Package 'GARCHSK'

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Type Package

Title Estimating a GARCHSK Model and GJRSK Model

Version 0.1.0

Description Functions for estimating a GARCHSK model and GJRSK model based on a publication by Leon et,al (2005)<doi:10.1016/j.qref.2004.12.020> and Nakagawa and Uchiyama (2020)<doi:10.3390/math8111990>. These are a GARCH-type model allowing for time-varying volatility, skewness and kurtosis.

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LazyData TRUE

Imports stats, Rsolnp

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NeedsCompilation no

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GARCHSK *GARCHSK*

Description

Functions for estimating GARCHSK model and GJRSK model based on a publication by Leon et,al (2005).

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garchsk_construct *This function constructs GARCHSK model of given data and parameters.*

Description

This function constructs GARCHSK model of given data and parameters.

Usage

```
garchsk_construct(params, data)
```

Arguments

params	vector of GJRSK model parameters(p1,const2,p2,q2,const3,p3,q3,const4,p4,q4)
data	vector time series data

Value

list of conditional mean(mu), variance(h), skewness(sk) and kurtosis(ku)

garchsk_est *This function estimates GARCHSK model's parameters.*

Description

This function estimates GARCHSK model's parameters.

Usage

```
garchsk_est(data)
```

Arguments

data	vector time series data

Value

list of parameters,standard errors of parameters,t-statistics,the minimum value of log-likelihood,AIC and BIC.

Examples

```
library(GARCHSK)
#load data
data(GBP)

# Estimate the parameters of GARCHSK model
garchsk_GBP<-garchsk_est(GBP[1:100])

# Parameters
garchsk_GBP$params
```

garchsk_fcst *This function forcasts conditional mean,variance,skewness and kurtosis with given GARCHSK model.*

Description

This function forcasts conditional mean,variance,skewness and kurtosis with given GARCHSK model.

Usage

```
garchsk_fcst(params, data, max_forecast = 20)
```

Arguments

params	vector of GARCHSK model parameters(p1,const2,p2,q2,const3,p3,q3,const4,p4,q4)
data	vector time series data
max_forecast	how long does this function forecast(Default value is 20)

Value

list of predicted conditional mean,variance,skewness and kurtosis

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garchsk_ineqfun *This function is inequality equation of GARCHSK parameters used in optimization process(Rsolnp).*

Description

This function is inequality equation of GARCHSK parameters used in optimization process(Rsolnp).

Usage

```
garchsk_ineqfun(params, data)
```

Arguments

params	vector of GARCHSK model parameters(p1,const2,p2,q2,r2,const3,p3,q3,r3,const4,p4,q4,r4)
data	vector time series data

Value

upper bound >parameters > lower bound

---

garchsk_lik *This function calculates the log-likelihood of GARCHSK model.*

Description

This function calculates the log-likelihood of GARCHSK model.

Usage

```
garchsk_lik(params, data)
```

Arguments

params	vector of GARCHSK model parameters(p1,const2,p2,q2,const3,p3,q3,const4,p4,q4)
data	vector time series data

Value

(negative) log-likelihood of GJRSK model

`GBP` *GBP/USD exchange rate from 1990-01-03 to 2002-5-3 from Bloomberg.*

Description

GBP/USD exchange rate from 1990-01-03 to 2002-5-3 from Bloomberg.

Format

A numeric vector with 3218 length

Source

Bloomberg(GBP CURRNCY)

`gjrsk_construct` *This function constructs GJRSK model of given data and parameters.*

Description

This function constructs GJRSK model of given data and parameters.

Usage

```
gjrsk_construct(params, data)
```

Arguments

`params`	vector of GJRSK model parameters(p1,const2,p2,q2,r2,const3,p3,q3,r3,const4,p4,q4,r4)
`data`	vector time series data

Value

list of conditional mean(mu), variance(h), skewness(sk) and kurtosis(ku)

`gjrsk_est` *This function estimates GJRSK model's parameters.*

Description

This function estimates GJRSK model's parameters.

Usage

```
gjrsk_est(data)
```

Arguments

`data`	vector time series data

Value

list of parameters,standard errors of parameters,t-statistics,the minimum value of log-likelihood,AIC and BIC.

Examples

```
library(GARCHSK)
#load data
data(GBP)

# Estimate the parameters of GJR-SK model
gjrsk_GBP<-gjrsk_est(GBP[1:100])

# Parameters
gjrsk_GBP$params
```

`gjrsk_fcst` *This function forcasts conditional mean,variance,skewness and kurtosis with given GJRSK model.*

Description

This function forcasts conditional mean,variance,skewness and kurtosis with given GJRSK model.

Usage

```
gjrsk_fcst(params, data, max_forecast = 20)
```

Arguments

params	vector of GJRSK model parameters(p1,const2,p2,q2,r2,const3,p3,q3,r3,const4,p4,q4,r4)
data	vector time series data
max_forecast	how long does this function forecast(Default value is 20)

Value

list of predicted conditional mean,variance,skewness and kurtosis

---

gjrsk_ineqfun *This function is inequality equation of GJRSK parameters used in optimization process(Rsolnp).*

Description

This function is inequality equation of GJRSK parameters used in optimization process(Rsolnp).

Usage

```
gjrsk_ineqfun(params, data)
```

Arguments

params	vector of GJRSK model parameters(p1,const2,p2,q2,r2,const3,p3,q3,r3,const4,p4,q4,r4)
data	vector time series data

Value

upper bound >parameters > lower bound

---

gjrsk_lik *This function calculates the log-likelihood of GJRSK model.*

Description

This function calculates the log-likelihood of GJRSK model.

Usage

```
gjrsk_lik(params, data)
```

Arguments

params	vector of GJRSK model parameters(p1,const2,p2,q2,r2,const3,p3,q3,r3,const4,p4,q4,r4)
data	vector time series data

Value

(negative) log-likelihood of GJRSK model

---

kurtosis *This function calculates kurtosis of given data.*

Description

This function calculates kurtosis of given data.

Usage

```
kurtosis(data)
```

Arguments

data	vector or T by 1 matrix

Value

kurtosis of given data

---

skewness *This function calculates skewness of given data.*

Description

This function calculates skewness of given data.

Usage

```
skewness(data)
```

Arguments

data	vector or T by 1 matrix

Value

skewness of given data

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