InSight : Market Visualizer

Introduction:

Abstract

The aim of this project is to present market data in a way which is optimum for research and distribution.

Technology used

- Python 3.2
- NASDAQ Realtime Stock Streaming API
- The New York Times Article Search API
- JSON
- Plotly
- Jupyter Notebooks

Benefits and Potential Impacts

InSight provides a superior way to view and analyze data, by cutting down on research time and using a powerful algorithm to predict important instances in both past and present data. It harnesses the power of the New York Times and helps the user to establish connections between the Financial World and the Real World. The engine is powerful enough to go beyond financial data and analyze to high accuracy, any data that can be quantified.

Visualizations and Code

In [1]:
```
#All the libraries used.
from datascience import *
import datetime as dt
import pandas as pd
import numpy as np
import websocket
import threading
import argparse
import time
import json
import requests
from time import sleep



# These lines set up graphing capabilities.
import matplotlib
%matplotlib inline
import matplotlib.pyplot as plt
plt.style.use('fivethirtyeight')
import warnings
warnings.simplefilter('ignore', FutureWarning)

from ipywidgets import interact, interactive, fixed, interact_manual
import ipywidgets as widgets
```

In [2]:
```
#This command runs the API and generates a '.csv' file of the data for p
rocessing.
%run nasdaq.py --start_date 20160101 --end_date 20170202 --symbols AAPL
```

```
--- request header ---
GET /stream?symbol=AAPL&start=20160101&end=20170202 HTTP/1.1
Upgrade: websocket
Connection: Upgrade
Host: 34.214.11.52
Origin: http://34.214.11.52
Sec-WebSocket-Key: XA5q6iwSesVxkbYMuTPcJg==
Sec-WebSocket-Version: 13


-----------------------
--- response header ---
HTTP/1.1 101 Switching Protocols
Content-Length: 0
Upgrade: websocket
Sec-Websocket-Accept: ntLqnwFAo0GM4UaAGBhYz0qfepw=
Server: TornadoServer/4.5.1
Connection: Upgrade
Date: Sun, 08 Oct 2017 13:18:10 GMT
-----------------------
send: b'\x81\x80\x06\xf3\x9a\xf6'
send: b'\x88\x82\xa8\xd5g\xb1\xab='

### closed ###
```

In [3]:
```
#Documenting the initial conditions.
start = '20160101'
end = '20170202'
company = 'AAPL'

#Gets the name of the company from a database of company names and code
s.
def getCompany(comp):
    comp_tab = Table.read_table('companylist.csv')
    return comp_tab.where(0, comp).column(1).item(0)
```

In [4]:
```
#Takes the "nasdata.csv" file and generates a table with useful informat
ion (Can be altered by the user).
raw_data = (Table.read_table("nasdata.csv")).drop(0)
```

In [5]:
```
#Function that helps to get the required date format for The NY Times.
def getDate(date):
    date=str(date)
    return date[0:10].replace("-", "")
def addOne(date):
    return getDate(str((pd.to_datetime(date) + dt.timedelta(days=1))))
```

In [6]:
```
#Takes particular values from "raw_data" to join with the NY Times data
nyData = Table().with_columns("Date", raw_data.apply(getDate, 1), "NextD
ate", raw_data.apply(addOne, 1) , "High", raw_data.column("High"),
"Low", raw_data.column("Low"), "Close", raw_data.column("Close"))
```

In [7]:
```
nasvizData = Table().with_columns("Date",
pd.to_datetime(raw_data.column(1)), "High", raw_data.column("High"), "Lo
w", raw_data.column("Low"), "Close", raw_data.column("Close"))
```

In [8]:
```
nasvizData
```

Out[8]:

Date	High	Low	Close
2016-01-05 00:00:00	105.85	102.41	102.71
2016-01-06 00:00:00	104.144	99.87	100.7
2016-01-07 00:00:00	104.09	96.43	96.45
2016-01-08 00:00:00	99.11	96.76	96.96
2016-01-11 00:00:00	99.06	97.34	98.53
2016-01-12 00:00:00	100.69	98.83	99.96
2016-01-13 00:00:00	101.19	97.3	97.39
2016-01-14 00:00:00	100.48	95.73	99.52
2016-01-15 00:00:00	99.0857	95.36	97.13
2016-01-19 00:00:00	98.65	95.46	96.66

... (263 rows omitted)

In [9]:
```
#Getting the rate of change of values.
def get_differential(num):
    return np.append([0], np.diff(nasvizData.column(num)))

#Modelling here with 'Low' for example.
differential = np.append([0], np.diff(nasvizData.column(2)))
```

In [10]:
```
#Creating a table out of the rates.
diff_table = Table().with_column("date", nasvizData.column(0), "diff",
differential, "abs diff", abs(differential))
diff_table = diff_table.with_columns("Thresh",
(max(diff_table.column(2)) - min(diff_table.where(2, are.above(0)).colu
mn(2))) / 2)
```

In [11]:
```
# A Table that keeps track of the important dates.
important_dates = diff_table.where(2, are.above(diff_table.column(3).it
em(0))).select(0)
important_dates = important_dates.join('date', nasvizData, 'Date')
important_dates
```

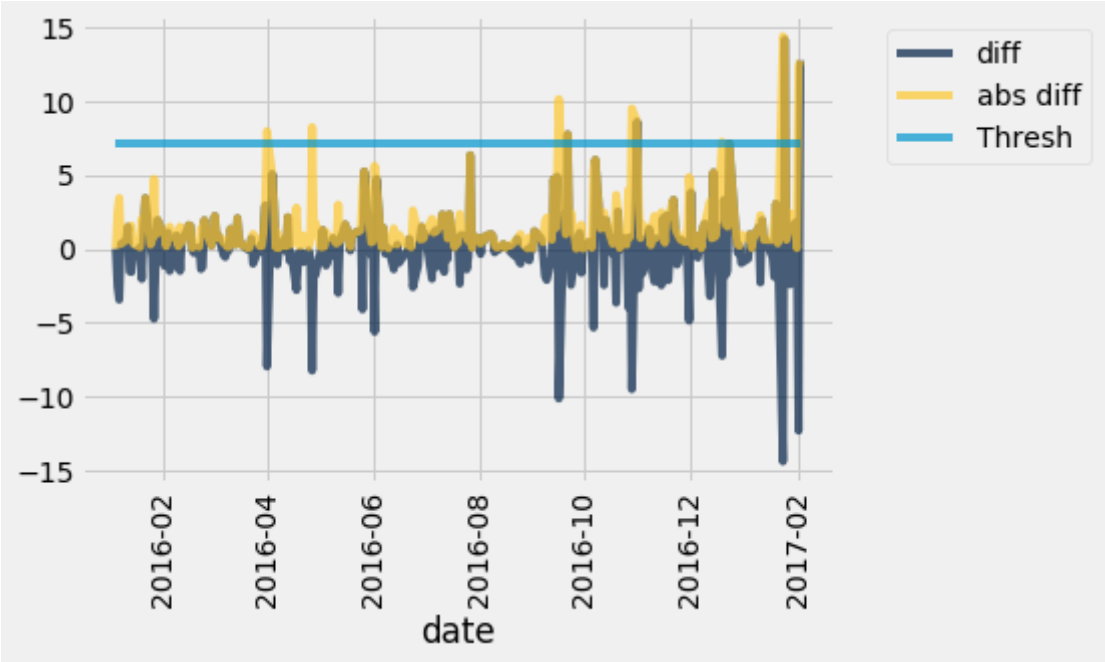
Out[11]:

date	High	Low	Close
2016-04-01 00:00:00	110	100.928	109.99
2016-04-27 00:00:00	98.71	95.68	97.82
2016-09-16 00:00:00	116.13	103.37	114.925
2016-09-21 00:00:00	113.989	112.44	113.55
2016-10-28 00:00:00	115.21	104.61	113.72
2016-10-31 00:00:00	114.23	113.2	113.54
2016-12-19 00:00:00	117.38	108.415	116.64
2017-01-23 00:00:00	120.81	105.36	120.08
2017-01-24 00:00:00	120.1	119.5	119.97
2017-02-01 00:00:00	130.49	108.313	128.75

... (1 rows omitted)

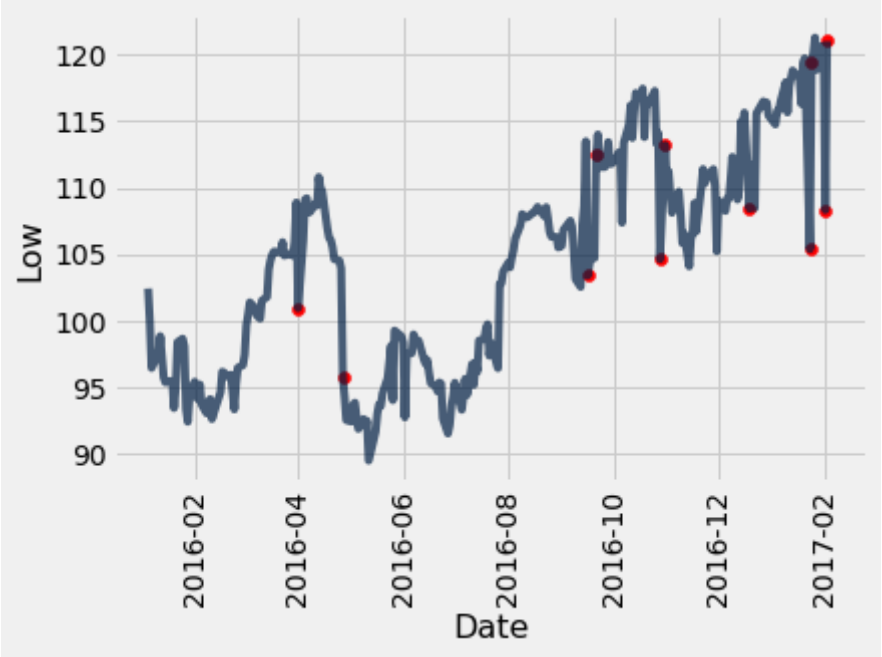
In [12]:
```
diff_table.plot(0)
plt.xticks(rotation=90)
```

Out[12]:
```
(array([ 735995.,  736055.,  736116.,  736177.,  736238.,  736299.,
736361.]),
 <a list of 7 Text xticklabel objects>)
```



In [13]:
```
#Actual graph with incident points marked in Red.
nasvizData.drop(1, 3, 4).plot(0)
plt.scatter(important_dates.column(0), important_dates.column(2), colo
r = 'red')
plt.xticks(rotation=90)
```

Out[13]:
```
(array([ 735995.,  736055.,  736116.,  736177.,  736238.,  736299.,
736361.]),
 <a list of 7 Text xticklabel objects>)
```



In [14]:
```
# Extracting Relevant articles using the New York Times Article Search
 API.
def article_extract(article):
    return {'Name': article['headline']['main'],
            'URL': article['web_url'],
            'Date-Time': article['pub_date'] if 'pub_date' in article
else ''

    }

def article_search(term, begin, end):
    data_search = (requests.get
                   ("https://api.nytimes.com/svc/search/v2/articlesear
ch.json?api-key=28ec5f20ab074501b55d83ea93cec91b&q=%s&begin_date=%s&en
d_date=%s"%
                    (term, begin, end)))
    return article_extract(data_search.json()['response']['docs'][0])
```

In [15]:
```
#Example of what an Article Search Returns.

article_search('apple', "20170809", "20170810")
```

Out[15]:
```
{'Date-Time': '2017-08-09T09:13:41+0000',
 'Name': 'Google’s War Over the Sexes',
 'URL': 'https://www.nytimes.com/2017/08/09/opinion/google-women-mem
o.html'}
```

In [16]:
```
# Tuning the important_dates Table to fit the format used by the New York Times Article Search API.

important_dates_tweaked = Table().with_columns("Date", important_dates.apply(getDate, 0), "High", important_dates.column("High"), "Low", important_dates.column("Low"), "Close", important_dates.column("Close"))
important_dates_tweaked
```

Out[16]:

Date	High	Low	Close
20160401	110	100.928	109.99
20160427	98.71	95.68	97.82
20160916	116.13	103.37	114.925
20160921	113.989	112.44	113.55
20161028	115.21	104.61	113.72
20161031	114.23	113.2	113.54
20161219	117.38	108.415	116.64
20170123	120.81	105.36	120.08
20170124	120.1	119.5	119.97
20170201	130.49	108.313	128.75

... (1 rows omitted)

In [17]:
```
#The Final Table after all the computation is finished.

final = important_dates_tweaked.join('Date', nyData, 'Date').drop(5,
 6, 7)
final
```

Out[17]:

Date	High	Low	Close	NextDate
20160401	110	100.928	109.99	20160402
20160427	98.71	95.68	97.82	20160428
20160916	116.13	103.37	114.925	20160917
20160921	113.989	112.44	113.55	20160922
20161028	115.21	104.61	113.72	20161029
20161031	114.23	113.2	113.54	20161101
20161219	117.38	108.415	116.64	20161220
20170123	120.81	105.36	120.08	20170124
20170124	120.1	119.5	119.97	20170125
20170201	130.49	108.313	128.75	20170202

... (1 rows omitted)

In [19]:
```
#The Articles recieved after implementing the API.

head=[]
for i in np.arange(final.num_rows):
    head[len(head):] = [article_search(getCompany(company), final.c
olumn(0)[i], final.column(4)[i])]
    sleep(1)
head
```

```
Out[19]: [{'Date-Time': '2016-04-02T00:00:00Z',
           'Name': 'Moving CD-Ripped Music From the Computer to the iPad',
           'URL': 'https://www.nytimes.com/2016/04/02/technology/personalt
          ech/moving-cd-ripped-music-from-the-computer-to-the-ipad.html'},
          {'Date-Time': '2016-04-28T00:00:00Z',
           'Name': 'Turning Down an OS X Upgrade',
           'URL': 'https://www.nytimes.com/2016/04/28/technology/personalt
          ech/turning-down-an-os-x-upgrade.html'},
          {'Date-Time': '2016-09-16T06:08:22Z',
           'Name': 'Apple Tax Row Raises $2.1 Trillion Question for Forex
          Traders',
           'URL': 'https://www.nytimes.com/reuters/2016/09/16/business/16r
          euters-global-forex-tax.html'},
          {'Date-Time': '2016-09-21T04:00:00+0000',
           'Name': 'How Tesla and Apple Could Be Good for Each Other',
           'URL': 'https://www.nytimes.com/2016/09/21/business/dealbook/ho
          w-tesla-and-apple-could-be-good-for-each-other.html'},
          {'Date-Time': '2016-10-28T17:13:30+0000',
           'Name': 'Review: ‘To Pixar and Beyond’ Plumbs New Depth in Oft-
          Told Tale',
           'URL': 'https://www.nytimes.com/2016/10/29/business/dealbook/re
          view-to-pixar-and-beyond-plumbs-new-depth-in-oft-told-tale.htm
          l'},
          {'Date-Time': '2016-10-31T16:31:10+0000',
           'Name': 'Daily Report: Google’s Day in Europe’s Court Highlight
          s Nature of New Tech',
           'URL': 'https://www.nytimes.com/2016/11/01/technology/daily-rep
          ort-googles-day-in-europes-court-highlights-nature-of-new-tech.ht
          ml'},
          {'Date-Time': '2016-12-19T00:59:57+0000',
           'Name': 'By Attacking the Press, Donald Trump May Be Doing It a
          Favor',
           'URL': 'https://www.nytimes.com/2016/12/18/business/media/by-at
          tacking-the-press-donald-trump-may-be-doing-it-a-favor.html'},
          {'Date-Time': '2017-01-23T16:12:52+0000',
           'Name': 'Fighting iPhone Battery Life Blues',
           'URL': 'https://www.nytimes.com/2017/01/23/technology/personalt
          ech/fighting-the-iphone-battery-blues.html'},
          {'Date-Time': '2017-01-24T05:00:00+0000',
           'Name': 'A Little Nostalgia, a Long Fork and Lots of Cheese',
           'URL': 'https://cooking.nytimes.com/recipes/1018557-sweet-gorgo
          nzola-fondue'},
          {'Date-Time': '2017-02-01T17:24:07+0000',
           'Name': 'Daily Report: At Apple, Triumphs Amid Tribulations',
           'URL': 'https://www.nytimes.com/2017/02/01/technology/daily-rep
          ort-at-apple-triumphs-amid-tribulations.html'},
          {'Date-Time': '2017-02-02T17:15:45+0000',
           'Name': 'Solving the Case of the Mac’s Disappearing Scroll Bar
          s',
           'URL': 'https://www.nytimes.com/2017/02/02/technology/personalt
          ech/solving-the-case-of-the-disappearing-scroll-bars.html'}]
```

In [20]:
```
#Tabulation for the interactive plot.

final_head = pd.DataFrame.from_dict(head)
headlines=make_array()
for i in np.arange(final.num_rows):
    headline= final_head.as_matrix(columns=final_head.columns[1:])
[i][0]
    headlines= np.append(headlines, headline)
# final_head.iloc[:,1]
URLS=make_array()
for i in np.arange(final.num_rows):
    URL= final_head.as_matrix(columns=final_head.columns[1:])[i][1]
    URLS= np.append(URLS, URL)
final_head
```

Out[20]:

	Date-Time	Name	U
0	2016-04-02T00:00:00Z	Moving CD-Ripped Music From the Computer to th...	https://www.nytimes.com/2016/04/02/technology
1	2016-04-28T00:00:00Z	Turning Down an OS X Upgrade	https://www.nytimes.com/2016/04/28/technology
2	2016-09-16T06:08:22Z	Apple Tax Row Raises $2.1 Trillion Question fo...	https://www.nytimes.com/reuters/2016/09/16/bus
3	2016-09-21T04:00:00+0000	How Tesla and Apple Could Be Good for Each Other	https://www.nytimes.com/2016/09/21/business/d
4	2016-10-28T17:13:30+0000	Review: 'To Pixar and Beyond' Plumbs New Depth...	https://www.nytimes.com/2016/10/29/business/d
5	2016-10-31T16:31:10+0000	Daily Report: Google's Day in Europe's Court H...	https://www.nytimes.com/2016/11/01/technology
6	2016-12-19T00:59:57+0000	By Attacking the Press, Donald Trump May Be Do...	https://www.nytimes.com/2016/12/18/business/m
7	2017-01-23T16:12:52+0000	Fighting iPhone Battery Life Blues	https://www.nytimes.com/2017/01/23/technology

	Date-Time	Name	U
8	2017-01-24T05:00:00+0000	A Little Nostalgia, a Long Fork and Lots of Ch...	https://cooking.nytimes.com/recipes/1018557-sw
9	2017-02-01T17:24:07+0000	Daily Report: At Apple, Triumphs Amid Tribulat...	https://www.nytimes.com/2017/02/01/technology
10	2017-02-02T17:15:45+0000	Solving the Case of the Mac's Disappearing Scr...	https://www.nytimes.com/2017/02/02/technology

In [21]:
```
#The Interactive Plot and URLs.

import plotly.plotly as py
import plotly
import plotly.graph_objs as go
plotly.tools.set_credentials_file(username='gaurav98m', api_key='9Z
Rh4HFPJ8wE5e5GBOzX')

# Create random data with numpy
# import numpy as np

# N = 500
# random_x = np.linspace(0, 1, N)
# random_y = np.random.randn(N)

# Create a trace
trace = go.Scatter(
    x = nasvizData.column(0),
    y = nasvizData.column(2)
#     hoverinfo='none'
)

trace2 = go.Scatter(
    x = important_dates.column(0),
    y = important_dates.column(2),
    mode='markers',
    name='Lines, Markers and Text',
    text=headlines,
    textposition='top'
)

data = [trace, trace2]

py.iplot(data, filename='basic-line')
```

```
High five! You successfully sent some data to your account on plo
tly. View your plot in your browser at https://plot.ly/~gaurav98
m/0 or inside your plot.ly account where it is named 'basic-line'
```

Out[21]:

In [22]:
```
for url in URLS:
    print(url)
```

```
https://www.nytimes.com/2016/04/02/technology/personaltech/moving
-cd-ripped-music-from-the-computer-to-the-ipad.html
https://www.nytimes.com/2016/04/28/technology/personaltech/turnin
g-down-an-os-x-upgrade.html
https://www.nytimes.com/reuters/2016/09/16/business/16reuters-glo
bal-forex-tax.html
https://www.nytimes.com/2016/09/21/business/dealbook/how-tesla-an
d-apple-could-be-good-for-each-other.html
https://www.nytimes.com/2016/10/29/business/dealbook/review-to-pi
xar-and-beyond-plumbs-new-depth-in-oft-told-tale.html
https://www.nytimes.com/2016/11/01/technology/daily-report-google
s-day-in-europes-court-highlights-nature-of-new-tech.html
https://www.nytimes.com/2016/12/18/business/media/by-attacking-th
e-press-donald-trump-may-be-doing-it-a-favor.html
https://www.nytimes.com/2017/01/23/technology/personaltech/fighti
ng-the-iphone-battery-blues.html
https://cooking.nytimes.com/recipes/1018557-sweet-gorgonzola-fond
ue
https://www.nytimes.com/2017/02/01/technology/daily-report-at-app
le-triumphs-amid-tribulations.html
https://www.nytimes.com/2017/02/02/technology/personaltech/solvin
g-the-case-of-the-disappearing-scroll-bars.html
```