Coded by Mark Tanzer

LSCC - Sentiment Trading with Google News TM

March 5, 2023

0.1 Import Libraries

```
[1]: import pandas as pd
     import numpy as np
     import time

     # Import Sentiment Intensity Analyzer
     from vaderSentiment.vaderSentiment import SentimentIntensityAnalyzer

     from GoogleNews import GoogleNews
     googlenews = GoogleNews()

     # Disable future warnings and version warnings
     import warnings
     warnings.simplefilter(action='ignore', category=FutureWarning)
     warnings.filterwarnings("ignore")
```

0.2 Define the Investment Universe and Google Search Terms

```
[2]: NVDA_search_terms = ['Nvidia-Stock', 'Nvidia-Revenue', 'Nvidia-Sales',␣
     ↪'Nvidia', 'NVDA']
     AAPL_search_terms = ['Apple-Stock', 'Apple-Revenue', 'Apple-Sales', 'Apple',␣
     ↪'AAPL']
     MSFT_search_terms = ['MSFT-Stock', 'MSFT-Revenue', 'MSFT-Sales', 'MSFT', 'MSFT']

     googlenews.set_time_range('03/03/2022', '03/03/2023')
```

0.3 Create a function to pull news from the Google API

```
[3]: # Create dataframe to capture google search results
     search_results_df = pd.DataFrame(columns=['Date of Article', 'Title',␣
     ↪'Articles', 'URL'])

     # Function to aggregate results from the Google News API
     def google_search(search_results_df, google_search_results):
         for i in range(len(google_search_results)-1):
             if google_search_results is not None:
```

```
            date_of_article = google_search_results[i]['datetime']
            date_of_article = pd.to_datetime(date_of_article)
            article_title = google_search_results[i]['title']
            google__search_results = google_search_results[i]['desc']
            google_link = google_search_results[i]['link']
            # Append results to the search results data frame
            search_results_df = search_results_df.append({'Date of Article':␣
↪date_of_article, 'Title': article_title,
                                                          'Articles':␣
↪google__search_results, 'URL': google_link}, ignore_index=True)
        else:
            break
    search_results_df = search_results_df.dropna()
    return search_results_df
```

0.4 Nividia Google Search

```
[4]: # Dataframe containing all the google search results
     NVDA_search_result_df = pd.DataFrame()

     for each in range(len(NVDA_search_terms)):
         keywords = (NVDA_search_terms[each])
         googlenews.search(keywords)
         time.sleep(1)

         google_results = googlenews.results()

         # Fetch the results of the first 20 pages
         display_page_results = 20

         for page in range(display_page_results):
             googlenews.get_page(page)
             results = google_search(search_results_df, google_results)

         NVDA_search_result_df = NVDA_search_result_df.append(results)

         # Clear the search
         googlenews.clear()

     NVDA_search_result_df

     shape = NVDA_search_result_df.shape[0]

     # Resetting the data frame index
     NVDA_search_result_df.index = np.arange(shape)
     NVDA_search_result_df
```

```
'NoneType' object is not iterable
'NoneType' object is not iterable
'NoneType' object is not iterable
'NoneType' object is not iterable
```

[4]:   Date of Article \
    0   2022-09-01 00:00:00.000000
    1   2022-09-01 00:00:00.000000
    2   2022-08-31 00:00:00.000000
    3   2023-02-26 18:49:49.055061
    4   2023-02-19 18:49:49.063849
    ..   …
    843 2023-02-12 18:51:02.163757
    844 2023-03-01 18:51:02.173523
    845 2023-02-26 18:51:02.183287
    846 2023-02-26 18:51:02.193053
    847 2023-02-27 18:51:02.201841

                                                Title \
    0   Why Nvidia Stock Cratered on Thursday
    1   Tesla Stock Takes Hit From Nvidia's Warning Ab…
    2   Nvidia stock falls after U.S. government restr…
    3   Nvidia stock jumps on Wall Street praise, bols…
    4   NVIDIA Stock: Q4 Earnings Expected To Fall 60%…
    ..   …
    843   How to Buy ChatGPT Stock
    844   Is NVIDIA Corporation (NVDA) a High-Growth Stock?
    845   Why the 2023 rally might be in trouble: Mornin…
    846   Making Headlines: SPACs & Space, the New "Gold…
    847   The Zacks Analyst Blog Highlights NVIDIA, Visa…

                                             Articles \
    0   Shares of Nvidia (NVDA -2.12%) tumbled hard on…
    1   Nvidia stock dropped 7.7% in Thursday trading …
    2   Nvidia said on Wednesday that it's been told b…
    3   The CNBC Investing Club gives investors a behi…
    4   In this article I'll take a look at what analy…
    ..   …
    843   Chip maker Nvidia (NASDAQ:NVDA) remains one of…
    844   Baron Opportunity Fund highlighted stocks like…
    845   Nvidia (NVDA) and Meta Platforms (META) are ea…
    846   After a delayed release Wednesday evening, chi…
    847   NVDA, Visa Inc. V, Toyota Motor Corp. TM, Cost…

                                                   URL
    0   https://www.fool.com/investing/2022/09/01/why-…
    1   https://www.barrons.com/articles/tesla-nvidia-…

```
2      https://www.cnbc.com/2022/08/31/nvidia-stock-f…
3      https://www.cnbc.com/2023/02/23/nvidia-stock-j…
4      https://seekingalpha.com/article/4580178-nvidi…
..                                                   …
843    https://www.tipranks.com/news/labs/how-to-buy-…
844    https://www.insidermonkey.com/blog/is-nvidia-c…
845    https://finance.yahoo.com/news/why-the-2023-ra…
846    https://finance.yahoo.com/news/making-headline…
847    https://au.finance.yahoo.com/news/zacks-analys…

[848 rows x 4 columns]
```

0.5 Apple Google Search

```python
[5]:  # Dataframe containing all the google search results
      AAPL_search_result_df = pd.DataFrame()

      for each in range(len(AAPL_search_terms)):
          keywords = (AAPL_search_terms[each])
          googlenews.search(keywords)
          time.sleep(1)

          google_results = googlenews.results()

          # Fetch the results of the first 20 pages
          display_page_results = 20

          for page in range(display_page_results):
              googlenews.get_page(page)
              results = google_search(search_results_df, google_results)

          AAPL_search_result_df = AAPL_search_result_df.append(results)

          # Clear the search
          googlenews.clear()

      AAPL_search_result_df

      shape = AAPL_search_result_df.shape[0]

      # Resetting the data frame index
      AAPL_search_result_df.index = np.arange(shape)
      AAPL_search_result_df
```

```
'NoneType' object has no attribute 'group'
```

```
[5]:              Date of Article  \
     0    2023-02-05 18:51:20.258513
     1    2022-09-20 00:00:00.000000
     2    2022-08-18 00:00:00.000000
     3    2022-09-12 00:00:00.000000
     4    2022-05-31 00:00:00.000000
     ..                          …
     780  2023-02-27 18:52:33.451386
     781  2023-03-01 18:52:33.460174
     782  2023-02-27 18:52:33.467994
     783  2023-03-01 18:52:33.477026
     784  2023-02-26 18:52:33.485812


                                           Title  \
     0      Dow Jones Slides 175 Points On Stunning Jobs R…
     1      Dow Jones Falls Amid These Fed Meeting Fears; …
     2      Futures: Costco Rival Breaking Out; Time To Bi…
     3      Dow Jones Gains Amid These Inflation Hopes; Tw…
     4      Apple Stock Has Had a Dreadful May. The Stock …
     ..                                               …
     780    Apple MR Headset Could Launch Alongside iPhone…
     781    Nokia Unveils New Smartphone And Logo - Apple …
     782    Mimic Warren Buffett's Strategy With These 3 S…
     783    Tesla, Apple, AMC, Novavax, Rivian: Top Trendi…
     784           10 Best Stocks To Buy For The Next 3 Months


                                         Articles  \
     0      Stock Market Rally. On Thursday, the Dow Jones…
     1      The Dow Jones Industrial Average fell as the l…
     2      Apple stock, a member of the Dow Jones, S&P 50…
     3      Twitter (TWTR) fell after it slammed Tesla (TS…
     4      Apple's stock, in turn, is down about 16% in 2…
     ..                                               …
     780    Apple Inc.'s. AAPL+3.51%+ Free Alerts. first-g…
     781    AAPL. in terms of the highest total operating …
     782    AAPL. Warren Buffett, also known as the Oracle…
     783    AAPL+3.51%+ Free Alerts. : Shares of Apple clo…
     784    Apple Inc. (NASDAQ:AAPL) reported fourth quart…


                                              URL
     0      https://www.investors.com/market-trend/stock-m…
     1      https://www.investors.com/market-trend/stock-m…
     2      https://www.investors.com/market-trend/stock-m…
     3      https://www.investors.com/market-trend/stock-m…
     4      https://www.barrons.com/articles/apple-stock-p…
     ..                                               …
     780    https://www.benzinga.com/news/23/02/31063721/a…
```

```
781  https://www.benzinga.com/news/23/02/31066207/p...
782  https://finance.yahoo.com/news/mimic-warren-bu...
783  https://www.benzinga.com/news/23/02/31109722/t...
784  https://finance.yahoo.com/news/10-best-stocks-...

[785 rows x 4 columns]
```

0.6 Microsoft Google Search

```python
[6]: # Dataframe containing all the google search results
     MSFT_search_result_df = pd.DataFrame()

     for each in range(len(MSFT_search_terms)):
         keywords = (MSFT_search_terms[each])
         googlenews.search(keywords)
         time.sleep(1)

         google_results = googlenews.results()

         # Fetch the results of the first 20 pages
         display_page_results = 20

         for page in range(display_page_results):
             googlenews.get_page(page)
             results = google_search(search_results_df, google_results)

         MSFT_search_result_df = MSFT_search_result_df.append(results)

         # Clear the search
         googlenews.clear()

     MSFT_search_result_df

     shape = MSFT_search_result_df.shape[0]

     # Resetting the data frame index
     MSFT_search_result_df.index = np.arange(shape)
     MSFT_search_result_df
```

```
'NoneType' object is not iterable
```

```
[6]:               Date of Article  \
     0    2023-02-05 18:52:45.747597
     1    2023-02-05 18:52:45.759314
     2    2023-02-05 18:52:45.771033
     3    2022-07-27 00:00:00.000000
     4    2023-02-05 18:52:45.813535
```

```
  ..                        …
824 2023-03-01 18:53:55.456960
825 2023-03-03 18:53:55.465746
826 2023-02-26 18:53:55.475510
827 2023-03-01 18:53:55.484299
828 2023-03-01 18:53:55.493087

                                                  Title  \
0    Why Is Microsoft (NASDAQ:MSFT) Stock Down 4% T…
1    MSFT Stock: Microsoft Cloud Services Fuel Earn…
2    Microsoft Delivers A Terrible Quarter, Stock S…
3    MSFT Stock: Microsoft Misses June-Quarter Targ…
4               My MSFT Stock Price Prediction for 2025
..                                                    …
824  Microsoft Contract Worker Supplier Attracts Ir…
825  Wall Street roundup: We unpack bullish calls o…
826  There's no going back on A.I.: 'The genie is o…
827  Salesforce's activist investors: Who are they,…
828    Microsoft Corporation (MSFT) Outperformed in Q4

                                               Articles  \
0    Two firms were divided on the outlook of MSFT …
1    MSFT stock ranks second out of six stocks in I…
2    Rather surprisingly they have yet to pounce on…
3    Microsoft Stock Rises After Software Giant Giv…
4    Since the start of the tech stock selloff in l…
..                                                    …
824  … blamed the construction company, Dulles Dr…
825  (MSFT) and more. Here's a closer look at the n…
826  A.I. systems like ChatGPT, Bing, and Bard are …
827   CRM · MSFT · PYPL · XOM · T · T-PA · T-PC · DIS.
828  Baron Opportunity Fund highlighted stocks like…

                                                    URL
0    https://investorplace.com/2023/01/why-is-micro…
1    https://www.investors.com/news/technology/msft…
2    https://seekingalpha.com/article/4572233-micro…
3    https://www.investors.com/news/technology/msft…
4    https://investorplace.com/2023/01/my-msft-stoc…
..                                                    …
824  https://finance.yahoo.com/news/microsoft-contr…
825  https://www.cnbc.com/2023/03/03/wall-street-ro…
826  https://finance.yahoo.com/news/theres-no-going…
827  https://finance.yahoo.com/news/salesforces-act…
828  https://www.insidermonkey.com/blog/microsoft-c…

[829 rows x 4 columns]
```

```
[7]: NVDA_search_result_df2 = NVDA_search_result_df
      AAPL_search_result_df2 = AAPL_search_result_df
      MSFT_search_result_df2 = MSFT_search_result_df
```

```
[8]: #NVDA_search_result_df = NVDA_search_result_df2
     #AAPL_search_result_df = AAPL_search_result_df2
     #TSLA_search_result_df = TSLA_search_result_df2
```

1 Calculate NVDA, AAPL and MSFT Sentiment Scores

```
[9]: # Initialize Sentiment Intensity Analyzer
     sentiment_analyzer = SentimentIntensityAnalyzer()
```

```
[10]: NVDA_search_result_df["NVDA Sentiment Score"] =␣
      ↪NVDA_search_result_df["Articles"].apply(lambda t: sentiment_analyzer.
      ↪polarity_scores(t)['compound'])
      NVDA_search_result_df.head()
```

```
[10]:             Date of Article  \
     0 2022-09-01 00:00:00.000000
     1 2022-09-01 00:00:00.000000
     2 2022-08-31 00:00:00.000000
     3 2023-02-26 18:49:49.055061
     4 2023-02-19 18:49:49.063849


                                            Title  \
     0          Why Nvidia Stock Cratered on Thursday
     1  Tesla Stock Takes Hit From Nvidia's Warning Ab…
     2  Nvidia stock falls after U.S. government restr…
     3  Nvidia stock jumps on Wall Street praise, bols…
     4  NVIDIA Stock: Q4 Earnings Expected To Fall 60%…


                                         Articles  \
     0  Shares of Nvidia (NVDA -2.12%) tumbled hard on…
     1  Nvidia stock dropped 7.7% in Thursday trading …
     2  Nvidia said on Wednesday that it's been told b…
     3  The CNBC Investing Club gives investors a behi…
     4  In this article I'll take a look at what analy…


                                      URL  NVDA Sentiment Score
     0  https://www.fool.com/investing/2022/09/01/why-…                0.0516
     1  https://www.barrons.com/articles/tesla-nvidia-…                0.0000
     2  https://www.cnbc.com/2022/08/31/nvidia-stock-f…               -0.2960
     3  https://www.cnbc.com/2023/02/23/nvidia-stock-j…                0.0000
     4  https://seekingalpha.com/article/4580178-nvidi…                0.0000
```

```
[11]: AAPL_search_result_df["AAPL Sentiment Score"] =␣
      ↪AAPL_search_result_df["Articles"].apply(lambda t: sentiment_analyzer.
      ↪polarity_scores(t)['compound'])
      AAPL_search_result_df.head()
```

```
[11]:              Date of Article  \
      0 2023-02-05 18:51:20.258513
      1 2022-09-20 00:00:00.000000
      2 2022-08-18 00:00:00.000000
      3 2022-09-12 00:00:00.000000
      4 2022-05-31 00:00:00.000000

                                                 Title  \
      0  Dow Jones Slides 175 Points On Stunning Jobs R…
      1  Dow Jones Falls Amid These Fed Meeting Fears; …
      2  Futures: Costco Rival Breaking Out; Time To Bi…
      3  Dow Jones Gains Amid These Inflation Hopes; Tw…
      4  Apple Stock Has Had a Dreadful May. The Stock …

                                               Articles  \
      0  Stock Market Rally. On Thursday, the Dow Jones…
      1  The Dow Jones Industrial Average fell as the l…
      2  Apple stock, a member of the Dow Jones, S&P 50…
      3  Twitter (TWTR) fell after it slammed Tesla (TS…
      4  Apple's stock, in turn, is down about 16% in 2…

                                                    URL  AAPL Sentiment Score
      0  https://www.investors.com/market-trend/stock-m…                0.3818
      1  https://www.investors.com/market-trend/stock-m…               -0.3744
      2  https://www.investors.com/market-trend/stock-m…                0.0000
      3  https://www.investors.com/market-trend/stock-m…               -0.1531
      4  https://www.barrons.com/articles/apple-stock-p…                0.2960
```

```
[12]: MSFT_search_result_df["MSFT Sentiment Score"] =␣
      ↪MSFT_search_result_df["Articles"].apply(lambda t: sentiment_analyzer.
      ↪polarity_scores(t)['compound'])
      MSFT_search_result_df.head()
```

```
[12]:              Date of Article  \
      0 2023-02-05 18:52:45.747597
      1 2023-02-05 18:52:45.759314
      2 2023-02-05 18:52:45.771033
      3 2022-07-27 00:00:00.000000
      4 2023-02-05 18:52:45.813535

                                                 Title  \
      0  Why Is Microsoft (NASDAQ:MSFT) Stock Down 4% T…
```

```
1  MSFT Stock: Microsoft Cloud Services Fuel Earn…
2  Microsoft Delivers A Terrible Quarter, Stock S…
3  MSFT Stock: Microsoft Misses June-Quarter Targ…
4           My MSFT Stock Price Prediction for 2025

                                        Articles  \
0  Two firms were divided on the outlook of MSFT …
1  MSFT stock ranks second out of six stocks in I…
2  Rather surprisingly they have yet to pounce on…
3  Microsoft Stock Rises After Software Giant Giv…
4  Since the start of the tech stock selloff in l…

                                        URL  MSFT Sentiment Score
0  https://investorplace.com/2023/01/why-is-micro…              0.0000
1  https://www.investors.com/news/technology/msft…              0.0000
2  https://seekingalpha.com/article/4572233-micro…             -0.1779
3  https://www.investors.com/news/technology/msft…              0.4019
4  https://investorplace.com/2023/01/my-msft-stoc…             -0.0772
```

1.1 Insert all news articles to Excel (Reference of Articles)

```python
[13]: NVDA_search_result_df.to_excel(r"C:\Project\All Nvidia News Articles.xlsx")
      AAPL_search_result_df.to_excel(r"C:\Project\All Apple News Articles.xlsx")
      MSFT_search_result_df.to_excel(r"C:\Project\All MSFT News Articles.xlsx")
```

1.1.1 Convert to dates, aggregate sentiment scores and check data frame

```python
[14]: #Aggregate sentiment scores and calculate the mean
      NVDA_search_result_df = NVDA_search_result_df.groupby(
          "Date of Article")["NVDA Sentiment Score"].agg('mean').to_frame("NVDA
       ↪Sentiment Score")
      AAPL_search_result_df = AAPL_search_result_df.groupby(
          "Date of Article")["AAPL Sentiment Score"].agg('mean').to_frame("AAPL
       ↪Sentiment Score")
      MSFT_search_result_df = MSFT_search_result_df.groupby(
          "Date of Article")["MSFT Sentiment Score"].agg('mean').to_frame("MSFT
       ↪Sentiment Score")

      NVDA_search_result_df = NVDA_search_result_df.reset_index(level=0)
      NVDA_search_result_df.rename(columns = {'Date of Article':'Dates'}, inplace =
       ↪True)

      AAPL_search_result_df = AAPL_search_result_df.reset_index(level=0)
      AAPL_search_result_df.rename(columns = {'Date of Article':'Dates'}, inplace =
       ↪True)
```

```
MSFT_search_result_df = MSFT_search_result_df.reset_index(level=0)
MSFT_search_result_df.rename(columns = {'Date of Article':'Dates'}, inplace =␣
 ↪True)


NVDA_search_result_df.head()
AAPL_search_result_df.head()
MSFT_search_result_df.head()
```

[14]:
```
        Dates  MSFT Sentiment Score
0  2022-04-19              0.421500
1  2022-04-20              0.119175
2  2022-04-22             -0.075400
3  2022-04-24             -0.401900
4  2022-04-25              0.000000
```

1.1.2 Output data to excel

[15]:
```
# Output Data Frame to Excel
NVDA_search_result_df.to_excel(r"C:\Project\Nvidia.xlsx")
AAPL_search_result_df.to_excel(r"C:\Project\Apple.xlsx")
MSFT_search_result_df.to_excel(r"C:\Project\MSFT.xlsx")
```
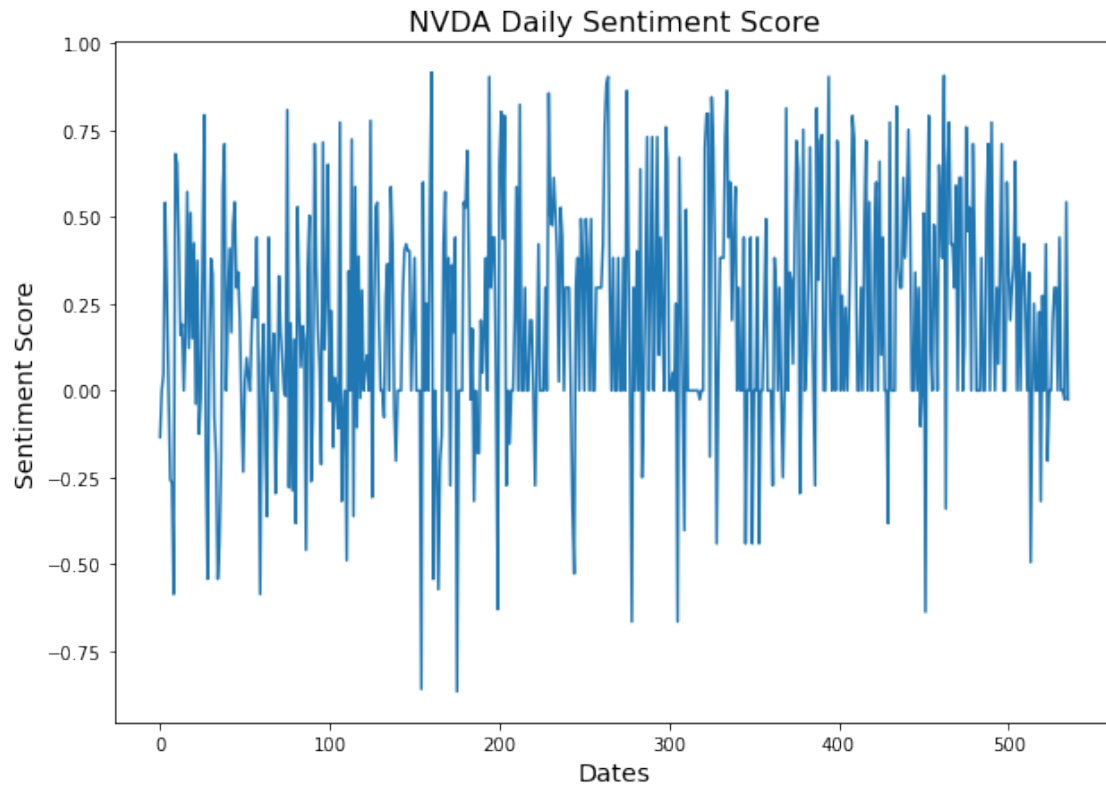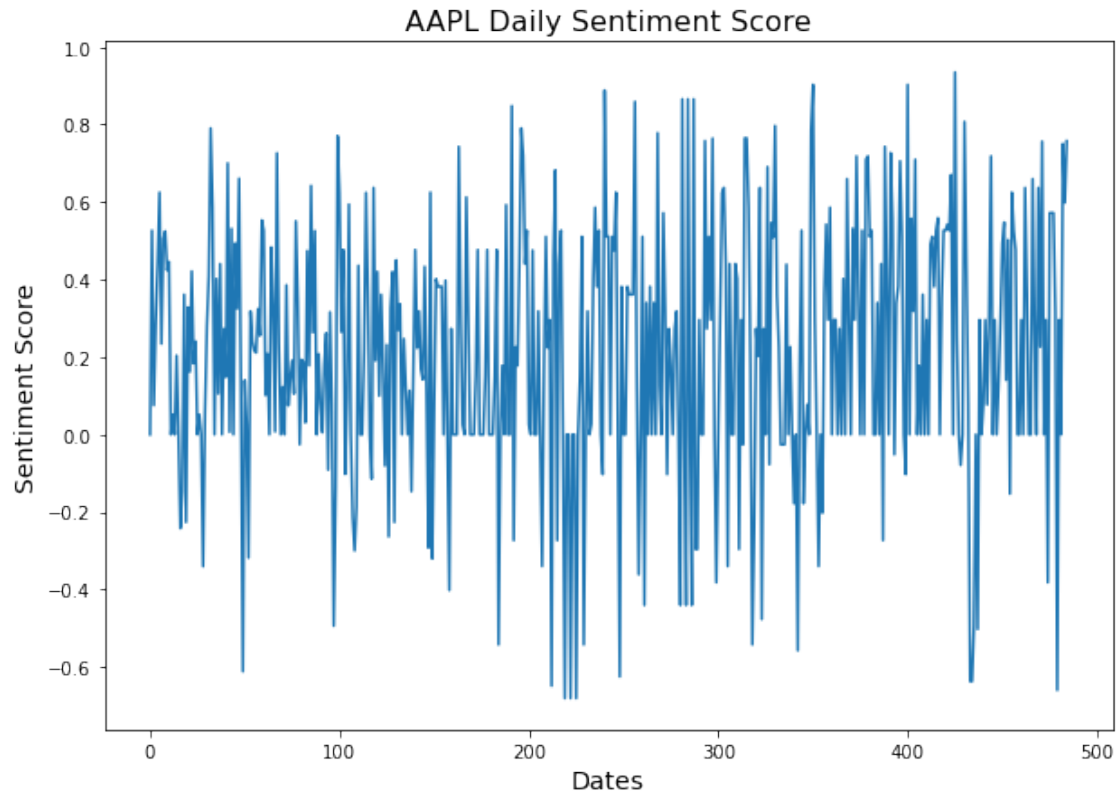
1.1.3 Plot Daily Sentiment Scores

[16]:
```
import matplotlib.pyplot as plt
plt.figure(figsize=(10, 7))
plt.plot(NVDA_search_result_df["NVDA Sentiment Score"])
plt.title('NVDA Daily Sentiment Score', fontsize=16)
plt.xlabel('Dates', fontsize=14)
plt.ylabel('Sentiment Score', fontsize=14)
plt.show()
```

NVDA Daily Sentiment Score

```
[17]: import matplotlib.pyplot as plt
      plt.figure(figsize=(10, 7))
      plt.plot(AAPL_search_result_df["AAPL Sentiment Score"])
      plt.title('AAPL Daily Sentiment Score', fontsize=16)
      plt.xlabel('Dates', fontsize=14)
      plt.ylabel('Sentiment Score', fontsize=14)
      plt.show()
```

AAPL Daily Sentiment Score

```
[18]: import matplotlib.pyplot as plt
      plt.figure(figsize=(10, 7))
      plt.plot(MSFT_search_result_df["MSFT Sentiment Score"])
      plt.title('MSFT Daily Sentiment Score', fontsize=16)
      plt.xlabel('Dates', fontsize=14)
      plt.ylabel('Sentiment Score', fontsize=14)
      plt.show()
```

MSFT Daily Sentiment Score
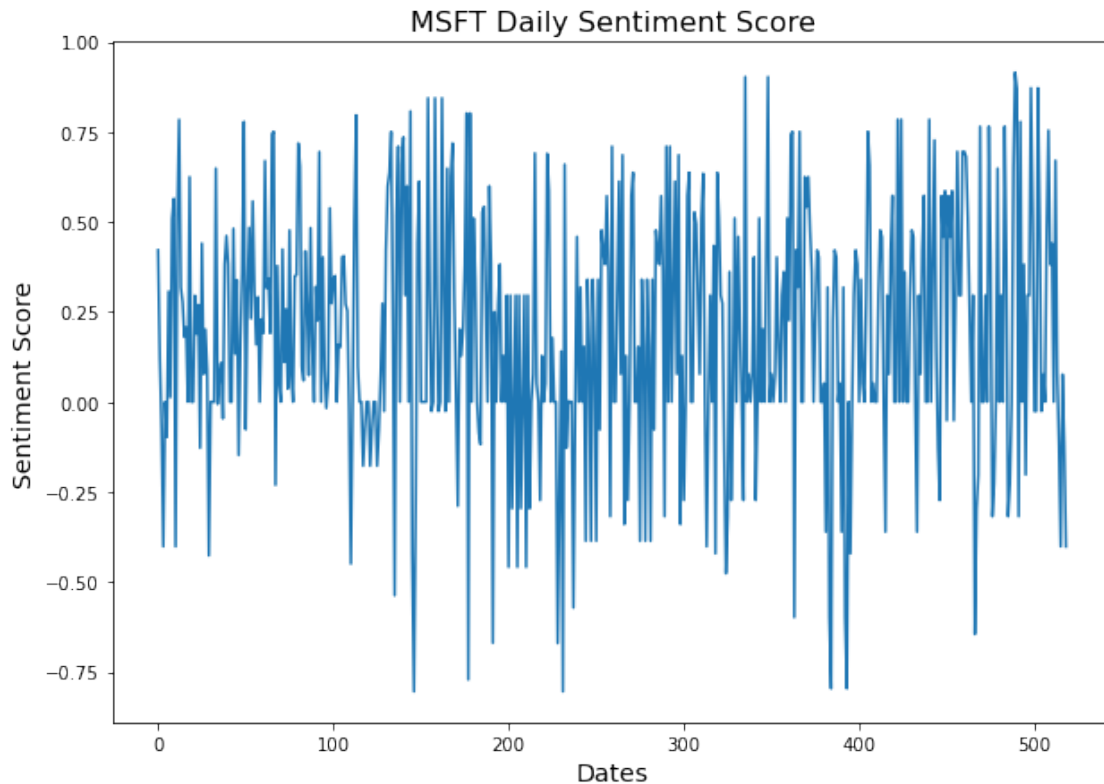
1.2 Read stock which was downloaded using R

```python
stock_data = pd.read_excel(r"C:\Project\Stock Data.xlsx")

stock_data["Dates"] = pd.to_datetime(stock_data["Dates"]).dt.date

#stock_data.rename(columns = {'NVDA.Adjusted':'Close'}, inplace = True)
stock_data.head()
```

[19]:
```
        Dates         NVDA        AAPL        TSLA        MSFT       INTC  \
0  2022-03-03  236.958817  165.229080  254.679993  293.045135  42.751701
1  2022-03-04  229.184784  162.187515  266.923340  287.044006  44.733696
2  2022-03-07  213.356873  158.340836  269.956665  276.200378  45.681602
3  2022-03-08  214.975632  156.492020  290.143341  273.170135  45.672031
4  2022-03-09  229.964172  161.968857  288.123322  285.697205  44.829445

         AMZN         JPM
0  144.826996  143.941254
1  151.358002  139.933456
2  153.788498  143.244232
3  153.563004  137.271301
```

14

```
4  151.141998  132.092163
```

[20]: `stock_data.head()`

[20]:
```
       Dates         NVDA         AAPL         TSLA         MSFT        INTC  \
0  2022-03-03  236.958817  165.229080  254.679993  293.045135  42.751701
1  2022-03-04  229.184784  162.187515  266.923340  287.044006  44.733696
2  2022-03-07  213.356873  158.340836  269.956665  276.200378  45.681602
3  2022-03-08  214.975632  156.492020  290.143341  273.170135  45.672031
4  2022-03-09  229.964172  161.968857  288.123322  285.697205  44.829445

         AMZN         JPM
0  144.826996  143.941254
1  151.358002  139.933456
2  153.788498  143.244232
3  153.563004  137.271301
4  151.141998  132.092163
```

[21]:
```python
nvda_news_df = pd.read_excel(r"C:\Project\Nvidia.xlsx")
aapl_news_df = pd.read_excel(r"C:\Project\Apple.xlsx")
msft_news_df = pd.read_excel(r"C:\Project\MSFT.xlsx")

nvda_news_df["Dates"] = pd.to_datetime(nvda_news_df["Dates"]).dt.date
aapl_news_df["Dates"] = pd.to_datetime(aapl_news_df["Dates"]).dt.date
msft_news_df["Dates"] = pd.to_datetime(aapl_news_df["Dates"]).dt.date

nvda_news_df.drop(nvda_news_df.columns[[0]], axis=1, inplace=True)
aapl_news_df.drop(aapl_news_df.columns[[0]], axis=1, inplace=True)
msft_news_df.drop(msft_news_df.columns[[0]], axis=1, inplace=True)
nvda_news_df.tail()
```

[21]:
```
          Dates  NVDA Sentiment Score
531  2023-03-04                0.0000
532  2023-03-04                0.0000
533  2023-03-04               -0.0258
534  2023-03-04                0.5423
535  2023-03-04               -0.0258
```

1.3 Plot the Aggregated Mean Sentiment Scores

[22]:
```python
import matplotlib.pyplot as plt
plt.figure(figsize=(10, 7))
plt.plot(nvda_news_df["NVDA Sentiment Score"])
plt.title('Agregated NVDA Daily Sentiment Score', fontsize=16)
plt.xlabel('Date', fontsize=14)
plt.ylabel('Sentiment Score', fontsize=14)
plt.show()
```

Agregated NVDA Daily Sentiment Score
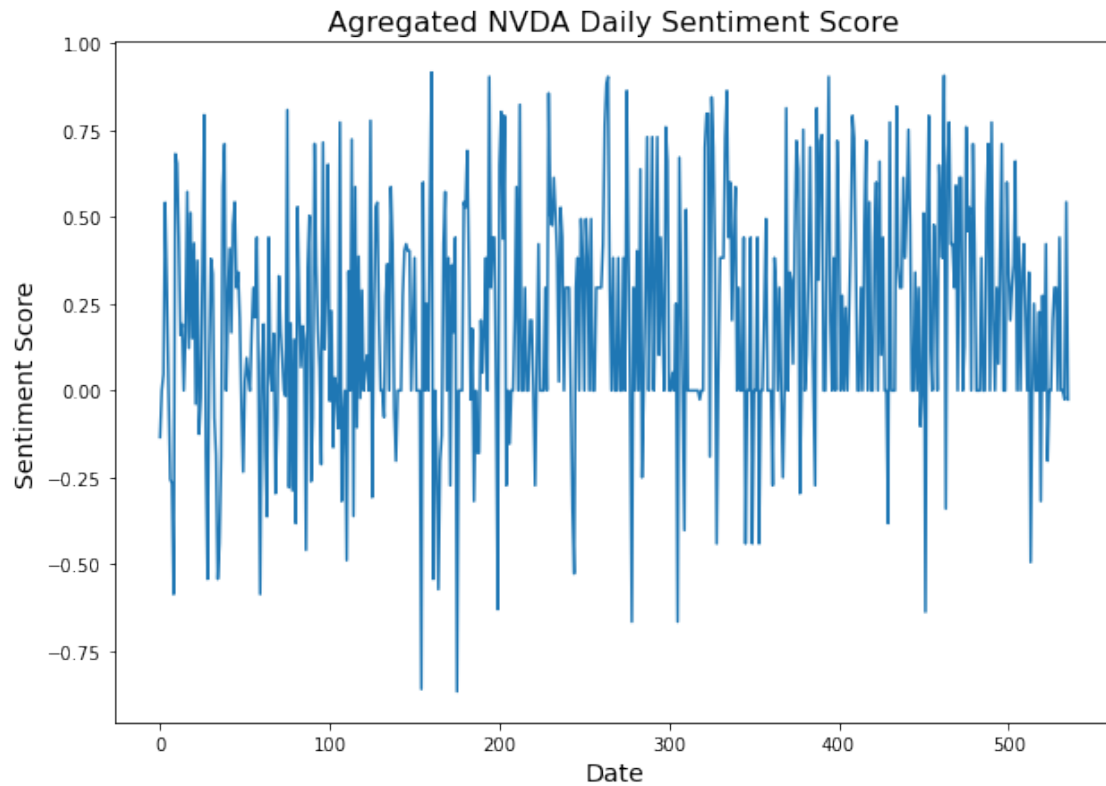
```
[23]: import matplotlib.pyplot as plt
      plt.figure(figsize=(10, 7))
      plt.plot(aapl_news_df["AAPL Sentiment Score"])
      plt.title('Agregated AAPL Daily Sentiment Score', fontsize=16)
      plt.xlabel('Date', fontsize=14)
      plt.ylabel('Sentiment Score', fontsize=14)
      plt.show()
```

Agregated AAPL Daily Sentiment Score
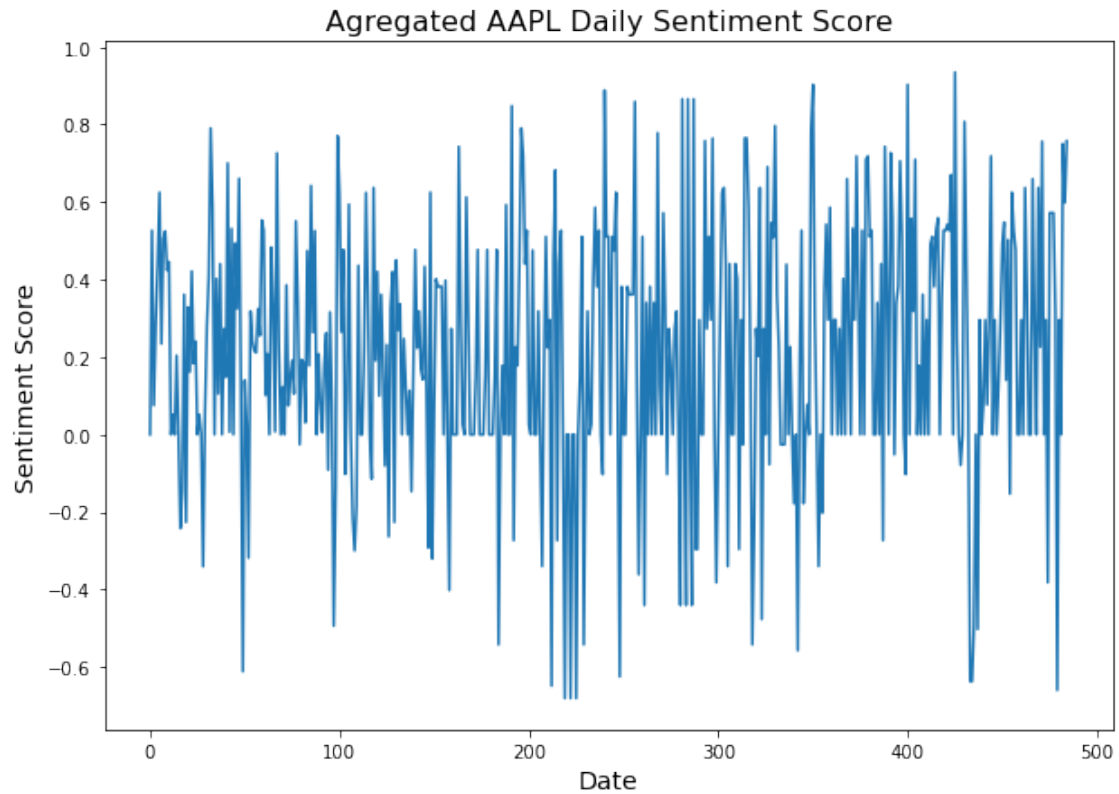

```python
[24]: import matplotlib.pyplot as plt
      plt.figure(figsize=(10, 7))
      plt.plot(msft_news_df["MSFT Sentiment Score"])
      plt.title('Agregated MSFT Daily Sentiment Score', fontsize=16)
      plt.xlabel('Date', fontsize=14)
      plt.ylabel('Sentiment Score', fontsize=14)
      plt.show()
```
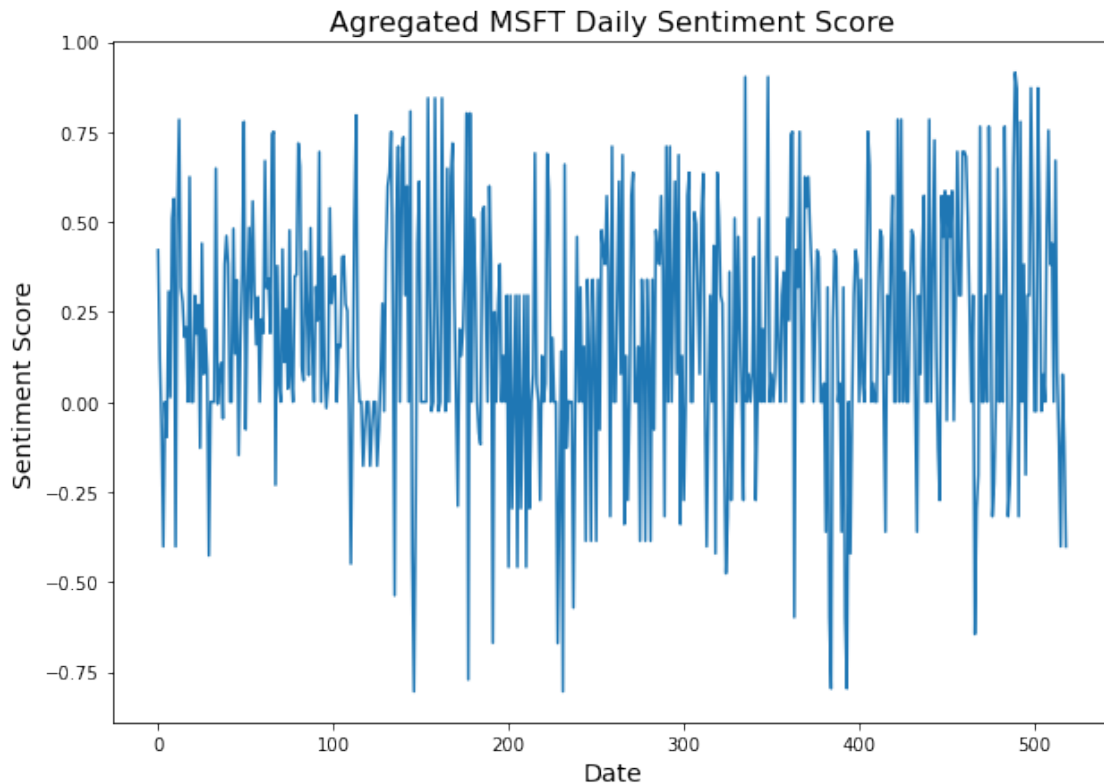
Agregated MSFT Daily Sentiment Score

1.4 Merge Stock Data and Sentiment Scores

```
[25]: nvda_news_df = stock_data.merge(nvda_news_df,how='left', left_on='Dates',
      →right_on='Dates')
      aapl_news_df = stock_data.merge(aapl_news_df,how='left', left_on='Dates',
      →right_on='Dates')
      msft_news_df = stock_data.merge(msft_news_df,how='left', left_on='Dates',
      →right_on='Dates')

      # Replace blanks and nan with 0
      nvda_news_df.fillna(0, inplace=True)
      nvda_news_df

      aapl_news_df.fillna(0, inplace=True)
      aapl_news_df

      msft_news_df.fillna(0, inplace=True)
      msft_news_df

      nvda_news_df.to_excel(r"C:\Project\NVDA Merged Data.xlsx")
      aapl_news_df.to_excel(r"C:\Project\AAPL Merged Data.xlsx")
```

```python
msft_news_df.to_excel(r"C:\Project\MSFT Merged Data.xlsx")
```

1.5 Nvidia Trade Signals

```python
[26]: # Create a signal column which would hold the buy/sell signals
      nvda_news_df["NVDA Trade Signal"] = 0
      nvda_news_df.fillna(0, inplace=True)

      # Generate a buy signal whenever the sentiment score is above a threshold
      nvda_news_df.loc[nvda_news_df["NVDA Sentiment Score"] >= 0.2, "NVDA Trade␣
       ↪Signal"] = 1

      # Generate a sell signal whenever the sentiment score is below a threshold
      nvda_news_df.loc[nvda_news_df["NVDA Sentiment Score"]  <= -0.3, "NVDA Trade␣
       ↪Signal"] = -1

      nvda_news_df.tail(5)
```

```
[26]:          Dates        NVDA        AAPL        TSLA        MSFT       INTC  \
      370  2023-03-02  233.139999  145.910004  200.860001  251.110001  25.469999
      371  2023-03-02  233.139999  145.910004  200.860001  251.110001  25.469999
      372  2023-03-02  233.139999  145.910004  200.860001  251.110001  25.469999
      373  2023-03-02  233.139999  145.910004  200.860001  251.110001  25.469999
      374  2023-03-02  233.139999  145.910004  200.860001  251.110001  25.469999

                 AMZN         JPM  NVDA Sentiment Score  NVDA Trade Signal
      370  95.790001  138.559998                0.7096                  1
      371  95.790001  138.559998                0.0000                  0
      372  95.790001  138.559998                0.0000                  0
      373  95.790001  138.559998                0.5994                  1
      374  95.790001  138.559998                0.3612                  1
```

1.6 Apple Trade Signals

```
[75]:  # Create a signal column which would hold the buy/sell signals
       aapl_news_df["AAPL Trade Signal"] = 0
       aapl_news_df.fillna(0, inplace=True)

       # Generate a buy signal whenever the sentiment score is above a threshold
       aapl_news_df.loc[aapl_news_df["AAPL Sentiment Score"] >= 0.2, "AAPL Trade␣
        ↪Signal"] = 1

       # Generate a sell signal whenever the sentiment score is below a threshold
       aapl_news_df.loc[aapl_news_df["AAPL Sentiment Score"]  <= -0.2, "AAPL Trade␣
        ↪Signal"] = -1

       aapl_news_df.tail(5)
```

```
[75]:         Dates          NVDA          AAPL          TSLA          MSFT          INTC  \
       307  2023-03-02   233.139999   145.910004   200.860001   251.110001   25.469999
       308  2023-03-02   233.139999   145.910004   200.860001   251.110001   25.469999
       309  2023-03-02   233.139999   145.910004   200.860001   251.110001   25.469999
       310  2023-03-02   233.139999   145.910004   200.860001   251.110001   25.469999
       311  2023-03-02   233.139999   145.910004   200.860001   251.110001   25.469999

                  AMZN          JPM  AAPL Sentiment Score  AAPL Trade Signal  \
       307  95.790001   138.559998                -0.6369                 -1
       308  95.790001   138.559998                -0.6369                 -1
       309  95.790001   138.559998                -0.4939                 -1
       310  95.790001   138.559998                 0.0000                  0
       311  95.790001   138.559998                -0.5023                 -1

            AAPL Returns  AAPL Strategy Returns
       307           0.0                    0.0
       308           0.0                   -0.0
       309           0.0                   -0.0
       310           0.0                   -0.0
       311           0.0                    0.0
```

1.7 MSFT Trade Signals

```
[251]:  # Create a signal column which would hold the buy/sell signals
        msft_news_df["MSFT Trade Signal"] = 0
        msft_news_df.fillna(0, inplace=True)

        # Generate a buy signal whenever the sentiment score is above a threshold
        msft_news_df.loc[msft_news_df["MSFT Sentiment Score"] >= 0.4, "MSFT Trade␣
         ↪Signal"] = 1

        # Generate a sell signal whenever the sentiment score is below a threshold
```

```
msft_news_df.loc[msft_news_df["MSFT Sentiment Score"]  <=-0.4, "MSFT Trade␣
  ↪Signal"] = -1

msft_news_df.tail(5)
```

[251]:
```
        Dates          NVDA        AAPL        TSLA        MSFT       INTC  \
307  2023-03-02  233.139999  145.910004  200.860001  251.110001  25.469999
308  2023-03-02  233.139999  145.910004  200.860001  251.110001  25.469999
309  2023-03-02  233.139999  145.910004  200.860001  251.110001  25.469999
310  2023-03-02  233.139999  145.910004  200.860001  251.110001  25.469999
311  2023-03-02  233.139999  145.910004  200.860001  251.110001  25.469999

          AMZN          JPM  MSFT Sentiment Score  MSFT Trade Signal  \
307  95.790001  138.559998               -0.3612                  0
308  95.790001  138.559998                0.2960                  0
309  95.790001  138.559998                0.0772                  0
310  95.790001  138.559998                0.4215                  1
311  95.790001  138.559998                0.5729                  1

     MSFT Returns  MSFT Strategy Returns
307           0.0                    0.0
308           0.0                    0.0
309           0.0                    0.0
310           0.0                    0.0
311           0.0                    0.0
```

1.8 Calculate the daily returns based on sentiment score thresholds

[252]:
```python
# Calculate the returns
nvda_news_df["NVDA Returns"] = nvda_news_df['NVDA'].pct_change()
aapl_news_df["AAPL Returns"] = aapl_news_df['AAPL'].pct_change()
msft_news_df["MSFT Returns"] = msft_news_df['MSFT'].pct_change()

nvda_news_df["NVDA Strategy Returns"] = nvda_news_df["NVDA Trade Signal"].
  ↪shift(1) * nvda_news_df["NVDA Returns"]
aapl_news_df["AAPL Strategy Returns"] = aapl_news_df["AAPL Trade Signal"].
  ↪shift(1) * aapl_news_df["AAPL Returns"]
msft_news_df["MSFT Strategy Returns"] = msft_news_df["MSFT Trade Signal"].
  ↪shift(1) * msft_news_df["MSFT Returns"]

#nvda_news_df = nvda_news_df.dropna()
#nvda_news_df.head(5)
```

[253]:
```python
aapl_news_df = aapl_news_df.dropna()
aapl_news_df.head(5)
```

```
[253]:          Dates          NVDA          AAPL          TSLA          MSFT          INTC  \
        32   2022-04-19   221.810394   166.392059   341.829987   282.528259   45.020943
        33   2022-04-20   214.655884   166.223068   325.309998   283.577972   44.590073
        34   2022-04-21   201.675812   165.417953   328.983337   278.081909   44.523052
        35   2022-04-22   195.000900   160.815826   340.790009   271.367767   45.011364
        36   2022-04-25   198.867950   161.899261   328.333344   277.992828   43.728333


                  AMZN          JPM   AAPL Sentiment Score   AAPL Trade Signal  \
        32   154.460495   130.184570              0.075400                   0
        33   151.121994   129.706696              0.000000                   0
        34   150.787506   128.282837              0.286400                   1
        35   155.541000   124.147850              0.000000                   0
        36   151.706497   122.997063              0.234167                   1


             AAPL Returns   AAPL Strategy Returns
        32       0.014115                0.000000
        33      -0.001016               -0.000000
        34      -0.004844               -0.000000
        35      -0.027821               -0.027821
        36       0.006737                0.000000
```

```
[254]: msft_news_df = msft_news_df.dropna()
       msft_news_df.head(5)
```

```
[254]:          Dates          NVDA          AAPL          TSLA          MSFT          INTC  \
        32   2022-04-19   221.810394   166.392059   341.829987   282.528259   45.020943
        33   2022-04-20   214.655884   166.223068   325.309998   283.577972   44.590073
        34   2022-04-21   201.675812   165.417953   328.983337   278.081909   44.523052
        35   2022-04-22   195.000900   160.815826   340.790009   271.367767   45.011364
        36   2022-04-25   198.867950   161.899261   328.333344   277.992828   43.728333


                  AMZN          JPM   MSFT Sentiment Score   MSFT Trade Signal  \
        32   154.460495   130.184570             -0.075400                   0
        33   151.121994   129.706696              0.000000                   0
        34   150.787506   128.282837             -0.401900                  -1
        35   155.541000   124.147850              0.000000                   0
        36   151.706497   122.997063              0.306967                   0


             MSFT Returns   MSFT Strategy Returns
        32       0.017040                0.000000
        33       0.003715                0.000000
        34      -0.019381               -0.000000
        35      -0.024144                0.024144
        36       0.024414                0.000000
```
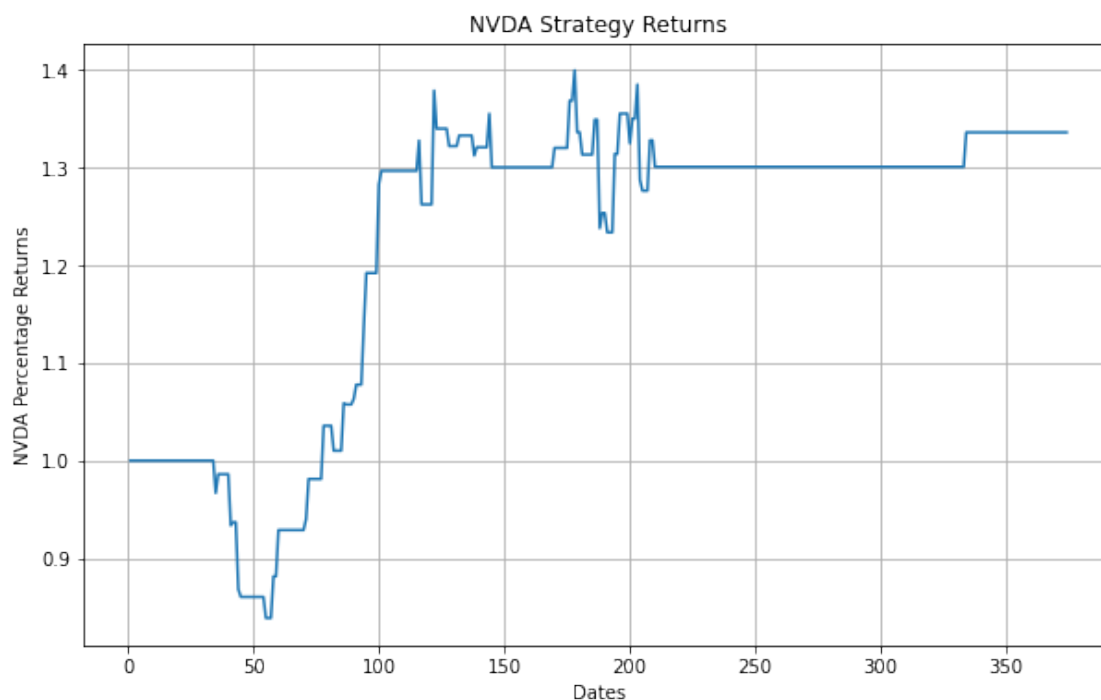
1.9 Plot Nvidia Backtest

[255]:
```python
# Import matplotlib
import matplotlib.pyplot as plt
%matplotlib inline

# Plot the strategy returns
(nvda_news_df["NVDA Strategy Returns"]+1).cumprod().plot(figsize=(10, 6))

# Label the graph
plt.title("NVDA Strategy Returns")
plt.grid()
plt.xlabel("Dates")
plt.ylabel("NVDA Percentage Returns")
plt.show()
```


1.10 Plot Apple Backtest

[256]:
```python
# Import matplotlib
import matplotlib.pyplot as plt
%matplotlib inline

# Plot the strategy returns
(aapl_news_df["AAPL Strategy Returns"]+1).cumprod().plot(figsize=(10, 6))
```

```python
# Label the graph
plt.title("AAPL Strategy Returns")
plt.grid()
plt.xlabel("Dates")
plt.ylabel("AAPL Percentage Returns")
plt.show()
```


1.11 Plot Microsoft Backtest

```python
[257]: # Import matplotlib
import matplotlib.pyplot as plt
%matplotlib inline

# Plot the strategy returns
(msft_news_df["MSFT Strategy Returns"]+1).cumprod().plot(figsize=(10, 6))

# Label the graph
plt.title("MSFT Strategy Returns")
plt.grid()
plt.xlabel("Dates")
plt.ylabel("MSFT Percentage Returns")
plt.show()
```

MSFT Strategy Returns