
# MARUTI STOCK EXCHANGE (2003-2021)

**Partial fulfilment for the award of the**
**Post Graduate Certification**
**in Data Analytics for Engineers**
**September 2021**

SUBMITTED BY,

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# ACNOWLEDGEMENT

First of all, I express my deep gratitude to Almighty God for his entire blessings throughout this project which enabled us to complete it successfully.

I sincerely express my gratitude to Miss Shalini Kumari, Technical Trainer, Edubridge. She helped vey much for completing this project work.

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Lastly, I wish to thank my group members who supported me through out my study and for the successful completion of this work.

# RIZAMOL

## ABSTRACT

Maruti Udyog Limited was founded by the Government of India on 24 Feb 1981 with Suzuki Motor Corporation as a minor partner, only to become the formal JV partner and license holder of Suzuki in August 2021. The first manufacturing factory of Maruti was established in Gurugram, Haryana, in the same year. Maruti Suzuki Limited is the Number 1 automobile company in India, commanding a market share of more than 50% in the 4-wheeler segment. One in every two cars you see on the road today is a Maruti Suzuki. This domination has made Maruti the 14th most-valued company in the Indian stock market. To analyse Maruti Stock Exchange, we use different tools. We used a data set from Kaggle. In this analysis, we cover the journey of the iconic company from the time it was first listed in 2003 to 2021.

Tools used

- Python
- R
- Excel
- Tableau

# CONTENTS

# INTRODUCTION

Maruti Suzuki India Limited (MSIL), formerly known as Maruti Udyog Limited, a subsidiary of Suzuki Motor Corporation of Japan, is India's largest passenger car company, accounting for over 50 per cent of the domestic car market. Maruti Udyog Limited was incorporated in 1981 under the provisions of Indian Companies Act 1956 and the government of India selected Suzuki Motor Corporation as the joint venture partner for the company. In 1982 a JV was signed between Government of India and Suzuki Motor Corporation.

# ANALYSIS

## PYTHON

Jupyter notebook is used for analysis of data set. Firstly, import all libraries. Then read the data set and done EDA analysis. Then done Machine learning. We used linear regression for ML approach.

## Library

```
import pandas as pd

import numpy as np

import matplotlib.pyplot as plt

import seaborn as sns


import warnings

warnings.filterwarnings('ignore')

%matplotlib inline
```

## Read data set

```
d = pd.read_csv("Maruti.csv")
```

# Screen shots

[6]:

| | Date | Symbol | Series | Prev Close | Open | High | Low | Last | Close | VWAP | Volume | Turnover | Trades | Deliverable Volume | %Deliverble |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **0** | 2003-07-09 | MARUTI | EQ | 125.00 | 164.90 | 170.40 | 155.00 | 164.00 | 164.30 | 165.95 | 35164283 | 5.835528e+14 | NaN | 8537695.0 | 0.2428 |
| **1** | 2003-07-10 | MARUTI | EQ | 164.30 | 167.00 | 168.70 | 164.50 | 167.00 | 167.00 | 166.74 | 10464179 | 1.744820e+14 | NaN | 4363947.0 | 0.4170 |
| **2** | 2003-07-11 | MARUTI | EQ | 167.00 | 167.75 | 174.85 | 166.25 | 173.60 | 173.35 | 172.45 | 11740117 | 2.024622e+14 | NaN | 3014852.0 | 0.2568 |
| **3** | 2003-07-14 | MARUTI | EQ | 173.35 | 174.25 | 179.25 | 174.25 | 178.60 | 177.95 | 177.91 | 5982324 | 1.064313e+14 | NaN | 1949217.0 | 0.3258 |
| **4** | 2003-07-15 | MARUTI | EQ | 177.95 | 200.00 | 200.00 | 173.00 | 176.30 | 176.20 | 176.88 | 6173689 | 1.092001e+14 | NaN | 1307694.0 | 0.2118 |
| **...** | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| **4422** | 2021-04-26 | MARUTI | EQ | 6676.10 | 6690.20 | 6789.00 | 6600.00 | 6645.00 | 6638.90 | 6678.34 | 937344 | 6.259903e+14 | 74474.0 | 464999.0 | 0.4961 |
| **4423** | 2021-04-27 | MARUTI | EQ | 6638.90 | 6669.95 | 6709.00 | 6542.00 | 6552.00 | 6568.75 | 6620.68 | 1610651 | 1.066360e+15 | 130986.0 | 588617.0 | 0.3655 |
| **4424** | 2021-04-28 | MARUTI | EQ | 6568.75 | 6568.75 | 6650.00 | 6545.00 | 6581.00 | 6573.80 | 6598.62 | 1406270 | 9.279437e+14 | 117843.0 | 672435.0 | 0.4782 |
| **4425** | 2021-04-29 | MARUTI | EQ | 6573.80 | 6635.00 | 6647.45 | 6552.00 | 6562.00 | 6565.65 | 6580.77 | 757075 | 4.982135e+14 | 64393.0 | 352987.0 | 0.4663 |
| **4426** | 2021-04-30 | MARUTI | EQ | 6565.65 | 6537.10 | 6559.60 | 6421.00 | 6438.35 | 6455.65 | 6500.51 | 849997 | 5.525418e+14 | 95248.0 | 382594.0 | 0.4501 |

4427 rows × 15 columns

## To print head row

In [4]:
```
1 d.head()
```

Out[4]:

| | Date | Symbol | Series | Prev Close | Open | High | Low | Last | Close | VWAP | Volume | Turnover | Trades | Deliverable Volume | %Deliverble |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **0** | 2003-07-09 | MARUTI | EQ | 125.00 | 164.90 | 170.40 | 155.00 | 164.0 | 164.30 | 165.95 | 35164283 | 5.835528e+14 | NaN | 8537695.0 | 0.2428 |
| **1** | 2003-07-10 | MARUTI | EQ | 164.30 | 167.00 | 168.70 | 164.50 | 167.0 | 167.00 | 166.74 | 10464179 | 1.744820e+14 | NaN | 4363947.0 | 0.4170 |
| **2** | 2003-07-11 | MARUTI | EQ | 167.00 | 167.75 | 174.85 | 166.25 | 173.6 | 173.35 | 172.45 | 11740117 | 2.024622e+14 | NaN | 3014852.0 | 0.2568 |
| **3** | 2003-07-14 | MARUTI | EQ | 173.35 | 174.25 | 179.25 | 174.25 | 178.6 | 177.95 | 177.91 | 5982324 | 1.064313e+14 | NaN | 1949217.0 | 0.3258 |
| **4** | 2003-07-15 | MARUTI | EQ | 177.95 | 200.00 | 200.00 | 173.00 | 176.3 | 176.20 | 176.88 | 6173689 | 1.092001e+14 | NaN | 1307694.0 | 0.2118 |

## To print tail row

In [5]:
```
1 d.tail()
```

Out[5]:

| | Date | Symbol | Series | Prev Close | Open | High | Low | Last | Close | VWAP | Volume | Turnover | Trades | Deliverable Volume | %Deliverble |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **4422** | 2021-04-26 | MARUTI | EQ | 6676.10 | 6690.20 | 6789.00 | 6600.0 | 6645.00 | 6638.90 | 6678.34 | 937344 | 6.259903e+14 | 74474.0 | 464999.0 | 0.4961 |
| **4423** | 2021-04-27 | MARUTI | EQ | 6638.90 | 6669.95 | 6709.00 | 6542.0 | 6552.00 | 6568.75 | 6620.68 | 1610651 | 1.066360e+15 | 130986.0 | 588617.0 | 0.3655 |
| **4424** | 2021-04-28 | MARUTI | EQ | 6568.75 | 6568.75 | 6650.00 | 6545.0 | 6581.00 | 6573.80 | 6598.62 | 1406270 | 9.279437e+14 | 117843.0 | 672435.0 | 0.4782 |
| **4425** | 2021-04-29 | MARUTI | EQ | 6573.80 | 6635.00 | 6647.45 | 6552.0 | 6562.00 | 6565.65 | 6580.77 | 757075 | 4.982135e+14 | 64393.0 | 352987.0 | 0.4663 |
| **4426** | 2021-04-30 | MARUTI | EQ | 6565.65 | 6537.10 | 6559.60 | 6421.0 | 6438.35 | 6455.65 | 6500.51 | 849997 | 5.525418e+14 | 95248.0 | 382594.0 | 0.4501 |

## Check data types

```
In [6]: 1 d.dtypes
```

```
Out[6]: Date                 object
        Symbol               object
        Series               object
        Prev Close          float64
        Open                float64
        High                float64
        Low                 float64
        Last                float64
        Close               float64
        VWAP                float64
        Volume                int64
        Turnover            float64
        Trades              float64
        Deliverable Volume  float64
        %Deliverble         float64
        dtype: object
```

## Size of data set

```
In [7]: 1 d.size
```

```
Out[7]: 66405
```

## To print number of rows and columns

```
In [8]: 1 d.shape
```

```
Out[8]: (4427, 15)
```

## To print dimensions of dataset

```
In [9]: 1 d.ndim
```

```
Out[9]: 2
```

## To check whether any data value is null

```
In [10]: 1 d.isna()
```

Out[10]:

| | Date | Symbol | Series | Prev Close | Open | High | Low | Last | Close | VWAP | Volume | Turnover | Trades | Deliverable Volume | %Deliverble |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **0** | False | False | False | False | False | False | False | False | False | False | False | False | True | False | False |
| **1** | False | False | False | False | False | False | False | False | False | False | False | False | True | False | False |
| **2** | False | False | False | False | False | False | False | False | False | False | False | False | True | False | False |
| **3** | False | False | False | False | False | False | False | False | False | False | False | False | True | False | False |
| **4** | False | False | False | False | False | False | False | False | False | False | False | False | True | False | False |
| **...** | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| **4422** | False | False | False | False | False | False | False | False | False | False | False | False | False | False | False |
| **4423** | False | False | False | False | False | False | False | False | False | False | False | False | False | False | False |
| **4424** | False | False | False | False | False | False | False | False | False | False | False | False | False | False | False |
| **4425** | False | False | False | False | False | False | False | False | False | False | False | False | False | False | False |
| **4426** | False | False | False | False | False | False | False | False | False | False | False | False | False | False | False |

4427 rows × 15 columns

## Sum of null values

```
In [11]: d.isna().sum()
```

```
Out[11]: Date                   0
         Symbol                 0
         Series                 0
         Prev Close             0
         Open                   0
         High                   0
         Low                    0
         Last                   0
         Close                  0
         VWAP                   0
         Volume                 0
         Turnover               0
         Trades              1971
         Deliverable Volume     1
         %Deliverble            1
         dtype: int64
```

## To check any duplicated value

```
In [12]: d.duplicated()
```

```
Out[12]: 0       False
         1       False
         2       False
         3       False
         4       False
                 ...
         4422    False
         4423    False
         4424    False
         4425    False
         4426    False
         Length: 4427, dtype: bool
```

```
In [13]: d.duplicated().sum()
```

```
Out[13]: 0
```

## To check high share value

```
In [14]: d['High'].max()
```

```
Out[14]: 9996.4
```

## Sort basis of high share values

```
In [15]: d.sort_values(by="High",ascending=False)
```

Out[15]:

| | Date | Symbol | Series | Prev Close | Open | High | Low | Last | Close | VWAP | Volume | Turnover | Trades | Deliverable Volume | %Deliverble |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **3597** | 2017-12-20 | MARUTI | EQ | 9801.50 | 9966.0 | 9996.40 | 9700.25 | 9755.4 | 9733.90 | 9848.56 | 1216280 | 1.197881e+15 | 127449.0 | 325474.0 | 0.2676 |
| **3744** | 2018-07-24 | MARUTI | EQ | 9701.00 | 9778.0 | 9929.00 | 9725.00 | 9842.0 | 9832.45 | 9850.96 | 749626 | 7.384534e+14 | 96801.0 | 307586.0 | 0.4103 |
| **3745** | 2018-07-25 | MARUTI | EQ | 9832.45 | 9853.0 | 9875.85 | 9701.00 | 9769.0 | 9758.95 | 9770.80 | 384750 | 3.759315e+14 | 51181.0 | 130726.0 | 0.3398 |
| **3596** | 2017-12-19 | MARUTI | EQ | 9309.10 | 9345.0 | 9858.00 | 9326.00 | 9846.0 | 9801.50 | 9603.52 | 1275759 | 1.225177e+15 | 113969.0 | 369478.0 | 0.2896 |
| **3746** | 2018-07-26 | MARUTI | EQ | 9758.95 | 9819.8 | 9831.70 | 9361.00 | 9390.0 | 9396.25 | 9510.08 | 1261317 | 1.199523e+15 | 151687.0 | 380582.0 | 0.3017 |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| **7** | 2003-07-18 | MARUTI | EQ | 172.20 | 165.0 | 171.90 | 160.00 | 167.4 | 167.40 | 167.86 | 5375212 | 9.011903e+13 | NaN | 1427995.0 | 0.2657 |
| **0** | 2003-07-09 | MARUTI | EQ | 125.00 | 164.9 | 170.40 | 155.00 | 164.0 | 164.30 | 165.95 | 35164283 | 5.835528e+14 | NaN | 8537695.0 | 0.2428 |
| **8** | 2003-07-21 | MARUTI | EQ | 167.40 | 169.0 | 169.40 | 163.05 | 164.0 | 164.90 | 166.67 | 3315845 | 5.526646e+13 | NaN | 980379.0 | 0.2957 |
| **9** | 2003-07-22 | MARUTI | EQ | 164.90 | 164.0 | 169.15 | 162.10 | 168.6 | 167.25 | 165.06 | 4627992 | 7.639124e+13 | NaN | 1257167.0 | 0.2716 |
| **1** | 2003-07-10 | MARUTI | EQ | 164.30 | 167.0 | 168.70 | 164.50 | 167.0 | 167.00 | 166.74 | 10464179 | 1.744820e+14 | NaN | 4363947.0 | 0.4170 |

## Sort basis of Turnover

In [16]:
```
d.sort_values(by="Low",ascending=False)
```

Out[16]:

| | Date | Symbol | Series | Prev Close | Open | High | Low | Last | Close | VWAP | Volume | Turnover | Trades | Deliverable Volume | %Deliverble |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **3744** | 2018-07-24 | MARUTI | EQ | 9701.00 | 9778.0 | 9929.00 | 9725.00 | 9842.0 | 9832.45 | 9850.96 | 749626 | 7.384534e+14 | 96801.0 | 307586.0 | 0.4103 |
| **3745** | 2018-07-25 | MARUTI | EQ | 9832.45 | 9853.0 | 9875.85 | 9701.00 | 9769.0 | 9758.95 | 9770.80 | 384750 | 3.759315e+14 | 51181.0 | 130726.0 | 0.3398 |
| **3597** | 2017-12-20 | MARUTI | EQ | 9801.50 | 9966.0 | 9996.40 | 9700.25 | 9755.4 | 9733.90 | 9848.56 | 1216280 | 1.197861e+15 | 127449.0 | 325474.0 | 0.2676 |
| **3603** | 2017-12-29 | MARUTI | EQ | 9629.20 | 9659.0 | 9769.00 | 9650.00 | 9735.3 | 9729.55 | 9717.74 | 471554 | 4.582438e+14 | 41973.0 | 134352.0 | 0.2849 |
| **3604** | 2018-01-01 | MARUTI | EQ | 9729.55 | 9749.0 | 9789.00 | 9629.80 | 9644.0 | 9651.90 | 9708.58 | 426354 | 4.139291e+14 | 37440.0 | 119356.0 | 0.2799 |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| **1** | 2003-07-10 | MARUTI | EQ | 164.30 | 167.0 | 168.70 | 164.50 | 167.0 | 167.00 | 166.74 | 10464179 | 1.744820e+14 | NaN | 4363947.0 | 0.4170 |
| **8** | 2003-07-21 | MARUTI | EQ | 167.40 | 169.0 | 169.40 | 163.05 | 164.0 | 164.90 | 166.67 | 3315845 | 5.526646e+13 | NaN | 980379.0 | 0.2957 |
| **9** | 2003-07-22 | MARUTI | EQ | 164.90 | 164.0 | 169.15 | 162.10 | 168.6 | 167.25 | 165.06 | 4627992 | 7.639124e+13 | NaN | 1257167.0 | 0.2716 |
| **7** | 2003-07-18 | MARUTI | EQ | 172.20 | 165.0 | 171.90 | 160.00 | 167.4 | 167.40 | 167.66 | 5375212 | 9.011903e+13 | NaN | 1427995.0 | 0.2657 |
| **0** | 2003-07-09 | MARUTI | EQ | 125.00 | 164.9 | 170.40 | 155.00 | 164.0 | 164.30 | 165.95 | 35164283 | 5.835528e+14 | NaN | 8537695.0 | 0.2428 |

4427 rows × 15 columns

## Sort value basis of Low Share values

In [17]:
```
d.sort_values(by="Low",ascending=False)
```

Out[17]:

| | Date | Symbol | Series | Prev Close | Open | High | Low | Last | Close | VWAP | Volume | Turnover | Trades | Deliverable Volume | %Deliverble |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **3744** | 2018-07-24 | MARUTI | EQ | 9701.00 | 9778.0 | 9929.00 | 9725.00 | 9842.0 | 9832.45 | 9850.96 | 749626 | 7.384534e+14 | 96801.0 | 307586.0 | 0.4103 |
| **3745** | 2018-07-25 | MARUTI | EQ | 9832.45 | 9853.0 | 9875.85 | 9701.00 | 9769.0 | 9758.95 | 9770.80 | 384750 | 3.759315e+14 | 51181.0 | 130726.0 | 0.3398 |
| **3597** | 2017-12-20 | MARUTI | EQ | 9801.50 | 9966.0 | 9996.40 | 9700.25 | 9755.4 | 9733.90 | 9848.56 | 1216280 | 1.197861e+15 | 127449.0 | 325474.0 | 0.2676 |
| **3603** | 2017-12-29 | MARUTI | EQ | 9629.20 | 9659.0 | 9769.00 | 9650.00 | 9735.3 | 9729.55 | 9717.74 | 471554 | 4.582438e+14 | 41973.0 | 134352.0 | 0.2849 |
| **3604** | 2018-01-01 | MARUTI | EQ | 9729.55 | 9749.0 | 9789.00 | 9629.80 | 9644.0 | 9651.90 | 9708.58 | 426354 | 4.139291e+14 | 37440.0 | 119356.0 | 0.2799 |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| **1** | 2003-07-10 | MARUTI | EQ | 164.30 | 167.0 | 168.70 | 164.50 | 167.0 | 167.00 | 166.74 | 10464179 | 1.744820e+14 | NaN | 4363947.0 | 0.4170 |
| **8** | 2003-07-21 | MARUTI | EQ | 167.40 | 169.0 | 169.40 | 163.05 | 164.0 | 164.90 | 166.67 | 3315845 | 5.526646e+13 | NaN | 980379.0 | 0.2957 |
| **9** | 2003-07-22 | MARUTI | EQ | 164.90 | 164.0 | 169.15 | 162.10 | 168.6 | 167.25 | 165.06 | 4627992 | 7.639124e+13 | NaN | 1257167.0 | 0.2716 |
| **7** | 2003-07-18 | MARUTI | EQ | 172.20 | 165.0 | 171.90 | 160.00 | 167.4 | 167.40 | 167.66 | 5375212 | 9.011903e+13 | NaN | 1427995.0 | 0.2657 |
| **0** | 2003-07-09 | MARUTI | EQ | 125.00 | 164.9 | 170.40 | 155.00 | 164.0 | 164.30 | 165.95 | 35164283 | 5.835528e+14 | NaN | 8537695.0 | 0.2428 |

4427 rows × 15 columns

## To print High share value row set ¶

In [18]:
```
a = d["High"].max()
a
```

Out[18]: 9996.4

In [19]:
```
d_max = d.loc[(d['High']==a)]
d_max
```

Out[19]:

| | Date | Symbol | Series | Prev Close | Open | High | Low | Last | Close | VWAP | Volume | Turnover | Trades | Deliverable Volume | %Deliverble |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **3597** | 2017-12-20 | MARUTI | EQ | 9801.5 | 9966.0 | 9996.4 | 9700.25 | 9755.4 | 9733.9 | 9848.56 | 1216280 | 1.197881e+15 | 127449.0 | 325474.0 | 0.2676 |

## To print mean, median, mode of data set

In [20]:
```
d.mean()
```

Out[20]:
```
Prev Close           2.923575e+03
Open                 2.927873e+03
High                 2.962918e+03
Low                  2.889128e+03
Last                 2.924652e+03
Close                2.925005e+03
VWAP                 2.926481e+03
Volume               1.194661e+06
Turnover             2.395307e+14
Trades               5.542851e+04
Deliverable Volume   3.627677e+05
%Deliverble          3.873908e-01
dtype: float64
```

In [21]:
```
d.mode()
```

Out[21]:

| | Date | Symbol | Series | Prev Close | Open | High | Low | Last | Close | VWAP | Volume | Turnover | Trades | Deliverable Volume | %Deliverble |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **0** | 2003-07-09 | MARUTI | EQ | 418.95 | 765.0 | 954.0 | 825.0 | 800.0 | 418.95 | 377.51 | 184121.0 | 2.131518e+12 | 10514.0 | 85105.0 | 0.3404 |
| **1** | 2003-07-10 | NaN | NaN | NaN | NaN | NaN | 920.0 | NaN | NaN | 414.79 | 261295.0 | 2.606075e+12 | 11304.0 | 93889.0 | NaN |
| **2** | 2003-07-11 | NaN | NaN | NaN | NaN | NaN | NaN | NaN | NaN | 423.64 | 328108.0 | 3.365101e+12 | 11607.0 | 96440.0 | NaN |
| **3** | 2003-07-14 | NaN | NaN | NaN | NaN | NaN | NaN | NaN | NaN | 461.96 | 420913.0 | 4.842874e+12 | 12463.0 | 188286.0 | NaN |
| **4** | 2003-07-15 | NaN | NaN | NaN | NaN | NaN | NaN | NaN | NaN | 481.03 | 679821.0 | 4.961826e+12 | 14982.0 | 192329.0 | NaN |
| **...** | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| **4422** | 2021-04-26 | NaN | NaN | NaN | NaN | NaN | NaN | NaN | NaN | NaN | NaN | 2.164002e+15 | NaN | NaN | NaN |
| **4423** | 2021-04-27 | NaN | NaN | NaN | NaN | NaN | NaN | NaN | NaN | NaN | NaN | 2.264809e+15 | NaN | NaN | NaN |
| **4424** | 2021-04-28 | NaN | NaN | NaN | NaN | NaN | NaN | NaN | NaN | NaN | NaN | 2.913613e+15 | NaN | NaN | NaN |
| **4425** | 2021-04-29 | NaN | NaN | NaN | NaN | NaN | NaN | NaN | NaN | NaN | NaN | 3.187016e+15 | NaN | NaN | NaN |
| **4426** | 2021-04-30 | NaN | NaN | NaN | NaN | NaN | NaN | NaN | NaN | NaN | NaN | 4.878992e+15 | NaN | NaN | NaN |

4427 rows × 15 columns

In [22]:
```
d.median()
```

Out[22]:
```
Prev Close           1.412450e+03
Open                 1.414000e+03
High                 1.432000e+03
Low                  1.390350e+03
Last                 1.412200e+03
Close                1.412600e+03
VWAP                 1.412210e+03
Volume               6.909590e+05
Turnover             1.121591e+14
Trades               4.093150e+04
```

dtype: float64

## To print information of data set

```
n [23]: 1 d.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 4427 entries, 0 to 4426
Data columns (total 15 columns):
 #   Column             Non-Null Count  Dtype
---  ------             --------------  -----
 0   Date               4427 non-null   object
 1   Symbol             4427 non-null   object
 2   Series             4427 non-null   object
 3   Prev Close         4427 non-null   float64
 4   Open               4427 non-null   float64
 5   High               4427 non-null   float64
 6   Low                4427 non-null   float64
 7   Last               4427 non-null   float64
 8   Close              4427 non-null   float64
 9   VWAP               4427 non-null   float64
 10  Volume             4427 non-null   int64
 11  Turnover           4427 non-null   float64
 12  Trades             2456 non-null   float64
 13  Deliverable Volume 4426 non-null   float64
 14  %Deliverble        4426 non-null   float64
dtypes: float64(11), int64(1), object(3)
memory usage: 518.9+ KB
```

## To print index values

```
In [24]: 1 d.index
```

```
Out[24]: RangeIndex(start=0, stop=4427, step=1)
```

## To print number of unique value in the data set

```
In [25]: 1 d.nunique()
```

```
Out[25]: Date               4427
         Symbol                1
         Series                1
         Prev Close         4296
         Open               3404
         High               3860
         Low                3897
         Last               3788
         Close              4296
         VWAP               4397
         Volume             4421
         Turnover           4427
         Trades             2418
         Deliverable Volume 4406
         %Deliverble        3132
         dtype: int64
```

```
In [26]: 1 d.nunique().sum()
```

```
Out[26]: 51171
```

## Check relationship between data set

```
In [27]: 1 d.corr()
```

Out[27]:

| | Prev Close | Open | High | Low | Last | Close | VWAP | Volume | Turnover | Trades | Deliverable Volume | %Deliverble |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Prev Close** | 1.000000 | 0.999940 | 0.999819 | 0.999789 | 0.999665 | 0.999677 | 0.999820 | -0.245643 | 0.649851 | 0.464892 | -0.194373 | 0.060529 |
| **Open** | 0.999940 | 1.000000 | 0.999842 | 0.999847 | 0.999696 | 0.999709 | 0.999856 | -0.245440 | 0.649903 | 0.464263 | -0.194295 | 0.060458 |
| **High** | 0.999819 | 0.999842 | 1.000000 | 0.999771 | 0.999876 | 0.999884 | 0.999940 | -0.243687 | 0.655949 | 0.474093 | -0.191977 | 0.058686 |
| **Low** | 0.999789 | 0.999847 | 0.999771 | 1.000000 | 0.999837 | 0.999849 | 0.999920 | -0.246699 | 0.646019 | 0.456209 | -0.196509 | 0.060714 |
| **Last** | 0.999665 | 0.999696 | 0.999876 | 0.999837 | 1.000000 | 0.999995 | 0.999943 | -0.245025 | 0.651448 | 0.465550 | -0.194335 | 0.059028 |
| **Close** | 0.999677 | 0.999709 | 0.999884 | 0.999849 | 0.999995 | 1.000000 | 0.999953 | -0.244997 | 0.651590 | 0.465683 | -0.194240 | 0.059002 |
| **VWAP** | 0.999820 | 0.999856 | 0.999940 | 0.999920 | 0.999943 | 0.999953 | 1.000000 | -0.245102 | 0.651271 | 0.465281 | -0.194284 | 0.059298 |
| **Volume** | -0.245643 | -0.245440 | -0.243687 | -0.246699 | -0.245025 | -0.244997 | -0.245102 | 1.000000 | 0.201224 | 0.778248 | 0.718711 | -0.388508 |
| **Turnover** | 0.649851 | 0.649903 | 0.655949 | 0.646019 | 0.651448 | 0.651590 | 0.651271 | 0.201224 | 1.000000 | 0.914480 | 0.270873 | -0.134744 |
| **Trades** | 0.464892 | 0.464263 | 0.474093 | 0.456209 | 0.465550 | 0.465683 | 0.465281 | 0.778248 | 0.914480 | 1.000000 | 0.488334 | -0.206539 |
| **Deliverable Volume** | -0.194373 | -0.194295 | -0.191977 | -0.196509 | -0.194335 | -0.194240 | -0.194284 | 0.718711 | 0.270873 | 0.488334 | 1.000000 | 0.113439 |
| **%Deliverble** | 0.060529 | 0.060458 | 0.058686 | 0.060714 | 0.059028 | 0.059002 | 0.059298 | -0.388508 | -0.134744 | -0.206539 | 0.113439 | 1.000000 |

## To print Columns

```
In [28]: 1 d.columns
```

```
Out[28]: Index(['Date', 'Symbol', 'Series', 'Prev Close', 'Open', 'High', 'Low', 'Last',
       'Close', 'VWAP', 'Volume', 'Turnover', 'Trades', 'Deliverable Volume',
       '%Deliverble'],
      dtype='object')
```

## Filter date column

```
In [29]: 1 d.filter(["Date"])
```

Out[29]:

| | Date |
|---|---|
| 0 | 2003-07-09 |
| 1 | 2003-07-10 |
| 2 | 2003-07-11 |
| 3 | 2003-07-14 |
| 4 | 2003-07-15 |
| ... | ... |
| 4422 | 2021-04-26 |
| 4423 | 2021-04-27 |
| 4424 | 2021-04-28 |
| 4425 | 2021-04-29 |
| 4426 | 2021-04-30 |

4427 rows × 1 columns

```
In [30]: 1 year = d.filter(["Date"])
         2 year
```

Out[30]:

| | Date |
|---|---|
| 0 | 2003-07-09 |
| 1 | 2003-07-10 |
| 2 | 2003-07-11 |
| 3 | 2003-07-14 |
| 4 | 2003-07-15 |
| ... | ... |
| 4422 | 2021-04-26 |
| 4423 | 2021-04-27 |
| 4424 | 2021-04-28 |
| 4425 | 2021-04-29 |
| 4426 | 2021-04-30 |

4427 rows × 1 columns

## To show Years from date column

```
In [31]: 1 pd.DatetimeIndex(year['Date']).year
```

```
Out[31]: Int64Index([2003, 2003, 2003, 2003, 2003, 2003, 2003, 2003, 2003, 2003,
             ...
             2021, 2021, 2021, 2021, 2021, 2021, 2021, 2021, 2021, 2021],
            dtype='int64', name='Date', length=4427)
```

## Add Year Column to data set

```
In [32]: 1 d["Year"] = pd.DatetimeIndex(year['Date']).year
         2 d
```

Out[32]:

| | Date | Symbol | Series | Prev Close | Open | High | Low | Last | Close | VWAP | Volume | Turnover | Trades | Deliverable Volume | %Deliverble | Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 2003-07-09 | MARUTI | EQ | 125.00 | 164.90 | 170.40 | 155.00 | 164.00 | 164.30 | 165.95 | 35164283 | 5.835528e+14 | NaN | 8537695.0 | 0.2428 | 2003 |
| 1 | 2003-07-10 | MARUTI | EQ | 164.30 | 167.00 | 168.70 | 164.50 | 167.00 | 167.00 | 166.74 | 10464179 | 1.744820e+14 | NaN | 4363947.0 | 0.4170 | 2003 |
| 2 | 2003-07-11 | MARUTI | EQ | 167.00 | 167.75 | 174.85 | 166.25 | 173.60 | 173.35 | 172.45 | 11740117 | 2.024622e+14 | NaN | 3014852.0 | 0.2568 | 2003 |
| 3 | 2003-07-14 | MARUTI | EQ | 173.35 | 174.25 | 179.25 | 174.25 | 178.60 | 177.95 | 177.91 | 5982324 | 1.064313e+14 | NaN | 1949217.0 | 0.3258 | 2003 |
| 4 | 2003-07-15 | MARUTI | EQ | 177.95 | 200.00 | 200.00 | 173.00 | 176.30 | 176.20 | 176.88 | 6173689 | 1.092001e+14 | NaN | 1307694.0 | 0.2118 | 2003 |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| 4422 | 2021-04-26 | MARUTI | EQ | 6676.10 | 6690.20 | 6789.00 | 6600.00 | 6645.00 | 6638.90 | 6678.34 | 937344 | 6.259903e+14 | 74474.0 | 464999.0 | 0.4961 | 2021 |

4427 rows × 16 columns

## To add a column of Month for printing particular month from date column

In [33]:
```
pd.DatetimeIndex(year['Date']).month
```

Out[33]:
```
Int64Index([7, 7, 7, 7, 7, 7, 7, 7, 7, 7,
            ...
            4, 4, 4, 4, 4, 4, 4, 4, 4, 4],
           dtype='int64', name='Date', length=4427)
```

In [34]:
```
d["Month"]  = pd.DatetimeIndex(year['Date']).month
d
```

Out[34]:

| | Date | Symbol | Series | Prev Close | Open | High | Low | Last | Close | VWAP | Volume | Turnover | Trades | Deliverable Volume | %Deliverble | Ye |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 2003-07-09 | MARUTI | EQ | 125.00 | 164.90 | 170.40 | 155.00 | 164.00 | 164.30 | 165.95 | 35164283 | 5.835528e+14 | NaN | 8537696.0 | 0.2428 | 200 |
| 1 | 2003-07-10 | MARUTI | EQ | 164.30 | 167.00 | 168.70 | 164.50 | 167.00 | 167.00 | 166.74 | 10464179 | 1.744820e+14 | NaN | 4363947.0 | 0.4170 | 200 |
| 2 | 2003-07-11 | MARUTI | EQ | 167.00 | 167.75 | 174.85 | 166.25 | 173.60 | 173.35 | 172.45 | 11740117 | 2.024622e+14 | NaN | 3014852.0 | 0.2568 | 200 |
| 3 | 2003-07-14 | MARUTI | EQ | 173.35 | 174.25 | 179.25 | 174.25 | 178.60 | 177.95 | 177.91 | 5982324 | 1.064313e+14 | NaN | 1949217.0 | 0.3258 | 200 |
| 4 | 2003-07-15 | MARUTI | EQ | 177.95 | 200.00 | 200.00 | 173.00 | 176.30 | 176.20 | 176.88 | 6173689 | 1.092001e+14 | NaN | 1307694.0 | 0.2118 | 200 |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| 4422 | 2021-04-26 | MARUTI | EQ | 6676.10 | 6690.20 | 6789.00 | 6600.00 | 6645.00 | 6638.90 | 6678.34 | 937344 | 6.259903e+14 | 74474.0 | 464999.0 | 0.4961 | 202 |

## To print column names

In [35]:
```
d.columns
```

Out[35]:
```
Index(['Date', 'Symbol', 'Series', 'Prev Close', 'Open', 'High', 'Low', 'Last',
       'Close', 'VWAP', 'Volume', 'Turnover', 'Trades', 'Deliverable Volume',
       '%Deliverble', 'Year', 'Month'],
      dtype='object')
```

## Extract data basis Year 2021

In [36]:
```
d_Year_2021 = d.loc[(d["Year"]== 2021 )]
d_Year_2021
```

Out[36]:

| | Date | Symbol | Series | Prev Close | Open | High | Low | Last | Close | VWAP | Volume | Turnover | Trades | Deliverable Volume | %Deliverble | Year | M |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4347 | 2021-01-01 | MARUTI | EQ | 7649.60 | 7654.00 | 7748.50 | 7650.0 | 7687.00 | 7691.30 | 7704.92 | 767574 | 5.914094e+14 | 55693.0 | 93385.0 | 0.1217 | 2021 | |
| 4348 | 2021-01-04 | MARUTI | EQ | 7691.30 | 7739.00 | 7755.20 | 7642.6 | 7691.05 | 7702.30 | 7687.13 | 598645 | 4.601847e+14 | 55195.0 | 171586.0 | 0.2866 | 2021 | |
| 4349 | 2021-01-05 | MARUTI | EQ | 7702.30 | 7680.00 | 7673.00 | 7586.0 | 7657.20 | 7655.45 | 7635.41 | 552668 | 4.298203e+14 | 57428.0 | 147432.0 | 0.2620 | 2021 | |
| 4350 | 2021-01-06 | MARUTI | EQ | 7655.45 | 7654.00 | 7749.00 | 7555.5 | 7625.25 | 7628.60 | 7670.88 | 840678 | 6.448736e+14 | 66618.0 | 204373.0 | 0.2431 | 2021 | |
| 4351 | 2021-01-07 | MARUTI | EQ | 7628.60 | 7676.00 | 7704.40 | 7552.1 | 7576.85 | 7596.05 | 7620.30 | 642968 | 4.899611e+14 | 65629.0 | 198399.0 | 0.3086 | 2021 | |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | |
| 4422 | 2021-04-26 | MARUTI | EQ | 6676.10 | 6690.20 | 6789.00 | 6600.0 | 6645.00 | 6638.90 | 6678.34 | 937344 | 6.259903e+14 | 74474.0 | 464999.0 | 0.4961 | 2021 | |

## Check and drop a row of Deliverable row as NAN

In [37]:
```
d[d['Deliverable Volume'].isna()]
```

Out[37]:

| | Date | Symbol | Series | Prev Close | Open | High | Low | Last | Close | VWAP | Volume | Turnover | Trades | Deliverable Volume | %Deliverble | Year | Month |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 76 | 2003-10-25 | MARUTI | EQ | 285.0 | 294.9 | 297.7 | 291.5 | 293.6 | 293.75 | 294.51 | 1888755 | 5.562562e+13 | NaN | NaN | NaN | 2003 | 10 |

In [38]:
```
a = d[d['Date']=='2003-10-25']
```

In [39]:
```
a
```

Out[39]:

| | Date | Symbol | Series | Prev Close | Open | High | Low | Last | Close | VWAP | Volume | Turnover | Trades | Deliverable Volume | %Deliverble | Year | Month |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 76 | 2003-10-25 | MARUTI | EQ | 285.0 | 294.9 | 297.7 | 291.5 | 293.6 | 293.75 | 294.51 | 1888755 | 5.562562e+13 | NaN | NaN | NaN | 2003 | 10 |

In [40]:
```
d.drop(76,axis=0,inplace=True)
```

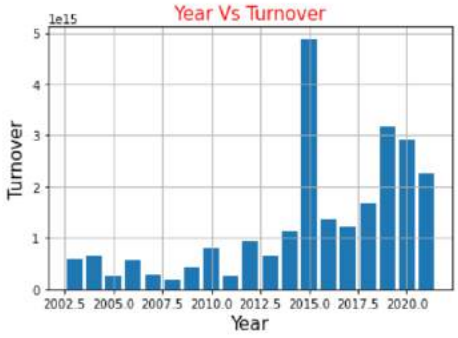
In [41]:
```
d.isna().sum()
```

Out[41]:
```
Date                 0
Symbol               0
Series               0
Prev Close           0
Open                 0
High                 0
Low                  0
Last                 0
Close                0
VWAP                 0
```

## Visualization

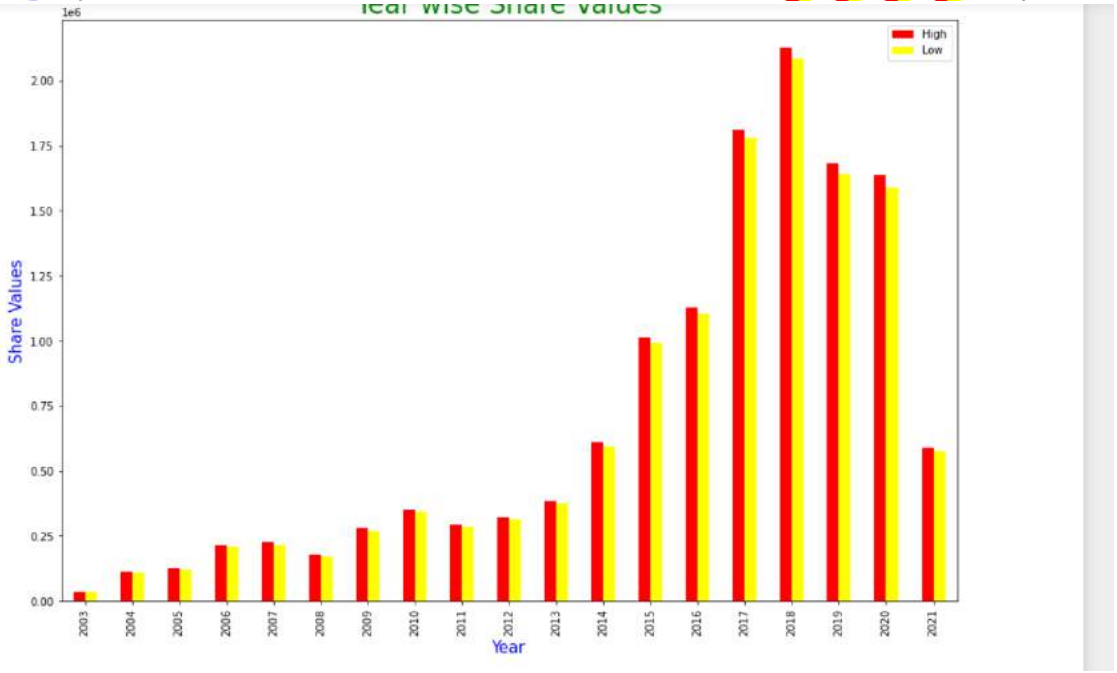
## To plot total turnover

In [43]:
```
plt.bar(d['Year'],d['Turnover'])
plt.title('Year Vs Turnover',fontsize=15,color='red')
plt.xlabel('Year',fontsize=15)
plt.ylabel('Turnover',fontsize=15)
plt.grid(True)
plt.show()
```



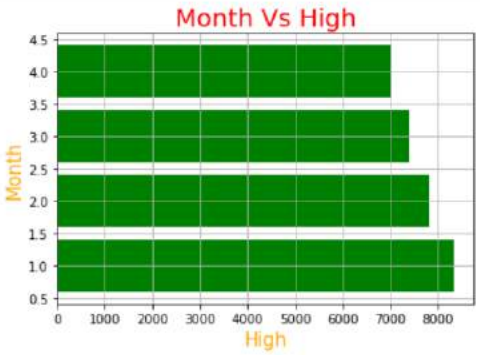

## Year wise analysis of high and low shre share analysis

In [110]:
```
d.groupby('Year')[['High','Low']].sum().plot.bar(color=['red','Yellow'],figsize=(15,10))
plt.title("Year wise Share Values",color="Green",fontsize=25)
plt.ylabel('Share Values',fontsize=15,color="blue")
plt.xlabel('Year',fontsize=15,color='blue')
plt.show()
```

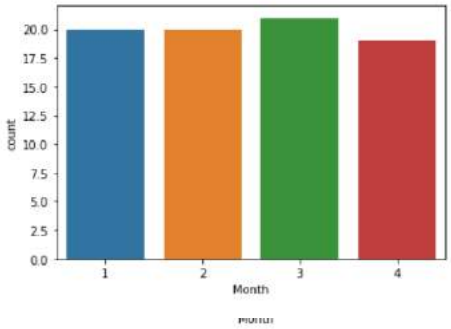

## To show High share values in 2021

In [44]:
```
plt.barh(d_Year_2021['Month'],d_Year_2021['High'],color = 'green')
plt.title('Month Vs High',fontsize=20,color='red')
plt.xlabel('High',fontsize=15,color ='orange')
plt.ylabel('Month',fontsize=15, color = 'orange')
plt.grid(True)
plt.show()
```



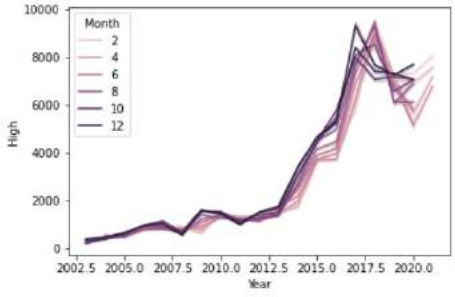

## Month basis of Analysis in year 2021

In [39]:
```
sns.countplot(x="Month",data=d_Year_2021,palette='tab10')
plt.show()
```



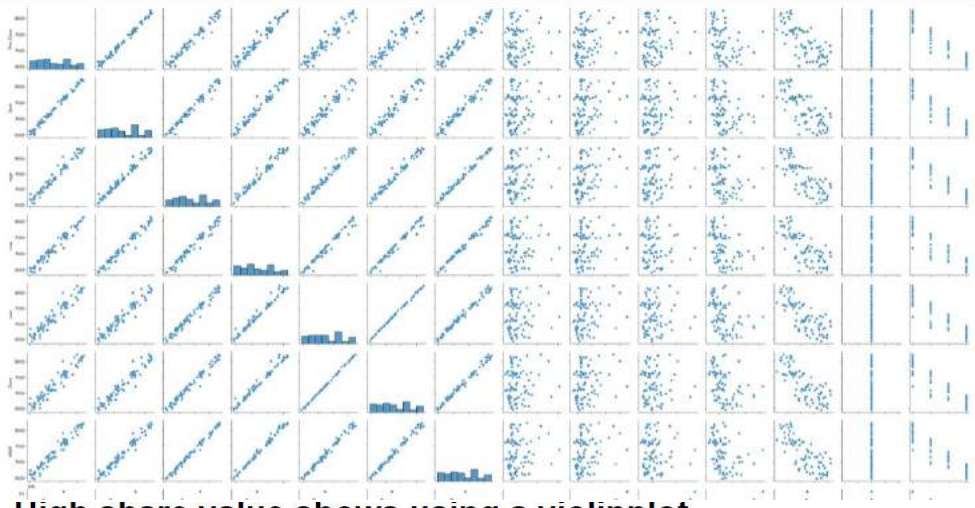

## To plot a line plot basis High share values in different year

In [40]:
```
sns.lineplot(x="Year",y='High',hue='Month',data=d)
plt.show()
```



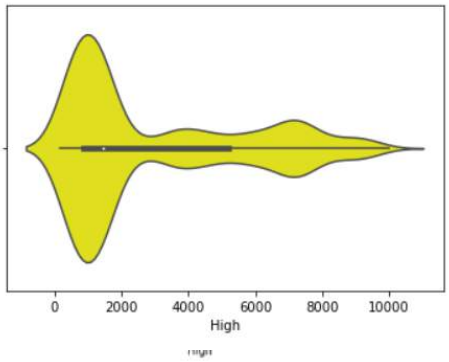
## Show a relationship plot in year 2021

In [41]:
```
sns.pairplot(d_Year_2021)
plt.show()
```



## High share value shows using a violinplot

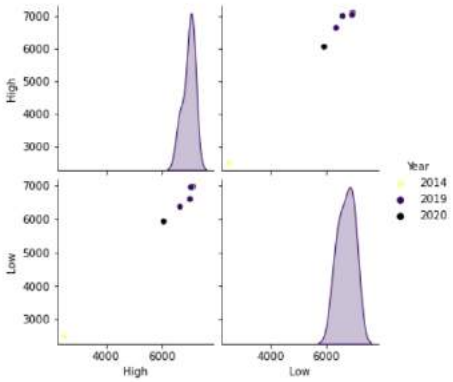
In [54]:
```
sns.violinplot(x=d.High,color='yellow')
plt.show()
```




## Check the some share values basis of opening balance

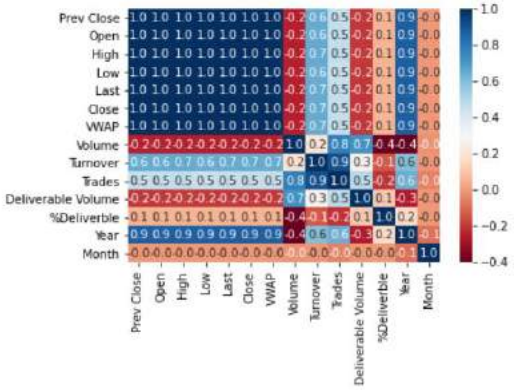
In [45]:
```
sns.pairplot(d[d.Open.isin([7000,6000,2500,7687,7657,6565])],
             hue='Year',
             vars=['High','Low'],
             palette='inferno_r')
```

Out[45]: <seaborn.axisgrid.PairGrid at 0x1e5f5515430>




## To plot a heat map

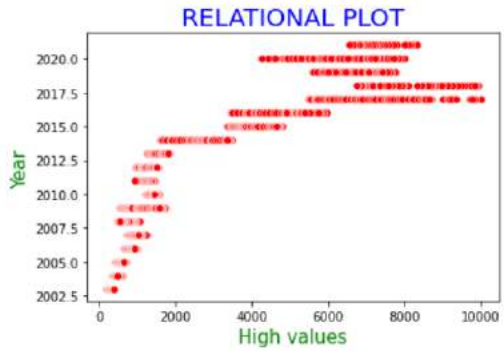
In [47]:
```
sns.heatmap(d.corr(),cmap='RdBu',annot=True,fmt='.1f')
plt.show()
```




## Machine learning

## To show a relationship of High value basis of Year

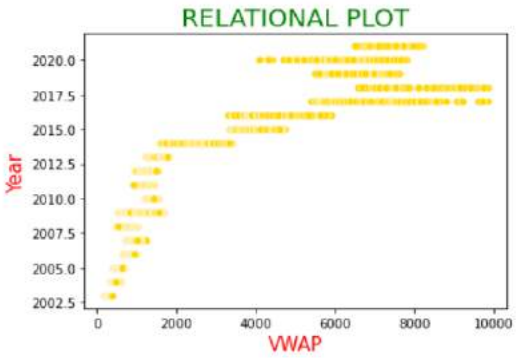
In [58]:
```
sns.scatterplot(y=d['Year'],x=d["High"],color='red')
plt.title("RELATIONAL PLOT",size=20,color='blue')
plt.ylabel("Year",size=15,color='green')
plt.xlabel("High values",size=15,color='green')
plt.show()
```



High values

## To plot a relationship of VWAP basis of Year

In [59]:
```
sns.scatterplot(y=d['Year'],x=d["VWAP"],color='gold')  # Volume weighted average price
plt.title("RELATIONAL PLOT",size=20,color='green')
plt.ylabel("Year",size=15,color='red')
plt.xlabel("VWAP",size=15,color='red')
plt.show()
```




4426 rows × 17 columns

## To drop Date column

In [42]:
```
d.drop('Date',axis=1,inplace=True)
```

In [43]:
```
d.head(10)
```

Out[43]:

| | Symbol | Series | Prev Close | Open | High | Low | Last | Close | VWAP | Volume | Turnover | Trades | Deliverable Volume | %Deliverble | Year | Month |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | MARUTI | EQ | 125.00 | 164.90 | 170.40 | 155.00 | 164.0 | 164.30 | 165.95 | 35164283 | 5.835528e+14 | NaN | 8537695.0 | 0.2428 | 2003 | 7 |
| 1 | MARUTI | EQ | 164.30 | 167.00 | 168.70 | 164.50 | 167.0 | 167.00 | 166.74 | 10464179 | 1.744820e+14 | NaN | 4363947.0 | 0.4170 | 2003 | 7 |
| 2 | MARUTI | EQ | 167.00 | 167.75 | 174.85 | 166.25 | 173.6 | 173.35 | 172.45 | 11740117 | 2.024622e+14 | NaN | 3014852.0 | 0.2568 | 2003 | 7 |
| 3 | MARUTI | EQ | 173.35 | 174.25 | 179.25 | 174.25 | 178.6 | 177.95 | 177.91 | 5982324 | 1.064313e+14 | NaN | 1949217.0 | 0.3258 | 2003 | 7 |
| 4 | MARUTI | EQ | 177.95 | 200.00 | 200.00 | 173.00 | 176.3 | 176.20 | 176.88 | 6173689 | 1.092001e+14 | NaN | 1307694.0 | 0.2118 | 2003 | 7 |
| 5 | MARUTI | EQ | 176.20 | 176.45 | 179.10 | 175.35 | 176.9 | 177.10 | 177.59 | 3759085 | 6.675695e+13 | NaN | 1155442.0 | 0.3074 | 2003 | 7 |
| 6 | MARUTI | EQ | 177.10 | 177.50 | 178.00 | 170.65 | 170.7 | 172.20 | 175.48 | 3814181 | 6.693030e+13 | NaN | 1064071.0 | 0.2790 | 2003 | 7 |
| 7 | MARUTI | EQ | 172.20 | 165.00 | 171.90 | 160.00 | 167.4 | 167.40 | 167.66 | 5375212 | 9.011903e+13 | NaN | 1427995.0 | 0.2657 | 2003 | 7 |
| 8 | MARUTI | EQ | 167.40 | 169.00 | 169.40 | 163.05 | 164.0 | 164.90 | 166.67 | 3315845 | 5.526646e+13 | NaN | 980379.0 | 0.2957 | 2003 | 7 |
| 9 | MARUTI | EQ | 164.90 | 164.00 | 169.15 | 162.10 | 168.6 | 167.25 | 165.06 | 4627992 | 7.639124e+13 | NaN | 1257167.0 | 0.2716 | 2003 | 7 |

## To define x Independent variable

In [44]:
```
x = d[[ 'Prev Close', 'Open', 'High', 'Low', 'Last',
       'Close', 'Volume', 'Trades', 'Deliverable Volume',
       '%Deliverble']]
```

In [45]:
```
x
```

Out[45]:

| | Prev Close | Open | High | Low | Last | Close | Volume | Trades | Deliverable Volume | %Deliverble |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 125.00 | 164.90 | 170.40 | 155.00 | 164.00 | 164.30 | 35164283 | NaN | 8537695.0 | 0.2428 |
| 1 | 164.30 | 167.00 | 168.70 | 164.50 | 167.00 | 167.00 | 10464179 | NaN | 4363947.0 | 0.4170 |
| 2 | 167.00 | 167.75 | 174.85 | 166.25 | 173.60 | 173.35 | 11740117 | NaN | 3014852.0 | 0.2568 |
| 3 | 173.35 | 174.25 | 179.25 | 174.25 | 178.60 | 177.95 | 5982324 | NaN | 1949217.0 | 0.3258 |
| 4 | 177.95 | 200.00 | 200.00 | 173.00 | 176.30 | 176.20 | 6173689 | NaN | 1307694.0 | 0.2118 |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| 4422 | 6676.10 | 6690.20 | 6789.00 | 6600.00 | 6645.00 | 6638.90 | 937344 | 74474.0 | 464999.0 | 0.4961 |
| 4423 | 6638.90 | 6669.95 | 6709.00 | 6542.00 | 6552.00 | 6568.75 | 1610651 | 130986.0 | 588617.0 | 0.3655 |
| 4424 | 6568.75 | 6568.75 | 6650.00 | 6545.00 | 6581.00 | 6573.80 | 1406270 | 117843.0 | 672435.0 | 0.4782 |
| 4425 | 6573.80 | 6635.00 | 6647.45 | 6552.00 | 6562.00 | 6565.65 | 757075 | 64393.0 | 352987.0 | 0.4663 |
| 4426 | 6565.65 | 6537.10 | 6559.60 | 6421.00 | 6438.35 | 6455.65 | 849997 | 95248.0 | 382594.0 | 0.4501 |

4426 rows × 10 columns

## To check null values

In [46]:
```
1 x.isna()
```

Out[46]:

| | Prev Close | Open | High | Low | Last | Close | Volume | Trades | Deliverable Volume | %Deliverble |
|---|---|---|---|---|---|---|---|---|---|---|
| **0** | False | False | False | False | False | False | False | True | False | False |
| **1** | False | False | False | False | False | False | False | True | False | False |
| **2** | False | False | False | False | False | False | False | True | False | False |
| **3** | False | False | False | False | False | False | False | True | False | False |
| **4** | False | False | False | False | False | False | False | True | False | False |
| **...** | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| **4422** | False | False | False | False | False | False | False | False | False | False |
| **4423** | False | False | False | False | False | False | False | False | False | False |
| **4424** | False | False | False | False | False | False | False | False | False | False |
| **4425** | False | False | False | False | False | False | False | False | False | False |
| **4426** | False | False | False | False | False | False | False | False | False | False |

4426 rows × 10 columns

In [47]:
```
1 x.isna().sum()
```

Out[47]:
```
Prev Close              0
Open                    0
High                    0
Low                     0
Last                    0
Close                   0
Volume                  0
Trades               1970
Deliverable Volume      0
%Deliverble             0
dtype: int64
```

## To print trades column data

In [48]:
```
1 x['Trades']
```

Out[48]:
```
0            NaN
1            NaN
2            NaN
3            NaN
4            NaN
           ...
4422     74474.0
4423    130986.0
4424    117843.0
4425     64393.0
4426     95248.0
Name: Trades, Length: 4426, dtype: float64
```

```
In [49]: x['Trades'].tail(10)
```

```
Out[49]: 4417     81274.0
         4418     94720.0
         4419     69676.0
         4420     75599.0
         4421     64854.0
         4422     74474.0
         4423    130986.0
         4424    117843.0
         4425     64393.0
         4426     95248.0
         Name: Trades, dtype: float64
```

```
In [50]: x['Trades'].head(10)
```

```
Out[50]: 0   NaN
         1   NaN
         2   NaN
         3   NaN
         4   NaN
         5   NaN
         6   NaN
         7   NaN
         8   NaN
         9   NaN
         Name: Trades, dtype: float64
```

```
In [51]: x['Trades'].value_counts()
```

```
Out[51]: 24569.0     2
         58345.0     2
         50530.0     2
         81920.0     2
         11304.0     2
                    ..
         50872.0     1
         122984.0    1
         67829.0     1
         11867.0     1
         179002.0    1
         Name: Trades, Length: 2418, dtype: int64
```

```
In [52]: x['Trades'].value_counts().max()
```

```
Out[52]: 2
```

## Fill Nill column of trades with a value

```
In [53]: x['Trades'].fillna(50530,inplace=True)

In [54]: x['Trades']

Out[54]: 0        50530.0
         1        50530.0
         2        50530.0
         3        50530.0
         4        50530.0
                   ...
         4422     74474.0
         4423    130986.0
         4424    117843.0
         4425     64393.0
         4426     95248.0
         Name: Trades, Length: 4426, dtype: float64
```

## To print Y dependent variable

```
In [55]: y= d["VWAP"]

In [56]: y

Out[56]: 0        165.95
         1        166.74
         2        172.45
         3        177.91
         4        176.88
                   ...
         4422    6678.34
         4423    6620.68
```

## Creating training and testing model

```
In [57]: from sklearn.model_selection import train_test_split

In [58]: x_train, x_test, y_train, y_test = train_test_split(x,y, test_size=0.60,random_state=2)

In [59]: x_train.shape

Out[59]: (1770, 10)

In [60]: y_train.shape

Out[60]: (1770,)

In [61]: x_test.shape

Out[61]: (2656, 10)

In [62]: y_test.shape

Out[62]: (2656,)

In [63]: from sklearn.linear_model import LinearRegression

In [64]: model = LinearRegression()

In [65]: model.fit(x_train,y_train)

Out[65]: LinearRegression()
```

```
In [66]: model.score(x_train,y_train)
Out[66]: 0.9999871641164005

In [67]: y_pred = model.predict(x_test)

In [68]: y_pred
Out[68]: array([ 754.27672123,  804.90426384, 6638.35853439, ..., 1339.68214756,
                 860.15643554,  924.87442132])

In [69]: d1 = pd.DataFrame({'Actual':y_test,'Predict':y_pred})

In [70]: d1
```

Out[70]:

| | Actual | Predict |
|---|---|---|
| **647** | 754.52 | 754.276721 |
| **1222** | 807.26 | 804.904264 |
| **3936** | 6646.86 | 6638.358534 |
| **1569** | 1478.07 | 1487.106710 |
| **4367** | 7315.28 | 7330.992774 |
| **...** | ... | ... |
| **379** | 467.16 | 466.216115 |
| **3893** | 6894.86 | 6899.289934 |
| **2173** | 1338.35 | 1339.682148 |
| **1052** | 861.20 | 860.156436 |
| **2115** | 924.07 | 924.874421 |

2656 rows × 2 columns

## Word Graph

```
In [1]: pip install wordcloud
Requirement already satisfied: wordcloud in c:\users\lenovo\anaconda3\lib\site-packages (1.8.1)
Requirement already satisfied: numpy>=1.6.1 in c:\users\lenovo\anaconda3\lib\site-packages (from wordcloud) (1.20.1)
Requirement already satisfied: matplotlib in c:\users\lenovo\anaconda3\lib\site-packages (from wordcloud) (3.3.4)
Requirement already satisfied: pillow in c:\users\lenovo\anaconda3\lib\site-packages (from wordcloud) (8.2.0)
Requirement already satisfied: python-dateutil>=2.1 in c:\users\lenovo\anaconda3\lib\site-packages (from matplotlib->wordcloud)
(2.8.1)
Requirement already satisfied: kiwisolver>=1.0.1 in c:\users\lenovo\anaconda3\lib\site-packages (from matplotlib->wordcloud)
(1.3.1)
Requirement already satisfied: cycler>=0.10 in c:\users\lenovo\anaconda3\lib\site-packages (from matplotlib->wordcloud) (0.10.
0)
Requirement already satisfied: pyparsing!=2.0.4,!=2.1.2,!=2.1.6,>=2.0.3 in c:\users\lenovo\anaconda3\lib\site-packages (from ma
tplotlib->wordcloud) (2.4.7)
Requirement already satisfied: six in c:\users\lenovo\anaconda3\lib\site-packages (from cycler>=0.10->matplotlib->wordcloud)
(1.15.0)
Note: you may need to restart the kernel to use updated packages.

In [2]: from os import path
        from PIL import Image
        from wordcloud import WordCloud, STOPWORDS, ImageColorGenerator

In [9]: text = d.Symbol[1]

In [10]: text
Out[10]: 'MARUTI'
```

Out[10]: MARUTI

In [11]:
```
?WordCloud
```

In [12]:
```
wordcloud = WordCloud().generate(text)
```

In [13]:
```
# Display the generated image:
plt.imshow(wordcloud, interpolation = 'bilinear')
plt.axis("off")
plt.show()
```

# R

## Import libraries first

```
library(ggplot2)
library(dplyr)
library(choroplethr)
library(choroplethrMaps)
library(openintro)
library(tidyverse)
library(scales)
library(lubridate)       # For extracting year
library(devtools)        # For plotting bar graphs easy way
library(vioplot)         # Violin Plot
```

**Reading data set**

```
print(getwd())    # returns absolute file path

  # Read Data file of Maruti

d=read.csv("C:/Users/LENOVO/Desktop/Maruti.csv")
print(d)
# Print head rows and tail rows

print(head(d))
```

```
print(tail(d))
# Print summary of data set

print(summary(d))

 # Print dimension of data set

print(dim(d))

 # Print column names

print(names(d))

 # Print Turnover details

print(d$Turnover)

 # To check length of data set

print(length(d))
# To check statistical values

print(mean(d$High))      # High value mean

print(mean(d$Low))       #Low value mean
```

```
print(median(d$High))     #Median-High

print(median(d$Low))      #Median-Low

print(mode(d$High))       #Mode-High

print(mode(d$Low))        #Mode-Low

print(mean(d$Turnover))   # Mean Turnover

print(range(d$Turnover))  # Print range of Turnover

print(range(d$High))      #Range-high

print(range(d$Low))       #Range-low

print(scale(d$Volume))    #Print scale values of volume

print(dnorm(d$Volume))   # Print normal density of volume

print(pnorm(d$Volume))    #Normal distribution

print(quantile(d$Open))   #Group values

print(sd(d$Open))         #Standard deviation
```

```
print(unique(d$Open))     #Unique values

 # to check high share value and low share value

print(max(d$High))

print(min(d$Low))

print(prod(d$Deliverable.Volume))

 # Sort basis of Turnover

print(sort(d$Turnover))

# print no. of rows and columns

print(nrow(d))

print(ncol(d))

 # To check string values

print(str(d))

print(glimpse(d))
```

```
 # Creating a new column for YEAR

d$Year<-year(d$Date)

print(d$year)

print(head(d))

 # Again check number of columns

print(ncol(d))

 # Extract data of year 2021

d_2021<- data.frame(d[d$Year == 2021, ])
d_2021

 # Extract Month

d_2021$Month<-month(d_2021$Date)
d_2021


 # Adding month in data set

d$Month<-month(d$Date)
```

```
d
```

```
 # Visualization
```

```
 # Plot high share value range
```

```
plot(d$High, col = 'red', xlab = "X-axis", ylab = 'Y-axis',main ='High share value')
```

```
 # Plot low share value range
```

```
plot(d$Low, col = 'red', xlab = "X-axis", ylab = 'Y-axis',main ='Low share value')
```

```
 # Turn over plot
```

```
plot(d$Turnover, col = 'red', xlab = "X-axis", ylab = 'Y-axis',main ='Turn Over')
```

```
 # High share value in 2021
```

```
plot(x=d_2021$Turnover,y=d_2021$High, main="High share values basis of
turnover",
    xlab="Turn Over", ylab="High",col='red')
```

```
 # Plot low share values in 2021
```

```
ggplot(data=d_2021, aes(fill=Month, y=Low, x=Date)) +
  geom_bar(position="dodge", stat="identity")

  # Plot high share values in 2021

ggplot(data=d_2021, aes(fill=Month, y=High, x=Date)) +
  geom_bar(position="dodge", stat="identity")

  # Plot for data set basis of high values

ggplot(data=d, aes(fill=Month, y=High, x=Year)) +
       geom_bar(position="dodge", stat="identity")

  # Turn over plot

ggplot(data=d, aes(fill=Month, y=Turnover, x=Year)) +
  geom_bar(position="dodge", stat="identity")

  # sIMPLE LINE PLOT OF closing value

plot(d$Close,type="l")

  #To plot a graph for showing VWAP

ggplot(data = d) +
```

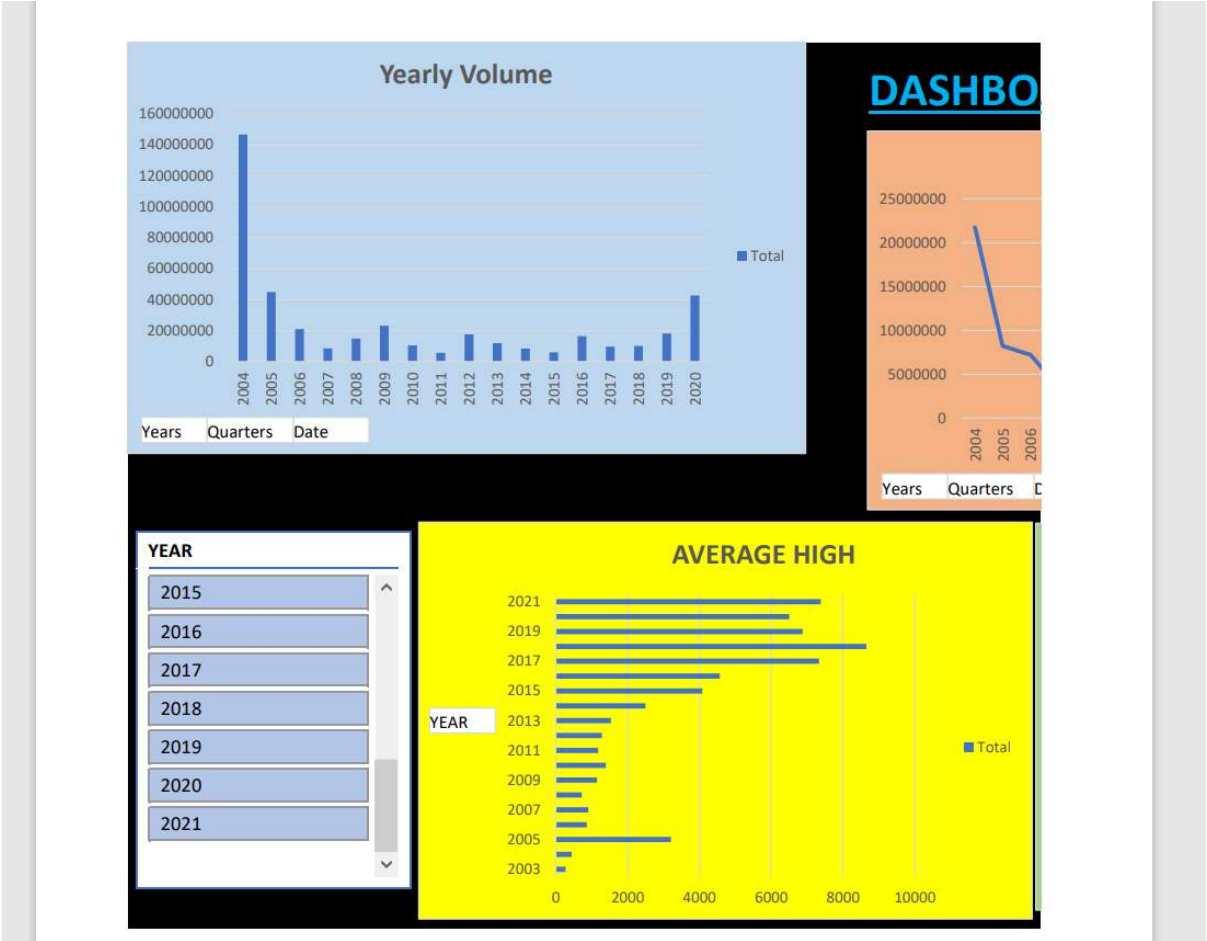
```
  stat_count(mapping = aes(x =VWAP),color='green')



  # Plot a relationship of High share value basis Year

ggplot(d, aes(x=Year, y=High)) +
  geom_line(colour="darkgreen", size=1.5)



  # Plot a relationship of Turnover with Year

ggplot(d, aes(x=Year, y=Turnover)) +
  geom_line(colour="darkgreen", size=1.5)

# Graph with a semitransparent shaded area

  # High value with year

ggplot(d, aes(x=Year, y=High)) +
  geom_area(colour="red", alpha=.2)

  # Low value with Year

ggplot(d, aes(x=Year, y=Low)) +
  geom_area(colour="red", alpha=.2)
```

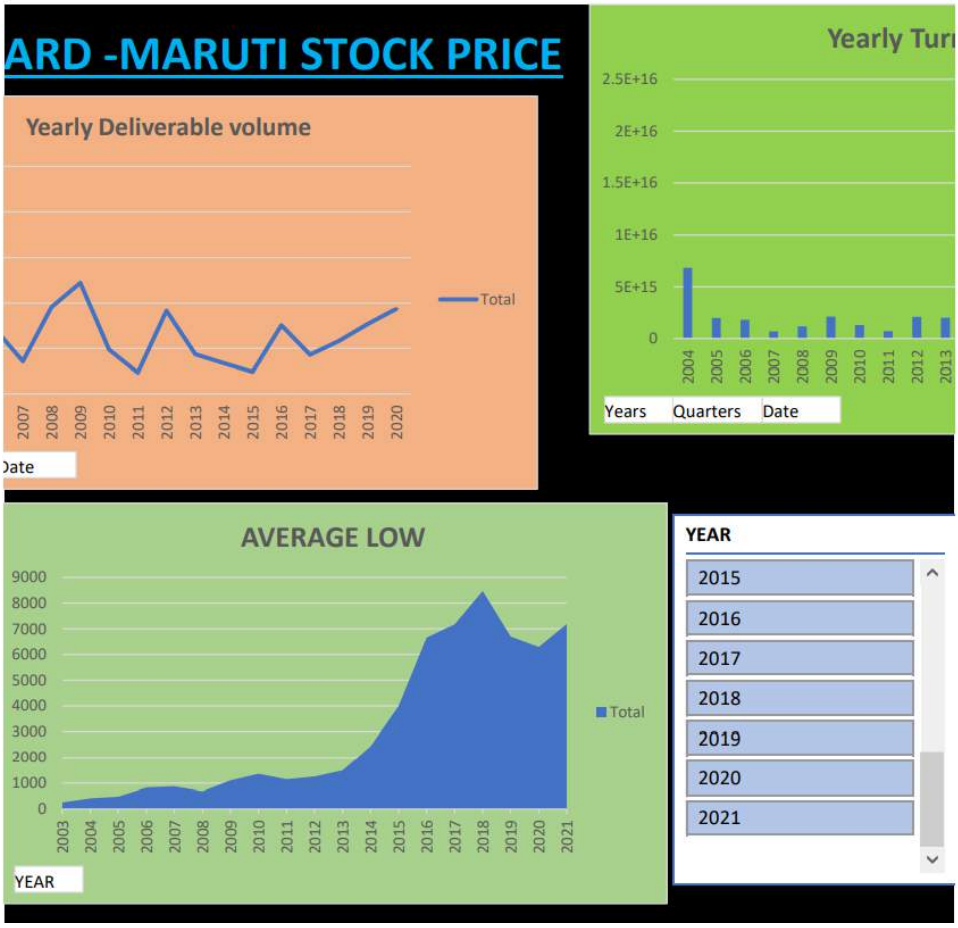
```
 # Plot a high share value in Year 2021

ggplot(d_2021, aes(x=Month, y=High)) +
 geom_area(colour="red", alpha=.2)


 # Plot a low share value in Year 2021

ggplot(d_2021, aes(x=Month, y=Low)) +
 geom_area(colour="red", alpha=.2)



 # Violin Plot

vioplot(d$High, horizontal=TRUE, col="red")          #High value

vioplot(d$Low,horizontal = TRUE,col="pink")          #Low value

vioplot(d$VWAP,horizontal = TRUE,col="blue")         #VWAP

vioplot(d$Deliverable,horizontal = TRUE,col="yellow") #Deliverable
```

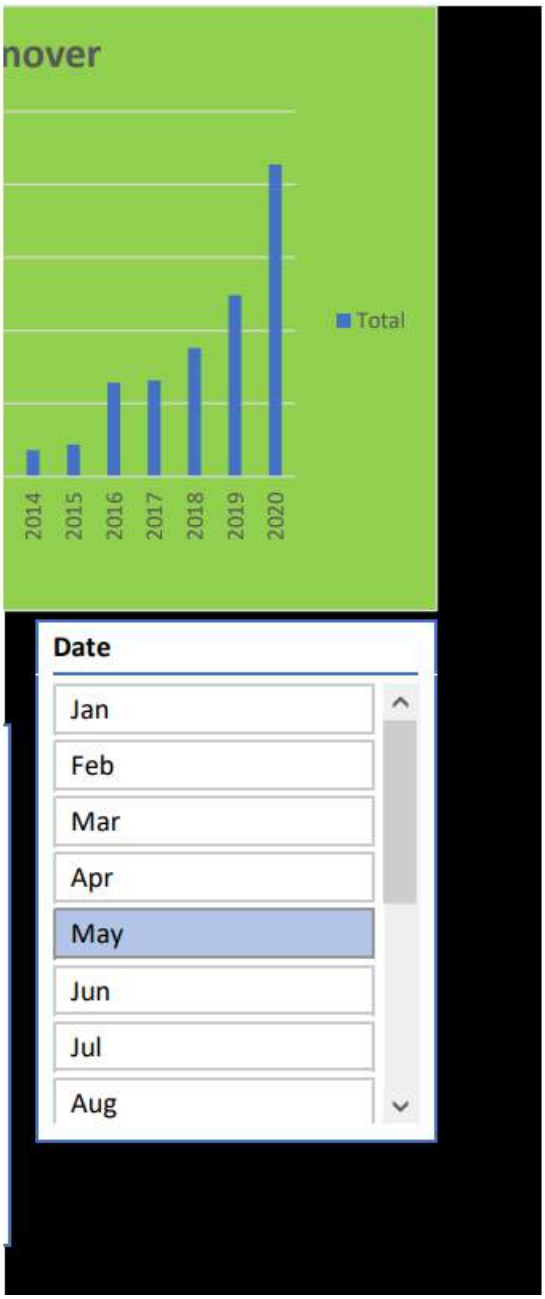
vioplot(d$Volume,horizontal = TRUE,col="green")  #Volume

vioplot(d$VWAP,horizontal = TRUE,col="gold")  #VWAP

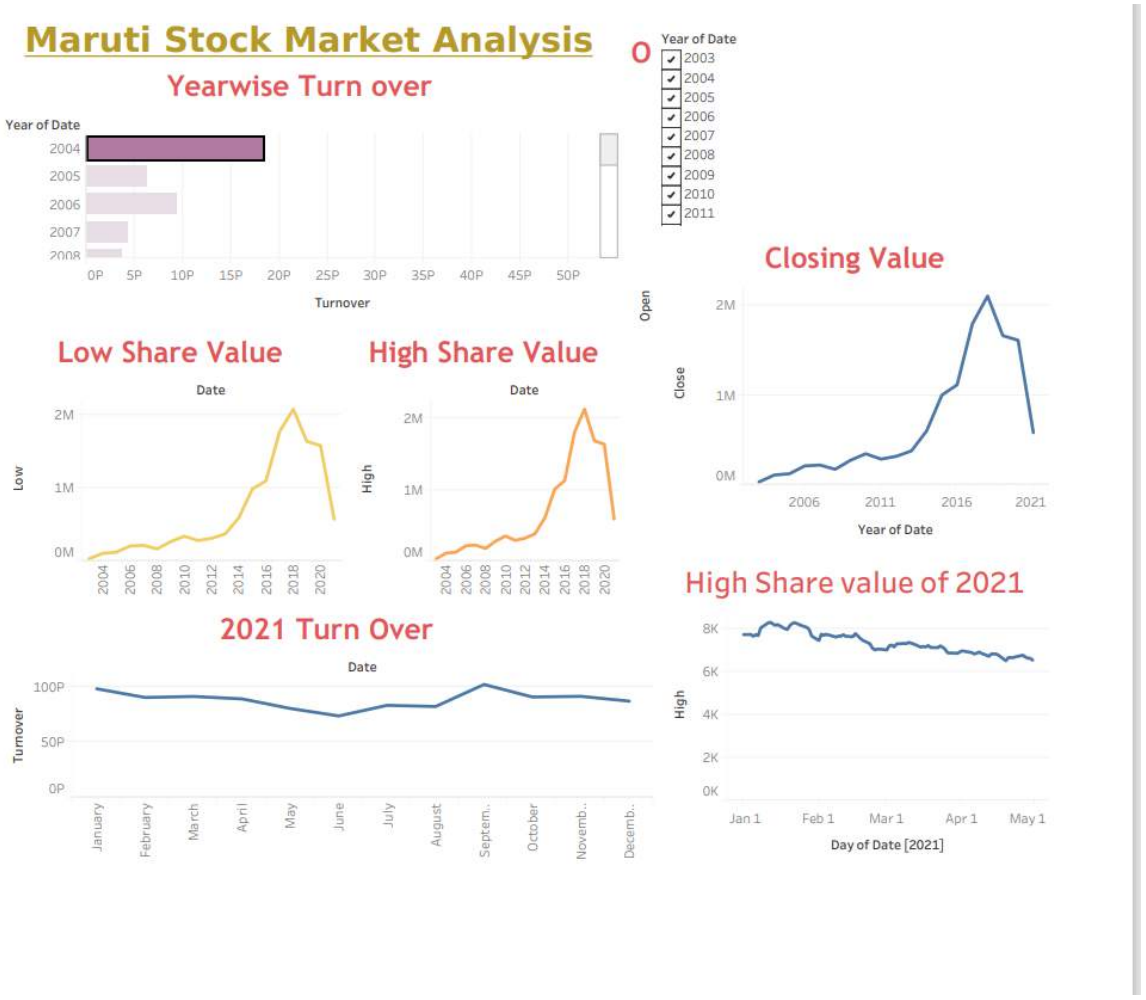
## EXCEL




ARD -MARUTI STOCK PRICE
Yearly Deliverable volume
Total
2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020
Date
Yearly Turn
2.5E+16
2E+16
1.5E+16
1E+16
5E+15
0
2004 2005 2006 2007 2008 2009 2010 2011 2012 2013
Years
Quarters
Date
AVERAGE LOW
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
Total
2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021
YEAR
YEAR
2015
2016
2017
2018
2019
2020
2021


nover
Total
2014
2015
2016
2017
2018
2019
2020
Date
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug

# TABLEAU


Maruti Stock Market Analysis
Yearwise Turn over
Year of Date
2004
2005
2006
2007
2008
0P 5P 10P 15P 20P 25P 30P 35P 40P 45P 50P
Turnover
Year of Date
2003
2004
2005
2006
2007
2008
2009
2010
2011
Closing Value
Open
Close
2M
1M
0M
2006 2011 2016 2021
Year of Date
Low Share Value
Date
Low
2M
1M
0M
2004 2006 2008 2010 2012 2014 2016 2018 2020
High Share Value
Date
High
2M
1M
0M
2004 2006 2008 2010 2012 2014 2016 2018 2020
High Share value of 2021
High
8K
6K
4K
2K
0K
Jan 1 Feb 1 Mar 1 Apr 1 May 1
Day of Date [2021]
2021 Turn Over
Date
Turnover
100P
50P
0P
January February March April May June July August Septem.. October Novemb.. Decemb..

# CONCLUSION

The Maruti journey at the stock market started in 2003 when the Government of India decided to divest 25% of its stake in Maruti Udyog Limited (old name). The IPO price was set at ₹ 125 per share. The IPO was over-subscribed 13 times. Those who were lucky to get allotment, were rewarded on the first day itself. On July 9th 2003, Maruti was first listed on the stock exchanges in India. The share opened at ₹ 165, hit a high of ₹ 170, fell to ₹ 155 and finally ended its day at ₹ 164 per share. A listing gain of 31%. Great interest in the IPO and fantastic listing. But it did not stop there. Since then, the journey hasn't been smooth, but Maruti has rewarded its shareholders with consistent dividends and excellent returns from growth in value of the share – this has been possible due to Maruti's domination of the automobile sector and steady growth in car sales across the country. From the end of 2007 to the end of 2008, Maruti crashed by nearly 50%. Nearly all the gains made between 2004 to 2007 was lost in a single year – the great market crash of 2008. Those who survived 2008 were rewarded in 2009 by 200% gains – but were tested once again in 2010 and 2011 which were extremely painful as the stock crashed by 45% during that period. The maximum value of share present in the middle of 2018-2019. Share value is decreasing in 2021. High share value is ten thousand. In April 2021, share value is fall down from January 2021