

# ***Impact Analysis of Price War on the New Energy Automobile Industry Based on BYD and GWM***

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**Abstract:** The price war that broke out in March in the first half of this year just ended in July. This is a knockout competition for auto companies, and companies that win the price war can take the lead in the market in the next few years. It turned out that BYD won the price war, while Great Wall Motor's semi-annual performance dropped sharply. This article analyzes the strategies of BYD and Great Wall Motors in the price war and explores the various measures that new energy car companies should take in the price war. In-depth comparison of the data of the two companies, through data comparison, data analysis and event analysis, a relatively comprehensive analysis of the sales, financial and stock market transaction data of the two companies was carried out to explore the results of the price war. This article focuses on the impact of price wars on car companies and explores what strategies new energy car companies should adopt in the future.

**Keywords:** new energy vehicles, price war, data analysis, event analysis

## **1. Introduction**

As the greenhouse effect becomes more and more serious today, how to reduce carbon emissions has become an urgent problem for major countries to solve. In order to reduce carbon emissions, China has proposed to complete the goal of carbon peaking in 2030 and the goal of carbon neutrality in 2060 [1]. Automobiles account for a high proportion of carbon emissions, and the carbon emissions caused by automobile-based road traffic account for more than 80% of the transportation sector [2]. To solve this problem, it is necessary to carry out energy reform in the automotive field. Traditional oil and gas vehicles must be replaced by trams and hybrid vehicles.

### **1.1. Development Background and Development Status of New Energy Automobile Industry**

Combining the development status of Europe and the United States and the historical development path of China, the development of new energy vehicles can be roughly divided into three stages: policy-driven stage, supply-driven stage and market-driven stage of supply and demand resonance. China entered the third stage in 2022. At this time, the degree of dependence on policies is low, and some policy measures have made it difficult for the new energy industry to make a subversive leap forward [3].

With the continuous increase in the production of new energy vehicles, the policy has entered a stage with little effect, and the update of new battery technology has been hindered. The Chinese

people's demand for new energy vehicles is insufficient, and there will be a problem of overproduction in 2023. Automobile price war thus produced.

## 1.2. The Causes and Breaking Points of The Automobile Price War

On October 24, 2022, Tesla cut its price for the first time. After this price cut, Chinese domestic car companies did not take any action. At the end of 2022, the domestic new energy vehicle purchase subsidy policy expired. After that the manufacturing cost of domestic new energy vehicles has increased by more than 10,000 yuan per vehicle. At the end of 2022 December, BYD even had a plan to increase the prices of several models, and some other domestic car companies also had similar plans.

In January of this year, Tesla cut prices again. This price cut has had an impact on domestic companies. Throughout January, the domestic sales of Tesla's new energy vehicles have soared in China. Only from January 9th to 15th, the average daily sales volume reached 12,654, a year-on-year increase of 76%. In contrast, the sales of domestic new energy vehicles have declined. The sales of Weilai, Xiaopeng and Ideal Automobile have declined by 11.9%, 59.6% and 23.4% respectively year-on-year [4].

On March 9, BYD publicly announced to lower the prices of its two main models, and the domestic new energy vehicle price war officially broke out. BYD is the leading company in China's new energy vehicles. After BYD's news, other car companies have also publicly released news that marks their participation in the price war. On March 10, the stock prices of automobile stocks in the A-share market fell sharply, and the automobile sector fell by nearly 4%. Therefore, the timing of BYD's announcement can be seen as a sign of the outbreak of a domestic price war.

The government-enterprise joint subsidy between Hubei Province and Dongfeng Motor's brands has pushed the domestic price war to a climax. According to incomplete statistics, more than 40 brands and more than 10 provinces and cities participated in this price war. The China Automobile Dealers Association and the China Association of Automobile Manufacturers successively issued documents calling for the hype of price cuts to cool down as soon as possible. Entering the second quarter, various car companies continued to compete on prices by reducing the price of new cars, reducing prices, reducing prices and increasing configurations.

## 2. Theory and Industry Overview

The subsidy policy for domestic new energy vehicles has made great progress at this stage, as shown in Figure 1. The data comes from the China Association of Automobile Manufacturers:

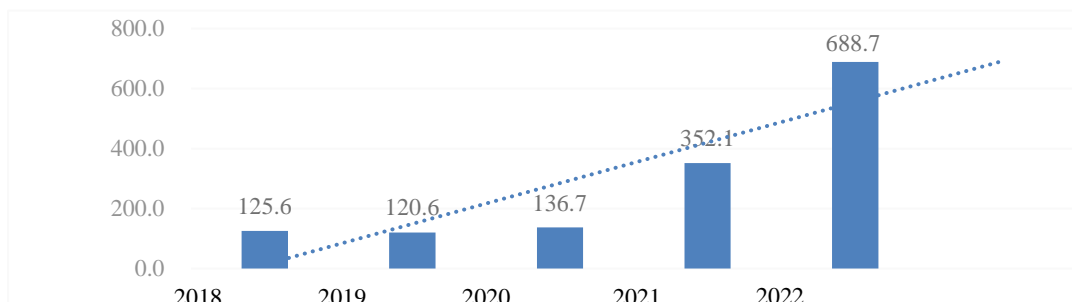


Figure 1: Sales of domestic new energy vehicles from 2018 to 2022.

It can be seen that the sales of new energy vehicles will rise sharply against the trend during 2020-2022 when many industries are in decline under the influence of the domestic epidemic in China, and policies related to the new energy vehicles play an important role in it.

## 2.1. Theory and Literature Related to Price War

Price Elasticity Theory [5]: The theory of price elasticity of demand refers to the theory that explains the relationship between changes in price and changes in quantity demanded. Under the assumption that supply has no or little influence on prices, changes in demand will cause changes in prices, and the degree of response of dependent variables to changes in independent variables is called elasticity.

The theory of demand and supply [6]: The theory of demand and supply is the basic theory in Crowd Giniology. Demand reflects the relationship between the price of a commodity and the quantity demanded. In economic life, whether people buy a commodity depends on whether the seller of the commodity is lower than the consumer's reservation price. The demand curve slopes downward to the right as shown in Figure 2:

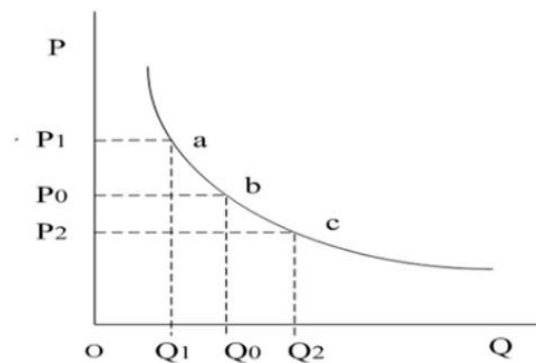


Figure 2: Schematic diagram of demand curve.

Ma and Huang stated in their research on the development of the new energy industry: China is currently leading the world in new energy technology, but sales are far behind, lacking policy support and supplements. At the same time, there is a huge gap in technology between enterprises, and policy support is needed at the level of technology diffusion [7]. This is an article written in 2017. Today, the sales problem has been gradually resolved, but the problem of technology diffusion still exists, and the technology gap between enterprises is still very large.

Judging from the results of the price war, the stock price of the auto industry is the most affected. Lei and Yu used the event analysis method to test the market in 'The Impact of Emergencies on the Fall of Stock Prices'. The results show that under the conditions of emergencies, small and medium-sized enterprises will rebound quickly after experiencing a decline, while large enterprises will have a more stable stock price performance and be less affected by the event [8]. The theory of this article is reflected in the price war. For example, the fluctuation of GWM's stock price is much greater than that of BYD. Although the scale of GWM is not considered a small and medium-sized enterprise, the scale of GWM is not as large as BYD, which is reflected in the fluctuation of stock price.

## 2.2. The Inner Logic of Price War

In the final analysis, there are several reasons for the price war: (1) The passenger car purchase tax subsidy policy has been withdrawn, and the overall automobile market is relatively sluggish. (2) Second, the 13-year-old state subsidy for new energy vehicles was officially canceled, prompting new energy vehicle manufacturers to take the lead in market action. (3) The implementation date of

the national VIB standard is approaching, and auto companies are accelerating the clearance of the current “national VIA standard” fuel vehicle inventory. Starting from July 1, 2023, cars that are below the national VIB standard will not be sold, registered, or licensed in China. In order to reduce the possible loss of existing new car inventory, gasoline car manufacturers have joined the ranks of price reduction promotions, further intensifying the intensity of the price war [9].

The battery drive system accounts for 30%-45% of the manufacturing cost of new energy vehicles, while 75%-85% of the cost of the battery drive system is on lithium batteries [10]. Lithium carbonate is the raw material for lithium batteries, and the price fluctuation of lithium carbonate has a great impact on the cost of new energy vehicles. From December 2022 to May 2023, the price of lithium carbonate fluctuated greatly. In March, the lowest price even reached the level of 110,000 yuan per ton, which was far lower than the average market price in the same period. This also gave domestic car companies room to cut prices, which indirectly led to the outbreak and intensification of price wars.

### **3. Overview of the Price War Between BYD and Great Wall Motors in 2023**

This section selects BYD Auto and Great Wall Motor as the research objects, and describe them and their major events in the price war.

#### **3.1. Overview of BYD and Great Wall Motor Company**

BYD Co., Ltd. is headquartered in Guangdong Province. Its main business products include new energy vehicles and mobile phone components. According to the annual report, in 2022, the total operating income of the enterprise will be 424.1 billion RMB and the gross profit will be 72.24 billion RMB. The enterprise's asset-liability ratio is 75.42%. BYD is currently the only company in China that has completed the transition to new energy vehicles. The huge sales ratio and popularity have also established BYD's position as a leading domestic new energy vehicle company, and it has the upper hand in the price war. Therefore, BYD is selected as the research object of price war.

Great Wall Motor Co., Ltd. is located in Hebei Province, and its main business is the automobile industry. According to the annual report, in 2022, the total operating income of the enterprise will be 137.3 billion RMB, the gross profit will be 26.6 billion RMB, and the asset-liability ratio will be 64.82%. GWM is in the process of transforming from a traditional car company to a new energy car company and is at a disadvantage in the price war. From the annual report, it can be seen that the proportion of GWM's new energy vehicle business revenue to total revenue has gradually increased. GWM, which has a revenue of 100 billion RMB, can represent the general situation of domestic car companies, so GWM was selected as the research object.

#### **3.2. An Overview of the Important Events of the Two Companies in the Price War**

This section explains the events of the two companies during the period from March 9th to July 6th.

##### **3.2.1. Price Reduction Strategy**

On March 9, BYD announced on its homepage that the prices of two main models would be cut, and the domestic new energy vehicle price war officially broke out.

On March 13, Great Wall Motor released the new four-wheel drive electric hybrid technology Hi4 to deal with the price war and announced in disguise that it will join the price war.

On March 16, two new commemorative models of BYD Auto were launched, and the price was reduced compared with the previous models.

On March 18, the Great Wall Motor Haval H6 series will carry out price reduction activities.

On March 30, Great Wall Motor announced that it would launch new models of new energy vehicles in April.

On April 1, the BYD Seal model opened a limited-time discount with a maximum discount of 31,000 RMB.

### 3.2.2. Network Information Level

Some news about price cuts, BYD and Great Wall Motors no longer have updates after May, and most of the other domestic car companies are the same. But in fact, the price war did not end until July, when 16 car companies jointly issued a circular.

It is speculated that after May, the main form of price wars between car companies will become network information wars, but such information wars are often carried out in the dark, so as not to damage the reputation of car companies themselves. It can be seen from some news that, for example, two days before BYD's new model was launched on March 16, there was news that BYD's new model would be below 200,000 RMB, but in fact, the price of BYD's new model started at 209,800. BYD's official Weibo also refuted rumors before the new car was released. Our own company will not indiscriminately report a low price before the new car goes on sale, because such an early low price report will make car buyers feel that the company has temporarily raised prices and reduced purchase demand, which does not benefit companies.

At 10:45 a.m. on May 25th, Great Wall Motor issued a notice to report that a certain BYD vehicle did not meet emission standards. The stocks of the two companies plunged that day, driving the entire auto sector down.

On July 6th, 16 auto companies including BYD and Great Wall Motor signed a document, and the price war on the surface of the car was declared over. However, some terms of the document were deleted two days later, and the secret fight between various auto companies continued.

## 4. Motivation and Data Analysis of the Price War Between BYD and Great Wall Motors in 2023

This part combines data to conduct an objective analysis of the performance of the two companies in the price war.

### 4.1. Overview of BYD and Great Wall Motor Company

Looking at the actions of the two car companies in the price war, most of them focus on reducing prices. There are also many ways to reduce prices, such as active price reduction, government subsidy price reduction, and so on, as shown in Table 1.

Table 1: Comparison table of price ranges of some models before and after the price war(unit: yuan).

Car Model	Price pre-war price	Price wartime price (net of subsidy)
BYD Song PLUS	194k-211k	187k-204k
BYD seal	232k-300k	213k-290k
GWM Haval H6	99k-157k	84k-137k

In order to win the price war, such a price reduction is worthwhile if it can earn more than the loss from the price reduction, otherwise, the gain outweighs the loss.

On the surface of the news, various companies are fighting openly and secretly. The most influential news is that GWM reported BYD's exhaust gas issue on May 25th, which directly

caused the stock prices of the two companies to plunge. It caused the stock price of GWM's own company to fall by more than 14% within three trading days, and BYD's stock price fell by nearly 6.5%. The report of GWM was a report of mutual death. As a result, the stock prices of both parties fell and their stock prices fell even more. Moreover, BYD's stock price recovered quickly, while GWM's stock price did not start to slowly recover until June.

## 4.2. Data Analysis

It analyzes the performance of the two companies in the price war from financial, sales and stock market transaction data.

### 4.2.1. Financial Data

The semi-annual reports of the two companies were released at the end of August, and the performance of the two companies in the price war was analyzed from the financial data. As shown in Table 2. Judging from the semi-annual report, BYD's total operating income and net profit both soared year-on-year. The total operating income of GWM Company decreased slightly year-on-year, and the net profit decreased significantly. In terms of gross profit, BYD is slightly higher than GWM. From the financial data, in general, BYD won the domestic market in the price war, and the financial data is very impressive. However, the gross profit margin of a group of transforming car companies represented by GWM has been reduced or even negative, and their total operating income and net profit have shrunk. If the price war continues for a long time, they will face the situation of being eliminated.

Table 2: Comparison of main financial data of BYD and GWM in the 2023 semi-annual report.

Company Name	Total operating income	Total operating income year-on-year	net profit	Net profit year-on-year	gross profit margin
BYD	260.1B	72.72%	10.95B	204.68%	18.33%
GWM	29.04B	-13.63%	0.1742B	-89.34%	16.07%

### 4.2.2. Financial Data

The following data comes from the China Association of Automobile Manufacturers regarding the sales of new energy vehicles in China, as shown in Figure 3.

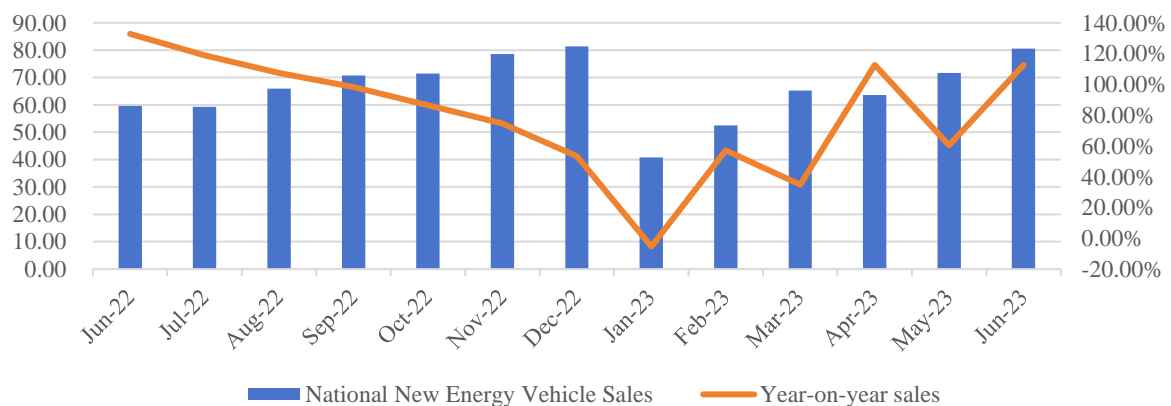


Figure 3: National new energy vehicle sales and year-on-year sales from June 2022 to June 2023(Unit: 10,000 vehicles).



The above data comes from the China Association of Automobile Manufacturers. According to the data in the above figure, although the national new energy vehicle sales in January-March 23 are much lower than the data from June-December 22, the year-on-year data except -5.64% in January 23, the other 23 years of data have increased year-on-year. From the data in March 2023, it can be seen that car companies' price cuts have improved sales, and the effect of price cuts is obvious. Especially in the three months from April to June, the sales of new energy vehicles have increased year-on-year and month-on-month for three consecutive months, as shown in Figure 4 and Figure 5.

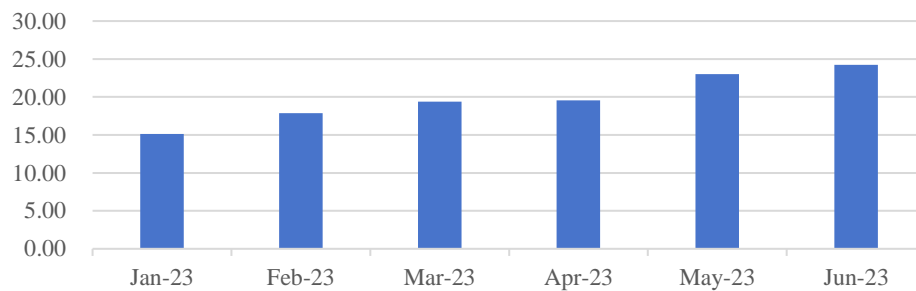


Figure 4: Sales of BYD's domestic new energy vehicles in January-June 2023(Unit: 10,000 vehicles).

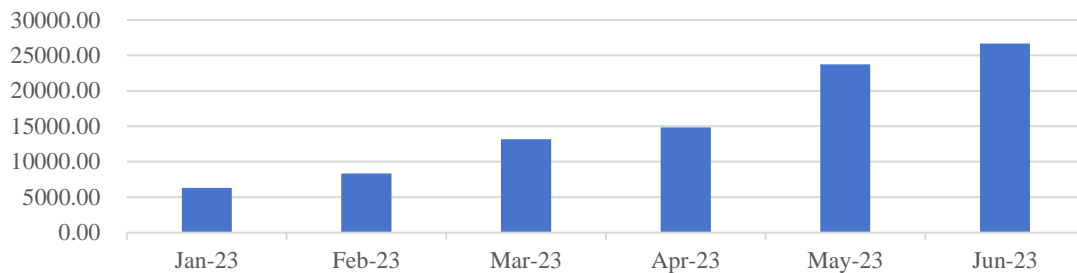


Figure 5: Sales of GWM's domestic new energy vehicles in January-June 2023.

The above data are all from Oriental Fortune Network. From the above chart, it can be seen that BYD Auto's sales in January and February were less affected than the average level of national auto companies. Its sales maintained steady growth from January to June and accounted for a large proportion of national new energy vehicle sales. Calculating the ratio of BYD's new energy vehicle sales to national sales in 2023 shows that it is close to 33%, which is greater than the 27% in 2022, indicating that BYD's performance in the price war is better than most car companies.

The relevant information of GWM lacks 22-year year-on-year data. Looking at sales alone, the sales volume of GWM's new energy vehicles is less than that of BYD. But the overall trend is positive. With the implementation of relevant price reduction measures of GWM on March 18 and the launch of new models of GWM's new energy vehicles in April and May, Great Wall Motor's sales in May increased by 59.82% compared with April.

#### 4.2.3. Stock Market Transaction Data

The stock market transaction data comes from Oriental Fortune.com, and the impact of the price war on the two companies is judged by analyzing stock price fluctuations, as shown in Figure 6.

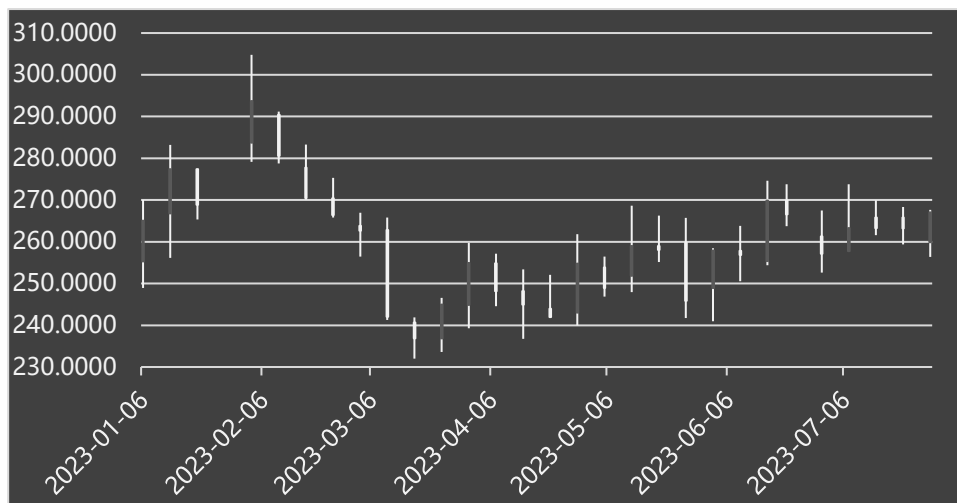


Figure 6: Weekly K-line chart of BYD from January to July 2023.

The stock price of BYD began to fall earlier than the automobile sector at the beginning of February. This was caused by Buffett's consecutive reductions in holdings this year. His reductions caused panic in the market, and more people chose to sell BYD stocks. BYD's stock price stabilized in late March, and until the end of July, the weekly line showed a steady upward recovery trend, which was earlier than the sector in June. From the K-line, it can be seen that GWM has little impact on BYD's report letter, and the stock price rebounded after a short-term decline, as shown in Figure 7.

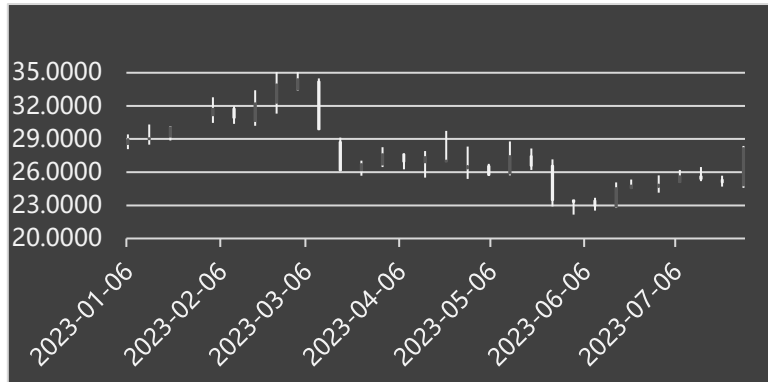


Figure 7: Weekly K-line chart of Great Wall Motor from January to July 2023.

The stock price of GWM fell with the sector in March stabilized earlier than the sector at the end of March, and fluctuated until May 25. After GWM's report letter was issued on May 25, the share price of GWM fell below the support level again. After stabilizing and rebounding in June, GWM's share price performance was also significantly weaker than that of the automotive sector. The impact of corporate reputation on stock prices can be seen, and the report letter has a greater impact on GWM itself.

#### 4.2.4. Analysis of the Impact of GWM's Report on BYD on the Stock Prices of the Two Companies

GWM's report on BYD is a typical representative of the information war, and it is also one of the few news that the public can see; in this case, GWM's share price fell more as the whistleblower, and the result was more dramatic. This event was therefore selected for separate analysis.



This paper uses the event study method to analyze the incident of GWM reporting BYD on May 25. The estimation sample is selected from May 6, 2022 to October 31, 2022. The time sample selects 13 trading days from t-6 to t+6.

First, it uses the estimated sample to get BYD's predictive linear equation:  $y = 1.046x - 0.0725$ ,  $R^2 = 0.6278$ .

Then it gets Table 3 as follows:

Table 3: BYD event analysis method T-6 to T+6 data (data with two decimal places).

Time	R	AR	CAR
T-6	-0.29	-1.27	-1.27
T-5	-0.31	-0.42	-1.69
T-4	-0.27	0.31	-1.38
T-3	1.24	1.03	-0.34
T-2	-0.85	0.03	-0.31
T-1	-0.85	0.46	0.15
T	-1.10	-1.31	-1.17
T+1	0.55	-3.92	-5.09
T+2	-1.58	0.75	-4.34
T+3	1.03	1.94	-2.40
T+4	-0.62	1.20	-1.21
T+5	-0.13	0.84	-0.37
T+6	1.93	-0.52	-0.89

After that, it selects T-2 to T+2 for analysis is shown in Table 4:

Table 4: BYD event analysis method T-2 to T+2 data (data with two decimal places).

Time	R	AR	CAR
T-2	-0.85	0.03	0.03
T-1	-0.85	0.46	0.49
T	-1.10	-1.31	-0.82
T+1	0.55	-3.92	-4.74
T+2	-1.58	0.75	-3.99

In the selected 13 days, the cumulative abnormal return rate of BYD stock was -0.89, which means that BYD stock oversold -0.89% during this period. The selected 5-day data shows that the stock price has fallen by 3.99%. It can be seen that the incident on May 25 had a certain short-term impact on BYD's stock price, and there was a tendency to repair it in the next few days, and the stock price was almost repaired in a week. As a large enterprise and a leader in new energy automobile enterprises, BYD has a certain stock price stability, and it will not be affected much by this incident in the long run.

It carries out the same analysis on Great Wall Motors. Get the prediction equation:  $y = 1.3166x + 0.0737$ ,  $R^2 = 0.5603$ , and it obtains Table 5:

Table 5: Data from T-6 to T+6 of the GWM Incident Analysis Method (data rounded to two decimal places).

TIME	R	AR	CAR
T-6	-0.19	-0.76	-0.76
T-5	-0.23	-0.36	-1.12
T-4	-0.18	0.52	-0.61
T-3	1.74	-0.54	-1.15
T-2	-0.91	-0.93	-2.08
T-1	-0.90	-0.11	-2.20
T	-1.21	-4.95	-7.15
T+1	0.86	-5.14	-12.30
T+2	-1.83	-2.55	-14.84
T+3	1.46	-0.14	-14.98
T+4	-0.61	-1.17	-16.15
T+5	0.00	1.02	-15.13
T+6	2.60	0.73	-14.39

In the selected 13 days, the accumulative abnormal return rate of GWM stock was -14.39, which means that GWM stock oversold by 14.39% during this period. Such a huge oversold shows the huge impact of the incident on GWM, which is difficult to repair in the short term. The market value of GWM is at the level of 100 billion, and the market value of such a decline has evaporated by tens of billions, and the loss is huge. In addition to the stock price drop, the incident mainly brought about the loss of GWM's word of mouth, and it even caused a joke that reporting others would result in greater losses.

Subjectively looking at the reporting incident of GWM, combined with the objective fact that the performance of GWM in the semi-annual report is far worse than that of BYD, the behavior of GWM this time is to interfere with the normal operation of BYD and to make the other party spend more energy on handling the reporting incident. I didn't expect to lift a rock and shoot myself in the foot. BYD was not affected much, but GWM suffered a greater loss in the stock market.

## 5. Conclusion

The impact of the price war on Chinese domestic companies is limited, leading to a decline in the gross profit margin and revenue of some companies' main businesses. If the price war continues, some companies will suffer losses, and some companies will eventually be eliminated from the market. In the short term, the price war will promote the sales of new energy vehicles, and most car companies will almost increase sales regardless of profit or loss. Looking at the price war in the long run, if such a price war continues, it will lead to the formation of an unhealthy market. In the end, a few giant companies will be left to monopolize the auto industry market, and arbitrarily lowering prices will also destroy the auto pricing rules. To some extent, the price war has also promoted the progress of technology, and under the conditions of mutual competition, it is better to compete for products that suit the market and the taste of the public.

Price wars For enterprises, price wars also expose the technical deficiencies of some new energy vehicles, such as batteries. This is the most fundamental problem of new energy vehicles. It is related to the life and battery life of new energy vehicles, and it is related to the future of new energy vehicles and whether they can completely replace traditional oil and gas vehicles.

The price war has also made some traditional companies realize that they need to transform to the new energy vehicle industry faster. Only by mastering the core technology can we survive in the future industry competition.

The new energy automobile industry will still have a good development trend for at least five years in the future, especially since breakthrough of key battery technology will bring another big market to the industry. For enterprises, it is necessary to accelerate the research of new energy battery technology in order to leap forward in the current industry. But price wars are likely to become a norm, especially under the conditions of China's domestic economic downturn and reverse population growth in the next 10 years. The emergence of problems such as overproduction, reduced demand, and rising labor costs will lead to the emergence of price wars in various industries.

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