Impact of Vaccine Events on Stocks in the Pharmaceutical Industry

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Abstract. What is the impact of the sensational vaccine incident in China on AC’s stock and stocks throughout the market? By analyzing the stock data of the pharmaceutical industry, this paper finds that the incident has a great impact on the stock fluctuations of AC companies. The impact on different types of companies in different markets is different, and the impact on the Shenzhen market is greater than that of the Shanghai Stock Exchange. The least impact is on Large-cap, followed by Small-cap.

Introduction

The vaccine incident has recently caused heated debate in China. On July 15 this year, the State Drug Administration (sda) conducted a flight inspection of AC company (this article called the event company AC company), and found that the company's freeze-dried human rabies vaccine production has committed some serious illegal Behaviors such as falsification of records and other serious violations of the quality management practices of pharmaceutical production [1]. The company's GMP certificate (certificate number: JL20180024) has been withdrawn by the Provincial Food and Drug Administration in accordance with the requirements of the State Drug Administration. The company was ordered to stop the production of rabies vaccines, requiring strict implementation of primary responsibilities, comprehensive investigation of risks and hidden dangers, and control measures to ensure public drug safety. The investigation team of the Provincial Food and Drug Administration has entered the enterprise and filed a lawsuit against the suspected illegal act. The State Drug Administration has sent a special inspection team to the provincial supervision office for investigation and handling. In the morning of July 16, Company A issued a notice stating that the company had fully recalled all batches of freeze-dried human rabies vaccines during the validity period [2]. On July 18, according to the official WeChat news of the National Health and Health Committee, Mao Qun'an, director of the National Health and Welfare Commission's CDC, said in an interview that the State Drug Administration issued the "Regulations on the illegal production of freeze-dried humans by Changchun Changsheng Biotechnology Co., Ltd. After the Notice of Rabies Vaccine, the CDC paid close attention to developments and maintained close communication with the State Drug Administration [3]. On July 18, Chongqing City has completely banned the lyophilized human rabies vaccine produced by Company A [4]. On July 21st, the sharing of "King of Vaccines" appeared in the circle of friends. After a few days, the circle of friends was swiped by the vaccine incident. Since the July 15th Longevity Biological Rabies vaccine record fraud, the company's stock has also undergone major changes with the incident. On July 16th, the AC company's share price was lying on the daily limit, with a seal of over 800,000 lots and a reported price of 22.10 yuan. On July 20th, the AC company's stock fell again [5]. Announcement on the evening of July 24, the company's stock will be suspended for one day on July 25, and resume trading on the 26th. The company's stock has been implemented other risk warnings since July 26, and the stock short name has been changed to “ST AC”, and the company's stock trading day is limited to 5% [6]. Overall, the stock has continued to fall since the 16th, as of August 7th, for 16 consecutive days.

This paper mainly analyzes the fluctuations of the company's stocks with the occurrence of events. And further analysis of the impact on the entire pharmaceutical industry, is the impact of the
Shanghai Stock Market and the Shenzhen market different? Is the impact on large, medium and small types of companies in the pharmaceutical industry different?

Data
The stock data in this article is from the stock price data of the pharmaceutical industry sector in Tongdaxin. The date is from June 25, 2018 to August 3, 2018 (data download deadline), which is 15 days before and after the vaccine fraud announcement, a total of 30 trading days of data. There are 215 companies, of which 16 companies are in suspension due to purchases, major asset restructurings, temporary suspensions, stock purchases, and unusual fluctuations in stock trading. This article will consider the impact of vaccine events on the pharmaceutical industry. These stocks with abnormal conditions only consider the remaining 199 stock data.

Results
AC Company's Share Price Fluctuations
July 15 (the date when AC is notified of vaccine production fraud) and July 25 (AC company suspended for one day) are two key time points for AC stock fluctuations. Figure 1 is the stock price of the AC company in 30 trading days and its price chart. The two key time nodes are highlighted by the red dot. The blue line is the price, and the orange line is the price. As can be seen from the figure, before the company was notified of fraud, AC's stocks fluctuated steadily, and since being notified, the stock price has fallen almost linearly. From 15th to 24th, the daily stock price fell by almost 10%, which is the biggest decline in China's stock market. On the 26th to the data download deadline, the daily stock price almost fell by 5%. 5% is the trading day's price limit for ST shares. Therefore, the stock has been in a down limit since being notified of fraud.

Figure 1. Average price of securities companies in 3 time units.
For a market, we mainly analyze the impact of vaccine events on the pharmaceutical industry, that is, whether the vaccine incident has caused more company stocks to fall. The ordinate of Figure 2 is the percentage of the company's total market in which the market is negative. In the figure, the red line fork is the case of 191 companies in the pharmaceutical industry. The blue line is the situation of 66 companies in the SSE medical industry, and the green line box is the case of 125 companies in the Shenzhen medical industry (AC company is in the Shenzhen market). As can be seen from the figure, the overall market is consistent with the overall trend of the Shanghai and Shenzhen markets. It can be seen from the chart that since July 16 (the 30th point), except for July 25 (the 37th point), the proportion of companies whose stock prices have fallen every day in the three markets is more than 30%, July 16 The previous ratio fluctuations were more random. It can be seen that the vaccine incident did cause some companies in the medical industry to fall in stock prices. Company AC suspended trading on July 25, which may be the reason for the low ratio on this day. In order to further study whether the companies whose stocks have fallen due to the impact of the vaccine incident are related to whether they are in the Shanghai Stock Exchange or the Shenzhen market, we calculated the average daily decline of the Shenzhen and Shanghai stock market, and recorded the difference as a difference. As shown by the gray dotted line in Figure 2. It can be seen from the fold line that with the 16th as the dividing line, the difference before the 16th is randomly fluctuating around the 0 line. From the 16th to the 24th, the difference is negative only one day, so it can conclude that the vaccine incident caused the company's stock price in the Shenzhen market to fall more during the period.

Stock Price Decline--Large, Medium and Small

In order to analyze the impact of vaccine events on different market capitalization companies in the pharmaceutical industry, this paper divides 191 companies into three categories: large, medium and small, based on the classification criteria of Morningstar, a well-known rating agency for domestic A-share listed companies. The specific classification criteria of Morningstar[8]: Sort stocks according to their total market value, from high to low, calculate the cumulative market value of each stock as a percentage of the total market value of all stocks; large stocks: the cumulative market value percentage is less than or equal to 70% of stock, ie 0 <cumulative market value <=70%. Mid-cap stocks: stocks with a cumulative market capitalization percentage between 70% and 90%, ie 70% <cumulative market value <=90%. Small-cap stocks: stocks with a cumulative market capitalization percentage greater than 90%, ie 90% <cumulative market value <=100%. According to this standard, there are 49 stocks with a cumulative market capitalization percentage of 70% or less, accounting for 25.65%, which is called Large-cap. 63 stocks with a cumulative market capitalization percentage between 70% and 90%, accounting for 32.98%, which is called Mid-cap (AC company belongs to this category). There are 79 stocks with a cumulative market value greater than 90%, accounting for 41.36%, called Small-cap. Figure 3 shows the ratio of the number
of companies in the entire pharmaceutical industry market and the three types of companies from June 25 to June 3, which accounted for the entire market or category. Among them, the red line is the market, the black is Large-cap, the purple is Mid-cap, and the orange is Small-cap. As can be seen from the figure, overall, the general trend of these three types of companies is consistent and roughly consistent with the market. Prior to 16, the three categories were more similar to the market trend than after the 16th. Compared with the other two categories, Mid-cap is closer to the market trend; Large-cap is in the stage of 16 to 24, which is more deviated from the market trend than other stages, so it can be inferred that the Large-cap is least affected by the vaccine event; similarly, the Small-cap is less affected by the event.

![Figure 3. Average price of securities companies in 3 time units.](image)

**Discussion**

From what we have discussed above, we may safely come to the conclusion that the vaccine incident has had a huge impact on AC companies. After being told that fraud, the company's share price has been at its greatest decline. Shareholders who are at least concerned about the pharmaceutical industry are very sensitive to the news of the pharmaceutical industry. The impact of the incident on the entire pharmaceutical market is also great, and the impact on the Shenzhen market is greater than that of the Shanghai Stock Exchange. In other words, the vaccine event has caused the market value of the pharmaceutical market in Shenzhen to evaporate more. For different market capitalization companies, the impact on Large-cap is minimal, followed by Small-cap.

**References**

[1] Notice of the State Drug Administration on the production of freeze-dried human rabies vaccine by Company AC (No. 60 of 2018). State Drug Administration [reference date 2018-07-15].

[2] Rabies vaccine production record fraud company apologizes: no quality problems have been found to cause adverse reactions. Pengpai [reference date 2018-07-16].

[3] The National Health and Health Commission responded to human rabies vaccine illegal production violations: is closely watching developments. Sina [reference date 2018-07-19].

[4] Chongqing banned AC company rabies vaccine: vaccinators can change other brands. Netease [reference date 2018-07-19].

[5] How much has the stock of AC Company fell?

[6] The company's stock short name will be changed to "ST" chairman and other 15 people will be detained from July 26th.

[7] Sanlu milk powder makes the people of the country angry.

[8] An article to understand the large, medium and small size index, you need to know these to learn investment.