Package: qgarch (via r-universe)

June 7, 2026

Type Package

Title Quadratic GARCH-in-Mean Models for Volatility Feedback

Version 0.1.0

Description Fits quadratic generalized autoregressive conditional heteroskedasticity-in-mean (QGARCH-M) models motivated by Campbell and Hentschel (1992). The package supports models with lambda fixed at zero, lambda restricted to a function of the remaining parameters, lambda estimated freely, and a threshold extension with state-dependent lambda. It also provides tools for starting values, estimation, forecasting, likelihood-ratio testing, moment diagnostics, and replication with the included monthly U.S. stock market dataset.

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Encoding UTF-8

Depends R (>= 4.1.0)

Imports MASS

Suggests testthat (>= 3.0.0)

Roxygen list(markdown = TRUE)

LazyData true

URL https://github.com/sho-125/qgarch

BugReports https://github.com/sho-125/qgarch/issues

Config/testthat/edition 3

Config/roxygen2/version 8.0.0

Repository https://sho-125.r-universe.dev

Date/Publication 2026-05-05 03:06:54 UTC

RemoteUrl https://github.com/sho-125/qgarch

RemoteRef HEAD

RemoteSha 883849056e34cc58a14c015cdd9412f9ff9acdda

Contents

`coef.qgarch` *Extract coefficients from a qgarch model*

Description

Extract coefficients from a qgarch model

Usage

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

Arguments

`object`	A fitted `qgarch` object.
`...`	Additional arguments. Supports `type = "estimated"` or `type = "full"`.

Value

A named numeric vector of coefficients.

fitted.qgarch *Fitted values from a qgarch model*

Description

Fitted values from a qgarch model

Usage

```
## S3 method for class 'qgarch'
fitted(object, ...)
```

Arguments

object	A fitted qgarch object.
...	Unused.

Value

A numeric vector of fitted values.

logLik.qgarch *Log-likelihood for a qgarch model*

Description

Log-likelihood for a qgarch model

Usage

```
## S3 method for class 'qgarch'
logLik(object, ...)
```

Arguments

object	A fitted qgarch object.
...	Unused.

Value

An object of class "logLik".

plot.qgarch *Plot a qgarch model*

Description

Plot a qgarch model

Usage

```
## S3 method for class 'qgarch'
plot(x, which = c("sigma2", "standardized"), ...)
```

Arguments

x	A fitted qgarch object.
which	Which plot to show: "sigma2" or "standardized".
...	Additional graphical arguments passed to graphics::plot().

Value

The input object, invisibly.

predict.qgarch *Forecast from a generalized qgarch(m, n) model*

Description

Forecast from a generalized qgarch(m, n) model

Usage

```
## S3 method for class 'qgarch'
predict(object, n.ahead = 1L, ...)
```

Arguments

object	A fitted qgarch object.
n.ahead	Number of periods ahead to forecast.
...	Unused.

Value

A data frame with forecast horizon, conditional mean, conditional variance, and conditional standard deviation.

print.qgarch *Print a qgarch model*

Description

Print a qgarch model

Usage

```
## S3 method for class 'qgarch'
print(x, digits = max(3L, getOption("digits") - 2L), ...)
```

Arguments

x	A fitted qgarch object.
digits	Number of digits to print.
...	Unused.

Value

The input object, invisibly.

print.summary.qgarch *Print a qgarch summary*

Description

Print a qgarch summary

Usage

```
## S3 method for class 'summary.qgarch'
print(x, digits = max(3L, getOption("digits") - 2L), ...)
```

Arguments

x	An object of class "summary.qgarch".
digits	Number of digits to print.
...	Unused.

Value

The input object, invisibly.

qgarch_default_starts *Default starting values for qgarch estimation*

Description

Creates a compact but order-adaptive set of starting values for the selected qgarch model.

Usage

```
qgarch_default_starts(
  x,
  model = c("zero", "restricted", "free", "threshold"),
  arch_order = 1L,
  garch_order = 1L
)
```

Arguments

x	A numeric vector or one-column data frame containing the observed series.
model	Character string specifying the model variant. Must be one of "zero", "restricted", "free", or "threshold".
arch_order	Positive integer giving the ARCH lag order.
garch_order	Positive integer giving the GARCH lag order.

Value

A list of named numeric vectors containing candidate starting values.

qgarch_fit *Fit generalized qgarch(m, n) models*

Description

Fits QGARCH-in-mean models using nonlinear minimization of the negative log-likelihood. Four variants are supported: a zero-lambda model, a restricted-lambda model, a free-lambda model, and a threshold model with state-dependent lambda.

Usage

```
qgarch_fit(
  x,
  model = c("zero", "restricted", "free", "threshold"),
  arch_order = 1L,
  garch_order = 1L,
  threshold_indicator = NULL,
```

```
  start = NULL,
  rho = 1,
  steptol = 1e-10,
  typsize = 0.1,
  iterlim = 300L,
  print.level = 0,
  hessian = TRUE,
  vcov_type = c("auto", "sandwich", "hessian", "opg", "none")
)
```

Arguments

x	A numeric vector or one-column data frame containing the observed series. The series must contain only finite, non-missing values.
model	Character string specifying the model variant. Must be one of "zero", "restricted", "free", or "threshold".
arch_order	Positive integer giving the ARCH lag order m.
garch_order	Positive integer giving the GARCH lag order n.
threshold_indicator	Optional threshold indicator used only when model = "threshold". Must have the same length as x. Nonzero values are converted to 1 and zero values to 0.
start	Optional starting values. May be NULL, a numeric vector, or a list of numeric vectors.
rho	Scalar used in the restricted-lambda mapping.
steptol	Step tolerance passed to stats::nlm().
typsize	Typical size passed to stats::nlm(). A single value is repeated to the appropriate length.
iterlim	Maximum number of iterations passed to stats::nlm().
print.level	Print level passed to stats::nlm().
hessian	Logical; should the Hessian be returned by stats::nlm()?
vcov_type	Character string controlling standard-error estimation. One of "auto", "sandwich", "hessian", "opg", or "none". In "auto" mode, Hessian-based standard errors are tried first.

Value

An object of class "qgarch".

qgarch_lr_test *Likelihood ratio test for nested qgarch models*

Description

Compares two fitted qgarch models using the likelihood ratio test.

Usage

```
qgarch_lr_test(restricted, unrestricted, df = NULL)
```

Arguments

restricted	A fitted qgarch object representing the restricted model.
unrestricted	A fitted qgarch object representing the unrestricted model.
df	Degrees of freedom for the test. If NULL, it is computed as the difference in the number of estimated coefficients.

Value

A data frame with the likelihood ratio statistic, degrees of freedom, p-value, and the model names. The returned object has class c("qgarch_lr_test", "data.frame").

qgarch_moments *Compute sample moments for a series*

Description

Computes the sample mean, variance, skewness, and excess kurtosis for a numeric series, along with simple standard errors.

Usage

```
qgarch_moments(x, scale_mean_variance = 1)
```

Arguments

x	A numeric vector or a one-column data frame containing the series.
scale_mean_variance	A finite scalar used to rescale the reported mean and variance and their standard errors.

Value

A list with elements:

estimate Named numeric vector of moment estimates.

std_error Named numeric vector of standard errors.

n Number of usable observations.

The returned object has class `"qgarch_moments"`.

---

residuals.qgarch *Residuals from a qgarch model*

Description

Residuals from a qgarch model

Usage

```
## S3 method for class 'qgarch'
residuals(object, type = c("raw", "standardized", "eta"), ...)
```

Arguments

`object`	A fitted qgarch object.
`type`	Type of residuals to return: `"raw"`, `"standardized"`, or `"eta"`.
`...`	Unused.

Value

A numeric vector of residuals.

---

summary.qgarch *Summarize a qgarch model*

Description

Summarize a qgarch model

Usage

```
## S3 method for class 'qgarch'
summary(object, ...)
```

Arguments

`object`	A fitted `qgarch` object.
`...`	Unused.

Value

An object of class `"summary.qgarch"`.

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us_monthly *Monthly U.S. data*

Description

Monthly data used in examples and tests for the qgarch package.

Usage

```
us_monthly
```

Format

A data frame with monthly observations and 3 variables:

YearMon Month of the observation.

Mktrf Market excess return.

ER Excess return series.

Source

Prepared by the package author.

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vcov.qgarch *Variance-covariance matrix for a qgarch model*

Description

Variance-covariance matrix for a qgarch model

Usage

```
## S3 method for class 'qgarch'
vcov(object, ...)
```

Arguments

`object`	A fitted `qgarch` object.
`...`	Unused.

Value

A variance-covariance matrix.

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