Package: robustGarch (via r-universe)

May 13, 2026

Type Package

Title Robust Garch(1,1) Model

Version 0.4.0

Description A method for modeling robust GARCH (1,1) processes, providing robustness toward additive outliers instead of innovation outliers. This work is based on the methodology described by Muler and Yohai in 2008.

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Encoding UTF-8

LazyData true

URL https://github.com/EchoRLiu/robustGarch

BugReports https://github.com/EchoRLiu/robustGarch/issues

RoxygenNote 7.3.2

Suggests knitr, rmarkdown, testthat

Imports Rsolnp, nloptr, rugarch, zoo, xts

VignetteBuilder knitr

Depends R (>= 4.3.0)

Config/pak/sysreqs cmake

Repository https://echorliu.r-universe.dev

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RemoteRef HEAD

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Contents

gspc *Daily log return of the GSPC from 2004-01-05 to 2024-08-02*

Description

This is processed from the original ^GSPC.csv dataframe.

Usage

```
data(gspc)
```

Format

A vector with length 5180.

log return log return ...

Details

GSPC is a ticker for S&P 500 Index, see https://en.wikipedia.org/wiki/S%26P_500#cite_note-10.

Source

https://finance.yahoo.com/quote/%5EGSPC/history?period1=949363200&period2=1025222400&interval=1d&filter=history&frequency=1d

robGarch *Robust GARCH(1,1) Model Estimation*

Description

Computes "BM" robust Garch(1,1) model parameter estimate by using a bounded objective function and a bounded conditional variance recursion. Alternatively, it computes: (1) "M" estimates by using only the bounded objective function, (2) "QML" estimates based on a typically incorrect assumption of normally distributed innovations, (3) "t-MLE" estimates based on an assumption of an innovations t-distributed MLE with unknown location, scale,and degrees of freedom parameters. CHECK IF (3) IS CORRECT.

Usage

```
robGarch(
  data,
  fitMethod = c("BM", "M", "QML", "MLE"),
  robTunePars = c(0.8, 3),
  optChoice = c("Rsolnp", "nloptr", "nlminb"),
  initialPars = c(5e-04, 0.15, 0.75),
  SEmethod = c("numDeriv", "optim", "sandwich"),
  optControl = list(trace = 0)
)
```

Arguments

`data`	an xts object
`fitMethod`	character valued name of fitting method, one of "BM", "M" "QML" or "tMLE", with "BM" the default value.
`robTunePars`	a numeric vector c(cM,cFlt) that controls the extent of fitMethod robustness, with default c(0.8,3.0).
`optChoice`	character valued optChoice name, one of "Rsolnp", "nloptr", "nlminb", with default "Rsolnp".
`initialPars`	numeric user-defined initial parameters c(gamma0, alpha0, beta0) for use by optChoice, with default values c(0.0005, 0.15, 0.75).
`SEmethod`	character valued name of standard error method, one of "numDeriv", "optim", "sandwich", with default "numDeriv".
`optControl`	list of arguments passed to optChoice, with default `list(trace=0)`.

Details

The "BM" fit method delivers the highest robustness by using a half-Huber psi function to bound the normal distribution log-likelihood, and using a Huber psi function to prevent the propagation of influential outliers in the variance recursion. The "M" method is obtained by dropping the BM bounding of the variance recursion, and is therefore less robust toward outliers.

ECHO OR DAN, PLEASE PROVIDE DETAILS FOR optControl. For details of the list of control arguments, please refer to `nloptr::nloptr`, `Rsolnp::solnp`, `nlminb`. The SEmethod default "numDeriv" is based on the Hessian from the optimization.

Value

A list object of class “robustGarch” with components:

`data`	the input xts object
`fitMethod`	the the fitMethod specified
`robtunePars`	the robtunePars specified
`initialPars`	the initialPars specified
`optChoice`	the optChoice specified

coefEstimates	computed parameter estimates
sigma	conditional standard deviation xts class time series
SEmethod	the specidied of calculating standard errors
observedInfoMat	observed information matrix
optDetails	a list containing the optChoice specified, the control values specified, and the optChoice minimized objective, and convergence status message

References

Muler, N. and Yohai, V. (2008). Robust estimates for GARCH models. Journal of Statistical Planning and Inference, 138, 2918-2940.

Examples

```
data("gspc")
fit <- robGarch(gspc[1:604], fitMethod = "BM")
summary(fit)
```

---

robustGARCH-summary *Summary for robustGARCH class*

Description

Summary for robustGARCH S3 class

Usage

```
## S3 method for class 'robustGARCH'
summary(object, digits = 3, ...)

## S3 method for class 'robustGARCH'
print(x, digits = 3, ...)

## S3 method for class 'robustGARCH'
plot(
  x,
  digits = 3,
  estimation_pos = "topleft",
  line_name_pos = "topright",
  par_ = par(no.readonly = TRUE),
  pctReturn_ = TRUE,
  abs_ = TRUE,
  original_ = FALSE,
  main_name = "Conditional Volatility (vs |pctReturns(%)|)",
  ...
```

```
)

## S3 method for class 'robustGARCH'
coef(object, ...)

aef(fit, nu = 5)
```

Arguments

object	Same as fit, for summary.robustGARCH
digits	the number of digits for print and plot, default is 3.
...	# to be written
x	Same as fit, for plot.robustGARCH and print.robustGARCH
estimation_pos	string that determines the legend position that specifies gamma, alpha, beta estimations. Choice of "bottomright", "bottom", "bottomleft", "left", "topleft", "top", "topright", "right" and "center". Default is "topleft".
line_name_pos	string that determines the legend position that specifies the names of lines in the plot. Choice of "bottomright", "bottom", "bottomleft", "left", "topleft", "top", "topright", "right" and "center". Default is "topright".
par_	graphical parameters that can be set, which is in the form of par(...). The default is par(no.readonly = TRUE).
pctReturn_	a logical argument. IF TRUE, the plot function will plot the returns in percentage instead of original. Default is TRUE.
abs_	a logical argument, when TRUE, the plot function will plot abs(returns) with conditional standard deviation instead of returns, default to TRUE.
original_	a logical argument. If TRUE, the original return will be plotted. Default is FALSE
main_name	the title of the plot, default is "Conditional SD (vs returns)"
fit	A robustGARCH fit object of class robGarch
nu	degrees of freedom in a Student's t-distribution.

Examples

```
data("gspc")
fit <- robGarch(gspc, fitMethod="BM", robTunePars = c(0.8, 3.0),
                optChoice="Rsolnp", SEmethod = "numDeriv")
summary(fit)
print(fit)
plot(fit)
coef(fit)
```

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