



# Relationship between Negative Emotion and Investment Behavior of Enterprises

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## ABSTRACT

Emotion is the result of the interaction of subjective factors, environmental factors, neural processes and endocrine processes. The production and regulation of emotion cannot be separated from the regulation of cranial nerves. Meanwhile, emotion can influence human behavior through a certain nervous system. The investment behavior of an enterprise is an important link of its financial decision-making, which determines the business situation and development prospect of the enterprise. Starting from the cranial nerve, this study focuses on the influence of emotion on investment from both theoretical and empirical perspectives, and both theoretical and empirical results show that emotion has a significant impact on investment, and positive emotion can significantly promote the increase of the investment.

**Key Words:** Negative Emotion, Investment Behaviour, Investors' Emotion

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## Introduction

Macroscopically, the investment behavior of an enterprise is the basis of the economic operation of an economy and, to a certain extent, will play a decisive role in the overall economic development of the country (Baker and Wurgler, 2007). Microscopically, investment affects the development prospects of enterprises and is also a fundamental problem of financial theory of an enterprise (Brown and Cliff, 2004). However, the academic circles have not reached a definite conclusion as to the main factors that influence the investment behavior of enterprises so far (Baker and Wurgler, 2009). With the constant development and perfection of the modern financial theory of enterprises, the hypothesis of "rational man" in the mainstream economics theory is different from the reality. Under this background, economics and finance continue to relax the traditional hypotheses (Tetlock, 2007;

Brown and Cliff, 2005), and at the same time draws on the ideas of psychology, behavior, sociology and other related disciplines, thus creating a new branch of science, that's, behavioral finance (Stambaugh *et al.*, 2012). The discipline analyzes the psychological characteristics of participants by taking into account the relevant results of psychological experiments to investigate the impact of their decision-making behavior on the economy (Zhan *et al.*, 2011).

Emotion is the result of the interaction of subjective factors, environmental factors, neural processes and endocrine processes. The production and regulation of emotion cannot be separated from the regulation of cranial nerves. (Zhan *et al.*, 2011). Some scholars believe, that the center of emotion lies in the thalamus of the cranial nerve system, and the release of inhibition by the brain on the thalamus, can make the

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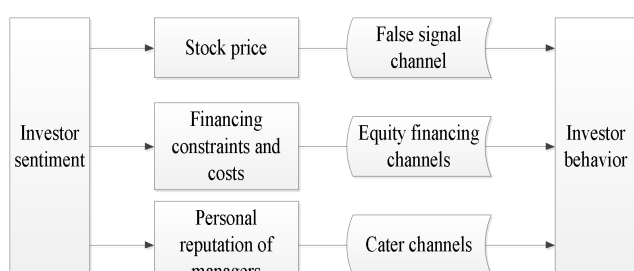
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autonomic nerve active and strengthen the body's physiological response, thus producing emotion (Holm *et al.*, 2017). At the same time, emotion can influence human behavior through a certain nervous system (Jari *et al.*, 2006). Based on this, this study analyzes the influence of negative emotion on the investment behavior of enterprises from the rational and irrational behavior of managers and investors

### Influence mechanism of negative emotion on investment behavior

In general, investors' emotion acts on an enterprise's investment behavior through three channels, as shown in Figure 1.



**Figure 1.** Channels of investors' emotion affecting investment

The first channel is the false signal channel. In the stock market, the behavior of buying and selling stocks affects the price of stocks, and the buying and selling behavior of investors has some irrational factors (Zouaoui *et al.*, 2011). Due to the asymmetry of information, some information cannot be fully publicly expressed in the stock price, so the stock market is a limited arbitrage market (Ljungqvist *et al.*, 2006). Under normal circumstances, the stock price will deviate from the fundamental value of the enterprise, that's to say, the stock price will contain some irrational factors, that's, investor's emotion, and the manager cannot recognize and peel off the emotion, so this affects the manager's investment behavior (Kumar, 2006).

The second channel is equity financing channel. Investors' emotion can have an impact on investment behavior of enterprises through stock issuance channels (Han, 2008). Investors' emotion can affect the financing constraints and costs of an enterprise, thus limiting the investment of the enterprise and then distorting the investment behavior of the enterprise (Holm, 2015). If an enterprise relies heavily on external financing, stocks are undervalued when investors are pessimistic, and the enterprise may face the

dilemma of overfunding or underfunding (Bergman and Roychowdhury, 2008). At present, some projects with better returns may have to be abandoned because of lack of funds, which will result in the phenomenon of insufficient investment; otherwise, there is a risk of overinvestment (Jari, 2006).

The third channel is catering channel. If the investor has a positive attitude toward the future growth of the enterprise, when the decision makers make a decision to reject the investment based on the maximum value of the enterprise, even if it is a rational conclusion, and the project is a profit project approved by the investor, the decision to reject the investment will cause the investor to sell the stocks of the enterprise, and as a result, the enterprise's share price falls (Joseph *et al.*, 2011), the reputation of the decision-maker will be damaged, with a risk of being fired (McClean *et al.*, 2014). Therefore, the decision-maker will promote investment growth and cater to investors' emotion based on the purpose of maximizing self-interest, which may result in overinvestment; otherwise, it may result in underinvestment (Hribar and McInnis, 2012).

### Construction and analysis of theoretical model

#### Model construction

Assume that rational managers have the ability to recognize "asset mispricing" (investors' emotion), and that rational managers may take two objectives into account when making investment decisions:

First, enterprise value, that's, the net present value of investment is maximized.

$t=0$ , the investment scale of the enterprise is  $K$ , and its unit market price is  $C$ .

$t=1$ , the profit that the enterprise gets from the investment is  $f(K)$ , and the net present value of its investment scale:

$$\frac{f(K, \bullet)}{1+R} - KC \quad (1)$$

Secondly, project financing will be considered. When the stock market is good, the decision-maker will make use of the current positive emotion to issue stocks in order to achieve the optimization of the enterprise's equity financing level; otherwise, the decision-maker will buy back the stocks. Assuming that the number of shares issued or repurchased by the enterprise is  $M$ , the "asset mispricing" (that's, the expression function of investors' emotion) is expressed as  $\delta$



(·), and the issue cost is expressed as S, so the function of equity financing of the enterprise can be expressed as:

$$M[\delta(\bullet) - S] \quad (2)$$

It is assumed that when making decisions, managers take into account the effects of these two factors, that's to say, the maximization of enterprise value and the maximization of equity financing scale. However, there is also a difference in the attention that the manager pays to these two objectives, assuming that the attention (weight) on enterprise value maximization is  $\lambda$ , and the weight of equity financing is  $1-\lambda$ , and then the model of enterprise investment decision can be expressed as:

$$\max_K \lambda \left[ \frac{f(K, \bullet)}{1+R} - KC \right] + (1 - \lambda)M[\delta(\bullet) - S] \quad (3)$$

Where, the value range of  $\lambda$  is  $0 \leq \lambda \leq 1$ , and the larger  $\lambda$  represents that the manager pays more attention to the contribution of investment projects to the maximization of enterprise value. In the derivation of Formula (3), the optimal solution of enterprise investment under investor emotion can be obtained as follow:

$$\begin{aligned} \text{Set } \{ \lambda \left[ \frac{f(K, \bullet)}{1+R} - KC \right] + (1 - \lambda)M[\delta(\bullet) - S] \}' &= 0 \\ \text{Then, } \lambda \left[ \frac{f'_K(K, \bullet)}{1+R} - C \right] + (1 - \lambda)M\delta'_K(\bullet) &= 0 \\ \text{Simplified as } \frac{f'_K(K, \bullet)}{1+R} = C - \frac{1-\lambda}{\lambda} M\delta'_K(\bullet) & \quad (4) \end{aligned}$$

### Theoretical analysis

According to the previous analysis, if  $\delta'_K(\bullet) = 0$ , the market is effective, and the expression for the optimal solution of the investment decision is  $\frac{f'_K(K, \bullet)}{1+R} = C$ , and the optimal solution can be obtained therefrom as  $K^*$ .

If  $\delta'_K(\bullet) \neq 0$ , The market is ineffective, and investors' emotion can affect the price of stocks.

If  $\delta'_K(\bullet) > 0$ , which indicates that the investor is in a high mood and the stock price is overvalued, the expression of the optimal solution is  $\frac{f'_K(K, \bullet)}{1+R} < C$ . This study assumes that the first derivative of the investment function  $f(K)$  is  $f'(K) > 0$  and its second derivative is  $f''(K) < 0$ . The optimal investment at this time is obtained as  $K > K^*$ . In addition, the higher the investors' emotion is, that's,  $\delta'_K(\bullet) > 0$  is higher and  $\frac{f'_K(K, \bullet)}{1+R}$  is

smaller in optimal solution of starting investment and  $K$  is larger, that's, investment level is positively correlated with investment emotion. Otherwise, if  $\delta'_K(\bullet) < 0$ , the optimal solution of the investment is obtained as  $K < K^*$ , and investment level is positively correlated with investment emotion.

To sum up, it can be considered that in the ineffective capital market, investors' emotion is positively related to investment behavior, that's, the high investment emotion will lead to an increase in investment, and the pessimistic investment emotion will lead to a decrease in investment.

## Empirical research

### Model setting and data sources

The following model is established in studying the influence of investors' emotion on investment behavior:

$$I_{i,t} = \alpha_0 + \alpha_1 Sent_{i,t-1} + \alpha_2 Q_{i,t-1} + \alpha_3 Leve_{i,t-1} + \alpha_4 Ret_{i,t-1} + \alpha_5 Size_{t-1} + \alpha_6 I_{i,t-1} + \alpha_7 Cash_{i,t} + \alpha_8 D_{i,t} + \varepsilon_{i,t} \quad (5)$$

The main interpretations of the variables are as follows:

(1)  $I_{i,t}$  indicates the investment level of the enterprise. The investment level measures the total investment amount of the enterprise, specifically, including physical investment (plant, equipment, etc.) and equity investment (stocks, bonds, etc.), as well as intangible assets investment that will increase the competitiveness of the enterprise in the future. The expression of the enterprise's investment level is:

$$I_{i,t} = \frac{\Delta FK_{i,t} + \Delta LK_{i,t} + \Delta IK_{i,t}}{K_{i,t}} \quad (6)$$

Where,  $I_{i,t}$  is the investment level of the enterprise;  $FK_{i,t}$  is the investment in fixed assets of the enterprise;  $LK_{i,t}$  is the long-term investment of the enterprise, including long-term equity investment and long-term bond investment;  $IK_{i,t}$  is investment in intangible assets and  $\Delta$  measures the difference in data between the current year and the previous year.

(2)  $Sent_{i,t-1}$  is an indicator of investors' emotion. At present, there are many indirect indexes to measure investors' emotion. However, considering the reality of China, as well as the restriction of short sales mechanism, and the



turnover rate can just meet this requirement, so the study adopts the turnover rate to measure investors' emotion.

(3)  $Q_{i,t-1}$  indicates the market value of the enterprise and Jon-Paul Tobin (Q) is taken to express:

$$Q_{i,t-1} = \frac{MVE_{i,t-1} + PS_{i,t-1} + DEBT_{i,t-1}}{TA_{i,t-1}} \quad (7)$$

Where, MVE indicates the market value of an enterprise's circulation of stock, PS is the value of the preferred stocks, DEBT indicates the net value of debt and TA is the book value of the total assets.

(4)  $Leve_{i,t-1}$  represents the financial risk of an enterprise, measured by the financial leverage ratio;

$$Leve_{i,t-1} = Debt_{i,t-1} / Asset_{i,t-1} \quad (8)$$

(5)  $Cash_{i,t-1}$  represents cash holdings, measured using operating income cash ratio:

$$Cash_{i,t-1} = Nec_{i,t-1} / Grow_{i,t-1} \quad (9)$$

Where, Nec indicates the net operating cash flow and Grow indicates the revenue of the main business of the year.

In addition,  $Ret_{i,t-1}$  represents the profitability of an enterprise, measured by the stock returns of listed companies;  $Size_{t-1}$  represents the size of the enterprise, measured by the logarithm of total assets;  $D_{i,t}$  is virtual variable, its value is 1 if it is a state-owned holding enterprise; otherwise, the value is 0;  $\varepsilon_{i,t}$  is random error. Subscript I represents the enterprise and t represents the year.

About samples, this study selects data of 1,120 listed enterprises from 2012 to 2015 to carry on the research, and the data come from the

RESSET query system, combining the data from the financial reports of listed enterprises.

### Result analysis

#### (1) Statistical description of variables

Table 1 lists the statistical characterization of the variables required in the empirical test. From the data in Table 1, it can be seen that China's SME listed enterprises have a certain degree of overinvestment tendency, the median of the investment level is 0.0171, and the mean is 0.0429, which is partly because of the managers wanting to expand the scale of operation, and partly because of the government policy orientation. The median of investors' emotion is 2.5359, which is slightly lower than the average median of 2.9028. It can be seen that investors' emotion is relatively optimistic in the sampling period. The maximum value is 13.2325, the minimum value is 0.0152, and the standard deviation is 1.7349, which indicates that investors' emotion fluctuates greatly during the sampling period, so it's very necessary to carry out this study.

#### (2) Multiplecollinearity test

If there exist multiplecollinearity among that variables, the regression results are not effective. In order to enhance the validity and accuracy of the model prediction, this study firstly carries out the correlation test on all variables, and as shown in Table 2, the correlation coefficients are all less than 0.8. Therefore, the study finds that there is no significant multiplecollinearity among variables.

#### (3) Regression analysis

This study uses F Test to judge the validity of panel data and decide to use which model for estimation. The F test:

$$F = \frac{(SSE_v - SSE_u) / N}{SSE_u / (NT - N - k)} \quad (10)$$

**Table 1.** Statistical description of variables

variable	mean	median	Max	Min	Standard deviation	observations
$I_{i,t}$	0.0429	0.0171	1.4708	-0.7998	0.1287	4321
$Sent_{i,t-1}$	2.9028	2.5359	13.2325	0.0152	1.7349	4321
$Q_{i,t-1}$	2.1677	1.6129	34.7671	0.6548	1.7261	4321
$Leve_{i,t-1}$	0.5018	0.5161	0.9987	0.0128	0.1798	4321
$Size_{t-1}$	21.5681	21.4678	27.3612	18.6432	1.0709	4321
$Ret_{i,t-1}$	0.2532	0.1809	6.2802	-3.4012	0.4453	4321
$Cash_{i,t-1}$	108.1142	107.1238	4029.442	0.3621	78.4489	4321
$D_{i,t}$	0.1552	0	1	0	0.3623	4321



**Table 2.** Correlation coefficient between variables

variable	$Sent_{i,t}$	$Q_{i,t-1}$	$Leve_{i,t-1}$	$Size_{t-1}$	$Ret_{i,t-1}$	$Cash_{i,t-1}$	$D_{i,t}$
$Sent_{i,t-1}$	1						
$Q_{i,t-1}$	0.2641	1					
$Leve_{i,t-1}$	0.0267	-0.2022	1				
$Size_{t-1}$	-0.0297	0.0192	0.0401	1			
$Ret_{i,t-1}$	-0.0459	0.2046	-0.1202	-0.0149	1		
$Cash_{i,t-1}$	-0.0267	-0.0098	0.0154	0.7889	-0.0217	1	
$D_{i,t}$	-0.1569	-0.1648	0.2932	-0.0422	0.2899	-0.0138	1

Where,  $SSE_v$  represents the residual sum of the squares of the mixing effect,  $SSE_u$  represents the residual sum of the squares of the individual fixation effect, N represents the number of constraints, K represents the number of public parameters and F statistics are subordinate to distribution:  $F \sim F(N, NT - N - K)$

The original assumption of F Test is  $\alpha_{i,t} = \alpha$ , that's, mixed effect model; alternative assumption is  $\alpha_{i,t} \neq \alpha$ , that's, mixed effect model. After F Test, this study takes the alternative assumption and adopts the fixed effect model.

In Model (5), Eviews software is used to analyze the fixed effect, and the results are shown in Table 3. It can be seen from the regression results in Table 3 that the coefficient of investors' emotion ( $Sent_{i,t-1}$ ) is significantly positive with a significant level of 10%, which indicates that investors' emotion has a significant positive correlation with enterprise investment behavior, that's to say, investors' pessimism will reduce the investment level of the enterprise. In addition, the market value ( $Q_{i,t-1}$ ), the enterprise size ( $Size_{t-1}$ ), the rate of return per share ( $Ret_{i,t-1}$ ) and the state-controlled enterprise ( $D_{i,t}$ ) of the enterprise all have a significant positive correlation with the investment level of the enterprise.

**Table 3.** Fixed effect model results

variable	Result	Standard deviation
C	-0.0913***	-3.4667
$Sent_{i,t-1}$	0.0026*	1.6149
$Q_{i,t-1}$	0.0030**	2.1166
$Leve_{i,t-1}$	-0.0263**	-2.2241
$Size_{t-1}$	0.0106***	4.3521
$Ret_{i,t-1}$	0.0348***	7.0462
$I_{i,t-1}$	0.0233	1.3941
$Cash_{i,t-1}$	-0.0215	-0.8705
$D_{i,t}$	0.0131**	2.2881
R-squared	0.0318	
F value	13.6401	
F significance	0	

Note: \*, \*\* and \*\*\* represent that they are significant at the statistical levels of 10%, 5% and 1%, respectively. In parentheses is the standard deviation of the estimate

## Conclusions

Under the framework of behavioral finance, this study takes the control and influence of brain nerve on emotion and behavior into account, and constructs a decision model to study how investors' emotion affects the investment behavior of enterprises. On the basis of the theoretical model, this study makes an empirical study by using the data of listed enterprises in China. Three main conclusions are reached in this study as follows:

First, this study uses the stock turnover rate to measure the investors' emotion and concludes that there is a significant positive correlation between investors' emotion and enterprise investment behavior. If the investors are highly optimistic, the financing cost of the enterprise will be reduced. Under this background, the enterprise will have more capacity to obtain sufficient funds to invest because the enterprise gave up some investment opportunities due to the lack of funds, and accordingly, the investment scale will be increased. On contrary, when the investors are depressed, the enterprise will correspondingly reduce the investment level due to the rising financing cost. At the same time, the above reasons are the reasons and reference factors for some companies choose the timing of listing, and being listed when investors are highly optimistic, enterprises can have more opportunities to finance more.

Second, it is calculated that Jon-Paul Tobin Q is greater than 1, that's to say, investors in the stock market are relatively optimistic about the investment of the enterprise. The main reason is that the capital market in China is still a relatively new market, the investment knowledge of many investors is still scarce, and the cash dividend of listed enterprises is less, which has promoted the short-term speculation. If the investors are optimistic about the investment prospect of a listed enterprise, but the enterprise does not increase the investment, the investors of China usually does not choose to hold the stocks for a



long time based on the fundamental principle of the enterprise, but will sell the stocks "vote by foot". This kind of behavior also deepens to a certain extent the influence of investors' emotion on the enterprise investment behavior.

Thirdly, in the empirical research, this study adds the virtual variable of whether the listed enterprise is state-controlled or not. The study shows that the state-controlled enterprises will increase their investment scale. This is mainly because of China's special situation. At present, the financing restriction and cost of the state-controlled enterprises are relatively low, so the investment behavior of enterprises will be relatively more radical.

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