Studies show that the outbreak of coronavirus disease 2019 (COVID-19) as a natural experiment can provide insights into the effects of investor sentiment on stock market reactions. Employing the event study methodology (ESM) and taking the date of the Wuhan lockdown as the event date, we find that average abnormal return (AAR) and cumulative abnormal return (CAR) are significantly negative, and average trading volume exceeds far more than before within two days of the outbreak. Further, we establish a difference-in-differences (DID) model to investigate the differences between Hubei and non-Hubei listed companies. The results show that for Hubei listed companies, the change of excessive trading volume (ETV) between pre-event and post-event period is significantly higher than that of non-Hubei listed companies, while there exhibits no relationship between the change of AAR and registration place. Overall, our findings provide new evidence for the interaction of local bias and investor sentiment affecting stock market reactions.

1. Introduction

The sudden outbreak of COVID-19 in Wuhan in early 2020 is a major public health event. From the first case of pneumonia of an unknown cause at the end of December 2019 to the lockdown of Wuhan on 23 January 2020, the number of people with this type of pneumonia across the country increased dramatically every day. In order to control the spread of the COVID-19, the government began to adopt stringent quarantine policies such as closing the borders, restricting air and intercity movement, closing offices, restaurants, and academic institutions [1].

Reports and news related to the COVID-19 on major Internet platforms such as Toutiao, WeChat, and Weibo have quickly risen, affecting investors’ attention and sentiment on the stock market to a certain extent. Affected by the COVID-19, the A-share market fell sharply on the first trading day after 2020 Lunar New Year. It is fair to say that the outbreak of COVID-19 created a level of anxiety and fear in Mainland China so strong and so widespread that is incomparable to any public health event the country experienced in the past 20 years. Given the extensive recent literature on the investor sentiment and stock returns, the conditions of the COVID-19 generate a unique opportunity to contribute to the literature by examining investor sentiment in extreme circumstances. The outbreak of COVID-19 in Wuhan also provides an excellent natural experiment to explore the local bias hypothesis by investigating whether Hubei listed companies have a stronger adverse effect on stock returns and trading volume than non-Hubei listed companies.

Our empirical strategy is organized as follows. First, we use the event study methodology, choose Wuhan lockdown as the event date, and then calculate the abnormal return (AR), average abnormal return (AAR), cumulative abnormal return (CAR), and excessive trading volume (ETV) within the event window to analyze the investor sentiment and stock market reactions. Second, we establish a difference-in-
differences (DID) model to investigate whether listed companies registered in Hubei Province behavior differently from non-Hubei listed companies in terms of AAR and ETV since the development of Hubei Province has been the most severely affected by the epidemic.

This study makes contributions to the literature in two aspects. In the first place, we provide evidence through a natural experiment that a large-scale emergent public health event can affect investor sentiment and hence stock returns and trading volume. In the second place, we explore the possibility of local bias on the stock market. The results show that the change of ETV before and after the event date is significantly higher than that of non-Hubei listed companies, while there exhibits no relationship between the change of AAR and registration place. It adds to the research on local bias and expands the perspective of study on the impact of COVID-19 on stock prices.

The remainder of this paper proceeds as follows. Section 2 summarizes the literature review. Section 3 describes research methods and data. Section 4 presents the empirical results and Section 5 concludes.

2. Literature Review

As our paper links to the two lines of studies in existing literature. We first review studies on investor sentiment and stock market reaction. And then we discuss the researches on financial markets and COVID-19.

2.1. Investor Sentiment and Stock Market Reaction. In the field of behavioral finance, the influence of investor sentiment on the stock market has always been the focus of scholars. There are two main methods to conduct the study.

The first one is to construct proxy variables of investor sentiment. Many scholars directly use market trading data, such as the discount of closed-end funds [2] and the trading volume on the day of IPO [3]. And principal component analysis is often used to construct a comprehensive proxy of investor sentiment by market trading data [4]. The data from questionnaire survey are also widely used, such as the consumer sentiment index proposed by the University of Michigan [5]. Recently, with the development of information technology, many scholars extract keywords from media reports and news by the Internet platform and apps to construct investor sentiment variables, such as Facebook [6], Google Trend [7], Baidu index data [8], and so on. Although these proxy variables obtained by the first three methods are essentially related to investor sentiment, there are endogenous problems because online announcements and changes in financial market variables may be the result of trading activities. In addition, the survey participation rate may be insufficient, and participants may be not motivated enough to answer the survey questions truthfully.

The second one focuses on events that cause changes in investor sentiment and affect investment decisions and investors’ trading behavior in financial market. Using the impact of major events as the basis for the construction of sentiment can well describe the change of investor sentiment after such events. As a part of the whole, the change of investor sentiment should be consistent with the change of sentiment in the social environment after the event, which has been confirmed by existing studies. For example, Edmans et al. [9] explore the impact of football match results on the stock market and find that the stock prices drop significantly after the loss of the football match. Kaplanksi and Levy [10] investigate the effect of aviation disasters and find that they cause stock market drops that are disproportionately larger than their economic effects and ascribe these to bad moods and anxiety being induced among investors. One study that examines the sentiment of stock returns in the case of extreme circumstances is Shan and Gong [11] who investigate the effect of the Wenchuan earthquake on stock returns. They find that during the 12 months following the earthquake, stock returns are significantly lower for firms near the epicentre of the earthquake and that these results cannot be explained by actual economic losses or by systematic risk.

The second method can avoid endogenous problems and provide more objective results but samples are scarce due to the low frequency [12]. However, the COVID-19 is exactly such kind of event. Therefore, we choose the outbreak of COVID-19 to conduct study, which can avoid the drawbacks of the first method and provide an excellent natural experiment to explore investor sentiment on the stock market.

2.2. Financial Markets and COVID-19. The literature on financial markets and COVID-19 is growing. Baker et al. [13] use textual analysis of news mentions and find that COVID-19 pandemic has resulted in the highest stock market volatility among all recent infectious diseases including the Spanish Flu of 1918. Using 75 countries as research samples, Erdem [14] notes that the pandemic decreases stock returns and increases volatility. Likewise, Zhang et al. [15] find that COVID-19 has led to increase in global financial market risk. But rare research analyzes investor sentiment and the impact of COVID-19 from the perspective of local bias, a financial anomaly, which can be explained by information asymmetry [16–19] or behavioral-based reasons such as familiarity or relative optimism [20–23].

Huang et al. [24] examine local bias in investor attention by analyzing messages posted by investors on China’s Internet stock message board and find that individual investors pay more attention to stocks of local companies than to those of nonlocal companies. At the beginning of the COVID-19 outbreak, Wuhan became the focus of the public, and the lockdown of Wuhan pushed the panic and anxiety of the public to the extreme. Thus, after the outbreak of COVID-19, investors may pay more attention to listed companies in Wuhan and Hubei, which may affect investors’ decisions. Therefore, we not only apply the event study methodology [25, 26] to analyze the effect of COVID-19 outbreak on the stock market of China by capturing AAR and ETV within the event window but also establish a DID model to analyze local bias in investor attention.
3. Methods and Data

3.1. Event Study Methodology (ESM). This research employs the ESM to analyze investor sentiment and stock market reactions to COVID-19. ESM is mainly used to evaluate whether the occurrence of an event or the release of information will change the decision of investors, thereby affecting the price or trading volume of stocks. Nikkinen et al. [27] study the impact of 9/11 on returns and volatility of global stock markets, finding that the terrorist attack has a short-term negative impact on stock returns, and that the attack significantly increases volatility. Chen et al. [28] explore the impact of severe acute respiratory syndrome (SARS) on the stock price movements of hotels in Taiwan, showing that the SARS outbreak adversely affects their earnings. Tee and Tessema [29] analyze stock market reactions to dividend announcements.

Therefore, we utilize the ESM to conduct our study. First, we should define the event day and determine the event window as well as estimation window.

Although there were confirmed COVID-19 cases in late December 2019, it was not until January 23, 2020, when Wuhan Epidemic Prevention and Control Headquarters released a notice to temporarily close channels leaving the city, COVID-19 came to be widely known by people in China and even around the world, resulting in serious social panic and economic instability. On February 3, 2020, the stock market opened but CSI 300 index fell down 7.88 percent, which was the biggest drop since 2015, as shown in Figure 1. Hence, following to Huang and Liu [30], we set the date of the Wuhan lockdown (January 23, 2020) as the event date \( T_0 = 0 \), on which the market reaction can better and timely reflect the unexpected shock of COVID-19 outbreak on stock market. Consistent with Zhang et al. [31], our estimation period include 100 days—from July 23, 2019 to December 17, 2019—while \((-25,60)\) is the event window.

3.2. Difference-in-Differences Model. As the COVID-19 first broke out in Wuhan, the number of confirmed cases in Wuhan, Hubei province far exceeded other provinces, and a series of lockdown measures were stricter there, which further restricted the operation and development of companies in Hubei province, especially in Wuhan. Corporate losses are greater and uncertainty is higher, leading to lower stock returns and higher volatility of listed companies. In addition, when systemic external risks come, market sentiment is complex and noise is high. According to the theory of limited attention [32], investors’ attention is scattered and limited, and they may have more pessimistic expectations for listed companies in Hubei Province, which also has a certain impact on investment decisions. Therefore, we establish the DID model based on the event study methodology to further explore whether the registered area has an impact on investors’ decision making during the epidemic.

For reliability, we take the following steps to select our sample of the test group. First, we remove all listed firms marked “ST” (special treatment) or “SST”. Second, we exclude all financial firms, all firms whose total debt is greater than their total assets, and all firms with missing data. Third, we pick out all listed firms registered in Hubei province. Our sample of the test group includes 95 firms.

Then, we match the sample of the control group as follows. First, for each stock in the test group, we find a stock from the same industry; second, the stock in the control group is as close as possible to the corresponding stock in the test group in terms of market capitalization, turnover, PE ratio, ROE, net profit per share, and net asset per share in the windows around the event. In particular, we calculate the following matching error for each stock in the test group and the control group.

\[
\text{matching error} = \frac{\text{Cap}_{\text{test}} / \text{Cap}_{\text{control}} + \text{TO}_{\text{test}} / \text{TO}_{\text{control}} + \text{PE}_{\text{test}} / \text{PE}_{\text{control}} + \text{ROE}_{\text{test}} / \text{ROE}_{\text{control}} + \text{EPS}_{\text{test}} / \text{EPS}_{\text{control}} + \text{BPS}_{\text{test}} / \text{BPS}_{\text{control}}}{6}
\]

where Cap is the market capitalization, TO is the turnover, PE is the PE ratio, ROE is the returns on equity, EPS is the net profit per share, and BPS is net asset per share. The definitions of all variables are presented in Appendix. The stock belongs to the potential list of the control group with the lowest matching error is selected as the match for stock in the test group.

Our final sample includes 95 Hubei firms and 95 non-Hubei firms. To avoid the effect of outliers of variables, we winsorize all the continuous variables at the 1st and 99th percentiles.

Table 1 reports the descriptive statistics for the test group and the control group. We can see that the control group displays the similar characteristics as the test group.

3.3. Capital Data. For each sample, we collect the following data from the China Stock Market and Accounting Research (CSMAR) database and Wind database: daily individual return rate, daily trading volume, and the corresponding daily returns of the Chinese Stock Index (CSI) 300. The series period is from July 23, 2019 to April 27, 2020. The rationale for using the CSI 300 Index return as the market return is twofold. First, the CSI 300 Index is the first equity index released by both the Shenzhen Stock Exchange (SZSE) and the Shanghai Stock Exchange (SSE) and aims to reflect the price fluctuation and performance of China stock market. Second, our sample covers the stocks in the Main Board, SME Board, and the ChiNext Board from the two stock exchanges.
4. Model Setup and Empirical Results

4.1. Cumulative Abnormal Return. To empirically investigate the market reaction to the outbreak of COVID-19, we employ the event study methodology with the market model to observe changes in stock returns. Therefore, the abnormal return for stock $i$ on date $t$, $AR_{it}$, is calculated as follows:

$$R_{it} = \alpha_i + \beta_i R_{mt} + \epsilon_{it}, \quad t = -125, \ldots, -26,$$

$$AR_{it} = R_{it} - (\alpha_i + \beta_i R_{mt}), \quad t = -25, \ldots, 60,$$

where $R_{it}$ is the return on stock $i$ for date $t$, $R_{mt}$ is the return on CSI 300 Index for date $t$, and $\alpha_i$ and $\beta_i$ are the ordinary least squares (OLS) estimates for the stock $i$'s market model parameters. $\alpha_i$ and $\beta_i$ are estimated over a period that extends from 125 trading days prior to through 26 trading days prior to the event date and $AR_{it}$ is calculated for the days $[-25, 60]$.

For the test group and the control group, the average abnormal return ($AAR_{it}$) for date $t$ and the cumulative abnormal return from date $t_1$ to date $t_2$ (CAR($t_1, t_2$)) are calculated as follows:

$$AAR_t = \frac{\sum_{t=1}^{N} AR_{it}}{N}, \quad t = -25, \ldots, 60,$$

$$\text{CAR}(t_1, t_2) = \sum_{t=t_1}^{t_2} AAR_t, \quad t_1 = 0, t_2 = 60,$$

where $N$ denotes the number of stocks in the test group and the control group.

Figure 2 depicts the average abnormal returns of the test group and the control group. Each line in the figure is the cross-sectional average value of the event. We find that on the day of the event and the second trading day after the event date, the AAR of the test group and the control group decreased significantly, deviating from 0, and the test group deviated to a greater degree. On the day $t=2$, and it is found that in the test group and the control group, the AAR is $-0.0458$ (t-value $=-8.507$) and $-0.0233$ (t-value $=-3.982$), respectively.

Figure 3 captures the CAR of the test group and the control group. We observe that the CAR drops significantly on the day of the event and the two trading days after the event day. As time goes by, the CAR slowly rises, and then slowly decreases. Basically, there is no major and continuous deviation. In addition, the CAR of the test group is generally lower than that of the control group on the day of the event and within 20 trading days after the event date, which preliminarily indicates that the outbreak of COVID-19 may have a greater impact on Hubei listed companies.
4.2. Excessive Trading Volume. In addition, we also investigate the changes of ETV after the outbreak of COVID-19 since the trading volume also reflects the decisions of investors. Following Barber and Odean [33] and Zhang et al. [31], we calculate for each stock on each trading day the ratio of the stock’s trading volume that day to its average trading volume over previous 100 trading days. Thus, the definition of the excessive trading volume is denoted as follows:

\[
ETV_{it} = \frac{V_i t}{V_{	ext{it} - 100}}
\]

where \(V_{it} \) is the average trading volume over the previous 100 trading days; \(V_i t\) is trading volume of stock \(i\) on day \(t\); and \(ETV_{it}\) is the excessive trading volume of stock \(i\) on day \(t\). If the value of ETV is bigger than 1, then it can be viewed as excessive trading volume on that day.

Figure 4 depicts the ETV of the test group and the control group. We find that on the day of the event and the subsequent 30 trading days, the ETV of the test group and the control group is much greater than 1, fluctuating around the value of 2, and then gradually decreases, fluctuating around the value of 1. And the ETV of the test group is significantly greater than that of the control group, which preliminarily shows that the outbreak of COVID-19 has a significant positive impact on ETV, especially for listed companies in Hubei province.

4.3. Difference-in-Differences Model. In this section, we establish a DID model to analyze the differences between the test group and the control group during the event. In order to avoid holiday effects and seasonal effects and ensure the reliability of sample data, we selected 25 trading days from December 18, 2019, to January 22, 2020, as the pre-event study period and 25 trading days from February 3, 2020, to March 6, 2020, as the post-event study period.

4.3.1. The Setup of DID Model. Referring to Li et al. [34], we run the difference-in-differences regression, which is as follows:

\[
AAR_{j, \text{post}} - AAR_{j, \text{pre}} = \alpha + \beta \cdot \text{CDummy}_j + \gamma \cdot \text{Control}_j + \epsilon_j,
\]

where \(AAR_{j, \text{post}}\) is the post-AAR for stock \(j\) and \(AAR_{j, \text{pre}}\) is the pre-AAR for stock \(j\). \(\text{C Dummy}_j\) takes the value of 1 if stock \(j\) is from the test group, and 0 if stock \(j\) is from the control group. \(\text{Control}_j\) represents the control variables including the firm size (defined as the natural logarithm of the market value of equity), turnover, PE, ROE, BPS, and EPS during the event period. The definitions of all variables are presented in Appendix. Particularly, we run two regression models for each of the comparison: model (1) with \(\text{C Dummy}_j\) alone; and model (2) with \(\text{C Dummy}_j\) and \(\text{Control}_j\).

4.3.2. Empirical Results. Table 2 reports the result of model (1). \(T\) represents the number of trading days before and after the event date. We consider \(T = 1, 5, 10, 15, 20, 25\) and run regression, respectively. When \(T = 25\), the coefficient of \(\text{C Dummy}_j\) is 0.0011, and it is not significant, indicating that,
there is no obvious correlation between CDummy$_j$ and the difference of AAR before and after the event date. When we change the number of trading days before and after the event date, the result is the same. Table 3 reports the result of model (2). The result is consistent with Table 2.

4.3.3. Analysis of the Result. The results show that, regardless of whether control variables are added, there is no obvious correlation between the CDummy$_j$ and the difference of AAR before and after the event date. In other words, under the nationwide impact of the COVID-19, there is no obvious regional difference in the changes of average abnormal return. The reason may be as follows: The Spring Festival holiday started from the first day after Wuhan lockdown on January 24, 2020, and it was not until February 3 that Spring Festival holiday ended and the stock could be traded again. During this long period, people’s panic and anxiety have gradually been relieved, and a series of prevention measures taken by the government have also gradually increased the confidence of the people in the victory against the COVID-19. Overall, there is no significant difference in the average abnormal return between Hubei listed companies and non-Hubei listed companies.

4.4. Further Research. In order to further analyze this topic, we change the dependent variable of the DID model from the AAR to ETV, and the control variables and CDummy$_j$ remain unchanged. The DID model is as follows:

$$\text{ETV}_{j,\text{post}} - \text{ETV}_{j,\text{pre}} = \alpha + \beta \cdot \text{CDummy}_j + \gamma \cdot \text{Control}_j + \epsilon_j$$

where ETV$_{j,\text{post}}$ is the post-ETV for stock $j$ and ETV$_{j,\text{pre}}$ is the pre-ETV for stock $j$. CDummy$_j$ takes the value of 1 if stock $j$ is from the test group, and 0 if stock $j$ is from the control group. Control$_j$ represents the control variables including the firm size (defined as the natural logarithm of the market value of equity), turnover, PE, ROE, BPS, and EPS during the events period. The definitions of all variables are presented in Appendix. Particularly, we run two regression models for each of the comparison: model (3) with CDummy$_j$ alone and model (4) with CDummy$_j$ and Control$_j$.

Table 4 reports the result of model (3). When $T = 25$, the coefficient is significant, indicating that there is an obvious correlation between CDummy$_j$ and the change of ETV before and after the event date. When we change the number of trading days before and after the event date, the result is the same. Table 5 represents the result of model (4). The result is consistent with Table 4.

Regardless of whether the control variables are considered, there is a significant positive correlation between the CDummy$_j$ and the difference of ETV before and after the event date. We think the reasons may be as follows. On the one hand, the sudden outbreak of COVID-19 has led to a sharp increase in investors’ attention to listed companies in Hubei. Investors are generally pessimistic about them because of the impact of the COVID-19 on the economy of the entire country, especially the economic development of Hubei province. Out of pessimistic expectations, investors have dumped the stocks of Hubei listed companies. Thus, for listed companies registered in Hubei, the change of ETV before and after the event date is significantly higher than that of non-Hubei listed companies.

On the other hand, it may also be that after such a long Spring Festival holiday, investors gradually restored confidence in the stock market due to the powerful measures taken by the government. In addition, when the Spring Festival ended, many people were still in a state of being unable to return to work and staying at home. To kill the time, more and more people began to pay attention to the stock market, so the stock trading volume has increased significantly. According to the Financial Associated Press on February 21, 2020, the Securities Times reported that according to Baidu index query results, since the opening of the stock market on February 3, the number of searches for “stock account opening” on Baidu surged. What is more
Table 2: Regression result of model (1): average abnormal return and registered place of listed company.

<table>
<thead>
<tr>
<th></th>
<th>$T = 1$</th>
<th>$T = 5$</th>
<th>$T = 10$</th>
<th>$T = 15$</th>
<th>$T = 20$</th>
<th>$T = 25$</th>
</tr>
</thead>
<tbody>
<tr>
<td>CDummy</td>
<td>0.0050 (0.643)</td>
<td>0.0014 (0.486)</td>
<td>0.0028 (1.588)</td>
<td>0.0011 (1.018)</td>
<td>0.0009 (0.932)</td>
<td>0.0011 (1.168)</td>
</tr>
<tr>
<td>Constant</td>
<td>$-0.03045$ ($-0.821$)</td>
<td>$-0.0023$ ($-1.133$)</td>
<td>$-0.0038^{***}$ ($-3.078$)</td>
<td>$-0.0013$ ($-1.649$)</td>
<td>$-0.0006$ ($-0.837$)</td>
<td>$0.0001$ (0.123)</td>
</tr>
<tr>
<td>N</td>
<td>190</td>
<td>190</td>
<td>190</td>
<td>190</td>
<td>190</td>
<td>190</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.0022</td>
<td>0.0013</td>
<td>0.0132</td>
<td>0.0055</td>
<td>0.0046</td>
<td>0.0072</td>
</tr>
</tbody>
</table>

Note. This table is based on the following regression: \( \text{AAR}_{j, \text{post}} - \text{AAR}_{j, \text{pre}} = \alpha + \beta \cdot \text{CDummy}_j + \gamma \cdot \text{Control}_j + \varepsilon_j \), and presents the result of the regression without control variables. $T$ is the number of trading days before and after the event date. $T$ statistics are reported in parentheses. Significance at 10%, 5%, and 1% levels is indicated by *, **, and ***, respectively.
worth mentioning was that people in Wuhan who searched for "stock account opening" ranked first in the country during the week from February 9th to February 16th. Investors said it was mainly due to their concern in COVID-19 prevention and control and the sudden increase of free time. Therefore, after the outbreak, the ETV is significantly greater than 1 for a period, and after the event date, the ETV of Hubei listed companies increased much more than that of non-Hubei listed companies.

5. Conclusions

This study investigates investor sentiment and stock market reactions to COVID-19 outbreak in Wuhan. Our research employs an ESM to calculate the AAR, CAR, and ETV of the event window and finds that the sudden outbreak of COVID-19 has a negative effect on the stock returns and a positive effect on the trading volume.

On this basis, by establishing a DID model, we further investigate whether listed companies registered in Hubei Province behave differently from non-Hubei listed companies in terms of AAR and ETV since the development of Hubei Province has been most severely affected by the epidemic. The results show that for listed companies registered in Hubei, the change of ETV before and after the event date is significantly higher than that of non-Hubei listed companies, while there exhibits no relationship between the change of AAR and registration place. There are two possible reasons. First, the impact of the COVID-19 is nationwide, and during the Spring
Festival holiday, with the implementation of prevention and control measures, investor sentiment gradually changed from pessimism to optimism. Therefore, there is no obvious regional differences in AAR. Second, due to the long holiday after the event day and the fact that people cannot return to work in the short time, more people especially Hubei investors have turned their attention to the stock market and the number of stock account openings has increased, leading to a more significant increase in the ETV of Hubei listed companies.

Our study provides new insights into the impact of a large-scale emergent public health event on investor sentiment and stock market reactions. Moreover, it complements the works studying on local bias and expands the perspective of study on the impact of COVID-19 on stock prices. Our findings can enable policymakers to evaluate and implement effective policies to stabilize the stock markets and help investors to make appropriate investment strategies.

The limitation of this paper is as it is difficult to match the sample using all the stock trading data, we select the stock with the lowest matching error calculated from the six market trading data as the match for stock in the test group, which may have deviations in reflecting the entire sample in the market (Table 6).

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**Appendix**

**Table 6: Variables.**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAR</td>
<td>Cumulative average return, which is measured by model (3).</td>
</tr>
<tr>
<td>ETV</td>
<td>Excessive trading volume, which is measured by model (4).</td>
</tr>
<tr>
<td>CDummy</td>
<td>Takes the value of 1 if stock is from the test group, and 0 if stock is from the control group.</td>
</tr>
<tr>
<td>Cap</td>
<td>Market capitalization, the sum of the market value of tradable shares.</td>
</tr>
<tr>
<td>TO</td>
<td>Turnover, the trading volume scaled by the total number of shares outstanding.</td>
</tr>
<tr>
<td>PE</td>
<td>PE ratio, the ratio of market value per share to earnings per share, which is divided by 10.</td>
</tr>
<tr>
<td>ROE</td>
<td>Return on equity, net profits divided by the net assets.</td>
</tr>
<tr>
<td>EPS</td>
<td>Net profit per share, the ratio of net profit to general capital.</td>
</tr>
<tr>
<td>BPS</td>
<td>Net asset per share, the ratio of net asset to general capital.</td>
</tr>
<tr>
<td>Firm size</td>
<td>The natural logarithm of the market value of equity.</td>
</tr>
</tbody>
</table>

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**Data Availability**

The data used to support the findings of this study are available from the corresponding author upon request.

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**Conflicts of Interest**

The authors declare that there are no conflicts of interest regarding the publication of this paper.

**Authors’ Contributions**

Lin Sun and Wei Shi are co-first authors of this work and have equal contribution to this paper.

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