

Project 4 Summary: Analyzing President Trump's Economic and Financial Tweets

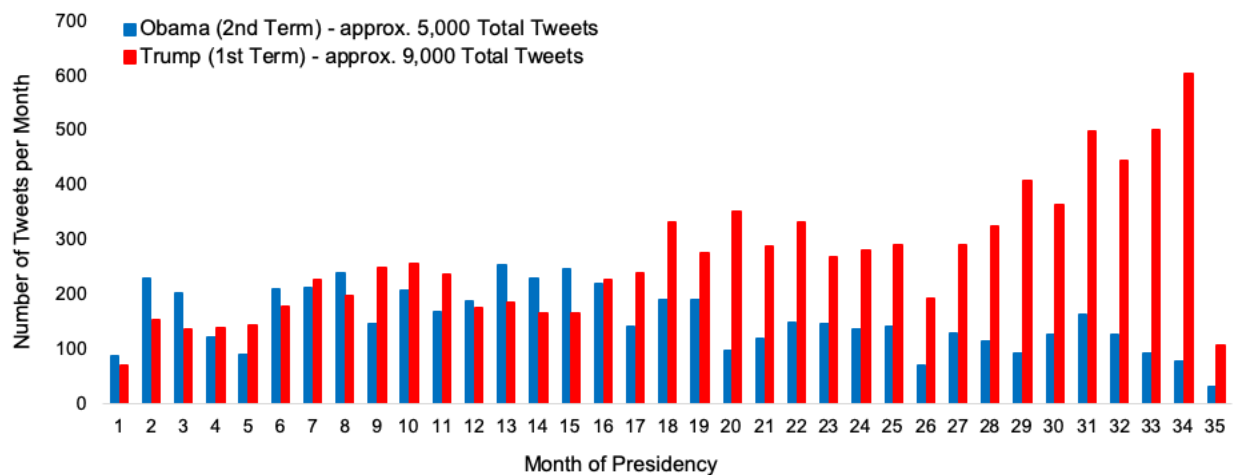
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Domain

Motivation

No other president has used social media, in particular Twitter, as freely or frequently as Donald Trump. In fact, his penchant for the platform has many calling him the “Tweeter-in-Chief”.

In the first 35 months of his second term, President Obama averaged approximately 150 tweets per month. In the same timeframe, President Trump has tweeted about 250 tweets per month for a total of about 9,000 tweets.¹



Since Twitter seems to be one of President Trump's favorite means of communication with the general public, I wanted to find out if his tweets send any signals about the financial markets, in particular for my analysis, the S&P 500.

Methodology

Data

The dataset I used consists of all of Trump's tweets from January 20, 2017 (inauguration day) to November 6, 2019 (present day) which I downloaded from the [Trump Twitter Archive](#). The original file included 12,042 tweets in total. Here's a sample of some of the tweets:

Tweet	Date and Time
This is the time for Mexico with the help of the United States to wage WAR on the drug cartels and wipe them off the face of the earth. We merely await a call from your great new president!	11/5/19 13:28

¹ These numbers do not include retweets.

Tweet	Date and Time
Our Economy and Jobs Market is BOOMING the best in the World and in our Country's history - and we have just started!	5/19/19 19:54
I will be in Green Bay Wisconsin this Saturday April 27th at the Resch Center — 7:00pm (CDT). Big crowd expected! #MAGA https://t.co/BPYK8PF0O8	4/23/19 18:08
I am in the process of interviewing some really great people for the position of White House Chief of Staff. Fake News has been saying with certainty it was Nick Ayers a spectacular person who will always be with our #MAGA agenda. I will be making a decision soon!	12/10/18 1:27
Melania and I were thrilled to join the dedicated men and women of the @USEmbassyFrance members of the U.S. Military and their families. https://t.co/ZSdsJ0Bsbl	7/13/17 12:50

As part of pre-processing and data cleaning, I took the following steps:

- Removed retweets
- Decoded HTML (for example, turned ‘&’ into ‘&’)
- Removed URL links
- Removed numbers (did not remove if part of hashtag or mention), punctuation, and emojis
- Removed capitalization
- Removed stop words
- Assigned sentiment scores using NLTK VADER’s `SentimentIntensityAnalyzer()`
- Removed pre-processed tweets that have less than 20 characters

Tweet Before Cleaning	Tweet After Cleaning ²
This is the time for Mexico with the help of the United States to wage WAR on the drug cartels and wipe them off the face of the earth. We merely await a call from your great new president!	this is the time for mexico with the help of the united states to wage war on the drug cartels and wipe them off the face of the earth we merely await a call from your great new president
Our Economy and Jobs Market is BOOMING the best in the World and in our Country's history - and we have just started!	our economy and jobs market is booming the best in the world and in our country s history and we have just started
I will be in Green Bay Wisconsin this Saturday April 27th at the Resch Center — 7:00pm (CDT). Big crowd expected! #MAGA https://t.co/BPYK8PF0O8	i will be in green bay wisconsin this saturday april th at the resch center pm cdt big crowd expected maga
I am in the process of interviewing some really great people for the position of White House Chief of Staff. Fake News has been saying with certainty it was Nick Ayers a spectacular person who will always be with our #MAGA agenda. I will be making a decision soon!	i am in the process of interviewing some really great people for the position of white house chief of staff fake news has been saying with certainty it was nick ayers a spectacular person who will always be with our maga agenda i will be making a decision soon
Melania and I were thrilled to join the dedicated men and women of the @USEmbassyFrance members of the U.S. Military and their families. https://t.co/ZSdsJ0Bsbl	melania and i were thrilled to join the dedicated men and women of the usembassyfrance members of the u s military and their families

I also tried using `LancasterStemmer()` to stem words, however it did not substantially benefit my final results so I ended up not using it. After cleaning, I was left with 8,712 tweets.

Clustering

I tried vectorizing my data with `CountVectorizer()` and `TfidfVectorizer()` and `ngram_range = (1,1)`, `(1,2)`, `(1,3)`, and `(1,4)`. In the end, `TfidfVectorizer()` with `ngram_range = (1,1)` worked the best. The 8,712 tweets produced a vector of 11,295 words.

² stopwords were removed when vectorizing

For dimensionality reduction, I tried Latent Semantic Analysis (LSA) and Non-Negative Matrix Factorization (NMF) with number of components equal to 5, 10, 15, 20, 25 and 30. In the end, NMF with 10 components provided sensible topics. Additionally, I am interested in the tweets which belong in clusters 6 and 10 as they seem to be related to the economy.

Cluster	Topic	Top 5 Words	Number of Tweets
1	Elections / Platform	vote, crime, endorsement, military, strong	421
2	Making America Great	america, make, great, making, safe	431
3	Fake News	news, fake, media, cnn, people	786
4	Praising Hard Work	thank, working, hard, love, maga	549
5	Witch Hunt	hunt, witch, collusion, mueller, history	414
6	Trade / Tariffs	china, united, states, trade, korea	1,078
7	Border Wall	border, wall, democrats, security, want	809
8	Trump / Obama / Hillary	president, trump, obama, campaign, hillary	1,521
9	Issuing Praise	great, today, honor, congratulations, job	1,442
10	General Economy	jobs, market, economy, time, tax	1,261
Total			8,712

To assign clusters to each tweet, I took the maximum NMF component. I also tried clustering with K-means (K = 5, 10, 15, 20, 25 and 30), but NMF worked better. To be highly confident the tweets were assigned correctly, I filtered the tweets to only include those where the max component was at least 0.10. Additionally, I was interested in tweets with strong sentiments (either negative or positive) so I filtered the tweets to only include those with absolute sentiments of at least 0.70.

Tweet	Cluster (Component Score)	Sentiment Score
This is the time for Mexico with the help of the United States to wage WAR on the drug cartels and wipe them off the face of the earth. We merely await a call from your great new president!	Cluster 6 (0.065)	0.7269
Our Economy and Jobs Market is BOOMING the best in the World and in our Country's history - and we have just started!	Cluster 10 (0.243)	0.6369
I will be in Green Bay Wisconsin this Saturday April 27th at the Resch Center — 7:00pm (CDT). Big crowd expected! #MAGA https://t.co/BPYK8PF0O8	Cluster 1 (0.016)	0.000
I am in the process of interviewing some really great people for the position of White House Chief of Staff. Fake News has been saying with certainty it was Nick Ayers a spectacular person who will always be with our #MAGA agenda. I will be making a decision soon!	Cluster 3 (0.070)	0.5095
Melania and I were thrilled to join the dedicated men and women of the @USEmbassyFrance members of the U.S. Military and their families. https://t.co/ZSdsJ0Bsbl	Cluster 9 (0.016)	0.7964

None of the tweets above made it to the final dataset for analysis because none of them had a component score greater than or equal to 0.10 *and* a sentiment score of at least 0.70. Below are a sample of the 81 tweets in cluster 6 and 83 tweets in cluster 10 which fit these criterion.

Tweet	Cluster (Component Score)	Sentiment Score
The deal I just made with China is by far the greatest and biggest deal ever made for our Great Patriot Farmers in the history of our Country. In fact there is a question as to whether or not this much product can be produced? Our farmers will figure it out. Thank you China!	Cluster 6 (0.127)	0.8957
Heading to Montana and Florida today! Everyone is excited about the Jobs Numbers - 250000 new jobs in October. Also wages rising. Wow!	Cluster 10 (0.114)	0.7351

Tweet	Cluster (Component Score)	Sentiment Score
China is targeting our farmers who they know I love & respect as a way of getting me to continue allowing them to take advantage of the U.S. They are being vicious in what will be their failed attempt. We were being nice - until now! China made \$517 Billion on us last year.	Cluster 6 (0.118)	0.743
The United States must at long last be treated fairly on Trade. If we charge a country ZERO to sell their goods and they charge us 25 50 or even 100 percent to sell ours it is UNFAIR and can no longer be tolerated. That is not Free or Fair Trade it is Stupid Trade!	Cluster 6 (0.122)	-0.8613
A great deal of good things happening for our country. Jobs and Stock Market at all time highs and I believe will be getting even better!	Cluster 10 (0.210)	0.8720

Return Calculations

In order to determine if Trump's tweets send any insight about the stock market, I calculated daily open/close returns for the S&P 500 since his inauguration. I then calculated the returns after his tweets in the following manner:

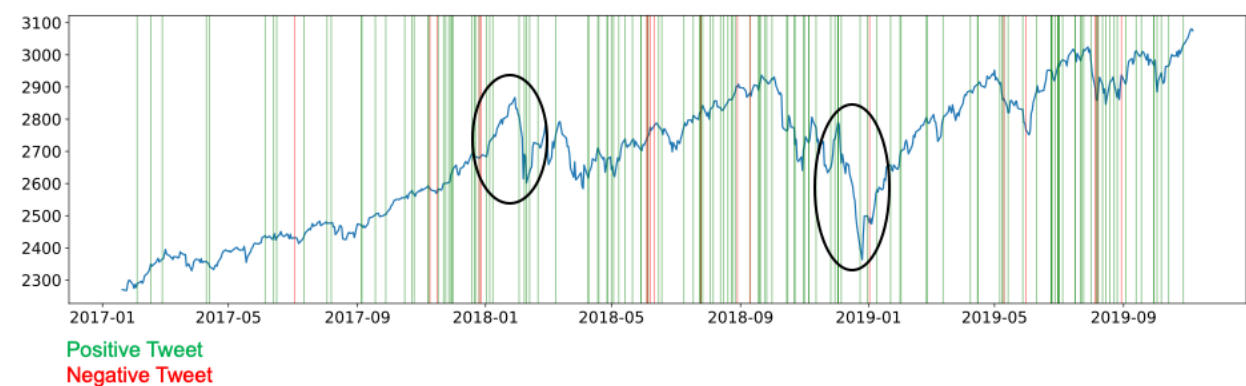
Time of Tweet	Return Calculation
Before Market Open	Buy at today's open and sell at today's close
During Market Hours	Buy at today's close and sell at tomorrow's close
After Market Closes	Buy at tomorrow's open and sell at tomorrow's close

If his tweets send signals about the stock market, the returns after his tweets should be overall different from the daily returns on any day.

Results

Timing of Tweets Relating to the Economy

The chart below shows the timing and sentiment of the 164 tweets in clusters 6 and 10 I analyzed on top of the S&P 500 daily price. There is a lot going on in this chart. However, one interesting item I noticed was that there were no qualifying tweets during the rapid increase at the beginning of 2018 and during the sharp decline at the end of the year.

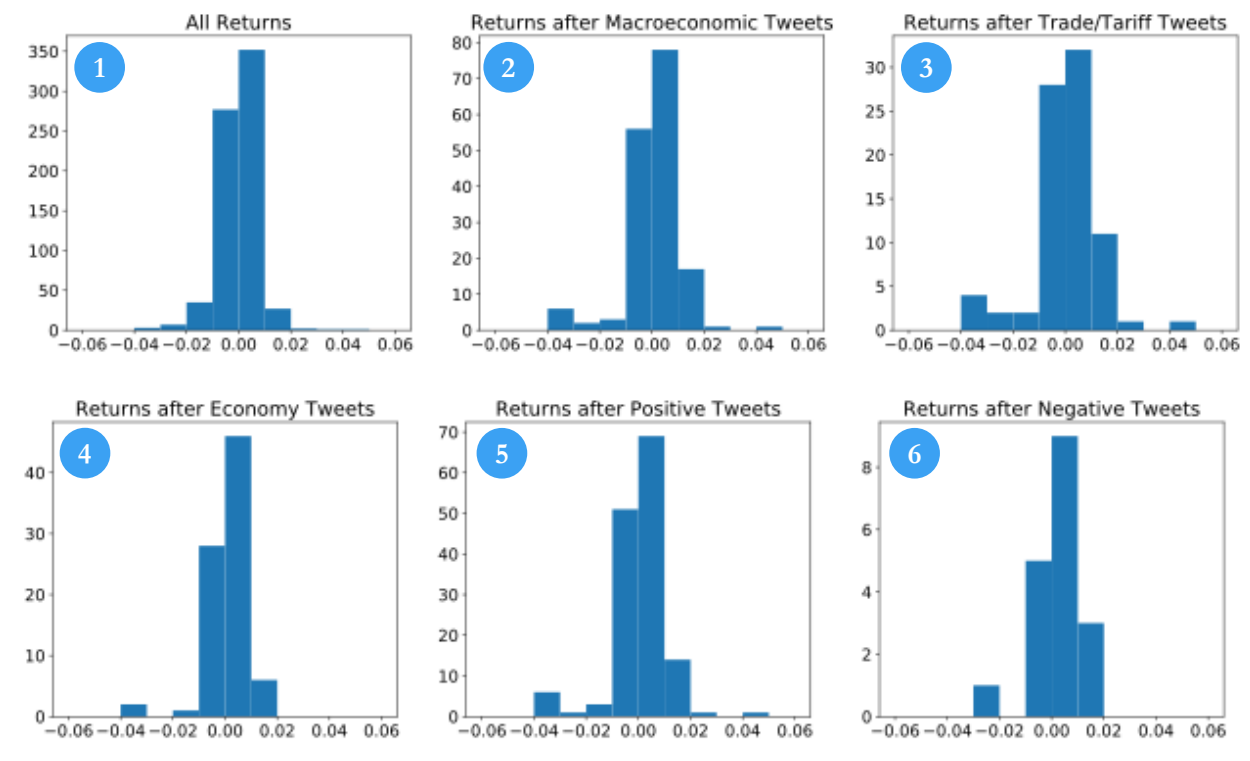


S&P 500 Returns

The charts below show the distribution of S&P 500 returns.

Chart #	Chart Description
1	All daily returns (from open to close of same day) since inauguration; used for comparison

Chart #	Chart Description
2	Calculated returns after tweets in clusters 6 and 10
3	Calculated returns after tweets in clusters 6
4	Calculated returns after tweets in clusters 10
5	Calculated returns after positive tweets in clusters 6 and 10
6	Calculated returns after negative tweets in clusters 6 and 10



As you can see, the returns after his tweets look pretty much the same as returns on any day. I was not able to find any patterns.

Final Comments

Future Enhancements

To improve my analysis, I would like to calculate returns immediately (a few seconds) after a tweet. For my project, I only had daily open and closing prices. I would also like to look at other financial indices such as the Dow Jones or interest rates and individual companies' stocks. For my analysis, I only presented S&P 500. Finally, I would like to pick out the tweets that occur before big financial movements (not just those tweets related to the economy) and see if they have any patterns.

Appendix – VIX

I did not get a chance to present these results, but I also took a look at returns from the volatility index, VIX. The takeaway here is largely the same as the S&P 500. No patterns detected.

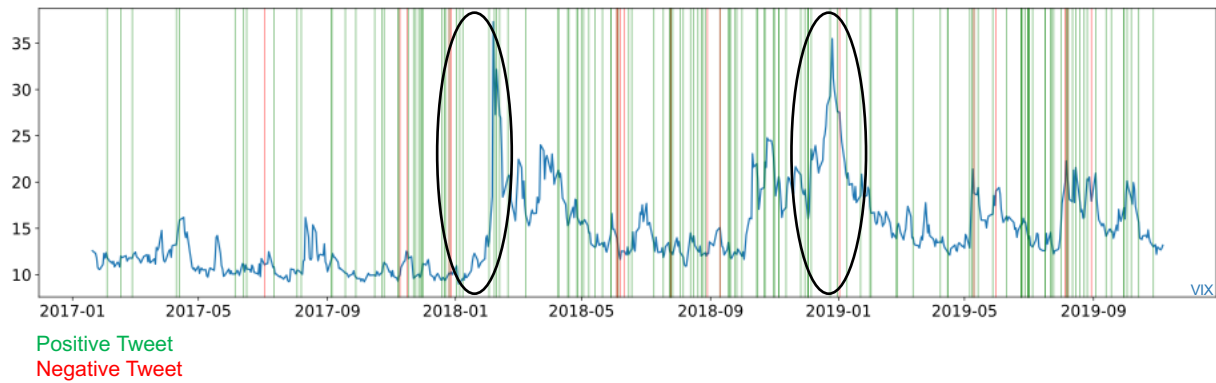


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