Package ‘mgarchBEKK’

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Title Simulating, Estimating and Diagnosing MGARCH (BEKK and mGJR) Processes

Version 0.0.2

Description Procedures to simulate, estimate and diagnose MGARCH processes of BEKK and multivariate GJR (bivariate asymmetric GARCH model) specification.

Depends R (>= 3.2.3), tseries, mvtnorm

Suggests testthat, devtools, roxygen2

License GPL-3

LazyData true

URL https://github.com/vst/mgarchBEKK/

RoxygenNote 5.0.1

NeedsCompilation yes

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Description

Provides the MGARCH-BEKK estimation procedure.

Usage

BEKK(eps, order = c(1, 1), params = NULL, fixed = NULL, method = "BFGS",
    verbose = F)

Arguments

eps Data frame holding time series.
order BEKK(p, q) order. An integer vector of length 2 giving the orders of the model
to be fitted. order[2] refers to the ARCH order and order[1] to the GARCH
order.
params Initial parameters for the optim function.
fixed Vector of parameters to be fixed.
method The method that will be used by the optim function.
verbose Indicates if we need verbose output during the estimation.

Details

BEKK estimates a BEKK(p, q) model, where p stands for the GARCH order, and q stands for the
ARCH order.

Value

Estimation results packaged as BEKK class instance.

eps a data frame containing all time series
length length of the series
order order of the BEKK model fitted
estimation.time time to complete the estimation process
total.time time to complete the whole routine within the mvBEKK.est process
estimation estimation object returned from the optimization process, using optim
aic the AIC value of the fitted model
est.params list of estimated parameter matrices
asy.se.coef list of asymptotic theory estimates of standard errors of estimated parameters
cor list of estimated conditional correlation series
sd list of estimated conditional standard deviation series
**diagnoseBEKK**

**H.estimated** list of estimated series of covariance matrices  
**eigenvalues** estimated eigenvalues for sum of Kronecker products  
**uncond.cov.matrix** estimated unconditional covariance matrix  
**residuals** list of estimated series of residuals

**References**


**Examples**

```r
## simulate series:
simulated <- simulateBEKK(2, 1000, c(1,1))

## Prepare the matrix:
simulated <- do.call(cbind, simulated$eps)

## Estimate with default arguments:
estimated <- BEKK(simulated)

## Not run:
## Show diagnostics:
diagnoseBEKK(estimated)

## End(Not run)
```

diagnoseBEKK  
*Diagnose BEKK process estimation*

**Description**

Provides diagnostics for a BEKK process estimation.

**Usage**

diagnoseBEKK(estimated)
Arguments

estimation The return value of the mvBEKK.est function

Details

This procedure provides console output and browsable plots for a given BEKK process estimation. Therefore, it is meant to be interactive as the user needs to proceed by pressing c on the keyboard to see each plot one-by-one.

Value

Nothing special

Examples

## simulate series:
simulated = simulateBEKK(2, 1000, c(1,1))

## Prepare the matrix:
simulated = do.call(cbind, simulated$eps)

## Estimate with default arguments:
estimated = BEKK(simulated)

## Not run:
## Show diagnostics:
diagnoseBEKK(estimated)

## End(Not run)

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mGJR  Bivariate GJR Estimation

Description

Provides bivariate GJR (mGJR(p,q,g)) estimation procedure.

Usage

mGJR(eps1, eps2, order = c(1, 1, 1), params = NULL, fixed = NULL, method = "BFGS")
Arguments

- **eps1**: First time series.
- **eps2**: Second time series.
- **order**: mGJR(p, q, g) order a three element integer vector giving the order of the model to be fitted. order[2] refers to the ARCH order and order[1] to the GARCH order and order[3] to the GJR order.
- **params**: Initial parameters for the optim function.
- **fixed**: A two dimensional vector that contains the user specified fixed parameter values.
- **method**: The method that will be used by the optim function. See ?optim for available options.

Value

Estimation results packaged as mGJR class instance. The values are defined as:

- **eps1**: first time series
- **eps2**: second time series
- **length**: length of each series
- **order**: order of the mGJR model fitted
- **estimation.time**: time to complete the estimation process
- **total.time**: time to complete the whole routine within the mGJR.est process
- **estimation**: estimation object returned from the optimization process, using optim
- **aic**: the AIC value of the fitted model
- **est.params**: estimated parameter matrices
- **asy.se.coef**: asymptotic theory estimates of standard errors of estimated parameters
- **cor**: estimated conditional correlation series
- **sd1**: first estimated conditional standard deviation series
- **sd2**: second estimated conditional standard deviation series
- **H.estimated**: estimated series of covariance matrices
- **eigenvalues**: estimated eigenvalues for sum of Kronecker products
- **uncond.cov.matrix**: estimated unconditional covariance matrix
- **resid1**: first estimated series of residuals
- **resid2**: second estimated series of residuals

References


Examples

```r
## not run:
sim = BEKK.sim(1000)
est = mGJR(sim$eps1, sim$eps2)
```

### simulateBEKK

Simulate BEKK processes

**Description**

Provides a procedure to simulate BEKK processes.

**Usage**

```r
simulateBEKK(series.count, T, order = c(1, 1), params = NULL)
```

**Arguments**

- `series.count`: The number of series to be simulated.
- `T`: The length of series to be simulated.
- `order`: BEKK(p, q) order. An integer vector of length 2 giving the orders of the model to fit. `order[2]` refers to the ARCH order and `order[1]` to the GARCH order.
- `params`: A vector containing a sequence of parameter matrices’ values.

**Details**

simulateBEKK simulates an N dimensional BEKK(p, q) model for the given length, order list, and initial parameter list where N is also specified by the user.

**Value**

Simulated series and auxiliary information packaged as a `simulateBEKK` class instance. Values are:

- `length`: length of the series simulated
- `order`: order of the BEKK model
- `params`: a vector of the selected parameters
true.params  list of parameters in matrix form
eigenvalues  computed eigenvalues for sum of Kronecker products
uncond.cov.matrix  unconditional covariance matrix of the process
white.noise  white noise series used for simulating the process
eps  a list of simulated series
cor  list of series of conditional correlations
sd  list of series of conditional standard deviations

References
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Engle R.F., K.F. Kroner, Multivariate simultaneous generalized ARCH, Econometric Theory, 122-
150, 1995
Engle R.F., Dynamic conditional correlation: A new simple class of multivariate GARCH models,
Tse Y.K., A.K.C. Tsui, A multivariate generalized autoregressive conditional heteroscedasticity
2002

Examples
## Simulate series:
simulated = simulateBEKK(2, 1000, c(1,1))
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