Blockchain Mania without Bitcoins: Evidence from China Stock Market

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Abstract

Blockchain mania occurs in response to the quick rise of Bitcoin price in markets with cryptocurrencies circulation. However, Chinese government policies regarding the development of blockchain are inconsistent--block access to the offerings and exchanges of cryptocurrencies such as Bitcoins, but raise the blockchain technology to a strategic position. We empirically investigate whether the government's inconsistent policies will lead to blockchain mania and how it affects the blockchain-related firms' activities and performance. Our results are threefold: First, the supportive policy can fully offset the negative effect due to the national boycott of cryptocurrencies. Second, Non-speculative firms experience a stronger and long-standing positive reaction, while the effect on Speculative firms is transient and vanishes after receiving a definitive warning ten days later. Third, the market reaction to government support appears more pronounced among firms having established blockchain technology alliances, or being endorsed officially.

JEL classification: G12; G14; G18

Keywords: Blockchain technology; Government's inconsistent policy; Blockchain mania; Stock market performance; Event study

1 Introduction

Countries have different attitudes towards the applications of blockchain. The majority of countries, such as the US and Germany, keep an open attitude towards cryptocurrencies and also promote the application of blockchain technology in diverse industries (Abdul-Jabbar 2022). China, however, divides blockchain into two parts, namely, '*chain'* and '*currency*', and has an inconsistent attitude towards them (Jiang et al. 2021). On one hand, they block access to cryptocurrency offerings and exchange, and even declared a restriction on crypto mining (John et al. 2021). On the other hand, they also increasingly consider blockchain technology as a significant economic and political asset for the country, and have incorporated the development of blockchain technology into the national strategy outlined in "the 14th Five-Year Plan" (Feng 2021).

Researchers have found that the crypto mania has a spillover effect on the stock market (Akyildirim et al. 2020; Jain A and Jain C 2019). Specifically, the price surge of Bitcoin attracted more attention from investors, who anticipate more resources will be devoted to the blockchain technology development by firms, which in turn leads to a blockchain bubble in stock markets. Cheng et al. (2019) show that firms' market values, which relate to their first 8-K disclosure of a potential foray into blockchain technology, increase with the price of Bitcoin. Cahill et al. (2020) also find that the market response to firms' interest in blockchain is linked to the performance of Bitcoin. However, in a country prohibiting crypto coin offering and exchange while supporting the development of blockchain technology in real economy applications, the influence of global crypto mania is restricted. Chen et al. (2022) reveal that Bitcoin returns do not affect the market reaction of firms to blockchain-related announcements in China. Will the blockchain bubble still happen in the Chinese stock market? If so, what's its main driving force? And how will investors react to firms' blockchain-related behavior? The inconsistency of Chinese government policies towards cryptocurrencies versus other applications of blockchain technology provides a quasi-experiment situation for us to give answers to these questions.

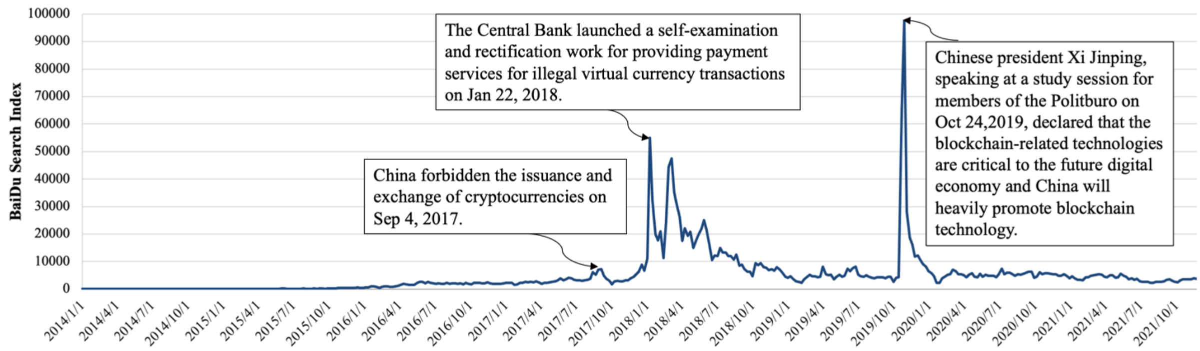

Fig. 1. Baidu Search Index of Blockchain. This figure plots the quarterly Baidu search index of blockchain technology. It also points out the timing of three important policy events in China regarding blockchain.

We adopt two symbolic events to represent the government's inconsistent policies on blockchain technology. The first one is the regulation issued on 4th September 2017 which stringently prohibited the issuance and trading of cryptocurrencies ('the crackdown event' hereafter). At this critical moment, China accounts for more than 90% of trading volumes in cryptocurrencies (Shen and Siu 2021). After the prohibition regulation is promulgated, investors encounter challenges when attempting to access the cryptocurrency market and purchase cryptocurrencies through diverse payment channels (Galbraith and Shen 2021). Interestingly, the government's crackdown on cryptocurrencies has garnered increased public attention towards blockchain. As shown in Fig. 1, the moment of the biggest change in the number of Baidu searches on "bitcoin," "blockchain," and "cryptocurrency(ies)" coincides with the time when China government issued the regulatory policy about cryptocurrency[ii]. The government regulation could trigger speculations in the stock market. From investors' side, the crackdown event has largely attracted their attention to blockchain as well as equipped them with blockchain-related knowledge. From firms' side, to cater to investors' preferences, some firms may intentionally disclose their involvement in the blockchain technology, by releasing some vague blockchain-related messages.

The second one is the 18th collective learning of Politburo (CLP) of the 19th CPC central committee on 24th October 2019. During the conference, Chinese president Xi Jinping delivered a speech about blockchain which emphasized the necessity of gaining an edge in this emerging technology ('the supportive event' hereafter). It's a landmark event for the development of blockchain technology in China, emphasizing that blockchain would play an important role in the next round of technological innovation and industrial transformation (Xinhua 2019). The speech resolved the uncertainty of blockchain technology development in China. What's more, it delivered a strong signal to the market that central government will support and devote more resources to this area (Chen et al. 2022). We use the two signature blockchain events to study the relationship between government's inconsistent policies and the stock market reactions. In particular, we explore whether the government's inconsistent policies will lead to a blockchain bubble in the stock market and how investors and firms will react accordingly.

We used a preliminary set of keywords to search in Wind Financial Terminal (Wind)[i], a prominent financial and economic database in China. Subsequently, we collected all blockchain-related information disclosed by public firms, encompassing news articles, official announcements, and annual reports. As of October 2019, 152 listed firms had announced their involvement in blockchain technology. To explore the blockchain mania in Chinese stock market, we also divide the firms involved in blockchain technology into two categories: Speculative and Non-speculative respectively, inspired by Cheng's and Cahill's works. Cheng's (2019) categorization of the firm types is mainly based on firms' first 8-k disclosure about blockchain. Cahill et al. (2020) similarly classify firms as speculative or non-speculative based on the degree of their blockchain commitment highlighted in their announcement headlines. We, however, identify firm attributes (speculative vs. non-speculative) based on their long-term records by checking whether they have undertaken subsequent initiatives following their initial announcement of engagement with blockchain technology. Thus, we define speculative firm as firms who typically have clearly clarified their interests in blockchain technology or they have plans to venture into blockchain technology in the future, but provide rather vague information regarding the applications of the technology in all of their blockchain-related announcements. In contrast, non-speculative firms provide more detailed information such as blockchain-related patents, the launch of blockchain products or service, the specific amount of capital investment, as well as cooperation with other firms.

The results show that the government's crackdown on cryptocurrencies leads to a 0.90% decline in the market value of blockchain-related firms, while the government's supportive policy on blockchain technology results in an average increase of 5.42% in abnormal returns, instantly. Our results also imply that the government's supportive policy on blockchain technology can improve firms' stock market performance and fully offset the negative impact due to the national boycott of cryptocurrencies. We also observe an increased investor interest in purchasing blockchain-related stocks during the supportive event. Both non-speculative firms and speculative firms encounter positive and statistically significant cumulative abnormal returns in the initial 10 trading days following the supportive event. However, when the music stops, only those with true innovation will continue to thrive. The positive effects of speculative firms not only vanish but turn negative on Day 10, after the "Credible Blockchain Summit" organized by an official institution in China is held. In contrast, the positive of abnormal returns for non-speculative firms last further. To gauge the robustness of our findings concerning specific design choices, we perform a series of robustness checks regarding the endogeneity test, virtual event time points, and alternative expected return models.

We also conduct four additional analyses to examine whether other blockchain-related factors influence the stock market reaction to the government's supportive event. Particularly, firms that have formed technology alliances with other entities show a 2.46% higher abnormal return compare to those that independently develop blockchain technology. We also find that the abnormal return of firms that have been officially endorsed by the Cyberspace Administration of China is 5.87% higher than those without certification. However, the presence of blockchain-related products and the duration of blockchain-related projects have no impact on firms' stock market performance in response to the supportive event.

This study contributes in two ways. First, we find that the government's inconsistent attitude towards blockchain leads to the blockchain bubble in the stock market. Most literature related to government support and technology development, concentrate on the impact of consistent polices (support or boycott) on firms' innovation performance (Doh and Kim 2014; Guan and Yam 2015; Kang and Park 2012; Wei and Liu 2015). Less attention has been paid to the influence of inconsistent or conflicting government policies. China distinguished attitudes toward blockchain, which prohibit coins offering and trading initially, but encourage its development in other aspects later, provide us a fresh angle to investigate the inconsistency of government policies on technology development.

Second, our work innovatively studies the listed firms' speculative behaviour on blockchain unrelating to the phenomena of crypto mania. Several studies have empirically investigated the impact of blockchain technology on firms' market value in different countries (Sharma and Paul 2021; Cheng et al. 2019; Cahill et al. 2020; Chen et al. 2022; Klöckner et al. 2022; Akyildirim et al. 2020; Jain A and Jain C 2019). However, the aforementioned researches cannot rule out the spillover effect from the crypto market. For example, Cheng et al. (2019) find the market reactions to Blockchain 8-Ks are stronger for both speculative and existing firms when Bitcoin returns are higher in US stock market. Cahill et al. (2020) observe a link between bitcoin performance and firms' stock price reactions involving blockchain information releases. Sharma and Paul (2021) find that the stock market gains related to firms' cryptocurrency-related name changes are higher during periods of high sentiment for cryptocurrencies. In our study, Chinese government boycott the cryptocurrencies which clearly exclude the spillover effect of crypto market and leave us a clear situation to study firms' speculative behavior.

The rest of the study is organized as follows. The next section develops our hypotheses. Section 3 describes data and methodology. Section 4 presents the results. Section 5 outlines four additional analyses. Section 6 concludes the study with a summary and implications.

2 Theory and Hypotheses

2.1 Stock Market Reaction to Government's Inconsistent Policies

Cryptocurrencies are often associated with illegal trade such as drugs and firearms trafficking, illegal fundraising, money laundering and so on (Foley et al. 2019). Considering the potential financial stability risks, China strictly forbidden the issuance and trading of cryptocurrencies since September 2017 (the crackdown event). The boycott is conducive to curbing inappropriate financial arbitrage, preventing cross-border capital flow and potential tax evasion, and maintaining a centralized financial market (Allen et al. 2022; Shanaev et al. 2020). However, from a micro perspective, it may be harmful to the technology and business innovations of Chinese firms. Cryptocurrencies have many potential benefits including greater access to credit, faster and more efficient settlement of payments, less transaction fees, easier international exchanges and stronger security (Bhaskar et al. 2022; Murimi et al. 2023; Dierksmeier and Seele 2018). In addition, the issuance of cryptocurrencies can also provide new financing avenues for firms, facilitating innovation in areas such as fintech, business models, etc. (Lyandres, 2022; Abraham, 2022; Patel et al. 2022). However, the government's crypto crackdown hinders all these possibilities. Especially for enterprises that have already laid out blockchain technology in the early stage, the inputs and planning of cryptocurrency are no longer in line with the requirements of regulation. Moreover, the divestiture of the virtual currency related business will result in some cost attrition. Thus, it seems that the Chinese government's crypto crackdown has a negative impact on firm' financial performance.

While shunning cryptocurrencies, China government takes an almost opposite attitude towards the underlying technology innovation and real economy application of blockchain. The most profound event occurred on October 24, 2019, the date Chinese president Xi Jinping gave a speech that the blockchain-related technologies are critical to the future digital economy and China will heavily promotes blockchain technology (Xinhuanet 2019). The supportive event benefits Chinese blockchain-related firms in two ways. Firstly, it formally enhanced the legitimacy of blockchain technology in China. Prior to the speech, the official attitude towards blockchain technology was unclear due to the government's early suppression of cryptocurrencies and the inherent intertwined relationship between cryptocurrencies and blockchain technology. Within a month of Xi's speech, local governments in 20 provinces introduced 44 policies to encourage the development of blockchain. Legitimacy is important in technology development, which can decrease the environmental uncertainty and promote investment in the technology (Hall et al. 2014; Rao et al. 2008; Mahmood and Rufin 2005). Secondly, the speech provided a clear signal that increased resources, including technical development, financial support, and talent incentives, will be allocated to this emerging field. The inflow resources can improve innovation performance and create positive spillover effect on innovation (Lin and Luan 2020) which finally increase financial performance of firms. Thus, we conjecture that the government's supportive attitude towards blockchain would have a positive impact on firms' stock market performance.

Analyzing the aforementioned policies reveals an inconsistent stance by the Chinese government towards blockchain's 'chain application' and 'currency application'. They insist on promoting the application of the underlying blockchain technology in the real economy while resisting cryptocurrencies. Against this inconsistent policy backdrop, the negative impact of the crackdown event assesses the loss for firms to divest the cryptocurrency business, to a certain extent, reflects the impact of the cryptocurrency on the value of the firms. Meanwhile, the positive impact of the supportive event also indirectly reflects the possible value gains that firms may be able to achieve with the support of blockchain technology. Accordingly, by comparing the impact of the two events, it is possible to demonstrate the difference between 'currency' application and 'chain' application of firms' blockchain technology.

We conjecture that the positive effect of the supportive effect is rather limited and cannot fully compensate the negative effect taken by the earlier crackdown event. We make this argument for two reasons. First, cryptocurrencies have unique advantages in terms of improving transactions efficiency and facilitating corporate finance (Hashemi Joo et al. 2020; Symss 2023). Firms can raise capital by conducting an initial coin offering, which involves issuing and selling digital tokens to investors in exchange for funding (Fisch and Momtaz, 2020). The total market value of cryptocurrencies including their applications in decentralized finance and non-fungible tokens worth more than trillions of dollars at their peaks. Second, some of blockchain-based applications rely on seamless divisibility of cryptocurrencies for smooth operation and successful implementation, especially in incentive mechanisms and fair benefit distribution (He et al. 2018; Ballandies 2022). In our analysis, although the supportive event will undoubtedly ripple in the stock market, its positive impact is insufficient to fully offset the negative repercussions of the earlier crackdown event. We therefore hypothesize that:

H1*: The early negative impact of the crackdown event cannot be mitigated by that of the late supportive event in the stock market in magnitude.*

2.2 Blockchain Mania in the Stock Market

There are many similarities between the development stages of blockchain technology and TCP/IP technology (Lansiti and Lakhani, 2017). The blockchain mania in stock markets could potentially resemble the Internet bubble that occurred in the early 2000s. Former studies find that blockchain mania happens in stock markets due to the spillover effect of the crazy rise in the price of Bitcoin, which jumped from just a fraction of a penny to more than $80,000[ii] (Canepa 2017; Castillo 2021; Cheng et al. 2019; Cahill et al. 2020). However, turning to China, due to the government' crackdown on cryptocurrencies in 2017, the prices of Bitcoins have limited effect on stock market since listed firms cannot legally get involved in cryptocurrency-related businesses. As found by Chen et al. (2022), Bitcoin returns have no effect on the market response to blockchain-related announcements by Chinese listed firms. Interestingly, even without the spillover effect from the cryptocurrency market, Chinese investors are still mesmerized by the blockchain bubble and crazy about blockchain-related stocks. We infer that the driving force of blockchain mania in the Chinese stock market if exists is not the skyrocket increase of Bitcoin price but the government policy regarding blockchain technology. We made the above inference for two reasons.

Firstly, in light of the crackdown on cryptocurrencies, investors found their avenues for cryptocurrency investment restricted, prompting a shift in focus towards the stock market and an increased pursuit of stocks related to blockchain technology. Before the government's volt-face in 2017, China was among the earliest countries to enthusiastically embrace cryptocurrencies (Sharma 2021). Chen and Liu (2022) find that Chinese investors wielded significant influence in shaping Bitcoin's pricing dynamics prior to the crackdown event. However, the crackdown on cryptocurrencies introduced legitimate risks and amplified transaction costs for investors engaged in this realm. Although the over-the-counter trading for cryptocurrencies was allowed at that time, the regulation made it harder for investors to exchange cryptocurrencies for Chinese yuan. These barriers consequently prompted certain investors to exit the cryptocurrency market, redirecting their attention towards domestic publicly-listed companies engaged in blockchain technology development. Moreover, the crackdown event has created a buzz domestically, drawing increased attention from investors, while the release of the blockchain supportive speech further fuels the stock market's enthusiasm for blockchain concepts. All of these factors may lead investors to become enthusiastic about blockchain, exhibiting irrational behavior in the traditional stock market, primarily evident in their increased purchase of blockchain-related stocks. Baker and Stein (2004) discovered that irrational investors tend to engage in trading and contribute to trading volume when they hold optimistic views and are betting on rising stocks. Thus, we hypothesize that:

H2: The supportive event will induce irrational behavior among investors, subsequently augmenting the trading volume of firms related to blockchain technology.

Secondly, the government's inconsistent attitude has also triggered listed firms' speculative behaviors by riding the wave of blockchain concept's popularity. According to Figure 1, the crackdown event and its subsequent policies actually have attracted more attention from individual investors, who are well educated about the blockchain technology. In addition, China government often overacts to the defect of emerging technologies to mitigate their risks in the short term but releases some ease policies later. In anticipating of this, some public listed firms are prone to intentionally disclosing their involvement in blockchain by releasing some vague blockchain-related messages. For example, on January 11, 2018, First Capital Securities Co., Ltd., a nationally recognized comprehensive securities firm, announced that "…it is one of the founding members of the Shenzhen Financial Blockchain Alliance. It has been actively participating in research on the application of blockchain in the securities industry and actively seeking suitable blockchain application scenarios." However, after the announcement was made, the company has not provided any further information or updates related to blockchain technology research and application. Although, this kind of firms provide vague blockchain information, the market and investors still consider them as blockchain-related firms. Once there are positive events related to blockchain, the stocks of these companies can still experience an increase in value. To contain firms' speculative behaviors, in November 2019 only the China Securities Regulatory Commission (CSRC) launched more than 30 investigations into blockchain-related news released by listed firms (China Securities Journal 2019).

To explore firms' speculation behavior, we divide firms involved in blockchain into two categories: Speculative and Non-speculative respectively. Speculative firms typically have clearly clarified their interests in blockchain technology or they have plans to venture into blockchain technology in the future, but provide rather vague information regarding the applications of the technology in all of their blockchain-related announcements. In contrast, non-speculative firms are committed to its R&D and real applications. They release very convincing information, such as patents, the launch of blockchain products or service, the specific amount of capital investment, as well as cooperation with other firms. On the one hand, the authenticity of information released by non-speculative firms is higher which may further trigger more dramatic stock market reactions. Former research finds that the price reaction to an announcement is positively related with the precision of the announced information (Holthausen and Verrecchia 1988; Kim and Verrecchia 1991). On the other hand, the information released by non-speculative firms also implies that they are equipment with more resources, a key factor for creating technical capabilities (Wernerfelt 1984). When blockchain supportive speech is released, these companies are more likely to leverage the policy momentum due to their earlier accumulation of knowledge and technology in the field. As a result, we infer that the stock market reaction is stronger for non-speculative firms when the government supportive event is announced. We therefore hypothesize that:

***H3**: Relative to speculative firms, non-speculative firms are expected to exhibit a more positive stock market reaction to the government's supportive event.*

3 Data and Methodology

3.1 Data Collection

Our sample and data about blockchain-related firms were gathered from multiple sources. Firstly, we used a preliminary set of keywords[iii] to search in three sections of the Wind Financial Terminal (Wind), namely, Research Reports, Financial News and Announcements of listed firms. As a leading financial and economic database in China, Wind gathers information on stocks, bonds, insurance, macro economy and financial news from government departments or news service agencies. The keywords we used were "blockchain" or "bitcoin" or "digital asset" or "cryptocurrency"[iii]. Secondly, given that we focus on examining the market reaction to policy, we restricted our sample to the information released by listed firms whose stock prices and financial information were available in China Stock Market & Accounting Research Database (CSMAR)[iv]. After elimination of repeated and irrelevant information, we identified an initial sample consisting of 170 firms that had been considered as blockchain-related listed firms before 24 October 2019. Thirdly, to make sure that we have fully collected blockchain-related information released by our sample firms, we searched on Baidu, the largest search engine in China, to supplement information that could be missed. The complementary materials including the blockchain-related information are from investor interactive platforms and official websites. We excluded 17 firms that have clearly denied the market rumors on their involvement in blockchain-related projects or businesses and one firm with less than 40 trading days of data. The final sample consists of 162 research reports, 364 pieces of financial news and 64 announcements of 152 firms. Within the sample of 152 companies, a mere 4 firms initiated their involvement in blockchain technology in 2016, followed by 16 companies in 2017. Furthermore, a significant influx occurred in 2018, with 84 companies entering the blockchain domain, and 48 companies had ventured into this sector before the supportive events in 2019.

Two of the coauthors independently reviewed each firm's reports and divided our sample into two groups, Speculative and Non-speculative respectively. Speculative firms provide only vague information and are absent from track records of Blockchain technology application. While, non-speculative firms are reportedly involved in real practices and release more detailed information, such as the launch of blockchain products or service, investment projects of blockchain technology as well as certification from official institutions. Our sample consists of 113 non-speculative firms and 39 speculative firms. Meanwhile, we also divide the sample into several categories according to other features of firms' involvement in blockchain-related activities. The features we consider include establishing technical alliances with other entities, launching a blockchain product or service, obtaining official certification from authority, and the duration of project development.

3.2 Sample Description

Table 1 presents the summary statistics for 152 sample firms based on the most recent fiscal year (2018). The mean (median) market value of our sample firms is CNY 280 (7.55) billion, the mean (median) total income is CNY 21 (2.03) billion, the mean (median) R&D expenses is CNY 307 (111) million, and the mean (median) return on assets (ROA) is 0.028 (0.033). We split our sample into speculative firms and non-speculative firms and find that, on average, non-speculative firms are larger in size, obtain more income and invest more in R&D compared with speculative firms. Meanwhile, we note that speculative firms have worse ROA and working capital turnover rate. Most importantly, speculative firms have less analyst and research report coverage than non-speculative firms which indicates that speculative firms face fewer external monitors, and are more likely to take opportunistic actions. We also find that large-scale firms prefer to independently develop blockchain technology. At the same time, firms adopting a technology alliance strategy to develop blockchain technology would like to invest more in R&D activities, have more working capital and get more attention from analysts and research institutions. To get an overview of the industry distribution of the sample, we segment it into five industry groups. Table 2 lists the industry distribution of our sample. Over half (52%) of the sample is from the industry of telecommunications, internet and software. 22% of the sample is from computer, metals, machinery and equipment.

3.3 Event Study

We use event study methodology to estimate the stock market reaction to the government's inconsistent policies on blockchain technology. In an efficient market, the impact of events on shareholder value will be immediately incorporated into stock prices. This methodology is widely used in the evaluation of many kinds of events that have significant impact on firms (Girotra et al. 2007; Hendricks et al. 2009; Florian, 2018). To begin our analysis, we first define the announcement dates of the two events we are interested in. The first event, the Chinese government's crackdown on cryptocurrencies, took place at 9:31 pm on Sep 4, 2017. We choose the next trading day (Sep 5, 2017) as our announcement day. The second event, Chinese President Xi delivered a speech expressing a supportive attitude towards blockchain technology, occurred on October 24, 2019. However, the news was publicly released at 6:14 pm on October 25. Thus, we choose the next trading day (October 28, 2019) as our announcement day on which investors can act on this information. We map calendar days onto corresponding event days, designating Day 0 as the announcement day, Day 1 as the trading day following the announcement day, and Day -1 as the trading day preceding the announcement day, and so forth. Matching the occurrence times of the two events with the initial announcements of blockchain technology involvement by sample firms, we identified that only 17 firms had already declared their engagement in blockchain technology prior to the crackdown event.

Table 1 Descriptive Statistics for Blockchain-related Firms.

	Total		Speculative firm		Non-speculative firm		Non-Technology alliance		Technology alliance	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Market value(billion)	280	7.55	8.78	6.91	373	7.90	681	5.42	17.6	8.43
Assets(billion)	277	4.23	5.73	3.70	370	5.07	683	3.31	12.1	5.95
Income (billion)	21.0	2.03	2.68	1.90	27.3	2.11	39.6	1.41	8.91	2.17
R&D expenses(million)	307	111	191	112	347	110	256	127	339	106
ROA	0.028	0.033	0.019	0.031	0.031	0.037	0.036	0.033	0.016	0.038
ROE	4.26	6.81	4.48	7.02	4.19	6.76	3.43	7.68	4.82	6.49
Tobin Q	1.72	1.54	1.64	1.52	1.75	1.54	1.75	1.54	1.70	1.53
Book to market ratio	0.67	0.52	0.68	0.66	0.67	0.65	0.67	0.65	0.68	0.65
DAR	0.41	0.39	0.41	0.43	0.41	0.39	0.43	0.40	0.39	0.39
Working capital turnover rate	4.71	1.84	3.45	2.17	5.16	1.69	2.45	1.39	6.00	1.87
Research report coverage	16.41	4	9.36	1	18.84	7	15.35	2.5	17.10	8
Analyst coverage	7.51	3	4.51	1	8.54	4	6.82	2	7.96	4
N	152		39		113		60		93	

Table 2 Industry Distribution of Blockchain-related Firms.

Industry distribution	Code	No. of obs.	Percentage
Agriculture, food, textiles, apparel, paper, printing, chemicals, and pharmaceuticals	01-27	13	8.55

Manufacture of Non-metallic, metals, machinery, equipment, computers, instrument	30-40	33	21.71
Electronics, construction, transportation, storage, wholesaling and retailing	44-60	11	7.24
Telecommunications, internet, software	63-65	78	51.97
Financial service, insurance, Real estate, Healthcare, Press and publishing	66-87	16	10.53

We use the Fama-French three-factor model to estimate abnormal return and market model to measure abnormal trading volume respectively. The abnormal return is computed as the difference between the actual and the expected returns. The estimation period starts at Day -210 and ends at Day −11. We end the estimation period 10 trading days prior to the announcement day to shield the estimates from possible effects related to the events and to avoid non-stationary in the estimates. Also, we require that a firm must have a minimum of 40 days of stock return data during the 200-day estimation period. To modify the cross-correlation and over-rejecting issues, we apply the adjusted Patell test to test the significance of the mean abnormal returns (Kolari and Pynnönen 2010). We also apply nonparametric test, Wilcoxon signed-rank test and Corrado rank test, to detect the median abnormal returns are significantly different from zero (Wilcoxon 1945; Corrado 1989). Also, the generalized rank test, which is one of the most powerful tests for both shorter and longer windows, is used to test cumulative abnormal returns (Kolari and Pynnönen 2011). For more details regarding the three-factor model and statistical tests, please refer to the Appendix 1 and 3.

4 Results

4.1 Market Reaction to Government Inconsistent Policies

Panel A and B of Table 3 presents the results of the stock market reaction to the government's crackdown on cryptocurrencies by using Fama-French three-factor model. As shown in Panel A, the daily median abnormal return on Day 0 is -0.89% and it's statistically significant at the 5% level when using the Wilcoxon signed-rank test. Meanwhile, the abnormal return on Day -2 is also significantly negative, suggesting that there may be information leakage prior to the crackdown event. Furthermore, the cumulative abnormal returns in Panel B exhibit consistent negativity and statistical significance across all windows subsequent to the event. For example, within the [0, 5] event window, the government's crackdown on cryptocurrencies leads to an average decrease of 1.63% in firm value, a significance observed in both parametric and non-parametric tests. And over two-thirds (64.71%) of sample firms experience significant negative abnormal returns. These results provide evidence that the government's crackdown on cryptocurrencies has a negative effect on blockchain-related firms' stock market performance.

We display the results of the government's supportive event in Panel C and D of Table 3. The daily mean (median) abnormal return of the supportive event on Day 0 is 5.42% (6.50%), which is statistically significant at the 1% level in both parametric and non-parametric tests. Almost 93% of blockchain-related firms experience positive abnormal returns on event day. In addition, the CARs after the event are positive and significant in the next several event windows. For instance, during the [0,1] event window, the blockchain-related firms experience an average abnormal return of 6.49% and 80.79% of sample firms obtain positive abnormal returns. These results indicate that the government's supportive event contributes to the increase of stock market value of blockchain-related firms.

Table 3 Market response to the crackdown event and the supportive event using the Fama-French three factor model.

	The Crackdown Event							The Supportive Event						
Trading day/Event window	N	Mean abnormal return	Adjusted Patell Z	Median abnormal return	Wilcoxon signed-rank test	Percentage more than zero	rank test	N	Mean abnormal return	Adjusted Patell Z	Median abnormal return	Wilcoxon signed-rank test	Percentage more than zero	rank test
	Panel A: Average Abnormal Return							Panel C: Average Abnormal Return						
-5	17	-0.0032	-0.4730	0.0063	-1.1598	0.7059	-1.0019	152	-0.0002	-0.0905	-0.0022	-0.5408	0.4539	-0.0515
-4	17	-0.0045	-1.0203	-0.0055	-1.8699*	0.4118	-1.2234	152	0.0055	1.0478	0.0010	1.5304	0.5329	0.7957
-3	17	0.0009	-0.1685	0.0020	-0.4971	0.6471	-0.2115	152	0.0061	1.1609	-0.0021	0.2667	0.4474	0.4334
-2	17	0.0130	1.8724*	-0.0093	1.8225*	0.2352	1.6790*	152	0.0046	0.8658	0.0036	1.8891*	0.6053	0.9002
-1	17	0.0056	1.4797	0.0020	0.3550	0.5882	0.6092	152	-0.0017	-0.2587	-0.0043	-3.0682***	0.3421	-0.6058
0	17	-0.0090	-1.2653	-0.0089	-2.0119**	0.2352	-1.7847*	151	0.0542	10.1594***	0.0650	10.4625***	0.9338	5.5174***
+1	17	0.0014	0.1829	0.0014	0.6864	0.5294	0.4179	151	0.0106	2.0345**	-0.0100	0.9066	0.4437	-0.3482
+2	17	-0.0103	-1.8177*	0.0067	-2.5326**	0.7647	-2.0843**	151	-0.0086	-1.6991*	-0.015	-3.2082***	0.3642	-1.6373
+3	17	-0.0017	-0.1777	-0.0025	0.2130	0.3529	0.1661	151	-0.0143	-2.4260**	-0.0115	-4.9117***	0.3377	-1.9643**
+4	17	-0.0051	-0.8884	-0.0054	-1.7278*	0.2941	-1.2209	151	-0.0007	0.1714	-0.0034	-1.5865	0.4238	-0.1993
+5	17	0.0083	1.3962	-0.0079	1.7278 *	0.2941	1.4374	151	-0.0016	-0.2287	-0.0050	-2.4614***	0.3841	-0.6375
	Panel B: Cumulative Abnormal Return							Panel D: Cumulative Abnormal Return						
[-5, -1]	17	0.0118	0.3063	0.0016	-0.3659	0.5294	-0.3219	152	0.0143	1.6379	0.0008	0.0894	0.5197	0.5938
[0, 1]	17	-0.0075	-1.1360	-0.0017	-1.2908	0.3529	-2.3966**	151	0.0649	11.5980***	0.0563	9.7331***	0.8079	5.6623***
[0,2]	17	-0.0178	-2.1855**	-0.0184	-2.7089***	0.2353	-2.8024***	151	0.0563	10.6170***	0.0337	6.7103***	0.7748	5.1014***
[0, 5]	17	-0.0163	-2.1016**	-0.0209	-2.0613**	0.3529	-2.1955**	151	0.0397	9.3874***	0.0254	1.9101*	0.6424	4.7779***
[0, 10]	17	-0.294	-2.8201***	-0.0390	-2.8280***	0.2353	-1.8669*	152	0.0400	9.3789***	0.0217	0.1569	0.5855	4.6446***
[0, 15]	17	-0.0336	-2.6868***	-0.0364	-2.6099***	0.4118	-1.8373*	152	0.0313	9.0180***	0.0063	-1.6502*	0.5395	4.5202***
[0, 20]	17	-0.0078	-1.7247*	-0.0089	-1.1865	0.4706	-1.1232	152	0.0001	7.6501***	-0.0131	-5.4652***	0.4539	4.0295***

Notes. Panel A&C presents the daily abnormal returns for several event days and Panel B&D presents the cumulative abnormal returns for multiple event windows. We use the Fama-French three factor model to estimate the abnormal return. $^{*}p < 0.1$; $^{**}p<0.05$ $^{***}p < 0.01$. Two-tailed tests.

Table 4 Comparative analysis of the two events.

Trading day	The crackdown event N	Mean abnormal return	The supportive event Full sample N	Mean abnormal return	The fully impact of the two events. (5) + (3)	The supportive event Sub-sample N	Mean abnormal return	The fully impact of the two events for sub-sample. (8) + (3)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
[-5, -1]	17	0.0118	152	0.0143	0.0261	17	0.0351*	0.0469**
[0, 1]	17	-0.0075**	152	0.0649***	0.0574***	17	0.0673***	0.0598**
[0,2]	17	-0.0178***	152	0.0563***	0.0385**	17	0.0666**	0.0488**
[0, 5]	17	-0.0163**	152	0.0397***	0.0234	17	0.0404**	0.0241
[0, 10]	17	-0.0294*	152	0.0400***	0.0106	17	0.0441**	0.0147
[0, 15]	17	-0.0336*	152	0.0313***	-0.0023	17	0.0422**	0.0086
[0, 20]	17	-0.0078	152	0.0001***	-0.0077	17	0.0016*	-0.0062

Notes. This table presents comparative analysis of two events using the Fama-French three factor model, accompanied by the application of the generalized rank test to assess their significance. Column (2) and (3) show the results of the crackdown event. Column (4) and (5) show the results of the supportive event. Column (6) displays the sum of the impacts from both events. Column (7) and (8) show the mean abnormal return for the supportive event of the same 17 firms list in the crackdown event. Column (9) shows the sum of the impacts of the two events for the same 17 firms. We apply one-tailed t-tests to explore whether the collective impact of the two events is lagger than 0. $^{*}p < 0.1$; $^{**}p<0.05$ $^{***}p < 0.01$.

We conduct a comparative analysis of the effects of these two events to ascertain whether the positive impact of the government's supportive event can offset the negative implications stemming from the nationwide crackdown on cryptocurrencies. The results are shown in Table 4. For ease of reading, we present the cumulative returns of the two events in Column (3) to Column (5). Subsequently, we compute the sum of the cumulative abnormal returns from the two events and conduct a t-test to determine if the combined effect is significantly greater than zero, as shown in Column (6). The result presents that the combined impact of the two events is 5.74% and significantly greater than 0 within the [0, 1] event window. To control the firm-level factors, we use the same 17 firms in the crackdown event as our sample to detect the mean abnormal return they experienced in our second event. The results are shown in column (7) and column (8). Further analysis shows that those 17 firms also obtain positive abnormal returns in the supportive event. In Column (9), the combined impact of the two events for the same 17 firms is presented. This indicates that former consequence still holds that the positive effect of the government's supportive attitude towards blockchain technology can offset its negative side due to the national crackdown on cryptocurrencies. These findings contradict Hypothesis 1, predicting that the government's inconsistent policies towards blockchain ultimately have a positive effect on the stock market performance of blockchain-related firms.

4.2 Blockchain Mania Manifested by Investors' Irrationality

We analyze the abnormal trading volume of blockchain-related stocks to investigate whether the Chinese government's supportive event for blockchain leads to irrational investor behavior, characterized by an increased pursuit of blockchain-related stocks during the event. Trading volume, which represents the proportion of shares traded relative to the total number of shares outstanding, serves as an indicator of changes in individual investor expectations and reflects unique trader reactions (Bharandev and Rao 2021; Kim and Verrecchia 1991). Given the typically skewed distribution of daily trading volume for individual securities, we employ natural logarithm transformations to ensure well-specified statistical tests (Ajinkya and Jain 1989). To measure the abnormal trading volume of blockchain-related firms, we utilize the market model approach, and we also consider firm-specific mean-adjusted trading volume for robustness verification. Due to the non-normal distribution of trading volume, non-parametric test statistics exhibit higher statistical power than parametric counterparts. Hence, we apply the Corrado rank test to assess the statistical significance of daily abnormal trading volume. Further details can be found in Appendix 2.

The results are shown in Table 5. The abnormal trading volume on Day 0 is positive but insignificant, which means that the investors have not yet reacted to the government's supportive event. However, in the next 11 days, the abnormal trading volumes are positive and significant. In summary, these results provide evidence for Hypothesis 2, indicating that the government's supportive attitude towards blockchain technology will prompt investors to pay more attention to blockchain-related stocks and ultimately improve the trading volume of firms.

4.3 Blockchain Mania manifested by Firms' Speculation

We delve into the phenomenon of blockchain mania from the perspective of firms. This trend is primarily characterized by certain listed firms engaging in speculative actions by intentionally disclosing their involvement in blockchain technology through the dissemination of somewhat vague blockchain-related messages. As previously mentioned, we have taken a segmented approach by calculating the abnormal returns for two distinct subgroups: speculative firms and non-speculative firms. Our aim is to quantify and analyze the discrepancies in their market reactions within the same event windows.

Table 5 Abnormal trading volume of the supportive event.

Trading day	Mean abnormal trading volume %	Corrado rank test	Trading day	Mean abnormal trading volume %	Corrado rank test
-5	0.3194	0.9943	+8	0.7070	2.2769**
-4	0.3809	1.2312	+9	0.7077	2.5175**
-3	0.3643	1.0225	+10	0.9629	2.2177**
-2	0.4336	1.1991	+11	0.5800	1.8636*
-1	0.3920	1.3030	+12	0.5484	1.6060
0	0.4073	1.6095	+13	0.5091	1.4956
+1	0.9630	3.2608***	+14	0.4996	1.5968
+2	1.0223	3.2438***	+15	0.4638	1.3754
+3	0.8746	2.7828***	+16	0.5229	1.9159*
+4	0.7522	2.5052**	+17	0.4999	1.7399*
+5	0.7634	2.5918***	+18	0.4022	1.2126
+6	0.6649	2.3878**	+19	0.3979	1.3730
+7	0.6210	2.1443**	+20	0.3008	0.9231

Notes. This table presents the daily abnormal trading volume around the day when the government's supportive event occurred. We employ the market model to compute abnormal trading volume and utilize the non-parametric Corrado rank test as the test statistic. $^{*}p < 0.1$; $^{**}p<0.05$ $^{***}p < 0.01$ Two-tailed tests.

Table 6 shows that cumulative abnormal returns are positive but insignificant for both speculative and non-speculative firms for the five trading days prior to the supportive event. While CAR [0,1] for both speculative firms and non-speculative firms are positive and significant at the 0.1% level (4.95%

and 7.02%, respectively). Moreover, the cumulative abnormal returns of non-speculative firms outperform speculative firms in all event windows. After ten trading days of the supportive event, the difference of cumulative abnormal returns between the two types of firms starts to become larger. Especially in the time period [0, 20], the abnormal returns of speculative firms become significantly negative (CAR [0, 20] =-1.19%, p<0.01), while non-speculative firms remain positive and significant (CAR [0, 20] =0.43%, p<0.001). To discern the disparity between speculative and non-speculative firms, we employ t-tests to ascertain whether the differences between the two sub-samples in various event windows significantly deviate from zero. The outcomes reveal that non-speculative firms exhibit notably higher abnormal returns than speculative firms within event windows [0, 10] and [0, 15].

To delve deeper into this distinction, we utilize cumulative abnormal returns as the dependent

Table 6 Cumulative abnormal return of Speculative and non-speculative firms.

		Fama-French Three Factor Model--Cumulative Abnormal Returns (%)						
		[-5, -1]	[0, 1]	[0, 2]	[0, 5]	[0, 10]	[0, 15]	[0, 20]
Total firm	152	0.0143	0.0649***	0.0563***	0.0397***	0.0400***	0.0313***	0.0001**
Non-Speculative	113	0.0122	0.0702***	0.0574***	0.0405***	0.0467***	0.0388***	0.0043***
Speculative firm	39	0.0203	0.0495***	0.0532***	0.0375***	0.0205***	0.0096***	-0.0119**
Difference		-0.0081	0.0207	0.0042	0.003	0.0262*	0.0292*	0.0162

Notes. This table presents the cumulative abnormal return of speculative firms and non-speculative firms. We apply the generalized rank test to test the significance of CARs. Difference is equal to the CARs of non-speculative firm minus the CARs of speculative firms. We also apply t-test to detect whether the difference between two sub-samples is significantly different from 0. *p < 0.1; **p<0.05 ***p < 0.01. Two-tailed tests.

Table 7 Regression results for speculative firms and non-speculative firms using the Fama-French three factor model.

	Fama-French Three Factor Model				
	CAR [-5,-1] (1)	CAR [0,1] (2)	CAR [0,10] (3)	CAR [0,15] (4)	CAR [0,20] (5)
Speculative	0.0033	-0.0349**	-0.0357*	-0.0391*	-0.0201
	(0.0122)	(0.0107)	(0.0163)	(0.0181)	(0.0190)
Size	-0.0057	-0.0067	-0.0131	-0.0019	0.0022
	(0.0076)	(0.0067)	(0.0105)	(0.0116)	(0.0123)
Gross Margin	-0.0143	-0.0112	-0.1355*	-0.1275*	-0.0746
	(0.0342)	(0.0318)	(0.0535)	(0.0554)	(0.0496)
Market To Book Ratio	-0.0089	-0.0118	0.0009	0.0092	0.0048
	(0.0062)	(0.0071)	(0.0107)	(0.0110)	(0.0129)
DAR	-0.0210	-0.0383	-0.0200	-0.0414	-0.0607
	(0.0316)	(0.0384)	(0.0693)	(0.0737)	(0.0683)
Research Intensity	0.0265	-0.0537	0.0367	0.0571	-0.0606
	(0.0853)	(0.1025)	(0.1284)	(0.1330)	(0.1443)
Analyst attention	0.0001	-0.0014**	-0.0010	-0.0013	-0.0003
	(0.0006)	(0.0005)	(0.0007)	(0.0009)	(0.0010)
ROA	-0.1391*	-0.0945	0.0140	-0.0170	-0.1353
	(0.0697)	(0.0560)	(0.0798)	(0.0825)	(0.0703)
Institutional Holder Share	-0.0001	-0.0001	0.0003	0.0002	0.0006
	(0.0002)	(0.0002)	(0.0004)	(0.0004)	(0.0004)
Industry	Yes	Yes	Yes	Yes	Yes
constant	0.1716	0.2923	0.3814	0.1288	0.0010
	(0.1790)	(0.1567)	(0.2355)	(0.2612)	(0.2795)
N	141	140	141	141	140
R^2	0.1286	0.2129	0.1151	0.0932	0.0928

Note. This table presents the cross-section regression results for cumulative abnormal returns for speculative firms and non-speculative firms. The dependent variables are the cumulative abnormal returns in several event windows. *p < 0.1; **p<0.05 ***p < 0.01. Two-tailed tests.

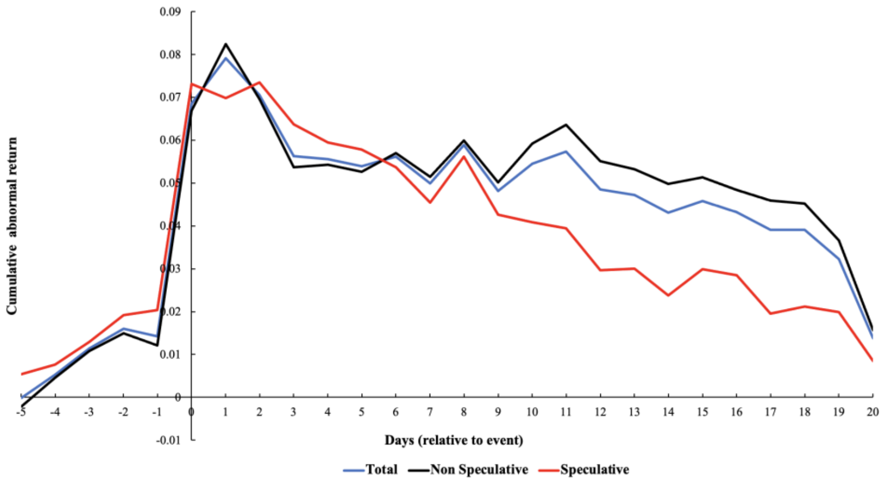

Fig. 2. Cumulative Abnormal Returns of Speculative Firms and Non-speculative Firms in the supportive event.

variable and incorporate a dummy variable *Speculative* in an OLS regression. The results are presented in Table 7. Following the control of other firm-level factors, the coefficients of *Speculative* display negative and statistically significant values in the initial 15 trading days post-event. This observation indicates that non-speculative firms do yield more abnormal returns than speculative firms, further substantiating our support for the Hypothesis 3.

To present our findings clearly, we have generated a graphical representation in Figure 2 illustrating the Cumulative Abnormal Returns (CARs) of both sub-samples. Notably, the graph reveals an intriguing phenomenon: a bifurcation in the gap between these two lines occurs around Day 10. In the initial stage [0,9], the gap between the lines is minimal, indicating similar investor behavior towards both speculative and non-speculative firms. Essentially, there is general enthusiasm for stocks related to blockchain, and the speculative behavior of listed firms in the stock market remains inconspicuous. However, in the subsequent stage [10, 20], the line representing non-speculative firms notably surpasses that of speculative firms. This development might be attributed to the '2019 Trusted Blockchain Summit' hosted by the China Academy of Information and Communications Technology (CAICT) on Day 10. During the summit, an authoritative evaluation tool was introduced to assess blockchain products, along with the release of a list of blockchain-related firms that passed the evaluation. Among the 36 tested blockchain products, only 20 received passing grades. The widening gap in the CARs indicates that the market became cognizant of listed firms' speculative behavior in the stock market after the summit.

In conclusion, our findings suggest the presence of a blockchain mania instigated by the speculative actions of listed firms. However, it becomes evident that the stock market recognizes this bubble only after external factors draw attention to it. This realization occurs when third-party entities, like the CAICT's summit, spotlight the existence of such speculative behavior. As a result, non-speculative firms, equipped with more substantial resources and meaningful initiatives, ultimately experience superior stock market performance compared to their speculative counterparts.

4.4 Robustness check

To gauge the robustness of our findings concerning specific design choices, we perform a series of robustness checks regarding endogeneity test, virtual event time points, and alternative expected return models.

First, a firm's choice to initiate or engage in a blockchain initiative follows a non-random self-selection process, potentially introducing endogeneity bias to our results. We construct a matched sample using Propensity Score Matching (PSM) approach and contrast the abnormal returns of the original sample firms with those of the matched firms during both political events. The matched firms are selected to closely align with our original sample firms based on specific characteristics, while not having announced any involvement in blockchain initiatives. Following the methodology delineated by Boyd et al. (2019) and Klöckner et al. (2022), the core principle of PSM involves gauging the proximity between our sample firms and potential matches through propensity scores. These scores reflect the likelihood of a firm belonging to our sample firm group, considering a specific set of observable firm factors. To compute propensity scores, we consider six variables, namely, firm size, firm growth, market-to-book ratio, debt-to-asset ratio, R&D intensity and ROA to undertake estimations through cross-sectional binary response regression models. Next, we predict propensity scores and apply nearest neighbor matching with replacement to identify the five closest matches for each sample observation within the same industry (Klöckner et al. 2022). Subsequently, we compute abnormal returns for the matched firms using the Fama-french three factor model.

Table A1 and A2 in Appendix present event study outcomes for both the sample firms and matched firms during the crackdown event and the supportive event, respectively. On the Day 0 of the crackdown event, no noteworthy stock market reaction is observed (Panel C and Panel D in Table A1). Then, we compute the disparity in abnormal returns between our original sample firms and matched firms, followed by the application of a t-test to detect whether the distinction between the two samples is significantly different from 0. The results show that, for the majority of the sample firms, cumulative abnormal returns are significantly lower compared to those of the matched firms, indicating that the crackdown event do have a negative impact on blockchain-related firms' stock market performance.

Turning to the supportive event, results in Table A2 shows that the matched firms also experience a positive and significant daily abnormal return on the Day 0. We again compare the difference of market reactions between two samples in supportive event and find that the cumulative abnormal returns of our original sample during the supportive event are observed to be roughly tenfold higher than those of the matched sample, revealing a significant disparity. These findings underscore that while the blockchain supportive event has a positive impact on both blockchain-related firms and non-blockchain-related firms, the former experience greater benefits in the stock market.

Second, to mitigate the influence stemming from the choice of event dates, inspired by Athey and Imbens (2017), we establish virtual event occurrence times for both the crackdown event and supportive event to conduct another placebo test. We calculate the sample's abnormal returns at these virtual time points separately. Furthermore, we examine the performance disparities between speculative and non-speculative firms at virtual time points during the supportive event. We designate virtual time points three months before the onset of each of the two events. For example, the supportive event occurred on October 24, 2019, then the corresponding virtual time point is set as July 24, 2019. Table A3 in Appendix presents the abnormal returns for virtual event day of two events. We do not see a significant stock market reaction on the announcement day (Day 0) for the both virtual event time points. Then, we calculate the abnormal returns for speculative and non-speculative firms during virtual event day of the supportive event in Table A4. We also apply t-test to detect whether the distinction between two samples is significantly different from 0 and the results show that there is no significant difference in the distribution of the two samples at the virtual supportive event point.

Third, our initial selection of the Fama-French three-factor model to estimate expected returns could potentially influence the outcomes of the event study. To address this, we apply traditional market model to compute abnormal returns and subsequently reassess the abnormal returns for both events. Moreover, we utilize firm-specific mean-adjusted trading volume to identify abnormal trading volume during the supportive event. Our findings remain consistent and resilient when subjected to alternative expected return models, as presented in Appendix Table A5 to A8.

5 Additional Analyses

We next explore whether various other blockchain-related factors have an impact on the stock market reaction to the government's supportive event. Our examination is centered on four key aspects, namely, technology alliances, official endorsement, development duration as well as the introduction of blockchain-related products. We employ cross-sectional regression models to examine the issues. Our analysis encompasses nine control variables described below.

We control for firm size, which is measured as the natural logarithm of total assets (*Size*). Market-to-book ratio (*MTB*), presenting the growth prospects of the firm, measures as the ratio of the market value to the book value of equity. Debt-to-asset ratio (*DAR*), presenting the liabilities of the firm, is calculated as the ratio of the book value of debt to the total assets. We also include Gross margin and ROA to control firms' profitability. Firms' innovation relates to firms' internal and external control (Hitt et al. 1996; Hill et al. 1988). Thus, we apply research intensity (R&D), analyst attention (Analyst) and institutional holder share (Institutional) as our control variables. All continuous variables are computed using data from the most recent fiscal year before the speech delivered, that is, 2018. In order to mitigate the potential influence of industry-related factors on the results, we categorize the industries into three distinct groups: manufacturing, internet and telecommunications, and other industries. Specifically, we use the following regression model:

$$CAR_i = \beta_0 + \alpha X_i + \beta Controls_i + \varepsilon_i \qquad (1)$$

Where CAR_i is the cumulative abnormal stock return within different event windows for firm i. $\boldsymbol{X_i}$ denote the firms' four blockchain project related features. We opted to incorporate these four variables individually into the regression model rather than combining them due to their theoretical covariation. *Controls* denote the control variables we specified above, and ε_i is the error term. All regression results are reported after symmetrically trimming the variables at the 1% level in each tail. The VIFs for all regression models are less than 2, indicating that collinearity is not an issue in our data. The White test shows the p-values for all models are higher than 0.1, suggesting that heteroscedasticity does not exist. Thus, we apply the ordinary least square to analyze the models.

5.1 Technology alliances

In practice, numerous firms endeavor to establish technology alliances with universities, technical companies, supply chain partners, or even competitors through diverse avenues, including joint ventures, mergers and acquisitions, and collaborative technical development, as part of their efforts to develop blockchain technology (Kuo and Shyu 2021). Technology alliances involve firms' R&D efforts and aim to share knowledge and resources across organizations (Lin and Ho 2021). Within the realm of blockchain technology, these alliances offer notable advantages, including the establishment of both horizontal and vertical partnerships, along with fostering collaboration across diverse industries (Babu and Weber 2019; Zhang et al. 2020). Therefore, we infer that firms adopting a technology alliance strategy when developing blockchain technology are likely to attain higher abnormal returns when the government's supportive event occurs.

We create a dummy variable, denoted as Tech_alliance, which is equal to 1 if a firm has formed technology alliances with other entities, and 0 otherwise. Among our sample firms, 92 have established technology alliances with other entities. The regression results reported in Table 8 show that across most models, the coefficients of technology alliance are positive and significantly different from zero. Within the [0, 1] event window, firms that have established technology alliances with other entities witness a 2.4% higher abnormal return compared to firms engaged in independent blockchain development. Consequently, our findings provide evidence that firms implementing technology alliance strategies tend to achieve higher abnormal returns during the government's supportive event compared to firms pursuing independent blockchain development.

Table 8 Cross-sectional regression results for technology alliance and product variables.

	(1) CAR[0,1]	(2) CAR[0,10]	(3) CAR[0,15]	(4) CAR[0,20]	(5) CAR[0,1]	(6) CAR[0,10]	(7) CAR[0,15]	(8) CAR[0,20]
Size	-0.0067	-0.0133	-0.0034	-0.0001	-0.0092	-0.0160	-0.0026	0.0012
	(0.0067)	(0.0104)	(0.0118)	(0.0123)	(0.0076)	(0.0106)	(0.0123)	(0.0129)
Gross Margin	-0.0149	-0.1393*	-0.1319*	-0.0774	-0.0188	-0.1434**	-0.1339*	-0.0786
	(0.0342)	(0.0534)	(0.0552)	(0.0503)	(0.0331)	(0.0522)	(0.0553)	(0.0501)
MTB	-0.0111	0.0016	0.0092	0.0039	-0.0112	0.0014	0.0104	0.0052
	(0.0066)	(0.0108)	(0.0113)	(0.0132)	(0.0068)	(0.0101)	(0.0108)	(0.0128)
DAR	-0.0314	-0.0122	-0.0275	-0.0467	-0.0317	-0.0130	-0.0381	-0.0578
	(0.0381)	(0.0686)	(0.0707)	(0.0675)	(0.0391)	(0.0683)	(0.0733)	(0.0682)
R&D	-0.0414	0.0510	0.0890	-0.0235	-0.0505	0.0412	0.0524	-0.0604
	(0.1000)	(0.1284)	(0.1374)	(0.1406)	(0.0968)	(0.1230)	(0.1323)	(0.1476)
Analyst	-0.0014**	-0.0010	-0.0014	-0.0003	-0.0012*	-0.0008	-0.0012	-0.0002
	(0.0005)	(0.0008)	(0.0010)	(0.0011)	(0.0006)	(0.0007)	(0.0009)	(0.0010)
ROA	-0.0973	0.0104	-0.0288	-0.1510*	-0.0906	0.0173	-0.0097	-0.1326
	(0.0511)	(0.0774)	(0.0796)	(0.0695)	(0.0509)	(0.0762)	(0.0791)	(0.0694)
Institutional	-0.0001	0.0003	0.0003	0.0006	-0.0001	0.0003	0.0002	0.0006
	(0.0002)	(0.0004)	(0.0004)	(0.0004)	(0.0002)	(0.0004)	(0.0004)	(0.0004)
Tech_alliances	0.0246*	0.0267	0.0439*	0.0405*				
	(0.0104)	(0.0178)	(0.0184)	(0.0185)				
Product					0.0243*	0.0265	0.0162	0.0117
					(0.0120)	(0.0180)	(0.0200)	(0.0197)
Industry	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.2643	0.3547	0.1171	0.0149	0.3287	0.4246	0.1268	0.0129
	(0.1571)	(0.2344)	(0.2661)	(0.2796)	(0.1751)	(0.2396)	(0.2751)	(0.2911)
N	140	141	141	140	140	141	141	140
R^2	0.1933	0.1078	0.1059	0.1188	0.1929	0.1079	0.0740	0.0889

Note. This table presents the results of cross-sectional regression. #p<0.1; *p < 0.05; **p<0.01 ***p < 0.001. Two-tailed tests.

Table 9 Cross-sectional regression results for official endorsement and duration variables.

	(1) CAR[0,1]	(2) CAR[0,10]	(3) CAR[0,15]	(4) CAR[0,20]	(5) CAR[0,1]	(6) CAR[0,10]	(7) CAR[0,15]	(8) CAR[0,20]
Size	-0.0081	-0.0143	-0.0021	0.0017	-0.0065	-0.0143	-0.0025	0.0044
	(0.0071)	(0.0107)	(0.0119)	(0.0125)	(0.0071)	(0.0105)	(0.0121)	(0.0126)
Gross Margin	-0.0253	-0.1486**	-0.1387*	-0.0810	-0.0164	-0.1479**	-0.1397*	-0.0872
	(0.0320)	(0.0541)	(0.0557)	(0.0498)	(0.0342)	(0.0524)	(0.0543)	(0.0493)
MTB	-0.0112	0.0014	0.0102	0.0052	-0.0115	0.0033	0.0122	0.0092
	(0.0059)	(0.0105)	(0.0110)	(0.0131)	(0.0068)	(0.0117)	(0.0122)	(0.0139)
DAR	-0.0417	-0.0263	-0.0469	-0.0640	-0.0389	-0.0286	-0.0550	-0.0675

	(0.0378)	(0.0690)	(0.0742)	(0.0680)	(0.0399)	(0.0701)	(0.0741)	(0.0679)
R&D	-0.0978	-0.0070	0.0184	-0.0833	-0.0829	0.0038	0.0210	-0.0523
	(0.0850)	(0.1247)	(0.1304)	(0.1467)	(0.0984)	(0.1187)	(0.1188)	(0.1394)
Analyst	-0.0012*	-0.0007	-0.0011	-0.0001	-0.0013*	-0.0009	-0.0012	-0.0005
	(0.0005)	(0.0007)	(0.0009)	(0.0010)	(0.0005)	(0.0008)	(0.0009)	(0.0010)
ROA	-0.0738	0.0325	0.0008	-0.1259	-0.0832	0.0269	-0.0043	-0.1226
	(0.0518)	(0.0822)	(0.0829)	(0.0721)	(0.0547)	(0.0795)	(0.0825)	(0.0701)
Institutional	-0.0001	0.0003	0.0002	0.0006	-0.0000	0.0004	0.0003	0.0006
	(0.0002)	(0.0004)	(0.0004)	(0.0004)	(0.0003)	(0.0004)	(0.0005)	(0.0004)
Official Endorsement	0.0587**	0.0578*	0.0446#	0.0270				
	(0.0196)	(0.0280)	(0.0242)	(0.0234)				
Duration					0.0108	0.0040	0.0006	-0.0145
					(0.0079)	(0.0132)	(0.0149)	(0.0132)
Industry	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
constant	0.3102	0.3942	0.1198	0.0032	0.2697	0.3924	0.1324	-0.0439
	(0.1622)	(0.2401)	(0.2664)	(0.2840)	(0.1645)	(0.2365)	(0.2699)	(0.2858)
N	140	141	141	140	137	138	138	137
R^2	0.2421	0.1280	0.0879	0.0934	0.1794	0.1111	0.0822	0.1006

Note. This table presents the results of cross-sectional regression. #p<0.1; *p < 0.05; **p<0.01 ***p < 0.001. Two-tailed tests.

5.2 The Launch of Blockchain-related Products

Although the development of blockchain technology is still in its infancy, some firms have already clarified that they have launched blockchain-related products or services. After collecting this information, we discovered that 74 firms have introduced blockchain-related products or services, such as Bass platforms, blockchain-related patents, and projects. The launch of such blockchain-related products can signify the firm's prominent position in this field.

To test whether the existence of products or service has an impact on the stock market reaction of the government's supportive event, we create an indicator variable, *Product,* which takes a value of 1 if the firm has developed specific blockchain-related products or services, and 0 otherwise. As shown in Model 3, the coefficients linked to product display positivity only when the cumulative abnormal return falls within the [0, 1] event window. This suggests that the presence of a blockchain-related product exerts a brief impact on stock market reactions.

5.3 Official Endorsement

On January 10, 2019, the Cyberspace Administration of China (CAC) issued the Regulations on the Management of Blockchain Information Services. These regulations stipulate that blockchain information service providers must submit filling information within 10 working days of commencing services. The CAC subsequently reviews the submissions and publishes a list of approved providers. A government-certified blockchain project holds greater credibility due to official endorsement. Consequently, we examine whether the stock market reaction of the sample firms is influenced by whether their blockchain projects received certification from the CAC.

We create a variable, *Official Endorsement,* that takes a value of 1 if the firm's blockchain project is certified, and 0 otherwise. If the certification makes a difference, we expect a positive sign of *Official*

Endorsement. The results are shown in Table 9. Across the majority of models, the coefficients associated with *Official Endorsement* are positive and exhibit statistical significance. This outcome indicates that the market displays a more favorable reaction towards firms that have received official certification.

5.4 Development Duration

We additionally gather information regarding the year when firms initially made their public announcements about entering the blockchain domain. More than 50% (83) of the firms declared their involvement in blockchain in 2018, while 48 firms released blockchain-related information in 2019. Only 4 firms initially disclosed their involvement in blockchain technology as early as 2016. We examine whether the stock market reaction to the government's supportive event varies with the duration of a firm's involvement in blockchain technology.

We introduce an indicator variable labeled as *Duration*, which calculates the time span between the firm's initial announcement day of its involvement in blockchain activities and the day of the supportive event. As depicted in Table 9, the coefficients of *Duration* are statistically insignificant, suggesting that the firm's duration of blockchain technology development is irrelevant to its stock market performance upon the emergence of the supportive event. One plausible explanation is that the applications of blockchain technology are still in its early stages, and early birds in this area do not necessarily establish their competitive advantage in the market.

6 Discussion and implications

Blockchain mania has been observed in stock markets of crypto-friendly countries due to the sharp rise of prices of cryptocurrencies like Bitcoins. However, China initially cracks down on cryptocurrencies, the largest application so far, while later encourages the advancement of blockchain technology in various domains such as supply chain management. The inconsistency in government policies provides us a quasi-experimental setting to investigate the blockchain mania within a context where cryptocurrencies are restricted and to delve into its underlying motivators. Interestingly, we find that the positive impact of the government's supportive event can fully counteract the negative impact taken by the early crackdown on cryptocurrencies. This implies that Chinese investors in general are very optimistic about the future development of blockchain technology.

We investigate the blockchain mania in China stock market from the interactions between government inconsistent policies and the reactions of investors as well as firms. The crackdown on cryptocurrencies and its following-up policies have attracted more attention from individual investors. In anticipation of the government's overreactions to cryptocurrencies, "smart" firms may release information regarding their involvement in blockchain-related activities. To identify the speculative behaviors of those "smart" firms, we categorize firms into Non-Speculative and Speculative respectively, by cross-checking their tracking records on blockchain related activities. Upon the occurrence of the supportive event, our results show that both non-speculative firms and speculative firms are associated with a significant increase in their stock market value. However, Non-Speculative firms experience a stronger and long-standing positive reaction compared with Speculative firms. The irrational behavior regarding Speculative firms lasts until a definitive warning is given by a third-party authority. Moreover, we find that the market reaction to this partial government support is stronger among those firms having established technology alliances with other entities, or being officially endorsed by the Cyberspace Administration of China.

Our analysis possesses certain limitations that warrant acknowledgment. Firstly, we only use two signature events to represent the inconsistent policies of the Chinese government on blockchain. Given the ongoing evolution of regulations in the blockchain domain, future research could expand its scope to encompass a broader array of blockchain-related policies, thereby yielding a more comprehensive understanding. Additionally, our examination involves investigating market reactions across diverse sub-samples. While we distinguish speculative and non-speculative firms using a multi-faceted approach, the criteria employed are inherently subjective. Leveraging more sophisticated analysis techniques, such as text mining, could enhance the precision of these categorizations. Furthermore, our analysis primarily centers on the immediate impacts of governmental policies on stock market dynamics. Exploring the long-term ramifications, including operational performance shifts such as supply chain transparency and resilience, could provide an enriched perspective on the enduring implications of these policies.

Our empirical results allow us to derive a set of economic implications. First, when policymakers adopt inconsistent policy attitudes toward different applications of the same technology, it becomes essential to examine not only the rationale behind such differentiated stances at a macro level but also the potential micro-level repercussions that may ensue. Especially when introducing favorable policies, vigilance is required regarding potential speculative behavior among listed companies and irrational investor conduct that could manifest in the market. Second, our finding suggest that firms should be wary of speculative behavior that uses the blockchain concept for speculation in order to obtain excess returns. Even for those genuinely seeking technological innovation through blockchain adoption, they should release comprehensive and explicit information to differentiate themselves from speculative counterparts. For instance, we recommend practitioners to enhance communication with investors and proactively provide detailed and specific information about blockchain-related research and practical applications. Third, we encourage investors to gather extensive information to accurately assess the true value of investments when making investment decisions. This approach can help prevent losses stemming from irrational behavior driven by the pursuit of market trends.

Notes

i We obtain News information from the Wind database, see in https://www.wind.com.cn/Default.html

ii The data was counted until December 1, 2021.

iii The keywords in Chinese are "区块链""比特币""数字资产""虚拟货币".

iv We obtain financial and stock price data from China Stock Market & Accounting Research Database, https://www.gtarsc.com/

Appendix

A.1 Specification of the Fama-French three-factor model for calculating abnormal returns.

Event study methodology involves determining how to measure abnormal returns. abnormal returns refer to the difference between the actual return and the expected return. While actual returns can be directly observed from the stock market, calculating abnormal returns requires the application of various models. Available models encompass the market model, market model, Fama-French three-factor model, and four-factor model. In this study, we employ the Fama-French three-factor model to assess abnormal returns. Moreover, to ensure the robustness of our results, we also conduct robustness tests using market model. The Fama-French three-factor model can be represented as follows:

$$R_{it}=\alpha_i+R_{ft}+\beta_{1i}(R_{mt}-R_{ft})+\beta_{2i}SMB_t+\beta_{3i}HML_t+\varepsilon_{it}$$

Where R_{it} represents the return of stock i at time t; α_i signifies the intercept; R_{ft} denotes the risk-free rate at time t; R_{mt} stands for the market return at time t; $(R_{mt}-R_{ft})$ signifies the market risk premium; SMB_t represents the simulated portfolio return of the size factor (Small minus Big) at time t; HML_t indicates the simulated portfolio return of the book-to-market factor (High minus Low) at time t; and ε_{it} is the error term. Employing the least squares method in conjunction with stock market data from the estimation period, the coefficients α_i, β_{1i}, β_{2i}, and β_{3i} are estimated for each stock i. Ultimately, the excess return for stock i is calculated as the difference between actual and expected market returns, as expressed in the following formula:

$$\mathrm{AR}_{it}=\mathrm{R}_{it}-(\widehat{\alpha}_i+\hat{\beta}_i(\mathrm{R}_{mt}-R_{ft})+\hat{\gamma}_i SMB_{it}+\hat{\delta}_i HML_{it})$$

A.2 Specification of market model for calculating abnormal trading volume

Just as the measurements of abnormal returns, empiricists have used a number of specifications of abnormal trading volume, including median- or mean-adjusted abnormal trading volume, market model abnormal trading volume and EGLS market model abnormal trading volume (Campbell and Wasley, 1996; Bamber et al. 2010). Bamber et al. (2010) put forward that the power arising from complex models of expected trading volume is rather limited. Thus, we apply market model to measure blockchain-related firms abnormal trading volume and use firm-specific mean-adjusted trading volume as robustness check. The specification of market model is as follows:

$$v_{it}=V_{it}-(\alpha_i+\beta_i V_{mt})$$

Where v_{it} means daily abnormal trading volume, V_{it} presents natural log transformation of daily trading volume for firm i. α_i and β_i are coefficients obtained via ordinary least squares (OLS) estimation. V_{mt} represents the market volume measure for a given day t, which is obtained through a natural logarithm transformation. And the specification is as follow:

$$V_{mt} = \ln\left(\frac{1}{N}\sum_{n=1}^{N} V_{nt}\right)$$

where N is the number of securities in the market index. V_{nt} is the percentage of shares traded in the market relative to the number of total shares outstanding.

A.3 Event Study Test Statistics

Applied researchers typically carry out both parametric and nonparametric tests to verify that the research findings are not driven by non-normal returns or outliers, which tend to affect the results of parametric tests but not the results of nonparametric tests. Parametric tests (at least in the field of event studies) assume that the individual firm's abnormal returns are normally distributed, whereas nonparametric tests do not rely on any such assumption.

A.3.1 The adjusted Patell test

When there is event-date clustering, even a relatively low cross-correlation among abnormal returns can lead to significant over-rejection of the null hypothesis of zero average abnormal returns. Thus, we apply the adjusted Patell test, which robust against the way in which ARs are distributed across the cumulated event window, to solve the cross-correlation problem (Kolari and Pynnönen 2010). The adjusted Patell test statistic for day t is given by:

$$z = \frac{ASAR_o}{S_{ASZR}}$$

The underlying idea is to standardize each $AR_{i,t}$ by the so-called forecast-error-corrected standard deviation before calculating the test statistic.

$$z_{adj} = z * \sqrt{\frac{1-r}{1+(N-1)r}}$$

Where r denotes the average of the (pairwise) sample cross-correlations of the estimation-period abnormal returns.

A.3.2 Wilcoxon signed-rank test

The Wilcoxon test is a nonparametric test based on the ranks of the $AR_{i,0}$ across i. The distribution of the test statistic under the null hypothesis, which serves as the foundation for calculating the p-value, is unconventional. For detailed insights, we recommend referring to the original work by Wilcoxon (1945) or relevant textbooks. The Wilcoxon signed rank test assesses if the median abnormal stock returns significantly deviate from zero. This evaluation is grounded in the ranking distribution of abnormal returns on day t.

A3.3 The Corrado rank test

The Corrado test considers the stock-specific rank distribution in the respective estimation period. For detailed insights, we recommend referring to the original work by Corrado (1982).

A.3.4 The generalized rank test

The Generalized Rank (GRANK) test is applicable to both single-day and cumulative abnormal returns (CARs). This procedure surpasses previous rank tests for CARs and remains resilient against issues like abnormal return serial correlation and volatility caused by events. Notably, the GRANK procedure demonstrates higher empirical power compared to widely used parametric tests. For detailed insights, we recommend referring to the original work by Kolari and Pynnönen (2011).

A.3 Robustness checks

A 3.1 Sample selection--Propensity Score Matching.

We construct a matched sample using Propensity Score Matching (PSM) approach and contrast the abnormal returns of the original sample firms with those of the matched firms during both political events. The matched firms are selected to closely align with our original sample firms based on specific characteristics, while not having announced any involvement in blockchain initiatives. Following the methodology delineated by Boyd et al. (2019) and Klöckner et al. (2022), the core principle of PSM involves gauging the proximity between our sample firms and potential matches through propensity scores. These scores reflect the likelihood of a firm belonging to our sample firm group, considering a specific set of observable firm factors. To compute propensity scores, we consider six variables, namely, firm size, firm growth, market-to-book ratio, debt-to-asset ratio, R&D intensity and ROA to undertake estimations through cross-sectional binary response regression models. Next, we predict propensity scores and apply nearest neighbor matching with replacement to identify the five closest matches for each sample observation within the same industry (Klöckner et al. 2022). Subsequently, we compute abnormal returns for the matched firms using the Fama-french three factor model. We also apply t-tests to detect whether the distinction between the two samples is significantly different from 0. Table A1 and A2 in Appendix present event study outcomes for both the sample firms and matched firms during the crackdown event and the supportive event, respectively.

Table A1 Abnormal returns for the sample firms and matched firms in the crackdown event.

	Original sample firms			Matched firms--Five nearest neighbors.			Difference between sample firms and matched firms
Trading day	N	Mean abnormal return	Adjusted Patell Z	N	Mean abnormal return	Adjusted Patell Z	
	(1)	(2)	(3)	(4)	(5)	(6)	(2)-(5)
	Panel A daily abnormal return			Panel C daily abnormal return			
-5	17	-0.0032	-0.4730	53	-0.0023	-0.5928	-0.0009
-4	17	-0.0045	-1.0203	53	-0.0008	-0.2679	-0.0037
-3	17	0.0009	-0.1685	53	0.0005	0.0234	0.0004
-2	17	0.0130	1.8724	53	0.0060*	1.7842	0.0070
-1	17	0.0056	1.4797	53	0.0044	0.8248	0.0012
0	17	-0.0090	-1.2653	53	-0.0004	-0.3460	-0.0086*
+1	17	0.0014	0.1829	53	0.0029	0.7724	-0.0015
+2	17	-0.0103*	-1.8177	53	-0.0014	-0.2655	-0.0089*
+3	17	-0.0017	-0.1777	53	0.0002	0.6443	-0.0019
+4	17	-0.0051	-0.8884	53	0.0015	0.4616	-0.0066
+5	17	0.0083	1.3962	53	0.0058	1.4284	0.0025
	Panel B cumulative abnormal return			Panel D cumulative abnormal return			
[-5, -1]	17	0.0118	0.3063	53	0.0078	0.4923	0.0040
[0, 1]	17	-0.0075	-1.1360	53	0.0025	0.2002	-0.0100*
[0,2]	17	-0.0178**	-2.1855	53	0.0012	0.0469	-0.0190**
[0, 5]	17	-0.0163**	-2.1016	53	0.0087	1.1587	-0.0250**
[0, 10]	17	-0.294***	-2.8201	53	-0.0019	0.3600	-0.2921*
[0, 15]	17	-0.0336***	-2.6868	53	-0.0111	-0.2668	-0.0225
[0, 20]	17	-0.0078*	-1.7247	53	-0.0024	0.3753	-0.0054

Note. Matched firms are constructed by using PSM approach. We also apply t-tests to detect whether the distinction between the two samples is significantly different from 0. *p < 0.1; **p<0.05 ***p < 0.01. Two-tailed tests.

Table A2 Abnormal returns for the sample firms and matched firms in the supportive event.

	Original sample firms			Matched firms--Five nearest neighbors.			Difference between sample firms and matched firms
Trading day	N	Mean abnormal return	Adjusted Patell Z	N	Mean abnormal return	Adjusted Patell Z	
	(1)	(2)	(3)	(4)	(5)	(6)	(2)-(5)
	Panel A daily abnormal return			Panel C daily abnormal return			
-5	152	-0.0002	-0.0905	712	-0.0010	-0.3516	0.0008
-4	152	0.0055	1.0478	712	0.0013	0.4791	0.0042
-3	152	0.0061	1.1609	711	-0.0006	-0.2420	0.0067
-2	152	0.0046	0.8658	711	-0.0020	-0.6472	0.0066
-1	152	-0.0017	-0.2587	710	-0.0018	-0.6520	0.0001
0	151	0.0542***	10.1594	710	0.0087**	2.7549	0.0455***
+1	151	0.0106**	2.0345	710	-0.0039	-1.1334	0.0145***

+2	151	-0.0086*	-1.6991	711	0.0000	0.0507	-0.0086***
+3	151	-0.0143**	-2.4260	711	-0.0009	-0.2221	-0.0134***
+4	151	-0.0007	0.1714	711	-0.0026	-0.7876	0.0019
+5	151	-0.0016	-0.2287	712	0.0003	0.2329	-0.0019
		Panel B cumulative abnormal return			Panel D cumulative abnormal return		
[-5, -1]	152	0.0143	1.6379	710	-0.0041	-0.7555	0.0184***
[0, 1]	151	0.0649***	11.5980	709	0.0047*	1.9309	0.0602***
[0,2]	151	0.0563***	10.6170	709	0.0047*	1.9615	0.0516***
[0, 5]	151	0.0397***	9.3874	710	0.0016	1.6040	0.0381***
[0, 10]	152	0.0400***	9.3789	710	-0.0008	1.4633	0.0408***
[0, 15]	152	0.0313***	9.0180	710	0.0060*	1.8727	0.0253***
[0, 20]	152	0.0001***	7.6501	710	0.0088**	2.1398	-0.0087

Note. Matched firms are constructed by using PSM approach. We also apply t-tests to detect whether the distinction between the two samples is significantly different from 0. *p < 0.1; **p<0.05 ***p < 0.01. Two-tailed tests.

A 3.3 Virtual event time points

To mitigate the influence stemming from the choice of event dates, we establish virtual event occurrence times for both the crackdown event and supportive event. Then, we calculate the sample's abnormal returns at these virtual time points. Furthermore, we examine the performance disparities between speculative and non-speculative firms at virtual time points during the supportive event. We designate virtual time points three months before the onset of each of the two events. For example, the supportive event occurred on October 24, 2019, then the corresponding virtual time point is set as July 24, 2019. Table A3 in Appendix presents the abnormal returns for virtual event day of two events.

Table A3 Abnormal returns for the sample firms and matched firms in the crackdown event.

Trading day	N	Mean abnormal return	Adjusted Patell Z	Rank test	N	Mean abnormal return	Adjusted Patell Z	Rank test
		Panel A daily abnormal return				Panel C daily abnormal return		
-5	15	0.0097	2.2047	2.3874	152	0.0003	0.0998	0.1577
-4	15	0.0043	0.8188	1.4408	152	0.0031	0.5098	0.8133
-3	15	0.0008	0.1690	0.3651	152	-0.0018	-0.2252	-0.0348
-2	15	-0.0016	0.0000	-0.3909	152	0.0019	0.5436	1.2004
-1	15	0.0084	1.6833	1.1953	152	-0.0015	-0.2481	-0.2373
0	15	-0.0022	-0.7802	-0.4911	152	0.0000	0.0856	0.1999
+1	15	0.0127	2.2237	1.7801	152	-0.0001	-0.0497	0.3349
+2	15	-0.0045	-0.9019	-1.8350	152	-0.0015	-0.3816	-0.1682
+3	15	0.0058	1.0231	0.1325	152	-0.0031	-0.4339	-0.5738
+4	15	-0.0013	-0.1708	-0.1551	152	0.0009	0.2207	0.5501
+5	16	0.0046	0.6371	-0.5179	152	-0.0011	-0.1110	0.0185
		Panel B cumulative abnormal return				Panel D cumulative abnormal return		
[-5, -1]	15	0.0217	3.6340	2.3872	152	0.0020	0.4911	0.5376
[0, 1]	15	0.0105	0.7922	0.6833	152	-0.0001	0.0504	-0.4243
[0,2]	15	0.0060	0.2715	0.4170	152	-0.0016	-0.1699	-0.4513
[0, 5]	15	0.0081	0.5055	-0.0790	152	-0.0048	-0.3335	-0.5367
[0, 10]	15	0.0201	1.2212	0.3617	152	-0.0035	-0.2064	-0.1665
[0, 15]	15	0.0117	0.8810	-0.2138	152	-0.0018	-0.0854	0.0007
[0, 20]	15	0.0254	1.5763	0.3167	151	0.0060	0.3025	0.3210

Note. Panel A&C presents the daily abnormal returns for several event days and Panel B&D presents the cumulative abnormal returns for multiple event windows. We use the Fama-French three factor model to estimate the abnormal return. *p < 0.1; **p<0.05 ***p < 0.01. Two-tailed tests.

Table A4 Abnormal returns for the sample firms and matched firms in the supportive event.

Trading day	N	Mean abnormal return	Adjusted Patell Z	Rank test	N	Mean abnormal return	Adjusted Patell Z	Rank test
		Panel A daily abnormal return				Panel C daily abnormal return		
-5	113	-0.0009	-0.1584	0.0932	39	0.0039	0.7822	0.3087
-4	113	0.0037	0.5262	0.7301	39	0.0016	0.3291	0.8878
-3	113	-0.0021	-0.2670	-0.1609	39	-0.0011	-0.0507	0.3278
-2	113	0.0006	0.3328	0.8792	39	0.0055	0.9776	1.8702

-1	113	-0.0021	-0.2878	-0.3059	39	0.0001	-0.0734	0.0029
0	113	0.0003	0.1857	0.3391	39	-0.0010	-0.2120	-0.2322
+1	113	0.0001	-0.0459	0.2910	39	-0.0007	-0.0469	0.3928
+2	113	0.0000	-0.1307	0.1528	39	-0.0059	-0.9688	-1.0407
+3	113	-0.0039	-0.5453	-0.6921	39	-0.0007	-0.0129	-0.1271
+4	113	0.0008	0.1730	0.4035	39	0.0015	0.2929	0.8553
+5	113	-0.0005	0.0435	0.1758	39	-0.0029	-0.5053	-0.4291
		Panel B cumulative abnormal return				Panel D cumulative abnormal return		
[-5, -1]	113	-0.0008	0.0972	0.1311	39	0.0099	1.4416	1.6093
[0, 1]	113	0.0005	0.1532	-0.2580	39	-0.0017	-0.2451	-0.7786
[0,2]	113	0.0004	0.0778	0.0838	39	-0.0076	-0.8044	-2.1052
[0, 5]	113	-0.0032	-0.0998	-0.1522	39	-0.0097	-0.8862	-1.5132
[0, 10]	113	-0.0007	0.0346	0.2650	39	-0.0116	-0.8129	-1.4961
[0, 15]	113	0.0015	0.1917	0.4328	39	-0.0112	-0.8231	-1.2480
[0, 20]	113	0.0072	0.4708	0.6122	38	0.0023	-0.2397	-0.7164

Note. Panel A&C presents the daily abnormal returns for several event days and Panel B&D presents the cumulative abnormal returns for multiple event windows. We use the Fama-French three factor model to estimate the abnormal return. *p < 0.1; **p<0.05 ***p < 0.01. Two-tailed tests.

A.3.1 Alternative Expected Return Models

We apply traditional market model to compute abnormal returns and subsequently reassess the abnormal returns for both events. Moreover, we utilize firm-specific mean-adjusted trading volume to identify abnormal trading volume during the supportive event.

Table A5 Market response to the crackdown event and the supportive event using market model.

	The Crackdown Event							The Supportive Event						
Trading day/Event window	N	Mean abnormal return	Adjusted Patell Z	Median abnormal return	Wilcoxon signed-rank test	Percentage more than zero	Rank test	N	Mean abnormal return	Adjusted Patell Z	Median abnormal return	Wilcoxon signed-rank test	Percentage more than zero	Rank test
		Panel A: Average Abnormal Return							Panel C: Average Abnormal Return					
-5	17	-0.0033	-0.5264	-0.0076	-1.0651	0.3529	-1.0516	152	0.0004	0.0170	-0.0013	-0.1876	0.4737	0.0848
-4	17	-0.0030	-0.9240	-0.0048	-1.4438	0.2941	-1.0755	152	0.0058	0.9393	0.0005	1.5617	0.5263	0.7044
-3	17	0.0021	0.0276	-0.0004	0.1657	0.5294	0.0782	152	0.0060	1.0049	-0.0028	0.1895	0.4605	0.4038
-2	17	0.0145	2.1292**	0.0068	1.9645**	0.7647	1.7333	152	0.0042	0.7218	0.0020	1.4771	0.5592	0.7752
-1	17	0.0069	1.5526	0.0033	0.8758	0.6471	0.8819	152	-0.0010	-0.1072	-0.0040	-2.6709	0.3750	-0.5172
0	17	-0.0090	-1.4194	-0.0093	-2.0119**	0.2353	-1.9057*	151	0.0550	9.7411***	0.0658	10.4328***	0.9276	5.5414***
+1	17	0.0029	0.3549	0.0032	0.8284	0.5882	0.5238	151	0.0112	1.9202*	-0.0069	1.0570	0.4605	-0.2351
+2	17	-0.0093	-1.7527*	-0.0089	-2.7693***	0.2353	-2.2001**	151	-0.0080	-1.5466	-0.0143	-2.9426***	0.3907	-1.4708
+3	17	-0.0009	-0.1029	0.0026	0.5444	0.5882	0.2931	151	-0.0135	-2.1109**	-0.0099	-4.4250***	0.3510	-1.7283*
+4	17	-0.0040	-0.7813	-0.0056	-1.4438	0.2942	-0.9827	151	-0.0004	0.1632	-.0027	-1.4100	0.4040	-0.1471
+5	17	0.0087	1.5008	0.0042	1.6805*	0.6471	1.3699	151	-0.0009	-0.1071	-0.0038	-2.0230**	0.3974	-0.4709
		Panel B: Cumulative Abnormal Return							Panel D: Cumulative Abnormal Return					
[-5, -1]	17	0.0173	0.6093	0.0047	0.3002	0.5882	-0.1030	152	0.0153	1.5743	0.0007	0.2560	0.5066	0.8085
[0, 1]	17	-0.0061	-1.1077	-0.0022	-0.9318	0.4118	-1.9725*	151	0.0662	11.0989***	0.0539	9.8516***	0.8421	5.9519***
[0,2]	17	-0.0154	-2.0825**	-0.0149	-2.3809**	0.0588	-3.3972***	151	0.0583	10.2060***	0.0327	6.9302***	0.7829	5.4720***
[0, 5]	17	-0.0116	-1.8648*	-0.0145	-1.6374	0.2941	-2.3586**	151	0.0435	9.1798***	0.0283	2.4735**	0.6908	5.6424***
[0, 10]	17	-0.0216	-2.4413**	-0.0240	-2.4759**	0.2353	-2.9056***	152	0.0455	9.2826***	0.0183	0.8284	0.6513	5.5491***
[0, 15]	17	-0.0231	-2.2601**	-0.0171	-2.2641**	0.2353	-2.9338***	152	0.0384	8.9449***	0.0129	-0.8618	0.6118	5.3933***
[0, 20]	17	0.0082	-1.1036	-0.0078	-0.7357	0.4706	-1.4759	152	0.0067	7.6652***	-0.0069	-4.6524***	0.4934	4.6717***

Notes. Panel A&C presents the daily abnormal returns for several event days and Panel B&D presents the cumulative abnormal returns for multiple event windows. We use the market model to estimate the abnormal return. *p < 0.1; **p<0.05 ***p < 0.01. Two-tailed tests.

Table A6 Comparative analysis of the two events using market model

Trading day	The crackdown event		The supportive event Full sample		The fully impact of the two events. (5) + (3)	The supportive event Sub-sample		The fully impact of the two events for sub-sample. (8) + (3)
	N	Mean abnormal return	N	Mean abnormal return		N	Mean abnormal return	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
[-5, -1]	17	0.0173	152	0.0153	0.0326	17	0.0346*	0.0519**
[0, 1]	17	-0.0061*	152	0.0662***	0.0601***	17	0.0655**	0.0594***
[0,2]	17	-0.0154***	152	0.0583***	0.0429**	17	0.0627***	0.0473**
[0, 5]	17	-0.0116**	152	0.0435***	0.0319*	17	0.0305***	0.0189

[0, 10]	17	-0.0216***	152	0.0455***	0.0239	17	0.0322**	0.0106
[0, 15]	17	-0.0231***	152	0.0384***	0.0153	17	0.0296**	0.0065
[0, 20]	17	0.0082	152	0.0067***	0.0149	17	-0.0102	-0.002

Notes. This table presents the comparable results of two events using market model, accompanied by the application of the generalized rank test to assess their significance. Column (2) and (3) show the results of the crackdown event. Column (4) and (5) show the results of the supportive event. Column (6) displays the sum of the impacts from both events. Column (7) and (8) show the mean abnormal return for the supportive event of the same 17 companies list in the crackdown event. Column (9) shows the sum of the impacts of the two events for the same 17 firms. We apply one-tailed t-test to explore whether the fully impact of the two events is lagger than 0. $^{*}p < 0.1$; $^{**}p<0.05$ $^{***}p < 0.01$.

Table A7 Mean-adjusted abnormal trading volume

Trading day	Mean abnormal trading volume %	Corrado rank test	Trading day	Mean abnormal trading volume %	Corrado rank test
-5	-0.0386	-1.0449	+8	0.3633	4.2236
-4	-0.0038	-0.2418	+9	0.4458	5.7372
-3	0.0207	-0.0458	+10	0.3331	4.6389
-2	0.0550	0.4075	+11	0.1704	2.0213
-1	0.0939	1.2522	+12	0.0406	0.3613
0	0.4200	5.4113	+13	0.0871	0.9039
+1	1.0314	13.5731	+14	0.1398	1.6642
+2	0.9141	11.6816	+15	-0.0229	-0.6268
+3	0.6608	8.4208	+16	0.2230	2.9257
+4	0.4770	6.1096	+17	0.2233	2.9292
+5	0.5428	6.9499	+18	-0.0322	-0.5232
+6	0.4458	6.1427	+19	0.2129	3.2333
+7	0.3686	4.7720	+20	0.0214	0.3797

Notes. This table presents the daily abnormal turnover around the day when the government's supportive event occurred. A firm's daily turnover is calculated as its share trading volume divided by its shares traded on a given day. Due to the distribution of volume is skewed and has thick tails, we take natural logarithm transformation of the turnover. We use market model to calculate the abnormal turnover. We use the Corrado rank test as we find the non-parametric test statistic has more power to detect abnormal trading volume than the parametric test statistic. $^{*}p < 0.1$; $^{**}p<0.05$ $^{***}p < 0.01$ Two-tailed tests.

Table A8 Cumulative abnormal return of speculative and non-speculative Firms.

		Market Model--Cumulative Abnormal Returns (%)						
		[-5, -1]	[0, 1]	[0, 2]	[0, 5]	[0, 10]	[0, 15]	[0, 20]
Total firm	152	0.0153	0.0662***	0.0583***	0.0435***	0.0456***	0.0384***	0.0067***
Non-Speculative	113	0.0134	0.0716***	0.0596***	0.0450***	0.0531***	0.0468***	0.0121***
Speculative firm	39	0.0209	0.0507**	0.0545***	0.0390***	0.0236***	0.0140***	-0.0087**
Difference		-0.0075	0.0209	0.0051	0.006	0.0295*	0.0328*	0.0208

Notes. This table presents the cumulative abnormal return of speculative firms and non-speculative firms. We apply the generalized rank test to test the significance of CARs. Difference is equal to the CARs of non-speculative firm minus the CARs of speculative firms. We also apply t-test to detect whether the difference between two sub-samples is significantly different from 0. $^{*}p < 0.1$; $^{**}p<0.05$ $^{***}p < 0.01$. Two-tailed tests.

Table A9 Regression results for speculative firms and non-speculative firms using market model.

	Market Model				
	(1) CAR [-5,-1]	(2) CAR [0,1]	(3) CAR [0,10]	(4) CAR [0,15]	(5) CAR [0,20]
Speculative	0.0026	-0.0337**	-0.0323*	-0.0356#	-0.0200
	(0.0119)	(0.0107)	(0.0162)	(0.0182)	(0.0191)
Size	-0.0051	-0.0071	-0.0129	-0.0012	0.0043
	(0.0075)	(0.0066)	(0.0107)	(0.0119)	(0.0125)
Gross Margin	-0.0110	-0.0120	-0.1415**	-0.1324*	-0.0785
	(0.0335)	(0.0321)	(0.0510)	(0.0519)	(0.0489)
Market To Book Ratio	-0.0093	-0.0107	0.0058	0.0144	0.0076
	(0.0063)	(0.0072)	(0.0088)	(0.0090)	(0.0112)
DAR	-0.0200	-0.0429	-0.0280	-0.0505	-0.0678
	(0.0316)	(0.0382)	(0.0640)	(0.0674)	(0.0635)
Research Intensity	0.0385	-0.0700	0.0206	0.0351	-0.0350
	(0.0846)	(0.1019)	(0.1180)	(0.1234)	(0.1412)
Analyst attention	0.0000	-0.0013*	-0.0003	-0.0007	0.0001
	(0.0006)	(0.0005)	(0.0008)	(0.0010)	(0.0011)
ROA	-0.1329	-0.0952	0.0370	0.0086	-0.1028
	(0.0718)	(0.0558)	(0.0702)	(0.0714)	(0.0645)

Institutional Holder Share	-0.0001	-0.0001	0.0004	0.0003	0.0006
	(0.0002)	(0.0002)	(0.0004)	(0.0004)	(0.0004)
Industry	Yes	Yes	Yes	Yes	Yes
constant	0.1584	0.2973	0.3576	0.0906	-0.0609
	(0.1751)	(0.1531)	(0.2400)	(0.2655)	(0.2851)
N	141	140	141	141	140
R^2	0.1296	0.2002	0.1106	0.0920	0.0821

*p < 0.1; **p<0.05 ***p < 0.01. Two-tailed tests.

Declaration of generative AI and AI-assisted technologies in the writing process

During the revision of this work the authors used ChatGPT to check for grammatical errors and to improve the readability of a small number of sentences. After using this tool, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

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