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The U.S. Market Reaction to Regulation of Social Media Disclosures

Amanda Aw Yong[a], Ching Tung Keung[b], and Yuen Teen Mak[c]

[a] *National University of Singapore*
angelsfall92@gmail.com
[b] *Associate Professor, National University of Singapore*
bizkct@nus.edu.sg
[c] *Associate Professor, National University of Singapore*
bizmakyt@nus.edu.sg

ABSTRACT

This paper examines the U.S. stock market reaction to events leading up to the SEC's decision to regulate (and allow) the use of social media for firm disclosures. By using an event methodology, we compare the market reaction for firms that use Twitter extensively with a set of control firms. Measures include size-adjusted cumulative abnormal returns (CARs), bid-ask spread, analyst forecast revision and dispersion as proxies for market reaction. Results show that firms actively using Twitter for financial disclosures suffered negative CARs after the final event when the SEC released its final guidance on social media disclosures.

JEL Classifications: *G3, M48, M41*

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I. INTRODUCTION

Traditionally, firms relied largely on the press to shape their "information environments…by creating new information through journalism activities" (Bushee et al., 2010). However, "many small firms face significant challenges in improving visibility" (Bushee and Miller, 2012) through such traditional news channels. The widespread accessibility of social media thus gives every stock issuer—small or large—the possibility of reaching out to its investors. According to Chen et al. (2011) and Yu et al. (2013), social media sentiment has a stronger correlation with stock returns than traditional media sentiment.

However, most research on Internet corporate reporting focuses on company website disclosures rather than on social media. Further, the Securities and Exchange Commission (SEC) did not provide guidance on social media disclosures previously, implying that social media are not proper communication channels.

The SEC first issued guidance on the use of electronic media to ensure "full and fair disclosure to investors" (SEC, 2000). In October 2000, the SEC published Regulation FD (Reg FD), which sought to improve information asymmetry, and discouraged issuers from treating "information as a commodity" (Fisch, 2012).

Eight years later, it released guidance to explain how company websites should be used in disclosing "important company information" (SEC, 2008), and stated that websites should comply with Reg FD. Yet, none of these addressed social media as a viable disclosure medium—an inadequacy that later generated much uncertainty.

In July 2012, Netflix CEO Reed Hastings posted on his personal Facebook page that Netflix has crossed "1 billion viewing hours for the first time," without an accompanying 8-K filing. Just hours after the post, Netflix's share price increased by 6.2%, and then by 13.4% the next trading day (Spangler, 2012). This generated debate about whether the post violated Reg FD. A collective conclusion was then drawn that the SEC needed to provide clear guidance on "whether and how social media sites can be compliant means of distributing financial information" (Mont, 2012). The issue was finally closed in April 2013 when the SEC released an investigation report, which detailed its decision not to take action against Netflix, and additionally provided guidance to organizations on the use of social media. After this report was released, the National Investor Relations Institute (NIRI) found that half of the survey respondents who had not previously used social media had plans to reassess their IR programs. 21% of this group cited the "recent disclosure guidance from the SEC" as the reason for this change (NIRI, 2013). In anticipation of this increase in social media use, Bloomberg announced that it would incorporate the firms' twitter feeds in its terminals, to provide "investors and traders with simple solutions to follow tweets about companies, industries and markets" (Q4 Web Systems, 2013).

The study of social media disclosure in the U.S. market is appropriate given that U.S. companies tend to have diffused ownership and rely on equity financing (La Porta et al., 1997); when firms disclose through social media, they reach many investors at once. Second, increased disclosure normally translates to a lower cost of equity (Lang and Lundholm, 2001; Healy et al., 1999; Leuz and Verrecchia, 2000).

Thus, our research studies the market's reaction to the events surrounding Reed Hasting's Facebook post that possibly violated Reg FD, which is the first time the SEC is enforcing Reg FD in this manner. According to Joseph Grundfest, an ex-SEC

Commissioner, of the 13 Reg FD violations since 2000, "none of these cases involved the channel or technology that company officials used to convey the information" (Thompson, 2013). On one hand, research has shown that increased disclosure benefit investors. On the other hand, this benefit must be weighed against the increased litigation risks associated with non-traditional channels such as Twitter and Facebook. It would thus be interesting to study which side weighs heavier – benefits from improved disclosure or fear of litigation.

Most of the evidence on market reactions to the SEC regulation on social media has been anecdotal, and even conflicting. Whether or not such evidence accurately portrays the true investor sentiment would be clearer if we study the stock price movements of companies, which is the basic signalling mechanism of the market. Understanding the impact of social media disclosure regulations on the market is thus an empirical problem with profound practical implications, and is what our research paper sets out to do.

II. THEORETICAL BACKGROUND

A. Corporate Disclosures

In the general disclosure literature, academics share a consensus that both shareholders and regulators desire disclosure, and that disclosure brings about financial and social benefits, albeit with litigation risks.

First, disclosure can reduce the firm's cost of capital by providing more financial transparency to equity and debt holders, as shown by Botosan (1997), Cheng et al. (2006), and Eaton et al. (2007). Khurana et al. (2006) also show that disclosure creates an information environment suitable for external financing, investments, and growth.

Second, disclosure nurtures a culture conducive for investors. Prescott (2008) posits that a continuous flow of such information keeps the stability of the financial ecosystem, as everyone can benefit from the public good. Healy and Palepu (2001) argue that the need for financial reporting and disclosures is born out of information asymmetry, and posit that managers could fully disclose their private information to the public.

Third, the threat of shareholder litigation can reduce the firm's incentive to release forward-looking information. In 1995, the U.S. Congress enacted the Private Securities Litigation Reform Act (PSLRA) to discourage frivolous lawsuits. Jones and Weingram (1996) found that, ceteris paribus, high technology issuers were twice as likely to face lawsuits, as compared to issuers from other industries.

B. Effects of Regulation FD

After Reg FD was implemented, several empirical studies showed a reduction in bid-ask spreads (e.g. Dong et al., 2011; Bailey et al., 2003; Eleswarapu et al., 2004). However, Sidhu et al. (2008) found that the reduction in information flow produced less-informed market participants who tried to protect the price, resulting in a widened bid-ask spread.

Agrawal et al. (2006), Mohanram and Sunder (2001), Shane et al. (2001), Irani and Karamanou (2003), Herrmann et al. (2008), and Bailey et al. (2003), reported that Reg FD reduced the informativeness of forecasts and widened the bid-ask spread.

C. Social Media

The organizational use of social media platforms in North America is substantial: of the Fortune 500 companies, 77% tweet, 70% have a Facebook presence, and 69% maintain Youtube accounts (Barnes et al., 2013). Subscription to social media platforms is mostly free, and thus removes barriers to participation (Schniederjans et al., 2013), unlike existing platforms that charge fixed subscription fees (e.g. Thomson One, Bloomberg).

The immediacy of social media platforms also allows for exchange of information in a fast and efficient manner (Mangold and Faulds, 2009). This timeliness is beneficial for firms as an increase in the frequency of reporting reduced information asymmetry and reduced the cost of equity (Fu et al., 2012).

Social media platforms create a special environment that facilitates two-way communication between the organization and investor, with a positive impact on firm performance (Schniederjans et al., 2013). Furthermore, Zhao and Lu (2012) found that such social interaction on social media had a greater positive impact on users' satisfaction, than if they simply got the information from a machine.

However, most studies on social media attempt to calculate the Return on Investment (ROI) of using social media (e.g. Weinberg and Berger, 2011; Hoffman and Fodor, 2010; Fisher, 2009; Blanchard, 2011), instead of how social media use affects stock prices.

1. Using Social Media for Financial Disclosures

There has been little research on the use of social media as it is relatively new and only proliferated from 2007 onwards; Facebook users increased from 50 million in April 2007 to 1.01 billion in 2012 (Associated Press, 2012). Furthermore, prior to April 2013, the SEC did not directly address "whether and to what extent Reg FD applies to social media disclosures" (Blankespoor et al., 2014).

Wang et al. (2013) found that firms that released news on Twitter recorded a greater market reaction to earnings news than firms that did not. Since the content of the financial information is identical regardless of dissemination channel, Wang et al.'s (2013) study shows that investors react and discriminate between information channels.

Another study by Blankespoor et al. (2014) examined the role of social media (i.e., Twitter) in information dissemination and market liquidity and reported that the "additional dissemination of firm-initiated news via Twitter is associated with lower abnormal bid-ask spreads and greater abnormal depths, consistent with a reduction in information asymmetry" (Blankespoor et al., 2014). This suggests that investors value firm information gleaned from social media and this is directly reflected in their trading behaviour. This study by Blankespoor et al. (2014) gathered firm samples based on how active they were on Twitter, and whether these firms used Twitter for investor relations purposes.

2. Credibility of Social Media as Disclosure Channels

Even though the SEC has allowed for social media disclosures, it is also important to consider the credibility of these platforms, since anyone could hide behind the veil of the Internet and release false information. For example, on 23 April 2013, the official Twitter account of the Associated Press (AP) was hacked. The hacker posed as the official news source, tweeting "Two Explosions in the White House and Barack Obama is injured" (Shapiro and Fung, 2013). Within a few minutes, the Dow Jones Industrial Average plunged 143 points. Although AP quickly retracted the tweet and the market recovered within minutes, this episode "demonstrates how tightly intertwined Wall Street has become with Twitter" (Moore and Roberts, 2013).

III. HYPOTHESES DEVELOPMENT

A. Identification of Sample Firms and Events

In order to identify firms that are active on social media, we obtain the list of firms that Blankespoor et al. (2014) used, and term this list as "treatment firms". We then match this list by size and industry to obtain a set of control firms, resulting in a second list of 64 unique firms, because many control firms match multiple treatment firms.

To identify events that might generate abnormal returns, we follow the research methodology of Barth et al. (2010), and present the events in Table 1. The trigger event was on 3 July 2012, when Hastings posted market-sensitive information on his Facebook page, and concluded on 2 April 2013, when the SEC issued a final investigative report. We identify these events by searching the ABI/INFORM database, using keywords "SEC", "social media", "Netflix" and "Reg FD", and searching the SEC website for public announcements and filings relating to Netflix.

Table 1
List of Event Dates

Event Date	Event Identifier	Description	Predicted Market Reaction
July 10, 2012	A	Compliance Week first reported that Netflix possibly violated Reg FD	Negative
Dec. 6, 2012	B	Netflix announced that Hastings and Netflix both received a Wells Notice from the SEC	Negative
Jan. 30, 2013	C	Grundfest releases paper compelling SEC to not raise charges against Netflix and Hastings	Positive
April 2, 2013	D	SEC releases an investigative report, decided not to charge Netflix and Hastings, and also provided guidance on social media disclosures	Negative

The first event was when the market started becoming concerned whether Netflix violated Reg FD. In researching the market reaction to the disclosure of internal control weaknesses, Hammersley et al. (2007) relied on Compliance Week to identify the sample dates. This methodology is consistent with De Franco et al. (2005), Doyle et al. (2007), Ge and McVay (2005), Hogan and Wilkins (2008), and Ashbaugh-Skaife et al. (2007). Similarly, we used Compliance Week to search for the first article that reported on this issue. This search returned an article dated 10 July 2012, titled "Did Netflix CEO's

Facebook post violate Reg FD?" (Mont, 2012). We thus take this as the first date the market was aware of possible repercussions Hastings' Facebook post had on the social media disclosure environment.

The second event was when the SEC issued a Wells Notice each to both Netflix and Hastings, warning "civil injunctive action against Netflix and Mr. Hastings for violations of Regulation Fair Disclosure, Section 13(a) of the Securities Exchange Act and Rules 13a-11 and 13a-15 thereunder" (Netflix, 2012). Netflix reported this in an 8-K filing on 6 December 2012, and we deem it as a negative event. This is especially so in the U.S., where cases set precedence for future cases, thus increasing the likelihood that the SEC can take actions against firms active on social media.

The third event is when Joseph Grundfest, former SEC commissioner and Stanford Law School professor, released a paper explaining why SEC should drop its charges against Netflix. The paper detailed nine such reasons, and was sent to the SEC as an e-mail. Prosecuting Netflix would seem to undo previous SEC efforts in encouraging disclosure through electronic means. Given that Grundfest was an ex-SEC commissioner, we posit that his argument might dissuade the SEC from pressing charges. Should he be successful, this would lead to a decrease in litigation risk for treatment firms, and thus should record a positive market reaction.

The fourth event was when the SEC released an investigation report, announcing that it would not take enforcement actions against Netflix and Hastings (Gallu, 2013). This was because it "do[es] not wish to inhibit the content, form, or forum of any [social media] disclosure" (SEC, 2013). In addition, the report acknowledged that "an increasing number of public companies are using social media to communicate with their shareholders and the investing public" (SEC, 2013). Thus it clarified how stock issuers could use social media to comply with Reg FD. Clearly, the SEC is in favour of social media disclosures as long as firms declare them as disclosure channels beforehand. As a result, treatment firms that are already active on Twitter might be encouraged to continue disclosing on Twitter, or even extend their disclosure channels to various social media platforms. Given that Hastings did not face any injunctions for releasing market-sensitive information without an accompanying 8-K filing, treatment firms may take it as a signal to do the same. While this predicted increase in social media disclosure activity should mean improved and timelier disclosures for shareholders, we should also consider the possible increase in litigation risks. The uncertainty that was generated around the Hastings issue and issuance of Wells Notices would have worried shareholders of treatment firms, since these firms might face similar litigation risks. Furthermore, previous research has shown that increased disclosure tends to benefit smaller firms. Since treatment firms are very large compared to the rest of the stock market, the magnitude of this supposed benefit would be minimized. Weighed against the increased social media disclosure activities and associated litigation risk, it is likely that the market would be nervous about the implications for treatment firms. As a result, there might be a mismatch between how managers of treatment firms and investors view this event. On one hand, managers might view this liberalization positively as they are accorded increased channels of disclosures. On the other hand, investors are likely to associate this liberalization with increased litigation risk, ultimately generating a negative market reaction towards treatment firms.

B. Hypotheses

There are two main research questions that our research aims to address: (1) What is the market impact of each event? (2) Does the market agree on the impact of each event? To measure market impact for (1), we study abnormal stock returns and mean analyst forecast revisions. To measure agreement on the impact in (2), we study the change in bid-ask spreads and analyst forecast dispersion. We test the following hypotheses:

H1a: Treatment Firms suffered a negative stock market impact around Event A
H1b: Treatment Firms suffered a negative stock market impact around Event B
H1c: Treatment Firms recorded a positive stock market impact around Event C
H1d: Treatment Firms recorded a negative stock market impact around Event D
H2a: Treatment Firms generated more market uncertainty around Event A
H2b: Treatment Firms generated more market uncertainty around Event B
H2c: Treatment Firms generated less market uncertainty around Event C
H2d: Treatment Firms generated more market uncertainty around Event D

IV. DATA AND RESEARCH DESIGN

A. Description of Firm Samples and Research Design

To construct the treatment firm sample, we acquire the list of firms used in Blankespoor et al. (2014). The process to arrive at the final 113 treatment firms is presented in Table 2. For each treatment firm, we identify a corresponding control firm: (1) Extract all firms within the same 3-digit Standard Industrial Classification (SIC) codes; and (2) Identify the firm that has the closest market value to the treatment firm.

This resulted in 64 control firms. For H1 (CAR), we download firm market data from the Centre for Research in Security Prices (CRSP) database, for 3-day (-1, +1), 5-day (-2, +2), and 11-day (-5, +5) windows surrounding all events. Next, we gather treatment and control firm data from Compustat, and merge the data with CRSP. For H1 (Forecast revision), we download treatment and control firm data from the Institutional Brokers' Estimate System (I/B/E/S) database for both fiscal and quarter period indicators surrounding all events, and merge it with CRSP and Compustat data. For H2 (Bid-ask spread), we extract CRSP data for a 3-day (-1, +1) window period surrounding each event. For H2 (Forecast dispersion), we download data from I/B/E/S for both fiscal and quarter period indicators. Variables are all presented in Appendix A. Due to the different availability of data between databases, the sample size for each hypothesis varies. Table 2 presents the final sample size for treatment and control firms.

To test the hypotheses, we employ a two-step approach. First, we run univariate analyses for each of the four dependent variables, and conduct a single-sample t-test. In addition, we conduct paired-sample t-tests to compare if there is a significant difference between treatment and control firms. Second, we run multivariate regression models to test the significance of the coefficients of interest.

Before running regressions, we use Pearson correlations to determine if there is multicollinearity. We then run the multivariate regression models, employing the Ordinary Least Squares (OLS) methodology. There are four different models – one for each dependent variable (CAR, Bid-Ask Spread, Forecast Revision, and Dispersion). The OLS regression examines if treatment firms affect the dependent variables, after controlling for other effects.

Table 2
Firm sample description

Panel A

3-Digit SIC	Description	Number of Firms	
335	Handling of Nonferrous Metals	1	0.9%
355	Special Industry Machinery	2	1.8%
357	Computer and Office Equipment	16	14.0%
365	Household Audio and Video Equipment	1	0.9%
366	Communications Equipment	12	10.5%
367	Electronic Components	22	19.3%
369	Miscellaneous Electrical Machinery	1	0.9%
382	Measuring Instrumentation	2	1.8%
386	Photographic Equipment and Supplies	1	0.9%
452	Air Transportation	1	0.9%
481	Telephone Communications	10	9%
484	Cable and Other Pay TV Services	1	0.9%
504	Wholesale – Equipment and Supplies	2	1.8%
506	Wholesale – Electrical Goods	2	1.8%
737	Computer Programming and Data Processing	33	28.9%
738	Miscellaneous Business Services	5	4.4%
784	Video Tape Rental	1	0.9%

Panel B

Sample Description	Treatment Firms	Control Firms
Number of firms from Blankespoor's sample	141	N.A.
Less: Number of firms delisted	(28)	N.A.
Number of active firms	113	64
Less: Number of firms without Compustat data for 2012	(1)	(3)
Number of firms for H1a, H1b, H2a, H2b (CAR and Bid-Ask Spread)	112	61
Less: Number of firms without Compustat data for 2013	(4)	(3)
Number of firms for H1c, H1d, H2c, H2d (CAR and Bid-Ask Spread)	108	58
Less: Number of firms without IBES data for 2012	(8)	(4)
Number of firms for H1a, H1b, H2a, H2b (Forecast Revision and Dispersion)	100	54
Less: Number of firms without IBES data for 2013	(2)	(4)
Number of firms for H1c, H1d, H2c, H2d (Forecast Revision and Dispersion)	98	50
Average market value in billions (as at 2 July 2012 – one trading day before trigger event	45.37	10.09

B. Variables

To calculate CAR, we size-adjust each firm's raw return by their respective size-decile average return, following Ikenberry et al.'s (1995) approach. Numerous studies have shown an empirical relationship between firm size and stock returns (Basu, 1977; Reinganum, 1981; Banz, 1981). For forecast revision, forecast dispersion and change in bid-ask spread, we calculate the difference before and after each event.

For each regression model, we employ a dummy variable to test the hypotheses. "Dum_treat" records a value of one if it is a treatment firm, and zero if it is a control firm. For CAR, we control for firm size ("Log_assets"), risk ("Risk_free_rate"), book-to-market ("Book_to_market"), and prior period returns ("Returns"). Industry effects are controlled through the inclusion of control firms, matched by industry. Past research has demonstrated the relation between firm size and returns (e.g., Larcker et al., 2011), positive relation between book-to-market and returns (e.g., Fama and French, 1992; Barber and Lyon, 1997). Comment and Jarrell (1991) show that prior period returns affect the current period returns.

For forecast revision, we control for firm size ("Log_assets"), book-to-market ("Book_to_market"), industry, analyst followings ("Coverage"), and trading volume ("Adj_turn"), selected based on previous forecast revision research by Herrmann et al. (2008) and Amiram et al. (2014). For bid ask spread, we control for ("Log_assets"), book-to-market ("Book_to_market"), prior quarter stock volatility ("Stdev_bas"), and trading volume ("Adj_turn"). For forecast dispersion, we control for firm size ("Log_assets"), book-to-market ("Book_to_market"), analyst followings ("Coverage"), and trading volume ("Adj_turn"), selected based on previous forecast dispersion research by Herrmann et al. (2008), and Agrawal et al. (2006).

C. Regression Models

1. CAR Model

Hypotheses 1a, 1b, and 1d postulate a negative stock market impact for treatment firms, while H1c postulates a positive impact. To evaluate them, we employ the following model to test the explanatory power of the dummy variable "Dum_treat":

$$\text{A\_ret} = \beta_0 + \beta_1\text{Dum\_treat} + \beta_2\text{Log\_assets} + \beta_3\text{Book\_to\_market} + \beta_4\text{Risk\_free\_rate} + \beta_5\text{Returns} + \varepsilon \quad (1)$$

2. Forecast Revision Model

This model measures the indirect impact that the events have on treatment firms' analyst forecasts. H1a, H1b and H1d postulate a negative revision, while H1c postulates a positive revision. We employ the following model to test these hypotheses:

$$\text{Diff\_est} = \beta_0 + \beta_1\text{Dum\_treat} + \beta_2\text{Log\_assets} + \beta_3\text{Book\_to\_market} + \beta_4\text{Coverage} + \beta_5\text{Adj\_turn} + \varepsilon \quad (2)$$

3. Bid-Ask Spread Model

H2a, H2b, and H2d predict higher uncertainty post-events A and B, while H2c predicts lower uncertainty post-events C and D. We employ the following model to test H2:

$$\text{Diff\_bidask} = \beta_0 + \beta_1\text{Dum\_treat} + \beta_2\text{Log\_assets} + \beta_3\text{Book\_to\_market} + \beta_4\text{Stdev\_bas} + \beta_5\text{Adj\_turn} + \varepsilon \quad (3)$$

4. Forecast dispersion Model

This model measures the indirect market uncertainty, proxied by the changes in forecast dispersion pre- and post-events. H2a, H2b and H2d predict wider dispersion post-events A and B, while H2c predicts a narrower dispersion. We employ the following model to test the explanatory power of the independent variable:

$$\text{Diff\_stdev} = \beta_0 + \beta_1\text{Dum\_treat} + \beta_2\text{Log\_assets} + \beta_3\text{Book\_to\_market} + \beta_4\text{Coverage} + \beta_5\text{Adj\_turn} + \varepsilon \quad (4)$$

V. RESULTS AND EMPIRICAL ANALYSIS

A. Univariate Statistics

To examine CAR, we run results for three different window periods – 3, 5 and 11-day windows, but focus discussion on the 11-day window period, since the market is still unfamiliar with regulation of social media disclosures. Single-sample t-tests show significant CARs for treatment firms, post-events A, B and D. Paired-sample t-tests indicate that treatment firms recorded a significantly higher CAR post-event D, as compared to control firms.

To examine forecast revision, we run results for both fiscal and quarter period indicators. However, our discussion focuses on fiscal forecasts, which are more accurate because analysts are predicting how possible regulation (a long-term event) might affect the market. Single-sample t-tests show significant forecast revisions for treatment firms, post-events A, B and C. Paired-sample t-tests show that treatment firms recorded a significantly lower forecast estimate post-event B, as compared to control firms.

To examine the changes in bid-ask spreads, we follow Blankespoor et al. (2014), and record the difference in spreads within -1 and +1 trading day of each event. Single-sample t-tests record a significant change in bid-ask spreads for treatment firms, post-events A, B and C. Further paired-sample t-tests verify that treatment firms record a wider bid-ask spread post-event A.

Analyst forecast dispersion is studied as a complementary indirect measure to the changes in bid-ask spread. Single-sample t-tests show a significant change in forecast dispersion for treatment firms' post-events B and D. However, further paired-sample t-tests show no significant difference of dispersion change between treatment and control firms. All univariate statistics are presented in Table 3.

Table 3
Univariate statistics

Variable	Difference in Means	Treatment Mean	Control Mean
Panel A: Event A			
CAR (-1, +1)	0.000	-0.011**	-0.015**
CAR (-2, +2)	0.000	-0.029***	-0.029**
CAR (-5, +5)	-0.010	-0.037***	-0.027***
Meanest1	-	3.461***	2.172***
Meanest	-	3.433***	2.153***
Diff_est	-0.009	-0.028***	-0.020***
Bidask2	-	0.846***	1.174***
Bidask	-	1.067***	1.102***
Diff_bidask	0.294*	0.222**	-0.073
Stdev1	-	0.120***	0.108***
Stdev	-	0.129***	0.103***
Diff_stdev	0.014	0.009	-0.005
Panel B: Event B			
CAR (-1, +1)	0.001	0.007**	0.006
CAR (-2, +2)	0.009	0.015***	0.006
CAR (-5, +5)	0.010	0.023***	0.013
Meanest1	-	3.401***	2.279***
Meanest	-	3.372***	2.324***
Diff_est	-0.074**	-0.029*	0.045
Bidask2	-	1.189***	1.084***
Bidask	-	1.023***	0.894***
Diff_bidask	0.031	-0.159**	-0.190***
Stdev1	-	0.132***	0.055***
Stdev	-	0.113***	0.236
Diff_stdev	-0.200	-0.019*	0.181
Panel C: Event C			
CAR (-1, +1)	0.000	-0.009**	-0.009*
CAR (-2, +2)	-0.007	-0.007	0.000
CAR (-5, +5)	-0.003	-0.001	0.001
Meanest1	-	3.361***	2.263***
Meanest	-	3.517***	2.295***
Diff_est	0.123	0.156*	0.032
Bidask2	-	1.112***	1.111***

Bidask	-	0.948***	1.176***
Diff_bidask	-0.229	-0.164*	0.065
Stdev1	-	0.122***	0.058***
Stdev	-	0.149***	0.110***
Diff_stdev	-0.023	0.027	0.050***
Panel D: Event D			
CAR (-1, +1)	0.005	-0.002	-0.007*
CAR (-2, +2)	0.013*	-0.002	-0.016
CAR (-5, +5)	0.016**	-0.007**	-0.023***
Meanest1	-	3.602***	2.172***
Meanest	-	3.587***	2.137***
Diff_est	0.020	-0.015	-0.035
Bidask2	-	0.991***	1.249***
Bidask	-	0.985***	1.313***
Diff_bidask	-0.070	-0.006	0.064
Stdev1	-	0.164***	0.118***
Stdev	-	0.157***	0.121***
Diff_stdev	-0.011	-0.008*	0.004

B. Multivariate Regression Analysis

1. Multicollinearity

To test for multicollinearity between control variables, we compute Pearson correlations for all data sets. For the bid-ask spread model, firm size is correlated with prior quarter stock volatility, with a correlation of 0.4345. For the analyst forecast models, firm size is correlated with the number of analyst forecasts, with a correlation of 0.5755. This is probably because large firms are covered by more analysts than smaller firms. When we drop one of the two correlated variables in the regression models, we obtained qualitatively similar results. The other control variables are not significantly correlated.

2. Explanatory Variables

Regression analysis shows that treatment firms suffered more negative CARs post-events A and D, as compared to control firms. Given that the coefficient of "Dum_Treat" is significantly negative for Events A and D, the null hypothesis for H1a and H1d are rejected.

The coefficients of "Dum_Treat" are insignificant across all events for forecast revision, forecast dispersion, and bid-ask spread models. This lack of explanatory power of forecast measures might be due to them being indirect proxies for market reaction. The nature of social media disclosure regulations directly impacts investors, who would suffer the consequences of litigation. Thus, abnormal returns would be more likely to show results, as opposed to analyst forecasts measures. In addition, bid-ask spread is also insignificant, and unaffected by the events identified. As opposed to Blankespoor et al.'s (2014) study where the increased use of Twitter directly increased disclosure and thus lowered bid-ask spread, the same set of firms did not record changes in bid-ask spread after a regulatory event. This might be because regulatory events are less likely to immediately improve information asymmetry as compared to actual use of social media disclosures. Descriptive statistics of all control and explanatory variables are presented in Table 4, while multivariate statistics are presented in Tables 5 and 6.

C. Discussion of Results by Events

While the multivariate analysis shows that treatment firms suffer a more negative CAR post event A and no other significant results for the other measures, t-tests show a wider bid-ask spread post-event A for treatment firms. Taken together, the reactions to event A reveal that the market is concerned about legal action against the use of social media. The negative CAR that treatment firms suffer is attributable to the fear of litigation. Event A sounds the alarm bell to firms active on Twitter about possible legal action against perceived misuse of social media. As Grundfest (2013) argues, this Netflix issue was the first incidence of possible civil injunction against using social media for disclosure. Hence, there may be no market consensus as to how this trigger event impacts those firms that were already active on Twitter. This result is also consistent with the existing anecdotal evidence, where financial journalists and market participants presented different viewpoints after the trigger event. Hence, there was a negative market reaction accompanied by market uncertainty about the consequential impact of social media disclosures on treatment firms.

For event B, the multivariate analysis shows insignificant results across all measures, while t-tests show that treatment firms recorded a lower forecast estimate post-event B. The insignificant direct market measures may be because the market has already adjusted to the risk of litigation in event A, and thus the issuance of a Wells Notice in event B does not trigger further impact.

Both multivariate analysis and t-tests show insignificant results across all measures, implying a lack of market reaction post-event C. Perhaps the market saw Grundfest's open letter as an invitation for open debate about social media regulation, and not as a signal that the SEC might correspondingly retract its Wells Notices. Hence, neither the market nor the analysts reacted accordingly.

While multivariate analysis shows that treatment firms suffered a more negative CAR post-event D, t-test shows that treatment firms recorded a less negative CAR. However, the multivariate regression model is more robust than paired-sample t-tests as the former controls for other variables such as prior period returns, risk, and book-to-market. Furthermore, the regression model has better controls for firm size ("Log_Assets"), while the paired-sample t-test compares treatment firms with control firms whose market values are largely different.

As with our initial hypothesis (H1d), treatment firms suffered a negative CAR, thus we reject the null hypothesis for H1d. Given that the SEC has released approval for social media disclosures, it is likely that these treatment firms would continue using Twitter (and possibly other social media) for disclosures. Thus, we posit that there would be an increased fear of litigation for treatment firms, should social media disclosures increase, especially since Wells Notices were issued to Netflix and Reed Hastings.

Table 4
Descriptive statistics of control variables

	N	Mean	Median	Min	Max	Std. Dev.
CAR (2012 data)						
Log_Assets		3.779***	3.702	2.221	5.710	0.735
Risk_Free_Rate		1.141***	1.000	0.100	8.890	0.845
Book_To_Market	174	0.435***	0.346	-2.103	2.074	0.454
Returns		0.025***	0.006	-0.254	0.449	0.082
Dum_Treat		0.644***	1.000	0.000	1.000	0.480
CAR (2013 data)						
Log_Assets		3.813***	3.761	2.242	5.665	0.723
Risk_Free_Rate		1.129***	1.000	0.060	10.390	0.907
Book_To_Market	174	0.425***	0.316	-1.109	2.650	0.400
Returns		0.047***	0.044	-0.197	0.488	0.101
Dum_Treat		0.651***	1.000	0.000	1.000	0.478
Bid-Ask Spread (2012 data)						
Log_Assets		3.779***	3.702	2.221	5.710	0.735
Book_To_Market		0.435***	0.346	-2.103	2.074	0.454
Stdev_bas	166	0.021***	0.012	0.002	0.049	0.009
Adj_turn		0.000	0.000	-0.029	0.008	0.002
Dum_Treat		0.644***	1.000	0.000	1.000	0.480
Bid-Ask Spread (2013 data)						
Log_Assets		3.813***	3.761	2.242	5.665	0.723
Risk_Free_Rate		0.425***	0.316	-1.109	2.650	0.400
Book_To_Market	166	0.019***	0.016	0.002	0.092	0.009
Returns		0.000*	0.000	-0.005	0.011	0.001
Dum_Treat		0.651***	1.000	0.000	1.000	0.478
	N	Mean	Median	Min	Max	Std. Dev.
Analyst Forecast (Event A)						
Log_Assets		3.714***	3.668	2.221	5.435	0.665
Book_To_Market		0.450***	0.336	-2.103	2.074	0.461
Coverage	153	18.235***	16.000	1.000	51.000	11.061
Adj_turn		0.000**	0.000	-0.004	0.017	0.002
Dum_Treat		0.654***	1.000	0.000	1.000	0.477
Analyst Forecast (Event B)						
Log_Assets	153	3.707***	3.668	2.221	5.435	0.669
Book_To_Market		0.447***	0.356	-2.103	2.074	0.460

Coverage		17.820***	14.500	1.000	54.000	11.286
Adj_turn		0.000	0.000	-0.028	0.008	0.002
Dum_Treat		0.649***	1.000	0.000	1.000	0.479
Analyst Forecast (Event C)						
Log_Assets		3.761***	3.717	2.242	5.444	0.664
Book_To_Market		0.393***	0.315	-1.109	2.027	0.344
Coverage	149	18.047***	15.000	1.000	56.000	11.385
Adj_turn		0.000	0.000	-0.006	0.019	0.002
Dum_Treat		0.658***	1.000	0.000	1.000	0.476
Analyst Forecast (Event D)						
Log_Assets		3.761***	3.717	2.242	5.444	0.664
Book_To_Market		0.393***	0.315	-1.109	2.027	0.344
Coverage	149	18.221***	15.000	2.000	55.000	10.983
Adj_turn		0.000*	0.000	-0.005	0.011	0.001
Dum_Treat		0.658***	1.000	0.000	1.000	0.476

Table 5

Multivariate statistics (CAR and forecast estimate)

	N	CAR		
		[-1,+1]	[-2,+2]	[-5,+5]
Panel A1: Event A				
Dum_Treat		-0.007	-0.015	-0.028**
		(0.382)	(0.127)	(0.011)
Log_Assets		0.013**	0.019***	0.019***
		(0.012)	(0.003)	(0.006)
Risk_Free_Rate	174	0.001	-0.004	-0.004
		(0.836)	(0.457)	(0.415)
Book_To_Market		0.008	0.016*	0.012
		(0.302)	(0.069)	(0.218)
Returns		-0.001	0.015	0.004
		(0.834)	(0.786)	(0.945)
Panel B1: Event B				
Dum_Treat		-0.006	0.012	0.014
		(0.511)	(0.167)	(0.141)
Log_Assets	174	-0.002	-0.008	-0.006
		(0.677)	(0.181)	(0.316)
Risk_Free_Rate		-0.003	-0.004	-0.009*

		(0.539)	(0.367)	(0.058)
Book_To_Market		0.006	0.007	0.008
		(0.470)	(0.390)	(0.394)
Returns		-0.060*	-0.027	-0.016
		(0.065)	(0.381)	(0.629)
Panel C1: Event C				
Dum_Treat		-0.001	-0.004	0.003
		(0.861)	(0.730)	(0.798)
Log_Assets		0.003	0.006	0.001
		(0.617)	(0.452)	(0.955)
Risk_Free_Rate	166	0.008*	0.007	0.005
		(0.053)	(0.190)	(0.401)
Book_To_Market		0.001	0.000	0.000
		(0.497)	(0.713)	(0.789)
Returns		-0.085***	-0.081*	-0.068
		(0.001)	(0.081)	(0.190)

	N	Forecast Estimate	
		Fiscal	Quarter
Panel A2: Event A			
Dum_Treat		-0.016	-0.008
		(0.266)	(0.581)
Log_Assets		0.015	0.025*
		(0.240)	(0.060)
Book_To_Market	153	-0.015	-0.004
		(0.301)	(0.808)
Coverage		-0.001	-0.001*
		(0.563)	(0.065)
Adj_turn		-7.253**	-1.698
		(0.031)	(0.630)
Panel B2: Event B			
Dum_Treat		-0.063	0.012
		(0.128)	(0.352)
Log_Assets	154	-0.012	-0.009
		(0.742)	(0.451)
Book_To_Market		-0.025	0.002
		(0.529)	(0.862)

Coverage			-0.001	-0.001
			(0.525)	(0.249)
Adj_turn			-1.804	0.081
			(0.813)	(0.872)
Panel C2: Event C				
Dum_Treat			0.072	-0.058
			(0.723)	(0.400)
Log_Assets			0.163	-0.079
			(0.392)	(0.224)
Book_To_Market	149		-0.526*	-0.032
			(0.051)	(0.727)
Coverage			0.001	-0.001
			(0.936)	(0.794)
Adj_turn			-6.170	-0.702
			(0.884)	(0.961)
Panel D1: Event D				
Dum_Treat		0.002	-0.017*	-0.017*
		(0.838)	(0.085)	(0.085)
Log_Assets		0.007	0.012**	0.012**
		(0.158)	(0.042)	(0.042)
Risk_Free_Rate	166	0.004	0.005	0.005
		(0.275)	(0.247)	(0.247)
Book_To_Market		0.005	-0.013	-0.013
		(0.539)	(0.181)	(0.181)
Returns		-0.051	-0.105**	-0.105**
		(0.135)	(0.014)	(0.014)
Panel D2: Event D				
Dum_Treat			0.034	-0.005
			(0.166)	(0.762)
Log_Assets			-0.013	0.037**
			(0.567)	(0.020)
Book_To_Market	149		-0.053*	-0.008
			(0.010)	(0.725)
Coverage			0.000	-0.002
			(0.882)	(0.626)
Adj_turn			0.900	-2.995
			(0.927)	(0.670)

Table 6
Multivariate statistics (bid-ask spread and forecast revision)

	N	Bid-Ask Spread [-1,+1]		N	Forecast Dispersion Fiscal	Forecast Dispersion Quarter
Panel A1: Event A			Panel A2: Event A			
Dum_Treat	174	0.226	Dum_Treat	152	0.010	0.001
		(0.236)			(0.523)	(0.840)
Log_Assets		0.153	Log_Assets		0.030**	0.010*
		(0.255)			(0.036)	(0.071)
Book_To_Market		-0.127	Book_To_Market		-0.019	-0.005
		(0.486)			(0.245)	(0.425)
Stdev_bas		1.102	Coverage		-0.002**	-0.001**
		(0.920)			(0.028)	(0.034)
Adj_turn		32.245	Adj_turn		0.088	-0.060
		(0.499)			(0.981)	(0.969)
Panel B1: Event B			Panel B2: Event B			
Dum_Treat	174	0.095	Dum_Treat	153	-0.238	0.003
		(0.423)			(0.135)	(0.538)
Log_Assets		-0.125	Log_Assets		0.020	0.002
		(0.140)			(0.892)	(0.594)
Book_To_Market		0.104	Book_To_Market		-0.069	0.005
		(0.362)			(0.663)	(0.227)
Stdev_bas		-0.862	Coverage		0.006	0.000
		(0.900)			(0.482)	(0.775)
Adj_turn		9.373	Adj_turn		-1.558	0.720
		(0.691)			(0.957)	(0.373)
Panel C1: Event C			Panel C2: Event C			
Dum_Treat	166	-0.296	Dum_Treat	148	-0.031	-0.053
		(0.271)			(0.286)	(0.163)
Log_Assets		-0.130	Log_Assets		0.045	0.039
		(0.477)			(0.100)	(0.277)
Book_To_Market		0.052	Book_To_Market		-0.043	0.067
		(0.858)			(0.299)	(0.214)
Stdev_bas		-24.367	Coverage		-0.002	-0.004**
		(0.085)			(0.221)	(0.048)
Adj_turn		84.273	Adj_turn		-4.298	-2.461
		(0.148)			(0.477)	(0.755)

Panel D1: Event D			Panel D2: Event D			
Dum_Treat		-0.144	Dum_Treat		-0.008	0.008
		(0.415)			(0.321)	(0.351)
Log_Assets		0.006	Log_Assets		-0.013*	-0.005
		(0.961)			(0.092)	(0.482)
Book_To_Market	166	-0.104	Book_To_Market	149	0.021*	-0.004
		(0.587)			(0.051)	(0.741)
Stdev_bas		-5.685	Coverage		0.000	0.000
		(0.527)			(0.742)	(0.339)
Adj_turn		45.349	Adj_turn		3.708	1.553
		(0.532)			(0.256)	(0.642)

Furthermore, the treatment firm sample consists of firms that are much larger than the average U.S. firm. Hence, the supposed benefit of increased information has a smaller impact, since such firms are already well-covered by traditional news and analysts. On the contrary, disclosure channels such as social media tend to benefit smaller firms who have lower coverage. The empirical results show that investors are ultimately more nervous about litigation risks, which is compounded by the uncertainty surrounding fairly new disclosure channels (i.e., social media).

D. Robustness Tests

To examine the robustness of the results from the CAR regression model, we conduct various robustness tests on the results for Events A and D. First, we add two additional control variables. We add each firm's Standard Industrial Classification (SIC), thus controlling for industry effects in a more robust manner than in the main model. Previously, industry effects were loosely controlled by including control firms from the same industry as treatment firms. Next, we add Adj_turn, which controls for the change in trading volume before and after each event, adjusted for the size of firms. The regression model, after adding in these two variables, is thus:

$$\begin{aligned} \text{A\_ret} = {} & \beta_0 + \beta_1 \text{Dum\_treat} + \beta_2 \text{Log\_assets} + \beta_3 \text{Book\_to\_market} \\ & + \beta_4 \text{Risk\_free\_rate} + \beta_5 \text{Returns} + \beta 6\ \text{Adj\_turn} + \textstyle\sum_i \beta_i K_i + \varepsilon \quad (5) \end{aligned}$$

where i represents the set of (n-1) SIC, β_i represents the beta for each industry, and K_i is a dummy variable which takes the value of 1 when the firm is in the industry)

Second, we remove firms that exhibit a Cook's distance that is above the conventional cut-off point, to ensure that significant results for Events A and D are not driven and skewed by outliers. After establishing the conventional point as 4/N, where N is the total number of firms, 9 outliers were removed from Event A and 12 outliers from Event D. Third, we use White's Heteroscedasticity-consistent standard error, according to White (1980). This allows us to have a more robust estimate of the standard error, which also corrects bias from heteroscedasticity of the residuals.

After the above three steps, the CAR regression model was run to test H1a and H1d. While H1d's coefficient of Dum_Treat increased in significance along the same direction (i.e. negative), H1a's coefficient of Dum_Treat became insignificant. Thus, after comprehensive robustness tests, only the null hypothesis for H1d is rejected.

Considering the list of events once again, Events A to C are not industry-wide regulatory events, but merely hint at the final direction of regulation. As a result, there was no significant market reaction recorded. On the other hand, Event D is the final and official stance that the SEC has published with regards to social media disclosures, and thus treatment firms suffered a negative CAR, which remains significant after robustness tests.

VI. CONCLUSION

In the existing social media literature, Blankespoor et al. (2014) find firms using Twitter for material disclosures enjoy better liquidity and lower bid-ask spreads. However, the literature is sparse due to the relatively new nature of this subject.

Using the firm dataset from Blankespoor et al.'s (2014) research, we find that treatment firms suffer negative CARs after the final event, after comprehensive robustness tests. This result suggests that the market remains nervous about social media disclosures, arguably because of litigation risks, as the Netflix saga raises possibility of Wells Notices against improper social media disclosures.

Our research paper contributes to the existing literature by first showing that social media are disclosure channels that interest investors, thus leading to significant market reactions around the final event date. Second, and more importantly, investors of large firms view the liberalization of social media disclosures as more harmful than beneficial. The supposed improved information environment that social media disclosures purports to bring about does not excite investors as much as it brings about fear. Social media are relatively new channels and little research has been done on the area of social media disclosures. Considering this and the Netflix saga that resulted in Wells Notices being issued, investors are more nervous about the increased litigation risks that come with increased social media disclosures. As a result, firms already active on Twitter with financial disclosures suffered a significantly negative abnormal return.

However, a major limitation of this research is the generalisability of the results. The dataset from Blankespoor et al. (2014) consists of firms much larger than the average firm in the CRSP database. This means that the effects of social media as disclosure channels are diminished, since large firms already receive extensive coverage from analysts and traditional media. Furthermore, the dataset only has 113 firms, and hence the results may not be fully representative of American stock issuers and their investors. Further research may study the relations between shareholding structure, firm size and the investors' reaction– would the use of social media similarly affect firms with wide shareholdings, and smaller market capitalization?

ENDNOTES

1. Twitter has reached 18.2 million unique visitors in 2009 and Facebook has reached 144.3 million unique visitors in 2009.

2. Grundfest, Joseph. 2013. Regulation FD in the Age of Facebook and Twitter: Should the SEC sue Netflix? Available at: http://ssrn.com/abstract=2209525
3. Grundfest, Joseph. 2013. Regulation FD in the Age of Facebook and Twitter: Should the SEC sue Netflix? Available at: http://ssrn.com/abstract=2209525
4. SIC is a standard series of 4-digit codes created by the U.S. government, for categorizing companies
5. Market value was calculated as the absolute magnitude of the stock price multiplied by shares outstanding on 2 July 2012, the trading day before the trigger event. This methodology is consistent with previous studies using CRSP database, such as Roll (1984).

APPENDIX

List of variables

Variable	Description
Returns	Cumulative return of each stock for 3-day, 5-day, 11-day window surrounding event
A_ret	Size-adjusted cumulative abnormal return of each stock
Log_assets	Logarithm of each firm's total assets
Risk_free_rate	Risk free rate for each stock
Book_to_market	Book to market ratio of each stock
Dum_treat	Dummy variable = 1 if stock is control firm and 0 otherwise
Meanest1	Lag- forecast mean estimate before event
Meanest	Forecast mean estimate after event
Diff_est	Difference of (meanest – meanest1)
Coverage	Number of analyst forecast estimates
Adj_turn	Change in number of shares traded pre- and post-event
Bidask2	Bid-ask spread on trading day before event
Bidask	Bid-ask spread on trading day after event
Diff_bidask	Difference of (bidask-bidask2)
Stdev_bas	Annualized standard deviation of daily stock returns
Stdev	Forecast dispersion after event
Stdev1	Lag- forecast dispersion before event
Diff_stdev	Difference of (stdev– stdev1)
Adj_turn	Change in number of shares traded pre- and post-event
Dum_treat	Dummy variable = 1 if stock is control firm and 0 otherwise

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