Package ‘lmmfit’

February 20, 2015

Type  Package
Title  Goodness-of-fit-measures for linear mixed models with
       one-level-grouping
Version 1.0
Date  2011-04-28
Author Aleksandra Maj
Maintainer Aleksandra Maj <amRT8TRT@students.mimuw.edu.pl>
Depends nlme, MASS
Description Package lmmfit contains three functions evaluating some
goodness-of-fit-measures for linear mixed models with
one-level-grouping fitted using lme() from package nlme.
License GPL-2
Repository CRAN
Date/Publication 2011-08-08 15:46:10
NeedsCompilation no

R topics documented:

lmmfit-package ................................................. 2
GIC .................................................................. 3
lmmCCC .......................................................... 4
lmmPRESS ....................................................... 5
lmmR2 ............................................................ 6
lmmR2LR .......................................................... 7
lmmR2W ......................................................... 8
structStep ....................................................... 10
structStepR2 .................................................. 11

Index 13
Description

Package contains four different functions for evaluating goodness-of-fit measures for linear mixed models with one-level-grouping, such as concordance correlation coefficient (CCC), $R^2$ based on Wald’s statistic and $R^2$ based on likelihood ratio and ordinary $R^2$. It also contains two functions for evaluating some criterions, which can be helpful in selecting linear mixed models: predicted residual sum of squares (PRESS) and general information criterion (GIC). There are also a few step-function for linear mixed models with one-level-grouping, which can be useful for selecting the best correlation structures for given/known fixed and random effects. They find the model through minimizing GIC criterion or maximizing measures of fit listed above.

Details

| Package:   | lmmfit |
| Type:      | Package |
| Version:   | 1.0 |
| Date:      | 2011-04-28 |
| License:   | GPL-2 |

Author(s)

Aleksandra Maj

Maintainer: Aleksandra Maj <am248424@students.mimuw.edu.pl>

References


See Also

lme
Examples

fm1 <- lme(distance ~ age + Sex, data = Orthodont, random = ~ 1)
lmmR2W(fm1)
lmmCCC(fm1)
lmmR2LR(fm1)
GIC(fm1)
structStep(fm1)
structStepR2(fm1)

GIC

General Information Criterion (GIC) for linear mixed model

Description

Function GIC() evaluates General Information Criterion (GIC) for linear mixed models. The function is usable only for models evaluated by lme() function from nlme package.

Usage

GIC(model, k, type)

Arguments

model object - one-level-grouped linear mixed model fitted with lme().
k numeric or "PRESS" - if numeric: penalty for number of model parameters, if "PRESS": PRESS coefficient for the model is evaluated
type character - type for PRESS: "marginal" (default) or "conditional"

Details

k can be any of real numeric, but if k = 2 (default) GIC is equivalent of AIC, if k = log(nrow(data)) GIC is equivalent of BIC. If k is "PRESS", then PRESS coefficient for the model is evaluated. This option is useful in structStep().

Value

GIC() returns general information criterion for mixed model (numeric) or PRESS coefficient for the model (numeric).

Author(s)

Aleksandra Maj

See Also

lmmPRESS, lmmR2LR, lmmCCC, lmmR2W, lmmR2
Examples

```r
fm1 <- lme(distance ~ age, data = Orthodont, random = pdDiag(~age))
GIC(fm1)
GIC(fm1, k = log(nrow(getData(fm1))))
GIC(fm1, k = "PRESS")
```

### Description

Function `lmmCCC()` evaluates concordance correlation coefficient (CCC) for linear mixed models with one-level-grouping. The function is usable only for models evaluated by `lme()` function from `nlme` package. Two types of CCC are available: marginal (default) and conditional.

### Usage

```r
lmmCCC(model, type = "marginal", adjust = "none")
```

### Arguments

- **model**: a one-level-grouping linear mixed model fitted with `lme()`
- **type**: character defining type of fitted values. There are two types available: "marginal" (default) and "conditional".
- **adjust**: character defining adjustment for number of model parameters. Three types available: "none" (default, no adjustment), "fixed" (adjustment for number of fixed effects) and "both" (adjustment for number of fixed effects and number of correlation structures parameters).

### Details

The CCC can be used as a measure of goodness-of-fit of linear mixed model with one-level-grouping.

### Value

`lmmCCC()` returns concordance correlation coefficient for linear mixed model with one-level-grouping, this value lies between -1 and 1.

### Author(s)

Aleksandra Maj
References


See Also

lmmR2W, lmmR2LR, lmmR2

Examples

```r
fm1 <- lme(distance ~ age + Sex, data = Orthodont, random = ~ 1)
lmmCCC(fm1)
lmmCCC(fm1, type = "conditional")
```

---

**lmmpress**

Predicted Residual Sum of Squares for linear mixed models with one-level-grouping

Description

Function lmmpress() evaluates predicted residual sum of squares (PRESS) for linear mixed models with one-level-grouping. The function is usable only for models evaluated by lme() function from nlme package. Two types of PRESS are available: marginal (default) and conditional.

Usage

```r
lmmpress(model, type = "marginal")
```

Arguments

- `model`: object - one-level-grouped linear mixed model fitted with lme().
- `type`: character defining type of fitted values. There are two types available: "marginal" (default) and "conditional".

Details

PRESS is evaluated using leave-one-out-group method. In order not to evaluate model too many times, the model hat matrix is used. For linear mixed model this matrix is: \( H = X(X'V^{-1}X)^{-1}X'V^{-1} \), where \( X \) is fixed effects model matrix and \( V \) is correlation matrix of model.

Value

Numeric.
Author(s)

Aleksandra Maj

References


See Also

lmmCCC, lmmR2LR, lmmR2W, lmmR2

Examples

```r
fm1 <- lme(distance ~ age, data = Orthodont) # random is ~ age
lmmPRESS(fm1)
```

```r
lmmPRESS(fm1, type = "conditional")
```

\texttt{lmmR2} \textit{R squared coefficient for linear mixed models with one-level-grouping}

Description

Function \texttt{lmmR2()} can be evaluated only for models class \texttt{lme}, because it uses methods for this class.

Usage

\texttt{lmmR2(model, type = "marginal", adjust = "none")}

Arguments

- \texttt{model} object - one-level-grouped linear mixed model fitted with \texttt{lme()}.  
- \texttt{type} character defining type of fitted values. There are two types available: "marginal" (default) and "conditional".  
- \texttt{adjust} character defining adjustment for number of model parameters. Three types available: "none" (default, no adjustment), "fixed" (adjustment for number of fixed effects) and "both" (adjustment for number of fixed effects and number of correlation structures parameters).
Details

\[ R^2(\text{adjust} = \text{"fixed"}) = 1 - k \times (1 - R^2), \text{ where } k = nrow(\text{data})/(nrow(\text{data}) - \text{rank}(X)). \]

\[ R^2(\text{adjust} = \text{"both"}) = 1 - k \times (1 - R^2), \text{ where } k = nrow(\text{data})/(nrow(\text{data}) - (\text{rank}(X) + \text{length}(\text{theta}))), \]

where theta is a vector of parameters of correlation structures of model.

Value

Numeric, between 0 and 1.

Author(s)

Aleksandra Maj

References


See Also

\text{lmcc}, \text{lmmrLR}, \text{lmmrW}

Examples

\begin{verbatim}
fm1 <- lme(distance ~ age + Sex, data = Orthodont, random = ~ 1)
lmmrLR(fm1)
lmmrLR(fm1, type = "conditional")
lmmrLR(fm1, type = "conditional", adjust = "both")
\end{verbatim}

\text{Description}

Function \text{lmmrLR}() can be evaluated only for models class \text{lme}, because it uses methods for this class.

Usage

\text{lmmrLR(model, type = "marginal", adjust = "none")}

Arguments

\begin{itemize}
  \item \text{model} \hspace{1cm} \text{object - one-level-grouped linear mixed model fitted with \text{lme}().}
  \item \text{type} \hspace{1cm} \text{changing this parameter won’t change anything. It is only used for \text{structStepR2}.}
  \item \text{adjust} \hspace{1cm} \text{changing this parameter won’t change anything. It is only used for \text{structStepR2}.}
\end{itemize}
Details
The R squared coefficient based on likelihood ratio (of the model and the Intercept-model) can be used as a measure of goodness-of-fit of mixed model.

Value
lmmR2LR() returns R squared coefficient based on likelihood ratio (of the model and the Intercept-model) for mixed model, this value lies between 0 and 1.

Author(s)
Aleksandra Maj

References

See Also
lmmCCC, lmmR2W, lmmR2

Examples
```r
fm1 <- lme(distance ~ age + Sex, data = Orthodont, random = ~ 1)
lmmR2LR(fm1)
```

Description
Function lmmR2W() evaluates an R squared coefficient based on Wald’s statistics for linear mixed models with one-level-grouping. The function is usable only for models evaluated by lme() function from nlme package. Two types of R squared coefficients based on Wald’s statistics are available: marginal (default) and conditional.

Usage
```r
lmmR2W(model, type = "marginal", adjust = "none")
```
Arguments

model a one-level-grouping linear mixed model fitted with lme()

 type character defining type of fitted values. There are two types available: "marginal" (default) and "conditional".

 adjust changing this parameter won’t change anything. It is only used for structStepR2.

Details

The R squared coefficient based on Wald’s statistics can be used as a measure of goodness-of-fit of linear mixed model with one-level-grouping.

Value

lmmR2W() returns R squared coefficient based on Wald’s statistics for linear mixed model with one-level-grouping. this value lies between 0 and 1.

Author(s)

Aleksandra Maj

References


See Also

lmmCCC, lmmR2LR, lmmR2

Examples

fm1 <- lme(distance ~ age + Sex, data = Orthodont, random = ~ 1)
lmmR2W(fm1)
lmmR2W(fm1, type = "conditional")
structStep

Selecting the best structures for random factors of linear mixed model with one-level-grouping using GIC (General Information Criterion) or PRESS coefficient

Description

Function structStep() selects the best structures (for random effects and for model errors for linear mixed model with one-level-grouping using GIC or PRESS coefficient) from:

random effects available structures: pdIdent, pdDiag, pdCompSymm, pdSymm, pdLogChol, pdNatural,
model errors available structures: NULL, corCompSymm, corARMA(p,q), corAR1.

Usage

structStep(model, k = 2, p = 1, q = 1, structChange = "both", trace = TRUE, type = "marginal")

Arguments

model object - one-level-grouped linear mixed model fitted with lme().
k numeric - penalty for number of model parameters (parameter for GIC() function). For example: if k = 2 (default) model will be selected by AIC, if k = log(nrow(data)) model will be selected by BIC. Or character "PRESS", then criterion for minimization is PRESS coefficient.
p integer - parameter for ARMA(p,q) correlation structure, default 1.
q integer - parameter for ARMA(p,q) correlation structure, default 1.
structChange character - specifies way to choose models. If "both" (default) both: random errors and random effects structures are selected, if "correlation" only correlation of random errors is chosen, if "random" only random effects structure is selected.
trace logical - if TRUE all fitted models will be printed, if FALSE nothing is printed.
type character - type for PRESS residuals: "marginal" (default) or "conditional"

Details

ARMA(p,q) correlation structure is default to ARMA(1,1) it can be changed, the best change may be if you know something about structure of your data.

Returned model is selected by minimizing the given criterion.

Value

Model of class lme().
structStepR2

Author(s)
Aleksandra Maj

See Also
GIC, lmmPRESS

Examples
```r
fm1 <- lme(distance ~ age, data = Orthodont, random = pdDiag(~age))
out <- structStep(fm1)
summary(out)
```

Description
Function structStepR2() selects the best structures (for random effects and for model errors for linear mixed model with one-level-grouping using $R^2$ measures of goodness-of-fit) from:
- random effects available structures: pdIdent, pdDiag, pdCompSymm, pdSymm, pdLogChol, pdNatural,
- model errors available structures: NULL, corCompSymm, corARMA(p,q), corAR1.
Available $R^2$ measures of goodness-of-fit: lmmCCC, lmmR2, lmmR2W, lmmR2LR.

Usage
```r
structStepR2(model, crit = lmmCCC, type = "marginal", adjust = "none", p = 1, q = 1, structchange = "both", trace = TRUE)
```

Arguments
- `model` object - one-level-grouped linear mixed model fitted with lme().
- `crit` function - one of: lmmCCC, lmmR2, lmmR2W, lmmR2LR.
- `type` character - defining type of fitted values. There are two types available: "marginal" (default) and "conditional".
- `adjust` character defining adjustment for number of model parameters. Three types available: "none" (default, no adjustment), "fixed" (adjustment for number of fixed effects) and "both" (adjustment for number of fixed effects and number of correlation structures parameters). Available only for: lmmCCC, lmmR2.
- `p` integer - parameter for ARMA(p,q) correlation structure, default 1.
- `q` integer - parameter for ARMA(p,q) correlation structure, default 1.
- `structchange` character - specifies way to choose models. If "both" (default) both: random errors and random effects structures are selected, if "correlation" only correlation of random errors is chosen, if "random" only random effects structure is selected.
- `trace` logical - if TRUE all fitted models will be printed, if FALSE nothing is printed.
Details

ARMA(p,q) correlation structure is default to ARMA(1,1) it can be changed, the best change may be if you know something about structure of your data.

Returned model is selected by maximizing the given criterion.

Value

Model of class lme().

Author(s)

Aleksandra Maj

See Also

lmmR2W, lmmR2LR, lmmR2, lmmCCC, structStep

Examples

fm1 <- lme(distance ~ age, data = Orthodont, random = pdDiag(~age))
out <- structStep(fm1)
summary(out)
Index

*Topic package
  lmmfit-package, 2

GIC, 3, 11
lme, 2
lmmCCC, 3, 4, 6–9, 12
lmmfit (lmmfit-package), 2
lmmfit-package, 2
lmmPRESS, 3, 5, 11
lmmR2, 3, 5, 6, 6, 8, 9, 12
lmmR2LR, 3, 5–7, 7, 9, 12
lmmR2W, 3, 5–8, 8, 12

structStep, 10, 12
structStepR2, 11