quantmod()

DIMAS RAMIREZ LUIS DANIEL

12/6/2021

Un solo activo (una acción)

Media y varianza

Los precios de las accciones son variables aleatorias

En realidad en lo que debemos enfocarnos es en los renidmientos de las acciones.

$$R = \frac{VF - VI}{VI}$$

```
library(quantmod)
```

```
## Warning: package 'quantmod' was built under R version 3.6.3
```

```
## Loading required package: xts
```

```
## Warning: package 'xts' was built under R version 3.6.3
```

```
## Loading required package: zoo
```

```
## Warning: package 'zoo' was built under R version 3.6.3
```

```
##
## Attaching package: 'zoo'
```

```
## The following objects are masked from 'package:base':
##
##     as.Date, as.Date.numeric
```

```
## Loading required package: TTR
```

```
## Warning: package 'TTR' was built under R version 3.6.3
```

```
## Registered S3 method overwritten by 'quantmod':
##   method            from
##   as.zoo.data.frame zoo
```

```
#addBBands <- Add Bollinger Bands to current chart
#addMA <- Add  Moving Average to chart
#attachSymbols <- Attach and Flush DDB
#chartSeries <- create financial charts, to make technical analysis.
#getQuote <- Download current stock quote
#getSymbols <- load and manage data from multiple sources
#getSymbols.csv
#saverCHart <- save chart to external file
```

```
getSymbols("BAC")
```

```
## 'getSymbols' currently uses auto.assign=TRUE by default, but will
## use auto.assign=FALSE in 0.5-0. You will still be able to use
## 'loadSymbols' to automatically load data. getOption("getSymbols.env")
## and getOption("getSymbols.auto.assign") will still be checked for
## alternate defaults.
##
## This message is shown once per session and may be disabled by setting
## options("getSymbols.warning4.0"=FALSE). See ?getSymbols for details.

## [1] "BAC"
```

```
head(BAC)
```

```
##            BAC.Open BAC.High BAC.Low BAC.Close BAC.Volume BAC.Adjusted
## 2007-01-03    53.40    54.18   52.99     53.33   16028200     40.51454
## 2007-01-04    53.33    53.89   53.05     53.67   13175000     40.77284
## 2007-01-05    53.59    53.59   53.03     53.24   10205000     40.44615
## 2007-01-08    53.46    53.64   52.80     53.45    9685900     40.60569
## 2007-01-09    53.60    53.71   52.97     53.50   12546500     40.64368
## 2007-01-10    53.26    53.70   53.16     53.58   10083900     40.70448
```

```
tail(BAC)
```

```
##            BAC.Open BAC.High BAC.Low BAC.Close BAC.Volume BAC.Adjusted
## 2021-06-08    42.86    43.24   42.43     42.88   41871400        42.88
## 2021-06-09    42.47    42.73   42.11     42.32   42366300        42.32
## 2021-06-10    42.76    42.96   41.62     41.69   40123600        41.69
## 2021-06-11    41.81    41.89   41.51     41.86   31188500        41.86
## 2021-06-14    41.85    41.91   41.06     41.36   36050700        41.36
## 2021-06-15    41.28    41.56   40.90     41.39   39241800        41.39
```

```
plot(Cl(BAC), col= 'black')
```

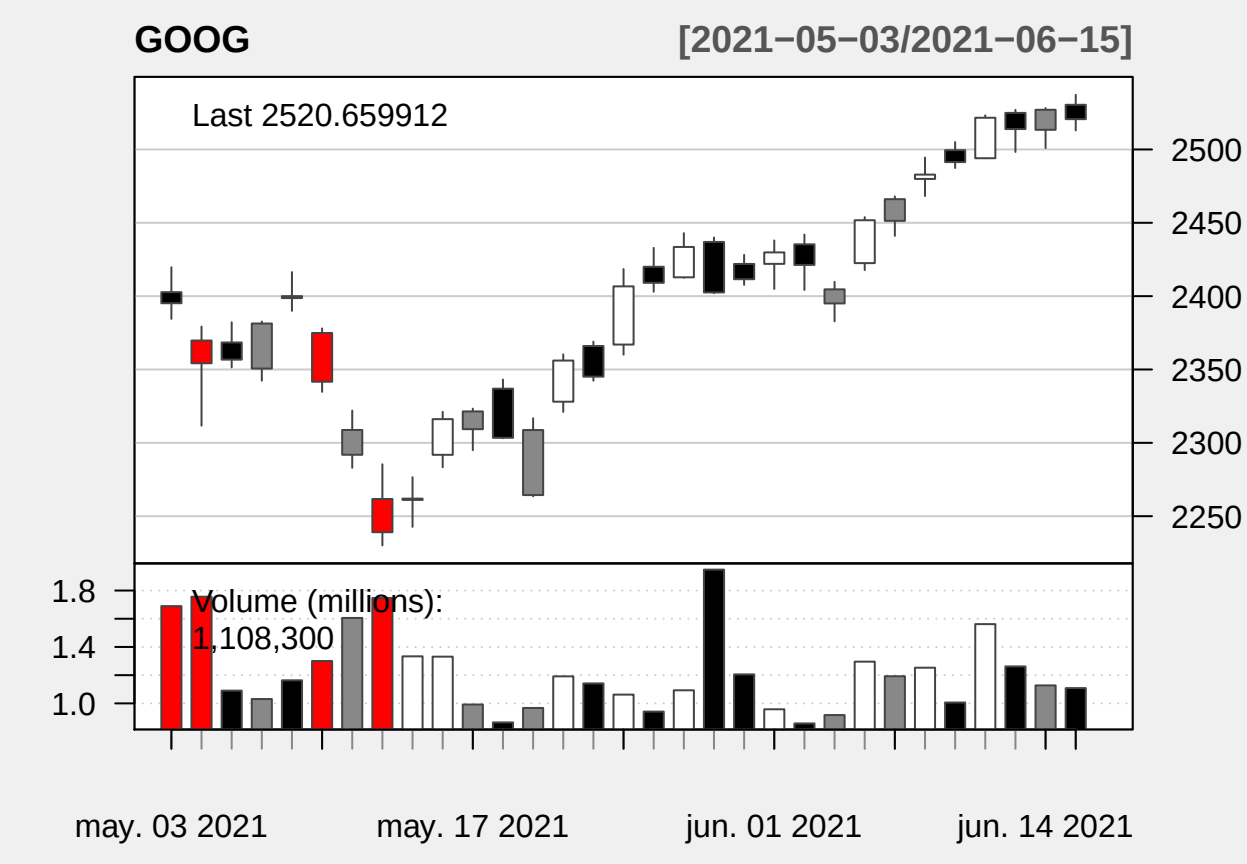

```
barChart(BAC)
```


```
getSymbols("GOOG")
```

```
## [1] "GOOG"
```

```
barChart(GOOG)
```


```
candleChart(GOOG, type = "candlesticks", multi.col = TRUE, theme= 'white', subset= 'last 2 months')
```




```
chartSeries(GOOG)
```

Wulfrano

```
getSymbols("AMZN")
```

```
## [1] "AMZN"
```

```
head(AMZN)
```

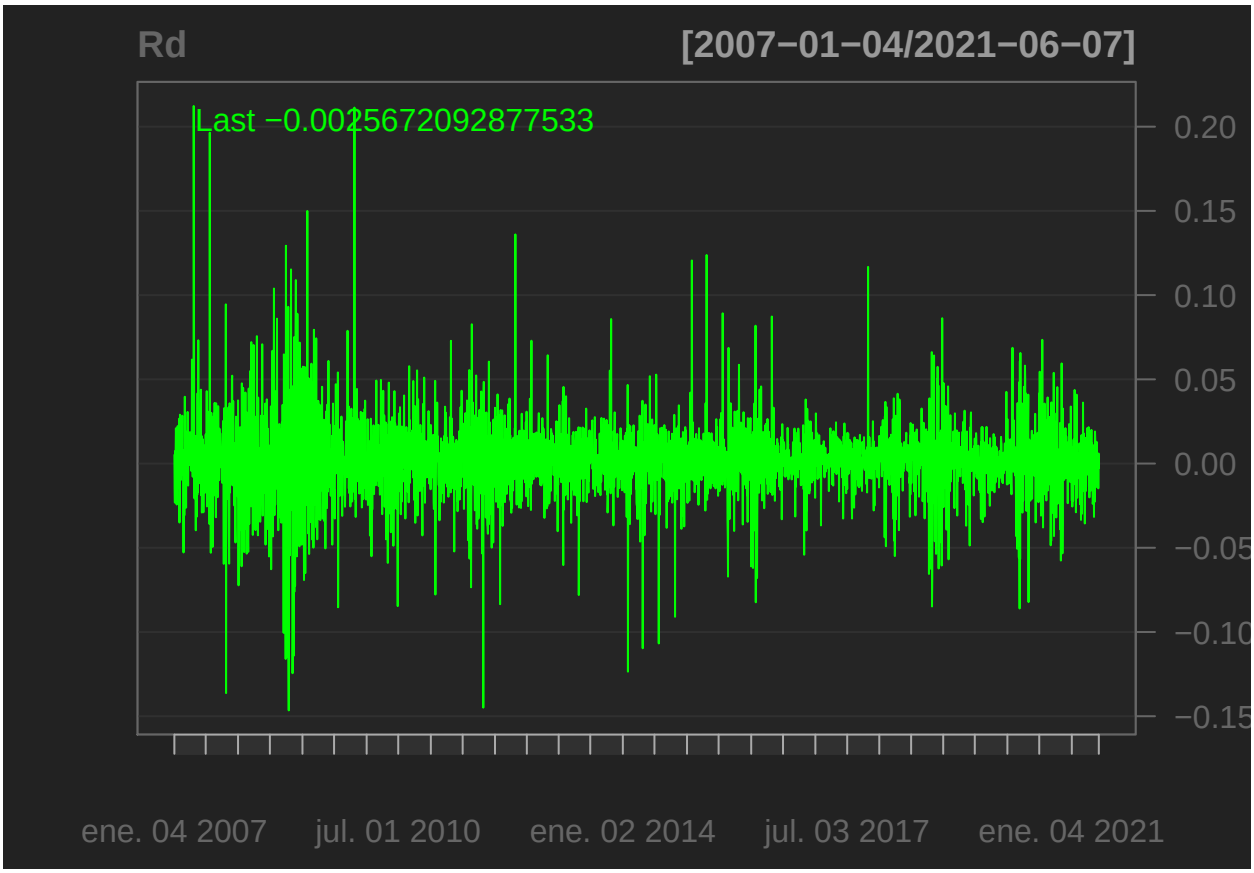
```
##            AMZN.Open AMZN.High AMZN.Low AMZN.Close AMZN.Volume AMZN.Adjusted
## 2007-01-03     38.68     39.06    38.05      38.70    12405100          38.70
## 2007-01-04     38.59     39.14    38.26      38.90     6318400          38.90
## 2007-01-05     38.72     38.79    37.60      38.37     6619700          38.37
## 2007-01-08     38.22     38.31    37.17      37.50     6783000          37.50
## 2007-01-09     37.60     38.06    37.34      37.78     5703000          37.78
## 2007-01-10     37.49     37.70    37.07      37.15     6527500          37.15
```

```
barChart(AMZN)
```

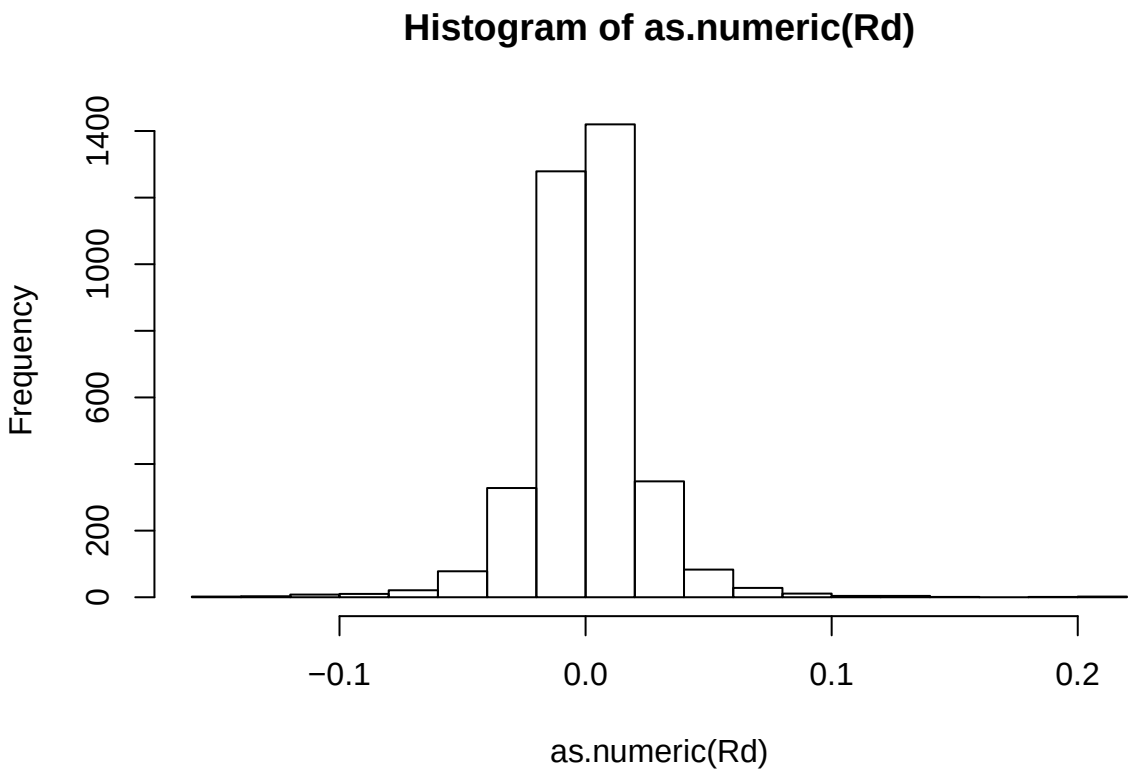

```
# SACANDO EL RENDIMIENTO

R <- as.numeric(AMZN$AMZN.Close["2021-06-08"]-as.numeric(AMZN$AMZN.Close["2007-01-03"]))/as.numeric(AMZ
R
```

```
## [1] 83.34393
```

```
# Rendimientos al cierre

Rd <- diff(AMZN$AMZN.Close)/AMZN$AMZN.Close["2007-01-03/2021-06-07"] #Aqui es igual la formula del rend
############################################################################ función diff()

barChart(Rd)
```




```
hist(as.numeric(Rd))
```



Tenemos los rendimientos de la acción de AMAZON y sabemos que es una variable aleatoria que se distribuye de forma normal

Calcular el rendimiento promedio diario de AMZN

```
AmznRd <- mean(Rd, na.rm = TRUE )
AmznVRd <- var(Rd, na.rm = TRUE )
AmznSDRd <- sd(Rd, na.rm = TRUE )

AmznRd
```

```
## [1] 0.0009342713
```

```
AmznVRd
```

```
##              AMZN.Close
## AMZN.Close 0.0005553116
```

```
AmznSDRd
```

```
## [1] 0.02356505
```

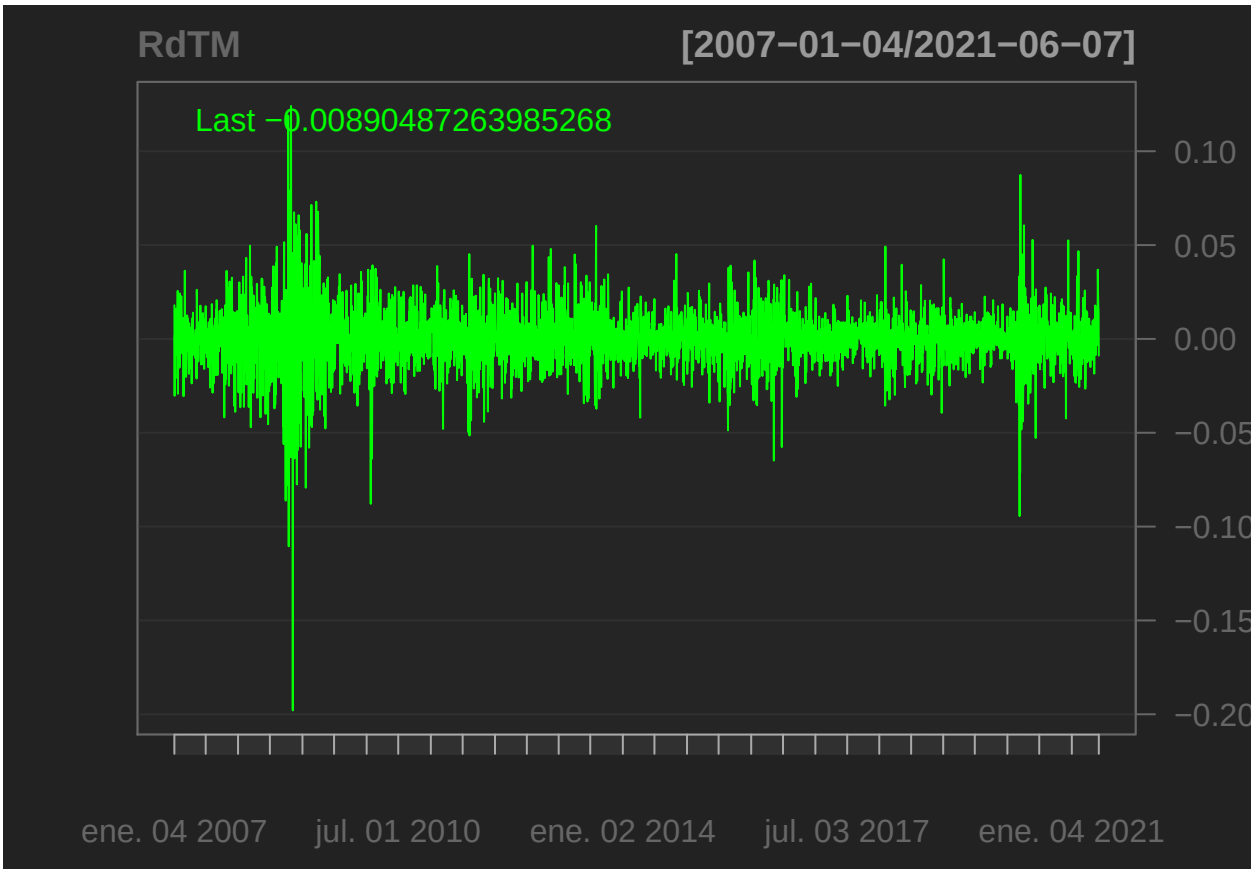
```r
AMZNra <- round(((AmznRd+1)^252-1)*100, 2)

AMZNVola <- round((AmznSDRd*252^0.5)*100, 2)
```

```r
getSymbols("TM")
```

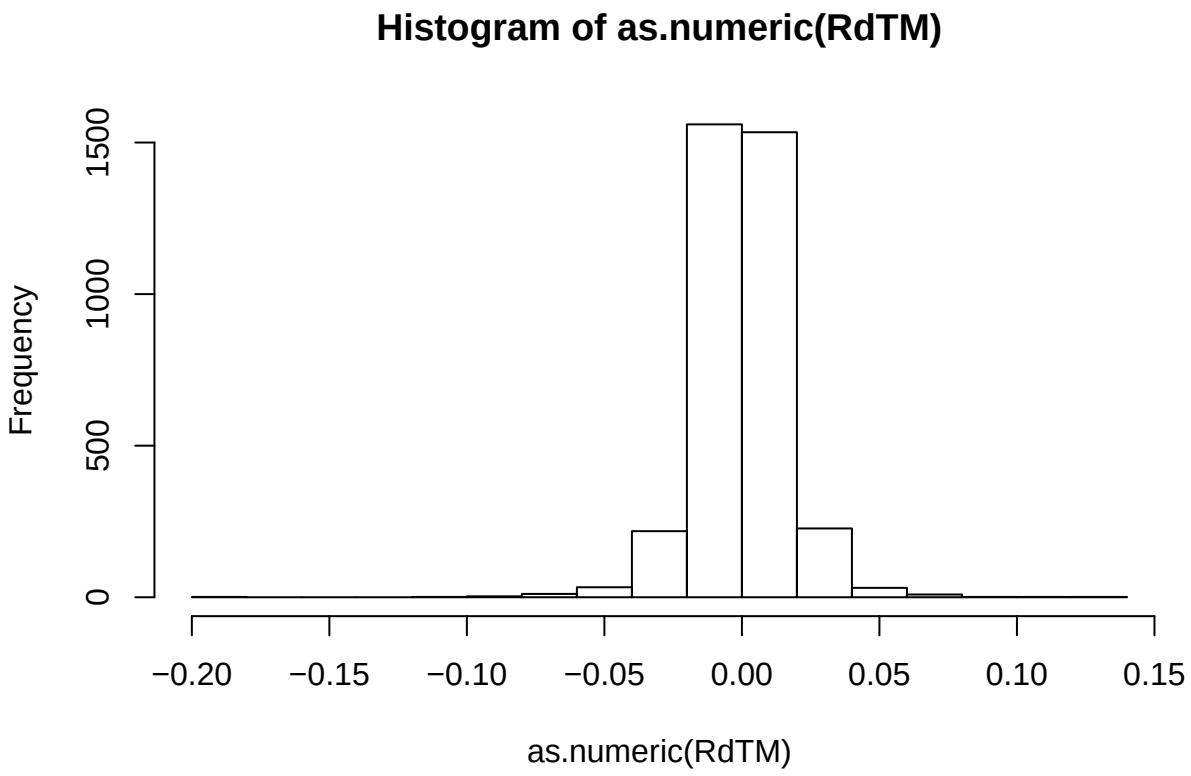
```
## [1] "TM"
```

```r
barChart(TM$TM.Close)
```


```r
# Rendimientos al cierre

RdTM <- diff(TM$TM.Close)/TM$TM.Close["2007-01-03/2021-06-07"] #Aqui es igual la formula del rendimient
############################################################################ función diff()

barChart(RdTM)
```




```
hist(as.numeric(RdTM))
```




```
tmRd <- mean(RdTM, na.rm = TRUE )
tmVRd <- var(RdTM, na.rm = TRUE )
tmSDRd <- sd(RdTM, na.rm = TRUE )

tmRd
```

```
## [1] -4.905227e-05
```

```
tmVRd
```

```
##             TM.Close
## TM.Close 0.000258893
```

```
tmSDRd
```

```
## [1] 0.01609015
```

```
pnorm(0, tmRd, tmSDRd)
```

```
## [1] 0.5012162
```

```r
length(tmRd[tmRd <= 0])/length(tmRd)
```

```
## [1] 1
```

```r
tmRA <- round(((tmRd+1)^252-1)*100, 2)

tmVola <- round((tmSDRd*252^0.5)*100, 2)
```

Lunes 14-Junio-2021

Para calcular la probabilidad de una variable aleatoria discreta

Recordad que el valor esperado o esperanza matemática no es más que la media o μ

$$E(\bar{x}_i) = \sum \bar{x}_i P(x_i)$$

$$R_i = \frac{Precio_f - Precio_i}{Precio_i}$$

Recuerda que con las acciones trabajamos con su rendimiento.

$$R_i \ = N(\mu, \sigma^2)$$

$$E(R_i) = \sum R_i \quad P(R_i) = \frac{\sum R_i}{n}$$

$$\sigma^2 = Var(R_i) = E(R_i - E(R_i))^2 = \frac{\sum_{i=1}^{N} \ (R_i - \mu)^2}{N}$$

$$VOLATILIDAD = \sigma = \sqrt{Var(R_i)}$$

W está definido como el capital inicial de mi portafolio.

Suponiendo que mi portafolio esta consitituido por la acción A y B. El valor esperado del rendimiento de mi portafolio queda definido como : R_p

$$E(R_p) = E[w * E(R_B) + (1 - w)E(R_B)]$$

La volatilidad del portafolio es tambíen conocido como el riesgo del portafolio

$$COV(x, y) = \sum X_i Y_i P()$$

Factor de correlación [-1,1]

$$\gamma_{x,y} = \frac{COV(x_i, y_i)}{\sigma_{xi}\sigma_{yi}}$$

PIDE QUE TE EXPLIQUE ESTO RODOLFO

Analizando dos activos, CEMEX y BIMBO

```
tickers <- c("CEMEXCPO.MX", "BIMBOA.MX")

getSymbols(tickers)
```

```
## Warning: CEMEXCPO.MX contains missing values. Some functions will not work
## if objects contain missing values in the middle of the series. Consider using
## na.omit(), na.approx(), na.fill(), etc to remove or replace them.

## Warning: BIMBOA.MX contains missing values. Some functions will not work if
## objects contain missing values in the middle of the series. Consider using
## na.omit(), na.approx(), na.fill(), etc to remove or replace them.

## [1] "CEMEXCPO.MX" "BIMBOA.MX"
```

```
names(BIMBOA.MX)
```

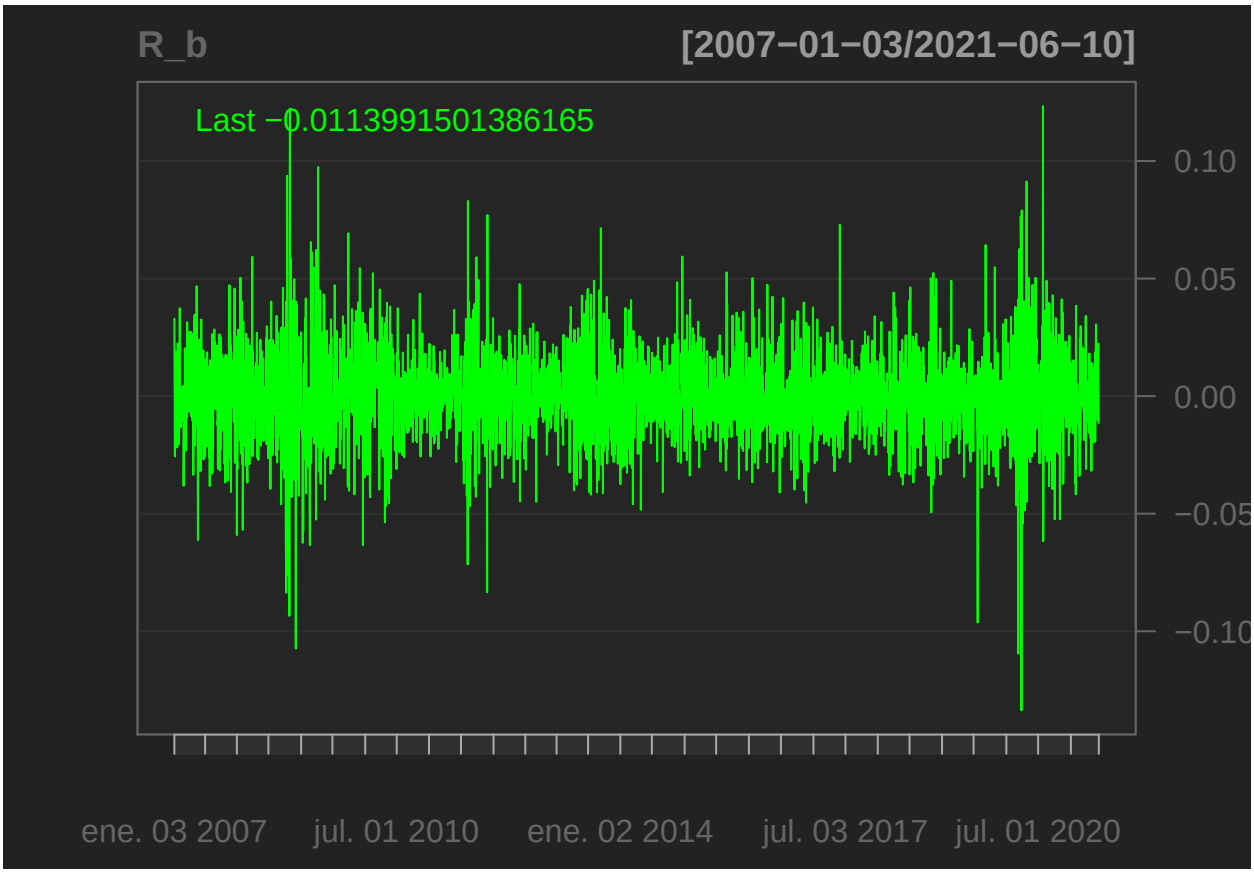
```
## [1] "BIMBOA.MX.Open"     "BIMBOA.MX.High"     "BIMBOA.MX.Low"
## [4] "BIMBOA.MX.Close"    "BIMBOA.MX.Volume"   "BIMBOA.MX.Adjusted"
```

```
barChart(BIMBOA.MX$BIMBOA.MX.Close)
```

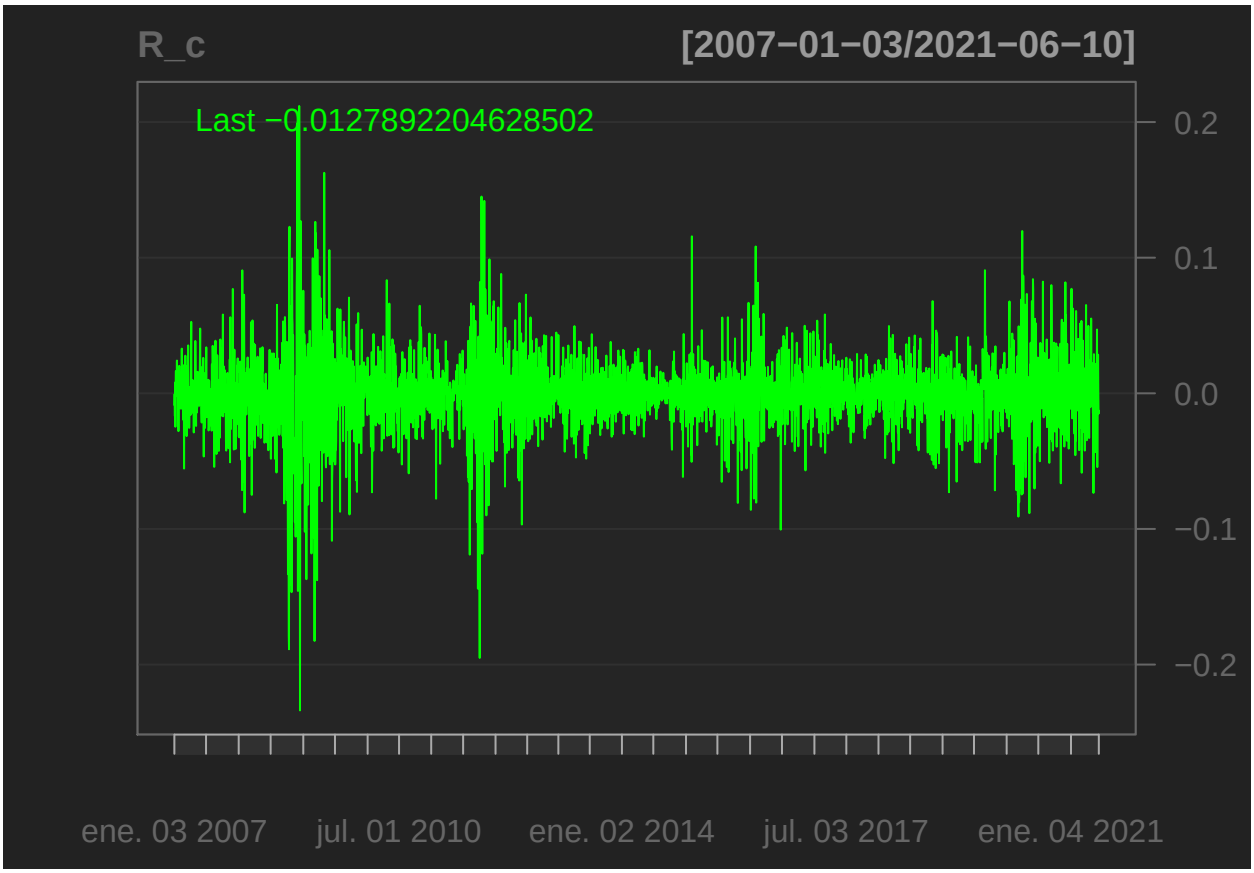
```
barChart(CEMEXCPO.MX$CEMEXCPO.MX.Close)
```

Cálculo de rendimientos

```
R_b <- diff(BIMBOA.MX$BIMBOA.MX.Close)/BIMBOA.MX$BIMBOA.MX.Close["2007-01-02/2021-06-10"]
barChart(R_b)
```




```
R_c <- diff(CEMEXCPO.MX$CEMEXCPO.MX.Close)/CEMEXCPO.MX$CEMEXCPO.MX.Close["2007-01-02/2021-06-10"]
barChart(R_c)
```



Considerar una ventana de tresa años

```
R_b3 <- R_b["2018-06-10/2021_06-10"]
```

```
## Warning in as_numeric(MM): NAs introducidos por coerción

## Warning in as_numeric(MM): NAs introducidos por coerción
```

```
R_c3 <- R_c["2018-06-10/2021_06-10"]
```

```
## Warning in as_numeric(MM): NAs introducidos por coerción

## Warning in as_numeric(MM): NAs introducidos por coerción
```

Valor esperado

```
ERB <- mean(R_b3)
ERC <- mean(R_c3)

ERB
```

```
## [1] 8.085803e-05
```

```
ERC
```

```
## [1] 2.514264e-05
```

```
#¿porque los promedios son tan pequeños?
```

Varianzas y covarianzas

```
VRB <- var(R_b3) #vairanza de Bimbo
VRC <- var(R_c3) #varianza de Cemex
cov_BC <- cov(R_b3, R_c3) #covarianza de bimbo y cemex
```

Valor esperado del portafolio con w=0.5

```
w <- seq(0,1, by=0.01)

ER_p <-  w*ERB+(1-w)*ERC
```

Cálculo de la varianza del portafolio y de su riesgo (Volatilidad = desviación estándar)

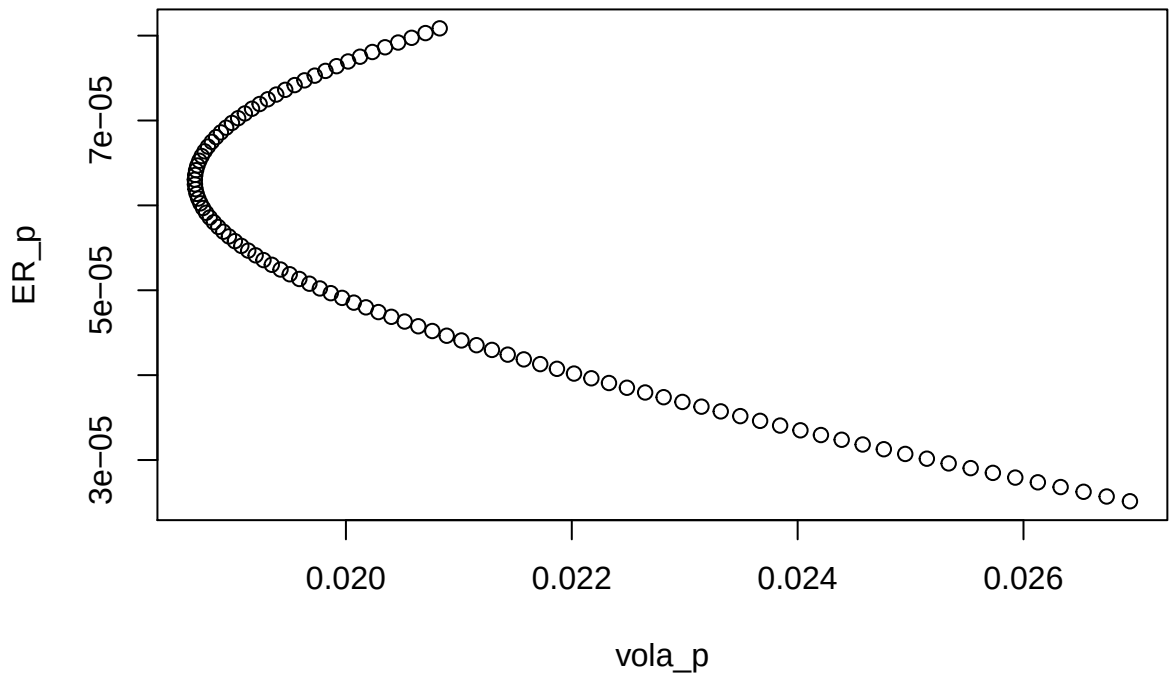
```
VRp <- w^2*VRB+(1-w)^2*VRC+2*w*(1-w)*cov_BC #pedirle a Rudy bien esta formula
```

```
## Warning in w^2 * VRB: Recycling array of length 1 in vector-array arithmetic is deprecated.
##   Use c() or as.vector() instead.
```

```
## Warning in (1 - w)^2 * VRC: Recycling array of length 1 in vector-array arithmetic is deprecated.
##   Use c() or as.vector() instead.
```

```
## Warning in 2 * w * (1 - w) * cov_BC: Recycling array of length 1 in vector-array arithmetic is depre
##   Use c() or as.vector() instead.
```

```
vola_p <- VRp^0.5

plot(vola_p, ER_p) #que te explique bien la gráfica
```



Valor esperado del portafolio

$$E(R_P) = WE(R_A) + (1 - W)E(R_B)$$

Varianza del portafolio

$$\sigma_P^2 = W^2\sigma_A^2 + (1 - W)^2\sigma_B^2 + 2W(1 - W)\gamma_{A,B}$$

¿Esta formula esta bien?