The Relationship between Investors' Sentiment and Stock Market Returns: Evidence from Margin Trading and the CSI 300 Index

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Abstract. In recent years, both academia and business have been more interested in investors' sentiment. Margin trading's deployment is beneficial to development of China's stock trading system. Margin trading, to some extent, reflect changes in investors' sentiment. To lessen the impact of noisy investors on stock market volatility, it is crucial to investigate the relationship between these sentiment changes and stock market returns. In this paper, the link between investors' sentiment and CSI 300 index returns is examined. To quantify investors' sentiment, the marginal trading variables eliminating macroeconomic factors are selected as proxy variables to research the correlation between investors' sentiment and CSI 300 index returns. The results show that investors' sentiment does not have a significant effect on returns. Stock market returns have a positive effect on investors' sentiment in the short run, but later this positive effect disappears quickly again. From the perspective of margin trading mechanism, this paper study the relationship between investors' sentiment and stock returns. The empirical results will provide a reference for small and medium investors to make rational decisions, and will also provide a scientific reference for improving the sentiment supervision mechanism of the stock market.

Keywords: investors' sentiment; stock market returns; margin trading; CSI 300 index.

1. Introduction

The efficient market hypothesis and the traditional financial assumptions about rational humans are challenged by behavioral finance, which contends that due to the unpredictable nature of investors' irrational behavior and the limited nature of arbitrage, rational arbitrageurs are unable to profit from mispricing. As a result, investors' irrational behavior and the derived investors' sentiment theory are gradually becoming a hot topic of research.

Shanghai Stock Exchange and Shenzhen Stock Exchange began to offer margin trading services on March 31, 2010. Margin trading have improved market liquidity, stimulated price discovery, and activated the market after more than 10 years of development. While investors' sentiment may serve to further encourage margin trading behavior, margin trading will unavoidably affect investors' sentiment about the market, resulting in market volatility. As can be shown, margin trading exhibits a significant association with investors' attitude; therefore, it is quite practical to create investors' sentiment in regard to margin trading. Since investors' margin trading transactions are easily influenced by macroeconomic factors, this paper intends to use principal component analysis to construct an investors' sentiment index after eliminating the influence of macroeconomic factors. Then further study the relationship between investors' sentiment and stock market returns on this basis, and finally provide suggestions for rational investor decisions and the smooth operation of the stock market.

The remainder of the article is organized as follows. Section 2 reviews the literature background and develops theoretical analysis. Section 3 explains the sample selection and model construction. Empirical results are reported in Section 4. Section 5 concludes this study.

2. Literature Review and Theoretical Analysis

2.1. Literature Review

There are three main construction methods for research on the construction of investors' sentiment indices: direct sentiment indicators, indirect sentiment indicators and comprehensive sentiment indicator method. Direct sentiment indicators are generally obtained from direct surveys of investors. Foreign subjective investors' sentiment indicators include the Investor Intelligence Index II, the American Association of Individual Investors Index AAII Bubble Index, the Michigan Consumer Confidence Index and the Confidence Index. Domestic explicit market sentiment indicators include the Good and Poor Index compiled by the Journal of Dynamic Analysis of the Stock Market (Cheng Kun and Liu Renhe, 2005; Yu Quanhui and Meng Weidong, 2010; Chen Qi'an and Lei Xiaoyan, 2017), CCTV watch index BSI (Wang Meijin and Sun Jianjun, 2004), China Consumer Confidence Index CCI (Ma Xiaokui and Sun Jie, 2012); Indirect sentiment indicators are generally used in the stock market, commonly used indicators include closed-end fund discount, volume, turnover ratio, P/E ratio; Comprehensive investors' sentiment indicators generally use statistical tools to assign weights to multiple proxy variables to obtain an indicator reflecting investors' expectations about the future market. The use of a single variable to represent investors' sentiment is biased and cannot provide a comprehensive and accurate picture of the changes in market sentiment and its impact on stock market prices, so domestic and foreign scholars recognize the method of principal component analysis proposed by Baker and Wurgler to construct a comprehensive investors' sentiment index. The comprehensive investors' sentiment index can reflect both subjective investors' attitudes toward the future of the market and the trend of existing investors' sentiment (Chi Lixu and Zhuang Xintian 2009; Wang Yiting and Wang Shiwen, 2020). Domestic and international scholars disagree on how to scientifically select sentiment proxy variables. As a result, this study also focuses on how to choose proxy sentiment indicators in a methodical and consistent way.

Regarding the relationship between investors' sentiment and stock returns, Chi Lixu (2010) found that investors' sentiment has a significant positive impact on stock returns, but investors’ sentiment shows a negative relationship with attention to stocks and size of stocks. Scholars have also studied the effect of sentiment on the structure of investors' portfolios. Yang et al. (2010) starting from the perspective of bull and bear markets, show that stock returns are significantly and positively related to investors' sentiment in bull markets. While stock market returns are significantly negatively related to investors' sentiment in bear markets. Yao and Wang (2021) used TVAR model to analyze the relationship between investors' sentiment and stock market returns under different macroeconomic conditions and found that there is variability in the relationship between investors' sentiment and stock market returns. Tang Zhiwu and Liu Xin (2020) find that there is a positive relationship between pricing bias and investors' sentiment for CSI 300 stock index futures.

Investors buy stocks or sell stocks with margin trading by judging the future trend of stocks, thus earning profits. Therefore, investors' margin trading behavior largely reflects their optimism or pessimism about future stock trends. But how to use margin trading to construct a sentiment index is still in the research stage. Existing studies do not take into account the influence of macroeconomic factors components in margin trading. In practice, the situation of macroeconomic will certainly affect stock market and investors' sentiment, and it is necessary to exclude macroeconomic factors from margin trading. In this paper, the macroeconomic prosperity index will be introduced as a macroeconomic proxy variable, the influence of macroeconomic factors on margin trading will be excluded, and the relationship between investors' sentiment and stock market returns will be studied using an empirical model when the investors' sentiment index is constructed by principal component analysis of the chosen margin trading indicators.

2.2. Theoretical Analysis

Traditional finance holds that any asset price deviation will eventually be eradicated by rational trading and that the market is efficient since noise trading has a negative correlation in the short run

and does not effect pricing in the long run. Price variations caused by noise trading are transient and do not last over time. Behavioral finance has grown in recent years. Based on the assumption that humans are irrational, behavioral finance contends that investors' sentiment can affect the stock market and that noise traders can generate higher expected returns and hence affect asset pricing.

Margin trading is a mechanism to influence stock price returns through information. After obtaining information, investors will react differently behaviorally based on their different understanding and judgment of the information, resulting in fluctuations in stock market prices. When the stock market is rising, some investors continue to be bullish and choose to buy stocks with margin trading; however, some investors will start to be bearish and choose to sell stocks with margin trading. Similarly, if the situation on the stock market deteriorates, various investors will reach different conclusions and handle the same information, which in turn affects stock market movements. In addition to irrational elements like investors' emotions, macroeconomic factors also have an impact on margin trading behavior.

Therefore, in this paper, when constructing the investors' sentiment index, the influence of macroeconomic factors is excluded, so as to analyze the influence of investors' sentiment on stock market volatility from the perspective of margin trading.

3. Data and Model Setup

Margin trading refers to the business activity of securities companies lending funds to customers for buying listed securities or lending listed securities for selling, and receiving collateral. The funds or listed securities lent by a security company may be its own or lent from a security finance company. After March 31, 2010, margin trading transactions have grown quickly in China. In addition, the market capitalization ratio of GEM stocks has significantly increased, and the trading volume and trading ratio of margin trading transactions have continued to rise and develop steadily. The number of stocks underlying margin trading securities has reached more than 1,600 after several expansions. In order to thoroughly examine the impact of investors' sentiment on stock market returns, we will choose margin trading-related indicators as proxy variables for investors' sentiment in this paper and then use these variables to build a sentiment index.

3.1. Data

In this paper, we use four indicators about margin trading to construct the sentiment index. The indicators are *rzye*, *rzmr*, *lrcz*, *lrzb*. $rzye_t$ means margin trading balance on day t. $rzmr_t$ means margin trading purchase volume on day t. $lrcz_t$ means margin trading volume minus short selling volume on day *t*. $lrzb_t$ means margin trading transactions (margin trading volume add short selling volume) as a percentage of A-share market turnover on day t. We chose data from March 31, 2010 to September 30, 2021, totaling 2,798 trading days. The daily returns (*hsreturn*) calculated from the closing prices of the CSI 300 index were selected as a proxy for stock market returns, and all data were obtained from Wind database. Table 1 shows the results of descriptive statistics for each variable.

Table 1. Descriptive statistics.

Variable Name	No. of Observations	Mean	Std. Dev.	Min	Max
rzye	2798	0.00446	0.0292	-0.110	0.925
rzmr	2798	0.00329	0.217	-1.287	1.307
lrcz	2798	0.00443	0.0294	-0.110	0.925
lrzb	2798	0.00278	0.116	-0.871	1.230
hsreturn	2798	0.000134	0.0145	-0.0915	0.0650

From Fig. 1 and Fig. 2, it can be seen that there is a high similarity between the trend of the closing price of the CSI 300 index and the indicators of margin trading, and there is some correlation between stock market returns and margin trading. Therefore, we processed the data of margin trading and the

CSI 300 index, and took the logarithmic rate of change of the four indicators of margin trading and the closing price of CSI 300 respectively.

The rate of change of margin trading balance is calculated as follows:

$$\Delta rzye_t = \ln \frac{\mathrm{rzye_t}}{\mathrm{rzye_{t-1}}} \tag{1}$$

If the value is greater than zero, it means that investors are more willing to buy stocks and the sentiment is optimistic; conversely, when the value is less than zero, investors are less willing to buy stocks and the sentiment is relatively less optimistic.

The rate of change of margin trading purchase volume is calculated as follows:

$$\Delta lrcz_t = \ln \frac{\mathrm{lrcz_t}}{\mathrm{lrcz_{t-1}}} \tag{2}$$

when the value is greater than zero, investors' sentiment is optimistic, and when the value is less than zero, investors' sentiment is less optimistic.

The rate of change of margin trading-short selling balance is calculated as follows:

$$\Delta lrzb_t = \ln \frac{\mathrm{lrzb_t}}{\mathrm{lrzb_{t-1}}} \tag{3}$$

when the value is greater than zero, the trading activity of investors increases; when the value is less than zero, the trading activity of investors weakens.

The rate of change of margin trading transactions as a percentage of A-share market turnover is calculated as follows:

$$\Delta rzmr_t = \ln \frac{rzmr_t}{rzmr_{t-1}} \tag{4}$$

the positive or negative of this value indicates the trend of investors' willingness to purchase stocks.

The CSI return of 300 index is calculated as follows:

$$hsreturn_t = \ln P_t - \ln P_{t-1} \tag{5}$$

where P_t is the closing price of CSI 300 index at time *t*.

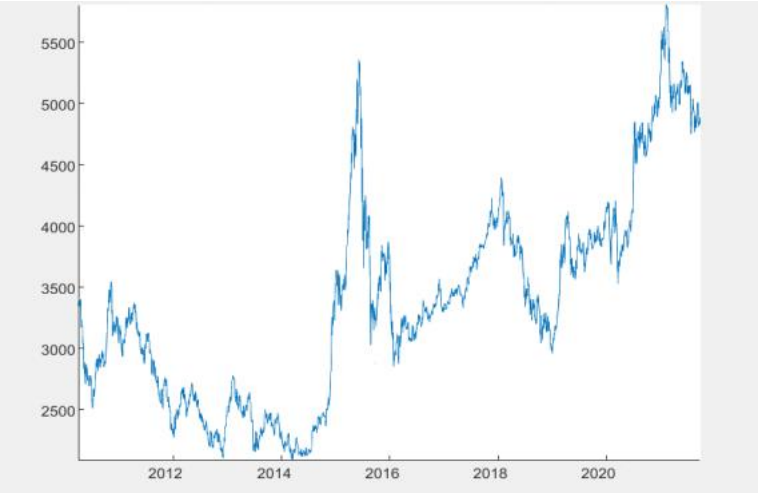

Fig 1. Chart of CSI 300 closing price

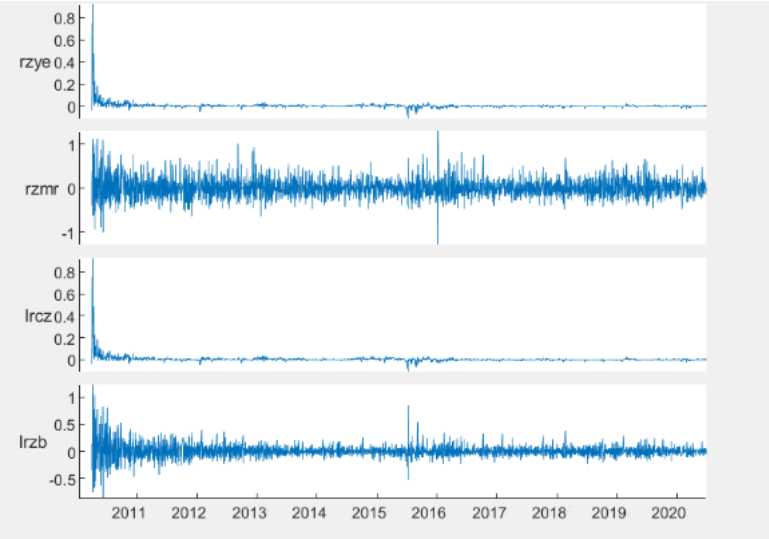

Fig 2. Chart of margin trading indicators

3.2. Model Setup

3.2.1 Construction of Sentiment Index

As mentioned earlier, the four indicators of margin trading are very similar in trend and highly correlated, making them suitable for the construction of sentiment index using principal component analysis. The principle of principal component analysis method is to transform a set of correlated variables by dimension reduction and recombination into fewer uncorrelated principal components to replace the previous correlated variables. The results of the principal component analysis performed by MATLAB are given in Table 2, which shows that the cumulative contribution of the first two principal components has reached 91.453%, so we extract the first two principal components.

Table 2. Extracted results of principal component analysis.

Component	Eigenvalue	Contribution rate (%)	Cumulative contribution rate (%)
Comp1	2.407	60.179	60.179
Comp2	1.251	31.274	91.453
Comp3	.341	8.527	99.980
Comp4	.001	.020	100.000

Table 3. Weights of the first 2 principal components.

Variable Name	Comp1	Comp2
rzye	.889	-.457
rzmr	.590	.704
lrcz	.885	-.464
lrzb	.698	.575

Based on the results in Table 3, the sentiment index was constructed as follows:

$$Comp1 = 0.889 * \Delta rzye_t + 0.590 * \Delta rzmr_t + 0.885 * \Delta lrcz_t + 0.698 * \Delta lrzb_t \quad (6)$$

$$Comp2 = -0.457 * \Delta rzye_t + 0.704 * \Delta rzmr_t - 0.464 * \Delta lrcz_t + 0.575 * \Delta lrzb_t \quad (7)$$

$$sentimnet\_index_t = (0.60179 * Comp1 + 0.31274 * Comp2)/0.91453 \quad (8)$$

From figure 3 and figure 4, it can be seen that the sentiment index and returns fluctuate more significantly around 2013 and 2016, mainly due to the large volatility experienced by the market during this period. Comparing figure 3 and figure 4, we can find that the sentiment index and the CSI 300 return have a relatively similar trend, which will be further verified in the following empirical work, for which the sentiment index will be further processed first.

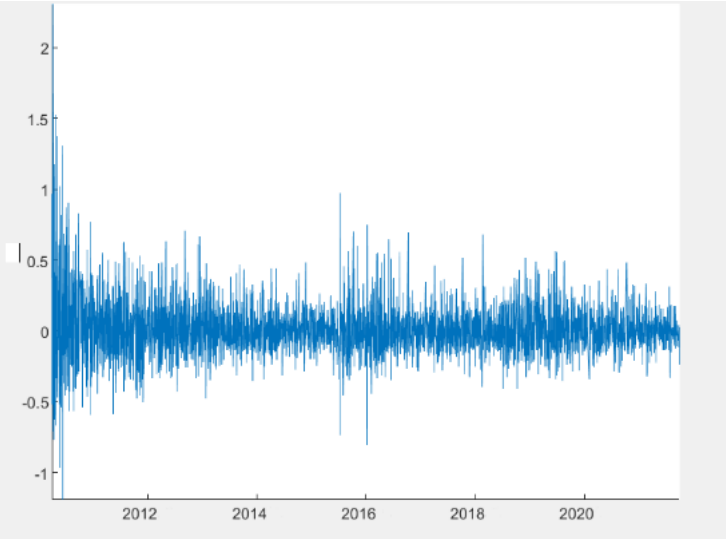

Fig 3. Trend of the change of sentiment index

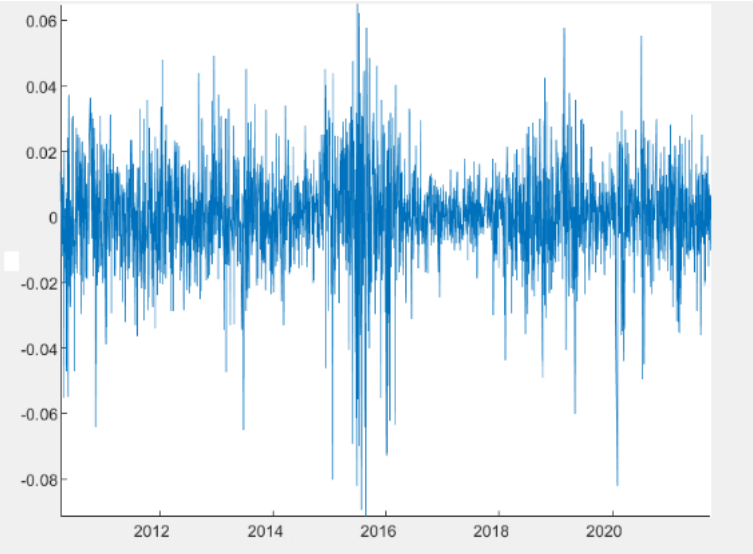

Fig 4. Trend of CSI 300 index return

3.2.2 Further processing of Sentiment Index

In practice, margin trading behavior is affected not only by irrational factors of investors' sentiment, but also by macroeconomic factors, so the constructed investors' sentiment index contains macro factors and it is necessary to exclude them. In addition, this paper considers the total data of A-share margin trading in SSE and SZSE, rather than individual stocks. Good news and bad news in the market will be decentralized and offset, and we excludes the information-driven factors in margin trading.

In this paper, the consistent index of the macroeconomic index is chosen as the macroeconomic proxy variable, and the data are obtained from the CSMAR database, and the sentiment index constructed above is further processed. Specifically, the rate of change of the sentiment index and the consistent index are regressed to obtain the residuals, and the residuals are used as the sentiment index. The macroeconomic index variable is macro_index , for which the log-rate of change is calculated as follows:

$$\Delta macro\_index_t = ln\, macro\_index_t - ln\, macro\_index_{t-1} \tag{9}$$

Regression analysis was performed as follows:

$$sentiment\_index_t = a_t^0 + a_t^1 \Delta macro\_index_t + e_t \tag{10}$$

Then, use this residual of equation (10) as the final investors' sentiment index, which is named *sentiment*.

4. Results and Discussions

4.1. VAR Model

4.1.1 Stability Test

Before empirical testing with the VAR model, we use MATLAB to check the stability of the data. Next, the constructed daily sentiment index and the CSI 300 return are tested for stability, respectively.

Table 4. DF test result of *sentiment*.

	Test Statistic	1% critical value	5% critical value	10% critical value
Z(t)	-67.373	-3.430	-2.860	-2.570

Table 5. DF test result of *hsreturn*.

	Test Statistic	1% critical value	5% critical value	10% critical value
Z(t)	-52.501	-3.430	-2.860	-2.570

Table 4 shows the test results of sentiment index and Table 5 shows the test results of the CSI 300 index return. Since the DF test statistic of *sentiment* is -67.373, the original hypothesis of the existence of a unit root can be rejected at the 1% level. Similarly, the DF test statistic of *hsreturn* is -52.501, so the original hypothesis of unit root can be rejected at the 1% level.

The ADF test was further performed and the results are shown in Table 6. The ADF test statistics of *hsreturn* and *sentiment* are -73.629 and -33.425, respectively, which reject the original hypothesis of unit root at the 1% level, so the *hsreturn* and s*entiment* series are smooth series and thus can be tested empirically by VAR.

Table 6. ADF test result of *hsreturn* and *sentiment*.

Variables		Test Statistic	1% critical value	5% critical value	10% critical value
hsreturn	Z(t)	-73.629	-3.430	-2.860	-2.570
sentiment	Z(t)	-33.425	-3.430	-2.860	-2.570

4.1.2 VAR results

In order to find the dynamic effects of investors' sentiment and the CSI 300 return, the VAR model is chosen for empirical testing. First, the optimal lag order of the model is determined. Table 7 gives a series of criteria for determining the optimal lag order, and the results show that lag order 3 is optimal.

Table 7. the criteria of VAR lag order.

Lag	LL	LR	Df	p	FPE	AIC	HQIC	SBIC
0	1624.3				5.7e-06	-6.3996	-6.39305	-6.38292
1	1675.06	101.52	4	0.000	4.7e-06	-6.58405	-6.56443	-6.53401
2	1694.37	38.626	4	0.000	4.5e-06	-6.64446	-6.61175	-6.56106*
3	1702.02	15.29*	4	0.004	4.4e-06*	-6.65884*	-6.61305*	-6.54208
4	1704.76	5.4826	4	0.241	4.4e-06	-6.65387	-6.595	-6.50375

After determining the optimal lag order, the regression equation of the VAR model is derived as follows:

$$hsreturn_t = C_t^1 + \sum_{i=1}^{3} A_i^1\, hsreturn_{t-i} + \sum_{j=1}^{3} B_j^1\, sentiment_{t-j} + \varepsilon_t^1 \quad (11)$$

$$sentiment_t = C_t^2 + \sum_{i=1}^{3} A_i^2\, hsreturn_{t-i} + \sum_{j=1}^{3} B_j^2\, sentiment_{t-j} + \varepsilon_t^2 \quad (12)$$

Using Stata, the above VAR model was tested and the empirical results reported in Table 8 and Table 9 were obtained.As shown in Table 8, when *hsreturn* is the dependent variable and *sentiment* is the independent variable, investors' sentiment has a negative but insignificant effect on stock returns, indicating that investors' sentiment has no effect on stock market returns. Since we study the effect of investors' sentiment on the overall stock market return, the stock market is filled with a large number of investors with divergent views.Both pessimism and optimism may balance each other out, having no discernible impact on the overall return on the stock market. Similarly, for the lagged term of *hsreturn*, the coefficients of lag one, lag two and lag three are positive but insignificant. This indicates that in the short run stock market returns have a positive but insignificant effect on themselves and that this effect is quickly corrected to return the stock to its underlying value.

Table 8. Regression results of equation (11)

	Coef.	t statistics
hsreturn		
sentiment		
L1	-0.00178	-0.66
L2	-0.00195	-0.72
L3	-0.00280	-1.09
hsreturn		
L1	0.0269	-0.76
L2	0.0280	-0.78
L3	0.0266	-0.94
_cons	-0.000379	-0.87

As shown in Table 9, when *sentiment* is the dependent variable and *hsreturn* is the independent variable, the coefficient of the effect of stock market returns on *sentiment* is positive at lag one and lag two, and negative at lag three, indicating that stock market returns have a positive effect on investors' sentiment in the short run, but later this positive effect disappears again in the short run. On the one hand, the positive news of the stock market stimulates investors' optimism, which in turn attracts a large number of investors to enter the stock market, and the market is bullish; on the other hand, the large number of investors' buying transactions promotes the rise of the stock market, and the rise of the stock market further stimulates investors' optimism. For the lagged term of *sentiment*, the lagged term of *sentiment* shows a negative correlation with the current period, indicating that investors' sentiment is volatile, and any changes in the market will lead to the ups and downs of sentiment, and short-term trading in the market is more obvious.

Table 9. Regression results of equation (12)

	Coef.	t statistics
sentiment		
sentiment		
L1	-0.545***	-15.83
L2	-0.245***	-7.04
L3	-0.0937**	-2.84
hsreturn		
L1	2.951***	-6.54
L2	0.870	-1.89
L3	-0.0877	-0.24
_cons	-0.0271***	-4.84

Based on the above VAR results, the following conclusions can be drawn: First, The insignificant impact of historical investors' sentiment on current returns suggests that the stock market is less influenced by noise trading. Optimistic and negative sentiment in the same market may balance each

other out, resulting in a non-significant impact on overall stock market returns. Second, The impact of return changes on investors' sentiment is significantly positive, showing that investors are more susceptible to market conditions and that investors' sentiment is persistent in the short term, which indicates that the irrational factors of investors in China's stock market are more pronounced.

4.1.3 Granger causality test

After the empirical tests with the VAR model, the variables are further tested for Granger causality. The results of the tests are given in Table 10. From Table 10, we can find that, firstly, the original hypothesis that CSI 300 index return is not the Granger cause of the change in investors' sentiment is rejected, which indicates that the prior period change in stock market return can effectively explain the change in investors' sentiment; Furthermore, the original hypothesis that investors' sentiment is not the Granger cause of return is accepted at the 1% level, and the change in investors' sentiment cannot effectively explain the change in stock market return.

Table 10. Granger causality test

Equation	Excluded	chi2	df	Prob > chi2
sentiment	hsreturn	44.573	3	0.000
sentiment	ALL	44.573	3	0.000
hsreturn	sentiment	1.3376	3	0.720
hsreturn	ALL	1.3376	3	0.720

4.2. Impulse Response Analysis

To further analyze the long-run effect between investors' sentiment and stock market return, we try impulse response analysis next.

4.2.1 VAR model stability test

As shown in Figure 5, it can be seen that the characteristic root of the VAR model characteristic equations of investors' sentiment (*sentiment*) and CSI 300 return (*hsreturn*) are within the unit circle, indicating that the VAR model is stable.

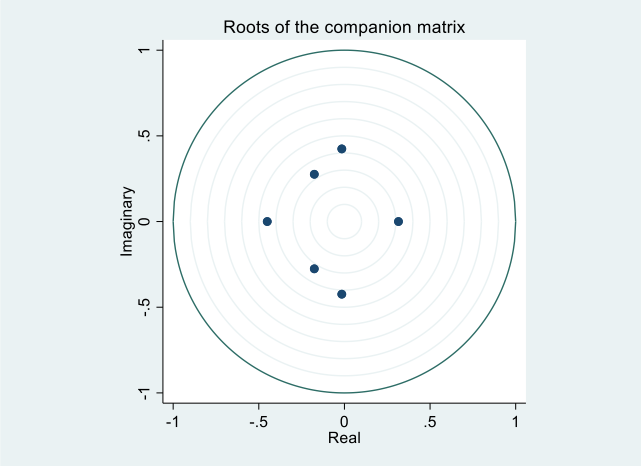

Fig 5. Roots of the companion matrix

4.2.2 Impulse Response Analysis

The VAR model states that when a variable is shocked, there is not only an impact on the present variable but also a lagged impact. Therefore, it is necessary to analyze this after-effect, so the impulse response function needs to be considered. The impulse response function reflects the dynamic effect of the variables in the model on other variables after a shock is applied, and can better portray the trend of the variables after a shock. Figure 6 presents the impulse response of variable itself and another variable after *sentiment* and *hsreturn* are subjected to shocks, respectively, where the horizontal coordinate is the lag order and the vertical coordinate is the impulse effect.

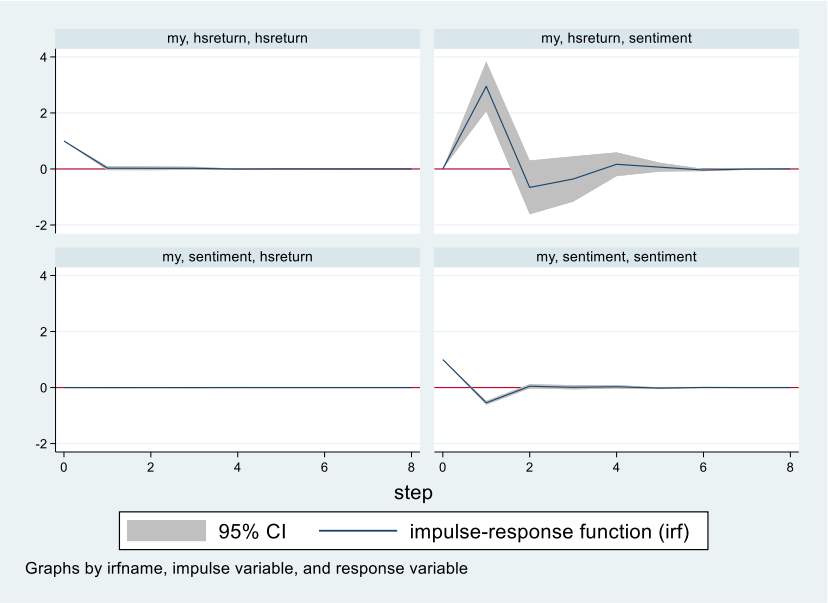

Fig 6. Impulse response

The top right panel of figure 6 depicts the trend of *sentiment* after a shock to *hsreturn*. When a positive shock is applied to the stock return, investors' sentiment is very optimistic, peaks in the first period, starts to fall below zero in the second period, then starts to regress, returns above zero in the fourth period, and levels off thereafter. That shows that investors' sentiment moves in the same direction as stock market returns, and that shocks to stock market returns have a positive and transient effect on investors' sentiment. The lower left panel of figure 6 depicts the response of *hsreturn* after a shock to *sentiment*. As can be seen from the figure, there is no significant response in stock market returns after a shock to positive investors' sentiment is imposed, due to the fact that good and bad investors' sentiment across the market cancel each other out, and our stock market is less affected by noise trading.

5. Conclusions and Implications

This paper constructs the sentiment index based on four indicators: margin trading balance, margin trading purchase volume, margin trading-short selling balance, and the proportion of margin trading, using the principal component analysis method. VAR model results show that CSI 300 index return is the Granger cause of investors' sentiment change, while investors' sentiment is not the Granger cause of return change. Further study finds that the impact of return change on investors' sentiment is significantly positive, indicating that investors are more susceptible to market situation and investors' sentiment is persistent in the short term, which indicates that the irrational factor of investors in China's stock market is more obvious. Investors' sentiment has a negative but insignificant effect on stock returns, as the stock market is filled with a large number of investors with divergent views, and optimism and negative sentiment may cancel each other out, resulting in a non-significant effect on the overall stock market returns. The results are also verified by impulse response analysis. Comprehensive analysis shows that the CSI 300 return can have a positive and significant impact on investors' sentiment, and the investors' sentiment index constructed from the perspective of margin trading can better reflect the changes in stock market returns.

The findings of our study help the Chinese regulatory authorities and financial institutions to deeply understand the impact of investors' sentiment to stock market returns, and provide reference for the formulation of relevant policies, so as to improve the sustainable development of margin trading in China. At the same time, This paper provides useful advice for institutions to strengthen regulation and for investors to make better investment decisions. First, balance the scale of the margin trading and short selling transactions. Margin trading transaction enhances the stock market liquidity, reduces the possibility of the stock market being high to a certain extent, and stabilizes the market

usage. However, the scale of short selling transactions is low and the scale of purchasing transactions is high. Regulators should provide more resources for short selling, so as to effectively suppress the fluctuation of irrational factors in trading and further drive the rational development of the market. Second, enhance the stock market information transmission mechanism to improve the capital market's stability. Financial market regulators should strengthen information disclosure, guide investors to make rational investment strategies, reduce the volatility caused by investor sentiment and macroeconomic fundamentals on the stock market, and enhance the financial market's ability to support the development of the real economy.

References

[1] Deng Chongzhen,Wang Man. A study on the impact of investor sentiment on stock market returns[J]. Market Week,2021,34(09):110-112.

[2] Yao Yuan, Wang Ruiqian. An asymmetric study of macroeconomics, investor sentiment and stock index return[J]. Price Theory and Practice,2021(01):124-127.

[3] Hu Yating, Wang Luxiu, Zhao Yue. An empirical study on the impact of individual investors' sentiment on stock returns--based on A-share market[J]. Journal of Panzhihua College,2020,37(06):64-70.

[4] Jiang Yuan. Construction and validity test of investor sentiment index in China's stock market[J]. Market Research,2020(02):17-19.

[5] Tang Zhiwu, Liu Xin. A study on the relationship between investor sentiment and pricing bias of CSI 300 stock index futures[J]. Price Theory and Practice,2020(01):111-114.

[6] Zhang Zhengchao, Liu Yuchenfei. Construction and validity test of investor sentiment index in China's stock market[J]. Business Economic Research,2018(07):156-158.

[7] Chen Qi'an, Lei Xiaoyan. Monetary policy, investor sentiment and Chinese stock market volatility:theory and empirical evidence[J]. China Management Science,2017,25(11):1-11.

[8] Liyan Han,Yang Xu,Libo Yin. Does investor attention matter? The attention-return relationships in FX markets[J]. Economic Modelling,2018,68:644-660.

[9] Hou Zhijie. The relationship between investor sentiment and stock market returns [D]. University of International Business and Economics,2016.

[10] Ma Xiaokui, Sun Jie. Construction of a comprehensive index of investors' sentiment in Chinese stock market[J]. Journal of Beijing University of Technology and Business (Social Science Edition),2012,27(06):89-95.

[11] Chen Qi'an, Zhu Min, Lai Qinyun. Research on portfolio model based on investor sentiment[J]. China Management Science,2012,20(03):47-56.

[12] Chi Lixu, Zhuang, Xintian, A study of investor sentiment in Chinese securities market[J]. Management Science,2010,23(03):79-87.

[13] Zhang Fang, Zeng Qingduo. Research on the relationship between investor sentiment and stock market returns in the context of margin trading securities--an empirical test based on the CSI 300 index[J]. Price Theory and Practice,2021, (06):123-128.

[14] Yang Yang, Wan Difang. Heterogeneous phenomena of investor sentiment and stock market returns and earnings volatility under different market states-an empirical analysis based on the SSE stock market[J]. Systems Engineering,2010,28(01):19-23.

[15] Zhang Qiang, Yang Shu-E. Noise trading, investor sentiment volatility and stock returns[J]. System Engineering Theory and Practice,2009,29(03):40-47.

[16] Malcolm Baker, Jeffrey Wurgler. Investor Sentiment in the Stock Market[J]. The Journal of Economic Perspectives,2007,21(2):129-152.

[17] Cheng Kun, Liu Renhe. A study on the interaction between investor sentiment and stock market[J]. Shanghai Economic Research,2005(11):88-95.

[18] Gregory W. Brown, Michael T. Cliff. Investor Sentiment and Asset Valuation[J]. The Journal of Business,2005,78(2):405-440.

[19] Wang Meijin, Sun Jianjun. Chinese stock market returns, return volatility and investor sentiment[J]. Economic Research,2004(10):75-83.

[20] Malcolm Baker, Jeffrey Wurgler. Investor Sentiment and the Cross-Section of Stock Returns[J]. The Journal of Finance,2006,61(4):1645-1680.