Social Network Activities, Future Earnings, and Equity Values

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We analyze Facebook activities of firms and find that the volume of firms' Facebook activities is positively associated with firms' future earnings. We interpret this finding as social network activities increasing firms' product visibility and brand awareness, and eventually creating a potential market that can generate future earnings. We also find that the volume of firms' Facebook activities is positively associated with their stock prices, indicating that investors recognize the potential product market benefits from Facebook activities and increase their expectations about firms' values. Our results suggest that the volume of social network activities is an important non-financial indicator of firms' values.

INTRODUCTION

Social media play an important role in generating values for business as the economy increasingly becomes knowledge-based. Companies are gradually adopting social networks, such as Facebook, as a channel to distribute corporate news and support their marketing strategies. In this paper, we analyze Facebook activities of firms included in Russell 3000 index. We find that the volume of Facebook activities, which include both company initiated posts and user initiated responses, is positively associated with firms' one-year-ahead and two-year-ahead earnings. Our explanation for this finding is that activities on social networks quickly disseminate information and sentiments which amplify firms' product visibility and brand awareness. This effect reaches a latent market that was not easily reachable with traditional media, and the potential market created by this network effect (Lev, 2001) brings profits to firms in the future.

We also find that the volume of activities on corporate Facebook pages is associated with increased equity values for firms after controlling for other value-creating components captured by current period accounting measures. This finding indicates that investors realize the potential product market benefits from the Facebook activities. Investors' realization of these potential benefits increases their expectations about firms' value. Eventually, the capital market rewards firms with increased stock prices.

Our study contributes to the emerging literature that addresses the impact of social media activities on firms' values. Research on the computer hardware and software industries (Luo, Zhang, & Duan, 2013) shows that consumer activities on social media such as web-blogs, ratings, consumer buzz, and Web traffic cause fluctuations in stock prices. In addition, studies also show that social media activities are associated with future revenue and profitability (Kim, Park, & Park, 2013; Kumar, Bhaskaran, Mirchandani, & Shah, 2013; Goh, Heng & Lin, 2013; Rishika, Kumar, Janakiraman, & Bezawada, 2013). However, the existing studies in this area are mostly limited to small samples that are generally restricted

to a specific industry or firms with certain business models. Large sample analysis in this area has become imperative because of the growing trend of firms integrating social networks into their marketing strategy. The 2013 Chief Marketing Officer Survey (www.cmosurvey.org) reports that expected spending on social media marketing will grow from 5.9% of firms' total marketing budgets in 2009 to over 20% by the early 2020's.[1] Among all the 2014 Russell 3000 firms, over 40% had already created Facebook pages by the end of 2014. A study that is more representative of the whole population of firms adopting social media is beneficial to both product markets and capital markets' stake holders in explaining how social media activities affect firms' values. Russell 3000 index stocks account for almost 85% US stock market trading volume. Using Russell 3000 index firms gives us the benefit of a broad coverage and the ability to generalize the findings of the value impact of social media activities. We extend the existing literature by providing large sample evidence and highlighting the underlying mechanism that higher volume of social network activities results in increased future earnings expectations which leads to increased firms' values. Our findings also contribute to the accounting literature that studies the value-relevance of non-financial information (e.g. Amir & Lev, 1996; Ittner & Larcker, 1998; etc.) by introducing the volume of Facebook activities as a new non-financial indicator of firms' values.

The rest of this paper has the following sections: section 2 discusses background and literature highlighting the uniqueness of Facebook in increasing brand awareness and creating potential markets for firms; section 3 specifies the hypotheses; section 4 explains data collections and test designs; section 5 elaborates the findings; and section 6 provides concluding remarks.

BACKGROUND AND LITERATURE REVIEW

Background

We choose Facebook in our study because of its large active user base and also because of its popularity as one of the most effective channels for information dissemination. Companies can choose from many available social network platforms for news dissemination, such as Facebook, Twitter, LinkedIn, etc. Among all the social network platforms, Facebook has the highest number of active users.[2] As of March 2016, Facebook has 1.65 billion monthly active users. Facebook users also cover a wide geographic area. Approximately 84.2% of its daily active users are outside the US and Canada.[3] Facebook pages can easily be connected with other social network platforms such as Twitter, YouTube, Instagram, etc. Facebook users can easily obtain information from these other platforms that are connected with Facebook.

The information dissemination process through Facebook is more efficient than the dissemination of news through traditional media. Traditional media outlets, such as newspapers, websites, blogs, RSS feed etc., do not have the dynamic platform offered by Facebook. People need to initiate the search for information they need. Someone who needs information related to multiple companies has to perform multiple searches. On Facebook, news posts are directly delivered to the newsfeed of the subscriber without the need for any search. Posts made on corporate Facebook pages are generally open to the public. New posts are delivered instantly if a person subscribes or follows a firm's page. This process significantly reduces the efforts related to news collection. Users can easily compare news for different companies directly from their newsfeed. Moreover, users can easily interact with the company and other users on Facebook. A simple 'like', 'share', or 'comment' to any post also makes the newsfeed available to the friends of the users and sometimes to the friends of friends. A significant portion of these interactions tend to happen fairly quickly. A study by Optimal Social (Brand Networks as of October 2013) shows that 75% of Facebook interactions happen within the first three hours.[4] This dynamic connectivity among the users accelerates the dissemination process. Thus, Facebook as a social media platform not only helps spread news among a very large set of users quickly, but also disseminates user sentiments through interactions. There is plenty of evidence of how social media is changing the public relations, marketing, and information systems landscape. Companies purchase statistics from the social media companies, such as Facebook, so that they can analyze users' behavior and develop strategic moves. Large corporations use social media strategists to maintain their pages in order to influence

investors' perceptions, the product market, and ultimately the financial market. Social media plays an important role in facilitating information demand and supply.

Literature Review

Studies have shown that social media-based activities affect the behavior of stock prices. Luo, Zhang, and Duan (2013) use a sample of 9 firms in computer hardware and software industries and find that social media-based activities such as web-blogs and consumer ratings are leading indicators of firms' equity values and have stronger predictive value than conventional online consumer behavioral metrics. Luo and Zhang (2013) use the same sample of these 9 tech firms and indicate that consumer buzz and traffic in social media explain a substantial portion of the total variance of firms' values. Lee, Hutton, and Shu (2015) find that social media disclosure related to recall announcements attenuate the negative price reactions. Research of certain industries also documents the association between social media activities and firms' future financial performance such as revenue and profitability. Kim et al. (2013) discover that the frequency of online word of mouth and expert reviews increase theatrical movies' box office success. Kumar et al. (2013) show that social media can be used to generate growth in sales and ROI of an ice-cream retailer. Customers' engagements in social media are found to increase apparel purchase (Goh et al. 2013) and the frequency of customer visits (Rishika, et al., 2013). Existing accounting studies have documented the value-relevance of different types of non-financial information (Amir & Lev, 1996; Ittner & Larcker, 1998; Trueman,Wong, & Zhang, 2000; Demers & Lev, 2001; Rajgopal, Venkatachalam, & Kotha, 2003) and analyzed the link between such non-financial information and firms' future earnings performance (Banker, Potter & Srinivasan, 2000; Nagar & Rajan, 2001; Rajgopal, Shevlin, & Venkatachalam, 2003).

Our study examines the value of a social network through its impact on firms' fundamental performance of all the Russell 3000 firms. We provide evidence that the volume of social network activities, as a non-financial indicator, explains firms' values. We aim to provide an explanation to the rationale behind the recent trend of companies adopting social network platforms for news dissemination and marketing purposes.

HYPOTHESES

The primary objective of this study is to examine and explain the relationship between corporate Facebook activities and firms' values. Our first hypothesis analyzes the association of Facebook activities and firms' future earnings. Our second hypothesis explores whether equity investors recognize the product market benefits of social network activities and raise their expectations about firms' values.

Social networks increase brand awareness and product visibility which create a potential future market and becomes a significant competitive advantage for the firm. On Facebook, brand awareness and visibility increase through two complementary processes. In the first process, firms post information on their Facebook pages which convey public information immediately to users who subscribe to the company's Facebook page. In the second process, when subscribers to firms' Facebook page react to the company's posts by sharing, liking, or commenting, they make such posts further available to people who are not subscribers to these pages but are their friends or interacting with their friends in the network. Thus, such posts become available to people who are not actively searching for this news or to people who might otherwise remain unaware of such information. These two types of activities make firms visible to a potential market that was difficult to access through traditional media. We expect to observe a positive impact on firms' future earnings from their social network activities.

Hypothesis 1: The volume of Facebook activities is positively associated with firms' future earnings.

Firms create visibility among equity investors when they post news on social networks and when users respond to these posts sending investors signals that these firms will have stronger future performance caused by expansion of their product market. These signals revise investors' beliefs and eventually influence stock prices. We expect to observe a positive association between the volume of firms' Facebook activities and their stock prices.

Hypothesis 2: The volume of firms' Facebook activities is positively associated with their stock prices.

DATA, RESEARCH DESIGN AND VARIABLES

Data

We collected publicly available Facebook posts from individual corporate Facebook pages (at www.facebook.com) from 2008 to 2014. These posts can be viewed at each corporate Facebook page and can be recorded in a machine readable format. We first manually collected each company's Facebook webpage from their companies' webpages for all the firms in Russell 3000 index published in July 2014. Next, we used a web-crawler, a program that can scrape webpages and collect information, to collect all the publicly available information from each company's Facebook page. We collected data on Facebook activities starting from each Facebook page initiation date until July 22, 2015, which is the date we executed the web crawling program. Our sample starts from 2008 because that is the earliest time when a significant amount of firms and Facebook users started using Facebook. Not all the firms in the July 2014 Russell 3000 index have corporate Facebook pages. At the beginning of our sample period there were only 122 firms with corporate Facebook pages, and by the end of our sample period we had 1,233 firms with corporate Facebook pages. The firm-years with no Facebook activities are included in our analysis as a control sample. We also collected Facebook users' interaction information which includes the total number of likes, comments, and shares of all the posts of a year. Users' interaction activities information is unique to social media and not available in traditional media. These interaction-related metrics tell us about the intensity of user engagement.

We collected financial data from COMPUSTAT and stock price data from CRSP for our sample period. We start with all firms on Russell 3000 index (in June 2014) and eliminate firm-years with missing stock price, book value of equity, or other financial information. We also delete observations with negative total shareholders' equity. Our final sample includes 16,162 firm-year observations of 2,794 firms with fiscal year ending between December 31, 2008 and December 31, 2014.

Research Design and Variables

In the analysis of our first hypothesis, we follow a methodology similar to what is applied in Rajgopal, Venkatachalam, and Kotha (2003). We first express earnings of a firm with a function of tangible and intangible assets (Mairesse & Sassenou, 1991; Hall, 1993; Lev & Sougiannis, 1996) that are recognized in firms' financial statements:

Earnings = f (*tangible assets, intangible assets*).

Following Rajgopal, Venkatachalam, and Kotha (2003), we proxy for tangible assets with the total assets (*AT*) of a firm. We include research and development expenses (*RD*) and advertising expenses (*ADV*) in our model to control for intangible assets. *AT*, *RD,* and *ADV* are all scaled by total number of shares outstanding at the end of the fiscal year. We introduce the market-to-book ratio (*MB*) as a control for potential effects of risk and growth (Fama & French, 1992; Aboody, Barth, & Kasznik, 1999). We then add the volume of Facebook activities (*FB*) in the regression as the major variable of our interest. We use one-year-ahead and two-year-ahead earnings ($FUTEARN_{i,t+n}$) per share from the year of Facebook posts to proxy for *Earnings*, where *n* equals 1 if the dependent variable is one-year-ahead earnings per share, and *n* equals 2 if the dependent variable is two-year-ahead earnings per share. Specifically, we estimate the impact of social network-created visibility on future earnings with the following model:

$$FUTEARN_{i,t+n} = \beta_0 + \beta_1 FB_{it} + \beta_2 AT_{it} + \beta_3 RD_{it} + \beta_4 ADV_{it} + \beta_5 MB_{it} + \beta_6 YEAR_{it} + \beta_7 IND_{it} + \varepsilon_{it} \quad (1)$$

We use this model for two reasons. First, we want to show that there is a similarity between Facebook activities (*FB*) and a value-creating asset captured by financial statements (*AT*, *R&D* and *ADV*) in terms of the way they contribute to the future earnings of a firm. Facebook activities increase firms' visibility and contribute to firms' values through their enhancement of firms' brand awareness. We expect the benefit from social network activities to be realized in more than one accounting period which is similar to the benefit generated by an asset. Second, using this model, we can show that social network activities

are new non-financial indicators of firms' future performance that are not captured by any of the traditional financial measurements. We use four different measures (*POSTS*, *SHARES, LIKES*, and *COMMENTS*) to capture two different aspects of Facebook activities. *POSTS* captures the supply side activities. It is measured as the number of Facebook posts by a firm during the fiscal year. *SHARES, LIKES*, and *COMMENTS* capture the users' reactions to corporate Facebook activities. These are calculated as the total number of shares, likes, or comments, respectively, for all posts made by a firm during a fiscal year. These three measures capture the effect of user engagement given that a firm has posted on its Facebook page. We use the natural log of one plus the total number of *POSTS, LIKES, SHARES*, and *COMMENTS* in our regression analysis to mitigate the issue of variable skewness. We assign zero to *POSTS, LIKES, SHARES,* and *COMMENTS* if a firm has no Facebook page or has not posted anything since it created its Facebook page.

In our analysis of the second hypothesis, we follow existing literature that applies the Ohlson (1995) framework (Barth, Clement, Foster & Kasznik, 1998; Keating, Lys, & Magee, 2003; Rajgopal, Venkatachalam, & Kotha, 2003) and examine the impact of Facebook posts on firms' equity values with the following regression:

$$PRC_{i,t+n} = \beta_0 + \beta_1 FB_{it} + \beta_2 BV_{it} + \beta_3 EARN_{it} + \beta_4 DCC_{it} + \beta_5 RD_{it} + \beta_6 ADV_{it} + \beta_7 DIV_{it} + \beta_8 IND_{it} + \beta_9 YEAR_t + \varepsilon_{it} \quad (2)$$

FB refers to variables of Facebook activities *POSTS*, *SHARES*, *COMMENTS,* and *LIKES*. The dependent variable *PRC* is the stock price of a firm three months after the end of the fiscal year. We use stock price three months after the end of the fiscal year to make sure that the stock price already incorporates the impact of the earnings release. According to Ohlson (1995), book value of equity, earnings, dividend, and residual income are components of the function of firms' equity values. We include book value of equity (*BV*), earnings before extraordinary items (*EARN*), dividend (*DIV*), and change in contributed capital (*DCC* = par value + additional paid in capital) as control variables. We also control for research and development expenditures (*RD*) and advertising expenditures (*ADV*) because they both have positive contributions to market values (Lev & Sougiannis, 1996; Hirschey & Weygandt, 1995). We scale all control variables (*BV, EARN, DCC, RD, ADV,* and *DIV*) by the total number of shares outstanding at the end of the fiscal year. We assign zero to *RD, ADV*, and *DIV* if they are missing values.

In both the regressions (1) and (2), we introduce industry and year dummies to control for any unexplained variation in stock price that may covary with industry membership or time. Industry dummies are constructed according to the definition of Fama-French 48 industries. We winsorize all variables in the top and bottom 1%. The t-statistics are calculated based on standard errors clustered by both firm and year for all regressions.

RESULTS

Descriptive Statistics

Table 1 shows the number of firms that post on Facebook and the average number of Posts, Shares, Likes, and Comments (hereafter, posts, shares, likes, and comments respectively) per firm every year from 2008 to 2014. The volume of Facebook activities grew rapidly from 2008 to 2014. In 2008, only 122 out of 1,620 firms posted on Facebook. On average, each of these 122 firms had only 6 posts in 2008. The averages of total number of shares, likes, and comments for all posts per firm in 2008 were only 1, 12, and 3 respectively. We see a rapid growth of Facebook usage by firms and user reactions over our sample years. In 2014, 1,233 firms posted on Facebook. On average, each of these 1,233 firms had 284 posts during the year. The total number of shares was 14,350, likes was 152,197, and comments was 7,394. This growing trend of Facebook usage among public firms indicates that firms are actively utilizing Facebook to increase their visibility among investors, followers, and customers. At the same time, Facebook users have also adopted the platform and increased their reactions and engagements.

TABLE 1
NUMBER OF FACEBOOK POSTS, SHARES, AND LIKES ON FACEBOOK PAGES

Year	Number of firms in the sample	Number of firms that post on Facebook	Average posts per firm that posts on Facebook	Average 'Shares' per firm that posts on Facebook	Average 'Likes' per firm that posts on Facebook	Average 'Comments' per firm that posts on Facebook
	(A)	(B)	(C)	(D)	(E)	(F)
2008	1,620	122	6	1	12	3
2009	2,214	387	49	12	664	298
2010	2,273	583	135	38	4,535	1,906
2011	2,373	805	179	315	12,661	3,640
2012	2,462	959	229	4,846	44,776	5,764
2013	2,561	1,112	260	13,295	124,123	8,151
2014	2,659	1,233	284	14,350	152,197	7,394

Note: Table 1 shows the total number of firm-years in the sample, the number of firms that post on Facebook every year, the average number of Facebook posts, 'Shares', 'Likes' and 'Comments' of a firm that post on Facebook. The table includes 16,162 firm-years from 2008 to 2014, among which 5,201 have non-zero posts.

Table 2 to Table 5 show the top 10 industries, according to Fama-French 48 industry classification, that have the highest total number of Facebook posts, shares, likes, and comments among all the industries from 2008 to 2014. The total number of posts in Table 2 shows which industries are most actively releasing information on Facebook. Retail industry and business services industry are the top two industries in terms of highest total number of Facebook posts. Firms in retail industry have 197,082 posts in total, and firms in business service industry have 175,462 posts in total. Each of these two industries has a total number of posts that is almost three times as many as the number of posts from the banking industry which is ranked third. This is not surprising since firms in the retail and the business services industries directly provide services to end users, and it is very important for them to keep the market informed and engaged all the time.

TABLE 2
TOP 10 INDUSTRIES WITH THE HIGHEST TOTAL NUMBER OF FACEBOOK POSTS

Industry Name (Fama-French 48 Industries Classification Code)	Total Number of Posts
Retail (42)	197,082
Business Services (34)	175,462
Banking (44)	62,476
Computers (35)	56,172
Healthcare (11)	48,567
Communication (32)	48,078
Electronic Equipment (36)	47,074
Trading (47)	41,056
Transportation (40)	37,157
Insurance (45)	32,072

Table 3, Table 4, and Table 5 show the total number of shares, likes, and comments, respectively, for the top 10 industries. These numbers indicate which industries generate the most user responses on their Facebook pages. The retail industry, the restaurants hotels & motels industry, and the communication industry get very high volume of user reactions indicating that these industries generate a high level of user reactions. One of the reasons for this high level of reactions is that firms use promotions to explore new markets. Consumers of these industries often can use their responses to firms' posts to receive referral discounts and coupons.[5] In Table 4, besides the restaurants hotels & motels industry, the apparel industry and the electronic equipment industry are the other two industries that have more than 1,000 likes per post. The products in these industries such as apparel, TV, and communication equipment update very quickly and the price of outdated styles and older models are discounted frequently. The high level of user reactions on the social network show that consumers of these two industries are interested in following the trends in fashion and staying abreast of new technologies. In general, there is an observable correlation between Facebook posts and user responses. We observe that six (Retail, Business Services, Banking, Communication, Electronic Equipment, and Transportation) out of the ten highest ranked posting industries (Table 2) also show up in Table 2, 3, or 4, meaning that in general industries that make high levels of posts also generate high levels of responses. This indicates that Facebook posts are effective in attracting people's attention which increases firms' visibility in the product market. The top ten 'Shares' industries are also the top ten 'Comments' industries. Nine of those industries are also among the top ten 'Likes' industries. This shows that the network effect of Facebook sharing is very effective in spreading the information and engaging users which enhances the firms' visibility.

Our sample's coverage of firms is significantly higher than what is used for analyses in prior studies. Rajgopal, Venkatachalam, & Kotha (2003) used a sample of 92 e-commerce firms, and Luo et al. (2013) focused on only 9 firms from the computer software and hardware industries. In our sample, the total number of firms that use Facebook in 2014 in our sample is 1,233. We also observe that the use of corporate Facebook pages extends over a large number of industries, and the usage of Facebook is not necessarily concentrated in the high-tech or the electronic equipment industries.

TABLE 3
TOP 10 INDUSTRIES WITH HIGHEST TOTAL NUMBER OF FACEBOOK 'SHARES'

Industry Name (Fama-French 48 Industries Classification Code)	Total Number of 'Shares'	Average Number of 'Shares' Per Post
Retail (42)	10,510,280	53
Business Services (34)	2,951,035	17
Restaurants, Hotels, Motels (43)	2,471,486	101
Transportation (40)	2,379,212	64
Communication (32)	2,247,177	47
Food Products (2)	2,149,456	107
Consumer Goods (9)	1,891,643	112
Apparel (10)	1,707,880	74
Entertainment (7)	1,471,895	84
Banking (44)	1,199,473	19

TABLE 4
TOP 10 INDUSTRIES WITH HIGHEST TOTAL NUMBER OF FACEBOOK 'LIKES'

Industry Name (Fama-French 48 Industries Classification Code)	Total Number of 'Likes'	Average Number of 'Likes' Per Post
Retail (42)	125,241,375	635
Restaurants, Hotels, Motels (43)	29,052,203	1,182
Communication (32)	27,304,310	568
Apparel (10)	24,641,198	1,068
Transportation (40)	24,056,552	647
Business Services (34)	22,663,057	129
Banking (44)	19,033,971	305
Consumer Goods (9)	17,103,223	1,013
Electronic Equipment (36)	14,367,427	305
Entertainment (7)	12,817,854	727

TABLE 5
TOP 10 INDUSTRIES WITH HIGHEST TOTAL NUMBER OF FACEBOOK 'COMMENTS'

Industry Name (Fama-French 48 Industries Classification Code)	Total Number of 'Comments'	Average Number of 'Comments' Per Post
Retail (42)	10,252,140	52
Communication (32)	2,376,453	49
Restaurants, Hotels, Motels (43)	2,080,576	85
Business Services (34)	1,789,102	10
Transportation (40)	1,752,465	47
Entertainment (7)	1,181,910	67
Consumer Goods (9)	1,124,119	67
Apparel (10)	994,887	43
Food Products (2)	894,476	45
Banking (44)	756,140	12

Table 6 compares the descriptive statistics of future earnings, stock prices, and control variables of the subsample of firms with Facebook posts and the subsample of firms with no Facebook posts. Firms that post on Facebook on average have slightly lower book value of equity (*BV*) and higher average stock prices (*PRC*) than firms without Facebook posts. Firms that post on Facebook have relatively higher average market-to-book ratios (*MB*) which shows that they have higher growth potential. Firms that post on Facebook also tend to have slightly higher investment in research and development (*RD*) which is 0.414 per share on average. Mean advertising expenditure of firms that post on Facebook is 0.346 per share which is more than twice of the advertising expenditure of firms that do not post on Facebook. In un-tabulated statistics, we find that more than half the firms that post on Facebook also invest in advertising (*ADV*) while the majority of the firms with no Facebook posts have zero advertising expenses. This indicates that Facebook activities are likely an integrated part of posting firms marketing strategies. Firms that post on Facebook also have higher current earnings per share (*EARN*) compared to firms that have no Facebook posts. The mean (0.76 per share) of the change in capital expenditure (*DCC*) is higher for firms with no Facebook posts. But the median (0.202 per share) is slightly higher for firms that post on Facebook indicating that the change in capital expenditure is less skewed for firms with Facebook posts.

TABLE 6
DESCRIPTIVE STATISTICS

	Total No. of Observations	No. of Obs. with FB Posts	Firms with no Facebook posts		Firms with Facebook posts	
			Mean	Median	Mean	Median
PRC	16,162	5,201	29.878	21.530	37.148	27.890
$FUTEARN_{(t+1)}$	15,907	5,100	1.204	1.014	1.630	1.329
$FUTEARN_{(t+2)}$	13.248	3,919	1.249	1.019	1.721	1.342
BV	16,162	5,201	15.753	11.657	14.890	11.133
EARN	16,162	5,201	1.000	0.934	1.538	1.213
DCC	16,162	5,201	0.760	0.185	0.552	0.202
RD	16,162	5,201	0.323	0.000	0.414	0.000
ADV	16,162	5,201	0.131	0.000	0.346	0.022
DIV	16,162	5,201	0.473	0.091	0.457	0.080
AT	15,907	5,100	64.651	30.697	52.328	26.222
MB	15,907	5,100	2.849	1.738	3.611	2.265

Note: Table 6 reports summary statistics for 16,162 firm-years of 2,794 firms between 2008 and 2014.

Analyzing the Association between Social Network Activities and Firms Future Earnings

In this section, we test Hypothesis 1 and provide direct evidence about the association between social network activities and future earnings. We keep all the observations that have available one-year-ahead and two-year-ahead earnings. All the observations of 2014 are eliminated because the earnings of 2016 are not available at the time of our test. The sample for the test related to one-year-ahead future earnings has 15,907 observations. The sample for the test related to two-year-ahead future earnings has 13,248 observations. Table 6 reports the descriptive statistics of future earnings. The average one-year-ahead and two-year-ahead earnings per share for firms with Facebook posts are 1.630 and 1.721. They are higher than 1.204 and 1.249 which are the one-year-ahead and two-year-ahead earnings per share of firms without Facebook posts.

Table 7 reports the results of estimating equations (1) for one-year-ahead future earnings ($FUTEARN_{t+1}$), and Table 8 reports the results of estimating equations (1) for two-year-ahead future earnings ($FUTEARN_{t+2}$). In both Table 7 and Table 8, Equation (1) is estimated for four different Facebook activity measures (*FB*): company initiated activity measures *POSTS* and user initiated activity measures *SHARES, LIKES,* and *COMMENTS*. Consistent with our expectations, we find that Facebook activities exhibit a strong positive association with one-year-ahead and two-year-ahead earnings. The coefficient on Facebook *POSTS* for the one-year and two-year-ahead earnings regressions are 0.052 and 0.050 (t-statistics are 3.978 and 3.288 in the one year and two-year-ahead regressions, respectively). The coefficient on Facebook *SHARES* for the one-year and two-year-ahead earnings regressions are 0.071 and 0.081 (t-statistics are 5.588 and 4.919 in the one year and two-year-ahead regressions, respectively). The coefficient on Facebook *LIKES* for the one-year and two-year-ahead earnings regressions are 0.049 and 0.051 (t-statistics are 5.428 and 4.977 in the one year and two-year-ahead regressions, respectively). The coefficient on Facebook *COMMENTS* for the one-year and two-year-ahead earnings regressions are 0.074 and 0.074 (t-statistics are 5.897 and 5.834 in the one year and two-year-ahead regressions, respectively). The strong positive association between the volume of social network activities and firms' future earnings supports our Hypothesis 1.

TABLE 7
THE ASSOCIATION OF FACEBOOK ACTIVITY AND FIRMS' ONE-YEAR-AHEAD EARNINGS

	1	2	3	4
	$FUTEARN_{(t+1)}$	$FUTEARN_{(t+1)}$	$FUTEARN_{(t+1)}$	$FUTEARN_{(t+1)}$
POSTS	0.052***			
	(3.978)			
SHARES		0.071***		
		(5.588)		
LIKES			0.049***	
			(5.428)	
COMMENTS				0.074***
				(5.897)
AT	0.004	0.004	0.004	0.004
	(0.986)	(0.980)	(0.982)	(0.982)
RD	0.500***	0.491***	0.491***	0.490***
	(5.449)	(5.367)	(5.364)	(5.343)
ADV	0.141	0.114	0.117	0.100
	(0.994)	(0.820)	(0.831)	(0.722)
MB	0.042***	0.040***	0.040***	0.040***
	(4.026)	(3.854)	(3.890)	(3.788)
Observations	15,907	15,907	15,907	15,907
Adjusted R-squared	0.124	0.127	0.126	0.127
Year Dummies	Yes	Yes	Yes	Yes
Industry Dummies	Yes	Yes	Yes	Yes

*Standard errors are clustered by both firm and time dimensions, t-statistics are in parentheses, level of significance is denoted as *** for p<0.01, ** for p<0.05, * for p<0.1.*

TABLE 8
THE ASSOCIATION OF FACEBOOK ACTIVITY AND FIRMS' TWO-YEAR-AHEAD EARNINGS

	1 $FUTEARN_{(t+2)}$	2 $FUTEARN_{(t+2)}$	3 $FUTEARN_{(t+2)}$	4 $FUTEARN_{(t+2)}$
POSTS	0.050***			
	(3.288)			
SHARES		0.081***		
		(4.919)		
LIKES			0.051***	
			(4.977)	
COMMENTS				0.074***
				(5.834)
AT	0.006***	0.006***	0.006***	0.006***
	(2.614)	(2.622)	(2.620)	(2.624)
RD	0.580***	0.569***	0.570***	0.569***
	(5.710)	(5.641)	(5.625)	(5.639)
ADV	0.121	0.095	0.099	0.086
	(0.744)	(0.599)	(0.619)	(0.546)
MB	0.055***	0.053***	0.053***	0.053***
	(4.832)	(4.654)	(4.653)	(4.563)
Observations	13,248	13,248	13,248	13,248
Adjusted R-squared	0.141	0.144	0.143	0.144
Year Dummies	Yes	Yes	Yes	Yes
Industry Dummies	Yes	Yes	Yes	Yes

*Standard errors are clustered by both firm and time dimensions, t-statistics are in parentheses, level of significance is denoted as *** for p<0.01, ** for p<0.05, * for p<0.1.*

5.2 Examining the Association between the Volume of Social Network Activities and Firms' Stock Prices

Table 9 reports the results of equation (2), the regression analysis of the association between the volume of Facebook activities and firms' equity values. A positive association between the volume of Facebook activities and stock prices supports our hypothesis that Facebook activities have a positive impact on firms' values. Equation (2) is estimated for four different Facebook activity measures (*FB*): company initiated activity measures *POSTS* and user initiated activity measures *SHARES, LIKES,* and *COMMENTS*. In all of the four regressions, the coefficient of Facebook activity is significantly positive indicating that activities on Facebook have significant positive impact on future firms' values. The coefficient of *POSTS* is 0.372 (t-statistics = 2.930). The coefficient of *SHARES* is 0.538 (t statistics = 4.312). The coefficient of *LIKES* is 0.361 (t-statistics= 3.976), and the coefficient of *COMMENTS* is 0.469 (t-statistics = 3.708). The user initiated activity measures *SHARES, LIKES,* and *COMMENTS* are only non-zero if companies have posts on their Facebook pages. So these measures capture the integrated benefit of an active Facebook page and active Facebook users' responses. *BV, EARN, DCC,* and *DIV* are all positively associated with future stock prices which is consistent with the results of prior studies (Ohlson, 1995; Collins, Maydew & Weiss, 1997; Kothari, 2001; Holthausen & Watts, 2001). The coefficients of *RD* and *ADV* are both positive for all the regressions. This result is also consistent with earlier studies which show that research & development and advertising expenses increase future revenues (Lev & Sougiannis, 1996; Hirschey & Weygandt, 1985). The results in Table 9 support our

Hypothesis 2 and implies that activities on company Facebook pages have positive impact on future firms' values. This positive impact is observed after controlling for other traditional financial statement measures which includes book value of equity, research & development, capital expenditure, and advertising expenditures. This indicates that the value that is provided through social network is beyond all the other value-creating assets that are recognized in the financial statement measures. Overall, our analysis of hypothesis 2 confirmed our expectation that Facebook activities have positive impact on firms' value, and the findings in hypothesis 1 analysis provides the underlying process through which Facebook activities affect firms' values.

TABLE 9
ANALYSIS ON THE IMPACT OF FACEBOOK ACTIVITY ON FIRMS' EQUITY VALUES

	1 *PRC*	2 *PRC*	3 *PRC*	4 *PRC*
POSTS	0.372*** (2.930)			
SHARES		0.538*** (4.312)		
LIKES			0.361*** (3.976)	
COMMENTS				0.469*** (3.708)
BV	0.899*** (11.552)	0.900*** (11.509)	0.900*** (11.518)	0.900*** (11.507)
EARN	3.627*** (4.318)	3.612*** (4.323)	3.613*** (4.319)	3.610*** (4.319)
DCC	1.586*** (3.756)	1.591*** (3.754)	1.589*** (3.755)	1.591*** (3.754)
RD	9.219*** (6.020)	9.144*** (6.001)	9.150*** (5.977)	9.166*** (6.011)
ADV	4.770*** (4.315)	4.556*** (4.176)	4.584*** (4.174)	4.526*** (4.169)
DIV	4.407*** (5.728)	4.314*** (5.570)	4.352*** (5.615)	4.348*** (5.584)
Observations	16,162	16,162	16,162	16,162
Adjusted R-squared	0.590	0.591	0.591	0.591
Year Dummies	Yes	Yes	Yes	Yes
Industry Dummies	Yes	Yes	Yes	Yes

*Standard errors are clustered by both firm and time dimensions, t-statistics are in parentheses, level of significance is denoted as *** for p<0.01, ** for p<0.05, * for p<0.1.*

CONCLUSION

Studies about the value of social media activities provide important information to corporations, regulators, investors, and other stakeholders who are making decisions to influence the markets and improve social welfare. Our study utilizes a novel and large sample of firms' Facebook usage data. Our results show the value impact of network effects that can be generalized to a large number of industries. We find that the volume of Facebook activities is positively associated with firms' future earnings and stock prices. A vibrant corporate social network can provide benefits to firms in the form of faster news

dissemination, increased market visibility, and increased brand awareness. Our findings highlight that higher volume of social network activities results in increased future earnings expectations, which lead to increased firm values.

ENDNOTES

1. https://cmosurvey.org/, The Social Media Spend-Impact Disconnect, February 16, 2016.
2. http://www.statista.com/statistics/272014/global-social-networks-ranked-by-number-of-users/ shows that the monthly active user is 1.59 billion for Facebook, 320 million for Twitter, and 100 million for LinkedIn, etc.
3. https://newsroom.fb.com/company-info/.
4. http://venturebeat.com/2013/03/28/75-of-facebook-engagement-is-in-the-first-180-minutes-says-facebook-competition-winning-tool/
5. An internet blog (https://blog.bufferapp.com/7-facebook-stats-you-should-know-for-a-more-engaging-page) cites data from Socially Stacked that 42% of Facebook fans like a page in order to get a discount or coupon.

REFERENCES

Aboody, D., Barth, M. E., & Kasznik, R. (1999). Revaluations of fixed assets and future firm performance: Evidence from the UK. *Journal of Accounting and Economics*, 26(1), 149-178.

Amir, E., & Lev, B. (1996). Value-relevance of nonfinancial information: The wireless communications industry. *Journal of accounting and economics*, 22(1), 3-30.

Banker, R. D., Potter, G., & Srinivasan, D. (2000). An empirical investigation of an incentive plan that includes nonfinancial performance measures. *The Accounting Review,* 75(1), 65-92.

Barth, M. E., Clement, M. B., Foster, G., & Kasznik, R. (1998). Brand values and capital market valuation. *Review of accounting studies*, 3(1-2), 41-68.

Collins, D., Maydew, E., Weiss, I. (1997). Changes in the value-relevance of earnings and book values over the past forty years. *Journal of Accounting and Economics,* 24(1), 39-67.

Demers, E., & Lev, B. (2001). A rude awakening: Internet shakeout in 2000. *Review of Accounting Studies*, 6(2-3), 331-359.

Fama, E. F., & French, K. R. (1992). The cross□section of expected stock returns. *The Journal of Finance*, 47(2), 427-465.

Goh, K. Y., Heng, C. S., & Lin, Z. (2013). Social media brand community and consumer behavior: Quantifying the relative impact of user-and marketer-generated content. *Information Systems Research*, 24(1), 88-107.

Hall, B. H. (1993). The stock market's valuation of R&D investment during the 1980's. *The American Economic Review*, 83(2), 259-264.

Holthausen, R., & Watts, R. (2001). The relevance of the value-relevance literature for financial accounting standard setting. *Journal of Accounting and Economics,* 31(1-3), 3-75.

Hirschey, M., & Weygandt, J. J. (1985). Amortization policy for advertising and research and development expenditures. *Journal of Accounting Research*, 23(1), 326-335.

Ittner, C. D., & Larcker, D. F. (1998). Are nonfinancial measures leading indicators of financial performance? An analysis of customer satisfaction. *Journal of accounting research*, 36, 1-35.

Keating, E. K., Lys, T. Z., & Magee, R. P. (2003). Internet downturn: Finding valuation factors in spring 2000. *Journal of Accounting and Economics,* 34(1), 189-236.

Kim, S. H., Park, N., & Park, S. H. (2013). Exploring the effects of online word of mouth and expert reviews on theatrical movies' box office success. *Journal of Media Economics*, 26(2), 98-114.

Kothari, S. (2001). Capital market research in accounting. *Journal of Accounting and Economics,* 31(1-3), 105-231.

Kumar, V., Bhaskaran, V., Mirchandani, R., & Shah, M. (2013). Practice prize winner-creating a measurable social media marketing strategy: increasing the value and ROI of intangibles and tangibles for hokey pokey. *Marketing Science*, 32(2), 194-212.

Lee, F., Hutton, A., & Shu, S. (2015). The role of social media in the capital market: evidence from consumer product recalls. *Journal of Accounting Research,* 53(2), 367-404.

Lev, B. (2001). *Intangibles: Management, measurement, and reporting*. Brookings Institution Press.

Lev, B., & Sougiannis, T. (1996). The capitalization, amortization, and value-relevance of R&D. *Journal of Accounting and Economics,* 21(1), 107-138.

Luo, X., & Zhang, J. (2013). How do consumer buzz and traffic in social media marketing predict the value of the firm? *Journal of Management Information Systems,* 30(2), 213-238.

Luo, X., Zhang, J., & Duan, W. (2013). Social media and firm equity value. *Information Systems Research*, 24(1), 146-163.

Mairesse, J., & Sassenou, M. (1991). *R&D productivity: A survey of econometric studies at the firm level* (No. w3666). National Bureau of Economic Research.

Nagar, V., & Rajan, M. V. (2001). The revenue implications of financial and operational measures of product quality. *The Accounting Review*, 76(4), 495-513.

Ohlson, J. A. (1995). Earnings, book values, and dividends in equity valuation. *Contemporary Accounting Research,* 11(2), 661-687.

Rajgopal, S., Shevlin, T., & Venkatachalam, M. (2003). Does the stock market fully appreciate the implications of leading indicators for future earnings? evidence from order backlog. *Review of Accounting Studies,* 8(4), 461-492.

Rajgopal, S., Venkatachalam, M., & Kotha, S. (2003). The value relevance of network advantages: The case of e–commerce firms. *Journal of Accounting Research,* 41(1), 135-162.

Rishika, R., Kumar, A., Janakiraman, R., & Bezawada, R. (2013). The effect of customers' social media participation on customer visit frequency and profitability: an empirical investigation. *Information systems research*, 24(1), 108-127.

Trueman, B., Wong, M. F., & Zhang, X. J. (2000). The eyeballs have it: Searching for the value in Internet stocks. *Journal of Accounting Research*, 38, Supplement, 137-162.

VARIABLE DESCRIPTIONS

Variable	Description	Source
POSTS	Total number of posts on company Facebook page during the fiscal year. This measure captures company initiated Facebook activity.	Facebook
SHARES	Total number of shares for all posts made by the company on its Facebook page during the fiscal year. This measure captures user or subscriber engagement in response to company initiated Facebook activity.	Facebook
LIKES	Total number of likes for all posts made by the company on its Facebook page during the fiscal year. This measure captures user or subscriber engagement in response to company initiated Facebook activity.	Facebook
COMMENTS	Total number of comments for all posts made by the company on its Facebook page during the fiscal year. This measure captures user or subscriber engagement in response to company initiated Facebook activity.	Facebook
PRC	Stock price of the firm three month after the end of fiscal year.	CRSP
BV	Book value of equity (SEQ) at the end of fiscal year, scaled by adjusted number of outstanding shares (CSHO*AJEX).	COMPUSTAT
EARN	Earnings before extraordinary items (IB), scaled by adjusted number of outstanding shares (CSHO*AJEX).	COMPUSTAT
DIV	Dividend paid (DVC) per share during the fiscal year.	COMPUSTAT
DCC	Change in Contributed Capital during the fiscal year, scaled by adjusted number of outstanding shares. [(CSTKCV – one year lag CSTKCV) – (CAPS – one year lag CAPS)]/(CSHO*AJEX). Where, contributed capital = par value + additional paid in capital.	COMPUSTAT
RD	Research and development expenditure (XRD) during the fiscal year, scaled by adjusted number of outstanding shares (CSHO*AJEX).	COMPUSTAT
ADV	Advertising expenses (XAD) during the fiscal year, scaled by adjusted number of outstanding shares (CSHO*AJEX).	COMPUSTAT
AT	The average of total assets at the beginning and the ending of the fiscal year, scaled by adjusted number of outstanding shares (CSHO*AJEX).	COMPUSTAT
MB	The ratio of market value of equity to book value of equity (PRCC_F/SEQ) at the end of the fiscal year.	COMPUSTAT
IND	Industry dummies defined according to Fama-French 48 industries classification.	Dr. Kenneth R. French web page