Social Media-Based Forecasting: A Case Study of Tweets and Stock Prices in the Financial Services Industry

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ABSTRACT
Social media-based forecasting has received significant attention from academia and industries in recent years. With a focus on Twitter, this paper investigates whether sentiments of the tweets regarding the 7 largest US financial service companies (in U.S. dollars) are related to the stock price changes of these companies. The authors’ findings indicate, in the financial services context, negative sentiments predict firms’ future stock prices. However, the number of and the positive sentiment of tweets are not correlated with stock prices. The findings of this paper suggest the possible predictive value of social media data on stock prices at the company level.

KEYWORDS
Forecasting, Sentiment Analysis, Social Media, Stock Market, Twitter

1. INTRODUCTION
Researchers have always been interested in finding ways to predict what will happen in the future. Many techniques have been developed to predict future outcomes using data-based models (Schoen et al., 2013). In recent years, social media-based forecasting has received significant attention from academia and industries. In particular, using social media data to predict stock market movement has become an important topic in both academia and industries. Researchers have, with some success, utilized a number of methods, indicators, and variables to predict stock market changes based on data collected from web forums, Twitter, news articles and blogs (Tumarkin & Whitelaw, 2001; Antweiler & Frank, 2004; Choudhury, Sundaram, John, & Seligmann, 2008; Gilbert & Karahalios, 2010; Bollen et al., 2011; Zhang et al., 2011; Sul, Dennis & Yuan, 2014; Li, Xie, Chen, Wang & Deng, 2014; Jiang, Chen, Nunamaker & Zimbra, 2014; Liu, Wu, Li & Li, 2015). For example, using sentiment analysis on a large corpus of Twitter messages, Bollen et al. (2011) found that the mood of the Twitter population was able to predict the movement of the Dow Jones Industrial Average (DJIA) on the following day with a claimed accuracy of 87.6%. Zhang et al. (2011) also found that the collective hope and fear embedded in twitter feeds are correlated with Dow Jones, NASDAQ and S&P 500. However, with a few exceptions (e.g., Sul et al., 2014), these studies have typically use aggregated social media data to predict stock movement at the general market exchange level, such as the ups and downs of Dow Jones Industry Average and NASDAQ. The use of social media to predict stock market performance at the company level, a subject that could be of great interest to managers and practitioners in the financial services industry, has been relatively neglected.

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This study aims to fill this gap by exploring the relationship between social media data concerning a company and the company’s future stock prices. In the financial industry, companies’ stock prices are significantly affected by perception (Zhang et al., 2011), making tweets a possible indicator for forecasting. Therefore, we chose to focus our study on the predictive utility of Twitter sentiment and tweet volume on the movement of stock prices for financial services companies. This study compliments current social-media based forecasting literature by focusing on the predictive power of tweet sentiment on an individual firm’s stock price rather than on overall market performance. Our results reveal the potential value of social media data and sentiment analysis in investment and financial analysis at the company level. This study provides additional evidence highlighting the usefulness of online social media data in the finance context. The results of this study may provide useful insights for investors, financial analysts, and decision makers in financial companies. The remainder of the paper is organized as follows. Section 2 provides a brief literature review of social media-based forecasting and sentiment analysis. Section 3 presents a case study that analyzes the relationship between tweets collected from seven large US financial services companies and changes in their respective stock prices. Section 4 discusses our findings, as well as their implications and limitations. Finally, we provide our conclusions and suggestions for future studies.

2. LITERATURE REVIEW

2.1. Social Media-Based Forecasting and Stock Market Performance

Over the years, social media has become an increasingly important platform through which consumers exchange opinions, feelings, and ideas. Compared with other information sources, such as survey and archival data, social media has several advantages in unveiling individual’s thinking and feelings and predicting firm performance (Cohn, Mehl, & Pennebaker 2004; Tetlock, 2007). First, because of its natural occurrence, social media data can reflect direct and immediate market reactions. Second, since social media data are mostly generated by individual consumers rather than marketers or companies, consumers often consider social media content to be more trustworthy (Levy, Duan, & Boo, 2013). Third, social media data have the ability to simultaneously capture a limitless variety of events and topics occurring in the market. Fourth, social media data provide a continuous stream of consumers’ and investors’ thoughts, feelings, and behaviors over time. Previous research has revealed the strong predictive power of different types of social media in a variety of contexts. For example, Mishne and Glance (2006) used weblog content to predict movie success; Ginsberg et al. (2009) used the search engine query data to detect influenza epidemics; and Ghose and Ipeirotis (2011) analyzed Amazon reviews to predict product sales. Research has also shown that the predictive power of social media on firms’ stock performance can be improved by differentiating between different stake-holder groups (Jiang et al., 2014) and by identifying homogenous stock groups (Liu et al., 2014).

Today, consumer-generated content is exerting greater impact not only on individuals’ decision-making but also on companies’ market performance. Research has shown that social media can predict stock market performance (Karabulut, 2011; Schoen et al., 2013). For example, Choudhury, Sundaram, John, and Seligmann (2008) used temporal aspects of blogs including posting frequency, response times, post ratings, and blogger roles to predict stock market changes. Antweiler and Frank (2004) analyzed the Yahoo! Finance message board to predict stock market volatility. This stream of research has investigated various types of social media outlets, including blogs (Choudhury, Sundaram, John, & Seligmann, 2008), Web searches (Da, Engelberg, & Gao, 2011), discussion boards (Antweiler & Frank 2004), and microblogs (e.g., twitter) (Bollen et al., 2011). The predictors used to predict stock market performance and firms’ stock performance fall into two broad categories: (1) volume-related
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Lessons in Implementing a Learning System in a University: The Academic User Perspective
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