Package ‘RobGARCHBoot’

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Description

Bootstrap forecast densities for returns and volatilities using the robust residual-based bootstrap procedure of Trucíos et al. (2017). The package also includes the robust GARCH (Generalized Autoregressive Conditional Heteroskedastic) estimator of Boudt et al. (2013) with the modification introduced by Trucíos et al. (2017).

Details

This package provides a robust bootstrap procedure to obtain forecast densities for both return and volatilities in a GARCH context. The forecast densities are useful to obtain forecast intervals as well as to estimate risk measures such as Value-at-Risk (VaR). Additionally, we also provide the robust GARCH estimator of Boudt et al. (2013) with the modification introduced by Trucíos et al. (2017). This procedure showed good finite sample properties in both Monte Carlo experiments and empirical data. For a recent implementation, see Trucíos (2019).

Author(s)

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References


Usage

fitted_Vol(theta,r)
Arguments

theta Vector of robust estimated parameters obtained from ROBUSTGARCH function.

r Vector of time series returns.

Details

More details can be found in Boudt et al. (2013) and Trucíos et al. (2017).

Value

The function returns the estimated volatility from 1 to T+1.

Author(s)

Carlos Trucíos

References


Examples

# Using the Bitcoin daily returns, we estimate the parameter of the GARCH model in a robust way
param = ROBUSTGARCH(returnsexample)
# With the estimated parameters, we estimate the volatility in a robust way
vol = fitted_Vol(param, returnsexample)

returnsexample Time series returns for illustrative purposes

Description

Cryptocurrencies report large returns over time. In this sense and with illustrative purposes, we use Bitcoin daily returns from July 2014 to February 2017.
RobGARCHBoot

Robust GARCH bootstrap procedure

Description

Robust GARCH (Generalized Autoregressive Conditional Heteroskedastic) Bootstrap procedure of Trucíos et al. (2017)

Usage

RobGARCHBoot(data, n.boot = 1000, n.ahead = 1)

Arguments

data Vector of time series returns.
n.boot Number of bootstrap replications. By default n.boot = 1000
n.ahead Numbers of steps-ahead. By default n.ahead = 1

Details

More details can be found in Trucíos et al. (2017), Hotta and Trucíos (2018), and Trucíos (2019).

Value

The function returns two lists with the empirical H-steps-ahead bootstrap densities for returns and squared volatilities.

Author(s)

Carlos Trucíos

References


Examples

```r
# Robust bootstrap forecast densities for returns and volatilities
boot = RobGARCHBoot(example, n.boot = 1000, n.ahead = 1)

# Obtaining the forecast intervals for returns (95%)
quantile(boot[[1]], prob = c(0.025, 0.975))
# Obtaining the forecast intervals for volatilities (95%)
quantile(boot[[2]], prob = c(0.025, 0.975))

# Risk measures can also be obtained
VaR1 = quantile(boot[[1]], prob = 0.01)
```

Description

Robust GARCH (Generalized Autoregressive Conditional Heteroskedastic) estimator of Boudt et al. (2013) with the modification introduced by Trucíos et al. (2017).

Usage

ROBUSTGARCH(y)

Arguments

y Vector of time series returns.

Details

More details can be found in Boudt et al. (2013) and Trucíos et al. (2017).

Value

The function returns the estimated parameters.

Author(s)

Carlos Trucíos

References


Examples

# Estimating the parameters of the GARCH model in a robust way.
param = ROBUSTGARCH(returnsexample*100)
param

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ROBUSTGARCHloss_RCPP  Loss function used in GARCH robust estimation.

Description

Loss function used in GARCH (Generalized Autoregressive Conditional Heteroskedastic) robust estimation.

Usage

ROBUSTGARCHloss_RCPP(theta, r, sigma2)

Arguments

- theta: Vector of robust estimated (or initial values) parameters obtained from ROBUSTGARCH function.
- r: Vector of time series returns.
- sigma2: robust squared volatility estimation (or initial value of squared volatility)

Details

This function is used in the robust estimation. We can use it to evaluate the value of the loss function using several values of the vector parameters (theta)

Value

Returns the value of the loss function

Author(s)

Carlos Trucios

References


Examples

# Using the Bitcoin daily returns, we estimate the parameter of the GARCH model in a robust way
param = ROBUSTGARCH(returnsexample)
# We can evaluate the loss function using the estimated parameters
ROBUSTGARCHloss_RCPP(param[2:3], returnsexample, param[1]/(1-param[2]-param[3]))
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