Analyzing the Influence of Presidential Candidates' Tweets on Stock Market Volatility: A Dynamic Topic Modeling Approach

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Research Topic

- Aiming to explore the impact of President Donald Trump's tweets on stock market volatility
- Leveraging Dynamic Topic Modeling (DTM) to analyze the temporal evolution of tweet topics and their impacts on the market indices

Background

- Predicting stock prices is critical to investors, financial markets, and the broader economy.
- Previous studies have shown that tweet moods correlate with market movements, as Twitter quickly disseminates information, making it essential for gauging market sentiment and public opinion.
- Researchers have found that Trump's tweets are followed by increased market uncertainty, trading volume, and sometimes negative market returns.
- By focusing solely on specific words, the study may overlook the political timeline influence on market behavior.
- Thus, integrating temporal political factors into the analysis could provide a more holistic perspective on the impact of politicians' social media activity on financial markets.

Data

- Trump Twitter
  - Source: Twitter Stance Election 2020
  - Duration: 2020.02 ~ 2020.11 (weekday 9AM to 4PM)
  - All tweets(9,868) during the election period
- Stock Market Data
  - Source: Alpha Vantage Stock API
  - Duration: 2020.02 ~ 2020.11 (weekday 9AM to 4PM)
  - S&P 500 data per minute (81,806) during the election period

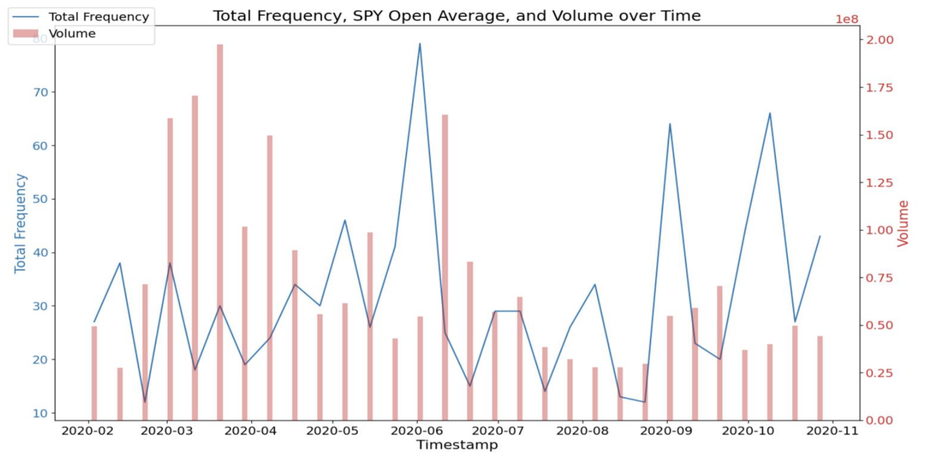
Methods

- Tweet Topic Modeling
  - Categorizing Trump's tweets with BERTopic into top 20 frequently mentioned topics

- Macro Analysis
  - Comparing between total frequency of all the topics and S&P 500 volumes within the same timeline (2020.02 ~ 2020.11)
- Micro Analysis
  - Analyzing the impact of the frequency of each topic on the average S&P 500 volumes across different time intervals (10min, 20min, 30min, 60min)

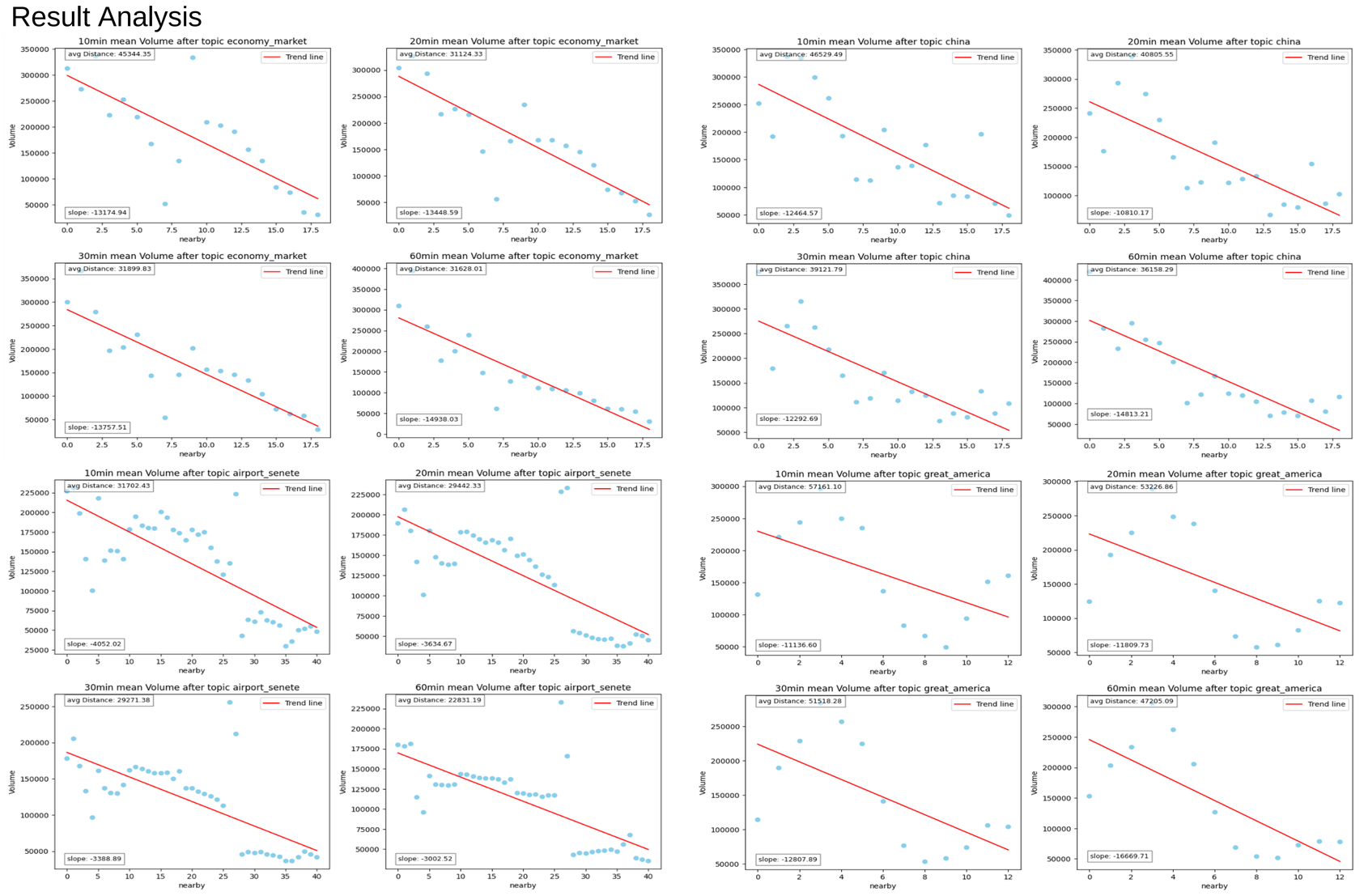
Macro Analysis Results

- Research Hypothesis
  Higher frequencies of tweets lead to larger stock trading volumes on a monthly scale.
- Result Analysis
  - Analyzing the aggregation of the top 20 most frequently mentioned topics, there is no significant trend.
  - Compared to the peaks of tweets' frequencies (blue line), the S&P 500 volumes are relatively low.
  - Similarly, compared to the peaks of S&P 500 volumes (red bar), tweets' frequencies are relatively low.

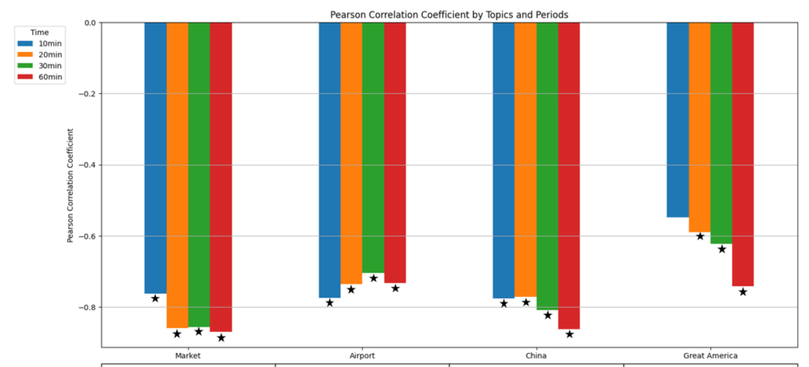


Micro Analysis Results

- Research Hypothesis
  A Trump tweet is more influential to stock market volatility when there are fewer recent tweets on the same topic.
- Result Analysis



Note:
- `Nearby`: The number of tweets for each topic within a 14-day period before the next tweet on the same topic
- `Volume`: The average of 10/20/30/60-minute S&P 500 volumes after the tweeted time of a given tweet



	10min	20min	30min	60min
Market	-0.763	-0.86	-0.857	-0.87
Airport	-0.775	-0.735	-0.704	-0.733
China	-0.776	-0.772	-0.809	-0.862
Great America	-0.548	-0.589	-0.623	-0.742

- Strong negative correlation between the number of tweets on the same topic within 14 days and average trading volume, except for market-irrelevant topics like "Great America".
- Most topics exhibit statistically significant differences across various time intervals.

Discussion and Limitation

- High topic frequency within 14 days leads to decreased stock volatility.
- Most topics show statistically significant differences across time intervals, indicating Trump's tweets impact lasts up to one hour.
- Potential for clearer correlation and accurate assessment of market sensitivity to specific topics by using sentiment-based weighting methods such as VADER or GPT.
- Challenges in obtaining general and robust results due to reliance on the number of tweets during market hours and topic diversity.
- Despite data limitations, a valuable attempt to explore the impact of prominent politicians' tweets on stock market volatility.