Economic Stocks Plot

I retrieved stock prices from Yahoo Finance and generated different plots in Python and R ggplot gganimate

In [1]:
```
import math
import pandas as pd
import numpy as np
import pandas
import matplotlib.pyplot as plt
```

In [2]:
```
pip install pandas-datareader
```

```
Requirement already satisfied: pandas-datareader in c:\users\k\anaconda3\li
b\site-packages (0.9.0)Note: you may need to restart the kernel to use upda
ted packages.
Requirement already satisfied: requests>=2.19.0 in c:\users\k\anaconda3\lib
\site-packages (from pandas-datareader) (2.24.0)
Requirement already satisfied: pandas>=0.23 in c:\users\k\anaconda3\lib\sit
e-packages (from pandas-datareader) (1.0.5)
Requirement already satisfied: lxml in c:\users\k\anaconda3\lib\site-packag
es (from pandas-datareader) (4.5.2)
Requirement already satisfied: urllib3!=1.25.0,!=1.25.1,<1.26,>=1.21.1 in
c:\users\k\anaconda3\lib\site-packages (from requests>=2.19.0->pandas-datar
eader) (1.25.9)
Requirement already satisfied: chardet<4,>=3.0.2 in c:\users\k\anaconda3\li
b\site-packages (from requests>=2.19.0->pandas-datareader) (3.0.4)
Requirement already satisfied: certifi>=2017.4.17 in c:\users\k\anaconda3\l
ib\site-packages (from requests>=2.19.0->pandas-datareader) (2020.6.20)
Requirement already satisfied: idna<3,>=2.5 in c:\users\k\anaconda3\lib\sit
e-packages (from requests>=2.19.0->pandas-datareader) (2.10)
Requirement already satisfied: numpy>=1.13.3 in c:\users\k\anaconda3\lib\si
te-packages (from pandas>=0.23->pandas-datareader) (1.18.5)
Requirement already satisfied: python-dateutil>=2.6.1 in c:\users\k\anacond
a3\lib\site-packages (from pandas>=0.23->pandas-datareader) (2.8.1)
Requirement already satisfied: pytz>=2017.2 in c:\users\k\anaconda3\lib\sit
e-packages (from pandas>=0.23->pandas-datareader) (2020.1)
Requirement already satisfied: six>=1.5 in c:\users\k\anaconda3\lib\site-pa
ckages (from python-dateutil>=2.6.1->pandas>=0.23->pandas-datareader) (1.1
5.0)
```

In [3]:
```
from pandas_datareader import data, wb
```

In [4]:
```
import datetime
```

In [5]:
```
import warnings
warnings.filterwarnings('ignore')
```

In [11]:
```
start = datetime.datetime(1970, 1, 1)
```

In [10]:
```
end = datetime.datetime(2021, 4, 2)
```

In [12]:
```
import pandas_datareader.data as web
```

S&P 500 index

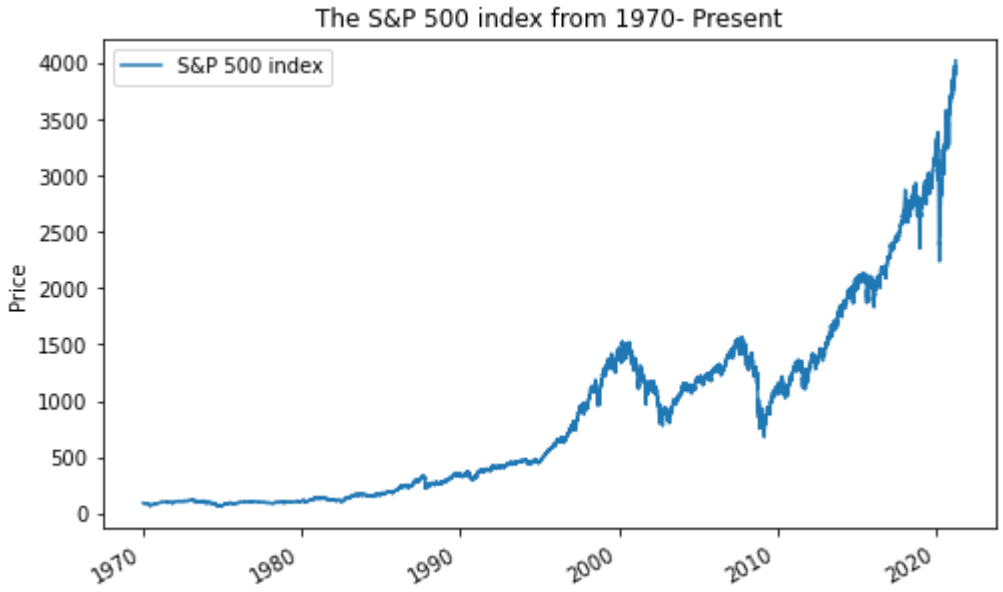
- measures the stock performance of the fortune 500 companies that are listed in the USA on NYSE, NASDAQ, etc.
- calculated using the formula: $\frac{\sum P_i \times Q_i}{d}$ where P_i = price of the i-th stock in the index and Q_i = number of shares publicly available for the i-th stock, divided by a normalization factor d.

In [13]:
```
sp500 = web.DataReader("^GSPC", 'yahoo', start, end)
sp500.tail()
```

Out[13]:

Date	High	Low	Open	Close	Volume	Adj Close
2021-03-26	3978.189941	3917.120117	3917.120117	3974.540039	5467850000	3974.540039
2021-03-29	3981.830078	3943.250000	3969.310059	3971.090088	4619840000	3971.090088
2021-03-30	3968.010010	3944.350098	3963.340088	3958.550049	4103570000	3958.550049
2021-03-31	3994.409912	3966.979980	3967.250000	3972.889893	4564980000	3972.889893
2021-04-01	4020.629883	3992.780029	3992.780029	4019.870117	4151240000	4019.870117

In [14]:
```
sp500['Adj Close'].plot(figsize=(8,5), label='S&P 500 index')

plt.xlabel('')
plt.ylabel('Price')
plt.title('The S&P 500 index from 1970- Present')
plt.legend(loc="")
plt.show()
```



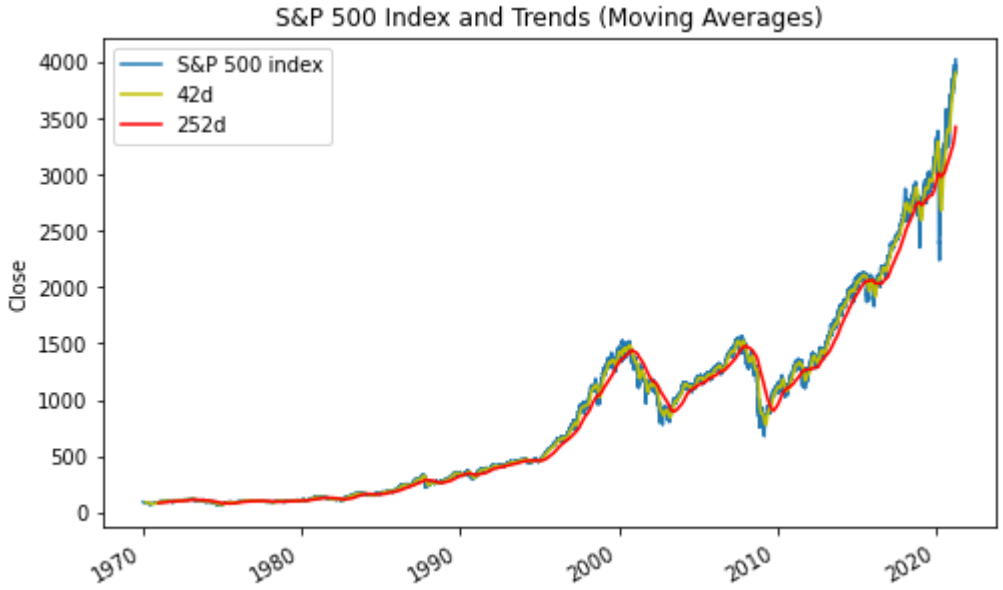
The graph above shows closing price history & milestones of the S&P 500 index:

- On October 10, 2002, during the stock market downturn of 2002, S&P 500 index fell to 768.83, about 50% from its high in March 2000.
- On Sept 29, 2008, the S&P 500 index had its biggest one-day point drop 8.8 % to 1106.42
- On March 9, 2020, the S&P 500 had reach 2,972.37, its worst day since Sept 29, 2008
- On April 1, 2021, the S&P 500 index, led by technology stocks, reachest its highest 4,019.87 in 38 years - a new record!

Trends using moving averages:

In [17]:
```
#moving_averages
sp500['42d'] = sp500['Close'].rolling(window=42).mean()
sp500['252d'] = sp500['Close'].rolling(window=252).mean()
```

In [18]:
```
sp500['Adj Close'].plot(figsize=(8,5), label='S&P 500 index')
sp500['42d'].plot(color ='y')
sp500['252d'].plot(color ='r')

plt.xlabel('')
plt.ylabel('Close')
plt.title('S&P 500 Index and Trends (Moving Averages)')
plt.legend(loc="")
plt.show()
```



Trends (moving average) are particularly useful in stock trading

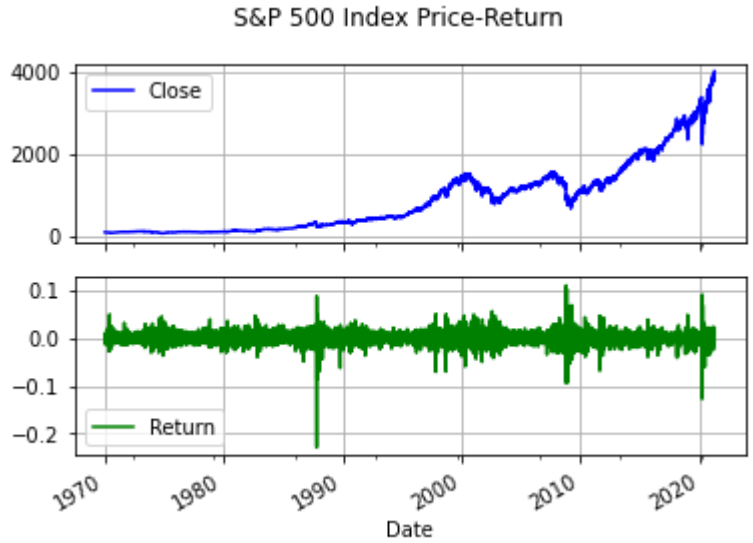
In [19]:
```
#Log returns
sp500['Return'] = np.log(sp500['Close']/sp500['Close'].shift(1))

sp500.tail(3)
```

Out[19]:

Date	High	Low	Open	Close	Volume	Adj Close	
2021-03-30	3968.010010	3944.350098	3963.340088	3958.550049	4103570000	3958.550049	3892.101
2021-03-31	3994.409912	3966.979980	3967.250000	3972.889893	4564980000	3972.889893	3898.259
2021-04-01	4020.629883	3992.780029	3992.780029	4019.870117	4151240000	4019.870117	3904.116

In [14]:
```
sp500[['Close','Return']].plot(kind='line', subplots=True, grid=True, title="
       layout=(2, 1), sharex=True, sharey=False, legend=True,style=['b','g']
```

Out[14]:
```
array([[<matplotlib.axes._subplots.AxesSubplot object at 0x000002368BDAD520
>],
       [<matplotlib.axes._subplots.AxesSubplot object at 0x000002368BDD29A0
>]],
      dtype=object)
```



The graph above depicts relation between returns and index prices rising/falling.

Volatility = standard deviation of the log returns. Below we highlight the correlation btw the historical moving volatility and returns:

- moving volatility tends to increase when markets comes down and decrease when they rises

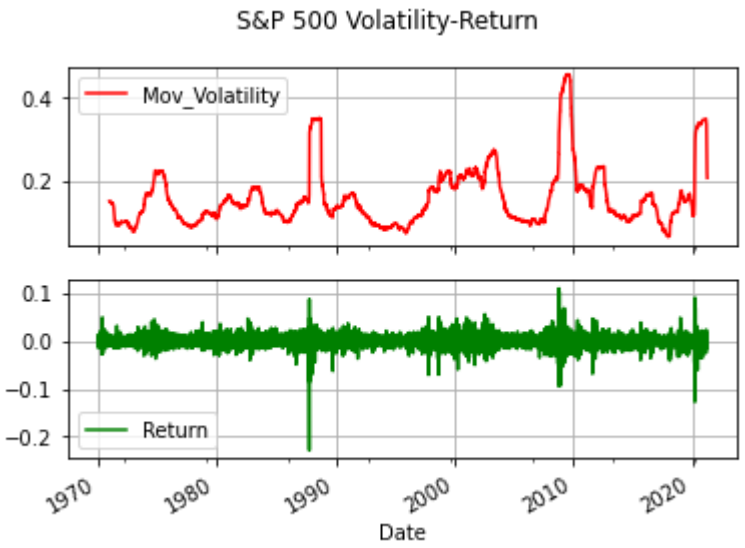
In [15]:
```
#Moving Annual Volatility
sp500['Mov_Volatility'] = sp500['Return'].rolling(window=252).std()* math.sqr
sp500.tail(3)
```

Out[15]:

Date	High	Low	Open	Close	Volume	Adj Close	
2021-03-30	3968.010010	3944.350098	3963.340088	3958.550049	4103570000	3958.550049	3259.835
2021-03-31	3994.409912	3966.979980	3967.250000	3972.889893	4564980000	3972.889893	3262.091
2021-04-01	4020.629883	3992.780029	3992.780029	4019.870117	4151240000	4019.870117	3264.476

In [16]:
```
sp500[['Mov_Volatility','Return']].plot(kind='line', subplots=True, grid=True
       layout=(2, 1), sharex=True, sharey=False, legend=True,style=['r','g']
```

Out[16]:
```
array([[<matplotlib.axes._subplots.AxesSubplot object at 0x000002368BB08D00
>],
       [<matplotlib.axes._subplots.AxesSubplot object at 0x000002368BD3DBE0
>]],
      dtype=object)
```



Historical volatility trends are particularly useful in Options trading

Let's look @ other major indexes:

The Dow Jones Industrial Average

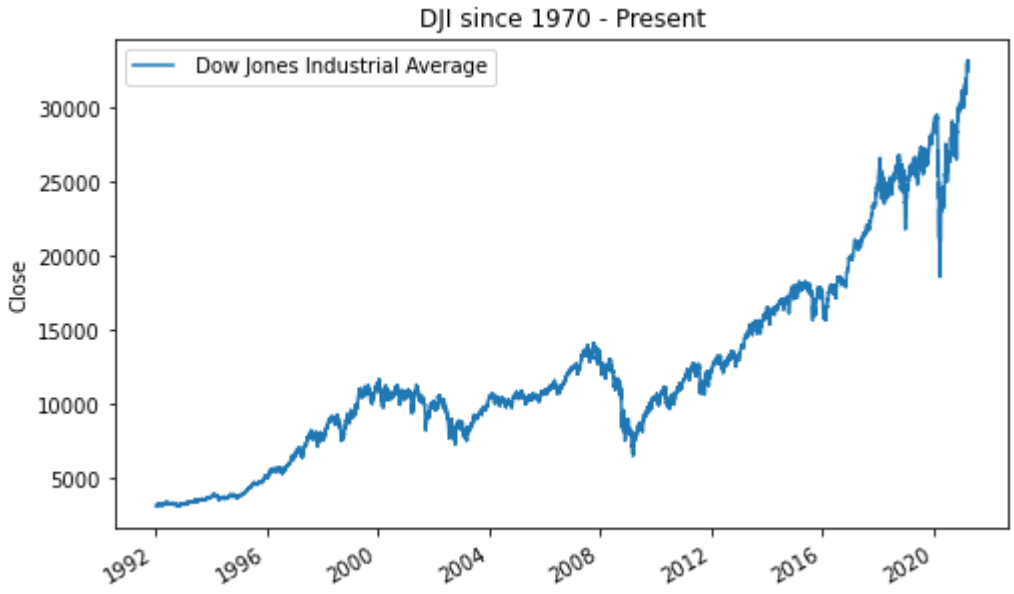
Dow stock market index measures the stock performance of 30 large companies listed on stock exchanges in the US

In [22]:
```
dow = web.DataReader("^DJI", 'yahoo', start, end)
dow.tail(3)
```

Out[22]:

Date	High	Low	Open	Close	Volume	Adj Close
2021-03-30	33170.929688	32988.921875	33127.878906	33066.960938	3075100	33066.960938
2021-03-31	33173.769531	32980.570312	33116.039062	32981.550781	4141400	32981.550781
2021-04-01	33167.171875	32985.351562	33054.578125	33153.210938	3118800	33153.210938

In [23]:
```
dow['Adj Close'].plot(figsize=(8,5), label=' Dow Jones Industrial Average')

plt.xlabel('')
plt.ylabel('Close')
plt.title('DJI since 1970 - Present')
plt.legend(loc="")
plt.show()
```



Nasdaq Composite Index

NASDAQ includes almost all stocks listed on the Nasdaq stock market. NASDAQ Composite is heavily weighted towards companies in the information technology sector.

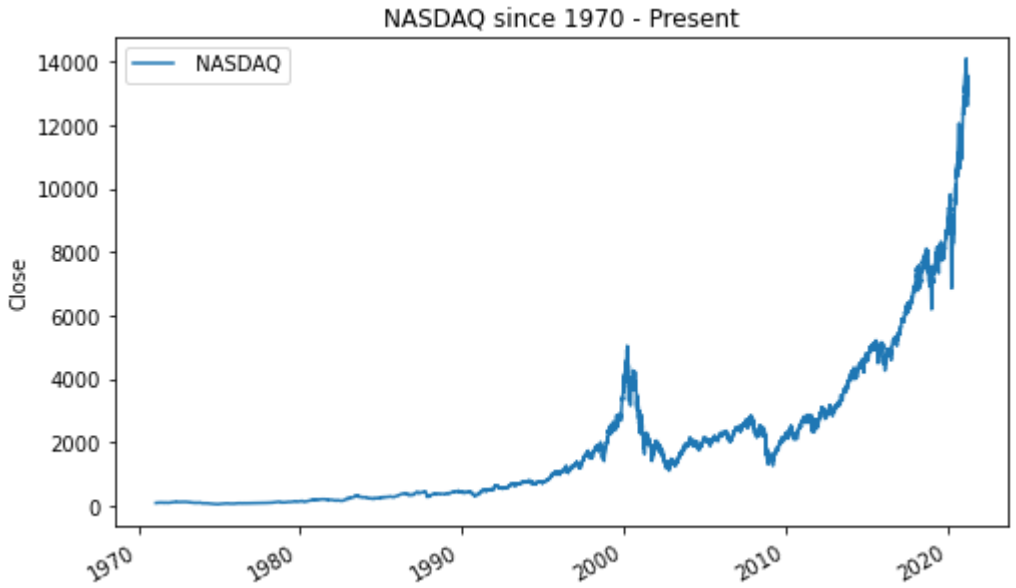
Along with the Dow Jones Industrial Average & S&P 500 Index, it is one the most-followed stock market indexes in the US.

In [24]:
```
nasdaq = web.DataReader("^IXIC", 'yahoo', start, end)
nasdaq.tail(3)
```

Out[24]:

Date	High	Low	Open	Close	Volume	Adj Close
2021-03-30	13075.750000	12922.570312	13008.799805	13045.389648	4685320000	13045.389648
2021-03-31	13325.540039	13118.379883	13122.570312	13246.870117	4980670000	13246.870117
2021-04-01	13487.080078	13404.179688	13414.320312	13480.110352	4553470000	13480.110352

In [25]:
```
nasdaq ['Adj Close'].plot(figsize=(8,5), label=' NASDAQ')

plt.xlabel('')
plt.ylabel('Close')
plt.title('NASDAQ since 1970 - Present')
plt.legend(loc="")
plt.show()
```



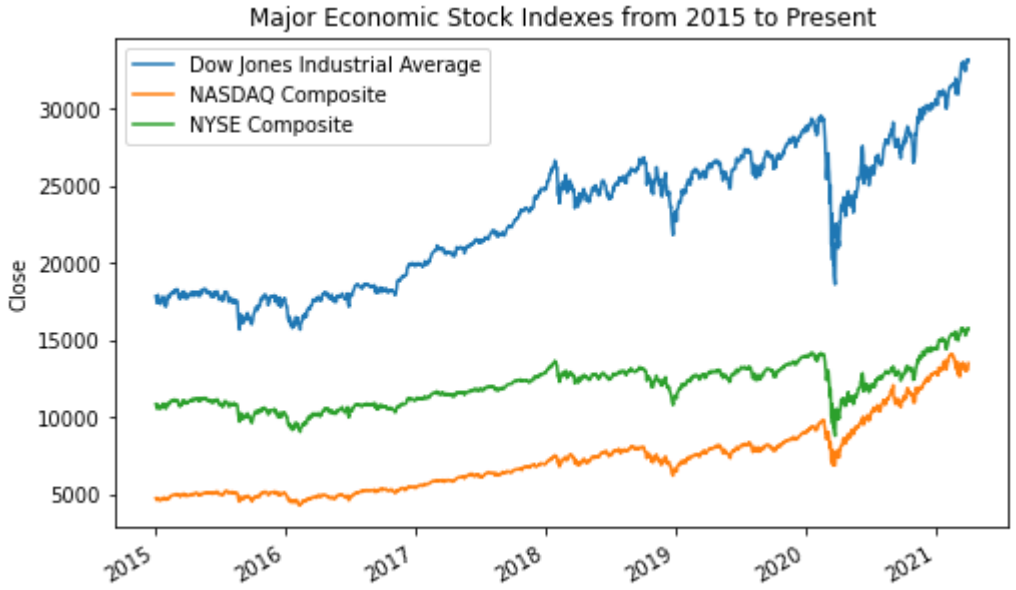
The graphs depicts the closing prices and milestone of these two major indexes on Sept 29, 2008:

- the Dow Jones Industrial Average ends at 10365.45 - its biggest one-day point drop ever and had its biggest one-day point drop
- Nasdaq Composite Index falled to 1983.73 - its biggest one-day point decline since 2000.
- On April 1, 2021, the Dow rose to 33,153.21 and the Nasdaq rose to 13,480.11.

Major Economic Stock Indexes from 2015 to Present:

In [26]:
```
start = datetime.datetime(2015, 1, 1)

dow = web.DataReader("^DJI", 'yahoo', start, end)
nasdaq = web.DataReader("^IXIC", 'yahoo', start, end)
nyse = web.DataReader("^NYA", 'yahoo', start, end)
```

In [27]:
```
dow['Close'].plot(figsize=(8,5), label='Dow Jones Industrial Average')
nasdaq['Close'].plot(figsize=(8,5), label="NASDAQ Composite")
nyse['Close'].plot(figsize=(8,5), label = "NYSE Composite")

plt.xlabel('')
plt.ylabel('Close')
plt.title('Major Economic Stock Indexes from 2015 to Present')
plt.legend(loc="")
plt.show()
```



See the animated plot of the same economic stocks on March 14, 2020

In [118]:
```
from PIL import Image, ImageSequence
im = Image.open("EconomicStocks.gif")
im.show()
```