

Research Article

Chinese Stock Market's Reaction to COVID-19 in the Short and Long Run

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We study the impact of COVID-19 on Chinese stock market which can be seen as a complex system. We use the event study method to evaluate its performance change in terms of the return rate, turnover rate, etc. We show that the abnormal return of stock market was significantly negative after the outbreak of COVID-19 and did not turn positive until May 2020. Moreover, the five-factor model is used to estimate the ordinary returns of different industries and show that abnormal returns for medical and food industries were significantly positive, while energy and public utility industries had significantly negative abnormal returns which persisted for a long time. COVID-19 had lag effects on clothes industry, finance industry, transportation industry, and IT industry. We also find that energy and finance industries had negative abnormal turnover rates during the sample period, while other industries, such as healthcare and telecommunications service industries, had positive abnormal turnover rates.

1. Introduction

In 2020, COVID-19 swept the world, and the global capital market fluctuated violently. The Shanghai Composite dropped by 7.72% on February 3, 2020; the stock indexes of almost all countries, including USA, Canada, Brazil, South Korea, and the Philippines, also plummeted in March 2020. Over the past two years, the COVID-19 pandemic tremendously influenced the global financial markets.

Literature about the impacts of the COVID-19 on the financial market of different countries and regions is increasing. For example, Del et al. [1] found that the increase of confirmed cases can influence the stability of African markets; however, the effect of the fatality rate is not significant. Zaremba et al. [2] showed that, for the countries which have relatively low unemployment rates and plenty of firms with conservative investment policies and low P/E ratio, stock markets are more likely to be immune to the healthcare crisis. Additional works also explore how the government policy and reports about COVID-19 influence the financial market [3–5], for example, Pandey and Kumari

(2021) [6, 7]. Moreover, researchers show that there are different impacts on different specific markets. For example, Ji et al. [8] demonstrated that the return of gold increases during the pandemic and remains robust as a safe asset; meanwhile Ali et al. [9] argued that the return of gold becomes negatively related to the COVID-19 deaths with the spread of COVID-19. Mazur et al. [10] and Sayed and Eledum [11] investigated the impact of the COVID-19 outbreak on the return of different industries in USA and Saudi Arabia, respectively. Corbet et al. [12] discussed the effect of COVID-19 on the Bitcoin market.

The aim of this work is to study the impact of COVID-19 on China's A-stock; specifically, we use event study to investigate the abnormal return and turnover rate for different industries in the long run and short run. Although related works, for example, those by Ali et al. [9], Dai et al. [13], Liu et al. [14], Mezghani et al. [15], and Nguyen et al. [16], explore the impact of COVID-19 on the Chinese stock market, we put emphasis on the abnormal return of the whole market via the OLS model; moreover, compared with existing works, for example, Liu et al. [17], we study the

impact of COVID-19 on the return of different industries by using a five-factor model [18]. In addition, since liquidation is an important feature of stock market, we explore the change of turnover rate in different industries.

COVID-19 may be traced back to December 8, 2019, when the first patient was suspected to catch COVID-19 in Wuhan, China. The Chinese government confirmed the existence of COVID-19 and set up the experts group on January 19, 2020. Therefore, we use January 20, 2020 (the first trading day after January 19, 2020), as the event date in event study. We use a long event window (about one year) to clearly examine the impact of COVID-19 on Chinese stock market in the short and long run.

Our results prove that China's A-stock suffered from the negative abnormal return which became zero after about 30 days. We find that the turnover rates of most industries increased during the sample period, while the responses to COVID-19 were different for different industries. Some industries, such as medical care (energy), benefitted (suffered) from COVID-19 very much; others, such as real estate, were affected slightly. Moreover, for some industries, such as food, the impact of COVID-19 lasted a short period; on the contrary, for some industries, such as energy and medical care, it lasted a long period.

The contribution of our work is twofold. First, it extends the literature about the impact of COVID-19 on emerging market; second, it uses a five-factor model to study the abnormal return of different industries and also examine the change of turnover rates. The remainder of this work is organized as follows. Section 2 presents data and methodology. Section 3 explores the impact of COVID-19 on China's A-stock. Section 4 investigates the impact of COVID-19 on the return rate of different industries. Section 5 studies the impact of COVID-19 on the turnover rate of different industries. Section 6 gives the conclusion.

2. Data and Methodology

We choose data of A-stock index, return rate, turnover rate, the one-year deposit interest rate, and five-factor data from China Stock Market & Accounting Research (CSMAR). All Country World Index (ACWI) is from Yahoo Finance. They are all the daily data of trading days from January 2, 2019, to December 31, 2020, roughly covering the years before and after the event day.

2.1. Event. In the event study method, the estimation window, the event date, and the event window need to be determined. We use the period from January 1, 2019, to December 6, 2019, as estimation window. The event date is January 20, 2020, since it is the first trading day after January 19, 2020, when China started to count the number of COVID-19 patients. The event window involves the period from t_{-5} to t_{230} , where t_x denotes the x th day before or after the event day.

2.2. Calculation of Benchmark Return and Abnormal Return

2.2.1. The Case of A-Stock. To analyze the abnormal return (AR), we firstly specify a benchmark. Following the works of Dyckman et al. [19], Pandey and Kumari [20], and others, we use OLS market model to define the benchmark return:

$$ER_t = \alpha + \beta ER_{mt}, \quad (1)$$

where α and β represent the intercept and slope of the market model, respectively; ER_{mt} is the return of ACWI on day t ; and α and β are calculated by the data from January 1, 2019, to December 6, 2019.

To get the abnormal return, we compare the benchmark return with the actual return by using the equations of AR and CAR as follows:

$$\begin{aligned} AR_t &= R_t - ER_t, \\ CAR &= \sum_{t_1}^{t_2} AR_t, \end{aligned} \quad (2)$$

where AR_t is the abnormal return on day t , R_t is the actual return on day t , ER_t is the benchmark return on day t ((1) above), and CAR is the cumulative abnormal return from t_1 to t_2 .

To calculate the daily return of actual index and benchmark, we use log-returns [21] as follows:

$$R_t = LN\left(\frac{P_t}{P_{t-1}}\right) * 100, \quad (3)$$

where LN is the log of nature number, P_t is the price on day t , and P_{t-1} is the price on day $t - 1$.

2.2.2. The Case of Industries. Huang [22] and others argued that the five-factor model in China may be superior to other traditional models in explaining the returns of different specific industries. Thus, the five-factor model is adopted to estimate the benchmark return of various industries as follows:

$$\begin{aligned} ER_{it} - R_f &= \alpha + \beta_m(R_m - R_f) + \beta_{SMB}SMB \\ &+ \beta_{HML}HML + \beta_{RMW}RMW + \beta_{CMA}CMA, \end{aligned} \quad (4)$$

where R_m is the return rate of the tradable market value weighted index of A-stock; R_f is the risk-free return rate; SMB is the difference between the return rate of the low market value stock portfolio and that of the high market value stock portfolio; HML is the difference between the return rate of the high book value stock portfolio and that of the low book value stock portfolio; RMW is the difference between the return of the high-profit stock portfolio and that of the low-profit stock portfolio; and CMA is the difference between the return of the high investment ratio stock portfolio and that of the low investment ratio stock portfolio.

The AR of industries can be obtained by the following equation:

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

where AR_{it} is the AR of one industry return on day t ; R_{it} is the actual return of one industry on day t ; and ER_{it} is the benchmark return on day t .

2.2.3. The Case of Turnover Rate. Following Liang [23], Michaely et al. [24], and others, the normal turnover rate is defined as the average turnover rate in the estimation window. We calculate the abnormal turnover rate and cumulative abnormal turnover rate as follows:

$$\overline{TO} = \frac{\sum_1^n TO_t}{n},$$

$$AT_t = \frac{TO_t - \overline{TO}}{\overline{TO}}, \quad (6)$$

$$CAT = \sum_{t_1}^{t_2} AT_t,$$

where n is the total number of days in the estimation window; TO_t is the turnover rate on day t ; \overline{TO} is the average turnover rate during the estimation window. AT_t is the abnormal turnover rate on day t ; σ_t is the variance of the turnover rate during the estimation window; and CAT is the accumulated abnormal turnover from t_1 to t_2 .

2.3. Calculation of t -Statistics. To determine the significance of the AR and CAR, we use popular parameter test t -statistics [25, 26]:

$$\sigma_A = \sqrt{\frac{\sum_1^n (AR - AAR)^2}{n}},$$

$$t - \text{statistics}_{AR} = \frac{AR_t}{\sigma_A}, \quad (7)$$

$$t - \text{statistics}_{CAR} = \frac{CAR}{\sqrt{(t_2 - t_1 + 1) * \sigma_A^2}}$$

where σ_A is the standard variance on the estimation window, AAR is the abnormal average return, n is the number of estimation days, and $t - \text{statistics}_{AR}$ represents the t -statistics of AR. CAR represents the cumulative abnormal return from t_1 to t_2 ; and $t - \text{statistics}_{CAR}$ represents the t -statistics of CAR.

3. The Impact of COVID-19 on China's A-Stock

As Figures 1 and 2 show, roughly speaking, China's A-stock suffered from two shocks of COVID-19 in the sample period: the outbreak in China and the outbreak in many other countries. However, it recovered quickly from the two shocks.

According to Figures 1 and 2 and Table 1, it can be seen that the AR was significantly negative on t_2 and remained negative until t_4 when the CAR reached -13.96% . Starting from t_4 , the CAR gradually turned to zero and returned to a

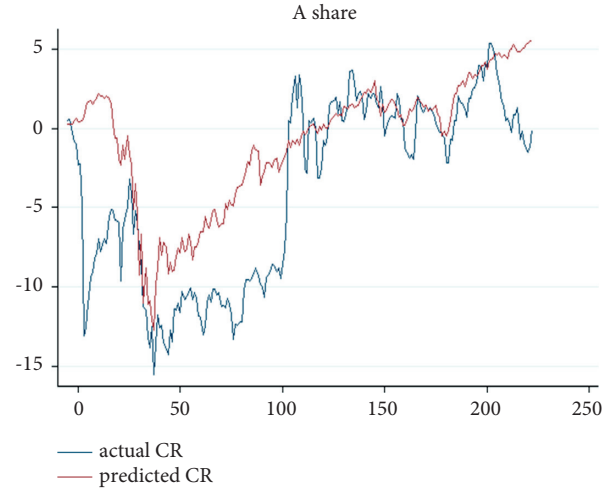


FIGURE 1: Actual and predicted cumulative return.

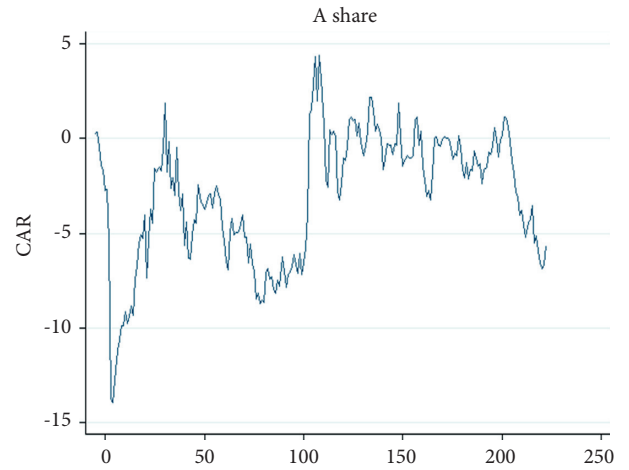


FIGURE 2: Cumulative abnormal return.

positive value on t_{30} . Subsequently, it turned negative again and reached its lowest point on t_{90} . Around t_{100} , the stock index suddenly rose and got close to the predicted return rate on t_{120} .

Table 1 presents that, on t_2 and t_3 , the market had significantly negative returns. The CAR from day t_3 to day t_{10} was also statistically significant. On t_{30} , the market had significant positive return, but the CAR was no longer significant.

4. The Impact of COVID-19 on the Return Rate of A-Stock in Various Industries

COVID-19 greatly influenced the return of A-stock; however, COVID-19 may have different impacts on various industries. We here investigate this issue by selecting the 12 following industries: healthcare, food and major supplies retail, utilities, energy, durable consumer goods and clothing, media, finance, real estate, materials, transportation, information technology, and telecommunication.

TABLE 1: AR, CAR, and t -statistics for China's A-stock.

Date t	AR (%)	t -stat	CAR (%)	t -stat	Date t	AR (%)	t -stat	CAR (%)	t -stat
-5	0.24	0.20	0.24	0.20	6	1.59	1.37	-11.20	-2.78
-4	0.05	0.04	0.29	0.18	7	0.57	0.49	-10.64	-2.54
-3	-0.75	-0.65	-0.46	-0.23	8	0.77	0.67	-9.87	-2.27
-2	-0.91	-0.78	-1.37	-0.59	9	0.00	0.00	-9.87	-2.19
-1	-0.26	-0.22	-1.63	-0.63	10	0.70	0.60	-9.17	-1.97
0	-1.13	-0.97	-2.76	-0.97	30	2.38	2.05	1.83	0.26
1	0.05	0.04	-2.71	-0.88	60	-0.64	-0.55	-5.37	-0.57
2	-2.69	-2.32	-5.40	-1.64	90	-0.68	-0.58	-6.97	-0.61
3	-8.38	-7.21	-13.78	-3.95	120	1.34	1.15	-1.06	-0.08
4	-0.17	-0.15	-13.96	-3.80	160	-1.85	-1.59	-1.47	-0.10
5	1.16	1.00	-12.80	-3.32	220	-0.36	-0.31	-6.90	-0.39

4.1. Industries with Positive Abnormal Return

4.1.1. Healthcare Industry. From Figures 3 and 4 and Table 2, we know that the actual and predicted cumulative returns of the healthcare industry had a clear upward trend in the sample period. In the short term, the CAR rose; on t_{-1} , t_0 , and t_3 - t_7 , the AR appeared significantly positive. But on t_2 , t_8 , t_9 , and t_{10} , the CAR remained significantly positive. Moreover, there was a longer-term impact of COVID-19 on the healthcare industry; the positive CAR remained significant until t_{120} .

4.1.2. Food and Major Supplies Retail Industry. Figures 5 and 6 show that the actual cumulative return of food and major supplies retail industry exhibited a trend of rising first and then rebounding. In the short term, COVID-19 had a positive impact. From Table 3, we know that the AR was significantly positive on t_2 , t_4 , t_5 , t_7 , and t_9 , and the CAR started to become significantly positive on t_{10} . From a long-term perspective, although the CAR of the food industry fell rapidly after t_{100} when reaching the peak, the CAR of the industry remained significant until t_{160} . This indicates that the impact of COVID-19 was relatively long-term.

4.1.3. Summary. Both the medical and food industries had positive ARs under the impact of COVID-19. In the early stage of the epidemic, the demand for COVID-19 medical testing increased significantly; meanwhile, the demand for medical protective equipment grew substantially. In the middle and late stages of the epidemic, the importance of COVID-19 vaccine was highlighted. Moreover, since the large-scale vaccination by the COVID-19 vaccine is still the only solution to the pandemic, it is obviously beneficial to vaccine-related companies. This may be why healthcare industry can keep a positive AR in the short and long term. For food industry, the traffic blockade led to the insufficient food supply; this boosted the performance of food industry companies. In addition, the food industry is a high-quality defense asset, so it can attract a large amount of capital inflow. However, in the long run, as the epidemic eases, investments are transferred from defensive assets, and the AR of the food industry returns to zero.

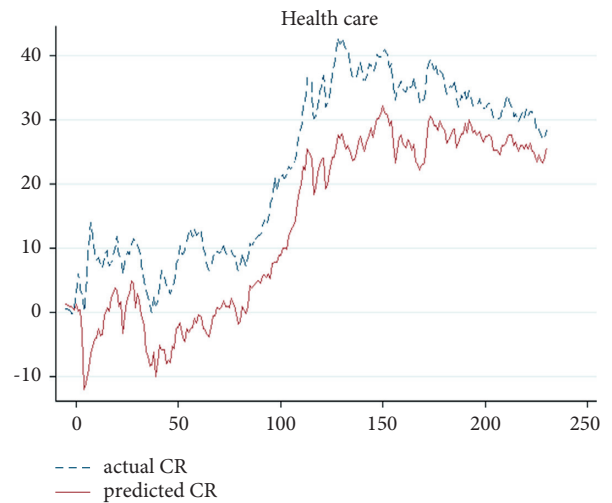


FIGURE 3: Actual and predicted cumulative returns.

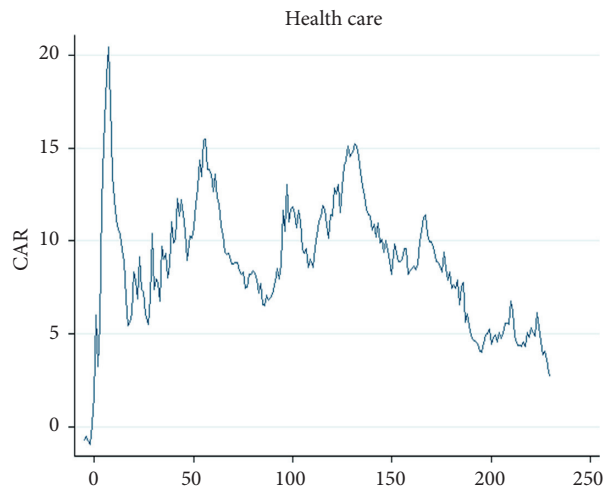


FIGURE 4: Cumulative abnormal return.

4.2. Industries with Negative Abnormal Return

4.2.1. Public Utilities. As Figures 7 and 8 and Table 4 show, from a short-term perspective, the CAR of public utilities has been significantly negative since t_6 . On t_9 , the CAR reached

TABLE 2: AR, CAR, and t -statistics for healthcare.

Date	AR (%)	t -stat	CAR (%)	t -stat	Date	AR (%)	t -stat	CAR (%)	t -stat
-5	-0.73	-1.29	-0.73	-1.29	6	3.64	6.46	18.84	9.65
-4	0.22	0.39	-0.51	-0.64	7	1.60	2.85	20.45	10.06
-3	-0.27	-0.49	-0.78	-0.80	8	-3.05	-5.42	17.39	8.25
-2	-0.16	-0.29	-0.94	-0.84	9	-3.87	-6.87	13.52	6.20
-1	1.02	1.82	0.08	0.06	10	-1.30	-2.31	12.22	5.42
0	1.54	2.73	1.62	1.17	30	-3.00	-5.32	7.41	2.19
1	4.36	7.74	5.98	4.01	60	-0.94	-1.67	12.69	2.77
2	-2.75	-4.88	3.23	2.02	90	0.35	0.62	7.33	1.33
3	2.36	4.18	5.58	3.30	120	-0.06	-0.10	11.35	1.79
4	6.47	11.48	12.05	6.76	160	0.10	0.18	8.50	1.17
5	3.15	5.59	15.20	8.13	230	-0.22	-0.39	2.68	0.31



FIGURE 5: Actual and predicted cumulative returns.

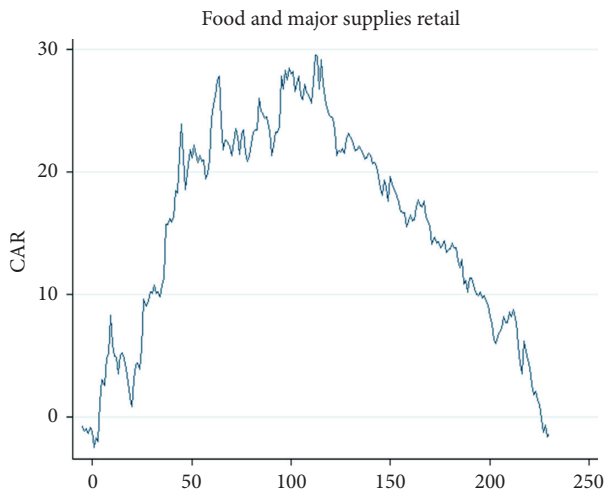


FIGURE 6: Cumulative abnormal return.

the maximum of -4.34% . In the long run, COVID-19 had a long-term negative impact on public utility companies. Since t_6 , the CAR has remained significantly negative for around 100 days. Although the AR turned positive on t_{150} , it quickly fell and turned positive again. Until t_{230} , a significantly negative return in the public utility industry still existed.

4.2.2. Energy Industry. As Figures 9 and 10 and Table 5 show, the energy industry had a bad situation under the impact of COVID-19. From a short-term perspective, significantly negative AR occurred on t_4 ; and, on the following 5 days, the ARs were all negative. As a result, the CAR became significantly negative on t_9 . In the long run, the CAR showed a significantly downward trend and continued until t_{150} . Subsequently, the CAR gradually rebounded, but the CAR in the energy industry was still significantly negative on t_{230} .

4.2.3. Durable Consumer Goods and Clothing Industry. As Figures 11 and 12 and Table 6 show, the CAR of consumer durable goods and clothing industry presented a downward trend. From t_1 to t_{10} , every day presented a significantly negative abnormal return rate. The AR of the first seven days was significant at the 1% significance level, but the t -test statistics on the following days gradually declined. The CAR started to be significantly negative on t_2 , showing a trend of long-term slow decline and reaching the lowest point on t_{100} , about -15% . From a long-term perspective, although the CAR tended to be positive, the consumer durable goods and clothing industry generally had a negative AR.

4.2.4. Finance Industry. As Figures 13 and 14 and Table 7 show, in the short term, the impact of COVID-19 on the finance industry was not significant. From t_{-5} to t_5 , the AR of finance industry did not have a significant decline. However, during the period from t_6 to t_{10} , a significantly negative AR appeared. On the following 100 days, the CAR neared zero; but it was significantly negative on t_{230} .

4.2.5. Transportation Industry. As Figures 15 and 16 and Table 8 show, on t_{-2} , there was a significantly positive gain which was presumably caused by the Spring Festival when many people went hometown to reunite. This led to a significantly positive CAR which remained until t_{10} .

With the implementation of social distancing, the volume of transportation fell sharply. Transportation industry has had a negative AR since t_{120} . On t_{230} , the CAR reached -10.34% . On the whole, the impact of COVID-19 was long-term and negative.

TABLE 3: AR, CAR, and t -statistics for food and major supplies retail.

Date	AR (%)	t -stat	CAR (%)	t -stat	Date	AR (%)	t -stat	CAR (%)	t -stat
-5	-0.81	-1.17	-0.81	-1.17	6	-0.44	-0.63	2.58	1.07
-4	-0.41	-0.58	-1.22	-1.24	7	2.26	3.25	4.84	1.93
-3	0.20	0.29	-1.02	-0.84	8	0.26	0.38	5.10	1.96
-2	-0.37	-0.54	-1.39	-1.00	9	3.18	4.58	8.28	3.08
-1	0.48	0.69	-0.91	-0.58	10	-2.38	-3.42	5.91	2.12
0	-0.27	-0.38	-1.17	-0.69	30	-0.11	-0.15	10.09	2.42
1	-1.31	-1.89	-2.49	-1.35	60	3.39	4.88	24.34	4.31
2	0.73	1.05	-1.76	-0.89	90	-1.98	-2.85	21.32	3.13
3	-0.26	-0.38	-2.02	-0.97	120	-0.20	-0.28	24.45	3.13
4	3.19	4.59	1.17	0.53	160	0.50	0.71	16.43	1.83
5	1.85	2.66	3.02	1.31	230	0.28	0.41	-1.32	-0.12

4.2.6. Information Technology Industry. As Figures 17 and 18 and Table 9 show, in the short term, the impact of COVID-19 on the information technology industry was relatively small. Although a significantly negative AR appeared on t_4 and t_7 , the CAR was not significantly negative. In the medium and long term, the negative CAR was kept. On t_{120} , the negative CAR was significant.

4.2.7. Media Industry. As Figures 19 and 20 and Table 10 show, in the short term, the media industry was negatively impacted by COVID-19. On t_0 and t_3 , the AR was significantly negative. The CAR continued to decline until t_{50} , and the CAR has started to become significantly negative since t_{30} . However the CAR returned to zero on t_{90} .

4.2.8. Summary. Based on the above analysis, the negative impacts of COVID-19 on different industries varied. For energy industry, because of the reduction of global demand for energy, high cost of energy saving, and speculation, the abnormal phenomenon of negative prices in crude oil futures appeared on April 20, 2020. Besides, due to the decrease of demand for some utilities, such as water and electricity, significantly negative ARs in these industries lasted for a long period.

Because of the policy of lockdown, the demand of traveling and cargo transportation dropped significantly. Because the epidemic prevented work and decreased the family income, demand for nonrigid demand products, such as durable consumer goods and clothing, also dropped significantly. Besides, IT industry faced difficulties in the recovery of domestic production lines, as well as domestic demand and foreign demand. Moreover, because companies' short-term debt paying ability declined, the quality of bank assets decreased and bad debt rates increased, and the bank's high-quality lending targets also shrunk, resulting in a credit crunch. Therefore, there were large negative impacts on durable goods and clothing, transportation, information technology, and finance industries.

In terms of media, COVID-19 had different impacts on offline and online media. Offline theaters were shut down and filming stalled, making the media industry face difficulties; however, the online media benefited from the increased number of people moving to home entertainment, driving negative abnormal return of the media industry.

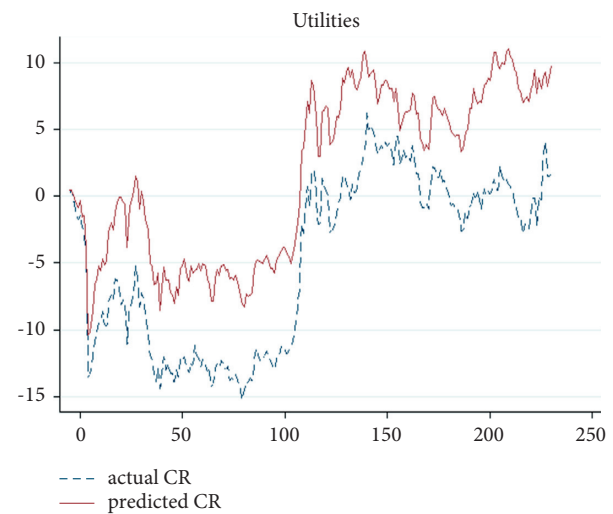


FIGURE 7: Actual and predicted cumulative returns.

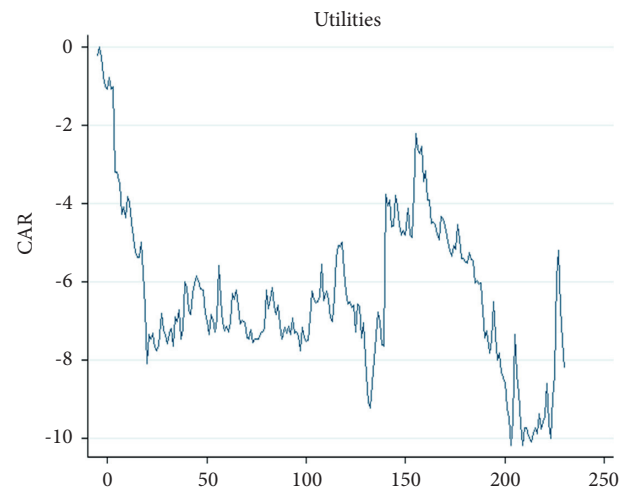


FIGURE 8: Cumulative abnormal return.

4.3. Industries without Significant Abnormal Return

4.3.1. Real Estate Industry. As Figures 21 and 22 and Table 11 show, real estate was not greatly affected by COVID-19. Within 120 days after the event, neither the AR nor the

TABLE 4: AR, CAR, and t -statistics for public utilities.

Date	AR (%)	t -stat	CAR (%)	t -stat	Date	AR (%)	t -stat	CAR (%)	t -stat
-5	-0.22	-0.39	-0.22	-0.39	6	-0.30	-0.52	-3.48	-1.74
-4	0.22	0.38	-0.01	-0.01	7	-0.77	-1.33	-4.26	-2.04
-3	-0.25	-0.43	-0.25	-0.25	8	0.18	0.32	-4.07	-1.88
-2	-0.50	-0.87	-0.76	-0.66	9	-0.27	-0.47	-4.34	-1.94
-1	-0.26	-0.44	-1.01	-0.79	10	0.52	0.90	-3.82	-1.65
0	-0.07	-0.11	-1.08	-0.76	30	-0.19	-0.32	-7.56	-2.18
1	0.29	0.51	-0.79	-0.51	60	0.10	0.17	-7.13	-1.52
2	-0.29	-0.50	-1.07	-0.66	90	-0.16	-0.27	-7.32	-1.29
3	0.07	0.12	-1.00	-0.58	120	-0.55	-0.94	-6.28	-0.97
4	-2.19	-3.79	-3.20	-1.75	160	0.26	0.44	-3.16	-0.42
5	0.01	0.02	-3.18	-1.66	230	-0.73	-1.27	-8.20	-0.92

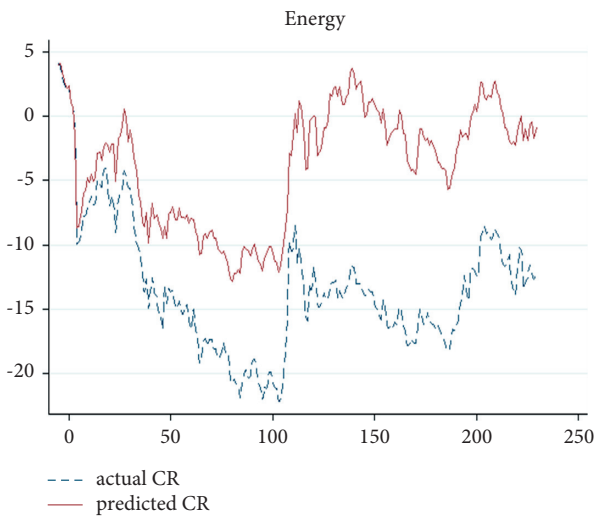


FIGURE 9: Actual and predicted cumulative returns.

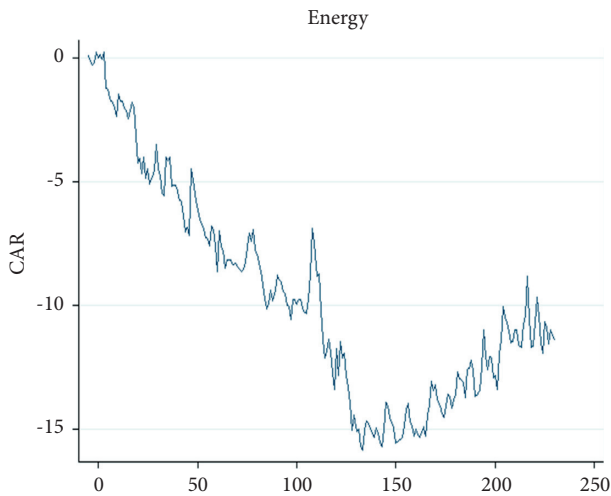


FIGURE 10: Cumulative abnormal return.

CAR presented significant fluctuation. The large negative AR that started to appear on t_{150} may be related to the government’s macro adjustment of housing prices, not directly caused by COVID-19.

4.3.2. *Telecommunications Industry.* As Figure 23 and Table 12 show, COVID-19 did not have an obvious impact on the telecommunications industry. Within 100 days after the event day, neither AR nor CAR was significant; but the CAR dropped largely after t_{100} .

4.3.3. *Materials Industry.* As Figures 25 and 26 and Table 13 show, the impact of COVID-19 on the materials industry was relatively small. Within 160 days after the incident, the CAR and AR were not significant on most of the days. Only t_{10} had a significantly positive abnormal return of 0.85%, but the CAR at that time was not significant. However, the CAR started to rise quickly around t_{170} .

4.3.4. *Summary.* Real estate, telecommunications, and materials did not have a significant AR in a short term after the outbreak of COVID-19. Although there were significant ARs after t_{100} for these industries, their occurrences were far from the event date. Therefore, we argue that the impacts of COVID-19 on these industries were limited relatively. As for real estate, even though the lockdown reduced the demand for office space, the real estate stock’s return did not drop significantly in the short term after the outbreak. In terms of telecommunications, it is speculated that the increase of the demand for online services compensated the negative impact of COVID-19, making the return of telecommunication industry stable. What is more, although the terminal manufacturing industry was hit hard, the material industry did not suffer a huge impact in the sample period. In the long run, benefiting from the recovery of the world economy, the materials industry gradually recovered and showed a significantly positive AR.

5. The Impact of COVID-19 on the Turnover Rate of A-Shares in Various Industries

Liquidity determines whether one trade can be made shortly at a low cost and therefore influences the value of stocks. We here use turnover rate to represent the liquidity of stock to investigate the impact of COVID-19.

As Figure 27 shows, among the 12 selected industries, the turnover rates of 10 industries, healthcare, real estate, materials, utilities, telecommunications services, durable

TABLE 5: AR, CAR, and t -statistics for energy industry.

Date	AR (%)	t -stat	CAR (%)	t -stat	Date	AR (%)	t -stat	CAR (%)	t -stat
-5	-0.28	-0.71	-0.28	-0.71	6	-0.48	-1.20	-2.15	-1.56
-4	-0.20	-0.49	-0.48	-0.85	7	-0.05	-0.12	-2.20	-1.53
-3	-0.21	-0.53	-0.69	-1.00	8	-0.16	-0.41	-2.36	-1.58
-2	0.10	0.25	-0.59	-0.74	9	-0.37	-0.92	-2.73	-1.77
-1	0.45	1.12	-0.14	-0.16	10	0.87	2.17	-1.86	-1.17
0	-0.23	-0.58	-0.38	-0.39	30	-0.96	-2.42	-4.85	-2.02
1	0.13	0.32	-0.25	-0.24	60	-1.07	-2.67	-9.04	-2.79
2	-0.19	-0.48	-0.44	-0.39	90	0.64	1.61	-9.14	-2.34
3	0.28	0.71	-0.16	-0.13	120	1.65	4.14	-12.13	-2.71
4	-1.46	-3.65	-1.61	-1.28	160	0.25	0.63	-15.40	-2.99
5	-0.06	-0.16	-1.67	-1.26	230	-0.22	-0.56	-11.79	-1.92



FIGURE 11: Actual and predicted cumulative returns.



FIGURE 12: Cumulative abnormal return.

consumer goods and clothing, transportation, media, information technology, and food and major supplies retail, increased significantly after the event date. Among them, the abnormal turnover rates of medical care, materials, utilities, durable consumer goods and clothing, and transportation industries maintained a growth trend during the event window.

For real estate, telecommunications services, media, information technology, and food and major supplies retail industries, the abnormal cumulative turnover rates dropped to some extent on t_{150} . Among them, only the abnormal cumulative turnover rate of the retail sales of food and major supplies dropped to become negative at the end of the event window. In addition, the abnormal cumulative turnover rate of energy and finance declined after event day. However, after the abnormal turnover rate suddenly increased on t_{100} , that of finance directly returned to the normal level, and that of energy also had a significant recovery.

TABLE 6: AR, CAR, and *t*-statistics for consumer durable goods and clothing industry.

Date	AR (%)	<i>t</i> -stat	CAR (%)	<i>t</i> -stat	Date	AR (%)	<i>t</i> -stat	CAR (%)	<i>t</i> -stat
-5	-0.47	-1.42	-0.47	-1.42	6	0.31	0.96	-2.54	-2.24
-4	-0.04	-0.11	-0.50	-1.08	7	0.01	0.03	-2.53	-2.14
-3	-0.04	-0.12	-0.54	-0.95	8	0.53	1.62	-2.00	-1.63
-2	-0.05	-0.14	-0.59	-0.89	9	-0.23	-0.72	-2.23	-1.76
-1	-0.10	-0.29	-0.68	-0.93	10	-0.22	-0.66	-2.45	-1.87
0	-0.22	-0.68	-0.91	-1.13	30	-1.41	-4.32	-0.08	-0.04
1	-0.20	-0.61	-1.11	-1.28	60	-0.14	-0.44	-5.97	-2.24
2	-1.38	-4.22	-2.49	-2.69	90	-0.44	-1.33	-7.92	-2.47
3	-0.04	-0.13	-2.53	-2.58	120	-0.10	-0.30	-13.22	-3.59
4	-0.12	-0.36	-2.65	-2.56	160	-0.16	-0.49	-10.58	-2.51
5	-0.20	-0.62	-2.85	-2.63	230	0.67	2.05	-14.89	-2.96

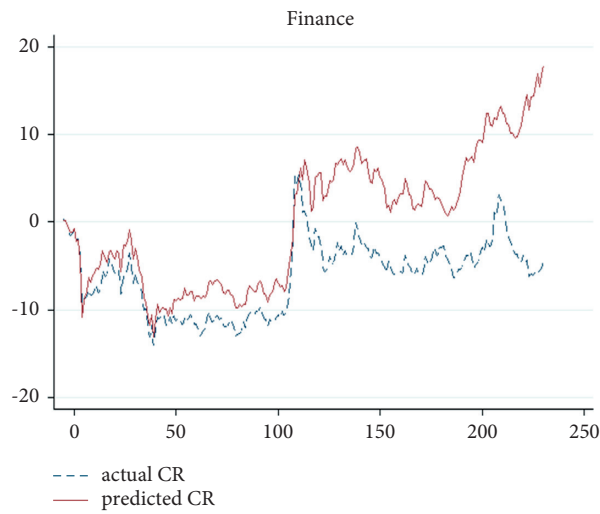


FIGURE 13: Actual and predicted cumulative returns.

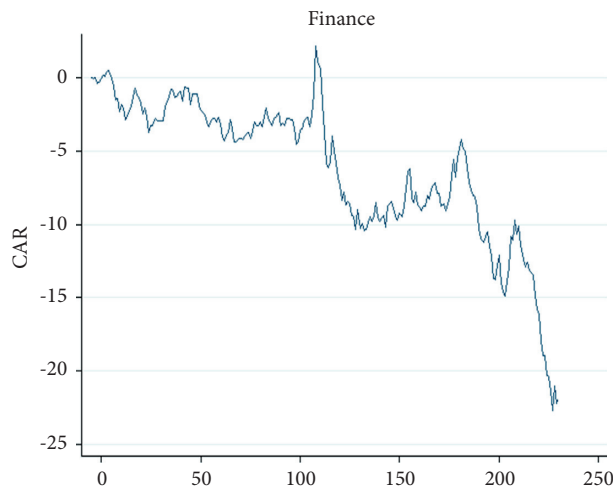


FIGURE 14: Cumulative abnormal return.

TABLE 7: AR, CAR, and t -statistics for finance industry.

Date	AR (%)	t -stat	CAR (%)	t -stat	Date	AR (%)	t -stat	CAR (%)	t -stat
-5	0.05	0.10	0.05	0.10	6	-0.79	-1.40	-0.57	-0.29
-4	-0.07	-0.13	-0.02	-0.02	7	-0.91	-1.62	-1.48	-0.73
-3	0.07	0.12	0.05	0.05	8	0.08	0.14	-1.41	-0.67
-2	-0.44	-0.78	-0.39	-0.34	9	-0.87	-1.55	-2.28	-1.04
-1	0.11	0.19	-0.28	-0.22	10	0.44	0.79	-1.83	-0.81
0	0.19	0.35	-0.09	-0.06	30	0.01	0.02	-2.89	-0.85
1	0.24	0.43	0.16	0.11	60	-0.47	-0.84	-3.17	-0.69
2	-0.05	-0.09	0.11	0.07	90	-0.89	-1.57	-3.21	-0.58
3	0.30	0.53	0.41	0.24	120	-0.48	-0.85	-7.34	-1.16
4	0.06	0.11	0.47	0.26	160	-0.22	-0.40	-8.86	-1.22
5	-0.25	-0.45	0.22	0.12	230	0.31	0.56	-21.94	-2.53

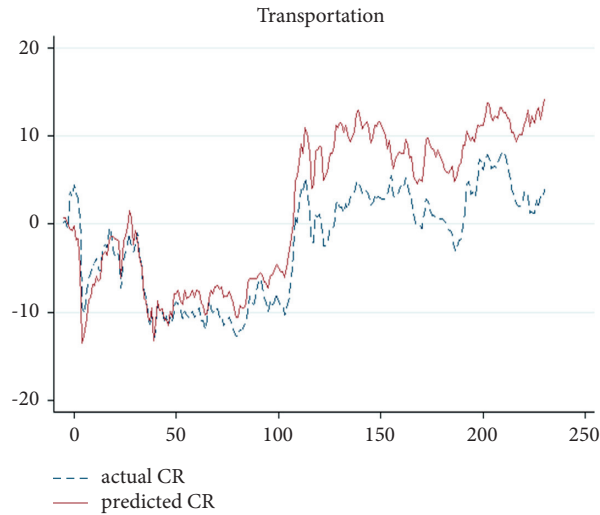


FIGURE 15: Actual and predicted cumulative returns.

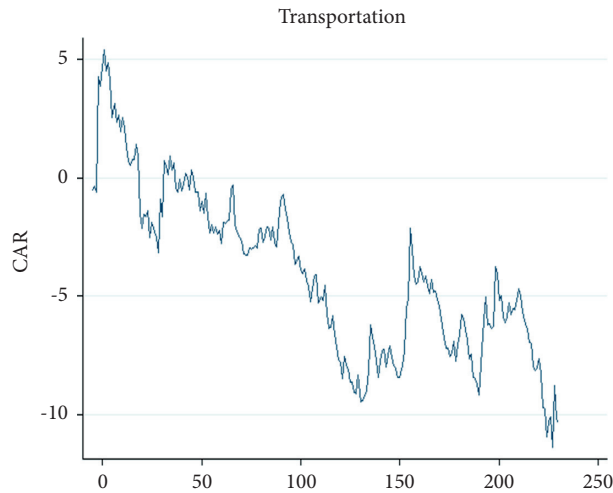


FIGURE 16: Cumulative abnormal return.

TABLE 8: AR, CAR, and *t*-statistics for transportation industry.

Date	AR (%)	<i>t</i> -stat	CAR (%)	<i>t</i> -stat	Date	AR (%)	<i>t</i> -stat	CAR (%)	<i>t</i> -stat
-5	-0.52	-0.94	-0.52	-0.94	6	0.62	1.13	3.14	1.65
-4	0.15	0.27	-0.37	-0.47	7	-0.81	-1.48	2.33	1.18
-3	-0.25	-0.45	-0.61	-0.64	8	0.31	0.56	2.64	1.28
-2	4.88	8.88	4.27	3.88	9	-0.71	-1.30	1.93	0.91
-1	-0.42	-0.76	3.85	3.14	10	0.63	1.14	2.55	1.16
0	0.79	1.44	4.64	3.45	30	-0.77	-1.40	-1.66	-0.50
1	0.75	1.37	5.40	3.72	60	-0.51	-0.92	-2.76	-0.62
2	-0.89	-1.61	4.51	2.90	90	0.58	1.05	-0.83	-0.15
3	0.32	0.58	4.83	2.93	120	-0.10	-0.18	-7.76	-1.26
4	-0.70	-1.28	4.13	2.38	160	0.62	1.13	-3.76	-0.53
5	-1.61	-2.93	2.52	1.38	230	-0.18	-0.32	-10.34	-1.23

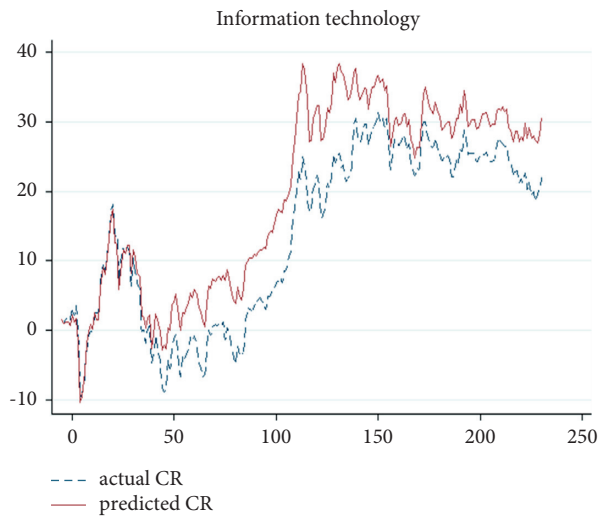


FIGURE 17: Actual and predicted cumulative returns.

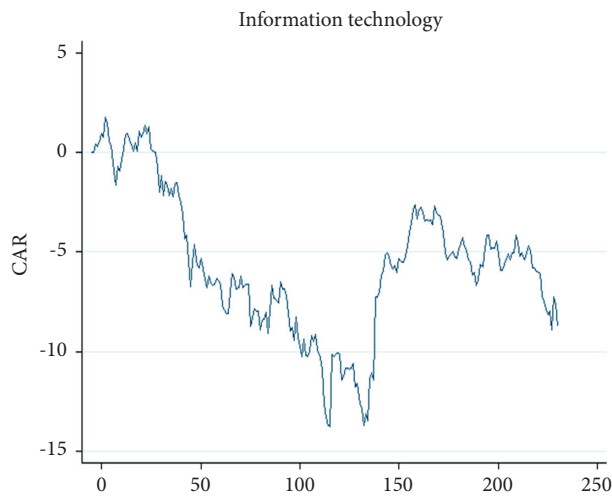


FIGURE 18: Cumulative abnormal return.

TABLE 9: AR, CAR, and t -statistics for information technology industry.

Date	AR (%)	t -stat	CAR (%)	t -stat	Date	AR (%)	t -stat	CAR (%)	t -stat
-5	-0.02	-0.05	-0.02	-0.05	6	-1.28	-2.62	-0.91	-0.54
-4	0.03	0.06	0.01	0.01	7	-0.71	-1.44	-1.61	-0.92
-3	0.41	0.83	0.41	0.49	8	0.93	1.91	-0.68	-0.37
-2	-0.10	-0.20	0.31	0.32	9	-0.23	-0.47	-0.91	-0.48
-1	0.22	0.44	0.53	0.48	10	0.59	1.20	-0.33	-0.17
0	0.44	0.90	0.97	0.81	30	0.81	1.66	-1.15	-0.39
1	-0.20	-0.41	0.77	0.59	60	-0.15	-0.30	-6.61	-1.66
2	1.02	2.08	1.78	1.29	90	1.03	2.10	-6.51	-1.36
3	-0.27	-0.55	1.51	1.03	120	-0.03	-0.06	-10.14	-1.85
4	-0.95	-1.94	0.56	0.36	160	0.45	0.91	-2.90	-0.46
5	-0.19	-0.38	0.37	0.23	230	-1.08	-2.20	-8.73	-1.16

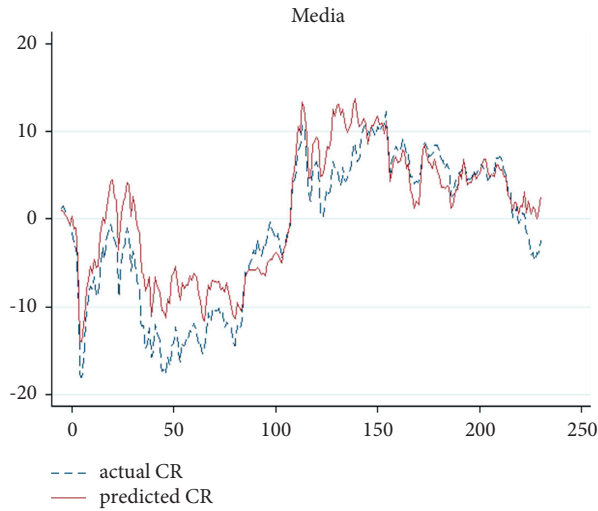


FIGURE 19: Actual and predicted cumulative returns.

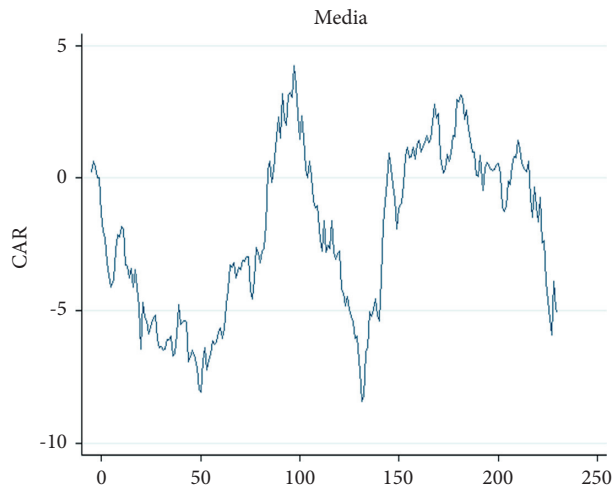


FIGURE 20: Cumulative abnormal return.

TABLE 10: AR, CAR, and *t*-statistics for media industry.

Date	AR (%)	<i>t</i> -stat	CAR (%)	<i>t</i> -stat	Date	AR (%)	<i>t</i> -stat	CAR (%)	<i>t</i> -stat
-5	0.25	0.43	0.25	0.43	6	0.31	0.53	-3.79	-1.86
-4	0.37	0.62	0.62	0.75	7	1.07	1.82	-2.72	-1.28
-3	-0.20	-0.34	0.42	0.41	8	0.56	0.95	-2.16	-0.98
-2	-0.40	-0.69	0.02	0.01	9	-0.07	-0.11	-2.22	-0.97
-1	0.02	0.03	0.04	0.03	10	0.38	0.65	-1.84	-0.78
0	-1.39	-2.35	-1.35	-0.94	30	0.07	0.12	-6.34	-1.79
1	-0.65	-1.10	-2.00	-1.28	60	0.15	0.25	-5.64	-1.18
2	-0.26	-0.44	-2.26	-1.35	90	-0.80	-1.36	1.52	0.26
3	-0.92	-1.56	-3.18	-1.80	120	0.09	0.16	-2.76	-0.42
4	-0.51	-0.87	-3.69	-1.98	160	0.16	0.28	1.44	0.19
5	-0.41	-0.69	-4.10	-2.10	230	-0.19	-0.32	-5.10	-0.56



FIGURE 21: Actual and predicted cumulative returns.

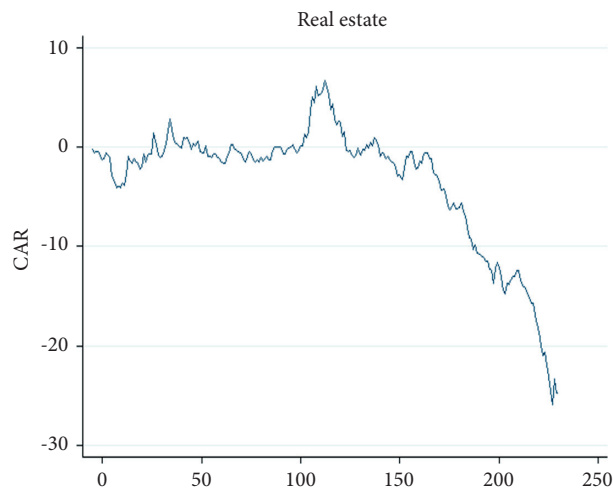


FIGURE 22: Cumulative abnormal return.

TABLE 11: AR, CAR, and t -statistics for real estate industry.

Date	AR (%)	t -stat	CAR (%)	t -stat	Date	AR (%)	t -stat	CAR (%)	t -stat
-5	-0.26	-0.54	-0.26	-0.54	6	-0.62	-1.30	-3.52	-2.13
-4	-0.27	-0.57	-0.53	-0.79	7	-0.59	-1.23	-4.11	-2.39
-3	0.01	0.03	-0.52	-0.63	8	0.13	0.27	-3.98	-2.23
-2	0.03	0.06	-0.49	-0.51	9	-0.17	-0.35	-4.15	-2.25
-1	-0.30	-0.62	-0.78	-0.73	10	0.54	1.12	-3.62	-1.89
0	-0.48	-1.00	-1.26	-1.08	30	0.11	0.23	-0.88	-0.31
1	0.11	0.23	-1.15	-0.91	60	-0.35	-0.73	-1.53	-0.40
2	0.52	1.08	-0.64	-0.47	90	-0.12	-0.25	-0.11	-0.02
3	-0.18	-0.38	-0.82	-0.57	120	-0.14	-0.29	2.43	0.45
4	-0.24	-0.50	-1.06	-0.70	160	0.70	1.47	-1.37	-0.22
5	-1.84	-3.87	-2.90	-1.83	230	-0.03	-0.05	-24.80	-3.38

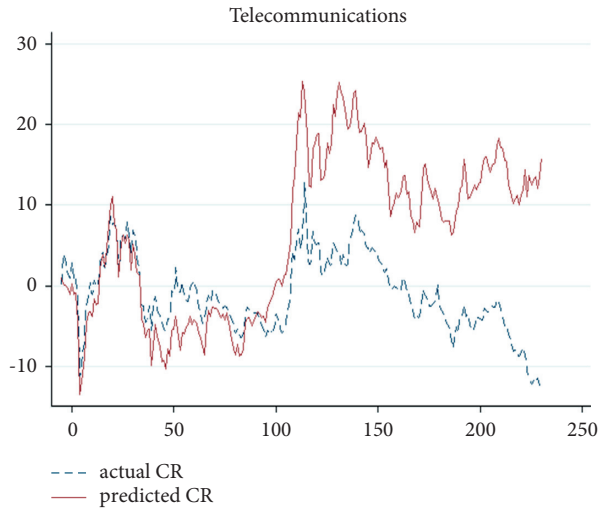


FIGURE 23: Actual and predicted cumulative returns.

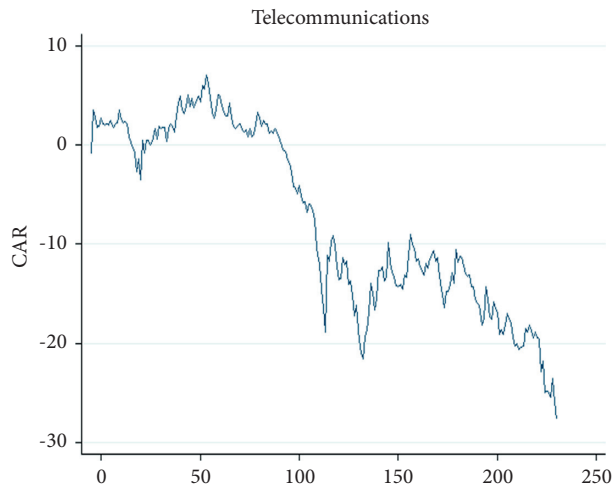


FIGURE 24: Cumulative abnormal return.

TABLE 12: AR, CAR, and *t*-statistics for the telecommunications industry.

Date	AR (%)	<i>t</i> -stat	CAR (%)	<i>t</i> -stat	Date	AR (%)	<i>t</i> -stat	CAR (%)	<i>t</i> -stat
-5	-0.78	-0.54	-0.78	-0.54	6	-0.69	-0.48	1.81	0.36
-4	4.35	3.00	3.57	1.74	7	0.28	0.19	2.08	0.40
-3	-0.73	-0.51	2.84	1.13	8	0.19	0.13	2.27	0.42
-2	-1.03	-0.71	1.81	0.62	9	1.24	0.86	3.51	0.63
-1	0.06	0.04	1.86	0.58	10	-0.92	-0.64	2.59	0.45
0	0.83	0.57	2.69	0.76	30	-0.14	-0.10	1.70	0.20
1	-0.61	-0.42	2.09	0.54	60	-0.19	-0.13	4.90	0.42
2	-0.04	-0.03	2.05	0.50	90	-0.64	-0.44	0.45	0.03
3	0.12	0.08	2.17	0.50	120	-1.30	-0.90	-13.56	-0.83
4	-0.20	-0.14	1.97	0.43	160	0.24	0.16	-11.44	-0.61
5	0.53	0.37	2.50	0.52	230	-1.81	-1.25	-27.72	-1.25

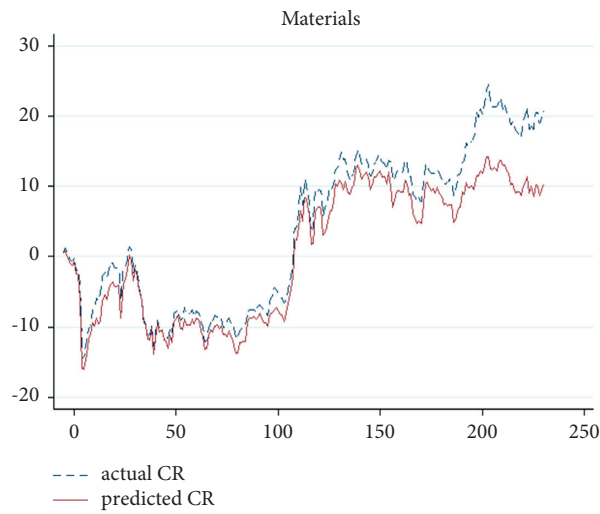


FIGURE 25: Actual and predicted cumulative returns.

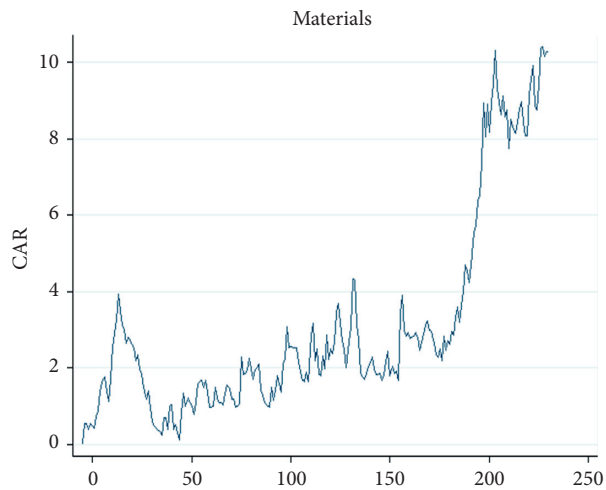


FIGURE 26: Cumulative abnormal return.

TABLE 13: AR, CAR, and t -statistics for materials industry.

Date	AR (%)	t -stat	CAR (%)	t -stat	Date	AR (%)	t -stat	CAR (%)	t -stat
-5	0.03	0.08	0.03	0.08	6	0.14	0.31	1.77	1.17
-4	0.50	1.14	0.53	0.86	7	-0.37	-0.84	1.41	0.89
-3	0.01	0.02	0.54	0.71	8	-0.27	-0.62	1.14	0.70
-2	-0.16	-0.36	0.38	0.44	9	0.58	1.32	1.71	1.01
-1	0.15	0.35	0.54	0.55	10	0.85	1.94	2.56	1.47
0	-0.04	-0.09	0.50	0.47	30	-0.35	-0.80	0.59	0.23
1	-0.07	-0.17	0.43	0.37	60	-0.01	-0.03	0.97	0.27
2	0.29	0.66	0.71	0.58	90	0.54	1.24	1.50	0.35
3	0.17	0.40	0.89	0.68	120	0.28	0.63	2.50	0.51
4	0.47	1.07	1.36	0.98	160	-0.15	-0.35	2.76	0.49
5	0.28	0.64	1.64	1.13	230	-0.01	-0.01	10.27	1.53

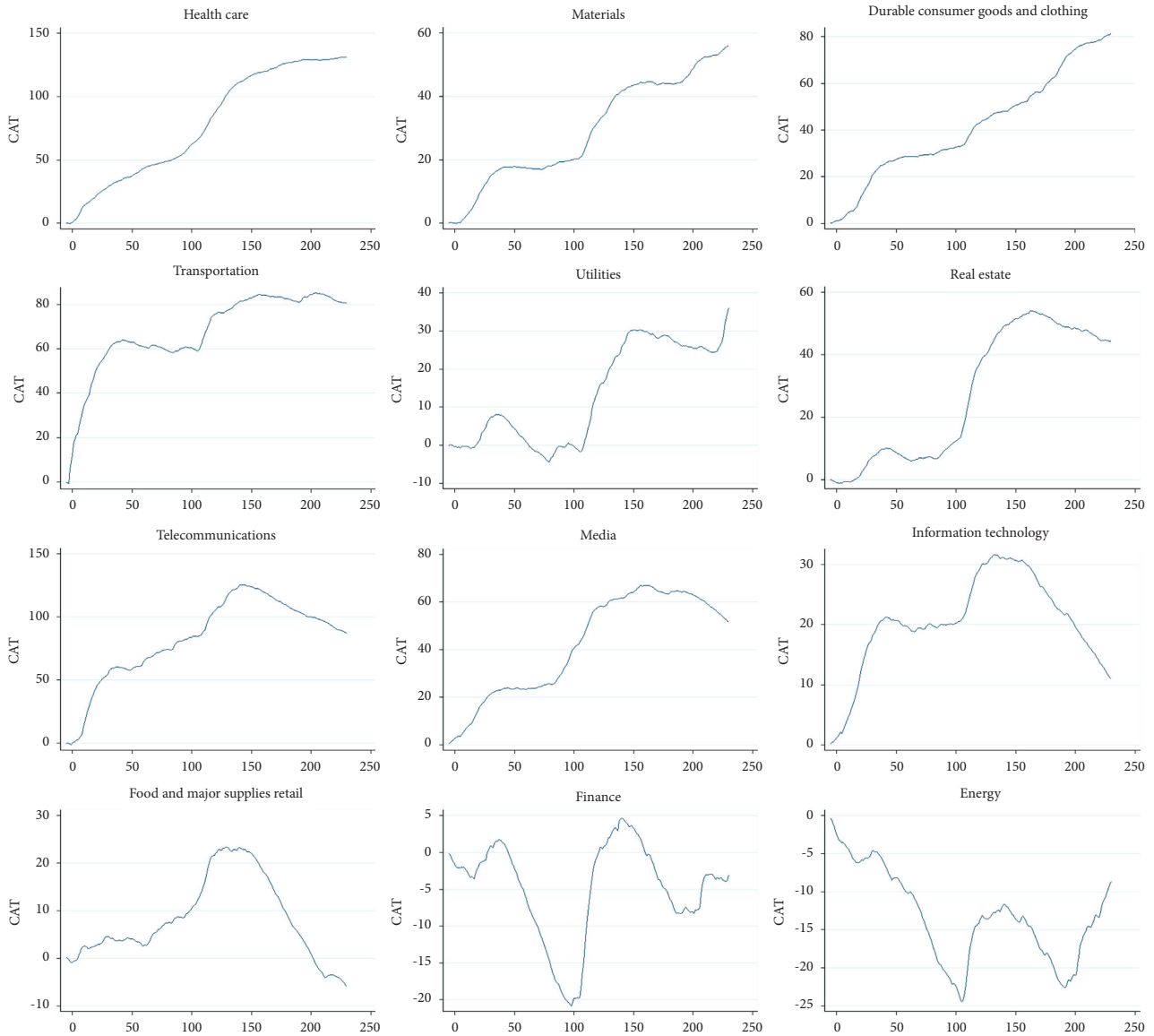


FIGURE 27: The abnormal turnover rates of industries.

6. Conclusion

In the short term, the actual return on A-stock was significantly lower than the expected return after the outbreak of COVID-19. After suffering two waves of shock, the return of A-stock came normal on May 2020. The medical and food industries benefited from the influence of COVID-19. However, energy and utility suffered the negative impact of COVID-19 for a long time; the negative impact on the durable consumer goods and clothing, finance, transportation, and information technology industries did not appear to be significant until several weeks after the event date. The industries of real estate, telecommunications, and materials were not influenced relatively by COVID-19 too much. In order to hedge the various impacts of the epidemic on A-stock and different industries, a more proactive fiscal policy and a flexible monetary policy from government may be helpful.

In terms of turnover rates, the energy and finance industries had significantly negative abnormal turnover rates after the outbreak of the pandemic; moreover, the cumulative abnormal turnover rates of real estate, telecommunications service, clothes, media, information technology, and food and major products started to drop after reaching the highest point on t_{150} ; but those of healthcare, materials, durable consumer goods and clothing, transportation, and utilities kept increasing in the event window.

Data Availability

The data are from China Stock Market & Accounting Research (CMSAR), Yahoo Finance.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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