Examen_Miranda_Belmonte_Hairo

Miranda Belmonte Hairo

8 de octubre de 2016

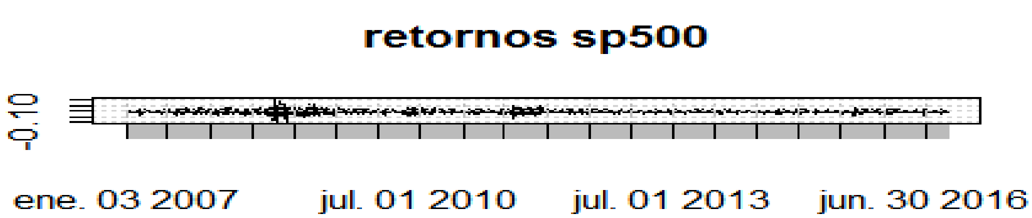
EJERCICIO 1

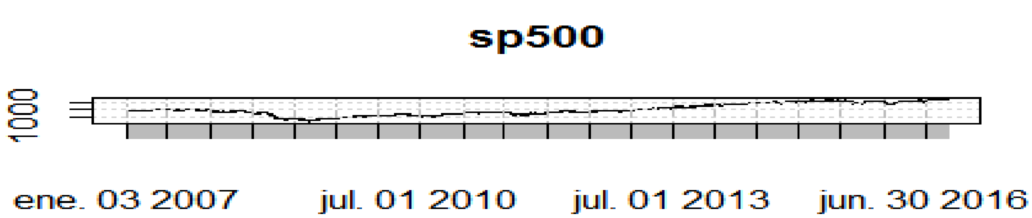
simbolos seleccionados: #Dow Jones Industrial Average--^DJI #Nikkei 225 --^N225 (tokmo japsn) #AEX-INDEX --^AEX (pamses bajos) #IPC---^MXX #CAC 40 (^FCHI) paris

EVALUANDO HECHOS ESTILIZADOS PARA GSPC #generando variable y seleccionando precios ajustados

h:1 precios de las acciones impredecibles

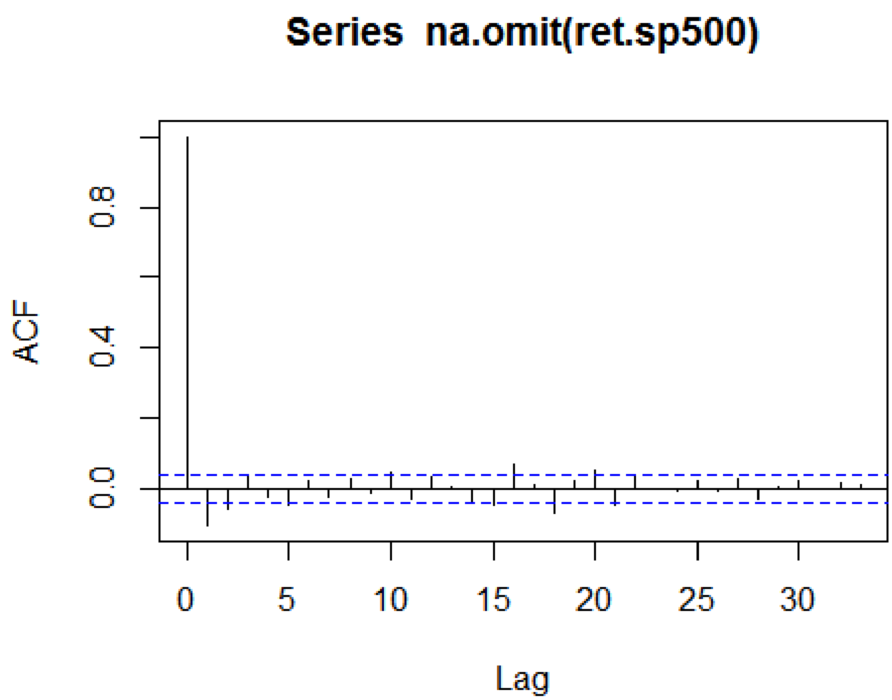
```
library(quantmod)

getSymbols("^GSPC")

## [1] "GSPC"

sp500<-get("GSPC")
sp500 <- Ad(sp500)
par(mfrow=c(2,1))
ret.sp500<-diff(log(sp500))
plot(ret.sp500, main="retornos sp500")
plot(sp500, main="sp500")
```



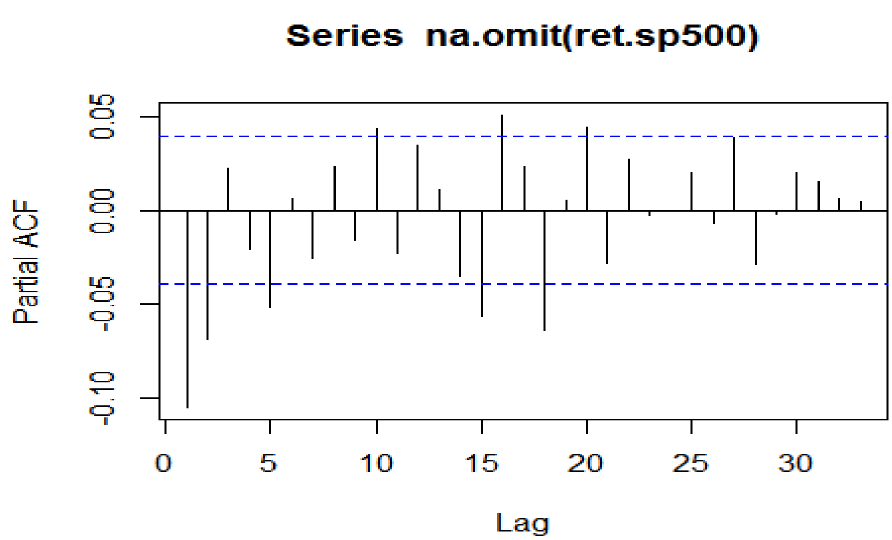


h:2 retornos no correlacionado

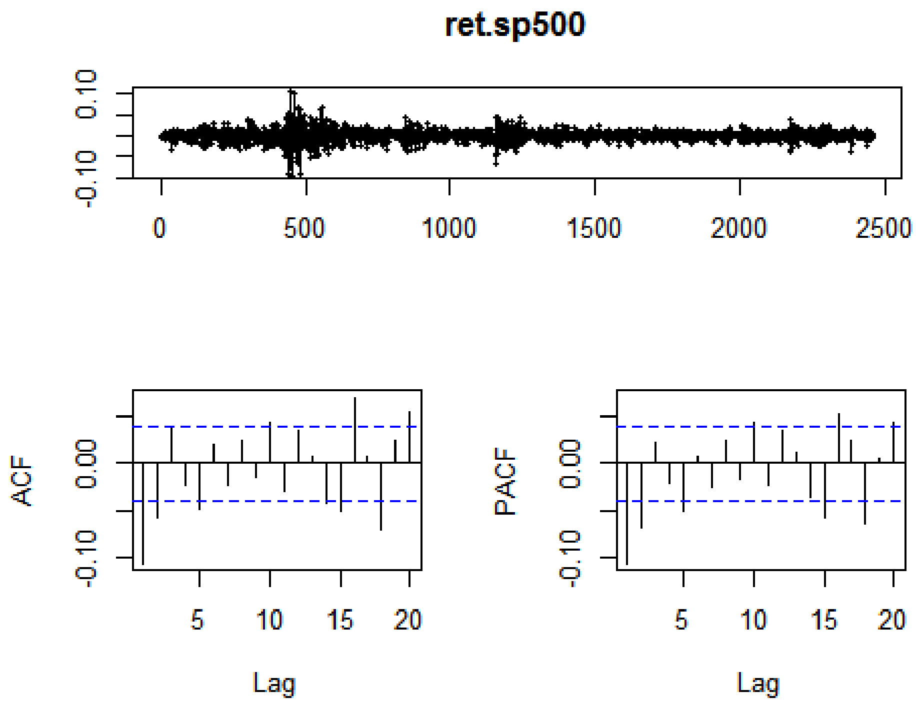
```
library(forecast)

ret.sp500<-diff(log(sp500))
par(mfrow=c(1,1))
acf(na.omit(ret.sp500))
```




```
pacf(na.omit(ret.sp500))
```

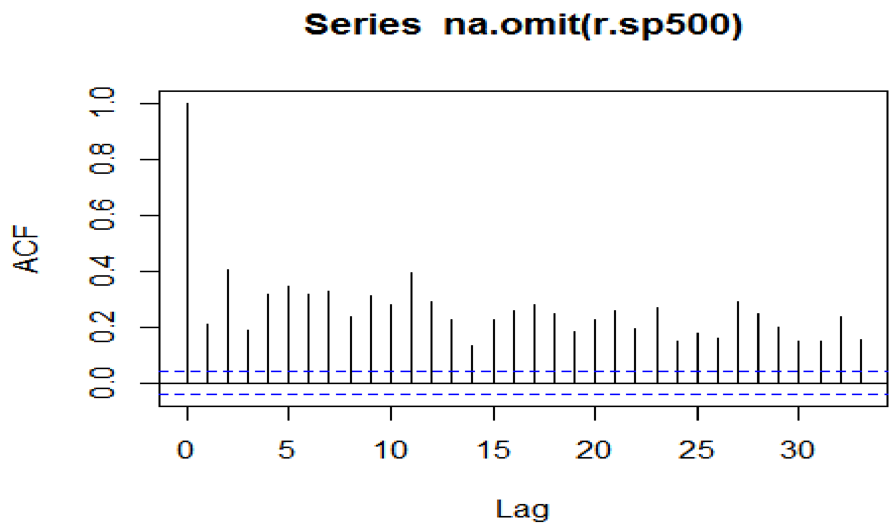


```r
tsdisplay(ret.sp500, lag.max = 20)
```

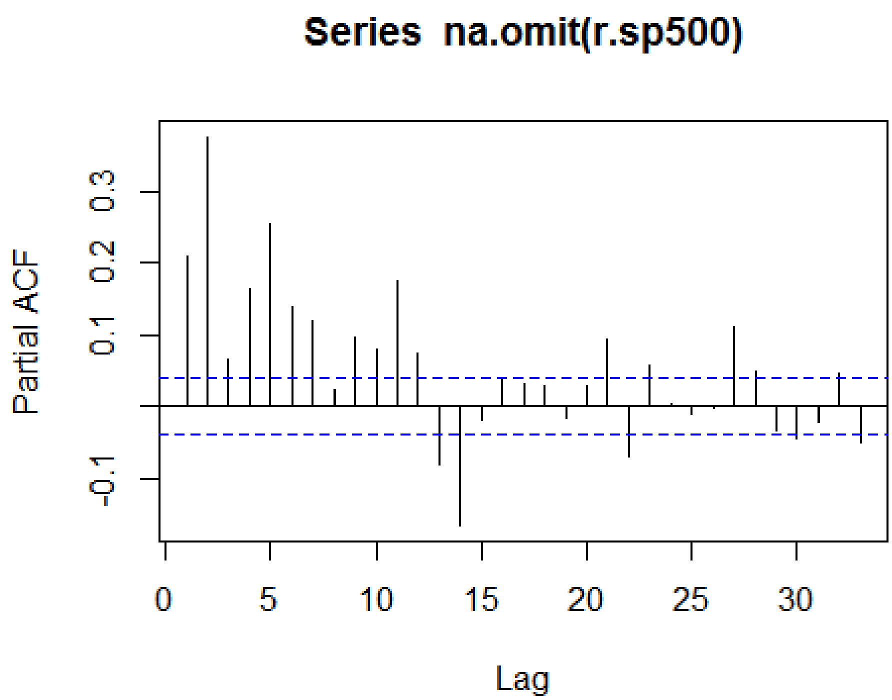


h:3 retornos al cuadrado correlacionados

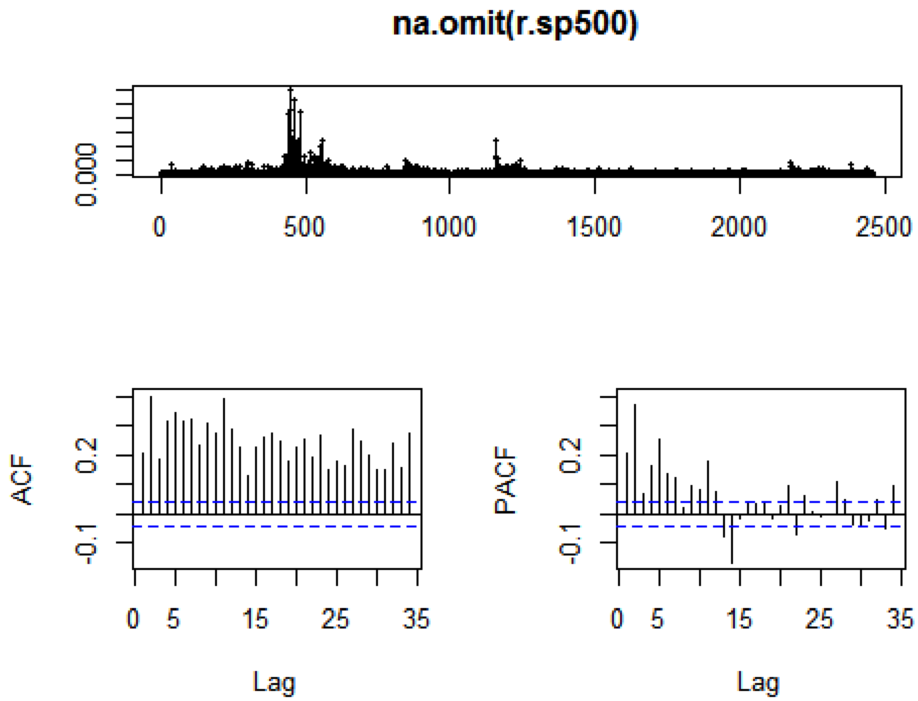
```r
r.sp500<-ret.sp500^2
acf(na.omit(r.sp500))
```




```r
pacf(na.omit(r.sp500))
```

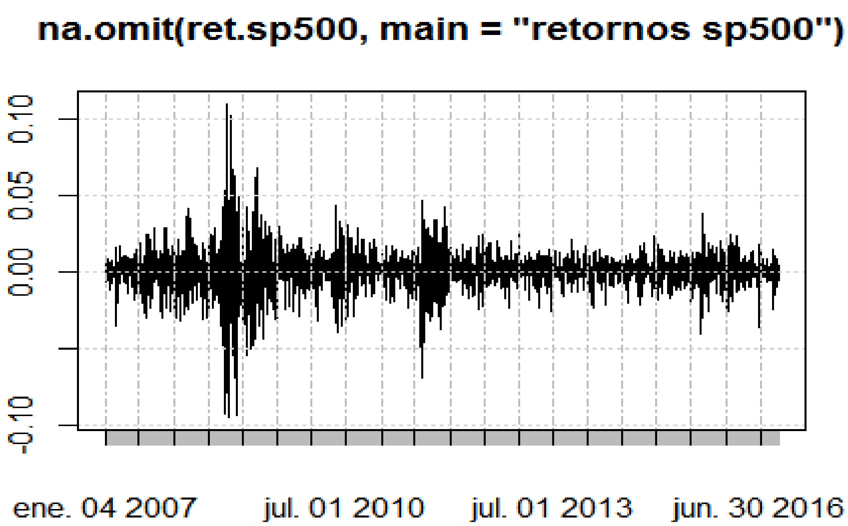



```r
tsdisplay(na.omit(r.sp500))
```

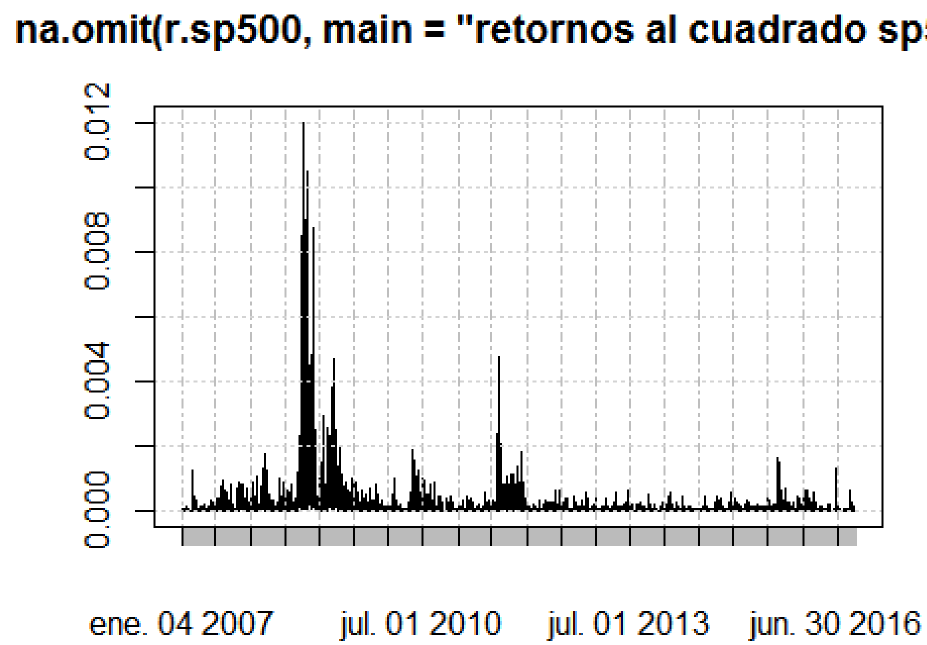


h:4 closters de volatilidad

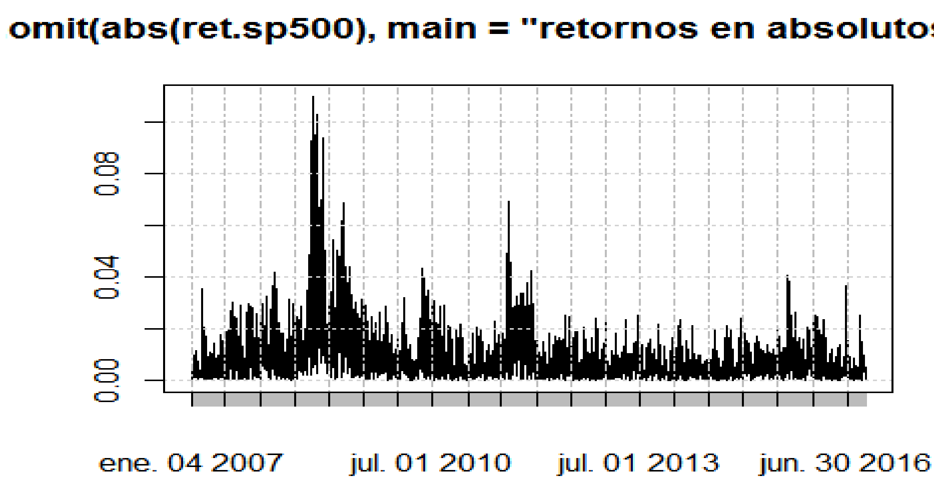
```
par(mfrow=c(1,1))
plot(na.omit(ret.sp500,main="retornos sp500"))
```



```r
plot(na.omit(r.sp500,main="retornos al cuadrado sp500"))
```

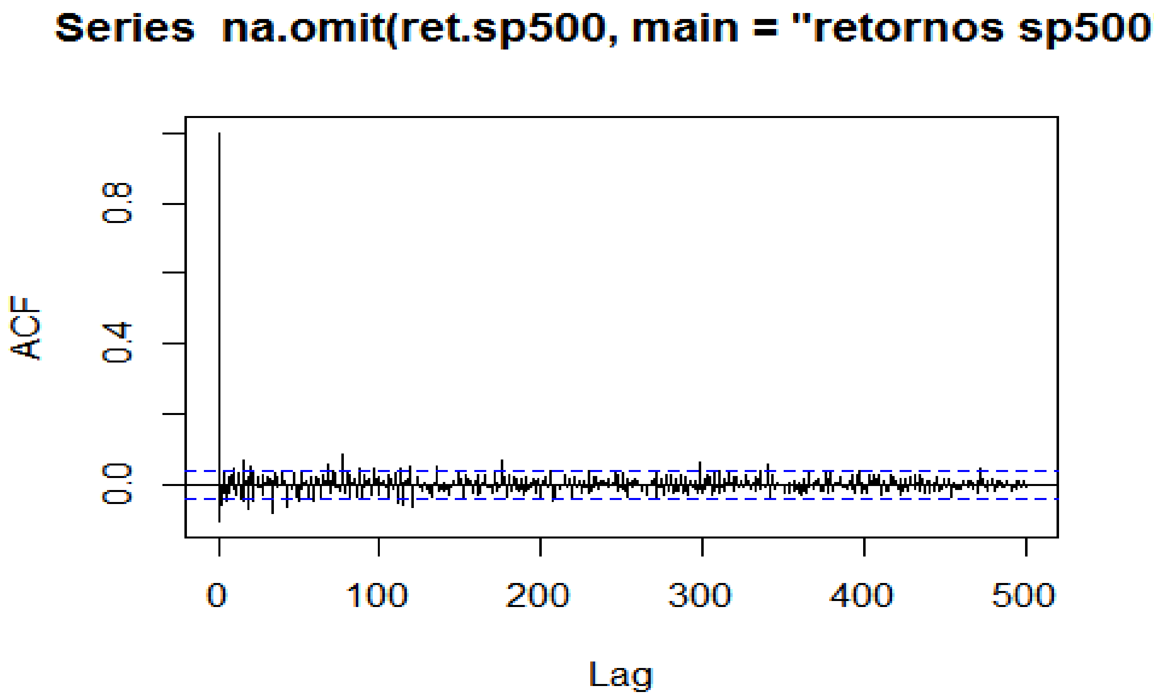



```r
plot(na.omit(abs(ret.sp500),main="retornos en absolutos sp500"))
```

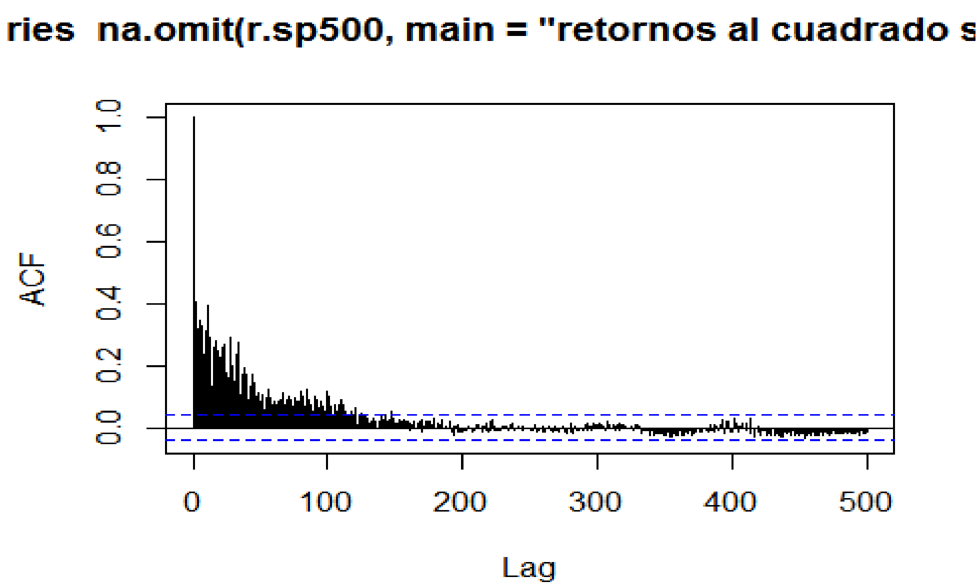


podemos observar que tanto en los retornos, sus cuadrados y en valores absolutos es notable los closters

```
par(mfrow=c(1,1))
acf(na.omit(ret.sp500,main="retornos  sp500"),lag.max = 500)
```

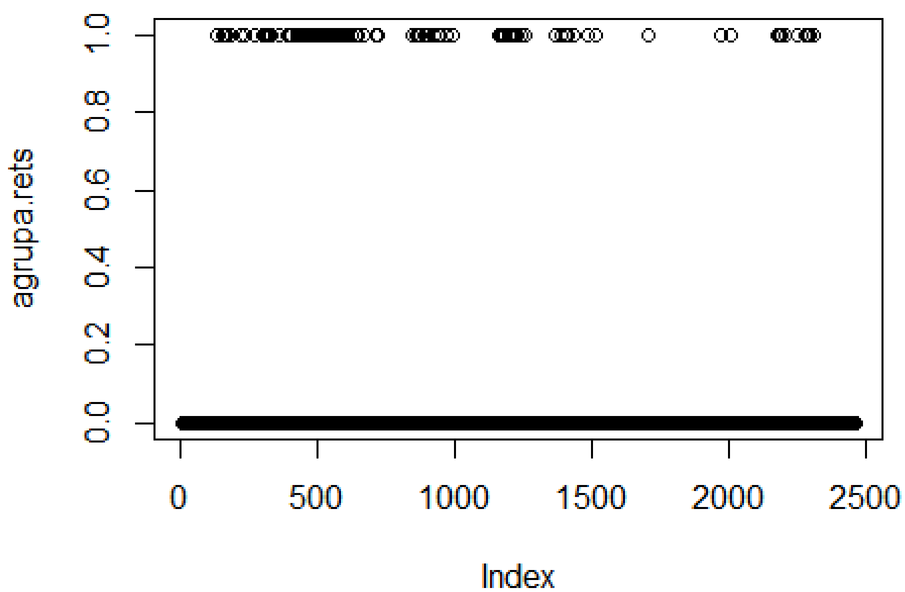



```
acf(na.omit(r.sp500,main="retornos al cuadrado sp500"),lag.max = 500)
```



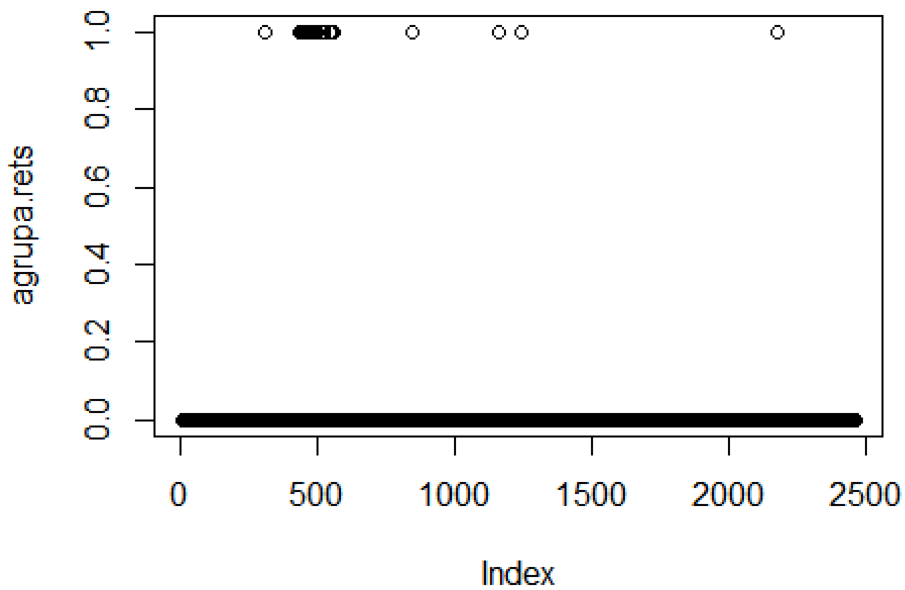
podemos observar significancia en lags alejados, se nota volatilidad por per cistencia de autocorrelacisn la varianza puede estar condicionada a sus valores pasados lo que determina closters

```
umbral <- quantile(na.omit(ret.sp500),0.95)
menor.umbr<-as.numeric(ret.sp500>umbral)
agrupa.rets<-menor.umbr
as.ts(agrupa.rets)

par(mfrow=c(1,1))
plot(agrupa.rets)
```



LOS VALORES SE AGLOMERAN

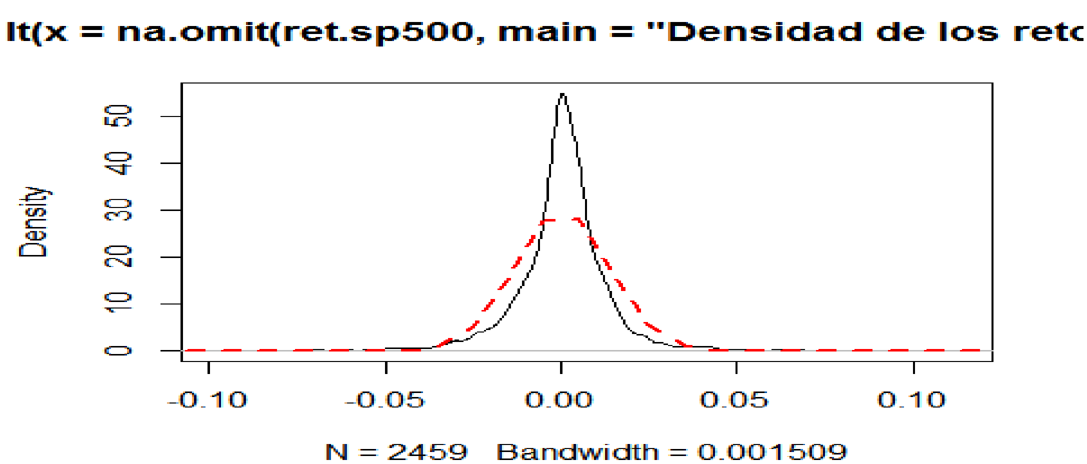
```
umb<-function(IC){
  umbral <- quantile(na.omit(ret.sp500),IC)
  menor.umbr<-as.numeric(ret.sp500>umbral)
  agrupa.rets<-menor.umbr
  as.ts(agrupa.rets)
  par(mfrow=c(1,1))
  plot(agrupa.rets)
}

umb(.99)
```



LOS VALORES SE AGLOMERAN

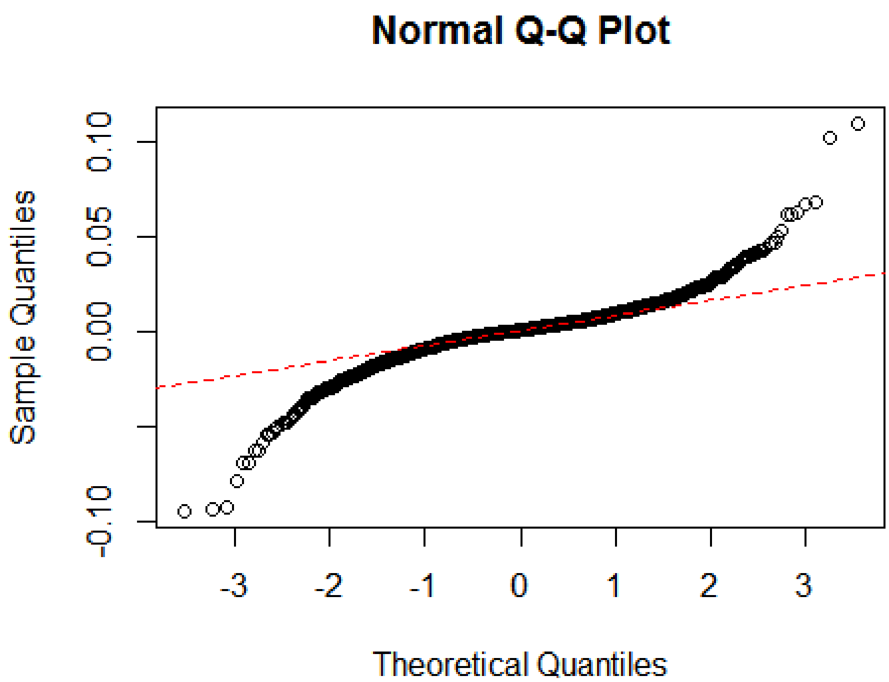
h:5 leptocurtosis

```
par(mfrow=c(1,1))
plot(density(na.omit(ret.sp500, main="Densidad de los retornos del 
sp500")))
z<-seq(-5,5,len=1000)
x<-dnorm(z,mean=mean(ret.sp500,na.rm=T),sd=sd(ret.sp500,na.rm=T))
lines(z,x,col='red',lty=2,lwd=2)
```



qq plot para determinar fat tails

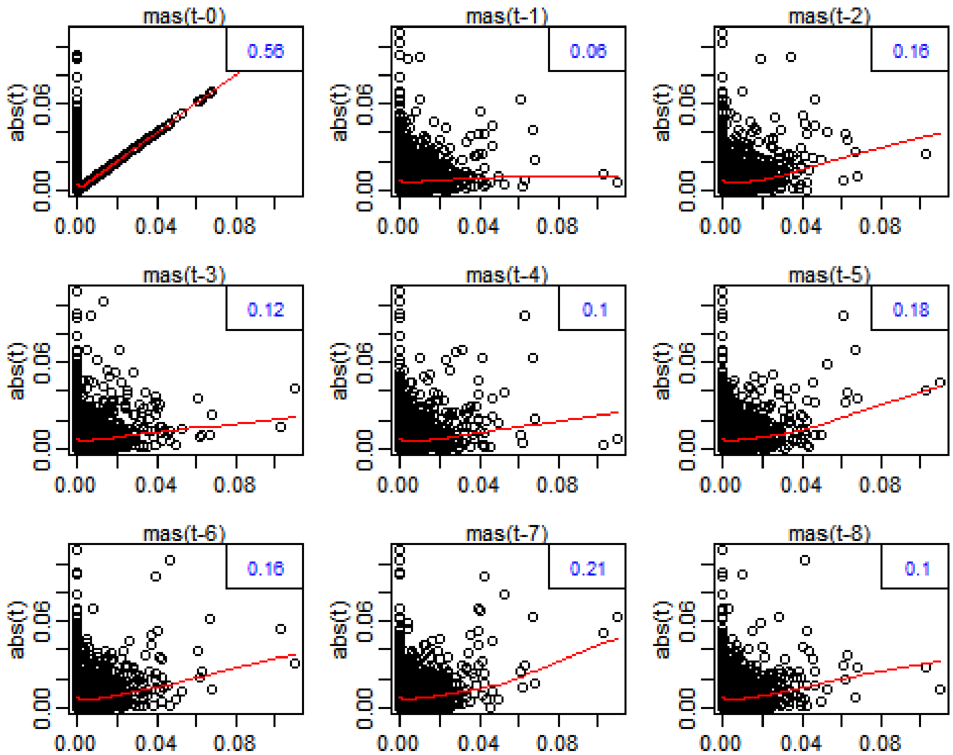
```
w<-na.omit(coredata(ret.sp500))
qqnorm(w)
qqline(w,col='red',lty=2)
```



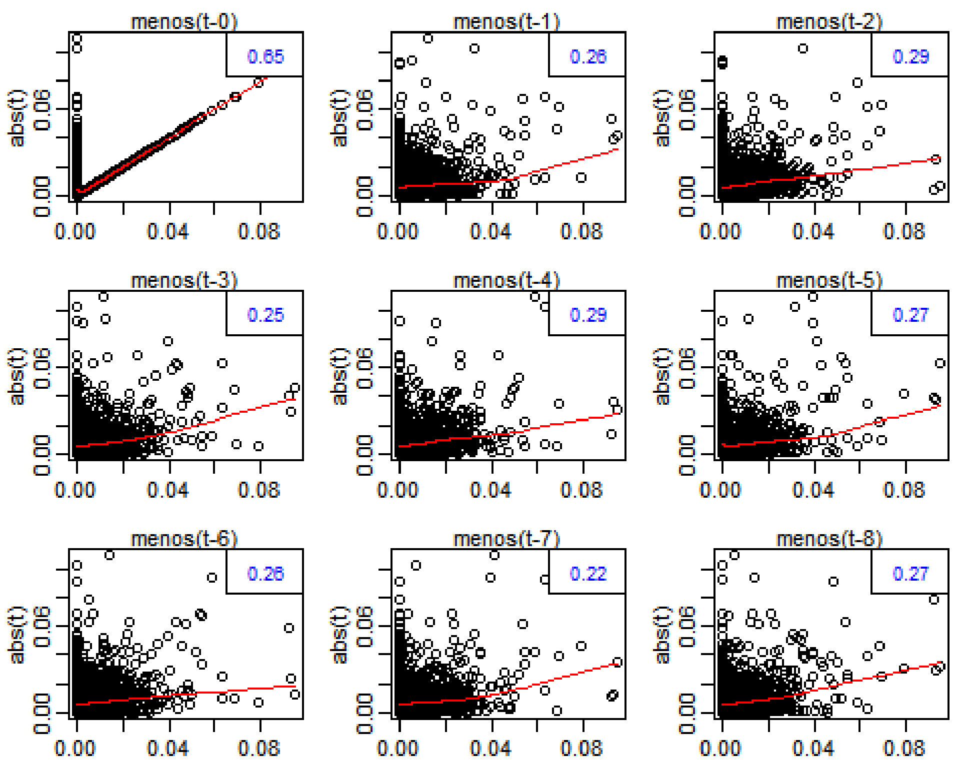
se observa informacisn a los extremos el cual es factor para tener colas anchas

h:6 leverage efect

```
library(astsa)

rets<-function(a){
  b<-diff(log(Ad(a)))
  return(b)
}
dato<-na.omit(ret.sp500)
mas<-apply.daily(dato,function(a) max(a,0))
menos<-apply.daily(dato,function(a) -min(a,0))
abs<-apply.daily(dato,function(a) abs(a))
lag2.plot(mas,abs,8)
```




```
lag2.plot(menos,abs,8)
```



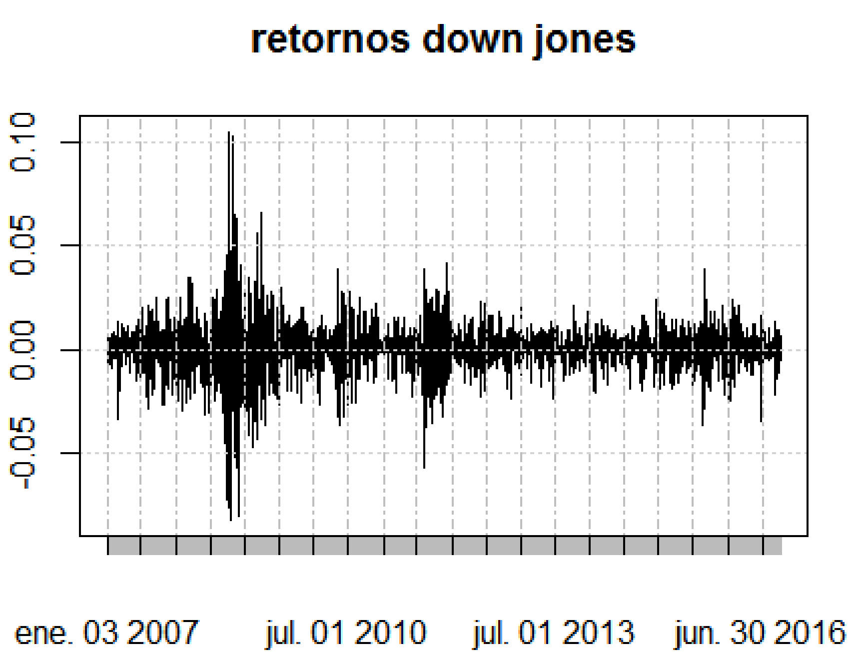
choques negativos y psitivos son asimetricos, los positivos hacen que los retornos varien menos que los negativos

justificaci??n:??Retornos se modelan mejor con ruido blanco debnil o fuerte? Ruido blanco debil #Ya que su funci??n de autocorrelaci?? de los retornos logaritmicos, # nos muestra valores significativos en sus lags. recoredemos que independencia nos indica no correlaci??, en el cual est?? no es el caso. #Con el Plot de la serie podemos ver como un valor elevado le precede otro elevado, imdicandonos #un proceso con memoria a lo inmediato, posiblemente por la correlaci??n.

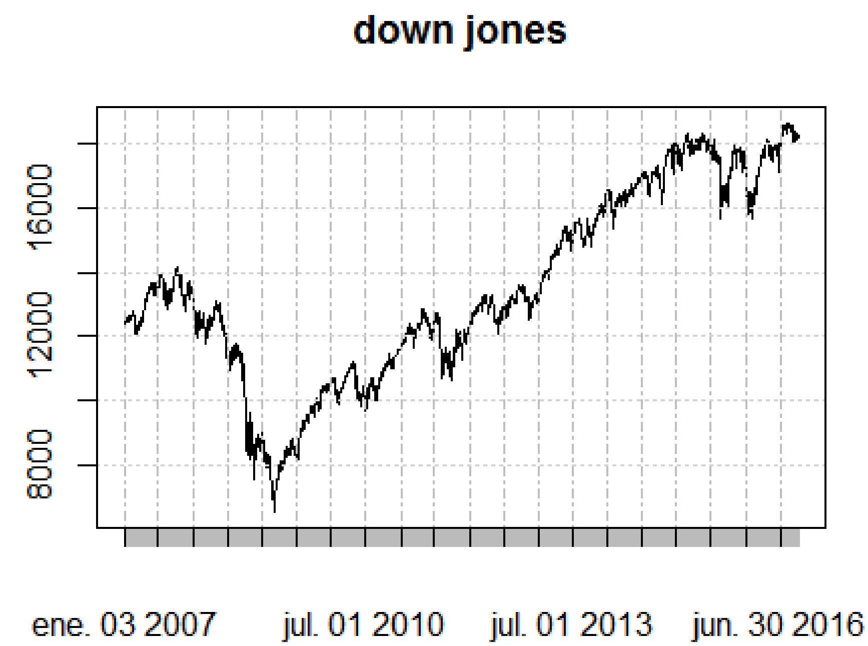
EVALUANDO HECHOS ESTILIZADOS PARA DJI

h:1 precios de las acciones impredecibles

```
getSymbols("^DJI")

## [1] "DJI"

djon<-get("DJI")
djon<- Ad(djon)
par(mfrow=c(1,1))
ret.djon<-diff(log(djon))
plot(ret.djon, main="retornos down jones")
```

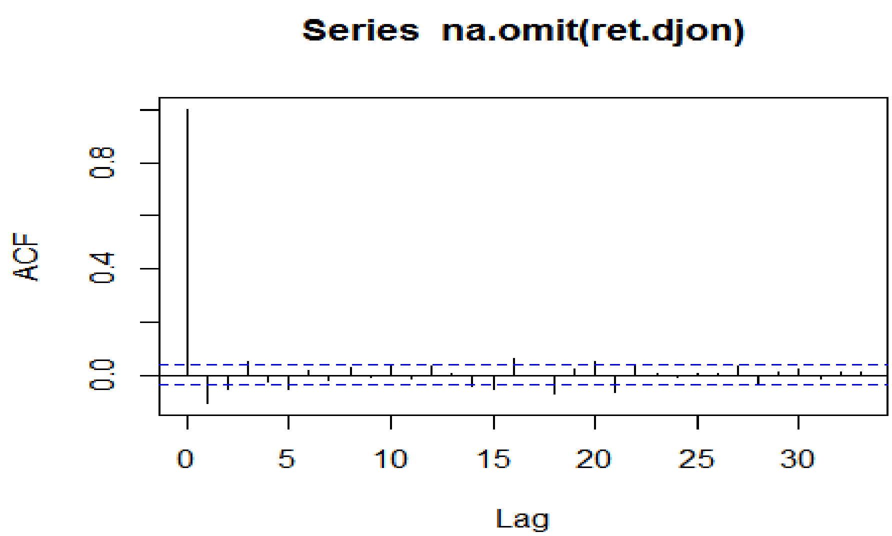



```
plot(djon, main="down jones")
```

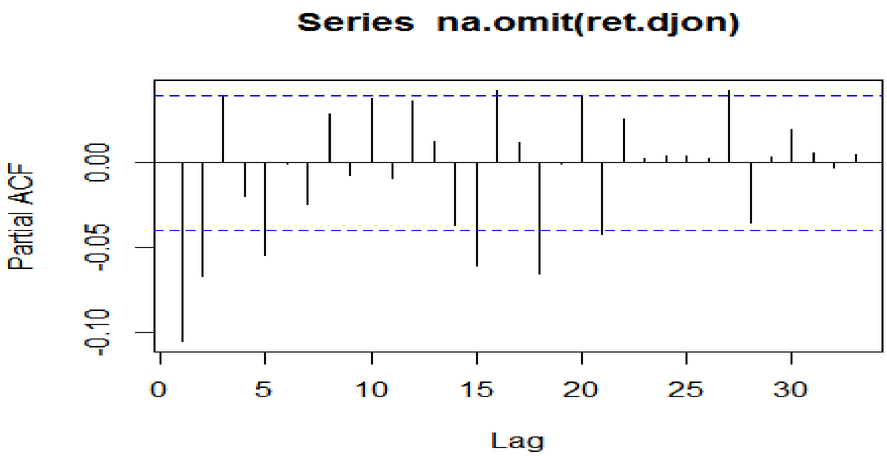


h:2 retornos no correlacionado

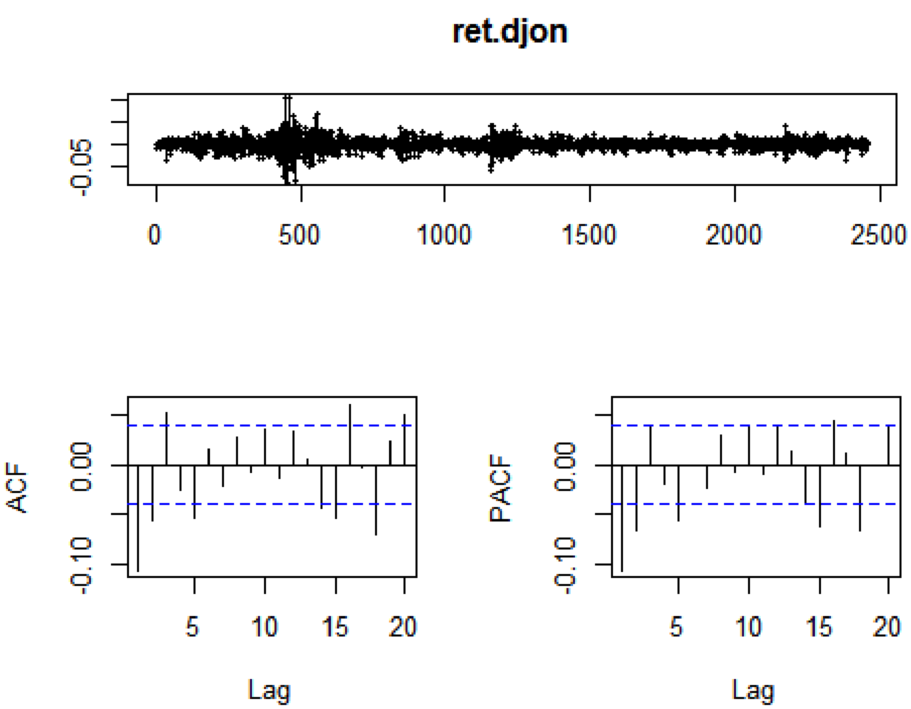
```
par(mfrow=c(1,1))
acf(na.omit(ret.djon))
```




```
pacf(na.omit(ret.djon))
```

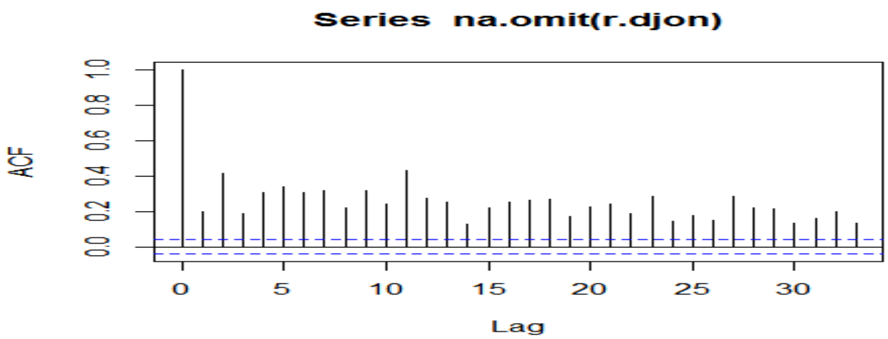



```r
tsdisplay(ret.djon, lag.max = 20)
```

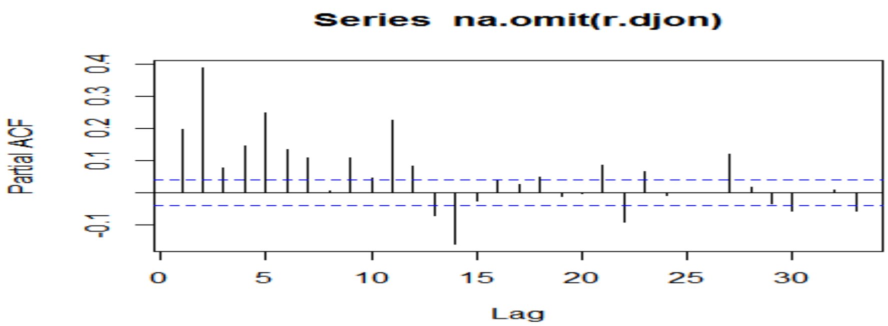


h:3 retornos al cuadrado correlacionados

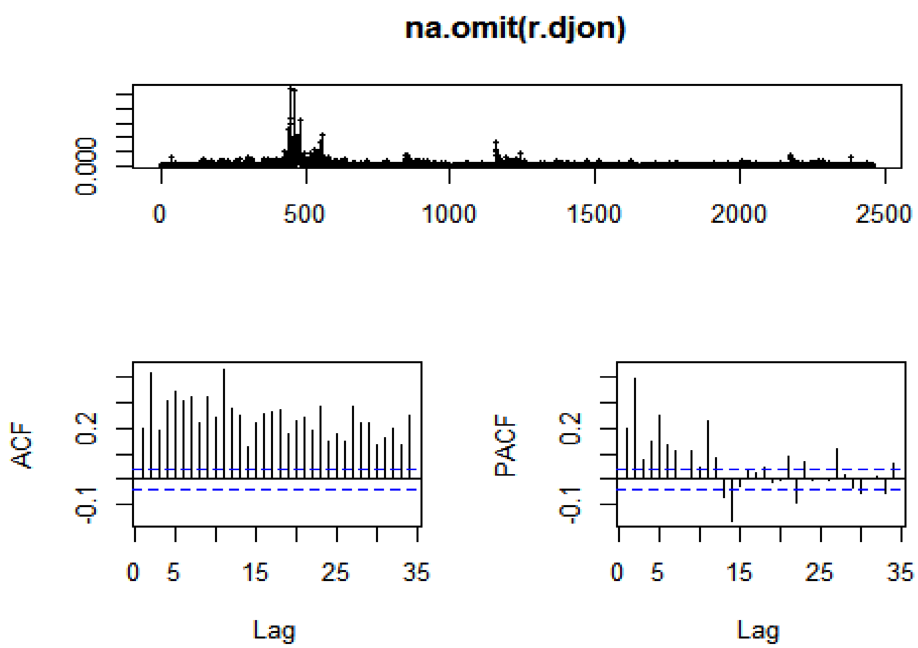
```r
r.djon<-ret.djon^2
par(mfrow=c(1,1))
acf(na.omit(r.djon))
```




```r
pacf(na.omit(r.djon))
```

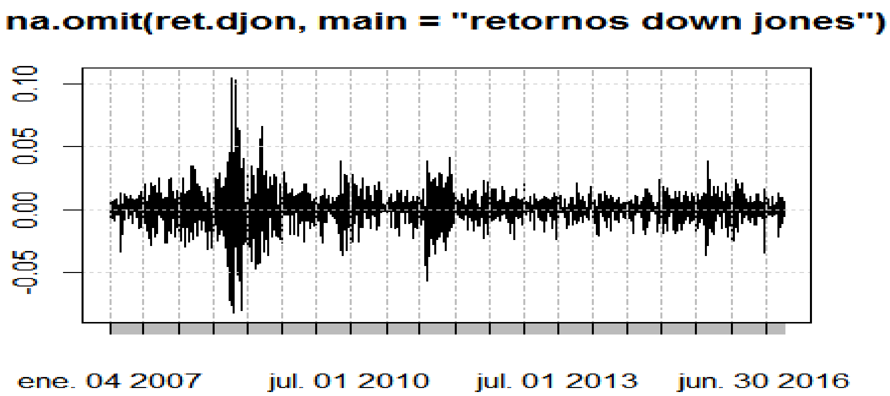



```r
tsdisplay(na.omit(r.djon))
```

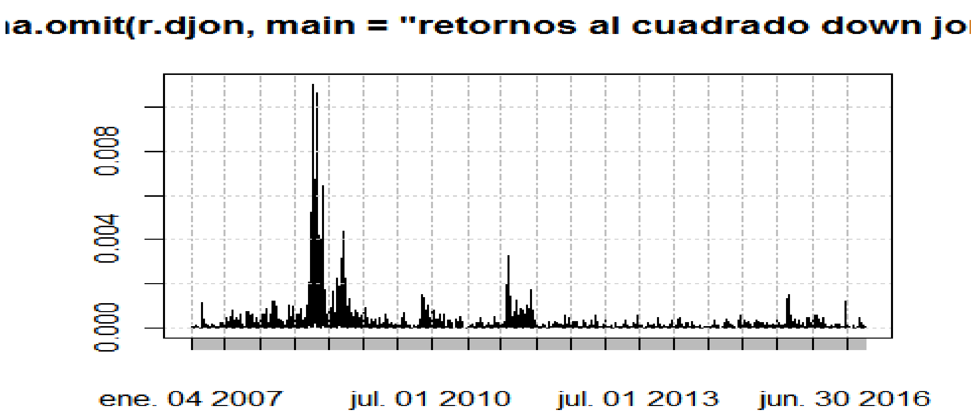


h:4 closters de volatilidad

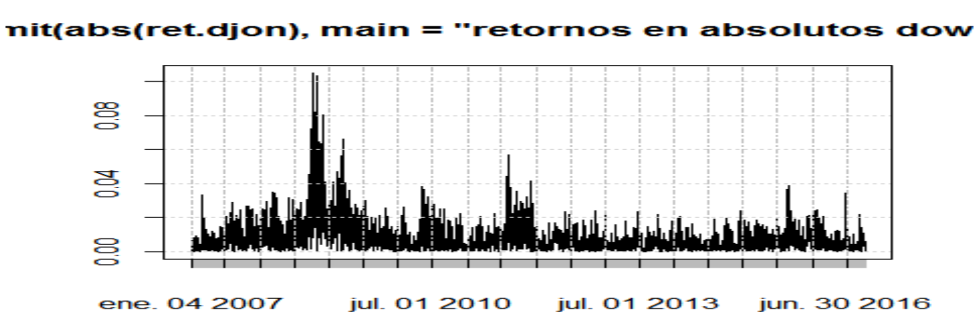
```r
par(mfrow=c(1,1))
plot(na.omit(ret.djon,main="retornos down jones"))
```




```r
plot(na.omit(r.djon,main="retornos al cuadrado down jones"))
```

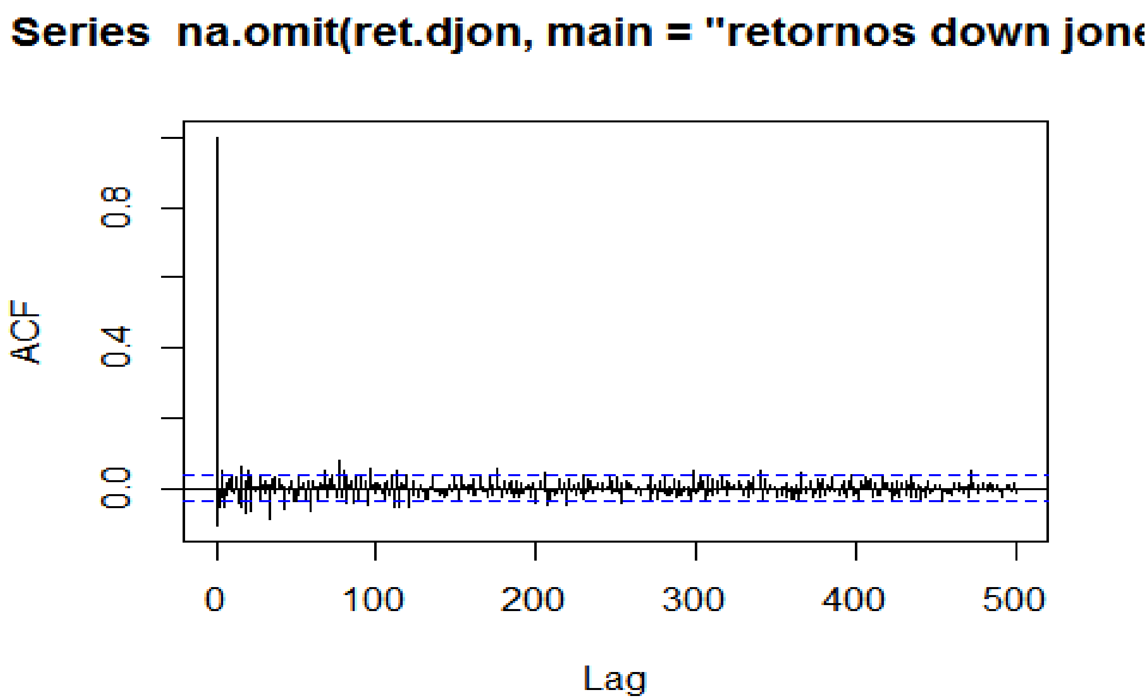



```r
plot(na.omit(abs(ret.djon),main="retornos en absolutos down jones"))
```

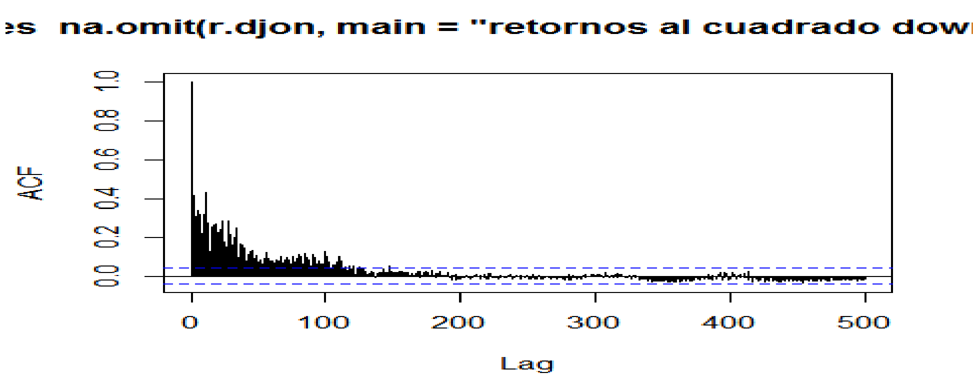


podemos observar que tanto en los retornos, sus cuadrados y en valores absolutos es notable los closters

```
par(mfrow=c(1,1))
acf(na.omit(ret.djon,main="retornos down jones"),lag.max = 500)
```



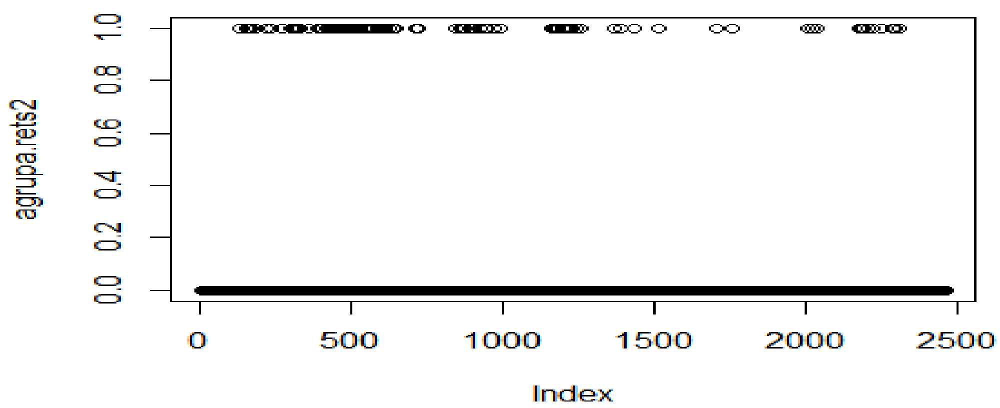

```
acf(na.omit(r.djon,main="retornos al cuadrado down jones"),lag.max = 500)
```



podemos observar significancia en lags alejados, se nota volatilidad por percistencia de autocorrelacisn la varianza puede estar condicionada a sus valores pasados lo que determina closters

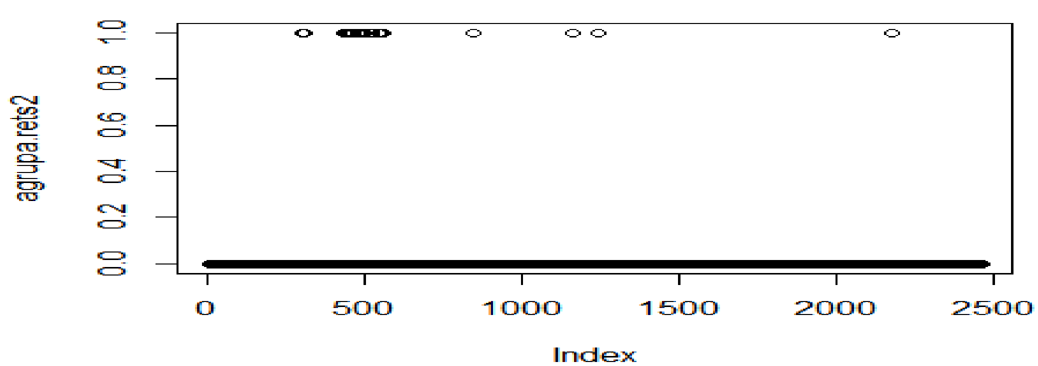
```
umbral2 <- quantile(na.omit(ret.djon),0.95)
menor.umbr2<-as.numeric(ret.djon>umbral2)
agrupa.rets2<-menor.umbr2
as.ts(agrupa.rets2)
```

```
par(mfrow=c(1,1))
plot(agrupa.rets2)
```



LOS VALORES SE AGLOMERAN

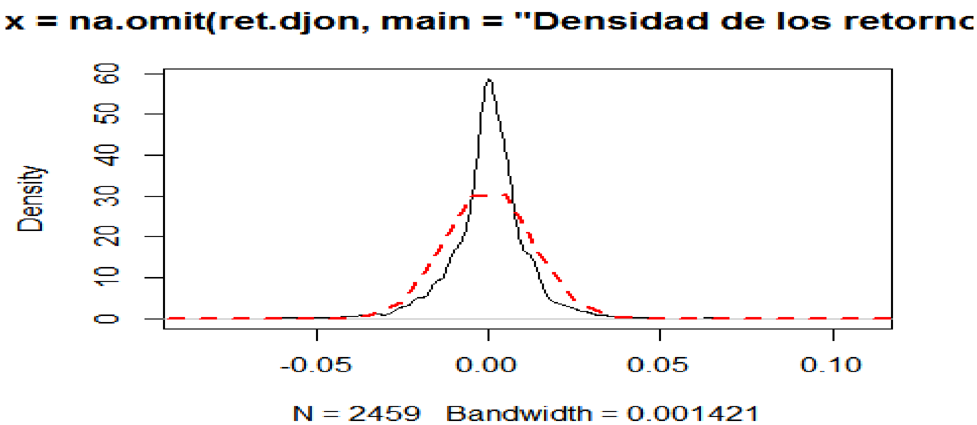
```
umb2<-function(IC){
  umbral2 <- quantile(na.omit(ret.djon),IC)
  menor.umbr2<-as.numeric(ret.djon>umbral2)
  agrupa.rets2<-menor.umbr2
  as.ts(agrupa.rets2)
  par(mfrow=c(1,1))
  plot(agrupa.rets2)
}

umb2(.99)
```



LOS VALORES SE AGLOMERAN EN LAS PRIMERAS OBSERVACIONES QUE SALEN DEL INTERVALO

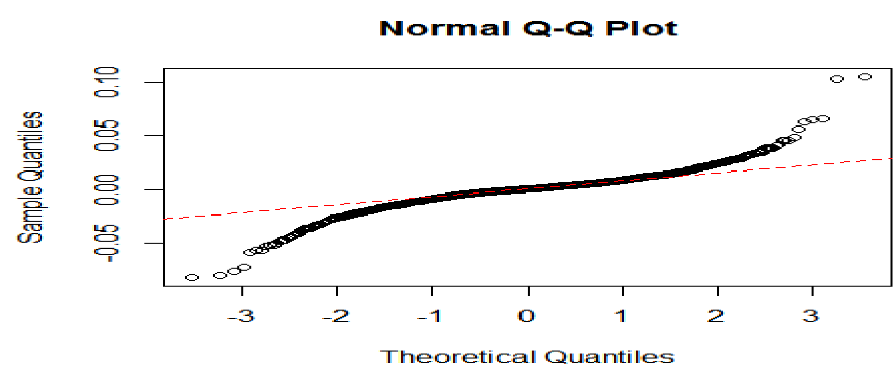
h:5 leptocurtosis

```
par(mfrow=c(1,1))
plot(density(na.omit(ret.djon, main="Densidad de los retornos del down
jones")))
z2<-seq(-5,5,len=1000)
x2<-dnorm(z2,mean=mean(ret.djon,na.rm=T),sd=sd(ret.djon,na.rm=T))
lines(z2,x2,col='red',lty=2,lwd=2)
```



qq plot para determinar fat tails

```
w2<-na.omit(coredata(ret.djon))
qqnorm(w2)
qqline(w2,col='red',lty=2)
```

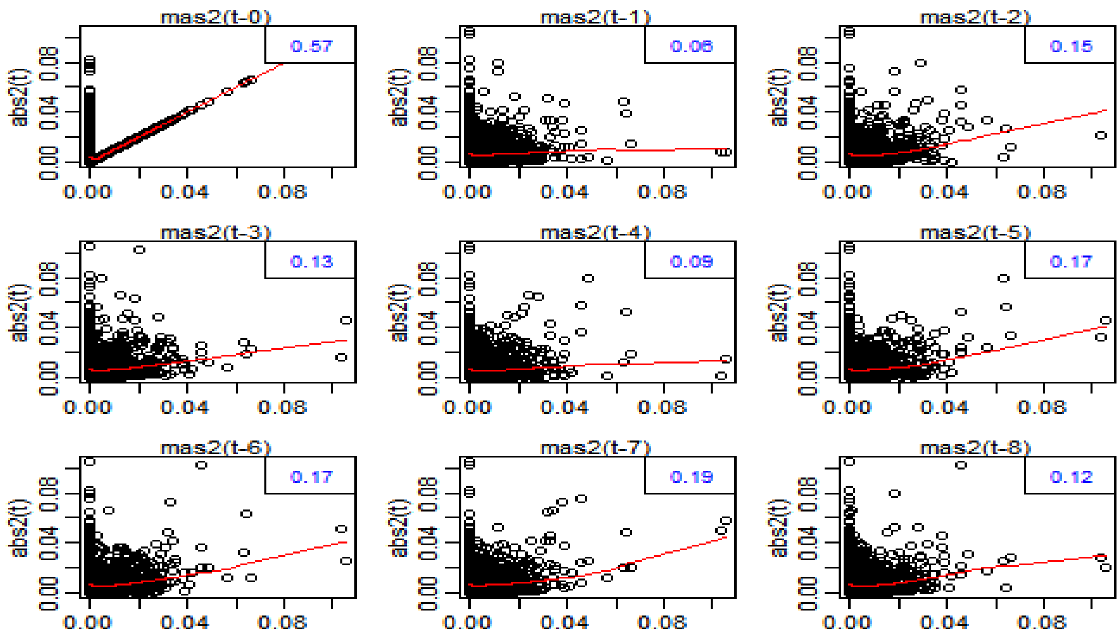


se observa informacisn a los extremos el cual es factor para tener colas anchas

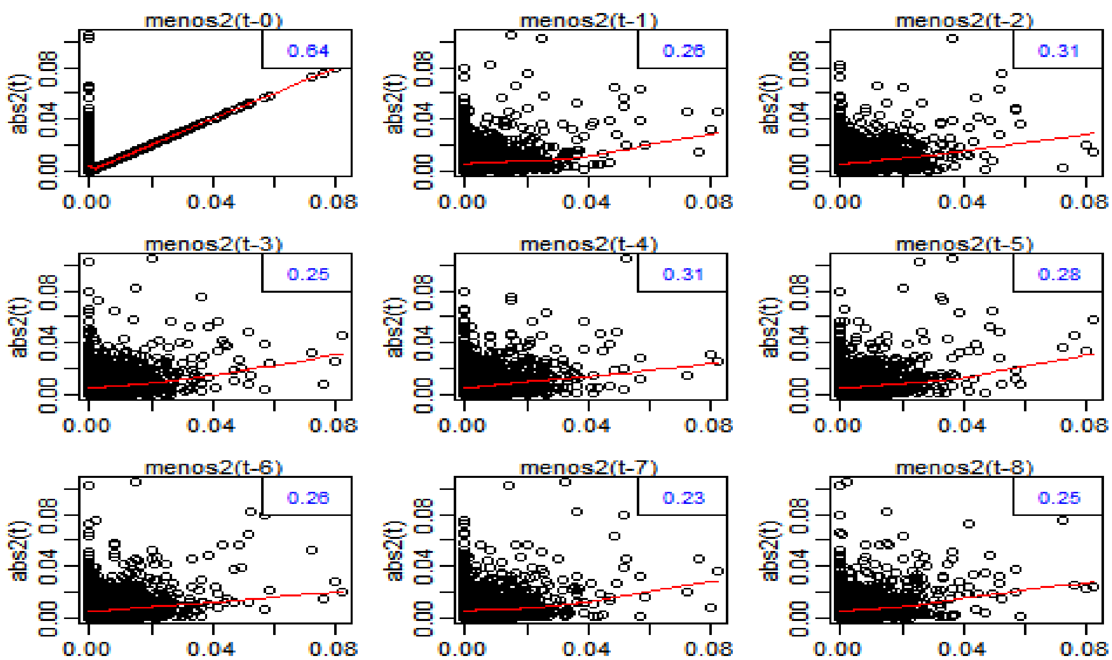
h:6 leverage efect

```
library(astsa)
rets<-function(a){
  b<-diff(log(Ad(a)))
  return(b)
}
```

```
dato2<-na.omit(ret.djon)
mas2<-apply.daily(dato2,function(a) max(a,0))
menos2<-apply.daily(dato2,function(a) -min(a,0))
abs2<-apply.daily(dato2,function(a) abs(a))
lag2.plot(mas2,abs2,8)
```




```
lag2.plot(menos2,abs2,8)
```



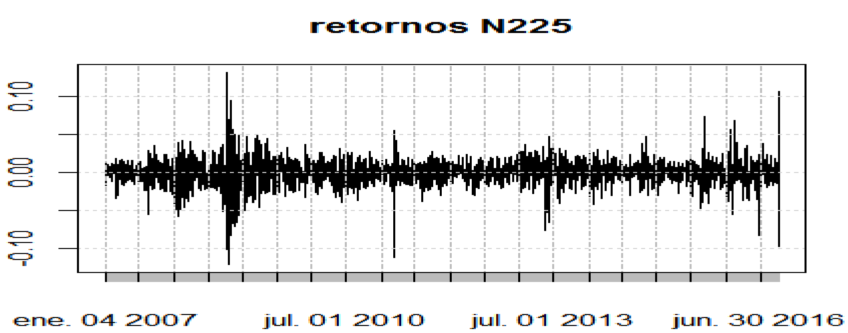
choques negativos y psitivos son asimetricos, los positivos hacen que los retornos varien menos que los negativos

justificaci??n:??Retornos se modelan mejor con ruido blanco debnil o fuerte?
Ruido blanco debil
Ya que su funci??n de autocorrelaci?? De los retornos logaritmicos,
Nos muestra un valor significativos en su lag 2. recoredemos que independencia nos indica no correlaci??, en el cual est?? no es el caso. #Con el Plot de la serie podemos ver como un valor elevado le precede otro elevado, imdicandonos #un proceso con memoria a lo de ayer , posiblemente por la correlaci??n.

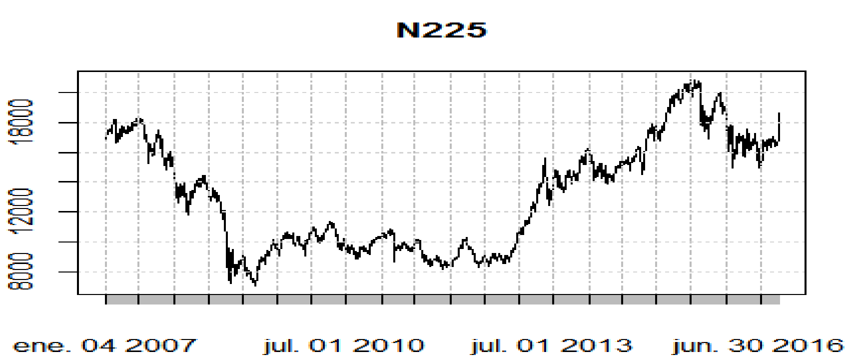
EVALUANDO HECHOS ESTILIZADOS PARA ^N225

h:1 precios de las acciones impredecibles

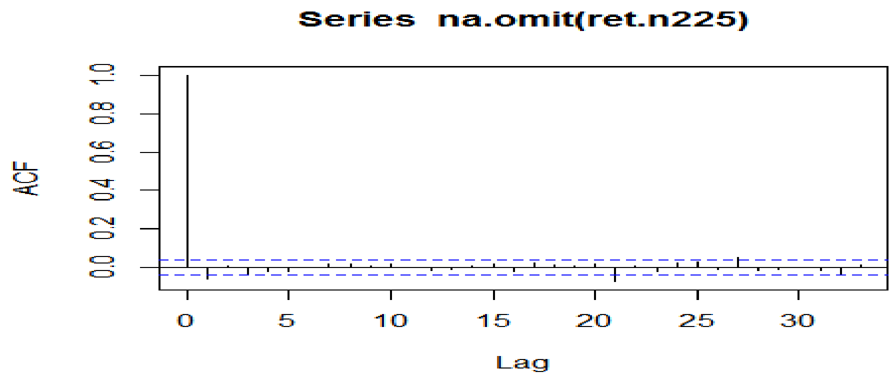
```
getSymbols("^N225")

## [1] "N225"

n_225<-get("N225")
n_225 <- Ad(n_225)
par(mfrow=c(1,1))
ret.n225<-diff(log(n_225))
plot(ret.n225, main="retornos N225")
```



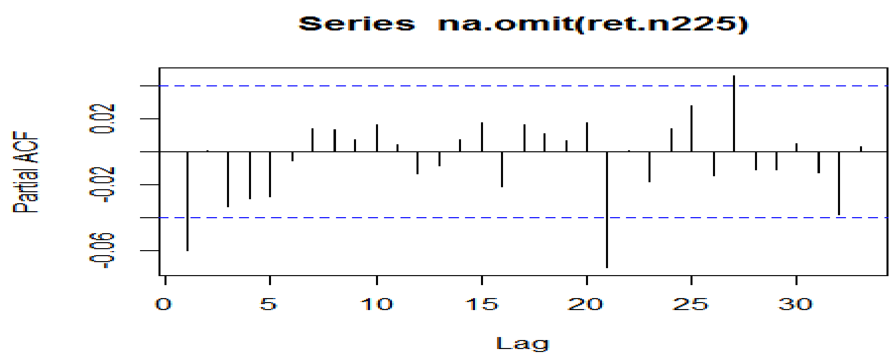

```
plot(n_225, main="N225")
```



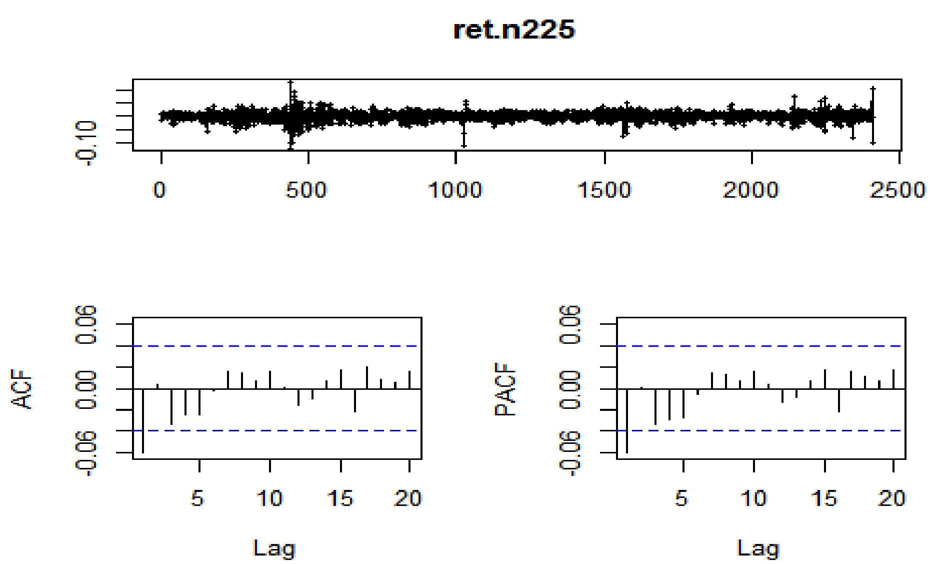
```r
#h:2 retornos no correlacionado
acf(na.omit(ret.n225))
```




```r
pacf(na.omit(ret.n225))
```

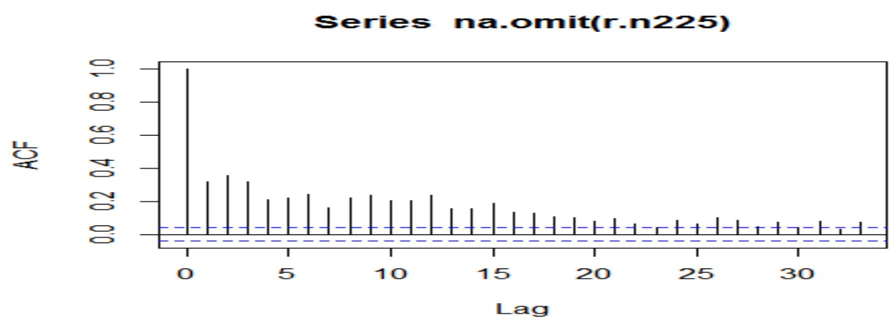



```r
tsdisplay(ret.n225, lag.max = 20)
```

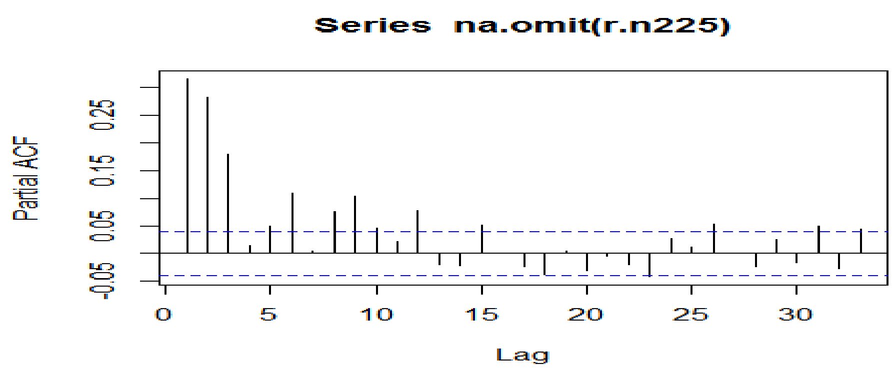


h:3 retornos al cuadrado correlacionados

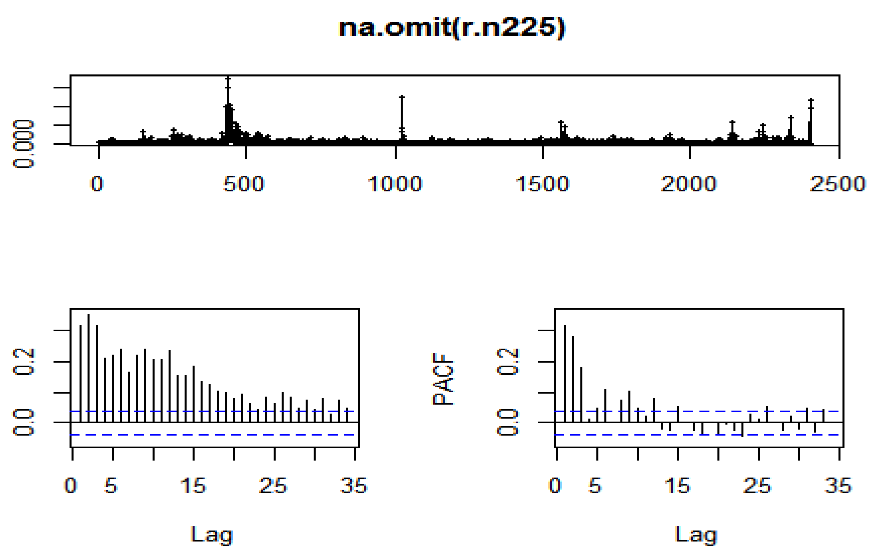
```
r.n225<-ret.n225^2
par(mfrow=c(1,1))
acf(na.omit(r.n225))
```




```
pacf(na.omit(r.n225))
```

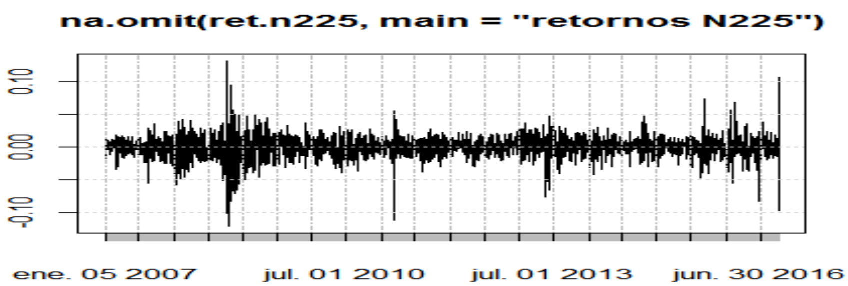



```
tsdisplay(na.omit(r.n225))
```

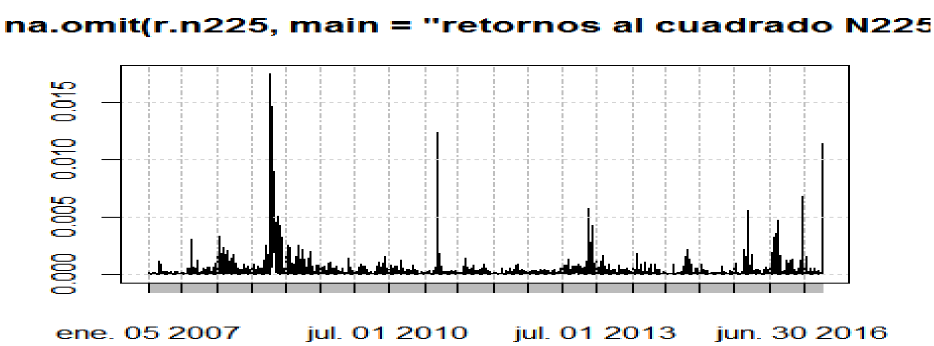


h:4 closters de volatilidad

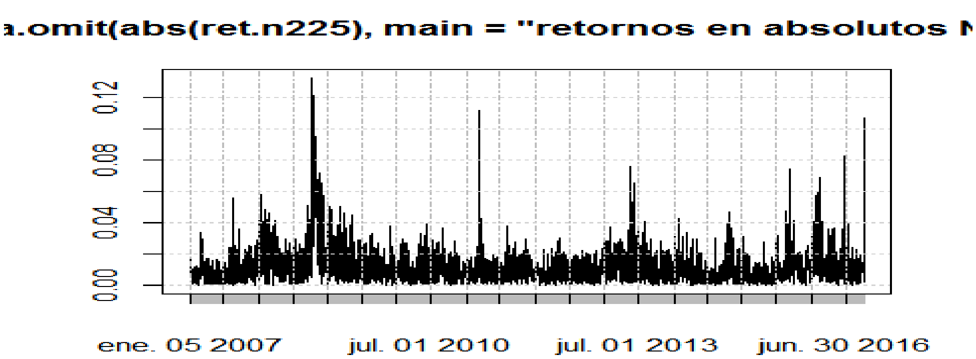
```r
par(mfrow=c(1,1))
plot(na.omit(ret.n225,main="retornos N225"))
```




```r
plot(na.omit(r.n225,main="retornos al cuadrado N225"))
```

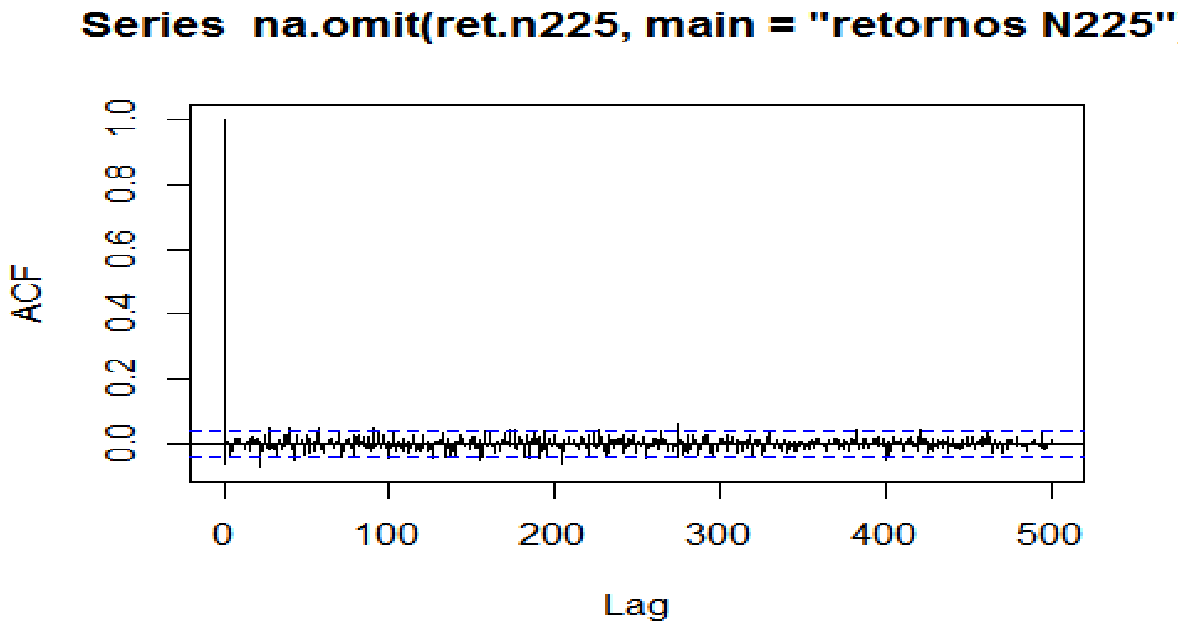



```r
plot(na.omit(abs(ret.n225),main="retornos en absolutos N225"))
```

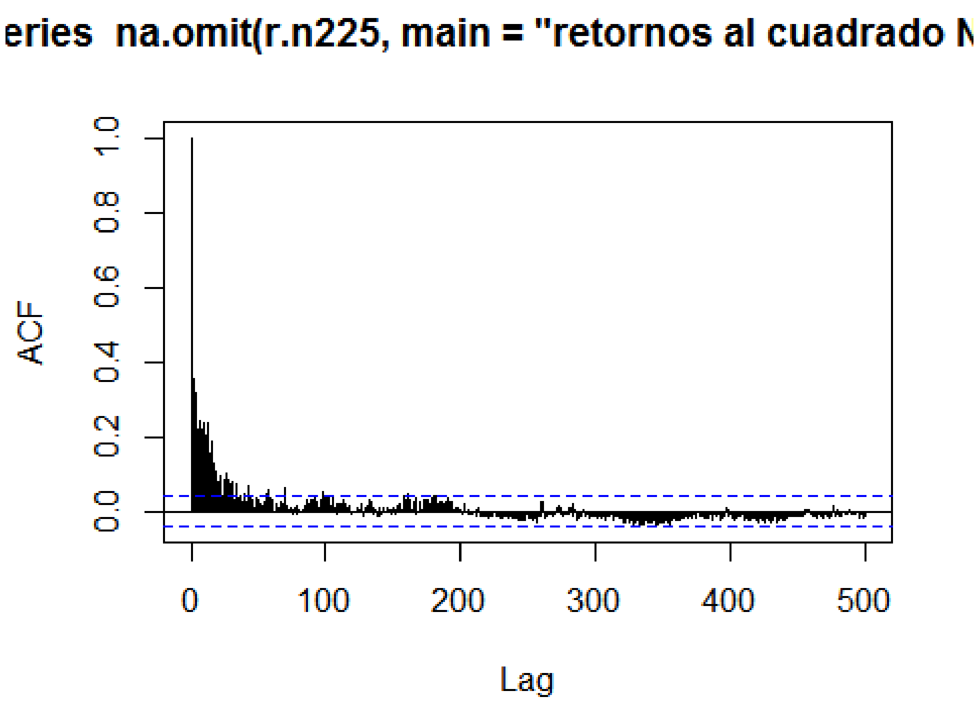


podemos observar que tanto en los retornos, sus cuadrados y en valores absolutos es notable los closters

```r
par(mfrow=c(1,1))
acf(na.omit(ret.n225,main="retornos N225"),lag.max = 500)
```

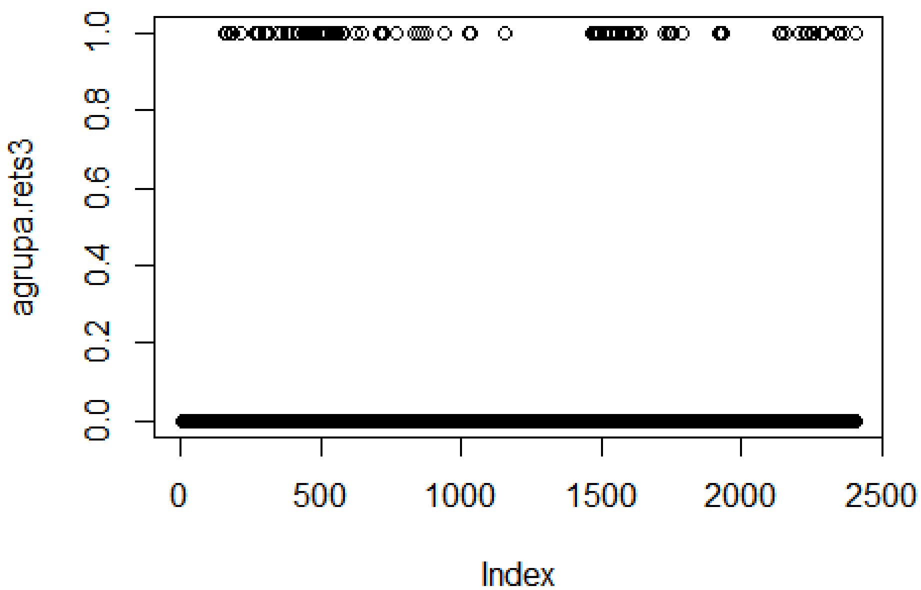



```
acf(na.omit(r.n225,main="retornos al cuadrado N225"),lag.max = 500)
```



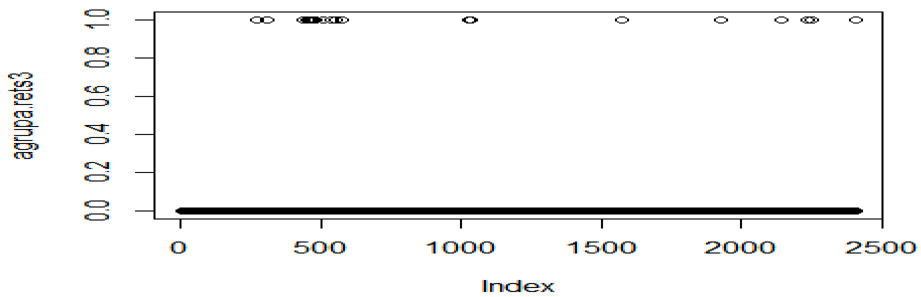
podemos observar significancia en lags alejados, se nota volatilidad por percistencia de autocorrelacisn la varianza puede estar condicionada a sus valores pasados lo que determina closters

```
umbral3 <- quantile(na.omit(ret.n225),.95)
menor.umbr3<-as.numeric(ret.n225>umbral3)
agrupa.rets3<-menor.umbr3
as.ts(agrupa.rets3)

par(mfrow=c(1,1))
plot(agrupa.rets3)
```



LOS VALORES SE AGLOMERAN

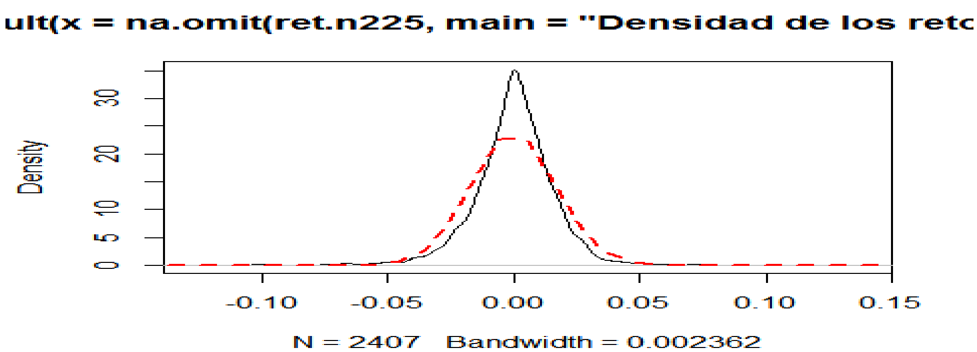
```
umb3<-function(IC){
  umbral3 <- quantile(na.omit(ret.n225),IC)
  menor.umbr3<-as.numeric(ret.n225>umbral3)
  agrupa.rets3<-menor.umbr3
  as.ts(agrupa.rets3)
  par(mfrow=c(1,1))
  plot(agrupa.rets3)
}

umb3(.99)
```



LOS VALORES SE AGLOMERAN

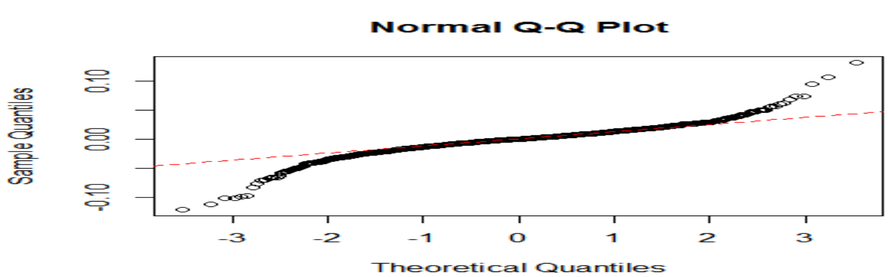
h:5 leptocurtosis

```
par(mfrow=c(1,1))
plot(density(na.omit(ret.n225, main="Densidad de los retornos del
N225")))
z3<-seq(-5,5,len=1000)
x3<-dnorm(z3,mean=mean(ret.n225,na.rm=T),sd=sd(ret.n225,na.rm=T))
lines(z3,x3,col='red',lty=2,lwd=2)
```



qq plot para determinar fat tails

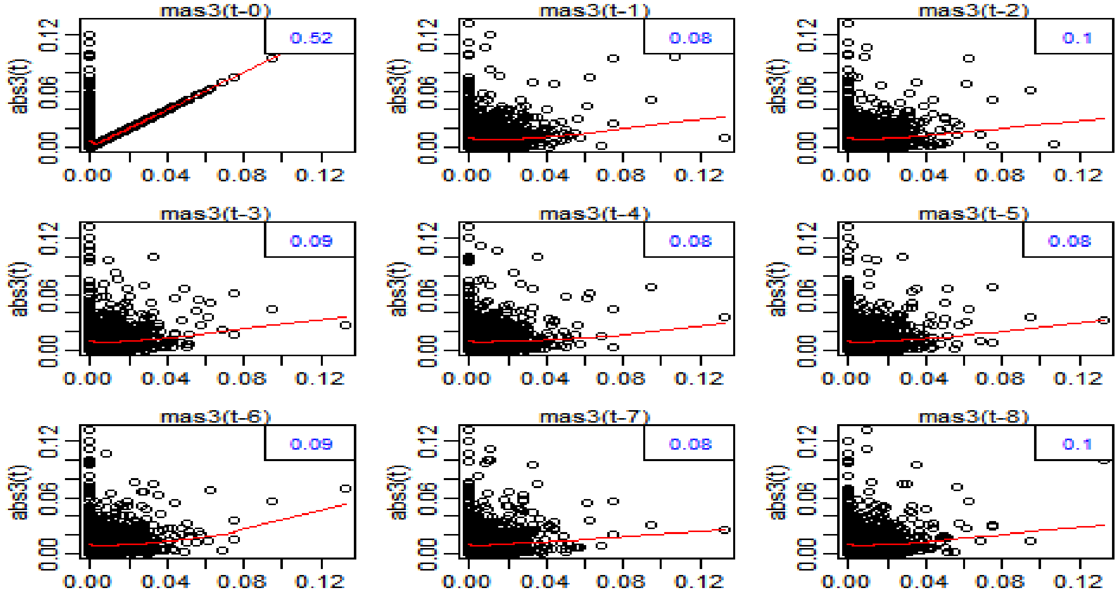
```
w3<-na.omit(coredata(ret.n225))
qqnorm(w3)
qqline(w3,col='red',lty=2)
```



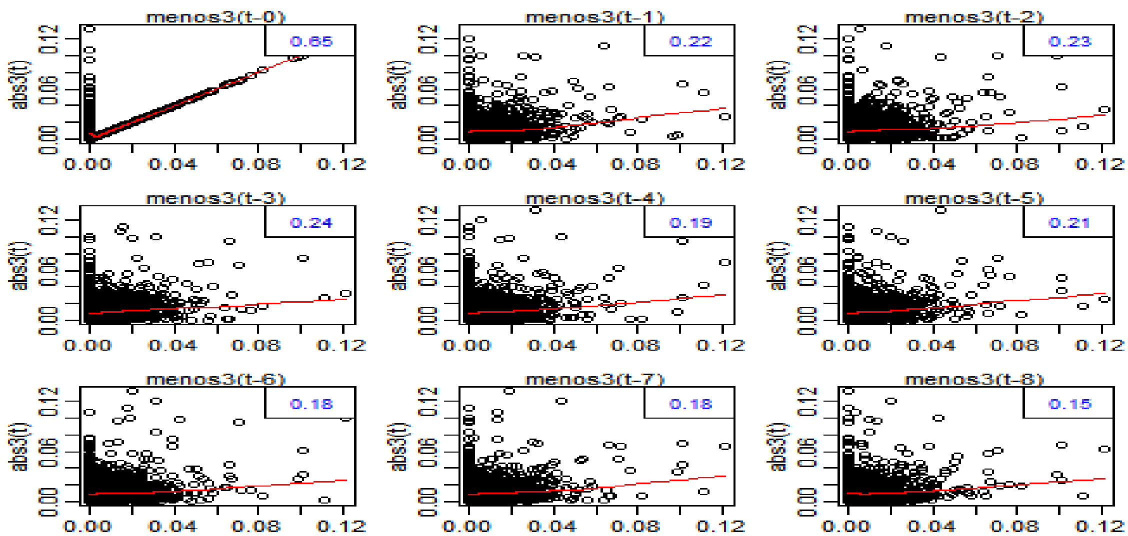
se observa informacisn a los extremos el cual es factor para tener colas anchas

h:6 leverage efect

```
library(astsa)
rets<-function(a){
  b<-diff(log(Ad(a)))
  return(b)
}
dato3<-na.omit(ret.n225)
mas3<-apply.daily(dato3,function(a) max(a,0))
menos3<-apply.daily(dato3,function(a) -min(a,0))
abs3<-apply.daily(dato3,function(a) abs(a))
lag2.plot(mas3,abs3,8)
```




```
lag2.plot(menos3,abs3,8)
```

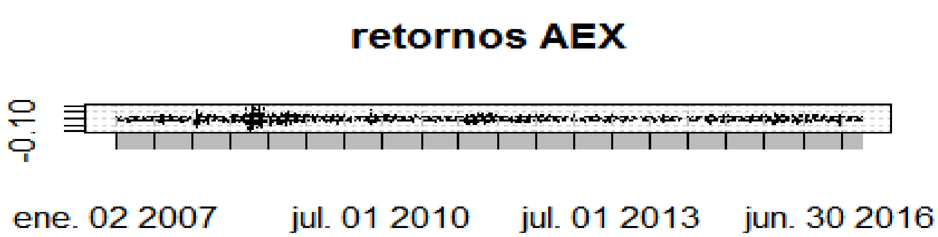


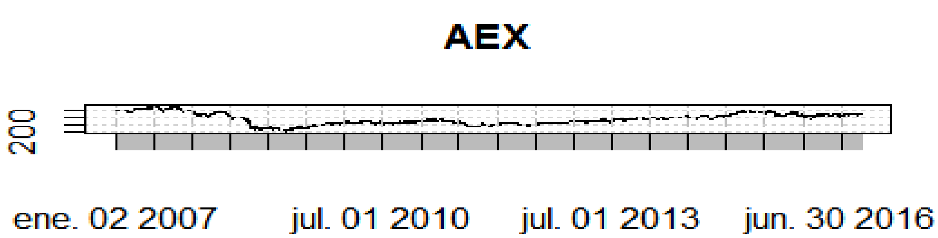
#choques negativos y psitivos son asimetricos, los positivos hacen que los #retornos varien menos que los negativos #justificaci??n:??Retornos se modelan mejor con ruido blanco debnil o fuerte? #Ruido blanco Fuerte #Ya que su funci??n de autocorrelaci?? de los retornos logaritmicos, # #no muestran significacien sus lags. #recoredemos que independencia nos indica no correlaci??, en el cual est?? no es el caso. #Con el Plot de la serie podemos ver como un valor elevado no sigue el comportamiento de su #valor o sus valores pasados, cae abruptamento como si fuera un arch sin tanta memoria.

EVALUANDO HECHOS ESTILIZADOS PARA ^AEX

h:1 precios de las acciones impredecibles

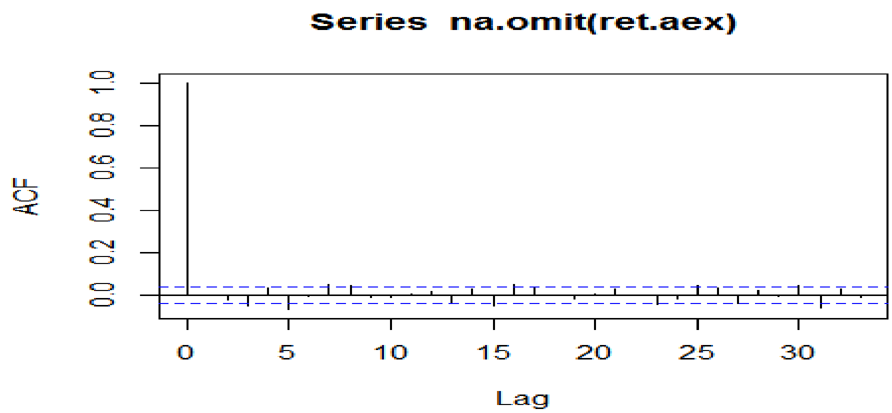
```
getSymbols("^AEX")

## [1] "AEX"

#generando variable
aex<-get("AEX")
#se seleccionan los precios ajustados
aex<- Ad(aex)
par(mfrow=c(2,1))
ret.aex<-diff(log(aex))
plot(ret.aex, main="retornos AEX")
plot(aex, main="AEX")
```



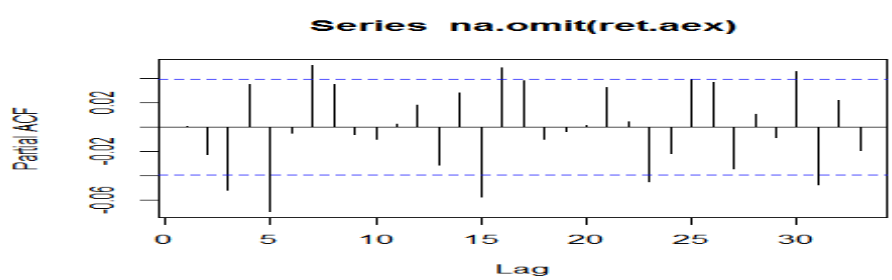


h:2 retornos no correlacionado

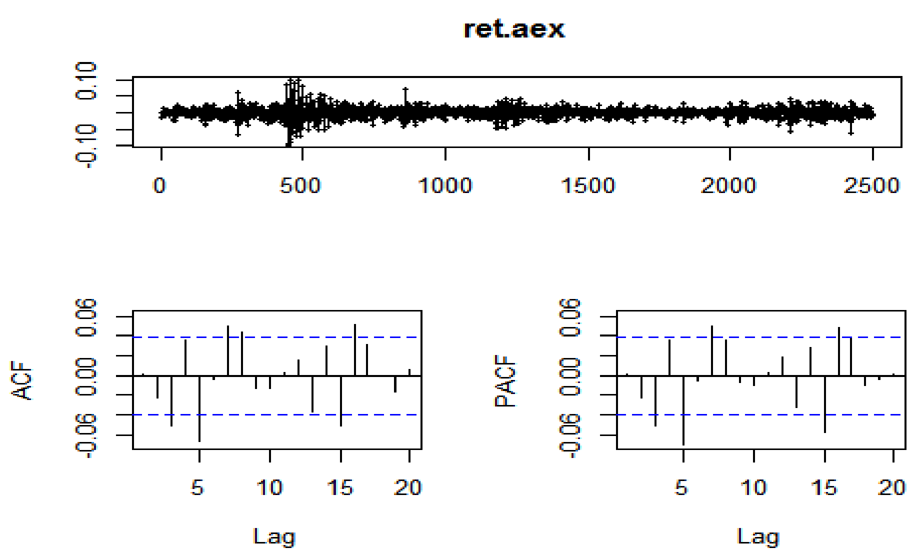
```
par(mfrow=c(1,1))
acf(na.omit(ret.aex))
```




```
pacf(na.omit(ret.aex))
```

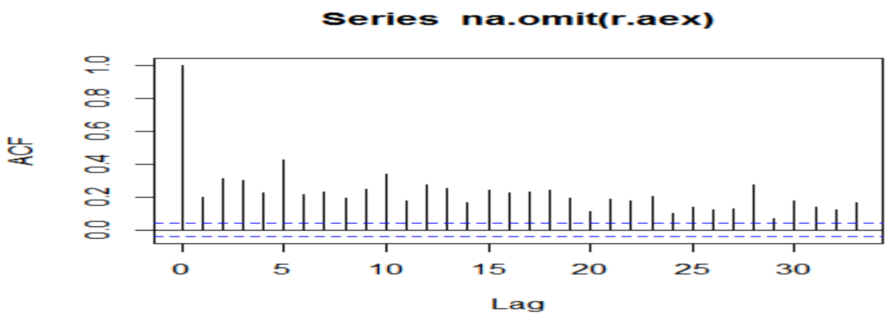



```
tsdisplay(ret.aex, lag.max = 20)
```

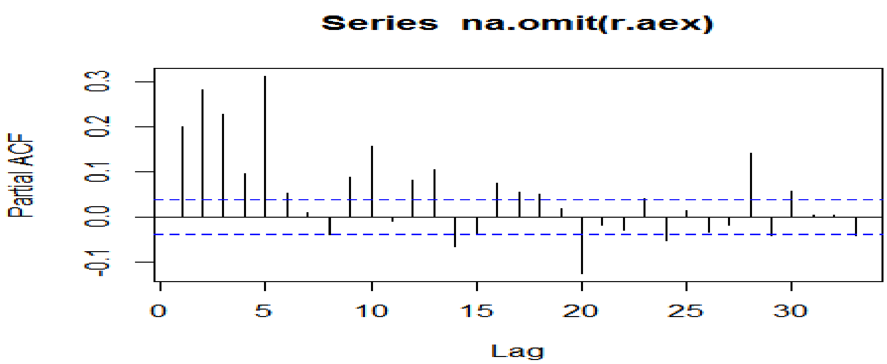


h:3 retornos al cuadrado correlacionados

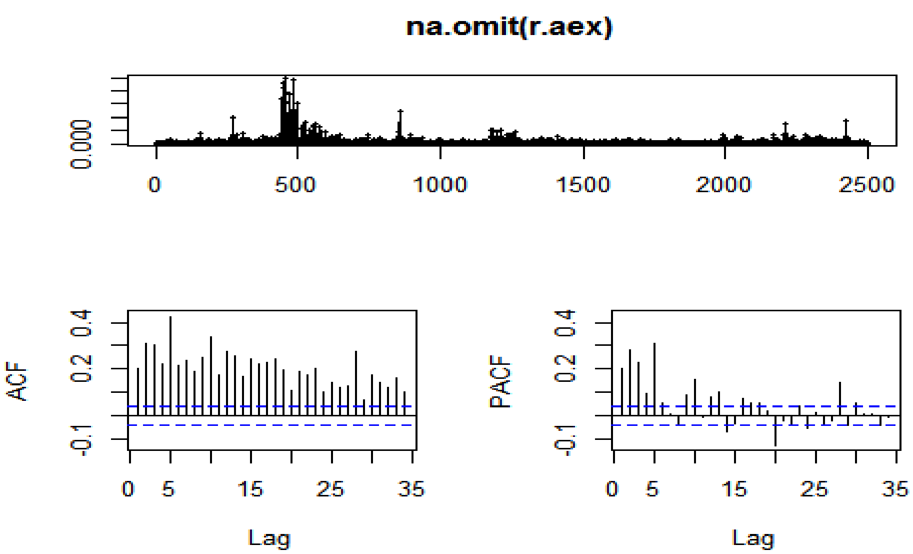
```
r.aex<-ret.aex^2
par(mfrow=c(1,1))
acf(na.omit(r.aex))
```




```
pacf(na.omit(r.aex))
```

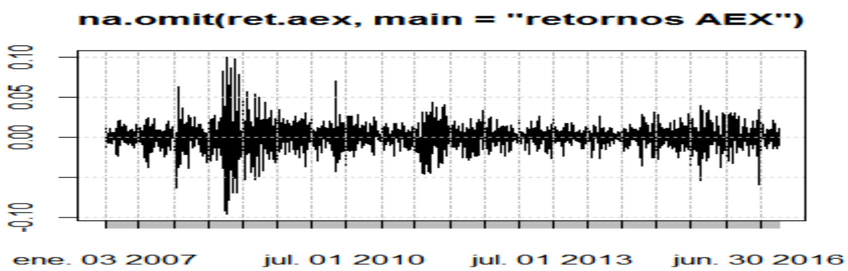



```
tsdisplay(na.omit(r.aex))
```

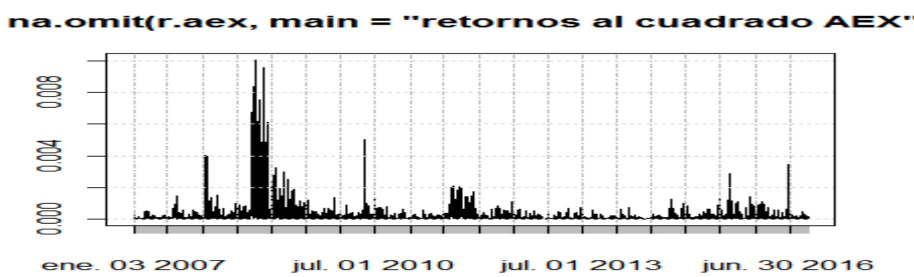


h:4 closters de volatilidad

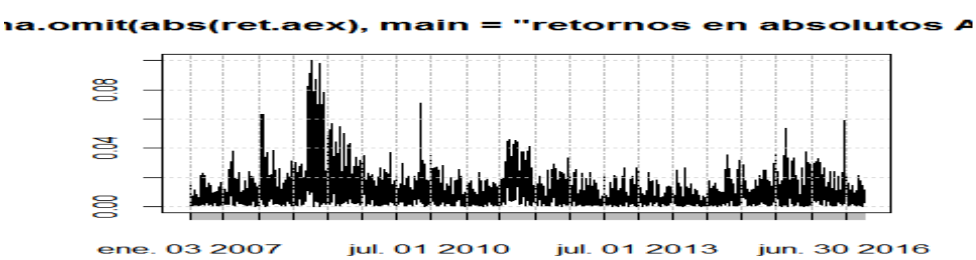
```
par(mfrow=c(1,1))
plot(na.omit(ret.aex,main="retornos AEX"))
```




```
plot(na.omit(r.aex,main="retornos al cuadrado AEX"))
```

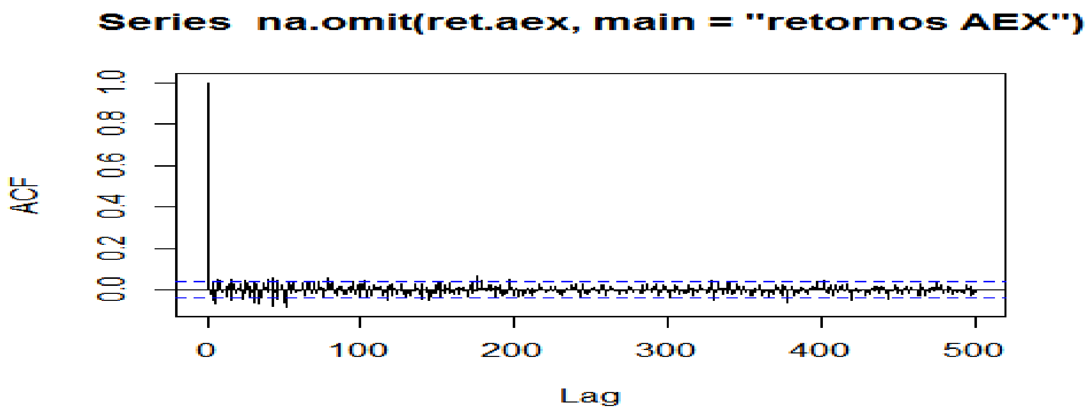



```
plot(na.omit(abs(ret.aex),main="retornos en absolutos AEX"))
```

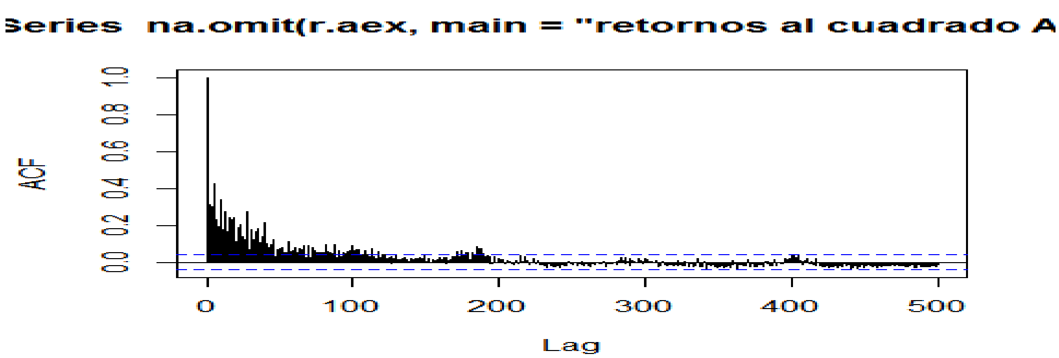


podemos observar que tanto en los retornos, sus cuadrados y en valores absolutos es notable los closters

```
par(mfrow=c(1,1))
acf(na.omit(ret.aex,main="retornos AEX"),lag.max = 500)
```

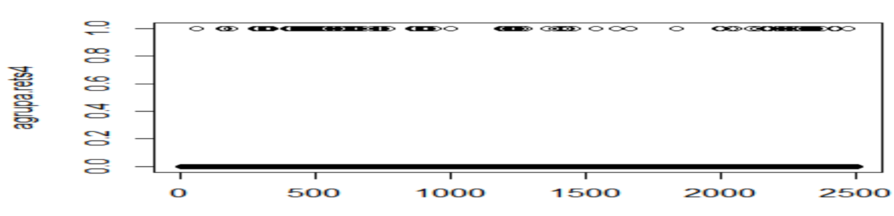



```
acf(na.omit(r.aex,main="retornos al cuadrado AEX"),lag.max = 500)
```



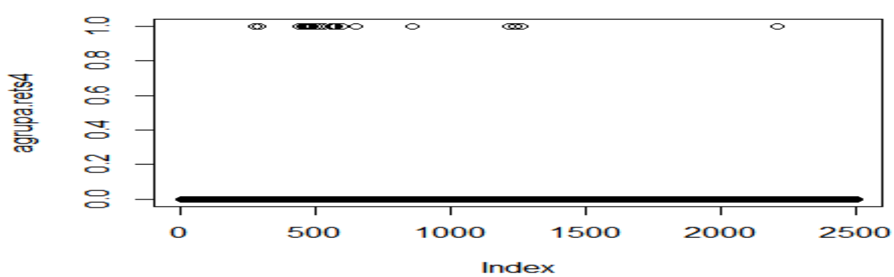
podemos observar significancia en lags alejados, se nota volatilidad por percistencia de autocorrelacisn #la varianza puede estar condicionada a sus valores pasados lo que determina closters

```
umbral4 <- quantile(na.omit(ret.aex),.95)
menor.umbr4<-as.numeric(ret.aex>umbral4)
agrupa.rets4<-menor.umbr4
as.ts(agrupa.rets4)

par(mfrow=c(1,1))
plot(agrupa.rets4)
```



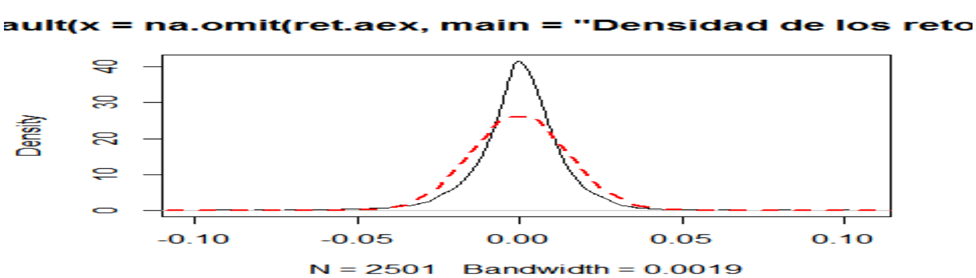
LOS VALORES SE AGLOMERAN

```
umb4<-function(x){
  umbral4 <- quantile(na.omit(ret.aex),x)
  menor.umbr4<-as.numeric(ret.aex>umbral4)
  agrupa.rets4<-menor.umbr4
  as.ts(agrupa.rets4)
  par(mfrow=c(1,1))
  plot(agrupa.rets4)
}

umb4(.99)
```



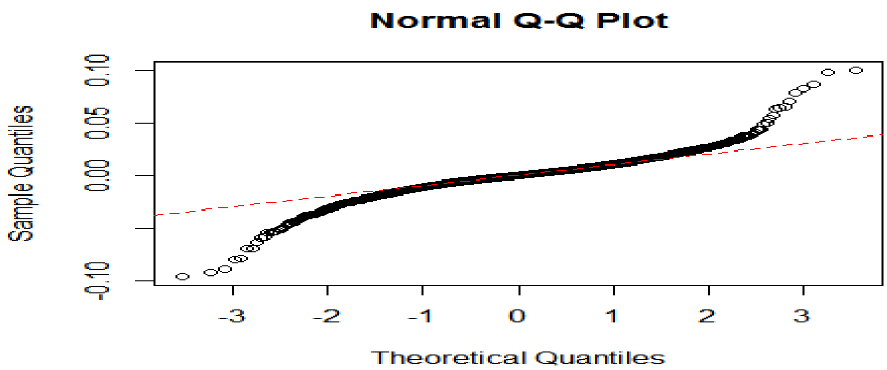
LOS VALORES SE AGLOMERAN h:5 leptocurtosis

```
par(mfrow=c(1,1))
plot(density(na.omit(ret.aex, main="Densidad de los retornos del AEX")))
z4<-seq(-5,5,len=1000)
x4<-dnorm(z4,mean=mean(ret.aex,na.rm=T),sd=sd(ret.aex,na.rm=T))
lines(z4,x4,col='red',lty=2,lwd=2)
```



qq plot para determinar fat tails

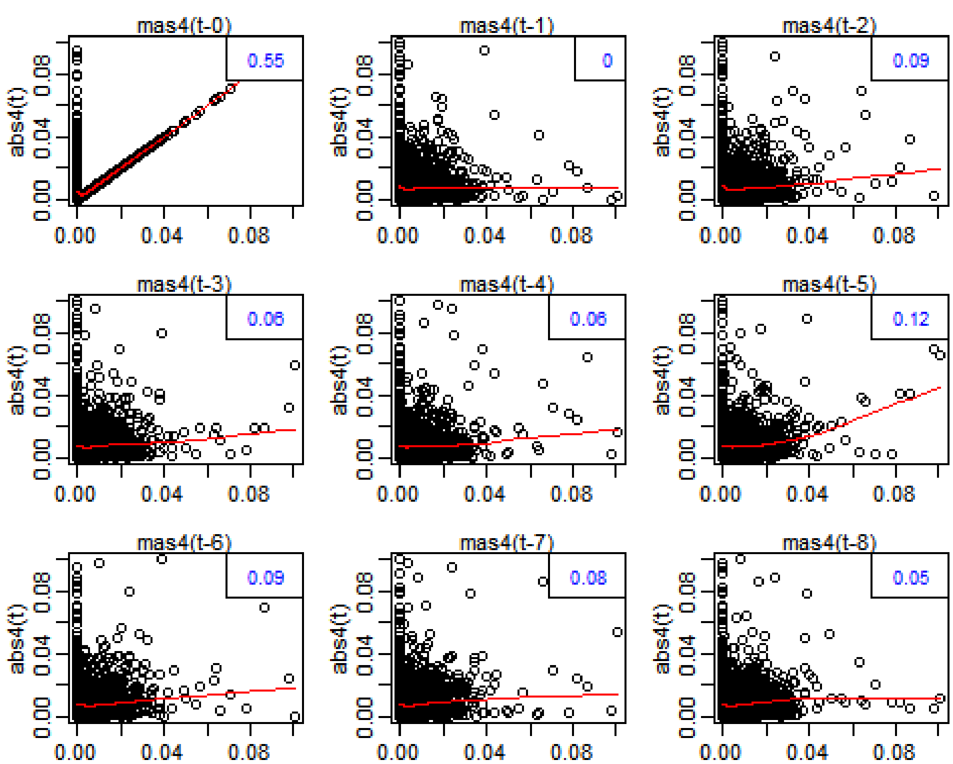
```
w4<-na.omit(coredata(ret.aex))
qqnorm(w4)
qqline(w4,col='red',lty=2)
```



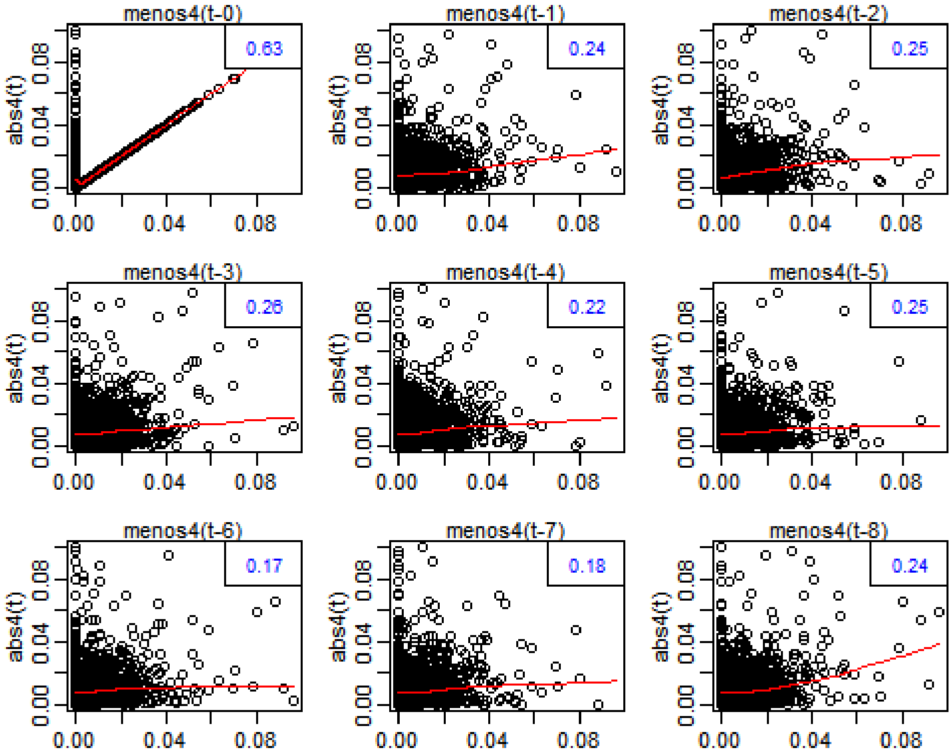
se observa informacisn a los extremos el cual es factor para tener colas anchas

h:6 leverage efect

```
library(astsa)
rets<-function(a){
  b<-diff(log(Ad(a)))
  return(b)
}
dato4<-na.omit(ret.aex)
mas4<-apply.daily(dato4,function(a) max(a,0))
menos4<-apply.daily(dato4,function(a) -min(a,0))
abs4<-apply.daily(dato4,function(a) abs(a))
lag2.plot(mas4,abs4,8)
```



```r
lag2.plot(menos4,abs4,8)
```

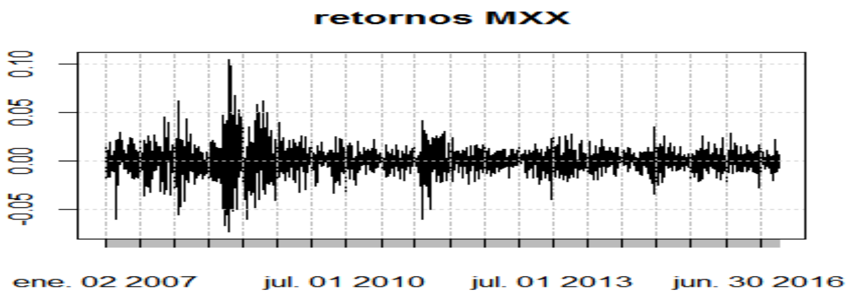


#choques negativos y psitivos son asimetricos, los positivos hacen que los #retornos varien menos que los negativos #justificaci??n:??Retornos se modelan mejor con ruido blanco debnil o fuerte? #Ruido blanco Debil #Ya que su funci??n de autocorrelaci?? de los retornos logaritmicos, # #muestran significacia en sus lags. #recoredemos que independencia nos indica no correlaci??, en el cual est?? no es el caso. #Con el Plot de la serie podemos ver como un valor elevado sigue el comportamiento de su #valor o sus valores pasados.

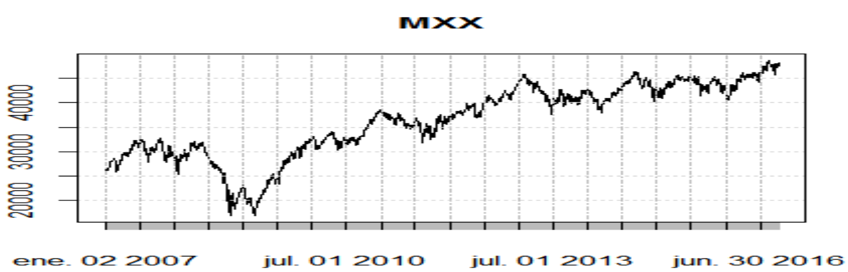
EVALUANDO HECHOS ESTILIZADOS PARA MXX

h:1 precios de las acciones impredecibles

```r
getSymbols("^MXX")

## [1] "MXX"

#generando variable
mxx<-get("MXX")
#se seleccionan los precios ajustados
mxx <- Ad(mxx)
par(mfrow=c(1,1))
ret.mxx<-diff(log(mxx))
plot(ret.mxx, main="retornos MXX")
```

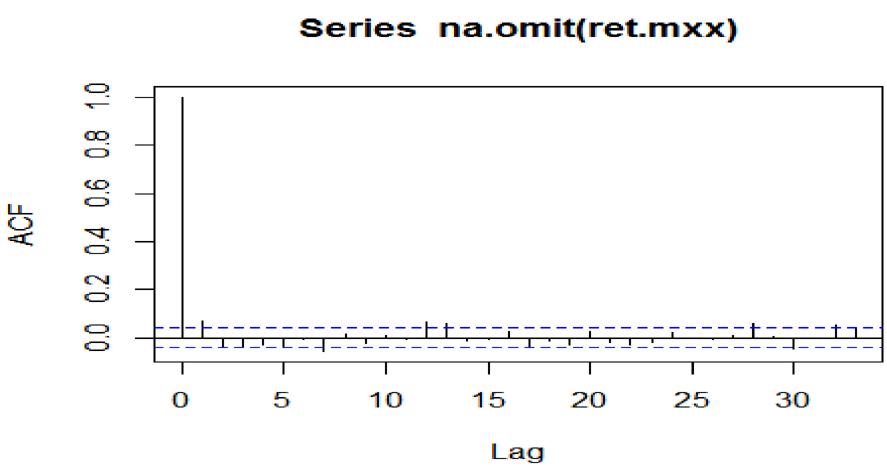



```r
plot(mxx, main="MXX")
```

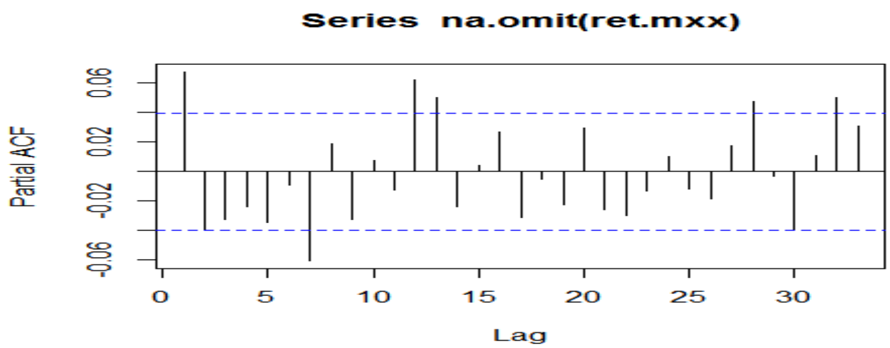


h:2 retornos no correlacionado

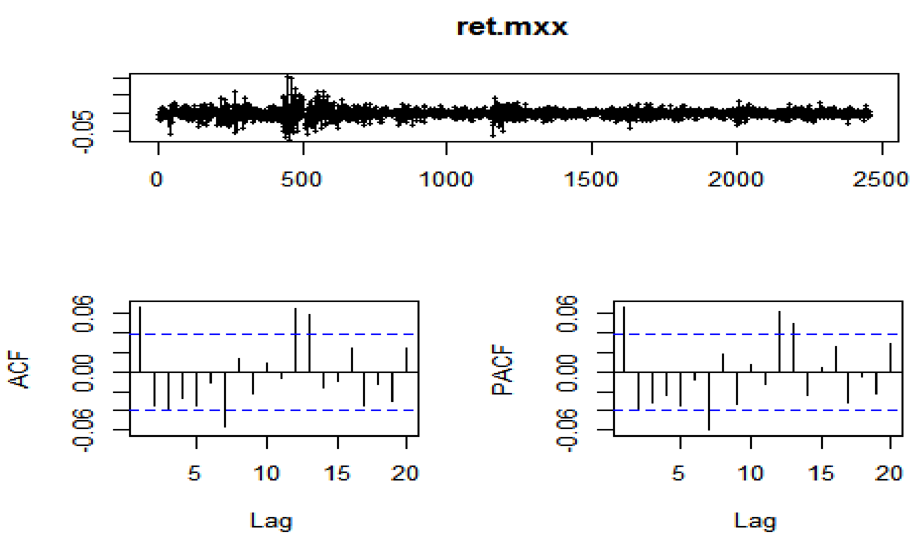
```r
par(mfrow=c(1,1))
acf(na.omit(ret.mxx))
```




```r
pacf(na.omit(ret.mxx))
```

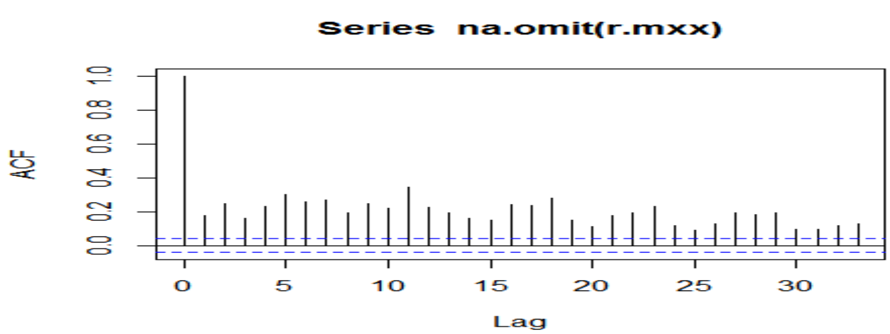



```r
tsdisplay(ret.mxx, lag.max = 20)
```

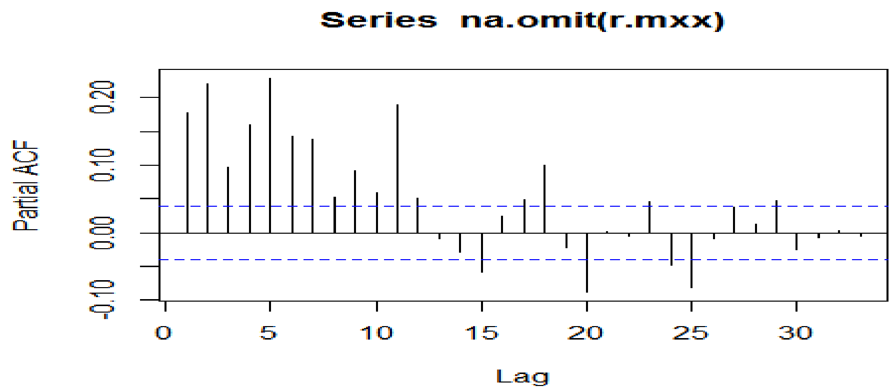


h:3 retornos al cuadrado correlacionados

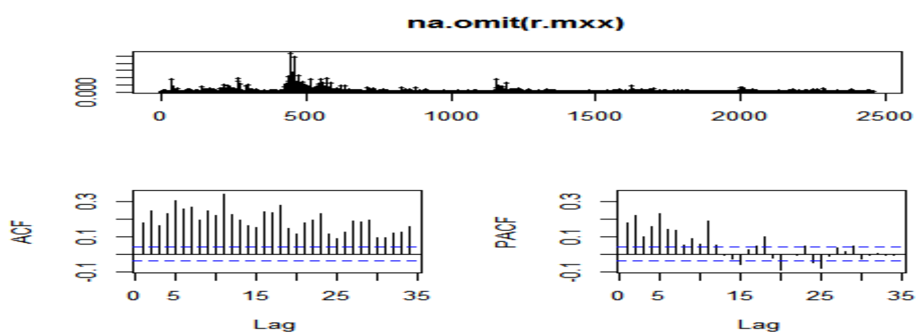
```r
par(mfrow=c(1,1))
r.mxx<-ret.mxx^2
acf(na.omit(r.mxx))
```




```r
pacf(na.omit(r.mxx))
```

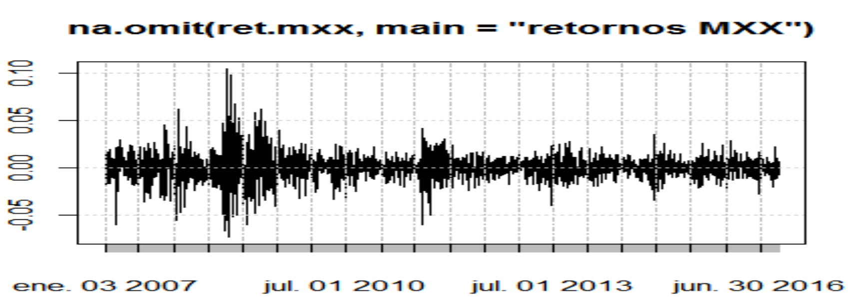



```r
tsdisplay(na.omit(r.mxx))
```

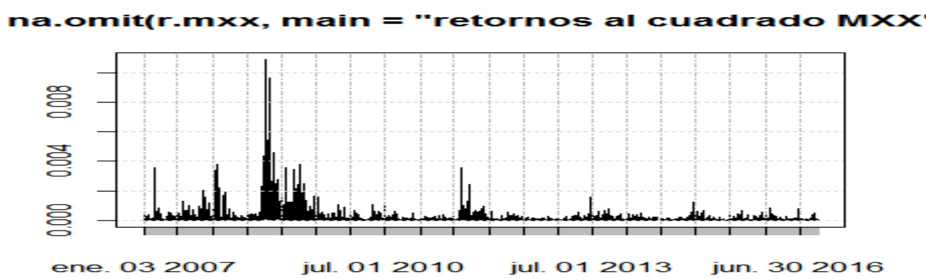


h:4 closters de volatilidad

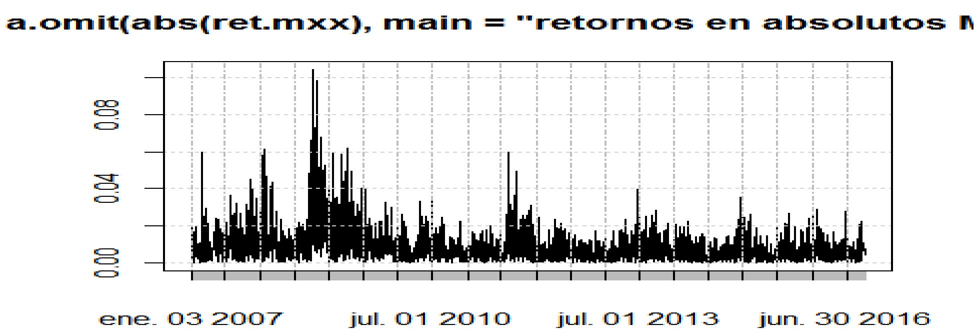
```r
par(mfrow=c(1,1))
plot(na.omit(ret.mxx,main="retornos MXX"))
```




```r
plot(na.omit(r.mxx,main="retornos al cuadrado MXX"))
```

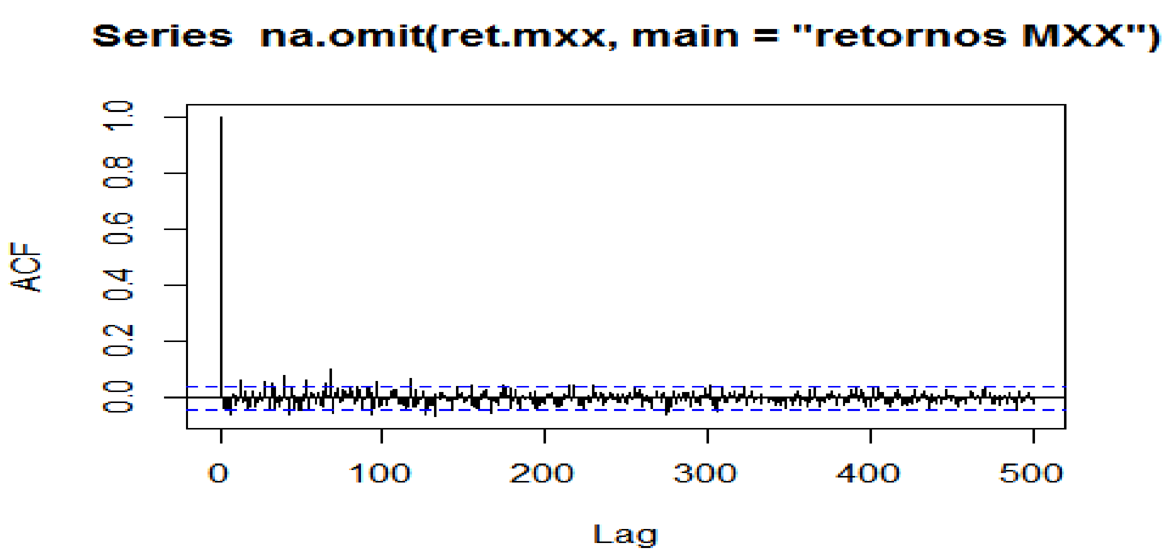



```
plot(na.omit(abs(ret.mxx),main="retornos en absolutos MXX"))
```

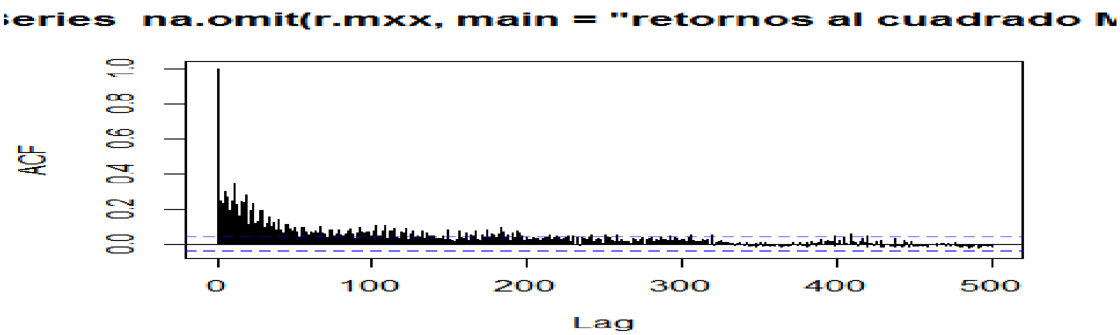


podemos observar que tanto en los retornos, sus cuadrados y en valores absolutos es notable los closters

```
par(mfrow=c(1,1))
acf(na.omit(ret.mxx,main="retornos MXX"),lag.max = 500)
```

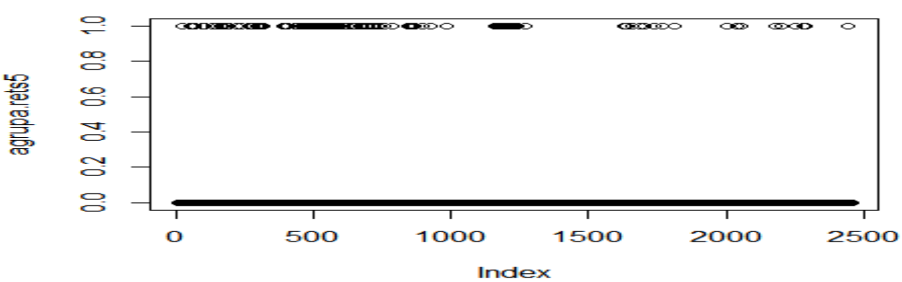



```
acf(na.omit(r.mxx,main="retornos al cuadrado MXX"),lag.max = 500)
```



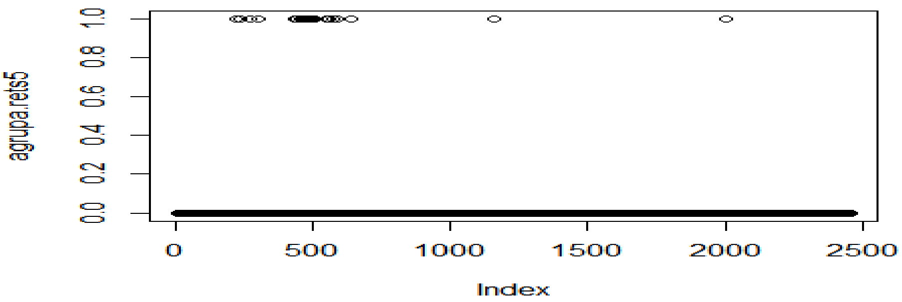
#podemos observar significancia en lags alejados, se nota volatilidad por percistencia de autocorrelacisn #la varianza puede estar condicionada a sus valores pasados lo que determina closters

```
umbral5 <- quantile(na.omit(ret.mxx),.95)
menor.umbr5<-as.numeric(ret.mxx>umbral5)
agrupa.rets5<-menor.umbr5
as.ts(agrupa.rets5)

par(mfrow=c(1,1))
plot(agrupa.rets5)
```



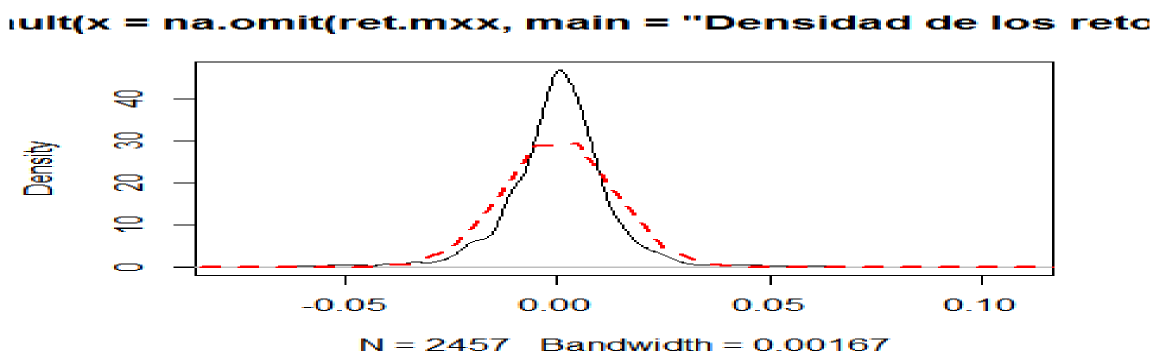
LOS VALORES SE AGLOMERAN

```
umb5<-function(x){
  umbral5 <- quantile(na.omit(ret.mxx),x)
  menor.umbr5<-as.numeric(ret.mxx>umbral5)
  agrupa.rets5<-menor.umbr5
  as.ts(agrupa.rets5)
  par(mfrow=c(1,1))
  plot(agrupa.rets5)
}

umb5(.99)
```



h:5 leptocurtosis

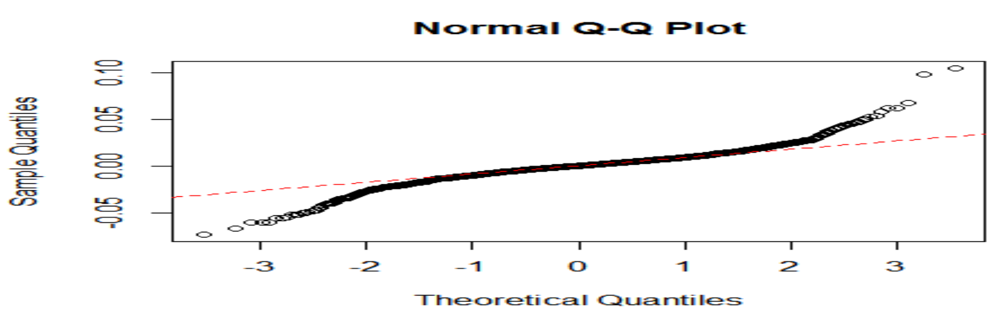
```
par(mfrow=c(1,1))
plot(density(na.omit(ret.mxx, main="Densidad de los retornos del MXX")))
z5<-seq(-5,5,len=1000)
x5<-dnorm(z5,mean=mean(ret.mxx,na.rm=T),sd=sd(ret.mxx,na.rm=T))
lines(z5,x5,col='red',lty=2,lwd=2)
```



q

q plot para determinar fat tails

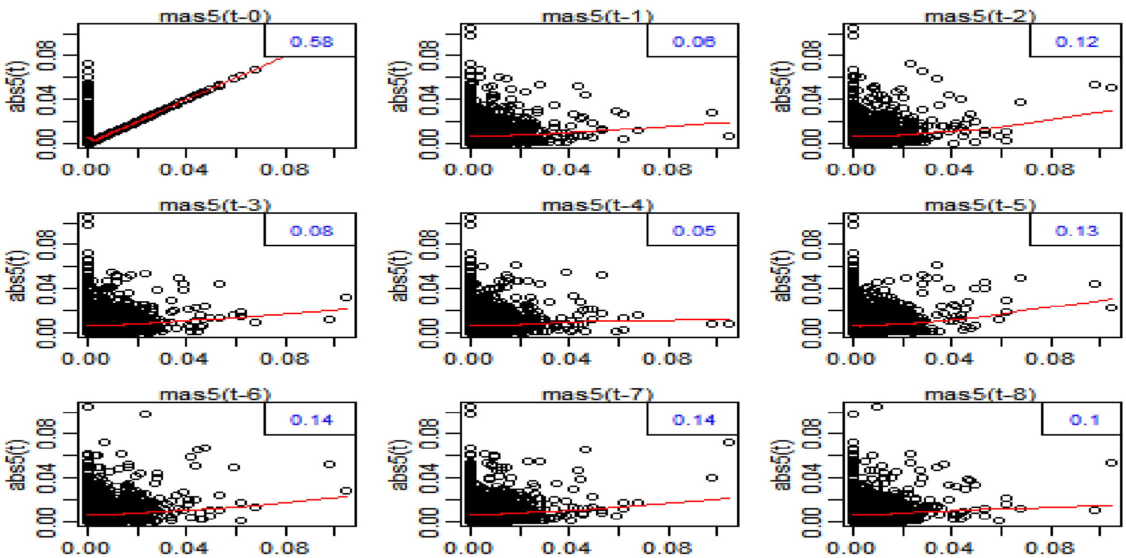
```
w5<-na.omit(coredata(ret.mxx))
qqnorm(w5)
qqline(w5,col='red',lty=2)
```



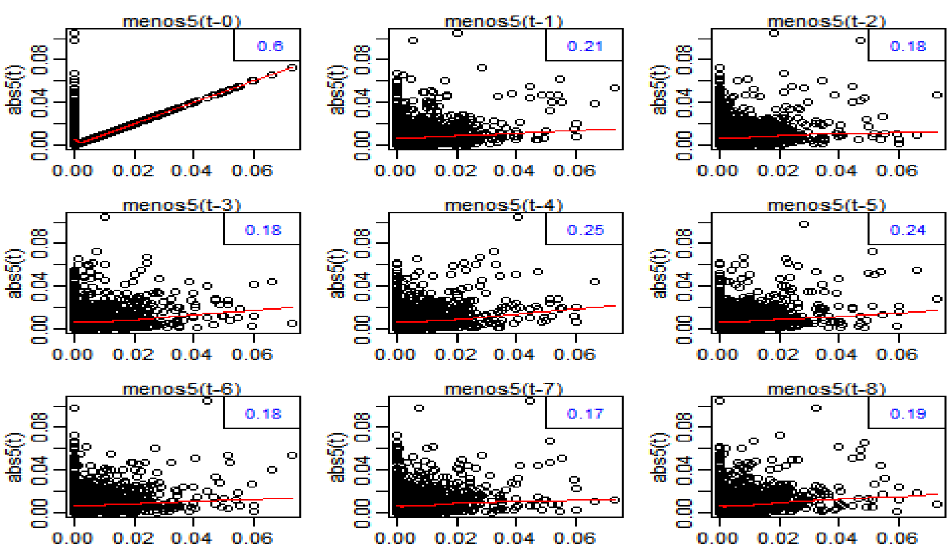
se observa informacisn a los extremos el cual es factor para tener colas anchas

h:6 leverage efect

```r
library(astsa)
rets<-function(a){
  b<-diff(log(Ad(a)))
  return(b)
}
dato5<-na.omit(ret.mxx)
mas5<-apply.daily(dato5,function(a) max(a,0))
menos5<-apply.daily(dato5,function(a) -min(a,0))
abs5<-apply.daily(dato5,function(a) abs(a))
lag2.plot(mas5,abs5,8)
```




```r
lag2.plot(menos5,abs5,8)
```

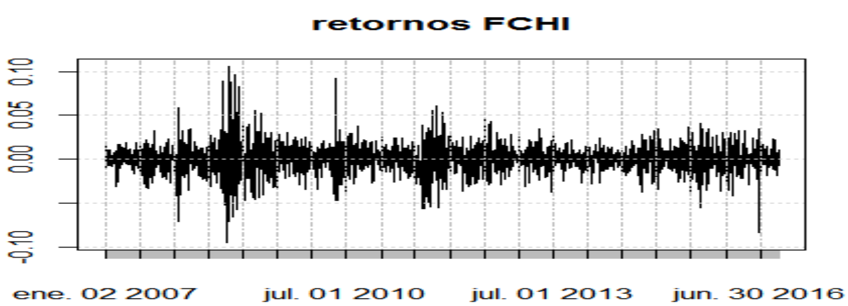


#choques negativos y psitivos son asimetricos, los positivos hacen que los #retornos varien menos que los negativos #justificaci??n:??Retornos se modelan mejor con ruido blanco debnil o fuerte? #Ruido blanco Debil #Ya que su funci??n de autocorrelaci?? de los retornos logaritmicos, # #muestran significacia en sus lags. #recoredemos que independencia nos indica no correlaci??, en el cual est?? no es el caso. #Con el Plot de la serie podemos ver como un valor elevado sigue el comportamiento de su #valor o sus valores pasados.

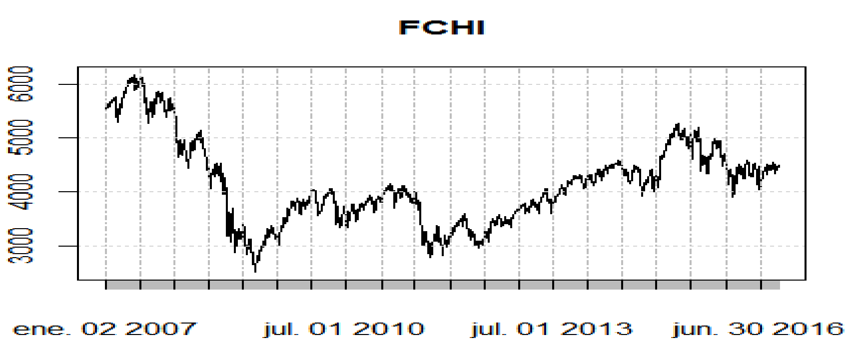
EVALUANDO HECHOS ESTILIZADOS PARA FCHI

h:1 precios de las acciones impredecibles

```
getSymbols("^FCHI")

## [1] "FCHI"

#generando variable
fchi<-get("FCHI")
#se seleccionan los precios ajustados
fchi <- Ad(fchi)
par(mfrow=c(1,1))
ret.fchi<-diff(log(fchi))
plot(ret.fchi, main="retornos FCHI")
```

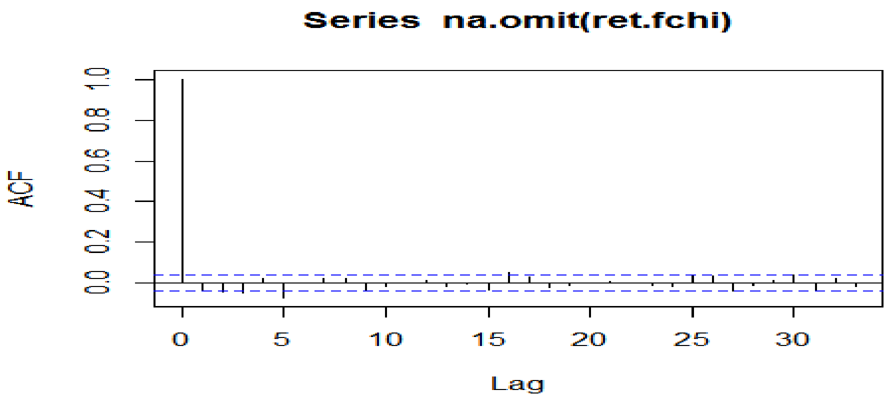



```
plot(fchi, main="FCHI")
```

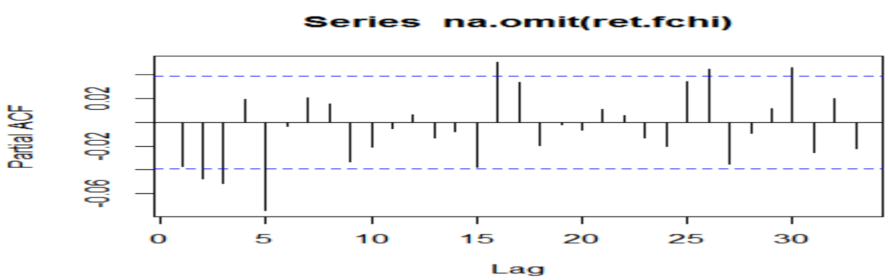


h:2 retornos no correlacionado

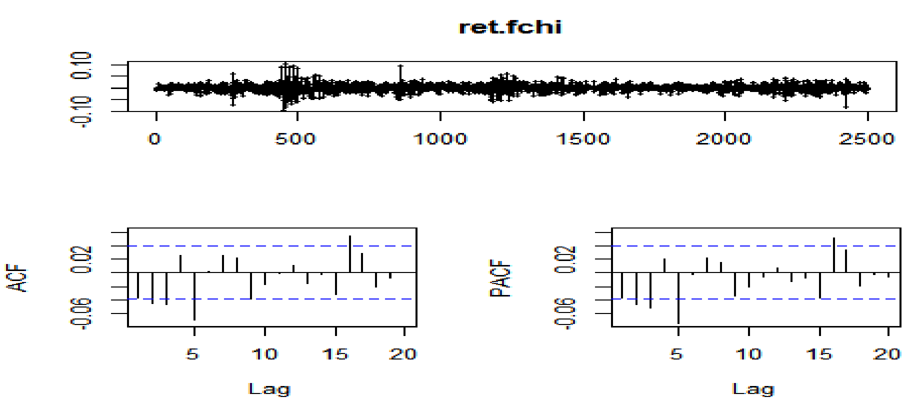
```r
par(mfrow=c(1,1))
acf(na.omit(ret.fchi))
```




```r
pacf(na.omit(ret.fchi))
```

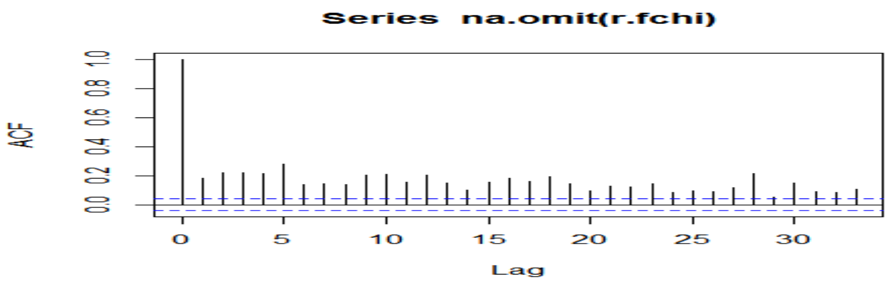



```r
tsdisplay(ret.fchi, lag.max = 20)
```

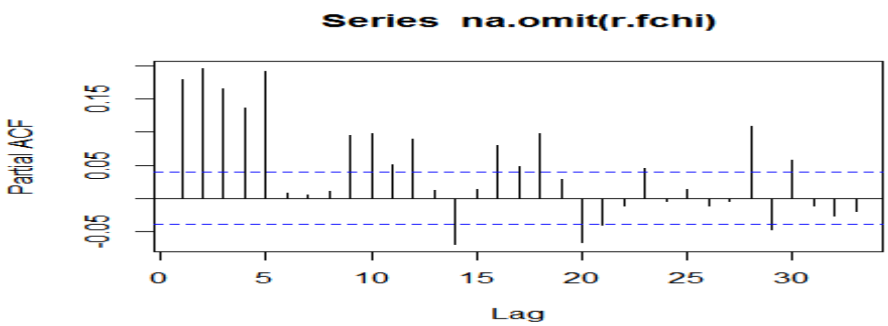


h:3 retornos al cuadrado correlacionados

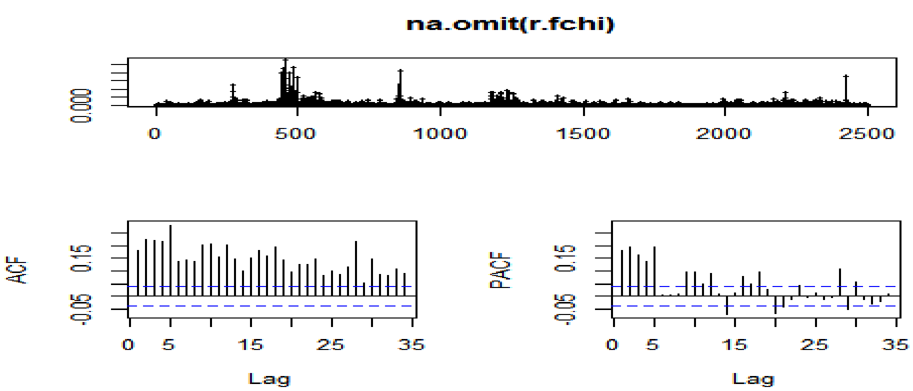
```r
par(mfrow=c(1,1))
r.fchi<-ret.fchi^2
acf(na.omit(r.fchi))
```




```
pacf(na.omit(r.fchi))
```

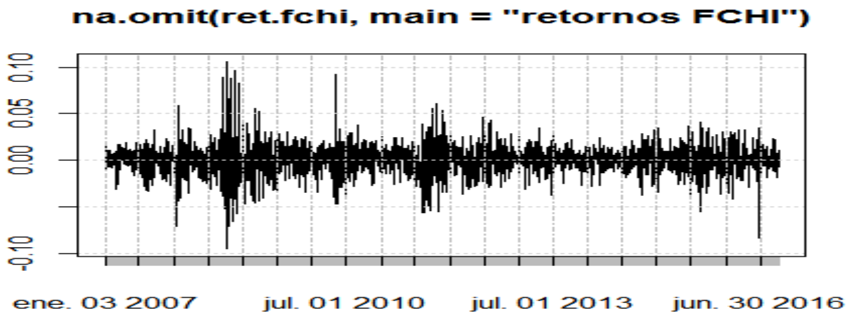



```
tsdisplay(na.omit(r.fchi))
```

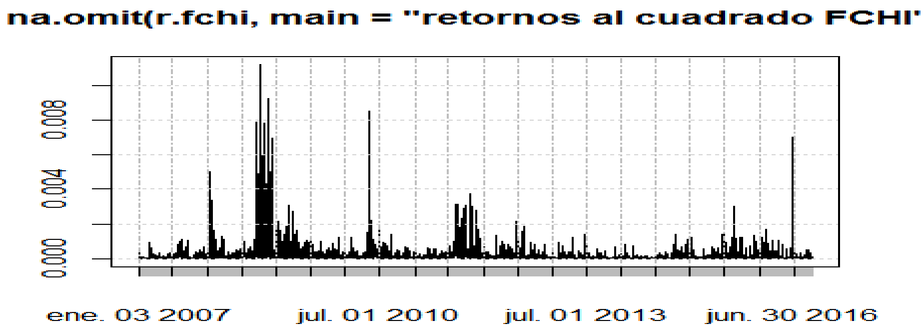


h:4 closters de volatilidad

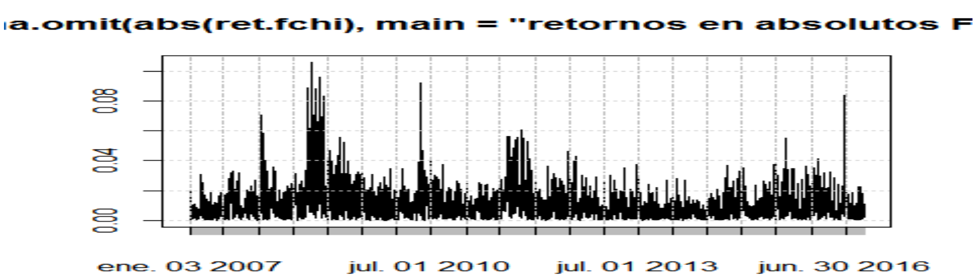
```
par(mfrow=c(1,1))
plot(na.omit(ret.fchi,main="retornos FCHI"))
```




```r
plot(na.omit(r.fchi,main="retornos al cuadrado FCHI"))
```

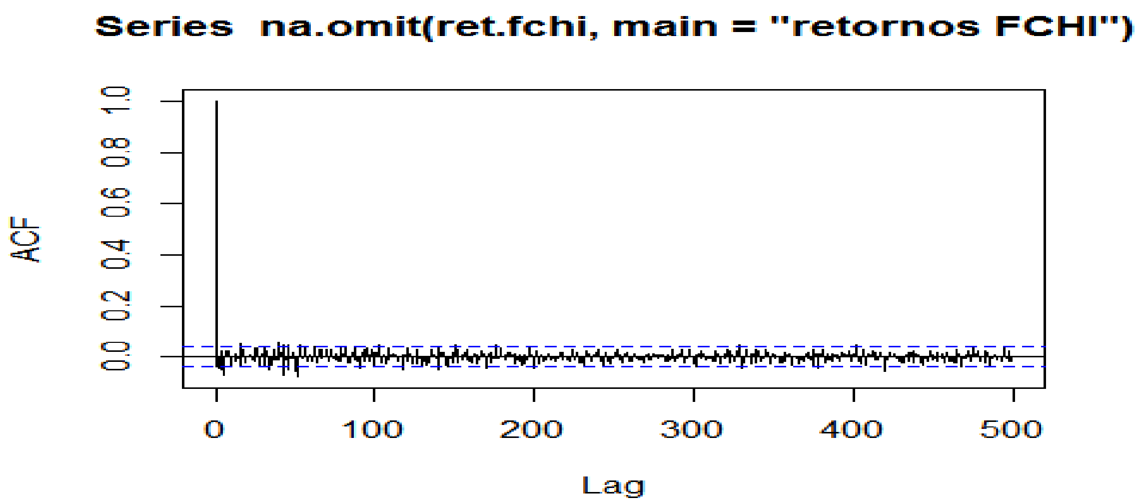



```r
plot(na.omit(abs(ret.fchi),main="retornos en absolutos FCHI"))
```

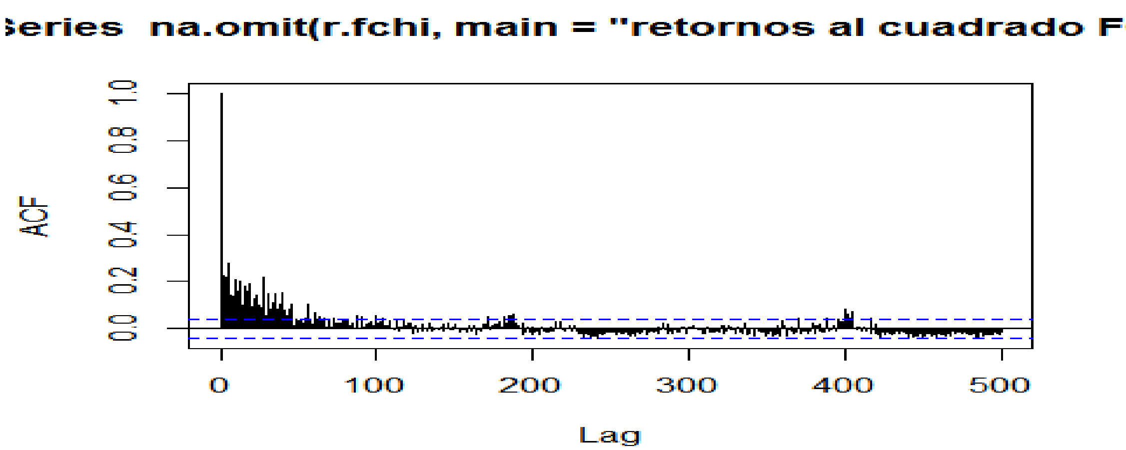


podemos observar que tanto en los retornos, sus cuadrados y en valores absolutos es notable los closters

```r
par(mfrow=c(1,1))
acf(na.omit(ret.fchi,main="retornos FCHI"),lag.max = 500)
```

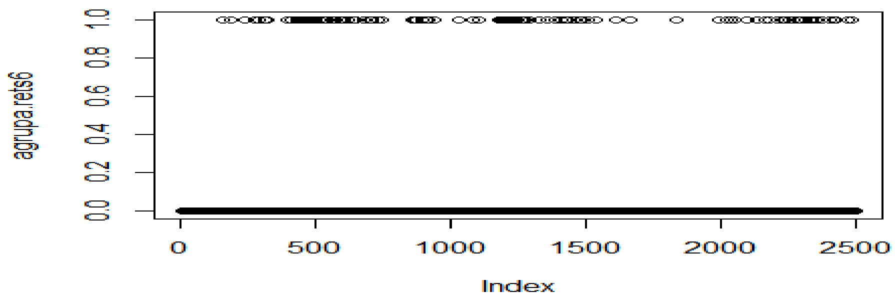



```r
acf(na.omit(r.fchi,main="retornos al cuadrado FCHI"),lag.max = 500)
```



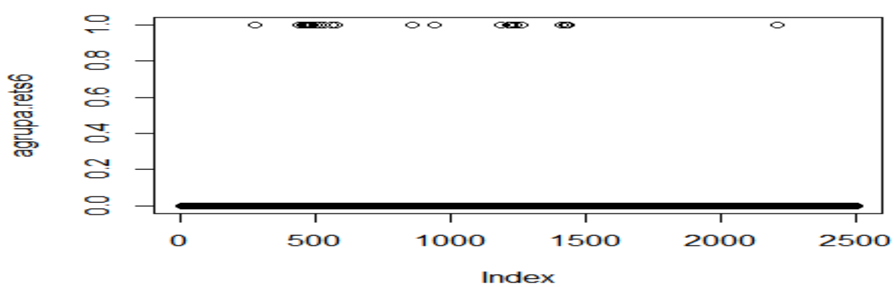
podemos observar significancia en lags alejados, se nota volatilidad por percistencia de autocorrelacisn #la varianza puede estar condicionada a sus valores pasados lo que determina closters

```r
umbral6 <- quantile(na.omit(ret.fchi),.95)
menor.umbr6<-as.numeric(ret.fchi>umbral6)
agrupa.rets6<-menor.umbr6
as.ts(agrupa.rets6)

par(mfrow=c(1,1))
plot(agrupa.rets6)
```



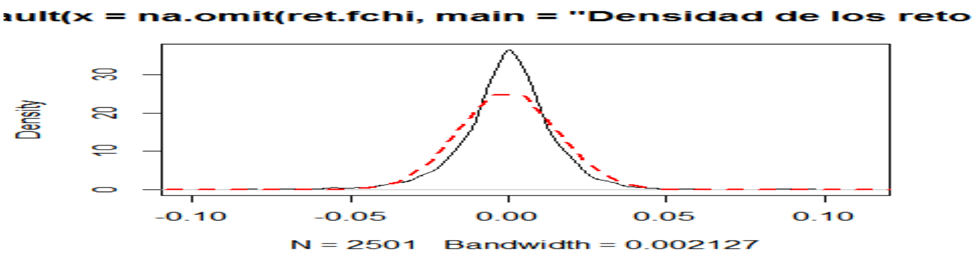
LOS VALORES SE AGLOMERAN

```
umb6<-function(x){
  umbral6 <- quantile(na.omit(ret.fchi),x)
  menor.umbr6<-as.numeric(ret.fchi>umbral6)
  agrupa.rets6<-menor.umbr6
  as.ts(agrupa.rets6)
  par(mfrow=c(1,1))
  plot(agrupa.rets6)
}

umb6(.99)
```



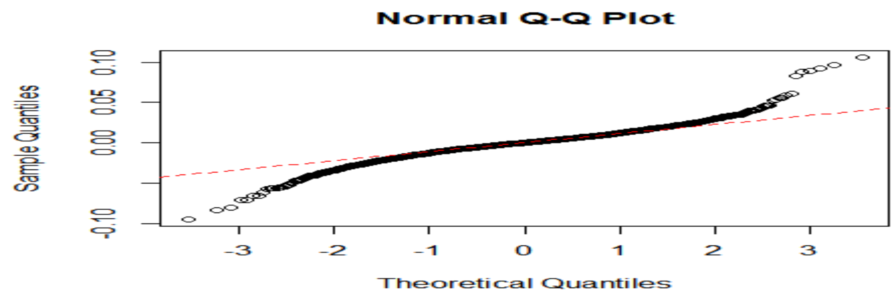
h:5 leptocurtosis

```
par(mfrow=c(1,1))
plot(density(na.omit(ret.fchi, main="Densidad de los retornos del
FCHI")))
z6<-seq(-5,5,len=1000)
x6<-dnorm(z6,mean=mean(ret.fchi,na.rm=T),sd=sd(ret.fchi,na.rm=T))
lines(z6,x6,col='red',lty=2,lwd=2)
```



qq plot para determinar fat tails

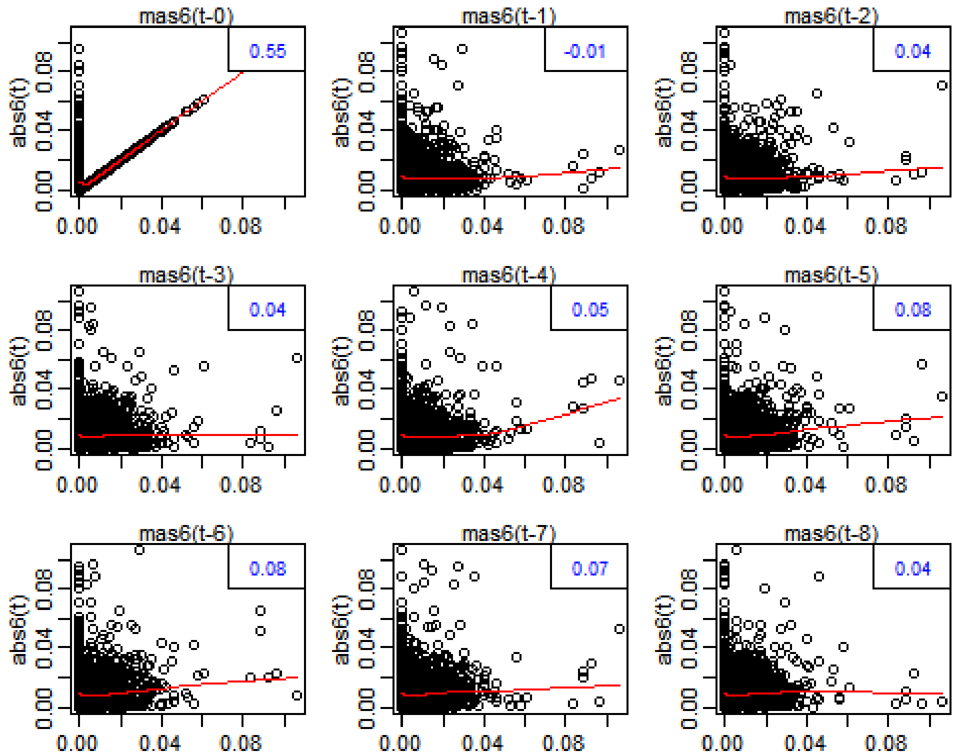
```
w6<-na.omit(coredata(ret.fchi))
qqnorm(w6)
qqline(w6,col='red',lty=2)
```



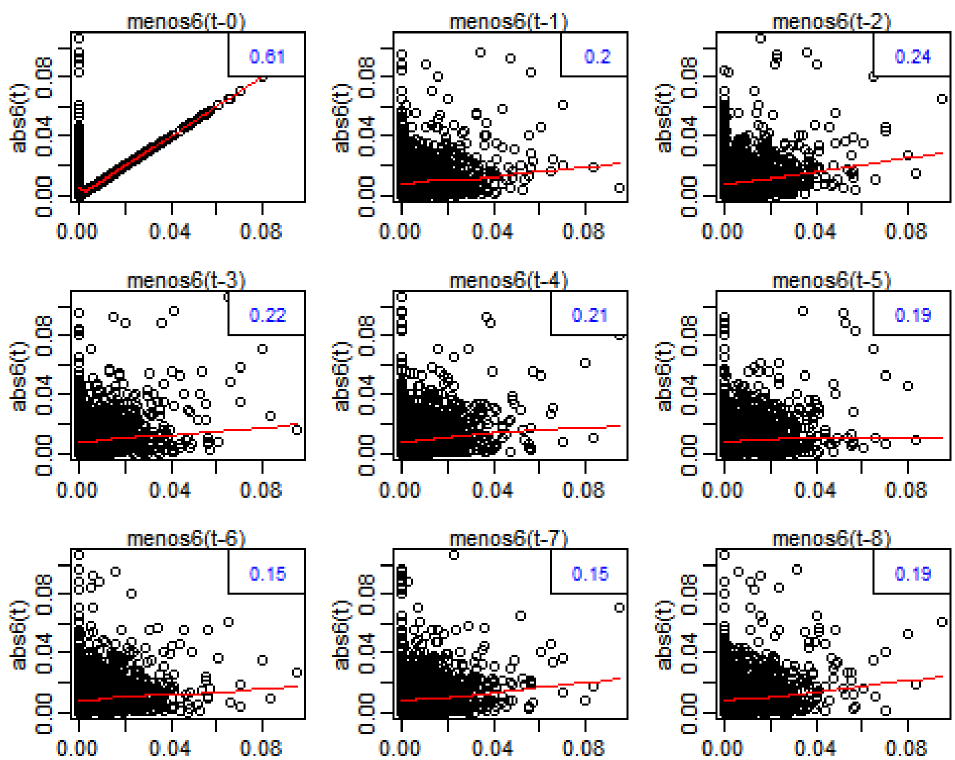
se observa informacisn a los extremos el cual es factor para tener colas anchas

h:6 leverage efect

```
library(astsa)
rets<-function(a){
  b<-diff(log(Ad(a)))
  return(b)
}
dato6<-na.omit(ret.fchi)
mas6<-apply.daily(dato6,function(a) max(a,0))
menos6<-apply.daily(dato6,function(a) -min(a,0))
abs6<-apply.daily(dato6,function(a) abs(a))
lag2.plot(mas6,abs6,8)
```




```
lag2.plot(menos6,abs6,8)
```



#choques negativos y psitivos son asimetricos, los positivos hacen que los #retornos varien menos que los negativos #justificaci??n:??Retornos se modelan mejor con ruido blanco debnil o fuerte? #Ruido blanco Debil #Ya que su funci??n de autocorrelaci?? de los retornos logaritmicos, # #muestran significacia en sus lags. #recoredemos que independencia nos indica no correlaci??, en el cual est?? no es el caso. #Con el Plot de la serie podemos ver como un valor elevado sigue el comportamiento de su #valor o sus valores pasados.

FIN EJERCICIO 1

Especificaciones GARCH en R

```
require(rugarch)

## Loading required package: rugarch

## Loading required package: parallel

##
## Attaching package: 'rugarch'

## The following object is masked from 'package:stats':
##
##     sigma
```

GARCH(1,1)

```
mod.med <- list(armaOrder = c(0, 0), include.mean = F)
mod.var1 <- list(model = "sGARCH", garchOrder = c(1, 1))
spec1 <- ugarchspec(variance.model = mod.var1,
                    mean.model = mod.med)
spec1

##
## *---------------------------------*
## *       GARCH Model Spec          *
## *---------------------------------*
##
## Conditional Variance Dynamics
## ------------------------------------
## GARCH Model      : sGARCH(1,1)
## Variance Targeting   : FALSE
##
## Conditional Mean Dynamics
## ------------------------------------
## Mean Model       : ARFIMA(0,0,0)
## Include Mean     : FALSE
## GARCH-in-Mean        : FALSE
##
## Conditional Distribution
## ------------------------------------
## Distribution :  norm
```

```
## Includes Skew     :  FALSE
## Includes Shape    :  FALSE
## Includes Lambda   :  FALSE
```

GARCH(1,2)

```
mod.med <- list(armaOrder = c(0, 0), include.mean = F)
mod.var2 <- list(model = "sGARCH", garchOrder = c(1, 2))
spec2 <- ugarchspec(variance.model = mod.var2,
                    mean.model = mod.med)
spec2
```

```
## 
## *---------------------------------*
## *       GARCH Model Spec          *
## *---------------------------------*
## 
## Conditional Variance Dynamics
## ------------------------------------
## GARCH Model      : sGARCH(1,2)
## Variance Targeting   : FALSE
## 
## Conditional Mean Dynamics
## ------------------------------------
## Mean Model       : ARFIMA(0,0,0)
## Include Mean     : FALSE
## GARCH-in-Mean        : FALSE
## 
## Conditional Distribution
## ------------------------------------
## Distribution :  norm
## Includes Skew     :  FALSE
## Includes Shape    :  FALSE
## Includes Lambda   :  FALSE
```

GARCH(2,1)

```
mod.med <- list(armaOrder = c(0, 0), include.mean = F)
mod.var3 <- list(model = "sGARCH", garchOrder = c(2, 1))
spec3 <- ugarchspec(variance.model = mod.var3,
                    mean.model = mod.med)
spec3
```

```
## 
## *---------------------------------*
## *       GARCH Model Spec          *
## *---------------------------------*
## 
## Conditional Variance Dynamics
## ------------------------------------
## GARCH Model      : sGARCH(2,1)
## Variance Targeting   : FALSE
```

```
##
## Conditional Mean Dynamics
## ------------------------------------
## Mean Model       : ARFIMA(0,0,0)
## Include Mean     : FALSE
## GARCH-in-Mean        : FALSE
##
## Conditional Distribution
## ------------------------------------
## Distribution :  norm
## Includes Skew    :  FALSE
## Includes Shape   :  FALSE
## Includes Lambda  :  FALSE
```

ARCH(1)

```
mod.med <- list(armaOrder = c(0, 0), include.mean = F)
mod.var4 <- list(model = "sGARCH", garchOrder = c(1, 0))
spec4 <- ugarchspec(variance.model = mod.var4,
                    mean.model = mod.med)
spec4
```

```
##
## *---------------------------------*
## *       GARCH Model Spec          *
## *---------------------------------*
##
## Conditional Variance Dynamics
## ------------------------------------
## GARCH Model      : sGARCH(1,0)
## Variance Targeting   : FALSE
##
## Conditional Mean Dynamics
## ------------------------------------
## Mean Model       : ARFIMA(0,0,0)
## Include Mean     : FALSE
## GARCH-in-Mean        : FALSE
##
## Conditional Distribution
## ------------------------------------
## Distribution :  norm
## Includes Skew    :  FALSE
## Includes Shape   :  FALSE
## Includes Lambda  :  FALSE
```

ARCH(2)

```
mod.med <- list(armaOrder = c(0, 0), include.mean = F)
mod.var5 <- list(model = "sGARCH", garchOrder = c(2, 0))
spec5 <- ugarchspec(variance.model = mod.var5,
                    mean.model = mod.med)
spec5
```

```
##
## *---------------------------------*
## *       GARCH Model Spec          *
## *---------------------------------*
##
## Conditional Variance Dynamics
## -----------------------------------
## GARCH Model      : sGARCH(2,0)
## Variance Targeting   : FALSE
##
## Conditional Mean Dynamics
## -----------------------------------
## Mean Model       : ARFIMA(0,0,0)
## Include Mean     : FALSE
## GARCH-in-Mean        : FALSE
##
## Conditional Distribution
## -----------------------------------
## Distribution :  norm
## Includes Skew    :  FALSE
## Includes Shape   :  FALSE
## Includes Lambda  :  FALSE
```

IGARCH(1,1)

```
mod.med <- list(armaOrder = c(0, 0), include.mean = F)
mod.var6 <- list(model = "iGARCH", garchOrder = c(1, 1))
spec6 <- ugarchspec(variance.model = mod.var6,
                    mean.model = mod.med)
spec6
```

```
##
## *---------------------------------*
## *       GARCH Model Spec          *
## *---------------------------------*
##
## Conditional Variance Dynamics
## -----------------------------------
## GARCH Model      : iGARCH(1,1)
## Variance Targeting   : FALSE
##
## Conditional Mean Dynamics
## -----------------------------------
## Mean Model       : ARFIMA(0,0,0)
## Include Mean     : FALSE
## GARCH-in-Mean        : FALSE
##
## Conditional Distribution
## -----------------------------------
## Distribution :  norm
## Includes Skew    :  FALSE
```

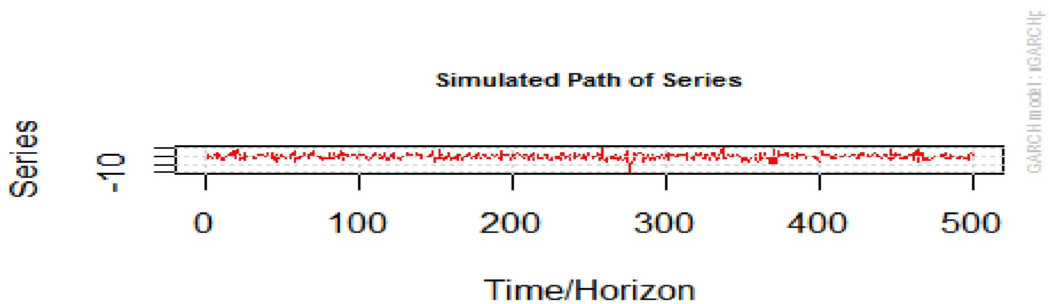
```
## Includes Shape    :   FALSE
## Includes Lambda   :   FALSE
```

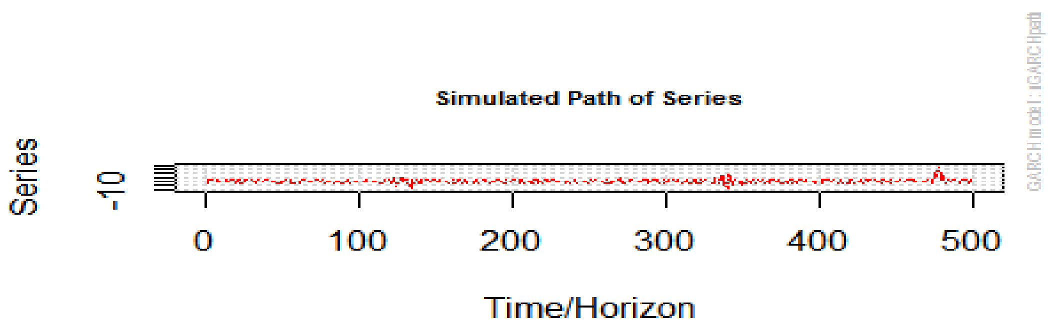
Simulacisn con las especificaciones GARCH

require(rugarch)

GARCH(1,1)

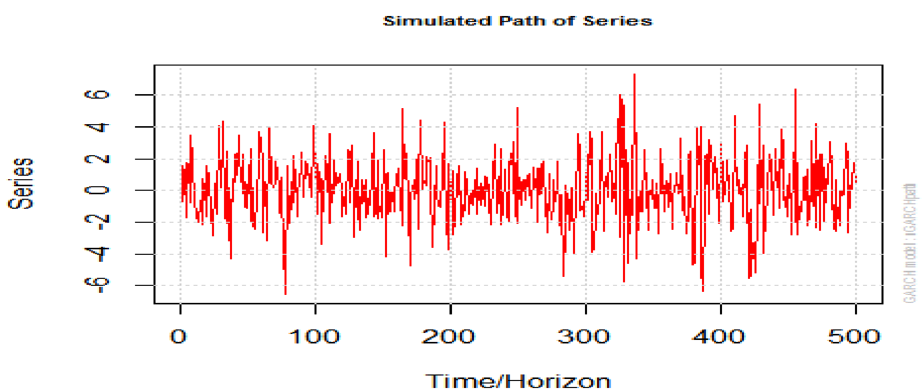
```
par(mfrow=c(2,1))
## Con Cuarto Momento Finito:
prmtrs1 <- list(omega=1, alpha1 = 0.4, beta1 = 0.2)
spec1 <- ugarchspec(variance.model = mod.var1,
                    mean.model = mod.med,
                    fixed.pars = prmtrs1)

garch.sim1 <- ugarchpath(spec1, n.sim = 500)
plot(garch.sim1, which = 2)

## Sin Cuarto Momento Finito
prmtrs1 <- list(omega=1, alpha1 = 0.6, beta1 = 0.2)
spec1 <- ugarchspec(variance.model = mod.var1,
                    mean.model = mod.med,
                    fixed.pars = prmtrs1)

garch.sim1 <- ugarchpath(spec1, n.sim = 500)
plot(garch.sim1, which = 2)
```





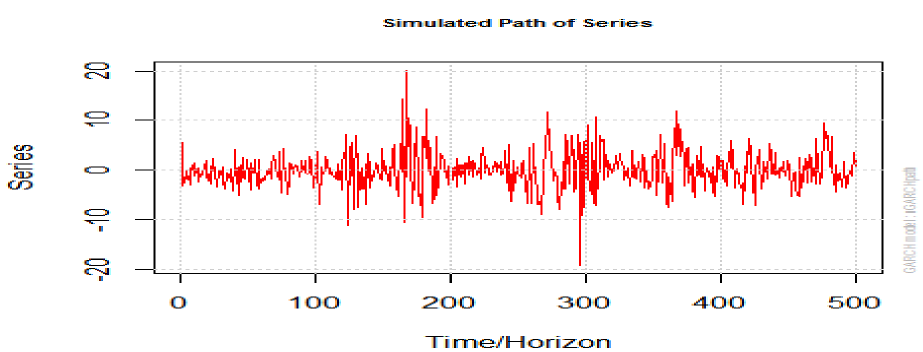
GARCH(1,2)

```r
par(mfrow=c(1,1))
prmtrs2 <- list(omega=1, alpha1 = 0.2, beta1 = 0.4, beta2 = 0.2)
spec2 <- ugarchspec(variance.model = mod.var2,
                    mean.model = mod.med,
                    fixed.pars = prmtrs2)

garch.sim2 <- ugarchpath(spec2, n.sim = 500)
plot(garch.sim2, which = 2)
```



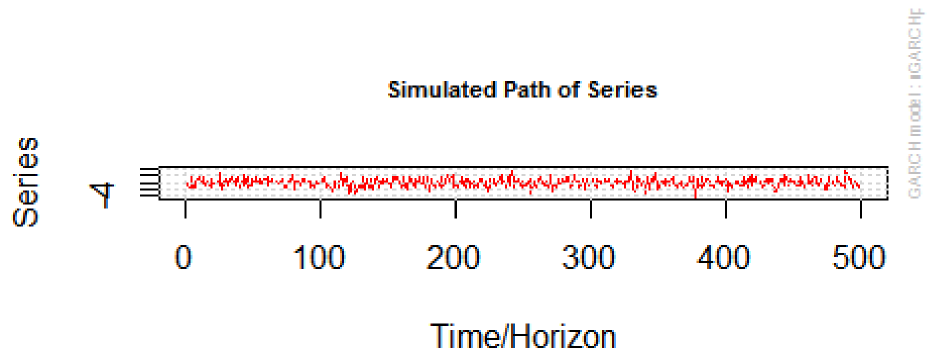
GARCH(2,1)

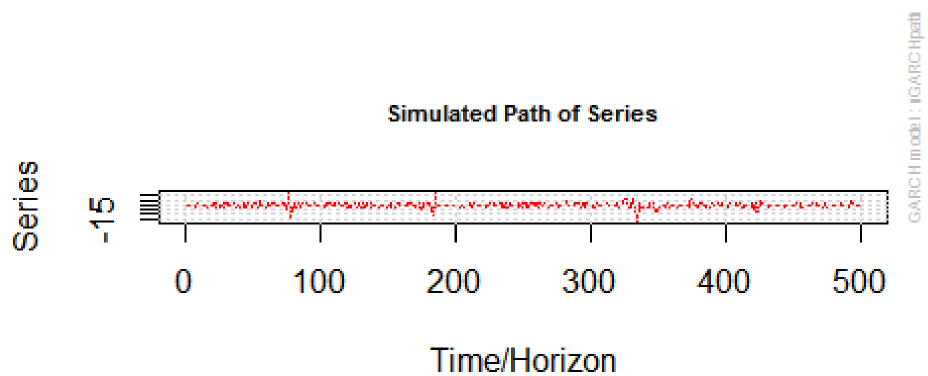
```r
par(mfrow=c(1,1))
prmtrs3 <- list(omega=1, alpha1 = 0.2, alpha2 = 0.23, beta1 = 0.5)
spec3 <- ugarchspec(variance.model = mod.var3,
                    mean.model = mod.med,
                    fixed.pars = prmtrs3)

garch.sim3 <- ugarchpath(spec3, n.sim = 500)
plot(garch.sim3, which = 2)
```



ARCH(1)

```r
par(mfrow=c(2,1))
# Con Cuarto Momento Finito
prmtrs4 <- list(omega=1, alpha1 = 0.36)
spec4 <- ugarchspec(variance.model = mod.var4,
                    mean.model = mod.med,
                    fixed.pars = prmtrs4)

garch.sim4 <- ugarchpath(spec4, n.sim = 500)
plot(garch.sim4, which = 2)

# Sin Cuarto Momento Finito
prmtrs4 <- list(omega=1, alpha1 = 0.8)
spec4 <- ugarchspec(variance.model = mod.var4,
                    mean.model = mod.med,
                    fixed.pars = prmtrs4)

garch.sim4 <- ugarchpath(spec4, n.sim = 500)
plot(garch.sim4, which = 2)
```

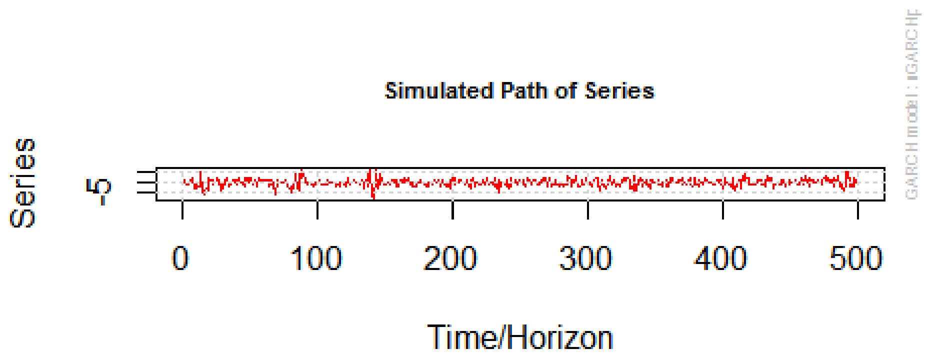


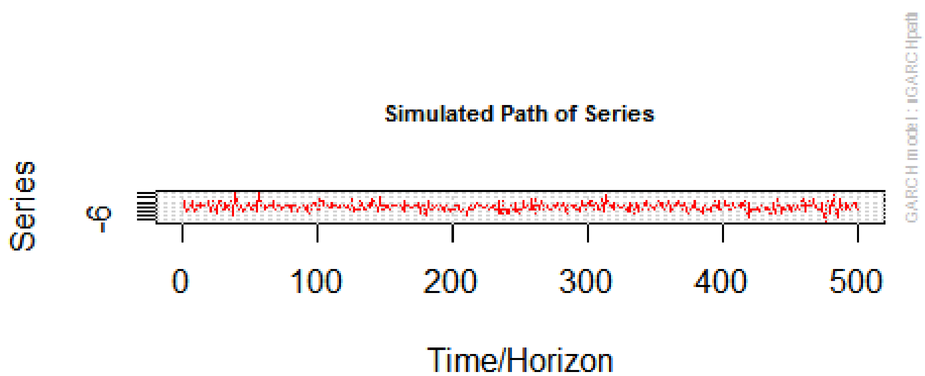


ARCH(2)

```r
par(mfrow=c(2,1))
# Con Cuarto Momento Finito
prmtrs5 <- list(omega=1, alpha1 = 0.2, alpha2 = 0.5)
```

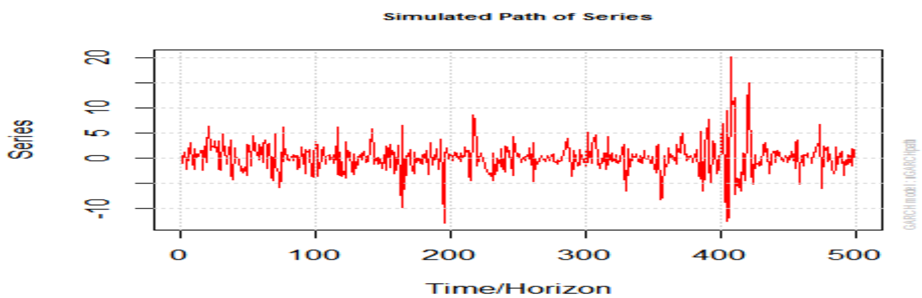
```
spec5 <- ugarchspec(variance.model = mod.var5,
                    mean.model = mod.med,
                    fixed.pars = prmtrs5)

garch.sim5 <- ugarchpath(spec5, n.sim = 500)
plot(garch.sim5, which = 2)

# Sin Cuarto Momento Finito
prmtrs5 <- list(omega=1, alpha1 = 0.4, alpha2 = 0.5)
spec5 <- ugarchspec(variance.model = mod.var5,
                    mean.model = mod.med,
                    fixed.pars = prmtrs5)

garch.sim5 <- ugarchpath(spec5, n.sim = 500)
plot(garch.sim5, which = 2)
```





IGARCH(1,1)

```
par(mfrow=c(1,1))
prmtrs6 <- list(omega=1, alpha1 = 0.9)
spec6 <- ugarchspec(variance.model = mod.var6,
                    mean.model = mod.med,
                    fixed.pars = prmtrs6)

garch.sim6 <- ugarchpath(spec6, n.sim = 500)
plot(garch.sim6, which = 2)
```

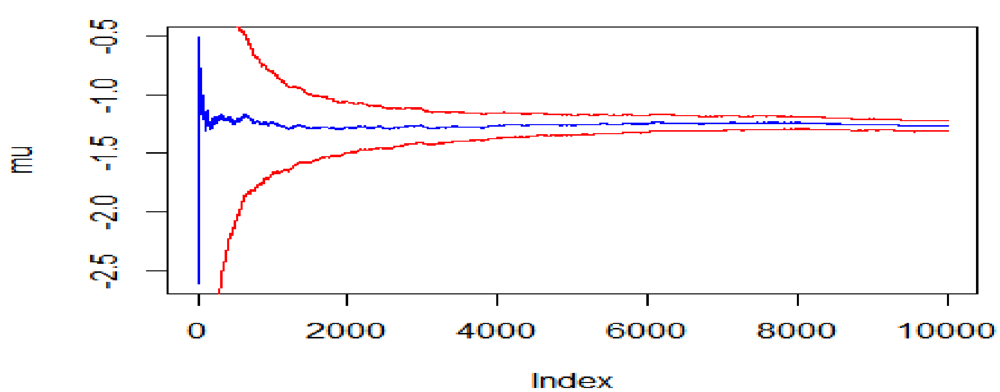


Estacionariedad

EJERCICIO 4

1

```
simula <- function(n.sim){
  alpha <- rnorm(n.sim)
  a<- log( alpha ^ 2 )
  mu <- cumsum(a) / seq_along(a)
  err.ind <- a - mu
  err.total <- sum(err.ind^2)
  sigma.n <- sqrt(err.total) / seq_along(a)
  upper <- mu + 1.96*sigma.n
  lower <- mu - 1.96*sigma.n
  plot(mu, type = 'l', col = "blue")
  lines(upper, col = "red")
  lines(lower, col = "red")
}
simula(10000)
```



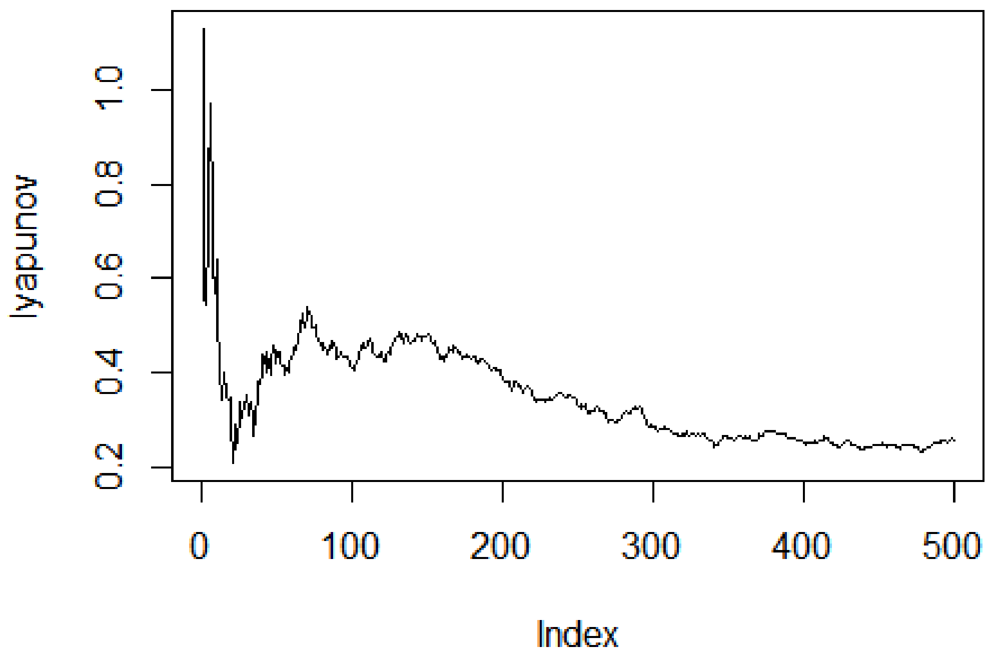
2

```
z<-rnorm(10^4)
estim<-mean(2*z^2+.9)
estim< 1

## [1] FALSE

decide<-function(n.sim,alpha,beta){
  z<-rnorm(n.sim)
  estim<-mean(alpha*z^2+beta)
  estim< 1
}
decide(1000,.2,.3)

## [1] TRUE
```

CAMBIANDO VALORES Y ORDENES DEL GARCH

SE PROGRAMA FUNCION EN EL CUAL SOLO SE DEBERA CAMBIAR EL ORDEN Y VALORES DEL GARCH Y SUS PARAMETROS

```
alpha=c(2,1)
beta=c(0)
garch_matrix<-function(alpha,beta){
  renglones <- rbind(c(alpha*rnorm(1)^2, beta*rnorm(1)^2),
                     cbind(diag(1,length(alpha)-1,length(beta)),
                           diag(0,length(alpha)-1,length(alpha))),
                     c(alpha, beta), cbind(diag(0,length(beta)-
1,length(alpha)),
                                           diag(1,length(beta)-
1,length(beta))))
  A <- matrix(renglones, nrow = length(alpha)+length(beta))
}
garch_matrix(alpha,beta)

matrices <- rerun(500, garch_matrix(alpha, beta))
prods <- accumulate(matrices, `%*%`)
normas <- map_dbl(prods, norm)
lyapunov <- log(normas) / seq_along(normas)
plot(lyapunov, type = "l")
```



El resultado del lyapunov varía según el modelo que se analice, notamos que para 500 simulaciones el valor tiende a estar entre 02 y .3.

Momentos superiores

EJERCICIO4

1

Nota mu4 es una variable aletoria y su cuarto momento es 3

```
mom.cuatro<-function(mu4,alpha,beta,w) {
  estim<-mu4*((w^2*(1-alpha+beta))/((1-alpha-beta)*(1-mu4)*alpha^2-
beta^2-2*alpha*beta))
  estim<-alpha+beta
  mu4>0 & estim!=1 & w!=0
}

mom.cuatro(3,.2,.8,2)
```

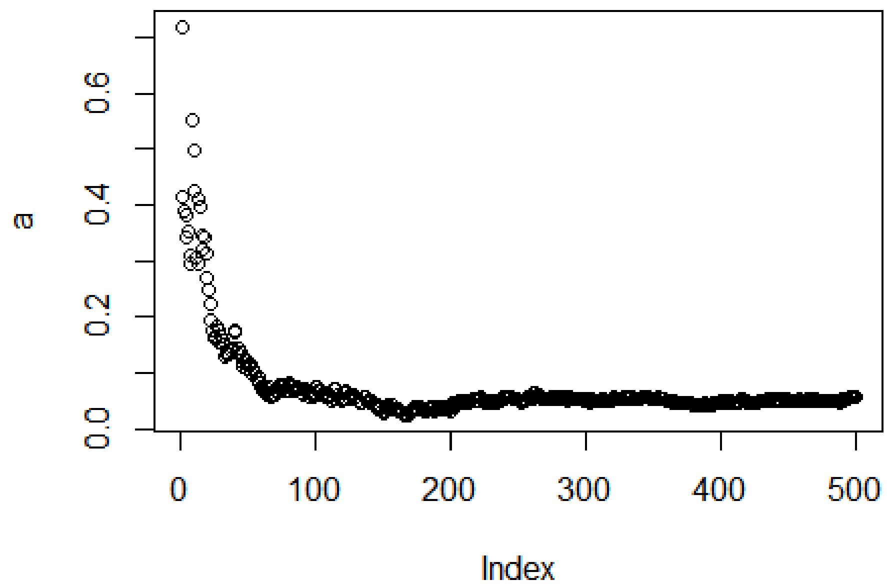
```
## [1] FALSE
```

EL metodo montecarlo te daran valores que convergan por lo tanto en cuanto mas elevada sea la simulacion los valores convergen podriendo violar las r estricci??nes.

FIN DEL 1

2

```
library(purrr)
alpha<-c(.1,.3)
beta<-c(.2,.5)

garch_matrix<-function(alpha,beta){
  renglones <- rbind(c(alpha*rnorm(1)^2, beta*rnorm(1)^2),
                     cbind(diag(1,length(alpha)-1,length(beta)),
                           diag(0,length(alpha)-1,length(alpha))),
                     c(alpha, beta), cbind(diag(0,length(beta)-
1,length(alpha)),
                                           diag(1,length(beta)-
1,length(beta))))
  A <- matrix(renglones, nrow = length(alpha)+length(beta))
  A.2 <- kronecker(A,A)
}

matrices <- rerun(500, garch_matrix(alpha, beta))
prods <- accumulate(matrices, `%*%`)
normas <- map_dbl(prods, norm)
a<- log(normas) / seq_along(normas)
plot(a)
```




```
rho <- max(abs(eigen(garch_matrix(alpha, beta))$values))
rho

## [1] 1.215237
```

si llevas al limite la la esperanza de las sumo de los productor (kronecker) tiende a cero, lo que equivale a un radio espectral menor a uno.

No es menor a uno el radio espectral dado el modelo.

FIN