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How Social Media is Transforming the Information Environment

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How Social Media is Transforming the Information Environment*

Abstract

For a long time, three primary sources of information were relevant for capital markets. One was the financial accounting disclosures made by firms in their regulated periodical financial statements. The second was information from stock prices and returns. The third was press coverage about firms and their activities. The past two decades has seen a fundamental shift in how information is generated, transmitted and processed. This white paper outlines some of the changes, focusing on social media as a new and potentially revolutionary channel for the generation and peer-to-peer sharing of information. It also outlines the implications of these changes for auditors, managers, information intermediaries, investors and the accounting profession.

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1. Introduction

Imagine you were a sell-side financial analyst in 1985, a time predating things we take for granted today, such as the internet, search engines and email. Your most important tool was probably the rolodex of contacts on your desk. Your daily routine would have included quickly perusing the *Wall Street Journal* and paying close attention to what might appear on the news wires about the firms you were following. If you had any questions about what was happening, you would try to call the CEO, the CFO or at the very least one of your contacts from the investor-relations team of the firm in question. If you were one of the anointed few who worked for a large, well-connected brokerage house, you would get through. You had preferential access and could ask detailed questions and get cutting-edge insights from the horse's mouth, as it were. You could attend invitation-only conference calls, where managers would share information in private with you and other preferred analysts. All these insights would be part of the mosaic of information you would use to generate your reports. Of course, you would not want to be too critical, lest you risk losing preferential access to this pipeline of information. If you were nice, your firm might be picked to handle the next big issuance or M&A deal for the company, and you would be compensated for playing your part. Life was relatively easy.

A lot has changed in the past 35 years. The capital markets of 2020 barely resemble those of 1985. Now, as an analyst, you have to follow many sources of information, which arrives instantaneously and often at a high frequency. Archived and real-time company financials are available through company investor-relations websites and on repositories like the EDGAR database of the Securities and Exchange Commission (SEC). If you have questions or need clarification, you can contact the company, but you may not get an answer, because of Regulation Fair Disclosure (Reg FD) or equivalent regulations. Conference calls are open to all and broadcast live on the web. You also have to think twice about currying favour with management through optimistic forecasts and recommendations. The benefits may not be as great in the post–Reg FD world, and now there can be real costs, as analysts have to disclose their ratings distribution histogram. Finally, you now need to deal with new sources of information from social media such as Twitter, and think not just about the seemingly endless stream of information arriving constantly, but also about how it is being interpreted in real time using emerging big-data analytics techniques.

It would take much more than a white paper to highlight every change to how analysts work since 1985. This paper will focus on the changes in the information environment, emphasizing the new and emerging sources of information and the channels through which it is disseminated. It will discuss how these changes affect firms, intermediaries and investors, highlight the benefits to capital markets, and warn of the risks and downsides.

2. Changes to capital markets

The past two decades have seen many changes to capital markets. Some deal with governance issues, such as the Sarbanes–Oxley act. Some deal with accounting standards, such as mandatory expensing of stock options (FAS 123-R) and changes in M&A accounting (FAS 141 among others). Others deal with issues of market microstructure, such as decimalization and changes in rules on shorting. This section focuses on changes that have directly affected the information environment, especially the rise of the internet, the creation of EDGAR, the passage of Regulation FD and the Global Analyst Research Settlement.

2.1 The emergence of the internet

Investors in capital markets have long depended on information intermediaries such as sell-side analysts, rating agencies and the business press to supply timely and value-relevant information. However, the past few decades have seen an explosion in new sources of and channels for information that are easily accessible to participants in capital markets.

By far the biggest change has been the emergence of the internet, especially since the launch of the Netscape browser in 1994. Now, investors have ready access to a wealth of current and historical information. Firms disclose their financials on their investor-relations websites. The SEC provides access to all annual and interim reports filed by US-listed public firms through its EDGAR database, and there are equivalent repositories all over the world (e.g., SEDAR in Ontario). Many information intermediaries also make their research reports available online.

In an early thought piece analyzing the effect of the internet on financial markets, Economides (2001) highlights a few salient changes it has brought about. First, the internet facilitates information flows. Second, it facilitates direct interaction among economic agents, often eliminating or diminishing the power of intermediaries, for example through the emergence of low-cost online trading. Third, the internet facilitates economic agents' more direct access to markets. As it is truly global, in bringing together investors and firms, the internet reduces the importance of national boundaries.

The rise of the internet has also contributed to related changes—the creation of the EDGAR database in the United States, and the growing importance of social media in capital markets. I discuss these below.

2.2 The EDGAR database

In 1996, the SEC created an electronic repository of financial statements named EDGAR (Electronic Data Gathering, Analysis and Retrieval). Since the early 2000s, all public firms must make all their financial filings with the SEC available on this database—not just annual 10-Ks and quarterly 10-Qs, but also any other material disclosures such as restatements, 8-K filings, insider trades and proxy statements. Since 2009, the SEC has made it compulsory for firms to use the XBRL (eXtensible Business Reporting Language) format so that users can use scripting languages such as Python to easily search for information within documents.

The EDGAR database makes it possible to get detailed and complete historical financial statements for all firms that have filed with the SEC. At last count, EDGAR has more than 13 million documents available for public viewing[1]. EDGAR has many equivalents in other major capital markets, such as the Company House database in Britain and the SEDAR database in Canada.

Academic research examining the effect of EDGAR on capital markets suggests that the easy availability of information has been a boon to retail investors. Asthana, Balsam and Sankaraguruswamy (2004) show that the availability of 10-K information on EDGAR increases the incidence of small trades and improves their profitability. The EDGAR database has transformed academic research itself, by

allowing researchers to analyze not just the numbers in financial statements but also the non-financial content. Many papers now lexically analyze the text in financial statements, examining aspects such as readability and intentional obfuscation. An influential paper by Li (2008) shows that the annual reports of firms with lower earnings are harder to read, while firms with easier-to-read annual reports have more persistent earnings.

2.3 Regulation FD

On October 23, 2000, the SEC passed Regulation FD (Reg FD), which requires that firms conduct investor communications so that all investors get material information at the same time. In issuing Reg FD, the SEC's stated objective was to eliminate selective disclosure of information to preferred analysts and institutional shareholders.

There was considerable resistance to Reg FD from financial analysts, who felt that changes in communicating information would affect their ability to operate effectively. For instance, the Securities Industry Association (SIA), a prominent industry trade group for financial analysts suggested that prohibiting non-public communications would reduce the quality of information that firms communicated and hinder analysts' ability to understand their performance. A comment letter to the SEC from the SIA stated, "We believe that these communications help get information into the marketplace, whereas the proposal will discourage issuers from exchanging ideas or information with analysts, and deter analysts from vigorously competing to glean useful information for their clients and the markets."

Academic literature analyzing the impact of Reg FD generally has not found support for the SIA's position. In an early study, Heflin, Subramanyam and Zhang (2003) fail to find that Reg FD has led to more inaccurate forecasts. Mohanram and Sunder (2006) find that with Reg FD in effect, analysts are more likely to incorporate their own specific insights about the companies they are following in their forecasts and reports, and less likely to regurgitate the information spoon-fed to them by firms. Reg FD certainly increased the workload for financial analysts, especially those well-connected ones who lost the preferential access they had before Reg FD. Consistent with this, Mohanram and Sunder (2006) find that such analysts are forced to reduce coverage as they deal with their increased workload. However, such declines in coverage are not necessarily detrimental, as analysts shift their coverage from highly covered firms to less-covered firms. Overall, the results suggest that Reg FD levelled the informational playing field in two dimensions. First, it put all analysts on a more equal footing, severely curtailing if not eliminating preferential access to information for a select few. Second, smaller firms became more likely to get coverage as analysts looked for opportunities to distinguish themselves.

2.4 The Global Analyst Research Settlement

The Global Analyst Research Settlement was an enforcement agreement reached in the United States on April 28, 2003, between the SEC, the Financial Industry Regulatory Authority (FINRA), the New York Stock Exchange (NYSE) and ten of the United States' largest investment firms, to address conflicts of interest within their businesses in relation to recommendations made by their financial analyst departments.

In addition to monetary fines, the firms agreed to make changes in how they worked. They instituted stricter rules on the separation of investment banking and research divisions, and set aside money to fund independent research by smaller firms that did not face the conflict of interest that typically plagues sell-side research. Finally, analysts had to supply information about their past rankings, and about whether they held any position in the firm that they were covering.

Empirical evidence on the impact of the global settlement has been mixed. Corwin, Larocque and Stegemoller (2017) find a substantial reduction in analyst affiliation bias following the settlement for sanctioned banks. However, Clarke et al. (2011) show that the research produced by the independent firms created and funded after this regulation is of lower quality.

[1] A search at https://research.secdatabase.com/Filing/SearchResult on October 30, 2020 delivered 13,803,273 results.

3.
New sources of information

The four changes discussed in the previous section have democratized access to information on multiple levels. Another big change over the past few decades is that new sources of information have emerged. Much of this is generated by and disseminated among investors themselves.

3.1 Peer-to-peer sharing of information before the social-media era

With the rise of the internet, individual investors increasingly started relying on each other as peer-to-peer sources of information on platforms and forums like Yahoo! Finance, Silicon Investor and Raging Bull. Research has given mixed evidence on whether these sources generate or disseminate information of any value. Examining internet bulletin boards, Hirschey, Richardson and Scholz (2000) find that investment reports on the Motley Fool predict stock returns, whereas Tumarkin and Whitelaw (2001) find no link between message-board activity on Raging Bull and returns. Antweiler and Frank (2004) and Das and Chen (2007) both find that the volume of messages on boards such as those of Yahoo! and Raging Bull is associated with stock return volatility, but not stock returns. Da, Engelberg and Gao (2011) find that increases in Google searches predict higher stock prices in the near term, followed by price reversals. Drake, Roulstone and Thornock (2012) show that the relationship between returns and earnings is smaller when Google search volume before earnings announcements is high. They attribute this to the information being included in prices earlier.

a. The effect of social media on capital markets

By far the biggest revolution in the dissemination of information on the internet has been the advent of social-media platforms such as Twitter, which let users post their views about stocks to a wide audience.

While Twitter undoubtedly is an exciting and emerging new source of information for capital markets, ex ante it is unclear whether information from Twitter will be useful to investors. On one hand, Twitter lets users tap into the wisdom of crowds: aggregated information given by many non-experts often predicts outcomes more precisely than individual experts can. Further, Twitter users, who come from diverse backgrounds, are less likely to herd, a phenomenon that plagues traditional information intermediaries such as financial analysts, as well as social-media platforms such as blogs and investing portals, where a central piece of information is posted and users comment on it. Finally, Twitter's short message format of (up to 140 characters until 2017, then 280 characters) and ease of information search (e.g., through the use of the $ symbol for "cashtags") make it an ideal medium to share opinions and information in a timely way, in contrast to the longer format and potentially reduced timeliness of research reports or articles.

On the other hand, information from tweets may be uninformative or even intentionally misleading, because Twitter is an unregulated platform with potentially anonymous users. For example, in two days in January 2013, a series of damning but false tweets on two stocks—Audience (ADNC) and Sarepta Therapeutics (SRPT)—sent their prices plunging by 28% and 16% respectively[2].

In recent years, researchers have begun studying the role Twitter plays in capital markets. One strand of this literature investigates whether information from Twitter predicts movements of the overall stock market. Bollen, Mao and Zheng (2011) show that aggregate mood inferred from textual analysis of Twitter feeds can help predict changes in the Dow Jones Index. Similarly, Mao, Wei, Wang and Liu (2012) find that the daily number of tweets that mention stocks in the S&P 500 index is significantly associated with the levels, changes, and absolute changes in the index. Another strand of this literature analyzes how Twitter activity influences investor responses to earnings. Curtis, Richardson and

[2] The two tweets are: (i) "AUDIENCE the noise suppression company being investigated by DOJ on rumoured fraud charges Full reort [sic] to follow later", and (ii) "$SRPT FDA steps in as its 48 weeks results on Etelplisen [sic] results are tainted and have been doctored they believe Trial papers seized by FDA." The perpetrator—who used two accounts with aliases similar to well-known short-selling firms Muddy Waters and Citron Research, but misspelled—managed to net only $97, as investors quickly figured out the deceit and the share prices almost instantly recovered. Other instances consist of Twitter users misleading entire markets with false information. In 2010, the Australian airline company Qantas saw its stock price decline more than 10% after false reports of a plane crash appeared on Twitter.

Schmardebeck (2016), who focus on overall social media (Twitter and StockTwits) activity during 30-day rolling windows, find that high levels of activity are associated with greater sensitivity of earnings announcement returns to earnings surprises, while low levels of social-media activity are associated with significant drift following an earnings announcement.

Can investor sentiment on Twitter can help predict earnings surprises and the market reaction to them. Bartov, Faurel and Mohanram (2018) parse individual tweets to determine if they have a positive or negative tone, and then aggregate the sentiment of all tweets relating to a given firm in the period just before the earnings announcement. The idea is remarkably simple: can this aggregate sentiment from Twitter provide useful information to capital markets? If the aggregate opinion on Twitter is positive, will the firm have a positive earnings surprise? The researchers find that aggregate opinion from individual tweets successfully predicts a firm's forthcoming quarterly earnings, as well as the returns around the announcement. Thus, Twitter provides value-relevant information that is incremental to information from other sources. These results hold for tweets that convey original information, as well as those that disseminate existing information. Twitter hence plays a dual role as a new source of information and a new channel for dissemination. Bartov, Faurel and Mohanram further find that the informativeness of aggregate sentiment on Twitter is strongest for firms in the weakest information environments, suggesting that social media is truly filling a void where no other sources of information exist.

The focus of research on Twitter seems to be solely on equity markets, neglecting other important segments of the financial markets such as the bond market—in the US, for example, the bond market is significantly larger than the equity market in both capitalization and trading volume. In a recent paper, Bartov, Faurel and Mohanram (2020) examine whether information aggregated from Twitter is relevant for bond investors, and find a significantly positive association between bond returns around quarterly earnings announcements and the aggregate opinion on Twitter. Further, given the importance of negative news to bond markets, they find that the positive association between bond returns and aggregate opinion on Twitter is strongest when the underlying news is negative and for riskier (non-investment grade) bonds. Overall, the findings suggest that information from Twitter posted before earnings announcements is relevant in capital markets, for investors in bonds as well as equities.

The broad consensus across all these papers is that despite concerns about credibility, wisdom of crowds really does work for social-media platforms such as Twitter. Twitter's importance as a valuable source of information has not gone unnoticed by practitioners. In 2015, Tashtego, a hedge-fund firm based in Boston, set up a social equities fund that based investment decisions on sentiment from social media (Geier 2015). Also in 2015, DataMinr, a start-up that parses Twitter feeds to generate actionable real-time signals, announced that it had raised over $130 million in financing (Demos 2015). On April 26, 2016, the Infinigon Group launched Echo, a Twitter-based financial information platform that converts social-media streams into actionable news and analytics for the trading community that provide insights early, before they reach mainstream channels (Infinigon Group 2016).

3.2 The use of social media for financial disclosure

Twitter has also become an important disclosure tool for firms. The SEC was initially cautious about the use of social media, but in April 2013, it approved the use of posts on Facebook and Twitter to communicate corporate announcements such as earnings. Following this, academic research has investigated how companies use this new channel to communicate with investors. Blankespoor, Miller and White (2014) show that firms can reduce information asymmetry among investors by more broadly disseminating their news, using Twitter[3] to send market participants links to press releases and other traditional disclosures. Jung et al. (2018) find that roughly half of S&P 1500 firms have created

[3]In June of 2015, in a "Compliance and Disclosure Interpretations," SEC staff said a start-up firm can post a Twitter message about its stock or debt offering to gauge interest among potential investors.

either a corporate Twitter account or a Facebook page, with a growing preference for Twitter. Lee, Hutton and Shu (2015) show that firms use social-media channels such as Twitter to interact with investors and dampen the negative price reactions to consumer-product recalls.

3.3 The rise of peer-to-peer research: Seeking Alpha and Estimize

Among social-media platforms, Twitter has some obvious advantages, including a wide reach, immediacy and parsimony. However, Twitter is not the ideal platform to express complex ideas that cannot fit the abbreviated format. Investors who need to share detailed information and insights among themselves rely on platforms such as Seeking Alpha. There, individuals can publish reports about firms, which are often in the style of sell-side equity reports, and are compensated based on the number of page views they generate. Chen, De, Hu and Hwang (2014) show that information in user-generated research reports and commentaries on SeekingAlpha helps predict earnings and long-window stock returns following the report posting date.

Estimize was founded in 2011 by Leigh Drogen, a former quantitative hedge-fund analyst, to provide an alternative to sell-side forecasts by crowdsourcing earnings and revenue forecasts. Forecasts are available on the Estimize and Bloomberg platforms and also sold as a data feed to institutional investors. The availability of Estimize data on platforms such as Bloomberg suggests that the market is potentially interested in such crowdsourced financial forecasts. For its part, Estimize incentivizes the accuracy and integrity of its data by asking contributors to provide a personal profile and then tracking and reporting contributor accuracy. Estimize also creates a consensus forecast where the weight a given forecast gets in the estimation of consensus depends on the forecaster's prior accuracy, with unreliable forecasts being excluded. Finally, to encourage participation and accurate forecasting, Estimize recognizes top contributors with prizes and features them in podcasts.

A recent paper by Jame et al. (2016) examines the value of crowdsourced earnings forecasts on Estimize, and finds that they are incrementally useful in forecasting earnings and measuring the market's expectations. The results are stronger when the number of Estimize contributors is larger, consistent with the idea that the wisdom of crowds effect increases with the size of the crowd. Finally, the authors find that Estimize consensus revisions generate a significant stock-market reaction. Overall, the paper shows that crowdsourced forecasts are a useful supplementary source of information for capital markets.

3.4 The impact of big-data analytics and emerging technologies

Another transformational change that we should not ignore is the rise of big big-data analytics and related emerging technologies, many of which are already making an impact on capital markets and academic research while still in their infancy.

According to De Mauro, Greco and Grimaldi (2015), "Big Data represents the Information assets characterized by such a High Volume, Velocity and Variety to require specific Technology and Analytical Methods for its transformation into Value." Big-data analytics is the backbone of work done by social-media aggregators and other data providers who are transforming capital markets.

Warren, Moffitt and Byrnes (2015) argue that big data will transform many aspects of accounting practice, including managerial and financial accounting, and financial reporting practices. They posit that big data will enhance management control systems and budgeting, improve the quality, transparency and relevance of accounting information, and even aid in the creation and refinement of accounting standards. Vasarhelyi, Kogan and Tuttle (2015) illustrate how new sources of big data can transform the traditional audit process—e.g., security videos to confirm the entry and exit of materials, social media to evaluate consumer satisfaction and product defects, and RFID tags for inventory measurement and valuation.

Big data is also a growing part of academic research. The definition De Mauro, Greco and Grimaldi offer encompasses the work of Li (2008), who conducts lexical analysis on a large sample

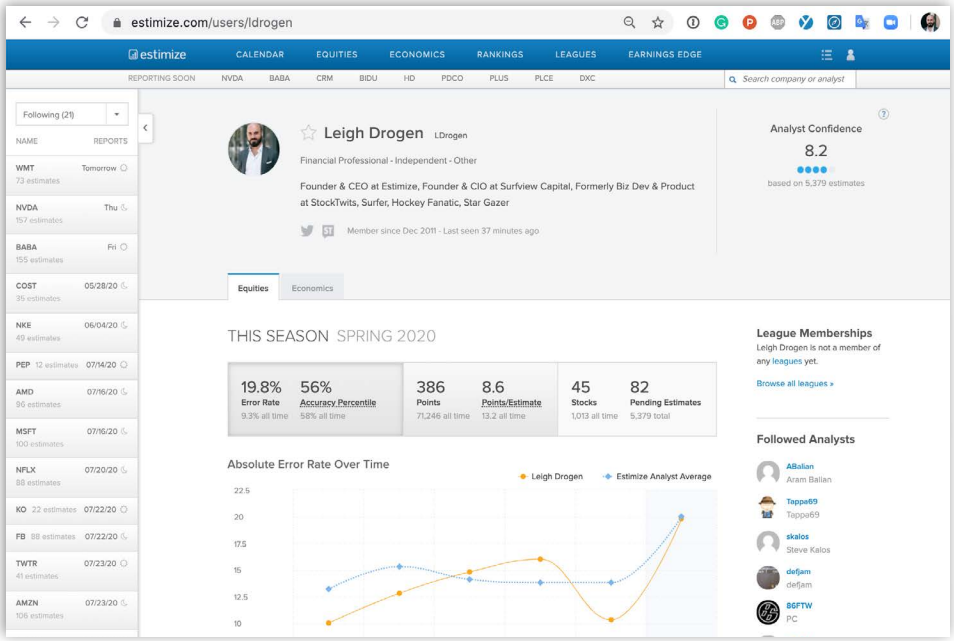
of unstructured corporate financial statements, as well as work by Bartov, Faurel and Mohanram (2018) using millions of tweets by ordinary investors. Other examples include Mayew and Venkatachalam (2012), who use vocal emotion analysis software to analyze the tone of voice used by CEOs during conference calls. They find that managers show positive and negative "affects" in their voice tone that are not picked up by human analysts, and that these affects help predict future earnings and analysts forecast errors. This is evidence that "managerial vocal cues contain useful information about a firm's fundamentals, incremental to both quantitative earnings information and qualitative 'soft' information conveyed by linguistic content."

Seeking Alpha allows investors to share detailed information.

Image source: AdobeStock

Estimize was developed as an alternative to sell-side forecasts by crowdsourcing earnings and revenue forecasts.

Image source: https://www.estimize.com/



4. Implications

What has been, and what will continue to be, the impact of all of these changes on the different players in the capital markets? This final section of this paper offers a range of conjectures, some based on insights from academic research, and others from less systematic observation while these changes have been taking place.

4.1 Implications for firms

The biggest change for firms is how they deal with investor relations. The IR function has become multifaceted, with firms needing to maintain a substantial presence on social-media networks, especially Twitter. Investor relations is no longer about keeping the big guys happy. Firms have to monitor social-media feeds where they are mentioned. It is not enough to keep track of what sell-side analysts are saying about you, as markets also pay attention to crowdsourced research on Seeking Alpha and crowdsourced forecasts on Estimize. Finally, firms have to be aware of their compliance with Reg FD in their interactions with investors.

Changes in the information environment also have implications for other firms: competitors, suppliers and buyers. Widespread access to detailed financial information, as well as the ability to attend conference calls virtually, means that everyone gets access to information in close to real time. This can be useful in understanding the factors behind success and failure in a given industry. As Yermack (2017) surmises, technologies like blockchain also could transform corporate disclosure, increasing its frequency, timeliness and informativeness.

4.2 Implications for sell-side analysts

By far the biggest impact of changes in the information environment has been on the sell-side research community, which no longer has a chokehold on the flow of information and has lost its position of privilege. Investors have many alternative sources of information and insight, including crowdsourced research and the ability to share information with each other through social media.

In this environment, sell-side equity research faces an existential crisis. This has been exacerbated by recent regulatory changes such as the European Union's recently enacted MiFID II regulation, which requires investment banks and brokers to separate the costs of research and trading activity. Whether sell-side equity research can survive in this environment will boil down to the quality of work. Analysts should focus less on forecasting short-term performance and stock prices, since a vast body of literature suggests that their forecasts of earnings and their stock recommendations tend to perform rather poorly. Sell-side analysts can add value by bringing their expertise to the fore in reports. Investors are not just looking for the most accurate estimates of quarterly earnings per share or the most prescient target prices. Indeed, anecdotal evidence suggests that buy-side investors are looking for other attributes such as industry knowledge and expertise in accounting issues. Sell-side analysts should focus more on becoming industry experts and identifying the factors that drive success and failure in a given industry.

4.3 Implications for buy-side firms

The changes brought about by a combination of regulation and technological advances have been a mixed bag for buy-side firms. Like the sell side, the buy side has also lost some of its privilege in the post–Reg FD world. However, the buy side is no longer beholden to the sell side as before. The buy side has also been buffeted by other structural changes such as the rise of low-cost passive investing through index funds and exchange-traded funds (ETFs). In addition, a lot of academic research shows that the ability to generate alpha from fundamental strategies has declined precipitously in the new millennium (see Mclean and Pontiff [2016 and Green, Hand and Zhang 2017).

In this difficult environment, the buy side is looking at other avenues in its elusive quest for alpha. One area of potential is data from new and emerging sources such as aggregated social-media feeds. In fact, the largest market for data aggregators that provide aggregated social-media information in real time is the buy side, where one can see an increased demand for data scientists and the use of big-data analytics.

4.4 Implications for retail investors

Retail investors have benefited tremendously from the democratization that has taken place in capital markets. While the playing field is probably not truly level, retail investors now have timely access to a vast quantity of information. They can also easily share information with each other.

However, small investors face new problems. The first is the paradox of too much information. Much research in the social sciences shows that investors with too much information often make bad investing choices because of a combination of limited processing skills and bounded rationality. Second, small investors are more likely to fall victim to fraudulent information on social media. Such information is likely to be washed out in the aggregate, but getting aggregated social-media information is prohibitively expensive; subscription fees for real-time data feeds are often beyond the reach of most individual investors. Paradoxically, those who are generating this new source of information may not necessarily be benefiting from it.
Retail investors also face a disadvantage from the tools and techniques of big-data analytics being beyond their means at present. However, this could provide an opportunity for enterprising data providers, who would provide these tools to retail investors either for a fee or as a part of the suite of services provided when they manage their money.

4.5 Implications for the accounting profession

The accounting profession will also be profoundly affected by all the changes discussed here. With the rise of social media, auditors now have to pay attention not just to firms' standard regulatory filings, but potentially also their social-media feeds. In addition, the rise of social media may have a big impact on the function of internal auditors. A recent report by Deloitte (2013) highlights the crucial role of internal audit (IA) in mitigating the additional risks imposed by social-media activities. They highlight the additional risks in terms of information leakage, reputational damage, third-party risk and governance risk. The report recommends that "it is up to IA to be at the forefront of the organization's social business initiative, helping to monitor and manage threats and strike a balance between risks and opportunities."

Second, the accountants of tomorrow have to be trained to be conversant with the latest tools and techniques. This is a big transformation that will need the joint efforts of accounting educators, audit firms, and accounting bodies such as the American Institute of Certified Public Accountants and national and provincial CPA bodies in Canada. Evidence of this change can already be seen. Many universities in the United States have started specialized master's programs in accounting analytics in conjunction with one of the big four firms—KPMG. The Rotman School of Management at the University of Toronto has modified its CPA-track accounting program by making a course on accounting data analytics one of the requirements, and has also modified the sequence of audit courses to incorporate advanced data analytics in auditing.

Finally, the accounting discipline within academia will rely on the support of the accounting bodies and big audit firms to fund research on emerging topics. The Rotman School of Management of the University of Toronto, with generous support from CPA Ontario, has set up the CPA Ontario Centre for Accounting Innovation Research. In addition to funding academic research, the centre also provides opportunities for interaction between academics and practitioners through conferences and white papers on emerging issues. Its first two annual practitioner conferences brought together experts from academia and practice to discuss a

number of topics including big data in accounting research, machine learning, blockchains, and disruptive technology and governance.

4.6 Implications for the media

At first glance, the rise of social media appears to be a threat to traditional media coverage of financial markets, but the reality is more nuanced. It appears as though social media has the biggest impact on capital markets where the existing information environment is weak. Second, as Bartov, Mohanram and Faurel (2018) highlight, social media has proven to be an effective new mechanism for disseminating information. Many of the tweets analyzed in the paper are links to articles on traditional media. The relationship between traditional media and social media may well be symbiotic, with traditional media trying to use social media to ensure that the news it provides reaches the greatest number of people. One can also see that traditional media organizations and brands are often very active on social media, trying to get stories to become "viral".

4.7 Implications for regulators

While regulation played a crucial role in the democratization of information in capital markets, regulators have largely taken a laissez-faire approach in the era of social media. In fact, they have fostered the use of emerging technologies by letting companies communicate with investors through social-media channels.

Skeptics argue that self-serving people exploit social-media tools such as Twitter by disseminating misleading and speculative information to investors, and thus call for regulating social media. But results from papers such as one by Bartov, Faurel and Mohanram (2018) show precisely the opposite: information on Twitter can help investors make sound investment decisions. Thus, social media can play a role in making the market more efficient by uncovering and disseminating value-relevant information, especially for firms in weak information environments.

4.8 Implications for academic research

The information explosion that has taken place has had a large impact on academic research in capital markets. Gone are the days when empirical research in this field meant spinning tapes with financial data (Compustat), stock-market data (CRSP) and occasionally, data on analysts (IBES) or executive compensation (ExecuComp). Now researchers conduct research using unstructured data—e.g., by analyzing putting company financials on EDGAR through lexical analysis, searching for specific disclosures on the internet using web-crawlers and scripting languages, and of course, processing data from new sources such as social media with the latest techniques such as big-data analytics and machine learning.

These changes have dramatically increased the breadth of academic research. A few examples from recent research help to demonstrate this. In "Big Data as a Governance Mechanism", Zhu (2019) shows that the rise of big-data availability has improved price informativeness. As investors gain access to real-time granular indicators of financial performance, they can better monitor and discipline managers. This leads to better managerial decision-making and less self-serving, opportunistic behaviour. Other examples include research using big-data methodologies and other emerging techniques such as machine learning. For instance, Crowley, Huang and Lu (2018) use a machine-learning approach to analyze tweets posted by S&P 1500 firms and find that firms strategically time financial tweets around earnings announcements, accounting filings and other important corporate events. They further find that feedback from Twitter users influences firms' future financial tweets.

5. Conclusions

This paper has presented possibilities about what could happen as the result of social media changing the information environment for capital markets, and some observations about what has already happened. But to quote the mathematician John Allen Paulos, "Uncertainty is the only certainty there is, and knowing how to live with insecurity is the only security."

Many of these changes can be deeply distressing for people who are deep into their careers and used to a simpler way of doing things, such as the hypothetical but certainly representative analyst described earlier who enjoyed his sheltered existence in the world before Reg FD, the internet, social media and big data. But all players must adapt to this new reality. This will take a huge investment, both financial and in terms of human capital. There is a need for re-skilling in all affected fields. Some of the changes needed are emotional—letting go of the old ways of doing thing and embracing the new.

Empirical researchers invariably now work on projects that use these new data sources and techniques. Examples this researcher has been involved in include lexical analysis of Twitter feeds and machine-learning algorithms that measure aggregate investor sentiment. Life was easier spinning Compustat and CRSP tapes, but the new methods offer rewards in the ability to more comprehensively answer complex questions. Similarly, the accountant of today must transition to become the accountant of tomorrow by acquiring and practising new skills. One does not need to necessarily become a subject-matter expert, but some familiarity with new analytical tools and techniques will be essential to understanding, appreciating and, if necessary, critiquing the analyses that they produce.

In the immortal words of Bob Dylan, "You better start swimmin' or you'll sink like a stone / For the times they are a-changin'."

Musician Bob Dylan in Toronto, 1980.

Image source: https://www.estimize.com/

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