Package ‘rollRegres’

November 25, 2019

Type Package

Title Fast Rolling and Expanding Window Linear Regression

Version 0.1.3

Description Methods for fast rolling and expanding linear regression models. That is, series of linear regression models estimated on either an expanding window of data or a moving window of data. The methods use rank-one updates and downdates of the upper triangular matrix from a QR decomposition (see Dongarra, Moler, Bunch, and Stewart (1979) <doi:10.1137/1.9781611971811>).

Encoding UTF-8

LazyData true

LinkingTo Rcpp, RcppArmadillo

Imports Rcpp, checkmate

Suggests knitr, rmarkdown, testthat, zoo, roll, microbenchmark, RcppParallel

VignetteBuilder knitr

RoxygenNote 7.0.0

BugReports https://github.com/boennecd/rollRegres/issues

SystemRequirements C++11

URL https://github.com/boennecd/rollRegres

NeedsCompilation yes

Author Benjamin Christoffersen [cre, aut],
Madeleine Thompson [cph]

Maintainer Benjamin Christoffersen <boennecd@gmail.com>

Repository CRAN

Date/Publication 2019-11-25 09:20:02 UTC

R topics documented:

`roll_regres` *Fitting Rolling and Expanding Linear Models*

Description

Method for fast rolling and expanding regression models. I.e., linear models estimated over a moving window or expanding window of data. The function assumes that data is ordered.

Usage

```
roll_regres(formula, data, width, contrasts = NULL,
  do_compute = character(), grp = NULL, do_downdates = TRUE,
  min_obs = NULL)
```

Arguments

`formula`	as `formula` in `lm`.
`data`	an optional `data.frame` containing the variables in the model.
`width`	integer with the width of the moving window. Only used if `do_downdates == TRUE`.
`contrasts`	list passed to `model.matrix.default`s `contrasts.arg` argument.
`do_compute`	character vector with elements `"sigmas"`, `"r.squareds"`, and/or `"1_step_forecasts"` for additional output to be computed. See "Details" in `roll_regres`.
`grp`	integer vector to be used if you e.g., want to run the regression over weekly blocks of data. See "Details" in `roll_regres`.
`do_downdates`	logical which is `TRUE` if you want a rolling window regressions. Otherwise, an expanding window is used.
`min_obs`	positive integer with minimum number of observation that are required in a window. Useful if there are gaps in `grp` or unequal number of observations for each `grp`.

Details

`do_compute` can contain `"sigmas"` if you want the estimated standard deviation of the residuals, `"r.squareds"` for the R^2 of the models, and `"1_step_forecasts"` for the out-of-sample forecast for the next periods value.

`grp` is a sorted integer vector if you want to make "block" updates. E.g., `grp` could be an integer vector with the week number. The `width` argument is relative to the `grp` argument if the `grp` argument is not `NULL`. The indices of `grp` should match with the other data objects.

See `vignette("Comparisons",package = "rollRegres")` for further examples.

Value

List with vector and matrices with the computed output. See the `do_compute` argument.

See Also

`roll_regres.fit` for method that avoids the call to e.g., `model.frame`.

Examples

```
# simulate data
set.seed(29132867)
n <- 50
p <- 2
X <- cbind(1, matrix(rnorm(p * n), ncol = p))
y <- drop(X %*% c(1, -1, 1)) + rnorm(n)
df <- data.frame(y, X[, -1])

# compute coefs
out <- roll_regres(y ~ X1 + X2, df, width = 45L)
tail(out$coefs)

# compute more output
out <- roll_regres(
 y ~ X1 + X2, df, width = 45L,
 do_compute = c("sigmas", "r.squareds", "1_step_forecasts"))
lapply(out, tail)
```

`roll_regres.fit` *Fitter Function for Rolling and Expanding Linear Models*

Description

Function with a few validations before calling C++ code.

Usage

```
roll_regres.fit(x, y, width, do_compute = character(), grp = NULL,
  do_downdates = TRUE, min_obs = NULL)
```

Arguments

`x` design matrix of dimension `n * p`.

`y` numeric vector of observations of length `n`.

`width` integer with the width of the moving window. Only used if `do_downdates == TRUE`.

`do_compute` character vector with elements `"sigmas"`, `"r.squareds"`, and/or `"1_step_forecasts"` for additional output to be computed. See "Details" in `roll_regres`.

`grp` integer vector to be used if you e.g., want to run the regression over weekly blocks of data. See "Details" in `roll_regres`.

`do_downdates` logical which is `TRUE` if you want a rolling window regressions. Otherwise, an expanding window is used.

`min_obs` positive integer with minimum number of observation that are required in a window. Useful if there are gaps in `grp` or unequal number of observations for each `grp`.

Details

First, the `dqrdc` routine from LINPACK is used to form the QR decomposition for the first window of data using Householder transformations without pivoting. Then, the LINPACK `dchud` and `dchdd` routines are used to update and downdate the Cholesky decomposition (the R matrix in the QR decomposition).

Notice that unlike `lm`, there are no checks of the rank of the matrix.

Value

Same as `roll_regres`.

References

Golub, G. H., & Van Loan, C. F. (2013). Matrix computations (4rd ed.). JHU Press. See chapter 5 and section 6.5.

See Also

`roll_regres` for method similar to `lm`.

Examples

```
# simulate data
set.seed(9623556)
n <- 50
p <- 2
X <- cbind(1, matrix(rnorm(p * n), ncol = p))
y <- drop(X %*% c(1, -1, 1)) + rnorm(n)

# compute coefs
out <- roll_regres.fit(x = X, y = y, width = 45L)
tail(out$coefs)
```

Index