Package ‘lotri’

October 13, 2022

Title  A Simple Way to Specify Symmetric, Block Diagonal Matrices
Version  0.4.2
Maintainer  Matthew L. Fidler <matthew.fidler@gmail.com>
Description  Provides a simple mechanism to specify a symmetric block
diagonal matrices (often used for covariance matrices). This is based
on the domain specific language implemented in 'nlmixr2' but expanded
to create matrices in R generally instead of specifying parts of
matrices to estimate.
License  GPL (>= 2)
URL  https://github.com/nlmixr2/lotri
BugReports  https://github.com/nlmixr2/lotri/issues
Depends  R (>= 3.4.0)
Imports  crayon, methods, stats, utils
Suggests  ggplot2, knitr, Matrix, microbenchmark, rmarkdown, testthat
VignetteBuilder  knitr
Biarch  true
Config/testthat/edition  3
Encoding  UTF-8
NeedsCompilation  yes
RoxygenNote  7.2.0
Language  en-US
Author  Matthew L. Fidler [aut, cre] (<https://orcid.org/0000-0001-8538-6691>)
Repository  CRAN
Date/Publication  2022-06-18 16:50:02 UTC
R topics documented:

as.lotri .............................................. 2
lotri ................................................. 3
lotriDataFrameToLotriExpression ................. 5
lotriEst ............................................ 6
lotriMat ........................................... 7
lotriMatInv ....................................... 8
lotriSep ........................................... 9

Description
As lower triangular matrix

Usage
as.lotri(x, ..., default = "")

## S3 method for class 'matrix'
as.lotri(x, ..., default = "")

## S3 method for class 'data.frame'
as.lotri(x, ..., default = "")

## Default S3 method:
as.lotri(x, ..., default = ")"

Arguments
x       Matrix or other data frame
...  Other factors
default  Is the default factor when no conditioning is implemented.

Value
Lower triangular matrix

Author(s)
Matthew Fidler
Description

Easily Specify block-diagonal matrices with lower triangular info

Usage

loltri(x, ..., envir = parent.frame(), default = "id")

Arguments

x list, matrix or expression, see details

... Other arguments treated as a list that will be concatenated then reapplied to this function.

eenvir the environment in which expr is to be evaluated. May also be NULL, a list, a data frame, a pairlist or an integer as specified to sys.call.

default Is the default factor when no conditioning is implemented.

Details

This can take an R matrix, a list including matrices or expressions, or expressions

Expressions can take the form

name ~ estimate

Or the lower triangular matrix when "adding" the names

name1 + name2 ~ c(est1, est2, est3)

The matrices are concatenated into a block diagonal matrix, like bdiag, but allows expressions to specify matrices easier.

Value

named symmetric matrix useful in ‘rxode2()’ simulations (and perhaps elsewhere)

Author(s)

Matthew L Fidler

Examples

## A few ways to specify the same matrix
loltri({et2 + et3 + et4 ~ c(40,
        0.1, 20,
        0.1, 0.1, 30)})
## You do not need to enclose in {}
lotri(et2 + et3 + et4 ~ c(40, 0.1, 20, 0.1, 0.1, 30),
et5 ~ 6)
## But if you do enclose in {}, you can use
## multi-line matrix specifications:
lotri({et2 + et3 + et4 ~ c(40, 0.1, 20, 0.1, 0.1, 30)
et5 ~ 6})

## You can also add lists or actual R matrices as in this example:
lotri(list(et2 + et3 + et4 ~ c(40, 0.1, 20, 0.1, 0.1, 30),
          matrix(1,dimnames=list("et5","et5"))))

## Overall this is a flexible way to specify symmetric block
## diagonal matrices.

## For rxode2, you may also condition based on different levels of
## nesting with lotri; Here is an example:
mat <- lotri(lotri iov.Ka ~ 0.5,
            iov.Cl ~ 0.6),
            lotri occ.Ka ~ 0.5,
            occ.Cl ~ 0.6 | occ(lower=4,nu=3))

mat

## you may access features of the matrix simply by `$` that is
mat$lower # Shows the lower bound for each condition
mat$lower$occ # shows the lower bound for the occasion variable

## Note that `lower` fills in defaults for parameters. This is true
## for `upper` true; In fact when accessing this the defaults
## are put into the list
mat$upper

## However all other values return NULL if they are not present like
mat$lotri

## And values that are specified once are only returned on one list:
mat$nu
lotriDataFrameToLotriExpression

Convert a lotri data frame to a lotri expression

Description

Convert a lotri data frame to a lotri expression

Usage

lotriDataFrameToLotriExpression(data, useIni = FALSE)

Arguments

data: lotri data frame
useIni: Use 'ini' instead of 'lotri' in the expression

Value

expression of the lotri syntax equivalent to the data.frame provided

Author(s)

Matthew L. Fidler

Examples

x <- lotri(
  tka <- 0.45; label("Log Ka")
  tcl <- 1; label("Log Cl")
  tv <- 3.45; label("Log V")
  eta.ka ~ 0.6
  eta.cl ~ 0.3
  eta.v ~ 0.1
  add.err <- 0.7
)

df <- as.data.frame(x)
lotriDataFrameToLotriExpression(df)

# You may also call as.expression directly from the lotri object
as.expression(x)

```
lotriEst

Extract or remove lotri estimate data frame from lotri object

Description

Extract or remove lotri estimate data frame from lotri object

Usage

lotriEst(x, drop = FALSE)

Arguments

x
lotri object

drop
boolean indicating if the lotri estimate should be dropped

Value

data frame with estimates or NULL if there is not a data.frame attached

Examples

fix1 <- lotri(
  a <- c(0, 1); backTransform("exp"); label("a label")
  b <- c(0, 1, 2)
  c <- fix(1)
  d <- fix(0, 1, 2)
  e <- c(0, 1, 2, fixed)
  f + g ~ c(1, 0.5, 1)
)

# Extract the attached lotri estimate data frame
lotriEst(fix1)

# Remove the attached lotri estimate data frame
lotriEst(fix1, drop=TRUE)
```
lotriMat  Create a matrix from a list of matrices

Description
This creates a named banded symmetric matrix from a list of named symmetric matrices.

Usage
lotriMat(matList, format = NULL, start = 1L)

Arguments
matList list of symmetric named matrices
format The format of dimension names when a sub-matrix is repeated. The format will
be called with the dimension number, so "ETA[%d]" would represent "ETA[1]",
"ETA[2]", etc
start The number the counter of each repeated dimension should start.

Value
Named symmetric block diagonal matrix based on concatenating the list of matrices together

Author(s)
Matthew Fidler

Examples

```
testList <- list(lotri({et2 + et3 + et4 ~ c(40, 0.1, 20, 0.1, 0.1, 30)}),
                  lotri(et5 ~ 6))
testList
lotriMat(testList)
```

# Another option is to repeat a matrix a number of times. This
# can be done with list(matrix, # times to repeat).

# In the example below, the first matrix is repeated 3 times
testList <- list(list(lotri({et2 + et3 + et4 ~ c(40, 0.1, 20, 0.1, 0.1, 30)}), 3),
                   lotri(et5 ~ 6))
lotriMatInv

Converts a matrix into a list of block matrices

Description

Converts a matrix into a list of block matrices

Usage

lotriMatInv(mat)

Arguments

mat

Matrix to convert to a list of block matrices

Details

This is the inverse of `lotriMat()`

Value

A list of block matrixes

Author(s)

Matthew Fidler

Examples

# Create a block matrix using `lotri()`
mat <- lotri(
  a+b ~ c(1,
    0.5, 1)
  c - 1)
lotriSep

```r

lotriSep

\[
\begin{align*}
d + e & \sim \text{c}(1, \\
0.5, 1)
\end{align*}
\]

\}

print(mat)

# now convert t a list of matrices

mat2 <- lotriMatInv(mat)
print(mat2)

# Of course you can convert it back to a full matrix:

mat3 <- lotriMat(mat2)
print(mat3)

```

---

**Description**

This is used for creating nesting simulations in `rxode2()` and may not be useful for external function calls.

**Usage**

```r
lotriSep(x, above, below, aboveStart = 1L, belowStart = 1L)
```

**Arguments**

- `x` : lotri matrix
- `above` : Named integer vector listing variability above the id level. Each element lists the number of population differences in the whole data-set (as integer)
- `below` : Named integer vector listing variability below the id level. Each element lists the number of items below the individual level. For example with 3 occasions per individual you could use `c(occ=3L)`
- `aboveStart` : Add the attribute of where THETA[#] will be added
- `belowStart` : Add the attribute of where ETA[#] will be added

**Value**

List of two lotri matrices

**Author(s)**

Matthew Fidler
Examples

\[
\begin{align*}
\omega & \leftarrow \text{lotri}(\text{eta.Cl ~ 0.1,} \\
& \quad \text{eta.Ka ~ 0.1}) \mid \text{id}(\text{nu=100}), \\
& \quad \text{lotri}(\text{eye.Cl ~ 0.05,} \\
& \quad \text{eye.Ka ~ 0.05}) \mid \text{eye}(\text{nu=50}), \\
& \quad \text{lotri}(\text{iov.Cl ~ 0.01,} \\
& \quad \text{iov.Ka ~ 0.01}) \mid \text{occ}(\text{nu=200}), \\
& \quad \text{lotri}(\text{inv.Cl ~ 0.02,} \\
& \quad \text{inv.Ka ~ 0.02}) \mid \text{inv}(\text{nu=10})
\end{align*}
\]

\text{lotriSep}(\omega, \text{above}=c(\text{inv=10L}), \text{below}=c(\text{eye=2L, occ=4L}))
Index

as.lotri, 2
bdiag, 3
environment, 3
lotri, 3
lotriDataFrameToLotriExpression, 5
lotriEst, 6
lotriMat, 7
lotriMatInv, 8
lotriSep, 9

sys.call, 3