Libraries Requirements

In [1]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import warnings
warnings.filterwarnings('ignore')
pd.set_option('display.max_columns', None)
```

1. Data Loading & Compliation

In [2]:
```
#Custom dataset formation
def time_frame(start_date,end_date):
    dataset = pd.DataFrame()
    dataset['Date'] = pd.date_range(start= start_date,end= end_date, freq ='1D')
    return dataset

start_date = '01/01/2017'
end_date = '10/01/2022'
date_frame = time_frame(start_date,end_date)
date_frame.head(2)
```

Out[2]:

	Date
0	2017-01-01
1	2017-01-02

1.1 Overall Daily Nasdaq-100 dataset

In [3]:
```
data_ndx = pd.read_csv('Raw_Data/NDX_100_daily_new.csv')

data_ndx['Date'] = pd.to_datetime(data_ndx['Date'])
date_i_ndx = date_frame.merge(data_ndx, on ='Date', how ='left')

date_i_ndx.tail(3)
```

Out[3]:

	Date	Open	High	Low	Close	Adj Close	Volume
2097	2022-09-29	11334.57031	11339.91016	11038.94043	11164.78027	11164.78027	4.516630e+09
2098	2022-09-30	11123.11035	11296.16016	10966.95020	10971.21973	10971.21973	4.649710e+09
2099	2022-10-01	NaN	NaN	NaN	NaN	NaN	NaN

In [4]:
```
date_i_ndx.isnull().sum().sort_values(ascending = False)
```

Out[4]:
```
Open          653
High          653
Low           653
```

```
Close        653
Adj Close    653
Volume       653
Date           0
dtype: int64
```

1.2 US Monthly Unemployment_rate dataset

In [5]:
```
date_i_ndx['Month_year'] = pd.to_datetime(date_i_ndx['Date']).dt.to_period('M')

data_unemp = pd.read_excel('Raw_Data/Unemployment_rate_monthly.xls')
data_unemp = data_unemp.rename(columns = {'observation_date':'Date', 'UNRATE':'U
data_unemp['Month_year'] = pd.to_datetime(data_unemp['Date']).dt.to_period('M')
data_unemp.drop(['Date'], axis =1, inplace = True)
data_unemp.head(3)
```

Out[5]:

	Unemp_rate	Month_year
0	3.4	1948-01
1	3.8	1948-02
2	4.0	1948-03

In [6]:
```
date_i_ndx_unemp = date_i_ndx.merge(data_unemp, on ='Month_year', how ='left')
date_i_ndx_unemp = date_i_ndx_unemp[['Date','Month_year','Open','High','Low','Cl
date_i_ndx_unemp.tail(3)
```

Out[6]:

	Date	Month_year	Open	High	Low	Close	Adj Close	
2097	2022-09-29	2022-09	11334.57031	11339.91016	11038.94043	11164.78027	11164.78027	4.5166
2098	2022-09-30	2022-09	11123.11035	11296.16016	10966.95020	10971.21973	10971.21973	4.649
2099	2022-10-01	2022-10	NaN	NaN	NaN	NaN	NaN	

In [7]:
```
date_i_ndx_unemp.isnull().sum().sort_values(ascending = False)
```

Out[7]:
```
Open          653
High          653
Low           653
Close         653
Adj Close     653
Volume        653
Date            0
Month_year      0
Unemp_rate      0
dtype: int64
```

1.3 Daily Brent price per Barrel dataset

In [8]:
```
col_bo = ['Date', 'COB_price']
data_bo = pd.read_csv('Raw_Data/brent_co_prices_daily.csv',header= 0,names = col
data_bo['Date'] = pd.to_datetime(data_bo['Date'])
```

In [9]:
```
data_bo.head(4)
```

Out[9]:

	Date	COB_price
0	2012-11-06	109.27
1	2012-11-07	108.21
2	2012-11-08	107.23
3	2012-11-09	108.61

In [10]:
```
date_i_ndx_unemp_bo = date_i_ndx_unemp.merge(data_bo, on ='Date', how ='left')
date_i_ndx_unemp_bo.tail(3)
```

Out[10]:

	Date	Month_year	Open	High	Low	Close	Adj Close	
2097	2022-09-29	2022-09	11334.57031	11339.91016	11038.94043	11164.78027	11164.78027	4.5166
2098	2022-09-30	2022-09	11123.11035	11296.16016	10966.95020	10971.21973	10971.21973	4.649
2099	2022-10-01	2022-10	NaN	NaN	NaN	NaN	NaN	

In [11]:
```
date_i_ndx_unemp_bo.isnull().sum().sort_values(ascending=False)
```

Out[11]:
```
Open          653
High          653
Low           653
Close         653
Adj Close     653
Volume        653
COB_price     638
Date            0
Month_year      0
Unemp_rate      0
dtype: int64
```

1.4 Daily US Covid-19 dataset

In [12]:
```
#Loading of Covid data
col_cv = ['date','continent','location','total_cases','new_cases','total_deaths'
data_cd = pd.read_csv('Raw_Data/covid-data.csv', usecols = col_cv)

#Preprocessing of covid data
data_cd = data_cd[(data_cd['continent'] =='North America') & (data_cd['location'
data_cd = data_cd.rename(columns = {'date':'Date'})
```

```
data_cd['Date'] = pd.to_datetime(data_cd['Date'])
col_d_cv = ['continent','location']
data_cd.drop(col_d_cv, axis =1, inplace = True)
```

In [13]:
```
data_cd.tail(5)
```

Out[13]:

	Date	total_cases	new_cases	total_deaths	new_deaths	icu_patients	hosp_patients	p
219539	2022-10-31	97503019.0	43008.0	1070508.0	123.0	2567.0	21762.0	
219540	2022-11-01	97550350.0	47331.0	1070907.0	399.0	NaN	NaN	
219541	2022-11-02	97622888.0	72538.0	1071649.0	742.0	NaN	NaN	
219542	2022-11-03	97692050.0	69162.0	1072222.0	573.0	NaN	NaN	
219543	2022-11-04	97729653.0	37603.0	1072561.0	339.0	NaN	NaN	

In [14]:
```
date_i_ndx_unemp_bo_cv = date_i_ndx_unemp_bo.merge(data_cd, on ='Date', how ='le
```

In [15]:
```
date_i_ndx_unemp_bo_cv.head(4)
```

Out[15]:

	Date	Month_year	Open	High	Low	Close	Adj Close	
0	2017-01-01	2017-01	NaN	NaN	NaN	NaN	NaN	
1	2017-01-02	2017-01	NaN	NaN	NaN	NaN	NaN	
2	2017-01-03	2017-01	4900.850098	4928.490234	4884.520020	4911.330078	4911.330078	1.8862
3	2017-01-04	2017-01	4920.790039	4944.740234	4919.799805	4937.209961	4937.209961	1.8833

In [16]:
```
date_i_ndx_unemp_bo_cv.shape
```

Out[16]:
```
(2100, 22)
```

2. Data Pre-processing

2.1 Null values Check in dataset

In [17]:
```
date_i_ndx_unemp_bo_cv.isnull().sum().sort_values(ascending=False)
```

Out[17]:
```
people_fully_vaccinated    1442
people_vaccinated          1442
total_vaccinations         1442
hosp_patients              1291
icu_patients               1291
tests_per_case             1266
positive_rate              1266
new_deaths                 1156
total_deaths               1154
new_cases                  1117
stringency_index           1116
total_cases                1116
Volume                      653
Adj Close                   653
Close                       653
Low                         653
High                        653
Open                        653
COB_price                   638
Month_year                    0
Unemp_rate                    0
Date                          0
dtype: int64
```

In [38]:
```
date_i_ndx_unemp_bo_cv
```

Out[38]:

Date	Month_year	Open	High	Low	Close	Adj Close	
2017-01-01	2017-01	NaN	NaN	NaN	NaN	NaN	
2017-01-02	2017-01	NaN	NaN	NaN	NaN	NaN	
2017-01-03	2017-01	4900.850098	4928.490234	4884.520020	4911.330078	4911.330078	1.88
2017-01-04	2017-01	4920.790039	4944.740234	4919.799805	4937.209961	4937.209961	1.88
2017-01-05	2017-01	4936.350098	4967.899902	4935.339844	4964.950195	4964.950195	1.79
...	...	...	...	...	...	...	
2022-09-27	2022-09	11411.339840	11502.379880	11175.290040	11271.750000	11271.750000	4.44
2022-09-28	2022-09	11258.740230	11546.870120	11210.809570	11493.830080	11493.830080	4.55
2022-09-29	2022-09	11334.570310	11339.910160	11038.940430	11164.780270	11164.780270	4.51
2022-09-30	2022-09	11123.110350	11296.160160	10966.950200	10971.219730	10971.219730	4.64
2022-10-01	2022-10	11123.110350	11296.160160	10966.950200	10971.219730	10971.219730	

2100 rows × 21 columns

2.2 Filling Null values in NDX-100 variables

In [22]:
```
dd = date_i_ndx_unemp_bo_cv.copy()
```

In [25]:
```
dd.Date = pd.to_datetime(dd.Date, format='%Y-%m-%d')
dd = date_i_ndx_unemp_bo_cv[['Date','Month_year','Open','High','Low','Close','Ad

def interpolate(dataset, columns):
    dataset[columns]= dataset[columns].interpolate(method=  'linear')
    return dataset

col_ndx_interp = ['Adj Close','Close', 'Low', 'High', 'Open','COB_price','new_ca
dd = interpolate(date_i_ndx_unemp_bo_cv,col_ndx_interp)
```

In [27]:
```
dd.isnull().sum().sort_values(ascending=False)
```

Out[27]:
```
people_fully_vaccinated    1442
people_vaccinated          1442
total_vaccinations         1442
hosp_patients              1291
icu_patients               1291
tests_per_case             1266
positive_rate              1266
new_deaths                 1156
total_deaths               1154
new_cases                  1117
stringency_index           1116
total_cases                1116
Volume                      653
Adj Close                     2
Close                         2
Low                           2
High                          2
Open                          2
COB_price                     1
Month_year                    0
Unemp_rate                    0
Date                          0
dtype: int64
```

2.3 Aggregation of Daily to Weekly Data

In [30]:
```
dd.set_index('Date', inplace = True)
gg = dd.resample('W').agg({'Open':'first', 'High':'max', 'Low':'min', 'Adj Close
gg.reset_index('Date', inplace = True)
```

In [31]:
```
gg.isnull().sum().sort_values(ascending=False)
```

Out[31]:
```
total_cases         160
stringency_index    160
Open                  1
```

```
High                1
Low                 1
Adj Close           1
Close               1
COB_price           1
Date                0
Unemp_rate          0
new_cases           0
dtype: int64
```

In [33]:
```
gg.fillna(0)
```

Out[33]:

	Date	Open	High	Low	Adj Close	Close	total_cases
0	2017-01-01	0.000000	0.000000	0.000000	0.000000	0.000000	0.0
1	2017-01-08	4900.850098	5029.113281	4884.520020	5018.959961	5018.959961	0.0
2	2017-01-15	5013.819824	5066.950195	4995.069824	5052.079834	5052.079834	0.0
3	2017-01-22	5044.192383	5085.339844	5029.609863	5064.866862	5064.866862	0.0
4	2017-01-29	5055.970215	5172.430176	5035.490234	5142.240072	5142.240072	0.0
...	...	...	...	...	...	...	...
296	2022-09-04	12488.459960	12594.339840	11982.169920	12054.875000	12054.875000	94760242.0
297	2022-09-11	12178.042722	12705.363283	11928.809570	12689.243167	12689.243167	95257606.0
298	2022-09-18	12649.230470	12752.830080	11710.259770	11922.639647	11922.639647	95664107.0
299	2022-09-25	11753.599610	12062.519530	11169.660160	11273.153643	11273.153643	96068353.0
300	2022-10-02	11283.139650	11546.870120	10966.950200	10971.219730	10971.219730	96387457.0

301 rows × 11 columns

2.4 Additional Filters

In [34]:
```
gg= gg[gg['Date']>'2017-01-02']
```

2.5 Saving Pre-processed Data Files

In [35]:
```
gg.set_index('Date', inplace = True)
gg.to_csv('Process_Data/NDX_100_daily_processed_w_covid_final.csv')
gg.reset_index('Date', inplace = True)
```

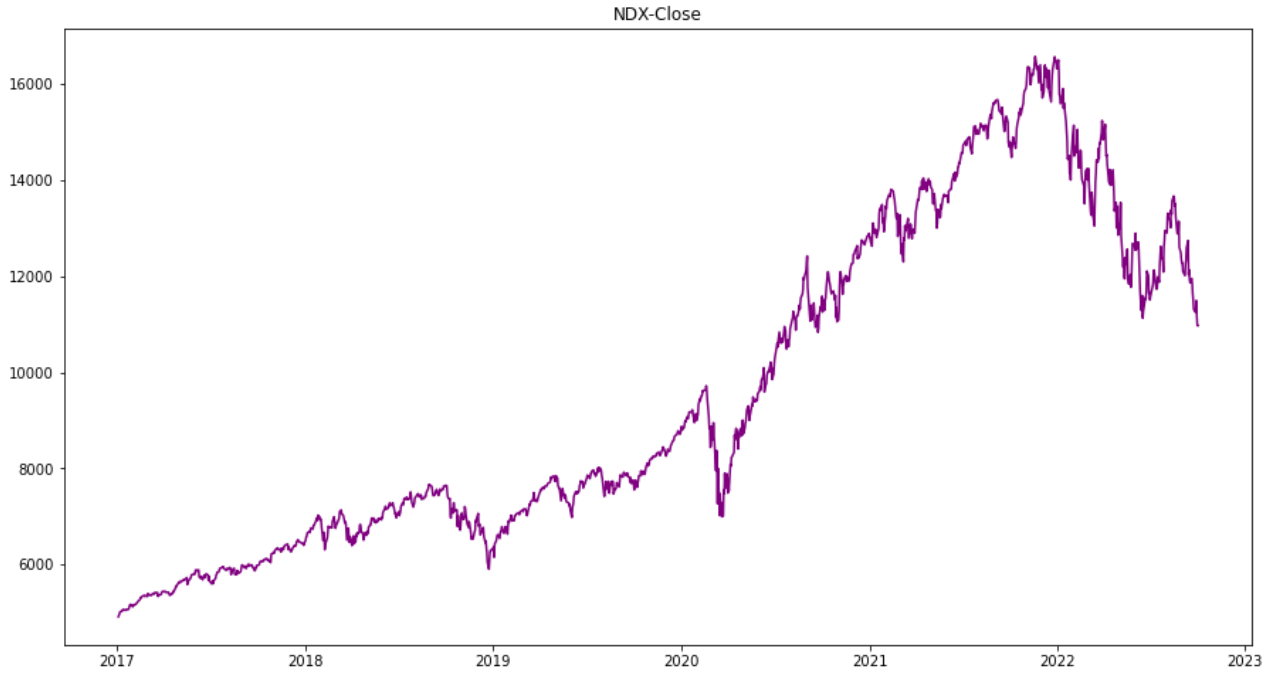
3. Plot Charts for observing Trends

In [36]:
```
gg.shape
```

Out[36]:
```
(300, 11)
```

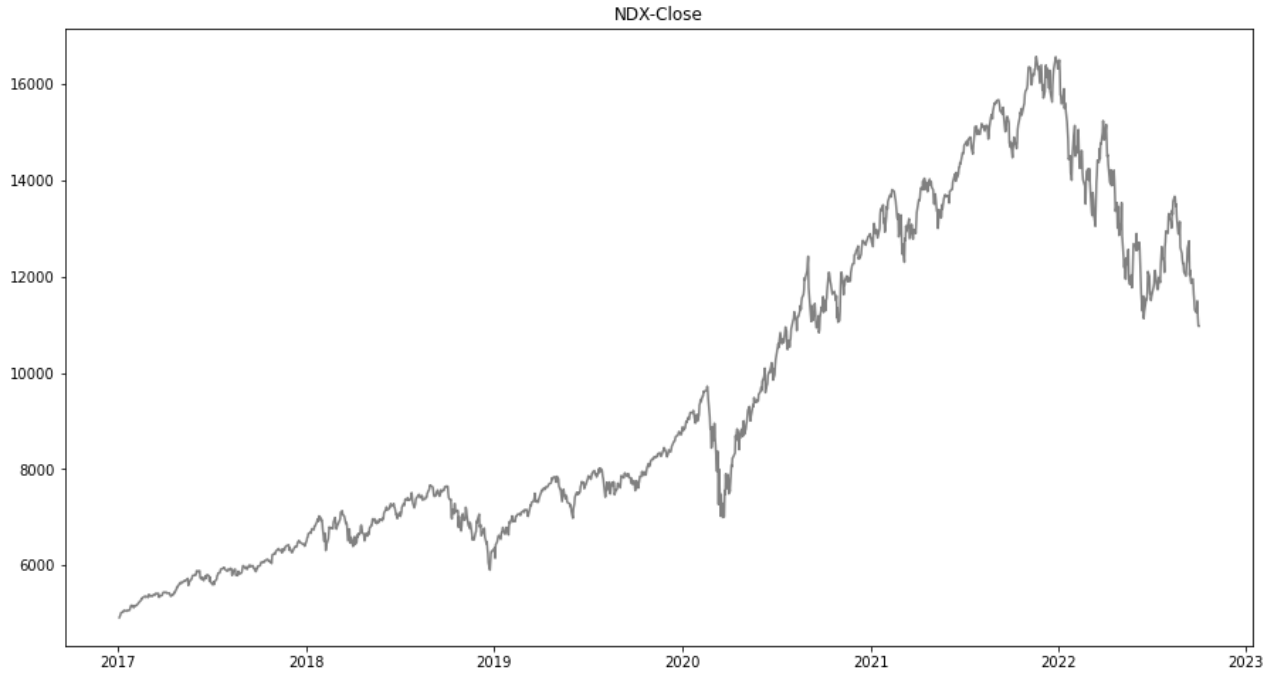
In [39]:
```
# setting the plot size
date_i_ndx_unemp_bo_cv.reset_index('Date', inplace = True)
plt.rcParams['figure.figsize']=(15,8)
plt.plot(date_i_ndx_unemp_bo_cv['Date'],date_i_ndx_unemp_bo_cv['Close'], color='
# add the title of our plot as NDX-Close
plt.title('NDX-Close')

# print the plot
plt.show()
```



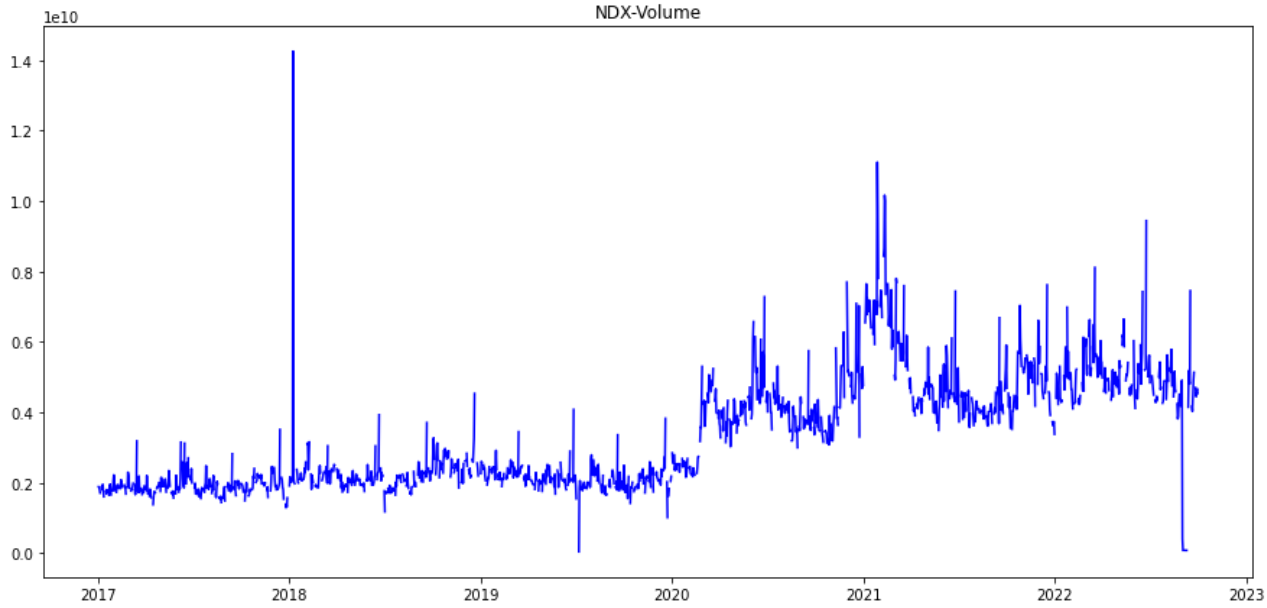
In [40]:
```
# setting the plot size
plt.rcParams['figure.figsize']=(15,8)
plt.plot(dd['Date'],dd['Close'], color='Grey')
# add the title of our plot as NDX-Close
plt.title('NDX-Close')

# print the plot
plt.show()
```



In [41]:

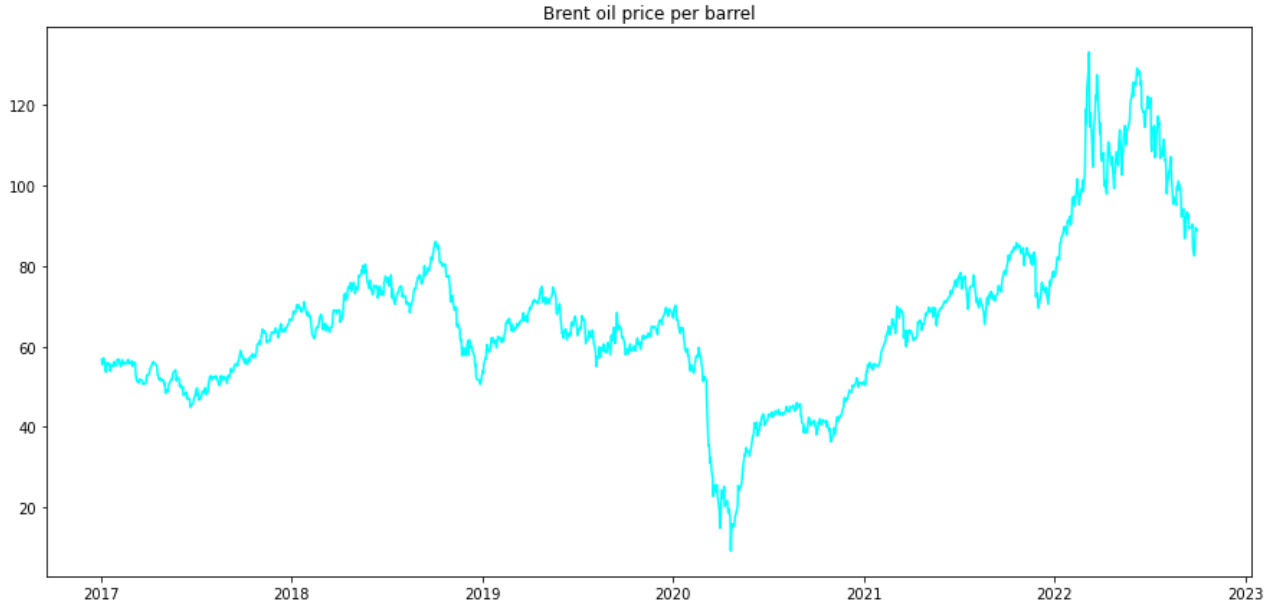
```
# setting the plot size
plt.rcParams['figure.figsize']=(15,7)
# on our data, impute the missing values using rolling window method
# plot the complete dataset
plt.plot(dd['Date'], dd['Volume'], color='blue')
# add the tittle of our plot as Linear interpolation
plt.title('NDX-Volume')
# print the plot
plt.show()
```



In [45]:

```
# setting the plot size
plt.rcParams['figure.figsize']=(15,7)
# on our data, impute the missing values using rolling window method
#data_ndx_final['Close']= data_ndx_final['Close'].interpolate(method='linear')
# plot the complete dataset
plt.plot(dd['Date'],dd['COB_price'], color='Cyan')
```

```
# add the tittle of our plot as Linear interpolation
plt.title('Brent oil price per barrel')
# print the plot
plt.show()
```



In [46]:

```
# setting the plot size
plt.rcParams['figure.figsize']=(15,7)
# on our data, impute the missing values using rolling window method
#data_ndx_final['Close']= data_ndx_final['Close'].interpolate(method='linear')
# plot the complete dataset
plt.plot(date_i_ndx_unemp_bo_cv['Date'],date_i_ndx_unemp_bo_cv['new_cases'], col
# add the tittle of our plot as Linear interpolation
plt.title('covid-19 total cases')
# print the plot
plt.show()
```