Assignment 04, Question 1&2

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FBE 543 Forecasting and Risk Analysis

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Question 1

Downloading data:

```
library(quantmod)
```

```
## Loading required package: xts
```

```
## Loading required package: zoo
```

```
##
## Attaching package: 'zoo'
```

```
## The following objects are masked from 'package:base':
##
##     as.Date, as.Date.numeric
```

```
## Loading required package: TTR
```

```
## Registered S3 method overwritten by 'quantmod':
##   method            from
##   as.zoo.data.frame zoo
```

```
## Version 0.4-0 included new data defaults. See ?getSymbols.
```

```
# Set start date and end date of data
start_date <- "2018-01-01"
end_date <- "2021-03-17"

# Get data
getSymbols("AAPL", src = "yahoo", from = start_date, to = end_date)
```

```
## 'getSymbols' currently uses auto.assign=TRUE by default, but will
## use auto.assign=FALSE in 0.5-0. You will still be able to use
## 'loadSymbols' to automatically load data. getOption("getSymbols.env")
## and getOption("getSymbols.auto.assign") will still be checked for
## alternate defaults.
##
## This message is shown once per session and may be disabled by setting
## options("getSymbols.warning4.0"=FALSE). See ?getSymbols for details.
```

```
## [1] "AAPL"
```

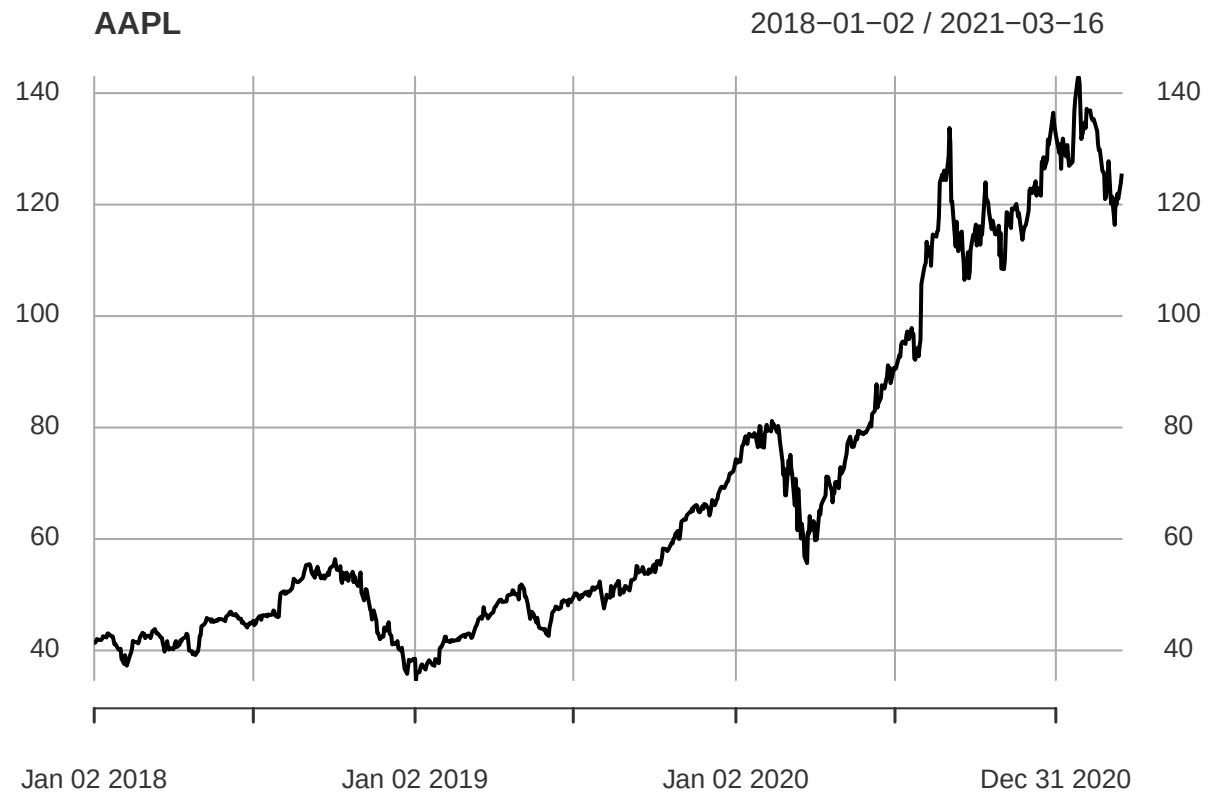
```
getSymbols("^GSPC", src = "yahoo", , from = start_date, to = end_date) # S&P 500
```

```
## [1] "^GSPC"
```

```
# Adjusted Prices
adjAAPL <- AAPL$AAPL.Adjusted
adjGSPC <- GSPC$GSPC.Adjusted
# Get adjusted returns data
#rAAPL <- diff(log(to.monthly(AAPL)$AAPL.Adjusted))
#rGSPC <- diff(log(to.monthly(GSPC)$GSPC.Adjusted))
```

a. Graph your AAPL against time (scatter diagram). Comment on the existence of time trend, seasonal trend, cyclical trend, autocorrelation, randomness, structural breaks, and outliers.

```
plot(adjAAPL, main="AAPL")
```



Time Trend AAPL displays time trend, as price increases over time.
Seasonal Trend AAPL displays seasonal trend with up and down spikes in price daily.
Cyclical Trend AAPL is affected by business cycle of peaks and troughs.
Autocorrelation AAPL rises for some times and they rise and vice versa.
Randomness Price of AAPL is unpredictable via inspection.
Structural Breaks AAPL does not experience any structural break during this time frame as price always recover quickly.
Outliers AAPL price has several outliers during this period (Jan 2019, March 2020) where price fell more than 30% and recovered.

b. Graph S&P 500. Comment on the existence of time trend, seasonal trend, cyclical trend, autocorrelation, randomness, structural breaks, and outliers.

```
plot(adjGSPC, main="S&P500")
```

Time Trend S&P 500 displays time trend, as price increases over time.
Seasonal Trend S&P 500 displays seasonal trend with up and down spikes in price daily.
Cyclical Trend S&P 500 is affected by business cycle of peaks and troughs.
Autocorrelation S&P 500 rises for some times and they rise and vice versa.
Randomness Price of S&P 500 is unpredictable via inspection.
Structural Breaks S&P 500 does not experience any structural break during this time frame as price always recover quickly.
Outliers S&P 500 price has several outliers during this period (Jan 2019, March 2020) where price fell more than 30% and recovered.

c. Graph your variable against the market index S&P 500 on x-y axis. Comment on the behavior and the relationship between the two variables.