```
from google.colab import drive
drive.mount('/content/drive')
```

```
Mounted at /content/drive
```

```
import pandas as pd
import numpy as np
from sklearn.preprocessing import MinMaxScaler
from sklearn.metrics import mean_absolute_error
import matplotlib.pyplot as plt
import plotly.graph_objects as go
%matplotlib inline
```

```
data = pd.read_csv('/content/drive/MyDrive/Colab_Notebooks/Datasets/NIFTY_PHARMA(unprocess
data_merged = data
df = pd.DataFrame(data)
df.head()
```

	Date	Open	High	Low	Close	Volume
0	1/31/2011 15:30:00	4633.30	4700.60	4593.90	4689.80	0
1	02-01-2011 15:30	4705.80	4723.95	4598.10	4629.25	0
2	02-02-2011 15:30	4643.65	4672.30	4603.25	4630.20	0
3	02-03-2011 15:30	4618.95	4662.35	4605.40	4640.90	0
4	02-04-2011 15:30	4637.85	4679.55	4557.10	4573.25	0

```
df.tail()
```

	Date	Open	High	Low	Close	Volume
2611	09-03-2021 15:30	14506.05	14553.40	14399.25	14485.65	0
2612	09-06-2021 15:30	14540.95	14562.25	14449.25	14481.55	0
2613	09-07-2021 15:30	14488.05	14503.30	14341.50	14387.35	0
2614	09-08-2021 15:30	14396.80	14410.90	14248.00	14349.45	0
2615	09-09-2021 15:30	14300.30	14339.65	14247.80	14329.85	0

```
data1 = pd.read_csv('/content/drive/MyDrive/Colab_Notebooks/Datasets/Sun_Pharma.csv')
data2 = pd.read_csv('/content/drive/MyDrive/Colab_Notebooks/Datasets/DR_Reddy.csv')
data3 = pd.read_csv('/content/drive/MyDrive/Colab_Notebooks/Datasets/Cipla.csv')
data4 = pd.read_csv('/content/drive/MyDrive/Colab_Notebooks/Datasets/Divis_Lab.csv')
data5 = pd.read_csv('/content/drive/MyDrive/Colab_Notebooks/Datasets/Lupin.csv')
```

```
print(data1.shape)
print(data2.shape)
```

```
print(data3.shape)
print(data4.shape)
print(data5.shape)
print(data.shape)
```

```
(2619, 6)
(2619, 6)
(2618, 6)
(2614, 6)
(2618, 6)
(2616, 6)
```

```
data_merged['Sun_Pharma'] = data1['Close']
data_merged['DR_Reddy'] = data2['Close']
data_merged['Cipla'] = data3['Close']
data_merged['Divis_Lab'] = data4['Close']
data_merged['Lupin'] = data5['Close']
```

```
df_merged = pd.DataFrame(data_merged)
```

```
df_merged = df_merged.drop(['Open'], axis=1)
df_merged = df_merged.drop(['High'],  axis=1)
df_merged = df_merged.drop(['Low'],  axis=1)
df_merged = df_merged.drop(['Volume'],  axis=1)
df_merged = df_merged.drop(['Date'],  axis=1)
```

```
df_merged.rename(columns = {'Close':'Pharma_Index'}, inplace = True)
```

```
df_merged = df_merged[2096:2446]
```

```
corr = df_merged.corr()
corr
```

	Pharma_Index	Sun_Pharma	DR_Reddy	Cipla	Divis_Lab	Lupin
Pharma_Index	1.000000	0.937226	0.969933	0.981512	0.940018	0.926567
Sun_Pharma	0.937226	1.000000	0.855968	0.907932	0.835631	0.895239
DR_Reddy	0.969933	0.855968	1.000000	0.963194	0.945044	0.884778
Cipla	0.981512	0.907932	0.963194	1.000000	0.915008	0.945770
Divis_Lab	0.940018	0.835631	0.945044	0.915008	1.000000	0.787800
Lupin	0.926567	0.895239	0.884778	0.945770	0.787800	1.000000

```
df = df.drop(['Volume'], axis=1)
df.head()
```

	Date	Open	High	Low	Close
0	1/31/2011 15:30:00	4633.30	4700.60	4593.90	4689.80
1	02-01-2011 15:30	4705.80	4723.95	4598.10	4629.25
2	02-02-2011 15:30	4643.65	4672.30	4603.25	4630.20
3	02-03-2011 15:30	4618.95	4662.35	4605.40	4640.90

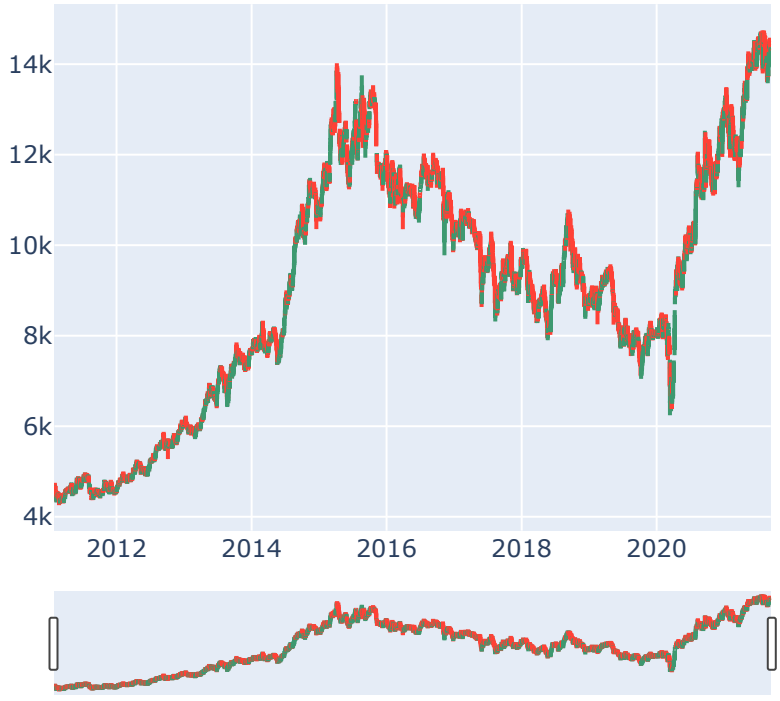
```
df['Date'] = pd.to_datetime(df['Date'])
df['Date'] = [i.date() for i in df['Date']]


df.head()
```

	Date	Open	High	Low	Close
0	2011-01-31	4633.30	4700.60	4593.90	4689.80
1	2011-02-01	4705.80	4723.95	4598.10	4629.25
2	2011-02-02	4643.65	4672.30	4603.25	4630.20
3	2011-02-03	4618.95	4662.35	4605.40	4640.90
4	2011-02-04	4637.85	4679.55	4557.10	4573.25

```
from datetime import datetime


'''
first wave

start = datetime.strptime('2019-07-30','%Y-%M-%d').date()
end = datetime.strptime('2020-03-14','%Y-%M-%d').date()
pre_covid_data = df.loc[(df['Date'] >= start) & (df['Date'] <= end)]

start = datetime.strptime('2020-03-15','%Y-%M-%d').date()
end = datetime.strptime('2020-12-25','%Y-%M-%d').date()
covid_data = df.loc[(df['Date'] >= start) & (df['Date'] <= end)]


second wave

start = datetime.strptime('2020-12-26','%Y-%M-%d').date()
end = datetime.strptime('2021-03-15','%Y-%M-%d').date()
pre_covid_data2 = df.loc[(df['Date'] > start) & (df['Date'] <= end)]

start = datetime.strptime('2021-03-16','%Y-%M-%d').date()
end = datetime.strptime('2021-07-30','%Y-%M-%d').date()
covid_data2 = df.loc[(df['Date'] > start) & (df['Date'] <= end)]
'''
```

```
'\nsecond wave\n\nstart = datetime.strptime('2020-12-26','%Y-%M-%d').date()\nend = d
```

```
pre_covid_data = df[2096:2247]
covid_data = df[2248:2446]


df_copy = df.copy()


for i in range(1,len(df)):
  df.loc[i,'Day_percent_change']=(df.loc[i,'Close']-df.loc[i-1,'Close'])/100


df.dropna(axis = 0, inplace = True)


fig = go.Figure(data=[go.Candlestick(x=df['Date'],open=df['Open'],high=df['High'],
                low=df['Low'],
                close=df['Close'])])

fig.show()
```




```
df_copy.dtypes
```

```
Date      object
Open     float64
High     float64
```

```
Low      float64
Close    float64
dtype: object
```

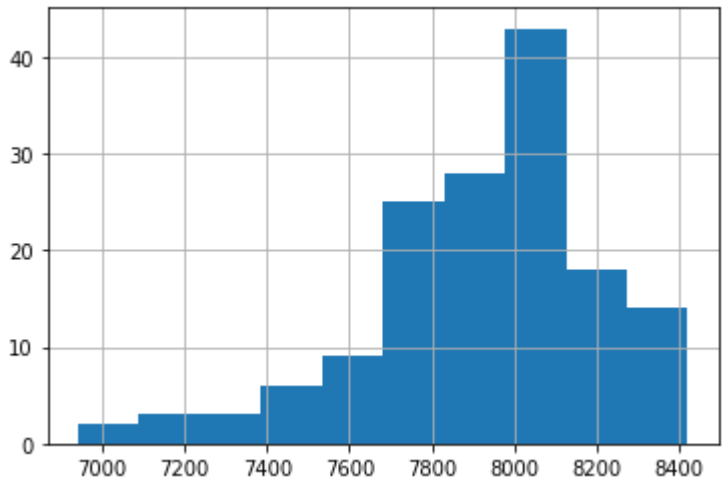
```
print(df.loc[2025,"Date"])
```

```
2019-04-23
```

```
print(covid_data)
```

```
            Date     Open     High      Low    Close
2204  2020-01-15  8135.75  8178.85  8080.35  8166.20
2205  2020-01-16  8188.05  8223.85  8175.35  8203.10
2206  2020-01-17  8208.30  8371.60  8200.00  8345.30
2207  2020-01-20  8353.70  8375.20  8251.00  8269.35
2208  2020-01-21  8249.15  8313.45  8214.55  8274.20
2209  2020-01-22  8295.00  8372.30  8245.45  8256.65
2210  2020-01-23  8245.95  8322.45  8208.55  8300.20
2211  2020-01-24  8291.75  8349.25  8273.95  8294.05
```

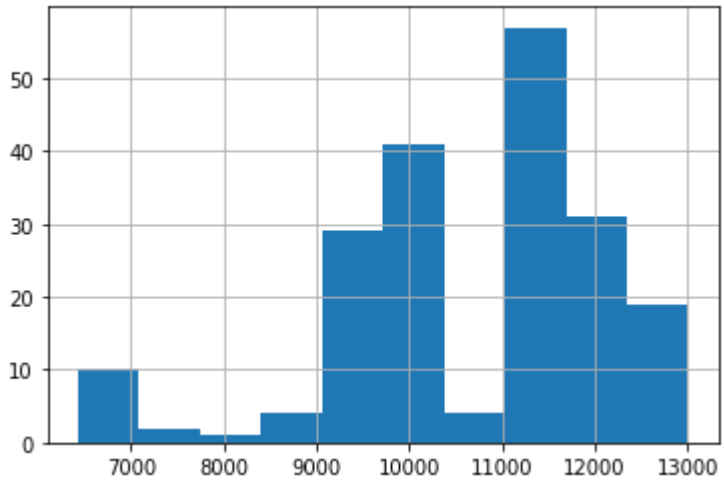
```
pre_covid_data['Close'].hist()
plt.show();
```




```
pre_covid_data.describe()
```

	Open	High	Low	Close

```
covid_data['Close'].hist()
plt.show();
```




```
covid_data.describe()
```

	Open	High	Low	Close
count	198.000000	198.000000	198.000000	198.000000
mean	10678.347980	10803.343182	10544.429293	10664.653283
std	1487.018618	1463.188764	1475.685332	1470.960222
min	6489.500000	6746.300000	6332.000000	6432.300000
25%	9851.425000	9985.012500	9803.650000	9867.537500
50%	11268.600000	11383.250000	11115.700000	11238.525000
75%	11718.812500	11828.600000	11590.325000	11687.887500
max	12989.400000	13045.550000	12875.550000	13001.950000

```
def ewma_5(df, column = 'Close'):
    df['ewma_5'] = df[column].ewm(span = 5, adjust = False).mean()
    return df

def ewma_20(df, column = 'Close'):
    df['ewma_20'] = df[column].ewm(span = 20, adjust = False).mean()
    return df

def ewma_50(df, column = 'Close'):
    df['ewma_50'] = df[column].ewm(span = 50, adjust = False).mean()
    return df

def ewma_200(df, column = 'Close'):
    df['ewma_200'] = df[column].ewm(span = 200, adjust = False).mean()
    return df
```

```
print(df3)
```

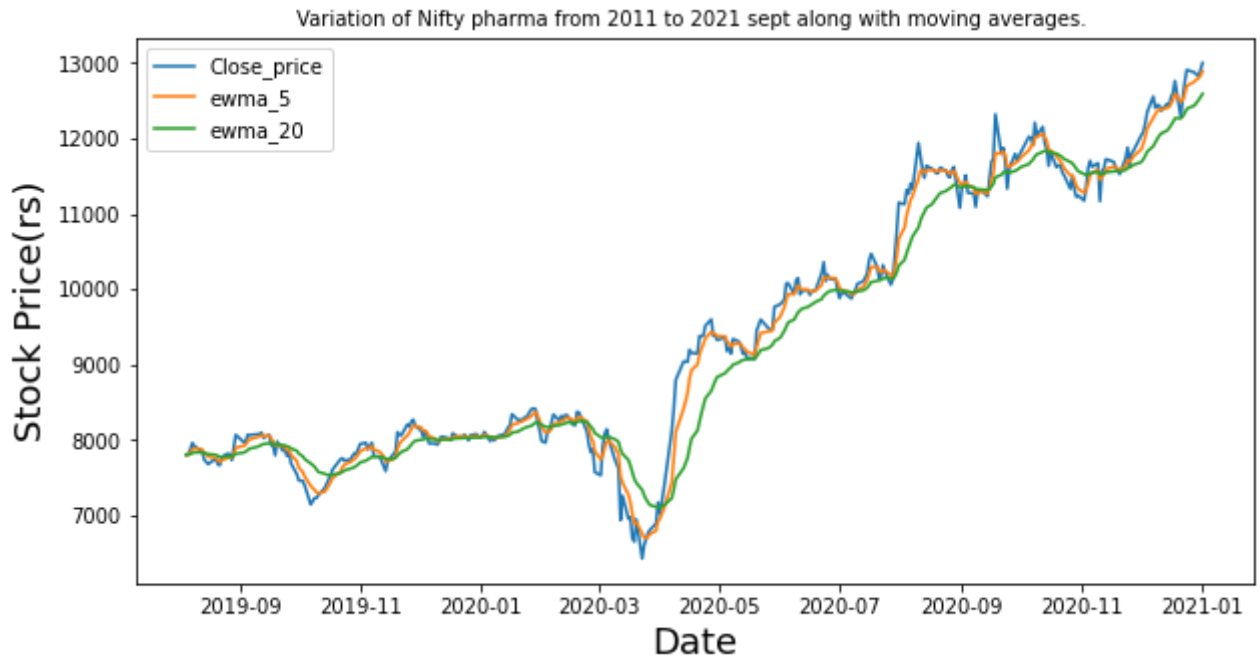
```
            Date      Open      High       Low     Close
2096  2019-08-05   7819.90   7881.85   7735.05   7807.95
2097  2019-08-06   7790.90   7905.90   7783.75   7818.50
2098  2019-08-07   7833.70   7959.95   7823.75   7879.75
2099  2019-08-08   7919.10   7994.10   7854.20   7964.80
2100  2019-08-09   8014.95   8049.10   7896.40   7924.05
...          ...       ...       ...       ...       ...
2441  2020-12-28  12989.40  12995.20  12842.55  12874.35
2442  2020-12-29  12932.30  13006.20  12802.85  12843.90
2443  2020-12-30  12898.60  12898.60  12753.85  12823.90
2444  2020-12-31  12829.75  12986.45  12797.95  12915.90
2445  2021-01-01  12933.10  13045.55  12875.55  13001.95

[350 rows x 5 columns]
```

```
df3 = df[2096:2446]
```

```
df3 = ewma_5(df3)
df3 = ewma_20(df3)
df3 = ewma_50(df3)
df3 = ewma_200(df3)
```

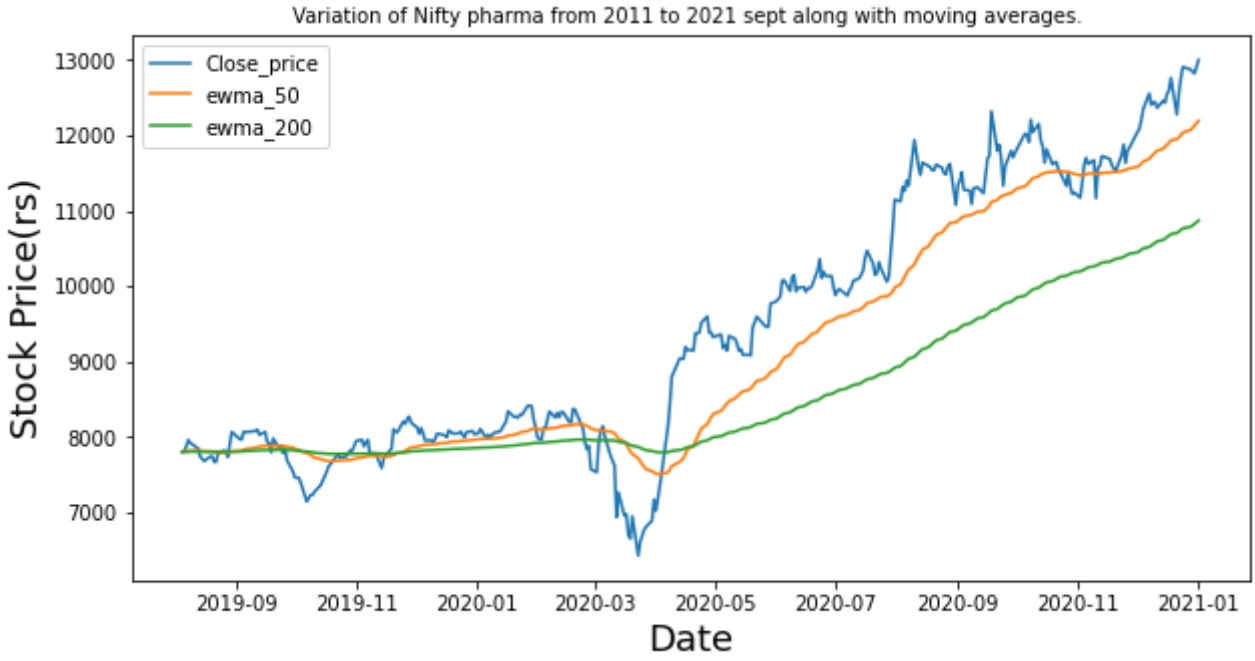
```
/usr/local/lib/python3.7/dist-packages/ipykernel_launcher.py:2: SettingWithCopyWarnir


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/us

/usr/local/lib/python3.7/dist-packages/ipykernel_launcher.py:6: SettingWithCopyWarnir


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/us

/usr/local/lib/python3.7/dist-packages/ipykernel_launcher.py:10: SettingWithCopyWarni


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/us

/usr/local/lib/python3.7/dist-packages/ipykernel_launcher.py:14: SettingWithCopyWarni


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/us
```

```
plt.figure(figsize=(10,5))
plt.title('Variation of Nifty pharma from 2011 to 2021 sept along with moving averages. ',
df_copy = df3.set_index('Date')
plt.plot(df_copy.Close)
plt.plot(df_copy.ewma_5)
plt.plot(df_copy.ewma_20)
plt.ylabel('Stock Price(rs)', fontsize=18)
plt.xlabel('Date', fontsize=18)
plt.legend(['Close_price','ewma_5','ewma_20'], loc='upper left');
```



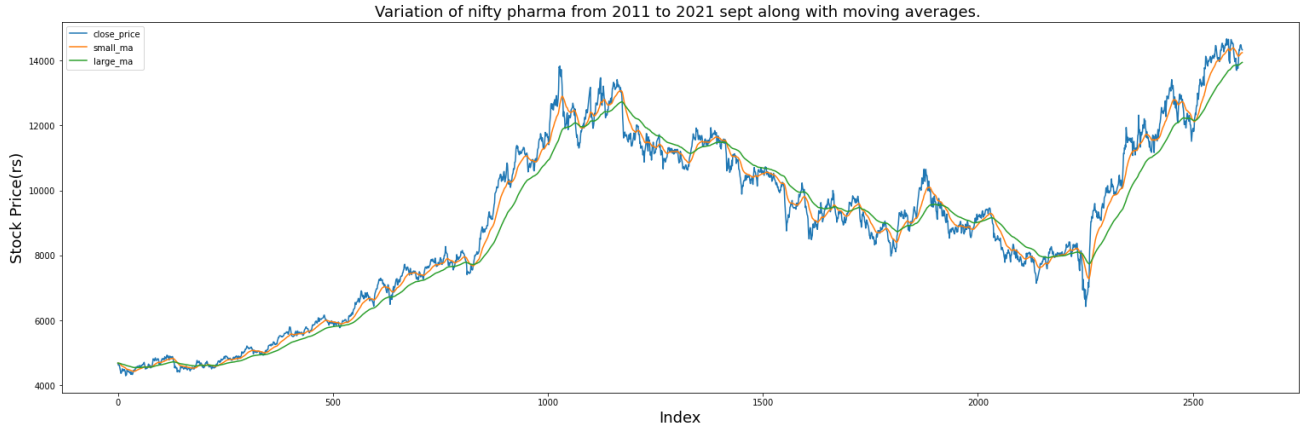

```
plt.figure(figsize=(10,5))
plt.title('Variation of Nifty pharma from 2011 to 2021 sept along with moving averages. ',
df_copy = df3.set_index('Date')
plt.plot(df_copy.Close)
plt.plot(df_copy.ewma_20)
plt.plot(df_copy.ewma_50)
plt.ylabel('Stock Price(rs)', fontsize=18)
plt.xlabel('Date', fontsize=18)
plt.legend(['Close_price','ewma_20','ewma_50'], loc='upper left');
```


```
plt.figure(figsize=(10,5))
plt.title('Variation of Nifty pharma from 2011 to 2021 sept along with moving averages. ',
df_copy = df3.set_index('Date')
plt.plot(df_copy.Close)
plt.plot(df_copy.ewma_50)
plt.plot(df_copy.ewma_200)
plt.ylabel('Stock Price(rs)', fontsize=18)
plt.xlabel('Date', fontsize=18)
plt.legend(['Close_price','ewma_50','ewma_200'], loc='upper left');
```



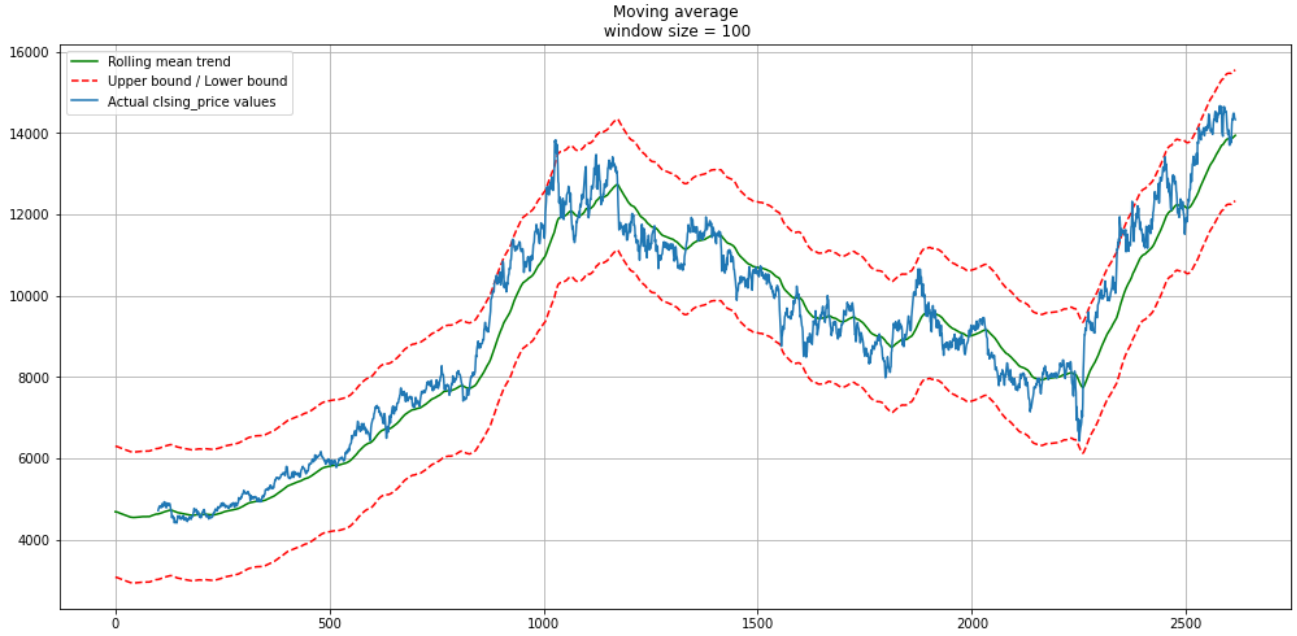

```
df_copy['ewma_30'] = df_copy['Close'].ewm(span = 30, adjust = False).mean()
df_copy['ewma_100'] = df_copy['Close'].ewm(span = 100, adjust = False).mean()
```

```
plt.figure(figsize=(26,8))
plt.title('Variation of nifty pharma from 2011 to 2021 sept along with moving averages. ',
plt.plot(df_copy.Close)
plt.plot(df_copy.ema_30)
plt.plot(df_copy.ema_100)
plt.ylabel('Stock Price(rs)', fontsize=18)
plt.xlabel('Index', fontsize=18)
plt.legend(['close_price','small_ma','large_ma'], loc='upper left');
```




```
from sklearn.metrics import mean_absolute_error


def plot_moving_average(df, window, column, plot_intervals=False, scale=1.96, plot_slopes=

    series = df.Close
    rolling_mean = df[column]

    plt.figure(figsize=(17,8))
    plt.title('Moving average\n window size = {}'.format(window))
    plt.plot(rolling_mean, 'g', label='Rolling mean trend')

    if plot_intervals:
        mae = mean_absolute_error(series[window:], rolling_mean[window:])
        deviation = np.std(series[window:] - rolling_mean[window:])
        lower_bound = rolling_mean - (mae + scale * deviation)
        upper_bound = rolling_mean + (mae + scale * deviation)
        plt.plot(upper_bound, 'r--', label='Upper bound / Lower bound')
        plt.plot(lower_bound, 'r--')

    if plot_slopes:
        plt.plot(df['slope_%s' % column], 'm,', label='Slope_MA')

    plt.plot(series[window:], label='Actual clsing_price values')
    plt.legend(loc='best')
    plt.grid(True)


plot_moving_average(df_copy, 30, column='ewma_30', plot_intervals=True)
```


```
plot_moving_average(df_copy, 100, column='ewma_100', plot_intervals=True)
```




```
def daily_trend(x):
```

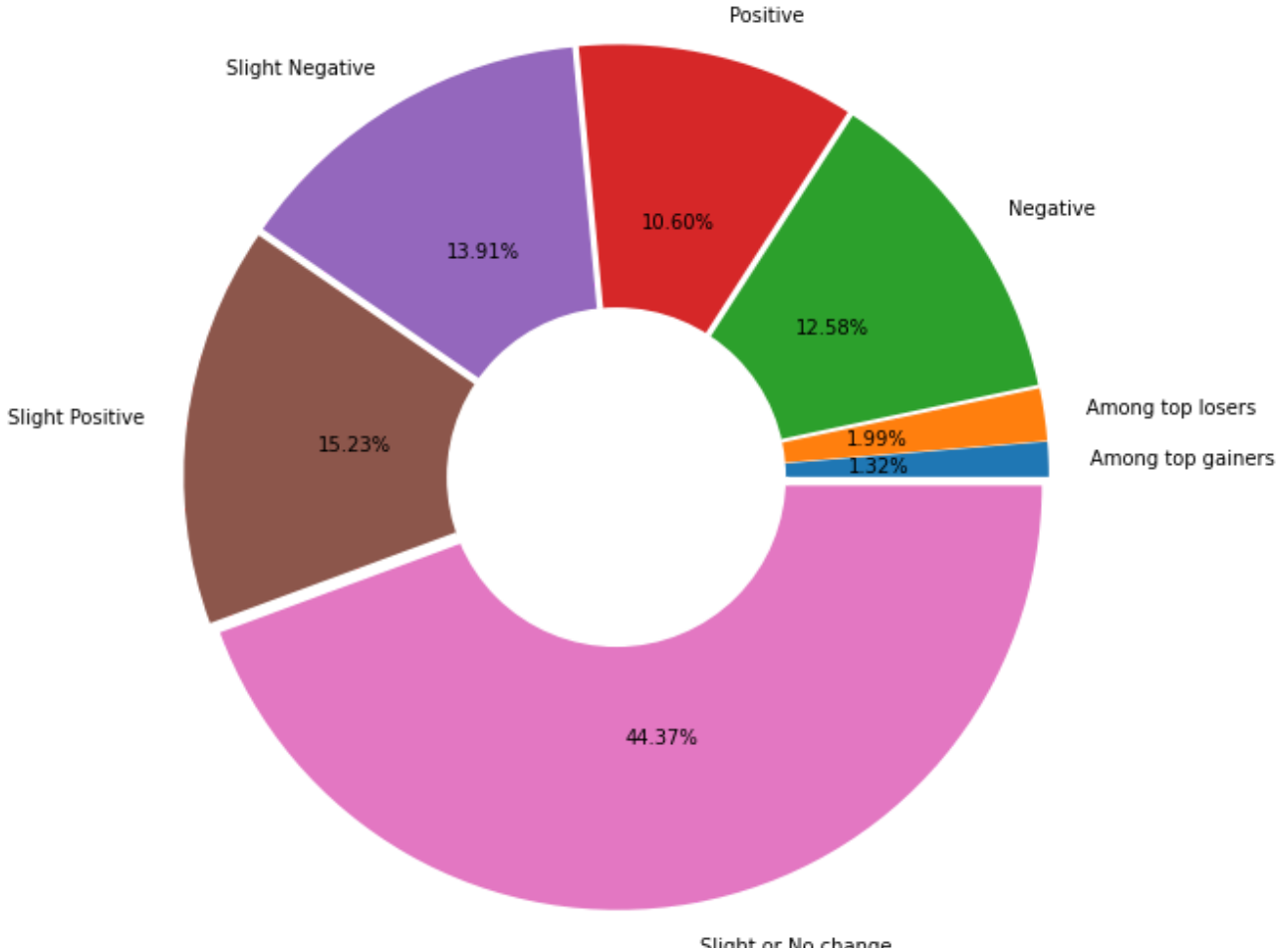
```
  if x > -0.5 and x <= 0.5:
    return 'Slight or No change'
  elif x > 0.5 and x <= 1:
    return 'Slight Positive'
  elif x > -1 and x <= -0.5:
    return 'Slight Negative'
  elif x > 1 and x <= 3:
    return 'Positive'
  elif x > -3 and x <= -1:
    return 'Negative'
  elif x > 3 and x <= 7:
    return 'Among top gainers'
  elif x > -7 and x <= -3:
    return 'Among top losers'
  elif x > 7:
    return 'Bull run'
  elif x <= -7:
    return 'Bear drop'

df['Trend']= np.zeros(df['Day_percent_change'].count())
df['Trend']= df['Day_percent_change'].apply(lambda x:daily_trend(x))

print(df.loc[2400,"Date"])
```

```
     2020-10-27
```

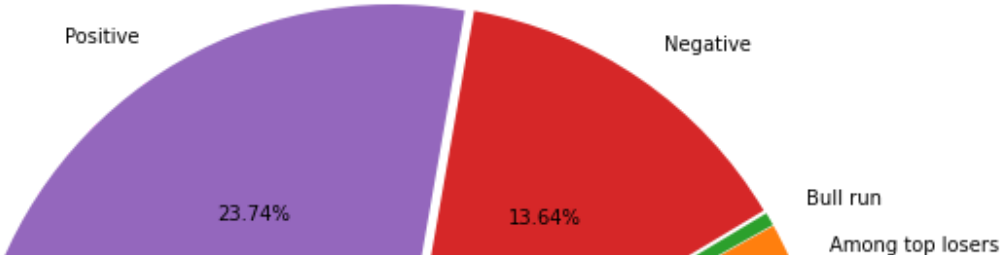
```
df1 = df[2096:2247]
df2 = df[2248:2446]
df.head()
```

	Date	Open	High	Low	Close
0	2011-01-31	4633.30	4700.60	4593.90	4689.80
1	2011-02-01	4705.80	4723.95	4598.10	4629.25
2	2011-02-02	4643.65	4672.30	4603.25	4630.20
3	2011-02-03	4618.95	4662.35	4605.40	4640.90
4	2011-02-04	4637.85	4679.55	4557.10	4573.25

```
pie_data1 = df1.groupby('Trend')
pie_label1 = sorted([i for i in df1.loc[:, 'Trend'].unique()])
explode = (0.05, 0.05, 0.05, 0.05, 0.05, 0.05, 0.05)
plt.pie(pie_data1['Trend'].count(), labels = pie_label1, autopct = '%2.2f%%', radius = 2.5
centre_circle = plt.Circle((0, 0), 1, fc='white')
fig = plt.gcf()

fig.gca().add_artist(centre_circle)

plt.show()
```




```
pie_data2 = df2.groupby('Trend')
pie_label2 = sorted([i for i in df2.loc[:, 'Trend'].unique()])
explode = (0.05, 0.05, 0.05, 0.05, 0.05, 0.05, 0.05, 0.05)
plt.pie(pie_data2['Trend'].count(), labels = pie_label2, autopct = '%2.2f%%', radius = 2.5
centre_circle = plt.Circle((0, 0), 1, fc='white')
fig = plt.gcf()

fig.gca().add_artist(centre_circle)

plt.show()
```




```
!pip install pandas_ta
```

```
Collecting pandas_ta
  Downloading pandas_ta-0.3.14b.tar.gz (115 kB)
     |████████████████████████████████| 115 kB 5.4 MB/s
Requirement already satisfied: pandas in /usr/local/lib/python3.7/dist-packages (from
Requirement already satisfied: numpy>=1.15.4 in /usr/local/lib/python3.7/dist-package
Requirement already satisfied: python-dateutil>=2.7.3 in /usr/local/lib/python3.7/dis
Requirement already satisfied: pytz>=2017.2 in /usr/local/lib/python3.7/dist-packages
Requirement already satisfied: six>=1.5 in /usr/local/lib/python3.7/dist-packages (fr
Building wheels for collected packages: pandas-ta
  Building wheel for pandas-ta (setup.py) ... done
  Created wheel for pandas-ta: filename=pandas_ta-0.3.14b0-py3-none-any.whl size=218
  Stored in directory: /root/.cache/pip/wheels/0b/81/f0/cca85757840e4616a2c6b9fe1256
Successfully built pandas-ta
Installing collected packages: pandas-ta
Successfully installed pandas-ta-0.3.14b0
```

```
df1 = df[2096-14:2247]
df2 = df[2248-14:2446]
df.head()
```

	Date	Open	High	Low	Close
0	2011-01-31	4633.30	4700.60	4593.90	4689.80
1	2011-02-01	4705.80	4723.95	4598.10	4629.25
2	2011-02-02	4643.65	4672.30	4603.25	4630.20
3	2011-02-03	4618.95	4662.35	4605.40	4640.90
4	2011-02-04	4637.85	4679.55	4557.10	4573.25

```
import pandas_ta as pta
df1['rsi'] = pta.rsi(df1['Close'], length = 14)
```

```
/usr/local/lib/python3.7/dist-packages/ipykernel_launcher.py:2: SettingWithCopyWarnir


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/us
```

```
def rsi_trend(x):
  if x < 25:
    return 'Oversold'
  elif x >= 25 and x < 45:
    return 'Bearish'
  elif x >= 45 and x < 55:
    return 'Neutral'
  elif x >= 55 and x < 75:
    return 'Bullish'
  else:
    return 'Overbought'


df1['RSI_Trend']= np.zeros(df1['Close'].count())
df1['RSI_Trend']= df1['rsi'].apply(lambda x:rsi_trend(x))
```

```
/usr/local/lib/python3.7/dist-packages/ipykernel_launcher.py:1: SettingWithCopyWarnir


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/us

/usr/local/lib/python3.7/dist-packages/ipykernel_launcher.py:2: SettingWithCopyWarnir


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Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/us
```
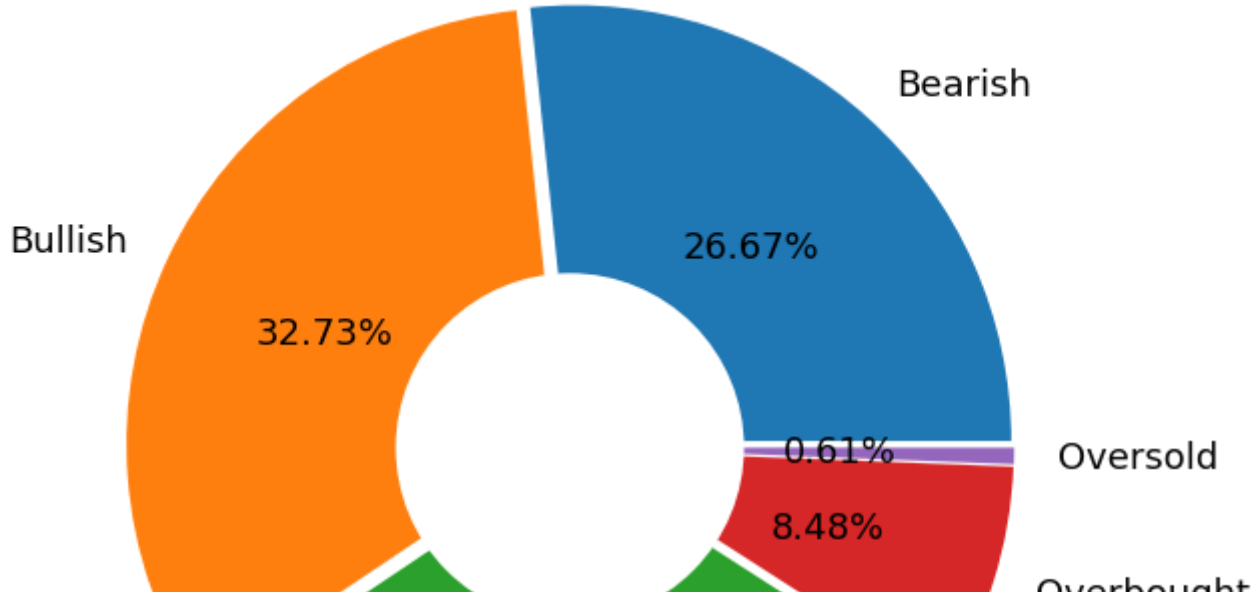

```
pie_data1 = df1.groupby('RSI_Trend')
pie_label1 = sorted([i for i in df1.loc[:, 'RSI_Trend'].unique()])
explode = (0.05, 0.05, 0.05, 0.05, 0.05)
plt.pie(pie_data1['RSI_Trend'].count(), labels = pie_label1, autopct = '%2.2f%%', textprop
centre_circle = plt.Circle((0, 0), 1, fc='white')
fig = plt.gcf()

fig.gca().add_artist(centre_circle)

plt.show()
```




```
import pandas_ta as pta
df2['rsi'] = pta.rsi(df2['Close'], length = 14)
```

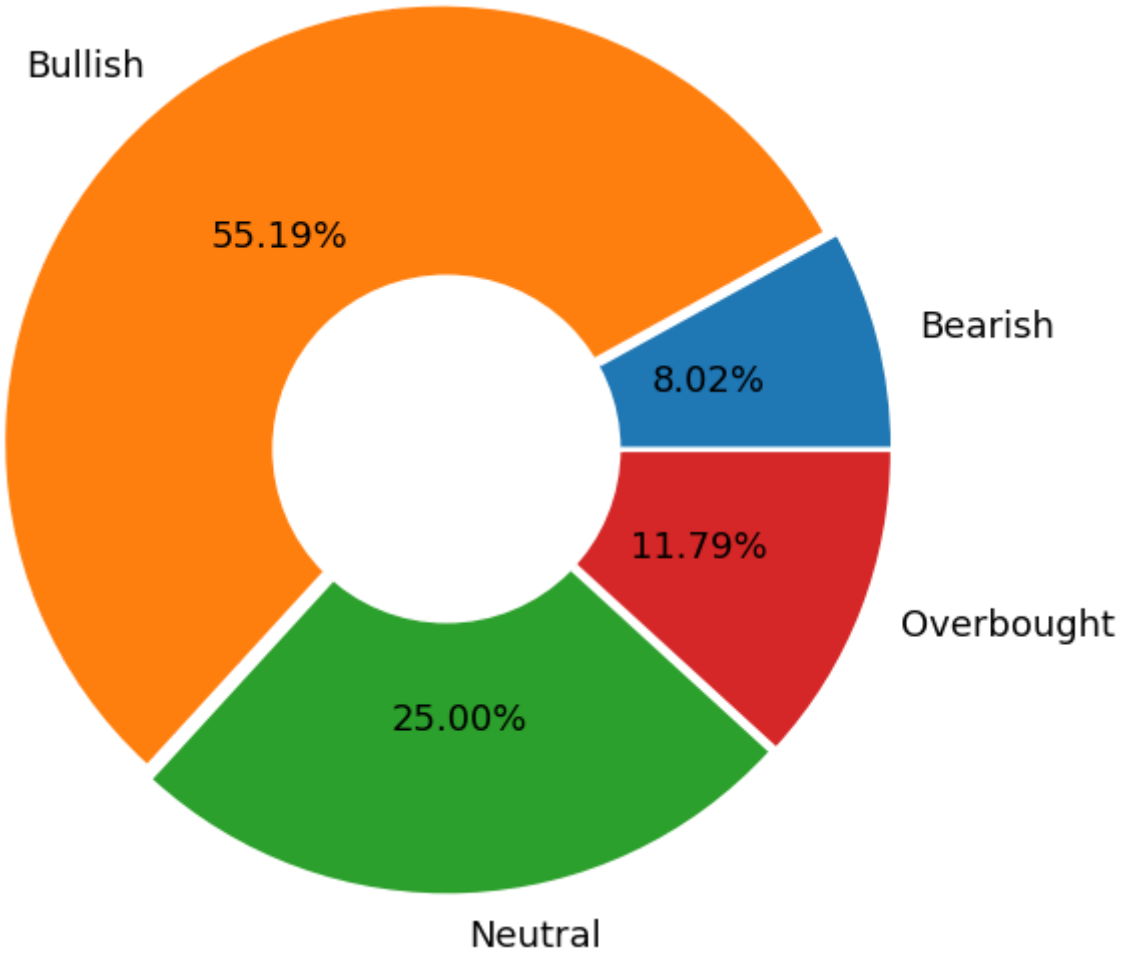
```
/usr/local/lib/python3.7/dist-packages/ipykernel_launcher.py:2: SettingWithCopyWarnir


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/us
```

```
df2['RSI_Trend']= np.zeros(df2['Close'].count())
df2['RSI_Trend']= df2['rsi'].apply(lambda x:rsi_trend(x))
```

```
/usr/local/lib/python3.7/dist-packages/ipykernel_launcher.py:1: SettingWithCopyWarnir


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/us

/usr/local/lib/python3.7/dist-packages/ipykernel_launcher.py:2: SettingWithCopyWarnir


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/us
```

```
pie_data2 = df2.groupby('RSI_Trend')
pie_label2 = sorted([i for i in df2.loc[:, 'RSI_Trend'].unique()])
explode = (0.05, 0.05, 0.05, 0.05)
plt.pie(pie_data2['RSI_Trend'].count(), labels = pie_label2, autopct = '%2.2f%%', textprop
```

```
centre_circle = plt.Circle((0, 0), 1, fc='white')
fig = plt.gcf()

fig.gca().add_artist(centre_circle)

plt.show()
```

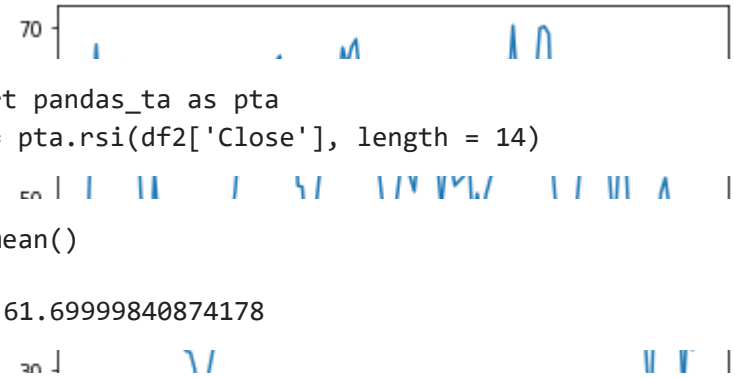



```
RSI.mean()
```

```
51.959771086953474
```

```
plt.plot(RSI)
```

```
[<matplotlib.lines.Line2D at 0x7f914ef56310>]
```



```
import pandas_ta as pta
RSI = pta.rsi(df2['Close'], length = 14)
```



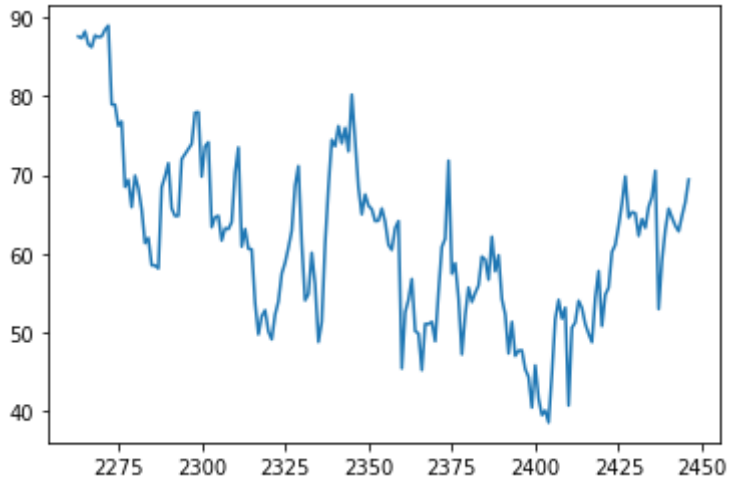
```
RSI.mean()
```

```
61.69999840874178
```



```
plt.plot(RSI)
```

```
[<matplotlib.lines.Line2D at 0x7f914ef3b4d0>]
```




```
df1.tail(10)
```

	Date	Open	High	Low	Close	Day_percent_change	Trend
2238	2020-03-03	7606.80	7966.15	7603.15	7920.60	3.8550	Among top gainers
2239	2020-03-04	7970.00	8131.85	7840.85	8086.55	1.6595	Positive
2240	2020-03-05	8125.90	8281.70	8122.60	8146.00	0.5945	Slight Positive
2241	2020-03-06	7863.10	8057.95	7860.60	8018.30	-1.2770	Negative
2242	2020-03-09	7921.25	7999.30	7698.25	7756.45	-2.6185	Negative
2243	2020-03-11	7754.75	7779.10	7596.35	7623.05	-1.3340	Negative
2244	2020-03-	7408.40	7423.95	6868.70	6942.55	-6.8050	Among top

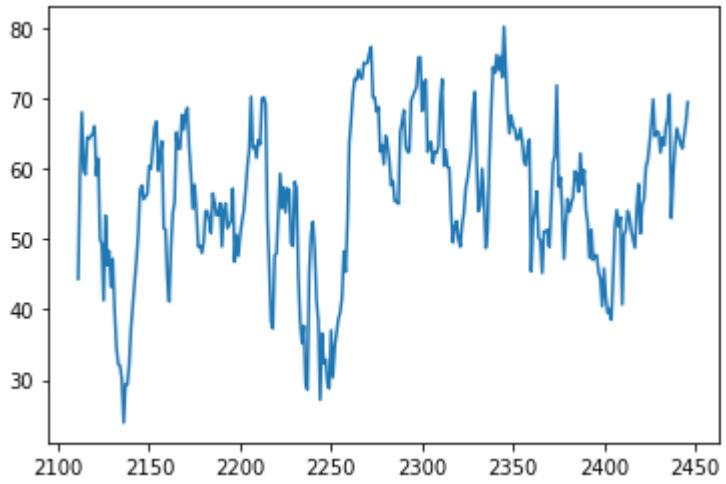
```
df3 = df[2096:2446]
```

```
df3.head(2250)
```

	Date	Open	High	Low	Close	Day_percent_change	Trend
2097	2019-08-06	7790.90	7905.90	7783.75	7818.50	0.1055	Slight or No change
2098	2019-08-07	7833.70	7959.95	7823.75	7879.75	0.6125	Slight Positive
2099	2019-08-08	7919.10	7994.10	7854.20	7964.80	0.8505	Slight Positive
2100	2019-08-09	8014.95	8049.10	7896.40	7924.05	-0.4075	Slight or No change
2101	2019-08-13	7909.30	7984.85	7789.15	7851.95	-0.7210	Slight Negative
...	...	...	...	...	...	...	...
2442	2020-12-29	12932.30	13006.20	12802.85	12843.90	-0.3045	Slight or No change

```
RSI = pta.rsi(df3['Close'], length = 14)
plt.plot(RSI)
```

```
[<matplotlib.lines.Line2D at 0x7f914ee2cb10>]
```




```
import pandas_ta as pta
CCI = pta.cci(df1['High'], df1['Low'], df1['Close'], window = 20)
```

```
df1 = df[2096-20:2247]
df2 = df[2248-20:2446]
df.head()
```

	Date	Open	High	Low	Close
0	2011-01-31	4633.30	4700.60	4593.90	4689.80
1	2011-02-01	4705.80	4723.95	4598.10	4629.25
2	2011-02-02	4643.65	4672.30	4603.25	4630.20

```
import pandas_ta as pta
df1['cci'] = pta.cci(df1['High'], df1['Low'], df1['Close'], window = 20)
```

```
/usr/local/lib/python3.7/dist-packages/ipykernel_launcher.py:2: SettingWithCopyWarnir


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```

```
def cci_trend(x):
  if x < -200:
    return 'Oversold'
  elif x >= -200 and x < -50:
    return 'Bearish'
  elif x >= -50 and x <= 50:
    return 'Neutral'
  elif x > 50 and x <= 200:
    return 'Bullish'
  else:
    return 'Overbought'


df1['CCI_Trend']= np.zeros(df1['Close'].count())
df1['CCI_Trend']= df1['cci'].apply(lambda x:cci_trend(x))
```

```
/usr/local/lib/python3.7/dist-packages/ipykernel_launcher.py:1: SettingWithCopyWarnir


A value is trying to be set on a copy of a slice from a DataFrame.
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Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/us
```
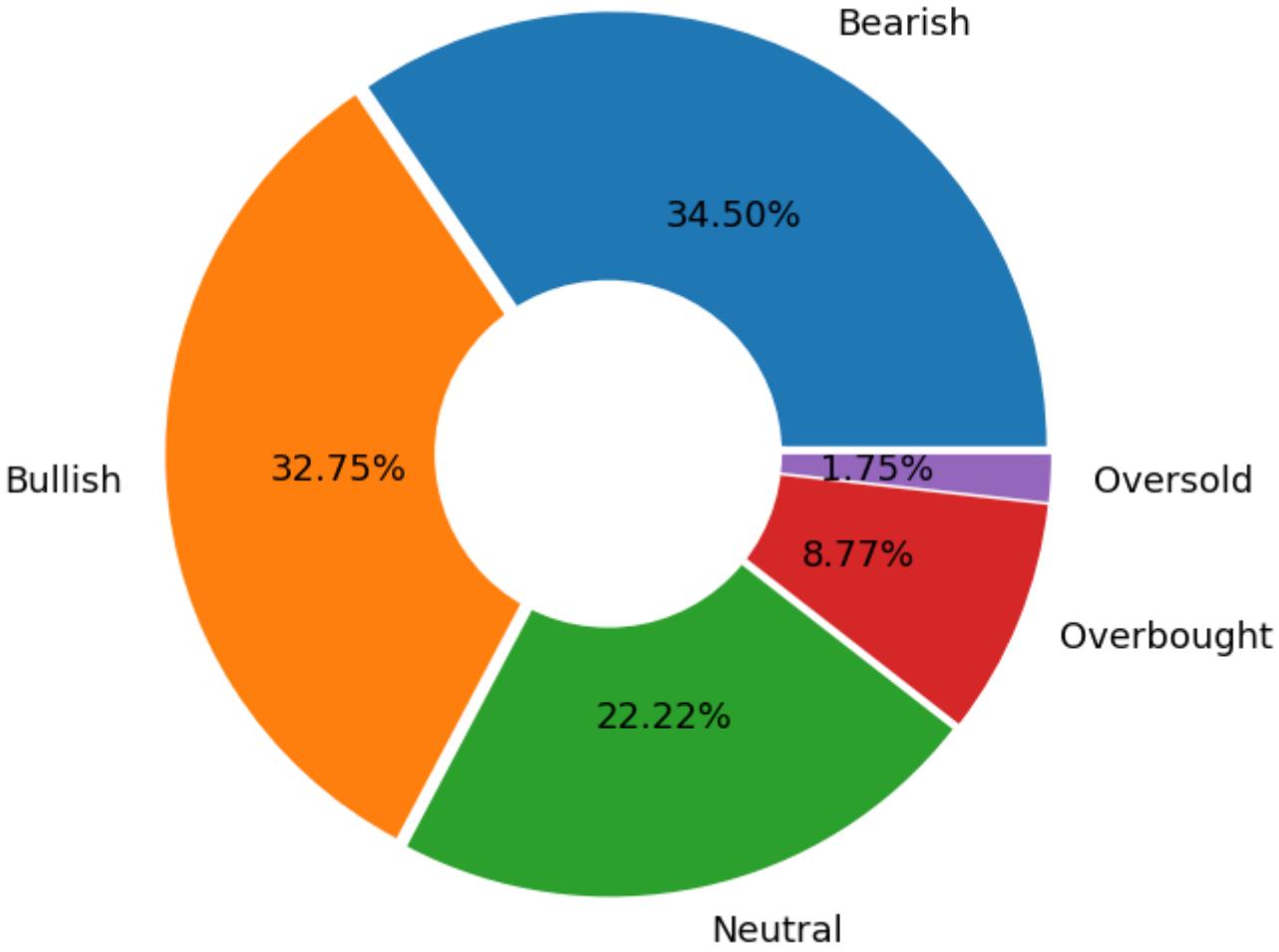

```
pie_data1 = df1.groupby('CCI_Trend')
pie_label1 = sorted([i for i in df1.loc[:, 'CCI_Trend'].unique()])
```

```
explode = (0.05, 0.05, 0.05, 0.05, 0.05)
plt.pie(pie_data1['CCI_Trend'].count(), labels = pie_label1, autopct = '%2.2f%%', textprop
centre_circle = plt.Circle((0, 0), 1, fc='white')
fig = plt.gcf()

fig.gca().add_artist(centre_circle)

plt.show()
```




```
df2['cci'] = pta.cci(df2['High'], df2['Low'], df2['Close'], window = 20)
```

```
/usr/local/lib/python3.7/dist-packages/ipykernel_launcher.py:1: SettingWithCopyWarnir


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/us
```

```
df2['CCI_Trend']= np.zeros(df2['Close'].count())
df2['CCI_Trend']= df2['cci'].apply(lambda x:cci_trend(x))
```

```
/usr/local/lib/python3.7/dist-packages/ipykernel_launcher.py:1: SettingWithCopyWarnir
```

```
A value is trying to be set on a copy of a slice from a DataFrame.
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See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/us
```
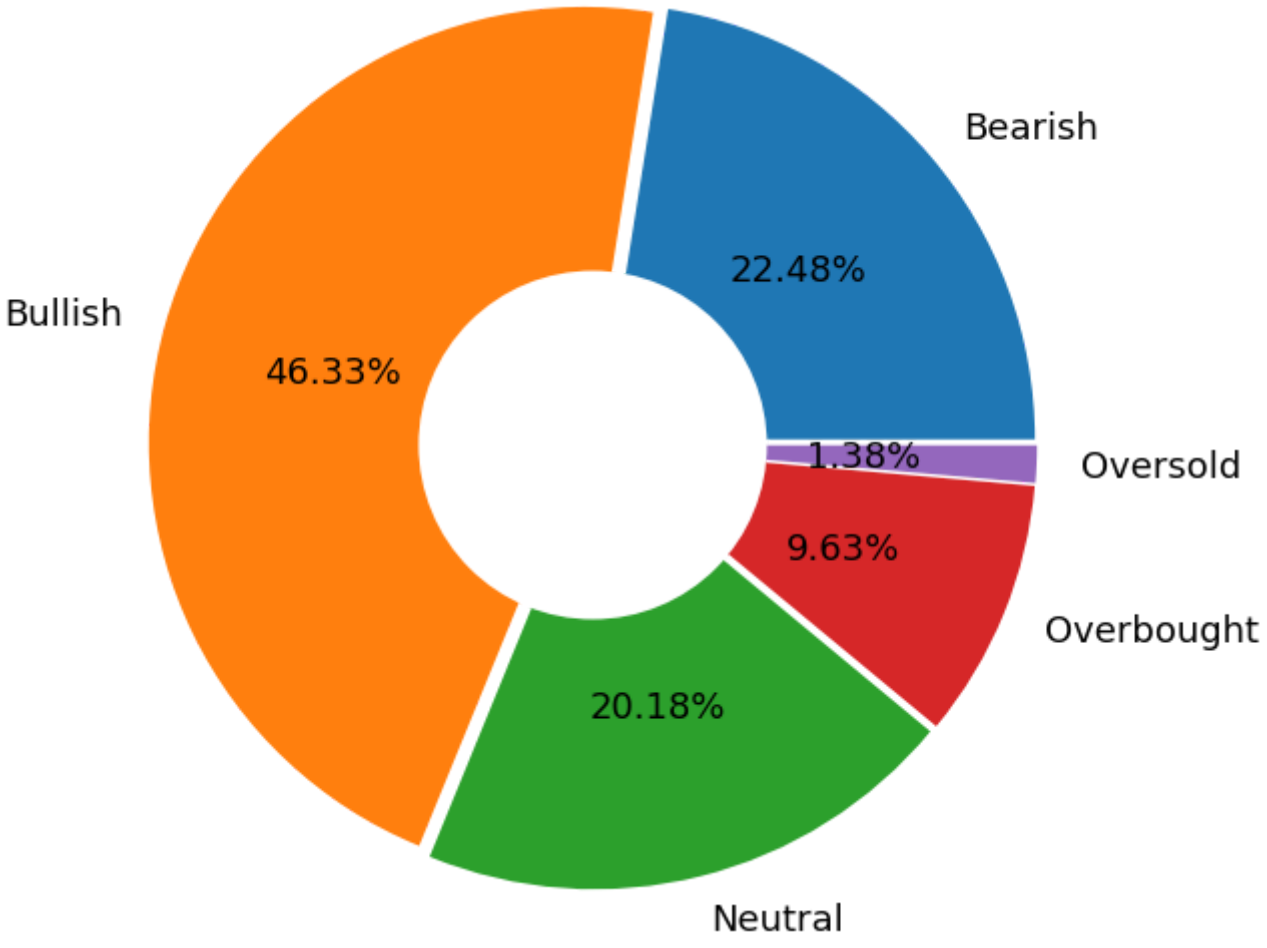

```
pie_data2 = df2.groupby('CCI_Trend')
pie_label2 = sorted([i for i in df2.loc[:, 'CCI_Trend'].unique()])
explode = (0.05, 0.05, 0.05, 0.05, 0.05)
plt.pie(pie_data2['CCI_Trend'].count(), labels = pie_label2, autopct = '%2.2f%%', textprop
centre_circle = plt.Circle((0, 0), 1, fc='white')
fig = plt.gcf()

fig.gca().add_artist(centre_circle)

plt.show()
```




```
df1 = df[2096-14:2247]
df2 = df[2248-14:2446]
```

```
df3 = df[2096-14:2446]

arr = pta.adx(df1['High'], df1['Low'], df1['Close'], window = 14)


plt.figure(figsize=(26,8))
plt.title('ADX', fontsize=18)
plt.plot(arr.ADX_14)
plt.plot(arr.DMP_14)
plt.plot(arr.DMN_14)
plt.ylabel('Stock Price(rs)', fontsize=18)
plt.xlabel('Index', fontsize=18)
plt.legend(['adx','dmp','dmn'], loc='upper left');
```


```
arr = pta.adx(df2['High'], df2['Low'], df2['Close'], window = 14)


plt.figure(figsize=(26,8))
plt.title('ADX', fontsize=18)
plt.plot(arr.ADX_14)
plt.plot(arr.DMP_14)
plt.plot(arr.DMN_14)
plt.ylabel('Stock Price(rs)', fontsize=18)
plt.xlabel('Index', fontsize=18)
plt.legend(['adx','dmp','dmn'], loc='upper left');
```

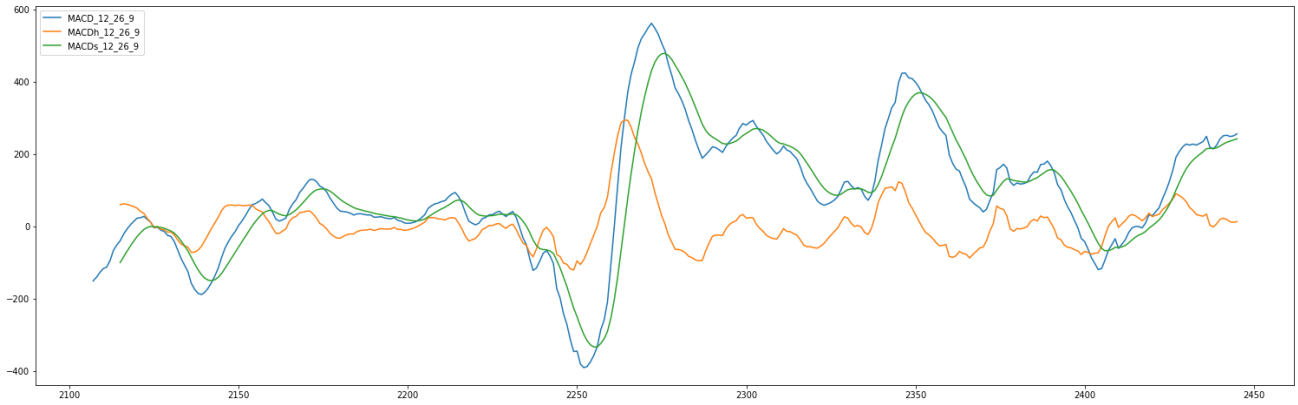

```
arr = pta.adx(df3['High'], df3['Low'], df3['Close'], window = 14)


plt.figure(figsize=(15,5))
arr1 = arr.set_index('Date')
plt.title('ADX(14)', fontsize=18)
plt.plot(arr1.ADX_14)
plt.plot(arr1.DMP_14)
plt.plot(arr1.DMN_14)
plt.ylabel('Index value', fontsize=18)
plt.xlabel('Date', fontsize=18)
plt.legend(['ADX','+DI','-DI'], loc='upper left');
```

```
arr['Date'] = df3['Date']
```

```
df1 = df[2096-14:2247]
df2 = df[2248-14:2446]
df3 = df[2096-14:2446]
```

```
arr = pta.macd(df3['Close'], 26, 12, 9)
```

```
plt.figure(figsize=(26,8))
plt.plot(arr)
plt.legend(['MACD_12_26_9','MACDh_12_26_9','MACDs_12_26_9'], loc='upper left');
```

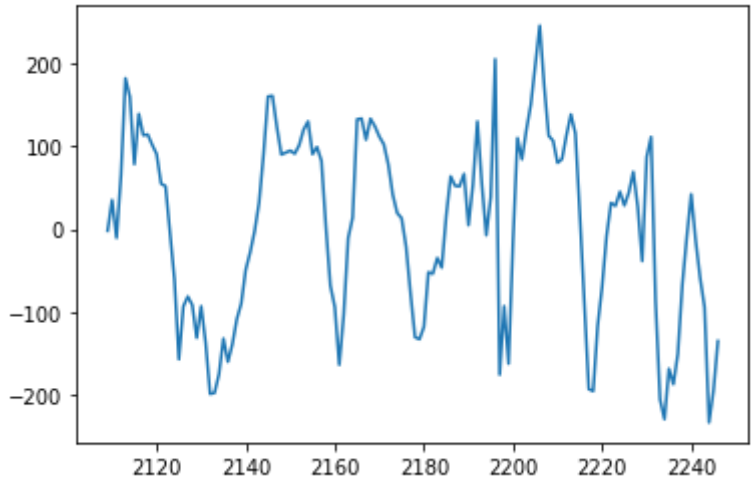



```
arr
```

	MACD_12_26_9	MACDh_12_26_9	MACDs_12_26_9
2082	NaN	NaN	NaN
2083	NaN	NaN	NaN
2084	NaN	NaN	NaN
2085	NaN	NaN	NaN
2086	NaN	NaN	NaN

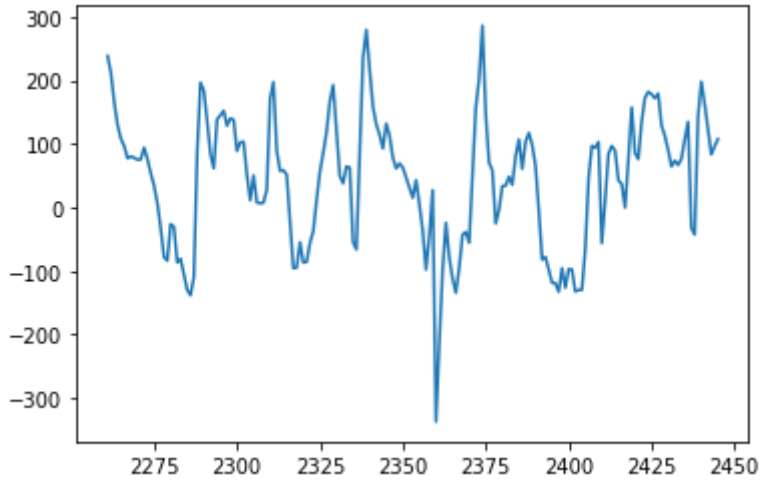
```
plt.plot(CCI)
```

```
[<matplotlib.lines.Line2D at 0x7ff2674d2c90>]
```



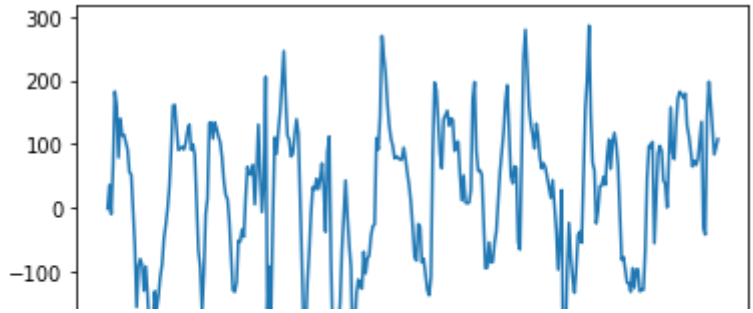

```
CCI = pta.cci(df2['High'], df2['Low'], df2['Close'], window = 20)
plt.plot(CCI)
```

```
[<matplotlib.lines.Line2D at 0x7ff266090090>]
```




```
CCI = pta.cci(df3['High'], df3['Low'], df3['Close'], window = 20)
plt.plot(CCI)
```

```
[<matplotlib.lines.Line2D at 0x7ff266034d90>]
```




```
data11 = pd.read_csv('/content/drive/MyDrive/Colab_Notebooks/Datasets/metrics11.csv')
df11 = pd.DataFrame(data11)
df11.head()
```

	Date	P/E	P/B	Div Yield
0	01-Aug-2019	33.92	3.22	0.76
1	02-Aug-2019	33.88	3.21	0.76
2	05-Aug-2019	33.62	3.19	0.76
3	06-Aug-2019	33.66	3.19	0.76
4	07-Aug-2019	33.93	3.22	0.76

```
df11['Date'] = pd.to_datetime(df11['Date'])
df11['Date'] = [i.date() for i in df11['Date']]
```

```
df11.describe()
```

	P/E	P/B	Div Yield
count	152.000000	152.000000	152.000000
mean	28.093947	3.108618	0.676974
std	3.090086	0.111052	0.040966
min	21.440000	2.650000	0.620000
25%	25.637500	3.057500	0.650000
50%	26.630000	3.140000	0.660000
75%	30.732500	3.190000	0.690000
max	33.950000	3.280000	0.780000

```
data12 = pd.read_csv('/content/drive/MyDrive/Colab_Notebooks/Datasets/metrics12.csv')
df12 = pd.DataFrame(data12)
df12.head()
```

	Date	P/E	P/B	Div Yield
0	16-Mar-2020	21.49	2.66	0.78
1	17-Mar-2020	21.55	2.67	0.77
2	18-Mar-2020	20.71	2.56	0.81
3	19-Mar-2020	20.55	2.55	0.81

```
df12['Date'] = pd.to_datetime(df12['Date'])
df12['Date'] = [i.date() for i in df12['Date']]
```

```
df12.describe()
```

	P/E	P/B	Div Yield
count	200.000000	200.000000	200.000000
mean	31.769450	4.360950	0.650900
std	3.945687	0.735512	0.126114
min	19.870000	2.460000	0.440000
25%	30.175000	3.757500	0.540000
50%	32.370000	4.665000	0.605000
75%	34.215000	4.872500	0.780000
max	38.430000	5.310000	0.840000

```
data21 = pd.read_csv('/content/drive/MyDrive/Colab_Notebooks/Datasets/metrics21.csv')
df21 = pd.DataFrame(data21)
df21.head()
```

	Date	Total Returns Index
0	01-Aug-2019	9366.45
1	02-Aug-2019	9353.92
2	05-Aug-2019	9282.33
3	06-Aug-2019	9294.85
4	07-Aug-2019	9367.66

```
df21['Date'] = pd.to_datetime(df21['Date'])
df21['Date'] = [i.date() for i in df21['Date']]
```

```
df21.describe()
```

	Total Returns Index
count	152.000000
mean	9463.520461
std	327.206563
min	8300.930000
25%	9283.117500
50%	9503.715000
75%	9665.997500

```
data22 = pd.read_csv('/content/drive/MyDrive/Colab_Notebooks/Datasets/metrics22.csv')
df22 = pd.DataFrame(data22)
df22.head()
```

	Date	Total Returns Index
0	16-Mar-2020	8321.03
1	17-Mar-2020	8344.61
2	18-Mar-2020	8017.81
3	19-Mar-2020	7967.31
4	20-Mar-2020	8322.12

```
df22['Date'] = pd.to_datetime(df22['Date'])
df22['Date'] = [i.date() for i in df22['Date']]
```

```
df22.describe()
```

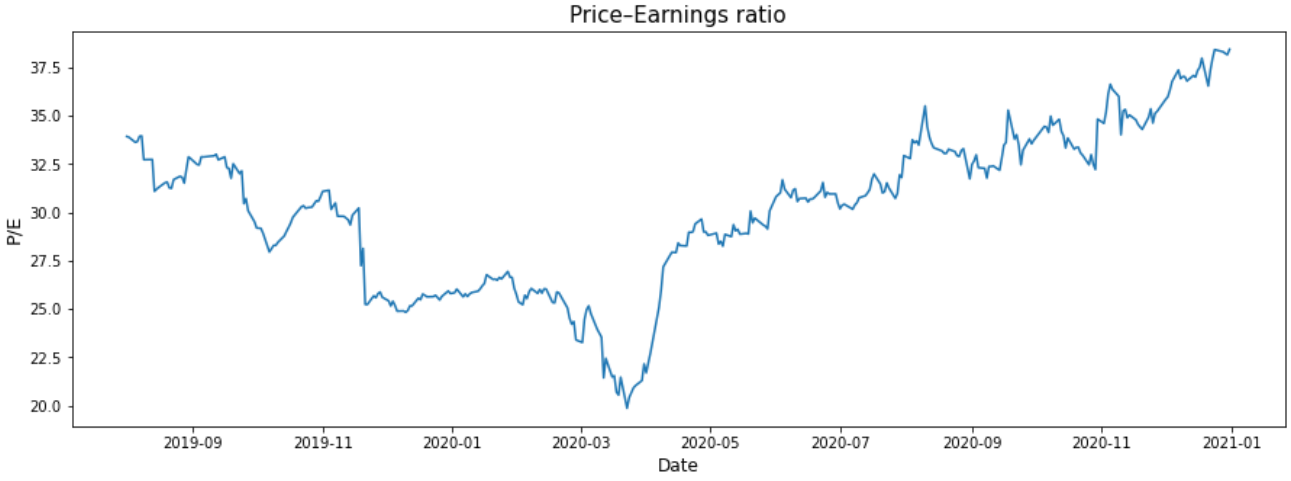
	Total Returns Index
count	200.000000
mean	12739.464450
std	1812.808014
min	7704.360000
25%	11768.875000
50%	13480.535000
75%	14029.035000
max	15506.600000

```
frames1 = [df11, df12]
frames2 = [df21, df22]
```

```
result1 = pd.concat(frames1)
result2 = pd.concat(frames2)


result1.rename(columns = {'P/E':'Price_Earnings'}, inplace = True)
result1.rename(columns = {'P/B':'Price_Book'}, inplace = True)
#result1.rename(columns = {'Div Yield':'Div_Yield'}, inplace = True)
result2.rename(columns = {'Total Returns Index':'TRI'}, inplace = True)


print(result1)
```

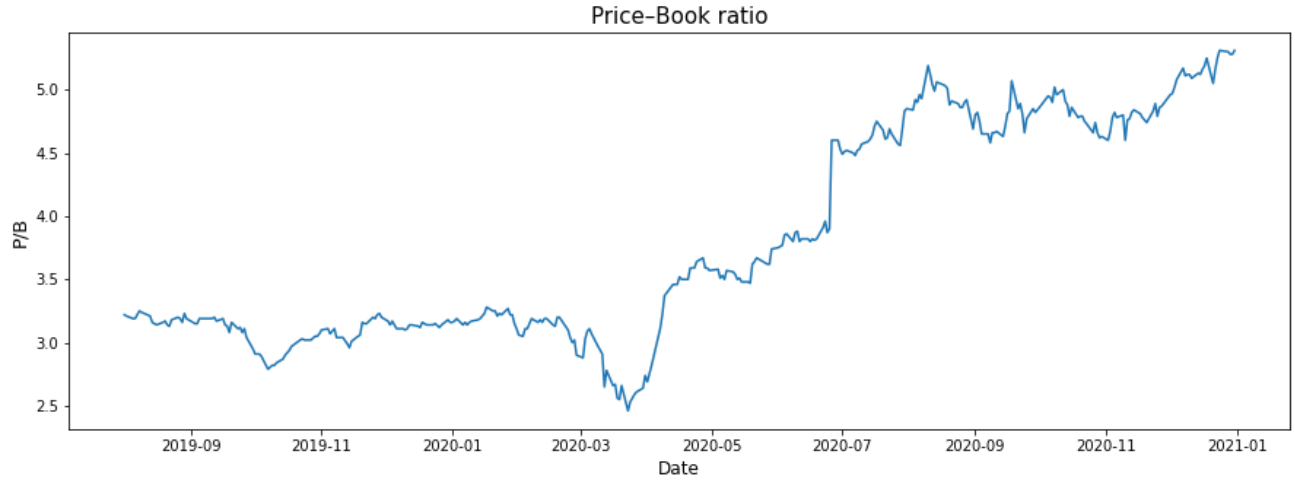
```
            Date  Price_Earnings  Price_Book  Div_Yield
0     2019-08-01           33.92        3.22       0.76
1     2019-08-02           33.88        3.21       0.76
2     2019-08-05           33.62        3.19       0.76
3     2019-08-06           33.66        3.19       0.76
4     2019-08-07           33.93        3.22       0.76
..           ...             ...         ...        ...
195   2020-12-24           38.41        5.31       0.72
196   2020-12-28           38.30        5.30       0.72
197   2020-12-29           38.21        5.28       0.72
198   2020-12-30           38.15        5.28       0.72
199   2020-12-31           38.43        5.31       0.72

[352 rows x 4 columns]
```

```
cd1 = result1.set_index('Date')
plt.figure(figsize=(15,5))
plt.title('Price-Earnings ratio', fontsize= 15)
plt.ylabel('P/E', fontsize=13)
plt.xlabel('Date', fontsize=12)
plt.plot(cd1.Price_Earnings);
```

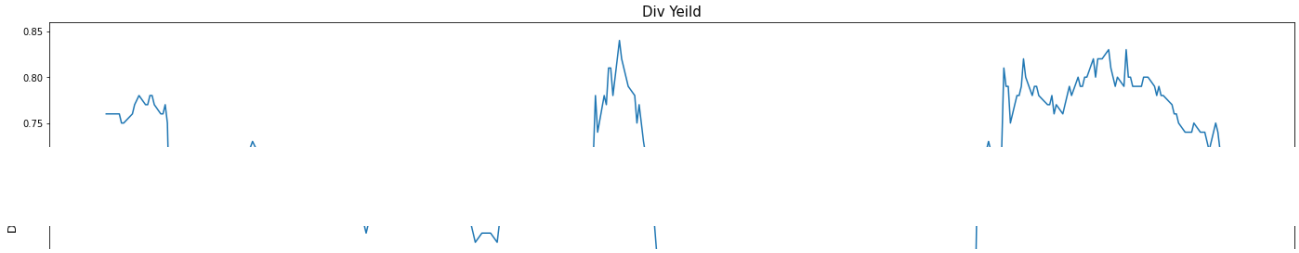



```
cd1 = result1.set_index('Date')
plt.figure(figsize=(15,5))
```

```
plt.title('Price-Book ratio', fontsize= 15)
plt.ylabel('P/B', fontsize=13)
plt.xlabel('Date', fontsize=12)
plt.plot(cd1.Price_Book);
```




```
cd1 = result1.set_index('Date')
plt.figure(figsize=(15,5))
plt.title('Div Yeild', fontsize= 15)
plt.ylabel('DY', fontsize=13)
plt.xlabel('Date', fontsize=12)
plt.plot(cd1.Div_Yield);
```




```
cd = result2.set_index('Date')
plt.figure(figsize=(15,5))
plt.title('Returns Index', fontsize= 15)
plt.ylabel('RI', fontsize=13)
plt.xlabel('Date', fontsize=12)
plt.plot(cd.TRI);
```