

THE ASSOCIATION OF THE NUMBER OF CONFIRMED COVID-19 CASES AND FATALITIES WITH STOCK MARKET RETURNS: A CASE OF THE USA AND CHINA

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Abstract

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The daily stock indices/returns of the Shanghai Stock Exchange (SSE) and the New York Stock Exchange (NYSE) were examined from January 2, 2020, to April 2, 2020, during the COVID-19 pandemic period. The sample was then split into three event windows. The returns were negative during the post-COVID-19 window for both markets. Interestingly, a positive link was found between NYSE returns and COVID-19 cases and deaths during the peak COVID-19 death window. These findings indicate the buying frenzy of investors in the NYSE in the wake of the increased pandemic level as compared to the SSE.

Keywords: COVID-19, Stock Returns, Post-COVID-19, Peak COVID-19

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1. INTRODUCTION

The spread of COVID-19 that emerged in December 2020 from the Wuhan of China has shaken the global economies and financial markets (Nguyen, 2020). According to McKinsey & Company, there is a steep decline in the market capitalization of the top 5000 global firms except for the pharmaceuticals sector (McKinsey & Company, 2020, p. 20). In a similar vein, International Monetary Fund (IMF) April's world economic outlook projects global growth in 2020 to fall to -3% (Gopinath, 2020). These financial and economic impacts have strident gloomy socio-economic consequences. For instance, the International Labor Organization (ILO) expects 10.50% of full-time job losses that amount to

305 million in the workforce of the world since the beginning of 2020 (ILO, 2020). Likewise, ILO has estimated that 1.6 billion workers in the informal economy which is nearly half of the global workforce, would be highly vulnerable to losing their livelihoods (Kenny, 2020). These non-linear and catastrophic socio-economic changes demanded researchers to explicate the volatility of stock exchanges and, more importantly, the non-linear investor behavior during the COVID-19 (Lucey & Peat, 2020).

To explain the very pronounced non-linear behavior of markets, we examine the initial impact of the COVID-19 outbreak on the Chinese and the USA stock markets. The study covers an initial period of the COVID-19 outbreak starting from

January 2, 2020, to April 2, 2020. It examines how the Shanghai Stock Exchange (SSE) and the New York Stock Exchange (NYSE) reacted to the pandemic. Moreover, the progress of the two stock markets during the pandemic is analyzed by splitting the sample period into different event windows to determine whether there will be a continuous declining trend during the sample period or whether these markets will become stable after the initial hit. The results showed that there is an overall negative reaction of both stock markets to the COVID-19 outbreak. However, further investigation presents interesting findings when the sample period is divided into three different event windows. The NYSE recovered during the peak death COVID-19 event window in the USA. However, there was no sign of improvement for the SSE during the peak period of deaths or cases of the COVID-19 event window in China. The result of this study validates the numerous press reports published, which predicted that COVID-19 would have a greater impact on the USA and China. Atkeson (2020) examined the consequences of COVID-19 for the next 12 to 18 months and reported that social distancing resulted in the loss of work and had a greater impact on the USA economy. Baldwin and Tomiura (2020) document that COVID-19 will affect not only the economy of the affected countries but also the rest of the world. A significant portion of world exports from China and the USA are going to be affected, which will have serious socioeconomic consequences, as discussed earlier.

The paper is organized as follows. The following Section 2 discusses the review of the literature. Section 3 explains the data and methodology followed by the results and discussion in Section 4. The final Section 5 concludes the study.

2. LITERATURE REVIEW

COVID-19 badly influences the social and economic lives of the people. During COVID-19 majority of the stock market generated losses and many people lost their money in the equity investments. COVID-19 has been extensively studied in all fields of research and the equity market does not have any exception. Many studies are showing the different impacts of COVID-19 on stock returns. Salisu and Vo (2020) predicted the stock returns during the COVID-19 by incorporating the health news. They took the 20-top worst-hit countries in terms of cases and deaths. They collected the data from January 1, 2020, to January 30, 2020, and reported that there is a negative association between COVID-19 cases and stock returns. Narayan, Devpura, and Wang (2020) studied exchange rate and stock returns for the Japanese stock market during COVID-19 and found a negative relationship between COVID-19 and stock returns. Salisu and Sikiru (2020) studied the influence of COVID-19 on the performance of Islamic fund heading and found there is a decline in Islamic fund heading performance during COVID-19.

In the same line Adekoya and Oliyide (2021) studied the role of COVID-19 on the connectedness among commodity and financial markets. By employing the time-varying parameter vector autoregressions (TVP-VAR), they concluded that COVID-19 has extensively responsible for the risk transformation among the different markets. Salisu

and Adediran (2020) examined the role of the pandemic on the stock markets. They collected the data before COVID-19 and after COVID-19, among 24 countries around the globe. They employed the panel data technique and found that emerging markets are more volatile as compared to developed markets. Haroon and Rizvi (2020) examined the COVID-19 and liquidity of the stock markets. They concluded that a higher infection rate decreases the liquidity of the emerging markets.

Subramaniam and Chakraborty (2021) examined the investor's COVID-19 fear and stock returns. They developed the special COVID-19 fear index based on the Search Volume Index (SVI). They found that there is a strong association between COVID-19 and stock returns. Rizwan, Ahmad, and Ashraf (2020) examined the systematic risk during COVID-19 among the top 8 infected countries. They found that there is a sharp increase in the systematic risk during the COVID-19. In the same line, Ashraf, Rizwan, and Ahmad, (2020) examined the Islamic equity investments during COVID-19 and found that Islamic equity provides higher returns and the best heaven for heading during COVID-19 peak time.

Yan (2020) examined the COVID-19 and stock returns making the COVID-19 windows. He collected the data on the Chinese stock market from January 20, 2020, to April 7, 2020, and revealed interesting findings. He showed that stock return slipped during the lockdown time and it gets reversed after every 10 trading days. In the same direction Sun, Wu, Zeng, and Peng (2021) examined the Chinese stock market during COVID-19. They created different windows for COVID-19 and found that seven industries related to *pharmacy*, *digitalization*, and *agriculture* performed well during the emerging COVID-19 window and post COVID-19 window. In the light of the above-cited literature, this study aims to address the following question:

RQ: How do the different windows of COVID-19 influence the stock returns among Chinese and the US stock markets?

3. DATA AND METHODOLOGY

The daily market indices of the SSE and NYSE from January 2 to April 2, 2020, are employed to examine the initial impact of the COVID-19 outbreak in both countries. The number of confirmed COVID-19 cases and deaths are also taken from World Health Organization (WHO) situation reports that publish COVID-19 updates. Since January 21, 2020, the WHO has been publishing situation reports on COVID-19 worldwide; these reports include the number of confirmed COVID-19 cases and deaths. The sample period is divided into three event windows. The first window was the window of the post-COVID cases (January 20 for China, and January 23 for the USA), the second window was the peak COVID-19 deaths (when deaths numbers reached three digits) window (January 23 for China, and March 18 for the USA), and third event window was the peak COVID-19 confirmed cases (when confirmed cases reached four digits) window (January 25 for China, and March 13 for the USA). We hypothesize that in all three event windows, the stock markets of both countries will be adversely affected. More importantly, we investigate the link between the number of COVID-19 cases and

deaths with the returns of both stock exchanges. The following Table 1 describes dependent and independent variables. All the stock returns are taken as dependent variables while the COVID-19 cases and deaths are taken as independent variables that are handled in three different windows created based on the number of cases and deaths.

Table 1. Description of dependent and independent variables

Name	Abbreviation	Measurement
New York Stock Exchange	NYSE	Index price
New York Stock Exchange returns	NYSER	Log(Price _t /Price _{t-1})
Log New York Stock Exchange indices	LogNYSE	Log(index price)
Shanghai Stock Exchange	SSE	Index price
Shanghai Stock Exchange return	SSEr	Log(Price _t /Price _{t-1})
Log Shanghai Stock Exchange indices	LogSSE	Log(index price)

Initially, a comparison of the means test was employed to examine the performance of SSE and NYSE during these three different event windows. Furthermore, ordinary least square estimation models were applied to determine the impact of

different event windows on the SSE and NYSE. This model helps to capture the relevance of COVID-19 cases and deaths with the stock markets volatility during the COVID-19 period. Moreover, the impact of the number of deaths and confirmed cases on the stock market returns of both countries were examined.

Table 2 shows that the NYSE returns are more volatile during the COVID-19 death period, which indicates the overreaction of investors. The NYSE daily market returns declined to -0.1184 and indicated recovery at the level of 0.1004 per day.

Meanwhile, the SSE stock returns declined to -0.0804 in a day and recovered to 0.0231 during the sample period. Thus, the NYSE was more volatile during this pandemic than SSE. Table 3 illustrates that the case rate in the USA is more (91.6%) than in China (79.4%), and the death rate was higher in the USA (109%) than in China (25%).

Figure 1 showed the non-linear and volatile behavior of daily market returns of NYSE and SSE during the pandemic sampled period. The trend showed that NYSE was more volatile as compared to SSE during peak death and peak case windows. As evident in Table 2, the daily returns the standard deviation of NYSE was 3% to 4% higher than the SSE daily returns standard deviation during these event windows.

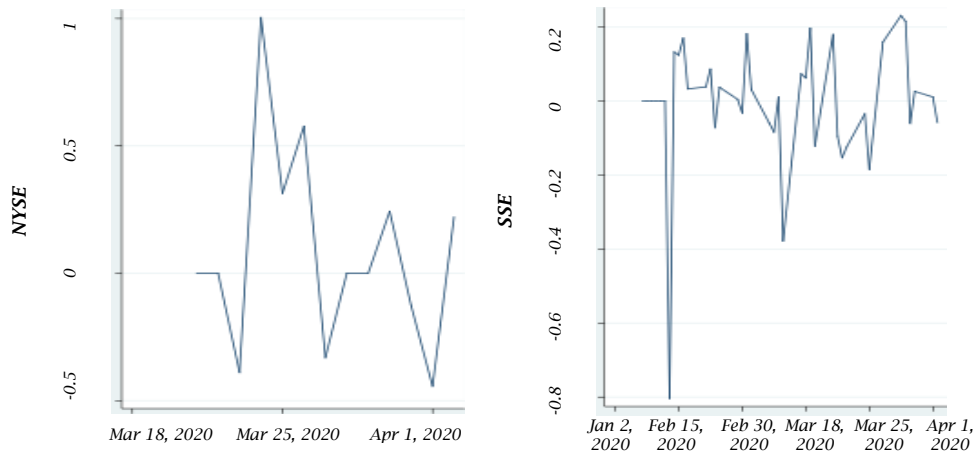
Table 2. Descriptive statistics

		New York Stock Exchange					New York Stock Exchange returns				
		Pre-COVID-19 (Jan. 2- Jan. 22, 2020)	Post-COVID-19 (Jan. 23- Apr. 2, 2020)	Overall (Jan. 2- Apr. 2, 2020)	Peak death period (Mar. 19- Apr. 2, 2020)	Peak confirmed cases period (Mar. 13- Apr. 2, 2020)	Pre-COVID-19 (Jan. 2- Jan. 22, 2020)	Post-COVID-19 (Jan. 23- Apr. 2, 2020)	Overall (Jan. 2- Apr. 2, 2020)	Peak death period (Mar. 19- Apr. 2, 2020)	Peak confirmed cases period (Mar. 13- Apr. 2, 2020)
USA	Days	21	70	91	14	20	20	69	89	13	19
	Mean	14029.8900	12389.8900	12768.3500	9824.1630	9955.4880	0.0004	-0.0039	-0.0030	0.0082	0.0027
	Std	102.4288	1768.6870	1698.0600	563.9986	618.8233	0.0032	0.0338	0.0298	0.0401	0.0514
	Min	13898.4500	8777.3800	8777.3800	8777.3800	8777.3800	-0.0061	-0.1184	-0.1184	-0.0444	-0.1184
	Max	14183.2000	14136.9800	14183.2000	10536.2800	10852.0000	0.0063	0.1004	0.1004	0.1004	0.1004
		Shanghai Stock Exchange					Shanghai Stock Exchange returns				
		Pre-COVID-19 (Jan. 2- Jan. 21, 2020)	Post-COVID-19 (Jan. 22- Apr. 2, 2020)	Overall (Jan. 2- Apr. 2, 2020)	Peak death period (Jan. 28- Apr. 2, 2020)	Peak confirmed cases period (Jan. 25- Apr. 2, 2020)	Pre-COVID-19 (Jan. 2- Jan. 21, 2020)	Post-COVID-19 (Jan. 22- Apr. 2, 2020)	Overall (Jan. 2- Apr. 2, 2020)	Peak death period (Jan. 28- Apr. 2, 2020)	Peak confirmed cases period (Jan. 25- Apr. 2, 2020)
China	Days	12	57	69	40	52	9	47	59	49	43
	Mean	3089.4390	2911.9420	2942.8110	2895.7010	2900.3640	-0.0012	-0.0014	-0.0013	-0.0006	-0.0006
	Std	14.4092	112.8617	122.9486	112.1691	110.4715	0.0065	0.0169	0.0157	0.0177	0.0171
	Min	3066.8900	2660.1700	2660.1700	2660.1700	2660.1700	-0.0123	-0.0804	-0.0804	-0.0804	-0.0804
	Max	3115.5700	3071.6800	3115.5700	3071.6800	3071.6800	0.0091	0.0231	0.0231	0.0231	0.0231

Table 3. Descriptive statistics of cases and deaths (number of cases)

Cases	Days	Mean	Std	Min	Max
The USA cases	73	12848.48	33785.39	0	163199
The USA death	31	475.871	782.5037	0	2850
The USA case rate	68	1662862	0.236432	0	0.916291
The USA death rate	28	0.2399	0.241139	0	1.098612
China cases	73	57146.05	31179.4	278	31179.4
China death	65	2263.862	1134.158	106	3321
China case rate	71	0.080194	0.146043	0	0.7945
China death rate	63	0.054622	0.069693	0	0.252997

Figure 1. NYSE and SSE return the sample period



Source: Authors' elaboration.

4. RESULTS AND DISCUSSION

Table 4 presents a comparison of the mean returns of NYSE and SSE during different event windows. The average daily returns were negative for SSE and positive for NYSE during the COVID-19 period. However, the mean difference between their returns was insignificant. This result showed that SSE underperformed amid the COVID-19 outbreak, as compared to NYSE. Furthermore, as expected during the COVID-19 window, both stock market performances were affected. The average daily returns of SSE and NYSE were negative, but their mean difference remained insignificant. Moreover, the Chinese market continued to underperform, and COVID-19 made no difference. However, the US stock market overreacted to the COVID-19 outbreak, and its performance declined significantly. The results of the other two windows (peak death period and peak case period) showed surprising results for both markets. The average daily returns of both markets became positive, but their mean differences remained insignificant.

Table 4. The difference in mean returns

	Days	Mean	Pr(T > t)
<i>Pre-COVID-19</i>			
NYSE returns	17	0.00076	
SSE returns	9	-0.00117	0.3137
<i>Post-COVID-19</i>			
NYSE returns	69	-0.0039229	
SSE returns	45	-0.0011761	0.6156
<i>Peak death period</i>			
NYSE returns	13	0.0082052	0.9654
SSE returns	7	0.0075126	
<i>Peak number of cases period</i>			
NYSE returns	19	0.0027014	0.9585
SSE returns	10	0.0018251	

This result showed that the initial impact of COVID-19 caused panic among investors in both countries; thus, markets crashed. However, as COVID-19 entered the pandemic stage and spread in these regions, the governments of both countries took aggressive preventive measures against the disease. They announced huge bailout packages for the economy, including Asia, Europe, and North America. For instance, the US government announced a 2-trillion USD bailout, the largest

bailout package in the history of the USA. These immediate government actions gave some confidence to investors, which resulted in some corrections in the markets.

To make an in-depth understanding of the link between COVID-19 cases and deaths with the returns of stock exchanges, Table 5 presents the simple linear regression model results. In the first instance, the number of cases and deaths are regressed against the log value of NYSE and SSE market indices for the full sample period. The results showed that the number of confirmed cases is negative and significantly associated with both NYSE and SSE market indices. Moreover, the number of deaths negatively affected the NYSE (SSE) market indices. Both markets showed negative returns during the overall sample period of the pandemic. The Chinese market also observed negative returns but reported an insignificant impact on death cases.

Regarding an even number of cases, the market operated at a 9% level, which is much lower than the USA. In the current situation, the exact impact of the pandemic is yet to be established, but the financial markets have already started to show volatility and erratic behavior during this pandemic. The USA stock market hit the circuit breaker four times in ten days in March 2020, which it has hit only once in 1997 since its inception. In the next phase, the overall sample period was further divided into two event windows, the first event window was created when the number of deaths exceeded three digits, and it was called the peak COVID-19 (*death*) event window. The second event started when the number of confirmed cases reached four digits and it was referred to as the peak COVID-19 (*cases*) event window. The results showed that the peak death event window, the number of deaths, and confirmed cases had a positive and significant impact on NYSE market indices in comparison to the SSE market indices. A possible explanation for this unexpected result was the timely announcement of the bailout packages by the US government which led to the buying frenzy of investors. Similarly, the Federal Reserve (Fed) announced a zero interest-rate policy (ZIRP) with an unlimited quantitative easing (QE) program in March 2020 (Zhang, Hu, & Ji, 2020). The recovery of the USA market seems to be short-term and it is likely a reaction to

the immediate economic initiative of the USA market. Furthermore, the number of confirmed cases and deaths had a negative and insignificant impact on the SSE market indices. The results for China were somewhat expected indicating

a stronghold of the Chinese government on the economic affairs in the backdrop of COVID-19 during March 2020. While the last event window did not show significant results.

Table 5. Regression analysis of stock market returns of the USA and China

Overall sample										
	USA					China				
	Days	Co-efficient	t-value	R ²	Model sig.	Days	Co-efficient	t-value	R ²	Model sig.
Number of deaths	14	-0.0344	-4.49	0.418	0	49	-0.007	-1.41	0.05	0.1656
Number of cases	70	-0.04	-19.03	0.842	0	57	-0.0092	-3.25	0.16	0.002
Peak COVID-19 (deaths) window										
	Days	Co-efficient	t-value	R ²	Model sig.	Days	Co-efficient	t-value	R ²	Model sig.
Number of deaths	14	0.04	4.66	0.644	0	49	-0.007	-1.41	0.05	0.1656
Number of cases	10	0.047	5.13	0.687	0.0003	49	-0.008	-1.16	0.03	0.2532
Peak COVID-19 (cases) window										
Number of cases	20	-0.0002	-0.03	0.005	0.9743	49	-0.008	-1.73	0.06	0.0899
Number of deaths	20	0.0031	0.33	0.006	0.7489	49	-0.0077	-1.41	0.04	0.1656

These results give significant information regarding the COVID-19 management at a country level and boost the investors' confidence, as results depict that in the initial phase of the COVID-19, markets showed the abnormal negative returns for both countries which were so obvious because that was the most panic time around the world. The reason behind that panic was that there was no treatment available for this disease and daily cases and deaths were alarming. But as results showed the second window once countries showed up their solutions and treatments, markets showed the reversal effect and moved from negative returns to positive returns.

5. CONCLUSION

This study demonstrates the impact of the pandemic outbreak of COVID-19 on the financial markets of the USA and China. This pandemic has already claimed many precious human lives. The financial markets of the USA and China showed adverse non-linear reactions to this pandemic, which was unexpected and unprecedented. The Chinese stock market observed abnormal negative returns during the COVID-19, peak deaths, and peak cases event windows. The USA stock market also showed the same trend except for the peak death event window, when the returns became positive. The high

volatility of the financial markets became the hallmark of the pandemic. Policy reactions were needed to curtail the virus and the erratic movements of the stock markets, especially from the Chinese government. For the USA, these policy measures may have long-term economic implications for the country including zero-interest rates and unlimited quantitative easing. After the persistence of the new normal, it will be interesting to extend this research to capture these policy measures in the wake of the recent USA and China wrangle regarding the spread of COVID-19.

Apart from the contribution to the current literature, this study has a few limitations. First, this study is considering only the COVID-19 pandemic while it would be more interesting to compare this pandemic versus the previous pandemic such as SARS. Future research may consider the comparison for a better understanding of the pandemic diseases' influence on stock returns. Secondly, this study is conducted during the COVID-19 and it would be interesting to know the stock markets' reactions towards the treatment or vaccination of this disease. Additionally, future research may compare the stock movements during COVID-19 and after COVID-19 recovery. The stock market reaction volatility may be compared which may develop a better understanding of stock movements.

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