

How Twitter is Changing the Nature of Financial News Discovery

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ABSTRACT

Access to the most relevant and current information is critical to financial analysis and decision making. Historically, financial news has been discovered through company press releases, required disclosures and news articles. More recently, social media has reshaped the financial news landscape, radically changing the dynamics of news dissemination. In this paper we discuss the ways in which Twitter, a leading social media platform, has contributed to changes in this landscape. We explain why today Twitter is a valuable source of material financial information and describe opportunities and challenges in using this novel news source for financial information discovery.

CCS Concepts

•Information systems → Business intelligence;

Keywords

Twitter, social media, financial news

1. INTRODUCTION

Engagement in financial markets requires reliable, relevant and current financial information. Determining the financial value of a company and evaluating it as an investment opportunity, estimating fair value of assets such as commodities or illiquid fixed income instruments, and analyzing long term potential of different sectors of the economy are all information intensive tasks. Financial market participants are in constant search of new data to inform these analyses. Market behavior is driven by many factors, one of the most important being events such as e.g. mergers or acquisitions, issuance of new stock or legal action. Such events, materialized as news stories, tweets, audio, video and even images, change the financial landscape and reveal critical information about companies and the financial world.¹

¹While our focus is on news as a significant driver of market behavior, others have proposed different factors [27].

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Financial events are well represented in textual sources, and thus we ignore automated analysis of video and images for the purposes of this paper.

For many years, financial information was primarily disseminated slowly through formal channels. Companies would issue press releases and submit filings required by regulators (e.g. 10K or 10Q), whereas newspapers would provide coverage of these and general news events. The news cycle moved relatively slowly as information trickled on a roughly daily basis. The information age changed this, allowing for extremely rapid information dissemination. News organizations could push content to financial analysts nearly instantaneously, and electronic wire services provided new, albeit controlled, channels for fast information access. Today, tools such as the Bloomberg Terminal provide access to an unparalleled amount of financial information, including over one million news stories published per day. Financial news discovery happens nearly instantly, as informed investors are notified the moment new content is published.

The rise of social media is once again transforming financial news discovery and ushering in a new age of information access. Social media platforms such as Twitter make it easy for anyone to share information instantly with the entire world. Twitter breaks the traditional controlled channel model, allowing anyone to share information directly with financial industry actors. In this way, Twitter has become the **world's newswire**, an information source to which everyone can contribute. The Bloomberg terminal provides a curated stream of nearly half a million financially relevant tweets per day, and Twitter has rapidly become one of most popular information sources in the Bloomberg ecosystem. As of 2013, the SEC allows companies in the United States to use Twitter and Facebook for public disclosure.² This regulatory change is one of the factors that transformed social media into the powerful force it is today.

These changes create tremendous opportunities, as well as challenges, to the research community. Twitter is quite unlike traditional news both in terms of language and the type of information it contains [42]. In this paper, we summarize these opportunities and challenges, providing perspective into the financial news ecosystem as a leading financial information company.

2. FINANCIAL NEWS IN TWITTER

While there are many social media sites, Twitter leads as a news discovery platform because of its overall popularity, the

²<https://www.sec.gov/News/PressRelease/Detail/PressRelease/1365171513574>

easily digestible form of its content, because most tweets are shared publicly, and because it has historically had a news focus [30, 25]. As a result, much of financial news discovery has focused on Twitter.

Where does financial news come from on Twitter? What motivates different people to share information on Twitter? What type of financial content is shared on Twitter? Authors of tweets are a diverse group of individuals, reflecting a broad range of interests and backgrounds from all over the world. Such a heterogeneous group is difficult to characterize; indeed, we constantly encounter new and fascinating types of tweets. However, broadly speaking, the major contributors to Twitter financial news fall into five categories.

Journalists and traditional news organizations contribute a large percentage of financial news on Twitter. Reporters often tweet to build a reputation and share breaking news before writing an article to ensure a scoop. Twitter is now an important part of many journalists' portfolios [2, 54]. **Companies** and their representatives have turned to Twitter for a direct line of communication with the financial world. They promote their products and highlight important developments, giving analysts insight into a company's thinking and priorities. Similarly, **government** agencies, central banks and politicians use Twitter to share information important to their interests [51]. **Activist investors**, who seek changes in a company, use Twitter to influence other investors and the financial world. Finally, **citizen journalists** - individuals without an official position in the press - use Twitter as their newswire [22]. They often provide first glimpses into major social and political unrest [31] as well as disasters [52].

What type of financial information appears on Twitter? Financial news coverage is traditionally distributed over a number of broad topics such as securities (equities, foreign exchange, fixed income, commodities, derivatives), events such as mergers and acquisitions, regulation, compliance and others. Twitter is biased to general news, but the content can touch upon these specialized topics. In addition to tweets that report breaking events, rumor and speculation can be informative as it reflects investor mood and outlook. This type of content can be infrequent, often produced by financial professionals or journalists and not by the Twitter population as a whole. Therefore, Twitter can provide a complementary role to traditional news sources, reporting information that may not yet have risen to the level requiring a formal article. This presents different news gathering challenges, as we discuss below.

3. OPPORTUNITIES OF TWITTER

Many believe that Twitter discovers and reports news faster than traditional news organizations [24, 57]. While Twitter does cover many minor events that are not reported by traditional media [42], the story for information material to the financial industry and market moving events is much more complex. First, many traditional news organizations that lack their own real time distribution product post their content to Twitter first [23, 3]. Thus, frequently the first report on Twitter comes from a traditional journalist, who also links to her organization's website. Second, literature suggests that often traditional news outlets report an event first, while the first tweet follows thereafter [42, 38]. However, since many events are broken by small media outlets, unknown to the majority of the public, Twitter can iden-

tify these stories and share them with a wider audience who would normally not read the original media outlet. While Twitter may not be the first source, many people *experience* Twitter as their source for breaking news events. Given the structure of Twitter workflow (e.g. re-tweeting as a way of sharing), identifying stories as they spread through social media can be an effective way to identify major news events from a financial news discovery standpoint.

Beyond news discovery, there is work on analyzing tweets to extract financially relevant information. For example, several papers have looked at predicting market movements [32, 4], asset values [56] and market events [48], or using Twitter, with a focus on correlating the mood of a population with the direction of financial markets [5, 53]. Others have found that tweet sentiment correlates with consumer confidence [37, 10]. More generally, Twitter has been widely used in a range of other fields to measure population level trends, such as sociolinguistics [17], political science [37], and public health [40]. This work suggests that wisdom of the crowd methods can yield additional opportunities for financial analysis.

4. CHALLENGES OF TWITTER

Lack of traditional quality control makes identifying, organizing, and understanding Twitter much harder than news. We briefly summarize a few of the key challenges.

First, the number of tweets far exceeds the amount of traditional news traffic, presenting substantial technological challenges. However, only a small fraction of these messages matter to financial analysts; finding the right tweets can be difficult [11]. While researchers have considered tweet recommendation systems [43, 44, 21, 1, 8], it remains a non-trivial challenge to find the right tweet for the right person at the right time. This is even more complex for identifying tweets in real-time, as opposed to recommending content at rest [45]. While traditional news discovery can rely on how often a news event is reposted and commented on, important news in finance can happen without anyone retweeting or liking it. This makes importance identification more difficult, as re-tweets are not an accurate proxy for news value.

Second, while many tweets may be carrying relevant content, they often report identical information. An analyst should not be inundated by thousands of identical reports for large news events. Event tweet clustering can help [41, 46], but natural language processing of Twitter is substantially more difficult than news [15]. This means that there is a need for improved NLP algorithms for twitter that cover the range of tasks in standard NLP pipelines, such as named entity recognition, relation extraction and event extraction. Additionally, some work has considered how relevant tweets can be linked to news stories [18, 55].

Third, verification presents a unique challenge in Twitter. Traditional news outlets carefully present both information and an estimate as to its quality. Rumors, when reported in news, are reported as such. In contrast, news propagated on Twitter suffers from a lack of verification, making some tweet content inaccurate or outright false [50, 19]. Rumors often travel quickly and are reposted by a wide range of users. How and why rumors spread on Twitter has been the subject of several studies [34, 26, 12]. Therefore, we require means for the identification of rumors and measurement of tweet credibility [6]. Yet a fully automated approach cannot solve this problem; ultimately a reader will need to make a

judgement as to the information's reliability. This decision can be aided by methods that contextualize tweets [35], such as displaying inferred location [16, 20, 47, 9, 7, 28, 39, 14, 13] or topic context [29, 33].

While information verification is important, Twitter is not just about fact finding. Prices of securities are driven in large part by expectation; thus, opinions and rumors can drive markets just as much as true reports of material events [36, 49]. A pertinent example is mergers and acquisitions, where rumors and speculation can reveal early signals that move markets. Even false reports can also be of interest to investors if they have market impact. Compounding the discovery problem are adversarial actors attempting to manipulate markets through false information. The integration of measures of credibility, opinion and financial importance remains an open challenge.

5. CONCLUSION

As the world's newswire, Twitter is changing the way in which financial analysts and investors discover news. While sharing of information via social media has already changed the financial news world, we are only at the beginning of this new age. There remain numerous opportunities for new technologies and applications to shape the financial news landscape for years to come.

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7. REFERENCES

- [1] F. Abel, Q. Gao, G.-J. Houben, and K. Tao. Analyzing user modeling on twitter for personalized news recommendations. In *User Modeling, Adaption and Personalization*, pages 1–12. Springer, 2011.
- [2] A. N. Ahmad. Is twitter a useful tool for journalists? *Journal of Media Practice*, 11(2):145–155, 2010.
- [3] C. L. Armstrong and F. Gao. Now tweet this how news organizations use twitter. *Electronic News*, 4(4):218–235, 2010.
- [4] P. Azar and A. W. Lo. The wisdom of twitter crowds: Predicting stock market reactions to fomc meetings via twitter feeds. *Available at SSRN 2756815*, 2016.
- [5] J. Bollen, H. Mao, and X. Zeng. Twitter mood predicts the stock market. *Journal of Computational Science*, 2(1):1–8, 2011.
- [6] C. Castillo, M. Mendoza, and B. Poblete. Information credibility on twitter. In *World wide web (WWW)*, 2011.
- [7] M. Cha, Y. Gwon, and H. Kung. Twitter geolocation and regional classification via sparse coding. In *Conference on Weblogs and Social Media (ICWSM)*, 2015.
- [8] J. Chen, R. Nairn, L. Nelson, M. Bernstein, and E. Chi. Short and tweet: experiments on recommending content from information streams. In *Conference on Human Factors in Computing Systems (CHI)*, pages 1185–1194. ACM, 2010.
- [9] R. Compton, D. Jurgens, and D. Allen. Geotagging one hundred million twitter accounts with total variation minimization. In *IEEE International Conference on Big Data (Big Data)*, pages 393–401, 2014.
- [10] P. J. Daas, M. J. Puts, et al. Social media sentiment and consumer confidence. Technical report, European Central Bank, 2014.
- [11] N. Diakopoulos, M. De Choudhury, and M. Naaman. Finding and assessing social media information sources in the context of journalism. In *Conference on Human Factors in Computing Systems (CHI)*, pages 2451–2460. ACM, 2012.
- [12] B. Doerr, M. Fouz, and T. Friedrich. Why rumors spread so quickly in social networks. *Communications of the ACM*, 55(6):70–75, 2012.
- [13] M. Dredze, M. Osborne, and A. Kambadur. Geolocation for twitter: Timing matters. In *North American Chapter of the Association for Computational Linguistics (NAACL)*, 2016.
- [14] M. Dredze, M. J. Paul, S. Bergsma, and H. Tran. Carmen: A twitter geolocation system with applications to public health. In *AAAI Workshop on Expanding the Boundaries of Health Informatics Using AI (HIAI)*, 2013.
- [15] J. Eisenstein. What to do about bad language on the internet. In *North American Chapter of the Association for Computational Linguistics (NAACL)*, pages 359–369, 2013.
- [16] J. Eisenstein, B. O'Connor, N. A. Smith, and E. P. Xing. A latent variable model for geographic lexical variation. In *Empirical Methods in Natural Language Processing (EMNLP)*, 2010.
- [17] J. Eisenstein, N. A. Smith, and E. P. Xing. Discovering sociolinguistic associations with structured sparsity. In *Association for Computational Linguistics (ACL)*, 2011.
- [18] W. Guo, H. Li, H. Ji, and M. T. Diab. Linking tweets to news: A framework to enrich short text data in social media. In *Association for Computational Linguistics (ACL)*, 2013.
- [19] A. Gupta and P. Kumaraguru. Credibility ranking of tweets during high impact events. In *Workshop on Privacy and Security in Online Social Media*, page 2, 2012.
- [20] B. Han, P. Cook, and T. Baldwin. Text-based twitter user geolocation prediction. *Journal of Artificial Intelligence Research*, pages 451–500, 2014.
- [21] J. Hannon, M. Bennett, and B. Smyth. Recommending twitter users to follow using content and collaborative filtering approaches. In *Conference on Recommender systems*, pages 199–206. ACM, 2010.
- [22] A. Hermida. Twittering the news: The emergence of ambient journalism. *Journalism Practice*, 4(3):297–308, 2010.
- [23] S. Hong. Online news on twitter: Newspapers' social media adoption and their online readership. *Information Economics and Policy*, 24(1):69–74, 2012.
- [24] M. Hu, S. Liu, F. Wei, Y. Wu, J. Stasko, and K.-L. Ma. Breaking news on twitter. In *Conference on Human Factors in Computing Systems (CHI)*, pages 2751–2754. ACM, 2012.
- [25] A. Java, X. Song, T. Finin, and B. Tseng. Why we twitter: understanding microblogging usage and

- communities. In *Workshop on Web mining and social network analysis*, pages 56–65. ACM, 2007.
- [26] F. Jin, E. Dougherty, P. Saraf, Y. Cao, and N. Ramakrishnan. Epidemiological modeling of news and rumors on twitter. In *Workshop on Social Network Mining and Analysis*, 2013.
- [27] A. Joulin, A. Lefevre, D. Grunberg, and J.-P. Bouchaud. Stock price jumps: news and volume play a minor role. *arXiv preprint arXiv:0803.1769*, 2008.
- [28] D. Jurgens, T. Finethy, J. McCorriston, Y. T. Xu, and D. Ruths. Geolocation prediction in twitter using social networks: A critical analysis and review of current practice. In *Conference on Weblogs and Social Media (ICWSM)*, 2015.
- [29] B. Kang, J. O’Donovan, and T. Höllerer. Modeling topic specific credibility on twitter. In *Intelligent User Interfaces (IUI)*, pages 179–188, 2012.
- [30] H. Kwak, C. Lee, H. Park, and S. Moon. What is twitter, a social network or a news media? In *International Conference on the World Wide Web (WWW)*, pages 591–600. ACM, 2010.
- [31] G. Lotan, E. Graeff, M. Ananny, D. Gaffney, I. Pearce, et al. The arab spring! the revolutions were tweeted: Information flows during the 2011 tunisian and egyptian revolutions. *International journal of communication*, 5:31, 2011.
- [32] H. Mao, S. Counts, and J. Bollen. Predicting financial markets: Comparing survey, news, twitter and search engine data. *arXiv preprint arXiv:1112.1051*, 2011.
- [33] J. McInerney and D. M. Blei. Discovering newsworthy tweets with a geographical topic model. In *NewsKDD*, 2014.
- [34] M. Mendoza, B. Poblete, and C. Castillo. Twitter under crisis: Can we trust what we rt? In *Workshop on social media analytics*, pages 71–79, 2010.
- [35] M. R. Morris, S. Counts, A. Roseway, A. Hoff, and J. Schwarz. Tweeting is believing?: understanding microblog credibility perceptions. In *Conference on Computer Supported Cooperative Work*, pages 441–450. ACM, 2012.
- [36] T. Oberlechner and S. Hocking. Information sources, news, and rumors in financial markets: Insights into the foreign exchange market. *Journal of Economic Psychology*, 25(3):407–424, 2004.
- [37] B. O’Connor, R. Balasubramanyan, B. R. Routledge, and N. A. Smith. From Tweets to Polls: Linking Text Sentiment to Public Opinion Time Series. In *Conference on Weblogs and Social Media (ICWSM)*, 2010.
- [38] M. Osborne and M. Dredze. Facebook, twitter and google plus for breaking news: Is there a winner? In *Conference on Weblogs and Social Media (ICWSM)*, 2014.
- [39] M. Osborne, S. Moran, R. McCreadie, A. Von Lunen, M. D. Sykora, E. Cano, N. Ireson, C. Macdonald, I. Ounis, Y. He, et al. Real-time detection, tracking, and monitoring of automatically discovered events in social media. In *Association for Computational Linguistics (ACL)*, 2014.
- [40] M. J. Paul and M. Dredze. You are what you Tweet: Analyzing Twitter for public health. In *Conference on Weblogs and Social Media (ICWSM)*, pages 265–272, 2011.
- [41] S. Petrović, M. Osborne, and V. Lavrenko. Streaming first story detection with application to twitter. In *North American Chapter of the Association for Computational Linguistics (NAACL)*, pages 181–189, 2010.
- [42] S. Petrovic, M. Osborne, R. McCreadie, C. Macdonald, and I. Ounis. Can twitter replace newswire for breaking news? In *Conference on Weblogs and Social Media (ICWSM)*, 2013.
- [43] O. Phelan, K. McCarthy, M. Bennett, and B. Smyth. Terms of a feather: Content-based news recommendation and discovery using twitter. In *Advances in Information Retrieval*, pages 448–459. Springer, 2011.
- [44] O. Phelan, K. McCarthy, and B. Smyth. Using twitter to recommend real-time topical news. In *Conference on Recommender systems*, pages 385–388, 2009.
- [45] S. Phuvipadawat and T. Murata. Breaking news detection and tracking in twitter. In *IEEE/WIC/ACM International Conference on Web Intelligence and Intelligent Agent Technology*, volume 3, pages 120–123, 2010.
- [46] A. Ritter, O. Etzioni, S. Clark, et al. Open domain event extraction from twitter. In *International conference on Knowledge discovery and data mining (KDD)*, pages 1104–1112, 2012.
- [47] D. Rout, K. Bontcheva, D. Preotjiuc-Pietro, and T. Cohn. Where’s wally?: a classification approach to geolocating users based on their social ties. In *Conference on Hypertext and Social Media*, pages 11–20. ACM, 2013.
- [48] E. J. Ruiz, V. Hristidis, C. Castillo, A. Gionis, and A. Jaimes. Correlating financial time series with micro-blogging activity. In *Conference on Web search and data mining (WSDM)*, 2012.
- [49] M. Schindler. *Rumors in financial markets: Insights into behavioral finance*, volume 413. John Wiley & Sons, 2007.
- [50] M. Schmierbach and A. Oeldorf-Hirsch. A little bird told me, so i didn’t believe it: Twitter, credibility, and issue perceptions. *Communication Quarterly*, 60(3):317–337, 2012.
- [51] C. Shirky. The political power of social media. *Foreign affairs*, 90(1):28–41, 2011.
- [52] B. Stelter and N. Cohen. Citizen journalists provided glimpses of mumbai attacks. *The New York Times*, 30, 2008.
- [53] H. K. Sul, A. R. Dennis, and L. I. Yuan. Trading on twitter: The financial information content of emotion in social media. In *Hawaii International Conference on System Sciences (HICSS)*, pages 806–815, 2014.
- [54] F. Vis. Twitter as a reporting tool for breaking news: Journalists tweeting the 2011 uk riots. *Digital Journalism*, 1(1):27–47, 2013.
- [55] Z. Wei and W. Gao. Gibberish, assistant, or master?: Using tweets linking to news for extractive single-document summarization. In *Conference on Research and Development in Information Retrieval (SIGIR)*, 2015.
- [56] X. Zhang, H. Fuehres, and P. A. Gloor. Predicting

asset value through twitter buzz. In *Advances in Collective Intelligence*, pages 23–34. Springer, 2012.

- [57] W. X. Zhao, J. Jiang, J. Weng, J. He, E.-P. Lim, H. Yan, and X. Li. Comparing twitter and traditional media using topic models. In *Advances in Information Retrieval*, pages 338–349. Springer, 2011.