Study on the Impact of COVID-19 on the Yield of Traditional Chinese Medicine Sector

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ABSTRACT

In order to investigate whether the release of relevant news has a significant effect on the daily return of the Chinese medicine sector so as to discuss consumer behavior. Based on the epidemic era and the efficient market hypothesis, this article uses the CSI Traditional Chinese medicine index and the CSI 300 index stock data to examine the data using event study methodology and hypothesis testing to investigate whether the results are significant. A total of three tests are conducted and the results are all significant, thus proving the hypothesis that the release of relevant news has a significant impact on the daily return of the Chinese medicine sector. This indicates that the investors' decisions are not completely rational and there is a great possibility of irrational behavior of blindly following public opinion to follow the trend of investment.

Keywords: COVID-19 Pandemic; Event Study Methodology; Traditional Chinese medicine; Media reports

1. INTRODUCTION

The COVID-19 has had a major impact on China's economy, the growth rate of the economy gradually slowed down.

As an important part of the economic market, the stock market went through huge fluctuations at the beginning of 2020. According to statistics, after the Chinese stock opened on February 3 in 2020, the situation is very negative. A total of 3,150 stocks in Shanghai and Shenzhen declines by the limit. The Shanghai Composite index closed down 7.72% and the CSI 300 index fell 7.88%.

Under the background of COVID-19, some industries are in the doldrums, while the other industries meet new opportunities. As the global epidemic continues to spread, countries have tapped effective drugs to treat new coronavirus pneumonia. The therapeutic effect of the traditional Chinese medicine such as Lianhua Qingwen (Yiling Pharmaceutical) in this new coronary pneumonia epidemic has attracted attention from all walks of life, and relevant research reports continue to appear. As of March 23,2020, 74,187 confirmed COVID-19 cases in China have been treated with TCM, accounting for 91.5% of the total. As the media continues to report, it will have an impact on the stock market of the TCM plate. The traditional Chinese medicine market is increasingly favored by domestic and overseas markets.

Besides，in the modern society, the news media is not only the investors' information source but also is the main channel for dissemination of information. According to the survey of Security Association of China, they find that the individual investors are the most important investors on the asset size to fund and in terms of quantity.

However, those individual investors lack the specialized information, and have limited access to information, thus the news media's reports are important for their strategy. News media can through the report to affect the Chinese stock market directly or indirectly. Wang X D, Shang W, Wang S Y. The effect of online news on the Chinese stock market[J]. Systems Engineering Theory & Practice, 2019,39(12): 3038-3047. Their model suits to the assumption that the online news can affect the Chinese stock market.

2. RESEARCH SIGNIFICANCE AND LITERATURE REVIEW

2.1. Research significance

With the rapid development of the Internet, media has an increasingly important impact on people's lives. People are no longer limited to browsing news on specialized news platforms, including some social media platforms, such as short video app like Tic Tok and Racer, as well as microblogs and WeChat public websites, which are transmitting hot news to people. People are used to getting first-hand information from the Internet. On the contrary, the number of stockholders in China is also rising steeply. Data shows that the number of natural person investors in China reached 201,969,100 by the end of March 2022. However, most retail investors lack professional background knowledge, overly pursue short-term gains and despise long-term investments. They have little capital and information, blindly listen to some so-called gossip to select stocks, and are more vulnerable to the guidance of news media. In the context of the COVID-19, some reports on the special drugs for treating this virus are even more numerous. Therefore, this paper selects certain reports on the Chinese medicine sector and uses event analysis to study the impact on the Chinese medicine industry. Have these media reports influenced investors' investment decisions and thus driven stock price volatility? If so, to what extent has this influence played a role? How can investors be guided to view online media more rationally? These questions are of strong research interest.

2.2. The impact of public health emergencies on the stock market.

Public health emergencies refer to major infectious disease outbreaks, mass unexplained diseases, major food and occupational poisonings, and other events that seriously affect public health (domestic definition) that occur suddenly and cause or may cause serious damage to public health. Like SARS, COVID-19, AIDS, EBOLA, etc. [1]. Yu Fan (2021) believes that with the occurrence of major public emergencies, the stock market will be negatively impacted; at the same time, with the occurrence of such events, new demands will also be generated, which will affect a particular industry. It has a positive impact, which in turn makes its stock price rise in the context of economic downturn. For example, during the pandemic, people's demand for medical equipment and masks has increased significantly [2]. Zhang Chuanxi (2021) used event analysis, VAR model and panel data regression model to conclude that the impact of the global outbreak of the COVID-19 on the domestic stock market is timely, and to a certain extent, the major consumer industries and medical The health industry and the traditional Chinese medicine sector were less affected by the pandemic and recovered quickly [3].

Chen Lin and Qu Xiaohui (2020) used the panel data fixed effect model to point out that the company's financial leverage level will increase as the company size decreases, and different sectors and different types of stock markets will also exist certain difference. It can be concluded that even if the COVID-19 has a negative impact on the company's stock price, the investors can still rationally distinguish the impact of different companies.

2.3. The impact of public opinion media on the stock market

Tang Yihe and Zhang Bo explained the efficient market theory, the essence of which is to study the speed and distribution of the response of securities market prices to all relevant information [4]. Based on the efficient market theory It is concluded that the price of the stock reflects all public market news, so it can be concluded that public opinion information has no effect on the stock market in essence, but there are many financial anomalies that show that this is not the case [5]. Li Zhenghui and Hu Zhihao (2018) researched pointed out that public opinion media will have an impact on investors' confidence, emotions and attention. It can be seen that the media will play an important role in disseminating financial market information [6]. Lin Bingcan (2013) found that through data analysis，it has been pointed out that "Internet public opinion information" represented by investor sentiment will indeed have an impact on the price of stocks [7]. Fang Qinyuan (2020) believes that Internet public opinion caused by sudden public health events will have negative impact on the overall stock market [8]. Sun Zhenjie (2020) pointed out that during the COVID-19, through the impact of the disclosure of government emergency information on the people's irrational panic buying behavior, it was found that the disclosure of government emergency information during the epidemic can improve people's satisfaction with the openness and transparency of information. It can be seen that if the government can release public information that is satisfactory to the masses and of high quality, it can effectively reduce the irrational behaviors of investors.

2.4. The research about investors' reaction

In 1970, Eugene Fama mentioned an important concept in financial economies, Efficient Market Hypothesis. EMH refers to that asset prices reflect all available information, it assumes that investors have perfect rationality, and ability of risk aversion. Compared to EMH, the Behavioral Finance has challenged the assumptions in EMH. In fact, the complex financial market has several events are not understandable based on EMH. The BF breaks seemingly perfect EMH, considering that investors are not fully rational, having limits to their self-control and influences by their own

biases. Different investors have different background, social status, personal experience, financial competence, and the storage of knowledge about market and stocks. When people are doing investment decisions, they will be affected by their own cognition, but also the external impacts, resulting the value of stocks deviates away from its real value. BF mentions the impact of emotional and psychological effects on investment decisions, and it leads to investors' overreaction and under-reaction.

Representative heuristic is one particular model of BF, the flaw is that it places too much emphasis on classifying things into typical categories and does not focus on other potential possible evidence [9]. demonstrates this phenomenon. Debondt and Thaler further explain Winner Lose Effect, thinking that due to the representative heuristic, leading investors to show excessive pessimism about past losers' portfolios and overly optimism about winner-tackers' portfolios, which cause under-reaction and overreaction respectively.

Overconfidence is another typical reason leads to overreaction of investors due to the emotional and psychological effects. Most people respond to intuition, historical evidence and common sense. This kind of hindsight cleverness can make investors pay less attention to reflection on behavior. It can also be seen that people often trust their own judgement too much. Odean found that individual investors would buy a stock soon after selling a stock, and the stock they sold in the first year would perform better than the stock they bought, leading to overconfidence about buying a new a stock and selling it, the overconfidence causes investors to trade frequently, resulting overreaction. Another consequence of overconfidence is that investors rely too much on information they collect and ignore the information in the company statements.

To verify whether China's stock market is effective and whether is an overreaction, many scholars have made research and expressed different point-views [10]. after empirical examination of the data of 48 companies on the Shanghai stock market for 722 trading days between June 1993 and April 1996, it was concluded that the Shanghai stock markets do not show the overreaction. In contrast [11], according to the analysis of the accounting data of 123 companies in Shanghai stock market from 1993 to 1996, it is proposed that the Shanghai stock market has overreacted to the expected good news, while there is an insufficient response to the expected bad news [12]. In this article, author more focused on Winner Lose Effect, and using the model of this to conclude that Chinese stock market do not show the overreaction.

The phenomenon of overreaction and under-reaction in the stock market can be used to prove that the market is not efficient, and the investors' actions will have a crucial impact on the price of stocks.

2.5. Literature review and implication

The COVID-19 pandemic is a global public health problem, it is contagious and has certain mortality. It will cause public anxiety, and will disorder the normal society. The sudden COVID-19 pandemic has led great impact on Chinese economy, which is particularly remarkable at stock market and stock price. The research about impact of COVID-19 on stock market has already been done a lot, however, the research about impact of COVID-19 on Chinese medicine field has not been done. The online news media act as a catalyst to affect investors' emotion and expectation, as the above paragraph mentioned, the Chinese stock market maybe is not a fully efficient market, the investors are the main factor to influence the stock market and cause the price of stock to fluctuate. Thus, it is obviously that the online news about "Chinese medicine can be used to treat the COVID-19" will have great effect on stock market of Chinese medicine field.

3. DATA

3.1. Data selection

The historical data of stock indexes were collected by WIND, and the data were selected as the closing prices of CSI930641 and CSI000300 from January 2, 2020 to April 21, 2022. The CSI930641 was used as the index of TCM market, and CSI000300 was used to reflect the comprehensive index of the market. In order to obtain the rate of return of the TCM sector and the rate of return of the whole market, it is necessary to further process the closing price. Because the fluctuation of rate of return is small, it can be approximated by the log return.

Let Pt be the closing price of the index on the t-day, Pt-1 be the closing price of the index on the (t-1) day, and Rt be the rate of return on the t-day. The rate of return can be calculated by the following formula.

$$R_t = \ln\left(\frac{P_t}{P_{t-1}}\right) \qquad (1)$$

3.2. Introduction to methodology

Event Study Methodology is an empirical research method, which is mainly used in the financial field. It analyzes the impact of a special economic event on the value of the company or the market with the help of financial market data, that is, whether abnormal returns are generated. Event Study Methodology is mainly to analyze whether an event has impact on time series. Some scholars believe that if a market full of rational investors, the impact of an event on the economy can be quickly reflected by the changes in assets prices. Therefore, Event Study Methodology refers to a method to study the impact of an event on the economy by observing changes in assets prices during a short period. So, in order to explore whether the release of news related to TCM

treatment of COVID-19 has an impact on the rate of return of stocks in TCM sector and whether the impact is significant or not, the rate of return of stocks in TCM sector can be studied by Event Study Methodology.

First, determine the data of occurrence of the event and the corresponding event window. The occurrence date of time is the data of news release. The event window is selected 5 days before and 5 days after the occurrence date, which reflects the possible influence of internal information before the news is issued and the sustained influence after the news is issued.

Second, select the estimation period. Select a period before the event window as the estimation period, whose function is to estimate the data in the event window when no event occurs.

Third, use the risk-adjusted rate of return method to calculate the normal rate of return. The revised CAPM model was used to estimate the normal rate based on the data from estimation period. Assume that $R_{i,t}$ is the rate of return of TCM sector on t-day, $R_{m,t}$ is the average rate of return of market on t-day, and assume that the risk-free rate is zero, namely, $\mu_{i,t}$ is zero. The formula is as follows.

$$R_{i,t} = \alpha_i + \beta_i R_{m,t} + \mu_{i,t} \tag{2}$$

Fourth, calculate the daily abnormal return (AR) in the event window and standardize it the obtain standardize abnormal return (SAR), which is then added to calculate the cumulative mean abnormal return (CAR). The specific calculation process is as follows.

Set AR as $AR_{i,t}$ and set the normal return calculated by regression equation as $EAR_{i,t}$.

$$AR_{i,t} = R_{i,t} - ER_{i,t} \tag{3}$$

After obtaining the abnormal return, use the following formula to standardize it. Set SAR as $SAR_{i,t}$.

$$SAR_{i,t} = \frac{AR_{i,t}}{S_{i,t}} \tag{4}$$

Where, Si,t can be calculated by the following formula, where Si2 is the variance of abnormal return, t1 is the beginning of event window and t2 is the end of event window. T is the length of event period.

$$S_i^2 = \frac{\sum_{t=t_1}^{t_2}\left(AR_{m,t} - \overline{AR_{m,t}}\right)}{T-1} \tag{5}$$

$$S_{i,t} = \sqrt{S_i^2\left[1 + \frac{1}{T} + \frac{\left(R_{m,t} - \overline{R_{m,t}}\right)^2}{\sum_{t=t_1}^{t_2}\left(R_{m,t} - \overline{R_{m,t}}\right)^2}\right]} \tag{6}$$

After obtaining SAR, the CAR can be calculated by the following formula.

$$CAR_i = \frac{1}{\sqrt{t_2 - t_1 + 1}}\sum_{t=t_1}^{t_2} SAR_{i,t} \tag{7}$$

Fifth, Determine the significant of CAR and use T-test. If the significance is less than 0.1, the hypothesis can be judged to be valid.

4. EMPIRICAL ANALYSIS BASED ON EVENT STUDY METHODOLOGY

4.1. The collection and selection of articles

In order to have a clearer understanding of the impact of news reports on TCM stocks, this section makes a brief descriptive analysis of the background and main contents of the relevant reports published.

Report 1: Zhong Nanshan affirmed the role of traditional Chinese medicine in the prevention and control of COVID-19.

On April 14, 2020, Zhong Nanshan said in a dialogue with Tencent Medical Dictionary that traditional Chinese medicine is effective in the prevention and control of pneumonia. For example, he said, Lianhua Qingwen capsule, which was found to be effective against the COVID-19, although its effect is weaker, but it has a good inhibitory effect on the tissue cell damage caused by the virus, and it is effective for patients with mild, common type. In addition, there is also some evidence-based medical evidence for the use of XueBi Jing injection, which we use to treat severe pneumonia, and patients have seen a reduction in death rates in addition to improvement in symptoms. This is the first statement since the COVID-19 that herbal medicine has played a role in the treatment of the pneumonia.

Report 2: State Administration of Traditional Chinese Medicine: Chinese medicine treats light, common type of COVID-19 patients and reduces progression to severe disease.

December 16, 2021 Zhang Zhongde believes that TCM-based treatment is still very effective. For example, during the course of the Guangzhou epidemic from May to June 2021, 166 local cases were admitted, of which 118 patients were treated with TCM alone, accounting for more than 71%, successfully blocking the transition to severe disease in 57 patients with a tendency to severe disease, with remarkable results.

Report 3: Wang Sicong called on the Securities Regulatory Commission to strictly investigate Yiling Pharmaceuticals.

On April 14, 2022, at 13:08, Wang Sicong retweeted a message about Lianhua Qingwen Capsules on his Weibo account, with the striking words "The Securities Regulatory Commission should strictly investigate Yiling Pharmaceuticals. On April 17, Dr. Ding Xiang, a public medical science website, released another piece of heavyweight news, an article titled "Don't take it! The article "Lianhua Qingwen" is not a preventive medicine for the COVID-19" was published on its official microblogging site, in which it was clearly stated that "Lianhua Qingwen cannot prevent the COVID-19." The article was released and caused a lot of debate among netizens. This is the first major negative after Lianhua

Qingwen was certified by the China as the recommended drug for the treatment of COVID-19.

4.2. Specific steps

In order to discern the significant effect of each event on CSI Traditional Chinese Medicine Index (Hereinafter referred to as CSI Medicine Index) in terms of statistical significance, it is necessary to conduct a statistical test. The original hypothesis is that news reports on Chinese medicine have no effect on the CSI Medicine Index (i.e., H0). In the following, the statistical significance of the impact of each event (i.e., the publication of each news article) is tested and explained separately.

In the first report, February 10, 2020 to February 28, 2020 was selected as the estimation period. The event window is chosen from April 7, 2020 to April 21, 2020. Firstly, using spss, the return of CSI 300 (Rm_t1) is used as the independent variable and the return of CSI Medicine Index (Ri_t1) is used as the dependent variable for the regression analysis. To test for the presence of heteroskedasticity, the scatter plot is plotted with ZPRED (regression standardized forecast value) as the X-axis and ZRESID (regression standardized residual value) as the Y-axis. From the coefficient model (see table 1), it is known that in

$$R_{i,t} = \alpha_i + \beta_i R_{m,t} + \mu_{i,t} \tag{8}$$

α_i=0.001, β =0.483, and β significance is less than 0.1, which is high significance. Due to the small sample size, the points are roughly observed to be in parallel, so we can assume that there is no heteroskedasticity. If heteroskedasticity exists, the weighted least squares method can be used to eliminate the heteroskedasticity. Next, it is calculated in steps. The cumulative abnormal return CAR1 = 2.19373 is obtained by calculation, and the t-test is performed using the TDIST function by entering CAR1, the number of samples, and the two-tailed distribution, respectively, and the value of the t-test is obtained as 0.05064 less than 0.1 then the variance is significant and the original hypothesis is rejected. Therefore, here it can be considered in statistical significance that the publication of Zhong Nanshan on April 14, 2020 affirming the role of Chinese medicine in the prevention and control of pneumonia in the COVID-19 has a positive and significant effect on the CSI Medicine Index. To verify the persistence of the impact, 10 to 20 trading days after the event, i.e., from April 22, 2020 to May 8, 2020, are selected to verify whether the news reports still have a significant positive impact on the CSI Medicine Index during this time period. The cumulative abnormal return CAR1.2= 0.63421 is calculated and the t-test using TDIST function yields a t-test value of 0.54018 greater than 0.1, then the difference is not significant and the original hypothesis is supported. Therefore, the event can be considered here as having no effect on the return after 10 days in terms of statistical significance.

In the second report, November 18, 2021 to December 10, 2021 was selected as the estimation period. And the event window period is chosen as December 14, 2021 to December 27, 2021. The cumulative abnormal return CAR2 = 2.04059 was obtained by calculation. T-test was performed using TDIST function and the value of t-test was obtained as 0.06604 less than 0.1, implying that the difference is significant and rejecting the original hypothesis. Therefore, here it can be considered statistically significant that the report of the State Administration of Traditional Chinese Medicine on December 16, 2021 confirming the effectiveness of Chinese medicine in epidemic prevention and control has a positive and significant effect on the CSI medicine index. To verify the persistence of the impact, 10 to 20 trading days after the event, i.e., December 28, 2021 to January 11, 2022, are selected to verify whether the news reports still have a significant positive impact on the CSI medicine index during this time period. The cumulative abnormal return CAR2.2 = 0.70483 is calculated. T-test using TDIST function yields a t-test value of 0.4970031930 greater than 0.1, then the difference is not significant and the original hypothesis is supported. Therefore, the event can be considered here as having no effect on the return after 10 days in terms of statistical significance.

In the third report, March 9, 2022 to April 8, 2022 was selected as the estimation period. The event window period is chosen as April 11 to April 22, 2022. By calculating the cumulative abnormal return CAR3 = -2.87916. T-test using TDIST function, the value of t-test was obtained as 0.01641 less than 0.1 and means the variance was significant, rejecting the original hypothesis. Therefore, it can be considered here in statistical significance that the report of April 14, 2022, in which Wang Sicong called on the SEC should strictly investigate Yiling Pharmaceutical has a negative and significant effect on the CSI medicine index. Since this paper was written in insufficient time to conduct a study 10 to 20 days after the event, no subsequent proof is made here.

Table 1. Coefficient model table

Model	Unstandardized Coefficients		Standardized Coefficients	t	significant
	B	standard error	Beta		
(constant1)	0.001	0.002		0.390	0.700
Rm_t1	0.483	0.115	0.628	4.198	0.000
Dependent variable:	Ri_t1				
(constant2)	0.001	0.002		0.304	0.766
Rm_t2	0.574	0.299	0.445	1.923	0.074
Dependent variable:	Ri_t2				
(constant3)	0.005	0.005		0.987	0.336
Rm_t3	0.723	0.247	0.557	2.923	0.009
Dependent variable:	Ri_t3				

5. CONCLUSIONS

5.1. Main conclusions and recommendations

This article uses event analysis to examine the impact of news reports on the returns of the Chinese medicine sector in the context of the COVID-19 outbreak. The article selects three news and reports about whether Chinese medicine can treat COVID-19 and estimates the normal return using a window period of 1-2 months before the event. Using about 10 days before to after the event as the event period. Then the original hypothesis is proposed: news reports about Chinese medicine have no effect on the (CSI pharmaceutical index). It is found that the market tends to gain excess positive returns whenever positive news reports on TCM stocks are released and will gain excess negative returns when negative news is released. This shows that people are very sensitive to reports about the treatment of COVID-19. Once there was positive news, investors will be bullish on the relevant companies and buy on a large scale, thus dampening the overall downward trend of the market in the economic downturn due to the epidemic control. Conversely, when there was bearish news, investors will be massively bearish on related TCM companies and sell on a large scale, bringing down the whole TCM sector. According to the efficient market hypothesis, in a strong efficient market, all valuable information has been timely, accurately and fully reflected in the stock price movement, including the current and future value of the company.

However, in China, news reports still have a significant impact on stock prices, and most retail investors are still addicted to "speculating on hot stocks" overreacting to the market. A good example of this is herd behavior, where investors blindly follow the herd and follow public opinion, which eventually turns into a herd behavior. In this epidemic, the good news for Chinese medicine has also led to the birth of many "hot stocks" in the Chinese medicine sector, such as Yiling Pharmaceutical, Panlong Pharmaceutical, etc., ushering in a wave of stock price hikes. By studying the 10 to 20 trading days after the event, we can find that this kind of good news often has a very fast timeliness. Usually within a week, it can serve to increase the yield, after which it tends to fall back to some extent. This also reflects that most current investors are not long-term bullish on the sector where they are, but thinking of taking advantage of this wave of hot spots to make a quick buck. Once the entry time is too late or do not sell in time to obtain the cash, investors will again face the risk of loss. Therefore, retail investors should try to focus on value investment instead of chasing the rise and fall. The state should establish a more complete and mature public opinion monitoring mechanism to respond to market rumors and news in timely manner. In today's highly developed information era, news media reports spread very quickly, and some news is not even confirmed. This can easily cause unnecessary and dramatic fluctuations in the market. Therefore, it is necessary to establish a more complete and mature public opinion monitoring mechanism to reduce the risk of information asymmetry.

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