Weekly Homework 1 570

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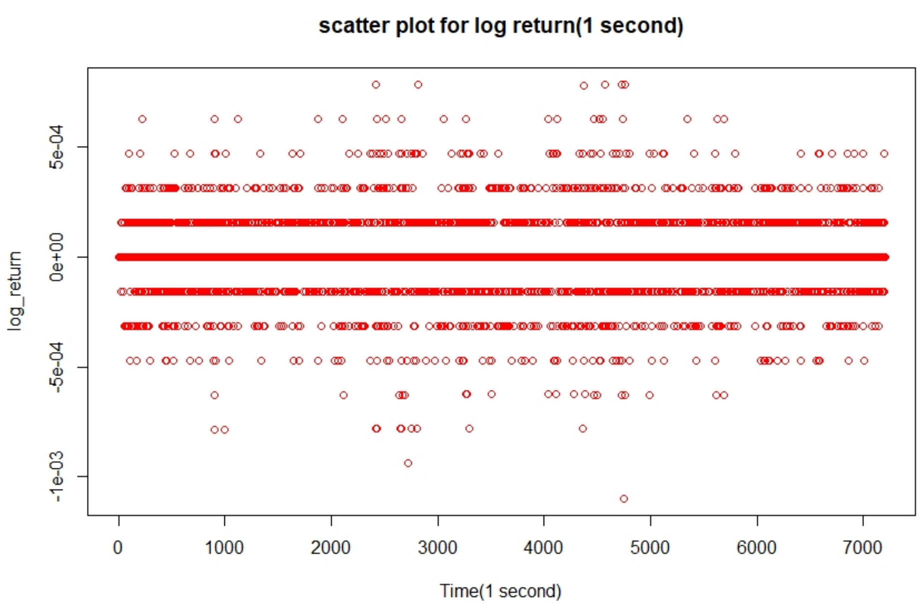
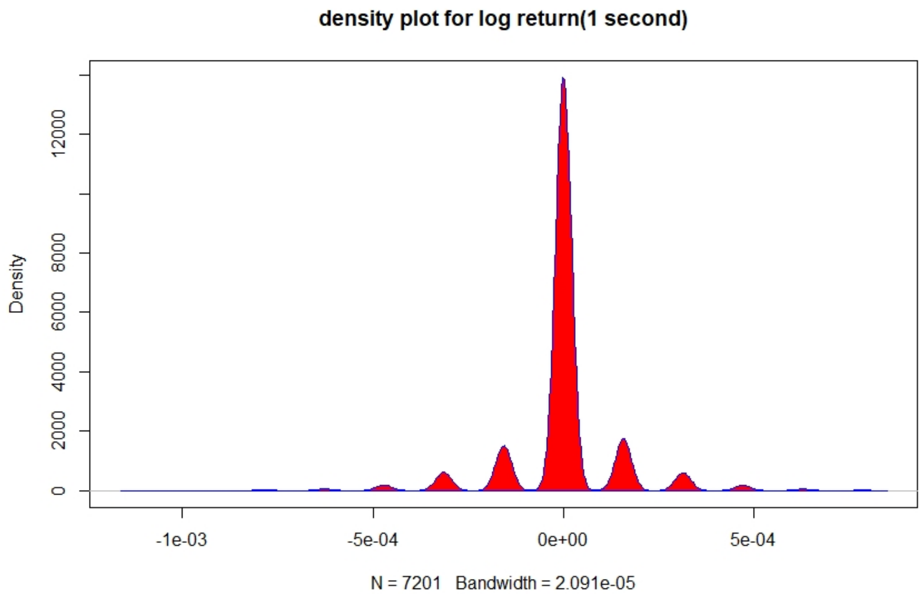
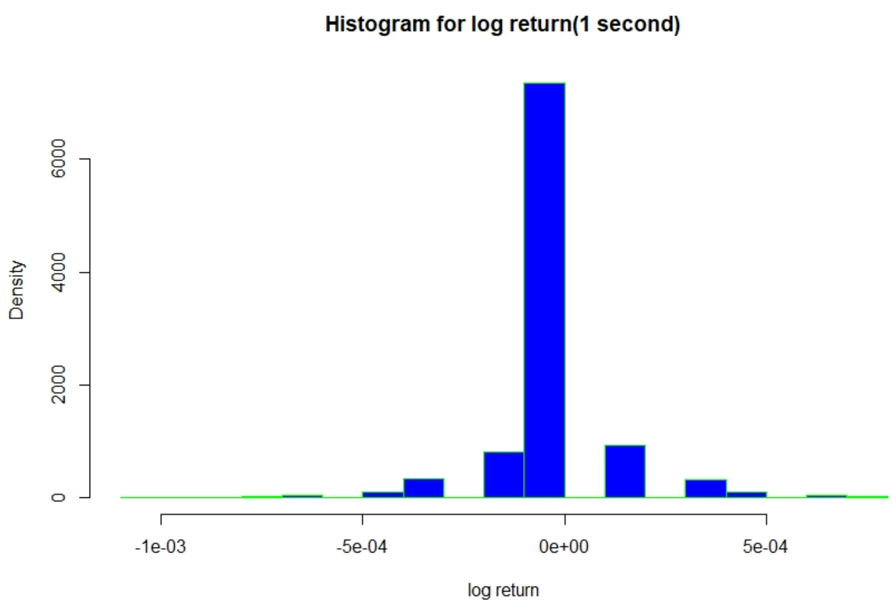
September 23,2018

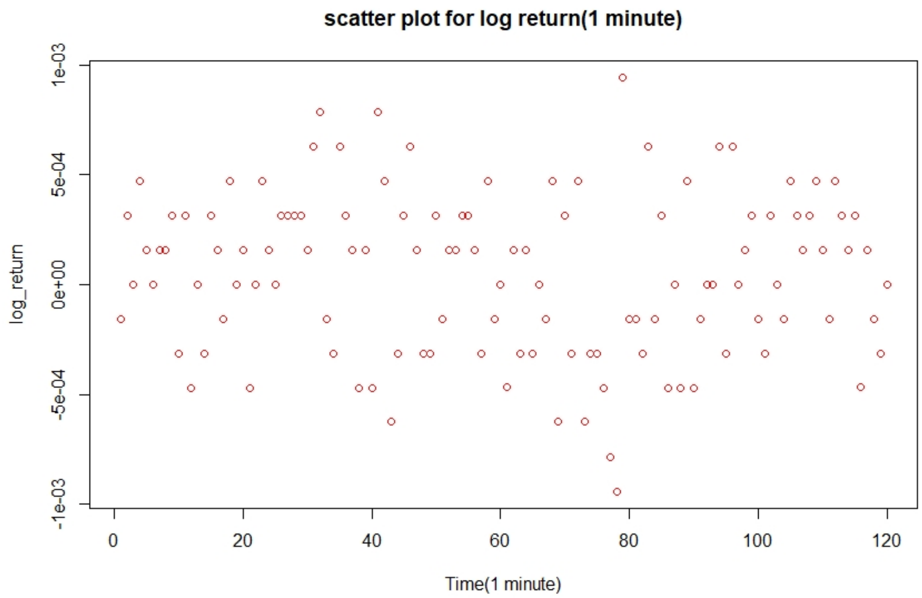
Assignment 1.

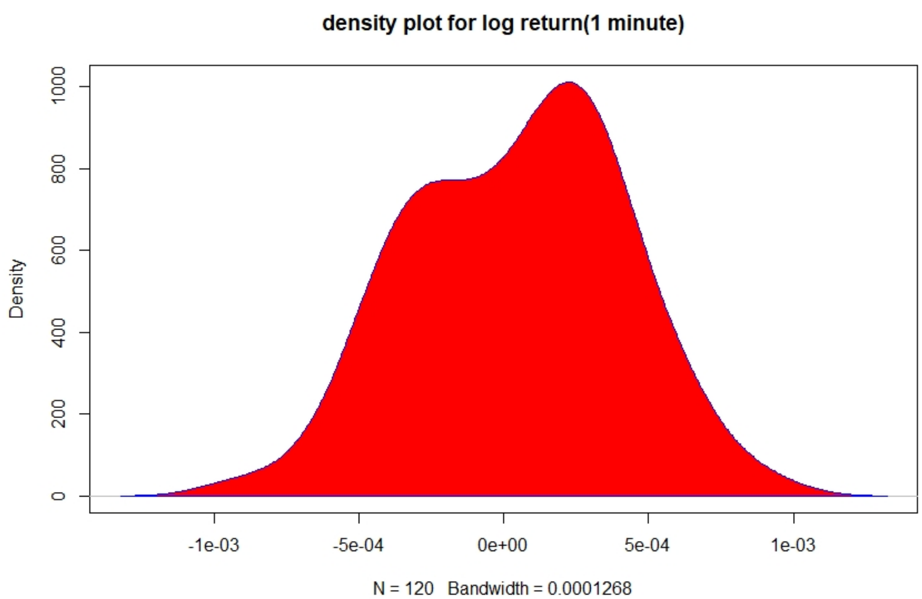
Solution.
The results were printed in the following table and pictures:

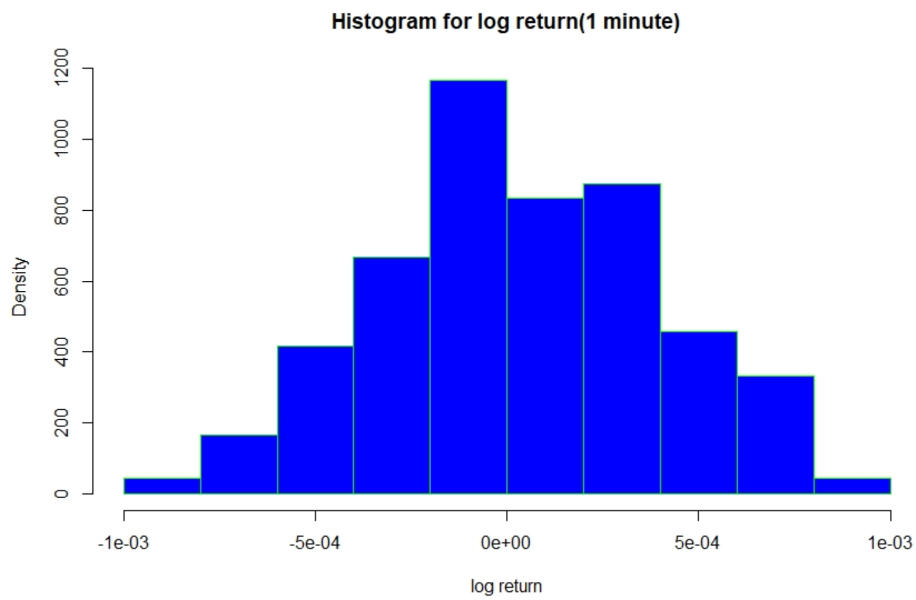



density plot for log return(1 second)
Density
0
2000
4000
6000
8000
12000
-1e-03
-5e-04
0e+00
5e-04
N = 7201 Bandwidth = 2.091e-05


Histogram for log return(1 second)
Density
0
2000
4000
6000
-1e-03
-5e-04
0e+00
5e-04
log return


scatter plot for log return(1 minute)
log_return
1e-03
5e-04
0e+00
-5e-04
-1e-03
0
20
40
60
80
100
120
Time(1 minute)


density plot for log return(1 minute)
Density
1000
800
600
400
200
0
-1e-03
-5e-04
0e+00
5e-04
1e-03
N = 120 Bandwidth = 0.0001268


Histogram for log return(1 minute)
Density
0
200
400
600
800
1000
1200
-1e-03
-5e-04
0e+00
5e-04
1e-03
log return

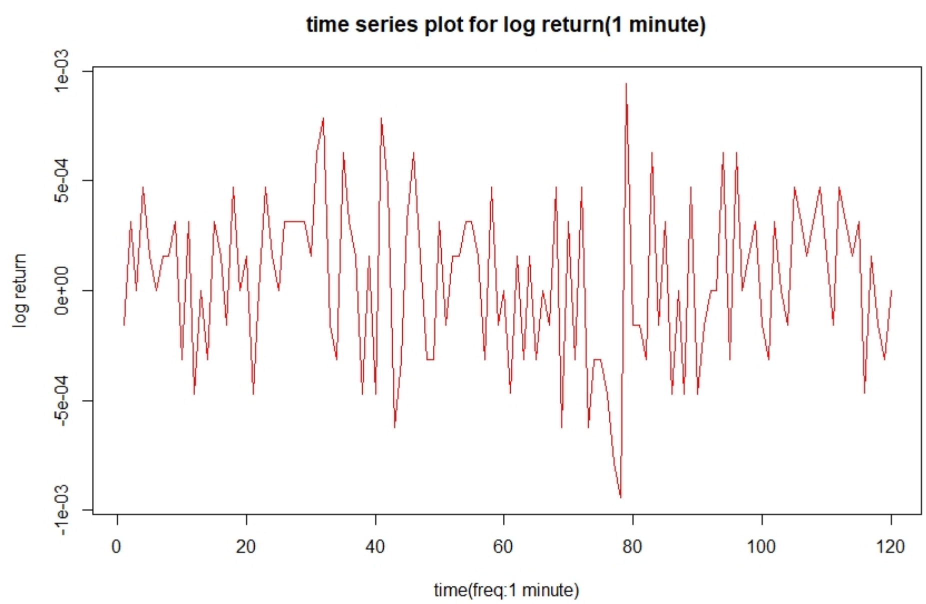

time series plot for log return(1 minute)
log return
-1e-03
-5e-04
0e+00
5e-04
1e-03
0
20
40
60
80
100
120
time(freq:1 minute)

Table 1: The summary statistics for log return under two time scale

time scale	1 second	1 minute
mean	7.849e-07	0.0000471
median	0.000e+00	0.0001565
min	-1.099e-03	-0.0009421
max	7.850e-04	0.0009421
standard deviation	0.0001372482	0.0003668975
skewness	-0.260372	-0.1312071
excess kurtosis	7.502312	-0.4560687

brief comments:
When the time scale is larger(1 minute here), the distribution of the log return is more similar to normal distribution. However, when the time scale becomes smaller(1 second here), the distribution function tend to have sharp peak and fat tail,it is not like a normal distribution anymore.
R code attached:

```
library(moments)
data<-read.csv(file.choose())#read the csv file given
head(data)
names(data)
time<-data[,1]
price<-data[,2]
n<-length(price)
```

```
#Analysis for time sclae 1 second
p1<-c()
i<-1
while(i<=n)
{
  val1<-mean(price[i:i+4])
  p1<-c(p1,val1)
  i=i+5
}
n1<-length(p1)
time1<-c(1:(n1-1))

lr1<-log(p1[-1])-log(p1[-n1])
summary(lr1)
sd(lr1)

skewness(lr1)

kurtosis(lr1)-3

plot(time1,lr1,xlab="Time(1 second)",ylab="log_return",
type="p",col="red",main="scatter plot for log return(1 second)")
plot(density(lr1),main="density plot for log return(1 second)")
polygon(density(lr1), col="red", border="blue")
hist(lr1,freq=FALSE,main="Histogram for log return(1 second)",
xlab="log return",border="green", col="blue")

#Analysis for time scale 1 minute
p2<-c()
j<-1
while(j<=floor(n/300)*300)
{
  val2<-mean(price[j:j+299])
  p2<-c(p2,val2)
  j=j+300
}
last<-mean(price[36001:36010])
p2<-c(p2,last)
n2<-length(p2)
lr2<-log(p2[-1])-log(p2[-n2])
summary(lr2)
sd(lr2)

skewness(lr2)
```

```
kurtosis(lr2)-3
time2<-c(1:(n2-1))

plot(time2,lr2,xlab="Time(1 minute)",ylab="log_return",
type="p",col="red",main="scatter plot for log return(1 minute)")
plot(density(lr2),main="density plot for log return(1 minute)")
polygon(density(lr2), col="red", border="blue")
hist(lr2,freq=FALSE,main="Histogram for log return(1 minute)",
 xlab="log return",border="green", col="blue")

ts_lr1<-ts(lr1)
ts.plot(ts_lr1,col="red",main="time series plot for log return(1 second)",
xlab="time(freq:1 second)",ylab="log return")
ts_lr2<-ts(lr2)
ts.plot(ts_lr2,col="red",main="time series plot for log return(1 minute)",
xlab="time(freq:1 minute)",ylab="log return")
```

Assignment 2.

Solution.
(1.a) The difference between CoCos and their traditional counterparts is related to the conversion process; traditional convertible bonds provide the holder with the option to convert if/when the bond hits its conversion strike price, while CoCos will not convert to equity until its issuing bank's capital ratio falls below a specified level, at which time the bank is forced to convert the bonds to equity. The conversion level is typically based on a percentage of the bank's tier one capital. If the bank's ratio falls below its trigger point, the debt is converted into common stock, while the bank is then no longer required to pay its stock dividends.
(1.b) Beacuse the yields CoCos are offering right now are very attractive as compared to those of tradtional convertible bonds, as well as many other fixed income products.Also, the risk is futher reduced by the quantitative easing policies of the European Central Bank, which have been designed to create a smooth functioning creadit market. So an appropriate allocation of CoCos will provides the protentail for both a realative and absolute risk-adjusted return beyond what most other asset classes can offer today.
(2.a) Firstly, Due to its debt nature,as compared to a common equity, the cost of capital and consequently, the cost of maintaining a risk absorbing system(the risk are divided from the issuers to the holders) are lower.
(2.b) Secondly, Considering risk management. CoCos have the protential to prevent system collaspse of financial institutions like banks. If the conversion occurs promptly, a bankruptcy can be entirely prevented due to quick injection of capital which would be impossible to be obtained otherwise.

Assignment 3.

Solution.

(1) Bitcoin has no intrinsic value and due to this the present value of bitcoin is determined on the basis of expectations about its future price. Trade in bitcoins is based on the assumption of and the expectations of future prices. For instance a buyer will buy bitcoin only if the buyer expects that the bitcoin will sell for the same price later on (at the minimum) or will sell for higher prices. Therefore the price of bitcoins reacts elastically to changes in the expectations of market participants and is relfected in extreme price volatility.

(2) In my opinion, Bitcoin is a kind of asset that stores value. It's similar to golds. However, it's virtual. Bitcoin can not generate income and be consumed. Bitcoin exists as a digital currency to store value. It can be saved , retrieved and exchanged at a later time and hence it's a store of value asset.(From the definition on the class, i think it most likely belongs to real assets.)