Impact of Blockchain Investment on the Market Performance of Public Companies in China

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Abstract. This paper examines the impact of blockchain investments on the market performance of Chinese listed companies. By utilizing event study methodology and data from 208 listed companies that made blockchain investment announcements between 2008 and 2023, the findings indicate that such announcements have a significant positive effect on short-term market value, but this effect diminishes over time. Furthermore, companies with greater scale and more robust innovation capabilities are able to attain higher stock prices and returns. This positive market response is evident across various industries, with industry distinctions having minimal impact on the market performance of corporate blockchain investment.

Keywords: blockchain investment announcements, market performance, event study

1 Introduction

Blockchain is a decentralized and tamper-proof distributed database that enables the integration of traditionally isolated databases into multiple nodes maintained by various entities (Ali et al. 2019).[2] The adoption and utilization of blockchain technology can facilitate continuous updates of strategic technologies, enhance business processing efficiency, and reduce information technology costs, thus providing competitive advantages (Ertz & Boily 2019, Hokey 2019, Maciel, Renato & Silvia 2019, Arvind et al. 2021).[3,4,5,6] However, doubts have arisen during its gradual implementation, and many enterprises have engaged in blind construction and investment due to the lack of clear business models. This has resulted in difficulties achieving expected project outcomes and even suspicion of hype (Akyildirim et al. 2020).[1] Despite the potential benefits of blockchain, the practical demonstration of its positive impact on reducing information technology infrastructure expenditure and improving enterprise management efficiency is yet to be realized. This paper aims to analyze the factors influencing the effects of blockchain investment and their market value creation by using the event study method to empirically examine the market performance of companies that have implemented blockchain technology. The study assumes that competitive advantages arise from asset scale, industry attributes, and innovation capabilities.

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2 Data and Methodology

2.1 Data

The purpose of this research is to examine the impact of investments in blockchain technology on the market value of publicly traded Chinese companies. To collect data for analysis, Python web scraping technology was utilized to extract all pertinent announcements related to blockchain made by public firms from Cninfo, a website designated by the China Securities Regulatory Commission for information disclosure. It is advisable to keep all the given values.

The data collection period ranged from January 2008 to March 2023, with only the initial announcement containing the keyword "blockchain" for each company being taken into account. To ensure the quality of data, this paper excluded annual and quarterly reports, as well as ST and *ST stocks, stocks with missing daily price data, and those with announcements unrelated to blockchain technology investment, profits, dividends, mergers and acquisitions or other emergency announcements within the research period. The final sample consisted of 208 companies and their daily stock price data was obtained from the Wind database.

2.2 Methodology

2.2.1 Event study

The event study approach is a widely utilized method in the fields of economics and management for investigating the impact of significant economic events on stock prices of companies. This approach typically involves six key steps, namely (1) Identification of the target event; (2) Definition of the event window; (3) Selection of valid samples; (4) Prediction of stock returns assuming non-occurrence during the event window; (5) Calculation of abnormal stock returns during the event window, which represents the difference between actual and predicted returns; and (6) Testing whether abnormal stock returns during the event window are significantly different from zero.

The definition of the event window is a crucial step in research design following identification of the event under investigation. Typically, the event window is represented as a time interval of [-x, +y]. Here, x represents the number of days preceding the event day, while y refers to the number of days succeeding it. The event day represents the moment when specific information related to an event is disclosed to the capital market, rather than a time point for non-specific occurrences. Typically, this day is referred to as day 0. Consistent with prior research, this paper employs 11 commonly utilized short-term event windows: [-1, +1], [0, +1], [0, +2], [0, +3], [0, +4], [0, +5], [0, +6], [0, +7], [0, +8], [0, +9], and [0, +10]. The estimation window refers to a predetermined time period that remains unaffected by the event being investigated. The estimation window for normal returns was selected as [-110, -10] in order to reduce the likelihood of bias or sample loss. The figure presented below illustrates the comprehensive window for analyzing blockchain investment announcement events.

Fig. 1. Event analysis window

A market model is selected to estimate the normal returns of publicly traded companies that have announced investments in blockchain technology within a specific time frame. The structure of the market model is outlined as follows:

$$R_{i,t} = \alpha_i + \beta_i R_{M,t} + \varepsilon_{i,t} \tag{1}$$

Among them, $t \in T$, T is the estimation window period; $R_{i,t}$ represents the individual stock return rate of listed company i on the t-th trading day; $R_{M,t}$ represents the market return rate of the sub-market where the listed company is located on the t-th trading day. By performing ordinary least squares (OLS) regression on equation (1), the risk-free return rate $\widehat{\alpha_i}$ for each sample company during the estimation window period and the correlation coefficient $\widehat{\beta_i}$ between individual stock returns and market returns can be estimated. Then, equation (2) can be used to estimate the expected normal return $E\left(\widehat{R_{i,e}}\right)$ of stocks in the event window in the absence of an event:

$$E\left(\widehat{R_{i,e}}\right) = \widehat{\alpha_i} + \widehat{\beta_i} R_{M,e} \tag{2}$$

Among them, $e \in E$, where E represents the event window period; $R_{M,e}$ represents the market return rate of the sub-market where the i-th listed company is located on the e-th trading day. By subtracting the expected return $E\left(\widehat{R_{i,e}}\right)$ from the actual return $R_{i,e}$ of the i-th listed company during the event window period, the abnormal return rate $AR_{i,e}$ can be obtained, and the calculation expression is:

$$AR_{i,e} = R_{i,e} - E\left(\widehat{R_{i,e}}\right) \tag{3}$$

Subsequently, the cumulative abnormal return (CAR) is computed for stock "i" during both the event window "E" and the subsequent post-event window "E" according to the following calculation:

$$CAR_{i,E} = \sum_{e=0}^{E} AR_{i,e} \tag{4}$$

To ascertain the statistical significance of the impact resulting from announcement events, t-statistics are computed for each specific event window. The calculation of t-statistics is based on the following formula:

$$t_{CAR} = \frac{E(CAR_{i,E})}{S(CAR_{i,E})/\sqrt{n}} \tag{5}$$

2.2.2 Linear Regression

A regression model is developed in this study to elucidate the variations in market performance among Chinese listed companies that have declared blockchain investments. The model incorporates variables such as firm size, industry classification, and innovation capacity. The specification of the model is presented below:

$$CAR_i = \alpha_i + \beta_1 Size_i + \beta_2 Industry_i + \beta_3 Innovation_i + +\varepsilon_i \tag{6}$$

CAR_i denotes the cumulative abnormal returns associated with a particular stock i. $Size_i$ represents the size of a firm, which is determined by the total assets of the sample companies before the release of blockchain investment announcements. The variable $Industry_i$ indicates the industry classification of the stock, with a value of 1 assigned to the IT industry and a value of 0 assigned to the non-IT industry, as per the official economic industry classification in China. Lastly, the variable $Innovation_i$ represents the innovation capability of the stock, as determined by the number of patents filed by the sample firm. A value of 1 indicates innovativeness, while a value of 0 indicates non-innovativeness. For a comprehensive overview of these variables, please refer to Table 1.

Table 1. Variable Interpretation

Variable	Interpretation
CAR	The cumulative abnormal return (CAR) is computed as the aggregate of abnormal returns across individual stocks throughout the event window. Abnormal return is determined as the disparity between the observed return and the anticipated return.
Size	The size variable is ascertained by considering the total assets of the sampled firm at the conclusion of the preceding year, prior to the dissemination of the blockchain investment announcement.
Industry	The industry is a dummy variable, with a value of 1 assigned to the IT industry and a value of 0 assigned to the non-IT industry.
Innovation	The industry is a dummy variable, with a value of 1 assigned to the innovative companies and a value of 0 assigned to the non-innovative companies.

3 Result

Drawing on the principles of event study, the study evaluate whether blockchain investments announcements significantly affect corporate value by observing the average cumulative abnormal returns (ACAR) of sample companies during the event window. If blockchain investments have no significant impact on corporate value, the ACAR of sample companies should remain close to a stable level of zero. The results show that during the entire event window and the post-event window, the ACARs of sample companies deviates significantly from zero and displays a declining trend. Specifically, the (-1, +1) period exerts the most significant influence, indicating that the announcement of blockchain investments indeed have a substantial positive effect on the market value of sample firms. However, as time elapses, the ACAR within the post-event window gradually decreases, implying a gradual weakening of the impact of blockchain investment announcements on corporate value. Figure 2 illustrates the variations in ACAR among the sample companies throughout the entire research window.

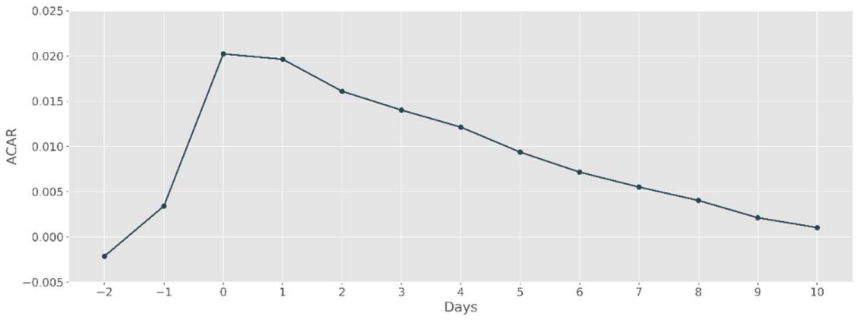

Fig. 2. ACARs of the firms

Table 2 displays the ACARs along with their respective t-statistics to determine significance. The findings suggest that companies which disclosed blockchain investments experienced a highly significant average cumulative abnormal return (ACAR) of 2.0231% in the (-1, +1) event window, followed by a downward trend in yields. On the tenth day, samples achieved an average return of 0.1032%.

Table 2. ACARs and t-statistics: Significance levels are indicated by ** and * symbols, representing a significance level of 1% and 5% respectively, based on two-tailed tests.

window	ACAR	Std
[-1,1]	0.020231	2.0324**
[0,1]	0.019645	2.1023**
[0,2]	0.016102	2.1047**
[0,3]	0.014023	2.0068**
[0,4]	0.012136	2.0199**
[0,5]	0.009372	2.0361**
[0,6]	0.007162	2.0251**
[0,7]	0.005513	1.4267
[0,8]	0.004031	1.1145
[0,9]	0.002120	0.6006
[0,10]	0.001032	0.5026

To further elucidate the performance disparities observed in the study, a regression model was utilized to analyze the abnormal returns to answer whether the size of the firm, whether the company is an IT company, and whether the company's innovation ability has an impact on abnormal returns.

Table 3. Regression result: Significance levels are indicated by ** and * symbols, representing a significance level of 1% and 5% respectively, based on two-tailed tests.

CAR	coef	Std
Size	0.326	4.143**
Industry	0.014	0.368
Innovation	0.165	3.624**

The findings in Table 3 demonstrate a statistically significant positive correlation (0.326) between the company size variable and CAR, indicating that larger companies embrace a

favorable influence on the market value after releasing announcements about blockchain investment. The total assets serves as a critical element for evaluating enterprise capabilities. Usually, big companys possess advanced technology, comprehensive facilities, and ample resources, which guarantee a flexble adjustment, lower management costs and maintain competitive advantages. Moreover, their robust IT infrastructure further enhances the viability of blockchain investment, leading to improved market performance. Additionally, the variable for innovation capacity also exhibits a positive and significant coefficient of 0.165, indicating that innovative companies achieve significantly higher abnormal returns compared to non-innovative ones. Usually, radical IT technology innovations generate higher returns for investors, while enhancing an enterprise's innovative capabilities enables it to secure a favorable market position and obtain resources for process reengineering and business model innovation. The blockchain announcement's innovation reflects the enterprise's competitive advantage. Investment firms operating within the realm of innovative information technology are apt to secure a prominent standing within the market, acquire substantial resources, and amass valuable experience. Consequently, these companies are more likely to achieve superior market returns compared to their counterparts. It is worth noting that the variable representing industry categorization demonstrates a positive correlation with CAR, suggesting that the service industry, in particular, experiences a deviation from the norm in terms of returns. However, it is important to mention that the coefficient associated with this correlation lacks statistical significance.

4 Conclusions

In this paper, an event study methodology is utilized to examine changes in market performance following blockchain announcements made by listed companies. Additionally, a multiple linear regression models is employed to investigate the relationship between cumulative abnormal returns and the size of listed companies, industry categories and innovation capabilities. The findings indicate that the announcements of blockchain investments have an immediate and significant favorable impact on the market performance of sample firms, which tends to gradually diminish as the market assimilates the information. Moreover, the size and innovation capacity of firms influence the effect of corporate blockchain investment announcements on market performance. Larger firms with stronger innovation capabilities achieve higher stock prices and experience significantly greater abnormal returns. However, positive market feedback is obtained by firms across different industries, indicating that the industry type of an enterprise has no significant impact on the market performance of blockchain investment. These findings offer valuable insights for decision-making in further exploring the commercial value of blockchain.

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