CFGR | FCRG

Canadian Foundation for Governance Research
Fondation canadienne de recherche sur la gouvernance

The Robert Bertram Doctoral Research Awards

2016 RESEARCH REPORT

Is Corporate Tweeting Informative or Is It Just Hype? Evidence from the SEC Social Media Regulation

Mohamed Al Guindy

Smith School of Business, Queen's University

Is Corporate Tweeting Informative or Is It Just Hype? Evidence from the SEC Social Media Regulatory Change

Mohamed Al Guindy
Queen's University
malguindy@business.queensu.ca

ABSTRACT

This paper examines the interaction between firms' use of Twitter and investors' response to tweeting. In particular, it investigates whether corporate use of Twitter is informative or is simply "hype". Using the full universe of all firms listed on the NYSE, AMEX, and NASDAQ since the inception of Twitter, and classifying corporate tweets as general and financial tweets, this paper examines the effects of the April 2, 2013 SEC regulation change that allows firms to use Social Media as an official channel to communicate with investors. The main findings of this paper are: i) corporate tweeting prior to the SEC ruling was largely "hype" and that, ii) corporate tweeting after the SEC ruling became informative; corresponding to a 20 basis points increase in returns on financial tweeting days – an effect that is not reversed on subsequent days.

JEL classification: G10, G12, G14

Keywords: Social Media; Twitter; Information Asymmetry; Textual Analysis; Disclosure; Trading volume; Asset Returns

1. Introduction

On July 3, 2012, Reed Hastings, CEO of Netflix made a controversial posting on Social Media that reads:

"Congratulations to Ted Sarandos, and his amazing content licensing team. Netflix monthly viewing exceeded 1 billion hours for the first time ever in June…Ted, we need even more!"

As seen in Figure 1, the Netflix stock price rose 20% in response to this Social Media posting.

[Insert Figure 1 Here]

On April 2, 2013, as a result of this posting, the Securities and Exchange Commission (SEC) issued a new regulation permitting firms to use Social Media as an official channel to communicate with investors. The SEC also stated that Regulation Fair Disclosure (Reg-FD) applies to corporate Social Media outlets. According to the Financial Times, "[the April 2013] decision could prompt a sea [of] change in how companies communicate with investors and comes as regulators more broadly grapple with adapting decades-old regulations to new and evolving technologies" (Scannell, 2013).

Diamond and Verrechia (1991) describe models of voluntary disclosure and show that firms can alleviate information asymmetry and reduce their cost of capital by disclosing more information to financial markets. Merton (1987), describes how communicating information through different channels can increase a firms' investor-base and increase the value of the firm. In this paper, I find that after the SEC regulation change, corporate use of Twitter is informative; while prior to the SEC regulation change, corporate tweeting was largely "hype".

I define informative tweets as tweets that correspond to a significant change to a company's stock return, and by necessity, an increase in trading volume. Furthermore, for corporate tweeting to be informative, the change in returns must not be reversed on subsequent trading days. I define "hype" as tweeting that does not correspond to a significant change to a firm's stock return. Moreover, "hype" tweets will correspond to an increase in trading volume; this is precisely the definition of hype: that it predicts a high trading volume with no corresponding effect on returns. Informative tweeting on the other hand, will predict high trading volume coupled with a significant change in returns.

Because of the SEC regulatory change, I hypothesize that corporate use of Twitter has become informative, after having been primarily "hype" prior to the SEC regulatory change. There are several reasons to hypothesize this transformation. Firstly, while corporate use of Twitter is still voluntary both before and after the SEC change, the fact that it is now regulated by the SEC suddenly increases the perceived value of Twitter by both firms and financial markets. This should correspond to a clearer economic signal from Twitter. Secondly, because many firms have been using Twitter, and because the number of firms using Twitter continues to increase, many firms find themselves "forced" to use Twitter as it has become an expectation of the market – and much more so because of the SEC regulatory change. Thirdly, because Reg-FD applies to Twitter use after the SEC regulation change, I expect a shift in behavior around the SEC regulation change in the quality of information on Twitter; CEOs and corporate executives have become directly accountable to the content on Twitter, this puts more emphasis on ensuring that the content of corporate Twitter accounts be both informative and accurate. Necessarily, "hype" behavior is unlikely in the post-SEC regulation change for the reasons listed above. Prior to the SEC regulation change, however, there was no regulatory or economic reason to stop firms from "hyping" their

firm on Twitter. Altogether, these reasons point in the direction that corporate tweeting after the SEC regulation is likely to be informative, while before the SEC change, it is likely to have been largely, but not entirely, hype. This paper tests this hypothesis directly.

While there are various social networks, Twitter is particularly pertinent because investors most often resort to Twitter for corporate information; in fact, Twitter has become the medium of choice for Investor Relations (IR) professionals (Q4 Web Systems, 2012). Furthermore, there is evidence that financial analysts and portfolio managers are also turning to Twitter for financial information (Kiladze, 2013). More recently, there are discussions between investment firms and ETF issuers to create a Twitter ETF that tracks the Twitter mentions of a large number of stocks on Twitter (Balchunas, 2015).

Since corporations tweet for various reasons, such as sharing general news, conveying information that may be of interest or novelty to followers, or simply to stay in touch with Twitter followers, there may be a large variance in the informativeness or usefulness of tweets. For example, tweets about the weather or ones that wish people a happy weekend are not of relevance to financial markets. However, tweets about a company's financial performance, or about revenue or dividends, are of prime importance. I get around this complication by using textual analysis to classify tweets according to their content. In particular, I designate a subset of the tweets as financial tweets: ones that strictly contain financial information. This approach allows me to focus on the tweets that are most pertinent without losing generality.

The analysis in this paper will run in two parallel lines. First, I will consider all corporate tweeting, and then focus on the more important subset of financial tweeting. The analysis will cover the periods before and after the SEC regulation change of April 2, 2013, covering one year

centered around the regulation change. I will consider the pre and post periods separately before conducting tests on the full sample to test the effect of the regulation change.

This paper will proceed as follows: Section 2 will review the literature and state the main hypothesis. Section 3 will describe the data used in this paper, particularly the Twitter dataset, and provide summary statistics. Section 3 will examine the determinants of firms' decision to initiate a Twitter account, as well as the determinants of daily tweeting. Sections 4 will examine the market response to tweeting before and after the SEC regulation change. I particularly determine whether tweeting predicts returns and/or trading volume on tweeting days. I conduct this analysis in three ways: first, I use a standard OLS regression analysis, then I use a simple event study set-up before conducting a more rigorous vector autoregressive analysis. Section 5 considers alternative hypotheses and conducts a number of robustness tests and section 6 concludes the paper.

2. Literature review and testable hypothesis

This paper relates to a number of areas in the literature. In particular, it relates to the literature on information asymmetry, firm visibility, selective disclosure, and the emerging literature on Social Media. From a theoretical perspective, this paper relates to the models of selective disclosure of Diamond and Verrechhia (1991), investor recognition of Merton (1987), and the economics of gathering and processing information by Grossman and Stiglitz (1980). Twitter serves as a channel of selective corporate disclosure, a way to increase a firm's investor recognition, and as a mechanism to facilitate the process of gathering and processing information from the perspective of investors.

The methodology of this paper, in part, borrows heavily from Tetlock (2007). Tetlock used a Vector autoregressive framework to examine the role of the media in stock markets. He showed

that pessimism expressed in a popular Wall Street Journal column predicts lower stock returns, which revert back to normal within the trading week. Tetlock also reported an abnormally high trading volume on days of high/low pessimism. This is especially relevant to this paper in that I examine whether corporate tweeting is associated with higher stock returns and trading volume, as well as whether this effect is reversed during the trading week.

As for the "hype" hypothesis, Gurun and Butler (2012) show that local media tends to "hype" news about local companies that advertise on the media sources. Solomon (2012) shows that news about companies can sometimes be "spinned" by Investor Relations (IR firms), but that investors cannot be fooled forever by the spinning of news in that such firms experienced return reversals. In this paper I seek to determine whether firms use Twitter as a "hype" mechanism or whether it is indeed informative.

In recent years, investors and financial markets have begun to rely on newer methods to gather and process information in financial markets. Increasingly, investors search for financial information on Google. Da, Engelberg and Gao (2011) show that search frequency for firms on Google (Google SVI), predicts higher stock prices that later experience reversals. Drake, Roulstone and Thornock (2012) show that search frequency on Google peaks during firms' earnings announcements season. Chen, De, Hu and Hwang (2014) investigate the value of stock opinions transmitted on Seeking Alpha, a popular financial crowd-source platform and find that those discussions predict stock returns.

More recently, investors are turning to Twitter for financial information about firms. Blankespoor, Miller and White (2014), using a sample of 141 technology firms, find that firms that use Twitter to disseminate information achieve lower bid-ask spreads and greater abnormal

depths, consistent with a reduction in information asymmetry and an increase in liquidity. Jung, Naughton, Tahoun and Wang (2015) focus on corporate dissemination of earnings announcements on Twitter to show that for SP 1500 firms, firms that receive less media coverage are more likely to use Twitter. They also show that firms can improve their information environment using Social Media. Chen, Hwang and Liu (2016) show that CEOs/CFOs personal tweets can increase investor and customer base and improve stock liquidity, but that this effect is subsequently reverted; thus destabilizing prices. Chawla, Da, Xu and Ye (2015) find, using brokerage accounts from TD Amertitrade, that the diffusion of trading news on Twitter contributes to lower bid-ask spreads and positive price pressures on news days.

This paper advances the literature in at least four ways: first, it makes the most general conclusions about corporate use of Social Media since the dataset comprises the full universe of all companies listed on all major US exchanges since the inception of Twitter. Secondly, it introduces a new methodology to identify a subset of corporate tweets as financial tweets, thus making a distinction between "noisy" tweets and those that are most pertinent (while equally analyzing both). Thirdly, this paper is agnostic towards whether corporate tweeting is informative or whether it is simply "hype". Finally and most importantly, this paper is first to directly test the effect of the SEC regulatory change regulating firms' use of Social Media.

The main hypothesis of this paper is that corporate financial tweeting prior to the SEC regulatory change is primarily hype, characterized by no change in returns and a large increase in trading volume. Tweeting after the SEC regulatory change is informative: characterized by a change in returns that is not reversed during the trading week, as well as an increase in trading volume.

3. Data and summary statistics

I start this research with a Twitter dataset comprising nearly 5 million corporate tweets. The tweets are all tweets listed on firms' official Twitter accounts. Because the objective of this paper is to isolate the effect of firms' tweets, I removed tweets that constitute replies to other Twitter users. These are the tweets in which the firm replies to questions or concerns from customers or other individuals. I also remove tweets that do not originate from the firm, but are re-tweets from other users. This effectively ensures that the sample set comprises only tweets that unambiguously originate from the firm.

I conducted textual analysis on the text of tweets to identify a subset of tweets as financial tweets. Financial tweets are those that strictly contain information that is relevant to financial markets. To conduct the textual classification on the tweets, I compare the content of the tweets against a list of financial keywords that I prepared, and which include such words as: stock, news, analyst, dividend, revenue, and other words as well as the derivatives of such words. A full list of all the financial words is shown in Appendix B. Since Twitter imposes a character limit of 140 characters per tweet, firms often use abbreviations or short-hand forms, such as "qtr 3" or "Q3" instead of writing the full 'Quarter 3'. This being the case, I augment the list of financial keywords with a number of abbreviations that are frequently used on Twitter such as the ones listed above. While this step is useful in accounting for the nature of the Twitter-specific language, it leads to the possibility of introducing false positives to the classification scheme. To overcome this difficulty, as well as the possibility that some financial words may carry a non-financial meaning (the word 'share' for example), I require that a tweet contains at least three of the keywords from

the list of financial words[1]. This conservative approach ensures that a tweet is only classified as financial when it almost certainly is and nearly eliminates the possibility of Type I errors. This classification mechanism identifies approximately 1% of all tweets as financial tweets. Although this methodology might mean that some tweets that are actually financial not be classified as such (Type II errors), it is much more important to ensure that the subset of tweets labeled as financial be certainly so. To put things in perspective, the goal of this classification is to provide a sample of tweets that are most pertinent to financial markets.

For those tweets that are classified as financial, I further classify them as positive or negative in tone. For this purpose, I use the Loughran and Macdonald (2011) sentiment classification[2], available on Bill MacDonald's website: http://www3.nd.edu/~mcdonald/Word_Lists.html. Using this methodology, tweets are classified as positive, negative, or neutral in tone. Because the textual content of each tweet is restricted by the character limit, many tweets are unclassified – or classified as neutral[3].

After performing this analysis at the tweet level, the Twitter dataset is merged with the corresponding data from WRDS. In particular, stock prices, returns, market index and daily trading volume information are obtained from the CRSP daily file. I restrict the analysis to common shares (share code 10 and 11), and remove financials and firms in regulated industries: SIC codes (6000-6999) and (4900-4999). Firm characteristics, particularly accounting data, are obtained from the

[1] In other tests, I defined financial tweets as ones that included at least 2 (rather than 3) keywords from the list of financial keywords. However, based on inspection of the tweets, many of the tweets identified using this method were false positives. Thus, I opted for the more conservative specification that requires that the tweet contains 3 words from the list of financial keywords.
[2] An alternative method of classifying linguistic tone is to use the Harvard IV-4 psychosocial dictionary. But since the classification is applied specifically to financial tweets, I use the Loughran and Macdonald, 2011 dictionary since it has shown to perform better in classifying financial language.
[3] Tweets with an equal number of positive and negative words are classified as "neutral" or unclassified.

Compustat annual file. Analyst coverage data is obtained from I/B/E/S, and institutional data from the Thomason Reuters 13F filings. CEO information is obtained from Compustat Executive Compensation file. A detailed list of all the parameters used, their descriptions and sources can be found in Appendix A.

3.2 Descriptive Statistics

Table 1 depicts descriptive statistics showing a summary of Twitter use by industry based on the Fame & French 48 industry classifications as of June 30, 2013. The table shows the industry, followed by the total number of firms in that industry as well as the number of firms that operate a corporate Twitter account, and the firms that tweet financial information in particular.

Of the 2595 firms in the sample as of June 30, 2013, 1420 or approximately 55% of firms use Twitter. Of those firms that use Twitter, another 626 firms (or 44% of tweeting firms), use Twitter to communicate financial information. The table shows that Twitter adoption varies widely depending on the industry; for example, Business Services, Computers, Restaurants, and Retails have some of the highest levels of Twitter use. On the other hand, textiles, shipbuilding and mining companies exhibit the lowest Twitter adoption levels.

[Insert Table 1 here]

Table 2 shows firm characteristics for tweeting and non-tweeting firms before and after the SEC regulatory change of April 2, 2013. Tweeting firms are generally larger in size, have a higher payout ratio, greater institutional ownership and are followed by more analysts than non-tweeting firms. Moreover, tweeting firms have lower dispersion of analyst forecasts. And the CEO's of such firms are generally younger.

[Insert Table 2 here]

Table 3 shows tweeting descriptive statistics before and after the SEC regulation change. The table shows that the average firm that operates a Twitter account, tweets on approximately 50% of the days prior to the SEC regulation change and on 55.8% of days after the SEC regulation change. Among the financial tweets, 7.6% and 7.16% are identified as negative tweets before and after the SEC regulation change.

[Insert Table 3 here]

3. Why do firms tweet?

Next, it is useful to explore the question of what drives a firm to tweet. I deal with this question in two ways. First, I identify firm characteristics that predict a firm's likelihood to initiate a Twitter account, as well as a firm's likelihood to tweet financial information in particular. After identifying firm characteristics that predict the decision to initiate a Twitter account, or to tweet financial information, I then identify the determinants of a firm's decision to tweet on a given day.

Table 4 examines the determinants of a firm's decision to operate a Twitter account and the determinants of beginning to tweet financial information. The table shows estimates from a probit regression where the dependent variable takes a value of 1 when a firm operates a Twitter account for a given year and 0 otherwise. The independent variables are firm characteristics: beta, book to market, size, leverage, return on equity, payout, percentage of institutional holdings, number of analysts following the firm, and the dispersion of analyst forecasts. Year and industry fixed effects are included. For the 'Financial Use of Twitter' section of the table, a similar probit regression is used whereby the dependent variable takes the value of 1 when the firm tweets financial information during a given year. The 'Financial Use of Twitter' section of the table

contains two columns: one where the set of financial tweeting firms is considered relative to all firms, and the second where the set of financial tweeting firms is considered relative to firms that already operate a Twitter account. Throughout this analysis, firm and year fixed effects are included.

Firms with higher CAPM beta are more likely to operate Twitter account, but within the group of tweeting firms, a lower beta predicts tweeting financial information in particular. A low book to market ratio predicts tweeting, showing that growth firms are more likely to tweet than mature firms. Firm size is a predictor of tweeting; larger firms are more likely to tweet, and within the tweeting subset, they are more likely to tweet financial information. This is consistent with Diamond and Verrechia (1991), that larger firms disclose more information since they benefit more from additional disclosure. In addition, firms that are followed by more analysts are more likely to tweet. Firms with less leverage are also more likely to tweet, and especially tweet financial information. This is consistent with the notion that tweeting companies target their equity holders, and as the proportion of equity in the firm's capital structure increases, so is the propensity to tweet – precisely to reach out to equity holders. Similarly, firms with less institutional ownership, holding everything else constant, are more likely to tweet, and especially to tweet financial information. This can be interpreted as firms with more retail investors being more likely to tweet in an attempt to reach out to the retail investor-base that is more likely to respond to Twitter.

[Insert Table 4 here]

After making the decision to operate a Twitter account, firms further make the decision to tweet (or to tweet financial information) on a given day. To identify determinants of daily tweeting, I set up a panel logistic regression with firm fixed effects where the dependent variable takes a

value of 1 if a firm tweets on a given day[4]. In a second model, a financial tweeting day takes the value of 1 if a firm tweets financial information on a given day. Table 5 shows the results of the logistic regression for all tweeting and for financial tweeting, both before and after the SEC regulation change on a daily basis.

[Insert Table 5 here]

Before the SEC regulation change, firms were more likely to tweet when the market had performed poorly on the previous day. In a way, firms were using Twitter to respond to negative market performance; but not necessarily to negative performance of their own firm. Firms were also more likely to tweet on earnings days, the week before earnings announcements and the week following earnings announcement. Moreover, firms were more likely to tweet when they had tweeted on the previous day or when other firms in their industries are tweeting on the same day. I interpret this as evidence of tweeting autocorrelation, and of industries tweeting together in clusters on the same day.

Financial tweeting, on the other hand, especially after the SEC regulatory change, exhibits different characteristics. Specifically, the financial tweeting decision is not driven by the firm's previous day's return or by the performance of the market – the coefficients on both of these parameters are insignificant. I interpret this to mean that financial tweeting is, on average, driven by "exogenous" events or actual financial information rather than being merely a response to market or firm performance[5].

[4] A tweeting day is defined from the close of market on the previous trading day to the close of market on the current trading day).

[5] I find companies with the least institutional ownership, and thus highest short-sale constraints are least likely to tweet negative information. This logic is consistent with Nagel(2005), that firms with the least institutional ownership are subject to the most short-sale constraints.

As is the case with regular tweeting, financial tweeting after the SEC regulatory change is more likely to occur during the week before and after earnings announcements, as well as on the earnings announcement day itself. Finally, firms are more likely to tweet financial information if they had done so on the previous day, or if other firms in their industry are also tweeting financial information. This result is consistent with the general result of the presence of tweeting autocorrelation as well as tweeting correlation within industries.

Another observation is that after the SEC regulatory change, firms were more likely to tweet financial information rather than general information during the week before and the week after their earnings announcement. This is consistent with the hypothesis that firms' use of Twitter became more focused or relevant after the SEC regulatory change in that their use of Twitter during earnings season became strictly focused on financial information.

4. Market reaction to tweeting

At this point, we wish to turn our attention to the market reaction to corporate tweets. First, I will examine the market reaction to all tweeting, before and after the SEC regulatory change, and then focus on the reaction on the more important financial tweeting days. The goal of this analysis is to determine whether tweeting is associated with higher returns and/or trading volumes on tweeting days.

4.1 Regression analysis

To investigate the relationship between tweeting and returns, I conduct the following OLS panel regression:

$$Return_{it} = \beta_1 * Tweeting\ Day_{it} + \beta_2 * Return_{i,t-1} + \beta_3 * Market\ Return_t + \beta_4 * Tweeting\ Day_{i,t-1} + \beta_5 * VIX_t + \beta_6 * Week\ Before\ Earnings_{it} + \beta_7 * Earnings\ Day_{it} + \beta_8 * Week\ After\ Earnings_{it} + \varepsilon_{it} \quad (1)$$

Return is defined as the 24 hour close-to-close return[6]. Tweeting day is a dummy variable that takes the value of 1 if a firm tweets on a given day. To be consistent with the definition of returns, the tweeting day starts at the close of markets on the previous day and ends at the close of market on the current day. $Return_{i,t-1}$ is the firm's previous day's return (also 24 hour close-to-close return). $Market\ Return_t$ is the value-weighted market index on the current trading day. $Tweeting\ Day_{i,t-1}$ is a dummy that takes the value of 1 if a firm tweeted on the previous day. VIX_t is the market volatility index. *Week before earnings*, and *week after earnings* are dummy variables that take the value of 1 during the week before or the week after earnings announcement day respectively. Day of the week fixed effects are included as well as firm fixed effects to account for the cross-sectional variation between firms. Standard errors are clustered by firms and days as suggested by Petersen (2009). The clustering of standard errors is carried out in all the subsequent analysis.

Overall, tweeting days correspond to an increase of just over 5 basis points for tweeting firms. This effect remains consistent and significant both before and after the SEC regulatory change.

To isolate the effect of the SEC regulatory change on tweeting days, I run the following model:

[6] It is also possible to define returns on a trading day basis rather than on a 24-hour basis. The results are not affected by this choice.

$$Return_{it} = \beta_1 * Tweeting\ Day_{it} + \beta_2 * Tweeting\ Day_{it} * after\ SEC + \beta_3 * Return_{i,t-1} + \beta_4 * Market\ Return_{t} + \beta_5 * Tweeting\ Day_{i,t-1} + \beta_6 * VIX_{t} + \beta_7 * Week\ Before\ Earnings_{it} + \beta_8 * Earnings\ Day_{it} + \beta_9 * Week\ After\ Earnings_{it} + \varepsilon_{it} \quad (2)$$

The difference between this model (model 2) and the previous model (model 1) is that this model is used against the full sample of tweets, both before and after the SEC regulatory change, with a dummy *'after SEC'* that takes the value of 1 after the SEC regulatory change. This dummy is interacted with the *Tweeting day* variable, allowing us to isolate the effect of the SEC regulatory change on returns on tweeting days. The analysis shows that there is no significant change in returns on tweeting days.

[Insert Table 6 here]

Having determined that tweeting days predict higher returns, I now investigate whether it predicts a corresponding increase in trading volume. To test this, I use a similar model to the one used to test returns, but I also control for the previous day's trading volume as follows:

$$Trading\ Volume_{it} = \beta_1 * Tweeting\ Day_{it} + \beta_2 * Return_{i,t-1} + \beta_3 * Market\ Return_{t} + \beta_4 * Trading\ Volume_{i,t-1} + \beta_5 * Tweeting\ Day_{i,t-1} + \beta_6 * VIX_{t} + \beta_7 * Week\ Before\ Earnings_{it} + \beta_8 * Earnings\ Day_{it} + \beta_9 * Week\ After\ Earnings_{it} + \varepsilon_{it} \quad (3)$$

given day′. As usual, firm and day of the week fixed effects are included, and standard errors are clustered by firm and day. The results of this test confirm that tweeting firms experience an abnormally high trading volume on tweeting days both before and after the SEC regulatory change.

[Insert Table 7 here]

[7] When alternative measures of trading volume such as turnover, or log(turnover) are used, the results remain similar

Having seen that tweeting days correspond to a small, but significant increase in returns, the remainder of this paper focuses on the more important financial tweeting days. Financial tweeting is considered more important than general, or "generic" tweeting, because it is immune to the "noise" problem that is often encountered when dealing with Twitter, in that financial tweets strictly contain financially relevant information. This allows us to test the central hypothesis of this paper: whether corporate tweeting is informative or hype on the more important financial tweeting days.

To conduct this analysis, I use a similar set-up to the one used above when looking at the general tweeting behavior. The only difference is that the main variable of interest is *Financial tweeting day* rather than *Tweeting day*. This analysis shows a striking difference between the return on financial tweeting days before and after the SEC regulatory change. Before the regulatory change, the coefficient on the *Financial tweeting day* variable is insignificant, and is, in fact, negative. After the SEC regulatory change, however, the coefficient is positive and significant. The result is both statistically and economically significant, showing an increase in returns on financial tweeting days.

To specifically test the difference between returns on financial tweeting days before and after the SEC regulatory change, I run the regression:

$$Return_{it} = \beta_1 * Financial\ Tweeting\ Day_{it} + \beta_2 * Financial\ Tweeting\ Day_{it} * after\ SEC + \beta_3 * Return_{i,t-1} + \beta_4 * Market\ Return_{t} + \beta_5 * Tweeting\ Day_{i,t-1} + \beta_6 * VIX_{t} + \beta_7 * Week\ Before\ Earnings_{it} + \beta_8 * Earnings\ Day_{it} + \beta_9 * Week\ After\ Earnings_{it} + \varepsilon_{it} \quad (4)$$

The coefficient on the *Financial Tweeting Day * after SEC* term is positive and statistically significant. In particular, it has a magnitude of 23 basis points: indicating that the difference in

returns on financial tweeting days before and after the SEC regulation is a significant 23 basis points. This provides evidence supporting the hypothesis that financial tweeting after the SEC regulatory change became more informative – a situation that was absent prior to the change.

[Insert Table 8 here]

What is surprising, however, is that despite not predicting a significant change in returns, financial tweeting days before the SEC regulation, are associated with a very large trading volume. This provides further support to the hypothesis that financial tweeting before the SEC regulation was largely hype in that it corresponds to a large increase in trading volume with no corresponding effect on returns. After the SEC change, however, financial tweeting days corresponded to a significant increase in both returns and trading volume.

[Insert Table 9 here]

If the hypothesis that financial tweets after the SEC regulation are informative and are not hype, it is necessary that tweeting firms do not experience return reversals on days following financial tweets. Presumably, if the financial tweets after the SEC regulation are hype, then markets will respond by undoing or reversing the returns on subsequent days. I analyze this scenario in two ways: firstly by examining the return behavior using a simple event study setup, and then more rigorously using a Vector Autoregressive framework similar to Tetlock (2007).

Figure 2 shows a plot of cumulative returns as a function of financial tweeting days for the interval [-5, +5] days relative to the financial tweet, the upper figure shows the pre-SEC regulation period and the lower figure shows the result in the post-SEC regulation period. Prior to the SEC regulation change, the market reaction to financial tweeting is primarily noise. This is consistent with the hype hypothesis before the SEC change. Had the return attained a positive value, the hype

hypothesis may have been refuted, but the lack of positive return – and in fact the presence of negative return provides further support to the hype hypothesis.

After the SEC regulation however, there is a clear positive cumulative return that begins on day -1 relative to the tweet, and attains its largest gain on the day of the tweet. Most importantly, this positive cumulative return is not reversed on the five subsequent trading days. I interpret this to be evidence in support of the hypothesis that financial tweeting after the SEC change is informative and is not simply hype. Had it been hype, we would expect the positive returns to be reversed within the trading week.

[Insert Figure 2 here]

Next, we turn our attention to trading volume in the [-5, +5] day interval relative to financial tweeting days. To conduct this analysis, I plot trading volume, defined as the natural logarithm of the number of shares traded[8], for each day in the interval [-5, +5] days relative to the financial tweet. As Figure 3 shows, trading volume is high on financial tweeting days both before and after the SEC change. It remains high on the day following financial tweeting before returning to lower levels two days after the financial tweet. Together with the return results in Figure 2, this is consistent with the "hype" hypothesis – that tweeting before the SEC change contributed merely to higher trading volume on financial tweeting days. Overall, the event-study results are consistent with the results of the OLS regression analysis.

[Insert Figure 3 here]

[8] Using share turnover as an alternate measure of trading volume yields the same results

4.3 Panel VAR Estimates

As an additional step to test the results dictated by the OLS regression and the event study, I conduct a Panel Vector Autogressive analysis similar to Tetlock (2007). The VAR model accounts for contemporaneous and lagged relations between tweeting days and returns. Unlike the standard OLS analysis, the VAR accounts for the complex dynamic relationships between the variables by virtue of directly accounting for the lags of the variables.

In this Panel VAR analysis, I define the endogenous variables to be tweeting days (financial tweeting days) and returns. The exogenous variables are: market return, lagged market return, VIX, earnings announcements day, the week before earnings announcements, and the week after earnings announcements. For the sake of presentation, I lump the exogenous variables into the vector $Exog_t$. I also define the lag operator L of a variable, x_t, using the notation: $L3(x_t) = [x_{t-1}\ x_{t-2}\ xt_{-3}]$ to represent three lags of the variable. I also define $L3_0(x_t)$ to denote the inclusion of the contemporaneous term as follows: $L3_0(x_t) = [x_t\ x_{t-1}\ x_{t-2}\ xt_{-3}]$.

The panel VAR equation is defined as follows:

$$Return_{it} = \beta_1 * L3_0(Tweeting\ Day)_{it} + \beta_2 * L3(Return)_{it} + \beta_3 * Exog_{it} + \varepsilon_{it} \qquad (5)$$

The Panel VAR estimate above is essentially equivalent to a standard OLS regression that includes the lags of the variables and contemporaneous tweeting as independent variables. The key focus of this analysis is the coefficients of the vector β_1. This vector describes the dependence of returns on contemporaneous and previous tweeting days. A summary of the results of the analysis showing the values of β_1 for five lags is shown in panel A of Table 10.

The table shows a consistent result: that returns are associated with tweeting days but not by the lags of tweeting days. In particular, tweeting days are associated with an increase of 17 basis points.

[Insert Table 10 here]

The results of the VAR analysis are consistent with both the regression analysis conducted in Table 8 and the event study of Figure 2. In particular, the result that financial tweeting days matter on the day of the tweet, and not on subsequent days is echoed in Figure 2, ii, where we see that the cumulative return achieves its highest gain on the financial tweeting day, but experiences no change on subsequent days.

5. Robustness tests

5.1 Do previous returns predict tweeting?

It is possible that tweeting is merely driven by the performance of the firm – that firms tweet to respond to their poor performance, or to highlight their good performance on the previous trading day. To ensure that this is not the case, I conduct a panel VAR analysis, similar to the one performed in section 4.3, but where the variable of interest, or the variable being predicted, is '*Tweeting day'* or *'Financial tweeting day'*. This analysis is presented in Panel B of Table 10 using the models:

$$Tweeting\ Day_{it} = \beta_1 * L3(Return)_{it} + \beta_2 * L3(Tweeting\ Day)_{it} + \beta_3 * Exog_{it} + \varepsilon_{it} \quad (6)$$

$$Financial\ Tweeting\ Day_{it} = \beta_1 * L3(Return)_{it} + \beta_2 * L3(Financial\ Tweeting\ Day)_{it} + \beta_3 * Exog_{it} + \varepsilon_{it} \quad (7)$$

The coefficient of interest is the vector β_1 which describes the dependence of tweeting days (or financial tweeting days) on lagged returns. Panel B of Table 10 reports the values of the coefficient β_1 for five lags. The table shows that there is no statistical significance to any of the lagged return parameters. I interpret this to be consistent with the notion that previous returns do not predict tweeting or financial tweeting.

5.2 Changes in tweeting frequency or tone

One competing hypothesis that may explain the change in market returns on financial tweeting days after the SEC regulation is that firms changed "the type" of tweets they tweet. In particular, they may have changed the frequency of financial tweeting, or it may be that the tone of financial tweets has changed: possibly becoming more positive or less negative. I test these possibilities in Table 3. First, I examine whether the difference, using a t-test, between the percentage of financial tweeting days has significantly changed after the SEC regulation. I find that it does not. Secondly, the table shows that the percentage of tweets with negative tone is not statistically different in the pre and post SEC regulation period. This again dispels the competing hypothesis that the return is driven by a change in tone[9].

5.3 New tweeting firms after the SEC regulation change

Another scenario that may refute the findings of this paper is that firms that have begun tweeting, or begun tweeting financial information after the SEC regulation change are responsible for the difference observed in the pre and post periods. It is, at least theoretically, possible that firms that began tweeting after the SEC regulation change behave systematically differently from

[9] In other tests, I find that the tone of the tweet does not affect returns. Returns are affected by the mere presence of tweets irrespective of the tone

other firms that were already tweeting prior to the change. To test this possibility, I repeat the analysis of Tables 8 and 9, examining the returns and trading volume on financial tweeting days, having removed firms that initiated a Twitter account after the SEC regulation change. I find that the results are not affected as shown in Tables 1 and 2 in Appendix C. Furthermore, I conduct an additional test where I remove firms that have begun tweeting financial information after the SEC regulation change. This analysis is shown in Tables 3 and 4 in Appendix C. The results of these analyses are consistent with the findings of this paper.

[Insert Tables 1, 2 from Appendix C]

5.4 Effect of earnings announcements period

It is possible that the main result of this paper – that financial tweeting is associated with high returns after the SEC regulatory change, is driven by earnings announcements. Specifically, it may be that financial tweeting coincides with earnings announcements, and that the earnings announcements are making the financial tweets appear more positive. To address this possibility, I replicate the analysis of tables 8 and 9 having removed earnings announcements days, the week before earnings announcements, and the week after earnings announcements. This analysis is presented in Panel B of each of these tables. The analysis shows that financial tweeting days correspond to positive and significant returns after the SEC regulation change, but are insignificant (and incidentally negative) before the SEC regulation change. Moreover, the difference between the pre and post SEC change is actually higher when excluding earnings season. This result actually strengthens the main result of this paper in that it shows that financial tweeting matters as much, or more, on a daily basis as it does during earnings season. Solomon (2012) showed that news media plays a larger role outside of earnings season than it does during earnings season.

Solomon explains that this is the case because earnings announcement period is already a time where investor attention is high and where information is abundant. However, outside of earnings period, information is more ambiguous to interpret. This may explain, in part, why the result is actually stronger outside of earnings announcements period.

6 Conclusion

The goal of this paper is to answer the question of whether corporate use of Social Media, particularly Twitter, is informative or whether it is simply hype. Furthermore, a second goal is to assess the impact of the SEC regulation change of April 3, 2013 that allowed firms to use Social Media as an official outlet to communicate with investors. The key finding is that corporate use of Twitter prior to the SEC regulation change was largely hype: corresponding to no change in returns and a large increase in trading volume. Following the SEC regulation change, however, corporate tweeting became more informative, corresponding to a large trading volume on financial tweeting days, as well as a statistically significant 20 basis points increase in returns. This increase in returns is not reversed during the next trading days.

Secondary findings of this paper report tweeting autocorrelation in that firms are more likely to tweet if they had tweeted on the previous day. Furthermore, I report an industry level correlation in that firms in the same industry tend to tweet on the same days.

The findings of this paper are most general insofar as the dataset comprises all firms listed on the NYSE, AMEX, and NASDAQ. Furthermore, by focusing on the subset of tweets containing strictly financial information, I am able to disentangle noisy tweets from those that are considered important to financial markets without loss of generality. In particular, I show that financial tweeting, unlike general tweeting, does not happen in response to self or market returns, but is

independent of these considerations. The results are robust to various specifications as well as to alternative hypotheses. Furthermore, the results are not driven by earnings announcements periods, or by firms that began using Twitter, or began tweeting financial information after the SEC regulation change.

References

Balchunas, E. 2015. Hey Finance Twitter, You Are About to Become an ETF. Bloomberg Business (October 15).

Blankespoor, E., Miller, G.S., White, H.D, 2014. The Role of Dissemination in Market Liquidity: Evidence From Firms' Use of Twitter. The Accounting Review, 89(1), 79–112.

Chawla, N., Da, Z., Xu, J., Ye, M. 2015. Catching Fire: The Diffusion of Retail Attention on Twitter. Working Paper, Notre Dame University.

Chen, H. De, P., Hu, Y., Hwang, B.H., 2014. Wisdom of Crowds: The Value of Stock Opinions Transmitted Through Social Media. Review of Financial Studies 27, 1367-1403

Chen, H., Hwang, B.H., Liu, B., 2016. The Economic Consequences of Having 'Social' Executives. Workign paper, City University of Hong Kong, Cornell University, and Florida State University.

Da, Z., Engelberg, J., Gao, P., 2011. In search of attention. Journal of Finance 66 (5): 1461–1499.

Diamond, D., Verrecchia, R., 1991. Disclosure, Liquidity, and the Cost of Equity Capital. Journal of Finance 46: 1325-60

Drake, M., Roulstone, D., Thornock, J., 2012. Investor information demand: Evidence from Google searches around earnings announcements. Journal of Accounting Research 50(4): 1001–1040.

Fama, E.; French, K.,1992. The cross-section of expected stock returns. The Journal of Finance 47, 427–465.

Grossman, S. J., Stiglitz, J.E., 1980. On the impossibility of informationally efficient markets. American Economic Review 70 (3), 393–408.

Gurun, U., Butler, A., 2012. Don't Believe the Hype: Local Media Slant, Local Advertising, and Firm Value. Journal of Finance 67 (2): 561-598.

Loughran, T., McDonald, B., 2011, When is a liability not a liability? Textual analysis, dictionaries, and 10-Ks, Journal of Finance 66, 35–65.

Merton, R. C., 1987. Presidential address: A simple model of capital market equilibrium with incomplete information. Journal of Finance 42, 483–510.

Motley, A., 2011. An Individual Disclosure Decision. IR Update March: 7–10.

Nagel, S., 2005. Short sales, Institutional Investors and the cross-section of stock returns. Journal of Financial Economics 78, 277-309

Jung, M., Naughton, J., Tahoun, A., Wang, C. 2015. Do Firms Strategically Disseminate? Evidence from Corporate Use of Social Media. Working Paper, New York University, Northwestern University, and London Business School.

Q4 Web Systems, 2013. New Q4 Whitepaper: Pubic Company Use of Social Media for IR – Part 1 Twitter & StockTwits (August 15). Available at: http://www.q4blog.com/2013/08/15/new-2013-q4-whitepaper-public-company-use-of-social-media-for-ir-part-1-twitter-stocktwits/

Scannell, K., 2013. Companies allowed to tweet #USearnings. Financial Times (April 2).

Securities and Exchange Commission (SEC), 2008. Commission Guidance on the Use of Company Websites. Release No. 34–58288. Washington, D.C.: SEC.

Securities and Exchange Commission (SEC), 2013. SEC Says Social Media Ok for Company Announcements If Investors are Alerted. Press Release 2013–51.Washington, D.C.: SEC.

Solomon, D., 2012, Selective Publicity and Stock Prices, Journal of Finance 67 (2), 599-637

Tetlock, P., 2007. Giving Content to Investor Sentiment: The Role of Media in the Stock Market. Journal of Finance 62, 1139-1168

Table 1
Summary of Twitter use by industry

This table shows, as of June 30, 2013, for the full sample of all firms listed on NYSE, AMEX, and NASDAQ, the breakdown of Twitter use by industry; where industry is based on the Fama French 48 industry classifications, not included financial firms and regulated industries. The number of companies in a given industry is reported in the first column, the number of companies in that industry that use Twitter is reported next, the number of companies that tweet financial information is reported in the last column.

Industry	# of firms	Use Twitter	Financial use	Industry	# of firms	Use Twitter	Financial use
Agriculture	8	5	3	Coal	12	4	1
Food Products	53	28	9	Petroleum and Natural Gas	132	34	20
Candy & Soda	11	8	2	Communication	95	64	27
Beer & Liquor	10	6	3	Personal Services	44	27	7
Tobacco Products	5	3	3	Business Services	341	260	161
Recreation	16	13	2	Computers	113	87	50
Entertainment	41	23	4	Electronic Equipment	193	121	65
Printing and Publishing	18	14	8	Measuring and Control Equipment	70	43	17
Consumer Goods	53	31	11	Business Supplies	36	17	6
Apparel	41	29	2	Shipping Containers	9	3	2
Healthcare	55	22	6	Transportation	70	36	15
Medical Equipment	110	45	16	Wholesale	95	41	20
Pharmaceutical Products	239	87	52	Retail	161	134	20
Chemicals	70	28	17	Restaurants, Hotels, Motels	50	40	5
Rubber and Plastic Products	15	5	0	Others	21	11	2
Textiles	9	2	0				
				Total	**2595**	**1420**	**626**
Construction Materials	48	16	5				
Construction	40	15	7				
Steel Works Etc.	42	8	5				
Fabricated Products	6	4	1				
Machinery	96	38	17				
Electrical Equipment	54	22	9				
Automobiles and Trucks	52	21	8				
Aircraft	17	9	5				
Shipbuilding, Railroad Equipment	6	1	1				
Defense	9	6	4				
Precious Metals	9	4	4				
Non-Metallic and Industrial Metal Mining	20	5	4				

Table 2
Firm characteristics by Twitter use

This table shows the mean firm characteristics of companies that use Twitter in comparison with companies that do not use Twitter before and after the SEC regulatory change. Under each group, the non-tweeting column represents the mean for companies that do not use Twitter while the Tweeting column represents the mean for companies that use Twitter. The Difference column is calculated using a t-test between the two groups. The Diff-in-diff column shows the difference in the difference between tweeting and non-tweeting firms after and before the SEC regulatory change. The variables are calculated as of June 30 of each year. The pre-SEC sample period is 2007-2012, the post-SEC regulation firm year is 2013. *Beta* is the CAPM beta, *B/M* represents the book to market ratio of equity. *Size* is the natural logarithm of the market value of equity. *Leverage* is the leverage ratio of the firm. ROE is the return on equity. *Inst* represents the percentage of shares held by institutional investors. *Analysts* is the number of analysts following the firm. *Disp* is the standard deviation of analyst forecasts scaled by the absolute value of the mean of forecasts. Finally, *CEO Age* reports the age of the CEO. **, * denote statistical significance at the 1% and 5% levels respectively. Standard errors are reported in parenthesis.

	Before SEC regulation			**After SEC regulation**			**Diff-in-Diff**
	Non-tweeting	Tweeting	Difference	Non-tweeting	Tweeting	Difference	
Beta	1.398	1.359	-0.039*	1.341	1.320	-0.021	0.018
			(0.015)			(0.03)	(0.04)
B/M	0.540	0.621	0.081**	0.783	0.564	-0.219**	--0.300**
			(0.02)			(0.04)	(0.06)
Size	19.605	20.423	0.818**	19.282	20.361	1.108**	0.260**
			(0.033)			(0.08)	(0.09)
Leverage	0.163	0.170	0.0068	0.166	0.169	0.0033	-0.0035
			(0.004)			(0.009)	(0.01)
ROE	0.143	-0.118	-0.261	0.0181	0.110	0.092	0.353
			(0.26)			(0.10)	(0.62)
Payout	0.097	0.127	0.0295**	0.107	0.127	0.020*	-0.0096
			(0.003)			(0.009)	(0.01)
Inst.	59.14	68.21	9.078**	55.837	65.731	9.894**	0.817
			(0.53)			(1.22)	(1.35)
Analysts	7.166	9.971	2.805**	7.129	10.741	3.613**	0.808*
			(0.12)			(0.35)	(0.32)
Dispersion	0.259	0.198	-0.0613	0.312	0.179	-0.134*	-0.072
			(0.032)			(0.05)	(0.08)
CEO Age	55.57	55.37	-0.193	57.27	56.38	-0.893*	-0.700
			(0.17)			(0.44)	(0.47)

Table 3

Tweeting descriptive statistics

This table reports descriptive statistics for corporate tweets during the six months before and after the SEC social media regulation of April 2, 2013, as well as the difference between the two periods. The percentage of tweeting days per firm reports the tweeting probability for the average firm on a given trading day. The percentage of days of tweets with negative tone shows the percentage of tweeting days containing tweets that are negative in tone according to the Loughran and McDonald (2011) classification. The number of unique tweeting firms reports the firm counts within the period. The difference column reports the difference using a t-test of the After SEC – Before SEC periods. Panel A reports the results for all tweeting days while Panel B reports the results for financial tweeting days. ***, **, * denote statistical significance at the 1%, 5% and 10% levels respectively.

	Before SEC regulation	After SEC regulation	Difference
Panel A: All Tweeting			
Percentage of tweeting days per firm	50.39%	55.80%	5.41%***
% days of tweets with negative tone	23.09%	25.14%	2.05%***
Number of unique tweeting firms	1359	1468	109
Panel B: Financial Tweeting			
Percentage of financial tweeting days per firm	2.76%	2.72%	-0.04%
% days of tweets with negative tone	7.60%	7.16%	-0.43%
Number of firms tweeting financial information	475	529	54

Table 4
Determinants of firms' decision use Twitter and to tweet financial information

This table analyzes the characteristics associated with firms that choose to tweet. The dependent variable of the probit regression takes the value of one for firms that choose to operate a corporate Twitter account and 0 otherwise. The header 'Use of Twitter' represents firms that operate an official corporate Twitter account. The header 'Financial Use of Twitter' represents firms that specifically tweet financial information about their firm; the 'Unconditional' column is the probit model for firms that tweet financial information relative to the full population of all firms listed on the NYSE, AMEX, and NASDAQ, whereas the 'Conditional on firm already using Twitter' computes the probit model relative to firms that operate a corporate Twitter account. The independent variables are: *Beta* is the CAPM beta, *B/M* represents the book to market ratio of equity. *Size*, the natural logarithm of the market value of equity. *Leverage*, the leverage ratio of the firm. ROE, the return on equity. *Inst*, the percentage of shares held by institutional investors. *Analysts*, the number of analysts following the firm. *Disp*, the standard deviation of analyst forecasts scaled by the absolute value of the mean of forecasts. Year and industry fixed effects are also included. **, * denote statistical significance at the 1% and 5% levels respectively. Standard errors are reported in parenthesis.

	Use of Twitter	**Financial Use of Twitter**	
			Conditional on firm already using Twitter
Beta	0.087** (0.02)	-0.013 (0.03)	-0.104** (0.04)
B/M	-0.051* (0.02)	0.039 (0.03)	0.078 (0.04)
Size	0.157** (0.01)	0.166** (0.02)	0.175** (0.02)
Leverage	-0.155* (0.07)	-0.312** (0.09)	-0.368** (0.13)
ROE	-0.003 (0.003)	-0.004 (0.003)	-0.003 (0.004)
Payout	0.075 (0.06)	0.104 (0.07)	0.051 (0.09)
Inst.	-0.002** (0.0007)	-0.004** (0.0008)	-0.006** (0.001)
Analysts	0.020** (0.003)	0.007* (0.003)	-0.001 (0.004)
Dispersion	-0.013 (0.01)	-0.003 (0.01)	0.033 (0.03)
Year Fixed Effects	Included	Included	Included
Industry Fixed Effects	Included	Included	Included
N	15411	11964	4004
Pseudo R^2	0.366	0.197	0.154

Table 5
Determinants of firms' decision to tweet (general and financial tweets) on a given day

This table documents the predictability of corporate tweets on a given trading day. The dependent variable indicates a corporate tweet (financial tweet). Estimates are from a panel logistic regression with firm fixed effects. *Lagged return* is the return on the previous trading day in basis points. *Market return* is the value-weighted market return in basis points. *Lagged market return* is the previous day's value-weighted market return. *VIX* $_{t-1}$ is the previous day's volatility index. *Earnings day* is the day of the firm's earnings announcement, *Week before earnings* is the week prior to the firm's earnings announcement. *Week after earnings* is the week after the firm's earnings announcement. *Tweeting on previous day* is a binary variable that takes the value of 1 if a firm tweeted (financial tweeted) on the previous day. *Industry tweeting* represents the proportion of firms within the same industry that tweet on a given day. The sample covers all tweeting (financial tweeting) days for the one year period centred on the SEC social media regulation of April 2, 2013, and includes 1359 and 1468 tweeting firms. ***, **, * denote statistical significance at the 1% 5%, and 10% levels respectively. Standard errors are reported in parentheses.

	All Tweeting		**Financial Tweeting**	
	Before SEC regulation	After SEC regulation	Before SEC regulation	After SEC regulation
Return $_{t-1}$	0.132	0.558*	2.306**	1.827*
	(0.30)	(0.30)	(1.13)	(1.06)
Market return $_{t-1}$	-3.329***	-1.201	-1.284	8.220**
	(1.14)	(1.01)	(4.32)	(4.14)
VIX_{t-1}	-0.029***	-0.007	-0.014	-0.064***
	(0.004)	(0.004)	(0.01)	(0.02)
Earnings Day	0.500***	0.354***	3.404***	3.304***
	(0.06)	(0.06)	(0.09)	(0.09)
Week Before Earnings	0.097***	0.042	0.837***	0.781***
	(0.03)	(0.03)	(0.09)	(0.09)
Week After Earnings	0.125***	0.098***	1.640***	1.683***
	(0.03)	(0.03)	(0.07)	(0.07)
Tweeting on previous day	0.519***	0.541***	0.175*	0.304***
	(0.02)	(0.02)	(0.10)	(0.09)
Industry tweeting	4.402***	3.195***	3.156	10.196***
	(0.18)	(0.18)	(2.97)	(2.13)
Pseudo R^2	0.027	0.018	0.129	0.143
N	152078	170693	152078	170693

Table 6
Returns on tweeting days

This table documents the results of the panel regression of returns on tweeting and market characteristics. Panel A shows the results for the full sample, and Panel B excludes earnings announcements period. The first two columns show the return before and after the SEC social media regulation of April 2, 2013 on all tweeting days. *Tweeting Day* is a dummy that takes the value of 1 if a firm tweets any information on a given day and 0 otherwise. Control variables used but not shown in the table are: *Lagged return* is the return on the previous trading day in basis points*; Market return* is the value-weighted market return; *Lagged market return* is the previous day's value-weighted market return; *Lagged tweeting day* is a dummy that takes the value of 1 if the firm tweeted on the previous day; *VIX* is the volatility index; *Earnings day* is the day of the firm's earnings announcement; *Week before earnings* is the week prior to the firm's earnings announcement. *Week after earnings* is the week after the firm's earnings announcement. Day of the week and firm fixed effects are included. The '*Effect of SEC regulation'* column shows the coefficient on the (*Tweeting day * after SEC)* term, representing the effect of the SEC regulation on returns on tweeting days. Standard errors, in parentheses, are clustered by firm and day. The sample covers all tweeting days for the one year period centred on the SEC regulation of April 2, 2013. ***, **, * denote statistical significance at the 1% 5%, and 10% levels respectively.

Panel A: Full sample

	Before SEC regulation	After SEC regulation	Effect of SEC regulation (Full sample)
Tweeting day	4.955*** (1.81)	5.476*** (1.82)	Included
Tweeting day * after SEC	-----	-----	4.707 (3.40)
Controls	Included	Included	Included
Fixed effects	Included	Included	Included
R^2	0.093	0.120	0.103
N	152075	170692	322769

Panel B: Sample excluding earnings period

	Before SEC regulation	After SEC regulation	Effect of SEC regulation (Full sample)
Tweeting day	4.62** (1.82)	6.373*** (1.94)	Included
Tweeting day * after SEC	-----	-----	5.253 (3.40)
Controls	Included	Included	Included
Fixed effects	Included	Included	Included
R^2	0.101	0.137	0.115
N	127376	141826	269207

Table 7
Trading volume on tweeting days

This table documents the results of the panel regression of trading volume on tweeting and market characteristics. Panel A shows the result for the full sample, and Panel B excludes earnings announcements period. Trading Volume is the dependent variable expressed as the natural logarithm of traded shares. The first two columns show the trading volume before and after the SEC social media regulation of April 2, 2013 on tweeting days. *Tweeting day* is a dummy that takes the value of 1 if a firm tweets on a given day and 0 otherwise. Control variables used but not shown in the table are: *Lagged return* is the return on the previous trading day in basis points*; Market return* is the value-weighted market return; *Lagged market return* is the previous day's value-weighted market return; *Lagged tweeting day* is a dummy that takes the value of 1 if the firm tweeted on the previous day; Lagged trading volume is the natural logarithm of the number of shares traded on the previous trading day*; VIX* is the volatility index; *Earnings Day* is the day of the firm's earnings announcement; *Week before earnings* is the week prior to the firm's earnings announcement. *Week after earnings* is the week after the firm's earnings announcement. Day of the week and firm fixed effects are included. The '*Effect of SEC regulation'* column shows the coefficient on the (*Tweeting Day * after SEC)* term, representing the effect of the SEC regulation on trading volume on tweeting days. Standard errors, in parentheses, are clustered by firm and day. The sample covers all tweeting days for the one year period centred on the SEC regulation of April 2, 2013. ***, **, * denote statistical significance at the 1% 5%, and 10% levels respectively.

Panel A: Full sample

	Before SEC regulation	After SEC regulation	Effect of SEC regulation (Full sample)
Tweeting day	0.040*** (0.01)	0.025*** (0.01)	Included
Tweeting day * after SEC	-----	-----	0.020 (0.02)
Controls	Included	Included	Included
Fixed effects	Included	Included	Included
R^2	0.901	0.901	0.897
N	151114	170022	321138

Panel B: Sample excluding earnings period

	Before SEC regulation	After SEC regulation	Effect of SEC regulation (Full sample)
Tweeting day	0.045*** (0.02)	0.023*** (0.01)	Included
Tweeting day * after SEC	-----	-----	0.044* (0.03)
Controls	Included	Included	Included
Fixed effects	Included	Included	Included
R^2	0.886	0.881	0.871
N	126933	141505	268443

Table 8
Returns on financial tweeting days

This table documents the results of the panel regression of returns (in basis points) on financial tweeting and market characteristics. Panel A shows the result for the full sample, and Panel B excludes earnings announcements period. The first two columns show the return before and after the SEC social media regulation of April 2, 2013 on financial tweeting days. The sample covers one year centred on the regulation date. *Financial tweeting day* is a dummy that takes the value of 1 if a firm tweets financial information on a given day and 0 otherwise. Control variables used but not shown in the table are: *Lagged return* is the return on the previous trading day in basis points*; Market return* is the value-weighted market return; *Lagged market return* is the previous day's value-weighted market return; *Lagged financial tweeting day* is a dummy that takes the value of 1 if the firm tweeted financial information on the previous day; *VIX* is the volatility index; *Earnings day* is the day of the firm's earnings announcement; *Week before earnings* is the week prior to the firm's earnings announcement. *Week after earnings* is the week after the firm's earnings announcement. Day of the week and firm fixed effects are included. The '*Effect of SEC regulation'* column shows the coefficient on the (*Financial tweeting day * after SEC)* term, representing the effect of the SEC regulation on returns on financial tweeting days. Standard errors, in parentheses, are clustered by firm and day. ***, **, * denote statistical significance at the 1% 5%, and 10% levels respectively.

Panel A: Full sample

	Before SEC regulation	After SEC regulation	Effect of SEC regulation (Full sample)
Financial tweeting day	-2.956 (9.42)	19.47** (8.43)	Included
Financial tweeting day * after SEC	-----	-----	23.08* (12.77)
Controls	Included	Included	Included
Fixed effects	Included	Included	Included
R^2	0.093	0.120	0.103
N	152075	170692	322769

Panel B: Sample excluding earnings period

	Before SEC regulation	After SEC regulation	Effect of SEC regulation (Full sample)
Financial tweeting day	-10.15 (7.79)	15.85* (8.30)	Included
Financial tweeting day * after SEC	-----	-----	27.73*** (10.65)
Controls	Included	Included	Included
Fixed effects	Included	Included	Included
R^2	0.101	0.137	0.115
N	127376	141826	269207

Table 9
Trading volume on financial tweeting days

This table documents the results of the panel regression of trading volume on financial tweeting and market characteristics. Panel A shows the result for the full sample, and Panel B excludes earnings announcements period. Trading volume is the dependent variable expressed as the natural logarithm of traded shares. The first two columns show the trading volume before and after the SEC social media regulation of April 2, 2013 on financial tweeting days. The sample covers one year centred on the regulation date. *Financial tweeting day* is a dummy that takes the value of 1 if a firm tweets financial information on a given day and 0 otherwise. Control variables used but not shown in the table are: *Lagged return* is the return on the previous trading day in basis points*; Market return* is the value-weighted market return; *Lagged market return* is the previous day's value-weighted market return; *Lagged financial tweeting day* is a dummy that takes the value of 1 if the firm tweeted financial information on the previous day; Lagged trading volume is the natural logarithm of the number of shares traded on the previous trading day*; VIX* is the volatility index; *Earnings day* is the day of the firm's earnings announcement; *Week before earnings* is the week prior to the firm's earnings announcement. *Week after earnings* is the week after the firm's earnings announcement. Day of the week and firm fixed effects are included. The '*Effect of SEC regulation'* column shows the coefficient on the *Financial tweeting day * after SEC* term, representing the effect of the SEC regulation on trading volume on financial tweeting days. Standard errors, in parentheses, are clustered by firm and day. ***, **, * denote statistical significance at the 1% 5%, and 10% levels respectively.

Panel A: Full sample

	Before SEC regulation	After SEC regulation	Effect of SEC regulation (Full sample)
Financial tweeting day	0.217*** (0.02)	0.206*** (0.02)	Included
Financial tweeting day * after SEC	-----	-----	-0.016 (0.03)
Controls	Included	Included	Included
Fixed effects	Included	Included	Included
R^2	0.901	0.901	0.897
N	151114	17022	321138

Panel B: Sample excluding earnings period

	Before SEC regulation	After SEC regulation	Effect of SEC regulation (Full sample)
Financial tweeting day	0.121*** (0.03)	0.100*** (0.02)	Included
Financial tweeting day * after SEC	-----	-----	-0.03 (0.04)
Controls	Included	Included	Included
Fixed effects	Included	Included	Included
R^2	0.901	0.901	0.896
N	126592	141250	267847

Table 10
Vector Autoregression of returns and tweeting

This table reports estimates from panel vector autoregressions: $y_{it} = \alpha_i + \sum_{i=1}^{5} \beta_i * y_{it-1} + \beta_6 Exog_{it} + \varepsilon_{it}$. The coefficients are obtained using system GMM estimations. The dependent variables are returns and tweeting days for Panels A and B respectively with 5 lags. Panel A shows the effect on returns due to a tweeting shock and Panel B shows the effect of return shocks on tweeting. Exogenous variables used (but not listed) are: *Market return* is the value-weighted market return; *Lagged market return* is the previous day's value-weighted market return; *VIX* is the volatility index; *Earnings day* is the day of earnings announcement; *Week before earnings* and *Week after earnings* are the week before and after earnings announcement. The sample covers all financial tweeting days for the six month period following the SEC social media regulation. ***, **, * denote statistical significance at the 1%, 5% and 10% levels respectively. Standard errors are reported in parentheses.

Panel A: Return as a function of tweeting shocks

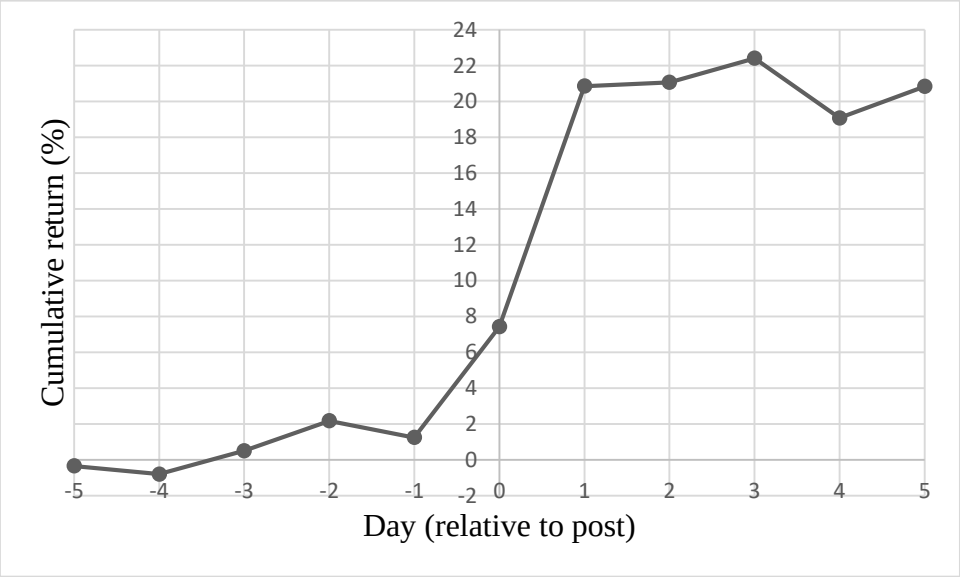
	Dep. variable: Returns (basis points)
Tweeting Day $_t$	17.038***
	(5.66)
Tweeting Day$_{t-1}$	-8.816
	(5.65)
Tweeting Day$_{t-2}$	4.154
	(5.66)
Tweeting Day$_{t-3}$	5.677
	(5.66)
Tweeting Day$_{t-4}$	-0.708
	(5.66)
Tweeting Day$_{t-5}$	-6.037
	(5.61)
AICC	6.247
N	170758

Panel B: Tweeting as a function of return shocks (Return is defined in units of 1)

	Dep. variable: Tweeting
Return$_{t-1}$	0.016
	(0.01)
Return$_{t-2}$	-0.002
	(0.01)
Return$_{t-3}$	0.003
	(0.01)
Return$_{t-4}$	0.012
	(0.01)
Return$_{t-5}$	0.004
	(0.01)
AICC	-12.169
N	170758

Figure 1. Market response to the Netflix post. Each graph shows the market response the Netflix post where Day 0 is the event date (July 3, 2012). Days [-5, +5] represent the five trading days around the event. Figure i (top figure) shows the cumulative return in percentage. The lower figure (ii) shows the trading volume (in units of 1 Million shares)

i) Return



ii) Trading volume

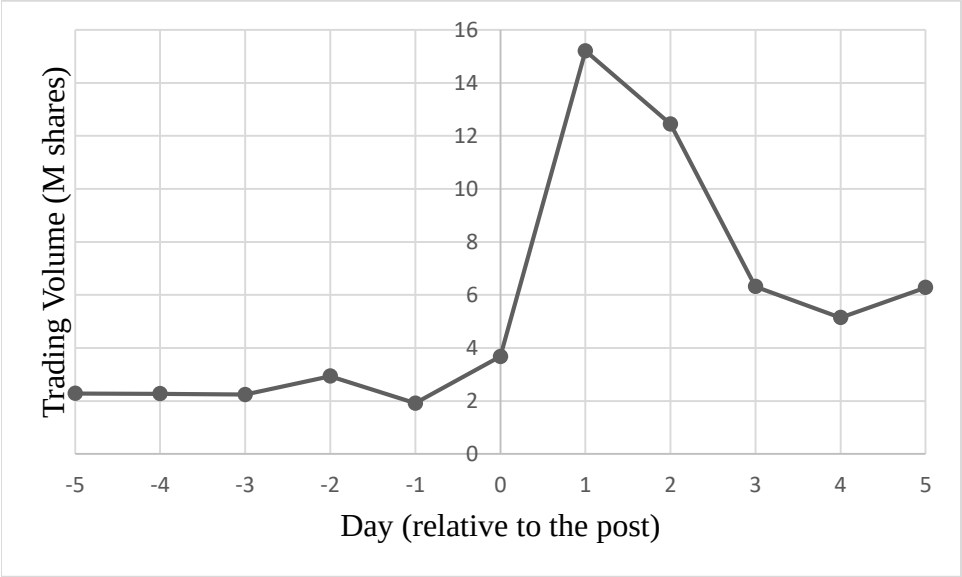
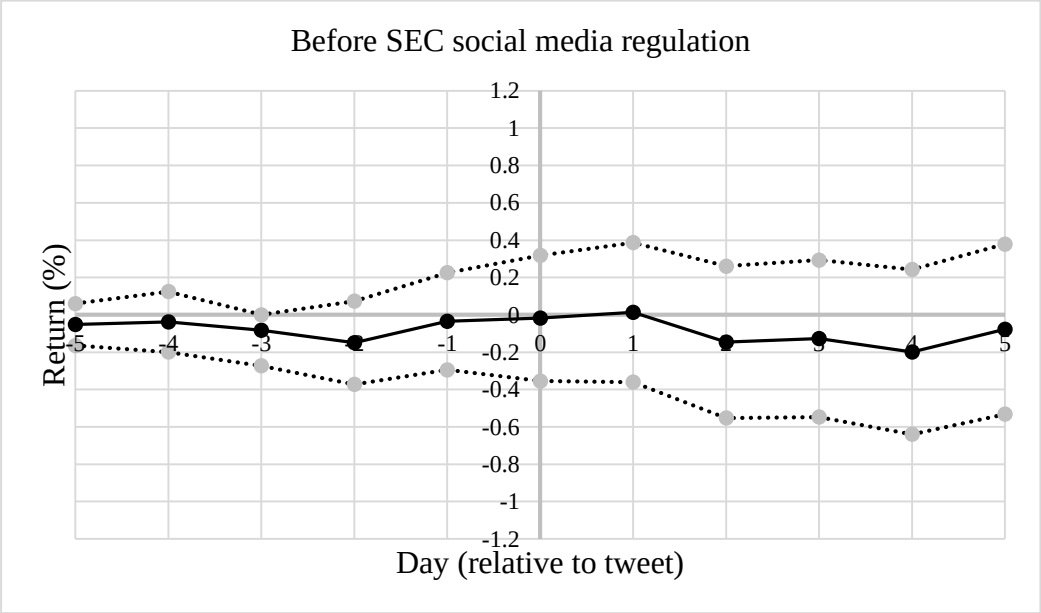


Figure 2. Returns on financial tweeting days. Each graph shows the cumulative abnormal return in percentage points relative to the Fama and French 3-factor model. Day 0 is the financial tweeting day. Days [-5, +5] represent the five trading days around the financial tweet. The solid line shows the average return, while the dotted lines represent the 95% confidence intervals. The top figure (i) shows returns for the six months prior to the SEC social media regulation, while the bottom figure (ii) shows returns for the six months following the SEC social media regulation. Both graphs represent the full population of all financial tweeting firms listed on NYSE, AMEX, and NASDAQ.

i)



ii)

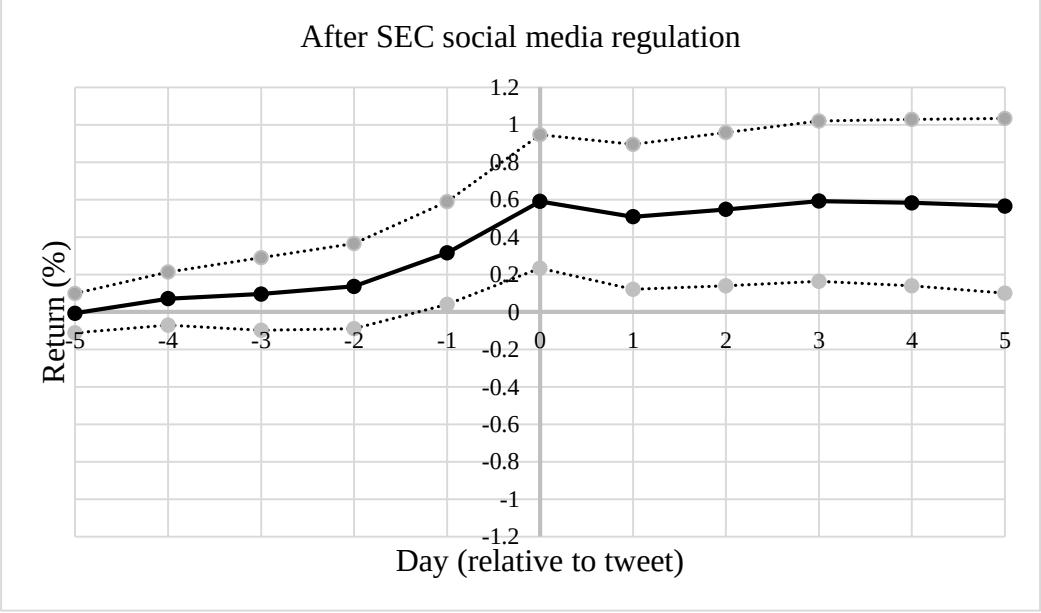
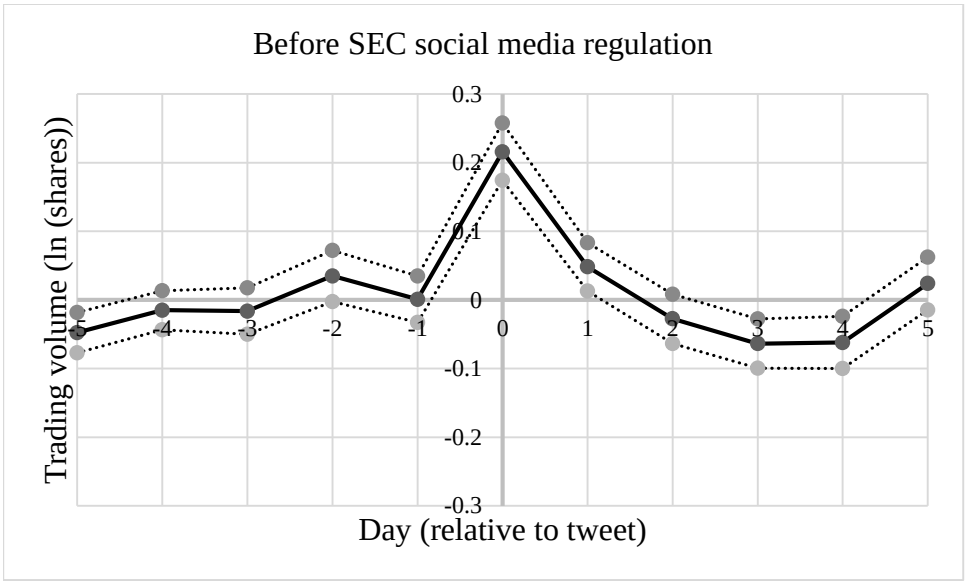
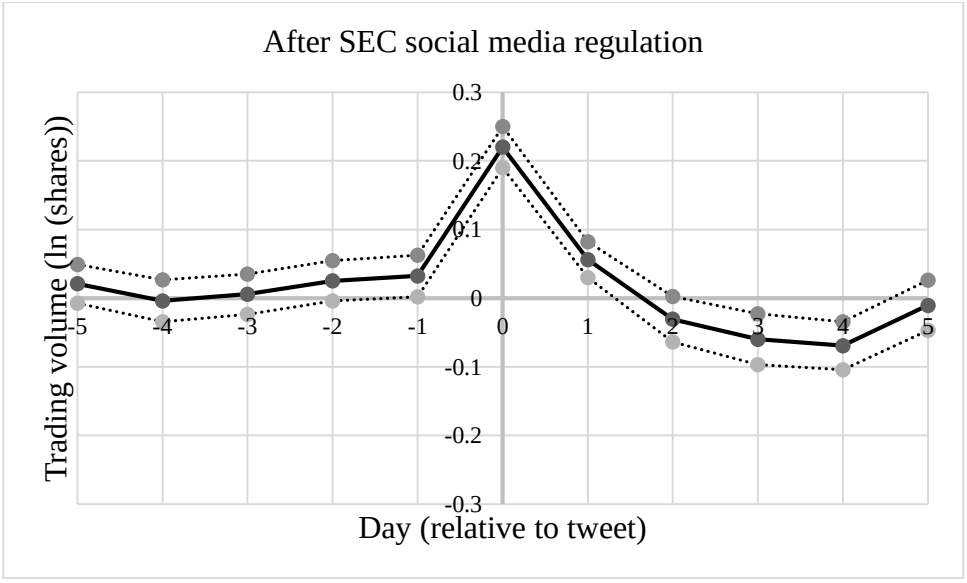


Figure 3. Trading volume on financial tweeting days. Each graph shows the trading volume defined as the natural logarithm of the number of shares traded, where day 0 is the financial tweeting day. Days [-5, +5] represent the five trading days around the financial tweet. The solid line shows the average trading volume, while the dotted lines represent the 95% confidence intervals. The top figure (i) shows trading volume for the six months prior to the SEC social media regulation, while the bottom figure (ii) shows trading volume for the six months following the SEC social media regulation. Both graphs represent the full population of all financial tweeting firms listed on NYSE, AMEX, and NASDAQ.

i)



ii)



Appendix A: Regression variable definitions and data sources

Variable	Definition	Source
Panel A: Dependent Variables		
Return	Daily return on company's common share	CRSP
Trading Volume	Natural logarithm of the number of shares traded	
Panel B: Control Variables		
Beta	The result of the regression of firms' monthly excess return on the excess return of the CRSP value-weighted portfolio using a 60-month rolling window defined in June of each year. Excess return is defined as the monthly return above the one-month treasury bill.	Author's calculation from CRSP returns data
Book to market ratio	The ratio of book value of equity to the market value of equity. The book value is defined as: [the book value of shareholders' equity + deferred taxes and investment tax credit – Book value of preferred stocks]	Author's calculation from COMPUSTAT data
Leverage	The ratio of the firm's long term debt to the total assets of the firm	Author's calculation from COMPUSTAT data
Ln (Size)	The natural logarithm of the market value of the firm's equity (in millions of dollars).	Author's calculation from COMPUSTAT data
Ln(Age)	The natural logarithm of the firm's age; age is defined as the time since the firm was first covered in CRSP	Author's calculation from CRSP data
Analyst Following	The number of analysts providing one-year EPS estimates for the stock	Author's calculation from I/B/E/S data
Dispersion of forecasts	The dispersion of analyst forecasts is the standard deviation of analysts' one-year ahead forecasts scaled by the mean of estimates	Author's calculation from I/B/E/S data
Institutional Ownership	The total percentage of the company's shares that are held by institutional investors	Author's calculation from Thomson Reuter's 13F
Long term growth	This is the consensus (mean) long-term growth forecast from analysts in June of each year	Author's calculation from I/B/E/S data
Industry	The industry membership of the firm in one of the Fama French 48 industry classifications	Determined from CRSP historical SIC codes and Kenneth French's website (to convert SIC to FF 48)

Appendix A (Continued)

Variable	Definition	
CEO Age	Age of the firm's Chief Executive Officer	Compustat Executive Compensation
Market return	The value-weighted daily market return	Compustat
VIX	CBOE S&P 500 Volatility Index	CBOE Indexes
Earnings Day	A binary variable that takes the value of 1 on a firm's earnings announcements day	I/B/E/S
Week Before Earnings	A binary variable that takes the value of 1 for the week prior to a firm's earnings announcement day	I/B/E/S
Week After Earnings	A binary variable that takes the value of 1 for the week following a firm's earnings announcement day	I/B/E/S
Panel C: Twitter Variables		
Tweeting Day	A trading day on which a firm tweets one or more tweet	Twitter API
Fin Tweeting Day	A trading day on which a firm tweets financial information	Twitter API
Tweeting on previous day	A binary variable that takes the value of 1 if the firm tweeted on the previous day	Twitter AP/author's calculation
Industry tweeting	A unit variable (ranges between 0 and 1) that represents the proportion of tweeting firms from a given industry on a given day (excluding the given firm)	Author's calculation

Appendix B: List of financial key words.

Key Word
Declare
Quarter, quarterly
Repurchase
Earning
Acquire
Acquisition
Analyst
Webcast
Payout
Growth
Subsidiary
$
News
Market, markets
Industry
Qtr, q1, q2, q3,q4, qtr1, qtr2, qtr3, qtr4
Dollar
Result, results
2006, 2007,…,2014
Price
Stock
Share, shares
10-k
10-q,10q
Merge, merger, merges
Fiscal
EBIT, EBITDA
EPS
Revenue
Invest, investment, investments
Investor, investors
Finance, financial, financing, financials
Dividend
Forecast

Appendix C: Additional robustness tests

Appendix C, Table 1

This table documents the results of the panel regression of returns (in basis points) on financial tweeting and market characteristics excluding firms that joined Twitter after the SEC social media regulation of April 2, 2013. Panel A shows the result for the full sample, and Panel B excludes earnings announcements period. The first two columns show the return before and after the SEC social media regulation of April 2, 2013 on financial tweeting days. *Financial tweeting day* is a dummy that takes the value of 1 if a firm tweets financial information on a given day and 0 otherwise. Control variables used but not shown in the table are: *Lagged return* is the return on the previous trading day in basis points*; Market return* is the value-weighted market return; *Lagged market return* is the previous day's value-weighted market return; *Lagged financial tweeting day* is a dummy that takes the value of 1 if the firm tweeted financial information on the previous day; *VIX* is the volatility index; *Earnings day* is the day of the firm's earnings announcement; *Week before earnings* is the week prior to the firm's earnings announcement. *Week after earnings* is the week after the firm's earnings announcement. Day of the week and firm fixed effects are included. The '*Effect of SEC regulation'* column shows the coefficient on the (*Financial tweeting day * after SEC)* term, representing the effect of the SEC regulation on returns on financial tweeting days. Standard errors, in parentheses, are clustered by firm and day. The sample covers all financial tweeting days for the one year period centred on the SEC regulation of April 2, 2013. ***, **, * denote statistical significance at the 1% 5%, and 10% levels respectively.

Panel A: Full sample

	Before SEC regulation	After SEC regulation	Effect of SEC regulation (Full sample)
Financial tweeting day	-2.956 (9.42)	22.539** (9.12)	Included
Financial tweeting day * after SEC	-----	-----	26.264** (13.14)
Controls	Included	Included	Included
Fixed effects	Included	Included	Included
R^2	0.093	0.123	0.104
N	152075	160243	312320

Panel B: Sample excluding earnings period

	Before SEC regulation	After SEC regulation	Effect of SEC regulation (Full sample)
Financial tweeting day	-10.152 (7.79)	18.127** (8.69)	Included
Financial tweeting day * after SEC	-----	-----	29.931*** (10.88)
Controls	Included	Included	Included
Fixed effects	Included	Included	Included
R^2	0.101	0.142	0.116
N	127376	132782	260163

Appendix C, Table 2

Returns on financial tweeting days excluding firms that joined or started tweeting financial news after SEC regulation

This table documents the results of the panel regression of returns on financial tweeting and market characteristics excluding firms that began tweeting financial information after the SEC social media regulation of April 2, 2013. Panel A shows the result for the full sample, and Panel B excludes earnings announcements period. The first two columns show the return before and after the SEC regulation of April 2, 2013 on financial tweeting days. *Financial tweeting day* is a dummy that takes the value of 1 if a firm tweets financial information on a given day and 0 otherwise. Control variables used but not shown in the table are: *Lagged return* is the return on the previous trading day in basis points*; Market return* is the value-weighted market return; *Lagged market return* is the previous day's value-weighted market return; *Lagged financial tweeting day* is a dummy that takes the value of 1 if the firm tweeted financial information on the previous day; *VIX* is the volatility index; *Earnings day* is the day of the firm's earnings announcement; *Week before earnings* is the week prior to the firm's earnings announcement. *Week after earnings* is the week after the firm's earnings announcement. Day of the week and firm fixed effects are included. The '*Effect of SEC regulation'* column shows the coefficient on the (*Financial tweeting day * after SEC)* term, representing the effect of the SEC regulation on returns on Financial tweeting days. Standard errors, in parentheses, are clustered by firm and day. The sample covers all financial tweeting days for the one year period centred on the SEC regulation of April 2, 2013. ***, **, * denote statistical significance at the 1% 5%, and 10% levels respectively.

Panel A: Full sample

	Before SEC regulation	After SEC regulation	Effect of SEC regulation (Full sample)
Financial tweeting day	-2.733 (9.42)	20.481* (10.53)	Included
Financial tweeting day * after SEC	-----	-----	23.937* (14.05)
Controls	Included	Included	Included
Fixed effects	Included	Included	Included
R^2	0.094	0.122	0.104
N	142295	153068	295365

Panel B: Sample excluding earnings period

	Before SEC regulation	After SEC regulation	Effect of SEC regulation (Full sample)
Financial tweeting day	-10.104 (7.79)	17.564* (9.55)	Included
Financial tweeting day * after SEC	-----	-----	29.397** (11.47)
Controls	Included	Included	Included
Fixed effects	Included	Included	Included
R^2	0.101	0.140	0.116
N	119170	127090	246264