

# INTRODUCTION TO ANALYTICS



ALY6000, WINTER 2022

Module 6 Project – Data Analysis

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Date: 02/18/2022

## Introduction:

In this report, as per the requirements analyzing the impact of big data in capital market which will look into the deep understanding about the variable available in dataset. This dataset is about the investment analysis in stock market which any investor seeks before investing in capital market. How analysis makes difference before investing in stock market? In this part of the report detailed information about the Apple stock. The Dataset we are using has 1258 observation and 12 variables from 2014 to 2019. Given dataset has open, high, low, close, volume, unadjusted volume, change, change in percent, vwap, label, and change overtime which will help in analyzing the stock price movement, trend, patterns, “BUY” or “SELL” signal.

## Details about the dataset: AAPL (Apple Stock)

After importing the dataset in R to present the data to get the results from the given variables.

	date	open	high	low	close	volume	unadjustedVolume	change	changePercent	vwap	label	changeOverTime
1	2014-02-21	69.9727	70.2061	68.8967	68.9821	69757247	9965321	-0.774858	-1.111	69.4256	Feb 21, 14	0.0000000000
2	2014-02-24	68.7063	69.5954	68.6104	69.2841	72364950	10337850	0.302061	0.438	69.1567	Feb 24, 14	0.0043779473
3	2014-02-25	69.5245	69.5488	68.4239	68.5631	58247350	8321050	-0.721010	-1.041	68.9153	Feb 25, 14	-0.0060740395
4	2014-02-26	68.7667	68.9492	67.7147	67.9446	69131286	9875898	-0.618575	-0.902	68.1373	Feb 26, 14	-0.0150401336
5	2014-02-27	67.9170	69.4457	67.7738	69.2999	75557321	10793903	1.355300	1.995	68.8615	Feb 27, 14	0.0046069922
6	2014-02-28	69.4851	69.9671	68.5710	69.1121	93074653	13296379	-0.187807	-0.271	69.2731	Feb 28, 14	0.0018845469
7	2014-03-03	68.7417	69.6913	68.6616	69.3117	59667923	8523989	0.199626	0.289	69.1371	Mar 3, 14	0.0047780511
8	2014-03-04	69.7372	69.9526	69.3130	69.7688	64884834	9269262	0.457035	0.659	69.6940	Mar 4, 14	0.0114044078
9	2014-03-05	69.7267	70.2297	69.4916	69.9158	50065519	7152217	0.147093	0.211	71.9382	Mar 5, 14	0.0135353954
10	2014-03-06	69.9723	70.1890	69.3564	69.7044	46423111	6631873	-0.211448	-0.302	69.7696	Mar 6, 14	0.0104708323
11	2014-03-07	69.7491	69.8659	69.0871	69.6637	55415241	7916463	-0.040710	-0.058	69.4844	Mar 7, 14	0.0098808242
12	2014-03-10	69.3905	70.0432	69.3878	69.7267	44691430	6384490	0.063038	0.090	69.7857	Mar 10, 14	0.0107941046
13	2014-03-11	70.3217	70.7537	69.9460	70.4057	70198849	10028407	0.678987	0.974	70.4848	Mar 11, 14	0.0206372378
14	2014-03-12	70.1982	70.5712	69.8686	70.4740	50195460	7170780	0.068289	0.097	70.2864	Mar 12, 14	0.0216273497
15	2014-03-13	70.5830	70.8746	69.4956	69.6913	64435609	9205087	-0.782734	-1.111	70.1013	Mar 13, 14	0.0102809280
16	2014-03-14	69.4470	69.7228	68.6866	68.9085	59299492	8471356	-0.782740	-1.123	69.0354	Mar 14, 14	-0.0010669435
17	2014-03-17	69.3038	69.6020	69.0609	69.1778	49886074	7126582	0.269229	0.391	69.3514	Mar 17, 14	0.0028369679
18	2014-03-18	69.0674	69.8646	68.9755	69.7898	52411863	7487409	0.612009	0.885	69.5941	Mar 18, 14	0.0117088346
19	2014-03-19	69.9027	70.4254	69.4746	69.7714	56188958	8026994	-0.018389	-0.026	68.8598	Mar 19, 14	0.0114420987
20	2014-03-20	69.5915	69.9566	69.2579	69.4352	52099537	7442791	-0.336209	-0.482	69.6656	Mar 20, 14	0.0065683706
21	2014-03-21	69.8594	70.0984	69.1239	69.9828	93612169	13373167	0.547656	0.789	57.3363	Mar 21, 14	0.0145066619
22	2014-03-24	70.7117	70.9849	70.2704	70.8128	88924871	12703553	0.830019	1.186	70.7067	Mar 24, 14	0.0265387688
23	2014-03-25	71.1162	71.6744	70.8654	71.5746	70573356	10081908	0.761722	1.076	73.7129	Mar 25, 14	0.0375822134
24	2014-03-26	71.7755	72.1012	70.7695	70.8903	74942224	10706032	-0.684238	-0.956	71.4402	Mar 26, 14	0.0276622486
25	2014-03-27	70.9212	71.1162	70.2783	70.5856	55507676	7929668	-0.304690	-0.430	70.1250	Mar 27, 14	0.0232451607
26	2014-03-28	70.6986	70.7800	70.1641	70.5068	50141063	7163009	-0.078800	-0.112	70.5193	Mar 28, 14	0.0221028354
27	2014-03-31	70.8181	71.0256	70.3847	70.4911	42167188	6023884	-0.015758	-0.022	70.6164	Mar 31, 14	0.0218752401
28	2014-04-01	70.6250	71.1648	70.4950	71.1359	50189665	7169955	0.644839	0.915	70.8293	Apr 1, 14	0.0312225925
29	2014-04-02	71.2318	71.3763	70.9534	71.2541	44792195	6398885	0.118198	0.166	71.1644	Apr 2, 14	0.0329360805
30	2014-04-03	71.1018	71.2475	70.6093	70.7603	40648111	5806873	-0.493807	-0.693	70.9206	Apr 3, 14	0.02577777018
31	2014-04-04	70.8943	70.9192	69.6821	69.8449	68812485	9830355	-0.915383	-1.294	70.0967	Apr 4, 14	0.0125075925
32	2014-04-07	69.3459	69.7241	68.5408	68.7483	72462530	10351790	-1.096600	-1.570	68.9934	Apr 7, 14	-0.0033892850
33	2014-04-08	68.9742	69.0963	68.1219	68.7444	60971883	8710269	-0.003941	-0.006	68.6783	Apr 8, 14	-0.0034458215

Showing 1 to 34 of 1,258 entries, 12 total columns

```
> AAPL <- read.csv("C:\\Abhinav _ NEU BOSTON\\ALY6000 Submission\\ALY6000-Final\\Module 6 Week 6\\AAPL.csv")
> AAPL
```

	date	open	high	low	close	volume	unadjustedvolume	change	changePercent	vwap	label
1	2014-02-21	69.9727	70.2061	68.8967	68.9821	69757247	9965321	-0.774858	-1.111	69.4256	Feb 21, 14
2	2014-02-24	68.7063	69.5954	68.6104	69.2841	72364950	10337850	0.302061	0.438	69.1567	Feb 24, 14
3	2014-02-25	69.5245	69.5488	68.4239	68.5631	58247350	8321050	-0.721010	-1.041	68.9153	Feb 25, 14
4	2014-02-26	68.7667	68.9492	67.7147	67.9446	69131286	9875898	-0.618575	-0.902	68.1373	Feb 26, 14
5	2014-02-27	67.9170	69.4457	67.7738	69.2999	75557321	10793903	1.355300	1.995	68.8615	Feb 27, 14
6	2014-02-28	69.4851	69.9671	68.5710	69.1121	93074653	13296379	-0.187807	-0.271	69.2731	Feb 28, 14
7	2014-03-03	68.7417	69.6913	68.6616	69.3117	59667923	8523989	0.199626	0.289	69.1371	Mar 3, 14
8	2014-03-04	69.7372	69.9526	69.3130	69.7688	64884834	9269262	0.457035	0.659	69.6940	Mar 4, 14
9	2014-03-05	69.7267	70.2297	69.4916	69.9158	50065519	7152217	0.147093	0.211	71.9382	Mar 5, 14
10	2014-03-06	69.9723	70.1890	69.3564	69.7044	46423111	6631873	-0.211448	-0.302	69.7696	Mar 6, 14
11	2014-03-07	69.7491	69.8659	69.0871	69.6637	55415241	7916463	-0.040710	-0.058	69.4844	Mar 7, 14
12	2014-03-10	69.3905	70.0432	69.3878	69.7267	44691430	6384490	0.063038	0.090	69.7857	Mar 10, 14
13	2014-03-11	70.3217	70.7537	69.9460	70.4057	70198849	10028407	0.678987	0.974	70.4848	Mar 11, 14
14	2014-03-12	70.1982	70.5712	69.8686	70.4740	50195460	7170780	0.068289	0.097	70.2864	Mar 12, 14
15	2014-03-13	70.5830	70.8746	69.4956	69.6913	64435609	9205087	-0.782734	-1.111	70.1013	Mar 13, 14
16	2014-03-14	69.4470	69.7228	68.6866	68.9085	59299492	8471356	-0.782740	-1.123	69.0354	Mar 14, 14
17	2014-03-17	69.3038	69.6020	69.0609	69.1778	49886074	7126582	0.269229	0.391	69.3514	Mar 17, 14
18	2014-03-18	69.0674	69.8646	68.9755	69.7898	52411863	7487409	0.612009	0.885	69.5941	Mar 18, 14
19	2014-03-19	69.9027	70.4254	69.4746	69.7714	56188958	8026994	-0.018389	-0.026	68.8598	Mar 19, 14

**Head() & Tail() :** Read the first 6 and last 6 rows of the dataset.

```
> head(aapl)
  date      open    high    low   close  volume unadjustedvolume  change changePercent  vwap  label changeoverTime
1 2014-02-21 69.9727 70.2061 68.8967 68.9821 69757247      9965321 -0.774858    -1.111 69.4256 Feb 21, 14 0.000000000
2 2014-02-24 68.7063 69.5954 68.6104 69.2841 72364950     10337850  0.302061     0.438 69.1567 Feb 24, 14 0.004377947
3 2014-02-25 69.5245 69.5488 68.4239 68.5631 58247350      8321050 -0.721010    -1.041 68.9153 Feb 25, 14 -0.006074039
4 2014-02-26 68.7667 68.9492 67.7147 67.9446 69131286      9875898 -0.618575    -0.902 68.1373 Feb 26, 14 -0.015040134
5 2014-02-27 67.9170 69.4457 67.7738 69.2999 75557321     10793903  1.355300     1.995 68.8615 Feb 27, 14 0.004606992
6 2014-02-28 69.4851 69.9671 68.5710 69.1121 93074653     13296379 -0.187807    -0.271 69.2731 Feb 28, 14 0.001884547

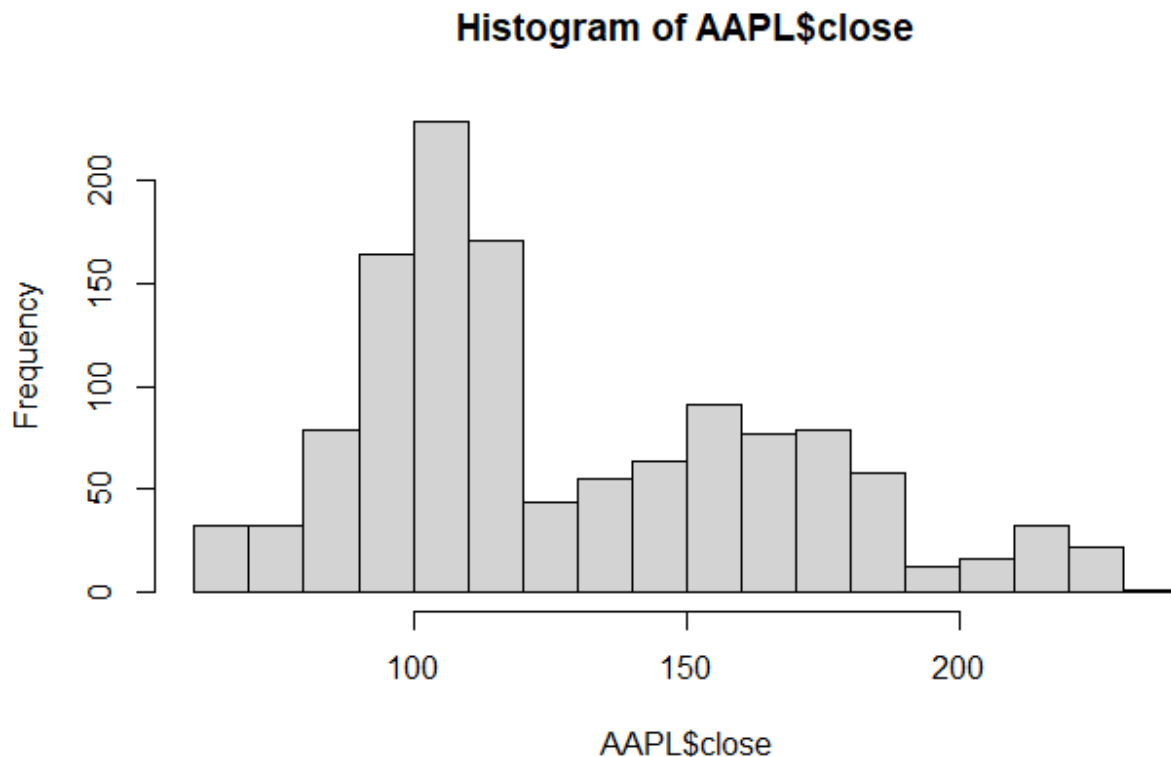
> tail(aapl)
  date      open    high    low   close  volume unadjustedvolume  change changePercent  vwap  label changeoverTime
1253 2019-02-12 170.10 171.0000 169.70 170.89 22283523      22283523  1.46     0.862 170.3732 Feb 12 1.477309
1254 2019-02-13 171.39 172.4800 169.92 170.18 22490233      22490233  -0.71    -0.415 171.0037 Feb 13 1.467017
1255 2019-02-14 169.71 171.2615 169.38 170.80 21835747      21835747  0.62     0.364 170.6527 Feb 14 1.476005
1256 2019-02-15 171.25 171.7000 169.75 170.42 24626814      24626814  -0.38    -0.222 170.4848 Feb 15 1.470496
1257 2019-02-19 169.71 171.4400 169.49 170.93 18972826      18972826  0.51     0.299 170.5200 Feb 19 1.477889
1258 2019-02-20 171.19 173.3200 170.99 172.03 26114362      26114362  1.10     0.644 172.2129 Feb 20 1.493835
```

In the below analysis, we have used str() command to discover the data dictionary.

```
> str(AAPL)
#Display the structure
'data.frame': 1258 obs. of 12 variables:
 $ date      : chr  "2014-02-21" "2014-02-24" "2014-02-25" "2014-02-26" ...
 $ open      : num  70 68.7 69.5 68.8 67.9 ...
 $ high      : num  70.2 69.6 69.5 68.9 69.4 ...
 $ low       : num  68.9 68.6 68.4 67.7 67.8 ...
 $ close     : num  69 69.3 68.6 67.9 69.3 ...
 $ volume    : int  69757247 72364950 58247350 69131286 75557321 93074653 59667923 64884834 50065519 46423111 ...
 $ unadjustedvolume: int  9965321 10337850 8321050 9875898 10793903 13296379 8523989 9269262 7152217 6631873 ...
 $ change    : num  -0.775 0.302 -0.721 -0.619 1.355 ...
 $ changePercent : num  -1.111 0.438 -1.041 -0.902 1.995 ...
 $ vwap      : num  69.4 69.2 68.9 68.1 68.9 ...
 $ label     : chr  "Feb 21, 14" "Feb 24, 14" "Feb 25, 14" "Feb 26, 14" ...
 $ changeoverTime : num  0 0.00438 -0.00607 -0.01504 0.00461 ...
```

Observed while looking at the dataset closing price helps investors to analysis the sentiment of the stock over the period.

For descriptive analysis below is the histogram shows that maximum data points are placed on the left side of the graph at price \$100 that's why this is a Right skewed histogram. The frequency of observation is higher on the left side and lesser on the right side is known as the positive skewed.



```
> hist(AAPL$close)
> |
```

Summarize the data in a table: mentioned in data length is 1258, minimum value, maximum value, median, mean, quartile. If we look at the close price in the summary 1<sup>st</sup> Quartile is around \$100 and 3<sup>rd</sup> Quartile has values as \$156.85. Also looking at the histogram attached above we can see the data is right or positively skewed which signifies that most of the time the price of the Apple stock price is between the range or 1<sup>st</sup> and 3<sup>rd</sup> quartile. This could be a good range to buy an apple stock, specifically near the median value of \$115.

```
> summary(aapl)      #Summary of Dataset
  date      open      high      low      close      volume
Length:1258
Class :character
Mode :character
  Min. : 67.92  Min. : 68.44  Min. : 67.15  Min. : 67.94  Min. : 11475922
  1st Qu.:100.61 1st Qu.:101.52 1st Qu.: 99.59 1st Qu.:100.57 1st Qu.: 26281928
  Median :115.90 Median :116.48 Median :114.75 Median :115.85 Median : 35903155
  Mean :128.60  Mean :129.72  Mean :127.48  Mean :128.63  Mean : 41300084
  3rd Qu.:156.82 3rd Qu.:158.31 3rd Qu.:155.19 3rd Qu.:156.85 3rd Qu.: 50315110
  Max. :229.00  Max. :231.66  Max. :228.00  Max. :230.28  Max. :189978082

  unadjustedvolume  change  changePercent  vwap  label  changeOverTime
Min. : 5704942  Min. : -15.66280  Min. : -9.96100  Min. : 57.34  Length:1258  Min. : -0.01504
1st Qu.: 24473327 1st Qu.: -0.72542  1st Qu.: -0.60350  1st Qu.:100.61  Class :character 1st Qu.: 0.45796
Median : 33610520 Median : 0.06888  Median : 0.06150  Median :115.74  Mode :character  Median : 0.67945
Mean : 37793995  Mean : 0.08130  Mean : 0.08362  Mean :128.63  Mean : 0.86462
3rd Qu.: 46737829 3rd Qu.: 1.04183  3rd Qu.: 0.85725  3rd Qu.:156.55  3rd Qu.: 1.27374
Max. :189846255  Max. : 11.08440  Max. : 8.19800  Max. :230.44  Max. : 2.33819
> |
```

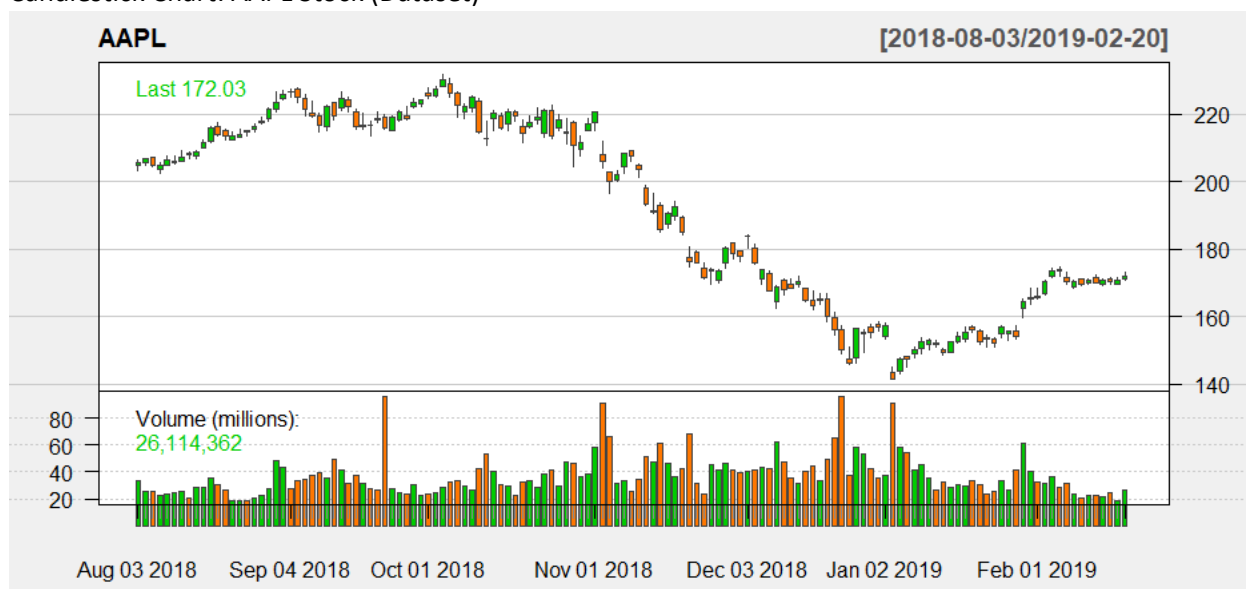
Below observation tells about the movement of the stock price from 2014 to 2019 which is between (67.94-230.2754) in stock market range gives the signal for the breakout and break down price of the stock.

```
> range(AAPL$close)
[1] 67.9446 230.2754
> |
```

Using the descriptive statistics and summarizing the data now we are going to plot a candlestick chart most frequently used in the stock market which will help in analyzing the patterns and trend of the stocks. It allows us to get profitable trades and decision while placing trades. With the help of dataset variable such as open, high, low, close with volume (shows the trades executed on each candle) able to plot candlestick in R. For this analysis, to show the clear analysis from “2018-08-03 to 2019-02-20”. Each candle form with open, high, low, close price of the stock.

```
> chartSeries(AAPL,
+             subset='2018-08-03::2019-02-20',
+             theme=chartTheme('white'))
> |
```

Candlestick Chart: AAPL Stock (Dataset)



**Note:** In the above graph, this candlestick graph has been used to represent the high, low, close, open price of Apple stock over the period. It helps in analyzing the trend of a stock, which determines the stock price movement in the stock market.

Open price is the starting price, high price is the highest price, low is the lowest price, close is the closing price on the different timeframes. Volume is the number of stocks traded.

Looking from a business personal or an investor’s perspective, I would like to find out the price movement of Apple stock. Below are the different ways in which the above descriptive analysis will answer different business questions:

**How does data look like?** - Starting with the data dictionary helped us in finding the different variables present in the dataset along with the different types of data types of respective attributes, it also helped in understating the format of the data present.

**Is the data skewed and where is the maximum data point?** Here we can see in the histogram that the maximum stock price lies around \$100 which refers in the summary of to the image of the histogram of the Apple dataset

**In this task**, we have taken only the date and close price of the dataset and removed all other variables to analyze the trend and price of the stock. We are using a close price here which gives us a reference to the previous day's closing price of a stock. It is useful to stipulate the assurance to the investor while assessing the stock price.

```
x
An 'xts' object on 2014-02-21/2019-02-20 containing:
Data: num [1:1258, 1] 69 69.3 68.6 67.9 69.3 ...
- attr(*, "dimnames")=List of 2
..$ : NULL
..$ : chr "close"
Indexed by objects of class: [Date] TZ: UTC
xts Attributes:
NULL
```

	close
2014-02-21	68.9821
2014-02-24	69.2841
2014-02-25	68.5631
2014-02-26	67.9446
2014-02-27	69.2999
2014-02-28	69.1121
2014-03-03	69.3117
2014-03-04	69.7688
2014-03-05	69.9158
2014-03-06	69.7044
2014-03-07	69.6637
2014-03-10	69.7267
2014-03-11	70.4057
2014-03-12	70.4740
2014-03-13	69.6913
2014-03-14	68.9085
2014-03-17	69.1778
2014-03-18	69.7898
2014-03-19	69.7714
2014-03-20	69.4352
2014-03-21	69.9828
2014-03-24	70.8128
2014-03-25	71.5746
2014-03-26	70.8903
2014-03-27	70.5856
2014-03-28	70.5068
2014-03-31	70.4911
2014-04-01	71.1359
2014-04-02	71.2541
2014-04-03	70.7603
2014-04-04	69.8449
2014-04-07	68.7483
2014-04-08	68.7444

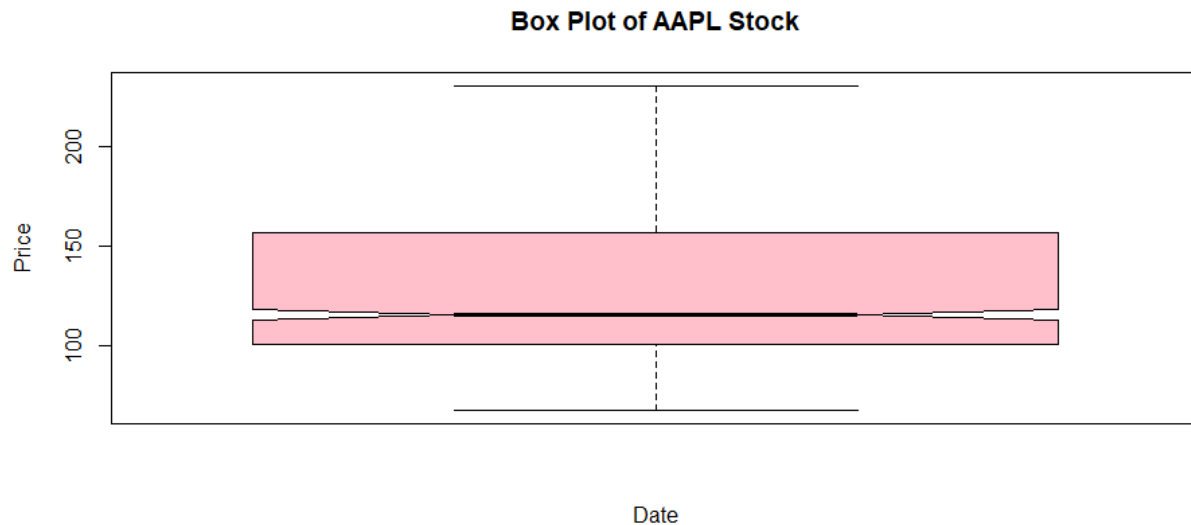
Showing 1 to 34 of 1,258 entries, 1 total columns

 close 	
2014-04-04	69.8449
2014-04-07	68.7483
2014-04-08	68.7444
2014-04-09	69.6479
2014-04-10	68.7496
2014-04-11	68.2414
2014-04-14	68.5132
2014-04-15	68.0247
2014-04-16	68.1626
2014-04-17	68.9414
2014-04-21	69.7596
2014-04-22	69.8290
2014-04-23	68.9164
2014-04-24	74.5663
2014-04-25	75.1140
2014-04-28	78.0230
2014-04-29	77.7918
2014-04-30	77.4976
2014-05-01	77.6802
2014-05-02	77.8246
2014-05-05	78.9252
2014-05-06	78.0650
2014-05-07	77.7918
2014-05-08	77.2831
2014-05-09	76.9614
2014-05-12	77.9193
2014-05-13	78.0415
2014-05-14	78.0560
2014-05-15	77.3922
2014-05-16	78.5344
2014-05-19	79.4650
2014-05-20	79.4807
2014-05-21	79.6910

Showing 31 to 64 of 1,258 entries, 1 total columns

**Box Plot for checking Outliers:** In this task created a box plot for Apple stock to find the outliers from the data. As the below box plot represents there is no range of outliers found in the data. We consider this data as clean to moving ahead with new findings from the data. After running the below code in R, it provides the box plot.

```
> boxplot(AAPL$close, data = AAPL, xlab = "Date",
+         ylab = "Price", main = "Box Plot of AAPL Stock", notch = TRUE,
+         varwidth = TRUE,
+         col = c("pink"),
+         names = c("close"))
+ )
```



The additional question that data is leading me to ask is **How to analyze when to buy or sell a stock?** to overcome this we can add a new attribute which can be driven from a closing price of the stock. The attribute is named MACD (Moving average convergence divergence) it is calculated by subtracting EMA(exponential moving average) of different periods. This attribute will act as an Indicator which will help in analyzing whether the stock price is bullish or bearish.





**Adding New Attribute MACD** (Moving Average Convergence and Divergence) to the dataset which indicate the trend and momentum of the stock to the investor, for buy and sell price of the stocks.

**How do investors take the decision to invest in stock?** This candlestick chart and MACD provide the depth analysis about investing in stock. Analyse the price movement, signal, trend makes easy with uptrend and downtrend of the stock. It helps the investor to make decisions about the investment in stock.

Before investing in the stock market every investor wants to entry at low price and exit on high price. This analysis will help in analysing the stock by using technical indicators which will reduce the risk of losing money in the stock market.

During the research of analyzing the Apple, stock dataset MACD (Moving Average Convergence Divergence)

Here, Using MACD as a new attribute to take better investment decisions in the stock.

**Finding the results after adding new attribute MACD (Moving Average Convergence Divergence):**

```
macd      An 'xts' object on 2014-02-21/2019-02-20 containing:
Data: num [1:1258, 1:2] NA NA NA NA NA NA NA NA NA NA NA ...
- attr(*, "dimnames")=List of 2
..$ : NULL
..$ : chr [1:2] "macd" "signal"
Indexed by objects of class: [Date] TZ: UTC
xts Attributes:
NULL
```

	macd	signal
2014-02-21	NA	NA
2014-02-24	NA	NA
2014-02-25	NA	NA
2014-02-26	NA	NA
2014-02-27	NA	NA
2014-02-28	NA	NA
2014-03-03	NA	NA
2014-03-04	NA	NA
2014-03-05	NA	NA
2014-03-06	NA	NA
2014-03-07	NA	NA
2014-03-10	NA	NA
2014-03-11	NA	NA
2014-03-12	NA	NA
2014-03-13	NA	NA
2014-03-14	NA	NA
2014-03-17	NA	NA
2014-03-18	NA	NA
2014-03-19	NA	NA
2014-03-20	NA	NA
2014-03-21	NA	NA
2014-03-24	NA	NA
2014-03-25	NA	NA
2014-03-26	NA	NA
2014-03-27	NA	NA
2014-03-28	0.706530479	NA
2014-03-31	0.750648967	NA
2014-04-01	0.787049184	NA
2014-04-02	0.819743557	NA
2014-04-03	0.779996914	NA
2014-04-04	0.636366834	NA
2014-04-07	0.392118788	NA
2014-04-08	0.195394184	NA

Showing 1 to 34 of 1,258 entries, 2 total columns

	macd	signal
2014-04-07	0.392118788	N/A
2014-04-08	0.195394184	N/A
2014-04-09	0.141857708	0.5877474015
2014-04-10	-0.004348992	0.4693281228
2014-04-11	-0.177378556	0.3399867870
2014-04-14	-0.280121461	0.2159651374
2014-04-15	-0.413956036	0.0899809027
2014-04-16	-0.498578351	-0.0277309481
2014-04-17	-0.469376380	-0.1160600344
2014-04-21	-0.346660703	-0.1621801682
2014-04-22	-0.238633853	-0.1774709052
2014-04-23	-0.256459831	-0.1932686904
2014-04-24	0.380328751	-0.0785492022
2014-04-25	0.931124630	0.1233655642
2014-04-28	1.670682912	0.4328450337
2014-04-29	2.194765539	0.7852291348
2014-04-30	2.540527913	1.1362888904
2014-05-01	2.796640524	1.4683592171
2014-05-02	2.976260354	1.7699394444
2014-05-05	3.196011873	2.0551539301
2014-05-06	3.236354806	2.2913941054
2014-05-07	3.199951591	2.4731056025
2014-05-08	3.080114633	2.5945074086
2014-05-09	2.916698097	2.6589455462
2014-05-12	2.854971552	2.6981507475
2014-05-13	2.785740118	2.7156686215
2014-05-14	2.700335005	2.7126018981
2014-05-15	2.533176847	2.6767168880
2014-05-16	2.491289226	2.6396313557
2014-05-19	2.525029041	2.6167108927
2014-05-20	2.522786407	2.5979259955
2014-05-21	2.512563295	2.5808534553
2014-05-22	2.487643762	2.5622115166

Showing 32 to 65 of 1,258 entries, 2 total columns

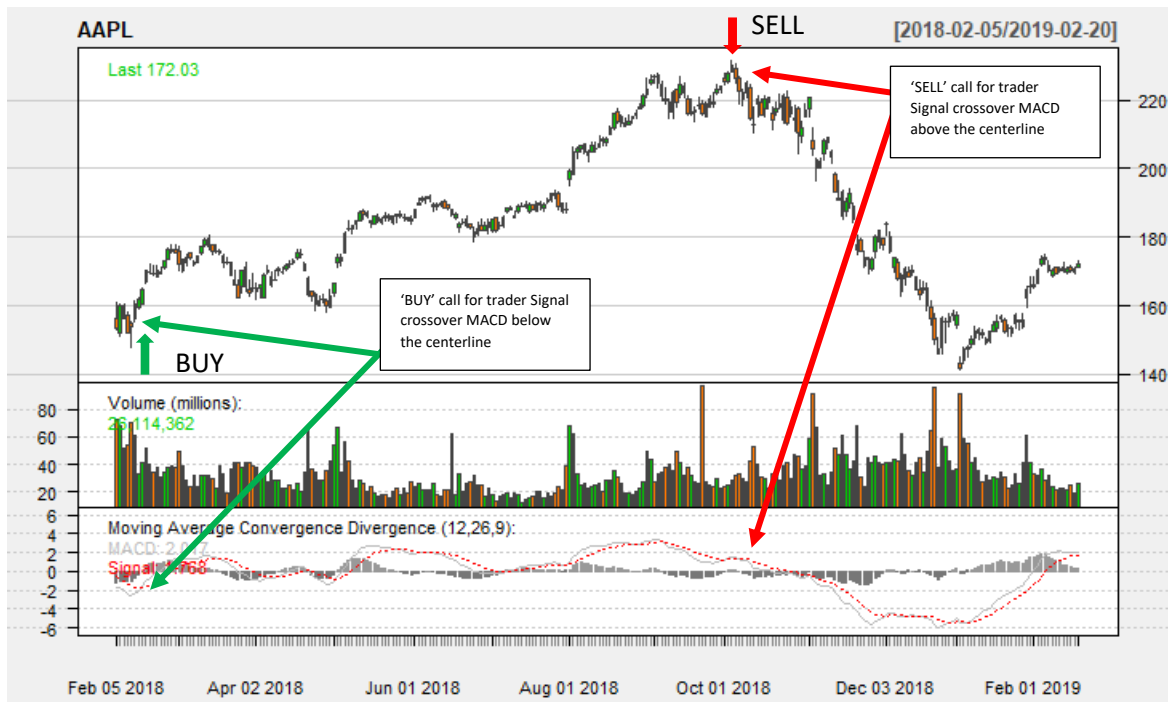
Getting a better understanding of the stock through MACD. **How MACD will help in analyzing the stock price to increase profitability?**

**MACD Indicator:** After computing a new attribute MACD is a lagging indicator which represents the momentum of the stock price . This helps in analyzing the bullish and bearish trend of the stock. It is also known as oscillator indicator. In this indicator we use three time series to make MACD effective indicator with ‘MACD’, ‘signal’, and MACD ‘histogram’. Here, MACD (12,26,9) is the substrating 12 day exponential moving average with 26 day EMA, where as 9 day EMA is signal. MACD moves with the signal when Macd above centerline or also called as zero line and signal crossover it gives the sell signal more over if the macd below the centerline and signal crossover macd will gives the buy signal. Most of the investors using MACD for positional trades for different timeframes like monthly contracts, quaterly, halfyearly to get better profitability.

```

> chartSeries(AAPL,
+             subset='2018-02-03::2019-02-20',
+             theme=chartTheme('white'))
> |
> addMACD(fast=12,slow=26,signal=9,type="EMA")
> |

```



Here, is the summary of MACD which provide the mean and median. It will help in analysing the direction of the stock while entry and exit in the contract. Most of the time it show the trend of the stock price condition that condition could be breakout or breakdown.

```

> summary(macd)
      Index      macd      signal
Min.   :2014-02-21  Min.   : -6.0381  Min.   : -5.4253
1st Qu.:2015-05-21  1st Qu.: -0.4140  1st Qu.: -0.3965
Median :2016-08-18  Median :  0.6794  Median :  0.6929
Mean   :2016-08-19  Mean   :  0.4570  Mean   :  0.4523
3rd Qu.:2017-11-15  3rd Qu.:  1.7083  3rd Qu.:  1.6165
Max.   :2019-02-20  Max.   :  4.0967  Max.   :  3.6004
NA's   :25          NA's   :33

```

**Summary:**

From the data I adopted for this analysis tell us daily open, low, high, and close price of daily apple stock. As we have taken daily close price of apple stock of the it will provide the analysis for the investor to take positional trades in the stock market. This project will help in understanding the analysis of the stock market to buy and sell contract at a better price. We have used the formula to calculate MACD that will give us the way the signal based on which an investor can design the buy or sell strategies of there portfolio. There are following question I would like to be answered:

1. Is this indicator being reliable to invest based on its insights?
2. What are better indicators then MACD?
3. How can I use other attributes given in the dataset?
4. How can I use advanced data analytics so that system gives predicted price to invest?
5. How concepts of machine learning and artificial intelligence can be incorporated in this analysis?

## References:

### [1]Understanding a Candlestick Chart

Mitchell

<https://www.investopedia.com/trading/candlestick-charting-what-is-it/>

### [2]Moving Average Convergence Divergence (MACD)

Fernando

<https://www.investopedia.com/terms/m/macd.asp>

### [3]5.9 MACD | Techinca Analysis with R (second edition)

This is an introductory textbook that focuses on how to use R to do technical analysis.

<https://bookdown.org/kochiuyu/technical-analysis-with-r-second-edition/macd.html>