Package ‘gogarch’

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Description Provision of classes and methods for estimating generalized
orthogonal GARCH models. This is an alternative approach to CC-GARCH models
in the context of multivariate volatility modeling.
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**Description**


**Usage**

data(BVDW)

**Format**

A data frame with 2610 observations on the following 3 variables.

- **Date** Date in the format YYYYMMDD.
- **DJIA** Level of the DIJA.
- **NASDAQ** Level of the NASDAQ.

**Details**

This data set has been utilized in the source below and was kindly provided by Roy van der Weide.

**Source**

See Also

VDW

Examples

data(BVDW)
str(BVDW)

BVDWAIR

Description

This data frame contains the stock prices from American Airlines, South-West Airlines, Boeing and FedEx. In addition the spot prices for crude oil and kerosene are included. This data set was used in the article by Boswijk and van der Weide (2009). The data range is from July, 1993 until August, 2008.

Usage

data(BVDWAIR)

Format

A data frame with 3791 observations on the following 7 variables.

Date  POSIXt: The dates of observations.
CrudeOil  Crude oil price.
Kerosene  Kerosene price.
AmericanAir  Stock prices of American Airlines.
SouthWest  Stock prices of South-West Airlines.
Boeing  Stock prices of Boeing.
FedEx  Stock prices of Boeing.

Details

The stock price data was downloaded from Yahoo Finance and the price series for crude oil and kerosene were obtained from the U.S. Energy Information Administration (EIA).

Source

http://www.econstats.com

References

Boswijk, H. Peter and van der Weide, Roy (2009), Method of Moments Estimation of GO-GARCH Models, Working Paper, University of Amsterdam, Tinbergen Institute and World Bank.
Examples

data(BVDWAIR)
str(BVDWAIR)

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BVDWSTOXX  
*Sector indices of the EURO STOXX 600*

Description


Usage

data(BVDWSTOXX)

Format

A data frame with 5652 observations on the following 16 variables.

- **Date**: POSIXt: The dates of observations.
- **AutoParts**: Sector index Automobiles & Parts
- **Banks**: Sector index Banks
- **BasicRes**: Sector index Basic Resources
- **Chemicals**: Sector index Chemicals
- **ConstrMat**: Sector index Construction and Materials
- **FoodBeverage**: Sector index Food & Beverages
- **FinService**: Sector index Financial Services
- **HealthCare**: Sector index Health Care
- **IndustrialGoods**: Sector index Industrial Goods & Services
- **Insurance**: Sector index Insurance
- **Media**: Sector index Media
- **OilGas**: Sector index Oil & Gas
- **Technology**: Sector index Technology
- **Telecom**: Sector index Telecommunications
- **Utilities**: Sector index Utilities

Source

http://www.stoxx.com
References


Examples

data(BVDWSTOXX)
str(BVDWSTOXX)

cora

**Autocorrelations of a Matrix Process**

**Description**

This function computes the autocorrelation matrix for a given lag. For instance, it is used for estimating GO-GARCH models whence the method of moments is utilized.

**Usage**

cora(SSI, lag = 1, standardize = TRUE)

**Arguments**

- **SSI**: Array with dimension dim = c(m, m, n)
- **lag**: Integer, the lag for which the autocorrelation is computed.
- **standardize**: Logical, if TRUE (the default), the autocorrelation matrix is computed, otherwise the autocovariance matrix.

**Details**

This function computes the autocorrelation matrix according to:

\[
\hat{\Gamma}_k(s) = \frac{1}{n} \sum_{t=k+1}^{n} S_t S_{t-k}
\]

\[
\hat{\Phi}_k(s) = \hat{\Gamma}_0(s)^{-1/2} \hat{\Gamma}_k(s) \hat{\Gamma}_0(s)^{-1/2}
\]

It is computationally assured that \(\hat{\Phi}_k(s)\) is symmetric by setting it equal to: \(\hat{\Phi}_k(s) = \frac{1}{2}(\hat{\Phi}_k(s) + \hat{\Phi}_k(s)^t)\). The standardization matrix \(\hat{\Gamma}_0(s)^{-1/2}\) is derived from the singular value decomposition of the co-variance matrix at lag zero.

**Value**

cora Matrix with dimension dim = c(m, m).
Author(s)

Bernhard Pfaff

References

Boswijk, H. Peter and van der Weide, Roy (2009), Method of Moments Estimation of GO-GARCH Models, Working Paper, University of Amsterdam, Tinbergen Institute and World Bank.

See Also

gogarch

goest-methods

Methods for Function goest

Description

These are methods for estimating GO-GARCH models. Currently only a method for estimating GO-GARCH models by Maximum-Likelihood is implemented.

Details

The declared estimation methods are called from function gogarch.

Methods

\begin{verbatim}
goest signature(object = "Goestica")
goest signature(object = "Goestmm")
goest signature(object = "Goestml")
goest signature(object = "Goestnls")
\end{verbatim}

Author(s)

Bernhard Pfaff

See Also

garchFit, Goestica, Goestml, Goestnls, Goestmm, gogarch
**Goestica-class**

*Class "Goestica": GO-GARCH models estimated by fast ICA*

**Description**

This class contains the GoGARCH class and has the mixing matrix $A$ as additional slot.

**Objects from the Class**

Objects can be created by calls of the form `new("Goestmm", ...)`, or with the function `gogarch` whereby method = "ica" has been set.

**Slots**

- `ica`: Object of class "list": List object returned by `fastICA`.
- `Z`: Object of class "matrix": Transformation matrix.
- `U`: Object of class "matrix": Orthogonal matrix.
- `V`: Object of class "matrix": Extracted component matrix.
- `H`: Object of class "list": List of conditional variance/covariance matrices.
- `models`: Object of class "list": List of univariate GARCH model fits.
- `estby`: Object of class "character": Estimation method.
- `X`: Object of class "matrix": The data matrix.
- `V`: Object of class "matrix": Covariance matrix of $X$.
- `P`: Object of class "matrix": Left singular values of Var/Cov matrix of $X$.
- `Dsqr`: Object of class "matrix": Square roots of eigenvalues on diagonal, else zero.
- `garchf`: Object of class "formula": Garch formula used for uncorrelated component GARCH models.
- `name`: Object of class "character": The name of the original data object.

**Extends**

Class "GoGARCH", directly. Class "Goinit", by class "GoGARCH", distance 2.

**Methods**

- `cvar` Returns the conditional variances as object with class attribute "mts" "ts".
- `ccov` Returns the conditional co-variances as object with class attribute "mts" "ts".
- `ccor` Returns the conditional correlations as object with class attribute "mts" "ts".
- `coef` Returns the coefficients of the component GARCH models.
- `converged` Returns the convergence codes of the component GARCH models.
- `formula` Returns the formula for the component GARCH models.
- `goest` Fast ICA estimation of Go-GARCH models.
plot  Plotting of the conditional correlations.
predict Returns the conditional covariances and mean forecasts and the forecasts of the component GARCH models, object is of class Gopredict.
residuals Returns the residuals of the Go-GARCH model as object with class attribute "mts" "ts".
resid Returns the residuals of the Go-GARCH model as object with class attribute "mts" "ts".
show show-method for objects of class Goestmm.
summary summary-method for objects of class Goestml, object is of class Gosum.
update Updates an object of class Goestml.

Author(s)
Bernhard Pfaff

References

See Also
GoGARCH, Goinit, Gosum, Gopredict, goest-methods and gogarch

Goestml-class

| Goestml-class | Class "Goestml": GO-GARCH models estimated by Maximum-Likelihood |

Description
This class contains the GoGARCH class and has the outcome of n1minb as an additional slot.

Objects from the Class
Objects can be created by calls of the form new("Goestml", ...), or with the function gogarch whereby method = "ml" has been set.

Slots
- opt: Object of class "list": List returned by n1minb.
- Z: Object of class "matrix": Transformation matrix.
- U: Object of class "matrix": Orthogonal matrix.
- Y: Object of class "matrix": Extracted component matrix.
- H: Object of class "list": List of conditional variance/covariance matrices.
- models: Object of class "list": List of univariate GARCH model fits.
- estby: Object of class "character": Estimation method.
Goestml-class

X: Object of class "matrix": The data matrix.
V: Object of class "matrix": Covariance matrix of X.
P: Object of class "matrix": Left singular values of Var/Cov matrix of X.
Dsqr: Object of class "matrix": Square roots of eigenvalues on diagonal, else zero.
garchf: Object of class "formula": Garch formula used for uncorrelated component GARCH models.
name: Object of class "character": The name of the original data object.

Extends
Class "GoGARCH", directly. Class "Goinit", by class "GoGARCH", distance 2.

Methods

angles Returns the Eulerian angles.
cvar Returns the conditional variances as object with class attribute "mts" "ts".
ccov Returns the conditional co-variances as object with class attribute "mts" "ts".
ccor Returns the conditional correlations as object with class attribute "mts" "ts".
coef Returns the coefficients of the component GARCH models.
converged Returns the convergence codes of the component GARCH models.
formula Returns the formula for the component GARCH models.
goest ML-Estimation of Go-GARCH models.
logLik Returns the value of the log-Likelihood function.
predict Returns the conditional covariances and mean forecasts and the forecasts of the component GARCH models, object is of class Gopredict.
residuals Returns the residuals of the Go-GARCH model as object with class attribute "mts" "ts".
resid Returns the residuals of the Go-GARCH model as object with class attribute "mts" "ts".
show show-method for objects of class Goestml.
summary summary-method for objects of class Goestml, object is of class Gosum.
update Updates an object of class Goestml.

Author(s)
Bernhard Pfaff

See Also
GoGARCH, Goinit, Gosum, Gopredict, goest-methods
**Goestmm-class**  
*Class "Goestmm": Go-GARCH models estimated by Methods of Moments*

### Description

This class contains the GoGARCH class and has the weights vector and the matched orthogonal matrices $U$ as additional slots.

### Objects from the Class

Objects can be created by calls of the form `new("Goestmm", ...)`, or with the function `gogarch` whereby `method = "mm"` has been set.

### Slots

- **weights**: Object of class "numeric": Weights for aggregating the matched orthogonal matrices $U$.
- **Umatched**: Object of class "list": List of matched orthogonal matrices $U$.
- **Z**: Object of class "matrix": Transformation matrix.
- **U**: Object of class "matrix": Orthogonal matrix.
- **Y**: Object of class "matrix": Extracted component matrix.
- **H**: Object of class "list": List of conditional variance/covariance matrices.
- **models**: Object of class "list": List of univariate GARCH model fits.
- **estby**: Object of class "character": Estimation method.
- **X**: Object of class "matrix": The data matrix.
- **V**: Object of class "matrix": Covariance matrix of $X$.
- **P**: Object of class "matrix": Left singular values of Var/Cov matrix of $X$.
- **Dsqr**: Object of class "matrix": Square roots of eigenvalues on diagonal, else zero.
- **garchf**: Object of class "formula": Garch formula used for uncorrelated component GARCH models.
- **name**: Object of class "character": The name of the original data object.

### Extends

Class "GoGARCH", directly. Class "Goinit", by class "GoGARCH", distance 2.

### Methods

- **cvar** Returns the conditional variances as object with class attribute "mts" "ts".
- **ccov** Returns the conditional co-variances as object with class attribute "mts" "ts".
- **ccor** Returns the conditional correlations as object with class attribute "mts" "ts".
- **coef** Returns the coefficients of the component GARCH models.
Goestnls-class

- **converged** Returns the convergence codes of the component GARCH models.
- **formula** Returns the formula for the component GARCH models.
- **goest** Methods of moments estimation of Go-GARCH models.
- **plot** Plotting of the conditional correlations.
- **predict** Returns the conditional covariances and mean forecasts and the forecasts of the component GARCH models, object is of class Gopredict.
- **residuals** Returns the residuals of the Go-GARCH model as object with class attribute "mts" "ts".
- **resid** Returns the residuals of the Go-GARCH model as object with class attribute "mts" "ts".
- **show** show-method for objects of class Goestmm.
- **summary** summary-method for objects of class Goestml, object is of class Gosum.
- **update** Updates an object of class Goestml.

Author(s)

Bernhard Pfaff

References


See Also

GoGARCH, Goinit, Gosum, Gopredict, goest-methods, gogarch, Umatch

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Goestnls-class

Class "Goestnls": GO-GARCH models estimated by Non-linear Least-Squares

Description

This class contains the GoGARCH class and has the outcome of optim as an additional slot.

Objects from the Class

Objects can be created by calls of the form `new("Goestnls", ...)`, or with the function `gogarch` whereby `method = "nls"` has been set.
Goestnls-class

Slots

  nls: Object of class "list": List returned by optim.
  Z: Object of class "matrix": Transformation matrix.
  U: Object of class "matrix": Orthogonal matrix.
  Y: Object of class "matrix": Extracted component matrix.
  H: Object of class "list": List of conditional variance/covariance matrices.
  models: Object of class "list": List of univariate GARCH model fits.
  estby: Object of class "character": Estimation method.
  X: Object of class "matrix": The data matrix.
  V: Object of class "matrix": Covariance matrix of X.
  P: Object of class "matrix": Left singular values of Var/Cov matrix of X.
  Dsq$: Object of class "matrix": Square roots of eigenvalues on diagonal, else zero.
  garchf$: Object of class "formula": Garch formula used for uncorrelated component GARCH models.
  name: Object of class "character": The name of the original data object.

Extends

  Class "GoGARCH", directly. Class "Goinit", by class "GoGARCH", distance 2.

Methods

  cvar  Returns the conditional variances as object with class attribute "mts" "ts".
  ccov  Returns the conditional co-variances as object with class attribute "mts" "ts".
  ccor  Returns the conditional correlations as object with class attribute "mts" "ts".
  coef  Returns the coefficients of the component GARCH models.
  converged  Returns the convergence codes of the component GARCH models.
  formula  Returns the formula for the component GARCH models.
  goest  NLS-Estimation of Go-GARCH models.
  plot  Plotting of the conditional correlations.
  predict  Returns the conditional covariances and mean forecasts and the forecasts of the component GARCH models, object is of class Gopredict.
  residuals  Returns the residuals of the Go-GARCH model as object with class attribute "mts" "ts".
  resid  Returns the residuals of the Go-GARCH model as object with class attribute "mts" "ts".
  show  show-method for objects of class Goestnls.
  summary  summary-method for objects of class GoGARCH, object is of class Gosum.
  update  Updates an object of class GoGARCH.

Author(s)

  Bernhard Pfaff
See Also

GoGARCH, Goinit, Gosum, Gopredict, goest-methods, gogarch

gogarch Specification and estimation of GO-GARCH models

Description

This function steers the specification and estimation of GO-GARCH models.

Usage

gogarch(data, formula, scale = FALSE, estby = c("ica", "mm", "ml", "nls"),
  lag.max = 1, initial = NULL, garchlist = list(init.rec = "mci", delta
  = 2, skew = 1, shape = 4, cond.dist = "norm", include.mean = FALSE,
  include.delta = NULL, include.skew = NULL, include.shape = NULL,
  leverage = NULL, trace = FALSE, algorithm = "nlminb", hessian =
  "ropt", control = list(), title = NULL, description = NULL), ...)

Arguments

data Matrix: the original data set.
formula Formula: valid formula for univariate GARCH models.
scale Logical, if TRUE the data is scaled. The default is scale = FALSE.
estby Character: by fast ICA estby = "ica" (the default), by Estbys of Moments
  estby = "mm" or by Maximum-Likelihood estby = "ml" or by non-linear Least-
  Squares estby = "nls".
initial Numeric: starting values for optimization (used if estby = "ml" or estby =
  "nls" has been chosen (see Details).
lag.max Integer: The number of used lags for computing the matched orthogonal matrices
  U (used if estby = "mm" has been chosen).
garchlist List: Elements are passed to garchFit.
... Ellipsis argument: is passed to the goest method (see details).

Details

The ellipsis argument is passed to the function fastICA if estby = "ica" has been set, or to optim
if estby = "nls" is employed or to nlminb if the GO-GARCH model is estimated by maximum
likelihood, i.e., estby = "ml". It is not employed if the methods of moments estimator is chosen.

If the argument initial is left NULL, the starting values are computed according seq(3.0, 0.1,
length.out = 1), whereby 1 is the length of initial for estby = "ml" and are set to rep(0.1,
d, whereby for method = "nls". This length must be equal to m * (m - 1)/2 for estimation by
Maximum-Likelihood and m * (m + 1)/2 for estimation by non-linear least-Squares, whereby m
is the number of columns of data.
Value

Dependent on the chosen estimation method either an object of class Goestica or, Goestmm or Goestml or Goestnls is returned. All of these classes extend the GoGARCH class.

Author(s)

Bernhard Pfaff

References


See Also

GoGARCH, Goestica, Goestmm, Goestnls, Goestml, goest-methods

Examples

```r
## Not run:
library(vars)
## Boswijk / van der Weide (2009)
data(BVDWSTOXX)
BVDWSTOXX <- zoo(x = BVDWSTOXX[, -1], order.by = BVDWSTOXX[, 1])
BVDWSTOXX <- window(BVDWSTOXX, end = as.POSIXct("2007-12-31"))
BVDWSTOXX <- diff(log(BVDWSTOXX))
sectors <- BVDWSTOXX[, c("AutoParts", "Banks", "OilGas")]
sectors <- apply(sectors, 2, scale, scale = FALSE)
gogmm <- gogarch(sectors, formula = \~ garch(1,1), estby = \"mm\", lag.max = 100)
gogmm
## Boswijk / van der Weide (2006)
data(BVDW)
BVDW <- zoo(x = BVDW[, -1], order.by = BVDW[, 1])
BVDW <- diff(log(BVDW)) * 100
gognls <- gogarch(BVDW, formula = \~ garch(1,1), scale = TRUE, estby = \"nls\")
gognls
## van der Weide (2002)
data(VDW)
var1 <- VAR(scale(VDW), p = 1, type = \"const\")
resid <- residuals(var1)
gogml <- gogarch(resid, \~ garch(1, 1), scale = TRUE, estby = \"ml\", control = list(iter.max = 1000))
```
GoGARCH-class

Class "GoGARCH": Estimated GO-GARCH Models

Description

This class defines the slots for estimated GO-GARCH models. It contains the class Goinit.

Objects from the Class

Objects can be created by calls of the form new("GoGARCH", ...).

Slots

Z: Object of class "matrix": Transformation matrix.
U: Object of class "Orthom": Orthonormal matrix.
Y: Object of class "matrix": Extracted component matrix.
H: Object of class "list": List of conditional variance/covariance matrices.
models: Object of class "list": List of univariate GARCH model fits.
estby: Object of class "character": Estimation method.
call: Object of class "call": Result of match.call in generating function.
X: Object of class "matrix": The data matrix.
V: Object of class "matrix": Covariance matrix of X.
P: Object of class "matrix": Left singular values of Var/Cov matrix of X.
Dcsv: Object of class "matrix": Square roots of eigenvalues on diagonal, else zero.
garchf: Object of class "formula": Garch formula used for uncorrelated component GARCH models.
name: Object of class "character": The name of the original data object.

Extends

Class "Goinit", directly.
Methods

- **cvar** Returns the conditional variances as object with class attribute "mts" "ts".
- **ccov** Returns the conditional co-variances as object with class attribute "mts" "ts".
- **ccor** Returns the conditional correlations as object with class attribute "mts" "ts".
- **coef** Returns the coefficients of the component GARCH models.
- **converged** Returns the convergence codes of the component GARCH models.
- **formula** Returns the formula for the component GARCH models.
- **plot** Plotting of the conditional correlations.
- **predict** Returns the conditional covariances and mean forecasts and the forecasts of the component GARCH models, object is of class `Gopredict`.
- **residuals** Returns the residuals of the GO-GARCH model.
- **show** show-method for objects of class `GoGARCH`.
- **summary** summary-method for objects of class `GoGARCH`, object is of class `Gosum`.
- **update** Updates an object of class `GoGARCH`.

Author(s)

Bernhard Pfaff

See Also

`Goinit, Gosum, Gopredict`

goinit

Constructor function for objects of class "Goinit"

Description

This function can be utilized to create objects of class `Goinit`. These objects are the starting point for estimating GO-GARCH models.

Usage

goinit(X, garchf = ~garch(1, 1), scale = FALSE)

Arguments

- **X** Matrix: the data matrix.
- **garchf** Formula: A formula object that will be used in the GARCH models of the uncorrelated components.
- **scale** Logical, if TRUE the data X will be scaled, the default value is FALSE for no scaling of the data.
Details
This function computes the variance/covariance matrix of \( X \). Next the singular value decomposition is applied and the projection matrix as well as the diagonal matrix with the square roots of the eigen values are computed.

Value
An object of class Goinit.

Author(s)
Bernhard Pfaff

See Also
Goinit

Examples
```r
## Not run:
library(vars)
data(VDW)
var1 <- VAR(VDW, p = 1, type = "const")
resid <- resid(var1)
goinit(resid, scale = TRUE)
## End(Not run)
```

Description
This class defines the required slots for estimating GO-GARCH models.

Objects from the Class
Objects can be created by calls of the form `new("Goinit", ...)`, or more conveniently by `goinit()`.

Slots
- \( X \): Object of class "matrix": The data matrix.
- \( V \): Object of class "matrix": Covariance matrix of \( X \).
- \( P \): Object of class "matrix": Left singular values of Var/Cov matrix of \( X \).
- \( Dsqr \): Object of class "matrix": Square roots of eigenvalues on diagonal, else zero.
- garchf: Object of class "formula": Garch formula used for uncorrelated component GARCH models.
- name: Object of class "character": The name of the original data object.
Methods

show  Prints the slots, whereby for X only the head is displayed.

Author(s)

Bernhard Pfaff

See Also

garchFit, goinit

Examples

showClass("Goinit")

gollh  

Description

This function returns the negative of the log-Likelihood function for GO-GARCH models.

Usage

gollh(params, object, garchlist)

Arguments

params  Vector of initial values for theta.
object  An object of class Goinit or an extension thereof.
garchlist  List, elements are passed to garchFit.

Details

The log-Likelihood function of GO-GARCH models is given as:

\[
L_{\theta, \alpha, \beta} = -\frac{1}{2} \sum_{t=1}^{T} m \log(2\pi) + \log |Z_\theta Z_\theta'| + \log |H_t| + y_t' H_t^{-1} y_t
\]

whereby \(Z = P \Delta \frac{1}{2} U_0, y_t = Z^{-1} x_t\) and \(H_t\) is the conditional variance matrix of the independent components.

Value

negll  Scalar, the negative value of the log-Likelihood function.
Author(s)
Bernhard Pfaff

References

See Also
garchFit

gonls

*Non-linear least-squares estimation of matrix B*

Description
This is the target function for estimating the matrix $B$ by non-linear least-squares. It is used in the estimation method *goest* if *method = "nls"* is chosen.

Usage
gonls(params, SSI)

Arguments

params The initial values of the $\text{vech}(B)$.

SSI A list with two elements, each a list itself, containing $S_t = s_t s'_t - I_m$ and $S_{t-1} = s_{t-1} s'_{t-1} - I_m$, respectively.

Details
Boswijk and van der Weiden (2006) proposed the following criterion function:

$$S(A) = \frac{1}{n} \sum_{t=1}^{n} \text{tr}([s_t s'_t - I_m - B(s_{t-1} s'_{t-1} - I_m)B]^2) = S^*(B)$$

for retrieving the matrix $U$. This matrix is the eigenvector matrix of $B$. The linear map $Z = P\Delta^{1/2} U$ and its inverse can then be computed for calculating the component matrix $Y = XZ^{-1}$.

Value

f numeric: The value of the target function.

Author(s)
Bernhard Pfaff
References

Boswijk, H. Peter and van der Weide, Roy (2006), Wake me up before you GO-GARCH, *Tinbergen Institute Discussion Paper, TI 2006-079/4*, University of Amsterdam and Tinbergen Institute.

See Also

gogarch

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Gopredict-class  
Class "Gopredict": Prediction of GO-GARCH Models

Description

This class defines the slots for forecasts from a GO-GARCH model.

Objects from the Class

Objects can be created by calls of the form `new("Gopredict", ...)`, or with the method `predict` of formal class objects GoGARCH and Goestml.

Slots

- `Hf`: Object of class "list": The forecasted conditional covariances.
- `Xf`: Object of class "matrix": The transformed forecasts of the component GARCH mean models.
- `CGARCHF`: Object of class "list": The original forecasts of the component GARCH models.

Methods

- `ccor` Returns the forecasted conditional correlations.
- `ccov` Returns the forecasted conditional co-variances.
- `cvar` Returns the forecasted conditional variances.
- `show` show-method for objects of class Gopredict.

Note

In case more than 10 forecasts steps are computed, the show-method displays only the head of the returned objects. Furthermore, the show-method displays the forecasted conditional variances only. The forecasted conditional co-variances and/or the forecasted conditional correlations can be retrieved with the methods `ccov` or `ccor`, respectively.

Author(s)

Bernhard Pfaff

See Also

GoGARCH, Goestml
Class "Gosum": Summary object of GO-GARCH model

Description

The formal summary class of GoGARCH objects or objects that extend this class.

Objects from the Class

Objects can be created by calls of the form new("Gosum", ...) or are set by the summary-method.

Slots

name: character: the name of the original data object.
method: character: the estimation method.
model: formula: The GARCH model formula for the component GARCH models.
garchc: list: The elements are matcoef matrices generated by garchFit for the components.
Zinv: matrix: The inverse of the linear map $X = YZ$.

Methods

show show-method for objects of class Gosum.

Author(s)

Bernhard Pfaff

See Also

GoGARCH, Goestml

gotheta

Creates an object of class GoGARCH based on Euler angles

Description

This function returns an object of class GoGARCH based on an input vector of Euler angles.

Usage

gotheta(theta, object, garchlist = list(init.rec = "mci", delta = 2, skew = 1, shape = 4, cond.dist = "norm", include.mean = FALSE, include.delta = NULL, include.skew = NULL, include.shape = NULL, leverage = NULL, trace = FALSE, algorithm = "nlminb", hessian = "ropt", control = list(), title = NULL, description = NULL))
Arguments

theta Vector of Euler angles.
object An object of formal class Goinit or an extension thereof.
garchlist List with optional elements passed to garchFit.

Details

In a first step the orthogonal matrix $U$ is computed as the product of rotation matrices given the vector theta of Euler angles with the function $\text{UprodR}$. The linear map $Z$ is computed next as $Z = PD^{1/2}U'$. The unobserved components $Y$ are calculated as $Y = ZX^{-1}$. These are then utilized in the estimation of the univariate GARCH models according to object@garchf. The conditional variance/covariance matrices are calculated according to $V_t = ZH_tZ'$ whereby $H_t$ signifies a matrix with the conditional variances of the univariate GARCH models on its diagonal.

Value

Returns an object of class GoGARCH.

Author(s)

Bernhard Pfaff

References


See Also

Goinit, GoGARCH, Goestml, garchFit

Examples

```r
## Not run:
library(vars)
data(VDW)
var1 <- VAR(VDW, p = 1, type = "const")
resid <- resid(var1)
gin <- goinit(resid, scale = TRUE)
sgtheta(0.5, gin)
## End(Not run)
```
Description

This class defines an orthogonal matrix, which is characterized by $\det(M) = 1$ and $MM' = I$.

Objects from the Class

Objects can be created by calls of the form `new("Orthom", ...)`. In addition the function `UprodR` returns an object of formal class `Orthom`.

Slots

`M`: Object of class "matrix".

Methods

`M` Returns the slot `M` of class `Orthom`.

`print` print-method for objects of class `Orthom`.

`show` show-method for objects of class `Orthom`.

`t` Transpose of object@M.

Note

Objects are validated by `validOrthomObject()`. This function is utilised by `validObject()`.

Author(s)

Bernhard Pfaff

See Also

`UprodR, validOrthomObject`

Examples

`showClass("Orthom")`
Rd2 \hspace{1cm} \textit{Rotation matrix, 2-dimensional} \\

\textbf{Description} \\
Given an angle $\theta$ whereby $\theta \in [0, \pi/2)$ the function \texttt{Rd2} returns a 2-dimensional rotation matrix of Euler angles.

\textbf{Usage} \\
\texttt{Rd2(theta)}

\textbf{Arguments} \\
\texttt{theta} \hspace{1cm} \text{Numeric, angle in the interval $[0, \pi/2)$.}

\textbf{Value} \\
\texttt{R} \hspace{1cm} \text{A 2-dimensional rotation matrix.}

\textbf{Author(s)} \\
Bernhard Pfaff

\textbf{See Also} \\
\texttt{UprodR}

\textbf{Examples} \\
\texttt{Rd2(pi/3)}

\textbf{Umatch} \hspace{1cm} \textit{Matching of Orthogonal Matrices for Cayley transforms} \\

\textbf{Description} \\
This function matches an orthogonal matrix to the importance of the columns of the matrix to which it should be matched.

\textbf{Usage} \\
\texttt{Umatch(from, to)}
`unvech`

**Arguments**

<table>
<thead>
<tr>
<th>from</th>
<th>Matrix: orthogonal</th>
</tr>
</thead>
<tbody>
<tr>
<td>to</td>
<td>Matrix: orthogonal</td>
</tr>
</tbody>
</table>

**Value**

| mat          | Matched matrix. |

**Author(s)**

Bernhard Pfaff

**References**


**See Also**

`gogarch`

---

`unvech`  
*Returns a symmetric matrix from a vector*

**Description**

This function returns the symmetric matrix `X` from a vector that resulted from `v = vech(X)`.

**Usage**

`unvech(v)`

**Arguments**

| v        | Vector, numeric. |

**Details**

The vector `v` must have length equal to `m * (m + 1) / 2`, whereby `m` is a dimension of the symmetric matrix `X_{m \times m}`.

**Value**

| `X`       | Matrix, symmetric of order `m \times m`. |
Author(s)

Bernhard Pfaff

See Also

vec

Examples

v <- c(1, 2, 3, 4, 5, 6)
unvech(v)

Description

This function returns an orthogonal matrix which results of the matrix products of rotation matrices.

Usage

UprodR(theta)

Arguments

theta Vector, of angles of the rotation matrices.

Details

The length of theta must be equal to m * (m - 1)/2, where m is the dimension of the orthogonal matrix. The elements of theta must lie in the interval [0, π/2).

Value

result Object of class Orthom.

Author(s)

Bernhard Pfaff

References


See Also

Rd2, Orthom
validGoinitObject

Examples

theta <- c(pi/3, pi/5, pi/7)
U <- UprodR(theta)
U

validGoinitObject  Validation function for objects of class Goinit

Description

This function validates objects of class Goinit.

Usage

validGoinitObject(object)

Arguments

object  Object of class Goinit.

Details

This function is utilized by validObject(). It is tested whether object@V, object@P, object@Dsqr are square matrices; object@V coincides with the singular value decomposition.

Value

TRUE  Logical, TRUE if the object passes the validation, otherwise an informative error message is returned.

Author(s)

Bernhard Pfaff

See Also

Goinit, goinit

Examples

data(VDW)
go <- goinit(VDW)
validObject(go)
validOrthomObject  
Validation function for objects of class Orthom

Description

This function validates objects of class Orthom.

Usage

validOrthomObject(object)

Arguments

object  Object of class Orthom.

Details

This function is utilized by validObject(). It is tested whether object@M is a square matrix, has \( \text{det}(M) = 1 \) and \( MM' = I \).

Value

TRUE  Logical, TRUE if the object passes the validation, otherwise an informative error message is returned.

Author(s)

Bernhard Pfaff

See Also

Orthom

Examples

theta <- c(pi/3, pi/5, pi/7)
U <- UprodR(theta)
validObject(U)
Description

The daily (log) returns of the Dow Jones Industrial Average and the NASDAQ composite, respectively. The daily observations start at the first of January, 1990, and end in October 2001.

Usage

data(VDW)

Format

A data frame with 3082 observations on the following 2 variables.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DJIA</td>
<td>Log-return of Dow Jones Industrial Average.</td>
</tr>
<tr>
<td>NASDAQ</td>
<td>Log-return of NASDAQ.</td>
</tr>
</tbody>
</table>

Details

This data set has been utilized in the source below and can be downloaded from the web-site of the *Journal of Applied Econometrics* (see link below).

Source


References


See Also

`BVDW`

Examples

data(VDW)
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