FIN 620: PROJECT REPORT 1
Group 4

a. Overview of the asset and the market for the asset

Thermo Fisher Scientific Inc. offers life sciences solutions, analytical instruments, specialty diagnostics, and laboratory products and service worldwide. The company's Life Sciences Solutions segment offers reagents, instruments, and consumables for biological and medical research, discovery, and production of drugs and vaccines, as well as diagnosis of infections and diseases to pharmaceutical, biotechnology, agricultural, clinical, healthcare, academic, and government markets. Its Analytical Instruments segment provides instruments, consumables, software, and services for use in laboratory, on production line, and in field for pharmaceutical, biotechnology, academic, government, environmental, and other research and industrial markets, as well as clinical laboratories. The company offers products and services through a direct sales force, customer-service professionals, electronic commerce, third-party distributors, and catalogs. It has a strategic alliance with the University of California, San Francisco. The company was incorporated in 1956 and is based in Waltham, Massachusetts.

Market: As of February 2023, Thermo Fisher Scientific has a market cap of $224.10 Billion. This makes Thermo Fisher Scientific the world's 40th most valuable company by market cap. The Stock is currently trading at $571.41. Thermo Fisher Scientific competitors include Agilent Technologies, Beckman Coulter, Bruker Corporation and Bio-Rad Laboratories.

b. Properties of the time-series

i. Descriptive statistics

```
tmo <- getSymbols("TMO", auto.assign = FALSE)
dates <- index(tmo) #Converting index of tmo to dates
head(tmo) #Getting details for top 5 rows

##            TMO.Open TMO.High TMO.Low TMO.Close TMO.Volume TMO.Adjusted
## 2007-01-03    45.15    45.86   44.97     45.17    3780000     43.16011
## 2007-01-04    45.16    45.72   45.06     45.64    3602100     43.60920
## 2007-01-05    45.50    45.60   44.82     45.01    1955700     43.00724
## 2007-01-08    44.97    45.24   44.54     44.93    2385800     42.93079
## 2007-01-09    45.90    46.58   45.61     46.20    5614000     44.14429
## 2007-01-10    46.20    47.34   45.80     47.19    4502800     45.09023

tail(tmo) #Getting details for bottom 5 rows

##            TMO.Open TMO.High TMO.Low TMO.Close TMO.Volume TMO.Adjusted
## 2023-02-03   584.56   592.84  582.65    587.76    1283200       587.76
## 2023-02-06   580.56   583.83  573.42    576.17    1119500       576.17
## 2023-02-07   570.78   586.34  569.41    583.15    1171100       583.15
## 2023-02-08   578.56   585.09  576.03    579.23     907200       579.23
## 2023-02-09   582.66   583.32  567.70    568.93     960800       568.93
## 2023-02-10   567.11   571.71  563.35    571.41     763700       571.41
```

```
basicStats(tmo.3)
```

```
##                    Adj.Price      Sim.ret      Log.ret
## nobs            4.055000e+03 4055.000000 4055.000000
## NAs             0.000000e+00    0.000000    0.000000
## Minimum         2.761407e+01  -42.470795   -0.099299
## Maximum         6.657687e+02   38.346802    0.156134
## 1. Quartile     5.306869e+01   -0.794990   -0.007608
## 3. Quartile     2.449250e+02    1.041502    0.009464
## Mean            1.838174e+02    0.130271    0.000637
## Median          1.225935e+02    0.076442    0.000850
## Sum             7.453795e+05  528.249866    2.583190
## SE Mean         2.658321e+00    0.068477    0.000270
## LCL Mean        1.786056e+02   -0.003981    0.000107
## UCL Mean        1.890292e+02    0.264523    0.001167
## Variance        2.865535e+04   19.014103    0.000297
## Stdev           1.692789e+02    4.360516    0.017224
## Skewness        1.265918e+00   -0.045788   -0.129823
## Kurtosis        3.647610e-01   16.149696    5.854356
```

```r
tmo.price <- tmo$TMO.Adjusted # Using Adjusted closing price for our calculation
tmo.log.price <- log(tmo.price) # Log of prices

tmo.daily.simple.return <- (diff(tmo$TMO.Adjusted))
head(tmo.daily.simple.return)
```

```
##               TMO.Adjusted
## 2007-01-03             NA
## 2007-01-04       0.449096
## 2007-01-05      -0.601963
## 2007-01-08      -0.076454
## 2007-01-09       1.213501
## 2007-01-10       0.945942
```

```r
tmo.daily.log.ret <- diff(tmo.log.price) # Defining daily log returns
tmo.daily.log.ret1 <- as.data.frame(tmo.daily.log.ret) #Converting into dataframe
tmo.daily.adjusted.price <- as.data.frame(tmo.price) #Converting into dataframe
tmo.1 <- cbind(date = dates, tmo.daily.adjusted.price, tmo.daily.simple.return, tmo.daily.log.ret1)
tmo.2 <- na.omit(tmo.1)
rownames(tmo.2) <- NULL #Removing dates from Index column
colnames(tmo.2) <- c('Date','Adj.Price','Sim.ret', 'Log.ret') #Renaming column name
tmo.3 <- tmo.2[,-1]

# Data Description and Summary
head(tmo.3) #Displaying details for top 5 rows
```
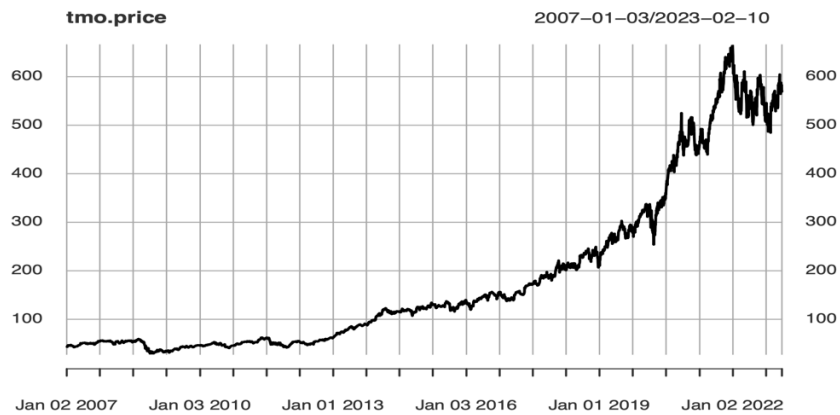
```
##    Adj.Price    Sim.ret       Log.ret
## 1   43.60920   0.449096   0.010351587
## 2   43.00724  -0.601963  -0.013899732
## 3   42.93079  -0.076454  -0.001779283
## 4   44.14429   1.213501   0.027874328
```

```r
tail(tmo.3) #Displaying details for bottom 5 rows
```
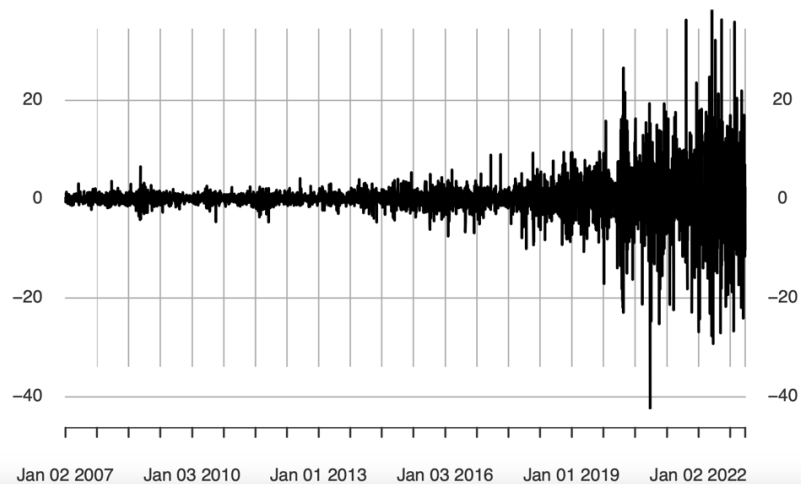
```
##        Adj.Price     Sim.ret       Log.ret
## 4050      587.76    0.690003   0.001174643
## 4051      576.17  -11.590027  -0.019915992
## 4052      583.15    6.980041   0.012041758
## 4053      579.23   -3.920044  -0.006744884
## 4054      568.93  -10.299987  -0.017942209
## 4055      571.41    2.479980   0.004349552
```
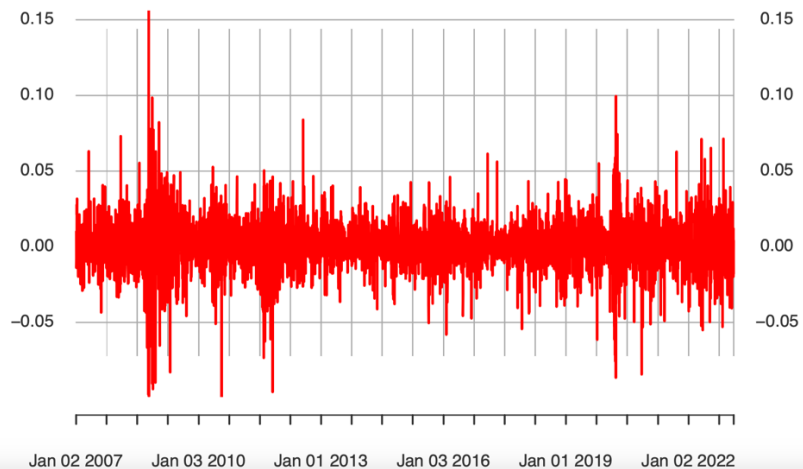
```r
plot(tmo.price)
```

ii. <u>Visualization</u>

```
plot(tmo.price)
```


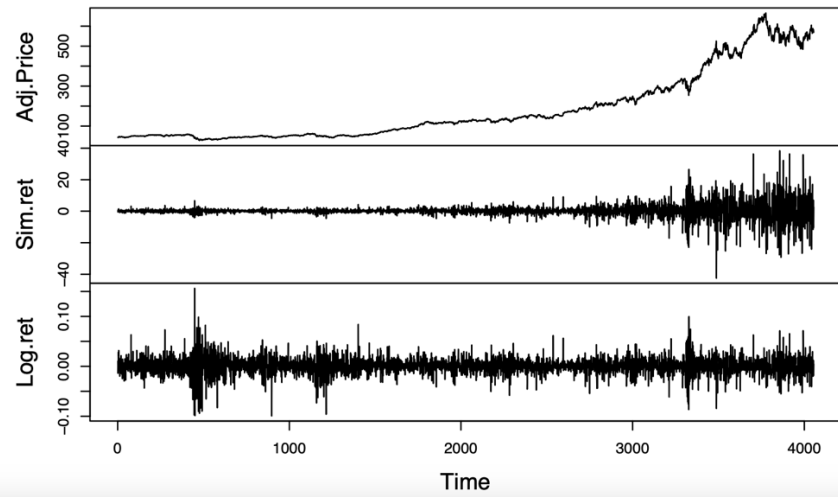**tmo.price**   2007−01−03/2023−02−10

tmo.daily.simple.return   2007−01−03/2023−02−10
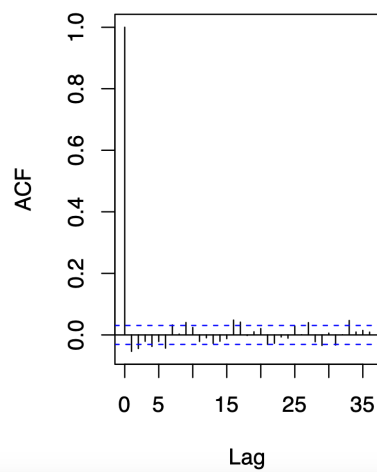

tmo.daily.log.ret   2007−01−03/2023−02−10

```
# ACF
acf(tmo.3$Log.ret) #ACF of Log Return
pacf(tmo.3$Log.ret)
```