Package ‘ARpLMEC’

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Type Package

Title Fitting Autoregressive Censored Linear Mixed-Effects Models

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Author Rommy C. Olivari, Aldo M. Garay and Victor H. Lachos

Maintainer Rommy Camasca Olivari <rco1@de.ufpe.br>

Description It fits left, right or interval censored mixed-effects linear model with autoregressive errors of order p using the EM algorithm. It provides estimates, standard errors of the parameters and prediction of future observations.

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Description

This function fits left, right or interval censored mixed-effects linear model, with autoregressive errors of order \( p \), using the EM algorithm. It returns estimates, standard errors and prediction of future observations.

Usage

\[
\text{ARpLMEC.est}(y, x, z, cc, nj, Arp = 1, beta0 = \text{NULL}, sigma0 = \text{NULL}, \\
D0 = \text{NULL}, pi0 = \text{NULL}, \text{cens.type} = "\text{left}"; LI = \text{NULL}, \\
LS = \text{NULL}, \text{MaxIter} = 200; \text{error} = 1e-04; \text{Prev} = \text{FALSE}, \\
\text{step} = \text{NULL}; \text{isubj} = \text{NULL}; xpre = \text{NULL}; zpre = \text{NULL})
\]

Arguments

- **y**: Vector \( 1 \times n \) of censored responses, where \( n \) is the sum of the number of observations of each individual.
- **x**: Design matrix of the fixed effects of order \( n \times s \), corresponding to vector of fixed effects.
- **z**: Design matrix of the random effects of order \( n \times b \), corresponding to vector of random effects.
- **cc**: Vector of censoring indicators of length \( n \), where \( n \) is the total of observations. For each observation: 0 if non-censored, 1 if censored.
- **nj**: Vector \( 1 \times m \) with the number of observations for each subject, where \( m \) is the total number of individuals.
- **Arp**: Order of the autoregressive process. Must be a positive integer value. To consider a model uncorrelated use UNC.
- **beta0**: Initial values for the vector of fixed effects. If it is not indicated it will be provided automatically. Default is NULL.
- **sigma0**: Initial values for sigma. If it is not indicated it will be provided automatically. Default is NULL.
- **D0**: Initial values for the covariance matrix for the random effects. If it is not indicated it will be provided automatically. Default is NULL.
- **pi0**: Initial values for the vector for autoregressive coefficients pi’s. If it is not indicated it will be provided automatically. Default is NULL.
- **cens.type**: left for left censoring, right for right censoring and interval for interval censoring. Default is left.
- **LI**: Vector censoring lower limit indicator of length \( n \). For each observation: 0 if non-censored, -\( \text{inf} \) if censored. It is only indicated for when cens.type is both. Default is NULL.
LS  Vector censoring upper limit indicator of length n. For each observation: 0 if non-censored, \( \infty \) if censored. It is only indicated for when cens.type is both. Default is \( \text{NULL} \).

MaxIter  The maximum number of iterations of the EM algorithm. Default is 200.

error  The convergence maximum error. Default is 0.0001.

Prev  Indicator of the prediction process. Default is \( \text{FALSE} \).

step  Number of steps for prediction. Default is \( \text{NULL} \).

isubj  Vector indicator of subject included in the prediction process. Default is \( \text{NULL} \).

xpre  Design matrix of the fixed effects to be predicted. Default is \( \text{NULL} \).

zpre  Design matrix of the random effects to be predicted. Default is \( \text{NULL} \).

Value

returns list of class “ARpMMEC”:

FixEffect  Data frame with: estimate, standars erros and confidence intervals of the fixed effects.

Sigma2  Data frame with: estimate, standars erros and confidence intervals of the variance of the white noise process.

Phi  Data frame with: estimate, standars erros and confidence intervals of the autoregressive parameters.

RnEffect  Data frame with: estimate, standars erros and confidence intervals of the random effects.

Est  Vector of parameters estimate (fixed Effects, sigma2, phi, random effects).

SE  Vector of the standard errors of (fixed Effects, sigma2, phi, random effects).

loglik  Log-likelihood value.

AIC  Akaike information criterion.

BIC  Bayesian information criterion.

AICc  Corrected Akaike information criterion.

iter  Number of iterations until convergence.

MI  Information matrix

Prev  Predicted values (if xpre and zpre is not null).

time  Processing time.

References


Examples

```r
## Not run:
p.cens = 0.1
m = 10
D = matrix(c(0.049, 0.001, 0.001, 0.002), 2, 2)
sigma2 = 0.30
phi = c(0.48, -0.2)
beta = c(1, 2, 1)
nj = c(6, 5, 6, 8, 5, 7, 8, 6, 5, 4)
x <- matrix(runif(sum(nj) * length(beta), -1, 1), sum(nj), length(beta))
z <- matrix(runif(sum(nj) * dim(D)[1], -1, 1), sum(nj), dim(D)[1])
data = ARpLMEC.sim(m, x, nz, beta, sigma2, D, phi, p.cens)
attach(data)
Arp = 2
## Estimacao sem Previsao
test1 = ARpLMEC.est(y_cc, x, z, cc, nj, Arp, MaxIter = 10)

## Estimacao com Previsao
xx = matrix(runif(6 * length(beta), -1, 1), 6, length(beta))
zz = matrix(runif(6 * dim(D)[1], -1, 1), 6, dim(D)[1])
isubj = c(1, 4, 5)
test2 = ARpLMEC.est(y_cc, x, z, cc, nj, Arp, MaxIter = 10, Prev = TRUE, step = 2, isubj = isubj, xpre = xx, zpre = zz)
test2$Prev
## End(Not run)
```

**Description**

This function simulates a censored response variable with autoregressive errors of order \( p \), with mixed effect and a established censoring rate. This function returns the censoring vector and censored response vector.

**Usage**

```r
ARpLMEC.sim(m, x = NULL, z = NULL, nj, beta, sigmae, D1, phi, 
p.cens = 0, cens.type = "left")
```

**Arguments**

- **m**: Number of individuals
- **x**: Design matrix of the fixed effects of order \( n \times s \), corresponding to vector of fixed effects.
**ARpLMEC.sim**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>z</td>
<td>Design matrix of the random effects of order ( n \times b ), corresponding to vector of random effects.</td>
</tr>
<tr>
<td>nj</td>
<td>Vector ( 1 \times m ) with the number of observations for each subject, where ( m ) is the total number of individuals.</td>
</tr>
<tr>
<td>beta</td>
<td>Vector of values fixed effects.</td>
</tr>
<tr>
<td>sigmae</td>
<td>It’s the value for ( \sigma ).</td>
</tr>
<tr>
<td>D1</td>
<td>Covariance Matrix for the random effects.</td>
</tr>
<tr>
<td>phi</td>
<td>Vector of length ( \text{Arp} ), of values for autoregressive parameters.</td>
</tr>
<tr>
<td>p.cens</td>
<td>Censoring level for the process. Default is 0.</td>
</tr>
<tr>
<td>cens.type</td>
<td>1 left for left censoring, right for right censoring and interval for interval censoring. Default is left.</td>
</tr>
</tbody>
</table>

**Value**

returns list:

- cc Vector of censoring indicators.
- y_cc Vector of responses censoring.

**References**


**Examples**

```r
p.cens = 0.1
m = 50
D = matrix(c(0.049,0.001,0.001,0.002),2,2)
sigma2 = 0.30
phi = c(0.48,-0.2)
beta = c(1,2,1)
nj=rep(6,m)
x=matrix(runif(sum(nj)*length(beta),-1,1),sum(nj),length(beta))
z=matrix(runif(sum(nj)*dim(D)[1],-1,1),sum(nj),dim(D)[1])
data=ARpLMEC.sim(m,x,z,nj,beta,sigma2,D,phi,p.cens)
y=data$y_cc
cc=data$cc
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