the $i$th subject
# and $d$ is the number of variance components.
# beta.all is a p by T matrix. Each column is the fixed effects at time t.
# thetastar is a d by T matrix. Each column is the variance components at time t.

    data(exampleNE0)
    t = 1 # consider the local problem at time t
```

```
re = ELvar(X,Y.all[,t],Philist,theta0=0) # with unknown fixed effects
re = ELvar(X,Y.all[,t],Philist,theta0=0,beta=beta.all[,t]) # with known fixed effects
```

GELvar *Empirical Likelihood Inference of Variance Components over an Interval*

Description

This function provides an empirical likelihood method for the inference of variance components over an interval in linear mixed-effects models.

Usage

```
GELvar(X,Y.all,Philist,theta0=0,beta.all=NA,permnum=1e3)
```

Arguments

X	design matrix for all observations, in which each row represents a p-dimentional covariates.
Y.all	response matrix, in which each column is the response vector at time t.
Philist	list of design matrices of variance components. Its i-th element is an ni by d*ni matrix that combines design matrices of variance components by columns for the i-th subject, where ni is the number of repeated measures for the i-th subject and d is the number of variance components.
theta0	value of the first variance component under the null. Its default value is 0.
beta.all	fixed effects. Each column is the fixed effects at time t. Its default value is NA (unknown fixed effects).
permnum	number of perturbation. Its default value is 1000.

Value

stat.global	value of the test statistic over an interval.
pvalue.global	approximated p-value over an interval based on the perturbation.

References

Zhang J., Guo W., Carpenter J.S., Leroux A., Merikangas K.R., Martin N.G., Hickie I.B., Shou H., and Li H. (2022). Empirical likelihood tests for variance components in linear mixed-effects models.

See Also

ELvar

Examples

```
# Datasets "exampleNE0" and "exampleNE1" contain normal distributed longitudinal data.
# Datasets "exampleTE0" and "exampleTE1" contain t distributed longitudinal data.
# The fist variance components in the datasets "exampleNE0" and "exampleTE0" are zero.
# The fist variance components in the datasets "exampleNE1" and "exampleTE1" are
# nonzero at the 24, 25, 26, 27 time points.

# X is an N by p matrix with N being the number of all observations and p being
# the dimension of covariates.
# Y.all is an N by T matrix with T being the number of time points.
# Philist is an n list of design matrices of variance components with n being the
# number of subjects. Its $i$th element Philist[[i]] is an $n_i$ by $n_id$ matrix
# that combines design matrices of variance components by columns for the $i$th
# subject, where $n_i$ is the number of repeated measures for the $i$th subject
# and $d$ is the number of variance components.
# beta.all is a p by T matrix. Each column is the fixed effects at time t.
# thetastar is a d by T matrix. Each column is the variance components at time t.

    data(exampleNE0)
    re = GELvar(X,Y.all,Philist,theta0=0)
```

`multiELvar` *Empirical Likelihood Inference of Variance Components at multiple time points*

Description

This function provides an empirical likelihood method for the inference of variance components at multiple time points in linear mixed-effects models.

Usage

```
multiELvar(X,Y.all,Philist,theta0=0,beta.all=NA,other=FALSE)
```

Arguments

`X`	design matrix for all observations, in which each row represents a p-dimentional covariates.
`Y.all`	response matrix, in which each column is the response vector at time t.
`Philist`	list of design matrices of variance components. Its i-th element is an ni by d*ni matrix that combines design matrices of variance components by columns for the i-th subject, where ni is the number of repeated measures for the i-th subject and d is the number of variance components.
`theta0`	value of the first variance component under the null. Its default value is 0.
`beta.all`	fixed effects. Each column is the fixed effects at time t. Its default value is NA (unknown fixed effects).
`other`	logical; if TRUE, the function gives auxiliary terms. Its default value is FALSE.

Value

`stat.all`	vector of test statistics at multiple time points.
`pvalue.all`	vector of approximated p-value at multiple time points based on asymptotic theory.
`Z.all`, `D.all`, `M.all`, `nv1sq.all`	auxiliary terms if other=TRUE.

References

Zhang J., Guo W., Carpenter J.S., Leroux A., Merikangas K.R., Martin N.G., Hickie I.B., Shou H., and Li H. (2022). Empirical likelihood tests for variance components in linear mixed-effects models.

See Also

GELvar

Examples

```
# Datasets "exampleNE0" and "exampleNE1" contain normal distributed longitudinal data.
# Datasets "exampleTE0" and "exampleTE1" contain t distributed longitudinal data.
# The fist variance components in the datasets "exampleNE0" and "exampleTE0" are zero.
# The fist variance components in the datasets "exampleNE1" and "exampleTE1" are
# nonzero at the 24, 25, 26, 27 time points.

# X is an N by p matrix with N being the number of all observations and p being
# the dimension of covariates.
# Y.all is an N by T matrix with T being the number of time points.
# Philist is an n list of design matrices of variance components with n being the
# number of subjects. Its $i$th element Philist[[i]] is an $n_i$ by $n_id$ matrix
# that combines design matrices of variance components by columns for the $i$th
# subject, where $n_i$ is the number of repeated measures for the $i$th subject
# and $d$ is the number of variance components.
# beta.all is a p by T matrix. Each column is the fixed effects at time t.
# thetastar is a d by T matrix. Each column is the variance components at time t.

    data(exampleNE0)
    re = multiELvar(X,Y.all,Philist,theta0=0)
```

Philist *Design Matrices of Variance Components*

Description

This is a list of design matrices of variance components. Its i-th element is an ni by d*ni matrix that combines design matrices of variance components by columns for the i-th subject, where ni is the number of repeated measures for the i-th subject and d is the number of variance components.

thetastar — *A Matrix Representing True Variance Components*

Description

This is a d by T matrix, where d is the number of variance components and T is the number of time points. Each column is the true variance components at time t.

X — *Design matrix for all observations*

Description

This is an N by p matrix with N being the number of all observations and p being the dimension of covariates. Each row represents a p-dimentional covariates.

Y.all — *Response matrix*

Description

This is an N by T matrix with N being the number of all observations and T being the number of time points. Each column is the response vector at time t.

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