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Riding the Blockchain Mania: Public Firms' Speculative 8-K Disclosures

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Abstract. This paper provides evidence on public firms' initial 8-K disclosures that mention Blockchain and investors' response to these disclosures. We categorize the description of Blockchain activities in firms' 8-Ks as Speculative (e.g., a vague future plan that involves Blockchain) or Existing (e.g., a description of Blockchain product). We document a sharp increase in the number of initial 8-K disclosures of Blockchain, particularly by Speculative firms, coinciding with the rise of Bitcoin prices and excitement in Blockchain technology in the last quarter of 2017. Investors react positively to the Blockchain 8-Ks issued by Speculative firms in the initial seven-day event window although the reaction is mostly reversed over the 30 days following the disclosure. The reaction is stronger when Bitcoin returns are more positive. Overall, our results are consistent with a situation that troubles the SEC and the financial press: investors overreact to a firm's first 8-K disclosure of a potential foray into Blockchain technology and that overreaction is a function of the Bitcoin price bubble.

History: Accepted by Brian Bushee, accounting.

Keywords: Blockchain • Bitcoin • SEC 8-K filing • disclosure • market mania

1. Introduction

The exponential rise in the price of the cryptocurrency Bitcoin from its inception in 2009 to its peak in December 2017 coincided with a correspondingly dramatic surge in public interest, debate, and prognosticating about Bitcoin as well as its underlying Blockchain technology (e.g., Grant 2017). In this paper, we study two questions related to this mania around these Blockchain-related technologies (simply "Blockchain" hereafter). We first examine public firms' 8-K disclosures about Blockchain with the aim of providing evidence on whether firms are opportunistic in their timing and content. Second, we analyze whether investors react rationally to these 8-K Blockchain disclosures.

The SEC is certainly worried about these Blockchain disclosures and the resulting investor reactions. In January 2018, the SEC chairman, Jay Clayton, highlighted a growing trend of Blockchain disclosures from public firms with no meaningful track record in Blockchain technology. In particular, the SEC is concerned that public firms simply state that they "start to dabble in Blockchain activities" or that they change their names to something like "Blockchain-R-Us" to hype up the stock price or to gain access to capital (SEC 2018a). These concerns are echoed by the financial press. Ervin (2018) warns investors that, although some firms are "investing in and developing Blockchain technology," others are "unwarrantedly" mentioning "blockchain" as a buzzword to generate a stock price spike.

Our research questions are intriguing because, on one hand, a long stream of theoretical and empirical work in accounting and finance builds on the assumption that investors do not respond to uninformative disclosures (e.g., Beaver 1968). Accordingly, investors are not expected to respond to corporate Blockchain disclosures that are vague (i.e., lack substance). On the other hand, the business press reports anecdotes of "little-known companies" that have seen higher market values after simply announcing a plan to "join the digital currency craze" (Herron and Russo 2017). Further, this type of reaction is not unprecedented. Lang and Lundholm (2000) find firms that substantially increase their disclosure activities in the six months before seasoned equity offerings experience substantial price increases before the announcement of the equity offering but subsequently suffer large price declines in the period following the announcement of the equity offering. In the context of a mania, Cooper et al. (2001) document a striking positive price reaction to over-the-counter firms' name changes to internet-related dotcom names during the dotcom bubble, suggesting that investors can demonstrate short-term irrationality in a market mania.

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Our aim in this study is to provide timely and systematic evidence on whether firms disclose opportunistically and how investors react to these disclosures. We start by using textual analysis to identify the first instance that a Blockchain keyword (i.e., "blockchain," "bitcoin," or "cryptocurrency(ies)") is mentioned in the 8-Ks. Our sample consists of 82 "Blockchain" 8-Ks filed by 82 unique firms with available Center for Research in Security Prices (CRSP) data.

One empirical challenge is to distinguish firms that are alluding to Blockchain activities from those that have track records in Blockchain technology and announce their continued/renewed commitments. We address this issue using a content analysis of the Blockchain 8-K. We classify a company as a Speculative (Existing) firm if its initial disclosure reveals that the firm lacks (has) a significant commitment or a meaningful track record in Blockchain technology. Speculative firms typically provide vague future plans to implement Blockchain technology. Another often-used strategy is to simply mention the hire of an employee or a board member with Blockchain-related experience without providing information about the firm's future plans. In contrast, Existing firms, for example, provide information about available Blockchain products or services as well as acquisitions of established Blockchain projects or firms. We provide examples in Appendix A. Our sample consists of 56 Speculative and 26 Existing firms.

We validate this classification method by examining whether Speculative firms are associated with certain firm characteristics measured prior to the Blockchain disclosure compared with a size-industry matched control group and with Existing firms. This descriptive analysis provides evidence consistent with Speculative firms experiencing pressure to hide bad news or deliver good news as well as undergoing less internal and external monitoring.

Our analyses start by documenting that the pattern of these 8-K Blockchain disclosures remarkably resembles (with a small lag) the pattern of Bitcoin prices, which also mirrors Google searches of Blockchain keywords. The dramatic increase in Blockchain disclosures in the latter period of our sample, when Bitcoin prices are at their highest levels, is driven by Speculative firms. In contrast, in the earlier period of our sample, Existing firms outnumber Speculative firms. This pattern suggests that managers, particularly those working at Speculative firms, are opportunistic in the timing of their Blockchain disclosures.

We next show that the short-window abnormal returns around the Blockchain 8-K filing dates are positive for Speculative firms (7.5%) but close to zero for Existing firms. These positive initial reactions to Speculative 8-Ks are mostly reversed within 30 trading days, consistent with the idea that investors partially overreact to the Speculative disclosures. We find a similar pattern, but with a stronger magnitude, using a sample of 33 Blockchain firms traded on the over-the-counter (OTC) market—the short-term abnormal returns for these Speculative firms are 65.7%.

We conduct two additional analyses to demonstrate that our results are consistent with a Blockchain mania by investors. We show that short-window market reactions to Blockchain 8-Ks are much stronger in the Bitcoin upmarket periods relative to insignificant returns in the down-market periods. This result is consistent with investors perceiving greater value to Blockchain technology when Bitcoin returns are higher. We also demonstrate that portfolios of Speculative and Existing Blockchain stocks comove with the Bitcoin price. Said differently, these investors gain exposure to Blockchain technology. This result supports our premise that investors' demand for such exposure is part of the reason why a Blockchain mania exists.

This study contributes in three ways. First, this paper provides initial evidence on public firms' Blockchain disclosures and investors' reactions. Our research design allows us to separate the investor reactions to the Speculative firms from those to the Existing firms. Overall, our results support the concerns of the SEC and the financial press that investors overreact to a firm's first 8-K disclosure of a potential foray into Blockchain technology—even one that lacks substance—and that the overreaction is a function of the Bitcoin price bubble.

Second, we contribute to the broader literature on firms' strategic disclosure behaviors induced by capital market incentives. Prior studies, for instance, show that firms increase positive disclosures before seasoned equity offerings and CEO's option equity vesting periods, push forward negative news and delay positive news before CEO's option award dates, and withhold negative information about corporate directors' biographies (Aboody and Kasznik 2000, Lang and Lundholm 2000, Edmans et al. 2018, Gow et al. 2018). We provide new evidence on Speculative firms' strategic disclosure behaviors in a setting of elevated investor excitement, which complements studies, such as Lang and Lundholm (2000) and Cooper et al. (2001).

Third, this paper contributes to the emerging literature on Blockchain technology in accounting, finance, and management. Most concurrent research focuses on specific topics, such as Bitcoin valuation, initial coin offerings, and Blockchain competition and system design (e.g., Abadi and Brunnermeier 2018, Cong et al. 2018, Feng et al. 2018, and Sockin and Xiong 2018). We use this setting to study how public firms respond to the rise of an innovative technology, such as Blockchain, in terms of their disclosure behaviors as well as how investors respond to such disclosures.

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2. Blockchain Mania

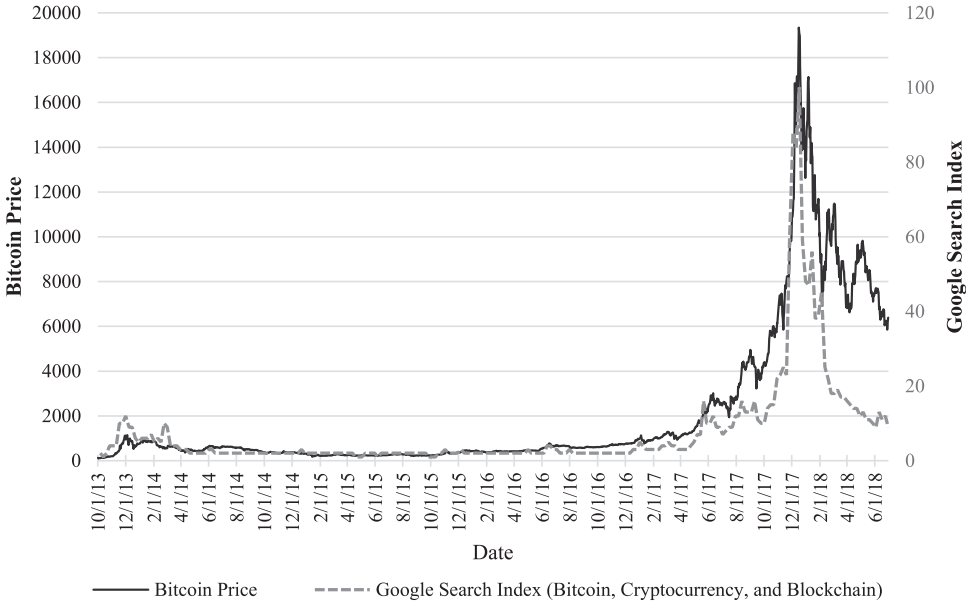
The price of Bitcoin, a cryptocurrency based on Blockchain technology, increased dramatically from less than a penny when it launched in 2009 to $900 in January 2017 and peaking to more than $19,500 in December 2017.[1] This rise in Bitcoin price coincided with growing interest and excitement in how Blockchain technology could improve and perhaps revolutionize many business products and processes (Deloitte 2018). As can be seen from Figure 1, the number of Google searches on "bitcoin," "blockchain," and "cryptocurrency(ies)" closely mirrored Bitcoin price and also peaked in December of 2017.[2] According to Google, "Bitcoin" was the second most searched news term in 2017, ranking just below "Hurricane Irma" and just above "Las Vegas Shooting."

Interest in Bitcoin and the underlying Blockchain technology also stimulated investor attention. However, directly investing in Blockchain products, such as Bitcoin or other cryptocurrencies, is inherently risky because cryptocurrency-trading platforms currently are not registered under state, federal securities, or commodities law and may lack investor-protection standards for cybersecurity, internal control, and market surveillance (Office of the New York State Attorney General 2018). Price manipulation presents additional risks to investors (SEC 2018b).[3] As such, investors seek exposure to Blockchain technology through publicly traded equity securities that are expected to covary with the success of Blockchain technology (Herron and Dentch 2017, Ervin 2018). Investors anticipate that firms with greater capacity to sense and incorporate new advanced technologies into their businesses will experience stronger financial performance and higher future growth (e.g., Srinivasan et al. 2002 and Sarkees 2011). This expectation leads to increased investor demand for Blockchain-related securities. Such firms, for instance, are those that offer Blockchain-related products or services as well as their suppliers. Given the strong demand but limited supply of equity securities in Blockchain-related firms, we expect that investors are willing to pay a higher price to purchase the stock of such firms. Further fueling demand, in such conditions we surmise that stock prices of Blockchain firms would enter a positive spiral in which high prices paid by investors drive up returns, which, in turn, drives more demand for the stock of such firms.

3. Sample

We downloaded all 8-Ks filed from January 2009, the year of Bitcoin inception, through June 2018 from the SEC's Electronic Data Gathering, Analysis and Retrieval (EDGAR). The primary purpose of 8-Ks is to report material corporate events on a more current basis. Specific examples of topics that mandate an 8-K include entry into material definitive agreements, results of operations, material impairments, and departures and appointments of principal executives and directors. Under regulation fair disclosure, if the firm releases material information to selective parties, such as investors or the media, the firm is required to release the same disclosure in such a way to "effect broad, non-exclusionary distribution of the information to

Figure 1. Bitcoin Prices and Google Searches



Notes. This figure plots the Bitcoin price (in US$) and the Google search index of Blockchain. The Google search index measures the popularity of the search queries with "bitcoin," "cryptocurrency," and "blockchain" in the United States.

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Table 1. Sample Construction

SEC registrants with the first mention of Blockchain in 8-Ks	224
After excluding:	
Firms with unavailable CRSP price data	104
Firms that are investment funds	102
8-Ks with an irrelevant mention of Blockchain, such as in boilerplate credit agreement language	94
8-Ks that state the firm has no intention to become involved in Blockchain	91
8-Ks discussing Blockchain in general without firm-specific Blockchain information	82

Note. This table presents the construction of the final sample.

the public" or simply issue an 8-K (SEC 2000, section I). The firm, however, has discretion in the contents of the 8-K because it is not limited to certain subjects and can disclose any information it "deems of importance to security holders" (SEC 2017, p. 21). The wide range of corporate events covered by an 8-K enable us to conduct a thorough search of firms' Blockchain initiatives. Our focus on 8-Ks also allows us to identify a cleaner event date of the firm's broadly distributed Blockchain information.

We define Blockchain 8-Ks as those that contain the words "blockchain," "bitcoin," or "cryptocurrency(ies)." Our keyword search includes 8-Ks and exhibits, in which companies often attach press releases or other disclosures, such as investor presentation slides. We trace these Blockchain 8-Ks to 224 unique SEC registrants using EDGAR identifiers, the central index keys. Firms issuing these 8-Ks are labeled as Blockchain firms. We exclude registrants without CRSP price data and firms that operate as investment funds. Then, we manually read and screen the first blockchain-related 8-Ks for each registrant. We exclude irrelevant 8-Ks. Typically, these 8-Ks are misclassified because

Table 2. Description of Initial Blockchain 8-Ks

	Speculative	Existing	Total	Percentage
	(1)	(2)	(3)	(4)
Panel A: By year				
2013	0	2	2	2
2014	0	3	3	4
2015	1	5	6	7
2016	8	2	10	12
2017	14	5	19	23
2018 (January to June)	33	9	42	51
Total	56	26	82	100
Prior to 2017	9	12	21	26
2017 to June 2018	47	14	61	74
Total	56	26	82	100
Panel B: Fama–French industry (12 industries)				
Consumer nondurable goods	2	0	2	2
Consumer durable goods	0	0	0	0
Manufacturing	3	1	4	5
Oil, gas, and coal extraction and products	0	0	0	0
Chemicals and allied products	0	0	0	0
Business equipment	19	11	30	37
Telephone and television transmission	2	0	2	2
Utilities	0	0	0	0
Wholesale, retail, and some services	2	1	3	4
Healthcare, medical equipment, and drugs	0	1	1	1
Finance	22	8	30	37
Other	6	4	10	12
Total	56	26	82	100
Panel C: By context of 8-Ks				
1. Merger and acquisitions	0	5	5	6
2. Board member changes	14	0	14	17
3. Blockchain-related product/services	5	9	14	17
4. Acceptance of Bitcoin payment	0	4	4	5
5. Future plans	29	1	30	37
6. Customer exposure	5	6	11	13
7. Subsidiary or investments	3	1	4	5
Total	56	26	82	100

Notes. This table describes our sample by the year of disclosure, by industry, and by context. Panel A presents the number of initial Blockchain 8-Ks by year. Panel B presents the number of initial Blockchain 8-Ks by Fama–French 12 industries. Panel C presents the number of initial Blockchain 8-Ks by the context of 8-Ks. In each panel, we provide data for Speculative and Existing firms separately.

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the Blockchain keywords are only found in their respective 8-Ks' attached credit agreements as part of boilerplate contract language.[4] We also exclude those filers stating no intention to purchase Bitcoin or get involved in the Blockchain business. Finally, we exclude those filers only commenting broadly on Bitcoin and Blockchain technology (such as when discussing industry trends) with no reference to their own firms' business operations. After applying these filters, we identify a final sample of 82 unique firms that filed Blockchain 8-Ks for the first time between November 2013 and May 2018. Table 1 describes the sample.

4. Description of Blockchain 8-Ks

Three of the coauthors independently reviewed each firm's initial Blockchain disclosure and, as explained earlier, classified the company as a Speculative (Existing) company if its initial Blockchain 8-K reveals that the company lacks (has) a significant commitment or a track record in Blockchain technology. Table 2 describes our sample of firms along three dimensions: by year of disclosure, by industry, and by the context of the Blockchain mention in the 8-K.

Panel A reveals that around 74% of firms in our sample filed their first Blockchain 8-Ks between January 2017 and June 2018—the same period that Bitcoin price and general interest in Blockchain are highest. Figure 2 plots these initial Blockchain disclosures on a quarterly basis as well as the Bitcoin price over time and illustrates that Blockchain disclosures and Bitcoin price move together over time.[5] We also observe that this dramatic increase in Blockchain disclosures in the latter period of our sample (i.e., after January 2017) is driven by Speculative firms, which accounts for 77% (47 out of 61) of the Blockchain 8-K disclosers. In contrast, in the early period of our sample, Existing Blockchain 8-Ks outnumber Speculative 8-Ks (12 versus 9). This result corroborates the notion of an opportunistic manager disclosing a Speculative Blockchain disclosure during the Blockchain mania.

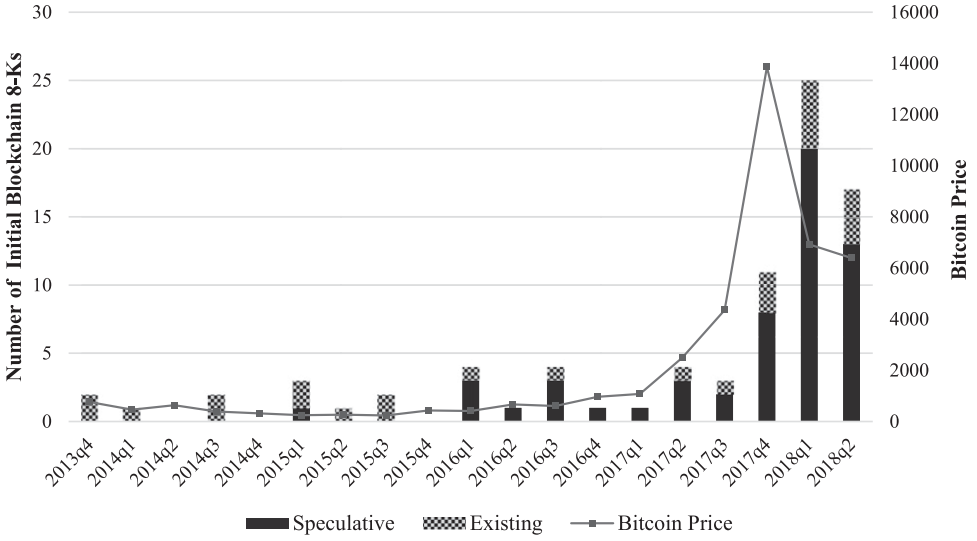
Panel B shows that the initial disclosers are concentrated in the business equipment industry (i.e., computers, software, and electronic equipment; 37%) and the finance industry (37%). The remaining Blockchain firms spread across 6 of the 12 Fama–French industries, consistent with Blockchain's potential applications in various business settings.

As part of our content analysis of the initial Blockchain 8-Ks, we also categorize the 8-K announcements by their context. Panel C shows that Existing firms are more likely to disclose news about more substantive topics that arguably should result in these firms gaining greater economic exposure to the potential success of Blockchain technology. These subjects include (1) mergers and acquisitions, (3) products and services, (4) acceptance of Bitcoin payment, and (6) customer exposure. Conversely, consistent with the prediction that Speculative firms are more likely to use Blockchain in a context conducive to more vague language, Speculative firms are more likely to issue Blockchain 8-Ks about (2) board member changes, (5) future plans, and (7) subsidiaries or investments.[6]

5. Characteristics of Speculative and Existing Firms

Table 3 compares the firm characteristics of Speculative firms with two benchmarks: a matched control sample and Existing firms. All variables are measured

Figure 2. Initial Blockchain 8-Ks



Notes. This figure plots the Bitcoin price (in US$) and the number of public firms mentioning Blockchain keywords for the first time in their 8-K filings. Blockchain keywords include "bitcoin," "cryptocurrency(ies)," and "blockchain." We indicate the 8-Ks disclosed by Speculative and Existing firms separately.

Table 3. Characteristics of Speculative and Existing Firms

	Speculative				Existing				
	N	Treatment	Control	Difference	*N*	Treatment	Control	Difference	Speculative – Existing Difference
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Initial Blockchain 8-Ks									
Keywords count	56	3.79	n/a	n/a	26	26.65	n/a	n/a	22.86***
General									
ln(*Total assets*)	56	6.49	6.52	–0.03	26	6.53	6.62	–0.19	–0.04
ln(*Market value*)	56	6.89	6.97	–0.08	25	7.07	7.15	–0.08	–0.18
ln(*Revenue*)	56	5.26	5.65	–0.39	26	5.53	6.03	–0.50	–0.27
Tobin's Q	56	1.90	2.01	–0.11	25	2.61	2.23	0.38	–0.71*
Book-to-market	56	0.82	0.57	0.25	25	0.38	0.46	–0.08	0.44
Age	56	18.64	25.43	–6.79**	26	24.92	23.42	1.50	–6.28*
Performance									
ROA	55	–0.16	–0.03	–0.13**	26	–0.04	–0.04	0.00	–0.12
ROE	54	–0.67	–0.18	–0.49*	25	0.03	–0.15	0.18	–0.70**
Loss	56	0.55	0.41	0.14*	26	0.54	0.38	0.16	0.01
Returns	56	–0.16	0.01	–0.17*	25	–0.06	0.24	–0.30**	–0.10
Demand for capital									
Equity issuance	56	0.08	0.01	0.07***	26	0.06	0.06	0.00	0.02
Financing cashflow	56	0.07	0.00	0.07*	26	0.03	0.00	0.03	0.04
Financial constraint index	56	–3.22	–3.46	0.24*	26	–3.30	–3.42	0.12	0.08
Going concern opinion	56	0.13	0.00	0.13***	26	0.12	0.08	0.04	0.01
Internal & external monitoring									
Analyst coverage	56	6.89	6.91	–0.02	26	11.58	10.96	0.62	–4.69**
Institutional ownership	56	0.39	0.49	–0.10*	26	0.44	0.50	–0.06	–0.05
ln(1 + *Media coverage*)	56	5.11	5.21	–0.10	26	5.63	5.81	–0.18	–0.52
Big-4 auditor	56	0.54	0.57	–0.04	26	0.62	0.65	–0.03	–0.08
Internal control weakness	56	0.84	0.25	0.59**	25	0.12	0.20	–0.08	0.72**

Notes. This table presents a comparison of firm characteristics as of the most recent fiscal year end before the initial Blockchain 8-K between the Speculative and Existing firms. We provide results for the control samples consisting of nondisclosing firms that are closest in size to the Speculative or Existing firms in the same SIC three-digit industry. All variables are defined in Appendix B.

***, **, and * denote significance for 1%, 5%, and 10%, respectively, using one-tailed tests.

in the 12-month period prior to the date of the firms' initial Blockchain 8-K disclosure.[7] Data to measure our variables come from a variety of sources: Compustat (annual), CRSP (daily), I/B/E/S (detail), Thomson Reuters, Audit Analytics, WRDS SEC Analytics Suite, and RavenPack.

We note that Speculative firms are similar in size, have lower growth prospects, and are younger than Existing firms. More importantly, Speculative firms use fewer Blockchain keywords in their initial Blockchain 8-Ks (four words) than the Existing firms (27 words), consistent with our conjecture that the Speculative firms use Blockchain keywords strategically in their disclosures and, thus, provide less detail about their actual Blockchain initiatives.

We also observe several patterns that support our identification of Speculative firms when we compare them to a matched control group. Each Speculative firm is matched to a single firm closest in size in the same three-digit standard industrial classification (SIC) codes. We borrow concepts from studies of fraud to motivate our assertions, and many of the differences we observe are empirically associated with a higher occurrence of accounting fraud (Lennox and Pittman 2010, Lennox et al. 2013). Although fraud is egregious compared with firms simply disclosing strategically, the underlying rationales to predict the two constructs are perhaps not that different. First, corporate managers delivering poor financial performance are under pressure to hide this bad news or deliver good news to offset the bad performance (Lennox and Pittman 2010). We find that Speculative firms are more likely to incur losses and have worse return on assets (ROA) and return on equity (ROE) ratios. Second, managers with greater demand for capital are highly motivated to produce good news for shareholders (Maksimovic and Titman 1991, Lennox and Pittman 2010, Lennox et al. 2013). Consistent with this notion, we find that Speculative firms issue more equity and, thus, have higher financing cash flows. At the same time, they receive more going concern opinions from auditors and are more likely to be financially constrained. Third, managers facing weaker internal and external monitoring are less constrained and, hence, more likely to act opportunistically (Miller 2006, Dyck et al. 2010). Consistent with this expectation, we show that Speculative firms have more internal control weaknesses and lower

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institutional ownership. A comparison between Speculative and Existing firms along these dimensions, although producing a smaller number of statistically significant differences, generally supports these inferences. In sum, these differences in firm characteristics collectively indicate that we have identified firms with a higher ex ante likelihood to strategically disclose Blockchain information.

For completeness, we also compare Existing firms with a similarly matched control group. Except for stock returns, there are no significant differences between the Existing firms and their respective control group, which further supports our classification of Speculative firms.

6. Investor Reactions

Our investor reaction is centered on the filing date of the first Blockchain 8-K ($t = 0$). Although the exact date of the event reported in the 8-Ks may occur earlier than the filing date, the filing date is when the event is first publicly disclosed. Firms have up to four business days after an event to file the 8-K, but they rarely wait this long. To adjust for an earlier possible disclosure, we start our returns analysis on day $t = -3$.

Table 4 presents the results of the short-window buy-and-hold abnormal returns (BHAR) tests. We measure BHAR as the difference between the firm's buy-and-hold return and that of a benchmark portfolio; the normal returns of the benchmark portfolio are estimated using the Fama–French three-factor model (Fama and French 1993).[8] The sample for this test includes 79 8-Ks.[9] Column (1) of panel A shows that the BHAR (−3, +3) to firms' first Blockchain 8-Ks are positive (5.1%; t-statistic = 1.59). The positive aggregate reaction is driven by the Speculative firms (7.5%; t-statistic = 1.78). The reaction to Existing firms is negligible. Likely, the market learned about an Existing firm's Blockchain activities prior to the first 8-K disclosure. By definition, these Blockchain activities are described as more substantial in the 8-K, implying that the activities were likely initiated earlier than the 8-K date. These more preliminary activities may have been communicated to investors, the media, or other stakeholders and, hence, would have already been incorporated into prices.[10]

Column (2) indicates the market reactions of the period following the initial reactions (+4, +30). The BHAR returns for Speculative firms are negative (−5.6%; t-statistic = −2.19), and those for Existing firms are not statistically significant. Column (3) provides the combined reactions over the initial and follow-up period (−3, +30). These findings show that the positive initial reactions to Speculative 8-Ks are mostly reversed within 30 days.[11]

One alternative explanation for our results is that non–Blockchain-related information in the Blockchain 8-K explains the market reactions we document. Although we do not directly control for this information, we have

Table 4. Investor Reactions

	Initial Blockchain 8-Ks			8-Ks in previous 12 months
	(−3, +3) (1)	(+4, +30) (2)	(−3, +30) (3)	(−3, +3) (4)
Panel A: BHAR returns				
All, %	5.1	0.3	3.9	−0.1
t-statistic	(1.59)	(0.06)	(0.74)	(-0.26)
N	79	79	79	1,180
Speculative, %	7.5	−5.6	0.2	−0.3
t-statistic	(1.78*)	(−2.19**)	(0.04)	(−0.51)
N	54	54	54	874
Existing, %	0.1	13.0	11.8	0.4
t-statistic	(0.02)	(0.98)	(0.83)	(0.41)
N	25	25	25	306
Difference (Speculative − Existing), %	7.4	−18.5	−11.6	−0.7
Panel B: BHAR returns for OTC sample				
All, %	60.5	−13.4	18.4	—
t-statistic	(1.78*)	(−1.38)	(0.85)	
N	37	37	37	
Speculative, %	65.7	−11.0	25.2	—
t-statistic	(1.74*)	(−1.03)	(1.05)	
N	33	33	33	

Notes. This table presents the average BHAR adjusted for the Fama–French three-factor model around 8-K filing dates for firms with available CRSP price data. Panel A presents the results using the main sample. Columns (1)–(3) show the results for the initial Blockchain 8-Ks. Column (4) provides the results for all the 8-Ks disclosed in the 12 months prior to the event period. Panel B provides the BHAR results adjusted for OTC market returns for a sample of OTC firms with available Bloomberg price data.

***, **, and * denote significance for 1%, 5%, and 10%, respectively, using two-tailed tests.

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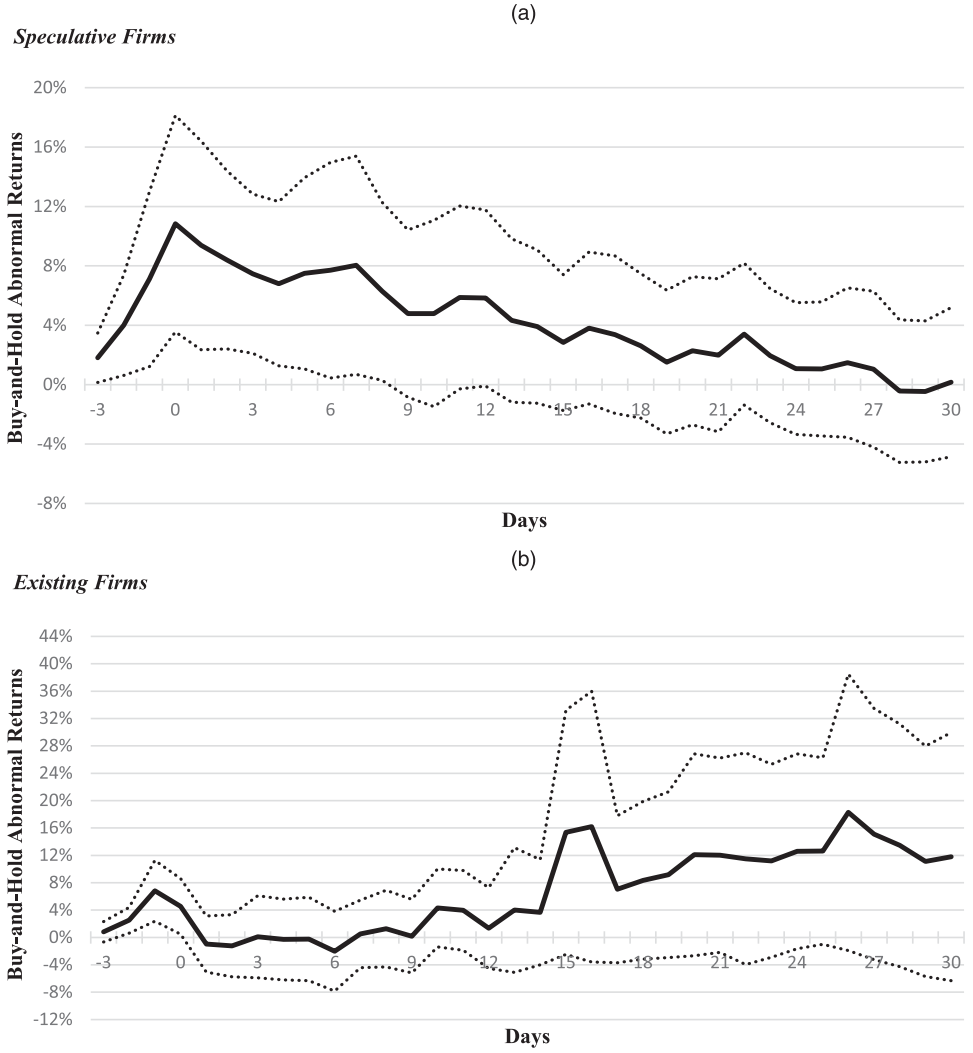
no reason to expect it to be systematically positive and then reverse as our results for Speculative firms show. As a benchmark for the type of information we expect to see in an 8-K, we calculate the BHAR (−3, +3) for all the 8-Ks that our sample firms disclosed in the 12 months prior to the Blockchain 8-Ks. As expected, the results in column (4) of Table 4 show that the average market reaction is close to zero.

In Figure 3, we plot the BHAR returns over the event window (−3, +30) separately for the Speculative and Existing firms. We also plot the 10%/90% confidence intervals. In panel A, we observe an initial reaction to the Blockchain 8-Ks for the Speculative firms followed by a reversal. From panel B, we observe that there is little initial reaction to the Blockchain 8-Ks for Existing firms. Although it may seem that returns drift upward following the disclosure, this positive return is not significantly different from zero.

Panel B of Table 4 provides the BHAR returns for a sample of 37 OTC firms with available Bloomberg data over the same event window. For this sample, we adjust the raw returns using the OTCQX U.S. Index (untabulated results using raw returns produce identical inferences). We follow the same process discussed previously to identify these firms' initial Blockchain 8-Ks and classify them into 33 Speculative and 4 Existing firms. As the number of Existing firms is so small, we do not tabulate this result and focus our discussion on the OTC Speculative firms. The initial event window (−3, +3) market reaction to Blockchain 8-Ks for Speculative firms is 65.7%, which is an order of magnitude larger than the reaction for our main sample.

Figure 3. Market Reactions to the Initial Blockchain 8-Ks



Notes. This figure plots the BHAR relative to the Fama–French three-factor model from three days before to 30 days after the date of the initial Blockchain 8-K filing. Panels (a) and (b) show the BHAR returns for 54 Speculative and 25 Existing firms, respectively. The solid lines represent the BHAR returns, and the dotted lines represent 10%/90% confidence intervals.

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Yet the variability is also much larger, leading to a similar level of statistical significance compared with our main result (t-statistic = 1.74). The BHAR (−3, +30) return is 25.2%, implying the majority of this initial reaction was reversed. Figure 4 plots the BHAR returns of the OTC Speculative firms over time and illustrates the large initial reaction followed by the partial price reversal.

Overall, the investor reactions we document are consistent with a situation that troubles the SEC and the financial press: investors overreact to a firm's first 8-K disclosure of a potential foray into Blockchain technology.

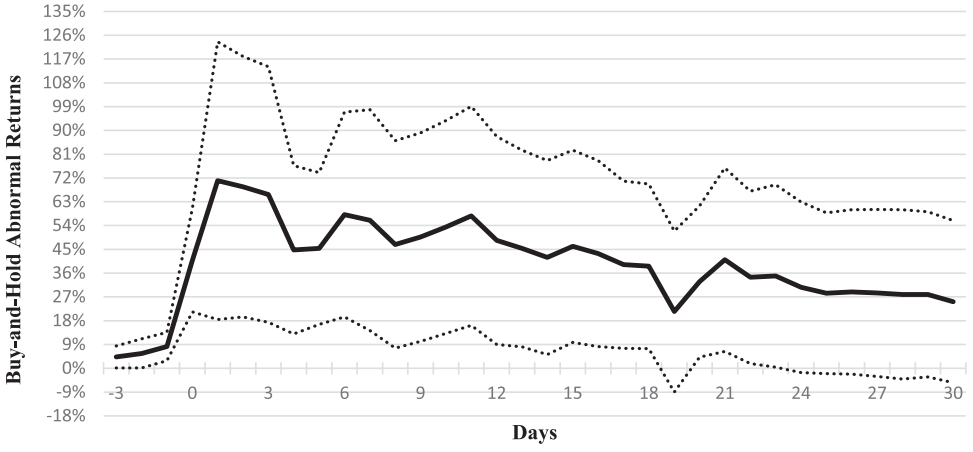
7. Additional Analyses

We conduct two additional analyses to confirm that our results are consistent with a Blockchain mania by investors. An important feature of these two tests is the use of Bitcoin prices to proxy for the perceived value of Blockchain technology. This notion is supported by recent studies arguing Bitcoin price is positively associated with Bitcoin adoption, a proxy for Blockchain's growth prospects, and that Bitcoin price exhibits no exposure to market returns or other macroeconomic factors (Cong et al. 2018, Liu and Tsyvinski 2018).

First, if investors perceive greater value to Blockchain technology when Bitcoin returns are higher, then we would expect market reactions to Blockchain 8-Ks should be stronger when Bitcoin returns are higher. Table 5 provides support for this premise. It shows that, for the full sample of firms, BHARs (−3, +3) are positive (12.4%; t-statistic = 2.03) in the Bitcoin upmarket periods and insignificant in the downmarket periods.[12] This difference is large and statistically significant (13.3%; t-statistic = 1.98). When we partition the sample into Speculative and Existing firms, we observe the same pattern of greater positive returns in Bitcoin upmarket periods, albeit at lower levels of statistical significance (i.e., 10% one-sided test). This result further alleviates a concern brought up earlier: the positive relation between Bitcoin returns and Blockchain 8-K reactions is not consistent with other information contained in the 8-Ks explaining our findings.

Second, we assert that investors anticipate the firms issuing Blockchain 8-Ks will have Blockchain exposure and, thus, are willing to pay higher stock prices, leading to a market mania. We validate this assertion ex post by examining whether investors subsequently gain exposure to Blockchain technology by purchasing Blockchain stocks. We expect that a company has exposure to Blockchain technology if its stock returns comove with the Bitcoin returns. To test this, we construct separate stock portfolios for Speculative and Existing firms by adding the firms into the portfolio after the release of their first Blockchain 8-Ks. Table 6 presents the estimated factor loadings of our portfolios on Bitcoin returns after controlling for the Fama–French three factors. Columns (1) and (3) show that the loadings on Bitcoin for both Speculative and Existing portfolios are positive and statistically significant (coefficients of 0.04 and 0.09, respectively), consistent with investors subsequently gaining exposure to Blockchain technology by investing in firms disclosing Blockchain 8-Ks. An untabulated test of the equality of coefficients indicates that the loadings are greater for Existing firms than for Speculative firms, suggesting that Speculative firms deliver less real exposure to Blockchain.[13] We also construct portfolios and estimate loadings for the matched control firms in a similar manner but, as columns (2) and (4)

Figure 4. Market Reactions to the Initial Blockchain 8-Ks of OTC Speculative Firms



Notes. This figure plots the BHAR relative to the OTCQX U.S. index returns from three days before to 30 days after the date of the initial Blockchain 8-K filing for a sample of 33 OTC Speculative firms with available Bloomberg price data. The solid line represents the BHAR returns, and the dotted lines represent 10%/90% confidence intervals.

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Table 5. Investor Reactions by Bitcoin Up- and Down-Market Periods

	Upmarket period	Down-market period	Difference (up – down)
	(1)	(2)	(3)
All, %	12.4	–0.9	13.3
t-statistic	(2.03**)	(–0.33)	(1.98**)
N	36	43	
Speculative, %	14.3	1.6	12.8
t-statistic	(1.83*)	(0.42)	(1.47)
N	25	29	
Existing, %	8.0	–6.1	14.1
t-statistic	(0.85)	(–1.73*)	(1.40)
N	11	14	

Notes. This table presents the BHAR in the event window (–3, +3) relative to the Fama–French three-factor model to the initial Blockchain 8-Ks for the sample periods corresponding to Bitcoin up- and down-market periods.

***, **, and * denote significance for 1%, 5%, and 10%, respectively, using two-tailed tests.

show, these portfolios do not comove with Bitcoin returns.

8. Conclusion

This paper documents a sharp increase in corporate Blockchain disclosures through 8-K filings during a Blockchain mania. Investors overreact to the initial Blockchain 8-Ks issued by Speculative firms, suggesting that investors are at least temporarily fooled by such disclosures. As such, our findings support related concerns raised by the SEC and financial press.

One caveat of this study is that we do not directly examine the intentions of firms in our setting. We leave this aspect to future research. For example, as a more controversial portrayal of the evidence, we cannot rule out the idea that this increase in disclosures by Speculative firms is driven by managers' desire to take advantage of investors' mania about Blockchain—accomplished by opportunistically disclosing Blockchain keywords in the 8-Ks to hype up stock prices. Further research could also investigate whether managers exploit this temporary investor overreaction by, for instance, selling stock, engaging in insider trades, exercising options, etc. Certainly, managers would have incentives to take these actions when their stock is overvalued. Another potential follow-up research question would be to examine how this temporary overvaluation corrects over time. For example, do analysts, sophisticated investors, or the media play a role in alleviating this overvaluation?

As Bitcoin prices dropped since their peak in 2017, the Blockchain mania seems to have cooled down. Yet investors continue to demand exposure to Blockchain. For example, financial services firms, such as Bats BZX Exchange Inc. and Cboe Global Markets Inc., are petitioning the SEC to launch Bitcoin exchange-traded funds to meet the demand (SEC 2018b). As a caveat to our study, we take as given the investor demand for Blockchain technology; our study has no direct implications for whether investors should or should not be investing in Blockchain technology. That said, in light of investors' sustained enthusiasm, we caution investors that despite corporate managers' increasing use of the word "Blockchain" in the 8-Ks, few firms have developed successful Blockchain projects.[14]

Table 6. Investors' Subsequent Exposure to Blockchain Technology

	Speculative		Existing	
	Treatment	Control	Treatment	Control
	(1)	(2)	(3)	(4)
α	–0.02	–0.02	–0.00	0.00
	(–0.36)	(–0.92)	(–0.01)	(0.09)
$Bitrf_t$	0.04	–0.00	0.09	–0.00
	(3.39***)	(–1.23)	(4.42***)	(–0.84)
$Mktr_t$	0.88	0.80	0.92	0.90
	(14.50***)	(26.12***)	(6.36***)	(25.48***)
SMB_t	0.26	0.20	0.76	0.49
	(2.58**)	(3.94***)	(3.28***)	(8.62***)
HML_t	0.28	0.24	–0.38	0.17
	(2.90***)	(4.97***)	(–1.59)	(2.83***)
Observations	851	851	1,168	1,168
Adjusted R^2	0.23	0.47	0.07	0.41

Notes. This table tabulates the factor loadings of Blockchain daily portfolios for the Speculative and Existing firms, using the following model:

$$BLOK_t = \alpha + \beta_1 Bitrf_t + \beta_2 Mktrf_t + \beta_3 SMB_t + \beta_4 HML_t + \epsilon_t.$$

$BLOK_t$ denotes the daily equal-weighted return of our Blockchain portfolio adjusted by the daily risk-free rate. $Bitrf_t$ denotes the Bitcoin daily return adjusted by the daily risk-free rate. We include Fama–French three factors ($Mktr_t$, SMB_t, and HML_t) in our regression to control for systematic risks. As a benchmark, we provide results for the control samples consisting of nondisclosing firms that are closest in size to the Speculative or Existing firms in the same SIC three-digit industry. All variables are defined in Appendix B.

***, **, and * donate significance for 1%, 5%, and 10%, respectively, using two-tailed tests.

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Appendix A. Examples of Blockchain 8-Ks

Company name (initial blockchain 8-K date) disclosure context
Speculative firms
1. GSV Capital Corp. (2017-06-05) Future Plan
The company plans to invest in "Artificial intelligence, Machine Learning, Cloud Robotics, [and] Blockchain."
2. ChinaNet Online Holdings, Inc. (2018-01-11) Board Member Change
The company "announced that it has appointed Mr. Zhongyi Liu as Chief Strategy Officer to head the Company's blockchain strategy plan and related business development."
3. Broadridge Financial Solutions, Inc. (2016-02-05) Future Plan
We will continue to invest in our product development, solutions, and technology capabilities, which now include blockchain technology.
Existing firms
1. Expedia, Inc. (2014-07-31) Acceptance of Bitcoin Payment
"During the quarter, Brand Expedia announced it is now accepting bitcoin as a form of payment through a third-party bitcoin payment processor, Coinbase."
2. Mediabistro Inc. (2013-11-07) Customer Exposure
"Also during the third quarter, we successfully launched our Inside Bitcoins trade show in New York City. This trade show was also financially successful and we have now planned to run this show in Las Vegas, Berlin and additional cities."
3. IBM Corp. (2016-02-25) Blockchain-Related Product/Service
"We have also made several key announcements this week. IBM delivers Blockchain as-a-service to speed DevOps."

Appendix B. Variable Definitions

Name	Definition
Age	The firm's age as of the most recent fiscal year end.
Analyst coverage	The total number of analysts covering the firm during the most recent fiscal year.
Buy-and-hold abnormal return (BHAR)	The firm's buy-and-hold return from t_1 to t_2 minus the buy-and-hold return of a benchmark portfolio. For the main sample, the Fama–French three-factor model is used to estimate the return of the benchmark portfolio from t_1 to t_2 with an estimation window (–175, –26). For the OTC sample, the OTCQX U.S. Index is used as the benchmark portfolio.
Big-4 auditor	Indicator variable equal to one if the firm hires a big-four auditor for the most recent fiscal year-end report.
Bitrf	Daily Bitcoin return minus the daily risk-free rate.
Book-to-market	The firm's book value of total common equity divided by the market value of equity as of the most recent fiscal year end ($ceq/csho \times prcc\_f$).
Equity issuance	The firm's sale of common and preferred stocks scaled by total assets as of the most recent fiscal year end ($sstk/at$).
Financial constraint index	The firm's financial constraint index developed by Hadlock and Pierce (2010) and calculated as $-0.737 \times \text{Size} + 0.043 \times \text{Size}^2 - 0.04 \times \text{Firm Age}$ as of the most recent fiscal year end.
Financing cash flow	The firm's net cash flow from financing activities scaled by total assets as of the most recent fiscal year end ($fincf/at$).
Going concern opinion	Indicator variable equal to one if the firm receives a going-concern opinion for the most recent fiscal year-end report.
HML	The Fama–French high-minus-low factor, measured as the performance of value stocks relative to growth stocks.
Institutional ownership	The firm's percentage of shares held by institutional investors at the end of the most recent calendar quarter before the most recent fiscal year end.
Internal control weakness	The firm's number of internal control weakness as of the most recent fiscal year end.
Keywords count	The number of keywords, including "bitcoin," "blockchain," and "cryptocurrency(ies)," contained in the firm's initial Blockchain 8-K text file.
Market value	The firm's market value of equity plus total assets minus the book value of total common equity as of the most recent fiscal year end ($csho \times prcc\_f + at - ceq$).
Media coverage	The firm's total number of media coverage from Dow Jones Edition sources during the most recent fiscal year, estimated by RavenPack.
Mktrf	The market return minus the risk-free rate.
Operating cash flow	The firm's net cash flow from operating activities scaled by total assets as of the most recent fiscal year end ($oancf/at$).
Return	The equity returns of the company for the 12-month period preceding the release of the initial Blockchain 8-K (from day –273 to –22).
Revenue	The firm's sales as of the most recent fiscal year end ($revt$).
ROA	The firm's income before extraordinary items divided by lagged total assets as of the most recent fiscal year end (ib/at).

Appendix B. (Continued)

Name	Definition
ROE	The firm's income before extraordinary items divided by lagged book equity as of the most recent fiscal year end (*ib*/*ceq*).
SMB	The Fama–French small-minus-big factor, measured as the performance of small stocks relative to big stocks.
Tobin's Q	The firm's market value divided by total assets as of the most recent fiscal year end ((*csho* × *prcc_f* + *at* − *ceq*)/*at*).
Total assets	The firm's book value of total assets as of the most recent fiscal year end (*at*).
Loss	An indicator equal to one if the firm's income before extraordinary items is negative and zero otherwise as of the most recent fiscal year end.

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Endnotes

[1] Blockchain technology refers to an emerging alternative approach to recording transactions on a decentralized network rather than through a centralized intermediary (Nakamoto 2008, Abadi and Brunnermeier 2018). A blockchain holds a growing list of open records linked by cryptographies, which are a technique for secure communication (Leeuwen 1990). Data stored in a block cannot be altered without the consensus of the network, enabling direct transactions between mistrusting parties without an independent third party as an intermediary. Although Blockchain technology has been applied in various industries (e.g., supply chain, healthcare, real estate, and energy), Bitcoin is arguably the most representative and successful application.

[2] We obtain Bitcoin prices from the CoinDesk website (https://www.coindesk.com/price/bitcoin) and Google search data series from Google Trends (https://trends.google.com/trends/?geo=US).

[3] Investing larger amounts of money in cryptocurrencies is also difficult because U.S. investors face fund-transfer limits when wiring from a bank to a cryptocurrency-trading platform.

[4] For example, "The Loan Parties hold, deposit, or transmit funds through or with the following payment transmitters or services including, but not limited to, PayPal, Stripe, Square, Dwolla, Bitcoin, or similar services."

[5] This pattern is not unique to our sample. In untabulated analysis, we produce a highly similar figure if we plot all (736) Blockchain 8-Ks over our sample period (without restricting observations to our sample firms or to the initial Blockchain disclosures).

[6] Untabulated tests show that our inferences remain unchanged if we conduct our analyses using an alternative classification method based on the 8-K contexts. Because (2) board member changes and (5) future plans related to Blockchain are ex ante more likely to be subject to management's discretion compared with the other contexts, we classify (2) and (5) as Speculative firms and the other contexts as Existing firms. Although we do not believe this classification method captures the construct of Speculative as precisely as our main classification method, it represents a potentially more objective method to distinguish Speculative from Existing firms.

[7] The sample size for some characteristics varies because of data availability.

[8] We employ the standard event-study method to generate abnormal returns and BHAR (e.g., Kothari and Warner 2007) with an estimation window (−175, −26).

[9] We exclude three observations from our main sample when calculating abnormal returns for the following reasons. One observation was spun off from its parent on the event date. Two observations are excluded because their returns are outliers. The return of the first (second) outlier on the fifth (seventh) day before the event date is 698% (272%).

[10] In an untabulated analysis, we use the newsfeed from Bloomberg to search the previous three months for any mention of Blockchain in the media coverage of the firm. We also search any previous press releases issued by the firm. We find that Blockchain activities are mentioned prior to the 8-K event window for 54% of the Existing firm observations, and they are only mentioned for 23% of the Speculative firm observations. This evidence is consistent with the market knowing about the Blockchain activities for some firms but particularly for Existing firms. A caveat is that this analysis only includes what we could find in the media and does not include all information known to investors prior to the 8-K.

[11] We further explore the distribution of the returns for Speculative firms. For the (−3, +3) event window, the returns are skewed positive with a median return close to zero. Our results are driven by a subset of observations with returns greater than 10% compared with the subset of observations with returns less than −10%. The former subset consists of 12 observations with an average return of 46.5%, and the latter subset consists of eight observations with an average return of −15.1%. For the (+4, +30) return reversal period, the returns are more consistently negative. Of the 54 observations, 32 have negative returns. Fifteen observations have returns less than −10% with an average return of −28.7%, compared with seven observations with returns greater than 10% with an average return of 18.5%.

[12] We calculate the monthly Bitcoin return for each of the 55 months from November 2013 to May 2018 and rank the months according to the Bitcoin return. The top 28 (bottom 27) months are the Bitcoin up (down) market periods.

[13] The adjusted R^2 for the Existing portfolio is small, potentially because of more idiosyncratic risks that the Existing firms bear by engaging in Blockchain activities.

[14] As an example, see surveys by Deloitte (2017, 2018).

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