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A Study on the Market Response to the Impact of Emergencies on New Energy Vehicle Companies—A Case Study of Tesla

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Abstract: *The occurrence of social emergencies often acts on the main body of the company involved. The positive social events of a company can enhance its reputation, while the negative ones will cause damage to its image and other influences. This paper will take Tesla as an example, focus on the social emergencies related to consumer rights protection, and analyze the market reaction brought by using the event study method. The study found that the unexpected consumer rights protection event had a certain negative impact on Tesla. This study provides a relevant reference for China's local new energy vehicle companies to promote the continuous improvement and development of the industry.*

Keywords: *Emergency; New Energy Vehicles; Market Response; Tesla; Rights Protection*

1. Introduction

Bp Energy Outlook 2022 edition notes that since the Paris Agreement (COP) in 2015, global carbon emissions have continued to increase in each of the years since, except for a modest decline in 2020 during the COVID-19 pandemic. Leaving the current carbon budget unchanged could lead to a dramatic increase in future costs. Therefore, the word 'carbon neutral' was put forward, which also promoted the current public to choose a way to green travel and reduce energy consumption, promoted the development of a new energy automobile industry, and constantly transmitted the concept of 'developing green economy' to the world[1].

In fact, since 2015, new energy vehicles have been gradually promoted to ordinary consumers. At the time, Tesla had already entered the Chinese market. Until today, it has been favored by many young consumers. According to the related financial statements disclosed by Tesla, the revenue of Tesla in the first three quarters of 2022 was 57.144 billion dollars, a year-on-year growth of 58.28%. Among them, the auto sales sector accounted for 82.19% of the total revenue, and the sales volume in the first three quarters reached about 909,000 units. While Tesla's new energy vehicles are popular around the world, they have also made great contributions to global environmental protection and energy security. However, in recent years, whether at home or abroad, accidents or consumer complaints often occur in the process of using its products, which are often heated by the media and have aroused the wide attention of society.

Based on this, this paper studies the market reaction to the impact of emergencies on new energy vehicle companies, aiming to understand the impact of emergencies on the company, and proposes that the company should solve possible problems and improve the details to promote the development of the industry.

2. General Overview of Tesla

2.1. Business Model

Most traditional automobile sales companies use offline 4S stores to attract consumers. With the popularization and upgrading of network and technology, Tesla has opened the functions of online reservation and appointment and attracted a large number of consumers through the business model of 'online sales and offline services' [2].

Compared with other brands of cars, Tesla can customize its vehicles more personalized to the

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individual needs of consumers, who can choose versions at different price points according to their budget. The smart technology inside Tesla cars is also popular with younger consumers [3].

With advanced sales services and high-quality follow-up services, Tesla is committed to bringing a better experience to consumers. For example, Tesla will update its software regularly with fixes and optimizations that will make its maps more user-friendly. With this follow-up service, which can be constantly optimized and updated, consumers have great expectations for the Tesla brand.

2.2. Revenue Business

In terms of new-energy vehicle sales, Tesla's main revenue business includes vehicle sales service, after-sales service, and development service. Sales services, including vehicle sales and spare parts sales, continue to promote the combination of a pure online sales model and an offline after-sales service model, ordering first before production. In addition, Tesla eliminated dealerships and streamlined the purchase process.

After-sales service, including repair and maintenance-related services. Tesla offers remote diagnostics and in-home repair services, allowing consumers to schedule, change or cancel service appointments at any time through the app rather than having to visit the service center frequently. Tesla also offers valet services and alternative vehicles as resources permit [4].

Development services, Tesla has advanced technology, for autonomous driving services, and battery management and development has strong technical support.

2.3. Market Positioning

Tesla sells almost all over the world. Tesla has attracted a large number of consumers to its products through its features of new energy, intelligence, and technology, combined with the current efforts to promote the dual-carbon goal and the development of a green economy. Moreover, Tesla can meet the personalized requirements of configuration and show excellent performance, which is favored by young high-consumption groups. At the same time, Tesla also aims at the mass market and lowers the selling price of cars to attract a large number of consumers.

In addition, according to the dynamic demands, feedback, and problems of consumers, Tesla constantly makes strategic adjustments and improves the current performance and equipment.

3. Consumer Rights Emergency and Impact

Two women wearing T-shirts with ‘Brake failure’ and the Tesla icon attract attention at the Tesla booth at the 19th Shanghai International Automobile Industry Exhibition, which opened on April 19, 2021. One of them stood on top of a car and shouted ‘Tesla brake failure’, causing chaos at one point. It is worth noting that the female owner of the car had previously raised a question in March and defended her rights.

Tesla Vice President Tao Lin said on Wednesday afternoon that the recent negative reaction was caused by the woman and that there is no way to compromise. It is a necessary process for the development of a new product. Tesla later replied on Weibo: ‘If the fault lies with Tesla products, Tesla will firmly take responsibility to the end...’, and apologized for not addressing consumers' problems on time.

Tesla was then interviewed by five agencies, and its reputation plummeted. Tesla shares fell 3.4 percent on the 19th, wiping out about $24.1 billion in market value. The rights protection incident went viral for a while. A large number of web media, social media platforms, and the three major central media criticized Tesla for its arrogant attitude toward Chinese customers. However, the next day, Tesla's stock price rose 0.61%. Perhaps as Tesla Vice President Tao Lin once said ‘90% of customers are willing to choose Tesla again’, there are still a large number of consumers who will continue to choose Tesla.

4. Analysis of Tesla's Market Response Based on Event Research

This paper studies the market reaction to the impact of consumer rights events on companies by using the event study method. This article will use the change in Tesla's stock price to reflect its market reaction. In the research process, it is necessary to determine the event date, event window, and estimation window

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[5]. Since Tesla stock is listed on the NASDAQ exchange, the main source of stock data about Tesla in this paper is EastMoney.com, and Nasdaq Index (NDX) is chosen as the basis for calculating the return rate of a market index.

4.1. Determine Event Date, Event Window, Estimate Window

Since the rights protection event took place on April 19, 2021, it was confirmed as the date of the event (T=0). An event window is a period that includes the day before and the day after the event. According to the online information, the party involved in the rights protection event once carried out the rights protection action in Henan Province on March 9, 2021. In addition, there was frequent news of Tesla accidents in China and the United States in May of that year, so the event window was set to include 30 trading days before and after the rights protection event occurred, namely [-30,30]. The estimation window is set as 100 trading days before the event window, i.e. [-130,-31].

4.2. Determine the Normal Income Rate

$$R_{it}=p_{it}/p_{it-1}-1 \quad (1)$$

$$R_{mt}=MP_t/MP_{t-1}-1 \quad (2)$$

In formula (1) R_{it} is defined as the actual rate of return of individual stocks, the p_{it} is the closing price of the stock on that day, and p_{it-1} is the previous day's closing price; In formula (2) R_{mt} is Market index rate of return, MP_t is the market's closing index for the day, and MP_{t-1} is the previous day's closing index[6]. The daily closing price of Tesla stock is based on the estimate window and the event window, and the daily closing index of Nasdaq is substituted into equations (1) and (2). Calculate the individual stock actual return rate and market index return rate of all data sets [-130,30], and take the calculated individual stock actual return rate of the estimated window [-130,-31] as the basis for calculating the normal return rate of the event window.

Secondly, the actual rate of return and market rate of return of individual stocks in the estimation window [-130, -31] are selected for regression analysis:

$$(R_{it})\hat{}=\alpha_i+\beta_i R_{mt} \quad (3)$$

In formula (3), $(R_{it})\hat{}$ is the estimated normal rate of return of individual stocks. According to the existing data, the regression analysis can be obtained: $\alpha_i=0.002567$, $\beta_i=1.660469$, namely, the regression equation is:

$$(R_{it})\hat{}=0.002567+1.660469R_{mt} \quad (4)$$

After Formula (4) is obtained, the Market index rate of returns in the event window [-30,30] is substituted respectively to obtain the normal returns of Tesla stock in the event window, as shown in Table 1.

Table 1: Normal rate of return of Tesla stock in the event window $(R_{it})\hat{}$

T	Date	(Rit)ˆ	T	Date	(Rit)ˆ
-30	2021/3/5	0.028234608	1	2021/4/20	-0.012767085
-29	2021/3/8	-0.037400745	2	2021/4/21	0.02231374
-28	2021/3/9	0.063756923	3	2021/4/22	-0.013122102
-27	2021/3/10	0.001933234	4	2021/4/23	0.026407445
-26	2021/3/11	0.044475043	5	2021/4/26	0.017015894
-25	2021/3/12	-0.007199758	6	2021/4/27	-0.003135923
-24	2021/3/15	0.020000861	7	2021/4/28	-0.002051365
-23	2021/3/16	0.004030119	8	2021/4/29	0.00629185
-22	2021/3/17	0.009177288	9	2021/4/30	-0.011566834
-21	2021/3/18	-0.047649014	10	2021/5/3	-0.005467366
-20	2021/3/19	0.015108974	11	2021/5/4	-0.028696631
-19	2021/3/22	0.022959677	12	2021/5/5	-0.003654202
-18	2021/3/23	-0.016031687	13	2021/5/6	0.008730912
-17	2021/3/24	-0.030800045	14	2021/5/7	0.017109824
-16	2021/3/25	0.004589761	15	2021/5/10	-0.039738481
-15	2021/3/26	0.023173035	16	2021/5/11	0.001026943
-14	2021/3/29	-0.007427108	17	2021/5/12	-0.041798801
-13	2021/3/30	0.000753913	18	2021/5/13	0.014456362

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-12	2021/3/31	0.028212174	19	2021/5/14	0.041151901
-11	2021/4/1	0.031803173	20	2021/5/17	-0.003729933
-10	2021/4/5	0.030341443	21	2021/5/18	-0.006792108
-9	2021/4/6	0.001693489	22	2021/5/19	0.002080229
-8	2021/4/7	0.001410595	23	2021/5/20	0.032031537
-7	2021/4/8	0.019606141	24	2021/5/21	-0.005376073
-6	2021/4/9	0.011077478	25	2021/5/24	0.026009078
-5	2021/4/12	-0.003428525	26	2021/5/25	0.002080814
-4	2021/4/13	0.02008285	27	2021/5/26	0.012394491
-3	2021/4/14	-0.013835887	28	2021/5/27	0.002359109
-2	2021/4/15	0.02424513	29	2021/5/28	0.00407319
-1	2021/4/16	0.004173208	30	2021/6/1	0.00108633
0	2021/4/19	-0.013688707			

4.3. Calculate excess return (AR_{it}) and cumulative excess return (CAR_{it})

The excess rate of return (AR_{it}) refers to the difference between the actual rate of return and the estimated normal rate of return of individual stocks in the event window, which is calculated as follows:

$$AR_{it}=R_{it}-(R_{it})\hat{} \quad (5)$$

The cumulative excess return rate (CAR_{it}) refers to the cumulative sum of the excess return rate of each trading day within the event window. The calculation formula is as follows:

$$CAR_{it}=\sum_{m\hat{}n}(AR_{it}), \text{ (In this example, m=-30, n=-30, -29... , 29,30)} \quad (6)$$

Table 2: Excess return (AR) and cumulative excess return (CAR) on Tesla stock

T	AR	CAR	T	AR	CAR
-30	-0.066033305	-0.066033305	1	0.018854151	-0.038075486
-29	-0.021047981	-0.087081286	2	0.012652462	-0.025423025
-28	0.132651667	0.045570381	3	-0.019695186	-0.045118211
-27	-0.01012813	0.035442251	4	-0.012943502	-0.058061713
-26	0.00272061	0.03816286	5	-0.004923598	-0.06298531
-25	-0.001205045	0.036957815	6	-0.042217025	-0.105202336
-24	0.000497323	0.037455138	7	-0.012592541	-0.117794877
-23	-0.047889768	-0.010434631	8	-0.031349093	-0.14914397
-22	0.027652921	0.017218291	9	0.059468637	-0.089675333
-21	-0.021685003	-0.004466713	10	-0.029123297	-0.11879863
-20	-0.012490933	-0.016957645	11	0.012183271	-0.106615358
-19	0.000128875	-0.01682877	12	-0.000265096	-0.106880455
-18	0.004344945	-0.012483825	13	-0.019774954	-0.126655409
-17	-0.01736052	-0.029844345	14	-0.003817483	-0.130472892
-16	0.011450983	-0.018393362	15	-0.024691289	-0.155164181
-15	-0.056996703	-0.075390064	16	-0.019865173	-0.175029354
-14	-0.004597717	-0.079987781	17	-0.002433931	-0.177463285
-13	0.039047815	-0.040939966	18	-0.045326524	-0.222789809
-12	0.022620884	-0.018319082	19	-0.009560801	-0.232350611
-11	-0.041055779	-0.059374861	20	-0.018144113	-0.250494724
-10	0.013950877	-0.045423984	21	0.008560362	-0.241934362
-9	-0.000868657	-0.046292641	22	-0.026999759	-0.268934121
-8	-0.031253572	-0.077546214	23	0.009337859	-0.259596262
-7	-0.000514663	-0.078060877	24	-0.004644889	-0.264241151
-6	-0.020992803	-0.09905368	25	0.017992368	-0.246248783
-5	0.040296518	-0.058757162	26	-0.004999438	-0.251248221
-4	0.065903731	0.007146569	27	0.011518984	-0.239729237
-3	-0.025635208	-0.018488639	28	0.016538071	-0.223191166
-2	-0.015231691	-0.033720331	29	-0.012966094	-0.23615726
-1	-0.002914478	-0.036634809	30	-0.003197553	-0.239354813
0	-0.020294829	-0.056929638			

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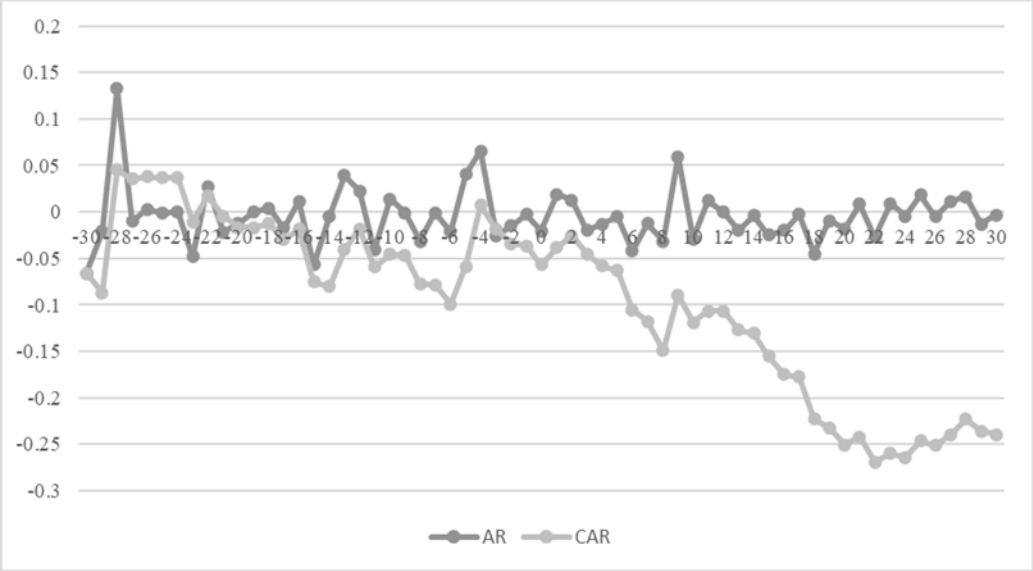

Figure 1: Tesla rights protection AR and CAR trends chart.

Therefore, the actual rate of return and normal rate of return of individual stocks within the range [-30, 30] are substituted into Equation (5) to obtain the excess rate of return of each trading day within the event window. Then, the obtained results are substituted into Equation (6) to calculate the cumulative excess return rate [7]. The specific results are shown in Table 2.

The excess rate of return and cumulative excess rate of return obtained through the above steps are combined with the interval of the event window [-30,30] to draw a broken line chart, as shown in Figure 1.

4.4. Result analysis

Through calculation and chart analysis, it can be seen that within the event window, the AR value of Tesla's excess return fluctuates around 0. Tesla's accumulated excess rate of return (CAR) fluctuates similarly to AR before the event day of consumer rights protection (T=0), but after the event, CAR shows a rapid downward trend, and through data analysis, in the event window [-30, 30], when T=30, CAR<0, Both the trend chart and the data suggest that Consumer rights protection event has harmed Tesla to some extent.

The reason for the obvious negative effect nearly 30 days after the occurrence of the rights protection incident may be due to the large and lasting social and media effect caused by the emergency. In 2021, for example, according to the relevant data consulted, there are 116,863 pieces of public opinion data about Tesla's consumer rights protection. It was precise because of the rapid fermentation of the rights protection incident at that time that the data volume of that month accounted for 50.45% of the whole year of 2021, and the public sentiment did not recover to the normal level of other stages until July.

In addition, according to the relevant data consulted, the proportion of brake system failure and brake failure accounted for 90.02% of the public opinion of rights protection in 2021, and the amount of public opinion data surged by 40.40% in April. While the data volume was significantly lower in May, the second half of 2021 was generally higher than before the rights violations. Therefore, this emergency has brought serious negative effects on Tesla.

5. Relevant Measures

As for the consumer rights protection event, the empirical analysis will harm Tesla, and the impact will last for a long time. Therefore, relevant measures and suggestions should be put forward for this incident.

First of all, since the parties involved in the rights protection case are consumers, and Tesla has a large number of consumers in China, it has attracted wide attention from society. Judging from the response of the vice president of Tesla, as a senior manager, he did not stand in the perspective of consumers at the first moment when the incident happened but subjectively expressed that ‘the recent

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negativity was contributed by this woman', which resulted in a large increase of negative public opinion on Tesla's products. Therefore, the departments and personnel involved in the product need to take the initiative to take responsibility for the follow-up problem to create favorable conditions. The Tesla party shall effectively communicate with an open, equal, and sincere attitude and release relevant information through official channels to reduce the adverse impact of various rumors that may arise due to the fermentation of the event on the company. Secondly, through consulting the materials, it can be known that the parties involved in the rights protection event had already defended the products they purchased in March, and the parties had asked Tesla to provide relevant data, but it was not effectively solved, and the timeline was prolonged, leading to the outbreak of the second rights protection event on April 19. Therefore, the company should solve the problem the first time and come up with effective solutions to prevent the problem from causing fermentation. As an enterprise, it is necessary to be responsible for the products it produces and sells. Especially for 'star' enterprises, it is more necessary to pay attention to the handling principles and attitudes in the face of consumer demands. Under the supervision of the market and public opinion, enterprises should implement the principles of timely handling, equal communication, and practical solution in the aspects of after-sales service. Otherwise, enterprises will easily be pushed to the top of the storm, which will greatly damage their reputation, sales business, and enterprise market value.

6. Conclusions

By studying the basic situation of Tesla, we can understand its unique business model combining online sales and offline services, its main revenue business, and its clear market positioning. In addition, through searching materials and collecting social emergencies related to Tesla and combining them with the event study method for empirical analysis, it is concluded that the emergencies have brought certain negative impacts on Tesla and greatly affected the market value of the enterprise. Finally, this paper analyzes and thinks through its influence and the reasons behind it, and puts forward suggestions and measures. The popularity of new energy vehicles has become an inevitable trend in the future, and production and sales are gradually rising, which can make great contributions to the protection of the ecological environment. Relevant enterprises should pay attention to such emergencies and constantly improve management details to meet the needs and expectations of consumers and investors.

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