

**RESEARCH ON THE SPILLOVER EFFECT OF SHAREHOLDING
CHANGES OF INSURANCE COMPANIES ON VOLATILITY OF STOCK
PRICES: A CASE STUDY OF CHINA**

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ABSTRACT

Financial supervision department has loosened restrictions on insurance company's holdings on capital market, aiming to give full play to the insurance funds which typically have the strengths of large scale, long investment horizon and stable supply. Nevertheless, some insurance companies carry out unfriendly behaviors through capital superiority, which may cause volatility of stock prices. Based on this, the paper mainly studies the insurance funds and volatility spillover of individual stocks as well as the entire capital market. This paper uses a framework of econometric methods based on vector autoregressive mode, and selects the 2016—2020 quarterly data from the SSE A-share disclosure. The results reveal that on one hand, price fluctuation has a unidirectional spillover effect on insurance companies' changes in ownership. On the other hand, insurance companies' changes in ownership also have a unidirectional spillover effect on volatility of the SSE index.

Key words: Insurance Company, shareholding changes, Volatility of Stock Prices

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CHAPTER 1. INTRODUCTION

Before 2005, insurance companies were not eligible to enter the stock market, and this situation was changed until the CIRC issued "Notice on Issues Related to the Use of Insurance Funds for Stock Investments" in that year. Due to the downward trend in underwriting profits in the process of competing for insurance market share in recent years, the growth rate of original insurance premium income has decreased significantly, as shown in the Figure 1. As a result, insurance companies have to use insurance funds as their main source of income. According to the "2020 Insurance Industry Operation Statistics" of CIRC, as of December 31, 2020, the total assets of China's insurance industry reached 23.3 trillion yuan, an increase of 14.84% over the beginning of the year. It can be seen that the amount of insurance funds is huge and plays a vital role in the normal operation of insurance companies.

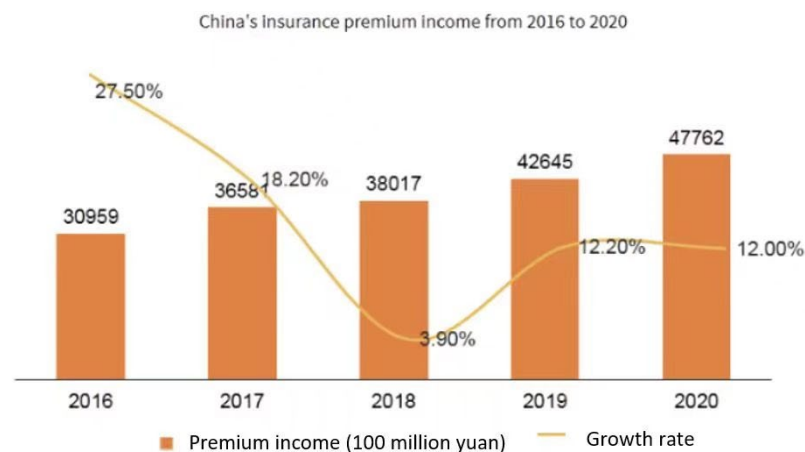


Figure 1 Growth rate of original insurance premium income from 2016 to 2020

By the end of 2020, balance of funds utilized by insurance companies was 21.7 trillion yuan, an increase of 17% over the beginning of the year, of which stock investment accounts for 11.71%. The total scale of balance of funds utilized by

insurance companies is stable, and the proportion of equity allocation has gradually rebounded. Since February 2021, the total scale of balance of funds utilized by insurance companies has remained at about 22 trillion yuan, and the proportion of stock and fund investment has risen to 12.23%. The average growth rate of balance of funds utilized by insurance companies in the first 8 months of 2021 was 13.37%, as shown in Figure 2, which shows that insurance institutional investors show great enthusiasm for holding stocks.

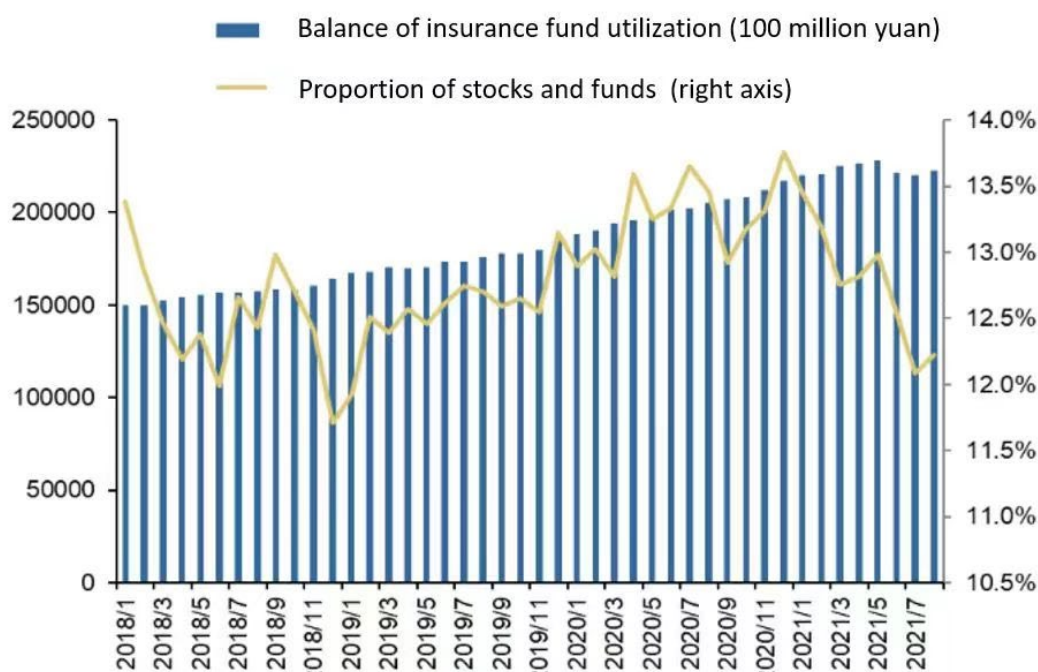


Figure 2 Utilization balance and market entry ratio of insurance funds since 2018

Insurance funds are important participants and promoters in Chinese capital market. The participation of insurance funds in the operation of capital market is a process of constantly optimizing the capital market structure, which plays an irreplaceable role in realizing the long-term healthy and stable development of the capital market. The characteristics of insurance business enable insurance companies to have a large number of long-term stable investment funds. When insurance funds enter the capital market, they not only increase the capital supply of the capital market,

but also stimulate the capital demand of the main body of capital market financing. It promotes the expansion of the capital market scale from two aspects, and effectively adjusts the market scale and the balance of capital supply. Table 1-1 shows the situation of the top 20 companies held by insurance institutional investors in 2021. Table 1-2 shows the overview of the top 10 companies held by insurance institutional investors in 2021, and Table 1-3 shows the overview of the top 5 cross shareholding companies in 2021.

Table 1-1: Top 20 companies held by insurance institutional investors in 2021

Shareholding Companies	Market value of shareholding (billion yuan)	Shareholding ratio (%)
China Life Insurance (Group) Company	5,814.45	92.80%
Ping An Bank Co., Ltd.	1,853.20	57.95%
COPYRIGHT GEMDALE GROUP ALL RIGHTS RESERVED	206.5	35.27%
CSG HOLDING CO.,LTD	67.47	34.72%
Financial Street Holdings Co.,Ltd.	53.16	31.43%
Shenzhen Agricultural Products Co., Ltd.	32.5	29.97%
Wonders Information Co., Ltd.	45.17	29.26%
China Fortune Foundation Co., LTD	35.29	25.18%
China Minsheng Banking Corp., Ltd.	340.39	0.2461

Shanghai Tianchen Information Technology Development CO,LTD	15.20	24.00%
POSTAL SAVINGS BANK OF CHINA	121.92	21.20%
Hua Xia Bank Co., Ltd.	143.54	19.99%
Shanghai Pudong Development Bank	495.86	19.80%
China merchants expressway network & technology holdings Co., Ltd.	28.23	19.05%
HNA Technology Group	12.38	16.15%
Xinjiang Goldwind Sci & Tech Co.,Ltd.	89.08	15.94%
Beijing JingxiCulture &Tourism Co., Ltd.	5.49	15.71%
Henan Province Liliang Diamond Co., Ltd.	6.33	14.63%
INDUSTRIAL BANK CO.,LTD.	531.75	14.24%
Vats Liquor Chain Store Management Joint Stock Co., Ltd.	7.18	11.98%

Table1- 2: Top 10 ranking of insurance institutional investors' shareholdings in 2021

Insurance institutional investors	Number of shares held (home)	Market value of shares held (billion yuan)
China Life Insurance (Group) Company	46.00	6517.36

PING AN INSURANCE (GROUP) COMPANY OF CHINA , LTD	15.00	2328.83
FUND SINO LIFE	10	708.56
The People'S Insurance Company (Group) Of China Limited	16	586.28
HUA LIFE INSURANCE CO.,LTD.	41	243.09
Taikang Life Insurance Co.,Ltd.	92	236.57
China Pacific Insurance (Group) Co.,Ltd.	41	131.17
NEW CHINA LIFE INSURANCE CO., LTD.	35	116.21
China Taiping Life Insurance Co., Ltd. (TAIPING LIFE)	30	108.54
Sunshine Insurance Group	10.00	104.93

Table1-3: Top 5 cross-holdings of insurance companies, 2021

Insurance institutional investors	Market value of shareholding (billion yuan)	Shareholding ratio (%)
China Life Insurance (Group) Company	6,114.50	97.59%
PING AN INSURANCE (GROUP) COMPANY OF CHINA , LTD	1,912.32	35.02%
The People'S Insurance Company	1,406.86	92.08%

(Group) Of China Limited		
CPIC (China Pacific Insurance (Group) Co Ltd)	1,317.61	70.98%
NEW CHINA LIFE INSURANCE CO., LTD.	621.25	76.62%

In 2016, the CIRC issued the "Outline of the 13th Five-Year Plan for the Development of Chinas Insurance Industry", which pointed out that in order to give full play to the advantages of long term, large scale and stable supply of insurance funds, insurance institutional investors should provide strong support for the long-term and stable development of the capital market. Such a large amount of insurance funds invested in the stock market is bound to have an impact on the stock market, placard investment of insurance will also have an impact on stock yields and turnover rates (Li Yashi, 2017). Based on this, this paper will empirically analyze the relationship between shareholding changes and volatility of stock prices from the two levels of individual stocks and the market: The first one is the relationship between shareholding changes of individual stock of insurance companies and volatility of individual stock prices. The second is the relationship between total shareholding changes of the insurance companies and volatility of SSE 50 index.

CHAPTER 2. LITERATURE REVIEW

2.1 Studies On The Impact Of Institutional Investor Shareholding Characteristics On Volatility Of Stock Prices

In view of the impact of institutional investors shareholdings on volatility of stock prices, scholars at home and abroad have different views. Based on "Information Superiority", "Rational Choice" and other perspectives, some scholars believe that institutional investors shareholdings are positively correlated with volatility of stock prices. Based on the perspective of "Herd Effect" and "Irrational Trading", some scholars believe that institutional investors and volatility of stock prices are negatively correlated and they mostly use empirical analysis. Based on the perspective of long-term dynamics, some scholars believe that institutional investors have no clear correlation with the volatility of stock prices.

2.1.1 Studies Of The Positive Correlation Between Institutional Investors' Shareholding And Volatility Of Stock Prices

From the perspective of "rational choice", some scholars believe that institutional investors' shareholding is positively correlated with volatility of stock prices, and Badrinath (1989) believes that institutional investors will actively avoid volatile stocks and favor prudent investment principles. From the perspective of "Rational Trading of Institutional Investors", it is believed that institutional investors have the role of stabilizing stock prices. Koh (2003) believes that institutional investor increase in stock holdings can effectively reduce the Information Asymmetry between investors and listed companies, thereby reducing volatility of stock prices. Wang

Xiaozheng and Teng Zhaoxue (2003) used Pearson correlation coefficient to study the correlation between various types of investors and market yields, and found that institutional investors are relatively independent in collecting and analyzing information, and the correlation between their transaction volume and market yield is not significant. Domestic scholars also draw positive correlation conclusions in the empirical analysis of institutional investors, Zhou Xuenong (2007) under the conditions of GARCH and EGARCH models, using the daily yield data of the SSE Composite Index and the SZSE Index, empirically found that the development of institutional investors can effectively reduce the volatility of stock prices. Wu Xinchun and Tian Cunzhi (2010) under the condition of revising the GARCH event model, taking the QFII entry and the pilot reform of equity splitting as two nodes, from the perspective of long-term holding and low turnover rate, it was analyzed that the impact of insurance companies entering the market on volatility of stock prices was small. Wang Jinle and Shi Yongdong (2018) analyzed the mechanism of the impact of executive change events on the company's volatility of stock prices from the perspective of investor behavior, and the empirical results showed that when a company has a mandatory change of executives, withdrawal of institutional investors and the increase of shares by small-sized and medium-sized individual investors will aggravate the volatility of stock prices. Cheng Xin et al. (2018) used the institutional investors' position data of A-shares from 2006 to 2017 to find that institutional investors' shareholding significantly improved the company's information transparency and reduced the volatility of stock prices through the two-step regression method. Guo

Mingxing (2021) selected the data of A-share listed companies from 2010 to 2018 as a sample and analyzed the correlation between the institutional investors' shareholding ratio and type and the stock price synchronicity. The results show that the increase in institutional investor ownership has helped to significantly reduce the stock price synchronicity.

2.1.2 Studies Of The Negative Correlation Between Institutional Investors' Shareholding And The Volatility Of Stock Prices

Other scholars, based on the "Herd Effect" research perspective, argue that institutional investors' holdings have increased the volatility of stock prices. Kraus, Stoll (1972) proposed parallel trading for institutional investors, an early definition of Herd Effect. Lakonishok (1992) also elaborated on the characteristics of Herd Effect earlier. Song Jun (2001, 2003) measured Herd Behavior by measuring stock price dispersion, and found that Herd Behavior in China's capital market was significant compared to the US market, and explained that Herd Effect was more intense when the market was down with expectation theory. Sun Peiyuan and Shi Donghui (2002) based on CAPM, used the absolute deviation of the cross-section to measure the degree of convergence of stock price changes, and found that the "buy on the upswing" tendency of the Chinese stock market was greater than that of "sell on the downswing". Xu Nianxing, Yu Shangyao and Yi Zhihong (2013) adjusted Weermerss (1999) method of measuring Herd Effect, obtained a new institutional investor Herd Behavior indicator, and analyzed and found that institutional investors have a "true Herd Behavior" in China's capital market, resulting in the stock price being unable to absorb the real

information of investors, the pricing efficiency decreased, and the stock market crash risk was increased. Liu Bo et al. (2004) studied the non-linear relationship between individual stock income deviation and market portfolio yield, and believed that the Herd Effect in Chinas overall stock market led to the convergence of stock price changes and enhanced the market influence of systemic risk.

Through empirical analysis, many scholars in China believe that institutional investors shareholdings are positively correlated with the Volcano of Stock Prices. Zhou Kefeng (2009) used Topview data to conduct a two-way dynamic analysis of institutional investor behavior and volatility of stock prices from the perspective of volatility overflow, and believed that the position volatility of institutional investors were the main reasons for volatility of stock prices. Chen Lan (2009) decomposed the volatility of individual stocks by calculating the covariance of individual stock returns and market returns, and found that the rise or fall of fund holdings in the stock market aggravated the volatility of individual stocks. Li Yong and Wang Mancang (2010) added the Averse Selection effect and the Moral Hazard effect when the research institution investor shareholding and volatility of stock prices rate, based on the extended CAPM model, believed that the pursuit of short-term returns by institutional investors caused the Herd Effect to intensify, the turnover rate to increase, resulting in the volatility of stock prices. Some scholars have found that fund shareholding changes will increase the volatility of stock prices through nonlinear simultaneous equations model and instrumental variable method (Xing Zhibin, Zhong Weizhou, 2014) and (Li Zhiyang, Yang Wancheng, 2014). Qiao Guorong et al. (2021) based on the sample of SZSE listed

companies during the abnormal stock market fluctuations in 2015, empirically tested that the concentration of shareholding is negatively correlated with the liquidity of individual stocks, and the rapid increase in the shareholding ratio of important shareholders often indicates a decline in the liquidity of individual stocks and an increase in volatility. Lu Rong and Sun Xinyu (2021) have confirmed that, according to rational speculation theory, the purpose of concept manufacturing of institutions is stock bubble riding, that is, buying overvalued stocks and selling before the bubble bursts, which promotes the emergence of stock market bubbles and causes violent market fluctuations. Ma Jianguo (2020) used the systemic generalized method of moments to eliminate endogenous problems, and found that institutional investors shareholdings have a negative impact on the stability of corporate stock prices, indicating that China's A-share institutional investors have played an "accelerator" role in volatility of stock prices. Yang Mianzhi et al. (2020) took advantage of the quasi-natural experiment of the 2010 "securities margin trading" pilot to empirically examine the impact of institutional investor heterogeneity on the stock market crash risk by taking the 2009-2016 A-share motherboard listed companies as a research sample, and found that the overall shareholding of institutional investors increased the future stock market crash risk of listed companies.

2.1.3 Studies Of The Unclear Correlation Between Institutional Investors' Shareholding And The Volatility Of Stock Prices

Some scholars believe that the relationship between institutional investors' shareholding and volatility of stock prices is not clear in the long run. Brown Brooke

(1993) showed the example of institutional investors spinning off stocks to balance portfolios and indicated that, on average, the initial price decline caused by the spin-off of a company's stock correlated significantly with the extent to which the institution divested its stake in the company. He Jia and He Ji Bao (2007) believe that different institutional investors have different influences on market volatility, and this influence also changes with market environment and structural changes, and there is no consistent conclusion. Shi Yongdong and Wang Jinle (2014) used Property Score Matching to find that institutional investors have different impacts on stock volatility at different stages of the market. Wang Dechun and Liu Jinjin (2018) selected A-share listed company data, analyzed the correlation between the corporate equity investment yield and the rate of stock price yield and volatility of stock prices, and discussed the role of institutional shareholding in regulating their relationship. It has been empirically shown that institutional shareholding has a negative regulatory effect on the relationship between corporate investment yield and stock price yield, while there is no regulatory effect on the relationship between corporate investment yield and volatility of stock prices.

2.2 Studies On The Shareholding Behavior Of Insurance Companies

By reviewing the literature related to the shareholding behavior of insurance companies, it is found that domestic and foreign scholars mainly study the risk analysis of the use of insurance funds, but insurance companies, as institutional investors with the main business of "Revenue comes first, costs come later", have special stock preference. At present, the views on the stock preference of institutional investors at

home and abroad are mainly divided into the following three categories: The first is to consider the risk, insurance companies tend to hold shares of listed companies with lower risk. For example, Zhang Xiaodong (2013) collected the institutional shareholding data of listed companies from 2006 to 2011, and used the Logit model for empirical analysis. It is significant that insurance companies tend to hold less risky, more liquid stocks. Zhang Yimin (2017) used the sample data of insurance product shareholding ratio in the A-share market from the second half of 2013 to the first half of 2016 to conduct a regression analysis of the shareholding ratio of insurance funds, and concluded that insurance companies tend to hold stocks with less absolute risk, higher prices and long listing age. The second is to consider liquidity. For example, Badrinath (1996) analyze insurance companies shareholding behavior separately and found that it prefers highly liquid stocks. The third is to consider profitability. Xu Gaolin and Ma Shibing (2006) found that important domestic insurance companies such as Chinese Life Insurance prefer listed companies with higher profitability. Wang Yuanyuan and Ge Houyi (2017) believe that life insurance companies and property insurance companies tend to hold stocks with better operating performance, larger company scale, better development ability, high stock return rate and higher proportion of outstanding shares.

Many scholars have found that the impact of different types of institutional investors on volatility of stock prices is significantly different by classifying institutional investors. Lan Xiuwen et al. (2020) have conducted empirical research and found that social security fund shareholdings improve the information environment and

governance structure of listed companies by increasing the number of analysts tracking and inhibiting tunneling from major shareholders, so as to exert the effectiveness of corporate governance and reduce stock price synchronicity. In contrast, Zhang Jinghui (2021) used the negative value of a company's idiosyncratic rate of return bias and the ratio of weekly idiosyncratic return volatility down to volatility up to measure the stock market crash risk, and through correlation analysis and regression analysis, it was found that insurance institutional shareholdings will aggravate the stock market crash risk of enterprises. Xia Changyuan et al. (2020) found information asymmetry, institutional investors and volatility of stock prices through regression analysis and concluded that insurance companies which have larger stock investment can more trigger market hype and exacerbate stock market crash risks. Different from the above two situations, Zhongsai Mo et al. (2021) from the perspective of heterogeneity of operating attributes, empirically concluded that the shareholding of life insurance companies with strong financial attributes will significantly aggravate the stock market crash risk, especially when the shareholding ratio is less than 5%. The shareholdings of life insurance companies with strong protection attributes can significantly inhibit stock market crash risks. Wei Longfei et al. (2021) used panel data, based on the perspective of institutional investor heterogeneity, found that compared with securities investment funds, insurance institutional long-term shareholding has played a role in stabilizing the stock market, but changes in the shareholding ratio of insurance institutions will aggravate the volatility of the stock market.

2.3 A Brief Review Of Relevant Studies At Home And Abroad

By reviewing the literature at home and abroad at this stage, it can be found that most of the current research analyzes the relationship between characteristics of institutional investors' shareholdings and volatility of stock prices as a whole, mainly based on empirical analysis. For the relationship between characteristics of institutional investors' shareholdings and volatility of stock prices, due to the difference in assumptions and research perspectives, it is mainly divided into three views, positive correlation, negative correlation, uncertain relationship. Most scholars support the second view, using "Herd Effect" as a research perspective to argue that institutional investors' shareholdings have increased the volatility of stock prices.

When analyzing the shareholding behavior of insurance companies, in the past, scholars mainly studied the efficiency of the use of insurance funds from the perspective of risk analysis, and insurance companies, as "risk operators", need to fully consider their own business characteristics and the nature of insurance funds, so their stock preference has special characteristics. Summarizing scholars research on stock preference of insurance companies, it is found that insurance companies tend to hold blue-chip shares with lower risk and higher liquidity, and the long-term investment trend is obvious.

CHAPTER 3. THEORETICAL ANALYSIS AND RESEARCH HYPOTHESIS

From the perspective of business characteristics of insurance companies, compared with other types of institutional investors, insurance companies operate on

risks. Underwriting operation has a nature of “gaining before paying”. Therefore, insurance companies need to have sufficient funds to ensure that the solvency ratio is higher than 150%. From the perspective of the main composition and nature of insurance funds, claim reserve is the reserve for unearned premium and outstanding losses. It is an important source of insurance funds, so it has the characteristics of liability and long term. Therefore, insurance companies pay more attention to security and liquidity while developing investment strategies. Based on the literature review at this stage, this paper holds that insurance companies, as "risk managers", prefer to hold blue-chip share with low risk and high liquidity and have the obvious long-term investment trend, considering their own business characteristics and the nature of insurance funds while trading stocks. From the perspective of "rational choice", the shareholding behavior of insurance companies conforms to the principles of stability and safety. Based on this, we put forward hypothesis 1: Chinese insurance companies' individual shareholdings changes have no spillover effect on volatility of individual Stock Prices.

Financial supervision department has loosed the restrictions on the entry of insurance funds into the market and encourage insurance companies to make long-term investments. In this context, for one thing, facing the pressure of declining underwriting operation profits, insurance companies urgently need to seek long-term and stable income from the capital market, and may use their capital superiority to conduct unfriendly placard investment of insurance. For another, the huge amount of insurance funds entering the stock market would lead to the Herd Effect easily and cause volatility

spillover effect to the whole stock market. Based on this, hypothesis 2 is put forward: Chinese insurance companies' total shareholdings changes have spillover effect on the fluctuation of SSE 50 index.

As an institutional investor, insurance companies have positive feedback trading behavior. The insurance companies would buy the stocks with high expected yield when they still perform well, and would sell the stocks with low expected yield when they perform poorly, which is also described as "buying on the upswing and selling on the downswing". Based on this, we put forward hypothesis 3: the Volatility of Stock Prices has spillover effect on Chinese insurance companies' shareholdings changes; and hypothesis 4: the fluctuation of SSE 50 index has spillover effect on Chinese insurance companies' total shareholdings changes.

CHAPTER 4. RESEARCH DESIGN

4.1 Data Selection

In this paper, the data of listed companies from the first quarter of 2016 to the fourth quarter of 2020 are taken as the sample interval, which includes totally 20 quarters. The split-adjusted daily closing prices of individual stocks which are over 5% owned by insurance companies since the fourth quarter of 2020 are selected. And we choose SSE 50 index as the research sample of the market index. The quarterly shareholding data of insurance companies are obtained by sorting out the financial statements disclosed by listed companies. The data come from the Wind financial database.

4.2 Variable Selection

In the study of the relationship between the insurance companies' shareholdings changes and volatility of individual stocks prices, the selected variables include the index of insurance companies' individual stock position changes, indicated as $\Delta INSTO_{i,t}$; and the index of individual stock prices volatility, indicated as $V_{i,t}$. In the study of the relationship between the total shareholdings changes of insurance companies and the fluctuation of SSE 50 index, the selected variables include the index of insurance companies' shareholdings changes, indicated as $\Delta INSTO_t$; and the index of overall volatility of the stock market, indicated as V_t . Please find the Table 4-1 for details :

Table 4-1. Variable Selection

Variable symbol	Variable name	Variable selection description	Variable formula
$\Delta INSTO_{i,t}$	Individual stock position changes of insurance companies	Difference between the proportion of shares held by insurance companies with a shareholding ratio of more than 5% in this quarter and that in the previous quarter	$\Delta INSTO_{i,t} = INSTO_{i,t} - INSTO_{i,t-1}$
$\Delta INSTO_t$	Insurance companies shareholdings changes	Difference between the total shareholding ratio of insurance companies disclosed in this quarter and that in the previous quarter	$\Delta INSTO_t = INSTO_t - INSTO_{t-1}$
$V_{i,t}$	Volatility of individual stock prices	Standard deviation of individual stock return	$V_{i,t} = \sqrt{\frac{\sum_{i=1}^n (R_{i,t} - \bar{R}_{t,t})^2}{n-1}}$
V_t	Overall volatility index of stock market	Standard deviation of SSE 50 stocks quarterly return	$V_t = \sqrt{\frac{\sum_{i=1}^n (R_t - \bar{R}_t)^2}{n-1}}$

4.3 Model Design

The core issue of this paper is to study the bidirectional volatility spillover effects that Chinese insurance companies' shareholdings changes have respectively on individual stock prices and SSE 50 index. And this issue can be transformed into two

questions: whether there is a bidirectional Granger causality between the individual shareholdings changes of insurance companies and the volatility of individual stock prices; and whether there is a bidirectional Granger causality between the total shareholdings changes of insurance companies and the fluctuation of SSE 50 index. In order to avoid the endogeneity of the volatility of stock prices, this paper refers to the vector autoregressive model (VaR) based on stationary series or the error correction model (VEC) of non-stationary series according to Sims (1980), and uses OLS least square estimation. Since VAR or VEC models contain a large number of coefficients, it is not of accurate economic significance to analyze the parameters in the model alone (Yanyi Li, 2013). Therefore, we study the existence of spillover effects of insurance companies' shareholdings changes and stock prices volatility with the help of Granger causality test. Meanwhile, IRF impulse response function and variance decomposition will be used to measure the intensity and size of spillover effects.[1][2]

[1] Sims Christopher A. Macroeconomics and Reality, *Econometrica*, 1980, 48(1):1-48.

[2] Liyanyi *Views statistics and application* [m] Beijing: Electronic Industry Press, 2013

CHAPTER 5. ANALYSIS OF EMPIRICAL RESULTS

5.1 Sample Selection And Descriptive Statistics Of Insurance Companies' Stock Preferences

A total of 9,630 initial sample data were collected. After eliminating missing values, 146 insurance companies held A-share listed companies on the Shanghai Stock Exchange from 2016 to 2020. According to the industry classification of Wind financial database, the industries in which insurance funds are invested include real estate, building materials, non-banking financial industry, energy, accommodation and catering industry, commercial trade, scientific research and technical service industry, manufacturing industry and other 14 industries. Among them, the real estate industry, construction industry, non-bank financial industry, commercial trade and integrated manufacturing industry are the most favored by insurance companies. As shown in Figure 3:

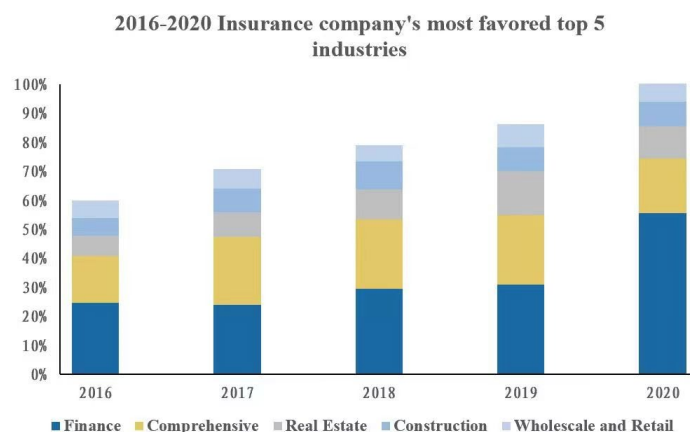


Figure 3 Top 5 industries in which insurance companies hold shares from 2016 to 2020

The main financial indicators of the five industries with the largest proportion of listed companies held by insurance companies from 2016 to 2020 are shown in Table

5-1. The asset-liability ratio of the real estate industry, non-banking financial industry and construction materials is relatively high, which is determined by the particularity of the industry business as a measure of financial health. The return on equity of the three major industries is between 10% and 18%, indicating that the investment income is relatively stable. The rolling price-to-earnings ratios of the financial industry and manufacturing industry are between 8% and 40%, indicating that the industry's stock price level is relatively reasonable and in line with the risky principle of insurance funds. The dividend yield of the five major industries is between 1% and 5%, indicating that investors can obtain stable returns from them, and the financing cost of operators is not high.

We analyzed insurance companies' stock preferences from financial indicators such as industry operating performance and income status. On the one hand, the underwriting operation of insurance companies has the characteristics of "income first, cost last", which determines that when formulating investment strategies, it is necessary to pay attention to the risk and liquidity of stocks, and they tend to hold lower risks and higher liquidity stocks. On the other hand, facing the pressure of declining underwriting profits and limited investment channels, insurance companies tend to hold stocks with long-term stable returns.

Table 5-1. Financial Indicators Of The Five Major Industries From 2016 To 2020

Industry name	Asset-liability ratio (%)	Return on Equity (%)	Dividend Yield (%)	Rolling P/E (%)
Real estate industry	79.08	11.23	3.68	8.56

Non-banking financial industry	84.33	10.53	1.44	18.73
Building materials integrated manufacturing industry	45.69	16.34	1.97	14.51
	54.91	0.70	0.52	36.39
Commercial trade	59.98	2.11	1.43	27.27

5.2 Descriptive Statistics Of Main Variables And Stationarity Test

Financial stocks, ST stocks and *ST stocks, as well as data with missing values, were removed from the initial sample data, and a 1% level of tailing was used to avoid the influence of outliers. After processing and screening, there are a total of 93 stocks and 3534 sample observations. The overall sample is unbalanced panel data. The descriptive statistics of the main variables are shown in Table 5-2:

Table 5-2. Descriptive Statistics Of Main Variables

Variable	Mean	Median	Maximum	Minimum	SD.
$\Delta INSTO_{i,t}$	0.33	0.00	19.30	-10.57	2.79
$\Delta INSTO_t$	15.43	16.53	52.06	-13.70	14.56
$V_{i,t}$	0.71	0.69	3.37	0.00	0.69
V_t	0.60	0.49	1.46	0.22	0.34

According to Table 3, the average value of the individual shareholding changes of insurance companies is 0.33%, indicating that the individual shareholdings of insurance companies in the sample range have not changed much. The average value of volatility of individual stock prices is 0.71%, indicating that the stocks preferred by insured funds are more stable. The average change in the total holdings of insurance

companies is 15.43%, indicating that insurance companies have impatience in trading behavior throughout the stock market. The average volatility of the Shanghai 50 Index is 0.6%, indicating that the broader-cap index is relatively stable in the sample range.

The ADF unit root test is performed on the variable sequence to determine whether it is stationary. If it is stationary, a vector autoregressive model (VAR) can be established. If it is not stationary, difference processing is performed to see whether it obeys the same-order single integration, and further analyzes whether there is a cointegration relationship. The test results are shown in Table 5-3:

Table 5-3. ADF Test Of Main Variables

Variable	Test type (c, t, d)	ADF Statistics	P value	Test conclusion
$\Delta INSTO_{i,t}$	(c,0,19)	-2.535659	0.1200	Non-stationary
$\Delta INSTO_t$	(c,0,0)	-3.468245*	0.0218	stable
$V_{i,t}$	(c,0,19)	0.356305	0.9764	Non-stationary
V_t	(c,0,3)	-3.049016*	0.0529	stable
$D(-4)\Delta INSTO_{i,t}$	(c,0,15)	-3.110115*	0.0392	stable
$D(-4)V_{i,t}$	(c,0,15)	-3.537501*	0.0157	stable

Note: (1) In the ADF test, (c, t, d) represent the constant term, the trend term and the lag order, respectively. The lag order is determined by the AIC criterion, and D (-4) represents the fourth-order difference; (2) * Indicates that it passed the 10% significance level test.

Table 5-3 shows that the $\Delta INSTO_t$ sequence of changes in the total shareholding changes of insurance companies and the fluctuation V_t sequence of the Shanghai Stock Exchange 50 Index are stable at a significant level of 10%.The

$\Delta INSTO_{i,t}$ sequence of individual shareholding changes of insurance companies and the $V_{i,t}$ sequence of volatility of individual stock prices are both non-stationary, but both variables are fourth-order single integration at a significant level of 10%. The test results are shown in Table 5-4:

Table 5-4. Cointegration Test Results Of Eg Two-Step Cointegration Test Of Individual Shareholding Changes And Volatility Of Individual Stock Prices

Variable	Test type (c, t, d)	ADF Statistics	P value	Test conclusion
ε_t	(0,0,3)	-10.09280*	0.0000	stable

Note: (1) Residual series ε_t is generated by the change of individual shareholding changes of insurance companies on volatility of individual stock prices; (2) (c, T, d) represent the constant term, trend term and lag order, respectively, and the lag order is determined by the AIC criterion ; (2)* means pass the 10% significance level test.

Shareholding changes in insurance companies and volatility of individual stock prices pass the test at a significant level of 10%, and there is a cointegration relationship. This shows that there is a long-term stable relationship between individual shareholding changes of insurance companies and volatility of individual stock prices.

5.3 The Impact Of Shareholding Changes In Insurance Companies And Volatility Of Stock Prices

According to the results of the previous stationarity test of the series, this paper selects a complete econometric method framework with the vector autoregressive model as the core, and uses the Granger causality test, IRF impulse response function

and variance decomposition to analyze and determine whether shareholding changes in insurance companies cause volatility spillovers to individual stocks and the entire capital market.

5.3.1 The Impact Of Individual Shareholding Changes In Insurance Companies And Volatility Of Individual Stock Prices

Based on the fourth-order non-stationary sequence, this paper further illustrates the relationship between changes in individual stock holdings of insurance companies and stock price fluctuations by constructing an error correction model. That is, ECM (error correction term) is added to the VAR model established by the difference sequence:

$$\Delta Y_{t-1} = \begin{bmatrix} -1.06 \\ -0.05 \end{bmatrix} \text{CointEq}1_{t-1} + \begin{bmatrix} 0.07 & 0.02 \\ 0.04 & -0.33 \end{bmatrix} \Delta Y_{t-1} + \varepsilon_t, \Delta Y = \begin{bmatrix} D(INSTO) \\ D(V) \end{bmatrix}$$

Next, based on the constraints of the VEC model, the Granger test-impulse response function-variance decomposition analysis is carried out to further illustrate the relationship between changes in insurance companies individual stock holdings and individual stock price fluctuations.

(1) Granger causality test based on VEC model constraints

Table 5-5. Granger Test Of Individual Shareholding Changes Of Insurance Companies And Volatility Of Individual Stock Prices

Null hypothesis	F statistic	P value	Conclusion
D(INSTO) is not the Ganger reason of D(V)	0.021303	0.8840	Accept
D(V) is not the Ganger reason of D(INSTO)	20.75434	0	Reject

It can be seen that the volatility of individual stock prices has a one-way causal relationship with shareholding changes of insurance companies, while individual shareholding changes of insurance companies does not constitute the Granger reason of volatility of individual stock prices. Assumptions 1 and 3 are established, and the stock price fluctuations spill over to the individual shareholding changes of insurance companies. This shows that on the one hand, insurance companies stand in the perspective of "rational choice", and their shareholding behavior conforms to the principles of soundness and safety. On the other hand, insurance companies have positive feedback trading behavior as institutional investors.

(2) Analysis of impulse response function

Next, we use the impulse response function to quantify the impact of shareholding changes of insurance companies and volatility of stock prices:

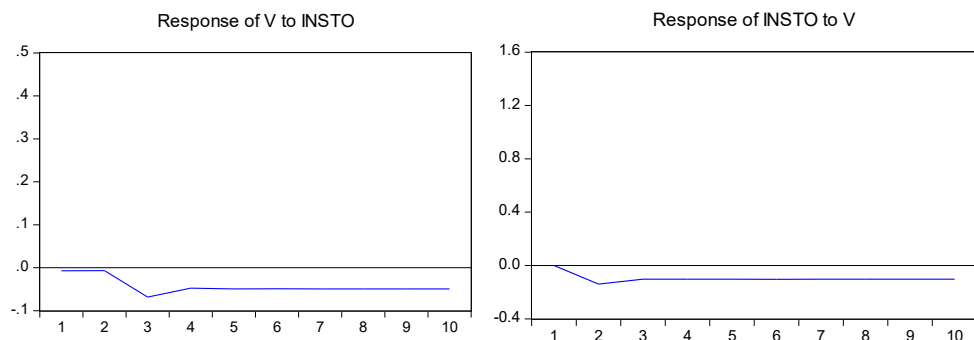


Figure 4 the response function curve of shareholding changes of insurance companies and volatility of stock prices

"Response of V to INSTO" represents the impulse function graph of individual shareholding changes of insurance companies to volatility of individual stock prices. The results show that after the impact of INSTO, V is in a state of balance-decline-increase-balance, and most of the periods are in a stable state, which shows that changes

in individual shareholding changes of insurance companies have limited impact on volatility of stock prices.

“Response of INSTO to V” represents the impulse function graph of the volatility of individual stock prices on individual shareholding changes of insurance companies. The results show that after being negatively impacted by V, INSTO maintains a balance first, and then declines for 2 consecutive periods, which shows that when the stock price fluctuates, insurance companies tend to sell their holdings, but the reduction of holdings has a hysteresis, which means the stock preference of insurance companies follows the principle of prudence and prudence.

(3) Variance decomposition

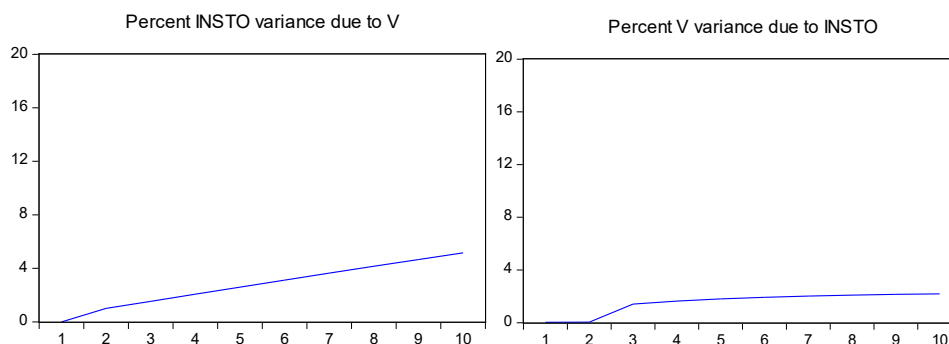


Figure 5 The variance decomposition of individual shareholding changes of insurance companies and volatility of individual stock prices

First, in the variance decomposition of individual shareholding changes of insurance companies INSTO, the contribution rate of volatility of individual stock prices is stable at 5.16%. Similarly, in the variance decomposition of volatility of individual stock prices V, the contribution rate of individual shareholding changes of insurance companies is 2.19%. That is, in the relationship between the two: the impact of volatility of individual stock prices on individual shareholding changes of insurance

companies is greater than the impact of individual shareholding changes of insurance companies on the volatility of individual stock prices.

On the one hand, this result shows that the shareholding behavior of insurance companies pays more attention to volatility of stock prices; on the other hand, it also shows that shareholding changes of insurance companies have a weak impact on the volatility of individual stock prices, that is, a large part of the factors that cause the volatility of individual stock prices exist in other types of institutional investors, general investors, and individual stocks themselves.

5.3.2. The Relationship Between Total Shareholding Changes Of Insurance Companies And The Volatility Of The Shanghai Stock Exchange 50 Index

After determining the optimal lag order is 2 through AIC, SC, and LR criteria, a binary VAR(2) model is established for $\Delta INSTO_t$ and V_t :

$$Y_t = \begin{bmatrix} -0.1345 & 0.0026 \\ 29.7937 & 0.3224 \end{bmatrix} Y_{t-1} + \begin{bmatrix} -0.6089 & -0.0010 \\ 6.7923 & 0.3021 \end{bmatrix} Y_{t-2} + \varepsilon_t, Y_t = \begin{bmatrix} \Delta INSTO_t \\ V_t \end{bmatrix}$$

After the AR stationarity test of the model, all eigenvalues are within the unit circle, indicating that the VAR model is stable.

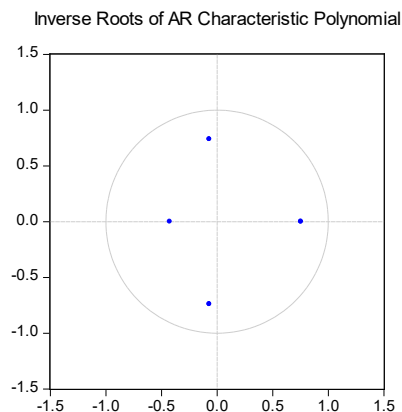


Figure 6 AR test unit circle diagram

(1) Granger causality test

Table 5-6. Granger Test Of Total Shareholding Changes Of Insurance Companies And The Volatility Of The Shanghai Stock Exchange 50 Index

Null hypothesis	F statistic	P value	Conclusion
ΔINSTO_t is not the Granger reson for V_t	5.447590	0.0656	Reject
V_t is not the Granger reson for ΔINSTO_t	0.241922	0.88861	Accept

Through the Granger causality test, it is found that during the sample period, the total shareholding changes of insurance companies have a one-way causal relationship with the volatility of the SSE 50 Index. Hypothesis 2 is true, and Hypothesis 4 is not true, and the fluctuations in the total shareholdings of insurance companies overflow to the SSE 50 Index (Shanghai Stock Exchange 50 Index) .

(2) Analysis of impulse response function

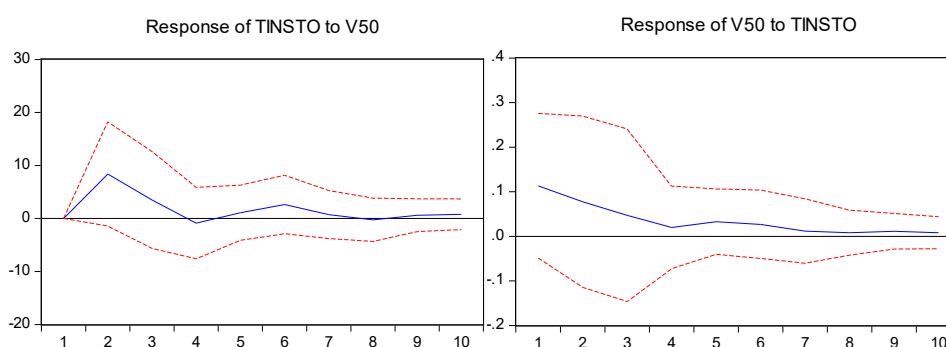


Figure 7 the response function curve of total shareholding changes of insurance companies and the volatility of the Shanghai Stock Exchange 50 Index

“Response of V50 to TINSTO” represents the impulse function graph of total shareholding changes of insurance companies and the volatility of the SSE 50 Index. The results show that total shareholding changes of insurance companies in the first four periods will not exacerbate market index volatility. However, it rebounds in the last four periods, which shows that the total shareholding changes of insurance

companies exacerbate the volatility of the market index and there is a lag. Balanced after the 8th period, this shows that total shareholding changes of insurance companies will indeed increase the overall volatility of the stock market, but the impact is limited. Combined with the previous literature review on insurance companies stock preferences, the limited degree of influence that can be obtained from the analysis is that insurance capital is essentially a liability to policyholders, so insurance companies tend to hold blue-chip shares with lower risk and higher liquidity, to ensure sufficient solvency.

“Response of TINSTO to V50” represents the impulse function graph of the volatility of the Shanghai SSE50 on the total shareholding changes of insurance companies. The results show that there is a positive effect between the volatility of the SSE 50 Index and the total shareholding changes of insurance companies, indicating that when the overall volatility of the stock market increases, insurance companies initially increase their holdings, but then rapidly reduce their holdings and increase their shareholding changes. This shows that insurance companies shareholding behavior is also affected by market system fluctuations, that is, insurance companies choose to increase or decrease their holdings of stocks according to volatility of stock price, which is the positive feedback trader mentioned by Delong (1990).

(3) Variance decomposition

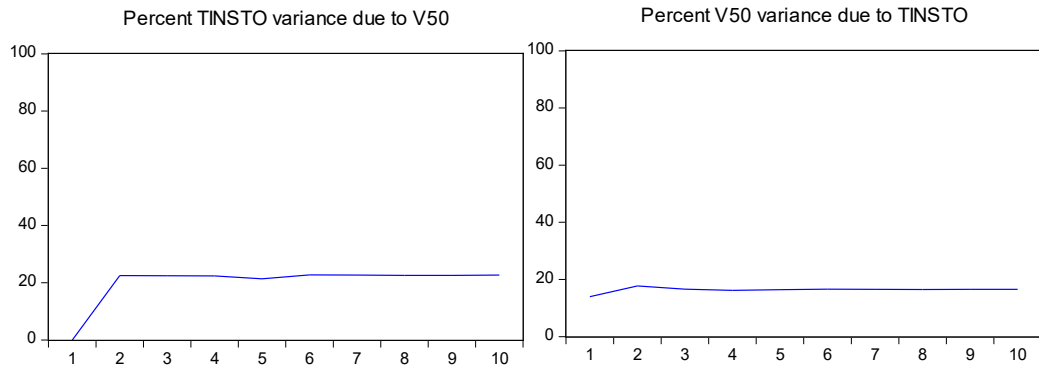


Figure 8 The variance decomposition of total shareholding changes of insurance companies and the volatility of the Shanghai Stock Exchange 50 Index

In the variance decomposition of the total shareholding changes of insurance companies in TINSTO, the contribution rate of the fluctuation of the Shanghai Stock Exchange 50 Index was stable at 22.67%. In the variance decomposition of the Shanghai Stock Exchange 50 Index V50, the contribution rate of changes in the total shareholding changes of insurance companies is 16.54%. That is, in the relationship between the two: the impact of the fluctuation of the Shanghai Stock Exchange 50 Index on the changes in the total shareholding of insurance companies is greater than the impact of changes in the total shareholding of insurance companies on the fluctuation of the Shanghai Stock Exchange 50 Index.

This result shows that: on the one hand, insurance companies pay more attention to the overall volatility of the stock market when holding shares, which reflects that insurance companies follow the principle of safety in their stock preferences; On the other hand, it further proves that changes in the total shareholdings of insurance companies aggravate the volatility of the market index. This is because the diffusion of transaction information of institutional investors can easily lead to a "herd effect" (Zhou Kefeng, 2009). As one of the important members of institutional investors, insurance

companies invest a large amount of money in the stock market. Their stock trading behavior will also affect other types of institutional investors or general investors to increase or decrease their stock holdings, and ultimately amplify the overall volatility of the stock market. However, compared with other types of institutional investors such as funds, insurance companies have a limited shareholding scale, so their effect on market index volatility is only 16.54%.

5.4 Robustness Check

In order to further verify the conclusions drawn above, this paper conducts research by establishing the following panel data model;

$$Vit=0.008-0.003 \Delta INSTOit+0.0475SIZEit+0.078 TURNit+ \varepsilon it$$

Among them, the meaning of the newly introduced control variable is: company size (SIZEit). Since the size of the company is positively correlated with the shareholding ratio of institutional investors, for those with large circulation market value, generally speaking, institutional investors have a higher shareholding ratio, and the circulation market value is also closely related to stock price volatility. Therefore, the circulation market value of the last trading day at the end of each quarter is selected as the variable of company size. In order to ensure the stability of the data and eliminate the problem of heteroscedasticity, the logarithm of the circulation market value is taken. The turnover rate (TURNit) reflects the liquidity of the stock. If the turnover rate is relatively high, it means that the stock is more active; otherwise, it means that the stock is less active. Institutional investors tend to choose companies with a higher turnover rate, which can keep funds liquid. The turnover rate is an important factor affecting the

volatility of stock prices. V_{it} is the volatility of the stock prices of the listed companies held by insurance institutions, INS_{it} is the shareholding ratio of insurance institutions, $\Delta INSTO_{it}$ is the the shareholding ratio changes of insurance institutions, $TURN_{it}$ is the quarterly average daily turnover rate, $SIZE_{it}$ is the circulation market value of the listed companies, and R_{it} is the market risk premium factor, HML_{it} is the book-to-market ratio factor, and ε_{it} it is the error term of the regression equation.

First, a Hausman test is done on the data to determine whether the model should use a fixed effects model or a random effects model. According to the analysis of the test results, it is known that the regression of insurance institutions should be based on a random effects model. The regression results are shown in the following table 5-7:

Table 5-7. The Regression Results

Variable	Volatility of Individual Stock	Volatility of Stock Market
P-value of Hausmans test	1.00	1.00
The model adopted	Random effects model	Random effects model
Shareholding ratio changes	0.008	-0.003
Whether the variable is controlled	Control variable	Control variable
Adjusted R ²	0.688	0.635
F-statistics	218.323	277.169
The corresponding P -value	0	0

From the regression results of the above table, it can be seen that the indicators of the shareholding ratio, the shareholding ratio changes, the circulation market value,

the turnover rate, the book-to-market ratio and the $R_m - R_f$ of the insurance companies are significant, and the R^2 after the adjustment of the two models is greater than 0.5, indicating that the panel data model has a good fit effect on the data. This paper also controls the role of listed companies turnover rate, company size, book-to-market ratio and market premium, and conducts regression analysis of the impact of institutional investors' shareholding ratio and shareholding ratio changes on stock price volatility respectively, and regression result analysis of shareholding ratio goes as follows: the regression coefficient of the shareholding ratio of insurance institutions to the volatility of stock prices is negative, indicating that long-term holdings by insurance institutions can stabilize the stock market. The main reason is that the insurance institutions' funding sources and investment principles. Insurance institutions focus on long-term value holdings, pay more attention to the growth and corporate governance of listed companies, making the stock prices of listed companies more stable for a long time.

5.5 Heterogeneity Analysis

In order to further analyze the mechanism of the impact of the shareholding changes of insurance companies on volatility of stock prices, this paper divides the sample enterprises into state-owned enterprises and non-state-owned enterprises for further analysis. According to classified statistics, 21 of the 146 stocks are state-owned enterprises and 125 are non-state-owned enterprises. By using a random effects model, the results are shown in the following table 5-8:

Table 5-8. The Results Of A Heterogeneity Analysis

Variable	Stock price volatility of state-owned companies	Stock price volatility of non-state-owned companies
$\Delta\text{INSTOit}$	-0.005	0.007*
Whether the variable is controlled	Control variable	Control variable
The model adopted	Random effects model	Random effects model
Sample observations	21	125
R-squared	0.390	0.740

*** p<0.01, ** p<0.05, * p<0.1

From the results in the above table, it can be seen that the impact of shareholdings changes in insurance companies on the volatility of individual stock prices has a heterogeneous effect between state-owned and non-state-owned companies. Among them, shareholdings changes in insurance companies have a positive and significant effect on the volatility of stock prices of non-state-owned enterprises at a statistical level of 10%, while it has a negative effect on the stock price volatility of state-owned enterprises, but it does not have statistical significance. On the one hand, the possible reason is that state-owned enterprises have stronger ability to resist risks, are more favored by investors, and their stock prices are more stable than non-state-owned enterprises.; on the other hand, this effect may not have been explored due to sample limitations.

CHAPTER 6. CONCLUSIONS AND RECOMMENDATIONS

Based on the correlations between the shareholdings changes of insurance companies and the volatility of stock prices, we take the quarterly data of insurance companies shareholding from 2016 to the fourth quarter of 2020 and the public data of Shanghai stock exchange A-share as the research samples, and focus on the empirical analysis of the relationship between the shareholdings changes of insurance companies and the volatility of stock prices, from perspectives of individual stock volatility and market index fluctuation. The empirical results show that: (1) the total shareholdings changes of insurance companies have an unidirectional Granger causality to the stock prices volatility of SSE 50 index, and the influence of the former on the latter is limited. It shows that the total shareholdings changes of insurance companies will indeed exacerbate the overall fluctuation of the stock market. This is because insurance companies, as one of the important institutional investors, invest a large amount of money in the stock market and their stock trading behavior also leads to Herd Effect, which ultimately amplifies the overall volatility of the stock market. However, compared with other types of institutional investors such as funds, insurance companies have limited shareholding scale, so they do not play a high role in the volatility of the market index. (2) The volatility of individual stock prices has an unidirectional Granger causality to the individual shareholdings changes of insurance companies, that is, the latter does not have the Granger causality to the former. On the one hand, it shows that insurance companies pay attention to the volatility of individual stock prices while investing in stocks, and tend to sell their stocks when they fluctuate, which shows that

the stock trading behavior of insurance companies follows the principle of steadiness and prudence. On the other hand, the individual shareholdings changes of insurance companies have a weak impact on the volatility of individual stock prices, indicating that a large part of the factors causing the individual stock prices volatility exist in other types of institutional investors, retail investors and individual stocks themselves.

Based on the above conclusions, the following suggestions are put forward from three levels:

First, it can be found that the volatility of stocks held by insurance institutional investors has a limited impact on the market volatility, and has a weak impact on the volatility of individual stock prices. In respect of the regulatory authorities, the stocks preferred by insurance institutional investors show a relatively stable trend, but the overall market stability still needs the participation of the regulatory authorities to stabilize the stocks prices and ensure the sufficient solvency of insurance companies.

Second, as one of the important institutional investors, insurance companies invest a large amount of money in the stock market, and their stock trading behavior would cause Herd Effect easily. Therefore, in respect of the insurance companies, they should reduce short-term speculation, focus on safety and liquidity while developing investment strategies, and pay attention to long-term investment.

Third, compared with institutional investors, retail investors in the stock market have disadvantages in information collection and analysis. Once the volatility of stock prices occurs, they are prone to "vote with their feet", thereby amplifying the volatility of the stock market. As insurance companies tend to hold blue-chip share with low risk

and good liquidity, they are more sensitive to stock risks while holding shares. Therefore, as for the retail investors, the empirical results of this paper can enhance the shareholding confidence of theirs.

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