

Whether Moods Affect Investors' Behavior? ——Research on Influencing Factors of Investors' Behavior Based on Risk Perception

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ABSTRACT

A large number of previous studies have shown that investors' sentiment has a certain ability to explain the changes of the stock market, but the indicators selected in these studies themselves turn the investors' sentiment into a black box. This approach brings a problem that emotion itself is deeply intertwined with cognition and rationality and the rational part can be explained by the classical financial theory. If the irrational factors in investors' sentiment are insignificant, then these models are only synonymous with the traditional models.

In order to solve this problem, this paper uses the Risk-as-feeling model for reference, subdivides investors' sentiment into investors' behavior, investors' mood and other factors, and studies the interaction and interaction between these factors and the external factors that will affect them in theory. In particular, it is divided into irrational emotional factors that are not directly related to cognition, and it will have a subtle impact on emotion and cognition with the potentiality and sustainability.

This paper distinguishes the indicators of investors' behavior and investors' sentiment, constructs the indicators to measure the constituent factors of investors' sentiment by using the principal component analysis method, and tests the relationship between various factors affecting each other and jointly determining investors' behavior in psychological theory by using VAR model and market data.

The results show that investors' mood is Granger Cause of investors' behavior. There are indeed non-cognitive factors that affect investors' behavior in investors' sentiment, and the paper studies the dynamic characteristics of each factor, which provides a certain basis for further study of investors' behavior and construction of mathematical model.

Keywords: *investors' sentiment, investors' mood, VAR model, investors' behavior*

1. INTRODUCTION

How are securities prices formed? What is the inherent law of securities price fluctuation? In order to answer these questions, scholars began to research from the perspective of how investors make decisions.

After the efficient market hypothesis was put forward, it has quickly aroused extensive discussion and controversy. The verification and refutation of the efficient market hypothesis promote the continuous development of this field. The asset price fluctuation theory represented by efficient market theory emphasizes the decisive role of rationality and information in price formation.

However, with the continuous development of financial markets, market anomalies such as Friday

effect, December effect and light effect appear in the securities markets of developed countries, which are generally considered to be strong efficient markets. The explanation of these phenomena in traditional finance is not satisfactory.

This paper aims to find acceptable indicators to measure the factors that affect decision-making for psychological research and verify how these factors interact and influence each other. In the actual text, this paper defines five indicators: investors' behavior, investors' mood, investors' background emotion, investors' cognition and market change, and studies the relationship between them with reference to the risk-as-feeling model proposed by the relevant psychological researches.

2. REVIEW OF PREVIOUS STUDIES AND RESEARCH HYPOTHESES

2.1 Foreign Related Literature Review

The DSSM model was constructed in the research of De Long, Shleifer and Summers (1990), showing that noise traders would not necessarily be eliminated by the market. Noise traders can create space for their own existence in the market.^[1]

Baker (2004) used the principal component analysis to construct appropriate indexes, and verified the influences of investors' sentiment on cross-section data of stock time by testing the relationship between investors' sentiment indexes at the beginning of the period and subsequent stock returns.^[2]

David Hirshleifer (2001) discussed that the brain acquired by human beings under the condition of natural selection can well adapt to the prehistoric civilization but it isn't well adapted to the contemporary society in many aspects. Therefore, human beings have systematic biases in judgment and decision-making, and construct a framework to explain the biases of judgment and decision-making based on the simplification of exploration, self-deception and emotional relaxation of control.^[3]

Loewenstein et al. (2001) divided the emotional influence into the anticipatory emotion that is an immediate visceral response to risk and uncertainty, and the anticipated emotion that reflects one's own cognition. People tend to expect that anticipated emotions will be experienced in the future rather than now. The author points out that emotions often actually only refer to anticipated emotions in the existing research in this field that the only anticipated emotions would influence behavior. In contrast, the risk-as-feeling hypothesis proposed in this paper holds that behavior is comprehensively determined by emotion and cognition, and demonstrates that feelings such as happiness, anxiety and sadness affect decision-making behavior and do not need to be mediated by the cognition.^[4]

David Dunning et al. (2017) divided emotions into anticipated emotions, immediate emotions, background emotions and behavior-related emotions, and discussed to what extent mixed emotions might affect economic decision-making.^[5]

2.2 Domestic Related Literature Review

A large number of existing researches show that investors' sentiment has a significant impact on China's stock market.

Two indirect indexes were used in the research of Zhang Dan (2009), namely, it used the closed-end fund discount rate and the implied volatility of warrants to

reflect investors' sentiment, and verified the effectiveness of these two indexes as indirect indexes of investors' sentiment.^[6] Wen Fenghua et al. selected five indexes of the closed-end fund discount rate (CEFD) to construct a comprehensive index reflecting investors' sentiment by principal component analysis, and verified that investors' sentiment has a significant impact on the stock market, and the impact of investors' sentiment on the market has a significant asymmetry.^[7] When the rising investors' sentiment interacts with the bull market, investors tend to make more emotional decisions. But when investors' sentiment starts to decline or turn negative, the proportion of rational decisions will rise.

In addition to using indirect indexes, there are also researches using Yale-CCER index or Giant Tide Investors' Confidence Index, CCTV Reading the Tape index and other indexes that directly measure investors' market cognition. Recently, with the progress of big data analysis technology, the investors' emotion status of the day can be obtained by crawling Sina Weibo, which was used in the emotion research and also gradually promoted.

2.3 Research Purpose and Hypothesis

The research purpose of this paper is two-fold. Firstly, a rationality problem in the research in this field has been neglected will be answered by explaining whether the irrational factor in investors' sentiment is the Granger causality of the significant investors' behavior. Here hypothesis H1 is made: the investors' mood is the Granger cause of investors' behavior.

Secondly, it makes a preliminary investigation on the dynamic relationship between the factors that constitute investors' sentiment and may affect investors' sentiment and are affected by investors' sentiment.

3. EMPIRICAL RESEARCH

3.1 Theoretical Preparation of Empirical Research

There are two ways to measure investors' sentiment. One is to observe the actual decision-making behavior of investors and indirectly measure investors' sentiment through several stock market indexes that have been verified to reflect investors' sentiment.

Two is to take the investors' own emotional information that is directly expressed by themselves as the measure of their emotion through the questionnaire surveys, crawling Weibo emotion and other ways.

These two ways are mostly mentioned in the existing literature on investors' sentiment. Among them, the first way is used more, that is, it more tends to construct brief indexes to measure investors' sentiment. This is not hard to understand the reason why there is such a research

tendency is the traditional reason of economics in finance.

According to the relevant literature, the individual view of the future stock trend at a certain time point is one of the factors that contribute to the final trading decision in the future. The investment decision under the trading situation will also be affected by background emotion, behavior-related emotion and other factors.

Loewenstein, Weber and Hsee put forward the risk-as-feelings hypothesis model in Risk As Feeling, which holds that investment behavior is jointly determined by the cognition and feelings of market. In this model, the authors believe that investors' behavior is affected by investors' cognition and investors' sentiment, while investors' sentiment is affected by the objective market probability, background sentiment and investors' expectation.

3.2 Index Selection

Investors' Perception: That is investors' subjective expectation of the price fluctuation of the investment subject matter.

This paper selects the market optimism, market rebound, market resistance and Optimism Index from the CSMAR Database to extract the principal component as the measure of investors' cognition. Unless otherwise specified in the following text, all data is from CSMAR Database.

Background Index: That is the factors that have an impact on investment decisions when investors make investment decisions, but do not have a direct causal relationship with specific investors' decisions.

This paper selects the international economic and financial environment, domestic economic fundamentals and domestic economic policies to extract the principal components indirectly measuring the background emotion.

Investors' Behavior: Investors' sentiment displayed by investors in their actual trading behavior. The CICI index provided by CSMAR Database is selected as the measure of behavior-related emotion reflected by investors' objective investment decisions.

The CICI index is based on the research of Jeffery Wurgler and Malcolm Baker (2006), which constructs the emotional basis factor suitable for China. This index is obtained by the principal component analysis using five indexes that are significantly related to investors' sentiment in Chinese market, namely, the closed-end fund discount rate (CEFD), IPO number (IPON), New opening account number of A shares (ACCOU), IPO first-day return rate (IPOR) and market turnover rate (TURN).

Investors' Mood: According to the guidance of the risk-as-feeling model, the residual part of investors'

behavior after removing the investors' cognition should be able to reflect investors' sentiment. Obviously, since investors' cognition and investors' sentiment are treated differently, they should reflect different "emotional" aspects. This paper refers to the emotion without cognitive factors as "Investors' Mood" in accordance with relevant psychological definitions.

3.3 Construction of Investors' Cognition Index and Background Emotion Index

The specific indexes selected in this paper to construct investors' cognition indexes are shown in the table above and the respective correlation between these indexes is shown in the figure below.

Table 1. Correlation Coefficients of Various Cognitive Variables

	Market Optimism	Market Rebound	Market Resistance	Optimism Index	Stock Valuation
Market Optimism	1.000				
Market Rebound	0.794	1.000			
Market Resistance	0.901	0.671	1.000		
Optimism Index	0.977	0.863	0.898	1.000	
Stock Valuation	-0.14	-0.397	0.053	-0.039	1.000

It can be seen from the figure that there is a certain form of correlation between the selected variables. It is feasible to reflect investors' cognition through these indexes.

According to the indexes obtained by principal component analysis, the cumulative factor load of the first two factors reaches 0.94, so the first two principal components are extracted, and the first principal component is named market cognition (MC) and the second principal component is named individual stock cognition (SC) according to the component matrix.

Similarly, the background mood indexes are constructed, and a principal component of them is extracted and named background emotion (BACK).

3.4 Index Relationship

In the hypothesis, we assume that there is a relationship of mutual influence among the selected variables. Therefore, before using VAR model to investigate the relationship, we first use the correlation

coefficient matrix to roughly investigate the relationship between these variables. As shown in the following table.

Table 2. Correlation Coefficients Matrix of Various Cognitive Variables

Correlation (Probability)	MC	CICSI	MOOD	BACK	Δ SC
MC	1.00 (—)				
CICSI	0.21 (0.029)	1.00 (—)			
MOOD	0.09 (0.329)	0.57 (0.00)	1.00 (—)		
BACK	0.85 (0.00)	0.31 (0.00)	0.15 (0.11)	1.00 (—)	
Δ SC	-0.04 (0.64)	0.004 (0.964)	-0.025 (0.792)	-0.12 (0.203)	1.00 (—)

As can be seen from this table, there is a significant correlation between investors' behavior (CICSI) and background index (BACK), market cognition (MC) and investors' mood (MOOD), and there is also a significant correlation between market cognition (MC) and background index (BACK).

In order to deepen the understanding of the relationship between variables, the further investigations are carried out in other measurement methods.

3.5 Construction and Test of VAR Model

3.5.1 Stability Test of Variables

Since Granger Causality Test based on VAR is required to be performed, the test of unit root should be carried out in advance to ensure the stability of the sequence to avoid pseudo regression and other problems. After the test of unit root, it was found that individual stock cognition (SC) failed to pass at five percent confidence and had no cointegration relationship in the sequence, so the first-order difference processing is carried out on SC to obtain Δ SC, thus to ensure that all of the variables passed the test of unit root at the five percent level. Please see the following table for details.

Table 3. Results of Index Unit Root Test

Variables	Test Form (c, t, n)	ADF	5% Critical Value	Conclusion
BACK	(c, t, 0)	-4.027148	-3.449716	Stable
CICSI	(c, t, 0)	-3.956131	-3.449716	Stable
MC	(c, t, 0)	-4.996077	-3.449716	Stable
Δ SC	(c, t, 0)	-12.40261	-3.449716	Stable

After the first-order difference of the individual stock cognition, the economic significance reflects the month-on-month change value of the investors' cognition of the

stock, which still has the significance of measuring the investors' sentiment.

Based on this, VAR is constructed with CICSI, MC and Δ SC. CICSI is selected as the explained variable and the remaining two were the residuals of the explanatory variable equation as a measure of investors' mood recorded as MOOD.

MOOD's ADF test result is -11.05956, less than a one-percent cutoff of -4.042042, passed the test of unit root stably.

3.5.2 Test of the Causal Relationship between the Factors Affecting Investors' Sentiment

In order to explore whether the causal relationship between the factors is true, then it needs to conduct Granger causality test. First, the lag order is 2 according to the LR, FPE, SC, HQ lag length criterion. We carried out the stability test of the VAR model with all the root modular reciprocal falling within the unit circle. Based on this, the Granger Causality test was carried out, whose results are shown in the table below:

Table 4. Granger Test Results

EXPLAINED VARIABLES	EXECUTION VARIABLES	CHI-SQUARE VALUE	DEGREE OF FREEDOM	P VALUE
MOOD	Δ SC	0.306	2	0.858
	MC	2.265	2	0.322
	CICSI	0.918	2	0.631
	BACK	3.494	2	0.174
	ALL	5.336	8	0.721
Δ SC	MOOD	1.694	2	0.429
	MC	2.012	2	0.366
	CICSI	1.664	2	0.435
	BACK	3.433	2	0.180
	ALL	38.729	8	0.000
MC	MOOD	0.514	2	0.848
	Δ SC	0.258	2	0.405
	CICSI	1.910	2	0.501
	BACK	1.000	2	0.616
	ALL	4.791	8	0.780
CICSI	MOOD	4.959	2	0.084
	Δ SC	2.422	2	0.298
	MC	0.419	2	0.811
	BACK	3.495	2	0.174
	ALL	38.37170	8	0.036
BACK	MOOD	0.0376	2	0.981
	Δ SC	0.523	2	0.770
	MC	3.466	2	0.177
	BACK	0.862	2	0.650
	ALL	5.844	8	0.5536

At 10% confidence, MOOD, Δ SC and MC cooperate with BACK, which is a significant Granger

reason for CICI changes. Obviously, there is a one-directional causal link between the BACK, MC and ΔSC synergy changes on changes in CICI.

In addition, MOOD, MC, CICI and BACK cannot simultaneously cause the null hypothesis of ΔSC is also rejected.

MOOD has a significant one-way Granger Causality relationship for CICI and MOOD is CICI's Granger Cause, but CICI is not MOOD's Granger Cause.

In other words, the residual investors' mood remains Granger's cause for investors' behavior after eliminating all cognitive and market factors.

In addition, there is no Granger Causality relationship between background sentiment and investors' cognition, but in terms of the inside investors' sentiment, the cognition of the market has a one-way Granger Causality relationship on the cognition of individual stocks.

3.5.3 Research on Conduction Factors of Mutual Influence of Various Elements

In order to further research the pathway and transmission mechanism of mutual influence among the cognitive variables, we further carried out the impulse response and analysis of variance decomposition for each factor. Because the whole tables are too lengthy(total) , only a few more important tables are extracted here.

Next, we will carry out an analysis of variance decomposition.

Table 5. Results of the Variance Decomposition of the Factors after Stabilization

	SE	BACK	CICI	MOOD	MC	SC	ALL
BAC	1.0268	88.946	2.3906	0.0052	7.7287	0.9289	100.0
K	87	43	55	33	22	64	00
CICI	5.7322	33.906	59.861	0.0807	2.9504	3.2013	100.0
MO	40	22	22	38	95	32	00
OD	3.2764	3.4095	93.446	0.7452	1.0928	1.3060	100.0
MC	0.9704	85.032	1.8785	0.0129	10.616	2.4601	100.0
SC	23	02	13	24	40	46	00
	1.0026	36.443	4.6580	0.0703	14.269	4.5588	100.0
	70	14	26	92	57	7	00

3.6 Empirical Conclusion and Summary

3.6.1 Results of Granger Test

Granger Causality test shows that the investors' mood is the Granger cause of investors' behavior, and the hypothesis that the investors' mood, investment background factors, market cognition, stock cognition cannot jointly cause investors' behavior was rejected, which shows that the change of investors' mood will cause the change of investors' behavior and investors'

mood and other factors changes will jointly have an impact on investors' behavior. Although no single factor is the Granger cause of individual stock cognition, the synergistic changes of other factors will have a significant impact on individual stock cognition.

On the other hand, three factors that are investors' mood, background factors and market cognition have no corresponding Granger cause, while it is not denied that the null hypothesis that the synergistic effect of other factors will not affect any of these three factors. It can be considered that the changes of the remaining variables will not cause the changes of these several variables.

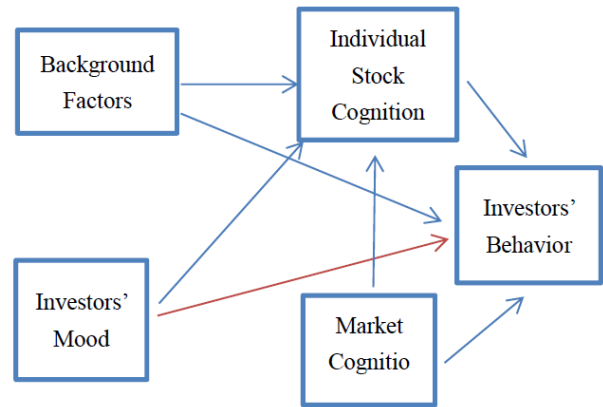


Figure 1. Risk-as-Feeling Perspective

3.6.2 Analysis of the Results of Variance Decomposition

The analysis of variance shows that background factors have played an important role in investors' behavior, market cognition and stock cognition fluctuation outside of itself, especially for the market cognition have played a far beyond the decisive role of the market cognition itself, which shows that this kind of objective economic fundamentals such as the international economic and financial environment, domestic economic fundamentals and domestic economic policy have an important impact on the fluctuation changes in each link of investors' cognition and behavior.

4. CONCLUSION

This result first validates hypothesis 2, irrational, that background sentiment factors not directly related to investment behavior do have an impact on investors' investment behavior. Secondly, it also partly illustrates the relationship between the factors selected in this paper, as shown in the following figure. The blue arrow represents its synergistic effect that is the Granger cause of the pointing factor, and brown represents the factor is alone the point factor of the Granger cause. the investors' mood itself has stabilized undisturbed, which is the inherent nature of the factor itself. Although the state of mood itself is largely unaffected by economic fundamentals and various factors derived from cognition,

its changes can be explained almost entirely by investors' behavior. This may be explained in the Risk-as-feeling model that the consequences of its failure can cause the sustained pain similar to the actual physical damage, and thus to change the people's state of mood when making economic decisions.

REFERENCES

- [1] De Long, J.B., Shleifer, A., Summers, L. and Waldmann, R. (1990) *Positive Feedback Investment Strategies and Destabilizing Rational Speculation*. *Journal of Finance*, 45, 375-395.
- [2] Baker, Malcolm P. and Wurgler, Jeffrey A., *Investor Sentiment and the Cross-Section of Stock Returns* (April 2004). NBER Working Paper No. w10449.
- [3] Hirshleifer, David A. and Hirshleifer, David A., *Investor Psychology and Asset Pricing* (February 26, 2001). AFA 2001 New Orleans Meetings.
- [4] George F.Loewenstein Elke U.Weber Christopher K.Hsee Ned Welch. *Risk as Fellings*[J]. *Psychological Balletin*, 2001.Vol.127
- [5] David Dunning, Detlef Fetchenhauer and Thomas Schlösser *The varying roles played by emotion in economic decision making*[J].*Current Opinion in Behavioral Science*, 20017,Vol 15.
- [6] Zhang Dan,Liao Shiguang. *Investor Sentiment in Chinese securities market*[J]. *Securities Market Herald* 2009, 000(010):61-68.
- [7] Wen Fenghua, Xiao Jinli, Wang Chuangxia, Chen Xiaohong, Yang Xiaoguang. *Research on the Impact of Investors' Sentiment Characteristics on Stock Price Behavior* [J]. *Journal of Management Science*, Volume 17, Issue 3 in 2004.