

Package ‘PWD’

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Type Package

Title Time Series Regression Using the Power Weighted Densities (PWD) Approach

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Description Contains functions which allow the user to perform time series regression quickly using the Power Weighted Densities (PWD) approach. `alphahat_LR_one_Rcpp()` is the main workhorse function within this package.

License GPL-3

Imports Rcpp (>= 0.11.5), stats, graphics

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PWD-package

Time Series Regression Using the Power Weighted Densities (PWD) Approach

Description

Contains functions which allow the user to perform time series regression quickly using the Power Weighted Densities (PWD) approach. `alphahat_LR_one_Rcpp()` is the main workhorse function within this package.

Details

Package: PWD
Type: Package
Version: 1.0
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Author(s)

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References

McCarthy, Daniel; Jensen, Shane. "Power Weighted Densities for Time Series Data." December 2015. Available at arXiv: <http://arxiv.org/abs/1412.4059>

alphahat_LR_one_Rcpp

Estimates PWD Parameter alpha by Maximum Marginal Predictive Likelihood

Description

This is the main function of the package. It takes as inputs the time series data as response, as well as a predictor matrix, excluding the intercept column, and other settings. It returns as outputs a scalar representing the value of alpha which maximizes the marginal predictive likelihood of the data given the grid of alpha values considered.

Usage

```
alphahat_LR_one_Rcpp(y, X = FALSE, alpha.grid = seq(0.65, 1, length.out =
  150), init = 2, plotting = TRUE)
```

Arguments

<code>y</code>	T-length time series vector. <code>y[1]</code> represents the beginning of the time series.
<code>X</code>	[T x p] dimensional matrix of covariates. This should not include the intercept column. If <code>X</code> is <code>FALSE</code> , intercept model is run.
<code>alpha.grid</code>	Grid of alpha values over which to compute the marginal predictive likelihood.
<code>init</code>	integer representing the time point to begin computing marginal predictive likelihoods.
<code>plotting</code>	If <code>TRUE</code> , plot the marginal predictive distribution of alpha.

Value

Return a scalar value representing the value of alpha which maximizes the marginal predictive likelihood of the data over the grid of alpha values considered.

Examples

```
set.seed(12)
N=80
err = rnorm(N)
X = 1:N
slopes = c(rep(1.5,40),rep(2,N-40))
y = rep(5,N) + slopes*X + err
init=6
alpha.grid = seq(.75,1,length.out=40)
alphahat=alphahat_LR_one_Rcpp(y=y,X=X,alpha.grid=alpha.grid,init=init,plotting=TRUE)
alpha1 = 1.0
coeffs1 = bhat.func(y,X,alpha1)
alpha2 = alphahat
coeffs2 = bhat.func(y,X,alpha2)
plot(x=X,y=y)
abline(a=coeffs2[1],b=coeffs2[2],lty=2,col="red")
abline(a=coeffs1[1],b=coeffs1[2],lty=2)
legend("right", legend=c("OLS","PWD"), col=c(1,2), lty=c(2,2), lwd=c(1,1))
```

bhat.func

Compute PWD Regression Coefficients Given alpha

Description

This function computes PWD regression coefficients for response `y` and predictors `X` given a particular value of alpha.

Usage

```
bhat.func(y, X, alpha)
```

Arguments

`y` T-length time series vector. `y[1]` represents the beginning of the time series.

`X` [T x p] dimensional matrix of covariates. This should not include the intercept column. If `X` is `FALSE`, intercept model is run.

`alpha` PWD parameter we are calculating the marginal predictive loglikelihood for.

Value

(p+1)-length vector representing the regression coefficients associated with a PWD regression of `y` upon `X` given PWD parameter `alpha`.

Examples

```
set.seed(12)
N=80
err = rnorm(N)
X = 1:N
slopes = c(rep(1.5,40),rep(2,N-40))
y = rep(5,N) + slopes*X + err
alpha1 = 1.0
coeffs1 = bhat.func(y,X,alpha1)
alpha2 = .9
coeffs2 = bhat.func(y,X,alpha2)
plot(x=X,y=y)
abline(a=coeffs2[1],b=coeffs2[2],lty=2,col="red")
abline(a=coeffs1[1],b=coeffs1[2],lty=2)
legend("right", legend=c("OLS","PWD"), col=c(1,2), lty=c(2,2), lwd=c(1,1))
```

loglik.norm.LR.Rcpp *Compute Marginal Predictive Loglikelihood of Data Given alpha*

Description

This function computes the marginal predictive loglikelihood of the observed data given a particular value of `alpha`, and the time point to begin computing marginal predictive loglikelihoods.

Usage

```
loglik.norm.LR.Rcpp(y, X = FALSE, alpha, init)
```

Arguments

<code>y</code>	T-length time series vector. <code>y[1]</code> represents the beginning of the time series.
<code>X</code>	[T x p] dimensional matrix of covariates. This should not include the intercept column. If <code>X</code> is <code>FALSE</code> , intercept model is run.
<code>alpha</code>	PWD parameter we are calculating the marginal predictive loglikelihood for.
<code>init</code>	integer representing the time point to begin computing marginal predictive loglikelihood.

Value

Return a scalar value representing the marginal predictive loglikelihood of the data given alpha.

Examples

```
N=80
err = rnorm(N)
X = 1:N
slopes = c(rep(1.5,40),rep(2,N-40))
y = rep(5,N) + slopes*X + err
init=4
alpha.grid = seq(.65,1,length.out=40)
i=40
loglik.norm.LR.Rcpp(y,X=X,alpha=alpha.grid[i],init=init)
```

logliknormLR

Fast Computation of Marginal Predictive Loglikelihood

Description

Helper function which takes as input a vector-valued response, `y`, a predictor matrix, `X`, a particular value of `alpha`, and `init`. It returns as an output the marginal predictive loglikelihood of the data given that value of `alpha`.

Usage

```
logliknormLR(yy, XX_aug, alpha, init)
```

Arguments

<code>yy</code>	T-length time series vector. <code>y[1]</code> represents the beginning of the time series.
<code>XX_aug</code>	[T x (p+1)] dimensional matrix of covariates. This will include the intercept column.
<code>alpha</code>	PWD parameter we are calculating the marginal predictive loglikelihood for.
<code>init</code>	integer representing the time point to begin computing marginal predictive loglikelihood.

Value

Return a scalar value representing the marginal predictive loglikelihood of the data given alpha.

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