



# The Construction of Investor Sentiment Index Based on Big Data and Its Impact on Enterprise Investment and Financing

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**Abstract.** Using the sample data of Chinese listed companies from 2002 to 2014, this paper examines the relationship between investor sentiment and corporate investment and financing. The results show that in the short term, investor sentiment stimulates investment and improves business performance. In the long run, the effect is still persistent. Strengthening the management and control of investor sentiment is helpful to reduce the financing cost of enterprises and improve the long-term business performance of enterprises.

**Keywords:** Investor sentiment · Equity financing · Business investment

## 1 Introduction

China's stock market as an emerging market, but often presents a roller-coaster rise and fall. Clearly, this sharp fluctuation in asset prices is likely to stem from investor sentiment. Therefore, it is necessary for us to study the impact of investor sentiment on the virtual economy, and further study how it is transmitted to the real economy. The investigation of investor sentiment and enterprise investment behavior just provides us with a unique research perspective from finance to entity, from micro to macro.

The following contents are organized as follows: The second part is literature review; The third part is the theoretical analysis and research hypothesis; The fourth part is the construction of investor sentiment; The fifth part is the measurement method and data description; The sixth part is the analysis of the research results; The last part is the conclusion.

## 2 The Literature Review

According to the existing literature, investor sentiment leads to stock price bias and further affects the actual investment behavior of enterprises, mainly through two channels.

(1) Equity financing channels. Since investor sentiment affects stock prices and leads to changes in corporate financing conditions, rational entrepreneurs will choose appropriate market timing to issue shares or buy back shares (Stein, 1996) [13]. Because companies are faced with financing constraints, entrepreneurs with a long-term vision will choose when the stock price is overvalued, which is conducive to reducing the financing cost of issuing stocks. At this time, issuing stocks for financing can promote the increase of actual investment of enterprises. The more enterprises depend on equity financing, the greater the impact of corporate investment on investor sentiment (Baker et al., 2003; Gilchrist et al., 2005) [8][10]. (2) Rational catering channels. In the case of information asymmetry, short-sighted entrepreneurs will take the initiative to cater to investor sentiment and even make inefficient investments. The degree to which managers cater depends on the expectations of shareholders and the degree of opacity of the enterprise. Under the effect of this channel, optimistic investor sentiment will encourage managers to invest in inefficient investment projects. Although this behavior can promote stock price rise in the short term, it will damage enterprise performance in the long term (Polk and Sapienza, 2009, etc.) [12].

There are abundant researches on the influence of investor sentiment on the actual investment of companies in China. There are some verifying theories (or mechanisms) that are effective, such as equity financing theory (Liu Hongzhong and Zhang Fang, 2004, etc.) [4], rational catering theory (Zhang Ge and Wang Meijin, 2007, etc.) [7], and some extending on this basis, such as examining the rational catering mechanism of management from the perspective of incentive mechanism (Zhang Qing and Zhu Dixing, 2014, etc.) [6]. From the institutional environment and corporate governance mechanism, it examines how investor sentiment affects corporate investment (Hua Guiru et al., 2014; Jin Guanghui et al., 2015) [2][3].

However, most of the research on investor sentiment is conducted at the micro enterprise level. There are two problems with such measures of investor sentiment based on the enterprise level: first, most of the researches are single indicators, which can only reflect a certain aspect of investor sentiment; second, there is no control of macroeconomic factors, and investor sentiment may be affected by the macroeconomic cycle. Therefore, it is necessary to integrate various indicators and eliminate the influence of macroeconomic factors in order to objectively reflect investor sentiment.

### 3 Theoretical Analysis and Research Hypothesis

We theoretically discuss how investor sentiment affects enterprise investment and financing, and find that the key question is whether investor sentiment influences enterprise investment behavior through equity financing channel or rational catering channel.

#### 3.1 Investor Sentiment and Business Investment

According to the theory of equity financing, the main reason why equity financing channels play a role lies in financing constraints. As an emerging country, China's enterprises have serious financing constraints. According to this mechanism, optimistic

investor sentiment will not only promote the short-term investment of enterprises, but also benefit the long-term investment of enterprises.

In addition, according to the rational catering theory, management pandered to investors' optimism by expanding investment. The assumption is that management thinks its compensation design is related to the share price. The extent to which managers cater depends on the degree of opacity. In fact, due to serious information asymmetry and principal-agent problems in China's stock market, market manipulation is serious, especially for small companies (Zhang Ge and Wang Meijin, 2007). Because of the short-sighted behavior of managers, although optimistic investor sentiment will increase the investment of enterprises in the current period, it is not conducive to the sustainable development of enterprises in the following period.

Based on the previous discussion, we propose the first research hypothesis:

Hypothesis I: Investor sentiment is significantly positively correlated with the actual investment of enterprises, which will promote (inhibit) the short-term investment of enterprises in the period of high (low) investor sentiment. If the financing mechanism is dominant, investor sentiment is positively correlated with long-term investment. If the catering mechanism plays a leading role, investor sentiment is negatively correlated with long-term investment.

### 3.2 Investor Sentiment and Corporate Finance

As is known to all, China, as the most brilliant emerging market star, has a high growth rate for its enterprises, while the financial market is not developed. Therefore, Chinese enterprises generally face serious financing constraints. Especially when the economy is in recession, financial constraints are very likely to reduce the normal investment level of enterprises, thus inhibiting the growth opportunities of enterprises (McLean and Zhao, 2014) [11]. Due to the financing constraints of enterprises, it is very possible for Chinese enterprises to reduce the financing costs of issuing stocks and accelerate the pace of enterprise expansion in the period of high investor sentiment.

Based on the above analysis, we propose the second research hypothesis:

Hypothesis II: Investor sentiment is significantly positively correlated with corporate financing, which will promote (inhibit) corporate financing, including equity financing and debt financing, when investor sentiment is high (low).

## 4 Construction of Investor Sentiment Index

Referring to Baker and Wurgler (2006) and combining with the characteristics of China's stock market, this paper adopts sentiment proxy indicators, including closed-end fund discount (*DCF*), turnover rate (*TurnR*), IPO number (*IPON*), IPO first-day return (*IPOR*), new investor account opening (*NI*), and consumer confidence (*CCI*) [9]. The sample data is from January 2001 to October 2014, which is from Wind information.

Referring to Yi Zhigao and Mao Ning (2009) [5], production, consumption and economic prosperity are taken as macroeconomic fundamental factors. PPI, CPI, added value of industrial output and macroeconomic climate index are selected as the control factors of the macroeconomic cycle (macro data are also from Wind Information).

**Table 1.** Statistical description of investor sentiment index

	A. Statistical description				B. The correlation coefficient						
	Mean	Std	Min	Max	$\widehat{InvSent}_i$	$DCF$	$TurnR$	$IPON$	$IPOR$	$NI$	$CCI$
$DCF$	-19.97	12.92	-47.13	-1.739	-0.208**	1.000					
$TurnR$	1.810	1.388	0.529	8.731	0.751**	-0.210**	1.000				
$IPOR$	5.762	5.426	-2.320	32.45	0.543**	0.0172	0.409**	1.000			
$IPON$	17.70	32.50	0.15	266.0	0.299**	-0.103	0.238**	-0.182**	1.000		
$NI$	72.84	92.06	5.01	560.05	0.692**	-0.092	0.849**	0.388**	0.314**	1.000	
$CCI$	107.46	4.80	97.0	114.5	0.412**	-0.226**	0.212**	0.306**	-0.035	0.0258	1.000

Firstly,  $DCF$ ,  $TurnR$ ,  $IPON$ ,  $IPOR$ ,  $NI$  and  $CCI$  are respectively regression to the above four macroeconomic variables (standardized treatment before regression) to obtain the self-residuals  $\widehat{DCF}$ ,  $\widehat{TurnR}$ ,  $\widehat{IPON}$ ,  $\widehat{IPOR}$ ,  $\widehat{NI}$ . Then principal component analysis is conducted on these residuals to obtain the orthogonalized investor sentiment index  $\widehat{InvSent} = -0.160\widehat{DCF} + 0.599\widehat{TurnR} + 0.419\widehat{IPOR} + 0.230\widehat{IPON} + 0.543\widehat{NI} + 0.318\widehat{CCI}$ . The statistical description and correlation series of data are shown in Table 1.

After mapping  $\widehat{InvSent}$  to  $[0, 1]$  for standardization, the investor sentiment index which eliminates macroeconomic factors is finally obtained.

## 5 Measurement Model Setting and Data Description

### 5.1 Model Specification

According to the previous theory, in order to test whether investor sentiment will affect corporate entity investment behavior, the test expression is set as:

$$Inv_{i,t} = \alpha + \beta \widehat{InvSent}_{i,t} + \gamma X_{i,t} + \varepsilon_{i,t} \tag{1}$$

Among them, subscript  $i$  represents the  $i$  stock and subscript  $t$  represents the  $t$  stock;  $Inv_{i,t}$  is investment for enterprises;  $\widehat{InvSent}_{i,t}$  is investor sentiment;  $X_{i,t}$  is the control variable, which mainly controls the influence of other factors such as business cycle, growth and corporate dividend. When examining the influence of financing channels or catering channels on corporate investment, investors' sentiment is replaced by  $\widehat{InvSent}_{i,t-1}\widehat{InvSent}_{i,t-2}$  with lag of one period (or lag of two periods).

If it is the financing channel that plays a role, investor sentiment may influence the company's financing behavior. The expression to test the influence of investor sentiment on corporate financing behavior is:

$$SI_{i,t}(DI_{i,t}) = \alpha + \beta \widehat{InvSent}_{i,t} + \gamma X_{i,t} + \varepsilon_{i,t} \tag{2}$$

Among them,  $SI_{i,t}(DI_{i,t})$  is equity financing and debt financing respectively.

## 5.2 Definition and Measurement of Variables

### 5.2.1 Explained Variable

The explained variables mainly involve enterprise investment and enterprise financing.

Business investment: measured by the growth rate of assets ( $A$ ), i.e.  $Inv_t = (A_t - A_{t-1})/A_{t-1}$ .

As for enterprise financing, this paper divides it into two categories by reference to McLean and Zhao (2014), one is equity financing, the other is debt financing.

Equity financing ( $SI$ ): change in book value ( $\Delta BE$ ), plus change in deferred tax ( $\Delta DT$ ), minus change in undistributed profit ( $\Delta RE$ ), measured by the inventory of lagging assets ( $A$ ), i.e.  $SI_t = (\Delta BE_t + \Delta DT_t - \Delta RE_t)/A_{t-1}$ ; Debt financing ( $DI$ ): change in the stock of assets ( $\Delta A$ ), minus the change in the book value of shares ( $\Delta BE$ ), minus the change in deferred tax ( $\Delta DT$ ), measured by the stock of lagged assets ( $A$ ), namely  $DI_t = (\Delta A_t + \Delta BE_t - \Delta DT_t)/A_{t-1}$ .

### 5.2.2 Core Explanatory Variable

Investor sentiment: It reflects the extent to which investors' irrationality causes asset prices to deviate from their fundamental values in the long or short term. In the previous section, we constructed a comprehensive index measure.

### 5.2.3 Control Variables

Based on McLean and Zhao (2014) and Cui Xiaolei et al. (2014) [1], economic expansion, growth, dividends and listing years of enterprises were selected as control variables.

Economic expansion ( $Expan$ ): dummy variable. If there are at least 6 months of the 12 months in which the economy is higher than the potential growth rate, the economic expansion variable is set as 1, and the other cases are set as 0. Economic expansion controls the impact of the business cycle.

Dividend ( $Did$ ): Dividend is the ratio of cash dividend per share to stock price.

Growth ( $GROI$ ): investors favor enterprises with high growth. The higher the growth opportunity, the lower the financing cost, which may affect the investment or performance of enterprises. The growth of the enterprise is measured by the growth rate of the main business income.

Listing period ( $Age$ ): control the listing time of an enterprise. The longer listed companies are, the more mature and stable they are.

## 5.3 Data Description

Using Wind information, I selected annual report data from 2001 to 2014 for data matching, and obtained corporate investment and corporate financing through calculation. For stock trading data, the annual data of 420 companies from 2002 to 2014 are obtained by removing stocks such as ST, missing data and abnormal data. The  $\widehat{InvSent}$ ,  $\widehat{TurnR}$  and  $\widehat{NI}$  data of the year are the average of the monthly data of the year. Descriptive statistical results of each variable are shown in Table 2.

**Table 2.** Descriptive statistical results of variables

<i>Variable</i>	<i>Unit</i>	<i>Mean value</i>	<i>Median</i>	<i>Minimum value</i>	<i>Maximum</i>	<i>Standard deviation</i>	<i>N</i>
<i>Inv</i>	100%	0.1839	0.1416	-0.4657	0.9953	0.1943	5040
<i>SI</i>	100%	0.0544	0.0153	0	0.9958	0.1126	5040
<i>DI</i>	100%	0.1097	0.0791	-0.7327	0.9942	0.1595	5040
<i>InvSent</i>	100%	0.2866	0.2665	0.138	0.681	0.1508	12
<i>TurnR</i>	100%	2.878	1.781	1.119	9.775	2.346	12
<i>NI</i>	户	789353.6	435919	71467.1	3132902	850305.3	12
<i>Expan</i>	100%	0.5833	1	0	1	0.4931	12
<i>Did</i>	元/股	0.1259	0.1	0	6.419	0.2024	5040
<i>GROI</i>	%	0.2237	0.1717	-0.9777	5.6033	0.3695	5040
<i>Age</i>	year	18.01	17	11	35	3.87	420

## 6 Measurement Results and Discussion

### 6.1 Fundamental Regression Result

First, examine the relationship between investor sentiment and business investment. With reference to Polk and Sapienza (2009) and Cui Xiaolei et al. (2014), OLS method was adopted to gradually add control variables, and regression was conducted on the lag period of investor sentiment respectively. The test results of Hypothesis I (logarithm) were obtained, which are listed in Table 3. It can be seen that investor sentiment is not only positively correlated with the current period of enterprise investment, but also positively correlated with the second and third phases of enterprise investment. Investor sentiment has an effect on enterprise investment through financing channels. Optimistic sentiment is conducive to the long-term development of enterprises, which means that the financing channels hypothesis of Hypothesis I is established. From the perspective of control variables, the economic cycle has an obvious effect on the investment of enterprises, and the investment of enterprises increases in the expansion period. The higher the growth of the enterprise, its investment will increase significantly; The higher the proportion of long-term dividends is, the higher the investment is. However, the time of listing is negatively correlated with the investment, which may be because the larger the size of the company, the slower the growth rate and the slower the investment.

Secondly, it examines the relationship between investor sentiment and corporate financing. The equity financing and debt financing are respectively regression to investor sentiment, and the test results of Hypothesis II are obtained, which are listed in Table 4. According to the regression results, optimistic investor sentiment has a significant promoting effect on both equity financing and debt financing, providing direct evidence to support equity financing channels, that is, Hypothesis II is established. From the perspective of control variables, economic expansion significantly promotes corporate equity financing, but has no significant effect on debt financing. The growth of enterprises is also conducive to the expansion of enterprise financing scale; Corporate cash dividend is conducive to improving the company's performance in the stock market and promoting equity financing, but it is negatively correlated with debt financing, which may mean that the better the company's performance is, the more abundant its own funds are and the less debt financing is. The longer an enterprise goes public, the less equity financing it has, and the debt financing is not significant.

**Table 3.** Test of Hypothesis I

Variable	(1)	(2)	(3)	(4)	(5)	(6)
<i>Cons</i>	0.147*** (23.36)	0.313*** (8.23)	0.141*** (17.90)	0.265*** (6.82)	0.113*** (13.07)	0.211*** (5.22)
<i>InvSenti,t</i>	0.0769*** (4.18)	0.0791*** (4.43)				
<i>InvSenti,t-1</i>			0.0714*** (3.70)	0.0647*** (3.45)		
<i>InvSenti,t-2</i>					0.146*** (7.08)	0.143*** (7.16)
<i>Expanti,t</i>	0.0258*** (4.58)	0.0106* (1.90)	0.0401*** (6.88)	0.0229*** (3.97)	0.0493*** (8.03)	0.0321*** (5.28)
<i>GROli,t</i>		0.114*** (13.67)		0.119*** (15.82)		0.114*** (14.84)
<i>Didi,t</i>		0.0734*** (5.60)		0.0663*** (5.14)		0.0598*** (4.60)
<i>Agei,t</i>		-0.0673*** (-5.16)		-0.0513*** (-3.88)		-0.0423*** (-3.09)
<i>Adj-R<sup>2</sup></i>	0.0089	0.0668	0.0103	0.0708	0.0193	0.0758
<i>N</i>	5040	5040	4620	4620	4200	4200

Note: \*\*\*, \*\* and \* represent the significance level of 1%, 5% and 10% respectively, the same as below.

**Table 4.** Test of Hypothesis II

Model	(1)	(2)	(3)	(4)	(5)	(6)
Variable	<i>SI<sub>it</sub></i>	<i>SI<sub>it</sub></i>	<i>SI<sub>it</sub></i>	<i>DI<sub>it</sub></i>	<i>DI<sub>it</sub></i>	<i>DI<sub>it</sub></i>
<i>Cons</i>	0.0418*** (12.29)	0.0323*** (8.76)	0.134*** (5.92)	0.100*** (20.75)	0.0814*** (15.93)	0.134*** (4.28)
<i>InvSenti<sub>it</sub></i>	0.0437*** (4.16)	0.0343*** (3.23)	0.0351*** (3.31)	0.0338** (2.27)	0.0276* (1.87)	0.0267* (1.81)
<i>Expansi<sub>it</sub></i>		0.0122*** (3.68)	0.0128*** (3.86)		-0.00418 (-0.91)	-0.00479 (-1.04)
<i>GROli<sub>it</sub></i>		0.0226*** (5.20)	0.0218*** (5.03)		0.00103*** (17.04)	0.00103*** (17.17)
<i>Didi<sub>it</sub></i>			0.0285*** (3.66)			-0.0315*** (-2.91)
<i>Agei<sub>it</sub></i>			-0.0368*** (-4.74)			-0.0170 (-1.58)
<i>Adj-R<sup>2</sup></i>	0.0032	0.0126	0.0195	0.0008	0.0559	0.0575
<i>N</i>	5040	5040	5040	5040	5040	5040

## 6.2 Robustness Analysis

In the above regression results, we test the relationship between investor sentiment and enterprise investment and financing, and Hypothesis I and Hypothesis II are verified. In order to further investigate whether this relationship is robust, we use the number of new account holders (*NI*) as the proxy variable of investor sentiment for reference of Yi Zhigao and Mao Ning (2009) to replace the previous investor sentiment index for regression. In order to avoid sample selectivity bias, the sample is further divided into two subsamples, sample 1 is from 2002 to 2008, and sample 2 is from 2009 to 2014. The robust regression results of the impact of investor sentiment on corporate investment and financing are shown in Table 5. The results show that Hypothesis I and Hypothesis II are further verified and support the conclusion that investor sentiment influences enterprise investment behavior through equity financing channels.

To sum up, in investor sentiment influence on enterprises investment and enterprise performance, whether the substitution variables or sample regression, support investor

**Table 5.** Robust regression results of investor sentiment, corporate investment and financing

Time interval Variable	Full sample				Sample1		Sample2	
	<i>Inv<sub>it</sub></i>	<i>Inv<sub>it</sub></i>	<i>SI<sub>it</sub></i>	<i>DI<sub>it</sub></i>	<i>Inv<sub>it</sub></i>	<i>Inv<sub>it</sub></i>	<i>Inv<sub>it</sub></i>	<i>Inv<sub>it</sub></i>
<i>Cons</i>	0.0651 (1.28)	0.0831 (1.41)	0.0836*** (2.76)	0.0197 (0.47)	0.343*** (6.36)	0.0253 (0.33)	0.197*** (3.69)	0.130** (2.21)
<i>InvSent<sub>it</sub></i>					0.0907*** (3.99)		0.148*** (3.72)	
<i>InvSent<sub>it-1</sub></i>						0.421*** (5.34)		0.276*** (4.76)
<i>NI<sub>it</sub></i>	0.0198*** (7.91)		0.00438*** (2.93)	0.00897*** (4.33)				
<i>NI<sub>it-1</sub></i>		0.0147*** (4.57)						
<i>Expan<sub>it</sub></i>	0.0357*** (5.91)	0.0432*** (5.43)	0.0193*** (5.36)	0.00607 (1.22)	0.0352** (3.25)	0.214*** (5.83)	0.0241** (2.28)	0.00473 (0.34)
<i>GROI<sub>it</sub></i>	0.113*** (15.51)	0.119*** (15.90)	0.0215*** (4.94)	0.103*** (17.07)	0.112*** (12.15)	0.121*** (12.58)	0.118*** (9.83)	0.0920*** (6.80)
<i>Did<sub>it</sub></i>	0.0721*** (5.52)	0.0651*** (5.05)	0.0279*** (3.59)	-0.0319** (-2.96)	0.155*** (6.14)	0.139*** (5.47)	0.0358** (2.52)	0.0346** (2.39)
<i>Age<sub>it</sub></i>	-0.0673*** (-5.18)	-0.0513*** (-3.88)	-0.0368*** (-4.75)	-0.0170 (-1.58)	-0.0923*** (-5.11)	-0.0678*** (-3.63)	-0.0277 (-1.52)	-0.0156 (-0.78)
<i>Adj-R<sup>2</sup></i>	0.0747	0.0726	0.0190	0.0604	0.0789	0.0911	0.0688	0.0739
<i>N</i>	5040	4620	5040	4620	2940	2520	2100	1680

sentiment mainly through equity or debt financing mechanism affect corporate investment behavior point of view, and optimistic sentiment is helpful to promote enterprise investment and enterprise performance for a long time.

## 7 Conclusion

This paper argues that investor sentiment in China’s stock market influences corporate investment behavior mainly through equity financing channels. Investor sentiment has a significant impact on the actual investment of enterprises. The high investor sentiment is conducive to the long-term growth of enterprises, improve the stock price of enterprises and improve the long-term performance of enterprises. After controlling for the business cycle, corporate dividends and growth, the results remain robust. Therefore, from the end of 2007 to November 2014 and from June 2015 to the beginning of 2016, investor sentiment in China’s securities market was depressed for a long time, which did harm to the real economy.

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