Package: mvdlm (via r-universe)

October 9, 2024

Title Multivariate Dynamic Linear Modelling With Stan

Version 0.1.0

Description Fits multivariate dynamic linear models in a Bayesian framework using Stan.

License GPL (>=3)

Encoding UTF-8

LazyData true

Roxygen list(markdown = TRUE)

RoxygenNote 7.3.1

Biarch true

URL https://github.com/atsa-es/mvdlm

BugReports https://github.com/atsa-es/mvdlm/issues

Depends R (>= 4.1.0)

Imports broom.mixed, methods, ggplot2, MARSS, Rcpp (>= 0.12.0), RcppParallel (>= 5.0.1), rstan (>= 2.18.1), rstantools (>= 2.1.1)

Suggests testthat, knitr, rmarkdown, parallel

LinkingTo BH (>= 1.66.0), Rcpp (>= 0.12.0), RcppEigen (>= 0.3.3.3.0), RcppParallel (>= 5.0.1), rstan (>= 2.18.1), StanHeaders (>= 2.18.0)

SystemRequirements GNU make

VignetteBuilder knitr

Repository https://atsa-es.r-universe.dev

RemoteUrl https://github.com/atsa-es/mvdlm

RemoteRef HEAD

RemoteSha d5241aa158ff8ad19e4cb43e14951e1e700f0016

Contents

`mvdlm-package` *The 'mvdlm' package.*

Description

Multivariate dynamic linear models fit with Stan

Author(s)

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References

Stan Development Team (2020). RStan: the R interface to Stan. R package version 2.21.2. https://mc-stan.org

See Also

Useful links:

- https://github.com/atsa-es/mvdlm
- Report bugs at https://github.com/atsa-es/mvdlm/issues

`dlm_trends` *Summarize and plot time varying coefficients from the fitted model*

Description

Summarize and plot time varying coefficients from the fitted model

Usage

```
dlm_trends(fitted_model)
```

Arguments

`fitted_model`	A fitted model object

Value

A list containing the plot and data used to fit the model. These include `plot` and `b_varying`

Examples

```
set.seed(123)
N = 20
data = data.frame("y" = runif(N),
                  "cov1" = rnorm(N),
                  "cov2" = rnorm(N),
                  "year" = 1:N,
                  "season" = sample(c("A","B"), size=N, replace=TRUE))
b_1 = cumsum(rnorm(N))
b_2 = cumsum(rnorm(N))
data$y = data$cov1*b_1 + data$cov2*b_2
time_varying = y ~ cov1 + cov2
formula = NULL
fit <- fit_dlm(formula = formula,
               time_varying = time_varying,
               time = "year",
               est_df = FALSE,
               family = c("normal"),
               data=data, chains = 1, iter = 20)
dlm_trends(fit)
```

`fit_dlm` *Fit a Bayesian multivariate dynamic linear model with Stan*

Description

Fit a Bayesian multivariate dynamic linear model with Stan that optionally includes covariates to estimate effects, extremes (Student-t distribution), etc.

Usage

```
fit_dlm(
  formula = NULL,
  time_varying = NULL,
  time = "year",
  est_df = FALSE,
  family = c("normal", "binomial", "poisson", "nbinom2", "gamma", "lognormal"),
  correlated_rw = FALSE,
  data,
  chains = 3,
  iter = 2000,
  warmup = floor(iter/2),
  ...
)
```

Arguments

formula	The model formula for the fixed effects; at least this formula or time_varying needs to have the response included
time_varying	The model formula for the time-varying effects; at least this formula or formula needs to have the response included
time	String describing the name of the variable corresponding to time, defaults to "year"
est_df	Whether or not to estimate deviations of B as Student - t with estimated degrees of freedom, defaults to FALSE
family	The name of the family used for the response; can be one of "normal","binomial","possion","nbinom2","ga
correlated_rw	Whether to estimate time-varying parameters as correlated random walk, defaults to FALSE
data	The data frame including response and covariates for all model components
chains	Number of mcmc chains, defaults to 3
iter	Number of mcmc iterations, defaults to 2000
warmup	Number iterations for mcmc warmup, defaults to 1/2 of the iterations
...	Any other arguments to pass to rstan::sampling().

Value

A list containing the fitted model and arguments and data used to fit the model. These include model (the fitted model object of class stanfit),

Examples

```
set.seed(123)
N = 20
data = data.frame("y" = runif(N),
                  "cov1" = rnorm(N),
                  "cov2" = rnorm(N),
                  "year" = 1:N,
                  "season" = sample(c("A","B"), size=N, replace=TRUE))
b_1 = cumsum(rnorm(N))
b_2 = cumsum(rnorm(N))
data$y = data$cov1*b_1 + data$cov2*b_2
time_varying = y ~ cov1 + cov2
formula = NULL

# fit a model with a time varying component
fit <- fit_dlm(formula = formula,
               time_varying = time_varying,
               time = "year",
               est_df = FALSE,
               family = c("normal"),
               data=data, chains = 1, iter = 20)

# fit a model with a time varying and fixed component (here, fixed intercept)
```

```
fit <- fit_dlm(formula = y ~ 1,
               time_varying = y ~ -1 + cov1 + cov2,
               time = "year",
               est_df = FALSE,
               family = c("normal"),
               data=data, chains = 1, iter = 20)

#' # fit a model with deviations modeled with a multivariate Student-t
fit <- fit_dlm(formula = y ~ 1,
               time_varying = y ~ -1 + cov1 + cov2,
               time = "year",
               est_df = TRUE,
               family = c("normal"),
               data=data, chains = 1, iter = 20)

#' #' # fit a model with deviations modeled with a multivariate Student-t
fit <- fit_dlm(formula = y ~ 1,
               time_varying = y ~ -1 + cov1 + cov2,
               time = "year",
               est_df = TRUE,
               family = c("normal"),
               data=data, chains = 1, iter = 20)
```

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