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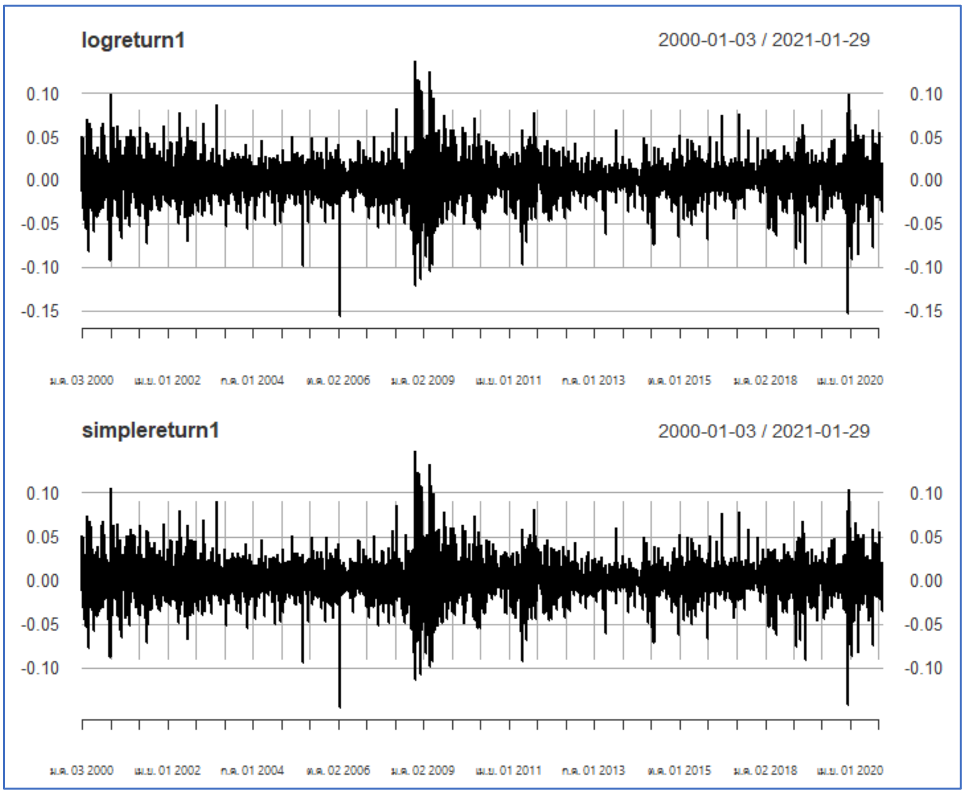
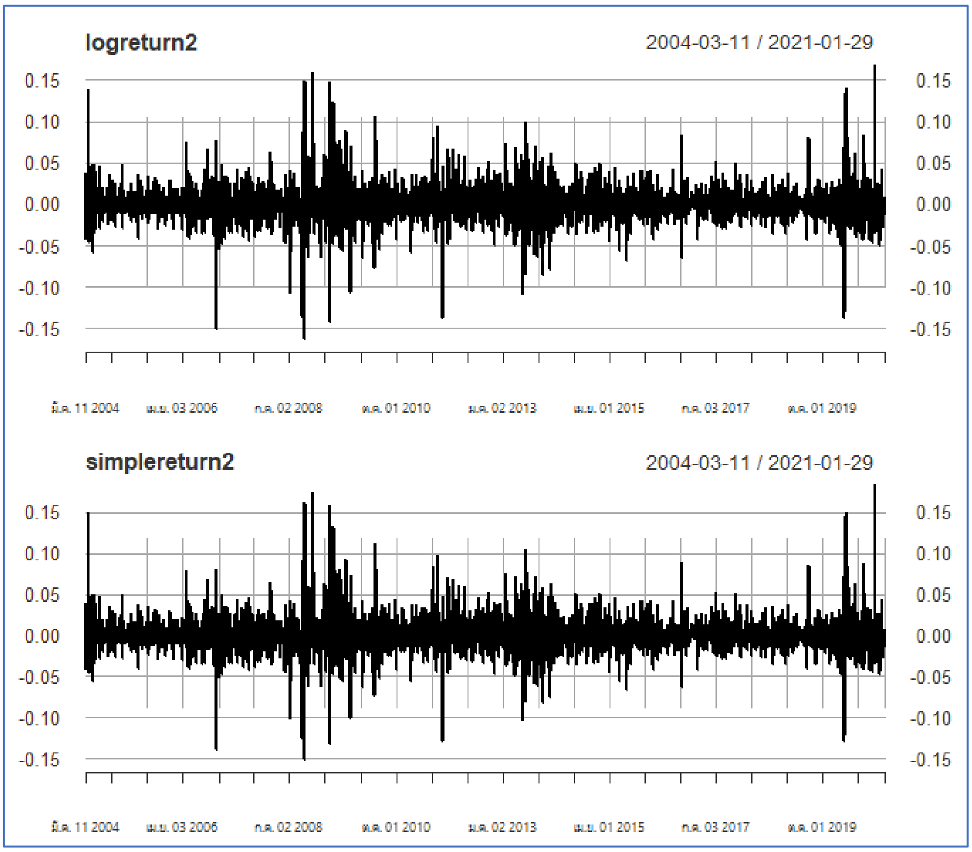
Assignment 2

a.1) CAT



a.2) AOT.BK



b)

	CAT.Adjusted
Observations	5302.0000
NAs	0.0000
Minimum	-0.1452
Quartile 1	-0.0095
Median	0.0005
Arithmetic Mean	0.0007
Geometric Mean	0.0005
Quartile 3	0.0110
Maximum	0.1472
SE Mean	0.0003
LCL Mean (0.95)	0.0001
UCL Mean (0.95)	0.0013
Variance	0.0004
Stdev	0.0205
Skewness	0.0197
Kurtosis	4.5480

	AOT.BK.Adjusted
Observations	4158.0000
NAs	0.0000
Minimum	-0.1505
Quartile 1	-0.0093
Median	0.0000
Arithmetic Mean	0.0010
Geometric Mean	0.0007
Quartile 3	0.0103
Maximum	0.1834
SE Mean	0.0003
LCL Mean (0.95)	0.0003
UCL Mean (0.95)	0.0016
Variance	0.0005
Stdev	0.0213
Skewness	0.5443
Kurtosis	10.0827

CAT: sample mean is 0.0007, standard deviation is 0.0205, skewness is 0.0197, excess kurtosis is 4.5480, minimum simple return is -0.1453 and maximum simple return is 0.1472

AOT: sample mean is 0.0010, standard deviation is 0.0213, skewness is 0.5443, excess kurtosis is 10.0827, minimum simple return is -0.1505 and maximum simple return is 0.1834

c) CAT

```
> #(C.1) CAT
> jarque.bera.test(newsimplereturn1)

        Jarque Bera Test

data:  newsimplereturn1
X-squared = 4569.9, df = 2, p-value < 2.2e-16
```

H0: r_t is distributed as normal

H1: r_t is not distributed as normal

α = 0.05

Since p-value computed of simple return of Caterpillar stock (CAT) is less than 2.2e-16. Then, we reject the null hypothesis. It mean that the return(r_t) of CAT is not distributed as normal with 95% confidence interval.

d.

```
                    CAT.Adjusted
Observations           5302.0000
NAs                       0.0000
Minimum                  -0.1569
Quartile 1               -0.0095
Median                    0.0005
Arithmetic Mean           0.0005
Geometric Mean            0.0003
Quartile 3                0.0110
Maximum                   0.1373
SE Mean                   0.0003
LCL Mean (0.95)          -0.0001
UCL Mean (0.95)           0.0010
Variance                  0.0004
Stdev                     0.0205
Skewness                 -0.1836
Kurtosis                  4.6982
>
```

```
                    AOT.BK.Adjusted
Observations              4158.0000
NAs                          0.0000
Minimum                     -0.1632
Quartile 1                  -0.0093
Median                       0.0000
Arithmetic Mean              0.0007
Geometric Mean               0.0005
Quartile 3                   0.0102
Maximum                      0.1684
SE Mean                      0.0003
LCL Mean (0.95)              0.0001
UCL Mean (0.95)              0.0014
Variance                     0.0004
Stdev                        0.0212
Skewness                     0.1746
Kurtosis                     9.6096
>
```

CAT: sample mean is 0.0005, standard deviation is 0.0205, skewness is -0.1836, excess kurtosis is 4.6982, minimum simple return is -0.1569 and maximum simple return is 0.1373

AOT: sample mean is 0.0007, standard deviation is 0.0212, skewness is 0.1746, excess kurtosis is 9.6096, minimum simple return is -0.1632 and maximum simple return is 0.1684

e.1) Test of mean for Caterpillar stock (CAT)

```
        One Sample t-test

data:  newlogreturn1
t = 1.7296, df = 5301, p-value = 0.08377
alternative hypothesis: true mean is not equal to 0
95 percent confidence interval:
 -6.513168e-05  1.041069e-03
sample estimates:
   mean of x
0.0004879685
```

H0: the mean of log return of CAT stock is zero

H1: the mean of log return of CAT stock is not zero

$\alpha = 0.05$

Since p-value is greater than α=0.05 (95% confidence level). It means that we cannot reject the null hypothesis. Therefore, the mean of log return of Caterpillar stock (CAT) is equal to zero with 95% confidence interval.

e.2) Test of mean for AOT.BK

```
        One Sample t-test

data:  newlogreturn2
t = 2.2696, df = 4157, p-value = 0.02328
alternative hypothesis: true mean is not equal to 0
95 percent confidence interval:
 0.0001016629 0.0013915769
sample estimates:
   mean of x
0.0007466199
```

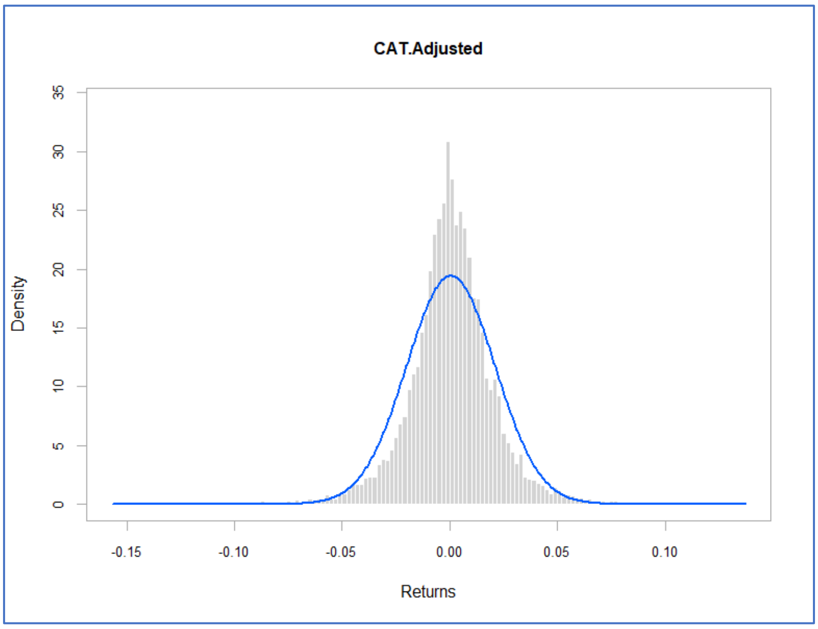
H0: the mean of log return of AOT.BK stock is zero

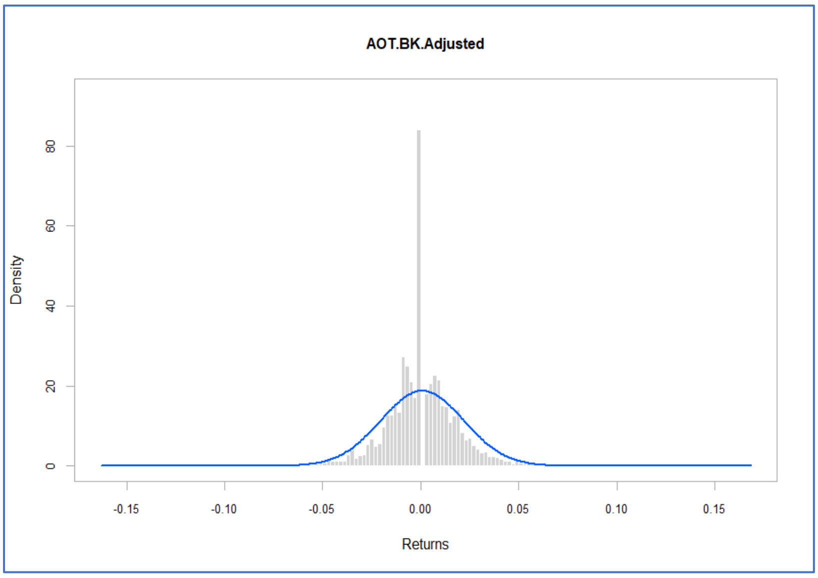
H1: the mean of log return of AOT.BK stock is not zero

α = 0.05

Since p-value is smaller than α=0.05 (95% confidence level). It means that we reject the null hypothesis. Therefore, the mean of log return of AOT.BK stock is not equal to zero with 95% confidence interval.

f)





g.1) CAT

From e.1), the 95% confidence interval is [-6.513168e-05 ,1.041069-03]

g.2) AOT.BK

From e.2), the 95% confidence interval is [0.0001016629 ,0.0013915769]

h.1 CAT Skewness test

```
> #(H.1) CAT Test Skewness =0
> T=length(newlogreturn1)
> m3=skewness(newlogreturn1)
> tst=m3/sqrt(6/T)
> tst
[1] -5.458812
> pv = 2*pnorm(tst)
> pv
[1] 4.793299e-08
>
```

H0: Skewness of r_t =0

H1: Skewness of r_t ≠0

α = 0.05

Since $S^*_{cal}(r_t)$ > critical number (1.96). Then, we reject the null hypothesis. Therefore, the skewness of CAT return is not equal to zero with 95% confidence interval.

h.2 AOT.BK Skewness test

```
> #(H.2) AOT.BK Test Skewness =0
> T=length(newlogreturn2)
> m3=skewness(newlogreturn2)
> tst=m3/sqrt(6/T)
> tst
[1] 4.596526
> pv = 2*(1-pnorm(tst))
> pv
[1] 4.29594e-06
>
```

H0: Skewness of r_t =0

H1: Skewness of r_t ≠0

α = 0.05

Since $S^*_{cal}(r_t)$ > critical number (1.96). Then, we reject the null hypothesis. Therefore, the skewness of AOT.BK return is not equal to zero with 95% confidence interval.

I.1

```
> #(i.1) Test excess kurtosis =0
> k4 = kurtosis(newlogreturn1)
> tst = k4/sqrt(24/T)
> tst
[1] 69.83078
> pv = 2*(1-pnorm(tst))
> pv
[1] 0
>
```

H0: $K(r_t)-3 = 0$

H1: $K(r_t)-3 \neq 0$

$\alpha = 0.05$

Since $K^*_{cal}(r_t)$ > critical number (1.96). Then, we reject the null hypothesis. Therefore, the excess kurtosis of CAT return is not equal to zero with 95% confidence interval.

I.2

```
> #(i.2) Test excess kurtosis =0
> k4 = kurtosis(newlogreturn2)
> tst = k4/sqrt(24/T)
> tst
[1] 126.4855
> pv = 2*(1-pnorm(tst))
> pv
[1] 0
>
```

H0: $K(r_t)-3 = 0$

H1: $K(r_t)-3 \neq 0$

$\alpha = 0.05$

Since $K^*_{cal}(r_t)$ > critical number (1.96). Then, we reject the null hypothesis. Therefore, the excess kurtosis of AOT.BK return is not equal to zero with 95% confidence interval.