

Behavior and Consequences of COVID-19-related Voluntary Disclosure: Evidence from Pharmaceutical Companies

Ziyi Cao^{1, †}, Eryu Sui^{2, †} and Yidan Wu^{3, *, †}

¹Faculty of Social Science, Western University, London, Canada

²Faculty of business, City University of Macau, Macau, China

³School of Economics and Finance, South China University of Technology, Guangzhou, China

*Corresponding author: ecydwu@mail.scut.edu.cn

†These authors contribute equally.

Abstract. With the explosion of COVID-19, a number of publicly traded companies in the pharmaceutical industry have thrown themselves into the development of novel coronavirus vaccines and therapeutics, and have voluntarily disclosed information about the development process. In this paper, six companies with different quality ratings of information disclosure in the pharmaceutical industry (refer to the results of the 2019 Shenzhen Stock Exchange quality assessment of information disclosure) were selected to explore the behavior and consequences of voluntary disclosure of information by listed companies in the pharmaceutical industry in China. The results show that voluntary disclosure of positive news will have a positive impact on the company's share price. Companies with high disclosure quality ratings have lower price volatility before and after disclosure. Low-rated companies have volatile stock prices before and after disclosure, and the price gains are unsustainable for long periods of time, even falling back to lower levels than they were before disclosure. It is not the case that companies' share prices do not fluctuate due to poor disclosure appraisal results, but rather they may cause a larger market reaction for the purpose of misleading investors. To some extent, this paper enriches the research on voluntary information disclosure of listed companies and will make listed companies understand the consequences of voluntary information disclosure on COVID-19-related issues, provide evidence for relevant supervisory authorities to regulate voluntary information disclosure further, and create a better voluntary information disclosure environment for China's stock market.

Keywords: COVID-19; Voluntary Information Disclosure; Pharmaceutical Industry; Stock Price; Information Disclosure Assessment Results.

1. Introduction

Because of the fixed expenses including rent payments and wages and the decline in social consumption, the outbreak of COVID-19 has hit Chinese enterprises to different degrees, so there is more uncertainty in the stock market. On the one hand, COVID-19 has had a negative but short-term impact on stock markets in affected countries [1]. For example, when China's stricken A-share market reopened on February 3rd, the Shanghai Composite index (SFI) fell by nearly 8%.

On the other hand, the epidemic has also brought many opportunities to listed companies in the pharmaceutical industry. The pharmaceutical industry includes many advanced technologies and production methods. It has broad development prospects and plays an important role in China's national economy. Therefore, it has always been one of the high-tech industries to which people attach the greatest significance, and it is always the focus of investors' attention. With the advent of COVID-19, the related enterprises involved in drug research and COVID-19 test have attracted unprecedented attention from investors in the stock market. As a bridge between listed companies and investors, voluntary disclosure of information has become one of the popular ways for enterprises to attract investors and even reduce the risk of stock price collapse.

However, China's capital market is imperfect at present, and voluntary information disclosure has just begun to form. In this case, many enterprises have poor awareness of information disclosure, and the information disclosed is limited, irregular and untimely due to the lack of guidance, which not

only restricts the development of China's capital market and induces investors to make unwise decisions, but also leads to some investors' losing their enthusiasm.

As time goes by, China's regulatory authorities have paid more attention to information disclosure and formulated corresponding policies and regulations. For example, the Decision on Authorizing the State Council to Adjust and Apply (Securities Law of the People's Republic of China) Regulations in the Reform of Stock Issuance Registration System has been officially implemented since March 1, 2016, requiring enterprises to take responsibility for all the information they offer for listing. The new Securities Law came into effect in March 2020, which defined the legal status of voluntary disclosure of information for the first time.

All in all, based on the above, this paper will analyze the behavior and consequences of COVID-19-related voluntary information disclosure of six pharmaceutical companies listed on the Shenzhen Stock Exchange (SZSE), in order to contribute to the research of voluntary disclosure of COVID-19-related information under special circumstances.

Affected by COVID-19, China's stock market has fluctuated violently, but the pharmaceutical sector rise instead. And the voluntary information disclosure of pharmaceutical listed companies has an unprecedented impact on investors' decision-making.

The original purpose of voluntary information disclosure is to improve the information asymmetry between listed companies and investors and to promote a win-win situation between them.

However, some pharmaceutical companies may make illegal voluntary information disclosure to reap unprecedented profits, letting investors bear too much risk. Such as strategic disclosure, which means deliberately mentioning hot topics in drug research that may not bring benefits to investors to confuse consumers' investment.

Researching the behavior and consequences of voluntary information disclosure related to COVID-19 in the pharmaceutical industry has the following benefits. Firstly, it can make the listed companies better understand the consequences of strategic disclosure. Then, it can provide evidence for the regulatory authorities to further standardize voluntary information disclosure. Finally, it can create a better voluntary information disclosure environment for the Chinese stock market.

Currently, domestic scholars have made rich achievements in the study of the motivation and consequences of voluntary information disclosure, but there is a lack of research and analysis on special circumstances such as COVID-19. The special background of COVID-19 is closely related to the pharmaceutical industry and has its research significance. Impacted by COVID-19, pharmaceutical companies voluntarily disclosed information related to COVID-19, but there has been no literature studying the voluntary information disclosure of COVID-19 until now. Therefore, against the specific background of COVID-19, this paper analyzes COVID-19-related voluntary information disclosure behaviors and consequences of six listed companies in the pharmaceutical industry.

The paper can be organized as follows. Section 2 presents the theory. Section 3 is the literature review. Section 4 illustrates research methods. Section 5 describes the case study. Finally, this paper concludes in Section 6.

2. Theoretical Analysis of Voluntary Information Disclosure

2.1 The Connotation of Voluntary Information Disclosure

2.1.1 The Concept of Voluntary Information Disclosure

Information disclosure refers to a major way for listed companies to directly or indirectly transmit important information that affects investors' investment decisions to investors, which can be divided into mandatory information disclosure and voluntary information disclosure.

The earliest voluntary information disclosure, defined by The Financial Accounting Standards Board in 2001, refers to information other than basic financial information explicitly required by GAAP and securities regulatory authorities voluntarily disclosed by listed companies. In 2003,

China's SZSE also mentioned information related to voluntary information disclosure in Work Guidelines for the Investor Relations Management of Listed Companies, which includes that compared to mandatorily disclosed information, voluntary information is information other than that required to be disclosed under existing laws and regulations, which is voluntarily disclosed by listed companies through various activities and means of investor relations management.

2.1.2 The Methods of Voluntary Information Disclosure

Since voluntary information disclosure is less constrained by laws and regulations, whether to disclose, when to disclose and how to disclose are more flexible. Listed companies can make the decision by themselves, depending on their own situation.

There are three main ways for domestic listed companies in China to voluntarily disclose information. The first one is to disclose in the form of regular financial reports or announcements, which is the most rigorous and formal way. The next is to communicate with institutional investors, securities companies and professional securities analysts and to release information, which is conducive to the company's stock price correctly reflecting its actual value. The last is to publicly disclose information through the media, which speeds up the dissemination of information and enables the market to respond in time, potentially contributing to the greater market effects.

2.1.3 The Content of Voluntary information disclosure

In most cases, the provisions on voluntary information disclosure of listed companies vary from country to country, which is related to the differences in the economic development status and institutional background of each country.

Meek et al. (1995) classify the information voluntarily disclosed by listed companies into three categories: strategic information, financial information and non-financial information while Botosan et al. (1997) categorize it into five types: company background information, non-financial information, historical information, forecast information and management comments and analysis [2, 3]. Moreover, the Financial Accounting Standards Board (FASB) divides the voluntary information disclosure into intangible asset information, company core competitiveness information, forward-looking corporate development information, managers' self-evaluation information, environmental protection and social responsibility information, and corporate governance structure information.

In the immature capital market of China, the definition of mandatory information disclosure and voluntary information disclosure is still unclear. At this stage, China mainly standardizes voluntary information disclosure and classifies the information which is not mandatorily disclosed as voluntarily disclosed information through the exclusivity method on the basis of the *Guidelines for the Content and Format of Information Disclosure of Publicly Issued Securities Companies* issued by the Shenzhen Stock Exchange and the *Measures for the Administration of Information Disclosure of Listed Companies* issued by the China Securities Regulatory Commission.

2.1.4 The Quality of Voluntary Information Disclosure

An important standard for measuring the quality of information disclosure is transparency, including the completeness and comparability of information, adequacy and timeliness of disclosure, etc. When making a voluntary disclosure, although companies can decide on their own whether and how to disclose, they should not adopt selective disclosure, evade the issue and mislead investors. Otherwise, they will receive an inquiry letter from the exchange which will also affect the exchange's rating on the quality of the companies' information disclosure.

At the same time, once the promises made by listed companies when disclosing information voluntarily through the news media are not fulfilled in time, it may backfire and have a negative impact on the company's reputation.

2.2 The Theory Related to Voluntary Information Disclosure

2.2.1 Efficient Markets Hypothesis

According to the Efficient Markets Hypothesis proposed by the famous American economist Fama in 1965, the capital market is completely effective, which means investors can obtain information about commodities accurately and quickly, and make judgments timely [4]. Effectiveness in the securities market refers to the situation where the transaction price of securities can synchronously and completely reflect all the securities-related information, which is closely related to voluntary information disclosure.

Timely and accurate voluntary information disclosure can help listed companies enhance their investors' confidence, thus increasing stock prices.

2.2.2 Information Asymmetry Theory

Information asymmetry refers to when one party in a transaction is in possession of more information than the other. Those with more information have the upper hand, while those with less information are at a relative disadvantage. Information asymmetry includes adverse selection, which occurs when the seller has information that the buyer does not have about some aspect of product quality, and moral hazard, the situation that arises when an individual has the chance to take advantage of a financial deal.

Spence (1974) proposed that in the process of buying and selling, if the information possessed by the buyer and the seller is asymmetrical, in which case the seller knows the full information of the goods sold while the buyer does not know it completely, the buyer can only buy goods below the average quality and will not be able to offer a higher price for higher quality goods because of the lack of detailed product information [5].

2.2.3 The Signaling Theory

As mentioned above, the existence of information asymmetry can easily lead to adverse selection and moral hazard, which is harmful to the efficient operation of the market. Therefore, listed companies need to carefully consider how to credibly transmit information signals to investors who are inferior in information through voluntary information disclosure, which is the focus of signaling theory.

In the securities market, most companies with good business performance and strong development potential choose to voluntarily disclose information, taking the initiative to convey signals that indicate their better-operating conditions and development prospects to establish a good image in investors' minds and distinguish themselves from other ordinary enterprises. High-quality voluntary information disclosure can help listed companies transmit information to investors timely, completely, truthfully and effectively in the market.

3. Literature Review

In terms of the evaluation of the listed companies' information disclosure quality, the voluntary disclosure index (VDI) constructed by Meek (1995) and Botosan (1997) is relatively authoritative. Meek (1995) divides corporate disclosures into strategic information, financial information and non-financial information while Botosan (1997) divides them into company background information, non-financial information, historical information, forecast information, and management comments and analysis [2,3]. Both the two methods are widely used in analysis currently.

A listed company's voluntary information disclosure can seriously affect its stock price. Chen and Han (2010) use the event study method and multiple regression analysis models to analyze the data of 173 SZSE A-share listed companies and verify the hypothesis that voluntary information disclosure has a value effect in both the short and long term, which means voluntary information disclosure has an impact on the short-term and long-term stock prices of listed companies [6].

At the same time, the quality of information disclosure can also affect the stock price. By constructing the unbalanced panel data regression model and moderating effect model, Chen and Tian (2021) find that the higher the quality of information disclosure is, the lower the risk of stock price crash will be. They also conclude that the downgrading of information disclosure evaluation results will lead to a significant increase in the risk of stock price crash shortly soon [7].

Through further empirical research, Han et al. (2020) selected monthly panel data of A-share listed companies as a sample during 2014-2016 and found that there is an impact of information disclosure on share price volatility and that more information disclosure can reduce share price volatility [8].

Xiao (2019) proposed that managers of listed companies actively respond to the real economic information carried by stock prices and improve the quality of information disclosure, which can help improve stock price accuracy and reduce abnormal share price volatility [9].

However, listed companies may make incomplete or even untruthful voluntary disclosures in pursuit of interests.

Ye (2014) analyses combined with the game relationship and finds that in the current process of information disclosure by listed companies, the costs of untruthful disclosure are much smaller than the benefits, i.e. it is always profitable for listed companies to disclose false information [10]. Therefore, the biggest beneficiaries of abnormal earnings are relevant institutions and event insiders, and retail investors generally gain little or even suffer losses. This makes it necessary to properly define and supervise the information disclosure capabilities of different companies in order to maintain the proper functioning of the market.

Listed companies may also choose to make voluntary disclosures about their risks to reduce the risk of share price collapse. The voluntary disclosure of risk is an important way for companies to mitigate information asymmetry and improve their information environment. Some studies have found that companies with high growth potential or low stock liquidity tend to voluntarily disclose risk information to mitigate information asymmetry. At the same time, companies that disclose risk information have a reduced risk of share price collapse due to reduced information asymmetry compared to those companies that do not report risk information.

By studying voluntary disclosure of risk in financial reporting with Heckman's two-step regression and 2SLS to explore the relationship between risk disclosure and equity risk, Hao and Dong (2022) showed that in extreme cases, detailed voluntary disclosure of risk is needed to reduce equity risk [11].

In conclusion, the research on voluntary information disclosure of listed companies in western countries has begun earlier and is mainly focused on the influencing factors, motives and consequences of voluntary information disclosure.

In terms of research methods, most of China's research is an empirical study conducted on A-share listed companies in China, in which scholars have found that both voluntary disclosure and its quality may have an impact on the share price of listed companies. In terms of motivation, listed companies may engage in different levels of voluntary information disclosure out of profit-seeking or goodwill considerations. At the same time, COVID-19 is a new hot topic at the moment, and there is a lack of relevant research using it as a background, which needs to be further developed.

Hence, based on the existing research results of scholars in China and western countries, this paper selects the voluntary information disclosure events of six specific listed companies in the pharmaceutical industry after the outbreak of COVID-19 as the research object, explores their behaviors and consequences, and analyses their impact on share price movements in conjunction with the results of information disclosure quality assessment.

4. Research Method

This paper uses the following research methods.

4.1 Event Study Method

In 1933, Dolley pioneered the event study method, after which this method has been widely used in the field of Economics and Finance because of its advantages of simple theory, clear logic and convenience of learning [12]. Mainly used to study an event's impact on asset prices and duration, the most common analysis method in the event study method is the market model method, which is theoretically the most reliable method of measuring market returns. It calculates the normal rate of return according to the capital asset pricing model, taking the beta coefficient of the stock into account.

Applying the event study method, this paper selects six listed companies in the pharmaceutical industry as research objects and uses the market model to briefly analyze the impact of the pharmaceutical company's disclosure of COVID-19-related voluntary information on its stock price.

4.2 Literature Research Method

This article consults research findings on voluntary information disclosure to analyze the behavior of voluntary information disclosure.

4.3 Combining Qualitative Analysis and Quantitative Research

This paper attempts to analyze the behavior and possible reasons for the voluntary disclosure of six announcement events related to the voluntary disclosure of the development of COVID-19 vaccines by six companies in 2020. Then, using the data in the event analysis method in this paper, this paper objectively analyzes the impact of voluntary disclosure on stock prices and draws relevant conclusions, combining qualitative and quantitative aspects to ensure the scientific nature of the study.

Using the research results of internal and international scholars as the foundation, this paper attempts to analyze the impact on share prices of six voluntary disclosure event behaviors of six listed pharmaceutical companies. Starting from theories such as the efficient market hypothesis, signaling theory, and information asymmetry theory, based on information disclosure rating standards, this article takes six events of six listed pharmaceutical companies as the main research objects and uses the event study method to analyze the possible causes and relevant conclusions of the changes in their share prices before and after the disclosure. Finally, recommendations are made to improve companies' information disclosure from the perspective of listed companies, regulators and investors.

5. Case Study of Voluntary Information Disclosure

5.1 Sample Selection and Data Sources

This paper selects six representative pharmaceutical companies, including Chongqing Zhifei Biological Products Co., Ltd. (ZFSW), Shenzhen Kangtai Biological Products Co., Ltd. (BioKangtai), Walvax Biotechnology Co., Ltd. (Walvax), Guan Hao Biotech Co., Ltd. (Guanhao Biotech), Zhejiang Yontai Technology Co., Ltd. (Yonta) and HAINAN HAIYAO CO., Ltd. (Haiyao), each with 1 significant event, for study. The event study method is used to calculate the abnormal rate of return (AR) and cumulative abnormal return (CAR), conduct research and analysis, and preliminarily judge the impact of events on stock prices.

The voluntary information disclosure announcement comes from CNINF. The information disclosure quality rating comes from SZSE. The price up-down of individual stocks and market indexes come from the CSMAR database.

5.2 Sample Company Profile

The six sample companies selected in this paper are all listed on SZSE, belong to the pharmaceutical industry and all made voluntary information disclosure related to COVID-19-related medicines in 2020.

Table 1. Company Profile

Company	Date of Establishment	Main Business	Company Strategy
Chongqing Zhifei Biological Products Co., Ltd. (ZFSW)	2002	R&D, production, sales, promotion, distribution and import and export of vaccines and other biological products	The company adopts a Technology plus Market Driven Model, adheres to independent R&D and actively introduces leading international technology.
Shenzhen Kangtai Biological Products Co., Ltd. (BioKangtai)	1992	Development, production and sales of vaccines	The corporate purpose is to create better vaccines and benefit human health; the corporate vision is to become a well-known large-scale multinational biopharmaceutical company.
Walvax Biotechnology Co., Ltd. (Walvax)	2001	R&D, production and sales of Biotechnological drugs such as vaccines	The company focuses on international business development and insights into the international vaccine corporate ecology to optimize the strategic pattern, altering from bringing-in to going-out.
Guanhao Biotech Co., Ltd. (Guanhao Biotech)	1999	Layout in the fields of biomaterials, stem cells, pharmaceuticals, and advanced medical technologies and products	The company is driven by innovation, based on the field of regenerative medicine, aiming at making outstanding contributions to human life, health and quality of life; the corporate vision is to become a global leader in the regenerative medicine industry.
Hainan Haiyao Co., Ltd. (Haiyao)	1965	High value-added generics and specialty drugs	According to the strategic deployment of <i>Innovation for Development</i> , the company has carefully built up three major R&D systems for chemical drugs, traditional Chinese medicine and biotechnology.
Zhejiang Yongtai Technology Co., Ltd. (Yonta)	1999	Manufacturer of fluorobenzene fine chemicals	With the development strategy of 'endogenous growth and outward expansion', the company has formed a vertically integrated industrial chain from intermediates, APIs to formulations.

5.3 Analysis of the Market Performance of Sample Companies after Voluntary Information Disclosure Based on Event Study Method

5.3.1 Event Overview

The selection of these six sample companies and related events is based on the three following reasons. Firstly, they are all pharmaceutical companies listed on SZSE. So they are faced with the same market index, information disclosure rating standards and investors. Secondly, the events they disclosed all happened in 2020, which was related to the research of COVID-19-related drugs, and this kind of information was a trend in the investor market at that time. Thirdly, all the selected events are positive, so that the subsequent data analysis and comparison can be consistent.

Table 2. Event Introduction

Company	Event Day	Event Content
ZFSW	2020/02/03	Technology transfer for COVID-19 vaccine research signed with Institute of Microbiology, Chinese Academy of Sciences. ZFSW is responsible for the subsequent industrial development based on the relevant technical secrets and experience acquired by the Institute
BioKangtai	2020/08/06	Signed an exclusive licensing cooperation framework agreement with AstraZeneca in the Chinese mainland market to promote the clinical development, production and commercialization of the new vaccine invented by AstraZeneca and the University of Oxford in the Chinese market. AstraZeneca conducts technology transfer and provides technical support, and BioKangtai ensures sufficient production capacity.
Walvax	2020/05/13	Research and late-stage commercialization of COVID-19 vaccine with Suzhou Abogen Biosciences (ABOGEN). ABOGEN is primarily responsible for the clinical studies of the vaccine and Walvax is primarily responsible for the subsequent research and commercial production and grants research and development costs to ABOGEN.
Guanhao Biotech	2020/02/03	In the <i>Announcement on the Joint U.S. Joint Stock Company's Plan to Conduct Research on the Novel Pneumonia Coronavirus Vaccine</i> , Guanhao Biotech said that it will cooperate with ZY Therapeutics Inc., a joint-stock company in the United States, to research the COVID-19-related mRNA vaccine (Z-VaccirNA).
Haiyao	2020/02/14	Haiyao has completed the first batch of production of Remdesivir formulation, with large-scale production capacity; the company and national and international partners successfully developed Remdesivir raw material technology and purification technology synthesis process, can mass production of Remdesivir raw material with a purity of 99% or more.
Yonta	2020/02/03	Yonta replied to investors on the interactive platform of SZSE that the company is involved in the production of COVID-19-related drugs and intermediates and research found that the drug Remdesivir under development by Gilead Sciences, Inc. is a good fit with the company's existing products.

5.3.2 Data Analysis

In this paper, the announcement date of the selected event is the event date, defined as T0. Considering the possibility of information being leaked in advance, this paper intends to select 2 trading days before and after the event date as the event window, i.e. [-2, 2]. The estimated window period is from the 210th trading day to the 11th trading day before the announcement date, i.e. [-210, -11]. This paper uses the market modelling method for analysis. The closing prices of the sample companies and the market's price up-down are obtained from the CSMAR database, and Excel software is used to calculate the change ratio, abnormal return (AR) and cumulative abnormal return (CAR).

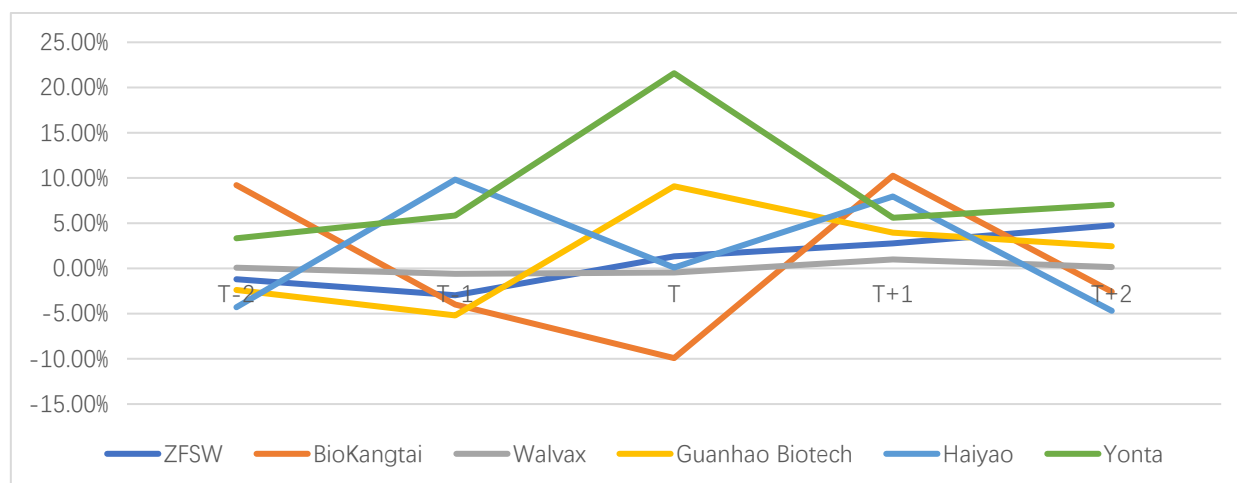


Fig. 1 Trends of AR during Event Windows for Sample Companies

5.3.2.1 Chongqing Zhifei Biological Products Co., Ltd. (ZFSW) First Public Announcement of Framework Agreement on Collaboration in the Development of a Novel Coronavirus Vaccine

During the event window, ARs were -1.19%, -2.97%, 1.34%, 2.76% and 4.76% respectively, the cumulative abnormal return (CAR) was 4.71%. The CAR reached a significant increase of 4.71% despite a negative AR two days before the event became public, and there was an obvious steady upward trend in AR with an almost multiplicative increase, after the event became public.

In practical terms, it is clear that many investors did not obtain favorable information about ZFSW before the event became public ($AR < 0$), or were unsure of the Authenticity of the disclosure about the development of the COVID-19 vaccine. However, on the day of the announcement and the following two days ($AR > 0$), the positive growth tends to be obvious, which shows that investors are mostly continuing to be bullish on the vaccines researched and developed by ZFSW. This phenomenon may be due to the company's high disclosure rating and partly due to the fact that the company has received awards such as *China AAA Credit Enterprise*, which proves the company's credibility. They both enhance the credibility of the announcement and investors' confidence that the company's stock will appreciate.

5.3.2.2 Shenzhen Kangtai Biological Products Co., Ltd. (BioKangtai)'s Disclosure of The Announcement on Signing with AstraZeneca

During the event window, BioKangtai's ARs were 9.20%, -3.99%, -9.92%, 10.25% and -2.58% while its CAR was 2.96%. Overall, AR fluctuated greatly, which reached 9.20% two days before the announcement and then fell rapidly to -9.92%. The day after the announcement, the stock market made a timely response, and the AR peaked 10.25%. Before and after the event, the company's stock price showed an unstable trend. From the overall point of view, however, the release of the cooperation announcement was good news for the company and its investors, which had a positive impact on the stock price.

Considering the actual situation, the research and development of COVID-19-related vaccines and drugs have become a hot topic for pharmaceutical companies and their investors in the context of the epidemic. If a pharmaceutical company can show a good development trend in the research and development of the vaccine, reflecting the company's scientific research strength and research and development potential, its stock price will rise accordingly.

5.3.2.3 Walvax Biotechnology Co., Ltd. (Walvax) First Release of Cooperation Agreement on the Development of Novel Coronavirus mRNA Vaccine Technology with Suzhou Aibo Biotechnology Co.

During the event window, Walvax's ARs was 0.07%, -0.60%, -0.45%, 0.99% and -0.14% respectively and its CAR was 0.15%. AR was negative two days before and on the day of the event, but there was positive growth in the following two days, and even the one day after the event, the growth rate was extremely rapid.

Combined with the actual situation, it can be seen that AR is low a few days before the event was disclosed, but reached a relatively high level after the event was disclosed. It can be seen that the first disclosure of the COVID-19 vaccine still has a relatively positive impact on the company, but the growth is not very rapid for two possible reasons, firstly, the company's information disclosure rating is B, so investors have positive but not strong confidence in the degree of trust in its events and future stock appreciation potential, secondly, the clinical trial announcement disclosed by Walvax in May, but many other companies have already launched clinical trials in February, and Walvax was not a frontrunner, investors may have invested in early-stage companies or questioned the company's scientific research capabilities.

5.3.2.4 Guanhao Biotech Co., Ltd. (Guanhao Biotech) Release of Announcement on the Joint U.S. Joint Stock Company's Plan to Conduct Research on the Novel Pneumonia Coronavirus Vaccine

During the event window, Guanhao Biotech's ARs were -2.38%, -5.20%, 9.08%, 3.95% and 2.45% while its CAR was 2.96%. Two trading days before the announcement, its AR was slightly negative, and the real return was lower than the expected return. On the day of the announcement, the market responded positively promptly on time. AR rose sharply by nearly 15% and achieved a change from negative to positive, reaching as high as 9.08%. Over the next two trading days, AR retreated modestly, but it was still clearly positive.

In the situation of the rapid spread of COVID-19, the research and development of the new vaccine have become a top priority. The mRNA vaccine that Guanhao Biotech intends to research in cooperation with ZYTherapeutics Inc. has more advantages than traditional vaccines in terms of safety. If the project can successfully innovate the COVID-19-related vaccine and realize industrialization, it will contribute to disease prevention and control in China and other countries around the world. Moreover, it can objectively bring profits to the company, and enhance the company's status in the specific industry, proving the company's strong strength, thus enhancing investors' confidence and making the stock price rise.

5.3.2.5 Announcement on Progress in the Development of Antiviral Drugs Disclosed by Hainan Haiyao

During the event window, the ARs were -4.30%, 9.82%, 0.09%, 7.96% and -4.69%, for a CAR of 8.88%. Overall, the AR were volatile, dropping to -4.30% in the two days before the announcement and then rising rapidly to 9.82%. On the day following the announcement, Haiyao responded in time, with the AR reaching a high of 7.96% again. On the following two days, however, the AR declined sharply to -4.69%. The company's share price showed an erratic trend before and after the event, but on the whole, the release of the announcement of progress on Haiyao's COVID-19-related drug was favorable news for both the company and its investors and had a positive impact on the share price.

In practical terms, the news of the potentially effective drug Remdesivir will undoubtedly attract the attention of investors and influence the trading price of the company's shares and their derivatives in the background of COVID-19.

5.3.2.6 Yonta Disclosed the Company's Involvement in the Production of COVID-19-related Drugs and Intermediates for the First Time on SZSE's Interactive Platform

During the event window, the ARs were 3.33%, 5.84%, 21.58%, 5.60% and 7.03%, for a CAR of 43.39%. Overall, the AR was volatile, rising dramatically from 3.33% to 21.58%, an increase of 18.25%, during the two days before the announcement. In contrast, on the day following the announcement, the AR fell to 5.60%, and on the following two days, the AR climbed back to 7.03%. Before the event, the company's share price showed a rapidly rising trend, and after the event, there was a tendency for the company's share price to fall before rebounding. However, on the whole, the information disclosed by Yonta on the Interactive Platform about COVID-19-related drugs was positive news for the company and its investors and had a positive impact on the share price.

In combination, the disclosure of the expected cooperation between Yonta and Gilead Sciences caught the investment market trend in 2020 and inspired investors to invest, further driving up the market price of the stock.

5.3.2.7 Total Analysis of the Six Sample Companies

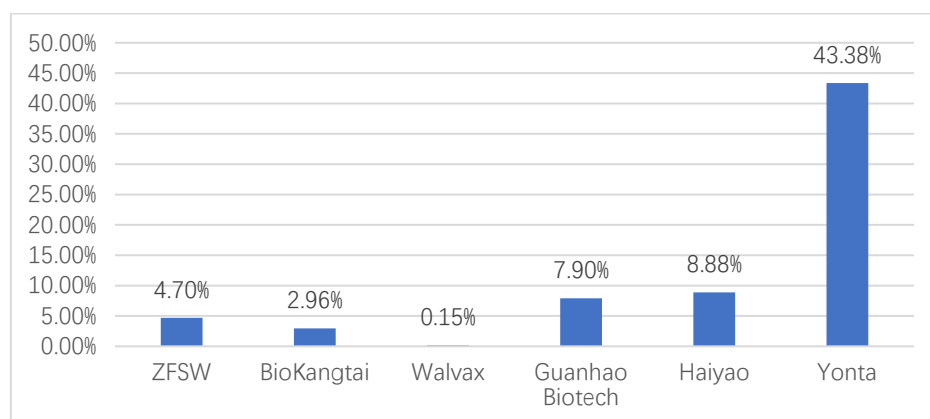


Fig. 2 Sample Companies' CARs Situation

Overall, CARs of all six sample companies were greater than zero, demonstrating that positive voluntary disclosure had a positive impact on the earnings of the sample companies. For all five companies except Yonta, CARs for the 2 days before and after the announcement date are relatively close. Combined with the line and bar charts, it can be seen that Walvax has the lowest share price volatility and the smallest CAR.

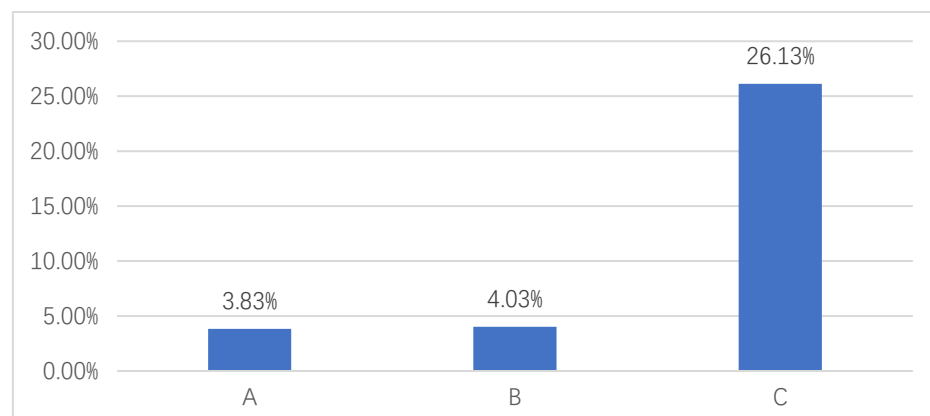


Fig. 3 Same Rating Sample Companies' CARs Situation

Analysis of the 2019 SZSE disclosure assessment results in conjunction with the sample companies.

The CARs of companies with A and B ratings are around 4%, while the CARs of two companies with C ratings are almost seven times higher than those with A and B ratings. The CARs of the companies with good disclosure ratings are smaller and smoother, while the CARs of the companies with poor ratings are, on the contrary, large and vary widely between companies. There are two possible reasons for this.

Firstly, companies with good ratings have high market expectations for their expected returns and CARs, while not very high, still steadily maintains positive market expectations for the company's stock. Poorly rated companies do not have high market expectations, but it is not surprising that the stocks of poorly rated companies have large AR as the disclosure of the COVID-19 vaccine is the hot topic in 2020.

Secondly, due to the large difference in CARs between the two companies with C ratings, it can also be seen that the CAR of poorly rated companies are extremely volatile, possibly because investors are not fully confident in the disclosure of information about poorly rated companies, resulting in an extremely volatile market response.

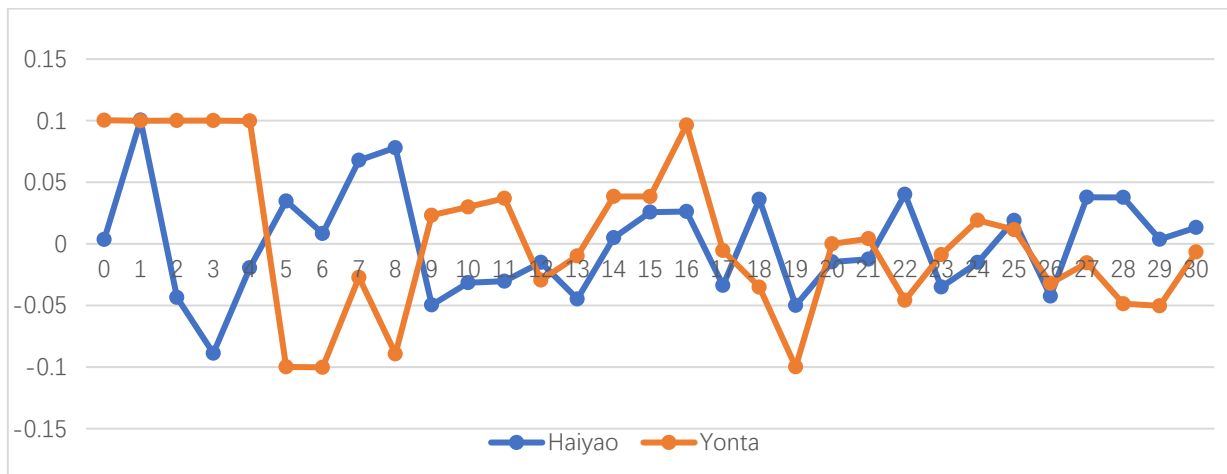


Fig. 4 Change in the 30-day Period after the Event Date of Haiyao and Yonta

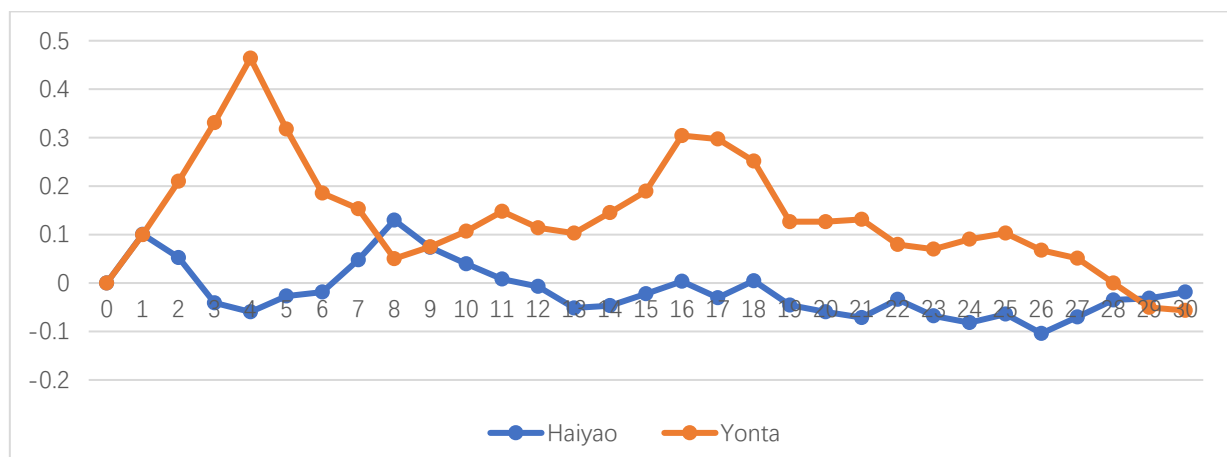


Fig. 5 30-day Holding Period Yield for Companies with a C Rating on Information Disclosure

For the two companies rated C with the largest CAR mentioned above, this paper obtains the closing prices of the sample companies from the CSMAR database and uses Microsoft Excel to calculate the stock price up-down and the holding period yield 30 days after the event day.

It can be observed from Picture X that one month after the event, the price up-down of Haiyao and Yonta, which were rated C by SZSE in 2019, fluctuated wildly within 30 days after the event. On the

30th day after the event, the stock price of Haiyao gradually returned to what it was on the event day while the price of Yonta was far lower than what it was on the event day.

From Picture X+1, it can be observed that one month after the event day the holding period yield of the two companies rated C gradually approached 0. On the 30th day after the event date, the holding period returns of both companies became negative.

In general, the positive impact of the voluntary information disclosure of the two companies was not long-term, and Yonta even suffered a backlash from the disclosure. The reason may be that investors gradually calmed down after a short impulse investing on the event day. They combined the event with various factors such as the poor performance in the SZSE's information disclosure assessment results in 2019, losing confidence in the accuracy of the companies' information disclosure and further thinking about the direction of investment. Adjustments were made so that the companies' price up-down gradually returned to normal.

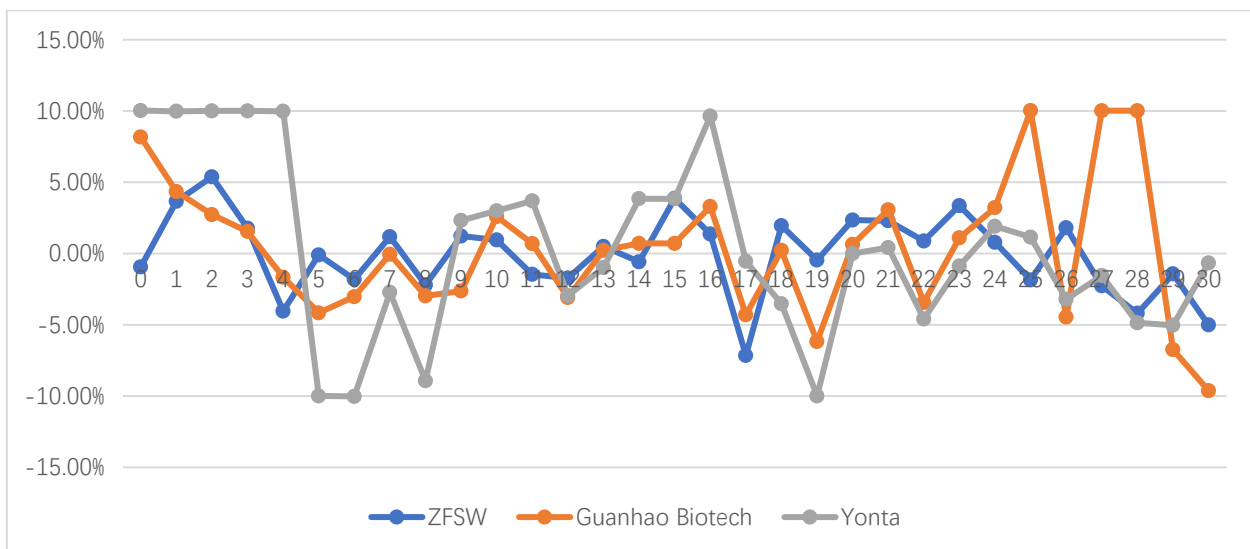


Fig. 6 Change in up-down of ZFSW, Guanhao Biotech and Yonta on 3 February 2020 and the following 30 trading days

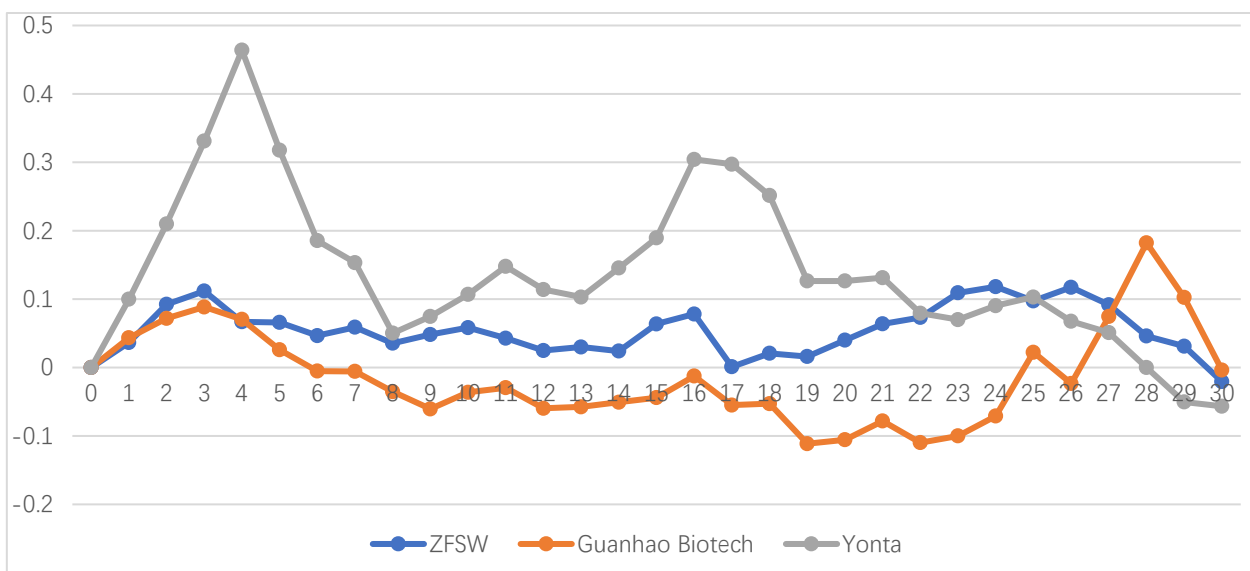


Fig. 7 Change in holding period yields for ZFSW, Guanhao Biotech and Yonta on 3 February 2020 and the following 30 trading days

Since three sample companies all made voluntary disclosures related to COVID-19-related drugs on February 3, 2020, and from different 2019 SZSE disclosure ratings. This paper compares the

contemporaneous change in up-down rates and the change in holding period returns over 30 days for these three events. The significance of this study, which compares the impact of different ratings on share prices by placing similar voluntary disclosure companies from the three ratings within the same period time, is that it excludes the effect of changes in the market environment on the results. The closing prices of the sample companies were obtained from the CSMAR database and Excel software was used to calculate the 30-day increase or decrease and holding period return after the event date.

On 3 February 2020, the first day the stock market reopened after the Chinese New Year break, the overall stock market was in a slump due to the impact of COVID-19, however, the pharmaceutical industry bucked the trend and rose.

From figure 6, it is evident that within the 30 trading days after 3 February 2020 and the following days, the up-down rates of Guanhao Biotech and Yonta, rated B and C respectively, were more volatile and even saw a number of cases close to $\pm 10\%$, while ZFSW, rated A, was relatively stable and basically remained between $\pm 5\%$.

Comparing the up-down rate on the 30th day after the event with the up-down rate on the day of the event, it can be seen that ZFSW, Guanhao Biotech and Yonta overall fell by 4.07%, 17.79% and 10.69% individually, with Guanhao Biotech with a B rating and Yonta with a C rating showing more dramatic changes overall compared to each other. As can be seen from Figure 7, in the medium to long term, the share price of C-rated Yonta was much higher than that of the better-rated A and B companies in the early stage, but it clearly entered a period of weakness in the late stage, with the share price falling off a cliff instead of staying high, and basically trending downwards slowly in the late stage; the holding period yields of B-rated Guanhao Biotech and A-rated ZFSW were more stable in the long term.

In general, companies with a disclosure rating of C may show a significant rise in the short term, even after the disclosure of good news, but this is not sustainable and will return to or even fall below the pre-disclosure price in the medium to long term, and the share price is extremely volatile during this period, reflecting investors' distrust of the stock and the disclosure announcement. Companies with a higher disclosure rating of A and B are relatively stable, even if they do not experience particularly significant increases in the short term, and the share price is less volatile and remains at a stable level even through time, and A-rated companies maintain this better than B rated companies.

6. Conclusions

Six pharmaceutical companies listed on the Shenzhen Stock Exchange disclosing COVID-19-related matters in 2020 were selected in this study. This paper analyzes the behavior and results of Chinese pharmaceutical companies' voluntary information disclosure through the event study method.

Based on the results of the event study method, the positive news has a positive impact on the company's share price. When combined with the quality of companies' disclosures, companies with higher ratings on the 2019 Shenzhen Stock Exchange's disclosure assessment had more stable share price up-down, less volatility in their share prices, and stable abnormal returns and cumulative abnormal returns at a low level.

In contrast, companies with lower ratings on the 2019 SZSE disclosure assessment had relatively high volatility in their share prices and short-term abnormal returns, and higher cumulative abnormal returns. However, in the medium to long term, for example in the month following the event date in this paper, companies with lower ratings have seen their share prices rise unsustainably and gradually fall back down, even to lower levels than before the voluntary disclosure. It is not the case that companies' share prices do not fluctuate due to poor disclosure appraisal results, but rather they may cause a larger market reaction for the purpose of misleading investors.

Economic development and prosperity have become a challenge due to COVID-19. It takes a lot of effort to keep the economy healthy and running smoothly. Against this background, the managers of listed companies should not fall into the error of myopia misconception of making incomplete voluntary disclosures and behaving like strategical disclosure to promote short-term share price rise.

Otherwise, even if short-term price increases are achieved after a voluntary information disclosure, in the long run, there is a risk that the stock price will fluctuate too much and fall back, even causing more damage to the company.

With the implementation of the registration system in China, voluntary information disclosure will become an inevitable trend. As a means to alleviate information asymmetry, it is an aid to the healthy operation of the capital market. Although only six listed companies in the pharmaceutical industry are analyzed and studied in this paper, we can also find that different quality of information disclosure will have different impacts on the stock price of the company from typical cases.

Thus, if listed companies want to maintain long-term, stable and efficient development and gain the goodwill of investors and capital markets, they need to raise awareness of voluntary information disclosure, improve the corporate governance framework, conduct accurate and honest information disclosure, and respond to relevant authorities promptly. Regulators also need to ensure the fairness of regulation of companies and sensitivity to the possibility of false events. Penalties and other methods can be used when necessary to ensure that voluntary capital market disclosure is effective and healthy. Individual investors, in the current tough economic situation, should be vigilant against the strategic disclosure behavior of listed companies, issue a rational analysis of the company's announcement and avoid suffering huge losses due to blindly following the crowd.

References

- [1] He Qing, Liu Junyi, Wang Sizhu, Yu Jishuang. The impact of COVID-19 on stock markets. *Economic and Political Studies-Eps*, 2020, 8(3): 275-288.
- [2] Meek, G. K., Gray, S. J. Factors Influencing Voluntary Annual Report Disclosures by U.S., U.K. and Continental European Multinational Corporations. *Journal of International Business Studies*, 1995, 26(3): 555-572.
- [3] Botosan, C. A. Disclosure Level and the Cost of Equity Capital. *The Accounting Review*, 1997, 72(3): 323-349.
- [4] Fama, E. F. The behavior of stock-market prices. *Journal of Business*, 1965, 38(1): 34-105.
- [5] Spence, M. Competitive and optimal responses to signals: An analysis of efficiency and distribution. *Journal of Economic Theory*, 1974, 7(3): 296-332.
- [6] Chen Guohui, Han Haiwen. Valuation Effects of Voluntary Information Disclosure. *Research on Financial and Economic Issues*, 2010, (05):60-68.
- [7] Chen Yuanzhi, Tian Jing. Information Disclosure Quality, Investor Expectations and Stock Price Crash Risks: An Empirical Study of China's SME and GEM Markets. *Financial Regulation Research*, 2021, (12): 75-91.
- [8] Han Yan, Cui Xin, Cheng Yuxing. A Research on the Influences of the Listed Firms' Information Quantity on Stock Price Volatility. *Management Review*, 2020, 32(12): 27-36.
- [9] Xiao Kui. Research on Corporate Governance and Information Disclosure from the Perspective of Stock Price Accuracy. *Modernization of Management*, 2019, 39(01): 13-16.
- [10] Ye Hua. Behavioral Choice of Listed Companies' Information Disclosure: The Game between Listed Companies and the Regulatory Authorities. *Friends of Accounting*, 2014, (21): 74-77.
- [11] Hao Yarong, Dong Bin. Determinants and Consequences of Risk Disclosure: Evidence from Chinese Stock Markets during the COVID-19 Pandemic. *Emerging Markets Finance & Trade*, 2022, 58(1): 35-55.
- [12] Dolley, J.C. Characteristics and Procedures of Common Stock Split-Ups. *Harvard Business Review*, 1933, (11): 316-26.