COVID-19's Impact on Investors Sentiment and Price Behaviour: Empirical Evidence from Chinese Stock Market

Yaogeng He, Zhirui Xu, and Xueying Zhan

Abstract—**Changes in investor sentiment are closely related to fluctuations of stock price. However, there seems to be little existing research that addresses the question of why investor sentiment changes. The purpose of this paper is to examine the impact of the COVID-19 on Chinese investor sentiment and stock price behavior from an event-driven perspective. First of all, this paper follows the method of Principal Component Analysis to form an investor sentiment index. Then, after the results were obtained, the index was incorporated into a simple linear regression model including stock prices and two SVAR models that includes stock prices and epidemic severity. Finally, the correlation test is carried out. The empirical results show that, first, the investor sentiment is overally higher and fluctuates more volatile after the COVID-19. Secondly, the relationship between investor sentiment and stock prices becomes insignificant during the epidemic, and stock prices revert to the intrinsic value corresponding to fundamental factors. Third, with the normalization of epidemic, the impact of the epidemic on investor sentiment gradually disappears after 10 months, but the impact of the epidemic on stock prices lasts longer, indicating that the impact of the epidemic on fundamentals is relatively deep and long-lasting. This paper may provide a way of thinking to better understand the formation of stock prices and investor behavior.**

Index Terms—**Chinese stock market, COVID-19, investor sentiment, price behavior.**

I. INTRODUCTION

Looking back at the history of China's capital market, we can easily observe an phenomenon that prices of most listed companies almost synchronously experienced plunges and spikes in the short to medium term, and this is undoubtedly an important factor that affects China's macroeconomic as well as financial system risks. Intuitively, it is difficult to assume that this phenomenon is caused exclusively by changes in fundamental factors, and a growing body of research has confirmed that investor sentiment is an important factor influencing stock prices. Investor sentiment has long been a focus of research in the field of behavioral finance. In 1936, John Maynard Keynes remarkably pointed out that stock prices can produce price deviations from their underlying value when influenced by emotionally driven investors. Later, DeLong, Shleifer, Summers, and Waldman [1] introduced investor sentiment into the assets pricing

model based on Keynes' theory, bringing the concept of investor sentiment into the field of behavioral finance for the first time. The current researches, as far as we know, on investor sentiment on stock price behavior can be divided into four areas:

The first is the overall effect of investor sentiment. Many studies have pointed out that there is a significant correlation between the investor sentiment and stocks returns [2]. In other words, changes in investor sentiment can significantly affect the cyclicality of prices [3].

The second is the cross-sectional effect of investor sentiment. The results of empirical tests by numerous scholars suggest that influenced by investor sentiment, returns of stocks with different accounting characteristics appear different [4].

The third is the characteristic effect of investor sentiment. Researches on this topic generally divides investor sentiment by some criterion in order to examine the asymmetry of the impact of different components on stock price behavior, with the main findings being that institutional investor sentiment better explains stock returns than individual investor sentiment [5]. In addition, both optimism and pessimism can increase stock volatility [6].

The fourth is the mechanism of investor sentiment. This type of research is relatively more concerned with the process of information transmission, and some scholars have found that: Asymmetries in information transmission can affect investor sentiment when processing new information, which can cause stock price volatility [7], investor sentiment can affect the relationship between information and downside risk to stock prices [8], investor online search behavior can influence asset pricing [9].

After studying certain literature, we found that most of the existing studies have well-roundedly considered the impact of changes in investor sentiment on stock price behavior from different perspectives, but it seems that not much of them covered the issue of why investor sentiment changes. Based on the existing research results, this paper analyses the impact of the COVID-19 on Chinese investor sentiment from an event-driven perspective and how this impact is reflected in the stock market, using simple linear regression and the SVAR model. The results show that during the pandemic the influence of investor sentiment on price becomes insignificant, and the impact of COVID-19 on sentiment disappears after 10 months, while the impact on price is more profound and lasts longer. This may provide an idea for a better understanding of stock price formation and investor behavior.

The remainder of the paper is organized as follows: Section II shows how hypotheses are proposed; Section III describes

chosen variables; Section VI introduces the models, and elaborates several empirical tests; Section V presents our conclusions.

II. RESEARCH HYPOTHESIS

A. The Outbreak of the COVID-19 Epidemic and Investor Sentiment

After the outbreak of the COVID-19 epidemic at the beginning of 2020, virus quickly swept the world and has a huge impact on economy and people's daily life. The global outbreak of the epidemic is a typical "Black swan" event, an unexpected, unpredictable event that has a considerable impact and exists in various aspects such as finance, economy, and life.

In the financial capital market, the outbreak of the COVID-19 epidemic has increased panic to a certain extent. At the same time, due to the need for epidemic prevention and control, many governments have introduced blockade measures, and companies have reduced work and production. The market value of many companies has fallen, and profits have been sharply reduced. The sudden outbreak of the epidemic has made it difficult for most companies to respond reasonably in a short time, and investor confidence will be greatly negatively affected, causing huge fluctuations in the stock capital market. During the epidemic, many investors are worried about their risk assets and become generally pessimistic about stocks. The investment participation of market investors has dropped significantly. This is a strong feedback from investors on negative information. Therefore, it is reasonable to speculate that the outbreak of the new crown epidemic has had a significant impact on investor sentiment.

B. The Impact of Investor Sentiment on stock Price Behavior before and after the Outbreak of the COVID-19 Epidemic

Although the impact of many major events before the outbreak of the COVID-19 epidemic will cause a certain degree of panic in a short period, most of them will gradually return to stability in a relatively short time.

However, the outbreak of the COVID-19 epidemic has had a long-lasting and severe impact on the stock capital market. In March 2020, the U.S. stocks rarely fuse four times in 10 days is a typical example. It not only impacts the capital market but also affects all aspects of life. It will greatly increase investor anxiety and panic. This is different from the impact of various emergencies on investor sentiment before the epidemic.

C. Changes in Investor Sentiment after the Normalization of the COVID-19 Epidemic

After April 2020, China's COVID-19 epidemic began to show stable characteristics, thus enterprises have accelerated the resumption of work and production, and the government has introduced several active policies to stimulate economic development. On the international front, due to the advancement of vaccine research, the epidemic has slowed down to a certain extent.

The COVID-19 epidemic will appear normalized, and the prevention and control of the new crown epidemic will be a

daily policy, which will to a large extent maintain the stability of the stock market. Investors' panic will be significantly reduced. Investors are aware of the risks of the COVID-19 epidemic on the stock market, but investors' attention to the stock market will also show an upward trend, which has been significantly improved compared with the initial period of the COVID-19 epidemic.

Based on the above analysis, the following hypotheses are proposed:

Hypothesis 1: The outbreak of the COVID-19 epidemic has significantly affected investor sentiment.

Hypothesis 2: Investor sentiment has different effects on stock price behavior before and after the outbreak of the COVID-19 epidemic.

Hypothesis 3: With the normalization of the COVID-19 epidemic, the fluctuation caused by the epidemic of investor sentiment and price gradually disappears.

III. VARIABLES

A. Investor Sentiment

Based on closed-end fund discount, NYSE share turnover, number of IPOs, average first-day returns of IPOs, and the share of equity issues in total equity and debt issues, and Investor Sentiment Index was given by Baker and Wurgler in 2006 [10]. This index could precisely and comprehensively indicate the psychological changes of investors to some extent. However, in a research published in 2009, Yi Z.G. and Mao Ning [11] argue that certain proxies, including closed-end fund discount, turnover, the number of IPOs, first-day returns of IPOs, newly increased accounts, and Consumer Confidence Index, would fit the actual situation of Chinese stock market better. In later years, a considerable number of methods to measure investor sentiment have been quoted by different scholars, but it seems that there is not a universal one. Taking accessibility and frequency of data into consideration, this article uses the same approach as Yi Z.G. and Mao Ning's:

Dependent variable: Investor sentiment (IS_t)

Independent variable: Discount of a closed-end fund, Turnover, The number of IPOs, First-day returns of IPOs, Newly increased accounts, Consumer Confidence Index ($DCEF_t, TURN_t, IPON_t, IPOR_t, NIA_t, CCI_t$).

Control variable: Consumer Price Index, Producer Price Index, Macro-economic business index, Industrial Added Value ($CPI_t, PPI_t, MBCI_t, IAV_t$).

B. Price Behaviour

The monthly closing price of Shanghai-Shenzhen 300 Index P_t is used to represent price behavior. It is undoubtedly that fundamental factors affect price, so PB_t, which is a proxy of book value, is taken into consideration in this research.

C. Severity of Covid-19

The severity of Covid-19 could be represented by new cases NC_t.

D. Data

Data resources used in this article are CSMAR, Eastmoney CHOICE, National Bureau of Statistics of the PRC, and National Health Commission of the PRC. Time ranges from

07/2018 to 05/2021, and the frequency is a month.

IV. MODELS AND TESTS

A. Change of Investor Sentiment after the Outbreak of COVID-19

The result of that methodology mentioned in Section III can be found directly on CSMAR. Generally, the index is calculated by the following steps: (i). Standardize all variables, (ii). Apply principal component analysis on independent variables of investor sentiment and their one-term lags, (iii). Choose 6 best proxies through correlation analysis, (iv). Use the residual series from the regression between each proxy in iii and every control variable as final independent variables, (v). Calculate Investor Sentiment Index through principal component analysis on 6 final independent variables.

The line chart below demonstrates how the Investor Sentiment Index changes in the given period. Here, Y-axis represents the value of the Investor Sentiment Index, and since the Index is standardized, the axis has no unit. X-axis represents time (07/2018-05/2021) and the unit is the month. In addition, The grey bar represents the month when COVID-19 was initially reported in China.
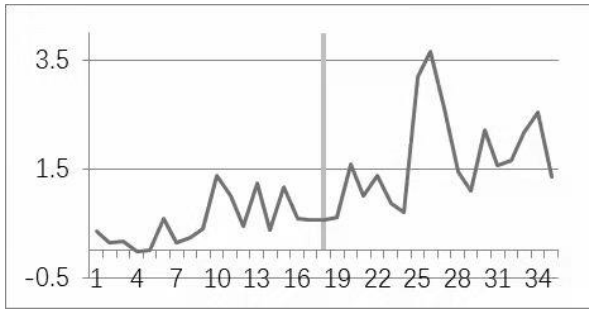

Fig. 1. The trend of Investor Sentiment Index.

Intuitively, it is illustrated that the level of investor sentiment is overall higher and the fluctuation of sentiment is more volatile after COVID-19. Dividing the first 17 and last 17 observations of the index into 2 samples, we could tell the difference between the sentiment before and after COVID-19 in the sense of descriptive statistics.

TABLE I: THE RESULT OF DESCRIPTIVE STATISTICS

	Sample 1	Sample 2
Mean	0.521	1.750
Variance	0.189	0.757
Skewness	0.756	0.714
Kurtosis	2.380	2.657
Obs	17	17

What may be indicated is that the influence of COVID-19 on investor sentiment is bidirectional and repeated.

B. Changes in the Relationship between Price Behavior and Investor Sentiment

A linear regression model for each sample mentioned above can be expressed as:

$$P_t = a + b_1 IS_t + b_2 PB_t + e. \qquad (1)$$

And the result for sample 1 is:

TABLE II: THE RESULT OF REGRESSION FOR SAMPLE 1

	IS_t	PB_t	Cons
Coef	303.315	2786.435	-329.239
Std.Err	99.647	617.427	817.009
P>|t|	0.009	0.000	0.711
P>F		0.000	
R-squared		0.7354	
Obs		17	

Result of Sample 2 is:

TABLE III: THE RESULT OF REGRESSION FOR SAMPLE 2

	IS_t	PB_t	Cons
Coef	6.843	3839.954	-937.229
Std.Err	47.060	227.239	374.665
P>|t|	0.886	0.000	0.025
P>F		0.000	
R-squared		0.9445	
Obs		17	

Because that the observation is not considerably large, tests for multi-collinearity, homoscedasticity, and normality of residuals are needed:

TABLE VI: THE RESULT OF FURTHER TESTS

	Sample 1	Sample 2
Mean VIF	1.07	1.23
P_W [1]	0.1741	0.6958
P_{J-B} [2]	0.6128	0.3822

1 P-value from the White test for H0: Homoskedasticity.
2 P-value from Jarque-Bera test for Ho: normality.

It is shown that multi-collinearity is not significant and the existence of homoscedasticity and normality can not be denied at the confidential level of 5%.

What can be drawn from these results above is that the influence of investor sentiment on price became less significant and the change of price can be nearly totally explained by book value during the pandemic.

C. COVID-19's Impulse on Price Behavior and Investor Sentiment

With Model 1, which includes IS_t^* (Residual series from the regression between IS_t and IS_{t-1}) and NC_t, and Model 2, which includes P_t^* (Residual series from the regression between P_t and P_{t-1}) and NC_t, being considered, what can be expressed is:

$$\text{Model1: A}\begin{pmatrix} IS_t^* \\ NC_t \end{pmatrix} = \begin{pmatrix} \gamma_{10} \\ \gamma_{20} \end{pmatrix} + \text{B}\begin{pmatrix} IS_{t-1}^* \\ NC_{t-1} \end{pmatrix} + \begin{pmatrix} u_{1t} \\ u_{2t} \end{pmatrix}, \qquad (2)$$

$$\text{Model2: A}\begin{pmatrix} P_t^* \\ NC_t \end{pmatrix} = \begin{pmatrix} \gamma_{10} \\ \gamma_{20} \end{pmatrix} + \text{B}\begin{pmatrix} P_{t-1}^* \\ NC_{t-1} \end{pmatrix} + \begin{pmatrix} u_{1t} \\ u_{2t} \end{pmatrix}. \qquad (3)$$

Short-term constraints for each model are (i). The seriousness of covid-19 has an impact on investor sentiment and price behavior, while the reverse impact does not exist, (ii). The impact of COVID-19 from last month is fully reflected in last month. Thus, the estimation of A and B is:

$$\text{Model 1: A} = \begin{pmatrix} 1 & 5.71 \times 10^{-4} \\ 0 & 1 \end{pmatrix}, \text{B} = \begin{pmatrix} 0.27 & 0 \\ 0 & 585.02 \end{pmatrix};$$

Model 2: $A = \begin{pmatrix} 1 & -0.24 \\ 0 & 1 \end{pmatrix}, B = \begin{pmatrix} 19.56 & 0 \\ 0 & 290.99 \end{pmatrix}.$

What may also worth mention is that all coefficients are significant and the two models are both robust.

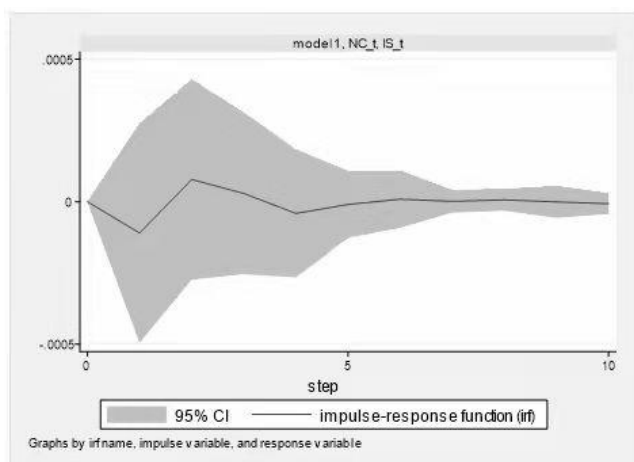Thereby, the impulse response function can be plotted:

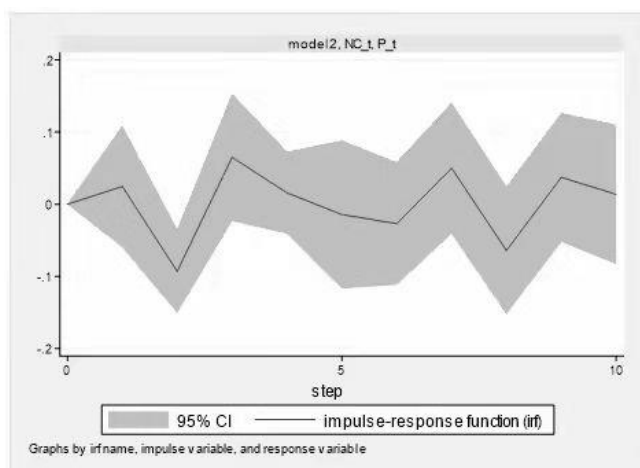Fig. 2. The irf of investor sentiment and new cases.

Fig. 3. The irf of price and new cases.

The line charts above illustrate that impulse on investor sentiment is bidirectional, but this impulse almost totally disappears after 10 months. In terms of price behavior, however, it takes longer to fully absorb the impulse and the bidirectional influence exists as well.

V. CONCLUSION

Investor sentiment is a hot topic in finance and an important angle to explain stock price behavior. In the past research, most of the researches focused on the influence of investor sentiment on stock price behavior but rarely involved why investor sentiment changes. Based on the existing research results, this article uses the regression model to test the impact of the investor sentiment on stock price behavior during the pandemic and the SVAR model to analyze how the investor sentiment and the price behavior are impacted by the COVID-19 epidemic.

Based on the relevant empirical analysis above, the conclusions are: (i). the overall level of investor sentiment after the COVID-19 epidemic is higher, and the volatility of

it is more severe. (ii). During the epidemic, the impact of investor sentiment on stock prices becomes insignificant, and the stock price returns to the intrinsic value corresponding to the fundamental factors. (iii). The impact of the epidemic on stock prices and investor sentiment is two-way. With the normalization of the epidemic and prevention and control, the impact of the epidemic on investor sentiment has gradually disappeared (10 months). However, the impact of the epidemic on stock prices lasts longer, which shows that the impact of the epidemic on fundamentals is relatively profound and long-lasting.

For the construction of investor sentiment indicators, this article uses the relevant research of Yi Zhigao and Mao Ning in 2009 but failed to construct a new composite indicator of investor sentiment. We also hope that in the future, domestic and foreign scholars can have a more standardized and unified standard when constructing investor sentiment indicators.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTIONS

The overall structure, general ideas and writting are done through several discussions together. Xueying Zhan reviewed several related articles and then point the topic we focused on, Zhirui Xu outlined these hypotheses after analysis, Yaogeng He conduct the empirical test, and Zhirui Xu explained results to reach conclusions in the end. All authors had approved the final version.

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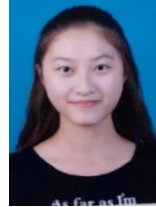
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