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*

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Details

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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

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

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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 eries.
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))
```

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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

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

yy	T-length time series vector. y[1] represents the beginning of the time eries.
XX_aug	[T x (p+1)] dimensional matrix of covariates. This will include the intercept column.
alpha	PWD parameter we are calculating the marginal predictive loglikelihood for.
init	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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