Package ‘MMeM’

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Title      Multivariate Mixed Effects Model
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Description Analyzing data under multivariate mixed effects model using multivariate REML and multivariate Henderson3 methods.
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**Description**


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**See Also**

Useful links:
- Report bugs at https://github.com/opengluyao/MMeM/issues

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**Usage**

```r
MMeM_henderson3(fml, data, factor_X)
```

**Arguments**

- `fml`: two-sided linear formula object describing both the fixed-effects and random-effects parts of the model, with the response on the left of a `~` operator. For univariate response, put variable name directly; for multivariate responses combine variables using concatenate operator, for example, for bivariate responses, `c(var1, var2)`. The predictor terms are separated by `+` operators, on the right. Random-effects terms are distinguished by vertical bars `'|'` separating expressions for design matrices from grouping factors.
- `data`: data frame containing the variables named in formula.
- `factor_X`: (logical) indicating whether predictor is a factor or continuous. By default is TRUE.
Value

The function returns a list with the following objects:

- `T.estimates` is the estimated variance covariance components (T.estimated) of the variance covariance matrix of the block random effects with corresponding sampling variances (T.variance)
- `E.estimates` is the estimated variance covariance components (E.estimated) of the variance covariance matrix of the residuals with corresponding sampling variances (E.variance)

References


Examples

data(simdata)
results_henderson <- MMeM_henderson3(fml = c(V1,V2) ~ X_vec + (1|Z_vec),
data = simdata, factor_X = TRUE)

Description

Estimating the variance components under the multivariate mixed effects model using REML methods

Usage

MMeM_reml(fml, data, factor_X, T.start, E.start, maxit = 50,
tol = 1e-09)

Arguments

- `fml` a two-sided linear formula object describing both the fixed-effects and random-effects parts of the model, with the response on the left of a ~ operator. For univariate response, put variable name directly; for multivariate responses combine variables using concatenate operator, for example, for bivariate responses, c(var1, var2). The predictor terms are separated by + operators, on the right. Random-effects terms are distinguished by vertical bars '|' separating expressions for design matrices from grouping factors.
- `data` data frame containing the variables named in formula.
- `factor_X` (logical) indicating whether predictor is a factor or continuous. By default is TRUE
- `T.start` the starting matrix for the variance covariance matrix of the block random effects, it has to be positive definite q by q symmetric matrix.
Details

Suppose \( n \) observational units, \( q \) variates, \( p \) fixed effects coefficients and \( s \) random effects units. The model supports multivariate mixed effects model for one-way randomized block design with equal design matrices:

\[
Y = XB + ZU + E
\]

where \( Y \) is \( n \) by \( q \) response variates matrix; \( X \) is \( n \) by \( p \) design matrix for the fixed effects; \( B \) is \( p \) by \( q \) coefficients matrix for the fixed effects; \( Z \) is \( n \) by \( s \) design matrix for the random effects; \( U \) is \( s \) by \( q \) matrix for the random effects; \( E \) is \( n \) by \( q \) random errors matrix.

The model also supports simple OLS multivariate regression:

\[
y = Xb + Zu + e
\]

where \( y \) is \( n \) by 1 response vector; \( b \) is \( p \) by 1 coefficients vector for the fixed effects; \( u \) is \( s \) by 1 matrix for the random effects.

Value

The function returns a list with the following objects:

- \( \text{T.estimates} \) is the estimated variance covariance components of the variance covariance matrix of the block random effects
- \( \text{E.estimates} \) is the estimated variance covariance components of the variance covariance matrix of the residuals
- \( \text{VCOV} \) is the asymptotic dispersion matrix of the estimated variance covariance components for the block random effects and the residuals.

References


Examples

data(simdata)
T.start <- matrix(c(10,5,5,15),2,2)
E.start <- matrix(c(10,1,1,3),2,2)
results_reml <- MMeM_reml(fml = c(V1,V2) ~ X.vec + (1|Z.vec), data = simdata, factor_X = TRUE, T.start = T.start, E.start = E.start, maxit = 10)
**MMeM_terms**

parses formulas to creates model matrices

**Description**

parses formulas to creates model matrices

**Usage**

```r
MMeM_terms(fml, data, factor_X)
```

**Arguments**

- **fml**: a two-sided linear formula object describing both the fixed-effects and random-effects parts of the model, with the response on the left of a ~ operator. For univariate response, put variable name directly; for multivariate responses combine variables using concatenate operator, for example, for bivariate responses, `c(var1, var2)`. The predictor terms are separated by `+` operators, on the right. Random-effects terms are distinguished by vertical bars `|` separating expressions for design matrices from grouping factors.
- **data**: data frame containing the variables named in formula.
- **factor_X**: (logical) indicating whether predictor is a factor or continuous. By default is `TRUE`

**simdata**

*simulated bivariate data*

**Description**

This is a simulated data with 2 dependent variables and one fixed effects and one random effects

**Usage**

```r
data(simdata)
```

**Details**

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