# News and Expected Volatility in the Stock Market

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MACS 30200 Project: Literature Review

## 1. Research Question

What is the relationship between news and expected volatility in the stock market?

## 2. Literature Review

### 2.1 VIX index

VIX is a popular measure of the stock market's expectation of volatility implied by S&P 500 index options, calculated and published by the Chicago Board Options Exchange (CBOE). It is colloquially referred to as the fear index or the fear gauge. Prior work has considered the relationship between the implied volatility index and stock market returns. A significant negative and asymmetric contemporaneous relationship between stock returns and changes in implied volatility (Whaley, 2000; Giot, 2005)

Asset pricing theory holds that fluctuation in options implied volatility can predict stock market returns to some degree. Merton (1973) found that implied volatility measures fluctuation in expected stock market volatility. Drechsler and Yaron (2011) found that implied volatility measures variance risk premium. Some researcher also discovered that the option implied volatility can predict large economics disasters (Gabaix, 2012; Wachter, 2013; Gourio, 2008, 2012). These researches illustrate the importance of predicting VIX – one of the target of my project.

## 2.2 News and Stock Market

Some financial economics research works have evaluated the impact of news on stock returns as well as volatility of the returns. Researchers have found that the arrival of firm-specific news have relationship with both stock prices and volatility. Earlier researchers focused on news that are known in advance, such as dividend announcements, earnings results in annual reports. For instance, Woodruff and Senchak (1988) found that much of the market adjustment occurs in the first 30 minutes following corporate announcements.

More recently, analyzing context and quality of news content has driven the identification of a broader range of news. The relationships between the news and stock returns and stock volatility have been confirmed by these researches.

The relevance and sentiment of news has been tested in a variety of market settings with reference to stock returns. Tetlock et al. (2008) find that a quantitative measure of language can predict firms' earnings and stock returns, Dzielinski (2011) finds that positive (negative) news results in above (below) average returns. Smales (2012) find that high-relevance news induces an increase in market activity, with negative news sentiment having a greater impact than positive news.

There are some studies about the relationship between news and stock market volatility as well. These researches are the most inspiring part of the literature reviews. They provide ideas about where to find data sources, how to analyze the content and sentiment of news, as well as how to analyze the relationship between stock volatility and news.

Zadeh (2009) harvested all the meeting minutes from the Federal Reserve Board website, split the documents into individual units corresponding to sentences, and tokenize the

sentences. The researcher then developed a framework that allows predicting realized volatility in stock market prices from Federal Reserve Board meeting minutes.

Smales (2014) used Ravenpack's Multi-Classifier for Equities sentiment indicator to confirm the "significant negative relationship" between 2000 - 2010 news releases and market volatility, measured by the implied volatility index.

Manela and Moreira (2016) constructed a text-based measure of uncertainty starting in 1890 using front-page articles of the *Wall Street Journal.* They found that News implied volatility peaks during stock market crashes, times of policy-related uncertainty, world wars and financial crises.

## 2.3 Analyze news and Stock Market using NLP approach

I plan to fully use Natural Language Processing (NLP) to analyze news sentiment, extract topics, and classify news. The following researches broaden my horizon of how to apply specific NLP methods in financial news analysis. For example, I learn that I can I can use topic modeling algorithm to extract themes from news articles and use SVM and Naïve Bayes models to classify them. In addition, I learned how to build prediction models to predict market activities.

NLP has been used to facilitate 'news-based trading'. In practice, some analysts seek to isolate financial news that affects stock prices and/or market activity (Das & Chen, 2007). Using an Naïve Bayes classifier, Gidofalvi (2001) classified textual data associated with upward-trending and downward-trending stock, establishing significant a predictive relationship between financial news and stock market activity.

Schumaker and Chen (2009) employed the 'Arizona Text Extractor (AzTeK) system's bag of words, noun phrases and NER analyses, combined with 'supervised learning of SVM regression' to classify news articles for use in subsequent stock price changes prediction.

Li X et al. (2014) used Chinese news articles and Hong Kong Exchange market prices, to successfully predict Hong Kong stock prices by employing TF-IDF term weighting and with multi-kernel SVM regression.

Malo et al. (2014) used an LPS model (a hybrid of rule-based linguistic models and machine-learning techniques) and a multi-class SVM algorithm to analyze the sentiments of debt disclosures in 10,000 financial news articles. Based on these models, they generated a lexicon of finance phrases and a general model to assess the 'semantic orientations' (positive, negative or neutral sentiment) of finance-related narratives.

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