In [ ]:

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.preprocessing import MinMaxScaler, StandardScaler
from sklearn.model_selection import train_test_split
from keras.models import Sequential
from keras.layers import Dense, LSTM
```

In [ ]:

```
data = pd.read_csv('Dataset.csv')
data
# parse_dates=True,index_col='Date'
```

Out[ ]:

	Date	Open	High	Low	Last	Close	Total Trade Quantity	Turnover (Lacs)
0	2018-09-28	234.05	235.95	230.20	233.50	233.75	3069914	7162.35
1	2018-09-27	234.55	236.80	231.10	233.80	233.25	5082859	11859.95
2	2018-09-26	240.00	240.00	232.50	235.00	234.25	2240909	5248.60
3	2018-09-25	233.30	236.75	232.00	236.25	236.10	2349368	5503.90
4	2018-09-24	233.55	239.20	230.75	234.00	233.30	3423509	7999.55
...	...	...	...	...	...	...	...	...
2030	2010-07-27	117.60	119.50	112.00	118.80	118.65	586100	694.98
2031	2010-07-26	120.10	121.00	117.10	117.10	117.60	658440	780.01
2032	2010-07-23	121.80	121.95	120.25	120.35	120.65	281312	340.31
2033	2010-07-22	120.30	122.00	120.25	120.75	120.90	293312	355.17
2034	2010-07-21	122.10	123.00	121.05	121.10	121.55	658666	803.56

2035 rows × 8 columns

In [ ]:

```
data.head()
```

Out[ ]:

	Date	Open	High	Low	Last	Close	Total Trade Quantity	Turnover (Lacs)
0	2018-09-28	234.05	235.95	230.20	233.50	233.75	3069914	7162.35
1	2018-09-27	234.55	236.80	231.10	233.80	233.25	5082859	11859.95
2	2018-09-26	240.00	240.00	232.50	235.00	234.25	2240909	5248.60
3	2018-09-25	233.30	236.75	232.00	236.25	236.10	2349368	5503.90
4	2018-09-24	233.55	239.20	230.75	234.00	233.30	3423509	7999.55

In [ ]:

```
data['Turnover (Lacs)'].sum()
```

Out[ ]:

```
7936460.45
```

In [ ]:

```
data['Close'].min()
```

Out[ ]: 80.95

In [ ]:
```python
data['Close'].max()
```

Out[ ]: 325.75

In [ ]:
```python
data.shape
```

Out[ ]: (2035, 8)

Statistical Analaysis

In [ ]:
```python
Start_date = data.index.min()
Last_date = data.index.max()

print(Start_date)
print(Last_date)
```

```
0
2034
```

In [ ]:
```python
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 2035 entries, 0 to 2034
Data columns (total 8 columns):
 #   Column                Non-Null Count  Dtype  
---  ------                --------------  -----  
 0   Date                  2035 non-null   object 
 1   Open                  2035 non-null   float64
 2   High                  2035 non-null   float64
 3   Low                   2035 non-null   float64
 4   Last                  2035 non-null   float64
 5   Close                 2035 non-null   float64
 6   Total Trade Quantity  2035 non-null   int64  
 7   Turnover (Lacs)       2035 non-null   float64
dtypes: float64(6), int64(1), object(1)
memory usage: 127.3+ KB
```

In [ ]:
```python
data.describe()
```

Out[ ]:

	Open	High	Low	Last	Close	Total Trade Quantity	Turnover (Lacs)
count	2035.000000	2035.000000	2035.000000	2035.000000	2035.00000	2.035000e+03	2035.000000
mean	149.713735	151.992826	147.293931	149.474251	149.45027	2.335681e+06	3899.980565
std	48.664509	49.413109	47.931958	48.732570	48.71204	2.091778e+06	4570.767877
min	81.100000	82.800000	80.000000	81.000000	80.95000	3.961000e+04	37.040000
25%	120.025000	122.100000	118.300000	120.075000	120.05000	1.146444e+06	1427.460000
50%	141.500000	143.400000	139.600000	141.100000	141.25000	1.783456e+06	2512.030000
75%	157.175000	159.400000	155.150000	156.925000	156.90000	2.813594e+06	4539.015000
max	327.700000	328.750000	321.650000	325.950000	325.75000	2.919102e+07	55755.080000

In [ ]:

```
# data.corr()
```

Data Proprocessing

Duplicates

In [ ]:

```
data.duplicated().sum()
```

Out[ ]:

```
0
```

Null Values

In [ ]:

```
data.isnull().sum()
```

Out[ ]:

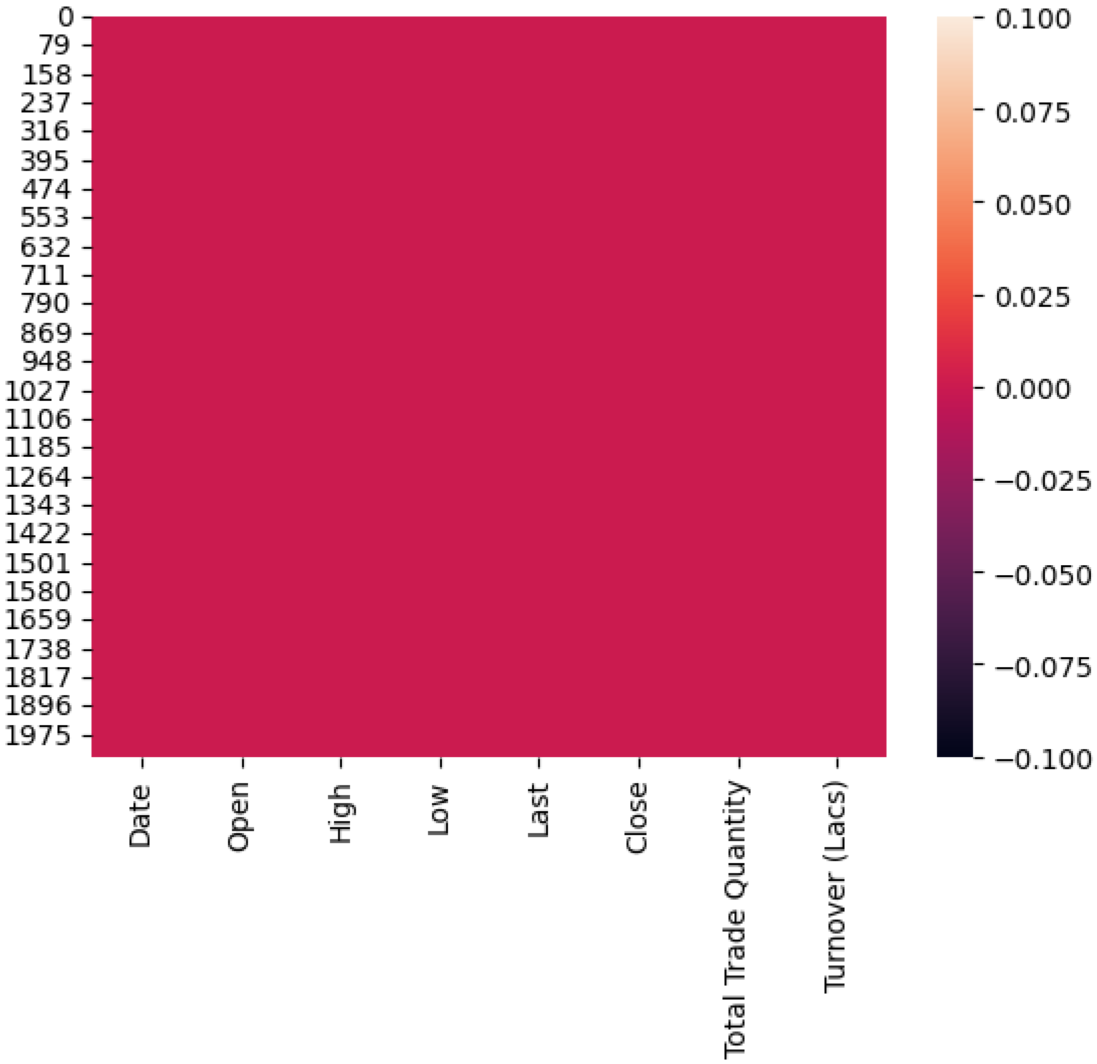
```
Date                    0
Open                    0
High                    0
Low                     0
Last                    0
Close                   0
Total Trade Quantity    0
Turnover (Lacs)         0
dtype: int64
```

In [ ]:

```
sns.heatmap(data.isnull())
```

Out[ ]:

```
<Axes: >
```



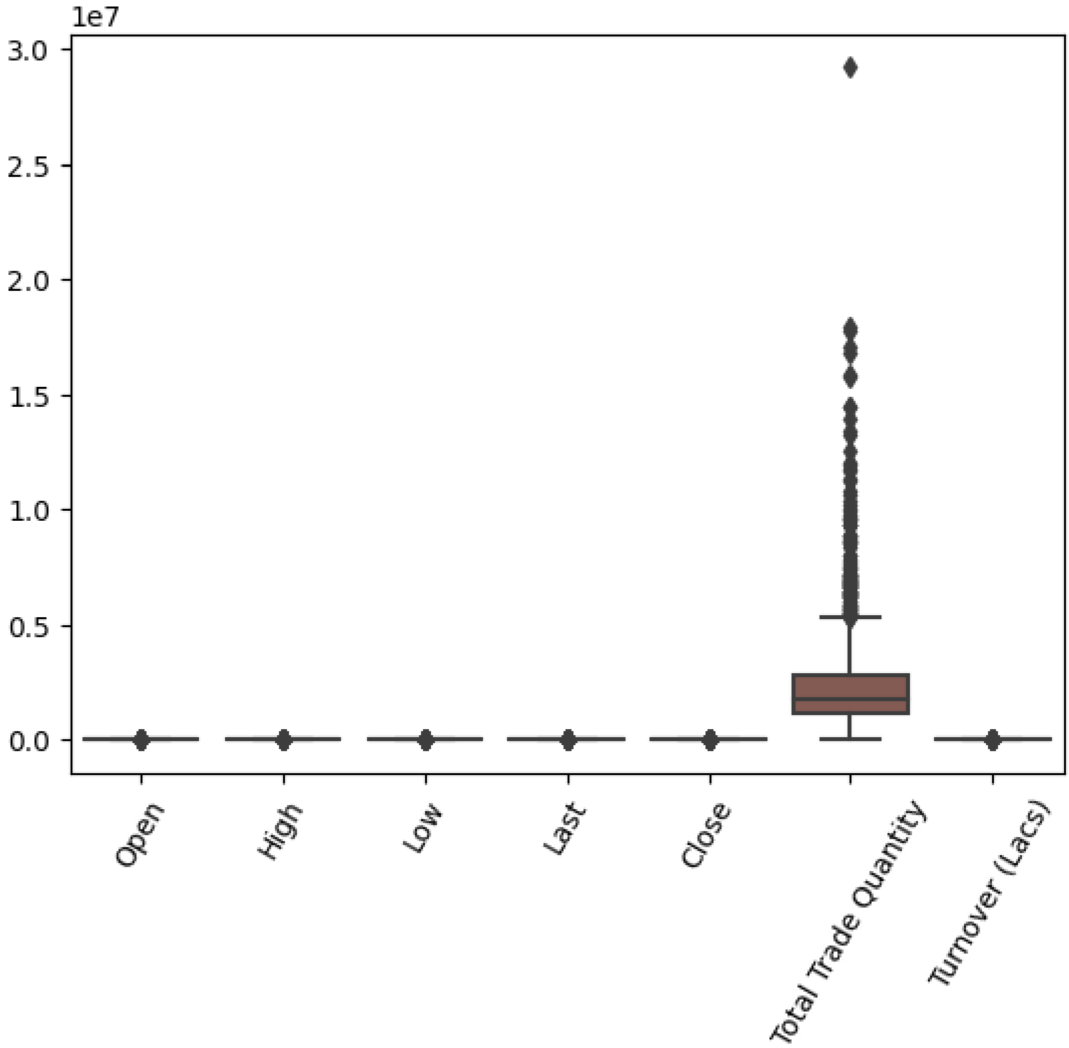
Outliers

In [ ]:

```
all = sns.boxplot(data=data)
all.set_xticklabels(all.get_xticklabels(),rotation=60)
```

Out[ ]:

```
[Text(0, 0, 'Open'),
 Text(1, 0, 'High'),
 Text(2, 0, 'Low'),
 Text(3, 0, 'Last'),
 Text(4, 0, 'Close'),
 Text(5, 0, 'Total Trade Quantity'),
 Text(6, 0, 'Turnover (Lacs)')]
```

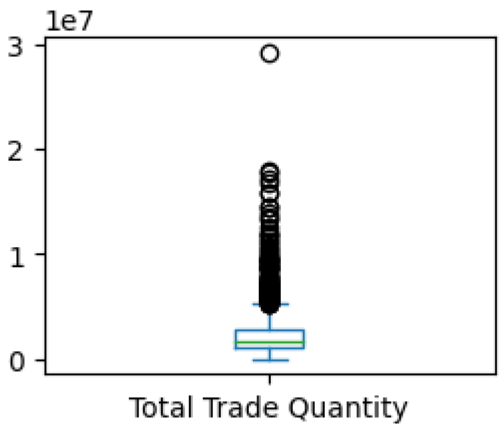


In [ ]:

```
data['Total Trade Quantity'].plot(kind='box', subplots=True,layout=(2,2))
```

Out[ ]:

```
Total Trade Quantity    Axes(0.125,0.53;0.352273x0.35)
dtype: object
```

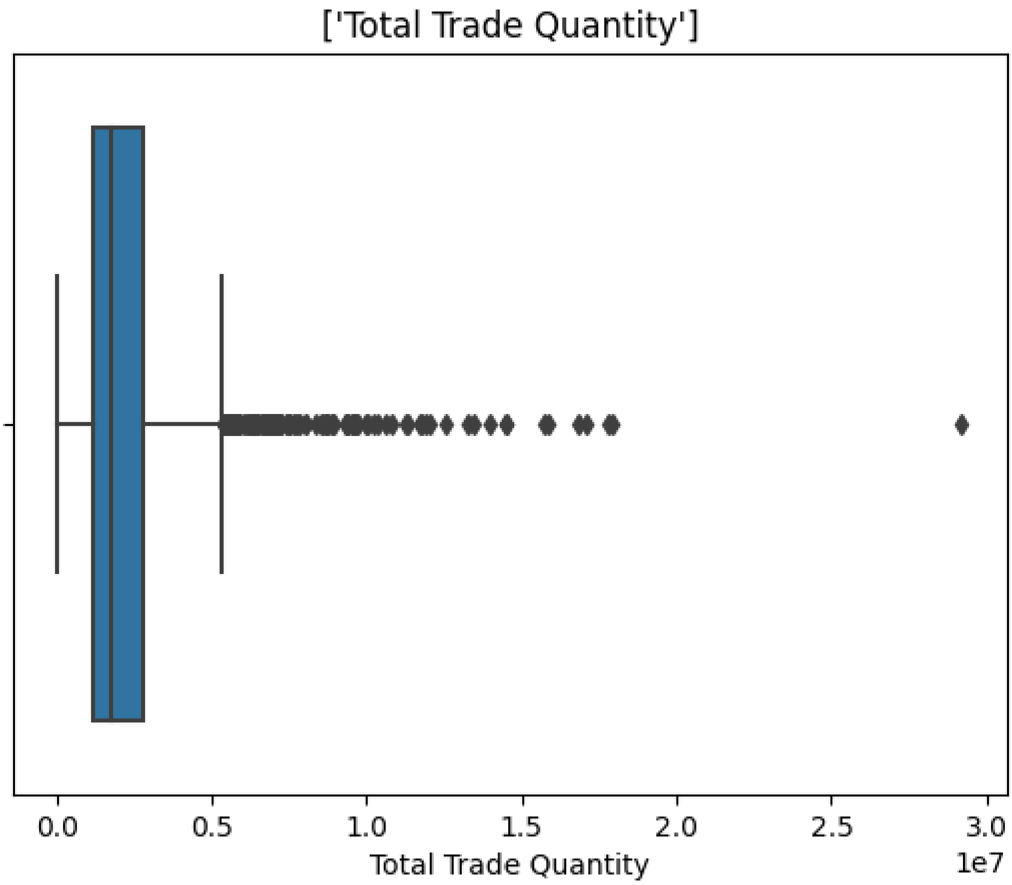


In [ ]:

```
sns.boxplot(data=data,x=data['Total Trade Quantity'])
plt.title(["Total Trade Quantity"])
```

Out[ ]:

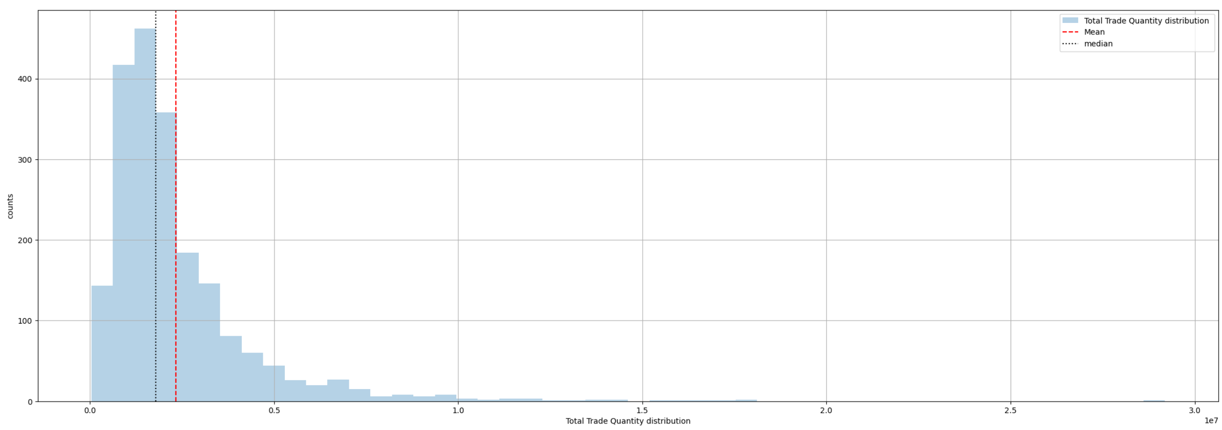
```
Text(0.5, 1.0, "['Total Trade Quantity']")
```



In [ ]:

```
plt.figure(figsize=(60,20),facecolor='white',edgecolor='white',num=10)


plt.subplot(2,2,1)
data['Total Trade Quantity'].hist(bins=50,label='Total Trade Quantity distribution '
plt.axvline(np.mean(data['Total Trade Quantity']),ls='--',c='r',label="Mean")
plt.axvline(np.median(data['Total Trade Quantity']),ls=':',c='black',label="median")


plt.ylabel('counts')
plt.xlabel('Total Trade Quantity distribution')
plt.legend()
```

Out[ ]: <matplotlib.legend.Legend at 0x119c4f78f50>

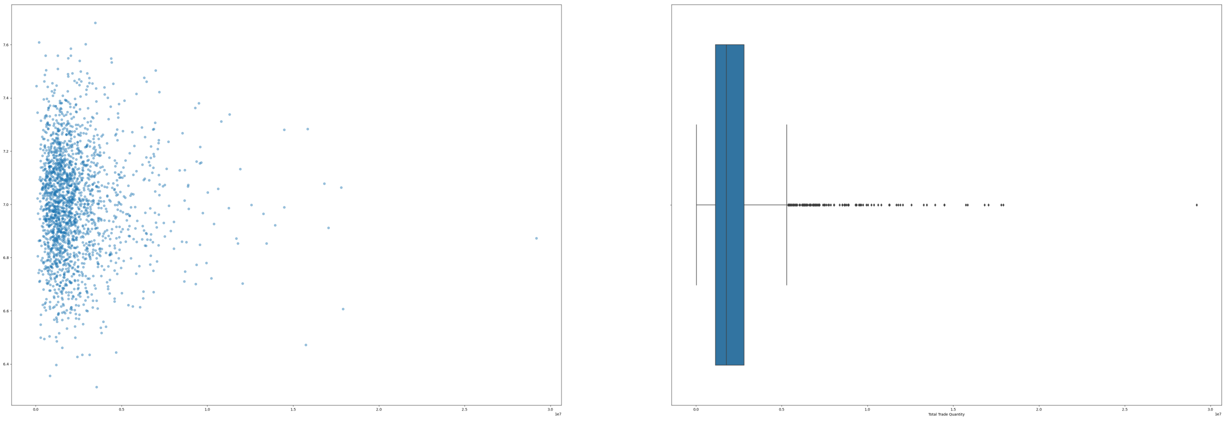


In [ ]:

```
plt.figure(figsize=(60,20),facecolor='white',edgecolor='white',num=10)

plt.subplot(1,2,1)
plt.scatter(data['Total Trade Quantity'],np.random.normal(7,0.2,size=data.shape[0]),
```

```
plt.subplot(1,2,2)
sns.boxplot(x='Total Trade Quantity',data=data)
```

Out[ ]: <Axes: xlabel='Total Trade Quantity'>



In [ ]:

```
data['Close'].describe()
```

Out[ ]:

```
count    2035.00000
mean      149.45027
std        48.71204
min        80.95000
25%       120.05000
50%       141.25000
75%       156.90000
max       325.75000
Name: Close, dtype: float64
```

In [ ]:

```
data['Close'].info()
```

```
<class 'pandas.core.series.Series'>
RangeIndex: 2035 entries, 0 to 2034
Series name: Close
Non-Null Count  Dtype
--------------  -----
2035 non-null   float64
dtypes: float64(1)
memory usage: 16.0 KB
```

Removing Outliers

In [ ]:

```
# Quantiles :
Q1 = data['Total Trade Quantity'].quantile(0.25)
Q3 = data['Total Trade Quantity'].quantile(0.75)
IQR = Q3 - Q1
print("Quantile 1 : ", Q1)
print("Quantile 3 : ", Q3)
print("IQR : ", IQR)

# Upper Quantile :
upper = Q3+1.5*IQR
print("Upper Quantile : ",upper)
# Lower Quantile :
lower = Q1-1.5*IQR
print("Lower Quantile : ",lower)
```

```
Quantile 1 :  1146444.5
Quantile 3 :  2813594.0
IQR :  1667149.5
```

```
Upper Quantile :  5314318.25
Lower Quantile :  -1354279.75
```

In [ ]:

```
upper_arr = np.where(data['Total Trade Quantity']>upper)[0]
lower_arr = np.where(data['Total Trade Quantity']<lower)[0]

print("Before Removing Outliers : ", data.shape)
data = data.drop(index=upper_arr)
data = data.drop(index=lower_arr)
print("After Removing Outliers : ", data.shape )
```

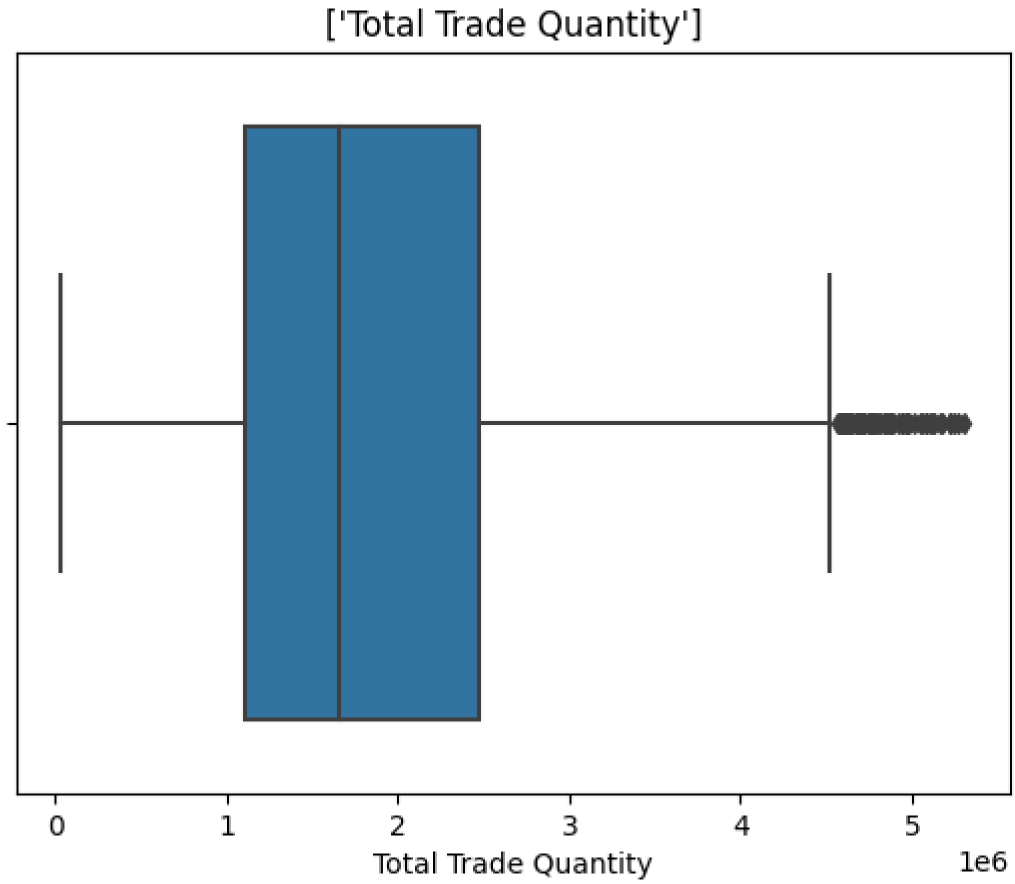
```
Before Removing Outliers :  (2035, 8)
After Removing Outliers :  (1896, 8)
```

In [ ]:

```
sns.boxplot(data=data,x=data['Total Trade Quantity'])
plt.title(["Total Trade Quantity"])
```

Out[ ]:

```
Text(0.5, 1.0, "['Total Trade Quantity']")
```

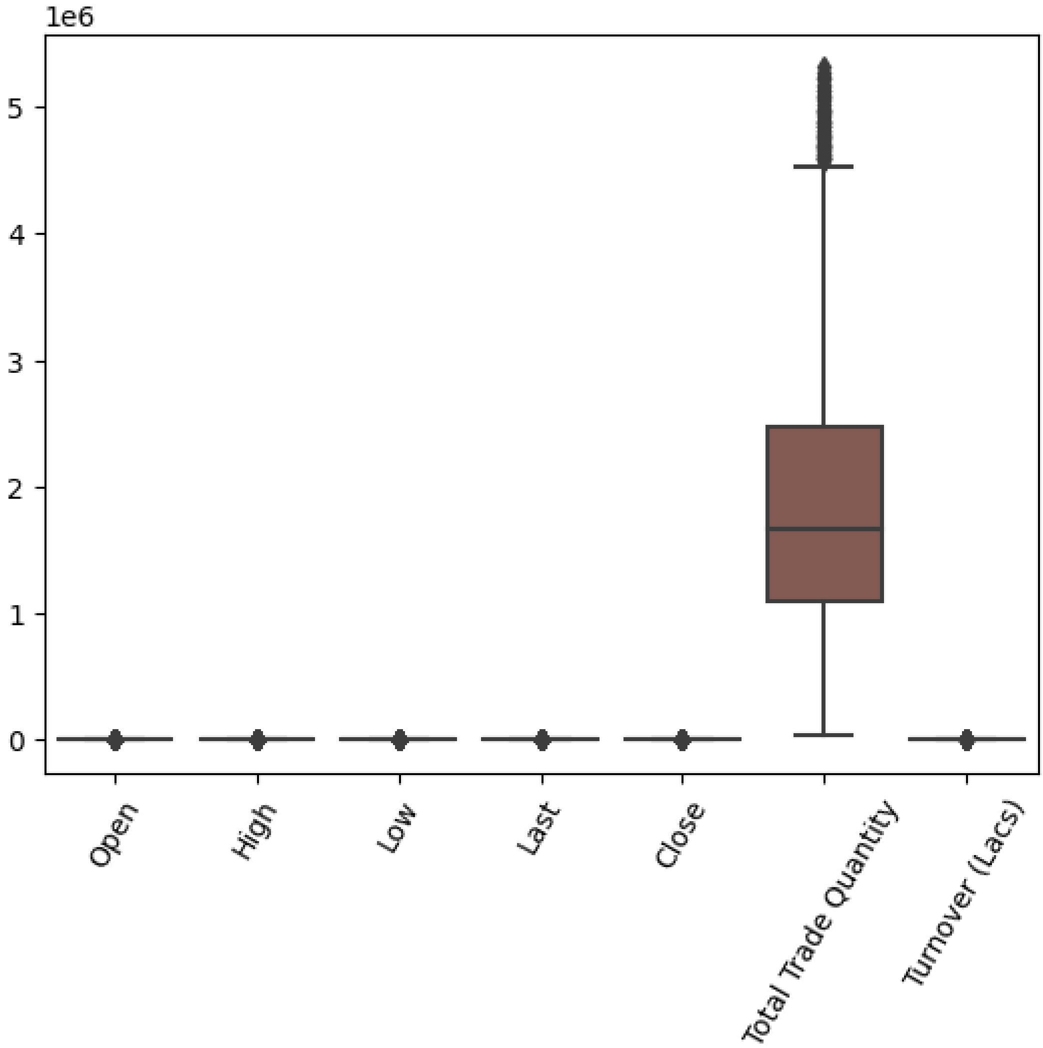


In [ ]:

```
chart = sns.boxplot(data=data)
chart.set_xticklabels(chart.get_xticklabels(),rotation=60)
```

Out[ ]:

```
[Text(0, 0, 'Open'),
 Text(1, 0, 'High'),
 Text(2, 0, 'Low'),
 Text(3, 0, 'Last'),
 Text(4, 0, 'Close'),
 Text(5, 0, 'Total Trade Quantity'),
 Text(6, 0, 'Turnover (Lacs)')]
```



Skewness

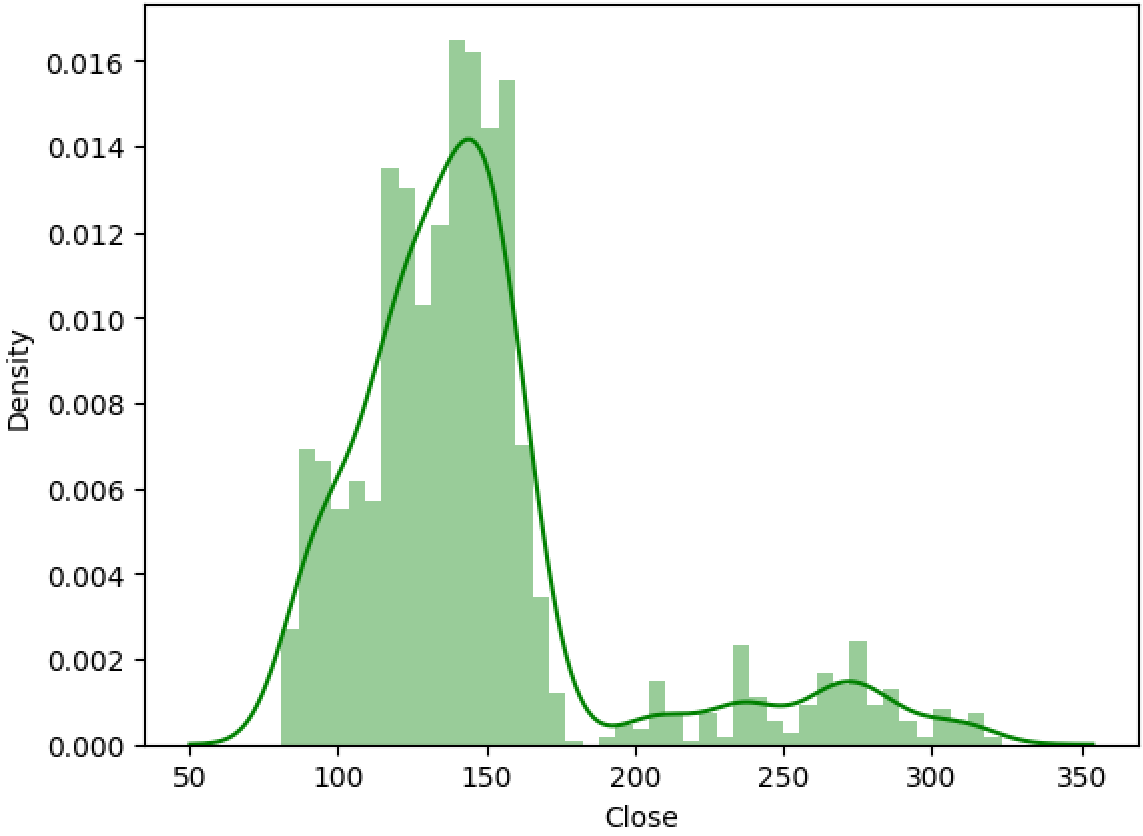
In [ ]:
```
skewness = data['Close'].skew()
print(skewness)
```

```
1.7261639290062123
```

In [ ]:
```
sns.distplot(data['Close'],color='g')
```

```
C:\Users\Hunain\AppData\Local\Temp\ipykernel_6640\757464049.py:1: UserWarning:

`distplot` is a deprecated function and will be removed in seaborn v0.14.0.

Please adapt your code to use either `displot` (a figure-level function with
similar flexibility) or `histplot` (an axes-level function for histograms).

For a guide to updating your code to use the new functions, please see
https://gist.github.com/mwaskom/de44147ed2974457ad6372750bbe5751

  sns.distplot(data['Close'],color='g')
```

Out[ ]:
```
<Axes: xlabel='Close', ylabel='Density'>
```

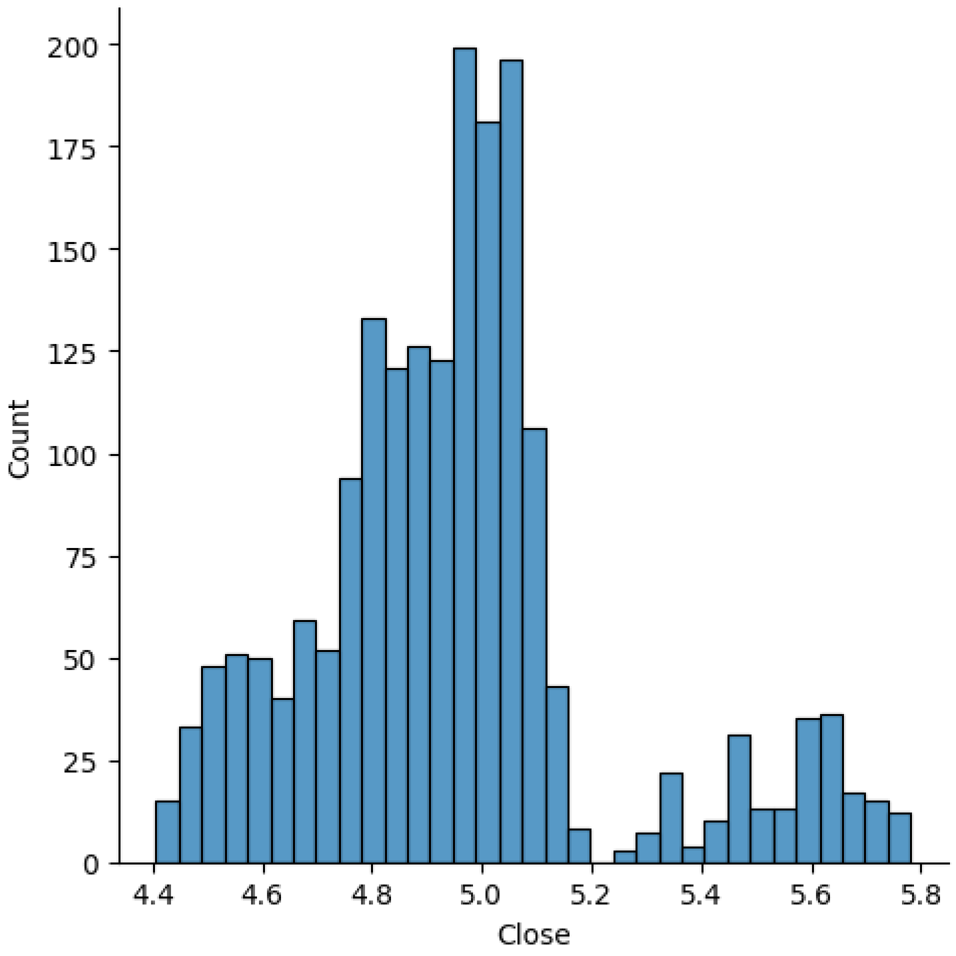


Normalize the Distribution

In [ ]:

```
log_y = np.log1p(data['Close'])
sns.displot(log_y)
```

Out[ ]: <seaborn.axisgrid.FacetGrid at 0x119c4e9a490>



In [ ]:

```
log_y.skew()
```

Out[ ]: 0.8407438858893567

Log1p Second time to Again and further normalize the distribution

In [ ]:

```
log_y2 = np.log1p(log_y)
log_y2.skew()
```

Out[ ]: 0.6852303282196177

In [ ]:

```
log_y3 = np.log1p(log_y)
log_y3.skew()
# Same Skewness as upper shows that it is skewed till its last.
```

Out[ ]: 0.6852303282196177

Scalling

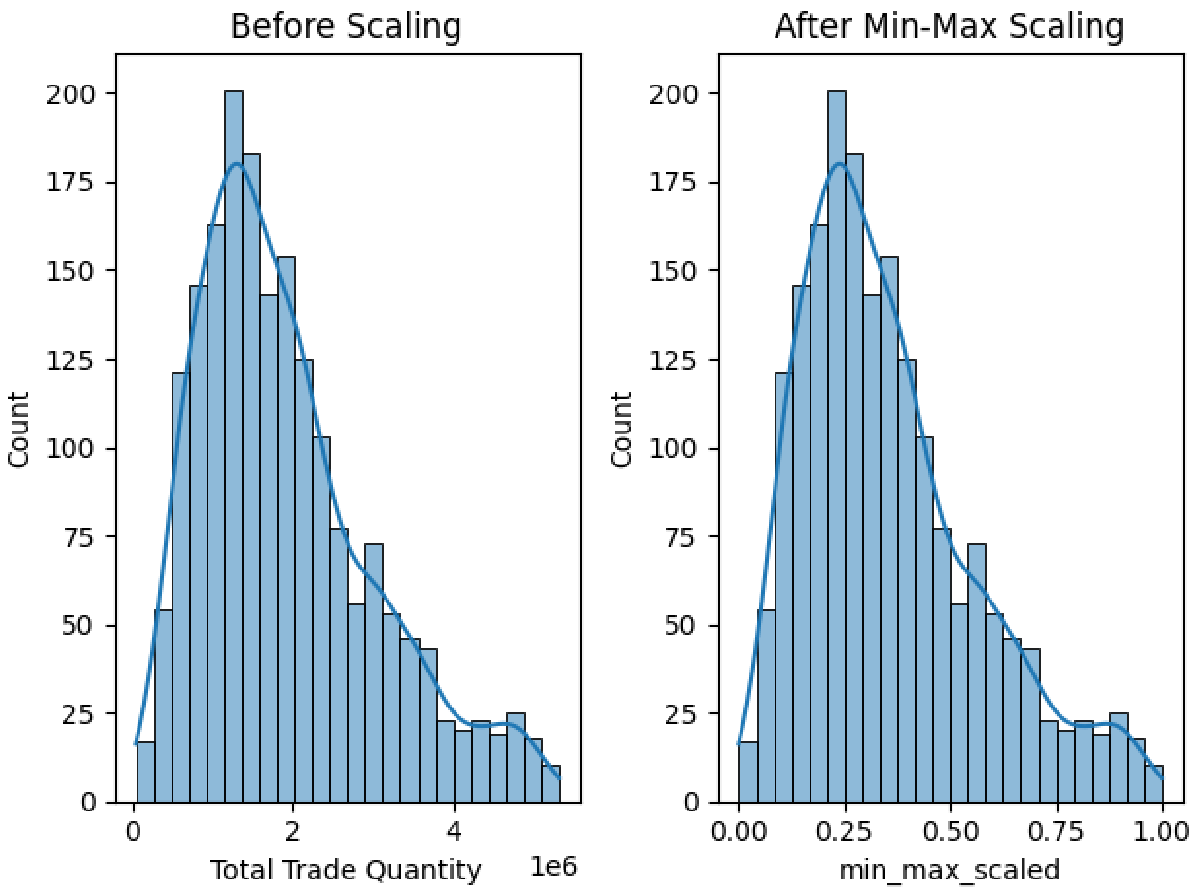
In [ ]:

```
scaler = MinMaxScaler()
# Mix_max_scaling :
data["min_max_scaled"] = scaler.fit_transform(data['Total Trade Quantity'].values.re
# Standarization :
st_scaler = StandardScaler()
data['st_scaled'] = st_scaler.fit_transform(data['Total Trade Quantity'].values.resh

print(data[['Total Trade Quantity','min_max_scaled','st_scaled']])
```

```
      Total Trade Quantity  min_max_scaled  st_scaled
0                  3069914        0.575308   1.063756
1                  5082859        0.957469   2.904318
2                  2240909        0.417920   0.305744
3                  2349368        0.438511   0.404915
4                  3423509        0.642439   1.387070
...                    ...             ...        ...
2030                586100        0.103752  -1.207352
2031                658440        0.117486  -1.141207
2032                281312        0.045888  -1.486038
2033                293312        0.048166  -1.475066
2034                658666        0.117529  -1.141000

[1896 rows x 3 columns]
```

In [ ]:

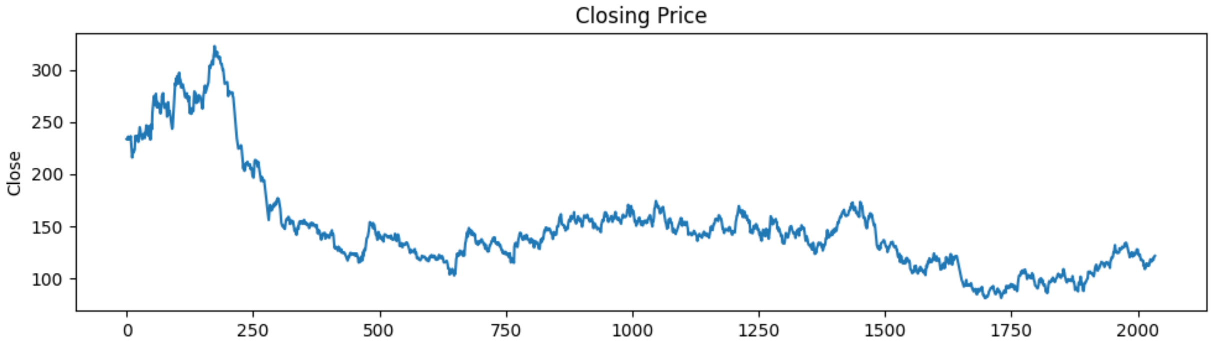
```python
# Assuming df is your DataFrame and 'Volume' is the column you want to scale

# Before Scaling
plt.subplot(1, 2, 1)
sns.histplot(data['Total Trade Quantity'], kde=True)
plt.title('Before Scaling')

# After Min-Max Scaling
plt.subplot(1, 2, 2)
sns.histplot(data['min_max_scaled'], kde=True)
plt.title('After Min-Max Scaling')

plt.tight_layout()
plt.show()
```



Basically Closing Price the only thing through which prediction can takes place and more accurately it will predict

In [ ]:

```
plt.figure(figsize=(10, 3))
data['Close'].plot()
plt.ylabel('Close')
plt.xlabel(None)
plt.title("Closing Price")

plt.tight_layout()
```



In [ ]:

```
data.set_index('Date',inplace=True)
```

In [ ]:

```
data.head()
```

Out[ ]:

	Open	High	Low	Last	Close	Total Trade Quantity	Turnover (Lacs)	min_max_scaled	st_scaled
Date									
2018-09-28	234.05	235.95	230.20	233.50	233.75	3069914	7162.35	0.575308	1.063756
2018-09-27	234.55	236.80	231.10	233.80	233.25	5082859	11859.95	0.957469	2.904318
2018-09-26	240.00	240.00	232.50	235.00	234.25	2240909	5248.60	0.417920	0.305744
2018-09-25	233.30	236.75	232.00	236.25	236.10	2349368	5503.90	0.438511	0.404915
2018-09-24	233.55	239.20	230.75	234.00	233.30	3423509	7999.55	0.642439	1.387070

In [ ]:

```
data.corr()
```

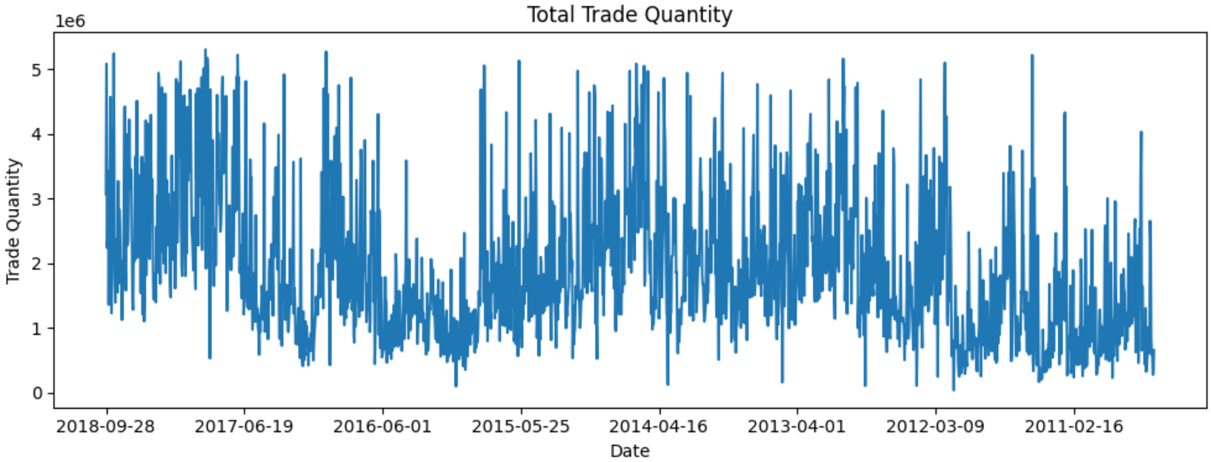
Out[ ]:

	Open	High	Low	Last	Close	Total Trade Quantity	Turnover (Lacs)	min_max_scale
Open	1.000000	0.999373	0.998968	0.998284	0.998355	0.449740	0.769881	0.4497
High	0.999373	1.000000	0.999163	0.999271	0.999316	0.458896	0.776549	0.4588
Low	0.998968	0.999163	1.000000	0.999370	0.999440	0.443922	0.766081	0.4439
Last	0.998284	0.999271	0.999370	1.000000	0.999961	0.453662	0.773059	0.4536
Close	0.998355	0.999316	0.999440	0.999961	1.000000	0.453268	0.772602	0.4532

	Open	High	Low	Last	Close	Total Trade Quantity	Turnover (Lacs)	min_max_scale
Total Trade Quantity	0.449740	0.458896	0.443922	0.453662	0.453268	1.000000	0.881089	1.00000
Turnover (Lacs)	0.769881	0.776549	0.766081	0.773059	0.772602	0.881089	1.000000	0.8810
min_max_scaled	0.449740	0.458896	0.443922	0.453662	0.453268	1.000000	0.881089	1.00000
st_scaled	0.449740	0.458896	0.443922	0.453662	0.453268	1.000000	0.881089	1.00000

In [ ]:

```
plt.figure(figsize=(10,4))

plt.subplot(1,1,1)
data['Total Trade Quantity'].plot()
plt.ylabel('Trade Quantity')
plt.title('Total Trade Quantity')

plt.tight_layout()
```

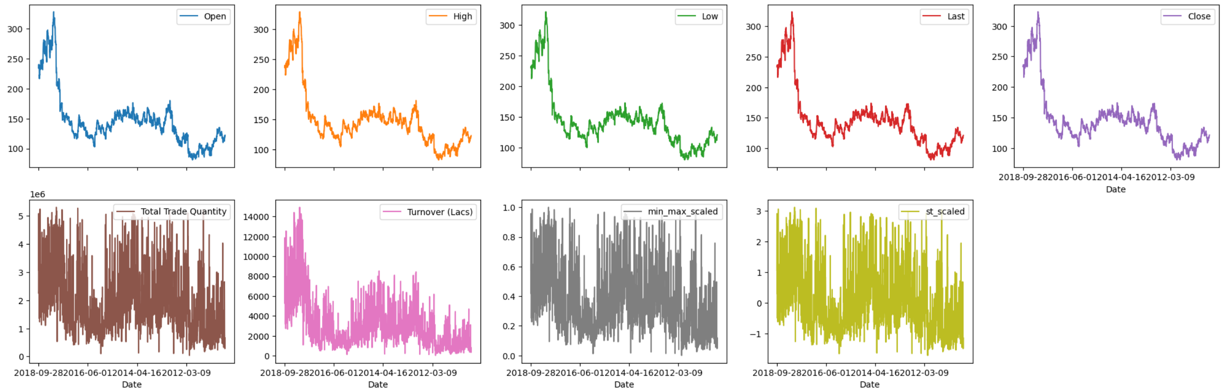


In [ ]:

```
data.plot(kind='line',subplots=True,figsize=(25,20),layout=(5,5),use_index=True)
```

Out[ ]:

```
array([[<Axes: xlabel='Date'>, <Axes: xlabel='Date'>,
        <Axes: xlabel='Date'>, <Axes: xlabel='Date'>,
        <Axes: xlabel='Date'>],
       [<Axes: xlabel='Date'>, <Axes: xlabel='Date'>,
        <Axes: xlabel='Date'>, <Axes: xlabel='Date'>,
        <Axes: xlabel='Date'>],
       [<Axes: xlabel='Date'>, <Axes: xlabel='Date'>,
        <Axes: xlabel='Date'>, <Axes: xlabel='Date'>,
        <Axes: xlabel='Date'>],
       [<Axes: xlabel='Date'>, <Axes: xlabel='Date'>,
        <Axes: xlabel='Date'>, <Axes: xlabel='Date'>,
        <Axes: xlabel='Date'>],
       [<Axes: xlabel='Date'>, <Axes: xlabel='Date'>,
        <Axes: xlabel='Date'>, <Axes: xlabel='Date'>,
        <Axes: xlabel='Date'>]], dtype=object)
```



Moving Average :

- A stock indicator commonly used in technical analysis, used to help smooth out price data by creating a constantly updated average price

How it is Calculated :

- Taking Average of Closing Price

Types of Moving Averages :

- Simple Moving Average
- Exponential Moving Average

Why Moving Average is used?

- Traders and investors use moving averages to identify potential buy or sell signals. When the price of a stock or an index crosses above its moving average, it is considered a bullish signal, indicating that the stock may continue to rise. Conversely, when the price crosses below the moving average, it is considered a bearish signal, suggesting that the stock may continue to decline.

In [ ]:

```
mov_avg_day = [10,20,50,100]

for ma in mov_avg_day:
    column_name = f"MA {ma} Days"
    data[column_name] = data['Close'].rolling(ma).mean()
```

In [ ]:

```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Index: 1896 entries, 2018-09-28 to 2010-07-21
Data columns (total 13 columns):
 #   Column                Non-Null Count  Dtype  
---  ------                --------------  -----  
 0   Open                  1896 non-null   float64
 1   High                  1896 non-null   float64
 2   Low                   1896 non-null   float64
 3   Last                  1896 non-null   float64
 4   Close                 1896 non-null   float64
 5   Total Trade Quantity  1896 non-null   int64  
 6   Turnover (Lacs)       1896 non-null   float64
 7   min_max_scaled        1896 non-null   float64
 8   st_scaled             1896 non-null   float64
 9   MA 10 Days            1887 non-null   float64
 10  MA 20 Days            1877 non-null   float64
```

```
 11  MA 50 Days            1847 non-null   float64
 12  MA 100 Days           1797 non-null   float64
dtypes: float64(12), int64(1)
memory usage: 207.4+ KB
```

In [ ]:

```
data.head()
```

Out[ ]:

Date	Open	High	Low	Last	Close	Total Trade Quantity	Turnover (Lacs)	min_max_scaled	st_scaled	MA 10 Days
2018-09-28	234.05	235.95	230.20	233.50	233.75	3069914	7162.35	0.575308	1.063756	NaN
2018-09-27	234.55	236.80	231.10	233.80	233.25	5082859	11859.95	0.957469	2.904318	NaN
2018-09-26	240.00	240.00	232.50	235.00	234.25	2240909	5248.60	0.417920	0.305744	NaN
2018-09-25	233.30	236.75	232.00	236.25	236.10	2349368	5503.90	0.438511	0.404915	NaN
2018-09-24	233.55	239.20	230.75	234.00	233.30	3423509	7999.55	0.642439	1.387070	NaN

In [ ]:

```
data.isnull().sum()
```

Out[ ]:

```
Open                    0
High                    0
Low                     0
Last                    0
Close                   0
Total Trade Quantity    0
Turnover (Lacs)         0
min_max_scaled          0
st_scaled               0
MA 10 Days              9
MA 20 Days             19
MA 50 Days             49
MA 100 Days            99
dtype: int64
```

In [ ]:

```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Index: 1896 entries, 2018-09-28 to 2010-07-21
Data columns (total 13 columns):
 #   Column                Non-Null Count  Dtype
---  ------                --------------  -----
 0   Open                  1896 non-null   float64
 1   High                  1896 non-null   float64
 2   Low                   1896 non-null   float64
 3   Last                  1896 non-null   float64
 4   Close                 1896 non-null   float64
 5   Total Trade Quantity  1896 non-null   int64
 6   Turnover (Lacs)       1896 non-null   float64
 7   min_max_scaled        1896 non-null   float64
 8   st_scaled             1896 non-null   float64
 9   MA 10 Days            1887 non-null   float64
 10  MA 20 Days            1877 non-null   float64
 11  MA 50 Days            1847 non-null   float64
```

```
 12  MA 100 Days          1797 non-null   float64
dtypes: float64(12), int64(1)
memory usage: 207.4+ KB
```

In [ ]:

```python
data.dropna(axis=0,inplace=True)
```

In [ ]:

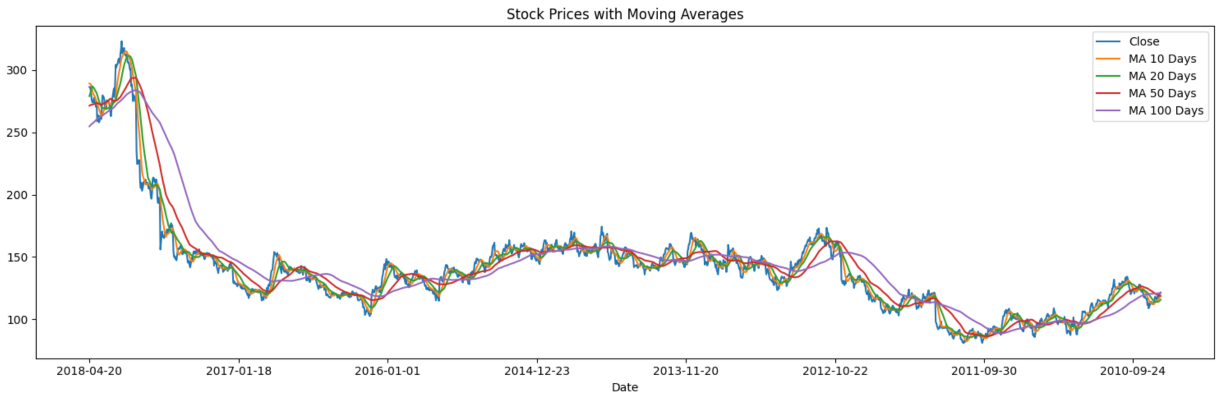
```python
data.head()
```

Out[ ]:

Date	Open	High	Low	Last	Close	Total Trade Quantity	Turnover (Lacs)	min_max_scaled	st_scaled	MA 1 Day
2018-04-20	285.95	288.80	283.65	286.00	286.30	2523492	7225.36	0.471569	0.564128	289.02
2018-04-19	286.00	288.65	283.60	285.55	286.20	2434183	6966.56	0.454613	0.482467	288.86
2018-04-18	282.30	287.45	279.25	285.35	284.10	4719061	13416.32	0.888401	2.571675	288.60
2018-04-16	274.00	280.20	272.55	279.40	279.65	3030999	8371.24	0.567920	1.028173	287.29
2018-04-13	274.00	277.35	271.75	275.70	275.50	2196800	6024.34	0.409546	0.265413	285.09

In [ ]:

```python
fig, axes = plt.subplots(nrows=1,ncols=1)
fig.set_figheight(5)
fig.set_figwidth(15)

data[['Close','MA 10 Days', 'MA 20 Days','MA 50 Days','MA 100 Days']].plot(ax=axes)
axes.set_title('Stock Prices with Moving Averages')

plt.tight_layout()
plt.show()
```

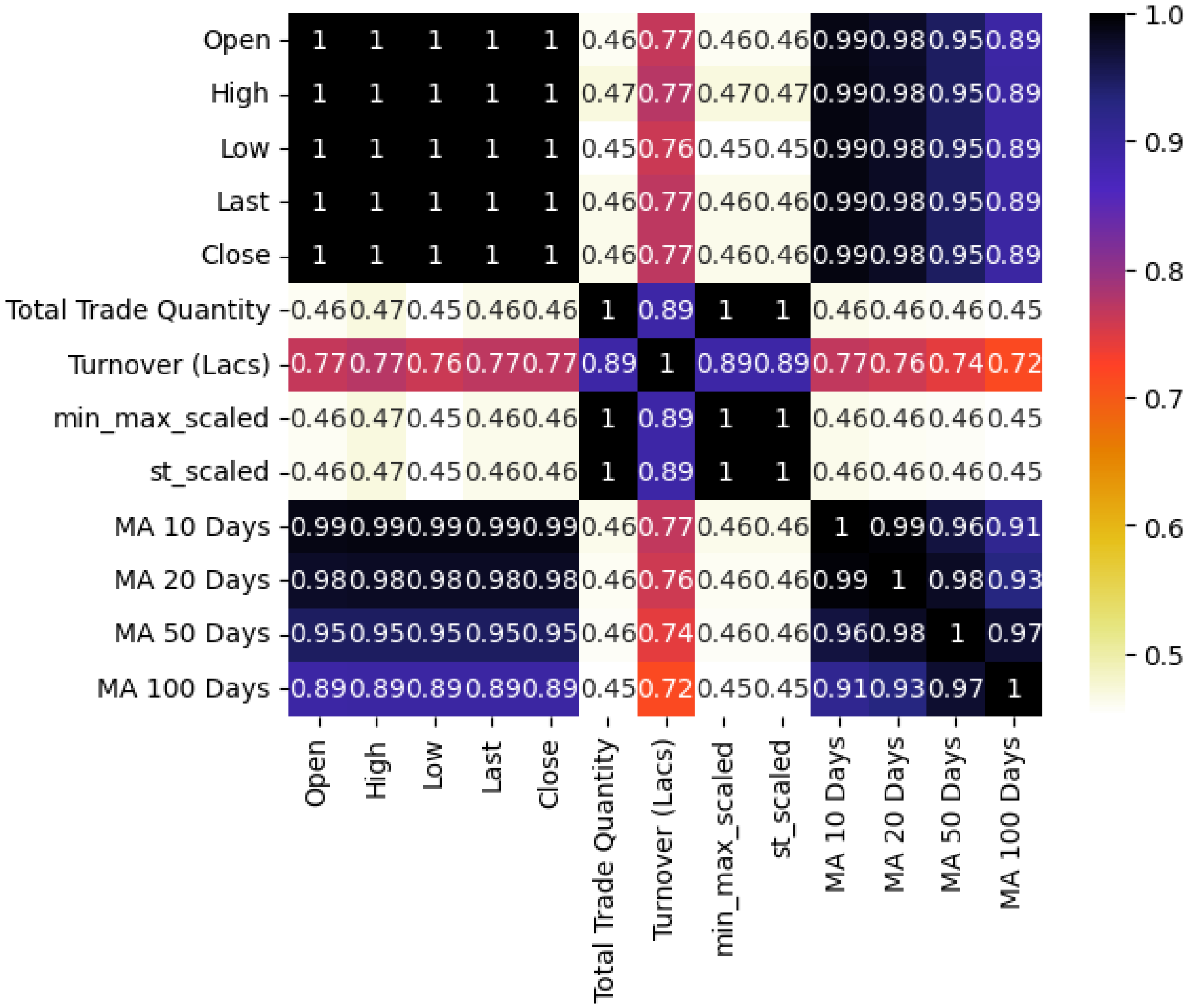


In the The Graph Orange, Green and Red are Perfect to Measure the Moving Average

In [ ]:

```python
correlation = data.corr()

sns.heatmap(correlation,cmap = "CMRmap_r",annot=True)
```

Out[ ]: <Axes: >



Daily Return of the Stock on Average

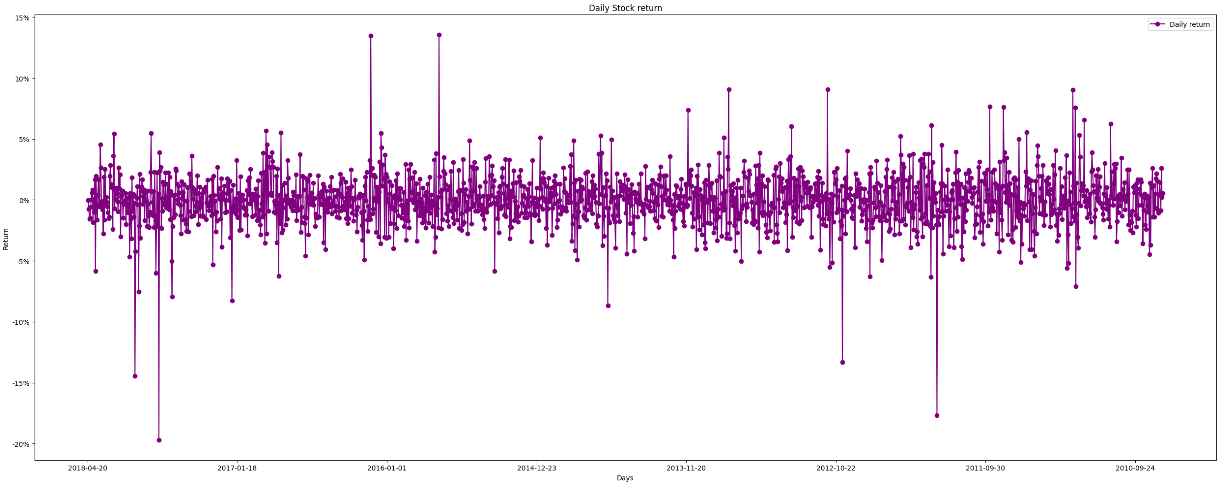
In [ ]:

```
data['Daily return'] = data['Close'].pct_change()
```

In [ ]:

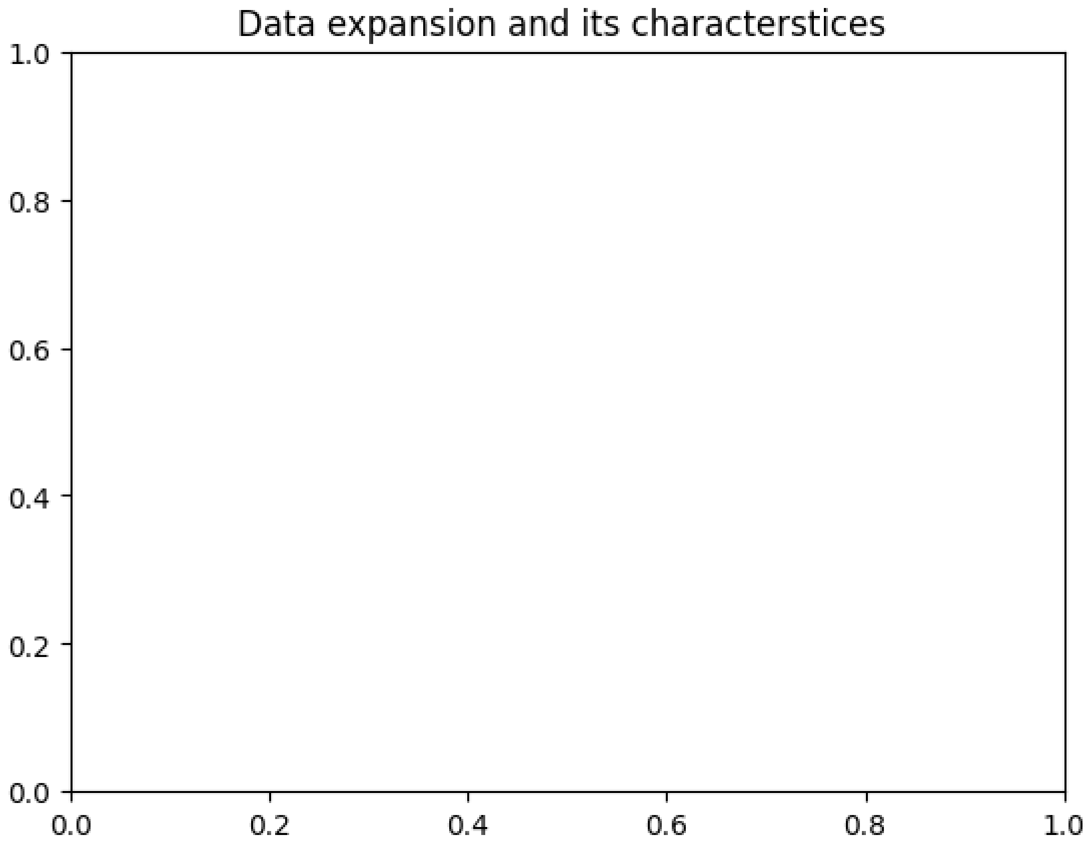
```
fig,axes=plt.subplots(nrows=1,ncols=1)
fig.set_figheight(10)
fig.set_figwidth(25)
fig.patch.set_facecolor('w')

data['Daily return'].plot(ax=axes,legend=True,linestyle='-',marker='o',color='purple
axes.set_title("Daily Stock return")
axes.set_xlabel("Days")
axes.set_ylabel("Return")

# Set the y-axis tick labels as percentages
axes.set_yticklabels(['{:.0f}%'.format(x * 100) for x in axes.get_yticks()])

plt.tight_layout()
plt.legend()
plt.show()
```

```
C:\Users\Hunain\AppData\Local\Temp\ipykernel_6640\3930271782.py:12: UserWarning: Fix
edFormatter should only be used together with FixedLocator
  axes.set_yticklabels(['{:.0f}%'.format(x * 100) for x in axes.get_yticks()])
```

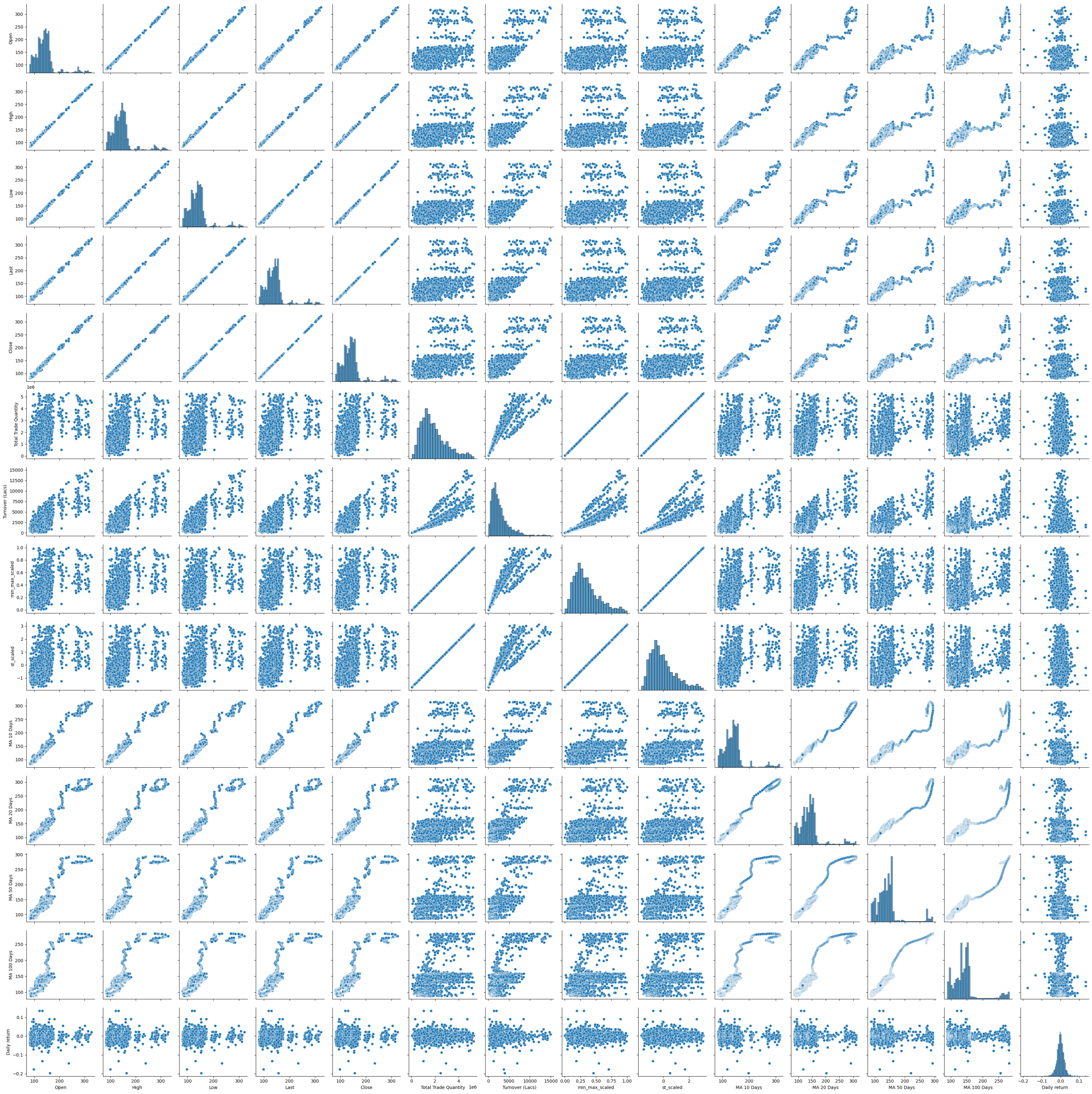


In [ ]:
```python
plt.title("Data expansion and its characterstices ")
plt.figure(figsize=(10,10))
sns.pairplot(data)
```

Out[ ]: <seaborn.axisgrid.PairGrid at 0x119c6032790>



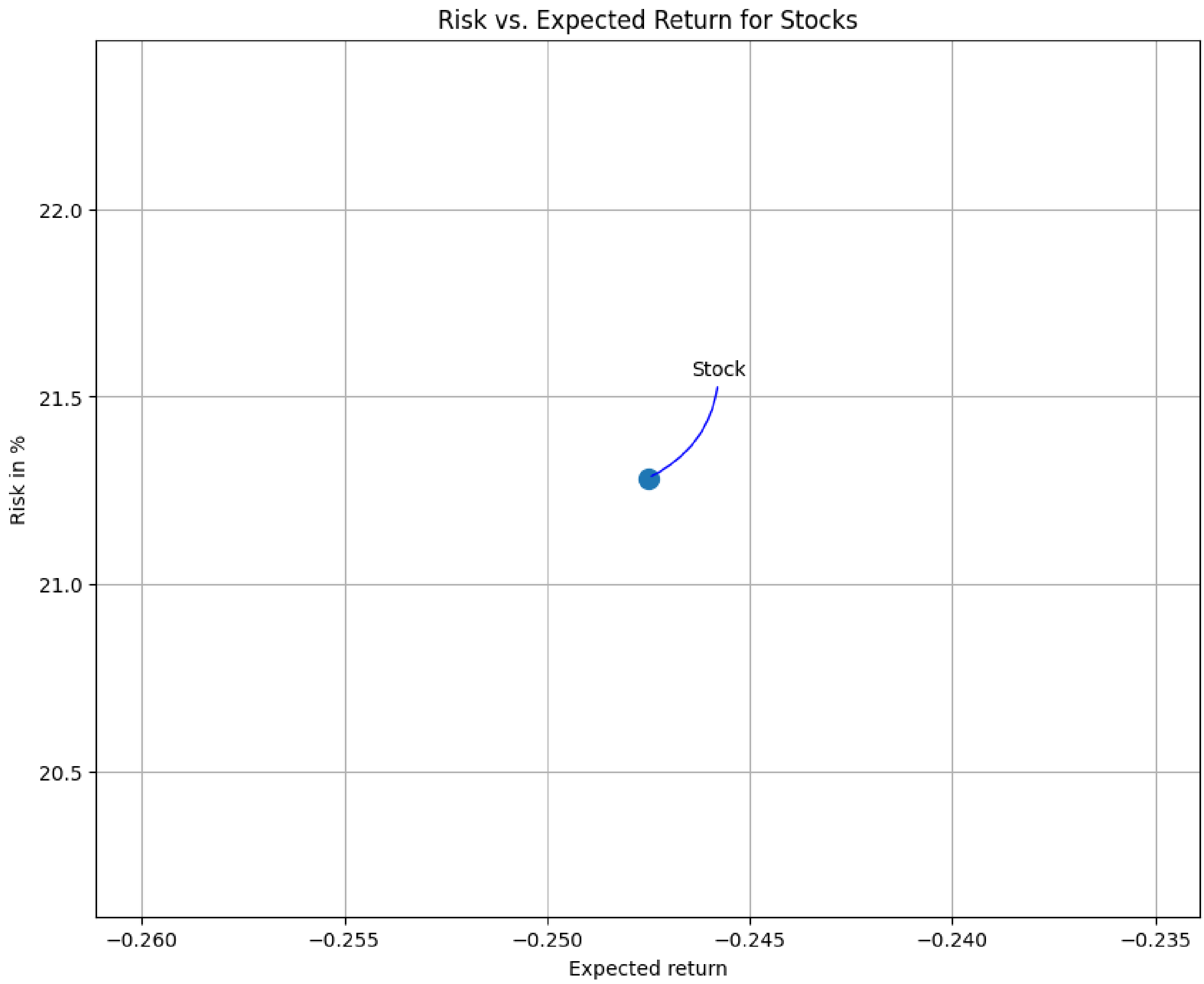
<Figure size 1000x1000 with 0 Axes>



Quantifying Risk

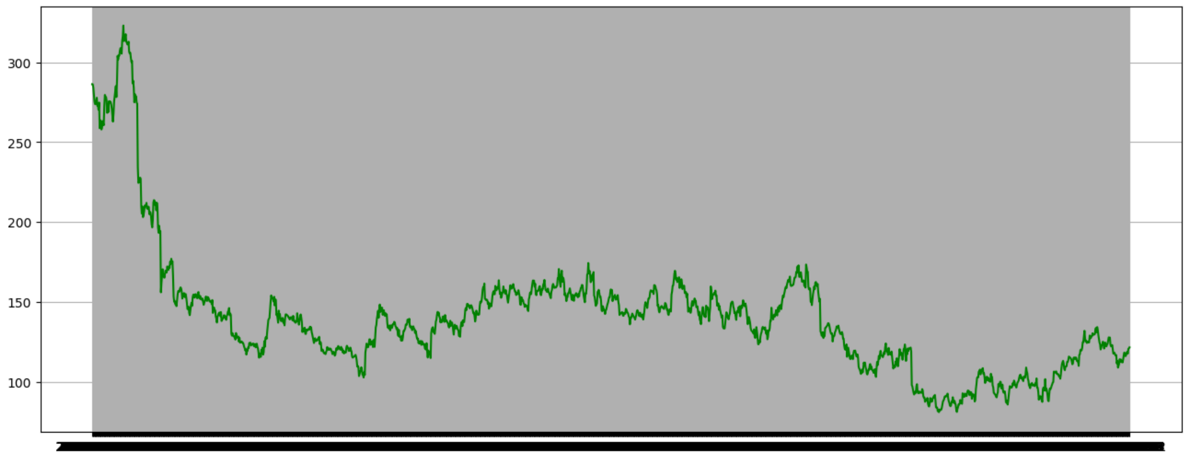
In [ ]:

```
# Calculate the daily returns for Apple stock
rets = data['Daily return'].dropna()

# convert returns to percentag
rets=rets*1000

plt.figure(figsize=(10, 8))
plt.scatter(rets.mean(), rets.std(), s=100)
plt.xlabel('Expected return')
plt.ylabel('Risk in %')



plt.annotate('Stock', xy=(rets.mean(), rets.std()), xytext=(50, 50), textcoords='off
             ha='right', va='bottom', arrowprops=dict(arrowstyle='-', color='blue',

plt.grid(True)
plt.title('Risk vs. Expected Return for Stocks')
plt.show()
```



In [ ]:

```
plt.figure(figsize=(16,6))
plt.title(" Clsoing price history",color='white')
plt.plot(data['Close'],color="green")

plt.xlabel("year",fontsize=20,color='white')

plt.grid(True)
plt.ylabel("Closing price USD",fontsize=20,color="White")

# plt.gca().set_facecolor('black')
plt.show()
```



In [ ]:

```
data2 = data.filter(['Close'])
dataset = data2.values
```

```
training_data_len = int(np.ceil(len(dataset) * .95))

training_data_len
```

Out[ ]: 1708

In [ ]:

```
scaler = MinMaxScaler(feature_range=(0,1))
scaled_data = scaler.fit_transform(dataset)

scaled_data
```

Out[ ]:

```
array([[0.84837843],
       [0.8479653 ],
       [0.8392894 ],
       ...,
       [0.1640157 ],
       [0.16504854],
       [0.16773394]])
```

In [ ]:

```
train_data = scaled_data[0:int(training_data_len), :]
x_train = []
y_train = []

for i in range(60, len(train_data)):
    x_train.append(train_data[i-60:i, 0])
    y_train.append(train_data[i, 0])
    if i<= 61:
        print(x_train)
        print(y_train)
        print()

x_train, y_train = np.array(x_train), np.array(y_train)

x_train = np.reshape(x_train, (x_train.shape[0], x_train.shape[1], 1))
```

```
[array([0.84837843, 0.8479653 , 0.8392894 , 0.82090477, 0.80375955,
       0.79694278, 0.79694278, 0.80375955, 0.81326172, 0.7921917 ,
       0.79343111, 0.78206982, 0.80086759, 0.73455898, 0.75542243,
       0.74881223, 0.7310473 , 0.73497211, 0.75294361, 0.74819252,
       0.74220202, 0.79095228, 0.8206982 , 0.81615369, 0.81491427,
       0.80603181, 0.7742202 , 0.79508366, 0.77649246, 0.80437926,
       0.80107416, 0.80375955, 0.80169386, 0.7954968 , 0.78392894,
       0.76699029, 0.75149762, 0.77256765, 0.80417269, 0.81842595,
       0.83040694, 0.84342078, 0.81512084, 0.85684776, 0.92150382,
       0.91241479, 0.92253667, 0.92253667, 0.93472423, 0.941541  ,
       0.93947532, 0.92749432, 0.96095848, 0.97273291, 1.        ,
       0.95992564, 0.96323074, 0.96818839, 0.97769056, 0.95847965])]
[0.9555876884941127]

[array([0.84837843, 0.8479653 , 0.8392894 , 0.82090477, 0.80375955,
       0.79694278, 0.79694278, 0.80375955, 0.81326172, 0.7921917 ,
       0.79343111, 0.78206982, 0.80086759, 0.73455898, 0.75542243,
       0.74881223, 0.7310473 , 0.73497211, 0.75294361, 0.74819252,
       0.74220202, 0.79095228, 0.8206982 , 0.81615369, 0.81491427,
       0.80603181, 0.7742202 , 0.79508366, 0.77649246, 0.80437926,
       0.80107416, 0.80375955, 0.80169386, 0.7954968 , 0.78392894,
       0.76699029, 0.75149762, 0.77256765, 0.80417269, 0.81842595,
       0.83040694, 0.84342078, 0.81512084, 0.85684776, 0.92150382,
       0.91241479, 0.92253667, 0.92253667, 0.93472423, 0.941541  ,
       0.93947532, 0.92749432, 0.96095848, 0.97273291, 1.        ,
       0.95992564, 0.96323074, 0.96818839, 0.97769056, 0.95847965]), array([0.847965
3 , 0.8392894 , 0.82090477, 0.80375955, 0.79694278,
       0.79694278, 0.80375955, 0.81326172, 0.7921917 , 0.79343111,
```

```
       0.78206982, 0.80086759, 0.73455898, 0.75542243, 0.74881223,
       0.7310473 , 0.73497211, 0.75294361, 0.74819252, 0.74220202,
       0.79095228, 0.8206982 , 0.81615369, 0.81491427, 0.80603181,
       0.7742202 , 0.79508366, 0.77649246, 0.80437926, 0.80107416,
       0.80375955, 0.80169386, 0.7954968 , 0.78392894, 0.76699029,
       0.75149762, 0.77256765, 0.80417269, 0.81842595, 0.83040694,
       0.84342078, 0.81512084, 0.85684776, 0.92150382, 0.91241479,
       0.92253667, 0.92253667, 0.93472423, 0.941541  , 0.93947532,
       0.92749432, 0.96095848, 0.97273291, 1.        , 0.95992564,
       0.96323074, 0.96818839, 0.97769056, 0.95847965, 0.95558769])]
[0.9555876884941127, 0.9512497417888864]
```

In [ ]:

```
model = Sequential()
model.add(LSTM(128, return_sequences=True,input_shape = (x_train.shape[1],1)))
model.add(LSTM(64,return_sequences=False))
model.add(Dense(25))
model.add(Dense(1))

model.compile(optimizer = 'Adam', loss = 'mean_squared_error', metrics=['accuracy'])

model.fit(x_train,y_train,batch_size=1,epochs = 4)
```

```
Epoch 1/4
1648/1648 [==============================] - 64s 35ms/step - loss: 0.0013 - accurac
y: 6.0680e-04
Epoch 2/4
1648/1648 [==============================] - 60s 36ms/step - loss: 4.8726e-04 - accu
racy: 6.0680e-04
Epoch 3/4
1648/1648 [==============================] - 60s 36ms/step - loss: 5.0128e-04 - accu
racy: 6.0680e-04
Epoch 4/4
1648/1648 [==============================] - 60s 37ms/step - loss: 4.1902e-04 - accu
racy: 6.0680e-04
```

Out[ ]: `<keras.src.callbacks.History at 0x119dc540750>`

In [ ]:

```
# Create the testing data set
# Create a new array containing scaled values from index 1543 to 2002
test_data = scaled_data[training_data_len - 60: , :]
# Create the data sets x_test and y_test
x_test = []
y_test = dataset[training_data_len:, :]
for i in range(60, len(test_data)):
    x_test.append(test_data[i-60:i, 0])

# Convert the data to a numpy array
x_test = np.array(x_test)

# Reshape the data
x_test = np.reshape(x_test, (x_test.shape[0], x_test.shape[1], 1 ))

# Get the models predicted price values
predictions = model.predict(x_test)
predictions = scaler.inverse_transform(predictions)

# Get the root mean squared error (RMSE)
rmse = np.sqrt(np.mean(((predictions - y_test) ** 2)))
rmse
```

```
3/3 [==============================] - 0s 41ms/step
```

Out[ ]: 4.7423049487885995

In [ ]:

```
# Plot the data
train = data[:training_data_len]
valid = data[training_data_len:]
valid['Predictions'] = predictions
# Visualize the data
plt.figure(figsize=(16,6))
plt.title('Model')
plt.xlabel('Date', fontsize=18)
plt.ylabel(' Close Price USD ($)', fontsize=18)
plt.plot(train['Close'],color='green')
plt.plot(valid[['Close', 'Predictions']])
plt.legend(['Train', 'Val', 'Predictions'], loc='lower right')
plt.show()
```

```
C:\Users\Hunain\AppData\Local\Temp\ipykernel_6640\1141653528.py:4: SettingWithCopyWa
rning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/u
ser_guide/indexing.html#returning-a-view-versus-a-copy
  valid['Predictions'] = predictions
```