ABF

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.libPaths()

library(zoo)\

library(tidyverse)

library(quantmod)

library(rugarch)

library(xts)

library(PerformanceAnalytics)

aapl <- read.zoo("aapl.csv", sep = ",", h=T, format = "%Y-%m-%d")  
head(aapl)

## 2000-01-03 2000-01-04 2000-01-05 2000-01-06 2000-01-07 2000-01-10   
## 27.58 25.25 25.62 23.40 24.51 24.08

plot(aapl, main ="Apple Closing price on NASDAQ", ylab = "Price(USD)", xlab = "DAte")

length(aapl)

## [1] 3347

which.max(aapl)

## [1] 3200

aapl[which.max(aapl)]

## 2012-09-19   
## 694.86

aapl[3200]

## 2012-09-19   
## 694.86

#단순 수익률(Simple return)  
SimpleR <- diff(aapl)/stats::lag(aapl, k=-1)\*100  
summary(coredata(SimpleR))

## Min. 1st Qu. Median Mean 3rd Qu. Max.   
## -51.85888 -1.32475 0.07901 0.12527 1.55332 13.91131

#지속적인 복리 수익률  
ContR <- diff(log(aapl)) \* 100

hist(SimpleR, breaks = 100, freq = FALSE, main = "Histogram of Simple Returns", xlab = "Percent(%)")

aapl\_2013\_1Q <- window(SimpleR, start = "2013-01-01", end = "2013-03-31")  
summary(coredata(aapl\_2013\_1Q))

## Min. 1st Qu. Median Mean 3rd Qu. Max.   
## -12.3554 -1.4246 -0.2814 -0.2673 1.1771 4.1523

hist(aapl\_2013\_1Q, breaks = 10, freq =FALSE, main ="Histogram of Simple Returns", xlab ="Percent(%)")

#1day 95%, 99% VaR using naive historiccal approach  
quantile(SimpleR, probs = c(0.05, 0.01))

## 5% 1%   
## -4.183982 -7.042678

getSymbols("^GSPC", from = "2014-01-01", to=Sys.Date())

## [1] "GSPC"

chartSeries(Cl(GSPC))

Ret <- dailyReturn(Ad(GSPC), type ="log")  
Ret

## daily.returns  
## 2014-01-02 0.0000000000  
## 2014-01-03 -0.0003330205  
## 2014-01-06 -0.0025149273  
## 2014-01-07 0.0060633454  
## 2014-01-08 -0.0002122315  
## 2014-01-09 0.0003482485  
## 2014-01-10 0.0023040305  
## 2014-01-13 -0.0126559665  
## 2014-01-14 0.0107598761  
## 2014-01-15 0.0051528891  
## ...   
## 2023-12-18 0.0045181223  
## 2023-12-19 0.0058492675  
## 2023-12-20 -0.0147931480  
## 2023-12-21 0.0102487693  
## 2023-12-22 0.0016586822  
## 2023-12-26 0.0042227610  
## 2023-12-27 0.0014294356  
## 2023-12-28 0.0003701061  
## 2023-12-29 -0.0028304770  
## 2024-01-02 -0.0056766608

par(mfrow=c(2,1))  
plot(Ret, main="Return")  
plot(abs(Ret), main ="Absolute Value of Return")

par(mfrow=c(2,2))  
acf(Ret, main ="ACF of Return")  
pacf(Ret, main = "PACF of Return")  
acf(abs(Ret), main = "ACF of Absolute(Return)")  
pacf(abs(Ret), main = "PACF of Absolute(Return)")

par(mfrow = c(1,1))

R\_mean <- mean(Ret); R\_sd <- sd(Ret)  
par(mfrow = c(1,2))  
hist(Ret, nclass = 40, freq = FALSE, main ="Histogram of Return")  
plot(density(Ret), main = "Distribution of Return")  
x <- seq(-0.3, 0.2, 0.01)  
curve(dnorm(x, mean=R\_mean, sd =R\_sd), from = -0.3, to = 0.2, add = TRUE, col = "red", lwd = 2)

kurtosis(Ret)

## [1] 16.05453

plot(density(Ret), xlim = c(-0.2, -0.1), ylim = c(0, 0.2), main ="Lower Tail Distribution of Return")  
  
curve(dnorm(x, mean = R\_mean, sd = R\_sd), from = -0.2, to =-0.1, add = TRUE, col ="red", lwd = 2)

getSymbols("AAPL", from ="2006-01-01", to ="2014-03-31")

## [1] "AAPL"

APL\_x <- dailyReturn(Cl(AAPL), type = "log")  
chartSeries(APL\_x)

g11\_spec <- ugarchspec(variance.model = list(model = "sGARCH", garchOrder = c(1,1), mean.model =list(armaOrder=c(0,0))))

## Warning: unidentified option(s) in variance.model:  
## mean.model

g11\_fit <- ugarchfit(spec = g11\_spec, data = APL\_x)  
coef(g11\_fit)

## mu ar1 ma1 omega alpha1   
## 1.947334e-03 3.692071e-01 -3.424005e-01 1.050947e-05 8.311883e-02   
## beta1   
## 8.971104e-01

g11\_fit2<-ugarchfit(spec=g11\_spec, data =APL\_x, out.sample = 20)  
g11\_fore <- ugarchforecast(g11\_fit2, n.ahead =10, n.roll = 5)  
plot(g11\_fore, which="all")

fitted(g11\_fore)

## 2014-02-28 2014-03-03 2014-03-04 2014-03-05 2014-03-06 2014-03-07  
## T+1 0.001948419 0.001977294 0.002081650 0.002006430 0.001848273 0.001852352  
## T+2 0.001953504 0.001964840 0.002005808 0.001976278 0.001914189 0.001915791  
## T+3 0.001955501 0.001959951 0.001976034 0.001964441 0.001940066 0.001940695  
## T+4 0.001956285 0.001958032 0.001964346 0.001959795 0.001950225 0.001950472  
## T+5 0.001956592 0.001957278 0.001959757 0.001957970 0.001954214 0.001954310  
## T+6 0.001956713 0.001956982 0.001957955 0.001957254 0.001955779 0.001955817  
## T+7 0.001956761 0.001956866 0.001957248 0.001956973 0.001956394 0.001956409  
## T+8 0.001956779 0.001956821 0.001956971 0.001956863 0.001956635 0.001956641  
## T+9 0.001956786 0.001956803 0.001956862 0.001956819 0.001956730 0.001956732  
## T+10 0.001956789 0.001956796 0.001956819 0.001956802 0.001956767 0.001956768

sigma(g11\_fore)

## 2014-02-28 2014-03-03 2014-03-04 2014-03-05 2014-03-06 2014-03-07  
## T+1 0.01637564 0.01588833 0.01548730 0.01506188 0.01473554 0.01438219  
## T+2 0.01653490 0.01606237 0.01567395 0.01526239 0.01494703 0.01460597  
## T+3 0.01668944 0.01623106 0.01585467 0.01545630 0.01515137 0.01482192  
## T+4 0.01683948 0.01639464 0.01602975 0.01564394 0.01534892 0.01503048  
## T+5 0.01698518 0.01655333 0.01619944 0.01582562 0.01554002 0.01523203  
## T+6 0.01712671 0.01670734 0.01636398 0.01600160 0.01572499 0.01542693  
## T+7 0.01726425 0.01685685 0.01652358 0.01617215 0.01590411 0.01561552  
## T+8 0.01739794 0.01700205 0.01667846 0.01633751 0.01607766 0.01579809  
## T+9 0.01752792 0.01714311 0.01682881 0.01649790 0.01624589 0.01597493  
## T+10 0.01765434 0.01728019 0.01697482 0.01665354 0.01640902 0.01614629

uncmean(g11\_fit)

## [1] 0.001947334

sqrt(uncvariance(g11\_fit))

## [1] 0.0230557

uncmean(g11\_fit)

## [1] 0.001947334

infocriteria(g11\_fit)

##   
## Akaike -4.929061  
## Bayes -4.912746  
## Shibata -4.929078  
## Hannan-Quinn -4.923081

g11\_impact <- newsimpact(g11\_fit)  
plot(g11\_impact$zx, g11\_impact$zy, type ="l", col="red", lwd = 2, main = "News Impact Analysis",  
 xlab =g11\_impact$xexpr, ylab = g11\_impact$yexpr)

eg11\_spec<-ugarchspec(variance.model = list(model ="eGARCH", garchOrder = c(1,1)), mean.model = list(armaOrder=c(0,0)))  
eg11\_fit <-ugarchfit(spec=eg11\_spec, data = APL\_x)  
coef(eg11\_fit)

## mu omega alpha1 beta1 gamma1   
## 0.00145036 -0.29245912 -0.09307696 0.96181464 0.17643608

eg11\_impact <- newsimpact(eg11\_fit)  
plot(eg11\_impact$zx, eg11\_impact$zy, type ="l", col = "red", lwd = 2, main ="News Impact Analysis", xlab = g11\_impact$xexpr, ylab = g11\_impact$yexpr)

infocriteria(g11\_fit); infocriteria(eg11\_fit)

##   
## Akaike -4.929061  
## Bayes -4.912746  
## Shibata -4.929078  
## Hannan-Quinn -4.923081

##   
## Akaike -4.958215  
## Bayes -4.944619  
## Shibata -4.958227  
## Hannan-Quinn -4.953232

tg11\_spec<-ugarchspec(variance.model = list(model = "fGARCH", submodel = "TGARCH", garchOrder = c(1,1)), mean.model = list(armaOrder = c(0,0)))  
tg11\_fit <- ugarchfit(spec=tg11\_spec, data = APL\_x)  
coef(tg11\_fit)

## mu omega alpha1 beta1 eta11   
## 0.0014498517 0.0008969289 0.0999259687 0.8804734533 0.5797016683

tg11\_impact<-newsimpact(tg11\_fit)  
plot(tg11\_impact$zx, tg11\_impact$zy, type = "l", col="red", lwd = 2, main ="News Impact Analysis", xlab = g11\_impact$xexpr, ylab = g11\_impact$yexpr)

infocriteria(g11\_fit); infocriteria(eg11\_fit); infocriteria(tg11\_fit)

##   
## Akaike -4.929061  
## Bayes -4.912746  
## Shibata -4.929078  
## Hannan-Quinn -4.923081

##   
## Akaike -4.958215  
## Bayes -4.944619  
## Shibata -4.958227  
## Hannan-Quinn -4.953232

##   
## Akaike -4.960820  
## Bayes -4.947224  
## Shibata -4.960831  
## Hannan-Quinn -4.955837

plot(density(Ret), log ='y', main ="Log Distribution of Return")  
curve(dnorm(x, mean=R\_mean, sd=R\_sd), from = -0.3, to=0.2, log ="y", add = TRUE, col = "red", lwd = 2)

qqnorm(Ret);qqline(Ret, col ="red",lwd =2)

y = rt(200, df = 5)  
qqnorm(y)  
qqline(y, col = 2, lwd = 2)

xt <- matrix(1:6, ncol = 2, nrow = 3)  
xt

## [,1] [,2]  
## [1,] 1 4  
## [2,] 2 5  
## [3,] 3 6

idxt <- as.Date("2020-01-01") + 1:3  
xtsData <- xts(xt, order.by = idxt)  
class(xtsData)

## [1] "xts" "zoo"

head(xtsData)

## [,1] [,2]  
## 2020-01-02 1 4  
## 2020-01-03 2 5  
## 2020-01-04 3 6

coredata(xtsData)

## [,1] [,2]  
## [1,] 1 4  
## [2,] 2 5  
## [3,] 3 6

index(xtsData)

## [1] "2020-01-02" "2020-01-03" "2020-01-04"

ts1 <- ts(1:10, frequency = 4, start = c(1959,2))  
xts1 <- as.xts(ts1)  
head(xts1)

## [,1]  
## 1959 Q2 1  
## 1959 Q3 2  
## 1959 Q4 3  
## 1960 Q1 4  
## 1960 Q2 5  
## 1960 Q3 6

ts2<-ts(1:10, frequency = 7, start = c(12,2))  
print(ts2, calendar = TRUE)

## p1 p2 p3 p4 p5 p6 p7  
## 12 1 2 3 4 5 6  
## 13 7 8 9 10

#error: Error in as.xts.ts(ts2) : could not convert index to appropriate type  
#xts2 <- as.xts(ts2)

aapl <- read.csv("aapl.csv", h= T)

idxt <- as.Date(aapl[,1])  
aapl\_xts <- xts(aapl[,-1], order.by = idxt)  
class(aapl\_xts)

## [1] "xts" "zoo"

head(aapl\_xts)

## [,1]  
## 2000-01-03 27.58  
## 2000-01-04 25.25  
## 2000-01-05 25.62  
## 2000-01-06 23.40  
## 2000-01-07 24.51  
## 2000-01-10 24.08

data(edhec)  
edhec["2009-03", c(1,3)]

## Convertible Arbitrage Distressed Securities  
## 2009-03-31 0.0235 0.0022

edhec["2009-03/2009-05", c(1,3)]

## Convertible Arbitrage Distressed Securities  
## 2009-03-31 0.0235 0.0022  
## 2009-04-30 0.0500 0.0387  
## 2009-05-31 0.0578 0.0504

edhec[index(edhec) >"2009-05-31" & index(edhec)<= "2009-08-31", c(1,3)]

## Convertible Arbitrage Distressed Securities  
## 2009-06-30 0.0241 0.0198  
## 2009-07-31 0.0611 0.0311  
## 2009-08-31 0.0315 0.0244

q\_dates<-lubridate::dmy("31/5/2009", "31/8/2009")  
edhec[q\_dates,1:2]

## Convertible Arbitrage CTA Global  
## 2009-05-31 0.0578 0.0213  
## 2009-08-31 0.0315 0.0054

xts::first(edhec[, c("Funds of Funds", "Short Selling")], "3 months")

## Funds of Funds Short Selling  
## 1997-01-31 0.0317 -0.0166  
## 1997-02-28 0.0106 0.0426  
## 1997-03-31 -0.0077 0.0778

xts::last(edhec[, c("Funds of Funds", "Short Selling")], "2 months")

## Funds of Funds Short Selling  
## 2019-10-31 0.0035 -0.0028  
## 2019-11-30 0.0071 -0.0140

d1<-as.Date("2019-12-31") + 1:3; x=1:3  
xts1<-xts(x,order.by=d1)  
xts1

## [,1]  
## 2020-01-01 1  
## 2020-01-02 2  
## 2020-01-03 3

d2<-as.Date("2019-12-31") + 2:5; x=2:5  
xts2<-xts(x,order.by=d2)  
xts2

## [,1]  
## 2020-01-02 2  
## 2020-01-03 3  
## 2020-01-04 4  
## 2020-01-05 5

xts1 + xts2

## e1  
## 2020-01-02 4  
## 2020-01-03 6

merge(xts1, xts2)

## xts1 xts2  
## 2020-01-01 1 NA  
## 2020-01-02 2 2  
## 2020-01-03 3 3  
## 2020-01-04 NA 4  
## 2020-01-05 NA 5

stats::lag(xts1, k=-1)

## [,1]  
## 2020-01-01 2  
## 2020-01-02 3  
## 2020-01-03 NA

stats::lag(xts1, k=1)

## [,1]  
## 2020-01-01 NA  
## 2020-01-02 1  
## 2020-01-03 2

na.omit(merge(xts1, xts2))

## xts1 xts2  
## 2020-01-02 2 2  
## 2020-01-03 3 3

merge(xts1, xts2, join="inner")

## xts1 xts2  
## 2020-01-02 2 2  
## 2020-01-03 3 3

merge(xts1, xts2, join="left")

## xts1 xts2  
## 2020-01-01 1 NA  
## 2020-01-02 2 2  
## 2020-01-03 3 3

merge(xts1, index(xts2), fill=-1)

## xts1  
## 2020-01-01 1  
## 2020-01-02 2  
## 2020-01-03 3  
## 2020-01-04 -1  
## 2020-01-05 -1

rbind(xts1, xts2)

## [,1]  
## 2020-01-01 1  
## 2020-01-02 2  
## 2020-01-02 2  
## 2020-01-03 3  
## 2020-01-03 3  
## 2020-01-04 4  
## 2020-01-05 5

air\_xts <- as.xts(AirPassengers) %>% head(., n=24)  
air\_xts

## [,1]  
## 1 1949 112  
## 2 1949 118  
## 3 1949 132  
## 4 1949 129  
## 5 1949 121  
## 6 1949 135  
## 7 1949 148  
## 8 1949 148  
## 9 1949 136  
## 10 1949 119  
## 11 1949 104  
## 12 1949 118  
## 1 1950 115  
## 2 1950 126  
## 3 1950 141  
## 4 1950 135  
## 5 1950 125  
## 6 1950 149  
## 7 1950 170  
## 8 1950 170  
## 9 1950 158  
## 10 1950 133  
## 11 1950 114  
## 12 1950 140

air\_diff<-diff(air\_xts, lag = 12, differences=1)  
air\_diff

## [,1]  
## 1 1949 NA  
## 2 1949 NA  
## 3 1949 NA  
## 4 1949 NA  
## 5 1949 NA  
## 6 1949 NA  
## 7 1949 NA  
## 8 1949 NA  
## 9 1949 NA  
## 10 1949 NA  
## 11 1949 NA  
## 12 1949 NA  
## 1 1950 3  
## 2 1950 8  
## 3 1950 9  
## 4 1950 6  
## 5 1950 4  
## 6 1950 14  
## 7 1950 22  
## 8 1950 22  
## 9 1950 22  
## 10 1950 14  
## 11 1950 10  
## 12 1950 22

ep <- endpoints(edhec, on ="years")  
ep

## [1] 0 12 24 36 48 60 72 84 96 108 120 132 144 156 168 180 192 204 216  
## [20] 228 240 252 264 275

period.apply(edhec[,"Funds of Funds"], INDEX = ep, FUN =mean) %>% head

## Funds of Funds  
## 1997-12-31 0.013591667  
## 1998-12-31 0.003725000  
## 1999-12-31 0.021300000  
## 2000-12-31 0.006616667  
## 2001-12-31 0.002933333  
## 2002-12-31 0.001066667

apply.yearly(edhec[,"Funds of Funds"], mean) %>% head

## Funds of Funds  
## 1997-12-31 0.013591667  
## 1998-12-31 0.003725000  
## 1999-12-31 0.021300000  
## 2000-12-31 0.006616667  
## 2001-12-31 0.002933333  
## 2002-12-31 0.001066667

bimonthly <- rollapply(edhec["200701/12","Funds of Funds"], 2, mean)  
bimonthly

## Funds of Funds  
## 2007-01-31 NA  
## 2007-02-28 0.01085  
## 2007-03-31 0.00960  
## 2007-04-30 0.01295  
## 2007-05-31 0.01835  
## 2007-06-30 0.01430  
## 2007-07-31 0.00615  
## 2007-08-31 -0.00905  
## 2007-09-30 -0.00115  
## 2007-10-31 0.02510  
## 2007-11-30 0.00775  
## 2007-12-31 -0.00540

edhec\_3sum <- rollapply(edhec["200701/12","Funds of Funds"], 3, sum)  
edhec\_3sum

## Funds of Funds  
## 2007-01-31 NA  
## 2007-02-28 NA  
## 2007-03-31 0.0313  
## 2007-04-30 0.0355  
## 2007-05-31 0.0463  
## 2007-06-30 0.0449  
## 2007-07-31 0.0327  
## 2007-08-31 -0.0099  
## 2007-09-30 0.0018  
## 2007-10-31 0.0280  
## 2007-11-30 0.0354  
## 2007-12-31 0.0195

merge(edhec["200701/12","Funds of Funds"], bimonthly, edhec\_3sum)

## Funds.of.Funds Funds.of.Funds.1 Funds.of.Funds.2  
## 2007-01-31 0.0121 NA NA  
## 2007-02-28 0.0096 0.01085 NA  
## 2007-03-31 0.0096 0.00960 0.0313  
## 2007-04-30 0.0163 0.01295 0.0355  
## 2007-05-31 0.0204 0.01835 0.0463  
## 2007-06-30 0.0082 0.01430 0.0449  
## 2007-07-31 0.0041 0.00615 0.0327  
## 2007-08-31 -0.0222 -0.00905 -0.0099  
## 2007-09-30 0.0199 -0.00115 0.0018  
## 2007-10-31 0.0303 0.02510 0.0280  
## 2007-11-30 -0.0148 0.00775 0.0354  
## 2007-12-31 0.0040 -0.00540 0.0195