LAB - 8 Pandas Time Series Analysis

Name : Annapoornima S

225229101

In [1]:
```
import pandas as pd
```

In [2]:
```
import matplotlib.pyplot as plt
plt.style.use('fivethirtyeight')
plt.show()
```

In [4]:
```
data = pd.read_csv('amazon_stock.csv')
```

INSPECT TOP 10 ROWS

In [7]:
```
data.head()
```

Out[7]:

	None	ticker	Date	Open	High	Low	Close	Volume	Adj_Close
0	0	AMZN	3/27/2018	1572.40	1575.96	1482.32	1497.05	6793279	1497.05
1	1	AMZN	3/26/2018	1530.00	1556.99	1499.25	1555.86	5547618	1555.86
2	2	AMZN	3/23/2018	1539.01	1549.02	1495.36	1495.56	7843966	1495.56
3	3	AMZN	3/22/2018	1565.47	1573.85	1542.40	1544.10	6177737	1544.10
4	4	AMZN	3/21/2018	1586.45	1590.00	1563.17	1581.86	4667291	1581.86

REMOVE UNWANTED COLUMNS

In [8]:
```
data = data.drop(['None','ticker'],axis=1)
```

In [9]:
```
data.head()
```

Out[9]:

	Date	Open	High	Low	Close	Volume	Adj_Close
0	3/27/2018	1572.40	1575.96	1482.32	1497.05	6793279	1497.05
1	3/26/2018	1530.00	1556.99	1499.25	1555.86	5547618	1555.86
2	3/23/2018	1539.01	1549.02	1495.36	1495.56	7843966	1495.56
3	3/22/2018	1565.47	1573.85	1542.40	1544.10	6177737	1544.10
4	3/21/2018	1586.45	1590.00	1563.17	1581.86	4667291	1581.86

In [10]:
```
# Look at the datatypes of the various columns , call info()
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1316 entries, 0 to 1315
Data columns (total 7 columns):
 #   Column     Non-Null Count  Dtype  
---  ------     --------------  -----  
 0   Date       1316 non-null   object 
 1   Open       1316 non-null   float64
 2   High       1316 non-null   float64
 3   Low        1316 non-null   float64
 4   Close      1316 non-null   float64
 5   Volume     1316 non-null   int64  
 6   Adj_Close  1316 non-null   float64
dtypes: float64(5), int64(1), object(1)
memory usage: 72.1+ KB
```

INSPECT THE DATATYPES OF COLUMNS

In [11]:
```
data.dtypes
```

Out[11]:
```
Date          object
Open         float64
High         float64
Low          float64
Close        float64
Volume         int64
Adj_Close    float64
dtype: object
```

CONVERT 'DATE' STRING COLUMN INTO ACTUAL DATE OBJECT

In [12]:
```
data['Date'] = pd.to_datetime(data['Date'])
```

In [13]:
```
data.dtypes
```

Out[13]:
```
Date         datetime64[ns]
Open                float64
High                float64
Low                 float64
Close               float64
Volume                int64
Adj_Close           float64
dtype: object
```

LET US CHECK OUR DATA ONCE AGAIN , WITH HEAD()

In [17]:
```
data.head()
```

Out[17]:

	Date	Open	High	Low	Close	Volume	Adj_Close
0	2018-03-27	1572.40	1575.96	1482.32	1497.05	6793279	1497.05
1	2018-03-26	1530.00	1556.99	1499.25	1555.86	5547618	1555.86
2	2018-03-23	1539.01	1549.02	1495.36	1495.56	7843966	1495.56
3	2018-03-22	1565.47	1573.85	1542.40	1544.10	6177737	1544.10
4	2018-03-21	1586.45	1590.00	1563.17	1581.86	4667291	1581.86

SET DATE OBJECT TO BE INDEX

In [18]:
```
data.set_index(['Date'], inplace=True)
```

In [19]:
```
data.head()
```

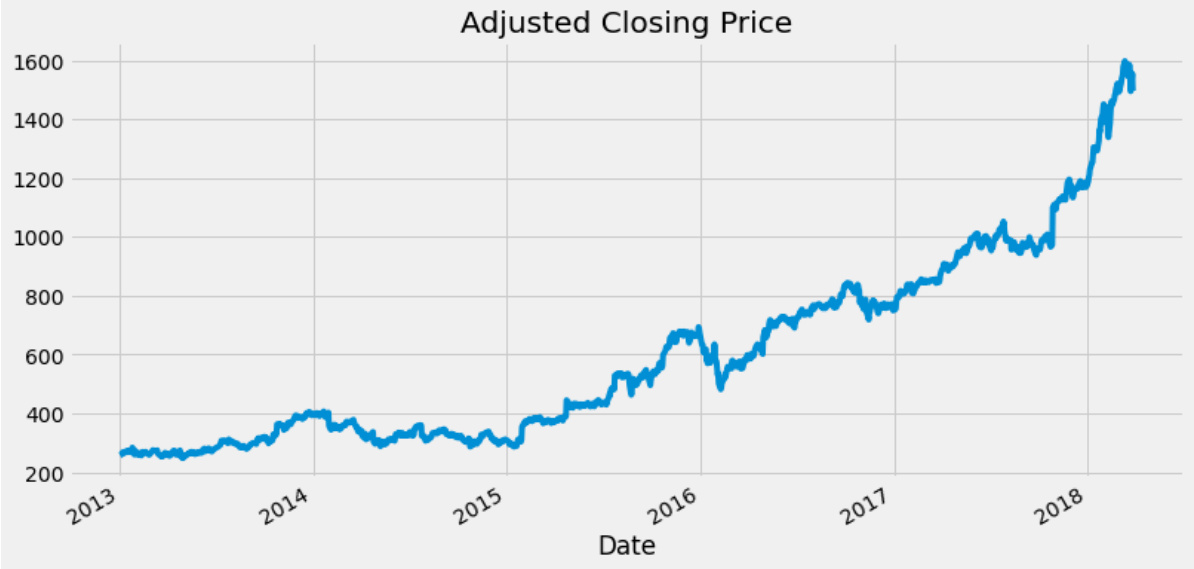
Out[19]:

	Open	High	Low	Close	Volume	Adj_Close
Date						
2018-03-27	1572.40	1575.96	1482.32	1497.05	6793279	1497.05
2018-03-26	1530.00	1556.99	1499.25	1555.86	5547618	1555.86
2018-03-23	1539.01	1549.02	1495.36	1495.56	7843966	1495.56
2018-03-22	1565.47	1573.85	1542.40	1544.10	6177737	1544.10
2018-03-21	1586.45	1590.00	1563.17	1581.86	4667291	1581.86

UNDERSTAND STOCK DATA

In [20]:
```
data['Adj_Close'].plot(figsize=(12,6), title = 'Adjusted Closing Price')
```

Out[20]:
```
<AxesSubplot:title={'center':'Adjusted Closing Price'}, xlabel='Date'>
```



UNDERSTAND DATE TIMEINDEX

In [22]:
```
from datetime import datetime
my_year = 2020
my_month = 5
my_day =1
my_hour = 13
my_minute = 36
my_second = 45
test_date = datetime(my_year, my_month, my_day)
test_date
```

Out[22]:
```
datetime.datetime(2020, 5, 1, 0, 0)
```

In [23]:
```
test_date = datetime(my_year, my_month, my_day,my_hour, my_minute, my_second)
print("The Day is : ", test_date.day)
print("The Hour is : ", test_date.hour)
print("The Month is : ", test_date.month)
```

```
The Day is :  1
The Hour is :  13
The Month is :  5
```

FIND MINIMUM AND MAXIMUM DATES FROM DATA FRAME, CALL INFO() METHOD

In [24]:
```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
DatetimeIndex: 1316 entries, 2018-03-27 to 2013-01-02
Data columns (total 6 columns):
 #   Column     Non-Null Count  Dtype  
---  ------     --------------  -----  
 0   Open       1316 non-null   float64
 1   High       1316 non-null   float64
 2   Low        1316 non-null   float64
 3   Close      1316 non-null   float64
 4   Volume     1316 non-null   int64  
 5   Adj_Close  1316 non-null   float64
dtypes: float64(5), int64(1)
memory usage: 72.0 KB
```

In [25]:
```
print("Minimum Date : ",data.index.min())
print("Maximum date : ",data.index.max())
```

```
Minimum Date :  2013-01-02 00:00:00
Maximum date :  2018-03-27 00:00:00
```

RETRIEVE INDEX OF EARLIEST AND LATEST DATES USING ARGMIN AND ARGMAX

In [26]:
```
print("Minimum Date Location : ",data.index.argmin())
print("Maximum date Location : ",data.index.argmax())
```

```
Minimum Date Location :  1315
Maximum date Location :  0
```

1.RESAMPLING OPERATION

RESAMPLE ENTIRE DATA FRAME

RESAMPLE DATA WITH YEAR END FREQUENCY ('Y') WITH AVERAGE STOCK PRICE

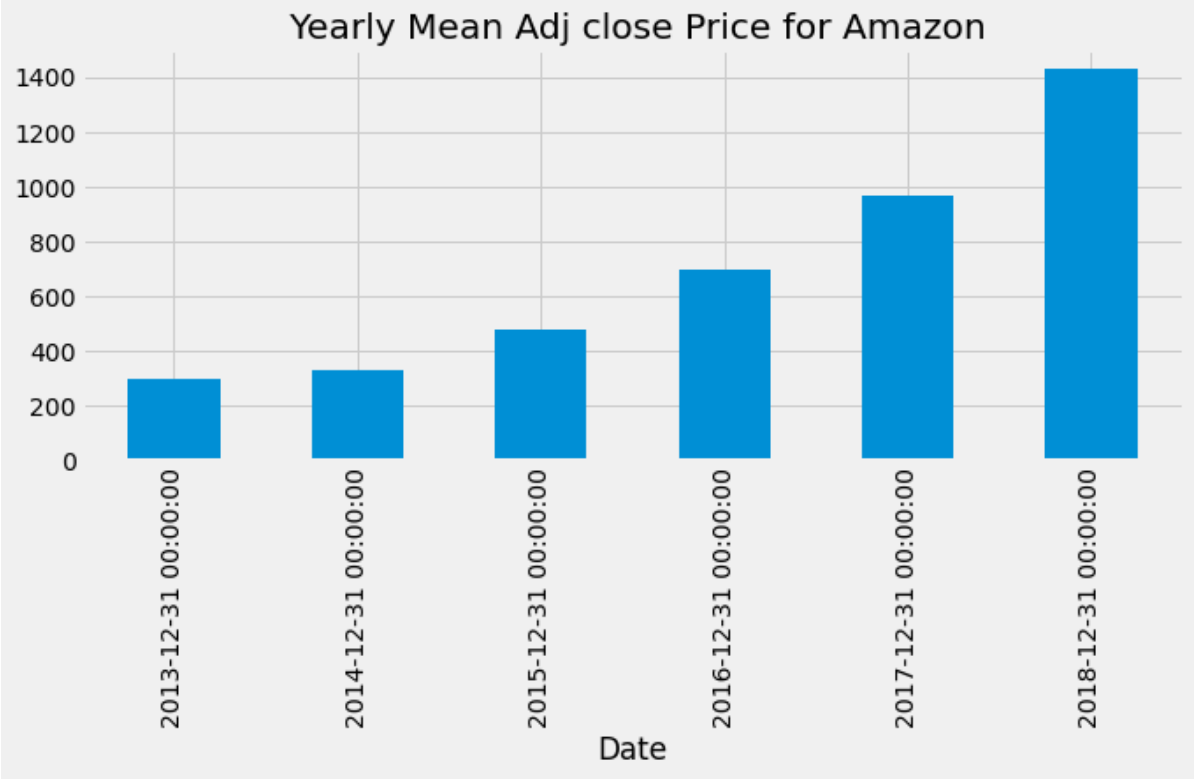
In [27]:
```
data.resample('Y').mean()
```

Out[27]:

Date	Open	High	Low	Close	Volume	Adj_Close
2013-12-31	297.877223	300.925966	294.656658	298.032235	2.967880e+06	298.032235
2014-12-31	332.798433	336.317462	328.545440	332.550976	4.083223e+06	332.550976
2015-12-31	478.126230	483.248272	472.875443	478.137321	3.797801e+06	478.137321
2016-12-31	699.669762	705.799103	692.646189	699.523135	4.122043e+06	699.523135
2017-12-31	967.565060	973.789752	959.991826	967.403996	3.466207e+06	967.403996
2018-12-31	1429.770000	1446.701017	1409.469661	1429.991186	5.586829e+06	1429.991186

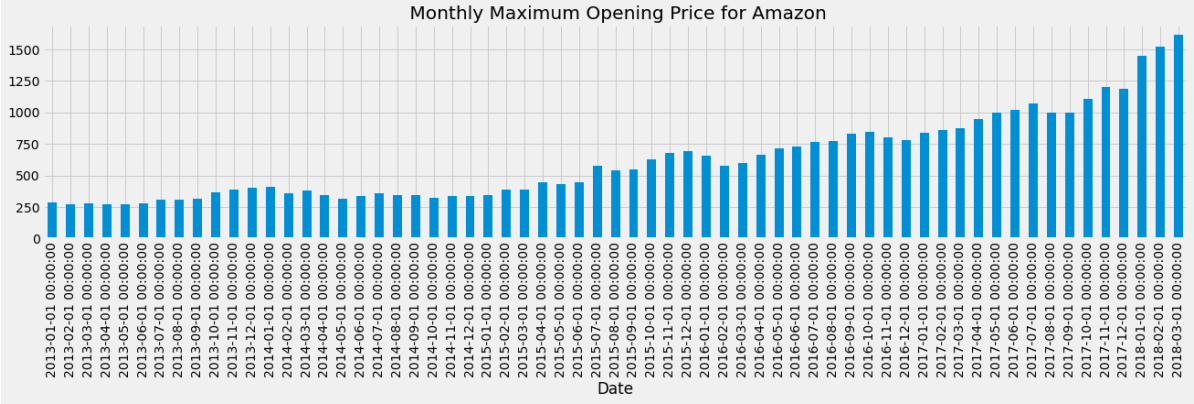
RESAMPLE A SPECIFIC COLUMN PLOT A BAR CHART TO SHOW THE YEARLY (USE 'A') MEAN ADJUSTED CLOSE PRICE

In [28]:
```
data['Adj_Close'].resample('A').mean().plot(kind = 'bar', figsize=(10,4))
plt.title(" Yearly Mean Adj close Price for Amazon")
plt.show()
```



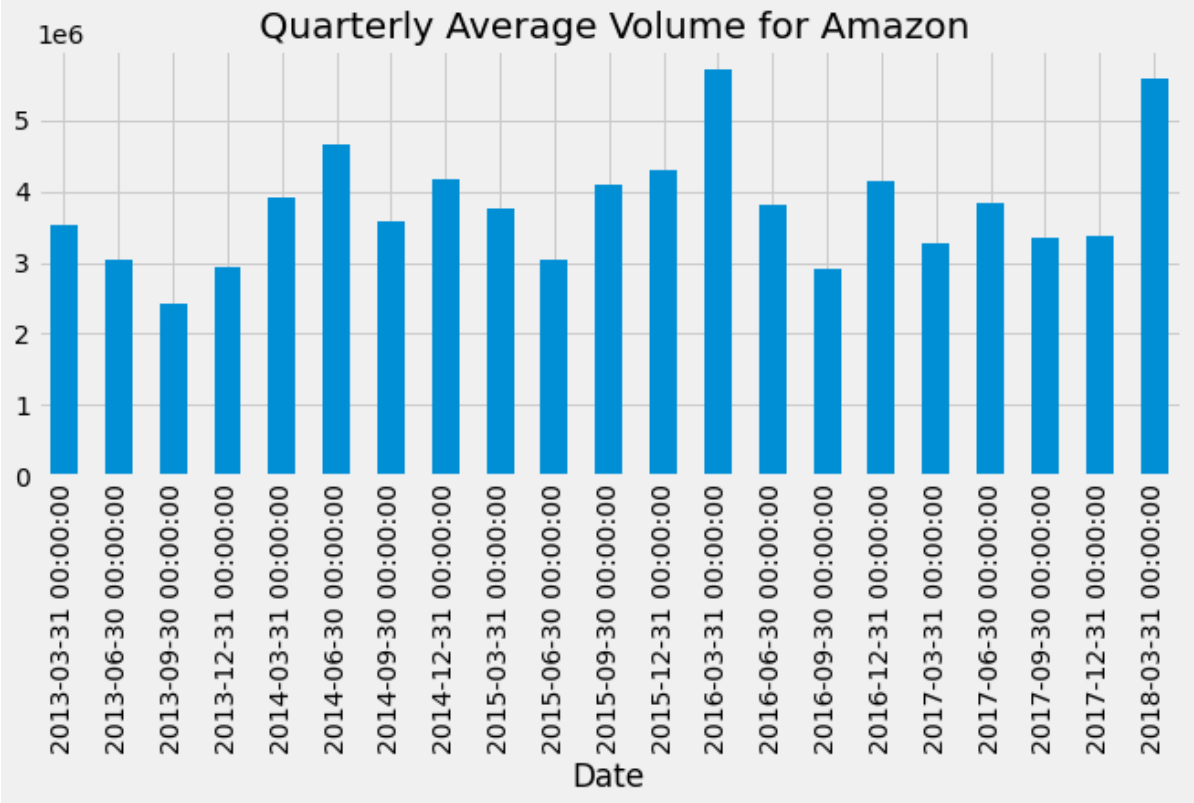
PLOT BAR CHART TO SHOW MONTHLY MAXIMUM (USE 'MS') OPENING PRICE FOR ALL YEARS

In [29]:
```
data['Open'].resample('MS').max().plot(kind = 'bar', figsize=(20,4))
plt.title(" Monthly Maximum Opening Price for Amazon")
plt.show()
```



PLOT BAR CHART OF QUATERLY (USE 'Q') AVERAGE VOLUME FOR ALL YEARS

In [30]:
```
data['Volume'].resample('Q').mean().plot(kind = 'bar', figsize=(10,4))
plt.title(" Quarterly Average Volume for Amazon")
plt.show()
```



2. TIME SHIFTING OPERATIONS

SHIFTING DATA FORWARD AND BACKWARD

In [31]:
```
data.head()
```

Out[31]:

Date	Open	High	Low	Close	Volume	Adj_Close
2018-03-27	1572.40	1575.96	1482.32	1497.05	6793279	1497.05
2018-03-26	1530.00	1556.99	1499.25	1555.86	5547618	1555.86
2018-03-23	1539.01	1549.02	1495.36	1495.56	7843966	1495.56
2018-03-22	1565.47	1573.85	1542.40	1544.10	6177737	1544.10
2018-03-21	1586.45	1590.00	1563.17	1581.86	4667291	1581.86

SHIFT DATA BY 1 DAY BACKWARD

In [32]:
```
data.shift(periods = -1).head()
```

Out[32]:

Date	Open	High	Low	Close	Volume	Adj_Close
2018-03-27	1530.00	1556.99	1499.25	1555.86	5547618.0	1555.86
2018-03-26	1539.01	1549.02	1495.36	1495.56	7843966.0	1495.56
2018-03-23	1565.47	1573.85	1542.40	1544.10	6177737.0	1544.10
2018-03-22	1586.45	1590.00	1563.17	1581.86	4667291.0	1581.86
2018-03-21	1550.34	1587.00	1545.41	1586.51	4507049.0	1586.51

SHIFTING TIME INDEX

In [33]:
```
data.head(10)
```

Out[33]:

Date	Open	High	Low	Close	Volume	Adj_Close
2018-03-27	1572.40	1575.96	1482.32	1497.05	6793279	1497.05
2018-03-26	1530.00	1556.99	1499.25	1555.86	5547618	1555.86
2018-03-23	1539.01	1549.02	1495.36	1495.56	7843966	1495.56
2018-03-22	1565.47	1573.85	1542.40	1544.10	6177737	1544.10
2018-03-21	1586.45	1590.00	1563.17	1581.86	4667291	1581.86
2018-03-20	1550.34	1587.00	1545.41	1586.51	4507049	1586.51
2018-03-19	1554.53	1561.66	1525.35	1544.93	6376619	1544.93
2018-03-16	1583.45	1589.44	1567.50	1571.68	5145054	1571.68
2018-03-15	1595.00	1596.91	1578.11	1582.32	4026744	1582.32
2018-03-14	1597.00	1606.44	1590.89	1591.00	4164395	1591.00

In [34]:
```
data.shift(periods = 3,freq='MS')
```

Out[34]:

Date	Open	High	Low	Close	Volume	Adj_Close
2018-06-01	1572.40	1575.9600	1482.320	1497.0500	6793279	1497.0500
2018-06-01	1530.00	1556.9900	1499.250	1555.8600	5547618	1555.8600
2018-06-01	1539.01	1549.0200	1495.360	1495.5600	7843966	1495.5600
2018-06-01	1565.47	1573.8500	1542.400	1544.1000	6177737	1544.1000
2018-06-01	1586.45	1590.0000	1563.170	1581.8600	4667291	1581.8600
...	...	...	...	...	...	...
2013-04-01	267.07	268.9800	263.567	266.3800	3010700	266.3800
2013-04-01	262.97	269.7250	262.670	268.4592	4910000	268.4592
2013-04-01	257.58	259.8000	256.650	259.1500	1874200	259.1500
2013-04-01	257.27	260.8800	256.370	258.4800	2750900	258.4800
2013-04-01	256.08	258.0999	253.260	257.3100	3271000	257.3100

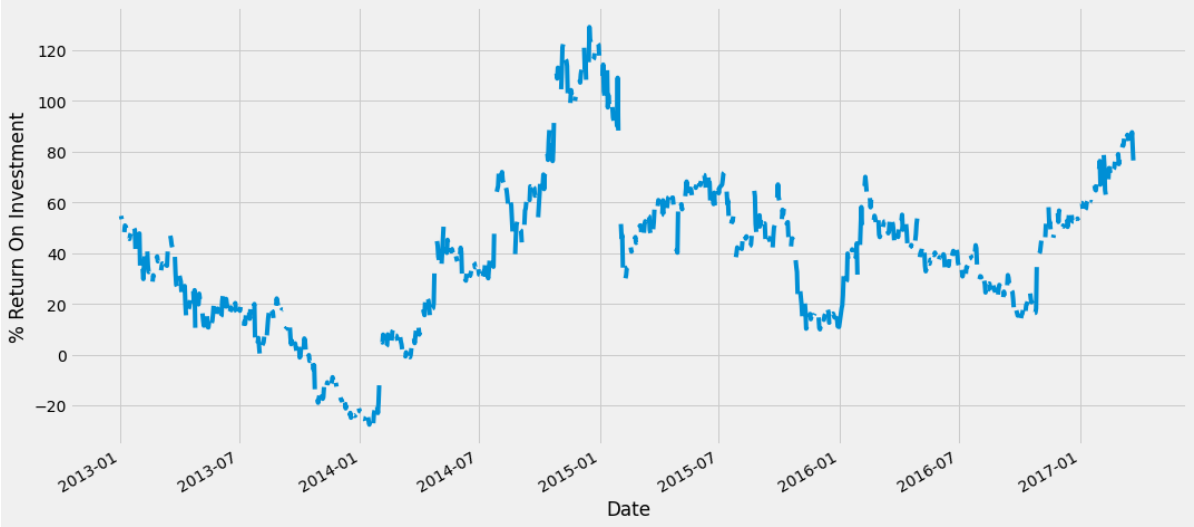
1316 rows × 6 columns

APPICATION - COMPUTING RETURN ON INVESTMENT

In [35]:
```
ROI = 100* (data['Adj_Close'].tshift(periods = - 365, freq ='D')/data['Adj_Clo
ROI.plot(figsize=(16,8))
plt.ylabel('% Return On Investment')
```

```
C:\Users\Lenovo\AppData\Local\Temp\ipykernel_5948\4237445623.py:1: FutureWarn
ing: tshift is deprecated and will be removed in a future version. Please use
shift instead.
  ROI = 100* (data['Adj_Close'].tshift(periods = - 365, freq ='D')/data['Adj_
Close']-1)
```

Out[35]:
```
Text(0, 0.5, '% Return On Investment')
```



ROLLING WINDOW OR MOVING WINDOW OPERATIONS

In [36]:
```
data['Adj_Close'].plot(figsize=(12,8), color='red')
```

Out[36]:
```
<AxesSubplot:xlabel='Date'>
```

FIND ROLLIMG MEAN FOR 7 DAYS AND SHOW TOP 10 ROWS

In [38]:
```
data.rolling(7).mean().head(10)
```

Out[38]:

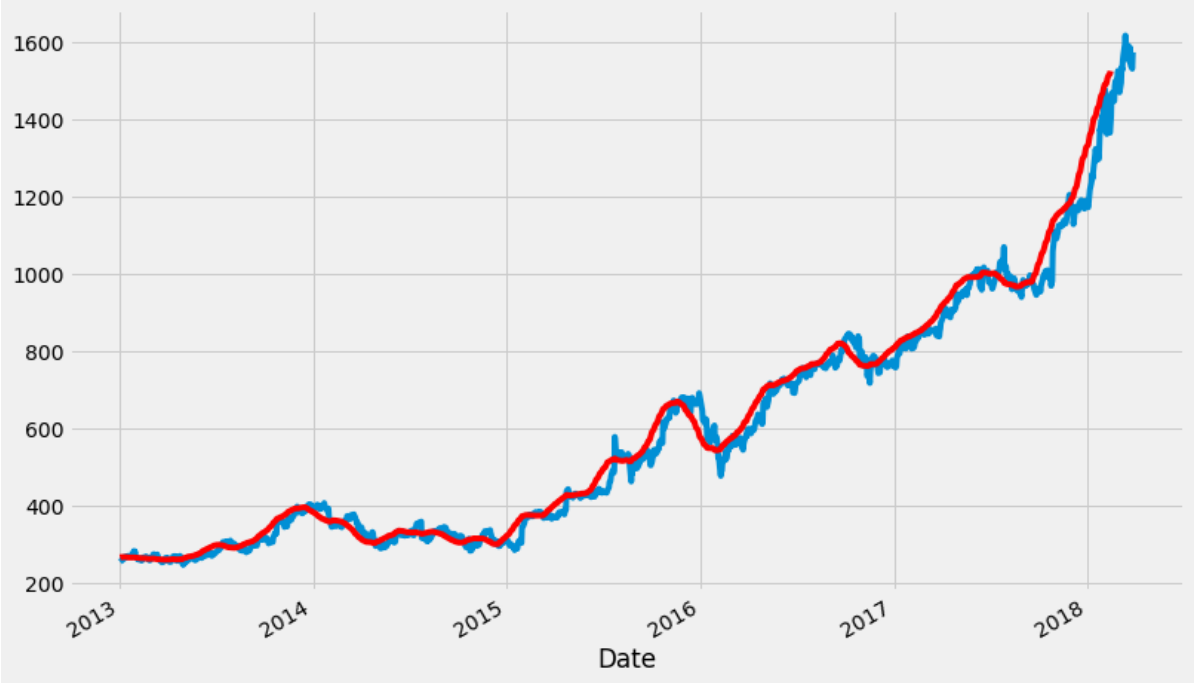
Date	Open	High	Low	Close	Volume	Adj_Close
2018-03-27	NaN	NaN	NaN	NaN	NaN	NaN
2018-03-26	NaN	NaN	NaN	NaN	NaN	NaN
2018-03-23	NaN	NaN	NaN	NaN	NaN	NaN
2018-03-22	NaN	NaN	NaN	NaN	NaN	NaN
2018-03-21	NaN	NaN	NaN	NaN	NaN	NaN
2018-03-20	NaN	NaN	NaN	NaN	NaN	NaN
2018-03-19	1556.885714	1570.640000	1521.894286	1543.695714	5.987651e+06	1543.695714
2018-03-16	1558.464286	1572.565714	1534.062857	1554.357143	5.752191e+06	1554.357143
2018-03-15	1567.750000	1578.268571	1545.328571	1558.137143	5.534923e+06	1558.137143
2018-03-14	1576.034286	1586.471429	1558.975714	1571.771429	5.009270e+06	1571.771429

PLOT A LINE CHART FOR OPEN COLUMN FOLLOWED BY AVERAGE ROLLING WINDOW OF 30 DAYS

DAYS ON THE SAME OPEN COLUMN

In [39]:
```
data['Open'].plot(figsize=(12,8))
data['Open'].rolling(30).mean().plot(figsize=(12,8), color='red')
```

Out[39]: <AxesSubplot:xlabel='Date'>



In [ ]: