Assignment 2

I pledge to the Honor Code to obey all rules for taking and performing homework assignments as specified by the course instructor.

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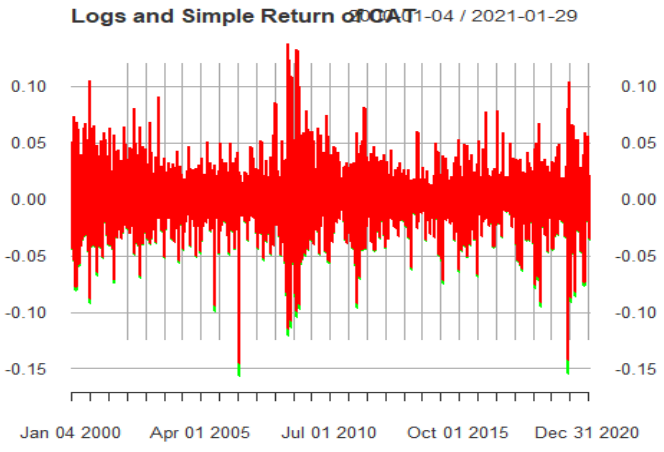
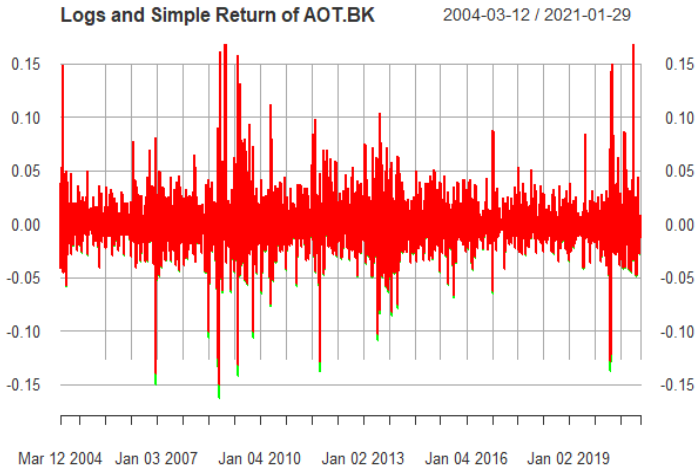
All data are downloadable from Yahoo Finance

1. Consider the stock price of Caterpillar (CAT) stocks, Airport of Thailand Public Company Limited (AOT.BK) from January 3, 2000 to January 31, 2021. The data are downloadable from yahoo finance.
   a. Calculate the log returns and the simple returns, then plot these 2 series on the same figure.



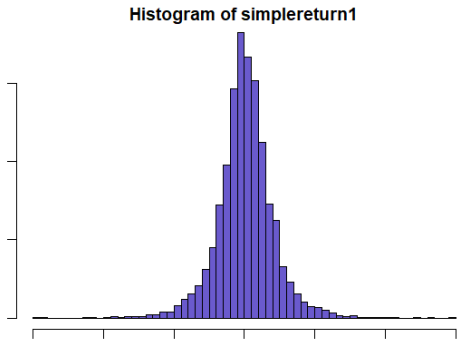


   b. Compute the sample mean, standard deviation, skewness, excess kurtosis, minimum, and maximum of each simple return series.

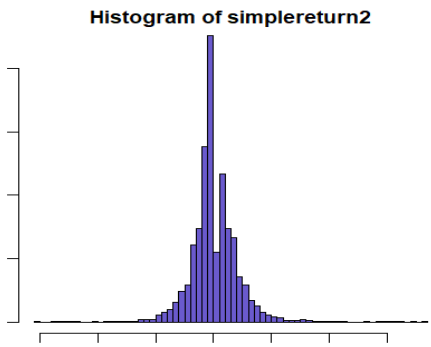
	CAT	AOT.BK
Sample mean	0.0007	0.0010
Standard deviation	0.0205	0.0213
Skewness	0.0197	0.5443
Excess Kurtosis	4.5480	10.0827
Minimum	-0.1452	-0.1505
Maximum	0.1472	0.1834

   c. Obtain the empirical density function of the simple returns of Caterpillar stock. Are the daily simple returns normally distributed? Perform a normality test to justify your answer.

According to Jarque Bera Test, data: newsimplereturn1
H0: The daily simple returns are normally distributed
Ha: The daily simple returns are not normally distributed.
X-squared = 4569.9, df = 2, p-value < 2.2e-16
p value is less than 0.05, therefore we can reject the null hypothesis, and the simple return of the stock is not distributed as normal distribution with 95% confidence interval.



CAT's simple returns



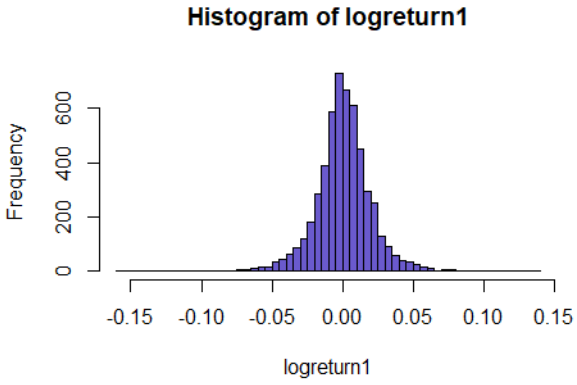
AOT's daily log return

d. Compute the sample mean, standard deviation, Skewness, Excess Kurtosis, minimum, and maximum of each log return series.

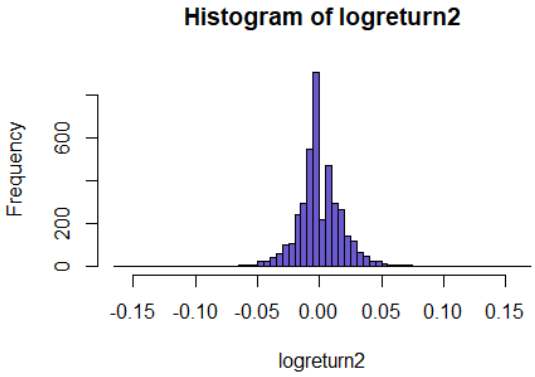
	CAT	AOT.BK
Sample mean	0.0005	0.0007
Standard deviation	0.0205	0.0212
Skewness	-0.1836	0.1746
Excess Kurtosis	4.6982	9.6096
Minimum	-0.1569	-0.1632
Maximum	0.1373	0.1684

e. Test the null hypothesis that the mean of the log returns of Caterpillar stock is zero. Do the same test for AOT stock.
From conducting the t test for the log returns of Caterpillar stock, the hypotheses are
H0: The mean of the log returns = 0
Ha: The mean of the log returns is not equal to 0
t = 1.7296, df=5301, p-value = 0.98377..
So we can not reject the null hypothesis at the significance level of 95%.
From conducting the t test for the log returns of AOT stock, the hypotheses are
H0: The mean of the log returns = 0
Ha: The mean of the log returns is not equal to 0
t = 2.2696 , df=4157 , p-value = 0.02328.
So we can reject the null hypothesis at the significance level of 95%.

f. Obtain the empirical density plot of the daily log returns of Caterpillar stock and AOT stock.



CAT's daily log return



AOT's daily log return

g. Construct a 95% confidence interval for the daily log returns of CAT stock.
95 percent confidence interval:
-6.513168e-05 - 1.041069e-03

h. Test H_0: $m_3 = 0$ versus H_a: $m_3 \neq 0$, where m_3 denotes the skewness of the return

For Caterpillar stock, we can test whether rt is distributed as a normal distribution ($m_3 = 0$)
The t-statistics = -5.458812, in which |-5.458812|> 2 (our critical value). Therefore, we can reject the null hypothesis at 95% confidence interval.

For AOT stock, we can test whether rt is distributed as a normal distribution ($m_3 = 0$)
The t-statistics = 4.596526, in which > 2 (our critical value). Therefore, we can reject the null hypothesis at 95% confidence interval.

i. Test H_0: K = 3 versus H_a: K ≠ 3, where K denotes the kurtosis (Excess kurtosis = 0)

For Caterpillar stock, we can test whether the excess kurtosis is equal to 0 or not (K = 3)
The t-statistics = 69.83078, in which > 2 (our critical value). Therefore, we can reject the null hypothesis at 95% confidence interval.
For AOT stock, we can test whether the excess kurtosis is equal to 0 or not (K = 3)
The t-statistics = 126.4855, in which > 2 (our critical value). Therefore, we can reject the null hypothesis at 95% confidence interval.