GR5261_HW1_tl2810

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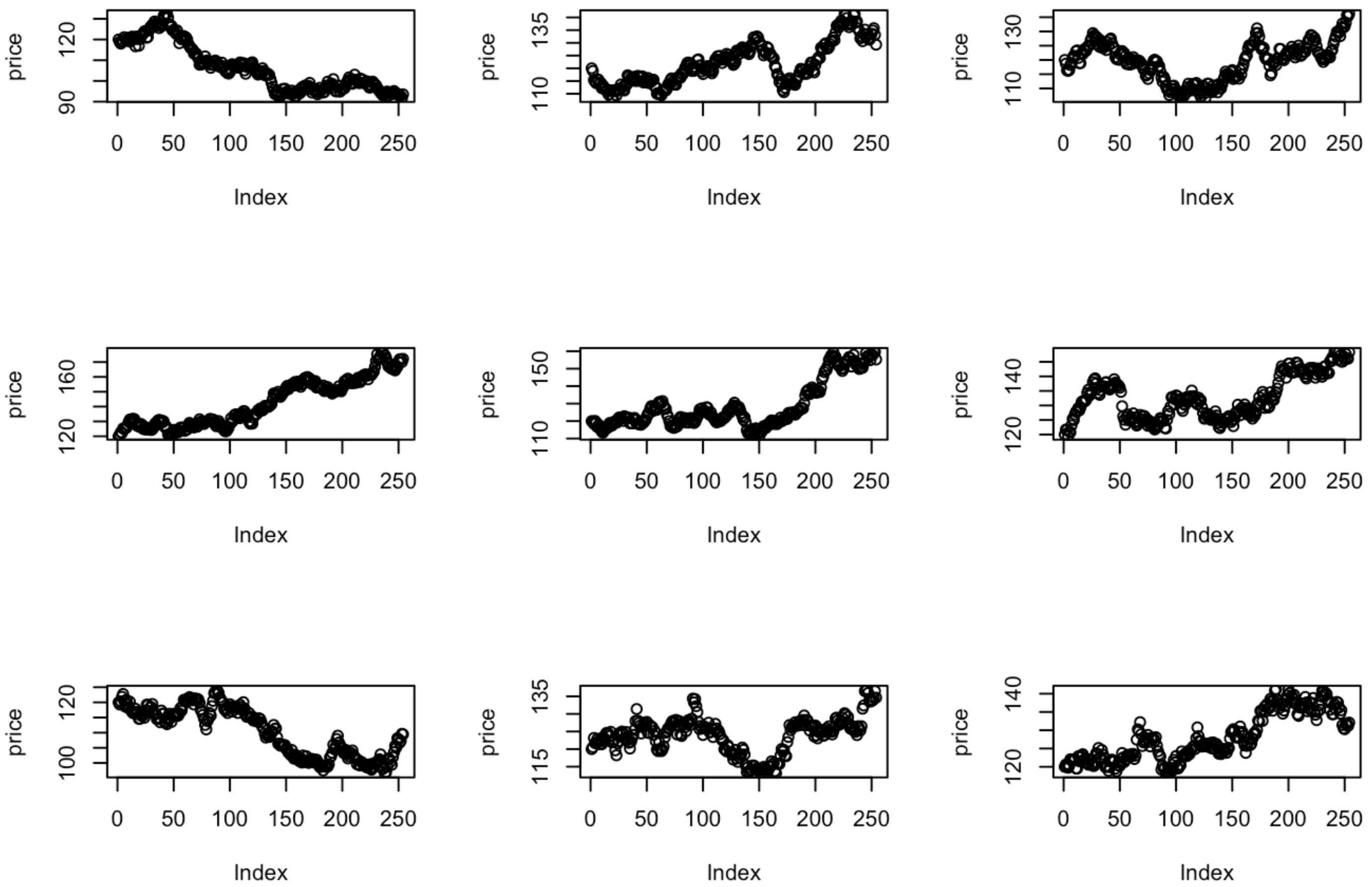
Problem 9: In this simulation, what are the mean and standard deviation of the log-returns for 1 year?

```
set.seed(2012)
n=253
par(mfrow=c(3,3))
for (i in (1:9))
{
logr = rnorm(n, 0.05 / 253, 0.2 / sqrt(253))
price = c(120, 120 * exp(cumsum(logr)))
plot(price, type = "b")
}
```



The mean is 0.05/253=0.0001976285 and the standard deviation is 0.2/sqrt(253)=0.01257389.

Problem 11: Explain what the code c(120,120*exp(cumsum(logr))) does.

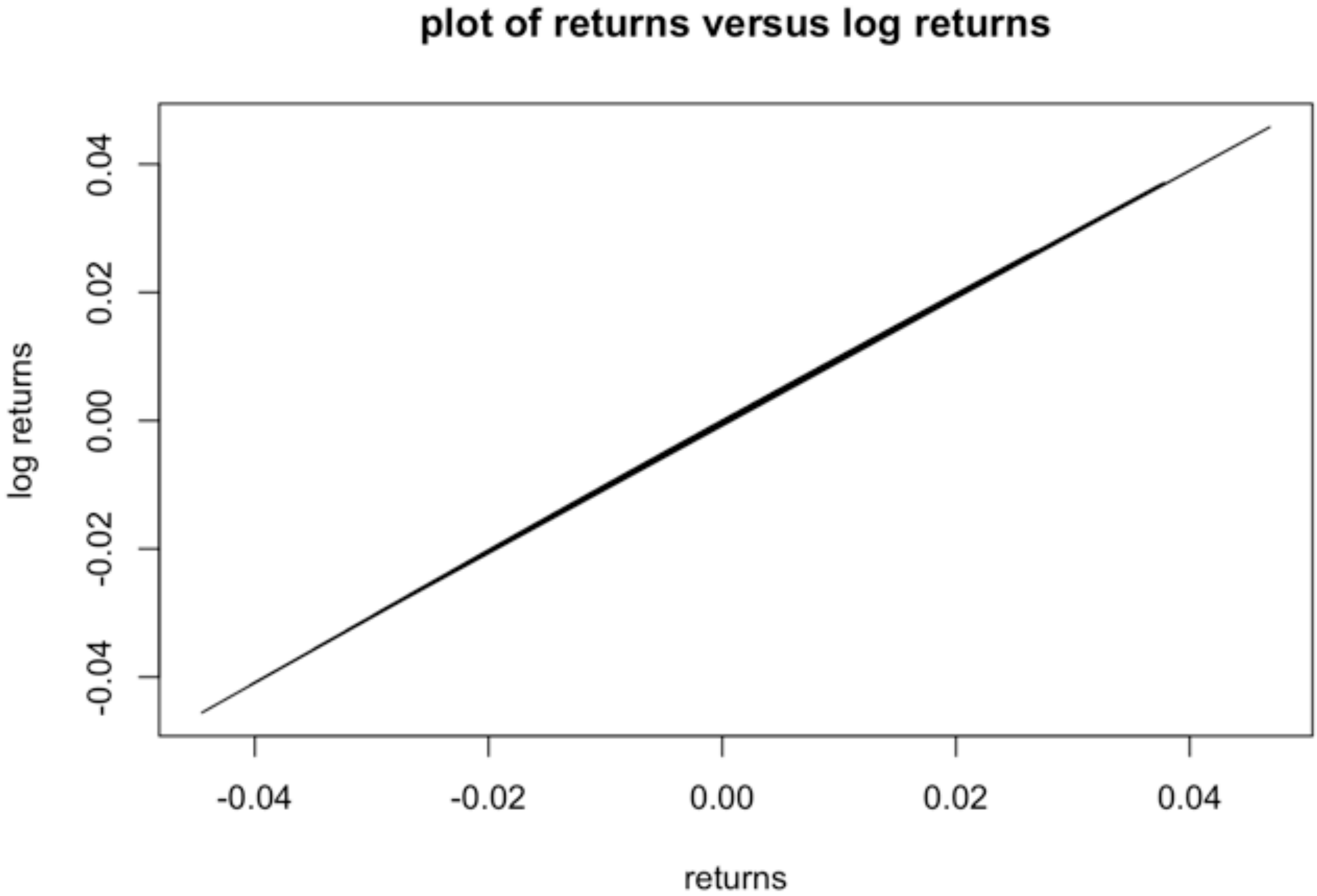
The code shows the simulation of stock price with the begining price 120 in 1 year. The code cumsum() form a series of log returns. Then, the code 120*exp() form log return to regular return with the starting price 120. Finally, c(120,120*exp(cumsum(logr))) form the final series of price for 1 year starting from 120.

Problem 12: Compute the returns and log returns and plot them against each other. As discussed in Sect. 2.1.3, does it seem reasonable that the two types of daily returns are approximately equal?

```
setwd("~/Downloads/5261/datasets")
data = read.csv("MCD_PriceDaily.csv")
head(data)
```

```
##        Date  Open  High   Low Close   Volume Adj.Close
## 1  1/4/2010 62.63 63.07 62.31 62.78  5839300     53.99
## 2  1/5/2010 62.66 62.75 62.19 62.30  7099000     53.58
## 3  1/6/2010 62.20 62.41 61.06 61.45 10551300     52.85
## 4  1/7/2010 61.25 62.34 61.11 61.90  7517700     53.24
## 5  1/8/2010 62.27 62.41 61.60 61.84  6107300     53.19
## 6 1/11/2010 62.02 62.43 61.85 62.32  6081300     53.60
```

```
adjPrice = data[, 7]
n = nrow(data)
return = adjPrice[-1]/adjPrice[-n] -1
logreturn = log(1+return)
plot(return,logreturn,type = "l",main = "plot of returns versus log returns", xlab
= "returns", ylab = "log returns")
```




```r
max(abs(return))
```

```
## [1] 0.04684758
```

Yes, it seems reasonable since most of the net returns are small. The maximum of the absolute value of returns are less than 5%, so log(1+x) is very approximately equal to x. Thus, it seems reasonable that the two types of daily returns are approximately equal.

Exercise 1:

```r
logr2 = log(990/1000)
pnorm(logr2, 0.001, 0.015)
```

```
## [1] 0.2306557
```

a. The probability that after one trading day your investment is worth less than $990 is 0.2306557.

```r
pnorm(logr2, 5*0.001, sqrt(5)*0.015)
```

```
## [1] 0.3268189
```

b. The probability that after five trading days your investment is worth less than $990 is 0.3268189.

Exercise 3:

```
logr3 = log(90/80)
1-pnorm(logr3, 2*0.08, sqrt(2)*0.15)
```

```
## [1] 0.5788736
```

The probability that 2 years from now it is selling at $90 or more is 0.5788736.

Exercise 10:

```
logr4 = log(100/97)
1-pnorm(logr4, 20*0.0002, sqrt(20)*0.03)
```

```
## [1] 0.4218295
```

The probability that it will exceed $100 after 20 trading days is 0.4218295.