Package ‘MSGARCHelm’

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Description

The fcastelm function computes the volatility forecasting performance of Extreme Learning Machine (ELM) model with root mean square error (RMSE), mean absolute error (MAE), MAPE etc.

Usage

fcastelm(data, stepahead=6, nlags=5, freq = frequency(data),
         hn=10, est=c("lm"), rep=20, combt=c("mean"))

Arguments

data Univariate time series data.
stepahead The forecast horizon.
nlags Lags of the data to use as inputs.
freq Frequency of the time series.
hn Number of hidden nodes.
est Estimation type for output layer weights. Can be "lasso" (lasso with CV), "ridge" (ridge regression with CV), "step" (stepwise regression with AIC) or "lm" (linear regression). Default: est=c("lm").
rep Number of networks to train, the result is the ensemble forecast.
combt Combination operator for forecasts when rep > 1. Can be "median", "mode" (based on KDE estimation) and "mean". Default: combt=c("mean")

Details

It helps to find the most appropriate Extreme Learning Machine model for the time series volatility forecasting.

Value

$accuracy_elm: Performance matrices of ELM model

References

Examples

```r
library(MSGARCHelm)
data(ReturnSeries_data)
fcastelm(ReturnSeries_data)
```

### Description

This function computes combined time series volatility forecast of Markov Switching GARCH (MS-GARCH) and Extreme Learning Machine (ELM) model according to the approach of Bates and Granger (1969).

### Usage

```r
msgarchelm_BG(data, stepahead=10, nlags=3, modelcomb=c("sGARCH", "gjrGARCH"), distcomb=c("norm", "std"), freq = frequency(data), hn=10, est=c("lm"), rep=20, combt=c("mean"))
```

### Arguments

- **data**: Univariate time series data.
- **stepahead**: The forecast horizon
- **nlags**: Lags of the data to use as inputs in the Extreme Learning Machine (ELM).
- **modelcomb**: Combination of volatility models in two different regimes in the MS-GARCH model. Valid models are "sARCH", "sGARCH", "eGARCH", "gjrGARCH", and "tGARCH". Default: modelcomb=c("sGARCH", "gjrGARCH").
- **distcomb**: List with element distribution in the MS-GARCH model. distribution is a character vector (of size 2) of conditional distributions. Valid distributions are "norm", "snorm", "std", "sstd", "ged", and "sged". Default: distcomb=c("norm", "std").
- **freq**: Frequency of the time series.
- **hn**: Number of hidden nodes in the ELM model.
- **est**: Estimation type for output layer weights in the ELM. Can be "lasso" (lasso with CV), "ridge" (ridge regression with CV), "step" (stepwise regression with AIC) or "lm" (linear regression). Default: est=c("lm").
- **rep**: Number of networks to train, the result is the ensemble forecast in the ELM.
- **combt**: Combination operator for forecasts in the ELM model when rep > 1. Can be "median", "mode" (based on KDE estimation) and "mean". Default: combt=c("mean").
Details

Bates and Granger (1969) introduce the idea of combining forecasts. Their approach builds on portfolio diversification theory and uses the diagonal elements of the estimated mean squared prediction error matrix in order to compute combination weights. This function gives the combined volatility forecast of Markov Switching GARCH model and Extreme Learning machine model based on Bates and Granger (1969) approach.

Value

$ fcast\_comb$: Forecasted value of combined model according to Bates and Granger (1969).

$ accuracy\_combined$: Performance matrices of the combined model.

References


Examples

```r
library(MSGARCHelm)
data(ReturnSeries_data)
msgarchelm_BG(ReturnSeries_data)
```

### msgarchelm\_NG

*Newbold and Granger MS-GARCH-ELM Combination*

#### Description

Computes time series volatility forecast combination of MS-GARCH and ELM model according to the approach by Newbold and Granger (1974) and evaluate its performance.

#### Usage

```r
msgarchelm_NG(data, stepahead = 10, nlags = 5, modelcomb = c("sGARCH", "gjrGARCH"), distcomb = c("norm", "std"), freq = frequency(data), hn = 10, est = c("lm"), rep = 20, combt = c("mean"))
```
Arguments

- **data**: Univariate time series data.
- **stepahead**: The forecast horizon.
- **nlags**: Lags of the data to use as inputs in the Extreme Learning Machine (ELM).
- **modelcomb**: Combination of volatility models in two different regimes in the MS-GARCH model. Valid models are "sARCH", "sGARCH", "eGARCH", "gjrGARCH", and "tGARCH". Default: modelcomb=c("sGARCH", "gjrGARCH").
- **distcomb**: List with element distribution in the MS-GARCH model. distribution is a character vector (of size 2) of conditional distributions. Valid distributions are "norm", "snorm", "std", "sstd", "ged", and "sged". Default: distcomb=c("norm", "std").
- **freq**: Frequency of the time series.
- **hn**: Number of hidden nodes in the ELM model.
- **est**: Estimation type for output layer weights in the ELM. Can be "lasso" (lasso with CV), "ridge" (ridge regression with CV), "step" (stepwise regression with AIC) or "lm" (linear regression). Default: est=c("lm").
- **rep**: Number of networks to train, the result is the ensemble forecast in the ELM.
- **combt**: Combination operator for forecasts in the ELM model when rep > 1. Can be "median", "mode" (based on KDE estimation) and "mean". Default: combt=c("mean").

Details

It gives the combined volatility forecast of Markov Switching GARCH model and Extreme Learning machine model based on Newbold and Granger (1974) approach. Here MS-GARCH model is restricted to two regime. The Newbold and Granger (1974) approach extracts the combination weights from the estimated mean squared prediction error matrix.

Value

- **fcast_comb**: Forecasted value of combined model.
- **accuracy_combined**: Performance matrices of the combined model.

References


Examples

```r
library(MSGARCHelm)
data(ReturnSeries_data)
msgarchelm_NG(ReturnSeries_data)
```
Description

This function computes combined time series volatility forecast of Markov Switching GARCH (MS-GARCH) and Extreme Learning Machine (ELM) model according to weights of ordinary least squares (OLS) regression.

Usage

msgarchelm_OLS(data, stepahead = 10, nlags = 5, modelcomb = c("sGARCH","gjrGARCH"), distcomb = c("norm", "std"), freq = frequency(data), hn =10, est = c("lm"), rep = 20, combt = c("mean"))

Arguments

data Univariate time series data.
stepahead The forecast horizon
nlags Lags of the data to use as inputs in the Extreme Learning Machine (ELM).
modelcomb Combination of volatility models in two different regimes in the MS-GARCH model. Valid models are "sARCH", "sGARCH", "eGARCH", "gjrGARCH", and "tGARCH". Default: modelcomb=c("sGARCH", "gjrGARCH").
distcomb List with element distribution in the MS-GARCH model. distribution is a character vector (of size 2) of conditional distributions. Valid distributions are "norm", "snorm", "std", "sstd", "ged", and "sged". Default: distcomb=c("norm", "std").
freq Frequency of the time series.
hn Number of hidden nodes in the ELM model.
est Estimation type for output layer weights in the ELM. Can be "lasso" (lasso with CV), "ridge" (ridge regression with CV), "step" (stepwise regression with AIC) or "lm" (linear regression). Default: est=c("lm")).
rep Number of networks to train, the result is the ensemble forecast in the ELM.
combt Combination operator for forecasts in the ELM model when rep > 1. Can be "median", "mode" (based on KDE estimation) and "mean". Default: combt=c("mean").

Details

The OLS combination method (Granger and Ramanathan (1984)) uses ordinary least squares to estimate the weights for the combination. An appealing feature of the method is its bias correction through the intercept – even if one or more of the individual predictors are biased, the resulting combined forecast is unbiased. This function gives the combined volatility forecast of Markov Switching GARCH model and Extreme Learning machine model based on OLS approach.
Value
$fcast\_comb$: Forecasted value of combined model according to ordinary least squares.  
$accuracy\_combined$: Performance matrices of the combined model.

References

Examples
library(MSGARCHelm)
data(ReturnSeries_data)
msgarchelm_OLS(ReturnSeries_data)

ReturnSeries_data       Return Series Data

Description
Monthly return series of international soybean price start from January 1980.

Usage
data("ReturnSeries_data")

Format
A data frame with 107 observations on the following variable.

Details
Dataset contain 107 observations of monthly return series of International soyabean price. It is obtained from World Bank "Pink sheet"

Source

References
Examples

    data(ReturnSeries_data)
    ## maybe str(ReturnSeries_data) ; plot(ReturnSeries_data) ...
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