



A study on the Influence of Investors' Mood Fluctuation on Returns in Securities Market

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Abstract. China's securities market is in the process of rapid expansion, but the relevant system is not mature enough. Therefore, based on the realistic background, this paper studies the relationship between investor sentiment and securities returns, which is helpful to analyze the different relationships between investor sentiment and securities indexes of different scales. It also helps to dig deep into the mechanism between the two to reasonably estimate the future development trend of the securities market, guide investors to invest more rationally, and promote the healthy development of securities trading. First of all, a compound emotion index is constructed from several single indicators, and a comprehensive index of investor sentiment suitable for the securities market is constructed, and then, it is proved that investor sentiment and securities return are cause and effect each other, and there is a two-way positive correlation. Finally, we analyze how investor sentiment affects market volatility, and the empirical results show that investor sentiment also has a magnifying effect on market volatility.

Keywords: stock market; mood fluctuation; return on investment; influence relationship

1 Introduction

There is a popular saying about the investment strategy of the securities market: the best time to buy securities is when retail investors are bearish, and the best time to sell

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securities is when retail investors are bullish. This illustrates the following points: first, retail investors' perception of the market is important; second, retail investors' decisions are usually wrong; and third, retail investor sentiment may support market timing decisions. The most fundamental reason is that trading by retail investors is largely emotional. Unlike institutional investors who rely on professional analysis and professional tools, retail investors are often regarded as so-called noise traders, that is, the information they receive is not based on currently available information, but on historical information. or based on some eye-catching news or rumors [1]. In addition, retail investors are prone to cognitive biases in the trading process and often make some of the same mistakes. Therefore, investor sentiment will have an impact on the trading activities of the securities market that can not be ignored.

In the past few decades, the cost of capital and investment decisions proposed by KennedyFM and GilbertNN play an important role in financial theory. Nevertheless, since the establishment of the efficient market hypothesis, scholars have been trying to question it from various aspects. The most noteworthy of these questions is that some theoretical assumptions about the behavior of individual investors in this hypothesis are too idealistic. For example, the complete rationality of investors, irrelevance of irrational investors, completely effective arbitrage and so on. Since the 1980s, scholars began to look for some evidence to refute the efficient market theory, which gave birth to a new research field of behavioral finance. Based on the two main hypotheses of limited arbitrage and investor irrationality, behavioral finance aims to combine the views of psychology with the theory of neoclassical economics. Investor sentiment, as one of the pillars of behavioral finance, is a theory that studies how investors form their beliefs about future markets or future asset prices. In reality, investors often make investment decisions not only based on some simple facts or basic information, but also on personal intuition, psychological or personality characteristics, as well as the comments and opinions of other investors[2].

2 Concept Definition

2.1 Investor Sentiment

From the perspective of psychology, emotion refers to the attitude and experience of people towards objective things and the summary of corresponding behavioral responses. In the financial market, the mood fluctuations caused by investors'

participation in financial activities may cause changes in their investment behavior, which will lead to irrational changes in asset prices in the market. According to the traditional financial theory, even if investor sentiment has an impact on asset prices, arbitrage will correct the deviated prices [3]. However, a growing number of subsequent financial anomalies suggest that the impact of investor sentiment on asset prices is likely to be crucial.

2.2 Measurement of Investor Sentiment

Emotion, as an extremely complex psychological activity in human daily life, is one of the most concerned research objects in the field of psychology. From the perspective of behavioral finance, the psychological complexity of heterogeneous investors and the uncertainty of the financial market are intertwined, which makes investor sentiment difficult to be directly measured. However, the premise of the related research on investor sentiment and securities returns and their fluctuations is to accurately measure the investor sentiment in the market [4]. Because of this, in the past few decades, a large number of scholars have devoted themselves to trying to accurately define investor sentiment through a variety of methods and from different angles. Although no agreement has been reached so far, the mainstream proxy indicators of investor sentiment can be broadly divided into three categories, as shown in Table 1.

Table 1. Indicators of investor sentiment agency

Classification	Describe	Illustrate
Market based individual direct or indirect substitute indicators	We subdivide investor sentiment into four aspects: economic fundamentals, economic policies, international economic and financial environment, and stock market valuation, and analyze the dynamic impact of categorized sentiment on stock market volatility.	American Association of Individual Investors Index, Investor Intelligence Index, Consumer Confidence Index, Positive/Negative Index, Huading Long Short Opinion Survey, etc
Constructing an	The characteristic of	Closed end fund

overall market sentiment index using principal component analysis based on multiple individual indicators	principal component analysis method is that it can filter out the heterogeneous noise of each factor, thereby retaining the common parts of each factor.	discount rate, number of IPOs, turnover rate, first day of listing yield, etc
Utilize content such as the internet, news, and social media to explore investor sentiment	Obtain public sentiment indicators and find that the prediction accuracy of the standard stock market prediction model has significantly improved after incorporating public sentiment indicators.	Using machine learning algorithms to classify online forum comments into bullish or bearish categories

At present, there are mainly three methods to construct emotional indicators, and each of these three methods has its own advantages and disadvantages. The first kind of agency index to measure investor sentiment is mainly based on market survey data or market transaction data to get a single subjective or objective index, which can only describe investor sentiment from a single aspect. The second category is to extract a common factor from a number of variables that can reflect investors' trading behavior and market heat, which can be used as a measure of investor sentiment.

3 The Construction and Effectiveness Analysis of Investor Sentiment Index

3.1 Variables And Methods of Constructing Investor Sentiment Agent Index

Considering that the Chinese securities market is more irrational and the herding effect is more prominent than the European and American markets, in order to improve the timeliness of the data and the accuracy of the expression effect, the idea of this paper is to select the proxy variable of daily frequency. after screening, the market turnover, the ratio of the number of rising and falling securities in the securities market, trading volume and price-to-earnings ratio are selected to construct the index. The following lists the significance of the selection of these variables and literature support. Specifically, this paper selects the data from January 4, 2015 to

December 31, 2023 as a sample, a total of 2188 trading days, the data are from the Wind database. Table 2 lists the four proxy metrics and their implications

Table 2. Agent variable scale selected in this paper

Variable	Abbreviation	Meaning
Turnover rate	TURN	The ratio of securities bought and sold within a certain period of time
Rise and fall ratio	ADR	The ratio of the number of rising securities in the market to the sum of the number of rising and falling securities
Turnover	VOL	The number of transactions of securities within a certain period of time in the market
P/E ratio	PE	The ratio of securities market price to earnings per share

Turnover rate: this index can not only reflect the current liquidity of securities or the market, but also reflect changes in investors' demand for securities. when the turnover rate is very high, it shows that a security is very hot, and when the turnover rate is very low, it shows that most investors are in a wait-and-see or bearish situation [5]. The earliest BW method in the theory of compound emotional indicators uses the turnover rate as one of the emotional proxy variables. Rise-fall ratio: if the rise-fall ratio rises, it means that the securities of most companies in the market are rising, and investor sentiment is in a relatively high position: on the contrary, when the rise-fall ratio falls, the share prices of most companies in the market are falling. investor sentiment is in a relatively low position. Brown and other studies use the ratio of the number of rising and falling companies as one of the emotional proxy variables to construct investor sentiment. The empirical results show that this index can better measure investor sentiment.

Trading volume: that is, the number of transactions, it is clear that the larger the number, the higher the heat of the securities, and vice versa.

Price-to-earnings ratio: refers to the ratio of the market price of securities to earnings per share. It is a very classic value used to judge the performance of securities. The higher the index, the higher the heat, and vice versa.

3.2 Descriptive Statistics of Proxy Variables

First of all, from the analysis of the relationship between the centralized variables selected in the article as a starting point to judge the feasibility of using them to construct emotional index. Table 3 is the correlation table between variables. From the correlation coefficient, we can see that the correlation analysis results of the four proxy variables, such as turnover, price-to-earnings ratio, trading volume and the ratio of rising and falling securities, have a significant correlation at 1% and 5% levels, so these variables can be used for the following principal component analysis to construct investor sentiment (hereinafter referred to as SENT).

Table 3. Correlation analysis of investor sentiment proxy variables

Relativity				
	VOL	PE	TURN	ADR
VOL	1			
PE	0.651**	1		
TURN	0.862**	0.598**	1	
ADR	0.083**	0.045*	0.118**	1

Note: * * means significant at 5% level, * indicates significant at 10% level.

3.3 The Construction of Emotional Index

Because there are no good experimental results in the case of selecting only the above four kinds of proxy variables, and some studies have shown that there is a certain relationship between variables with similar time nodes in the time series, this paper continues with the next attempt. Select 4 kinds of variables in t period plus 4 kinds of variables in tMui 1 period, a total of 8 kinds of variables, the result is relatively good at this time. Table 4 shows the results of principal component analysis of these eight variables.

Table 4. SENT results of suitability test of principal component analysis

KMO sampling suitability quantity	0.595
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Bartlett's sphericity test	Approximate chi square	26218.018
	Degree of freedom	28
	Significance	0.000

First of all, use spss software to do KMO and Bartlett test on the agent variables selected in this paper, through this test can be used to analyze whether this group of data can be used for factor analysis. The basic requirement is that factor analysis can be done when KMO is greater than 0.5 and the P value of Bartlett test is less than 0.05. It can be seen from Table 5 that the KMO test coefficient is 0.595 and the result of the Bartlett test is 0.000, which is less than 0.05. Therefore, the data structure of the research variable is more reasonable, and then we can continue to extract the principal components of the emotional agent variable.

Table 5. Explanation table of total variance

Component	Initial eigenvalue			Extracting the sum of squared loads		
	Characteristic value	Variance percent age	Accumulated%	Characteristic value	Variance percent age	
1	4.669	58.357	58.357	4.669	58.357	58.357
2	1.023	12.782	71.139	1.023	12.782	71.139
3	1.000	12.497	83.636	1.000	12.497	83.636
4	0.825	10.309	93.945			
5	0.239	2.984	96.929			
6	0.221	2.763	99.692			
7	0.023	0.293	99.984			
8	0.001	0.01	100.000			

According to the factor analysis of the above eight variables, the total variance explanation table can be obtained, and the principal components used to construct investor sentiment can be determined according to the results of Table 5. It can be clearly seen from the total variance explanation table of Table 5 that among the 8 principal components, the eigenvalues of the first three principal components are all greater than 1, principal component 1, principal component 2 and principal component 3, respectively, and the cumulative variance contribution rate of the three principal components is 83.636% (more than 80%).

Table 6. Component score coefficient matrix

Investor sentiment proxy variables	Component		
	1	2	3
VOL_t	0.192	0.054	0.034
C	0.187	-0.141	-0.061
$TURN_t$	0.186	0.140	0.076
ADR_t	-0.004	-0.026	0.983
VOL_{t-1}	0.194	-0.005	0.002
VOL_{t-1}	0.187	-0.142	-0.113
$TURN_{t-1}$	0.189	0.053	0.050
ADR_{t-1}	-0.024	0.958	-0.026

To sum up, there is a certain correlation between SENT and the fluctuation trend of the three securities indexes shown in the chart. At the same time, through the observation of the highest point of the above figure, it can be found that the securities index rose to its peak in 2018 from 2015 to 2023, and SENT also rose to the highest point in 2018, which is consistent with the great bull market of China's securities market in the first half of 2018 and the securities slump after June 2018. Therefore, the SENT constructed above can reflect the general changes of investor sentiment to some extent, and we can use SENT to continue the next step of research. The investor sentiment index (SENT) can describe whether the investment psychological state of investors is optimistic, pessimistic or neutral in a numerical range. The index range established in this paper (0-10), the closer the value is to 0, the more pessimistic the investment attitude of the securities participants is, the value about 5 indicates that the

securities participants have a relatively normal investment attitude, and the closer the value is to 10 indicates that the attitude of the whole market is extremely optimistic.

4 An Analysis of The Relationship Between Investor Sentiment Fluctuation and Securities Index Return

4.1 Data Source

Securities price index is an index that can be used to show the overall price fluctuation of securities, and it is usually used as one of the comparison and evaluation criteria of investment performance. This paper takes the CSI 300 Index, CSI 100 Index and CSI 500 Index from January 4, 2015 to December 31, 2023 as samples of securities index, with a total of 2188 data. The selected subjects have a relatively long time span and can better reflect the fluctuation of long-term time series. The data source is wind database.

4.2 Model Demonstration

1. Unit root test of variables.

Unit root test is the premise of establishing the model VAR, so the stationarity of the variables contained in the model needs to be tested first. In this paper, the ADF test is used to test whether the four financial time series SENT, H300, Z100 and Z500 are stationary, in order to avoid pseudo-regression. The test results are as follows:

Table 7. SENT and the unit root test results of the returns of three kinds of Shanghai and Shenzhen representative indices

Variable	ADF value	5% critical value	1% critical value	Conclusion
SENT	-2.18	-2.86	-3.43	Unstable
D (SENT)	-17.48	-1.94	-2.57	Stable
H300	-45.22	-1.94	-2.57	Stable
Z100	-45.53	-1.94	-2.57	Stable
Z500	-43.99	-1.94	-2.57	Stable

In Table 7, D (SENT) is the first-order difference of investor sentiment index. H300, Z100 and 2500 represent the logarithmic returns of CSI 300, CSI 100 and CSI

500 respectively. From the ADF values in the test results, it can be concluded that H300, Z100 and 2500 are all stable, but at the beginning of the test, SENT is found to be unstable, and after D (SENT) processing, it is found that it is stationary, so this difference sequence can be used for further exploration.

2.Granger causality test.

After confirming that the four financial time series to be studied in this paper are stable, we continue to conduct Granger causality test on SENT, H300, Z100 and Z500.

Table 8. SENT and the results of Granger causality Test of three kinds of Securities returns

Original assumption:	F-statistic	P-value
D (SENT) cannot Granger cause H300	75.6	0.0000
H300 cannot Granger cause D (SENT)	8.07	0.0177
D (SENT) cannot Granger cause 2100	73.2	0.0000
Z100 cannot Granger cause D (SENT)	7.95	0.0188
D (SENT) cannot Granger cause Z500	52.45	0.0000
Z500 cannot Granger cause D (SENT)	6.78	0.0154

As can be seen from Table 8, the P values of the original assumptions listed are 0.0000, 0.0177, 0.0000, 0.0188 and 0.0154, respectively, all of which are much less than 0.05. Therefore, they all reject the original hypothesis at a significant level of 5%, so there is a Granger causality between SENT and H300, Z100 and Z500.

3.Determination of lag order of VAR Model

Next, the lag order required by the model is determined, and the test results are shown in Table 9. It can be found that LR, FPE, AIC, SC and HC all have asterisks at the 8th stage. Therefore, after a comprehensive judgment, the maximum lag order of the model selected in this paper is 8.

Table 9. Check table of lag order of VAR model for SENT

L	LogL	LR	FPE	AIC	SC	HQ
ag						
0	23062.	NA	79e-15	-21.174	-21.163	-21.170
	80			29	85	47
1	23976.	1822.9	3.28e-	-21.998	-21.946	-21.979
	35	00	15	49	27	40

2	24552.	1147.4	196e-1	-22.512	-22.418	-22.478
	48	86	5	83	85	47
3	24885.	661.89	1.47e-	-22.803	-22.668	-22.754
	41	11	15	86	11	23
4	25067.	361.64	126e-1	-22.956	-22.778	-22.891
	65	07	5	52	99	62
5	25209.	281.56	1.12e-	-23.072	-22.853	-22.992
	81	85	15	36	06	19
6	25336.	250.46	1.01e-	-23.174	-22.919	-23.078
	49	74	15	01	3	56
7	25420.	165.98	9.52e-	-23.236	-22.933	-23.125
	61	45	16	55	71	83
8	25484.	126.25	9.11e-	-23.280	-22.936	-23.154
	70	07*	16*	72*	10*	73*

4.3 Characteristics of Return and Emotional Indicators

The lag order of ARMA-GARCH model is selected according to AIC and BIC. The AR order and MA order of emotional index were 8 and 2, respectively. The order of GARCH and GARCH were both 2. The AR order and MA order of the return series are 8 and 6 respectively. The GARCH order and the arch order are 2 and 1 respectively. The estimated results of ARMA-GARCH model for emotional index and return series are shown in tables 10 and 11, respectively.

Table 10. Results of ARMA-GARCH model for emotional indicators

Parameter	Estimated value	Standard deviation	Statistical value	P-value
u	-0.579	0.057	-10.150	0.000
a ₁	0.976	0.118	8.290	0.000
a ₂	0.478	0.104	4.611	0.000
a ₃	-0.634	0.084	-7.517	0.000
a ₄	0.178	0.030	5.998	0.000
a ₅	-0.035	0.024	-1.484	0.138
a ₆	-0.010	0.022	-0.442	0.658
a ₇	0.024	0.019	1.232	0.218

a ₈	0.015	0.021	0.711	0.477
s ₁	0.118	0.117	1.005	0.315
s ₂	-0.594	0.089	-6.697	0.000
o	0.000	0.000	28.220	0.000
c ₁	0.181	0.043	4.218	0.000
c ₂	0.000	0.136	0.000	1.000
b ₁	0.379	0.609	0.622	0.534
b ₂	0.415	0.529	0.853	0.394

Table 11. ARMA-GARCH model results of return series

Parameter	Estimated value	Standard deviation	Statistical value	P-value
u	0.107	0.259	0.413	0.680
a ₁	-0.312	0.139	-2.249	0.025
a ₂	0.977	0.172	5.681	0.000
a ₃	0.347	0.180	1.932	0.053
a ₄	-0.519	0.310	-1.677	0.094
a ₅	0.1360.501	0.271	0.501	0.617
a ₆	0.466	0.148	3.143	0.002
a ₇	-0.167	0.203	-0.824	0.410
a ₈	0.067	0.018	3.759	0.000
s ₁	0.311	0.139	2.236	0.025
s ₂	-0.991	0.170	-5.833	0.000
s ₃	-0.316	0.176	-1.802	0.072
s ₄	0.551	0.306	1.799	0.072
s ₅	-0.180	0.255	-0.705	0.481
s ₆	-0.529	0.150	-3.516	0.000
o	0.014	0.006	2.320	0.020
c ₁	0.021	0.018	1.184	0.236
c ₂	0.060	0.024	2.553	0.011
b ₁	0.700	0.276	2.539	0.011

4.4 Countermeasure and Suggestion

In recent years, China's economic development momentum is relatively rapid, has been among the forefront of big countries, the number of participants in securities is increasing and the securities are becoming more and more standardized, and investors' knowledge reserves for securities are also increasing step by step. but from the healthy and mature market, we still have many aspects to improve.

The securities market can be likened to an ecosystem in which market regulators, investors, listed companies, issuers and even social media for information dissemination constitute the whole system. and each component should clearly position and understand its position in the securities and the direction of efforts. For individual investors, the amount of money, operational concept, knowledge structure and psychological bearing capacity determine their different positions-ultra-short, quantitative, trend or long-term investment and other strategies are ways to make money. Individual investors will face a variety of choices because of their uniqueness, so it is very important for institutional investors to maintain and promote their own professionalism. If there is no internal risk prevention and control mechanism, can not use modeling and other technical means for effective risk control, then it will have a relatively negative impact on investment decisions and even the securities market [6]. For social media, the existence of false information, exaggerated information and non-objective reports will greatly mislead investors, and then affect market sentiment and investment environment. For listed companies, the information obtained by large and small shareholders is unequal due to the possible high valuation, false accounts, insider trading and benefit transfer. For market regulators, China's securities are greatly affected by the policy background, because we still have a certain distance from the mature markets in Europe and the United States, the current supervision of securities is relatively strict [7].

From the point of view of individual investors, it is necessary to improve the ability of information identification and investment risk analysis, understand how to analyze the deep-seated reasons behind stock price fluctuations, cultivate the ability of independent judgment, and avoid following the trend of trading as far as possible. reduce speculative psychology and improve investment awareness. Secondly, we should pay attention to the basic situation of national economic policy and enterprise development, and be able to deal with the fluctuation of securities more rationally [8]. In addition, we also need to strengthen our own risk awareness, accurately evaluate

our risk tolerance, and choose a more targeted investment model combined with the overall market environment and the differences in the characteristics of the securities market. In addition, investors should respect and comply with the laws of the market, constantly adjust their mentality, constantly enhance their knowledge reserves, and achieve stable investment [9]. Finally, accurate assessment of their own risk tolerance is the basic quality that individual investors should have, make a reasonable asset allocation according to their own financial situation, and evenly distribute assets in real estate, rights and interests, insurance, education and other aspects. in order to provide sufficient risk resistance; for the investment of high-risk assets, we should combine our own risk tolerance and make rational choices. Generally speaking, if investors are unable to control their own greed and fear, it is best to be careful to enter securities; if they can control their own greed and fear to some extent, you should always control your emotional investment [10].

5 Conclusions

Under the theoretical framework of behavioral finance, this paper pays attention to the combination of theory and demonstration, uses the mixing method to construct the investor sentiment index suitable for Chinese securities, and carries out in-depth research. The empirical results show that investor sentiment not only has a positive linear effect on the rate of return, but also has an asymmetric influence mechanism, which shows that it is an important factor affecting asset pricing in the market. Compared with the financial market of developed countries, there are often many irrational investment behaviors in China's securities market, and the whole is more inclined to the ineffective market. This paper puts forward the following suggestions:

The main contents are as follows: (1) to establish the evaluation mechanism of investor sentiment. It is found that investor sentiment has become a factor that can not be ignored in asset pricing and is a part of the systemic risk in China's financial market. Therefore, this paper proposes to establish an authoritative investor sentiment evaluation system and maintain high-frequency updates, so as to monitor and early-warn the emotional dynamics in the market. When the market mood is abnormal, regulators should make pre-control measures in advance to prevent the market from fluctuating violently due to abnormal mood. Specifically, seven levels of risk rating can be set up according to the different degrees of market sentiment, so as to judge the state of market emotion. that is, it can be divided into seven different

ratings: "extremely negative", "more negative", "general negative", "normal", "general positive", "over-positive" and "extremely positive". Make corresponding risk prevention measures for different states in advance, so as to keep the overall market sentiment within the normal range.

(2) deepen the research on the measurement of investor sentiment indicators and speed up the search for more effective measurement methods. In essence, investor sentiment index belongs to a qualitative index, and there will be differences in investor sentiment measurement methods when we understand the connotation of investor sentiment from different angles. A reasonable and effective construction method is the key to study investor sentiment. Therefore, we should carry out in-depth research on investor sentiment and constantly develop and improve the research methods of investor sentiment in order to grasp the impact of sentiment on the securities market and provide a basis for the CSRC to stabilize securities and reduce the spread of market risk.

(3) formulate policies reasonably and give full play to the government's "invisible hand" to regulate and stabilize emotions reasonably, so as to reduce the risk of securities. Proper government intervention has a positive effect on the operation of the market, but too much may fail. China's securities have always been policy-oriented, and the government intervened too much in the market, which unconsciously led to the dilution of market risk awareness and indirectly led to the irrational behavior of investors. Frequent issuance or change of securities policies will lead to emotional instability in the securities market and excessive volatility of securities. Therefore, the principle of prudence should be observed when issuing securities policies, and the stability of the policies should be maintained so that the market can give full play to its self-regulation mechanism.

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