Influences of COVID-19 on JD Stock Prices

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ABSTRACT
COVID-19 affected every whit of people's lives, influencing the worldwide economics on a large scale. It could also be observed that opportunities had been provided for industries like E-commerce. In the research, JD as the research object was analyzed by event study and linear regression to estimate the changes of its stock prices and to evaluate its performance during the period. From discoveries of this work, it can be concluded that the pandemic has an overall positive effect on JD stock prices. What is special in this study is: JD is listed in the US market while its major business is in China; it is required to take currency rate into account; For guaranteeing the independence of the events, it needs to compare statistics during the same period in the last few years.

Keywords: *E-commerce, Covid-19, Stock market*

1.INTRODUCTION

The sudden strike of COVID-19 caused a world-shaking change to the whole world. The powerful bacteria not only put the health of ours at risk, but also forced us to alter the lifestyles we have been used to. All kinds of activities now closely rely on the internet including work, entertainment and shopping. As for enterprises, the pandemic is undoubtedly a challenge. The panic of the public, the degradation of consumption and the transformation of consumption scene brought by the economic downturn have put forward higher requirements for the adaptability and transformation ability of enterprises This year has witnessed vanishments of various companies, as well as those found their paths to rise even in the storm. JD's excellent revenue and the decision of listing multiple times in multiple sectors reveal its vigorous vitality, which gives this work enough confidence to say that JD has gained additional benefits by sailing against the current in the epidemic situation. However, relationship between its revenue and the pandemic still awaits our inspection. In this work the stock prices of JD and the market have been taken as an epitome to study the influences of COVID-19 applied on JD.

2.LITERATURE REVIEW

Existing materials can be divided into two categories. One is about influences of COVID-19 on various aspects of the society. Two is research on JD company.

2.1 COVID-19 on economics

Zhang Yuyan used International Monetary Fund (IMF) and Consumer price index of different countries to list four manifestations that COVID-19 had a huge impact on global economics: drastic economical drop of economies; decrease of prices and rises of the unemployment rate; reduction on trades and cross-border investments as well as abnormal price changes in commodities; rapid expansions in debts of countries [1]. As for the situation of China, Niu Fang pointed out that China, as a developing country, with the background of limited importation and exportation, the crisis of broken supply chain and the shrink of external demand brought uncertainty to economics, thus causing poverty and pressure of employment [2]. But if classified by different industries, Zhong Zhen, Li Hongjin stated that intensive consumption, industries manufacturing industries and intensive production industries were negatively affected to different degrees, Online education, animation, e-commerce, telemedicine and other industries had achieved greater development [3].

2.2 COVID-19 on E-commerce platform

In Analysis of the impact of COVID-19 on China's platform economic development, authors pointed out that platform economics had taken up 10.5% of the GDP of our country [1]. Nowadays the scale of users, consumption ability, digital technology has advanced to a great extent. E-commerce platform made consumers, producers and organizers further strengthen their understanding of it and more economic subjects involved. The transformation of e-commerce platform from trading platform to innovation platform and composite platform had been promoted with its cross network and innovation [3]. Quest Mobile 2020 China mobile Internet "Fighting epidemic" special report demonstrated daily active users of China's fresh electricity suppliers increased by 60%. According to the statistics of Pingduoduo, the demand for medical and disinfection products rose sharply during the epidemic, sales of digital products, children's toys, chess and card entertainment, fitness equipment and other categories of goods had also risen [4]. National Bureau of Statistics data showed that from January to February, the online retail sales of physical goods reached 1,123.3 billion yuan by 3%, accounting for 21.5% of the total sales of consumer goods. It can be witnessed that the COVID-19 pandemic has not only increased online sales in scale, but also spawned new sales hotspots.

2.3 COVID-19 on stock market

People's Bank of China Tianjin Branch Business Department used event study and EGARCH model to find out that COVID-19 has a significant lag effect on the market return rates and has caused a large fluctuation in the market return rate, as well as the phenomenon of asymmetric fluctuation, making the negative impact more significant. Jiang Hai [5] used cross-market testing since ESA to conclude that COVID-19 had a significant positive impact on the stock market risk in China, the US and Europe, leading to a significant increase in the risk level, but the impact significance decreased with the extension of the window. Studies also show that risk spreads across markets, leading to a risk-sharing effect among stock markets [6]. Lan Bo (2020), on the other hand, proved that the impact was wavy and had obvious stages by dividing January, February and march into three stages. Furthermore, by comparing the data of the model, he concluded that there were different risk contagion characteristics among different financial market segments [7]. In conclusion, COVID-19, as an emergency event, has brought significant and complicated impact to global stock market.

2.4 Brief introduction to JD

JD Mall is a comprehensive retailer in China, selling tens of thousands of high-quality goods in 12 categories online, such as home appliances, digital, communications, computers, home furnishing department stores, clothing and apparel, maternal and child, books, food, online tourism and so on. JD's main brand is electronic products, and male consumers are the dominant group, which makes it different from Taobao, Amazon and other platforms and forms its own uniqueness [8]. JD is a 3C online shopping platform with the strongest professionalism and the widest coverage in the B2C market. JD was favored by numerous of venture capital firms at home and abroad and went public in the US in 2014. JD went public on the Hong Kong Stock Exchange in June 2020.

2.5 JD logistics

JD began to establish its own logistics network in 2007, forming a unique self-operated B2C warehouse logistics. JD chooses to establish branches in many provinces and regions across the country, sets up logistics distribution centers in developed cities, and employs delivery personnel as employees, thus establishing a completed and innovative service system. JD's logistics system ensures the timeliness and efficiency of delivery services, improves the turnover rate of goods, and satisfies customers' demands for products to a large extent [9]. During the outbreak of the epidemic, JD was once the only logistics company still in operation. It can be said that JD's achievements during the epidemic and its success at the present stage are greatly related to its logistics system

3.RESEARCH DESIGN (METHODOLOGY)

3.1 Event study

Event study is a common analysis framework in the financial field, which is mainly used to study the impact of an event on a company's stock price or return rate. Through the analysis of abnormal returns, the impact of the event itself on stock returns is analyzed. The steps of the event study method are generally divided into three steps: to clarify the situation of the event, to determine two windows, one estimation window used to estimate and create market model and one event window to measure the impacts of the event. Event analysis relies on three basic assumptions: the efficient market hypothesis, which states that stock prices reflect all known public information; unpredictability, that is, the studied event is unexpected in the market, the abnormal return can measure the reaction degree of stock price to the event; Independence, that is, the window in which an event occurs without the mixed effects of other events.

3.2 Determination of event window

Several significant time points have been selected including the iconic dates of the spread of the epidemic and the time periods when JD used sales strategies to

carry out time-limited promotion, which are as follows:

2020.1.31 The World Health Organization declared that COVID-19 is a world health emergency

2020.3.9 JD "Spring Rain Project" and "Goddess Festival" promotion, which began on Sunday, Mar. 8th

2020.4.3 With more than a million infections worldwide, COVID-19 has become the biggest health crisis of modern time

2020.5.21 The number of infected people worldwide exceeded 5 million and the day was when JD provide promotion for Chinese valentine's day

2020.6.18 "Billion-Yuan Subsidy", JD and Kuaishou Quality shopping festival

2020.7.12 The number of COVID-19 cases exceeded 230,000 in a single day

2020.8.10 The number of global infections exceeds 20 million

The event window is ten trading days before and after the selected time point, and the advance window is from November 2nd, 2018, to January 10th, 2020.

3.3 Analysis model

According to the market model, $Rt = \alpha + \beta Rmt + \varepsilon$, in which Rt represents the return for a stock, Rmt represents the return of the whole stock market, ε represents the random return, α represents the constant return of an individual stock and β represents the coefficient of Rt and Rmt. In case the correlation between the stock market, the market model suggests that the return of an individual stock can be represented using the return of the whole stock market. The market model also assumes that the relationship between the stock market is linear relationship and the β represents the coefficient of the return of one specific stock on that of the whole market.

Through the model established in the estimation window, it can be used to predict the market model and deduce the return of JD from it. The method to generate the model is linear regression, which can be used to estimate the normal return for JD in the event window.

What is special about JD stock is that most business activity of JD is operated in China, but the stock is launched on the stock market in the United States. Therefore, using only one market index from either China or the United States is not an accurate measure to estimate the return of JD. To improve the accuracy, a model of two independent variables is generated. The model takes both Shanghai Security Composite Index (SSEC) from China and the Stand and Poor's 500 (S&P500) from the US. This approach causes the market model to change from 1 independent variable to 2 independent variables and the model becomes：

$$Rt = \alpha + \beta Rmt(S\&P500) + \beta Rmt(SSEC) + \varepsilon. \quad (1)$$

All the variables are translated to the currency of RMB using the exchange rate on corresponding dates to make clear the effects of different exchange rates on different dates when measuring the return. The final value of calculation is shown below:

α = -0.00106 , $\beta RmtSSEC$ =0.47599 , $\beta Rmt(S\&P500)$=1.24122 (2)

3.4 Hypothesis verification

By making a null hypothesis, which is to assume JD has no abnormal return because of an event, the return of JD should fluctuate about the estimated return which can be estimated using the market model of $Rt = \alpha + \beta Rmt（S\&P500）+ \beta Rmt（SSEC）$. If the assumption is right, then the result will be that the return of JD is within the confidence interval. As the normal distribution suggests that 95% possibility of a standardized value should be greater than -1.96 and smaller than +1.96. This interval between 1.96 and -1.96 is considered as the confidence interval. If the actual return of JD is within the confidence interval, it means that to reject the null hypothesis is inappropriate. If the actual return of JD exceeds the confidence interval, it means that to reject the null hypothesis with 95% accuracy.

In case the effects of an event on the return of JD stock may be some days earlier or some days later than the exact date of the event, an event window which is ten days before and after the exact date of the event is drawn to measure there is the abnormal return over this period instead of just focusing on a specific day. To measure this, the abnormal return of each day is since the beginning of the event window is added together to get the cumulative abnormal return. The cumulative abnormal return is the sum of all the abnormal return before the specific day. For example, if the abnormal return for the first day is 3% and the second day is 5%, the cumulative abnormal return for the second day is 8%. With the cumulative abnormal return, if the cumulative abnormal return within the event window exceeds the confidence interval, it can be claimed that the event has an abnormal effect on the return of JD, either positively or negatively. The confidence interval is created according to the formula that $\pm\sqrt{（1.96T）}$ in which T represents the number of days after the beginning of the event window.

The following graphs represent visualized result. For each graph, the y-axis represents the standardized data and x-axis represents the time. Day 11 is the date of the event day, Day 1 represents ten days before the event date; Day 2, represents nine days before the event date and so on. The upper and lower blue curves represent the confidence interval of standardized data of the stock price. If the fluctuations of the real stock price, which is

represented by the wave-like orange lines, exceed the confidence interval, statistician will say that the possibility is less than 5%.

For the following graphs, Figure 1, Figure 5, Figure 6 and Figure 7 have their orange line fluctuates within the confidence interval, but Figure 2, Figure 3 and Figure 4 have their orange lines exceed the confidence interval, meaning that more than 95 percent that the events represent by these figures have influence on JD's stock price. The events are "2020.3.9 JD "Spring Rain Project" and "Goddess Festival" promotion, 2020.4.3 With more than a million infections worldwide, COVID-19 has become the biggest health crisis of modern time and 2020.5.21 The number of infected people worldwide exceeded 5 million."

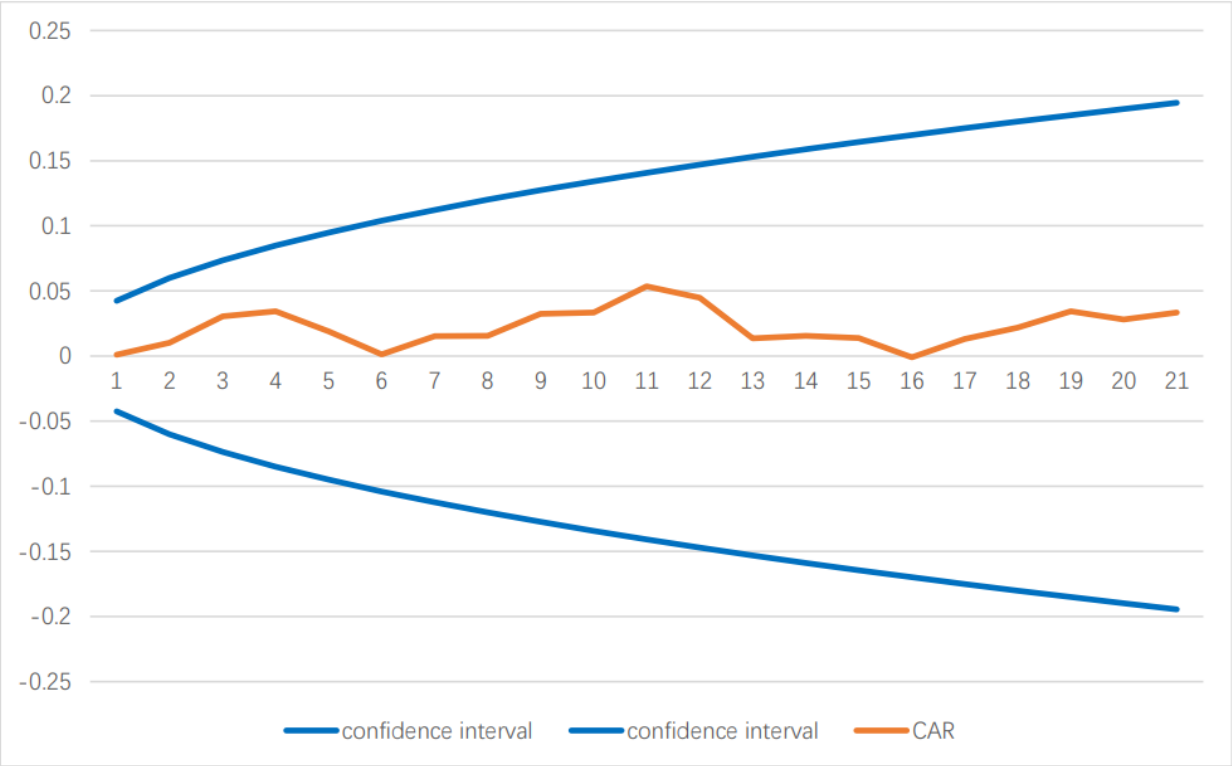

Figure 1 Cumulative abnormal return of JD stock when WHO declared covid-19 as a worldwide health problem (2020.1.31)

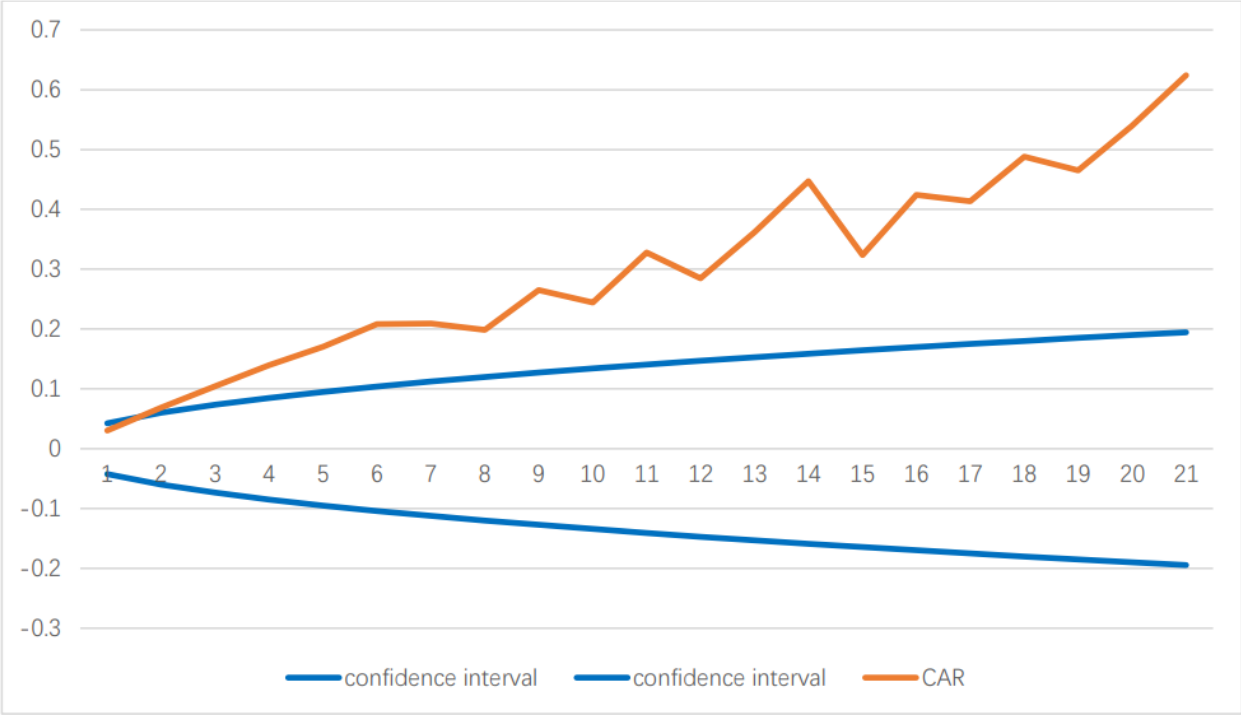

Figure 2 Cumulative abnormal return of JD stock when JD conducted "Spring Rain Project" and "Goddess Festival" promotion (2020.3.9)

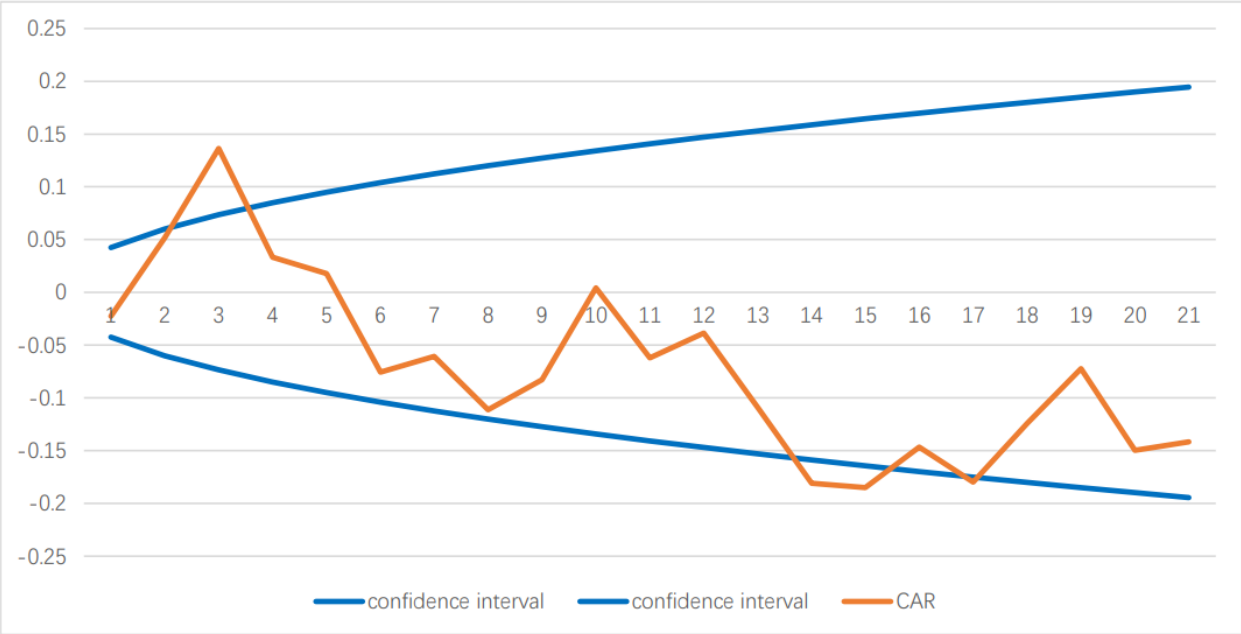

Figure 3 Cumulative abnormal return of JD stock when cases of Covid-19 became the greatest in modern time (2020.4.3)

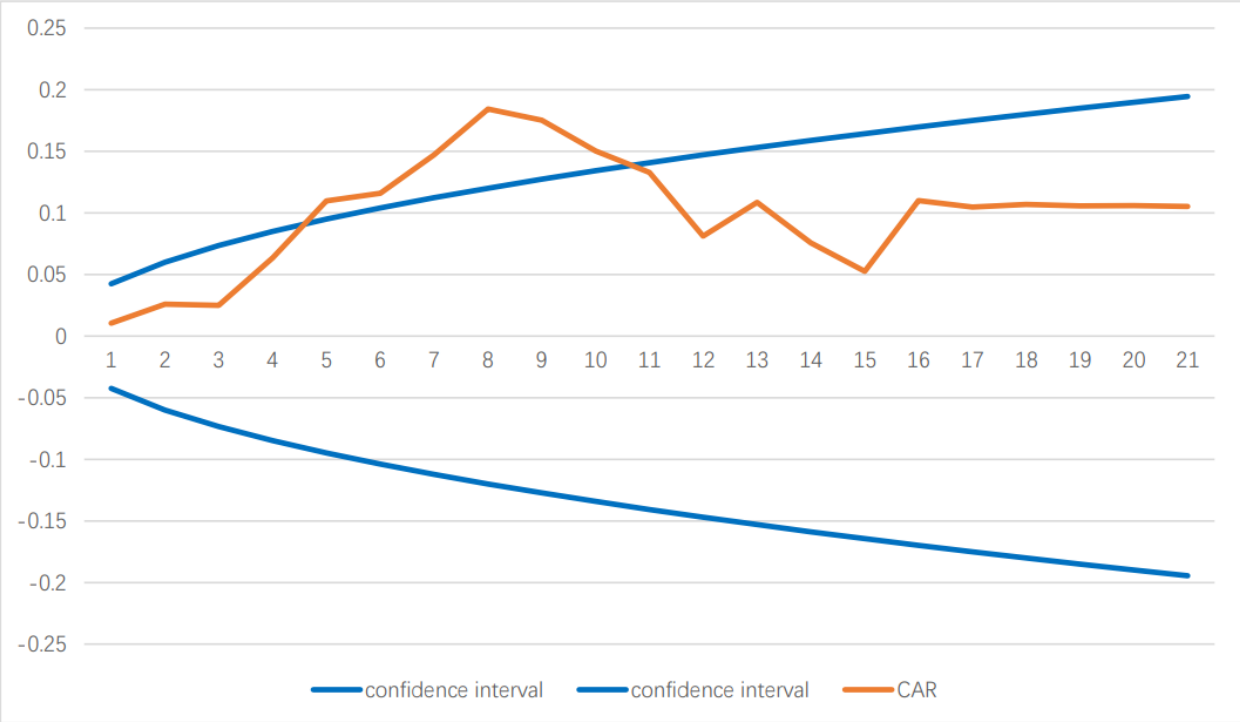

Figure 4 Cumulative abnormal return of JD stock when the cases of infections exceeded 5 million and JD gives Chinese valentine's day promotion (2020.5.21)

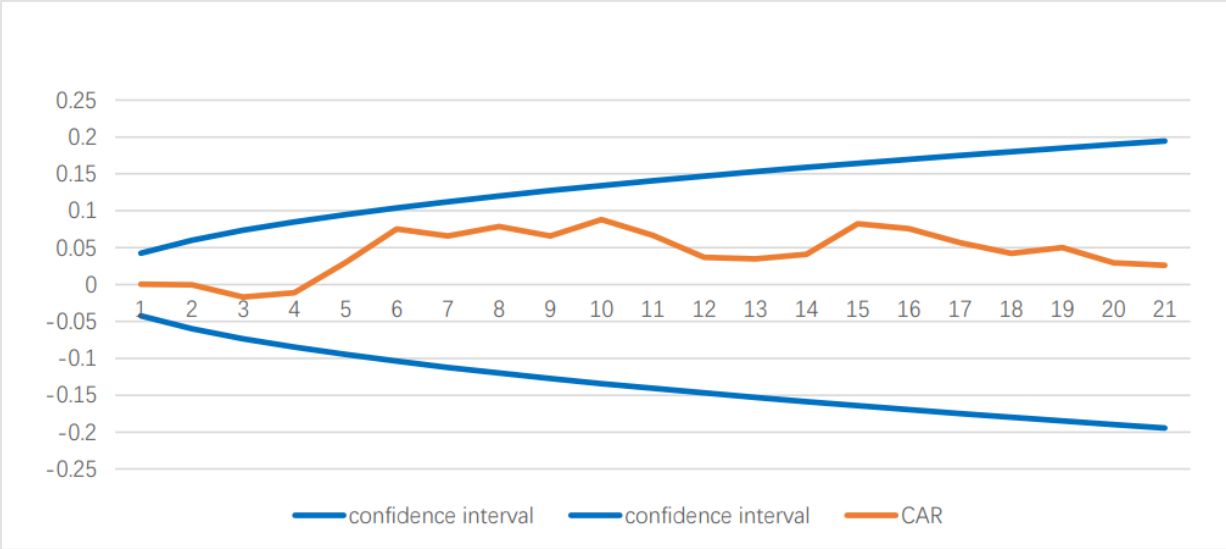

Figure 5 Cumulative abnormal return of JD stock when JD and Kuaishou conducted Quality Shopping Festival (2020.6.18)

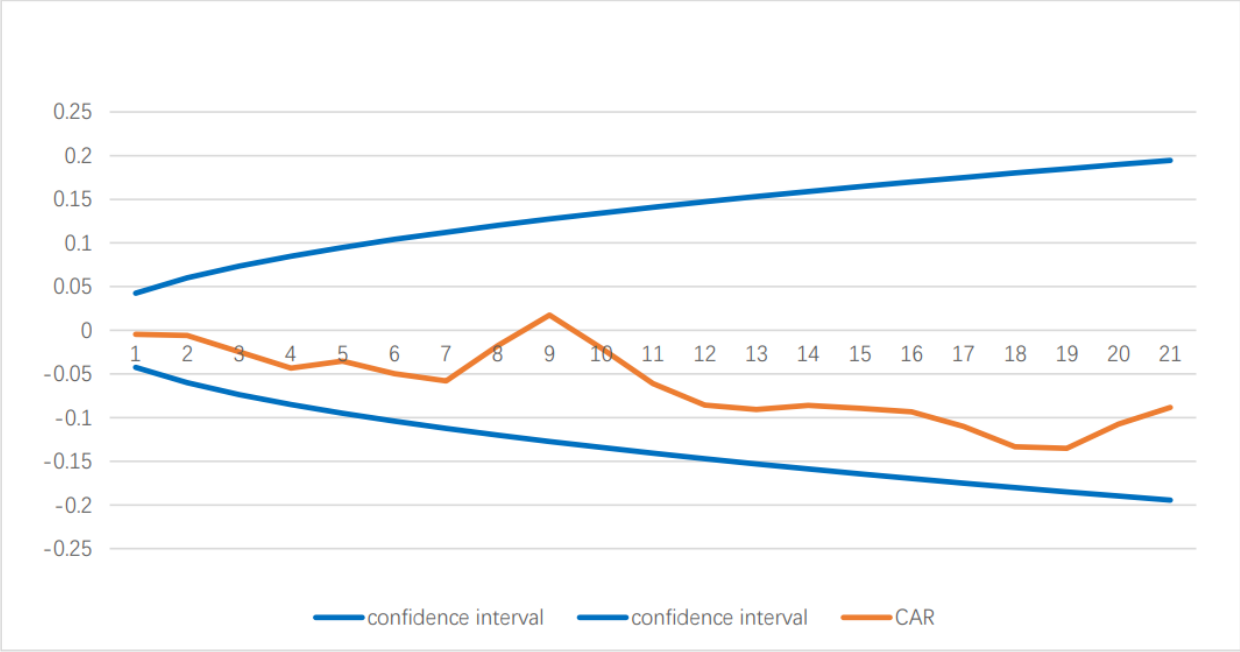

Figure 6 Cumulative abnormal return of JD stock when the number of COVID-19 cases exceeded 230,000 in a single day 2020.7.12

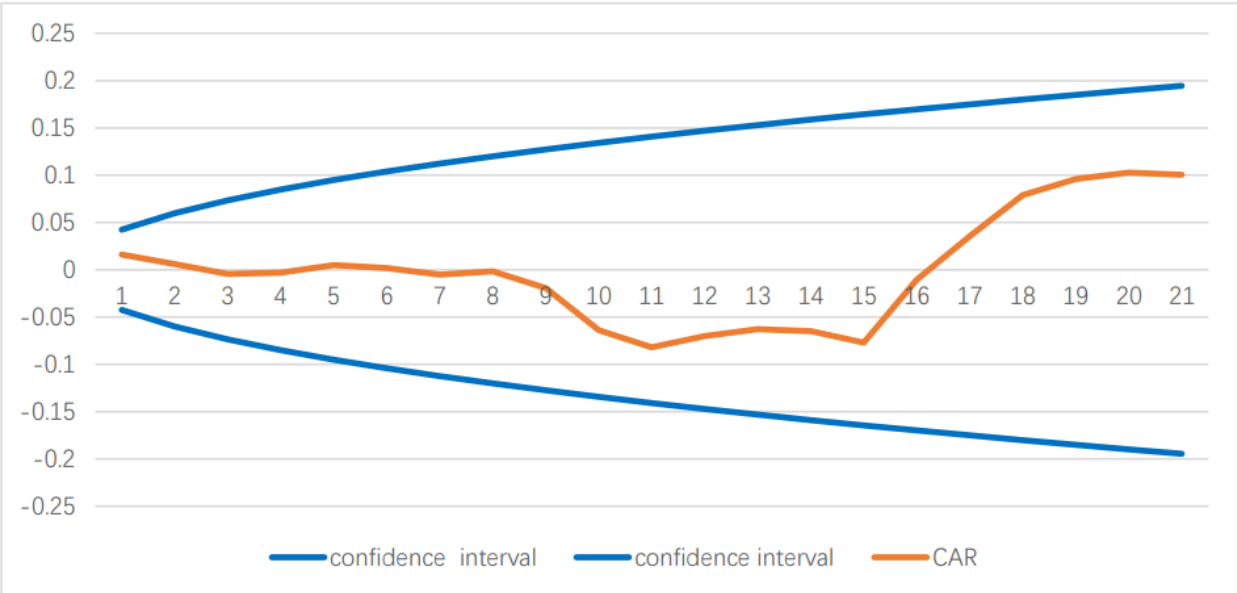

Figure 7 Cumulative abnormal return of JD stock when the number of global infections exceeds 20 million (2020.8.10)

3.5 Error elimination

As China's stock market was suspended at 1.31, it can be calculated the impact from the first day after it opened.

Since some of the dates chosen were related to the holidays, the statistics of those dates have also been compared to extra revenue from previous years trying to eliminate the influence of festivals on its AR through such comparison. The specific way to compare this is to see if the fluctuation on the chart is within the normal range.

4. EMPIRICAL RESULT

4.1 Elimination of the festival effect - exclusive method

After obtaining the data, it is necessary to explore whether the festival has a huge impact on stock prices, leading to misleading information about the reason for the huge returns on a certain date. The two dates picked are March 8th and June 18th, and they are all affected by the environment of COVID-19. March 8th is Women's

Day, people will buy gifts for their friends, and platforms will seize the opportunity to offer discounts and lower prices to win more profits. August 18th is the online shopping festival. People's desire to buy online and the purchase discounts offered by online shopping platforms will also boost the revenue of online shopping platforms. To put it simply, the two selected dates are the peak of people's shopping behavior, and the analysis of JD stock price trend around these two dates can tell whether the festival, or the shopping peak day, has a great impact on JD stock price. According to the data analysis, the increase on August 18th was in the confidence interval, indicating that the holiday did not have a dramatic impact on JD stock price. Therefore, the increase of stock price around March 8, which has the increase that is beyond the confidence range, can be concluded that is not caused by festival factors but was most likely caused by the epidemic.

The two graphs represent these festivals related change in stock price is shown in Figure 2 and Figure 5. They represented the cumulative abnormal return of JD stock on March 8th and June 18th, which are the dates of festivals that need to be further analyzed.

4.2 Difference between the same period of 2019 and 2020 - Comparison

Through analysis of the rise of the same stock in different years, it can be discovered whether there was a sharp rise in one year and thus give a reason for the rise. As shown in Figure 8 and figure 9, which represent the standardized data of stock price of JD on April 8th of 2019 and 2020 respectively, there is an obvious difference that 2020 has greater abnormal revenue than that in 2019. As shown in figure 12 and figure 13, though the trend of fluctuations of abnormal revenue are similar for both shopping festivals in 2019 and 2020, the degree of change in 2020 is much greater than that of 2019, which indicates the contribution of Covid-19. After comparing the result of the data analysis of JD stock price in 2019 and 2020, it can easily be found that the increases of these two periods are more drastic in 2020. From this finding, it can be concluded that JD stock price in 2020 increase unusually drastically. And because the increase of stock price in 2019, the year without COVID-19, is less drastic it in 2020, the JD stock price in 2020 is affected by COVID-19 positively.

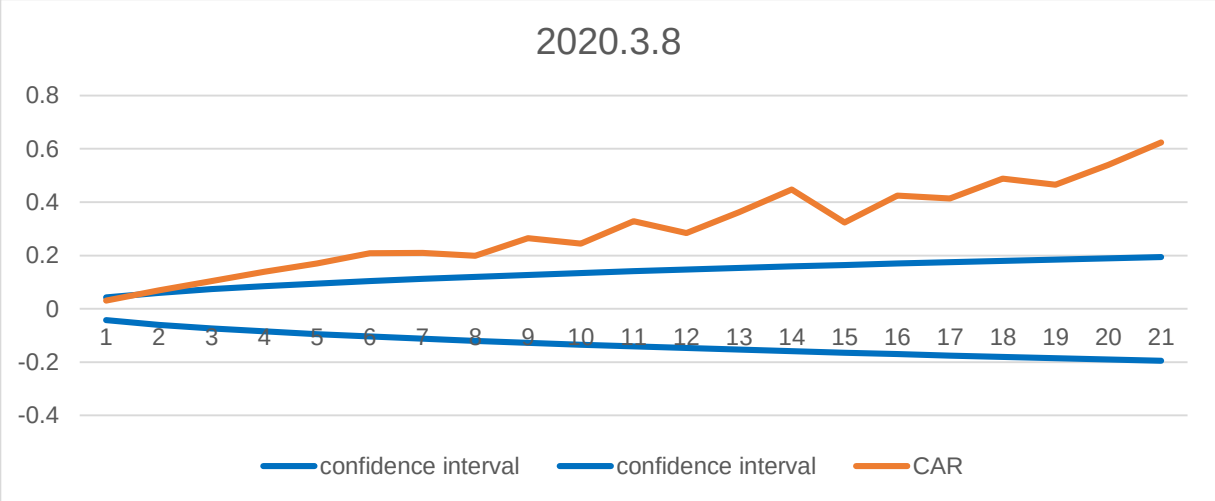

Figure 8 Cumulative abnormal return of JD stock when there is similar goddess festival promotion last year (2020.3.8)

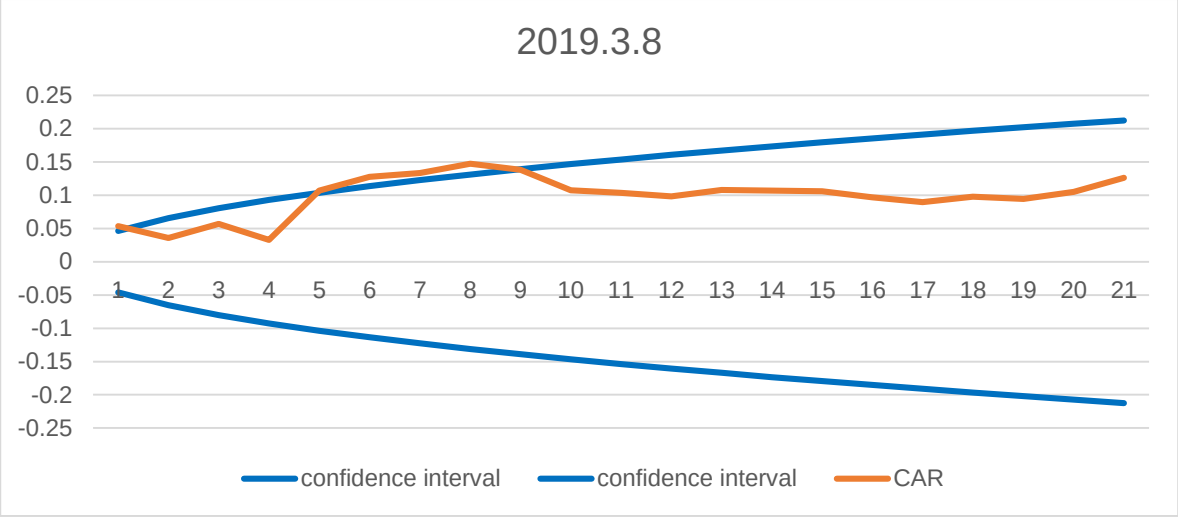

Figure 9 Cumulative abnormal return of JD stock when there is similar goddess festival promotion the year before last year (2019.3.8)

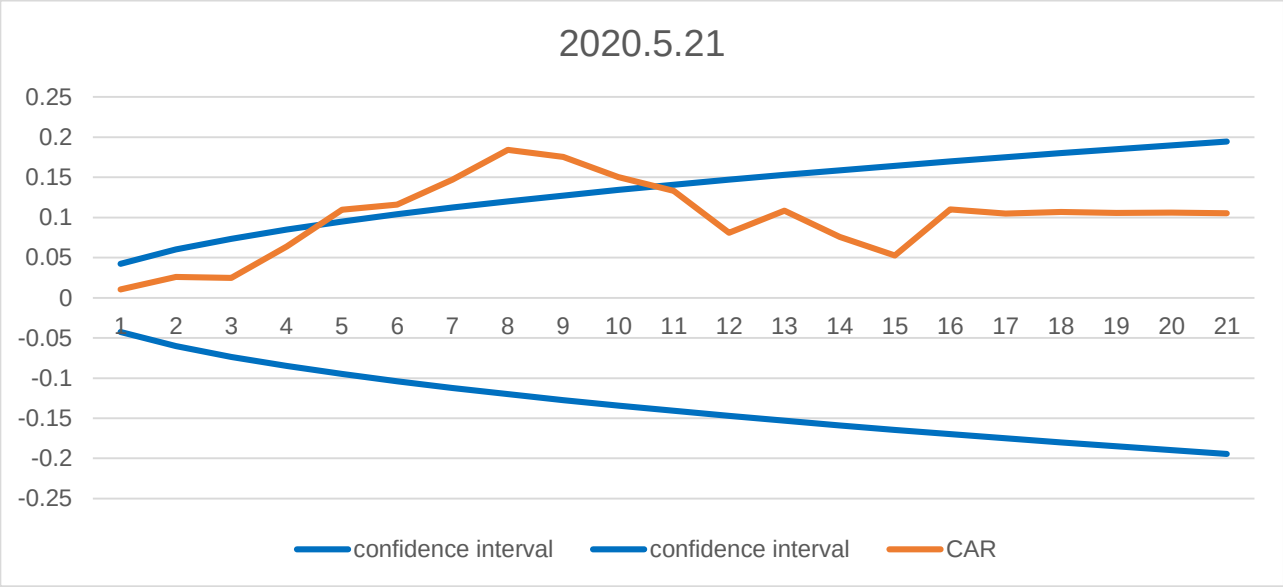

Figure 10 Cumulative abnormal return of JD stock when there is similar Chinese valentine's day promotion last year (2020.5.21)

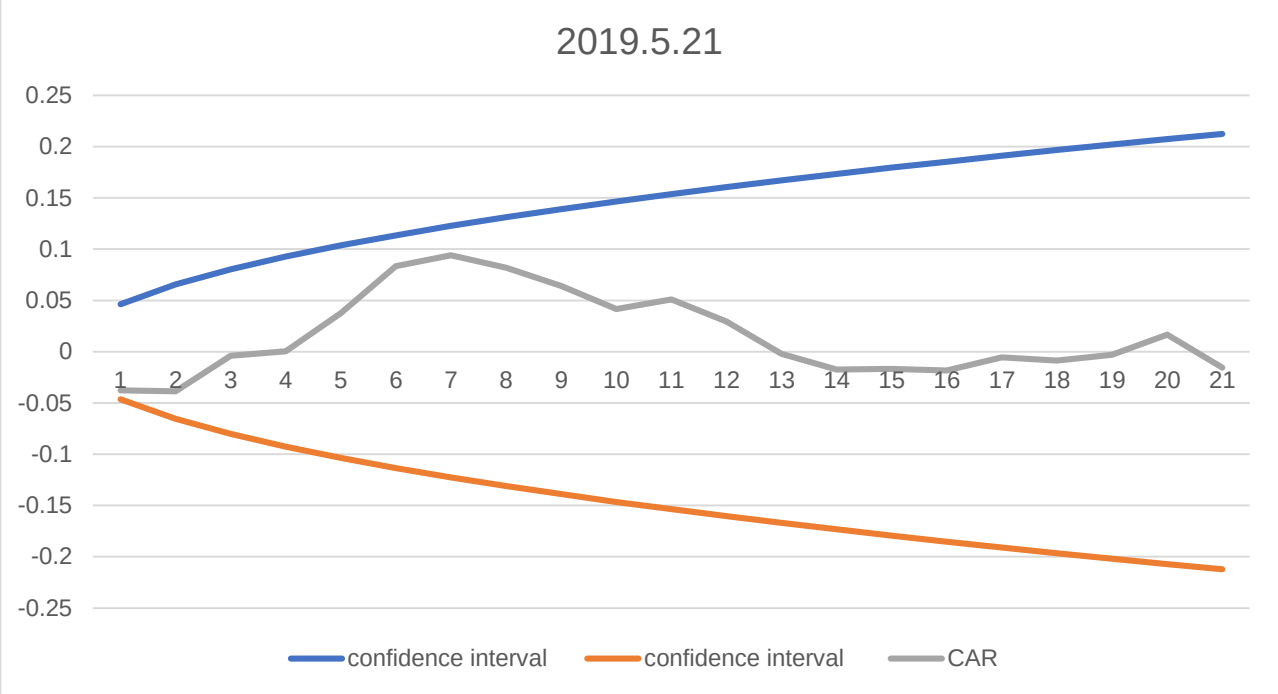

Figure 11 Cumulative abnormal return of JD stock when there is similar Chinese valentine's day promotion the year before last year (2019.5.21)

5. CONCLUSION

COVID-19 influenced the online shopping, especially for one of the largest online shopping platforms ---- JD. Depending on the background research, several reasons caused the change of JD stock price. But after having more data analysis and further inference, it can be confirmed that COVID-19 affects JD stock price positively to some extent. It can be witnessed that JD made several significant changes of strategies from cooperating with live platforms to developing its own branch offering supplies to communities locally. The efforts of JD met the needs of the society in the severe period and fit itself to the trend of the time. In the paper, it can be concluded that in the face of drastic changes, the companies actively use strategies suitable for itself and the changing environment are those which will succeed in the end.

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