

# The Impact of Investor Sentiment on Stock Yield

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**Abstract:** In recent years, China's stock market has developed rapidly, but there is still a certain gap compared with western mature market. The stability of China's stock market is insufficient and the fluctuation range is large. An important reason for this phenomenon is that investors in the market are often in an irrational state, and there are a lot of irrational behaviour in the market. Therefore, this paper establishes a VAR model to study the relationship between investor sentiment and stock yield. Among them, the yield of the Shanghai Composite Index represents the yield of the stock market, and the comprehensive index of investor sentiment is constructed through principal component analysis. The results show that: (1) there is a significant interaction between stock yield and investor sentiment in China in the short term, and stock yield is less affected by investor sentiment than the investor sentiment is affected by stock yield. (2) with the passage of time, the impact of investor sentiment on stock yield gradually decreases.

**Keywords:** Investor sentiment, Stock yield, PCA, VAR

## 1 Introduction

Compared with the mature stock market in the west, the stock market has a short development time and there is still a market phenomenon that needs to be improved and perfected in China. An important one is that most investors in the market have irrational behaviour, and some investors blindly follow the direction of market opinion and lack the ability to independently analyse and make the right investment decisions. Therefore, it is necessary to understand the formation process of investor sentiment and the interaction between investor sentiment and stock yield.

This paper firstly sorts out the representative literature on investor sentiment measurement and the relationship between investor sentiment and the stock market at home and abroad. One of the most representative sentiment indicators is the BW composite sentiment index [1], which is obtained by principal component analysis of six indicators including monthly stock trading volume, closed-end fund discount rate, stock returns, first-day return rate of listed companies, issuance of listed shares of enterprises and issuance of stocks and bonds. Secondly, combined with the previous research experience of scholars, aiming at the characteristics and current situation of China's stock market, a comprehensive index of investor sentiment is constructed

by principal component analysis. Finally, the impact of investor sentiment on stock yield is studied using a vector autoregression model.

## **2 Literature review**

Behavioural finance argues that the price of a stock is not determined by the intrinsic value of a company, but is largely influenced by investor sentiment. Therefore, this paper mainly focuses on how to measure investor sentiment and use it to study the relationship between investor sentiment and stock yield.

Due to the relatively mature development of the western stock market, foreign scholars have conducted more research on investor sentiment, mainly focusing on the construction of investor sentiment and the impact of investor sentiment on stock yield. The BW sentiment composite index, which is generally recognized by the academic community, has a certain predictability for stock returns and exhibits a negative correlation. Stocks with lower investor sentiment usually perform better later, and stock returns will increase [2]. Moreover, through the study of the sentiment index compiled by the data obtained from the survey, it is also found that there is a negative correlation between investor sentiment and the future returns of the stock market [3].

Besides, it is worth noting that the comprehensiveness and rationality of the selection of a single sentiment proxy indicator will directly affect the accuracy of the constructed investor sentiment index [4]. Based on the actual characteristics of China's stock market, domestic scholars used text mining technology to extract the comment data of Oriental Fortune Stock bar to construct an investor sentiment index of online media, and found that stock price and online investor sentiment have a two-way feedback effect [5]. In particular, there is a strong positive correlation between investor sentiment and stock price changes, and stock yield will increase when investor sentiment is high [6].

From the above research, it can be found that many scholars have carried out research on the correlation between investor sentiment and stock return. Due to differences in research objects, selected sentiment proxy indicators, comprehensive index construction methods and research sample periods, the results of the above research content are not consistent, but it is certain that there is a correlation between investor sentiment and stock yield. Therefore, this paper constructs a comprehensive sentiment index based on the comprehensiveness and availability of the indicators, which has certain practical significance.

## **3 Research design**

### **3.1 The Selection and Data Source of Investor Sentiment Proxy Indicators**

This paper selects six proxy indicators of investor sentiment, including closed-end fund discount rate (DCEF), market turnover rate (TRUN), number of new investors accounts (NA), price-earnings ratio (PE), consumer confidence index (CCI) and volume (VOL). All data come from CSMAR database.

### 3.2 The Selection and Data Sources of Macro Variables

Since the selected indicators reflect not only the irrational sentiments of investors, but also the effects of macroeconomics, we need exclude the influence of macroeconomic factors when constructing a comprehensive indicator of investor sentiment. The macroeconomic indicators selected in this paper include consumer price index (CPI), producer price index (PPI), and macroeconomic sentiment index (MBCI). The data of the CPI and the PPI are from the Cathay Pacific database, and the data of the MBCI comes from the global macro data website.

### 3.3 The Construction of Investor Sentiment Composite Index

In this paper, principal component analysis method is used to construct a composite index of investor sentiment. Since each sentiment indicator reflects investor sentiment at different levels, the information revealed by different sentiment indicators are bound to overlap, and each sentiment indicator contains heterogeneous factors unrelated to sentiment. Therefore, we must use principal component analysis to reduce the dimension of the initial sentiment indicator and extract the principal component as the proxy variable for sentiment.

**Construction of Initial Investor Sentiment Indicator:** Since the proxy indicators of investor sentiment may have a lag effect on the reflection of investor sentiment index, this section selects six proxy indicator variables of DCEF, TURN, NA, PE, CCI, and VOL for the current period. At the same time, the lagging period of the six proxy indicators is selected.

Firstly, KMO test and Bartlett sphericity test shows the 12 sentiment proxy indicators are suitable for principal component analysis.

Secondly, a Pearson correlation analysis will be performed between the investor sentiment index  $ISI_1$  constructed by principal component analysis and the original 12 proxy indicator variables, and the six indicators with the highest correlation are selected as the final sentiment proxy indicators.

Finally, the second principal component analysis was performed to obtain the investor's comprehensive sentiment index  $ISI_2$ .

**Construction of Macroeconomic Indicators:** There is a certain multicollinearity relationship among the five variables of consumer price index (CPI), industrial price index (PPI), macroeconomic consensus index (con), leading index (pre) and lagging index (lag). Therefore, through the principal component analysis of these five variables, the principal components whose cumulative variance contribution rate reaches 80% are extracted and weighted according to the variance contribution rate to construct a comprehensive index MPC.

**Construction of Composite Index of Investor Sentiment:** Linear regression is performed between the investor sentiment index  $ISI_2$  constructed above and the comprehensive macroeconomic variable MPC, and the residual result obtained is the final required comprehensive investor sentiment index CISI.

### 3.4 Validity Test of Composite Index of Investor Sentiment

Through the test of the Pearson correlation coefficient, it is found that the correlation between the Shanghai Composite Price Index and the Investor Sentiment Composite Index CISI is as high as 0.870 at a significant level of 1%, indicating that investor sentiment has a non-negligible

impact on the stock yield. And as can be seen from Figure 1, the trend of CISI is basically consistent with the trend of Shanghai Composite Index, indicating the effectiveness of the comprehensive index of investor sentiment to a certain extent.



Figure 1: Investor sentiment composite index and stock return trend comparison.

## 4 Empirical analysis

### 4.1 Descriptive Analysis

This paper selects the investor sentiment index constructed in Chapter 3 and the Shanghai Composite Index for empirical analysis. The selected data are all monthly data from 2010 to 2019. The descriptive analysis of variables is shown in the table 1.

Table 1: Descriptive analysis.

variable	mean	median	maximum	minimum
CISI	0.000	0.000	2.582	-1.419
SZ	0.001	-0.001	0.206	-0.227

### 4.2 Construction of the VAR Model

VAR model is often used to predict the interaction between variables and analyse the dynamic influence of random disturbance on the variable system. Therefore, this paper uses VAR model to study the relationship between investor sentiment change and stock yield. The matrix expression of the model is as follows:

$$\begin{pmatrix} \text{CISI}_t \\ \text{SZ}_t \end{pmatrix} = A_1 \begin{pmatrix} \text{CISI}_{t-1} \\ \text{SZ}_{t-1} \end{pmatrix} + \dots + A_p \begin{pmatrix} \text{CISI}_{t-p} \\ \text{SZ}_{t-p} \end{pmatrix} + \begin{pmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{pmatrix} \quad (1)$$

**Stationarity Test:** The VAR model requires that the variables involved must be stable time series. Therefore, in order to accurately and dynamically explain the relationship between investor sentiment and the yield of the Shanghai Composite Index, the unit root ADF test method should be used to test whether the time series of investor sentiment indicator and stock market yield are stationary before establishing the model for empirical analysis to avoid spurious regressions.

It is tested when the significance level is set to 1%, neither CISI nor SZ time series has a unit root, which means that they are both stationary time series and meet the preconditions of the VAR model.

**Selection of Optimal Lag Order:** When determining the optimal lag order of the model, it is necessary to ensure that there are an appropriate number of lag variables to reflect the dynamics of the model, and to reduce the loss of degrees of freedom to ensure the validity of the model. This paper uses AIC, SC, HQ and other criteria to determine the optimal lag order of the model. When the lag order is 2, the AIC criterion, the HQ criterion and the FPE are obviously in a significant state. So select the lag order to be 2 to establish the VAR model.

**Analysis of regression results:** After selecting the vector autoregression model with second-order lag for research, this paper carried out regression on CISI and SZ, and the regression results are shown in Table 2.

According to the results in Table 2, it can be concluded that the stock yield with a lag period has a significant positive impact on investor sentiment. Investors have a serious herd effect and tend to chase good news. The investor sentiment with a lag period has a significant positive impact on the stock yield. The high investor sentiment will increase investors' expectation of future returns, increase the demand for stocks, and then push up the stock price, which is manifested as the herd effect and overconfidence of investors. Investor sentiment with a lag of two periods has a significant negative impact on the yield, indicating that investor sentiment has a reverse effect on the yield, which is manifested by investors' overconfidence, underestimation of the value of public information and insufficient response to new public information. When investors are still immersed in the optimistic atmosphere of the bull market, investor sentiment is getting higher and higher. Even if the market adjusts, investors ignore the signs of the upcoming market is about to reverse due to overconfidence or insufficient response to information, and still hold an optimistic attitude towards the future stock market trend. Similarly, under the pessimistic atmosphere of the bear market, investor sentiment is getting lower and lower. Even if the market rebounds, they still hold a pessimistic attitude towards the future stock market trend due to underestimation of the value of public information and insufficient response to information.

Table 2: Estimated results of the VAR model.

	CISI (-1)	CISI (-2)	SZ (-1)	SZ (-2)
CISI	0.749*** (0.098)	0.133* (0.096)	2.301*** (0.542)	0.439 (0.542)
SZ	0.030** (0.017)	0.043*** (0.017)	0.105 (0.096)	0.153* (0.096)

where standard error in (), \*, \*\*, \*\*\* represent significant at the 10%, 5%, and 1% levels.

### 4.3 Granger Causality Test

In order to test whether the relationship between investor sentiment and stock yield can help explain future changes of each other in the case of including past information of SZ and CISI, granger causality test is conducted in this paper.

The result shows that SZ is the Granger cause of CISI at the significance level of 5%, and CISI is the Granger cause of SZ at the significance level of 1%, indicating that there is a two-way Granger causality relationship between investor sentiment and stock yield.

### 4.4 Impulse Response and Variance Decomposition Analysis

**Impulse Response:** Before performing the impulse analysis, we need to test the stationarity of the VAR model, and AR unit root test is used in this paper. The result shows that the eigenvalues of the VAR model are all within the unit circle, indicating that the model is stable.

According to Figure 2, it can be seen that the positive shock of one unit of investor sentiment will increase the stock yield in the future period, that is, when the investor sentiment is high, the stock yield will rise. However, the stock yield will decline in the second period, and the second period and after will be negative responses, and then it will be close to 0. the positive shock of one unit of stock yield will increase investor sentiment in the next period and reach a peak in the second period, and the shock will gradually decrease to zero after the third period.

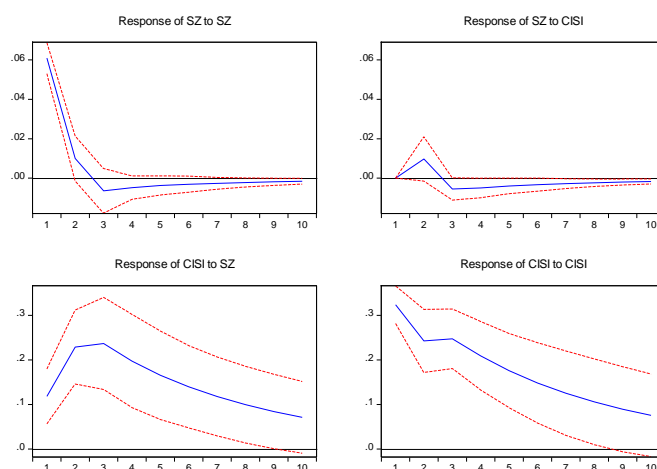


Figure 2: VAR model impulse response plot.

**Variance Decomposition Analysis:** As can be seen from the figure 3, fluctuations in stock market yield and investor sentiment mainly come from their own shocks. In the forecast of stock yield, the error of the first period of the predicted value all originate from itself. With the extension of the forecast period, the proportion of the error originating from the investor sentiment index increases. In the prediction of investor sentiment index, 88% of the error in the first-period forecast value comes from itself, and 12% of the error comes from the impact of stock yield. With the extension of the forecast period, the share of the error originating from

stock yield increases. In general, the impact of changes in the return of the Shanghai Composite Index on investor sentiment fluctuations is greater than the impact of changes in investor sentiment on the fluctuations in the return of the Shanghai Composite Index.

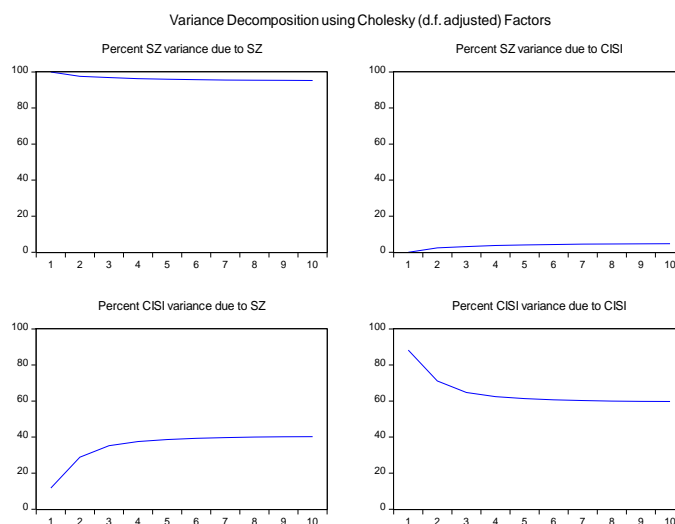


Figure 3: VAR model variance decomposition analysis.

## 5 Conclusion and prospect

### 5.1 Conclusion

With the development of China's stock market, there have been many anomalies that cannot be explained by traditional financial theories. The existence of a large number of noise traders in the market and irrational characteristics of investors chasing up and falling and herd effect cause securities prices to fail to objectively and truly reflect the information that appears in the stock market. Therefore, it is very important to study the influence degree of investor sentiment on stock prices to improve the market supervision system.

Starting from the construction of a comprehensive index of investor sentiment, this paper studies the impact of investor sentiment on stock yield in China. First of all, based on the availability and representativeness of indicators, combined with the operating characteristics of China's stock market, this paper selects six indicators as proxy indicators of investor sentiment, which are the discount of closed-end fund discount rate (DCEF), market turnover rate (TRUN), number of new investor accounts (NA), price-earnings ratio (PE), consumer confidence index (CCI), trading volume (VOL). Secondly, after appropriate selection of current and lagging variables of proxy indicators and excluding the influence of macroeconomic fundamentals, a more appropriate comprehensive index of investor sentiment is constructed by using principal component analysis method. Finally, VAR model is established to study the relationship between investor sentiment and stock yield and the following conclusions are drawn:

Firstly, through the pearson correlation test and the trend comparison chart of the investor sentiment composite index and the Shanghai Composite Index, it can be found that the

composite investor sentiment index (CISI) and the Shanghai Composite Index yield (SZ) have a significant correlation, and investor sentiment has a non-negligible impact on stock yield, which proves that the indicator of investor sentiment selected in this paper is feasible.

Secondly, there is a significant interaction between investor sentiment and stock yield in China in the short term. The estimation results of the VAR model show that the stock return with a lag period has a significant positive impact on investor sentiment and the investor sentiment with a lag period on the stock return, which is manifested as the herd effect of investors. Investor sentiment with a two-period lag has a significant negative impact on yield, indicating that investor sentiment has a reversal effect on yield, which is manifested by investors' overconfidence, insufficient response to new information, and underestimation of the value of public information.

Finally, according to the results of impulse response and variance decomposition analysis, it is concluded that the stock yield is less affected by investor sentiment than the investor sentiment is affected by stock yield. And over time, the impact of investor sentiment on stock return has diminished. Besides, when stock yield rises, investor sentiment will rise. In the long run, the good news of rising stock yield has been digested by investors, and the impact of stock yield on investor sentiment has gradually diminished.

## 5.2 Prospect

This paper studies investors as a large group, but there are differences in investors, such as individual investors and institutional investors, investors with high education degree and investors with low education degree, and investors with rich investment experience and investors with little investment experience. In other words, investor sentiment is heterogeneous. Therefore, the conclusion drawn in this paper is an overall generalization. Future research could attempt to differentiate investors to complement further research on investor sentiment.

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