

# Statistical Measurement of the Impact of the COVID-19 Epidemic on Investor Sentiment

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## Abstract

Major unexpected events affect the country's economic development, the livelihood and atmosphere of society. Based on the 36-month data from January 2020 to December 2022 in China, as well as real-time data on the COVID-19 epidemic released by the national and provincial health commissions, this article analyzes the impact of the COVID-19 epidemic on investor sentiment. It uses regression models and time series analysis to predict and empirically analyze the relationship between the COVID-19 epidemic and the investor sentiment index to propose policy recommendations for responding to major public health emergencies.

## Keywords

COVID-19; Investor Sentiment; Multiple Regression Analysis; Time Series Analysis.

## 1. Introduction

Since the end of 2019, the novel coronavirus (COVID-19) pandemic has rapidly spread worldwide, causing significant impacts on people's lives and economic activities. As significant participants in the global economy, investor sentiment has played a crucial role during this pandemic. The fluctuations in investor sentiment have had a significant impact on the stability of financial markets and investment decisions.

This paper aims to analyze the impact of the COVID-19 epidemic on investor sentiment through statistical measurements. The research results will help us better understand the extent of the impact of the COVID-19 epidemic on investor sentiment and provide references for investors and policymakers regarding investment decisions and market regulation. Through in-depth research on the statistical measurement of investor sentiment, we can better respond to the impact of future similar crisis events on financial markets and enhance investors' risk awareness and decision-making capabilities.

## 2. Research Content and Methods

### 2.1. Proposing Assumptions

Based on previous research, this article proposes a hypothesis: the COVID-19 has a negative impact on investor sentiment index.

### 2.2. Data Source and Indicator Selection

Investor sentiment index includes individual investor sentiment index and institutional investor sentiment index. The impact of investor sentiment on the stock market is an important viewpoint of behavioral finance theory. Investor sentiment represents investors' expectations of the future with systematic bias. Individual investor sentiment is easily influenced by various rumors and is the main noise trader; institutional investor sentiment, on the other hand, is relatively rational, and their sentiment can predict stock returns. Li Yimeng believes that

compared to individual investors, institutional investors have significant advantages in professional skills and the ability to obtain information [1]. The larger the investor sentiment index, the higher the market sentiment, and conversely, the smaller the investor sentiment index, the lower the market sentiment. This paper mainly focuses on the comprehensive value of investor sentiment.

The investor sentiment indicators used in this paper are mainly the CICI (China Investor Confidence and Sentiment Index, CICI) and ISI (Investors' Sentiment Index), with the specific data related to CICI and ISI obtained from CSMAR(China Stock Market Accounting Research), specifically calculated from the references of Yi Zhigao and Wei Xingji et al [2,3].

The data during the period from January 2020 to December 2022, which covers the period of the COVID-19 pandemic, is used as the research sample to construct a reasonable indicator system. In this paper, investor sentiment is taken as the dependent variable, the development of the COVID-19 situation (excluding Hong Kong and Macau) is taken as the independent variable, and the consumer price index, national urban survey unemployment rate, and the year-on-year growth rate of the national import and export value are taken as control variables. In this context, the number of newly confirmed cases is taken as an indicator of the development of the COVID-19 situation, with the related data obtained from the National Health Commission. The related data for the consumer price index, national urban survey unemployment rate, and the year-on-year growth rate of the national import and export value are obtained from the National Bureau of Statistics."

### 2.3. Comparison Analysis of Time Series Graphs of Relevant Variables.

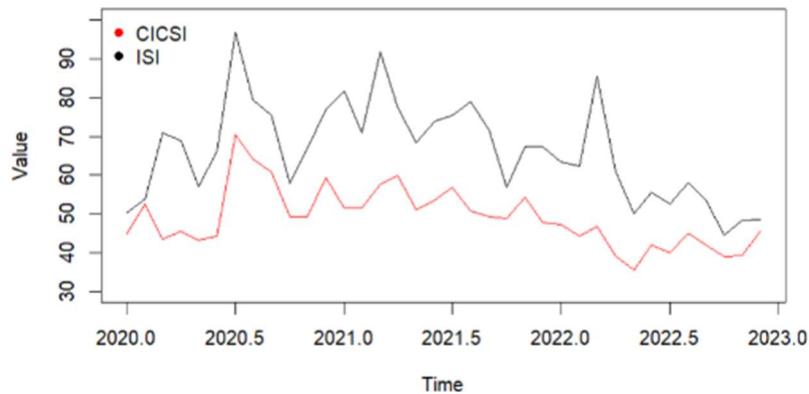


Figure 1. Trends in investor sentiment

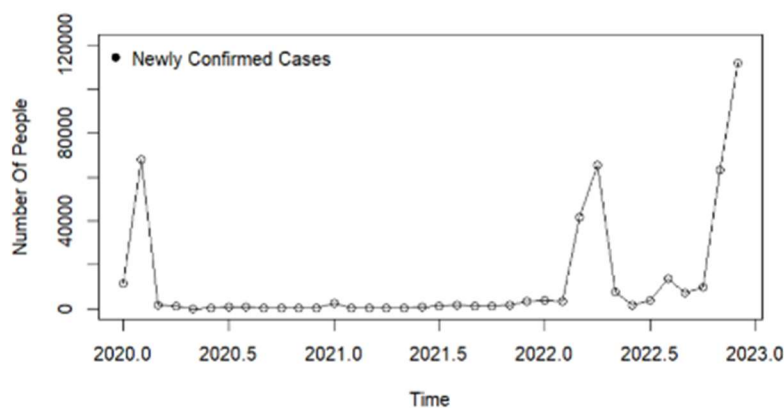


Figure 2. Trend of newly confirmed cases

The above two graphs show the time series of monthly investor sentiment index and monthly new confirmed cases. Figure 1 shows the time curve of investor sentiment index and Figure 2 curve of the number of newly diagnosed patients with COVID-19. CICS and ISI represent investor sentiment index for modeling analysis and robustness analysis of the model, respectively. They are calculated using different formulas, but the curves show similar trends. From the time series, it can be seen that investor sentiment index was relatively weak when the COVID-19 pandemic first broke out. It started to recover slightly in mid-2020 when the pandemic stabilized. From mid-2020 to early 2022, it remained relatively stable. In 2022, the COVID-19 situation worsened in Shanghai in March and April, with a sudden increase of 400 deaths nationwide and a small peak in new confirmed cases. The pandemic erupted, causing investor sentiment to plummet. By the end of 2022, the pandemic had erupted across the country, with repeated impacts in many places, and new confirmed cases peaked at the end of December. This was followed by a further decline in real estate investment, a significant expansion of consumption decline, a sharp drop in imports and exports, and a period of low investor sentiment.

## 2.4. Model Construction

The impact of the COVID-19 pandemic on the stock market is a topic of great concern, and investor sentiment is a reaction of investors to the stock market. We can use regression analysis to study the impact of the COVID-19 pandemic on investor sentiment. Therefore, this article first focuses on whether the COVID-19 pandemic directly leads to significant changes in the investor sentiment index, that is, the empirical analysis of the impact of the explanatory variables on the explained variables. Based on the research hypothesis, the following multiple regression model is established:

$$Y_1 = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \epsilon t \quad (1)$$

Among them:  $Y_1$  represents the investor sentiment index,  $X_i$  ( $i = 1$ ) represents pandemic-related indicators, with  $X_1$  representing the number of new confirmed cases, and  $X_i$  ( $i = 2, 3, 4, 5$ ) representing control variable-related indicators, with  $X_2$  representing the consumer price index,  $X_3$  representing the national urban survey unemployment rate, and  $X_4$  representing the year-on-year growth of total import and export value. The specific modeling approach is referenced from the viewpoint of Xing Linxue et al.

**Table 1.** Regression analysis results of Model (1)

	Estimate	Std. Error	t value	Pr (> t )
<b>(Intercept)</b>	4.2464318	0.1330471	31.917	< 2e-16 ***
<b>X1</b>	-0.0475000	0.0155616	-3.052	0.00463 **
<b>X2</b>	0.0475358	0.0234809	2.024	0.05161
<b>X3</b>	-0.0131305	0.0281384	-0.467	0.64402
<b>X4</b>	0.0002853	0.0017677	0.161	0.87284

Table 1 shows the result validation of regression analysis model (1). From the model results, it can be seen that regression coefficient of the core explanatory variable  $X_1$  (monthly newly confirmed cases) to the dependent variable (investor sentiment index) is negative and significant at the 5% significance level, indicating that as the number of newly confirmed cases increases, that is, as the epidemic gradually intensifies, the investor sentiment index decreases. Control variables are used in research to control for other variables that may affect the dependent variable, in order to more accurately assess the impact of the independent variable

on the dependent variable. It can be observed that the regression coefficient of X2 is positive, indicating that the consumer price index has a positive correlation with investor sentiment, which means that the better the national economic situation, the higher the investor sentiment; the regression coefficient of X3 is negative, indicating that the urban unemployment rate has a great impact on people's livelihoods and leads to lower investor sentiment; the regression coefficient of X4 is positive, indicating that the growth rate of import and export total value reflects the development of foreign trade economy, and the faster the growth rate, the better the economy and the higher the investor sentiment. It can be observed in the analysis process that as the control variables gradually increase, the R-squared value of the model gradually increases, indicating that the control variables can increase the explanatory power of the independent variable on the dependent variable, and are effective variables for the model.

The above analysis shows that the results of the multiple regression model are consistent with the theoretical assumptions, and the outbreak of the new coronavirus has a certain negative impact on the investor sentiment index.

### 3. Empirical Analysis

#### 3.1. Descriptive Analysis of Variables

**Table 2.** Descriptive analysis of variables

Variable name	Min.	1 <sup>st</sup> Qu.	Median	Mean	3 <sup>rd</sup> Qu.	Max.
ISI	44.47	56.57	67.11	66.27	75.37	96.73
CICSI	35.44	44.06	48.34	49.03	52.76	70.32
Monthly new confirmed cases	143	573.5	1561	12096.4	7265.8	111786
CPI	98.8	99.78	100.05	100.09	100.42	101.4
The national urban survey unemployment rate	4.9	5.175	5.4	5.439	5.7	6.2
Year-on-year growth of total import and export value	-11	1.95	10.65	12.81	23.55	67

Table 2 shows the descriptive statistical analysis results of the variables. From the above chart, it can be seen that there is a significant difference between the median and average number of newly diagnosed cases, indicating a significant increase in the trend of the number of newly diagnosed cases over time.

#### 3.2. Model Fitting

##### 3.2.1. Robustness Analysis

The robustness analysis mainly adopts the regression analysis between the investor sentiment measurement indicator Y2 (ISI comprehensive sentiment index) and the development of COVID-19 epidemic. Establish a multiple regression model for robustness as follows:

$$Y2 = \beta_0 + \beta_1 X1 + \beta_2 X2 + \beta_4 X4 + \epsilon_t \quad (2)$$

Among them: Y2 Investor Sentiment Index (ISI Comprehensive Sentiment Index),  $X_i$  ( $i=1$ ) represents epidemic related indicators, where X1 represents the number of newly confirmed cases,  $X_i$  ( $i=2,4$ ) represents control variable related indicators, where X2 represents the household consumption index, and X4 represents year-on-year growth in total import and export value.

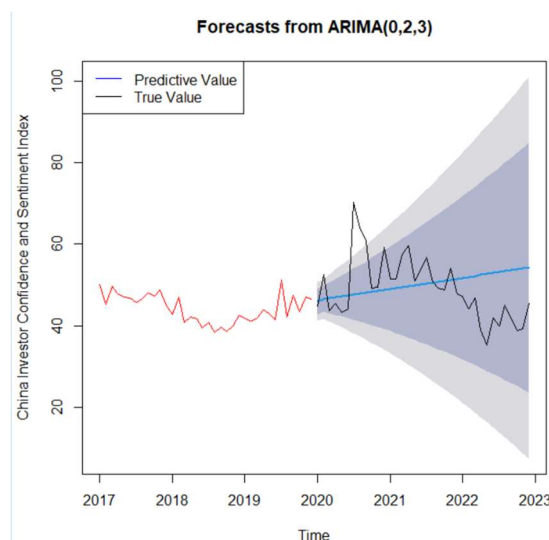
**Table 3.** Regression analysis results of Model (2)

	Estimate	Std. Error	t value	Pr (> t )
(Intercept)	4.462705	0.169602	26.313	<2e-16 ***
X1	-0.042135	0.019590	-2.151	0.0391 *
X2	0.001117	0.029664	0.038	0.9702
X4	0.003177	0.001969	1.614	0.1164

Table 3 shows the result validation of regression analysis model (2). From the model results, it can be seen that the regression coefficient between the core explanatory variable X1 (number of newly confirmed cases per month) and the dependent variable (investor sentiment index) is negative, which is significant at the 5% significance level. This indicates that the results of the regression model constructed above are not accidental factors.

**3.2.2. Comparison and Fitting of Predicted Results with Real Data**

Ye Yibiao et al. stated that comparing predicted values with actual values can be used to measure the impact of the COVID-19 outbreak [4]. In this study, a time series ARIMA model was used to predict the CICI investor sentiment index from 2020 to 2022 based on three years of data from 2017 to 2019, using a total of 36 data points, and compared with actual data to observe the impact of the COVID-19 outbreak on investor sentiment during the outbreak period. The specific modeling process is as follows: 36 monthly data points from 2017 to 2019 were used as samples, and the data was tested for stationarity. The results showed that it was not stationary, but became stationary after two differences and passed the white noise test. Based on the autocorrelation and partial autocorrelation coefficient graphs, the model order was determined, and the model parameters were selected based on these two graphs. It was found that the model had a third-order truncation of the autocorrelation coefficient and a tail of the partial autocorrelation coefficient. Based on this, an ARIMA (0,2,3) model was established. After significant testing of the model and its parameters, the model was used to predict the next three years, and the predicted values were compared with the actual values. The process of time series analysis is a complex process that requires in-depth analysis and processing of data, selection of appropriate models, and accurate comparison and interpretation of the results.



**Figure 3.** Comparison between investor sentiment prediction and actual investor sentiment

Figure 3 is a predictive graph of investor sentiment. Ye Yibiao and others indicate that the comparison between the predicted value and the actual value can be used to measure the

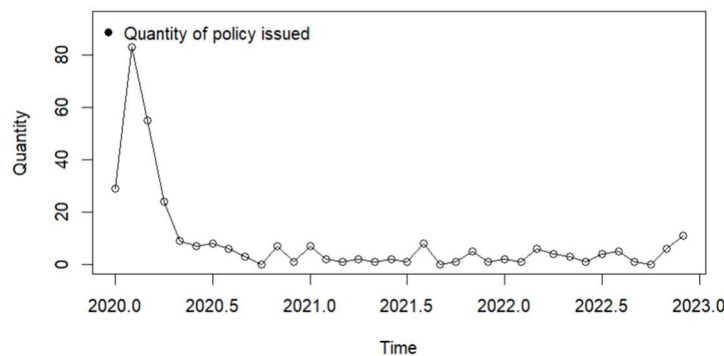
impact of the COVID-19 emergency [5]. The forecast results of the ARIMA (0, 2, 3) model, as depicted in the above figure, provide crucial insights into the trajectory of investor sentiment amidst the COVID-19 pandemic. The blue curve represents the predicted investor sentiment index for the years 2020-2022, utilizing data from 2017-2019 as the basis for the forecast. Notably, the predicted curve indicates an upward trend in investor sentiment. However, when comparing this projection to the actual values of investor sentiment from 2020-2022, a contrasting overall downward trend becomes apparent.

This discrepancy between the forecasted and actual sentiment values serves as a clear indicator of the adverse impact of the COVID-19 pandemic on investor sentiment. The divergence between the predicted and observed trends underscores the severity of the pandemic's influence on market perceptions. It not only highlights the unpredictability of such global crises but also emphasizes the necessity of robust analytical tools to comprehend and navigate through such turbulent times.

Furthermore, the alignment between the model's analytical results and the actual outcomes reinforces the reliability and accuracy of the ARIMA (0, 2, 3) model. This consistency underscores the model's ability to capture the complex dynamics of investor sentiment, particularly during extraordinary events such as the COVID-19 pandemic. The model's findings are not merely coincidental but rather a testament to the robustness of the analysis.

In essence, the ARIMA model's forecast and subsequent comparison with actual data unequivocally substantiate the adverse influence of the COVID-19 pandemic on investor sentiment. This empirical evidence serves as a critical foundation for understanding the profound impact of global crises on financial markets, emphasizing the need for adaptable and resilient investment strategies in the face of such unprecedented challenges.

### 3.3. Experimental Results and Policy Suggestions



**Figure 4.** Trends in policy release volume

Figure 4 above shows the number of policies issued by the government related to the COVID-19 epidemic during the COVID-19 epidemic (including State Council documents, State Council department documents, and State Council bulletins). The data is sourced from the official website of the State Council of the People's Republic of China. The graph provides clear evidence of a transparent and open approach adopted by the government in disseminating pandemic-related policies. Particularly in the initial stages of the outbreak, a substantial number of documents and policies were swiftly issued to address the severity of the situation. This proactive response demonstrated the government's commitment to tackling the challenges posed by the pandemic and its dedication to providing the public with timely and comprehensive information.

As the situation gradually stabilized, the government continued to exhibit flexibility and adaptability by implementing ongoing adjustments and measures to address the evolving

circumstances of the pandemic. This dynamic approach underscores the government's agility in responding to the unpredictable nature of the crisis, ensuring that policies remained aligned with the changing needs and challenges posed by the pandemic over time.

Moreover, the consistent and transparent communication of pandemic-related policies not only reflects the government's commitment to accountability and openness but also fosters public trust and confidence. By keeping the public well-informed and engaged, the government has effectively empowered individuals and organizations to make informed decisions and take appropriate actions in response to the pandemic.

Overall, the graph serves as a testament to the government's proactive and transparent approach in managing the pandemic, demonstrating its commitment to providing effective and adaptive policies that address the evolving challenges of the crisis. This approach has not only facilitated a better understanding of the government's response but has also contributed to building resilience and confidence within the community as it navigates through the complexities of the pandemic.

Based on the regression analysis, it is evident that the COVID-19 pandemic has had a negative impact on investor sentiment. Consequently, the following policy suggestions can be proposed:

(1) **Strengthen Information Disclosure and Transparency:** Government and relevant authorities should enhance the transparency of pandemic-related data and promptly release announcements and updates regarding the pandemic. This approach aims to alleviate the panic and despondency among numerous investors. Han Xiaocui emphasizes the need for further improvement in the coordination mechanisms between central and local governments, ensuring faster and transparent information dissemination [6]. Transparent and open information can assist investors in more accurately assessing the virus's impact on the entire market, reducing the risk and uncertainty in investment decisions.

(2) **Release Economic Policies Addressing the Pandemic:** The government can formulate corresponding economic policies to mitigate the negative impact of the pandemic on the economy. These policies may include providing fiscal support, tax reductions, stabilizing financial markets, and other measures. Such policies can boost investor confidence, alleviate market panic, and promote stable economic development.

(3) **Provide Investor Education and Guidance:** Government and financial regulatory authorities can enhance investor education and provide targeted guidance to help investors rationally navigate market fluctuations and risks. By raising awareness of risks and enhancing investment knowledge, the excessive influence of investor sentiment on the market can be mitigated.

(4) **Strengthen Risk Management and Supervision:** Financial institutions and regulatory authorities should bolster risk management and supervision to ensure market stability and healthy development. Strengthening supervision, regulating market order, and preventing market risks can reduce the negative impact of investor sentiment on the market.

(5) **Diversification of Investment Channels:** Investors can mitigate risks and reduce the impact of the pandemic on their investment portfolios by diversifying their investment channels, thus decreasing reliance on a single asset or market. The government and financial institutions can provide a wider range of investment products and services, encouraging investors to engage in rational asset allocation.

In conclusion, investors need to acknowledge the impact of the pandemic on the market, strengthen risk management, maintain rationality and composure, and flexibly adjust their investment portfolios to achieve better returns and asset protection. In response to the negative impact of the COVID-19 pandemic on investor sentiment, the government and relevant departments can alleviate the adverse effects on investor sentiment, promote market stability and healthy development by enhancing information disclosure, formulating economic policies, providing investor education and guidance, strengthening risk management and supervision,

and promoting investment diversification. These policy suggestions can assist investors in responding more rationally to the pandemic's impact on the market, reducing investment risks, and promoting stable economic growth.

## 4. Conclusion

The outbreak of the COVID-19 pandemic has had a profound impact on the global economy and financial markets, inevitably affecting investors as well. This article has analyzed the influence of the COVID-19 pandemic on investor sentiment, exploring its effects on investor mindset, investment decisions, and portfolios, while also proposing strategies and recommendations.

The focus of this article has been on investigating the changes in investor sentiment due to the COVID-19 pandemic. It has employed regression models and time series analysis to empirically examine the pandemic's impact on investor sentiment. By analyzing the evolving trends of the COVID-19 pandemic, the article has sought to identify the changing characteristics of investor sentiment, aiming to provide valuable experience and insights for addressing future unforeseen circumstances.

In summary, the COVID-19 pandemic has indeed impacted investors, but it has also presented opportunities for them. It is hoped that this research will inspire investors and decision-makers, helping them better understand and address the impact of the COVID-19 pandemic on investors. According to the findings, it is clear that the pandemic's influence on investor sentiment is multifaceted, and it is essential for stakeholders to consider these insights in order to navigate future challenges more effectively. By understanding the dynamics of investor sentiment during such crises, investors and decision-makers can make more informed choices, ultimately contributing to the resilience and adaptability of the financial markets in the face of unprecedented events.

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