Package 'mlVAR'

June 10, 2015

Type Package

Title Multi-Level Vector Autoregression

Version 0.1.0

Depends R (>= 3.0.0)

Imports plyr, lme4, arm, qgraph

Author Sacha Epskamp, Marie K. Deserno and Laura F. Bringmann

Maintainer Sacha Epskamp <mail@sachaepskamp.com>

Description Compute estimates of the multivariate vector autoregression model as used to (but not limited to) analyze experience sampling method data in clinical psychology. The model can be extended through treatment effects, covariates and pre- and post-assessment effects.

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NeedsCompilation no

Repository CRAN

Date/Publication 2015-06-10 15:08:04

R topics documented:

mlVAR *Multilevel VAR Estimation for Multiple Time Series*

Description

The function mlVAR computes estimates of the multivariate vector autoregression model as introduced by Bringmann et al. (2013) which can be extended through treatment effects, covariates and pre- and post assessment effects.

Usage

```
mlVAR(data, vars, idvar, dayvar, beepvar, periodvar, lags = 1, treatmentvar, covariates,
        control = list(optimizer = "bobyqa"))
```

Arguments

data	Data frame
vars	Vectors of variables to include in the analysis
idvar	String indicating the subject ID
dayvar	String indicating assessment day (if missing, every assessment is set to one day)
beepvar	String indicating assessment beep per day (if missing, is added)
periodvar	String indicating the period (baseline, treatment period, etc.) of assessment (if missing, every assessment is set to one period)
lags	Vector indicating the lags to include
treatmentvar	Character vector indicating treatment
covariates	Character indicating covariates independent of assessment.
control	A list of arguments sent to lmerControl

Details

mlVAR has been built to extract individual network dynamics by estimating a multilevel vector autoregression model that models the time dynamics of selected variables both within an individual and on group level. For example, in a lag-1-model each variable at time point t is regressed to a lagged version of itself at time point t-1 and all other variables at time point t-1. In psychological research, for example, this analysis can be used to relate the dynamics of symptoms on one day (as assessed by experience sampling methods) to the dynamics of these symptoms on the consecutive day.

Value

mlVAR returns a 'mlVAR' object containing

fixedEffects	A matrix that contains all fixed effects coefficients with dependent variables as rows and the lagged independent variables as columns.

`se.fixedEffects`
: A matrix that contains all standard errors of the fixed effects.

`randomEffects`
: A list of matrices that contain the random effects coefficients.

`randomEffectsVariance`
: A matrix containing the estimated variances between the random-effects terms

`pvals`
: A matrix that contains p-values for all fixed effects.

`pseudologlik`
: The pseudo log-likelihood.

`BIC`
: Bayesian Information Criterion, i.e. the sum of all univariate models' BICs

`input`
: List containing the names of variables used in the analysis

Author(s)

Sacha Epskamp (mail@sachaepskamp.com), Marie K. Deserno (m.k.deserno@uva.nl) and Laura F. Bringmann (laura.bringmann@ppw.kuleuven.be)

References

Bringmann, L. F., Vissers, N., Wichers, M., Geschwind, N., Kuppens, P., Peeters, F., Borsboom, D. and Tuerlinckx, F. (2013). A network approach to psychopathology: New insights into clinical longitudinal data. PloS one, 8(4): e60188.

See Also

`fixedEffects`, `fixedEffects`

Examples

```
## Not run:
# True L1 structure:
L1 <- matrix(c(
  0.5,0.25,0,
  0,0.5,0.25,
  0,0,0.5),3,3,byrow=TRUE)

# True L2 structure:
L2 <- matrix(c(
  0.1,0,-0.2,
  0,0.1,0,
  0,0,0.1),3,3,byrow=TRUE)

# Error variance:
error <- 0.1

# Number of subjects:
Np <- 10

# Number of measurements per subject:
Nt <- 30

# Generate random effects:
```

```
L1_RF <- lapply(1:Np, function(x) L1 + rnorm(prod(dim(L1)),0,error))
L2_RF <- lapply(1:Np, function(x) L2 + rnorm(prod(dim(L1)),0,error))

# Generate data:
Data <- do.call(rbind,lapply(1:Np, function(p) {
  subjectData <- simulateVAR(list(L1_RF[[p]], L2_RF[[p]]), 1:2, 100)
  names(subjectData) <- paste0("x",1:3)
  subjectData$ID <- p
  subjectData
  }))

# Run analysis:
Res <- mlVAR(Data, paste0('x',1:3), "ID", lags = c(1, 2))

  library("qgraph")

  # Plot true fixed VAR network vs estimated fixed VAR network:
  # Lag-1
  layout(t(1:2))
  qgraph(t(L1), labels = paste0('x',1:3), layout = "circle", title = "True Lag-1", diag = TRUE,
         mar = c(8,8,8,8))
  plot(Res, "fixed", lag=1, labels = paste0('x',1:3), layout = "circle", title = "Estimated Lag-1",
       mar = c(8,8,8,8))

  # Lag-2
  layout(t(1:2))
  qgraph(t(L2), labels = paste0('x',1:3), layout = "circle", title = "True Lag-2", diag = TRUE,
         mar = c(8,8,8,8))
  plot(Res, "fixed", lag=2, labels = paste0('x',1:3), layout = "circle", title = "Estimated Lag-2",
       mar = c(8,8,8,8))

## End(Not run)
```

`mlVAR-effects` *Fixed and random effects*

Description

These functions return a table of the fixed and random effects

Usage

```
fixedEffects(object)
randomEffects(object)
```

Arguments

`object`	A `mlVAR` object

Author(s)

Sacha Epskamp (mail@sachaepskamp.com), Marie K. Deserno (m.k.deserno@uva.nl) and Laura F. Bringmann (laura.bringmann@ppw.kuleuven.be)

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mlVAR-methods *print and summary functions for mlVAR objects*

Description

Create a short summary of an object created by `mlVAR`.

Usage

```
  ## S3 method for class 'mlVAR'
print(x, ...)
  ## S3 method for class 'mlVAR'
summary(object, ...)
```

Arguments

`object`	A "mlVAR" object
`x`	A "mlVAR" object
`...`	Not used

Author(s)

Sacha Epskamp (mail@sachaepskamp.com), Marie K. Deserno (m.k.deserno@uva.nl) and Laura F. Bringmann (laura.bringmann@ppw.kuleuven.be)

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plot.mlVAR *Plot Method for mlVAR*

Description

The function `plot.mlVAR` plots estimated model coefficients as a network using `qgraph`.

Usage

```
  ## S3 method for class 'mlVAR'
plot(x, type = c("fixed","se","random","subject"), lag = 1,subject,...)
```

Arguments

x	A mlVAR object obtained through the mlVAR-function
type	Indicates whether to plot a network of fixed effects coefficients ("fixed"), the standard deviations of the fixed effects ("se"), the variances of the random effect terms ("random") or an individual subject's random effects network ("subject").
lag	Vector indicating the lags to include
subject	If type="subject", vector indicating the ID subject number
...	Arguments sent to qgraph

Author(s)

Sacha Epskamp (mail@sachaepskamp.com), Marie K. Deserno (m.k.deserno@uva.nl) and Laura F. Bringmann (laura.bringmann@ppw.kuleuven.be)

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simulateVAR *Simulate data from VAR model*

Description

Simulates a timeseries using VAR parameters

Usage

```
simulateVAR(pars, lags = 1, Nt, init, errorSD = 0.1)
```

Arguments

pars	A square matrix or a list of square matrices indicating the VAR parameters
lags	The lags to which the 'pars' argument parameters correspond. If 'pars' is a list then this argument should be a vector indicating which lags are represented by each element of the 'pars' list.
Nt	Number of time points
init	Initial setup. Must be a matrix of the first lags with rows corresponding to time points and columns corresponding to variables (e.g., if only two lags are used then the matrix must have two rows indicating the first two times points.)
errorSD	Standard deviation of the error

Author(s)

Sacha Epskamp (mail@sachaepskamp.com), Marie K. Deserno (m.k.deserno@uva.nl) and Laura F. Bringmann (laura.bringmann@ppw.kuleuven.be)

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