

VaR OUT-SAMPLE FORECAST WITH “rgarch”, “rugarch”, “rmgarch” IN R

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```
>library(rugarch)
>library(timeSeries)
>library(Rcmdr) #your return series is now ret<-as.timeSeries(Dataset)
>ret<-ret*100 ####if you did not multiply them in excel

##NB: You must start by filtering the returns with a AR(1)-GARCH(1,1)
#then replace ret with residuals

# if you are running linux or mac and have multiple cores you should install and
# load the multicore library as this significantly speeds up calculations
# (set use.mclapply = T)
#model can be iGARCH, eGARCH, tGARCH, gjrGARCH
#distribution.model="nig"(normal inverse gamma), or "ged" (generalized error dist) "norm"

# We use the eGARCH model with the "nig" distribution.
>spec = ugarchspec(variance.model = list(model = "eGARCH", garchOrder = c(1,1)),
mean.model = list(armaOrder = c(1,1), include.mean = TRUE), distribution.model = "nig")

# The ugarchroll will use a 1-day ahead rolling forecast of 25 days, refitting every
# 25 days using an expanding window and calculating the resulting time varying
# distribution along the way in order to produce analytical VaR estimates.
#if the model doesn't converge, then change solver="solnp" to "gosolnp" or "nlminb" or
#"L-BGFS-U"

>ret.bktest = ugarchroll(spec, data = ret, n.ahead = 1, forecast.length = 500,
refit.every = 25, refit.window = "recursive", solver = "solnp", fit.control = list(), solver.control =
list(), calculate.VaR = TRUE, VaR.alpha = c(0.01, 0.025, 0.05))##forecast.length=your in
#sample range

# some plots of the forecast time-varying density, VaR etc
>plot(x=ret.bktest, which="all", n.ahead=1)
```

plot of the coefficients evolution and their s.e. over the refits:

>plot(x = ret.bktest, which = 5)

a standalone VaR plot

>plot(x=ret.bktest, which=4, n.ahead=1, VaR.alpha = 0.01)

#Do the exceedence test: Kupiec (unconditional voverage test) and Christoffersen (conditional coverage test)

1% does not reject the NULL hypothesis

>report(ret.bktest, type = "VaR", n.ahead = 1, VaR.alpha = 0.01, conf.level= 0.95)

2.5% does reject the NULL hypothesis

>report(ret.bktest, type = "VaR", n.ahead = 1, VaR.alpha = 0.025, conf.level=0.95)

forecast performance measure report over the refits

%%%

#BUILDING AN AR(1)-GARCH(1,1) WITH "rgarch" ##this model is not for prediction

>library(rugarch)##or library(rugarch)##the package "rgarch" is now divide in "rugarch" and "rmgarch"

>spec = ugarchspec(variance.model = list(model = "gjrGARCH", garchOrder = c(1,1)), mean.model = list(armaOrder = c(1,1), include.mean = TRUE), distribution.model = "nig")### model can be iGARCH, ##eGARCH, tGARCH, gjrGARCH; and distribution.model="nig"(normal inverse gamma), or # "ged" (generalized error dist) "norm" (normal)

>fit = ugarchfit(spec = spec, data = ret, solver.control = list(trace = 0))##ret is as.timeSeries(Dataset)

>show(fit)

>resi<-residuals(fit)