

## *Retraction*

# **Retracted: Minimum Shareholding Proportion of Equity Funds and Stock Volatility Evidence from a Quasi-Natural Experiment**

## **Security and Communication Networks**

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This article has been retracted by Hindawi, as publisher, following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of systematic manipulation of the publication and peer-review process. We cannot, therefore, vouch for the reliability or integrity of this article.

Please note that this notice is intended solely to alert readers that the peer-review process of this article has been compromised.

Wiley and Hindawi regret that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

## **References**

- [1] T. Wang and X. Zhu, “Minimum Shareholding Proportion of Equity Funds and Stock Volatility Evidence from a Quasi-Natural Experiment,” *Security and Communication Networks*, vol. 2022, Article ID 1580589, 8 pages, 2022.

## Research Article

# Minimum Shareholding Proportion of Equity Funds and Stock Volatility Evidence from a Quasi-Natural Experiment

Tian Wang and Xintong Zhu 

*School of Applied Economics, Renmin University of China, Beijing 100872, China*

Correspondence should be addressed to Xintong Zhu; 2020000938@ruc.edu.cn

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China's fund market is getting bigger and bigger. By September 2021, the number of funds in the market had exceeded 8000, with a net value of nearly 24 trillion yuan. Among them, the number of equity funds has doubled compared with 2015, and the net value has increased four times compared with 2015, and it still maintains a rapid growth momentum. Do mutual funds play a role in market stabilization? To demonstrate this issue, we combined the passive trading technique with the positive and negative feedback trading strategies and explained how the minimum position ratio of equity funds affects stock price volatility. Then, using empirical data, we apply the difference-in-differences model to analyze how shifting proportions of the equity funds' lowest shareholding affects stock volatility. The result shows that the volatility of high-institutional stocks was significantly reduced in comparison with other stocks after 2014. This result is further confirmed in the stocks held by large-scale funds. We used PSM-DID to solve potential endogenous problems and found that the results still support the hypothesis. This evidence supports the point of statement that the equity funds in the Chinese capital market can stabilize the market especially after 2014.

## 1. Introduction

China's securities market started in the 1990s. Compared with the European and the American securities markets, it started late and the system design is not perfect. With the rapid development of the stock market, serious speculation has appeared, causing huge fluctuations in the stock market. On the other hand, it also hinders the benign development of the country's financial system. Securities investment fund, social security fund, pension fund, and private equity fund are the most common institutional investors in China, with securities investment fund being the most representative. Since the proposal of "super-normal development of institutional investors" in 2001, China's securities investment fund market has developed rapidly. As of September 2021, the number of funds in the market has reached 8,866, with a net value of nearly 24 trillion yuan. Among them, the number of equity funds has doubled, and the net value has increased by four times compared with 2015. And still a rapid growth momentum is maintained.

In terms of policy considerations, securities investment funds, especially equity funds, play the role of "market stabilizer," but from the actual and existing research, whether this stabilizer effect is worthy of the name is not clear yet. Since equity funds investors prefer companies with stable operation, excellent performance, and strong anti-risk ability in stock selection, it is inevitable that the stocks held by funds have low volatility, which does not mean that the development of fund market can reduce market volatility. Although some studies have found that there is a significant negative correlation between the shareholding ratio of institutional investors and the stock volatility after dealing with endogeneity, conclusions are inconsistent in different market prices and time intervals. Due to the small scale of funds in the early stage, it is likely that funds have not played a sufficient role in stabilizing the market. Furthermore, when dealing with the endogeneity difficulties, they are prone to be confined by model design. Simple OLS regression ignores endogeneity issues caused by fund stock selection preference, which makes previous studies less convincing.

It is worth noting that in August 2014, the CSRC promulgated and implemented the Operation Management Measures for Public Offering Securities Investment Funds (hereinafter referred to as the MEASURES), which raised the minimum stock holding ratio of public offering funds from 60% to 80%. This policy provides an excellent quasi-natural experiment opportunity to study equity fund holdings and stock price volatility. With the help of this policy, we can answer the question whether equity funds can help reduce stock price volatility by explaining the volatility changes of equity funds held before and after the implementation of the policy. Two problems need to be considered before designing quasi-natural experiments. First, individuals in the treatment group and the control group do not change, because, even if the minimum holding proportion of the fund stocks increases, the consistency of the fund style makes the heavy holding stocks in the fund pool not to change greatly. Second, there is comparability between the treatment group and the control group. There is no significant difference between the performance of the indexes of the non-equity fund's heavy-position stocks and the heavy-position stocks; in other words, these stocks are also suitable for entering the list of the fund's heavy-position stocks, thus providing a suitable control sample for the design of the difference-in-differences model.

In the past, there was a lack of explanation on the mechanism of institutional investors' influence on market volatility. From the perspective of equity funds trading, this paper proposes the influence mechanism of passive trading behavior based on the minimum position limit of fund, so as to explain the influence of position proportion adjustment on stock price volatility. The conclusion is still valid, validating the validity of this paper's result while also demonstrating that the CSRC's MEASURES do play a function as a market stabilizer to some level.

The main contribution of this article is reflected in the following: firstly, this paper presents the influence mechanism of stock price volatility reduction under the limit of minimum stock holding ratio, which differs from traditional positive and negative feedback trading mechanisms, herd effect, and other active trading perspectives and from the perspective of passive fund trading under policy constraints, this paper explains that the adjustment of position ratio can reduce the volatility of stock prices; secondly, this paper designs a difference-in-differences model with the help of government policies, which is helpful to alleviate the endogeneity problem that is difficult to solve in previous studies and improve the credibility of the conclusion. Finally, the findings of this study give empirical support for the policy, demonstrating that the fund may act as a market stabilizer and providing guidance to relevant departments on how to continue to foster the fund industry's development and strengthen its management.

The remaining parts are arranged as follows: Section 2 introduces the institutional background and relevant literature review, Section 3 puts forward the research hypothesis based on the influence mechanism, Section 4 is the setting of variables and models, Section 5 is the empirical results and

analysis, Section 6 is the endogeneity and robustness test, and Section 7 is the conclusion and policy suggestions.

## 2. Institutional Background and Literature Review

In this section, we define the institutional background and literature review in detail.

*2.1. Institutional Background.* Before 2014, the mainland market equity funds held the stock's lowest positions of 60%, on August 8, 2014, the China Securities Regulatory Commission revised the "public securities investment fund operation management method" regulation equity funds' lowest positions from the original 60% to 80% and the methods for equity funds' 1 year of adjustment, that is, since August 8, 2015, equity funds holding positions in the proportion of stocks must be more than 80%. The proportion of equity funds at this time is the lowest position, which means that the fund manager will be more cautious in stock selection. On the other hand, equity fund operation space is limited, especially in a downtrend, as the stock holdings ratio falls as the share prices fall, and the proportion of equity funds at this time is the lowest position. From this perspective, the significance of the minimum holding ratio to stabilize the market is mainly reflected in the fall of the stock price. Since equity funds cannot be shortened, they will reduce their holdings of stocks to avoid risks when the stock price falls, which may accelerate the fall of the stock price.

For equity funds that existed before 2014 and after 2014, in the MEASURES before and after the implementation, its heavy stock position basically does not change, in accordance with the provisions of the "Securities Investment Fund Law" article 52, the fund contract of public fund-raising fund should include the investment direction of the fund property and investment restrictions, that is, the industry often said "fund style," which in the beginning of the fund will be explained, under normal circumstances, the fund style cannot change without authorization, otherwise it will be put to the attention of the regulatory department. Therefore, we can believe that the stocks held by the fund will maintain good consistency in a certain time range, and the comparison of the intermediate report disclosed by the fund in the selected time range also verifies this setting, which means that the samples of the treatment group and the control group in the following paper are comparable in time series.

In addition, in the fund holdings of stocks, there is no big difference between the heavy warehouse stock and other stocks, according to the style of the set, select the relevant shares into the open list, this is already a sign that fund managers are bullish on such stocks. As a result of the large amount of capital, the fund will often put the stock as a heavy warehouse to hold in the long term. Compared with non-heavy positions, there is no big difference. The descriptive test in the following paper also shows that the two companies have similar characteristics except for significant differences in earnings per share, which means that the treatment group and control group in the following paper are comparable.

*2.2. Literature Review.* Previous literature on whether institutional investors can reduce stock price volatility are not consistent with their conclusions. In terms of stock selection preference, it is generally believed that institutional investors prefer companies with low volatility due to the “prudence principle” [1, 2]. That means institutional investors own stocks that have naturally “low volatility”. This raises technical questions about whether institutional investors account for low volatility in the share prices.

Foreign scholars are divided into two schools based on this issue. Those who believe that institutional investors aggravate market volatility advocate positive feedback trading strategies, Delong [3] believes that positive feedback trading not only causes stock price fluctuations, but also can be passed on to different institutional investors to lead to more severe fluctuations. Similar studies include Sias [1]; Campbell et al. [4]; Dennis and Strickland [5]; and Lakonishok et al. [6] The herd effect among the institutional investors may lead to more violent price fluctuations; Brown and Brook [7] believe that institutions will also engage in noise trading, which pushes stock prices away from the value itself, resulting in greater volatility.

Some argue that institutional investors can alleviate market fluctuations, Hirshleifer [8] points out that institutional investors mostly adopt negative feedback trading strategy, buying when the stock price falls abnormally and selling when the stock price booms excessively, so as to ease the market volatility, and institutional investors can better maintain a consistent investment strategy and portfolio. It should be Lipson and Puckett [9] have done similar research. [9].

Chinese scholars also disagree on whether institutional investors in China can stabilize the stock market volatility, Hu Dachun and Jin [10], using the dynamic panel model of A-shares from 1999 to 2004, found that the increase of fund shareholding reduced the volatility of the stock market. Gao et al. [11], using the position data of institutional investors from 2006 to 2015, found that the institutional investors significantly reduced the occurrence of stock price boom and slump, and the inhibition effect is more significant for the slump phenomenon. On the contrary, Chen [12], using institutional daily position data from 2007 to 2008, found that institutions used noise trading to drive stock market movements, similarly, Cai and Song [13] believe that the securities investment funds will also increase stock price volatility. Hu and Song [14] point out that institutional investors or securities funds have no significant influence on stock price fluctuation.

The endogenous problem created by institutional investors’ shareholding preference cannot be solved by the Chinese and foreign research on regression of institutional investors’ holdings and stock price volatility using the OLS model. Qi et al. [15] controlling the company size to overcome selectivity bias, found a significant negative correlation between the Chinese institutional investor ownership and the stock volatility. Shi and Wang [16] used propensity score matching method to screen out stocks “similar” to the institutions’ heavy positions for volatility comparison, which further overcomes the problem of

selectivity bias and found that institutional investors reduce the volatility of stocks in the stage of market decline. Using the difference-in-differences model based on quasi-natural experiments can alleviate the endogeneity problem. Ye et al. [17] used China’s alternative stock system as a quasi-natural experiment to analyze the risk of stock index component stock adjustment and stock price crash. Gu and Zhou [18] used quasi-natural experiment based on margin and short selling system to analyze the relationship between short selling and corporate financing. However, due to the impact of the policy launch time, there is a lack of researches on the use of quasi-natural experiment to analyze institutional investment and stock price volatility.

Based on the existing research results, the following three problems can be summarized. First, the academic circle fails to reach a consensus on the role of stock price stability of institutional investors because there are differences in the selected time interval, holding frequency, market prices, and model treatment. The shorter the time interval and the earlier the research, the easier it is to draw the conclusion that institutional investors are not conducive to stock price stability, which is also affected by the size of institutional investors, small size is likely to have no significant effect on market stability. Second, previous studies emphasize the positive and negative feedback trading strategies or the herd effect of institutional investors, which belong to active trading behavior, and rarely explain the stabilizing effect of institutional investors from the perspective of passive trading strategies. Third, it is difficult to avoid the endogenous problem caused by sample selection bias, and the only good treatment is the study of Shi and Wang [16], which uses the propensity score matching method to compare the net value of fluctuations of the institutional stocks and the common stocks. Based on the references to the existing research, this paper makes use of the introduction of MEASURES in 2014. The difference-in-differences model was used to further overcome the endogeneity problem caused by the selection bias, and the data of longer time dimension from 2007 to 2019 were selected to obtain more reliable results.

### 3. Influence Mechanism and Research Hypothesis

Traditional research with the analysis of the positive and negative feedback trading strategy, institutional investors influence on stock price volatility, the starting point of this analysis is that the institutions can adjust portfolio, this adjustment behavior brings market stability or boost, and this article joins the passive trading strategies on the basis of the positive and negative feedback trading strategy. This paper gives an explanation of the influence of stock price volatility under the restriction of minimum holding ratio of equity funds. Following the introduction of the MEASURES, alleged passive trade refers to equity funds maintaining an 80 percent stock holdings proportion in their portfolio. During the stock price growth phase, equity fund holdings rise, and the market experiences positive and negative feedback, on the one hand, under the positive feedback strategy of buying

stocks, and on the other hand, under the negative feedback strategy of selling shares, but in the lowest equity funds holdings ratio under the constraints of the original space of the positive feedback trading is compressed, when 60% of the lowest position limits, the fund has 40% room to buy stocks, compared to 20% under the 80 percent minimum position limit, the fund will passively reduce its stock purchases, putting downward pressure on share prices and lowering the volatility.

This behavior is transmitted in all equity funds, bringing a stabilizing rebound signal to stock prices, thus reducing the volatility of stock prices. Therefore, Hypothesis 1 is given in this paper.

*Hypothesis 1.* After the implementation of the MEASURES, the volatility of stocks in heavy positions of equity funds has a gentler trend than that of stocks in non-heavy positions.

At the same time, the size of different equity funds has different effects on the stability of stock price volatility. Stocks held by large-scale funds are easier to get rid of the idiosyncratic volatility caused by the retail investment from the standpoint of the offset degree of individual and institutional investors. For example, Qi et al. [15] compared the effectiveness of funds of different sizes in suppressing volatility and found that the volatility of stocks led by funds of larger sizes declined more. Similarly, in our research, this paper believes that stocks held by large-scale equity funds will show a greater decline in volatility after the implementation of the MEASURES. Based on this, Hypothesis 2 is proposed.

*Hypothesis 2.* After the implementation of the MEASURES, the volatility of stocks which are held by large-size funds is gentler than that are held by small-size funds.

Next, this paper verifies the above two hypotheses by designing a difference-in-differences model.

## 4. Data, Variables, and Model Setting

In this part, we describe the data source and sample selection and variable setting and model design in depth.

*4.1. Data Source and Sample Selection.* In order to better investigate the effect of raising the minimum stock holding ratio of equity funds on stock price volatility, this paper adopts the annual data of A-share listed companies in Shanghai and Shenzhen. In view of the fact that our country, in 2006, has carried out the reformation of the accounting system, and in 2020, limit ChiNext stocks went up and dropped with stop adjustment 20%, and considering the two recent bear market, so in order to be able to keep the consistency of financial data and in order to be able to make a reasonable comparison test of stock volatility before and after the implementation of the MEASURES, the period from 2007 to 2019 is selected as the sample period of the study.

On this basis, this paper also processes some samples or observed values based on the following principles:

- (1) Delete the companies in the financial industry

- (2) Delete the samples listed after 2010
- (3) Delete the ST samples
- (4) Delete the missing values

After processing, 22,905 company annual observations are finally obtained. In addition, in order to avoid the interference of outliers on the results, all continuous variables were winsorised at 1% at each extreme to mitigate the effect of outliers. All data in this paper are from the Wind database.

### 4.2. Variable Setting and Model Design

*4.2.1. Variable Setting.* Idiosyncratic volatility, that is, volatility of individual stocks that cannot be explained by market returns, refer Chen Xinchun et al. [19], is represented by the standard deviation of the excess return rate after factor adjustment, meanwhile, the practice of Brown and Kapadia [20] can be used as reference. In this paper, the single-factor idiosyncratic risk is calculated, and the specific formula is as follows:

$$R_{it} = \alpha_i + \beta_i(R_{m,t} - R_{f,t}) + \varepsilon_{i,t}, \quad (1)$$

where  $R_{it}$ ,  $R_{m,t}$ ,  $R_{f,t}$ , respectively, represent the rate of return of stock  $i$  in month  $t$ , the market rate of return in month  $t$ , and the risk-free rate of return.  $\varepsilon_{i,t}$  is the residual term, that is, the part that cannot be explained by the market returns. In this paper, the standard deviation of the residual term is represented as the single-factor characteristic risk of a stock  $Vol_{it}$ . As the MEASURES came into effect on August 8, 2014, 2014 was divided into two observation values before August 8, 2014, and from August 8, 2014, to January 1, 2015.

In order to observe the changes of stock volatility before and after the implementation of the MEASURES, this paper built a difference-in-differences model (DID) and defined the dummy variables  $Treat_t$  and  $After_t$  as follows: if the company appears in the top ten heavy positions reported in equity funds in 2014 (the fund has not been converted to hybrid funds so far),  $Treat_t$  is equal to 1, otherwise, it is 0. If the observed year is the year after the implementation of the MEASURES,  $After_t$  is equal to 1; otherwise, it is 0.

*4.2.2. Model Setting.* In this paper, an empirical test is made on the minimum stock holding ratio and stock volatility of equity funds. Based on the quasi-natural experimental research opportunity brought by the implementation of The Operation and Management Measures for Publicly Offered Securities Investment Funds in China in 2014, difference-in-differences method (DID) is adopted as the basic statistical method. The core of this statistical method is to treat policy implementation as a quasi-natural experiment, divide all samples into two subsamples, the treatment group and the control group, according to whether they are affected by policy or not, and evaluate the net effect brought by policy through inter-group comparison and comparison before and after policy implementation.

For testing the Hypothesis 1, the empirical model constructed in this paper is as follows:

$$\text{Vol}_{it} = \alpha + \gamma \text{Treat}_i * \text{After}_t + \beta X_{i(t-1)} + \mu_i + \mu_t + \varepsilon_{it\#}. \quad (2)$$

For testing the Hypothesis 2, the empirical model constructed in this paper is as follows:

$$\begin{aligned} \text{Vol}_{it} = & \alpha + \gamma \text{Treat}_i * \text{After}_t + \delta \text{Treat}_i * \text{After}_t \\ & * \text{Fund}_{it} + \beta X_{i(t-1)} + \mu_i + \mu_t + \varepsilon_{it\#}, \end{aligned} \quad (3)$$

where the dummy variable  $\text{Fund}_{it}$  represents whether the company is held by the top 20% equity funds in the 2014 interim report. If the 2014 interim report shows that the company is held by the top 20% equity funds, it equals 1; otherwise, it equals 0. From Xin et al. [21], Xiong et al. [22] the control variables  $X_{i(t-1)}$  include: return on net assets (ROA), price-to-book ratio (PB), natural logarithm of market value (LMV), earnings per share (EPS), annual average turnover rate (Qturn), and other variables. In addition, we also had control for individual and temporal fixed effects in regression.

## 5. Empirical Results and Analysis

In this section, we define the descriptive statistical results and analysis and regression statistical results and analysis in depth.

*5.1. Descriptive Statistical Results and Analysis.* One of the assumptions of the difference-in-differences method is that the treatment group and the control group have relatively similar company characteristics before the implementation of the MEASURES. Therefore, this paper tests whether the characteristic fluctuations and company characteristics of the two groups are similar. Table 1 is the statistical test of the differences, and the results show that before the implementation of the MEASURES, there is no significant difference in the characteristics of the two groups except the company's earnings per share (EPS). This shows that, in general, there is a good control group. In order to exclude the difference in earnings per share between the two groups, this paper controls earnings per share in the regression model and uses the individual fixed effects model to control the endogenous problems caused by the differences in the characteristics of the company.

### 5.2. Regression Statistical Results and Analysis

*5.2.1. Minimum Stock Holding Ratio and Stock Price Volatility of Equity Funds.* Table 2 reports the regression results of the impact of the change in the minimum stock holding ratio of equity funds on the volatility of stock prices. The first one is the basic regression results without adding any control variables. In order to eliminate the influence of heteroscedasticity and other factors, this paper uses robust standard error and outputs the value of robust standard error in parentheses.

The estimation results in column (1) show that the coefficient of  $\text{Treat} * \text{After}$  is significantly negative at the 1% level, which indicates that the increase of the minimum stock holding ratio from 60% to 80% can significantly reduce the trait volatility compared to the heavy stocks of non-equity funds. On the basis of column (1), column (2) further adds other factors affecting the volatility of stock price. The coefficient of  $\text{Treat} * \text{After}$  is still significant at 1% level. In other words, after the implementation of the MEASURES, compared to the control group, the annual monthly characteristic volatility of the fund heavy holdings in the treatment group decreased by 1.480% on an average, and the main conclusion of this paper remains unchanged. In addition, the coefficients of control variables are consistent with the existing studies.

*5.2.2. Analyzing Whether It Is Affected by Large-Scale Fund Holdings.* In order to continue to explore the impact of large-scale funds on stock price volatility, this paper uses model (2) to verify Hypothesis 2. For Hypothesis 2, this paper introduces  $\text{Treat} * \text{After} * \text{Fund}$ , and the regression results are shown in Table 3.

The estimation results in column (1) show that the coefficient of  $\text{Treat} * \text{After}$  is  $-1.065$  and is significant at 1% level, and the coefficient of  $\text{Treat} * \text{After} * \text{Fund}$  is  $-0.739$  and is significant at 10% level, which indicates that after the implementation of the MEASURES, stocks that are heavily held by the top 20% equity funds have less idiosyncratic volatility. On the basis of column (1), other factors affecting stock price volatility are further added in column (2). The coefficient of  $\text{Treat} * \text{After}$  and the coefficient of  $\text{Treat} * \text{After} * \text{Fund}$  are both significant at 1% level. In other words, the monthly idiosyncratic volatility of the large fund heavy positions in the treatment group decreased by 1.386% on an average.

## 6. Endogeneity Analysis and Robustness Test

*6.1. Difference-in-Differences Estimation Based on Propensity Score Matching (PSM-DID).* Referring Xu et al. [23–25], this paper uses propensity score matching method and difference-in-differences method to solve the possible endogeneity problem. The specific steps are as follows: the first step is to construct matching samples. In this paper, the samples are divided into two groups. The first group is the top ten holding companies of all-market equity funds in 2014, and the second group is other companies. In the second step, the logit model is used to calculate the probability of the company becoming a heavy stock of the equity funds, in which, the explained variable  $\text{Treat}_i$  is whether the company appears in the equity funds in 2014 mid report top ten heavy stock, a heavy stock's  $\text{Treat}$  value is 1, non-heavy stock's  $\text{Treat}$  value is 0; explanatory variables are return on net assets (ROA), price-to-book ratio (PB), natural logarithm of market value (LMV), earnings per share (EPS), annual average turnover rate (Qturn), and dummy variables of individual and year. In the third step, the kernel density method is used for

TABLE 1: Analysis of characteristics differences between equity fund holding companies and other companies before the implementation of the MEASURES.

Variables	Control group		Treatment group		
	Observers	Mean	Observers	Mean	Diff
VOL	13554	11.06	1886	10.92	0.136
LMV	13554	22.08	1886	23.09	-1.011
PB	13554	3.741	1886	4.402	0.661
LEV	13554	60.22	1886	45.64	14.58
EPS	13554	0.324	1886	0.646	0.322 ***

Note. The symbols \*, \*\*, and \*\*\* mean significant at the level of 10%, 5%, and 1%, respectively.

TABLE 2: Regression statistical results of minimum stock holding ratio and stock price volatility of equity funds.

Variables	(1)	(2)
Treat* After	-1.279*** (0.266)	-1.480*** (0.275)
LMV		1.595*** (0.215)
PB		-0.000*** (0.000)
ROA		-0.000 (0.001)
EPS		0.283 (0.181)
Qturn		1.508*** (0.129)
Cons	19.385*** (0.702)	23.115*** (5.347)
Individual	Yes	Yes
Year	Yes	Yes
Observers	22905	22905
Adj. R <sup>2</sup>	0.0755	0.1047

Note. Standard error values are shown in brackets; the symbols \*, \*\*, and \*\*\* represent significant at the level of 10%, 5%, and 1%, respectively.

matching. The multi-variable *t*-test results of the grouped samples show that there is no significant difference between the two groups of company characteristics, which satisfies the parallelism hypothesis of the difference-in-differences estimation. Due to space limitations, there is no presentation here.

Columns (1) and (2) of Table 4 report the estimation results of difference-in-differences based on propensity score matching. The results show that the coefficients of Treat \* After and Treat \* After \* Fund are both significantly negative at the level of 1%, which indicates that, compared to the companies that are not heavily held by the equity funds, the volatility of the stock price of the companies that are heavily held by funds has significantly decreased after the implementation of the MEASURES. It further proves the causal relationship between the minimum stock holding ratio of equity funds and the volatility of stock prices.

**6.2. Changing the Definition of Whether It Is Owned by a Large Fund.** In this paper, the robustness of Hypothesis 2 is tested by changing the assignment standard of dummy variable

TABLE 3: Analyzing whether it is affected by large-scale fund holdings.

	(1)	(2)
Treat* After	-1.065*** (0.315)	-1.080*** (0.323)
Treat* After* Fund	-0.739* (0.439)	-1.386*** (0.444)
LMV		1.596*** (0.214)
PB		-0.000** (0.000)
ROA		0.000 (0.001)
EPS		0.286 (0.181)
Qturn		1.508*** (0.129)
Cons	19.384*** (0.702)	23.129*** (5.346)
Individual	Yes	Yes
Year	Yes	Yes
Observers	22905	22905
Adj. R <sup>2</sup>	0.0755	0.1047

Note. Standard error values are shown in brackets; the symbols \*, \*\*, and \*\*\* represent significant at the level of 10%, 5%, and 1%, respectively; individual indicates the individual effect, and year indicates the time effect.

Fund, which measures whether the company is owned by large-scale equity funds. In the previous study, the dummy variable Fund in this paper was processed according to the rank of 20% of equity funds size. Here, we relaxed the standard and reassigned the dummy variable Fund according to the rank of 40%. The robustness test found that after loosening the standard, the inspection result is consistent with the results obtained from the above, after the enforcement of “MEASURES”, the stock volatility of companies owned by large-scale equity funds is lower, which means that the results of stock price volatility of companies heavily owned by equity funds are more stable. See Table 5 for the specific results.

### 6.3. Changing Explanatory Variables and Rescreen Samples.

In order to verify the reliability of the previous conclusions, the following robustness tests are also carried out in this paper: (1) Replace the observation window. Companies listed after 2012 were deleted, and 2007–2017 was selected to conduct regression again, and the results were consistent with the benchmark regression mentioned above. (2) Replace explanatory variables. Replace ROA with ROE, PB with PE ratio, etc. The above test results all support the conclusion of this paper and will not be displayed due to space limitation.

## 7. Conclusion

This study empirically explores the impact of minimum holding ratio of equity funds on stock price volatility using public data from Chinese A-share listed businesses from 2007 to 2019. From the angle of view of the fund trader, the

TABLE 4: Estimation results of PSM-DID.

	(1)	(2)
Treat* After	-1.639*** (0.290)	-1.270*** (0.346)
Treat* After* Fund		-1.278*** (0.487)
Individual	Yes	Yes
Year	Yes	Yes
Observers	22641	22641
Adj. $R^2$	0.0778	0.0779

Note. Standard error values are shown in brackets; the symbols \*, \*\*, and \*\*\* represent significant at the level of 10%, 5%, and 1%, respectively.

TABLE 5: Estimation results of PSM-DID.

	(1)	(2)
Treat* After	0.945*** (0.308)	0.897*** (0.320)
Treat* After* Fund	0.730* (0.405)	1.419*** (0.456)
ROA		0.024 (0.026)
LMV		1.630*** (0.226)
PB		0.000 (0.001)
EPS		0.333*** (0.106)
Qturn		1.509*** (0.130)
Cons	19.185*** (0.713)	24.199*** (5.635)
Individual	Control	Control
Year	Control	Control
Observers	22905	22905
Adj. $R^2$	0.0743	0.1042

Note. Standard error values are shown in brackets; the symbols \*, \*\*, and \*\*\* represent significant at the level of 10%, 5%, and 1%, respectively; individual indicates the individual effect, and year indicates the time effect.

introduction of positive and negative feedback trading strategies and passive trading strategies, this paper expounds the rising and falling, under two kinds of market equity funds holdings ratio limit impact on stock price volatility mechanism, on this basis. The use of China's "Public Securities Investment Fund Operation Management Method" as an exogenous shock began in 2014. It has been discovered that increasing the minimum stock holding proportion of equity funds from 60% to 80% reduces the volatility of the heavy stock of the equity funds significantly. Then, this paper classifies the stocks that will be heavily held by funds according to whether they are held by the top 20% of the market size equity funds, which further proves that the stocks held by large-scale funds have lower volatility.

This study has important theoretical and practical significance. Theoretically, it is the first time to examine the impact of equity funds position adjustment on stock price volatility, which enriches the research of institutional investors on market volatility and provides evidence for a long-time window. In terms of research methodologies, this

work uses quasi-natural experiments to create a difference-in-differences model, which alleviates the endogeneity problem of prior studies and provides high reliability for the research conclusions.

The research in this paper supports the MEASURES to minimize market volatility at the policy level, suggesting that their adoption can help reduce the phenomena of China's A-share market's boom and crash. At the same time, it also provides evidence for the role of equity funds as market stabilizer to improve the efficiency of the secondary market and improve the quality of the market.

## Data Availability

The datasets used during the current study are available from the corresponding author on reasonable request.

## Conflicts of Interest

The authors declare no conflicts of interest.

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