The Impact of Blockchain Technology on Stock Price: An Emprical Study

Minhe Xu*

Economics and Management Department, Beijing Jiaotong University, Beijing, China

Abstract. With the rapid development of blockchain technology, more and more attention has shifted from the theoretical research of blockchain technology to the application of specific business of the company. However, there are few literatures on the quantitative research on the impact of blockchain technology on the company's market value after it is applied to the company's actual business. In this paper, 73 listed companies published blockchain application announcements from 2016 to 2019 are selected as the research objects, and the short-term event analysis method is used to quantitatively analyze the impact of the application about blockchain technology on the market performance of listed companies. The results show that: after the announcement of blockchain application in their own business, listed companies have a more significant abnormal income, which shows that the capital market has a significant positive response to the application of blockchain. Finally, this paper puts forward the theoretical and practical significance, limitations and future research.

1 Introduction

At present,The rise of blockchain technology has brought new development opportunities to many fields, which is both an opportunity and a challenge for China. In recent years, the academic research on the theory and application of blockchain has increased rapidly, especially in China. Various relevant departments of the country have gradually introduced various policies to encourage the development of blockchain. Enterprises from all walks of life have begun to combine blockchain technology with their own business through their own research or cooperation with technology companies, so as to give full play to the advantages of blockchain. However, there is no quantitative analysis on the market reaction of Chinese companies after applying this technology in their own business. This paper is based on this background. In this paper, 73 listed companies published blockchain application announcements from 2016 to 2019 are selected as the research objects, and the short-term event analysis method is used to quantitatively analyze the impact of the application of blockchain technology on the market performance of listed companies.

* Corresponding author: 19125563@bjtu.edu.cn

2 Literature review

Since the advent of bitcoin in 2008, blockchain technology, as the underlying core foundation, has been highly concerned by political, industrial and academic circles. Many scholars study blockchain technology from different aspects of theory and practice, and are committed to applying blockchain technology to all walks of life, especially in China, from the financial field to education, supply chain, logistics and other fields [1, 2]. Then, for the impact of the application of emerging technologies on the value of the company's stock has been studied by scholars, using the methods of event analysis, regression analysis and so on. The application of event analysis quantifies the impact of the emergence or application of new technologies on the company's stock price. For example, some scholars empirically test the impact of the implementation of 3D printing (3DP), cloud computing and intelligent logistics policies on the stock return rate; there are also studies on the price response of listed companies to blockchain related announcements[3];There are also scholars who study the impact of "blockchain" or "bitcoin" added to the name list of companies on abnormal returns, so as to judge the stock market reaction[4, 5].Therefore, this paper draws on the experience of the above literature to study the response of the capital market to the specific application of blockchain under the background of China. We adopt the short-term event analysis method, taking the Chinese listed companies issuing blockchain application announcements as the event samples, and judge the market reaction by studying abnormal returns.

3 Hypotheses development

H1: Stock markets react positively to the announcement of blockchain application in Chinese Enterprises.

Whether it is the research of technology theory or the application of specific business, blockchain technology has a huge development prospect. At present, the development of blockchain technology is only the tip of the iceberg. First of all, from the advantages of blockchain technology itself, due to its traceability, symmetry and other characteristics, it will bring different degrees of benefits to the company after it is applied to the business of many industries [6]. Secondly, due to the guiding role of the policy, the government promulgates policies, which indicate the development potential of the industry, along with some supportive actions of funds and talents, which are conducive to the future development of enterprises. In recent years, national departments have successively issued relevant policies to encourage the development of blockchain technology, which also has a certain impact on the stock value of companies applying blockchain technology. Finally, when the announcement of the practical application of this technology is announced, it not only indicates that the company is in good condition, but also has a clear plan for its future development, which will strengthen investors' confidence in development. Therefore, we expect that the application of blockchain technology to the company's specific business will produce a positive market reaction.

4 Research methodology

4.1 Data collection

We collected the variables to be studied from various sources. First of all, we obtain the news and announcement of blockchain application of Chinese enterprises from the official website, Sohu, Tencent and other news aggregation channels [7]. The application of blockchain technology in China has been booming in recent years. Therefore, we collected the

announcement of the company's application of blockchain in 2016-2019, which also conforms to the basic hypothesis of short-term event research. Then, by carefully reading each published news text, we only retain those announcements annouexcluding those related to research and development of blockchain technology. In additioncing that the company has actually applied blockchain technology in specific business, n, in order to make the research more targeted, we focused on the companies listed on the Chinese stock exchanges, excluding those listed on the New York Stock Exchange and NASDAQ. Finally, we cross check the same blockchain application announcement reported on different channels, and use the earliest publication date as the event date. Therefore, through a series of screening, we obtained 101 announcements.

We obtain the daily stock return and composite index of all target companies from China Securities Market and accounting research (CSMAR) database as the daily market return, so as to analyze the impact of blockchain technology announcement on stock returns by applying short-term event analysis method. CSMAR database can query the stock return data of all listed companies in China in the past 30 years.

4.2 Event study methodology

We use the short-term event research method to quantify the impact of the event of blockchain application on the abnormal return of stocks [8]. Specifically, abnormal return refers to the difference between the actual return rate of a company after it publishes the announcement on the application of blockchain technology in its business and the expected stock return assuming that no blockchain application announcement is published. According to the basic method of short-term event research, we use the market model to estimate the expected stock return when the company does not publish the blockchain application announcement.

$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it} \tag{1}$$

$$E(R_{it}) = \hat{\alpha}_i + \hat{\beta}_i R_{mt} \tag{2}$$

$$AR_{it} = R_{it} - E(R_{it}) \tag{3}$$

$$CAR_i[-t_1, t_2] = \sum_{t=-t_1}^{t_2} AR_{it} \tag{4}$$

The specific estimation process is as follows. First, we take 11 days to 100 days before the announcement date of the company's release of blockchain applications as the estimation period, so as to avoid affecting the estimation of the expected stock return rate of the announcement. Then, according to the formula (1), the daily stock return (R_{it}; the return rate of the company R_i on t day) and the market return (R_{mt}; corresponding to the return rate of the stock exchange's composite index on t day) during the estimation period are regressed.The estimated values of α_i and β_i are obtained by regression calculation, and then according to the formula(2), we calculate the expected stock return[$E(R_{it})$]during the event period. Next, calculate the abnormal return (AR_{it}) caused by the announcement of the blockchain application, that is, according to the formula (3), the difference between the actual stock return (R_{it}) and the expected stock return [$E(R_{it})$]. In addition, the sample number of event study is reduced from 101 to 73, because some sample companies are excluded because of the lack of all stock return data in the estimation period or the event period, or the regression effect of the company return and market return is not significant in the estimation period.

According to the previous research on short-term events, we selected three trading days before and after the event (i.e. day - 1 to day 1) as the event window to explain the possible information leakage before the event and the impact after the announcement was issued. In order to observe the total effect of the event, we also calculate the cumulative abnormal returns (CARs) in the event window, according to the formula (4). Consistent with previous event studies, we used parametric test (t-test) to analyze the statistical significance of ARS and CARs. Table 1 shows the average value, median value and parameter test (i.e. t test) of daily excess return and cumulative abnormal return in event window by event window and model, and tests whether the average and median of daily abnormal return and cumulative abnormal return are significantly different from zero.

5 Data analysis and results

The abnormal return test results of short-term event analysis are shown in Table 1. Panel A in Table 1 shows the abnormal returns on the release date of the blockchain application announcement and the days before and after the announcement (i.e., day - 1, day 0 and day 1). We found that the abnormal returns on day -1 were not statistically significant ($P > 0.1$ in t-test) on day - 1, but they became significant on day 0 and day 1 ($P < 0.1$ in t-test). This shows that there is no sign of information leakage before the listed companies issue the blockchain application announcement, excluding the possibility of issuing the announcement after the stock market is closed. In addition, the average rate of return and median of Chinese enterprises to the announcement are positive, indicating that Chinese enterprises have a positive reaction to the practical application of blockchain.

Table 1. The test results of event study.

Panel A: Abnormal Returns (ARs)				
Day	**N**	**Mean ARs**	**Median ARs**	**t-Test**
-1	73	0.00038821	-0.00009219	0.208
0	73	0.008554928	0.001561338	2.632***
1	73	0.007037378	0.00246896	2.356**
Panel B: Cumulative Abnormal Returns (CARs)				
Days	**N**	**Mean CARs**	**Median CARs**	**t-Test**
(-1,0)	73	0.008943137	0.00070318	2.228**
(0,+1)	73	0.015592306	0.002802485	2.89***
(-1,+1)	73	0.015980515	0.000938536	2.616**

* p<0.10 (two-tailed tests). ** p<0.05 (two-tailed tests). *** p<0.01 (two-tailed tests).

The test results of cumulative abnormal returns (CARs) shown in panel B further prove that the average and median values of cumulative abnormal returns (i.e. - 1 to 0, 0 to 1, and - 1 to 1) in the event window are positive, while the results of t test ($P < 0.05$) are significant. Therefore, H1 is supported.

6 Discussion and conclusion

From the analysis results, the announcement of the application of blockchain in China's listed companies' own business will have an immediate significant positive impact on the stock market of enterprises. From the theoretical aspect, this study deepens the understanding of

the enterprise value when the blockchain technology is applied to the company's specific business. From a practical point of view, we will suggest that enterprises can invest and use blockchain technology according to their own business conditions. Finally, although our whole research process is as objective and comprehensive as possible, there are still some limitations and areas for further study. The results of this paper mainly analyze the real-time market reaction based on the short-term, but not the medium and long-term impact. Therefore, we hope that future researchers can further expand the sample size and improve the representativeness; consider the medium and long-term impact of blockchain application on the company value; and study the impact of blockchain technology on different industries according to the industry scope.

References

1. Q. Wang, M. Su, R. Li, J. Clean. Prod. **264**, 121742 (2020)
2. L. Hughes, Y. K. Dwivedi, S. K. Misra, N. P. Rana, V. Raghavan, V. Akella, Int. J. Inform. Manage. **49**, 114-129 (2019)
3. C. Daniel, D. G. Baur, L. Zhangxin, Y. Joey, SSRN Electronic Journal. (2018)
4. P. Sharma, S. Paul, S. Sharma, Econ. Lett. **186**(Jan.), 108818.1-108818.3 (2020)
5. A. J. A, C. J. B, Econ. Lett. **181**, 178-181 (2019)
6. D. D. F. Maesa, P. Mori,J. Parallel. Distr. Com. **138**, 99-114 (2020)
7. H. K. S. Lam, Y. Zhan,M. Zhang, Y. Wang, A. Lyons, Int. J. Prod. Econ. (2019)
8. L. Ding, H. K. S. Lam, T. C. E. Cheng, H. Zhou, Int. J. Prod. Econ. **200**(JUN.), 329-342 (2018)