

INVESTOR SENTIMENT AND STOCK RETURN: EVIDENCE FROM CHINA

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ABSTRACT

This paper creates an investor sentiment index for the Chinese stock market based on the method of Baker and Wurgler. After construction of investor sentiment index, I perform an eyeball test and find similar trend for investor sentiment index and the SSE composite index. Deeper analysis using the granger causality test proves that the change of SSE composite index could lead to the change of investor sentiment index which can be explained by the “policy market” characteristics of Chinese stock market. In order to investigate the effect of investor sentiment on stock returns in terms of different styles of the company, I run a single-factor model and the sentiment beta results show that the change of investor sentiment has significant different effect on the return of stock with different market characteristics such as price, P/E ratio and P/B ratio. It is consistent with the market anomaly that behavior finance has demonstrated such as low price effect and herd effect. Overall, it is important for us to take investor sentiment into consideration when investing in the market.

BIOGRAPHICAL SKETCH

Rui Yin was born in Chengdu, China in 1996. She attended Renmin University of China in 2014, majoring in International Economics and Management. During the undergraduate period, she has learned many economic courses including Microeconomics, Macroeconomics and International Economics and has strengthened skills to tackle academic problems. She also did research on mortgage of farmers in China, which received highly recognition from her advisor. In 2018, Rui Yin started her 2-year academic study in Applied Economics and Management at Cornell. During the first year, she found interest on behavioral finance and started research on investor sentiment in China with supervision from Professor Byoung-Hyoun Hwang who is also Rui Yin`s committee chair.

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CHAPTER 1

INTRODUCTION

Before 1980s, CAPM model which is based on efficient-market hypothesis has explained the stock price fluctuation of developed markets in Europe and America in a good way using complex and perfect mathematical derivation. However, with the development of emerging market, more and more financial anomalies can't be explained well with CAPM theory and behavior finance emerges as the times require.

From the perspective of behavioral finance, stock prices are affected by the actions of irrational investors. First, there is no purely rational investor in the market. Second, there are market anomalies and random walk pattern cannot be effectively observed in the market. Daniel Kahneman and Amos Tversky (1979) put forward Prospect Theory, shaking the validity of Expected Utility Theory which is foundation of traditional finance. Shefrin and Statman (1985) proposed Behavior Portfolio Theory that investors' investment decisions are actually psychological choices under uncertain conditions, then they expanded CAPM to BAPM model. Baker and Wurgler deepened the area, exploring the impact of investor sentiment on stock returns and confirming that investor sentiment not only affects aggregate market returns but also has an influence on abnormal market returns that are caused by market anomalies.

China is now one of the biggest developing countries and expected to become more and more important to global investors based on its huge economic volume and key role in the world industrial production chain. Looking at the development history of China's stock market, we can find a unique phenomenon of the market, the so-called "policy market". The trend of the stock index has close relationship with the policies issued by the government, which often manifests as an overreaction of the market to the policy news, and even causes the trend of the stock index to deviate from the actual situation

of the fundamentals. The performance of the stock market is greatly affected by policy factors, and systemic risk has become the main risk of the stock market. This is exactly the opposite of a mature foreign stock market situation. Specifically, the differences between the "policy market" and mature markets are mainly in three aspects: First, the investor structure is different. In mature stock markets, there are more institutional investors, while in the "policy market", the majority of investors are retail investors. Second, the investment philosophy is different. In mature stock markets, investment income mainly comes from the long-term returns of stocks, and investors' investment ideas tend to be more rational. In the "policy market", investment income mainly comes from market spreads. Investors' investment ideas are excessively speculative, short-term, lack of independent analysis and judgment capabilities, and are greatly affected by market news. Third, investors receive policies in different ways. In mature markets, investors' reception of policy information has the characteristics of differentiation. Some investors regard it as a favorable policy, while others may consider it as a bearish policy, resulting in completely different investor responses to the same policy. In this way, with the introduction of the same policy information, investors' different behaviors has greatly reduced the impact of the policy introduction on stock indexes and reduced systemic risk in the stock market. In the "policy market", the impact of investors' acceptance of policies is relatively similar, and there is a strong convergence in the adjustment of investment behaviors, which reflects the same rise and fall of individual stocks and the sharp rise or plunge of stock indexes on a macro level, systematically. Due to these characteristics, China stock market are more volatile because of irrational investor behaviors.

In addition, China has stringent capital controls on foreign ownership of domestic equity and also limit the short selling mechanism, as a result China stock market is not considered a completely open market which also affect the investors` behavior

accordingly. These facts suggest that traditional finance theories are not suitable to explain the situation of China stock market. On contrary, behavior finance has put stress on the influence of sentiment and psychology on markets, and the anomalies such as herd effect, calendar effect, reversal effect are close to real market which indicates that this methodology can be apply to the research on China stock market.

CHAPTER 2

LITERATURE REVIEW

2.1 Investor Sentiment Model

Delong, Shieifer, Summers and Waldmann (1990) put forward the DSSW noise trader risk model. In this model, there are two kinds of traders in the market: noise trader and rational trader. Rational traders can rationally invest and arbitrage in the market based on market information, while noise traders mistakenly think that they have special information related to the pricing of risky assets, and they make decisions based on these information. DSSW model is developed based on two assumptions. The first assumption is that investment is short-term. The second is that information bias is random for noise trader. The model believes that noise traders, whose behaviors are random and unpredictable reduce the arbitrage of rational arbitrageurs. In this way, the price of financial assets deviates significantly from the basic value. More importantly, this model suggests that investors are subject to sentiment and not always rational in making decisions.

Shefrin and Statman (1994) proposed Behavioral Asset Pricing Model (BAPM). In the BAPM model, investors are also divided into information traders and noise traders. Information traders are "rational investors" who usually support the CAPM model of modern financial theory, avoid cognitive errors and have a mean-variance preference. Noise traders are usually inclined to cognitive errors, without strict mean variance preferences. When the information trader occupies the main body of the transaction, the market is efficient, and when the latter occupies the main body of the transaction, the market is inefficient.

Daniel, Hirshleifer and Subrahmanyam (1998) put forward DHS model, which use the idea that investors overreact to their private information and adjust only slowly when

the public signal contradicts it because they don't trust value of public information enough. The psychological condition of investor in DHS model can lead to short-term overreact to stock prices and reverse effect in the long run.

Hong and Stein (1999) proposed HS model. The model divides investors into two categories: "observers" and "momentum traders". Observers make predictions based on the information they have about future values. They are completely independent of current or past prices. Momentum traders are completely dependent on past price changes. The limitation is that their forecasts must be past. Under the above assumptions, the model unified the underreaction and overreaction into a gradual diffusion of basic value information, excluding other needs for investor emotional stimulation and liquidity trading. The model believes that due to the tendency of the "observant" to underreact to private information, the "momentum trader" tried to take advantage of this through hedging strategies, and the result of this was to go to overreaction.

Shefrin and Statman(2000) further proposed Behavior Portfolio Theory which breaks the assumption of rational investor in modern finance theory and make the theory more close to actual investment behavior of investors. BPT Model believes that the decision of investors is the result of psychological choice under uncertain conditions.

2.2. Investor Sentiment Measurement

2.2.1 Direct Measurement

Direct measurement is a kind of 'bottom-up' method which usually uses surveys and polls to get the investor attitude on market. The benefits are significant. This measurement comes directly from the reaction of real investors. And surveys take into account the psychological dimension of individuals in accordance with their individual

characteristics. However, there are unavoidable problems in terms of the number of samples, integrity, immediacy and accuracy. Some typical direct proxies are as follows.

(1)AAII Investor Sentiment: Since 1987, AAI members have been answering the same sample questions each week. The results are compiled into the AAI Investor Sentiment Survey, which offers insight into the psychological condition of investors for the following six months. Fisher and Statman(2000), Brown and Cliff(2005) used the index in their research on investor sentiment.

(2)UBS/Gallup Surveys. Each month, UBS/Gallup conducts phone interviews with around 1,000 haphazardly chosen investors. The UBS data represents a general investor pool, and this is often vital since speculators might display certain characteristics that recognize them from the common population.

2.2.2 Indirect Measurement

Indirect measurement is a kind of ‘top-down’ method and construct investor sentiment by calculating the indirect proxies in the market. Usually these proxies are financial market statistics that can represent market trends. As they are objective representation of market performance, they can be used as approximation to some extent. However, these measures can be affected by macroeconomic fundamentals so special software techniques need to be applied when dealing with the data. Some typical indirect proxies are as follows.

(1)Trading Volume. Baker and Stein(2004) note that irrational investors are more likely to trade when they hold positive view about future market. Scheinkman and Xiong (2003) uncovered that volume reflects underlying contradicts of opinions which are in turn related to valuation levels when short selling is difficult.

(2)Closed-End Fund Discount. When the fund market price is less than the net asset value, there may be less investor demand for fund investing. The larger the discount,

the more bearish the investors. Zweig(1973), Shleifer(1991) and Neal and Wheatley(1998) have argued that the average discount on closed-end equity funds can be sentiment index and retail investors are bearish when the discount increasing.

(3)IPO First-Day Returns. The higher the market sentiment, the higher the first day's yield. Baker and Wurgler(2006) use this measure in their construction of investor sentiment index.

(4)Turnover Rate. The turnover rate can also reflect the sentiment of investors in the securities market. The higher the investor sentiment, the more they tend to trade frequently, so the higher the turnover rate.

2.3. Effect of Investor Sentiment on Stock Market

Soltman and Statman(1988) used the data from 1963 to 1985 as sample and run regression between institutional investor sentiment and Dow Jones Index, but they didn't find significant influence of investor sentiment on index returns. Barbeirs(1998) did research on the synergy between market returns and investor sentiment from another aspect. Their results showed consistent effects of noise traders on stock returns are more pronounced than traditional fundamentals and concluded that noise trader sentiment played important role in assessing value of risky assets. Schmeling(2009) studies the prediction of investor sentiment on stock returns from 1985 to 2005 in 18 industrial countries and found that there is negative relationship between investor sentiment and the prediction of stock returns which means the higher the current investor sentiment, the lower the future stock returns. Baker and Wurgler(2006) made great contribution in research of the influence of investor sentiment index on the stock market. They constructed investor sentiment using several proxies and examined the influence of investor sentiment index on stocks with different characteristics such as small-cap

stocks, growth stocks, highly volatile stocks. The conclusion shows stocks that are difficult to arbitrage or to value are most affected by investor sentiment.

2.4. Investor Sentiment and China Stock Market

Jiang and Wang (2009) used the data from 1999 to 2008 as sample and did empirical analysis between investor sentiment and stock returns. They found that the gap between current and short future returns has some relationship with investor sentiment. Tang and Wang (2009) constructed investor sentiment using the same method of Baker and Wurgler and revealed that sentiment premium is existed in China stock market and could have effect on stock returns, and there is reverse effect in the long time. Wang and Liu (2011) using both direct proxies and indirect proxies to construct investor sentiment and found that investor sentiment significantly influences the returns of stocks but the influence in the bull market is less obvious than bear market. And higher market return in previous time would cause low level of investor sentiment later. Song and Li(2012) added sentiment beta into CAPM model and found that stocks with higher Price to Book ratio and higher volatility are more easily affected by investor sentiment while small-cap stocks are less affected by sentiment.

CHAPTER 3

CONSTRUCTION OF INVESTOR SENTIMENT INDEX

3.1. Principal Component Analysis

In the next procedure, Baker and Wurgler's method to construct investor sentiment using principal component analysis will be used to construct the China investor sentiment index. Principal component analysis (PCA) is a way used to reduce number of variables in your data by extracting important ones from a large pool. It reduces the dimension of data with the aim of retaining as much information as possible. The first principal component accounts for as much of the variability in the data as possible, and each succeeding component accounts for as much of the remaining variability as possible.

3.2 Sentiment Proxies Selection and Analysis

Although Baker and Wurgler used yearly data in their research, in this thesis I used monthly data as it can better reflect the dynamic changes in an unmaturred market like China. Data of the closed-end fund discount rate, numbers of new investor accounts, numbers of IPO, IPO first-day returns is from China Stock Market & Accounting Research Database (CSMAR). Data of average price to earnings ratio, share of partial equity funds, and exchange rate of RMB and US dollar comes from Wind database. After eliminating invalid data, there are 65 valid sets of observations in total. And the time range is from December 2012 to June 2019.

(1) The Closed-End Fund Discount Rate (DCEF)

According to Efficient Market Hypothesis, asset price is endogenous to its own intrinsic value, so the price of closed-end fund should be consistent with its per unit net assets value of stock portfolios. In reality, closed-end funds usually are issued at discount.

Many scholars including Delong (1990), Brown(1999), Neal and Wheatley(1998), Baker and Wurgler(2006) regarded the closed-end fund discount rate as reflection of investor sentiment. The more the discount, the lower the investor sentiment level.

(2)Numbers of New Investor Accounts (NIA)

Number of new investor accounts is the monthly new stock account opened in China market, which to some extent reflects the willingness and attitude to participate in market transactions. If there are more accounts opened, investors are optimistic about market and will tend to trade more. Although there are conflicts that number of new accounts is not a good indicator in mature market because of high base of existed investors, it can be indicator in emerging market as the number of investors accounts has not reached saturation level yet.

(3)Number of IPOs (IPON)

The underlying demand for IPO is found to be extremely sensitive to investor sentiment (Baker and Wurgler, 2006). Wei (2014) also revealed that there is a choice problem in the timing of IPO for companies who want to finance in the securities market. Number of IPOs can be a sentiment proxy as it is often positive with the up-trend of investor sentiment.

(4)IPO First-day Returns (IPOR)

Usually there is underpricing phenomenon on the first day of IPO, which means there could be remarkable returns on first trading day. One reasonable explanation is that it involves investor enthusiasm that drives the price high.

(5)Average Price to Earnings Ratio (PE)

Price to earnings ratio is a representative indicator of the valuation of stocks. It not only reflect the price of the stock market, but also reflect the financial continuity of the company`s earnings under macroeconomic operation. In general, the higher the P/E ratio, the higher the market sentiment.

(6)Share of Partial Equity Funds in All Funds (SEF)

Partial Equity Funds are funds in which equity assets account a large proportion. If the share of partial equity funds in whole funds market arises, maybe there are higher return in equity market including stock market so that fund manager want to assign more weight on equity assets. Partial equity funds are also seen as radical and risky investment options, which can be associated with positive investor sentiment.

(7)Exchange Rate of RMB and US Dollar (EX)

Although China has some limitation on foreign investors, there are still ways such as QFII that foreign investors can participate in China stock market. When the exchange rate of RMB and US dollar rises, RMB experiences devaluation. It is expected that China central bank would improve interest rate which would have negative effect on stock market and then decrease investor sentiment.

3.3 Construction of Investor Sentiment Index (excluding macroeconomic factors)

3.3.1 Descriptive and Correlation Analysis

The number of valid observations is 65 and the descriptive statistics of each variable are as follows. From the correlation table we can see most of the correlation coefficients are less than 0.5 and there are no strong correlation between variables overall.

Table 1 Descriptive Statistics

Variable	Obs	Mean	Std.Dev.	Min	Max
DCEF	65	-0.882	0.534	-2.359	0.517
IPON	65	17.25	14.25	0	54
IPOR	65	5.057	5.211	0	39.16
NIA	65	13.97	0.59	12.57	15.42
PE	65	15.25	2.863	9.76	22.55
SEF	65	0.127	0.101	0.05	0.43
EX	65	6.505	0.289	6.104	6.935

Table 2 Correlation Between Variables

	DCEF	IPON	IPOR	NIA	PE	SEF	EX
--	------	------	------	-----	----	-----	----

DCEF	1						
IPON	0.4978	1					
IPOR	0.1716	-0.0263	1				
NIA	0.4892	0.486	0.0698	1			
PE	0.4494	0.507	0.197	0.642	1		
SEF	-0.495	-0.173	-0.155	-0.438	-0.444	1	
EX	0.3267	0.257	0.0029	0.188	0.0903	-0.749	1

3.3.2 Determination of Lead and Lag Variables

The above seven indicators may contain lead or lag effect with investor sentiment. When constructing the investor sentiment index, we must first confirm whether lead or lag form of each indicator should be use. I start by estimating the principal components of the 7 proxies and their lags. This gives index1 with 14 loadings, one for each of the current and lagged proxies. Then I compute the correlation between the index1 and the current and lagged variables of each of the proxies and choose whichever has higher correlation with the index1.

Table 3 Correlation with index

	DCEF	IPON	IPOR	NIA	PE	SEF	EX
Index1	0.3998	0.3075	0.0985	0.3310	0.2435	-0.7463	0.9955

Table 4 Correlation with index (cont.)

	L_DCEF	L_IPON	L_IPOR	L_NIA	L_PE	L_SEF	L_EX
Index1	0.4272	0.3043	0.1680	0.3845	0.2584	-0.7614	0.9759

By comparing the correlation coefficients with index, L_DCEF, IPON, L_IPOR, L_NIA, L_PE, L_SFS, EX are chosen to construct the investor sentiment index.

3.3.3 Investor Sentiment Construction

In the process of BW sentiment index construction method, they only use the first component as the principal component which can only account for less than 50% of the total statistical standards. In my construction of investor sentiment index, I use number of component which can explain at least 85% of the cumulative variance. Firstly, I standardize the seven source indicators: L_DCEF, IPON, L_IPOR, L_NIA, L_PE,

L_SFS, EX . Then, the principal component analysis of the seven variables is carried out. Results show the first four components account for 86.81% of the cumulative variance and the SENT equation is finally obtained as follows.

Table 5 PCA eigenvalue and proportion results (excluding macroeconomic factors)

Component	Eigenvalue	Proportion	Cumulative
Comp1	3.55203	0.5074	0.5074
Comp2	1.0149	0.145	0.6524
Comp3	0.811389	0.1159	0.7683
Comp4	0.698813	0.0998	0.8681
Comp5	0.55878	0.0798	0.9479
Comp6	0.249654	0.0357	0.9836
Comp7	0.114443	0.0163	1.0000

Table 6 PCA loading results (excluding macroeconomic factors)

Variable	Comp1	Comp2	Comp3	Comp4
L_DCEF	0.3557	-0.2605	0.1616	0.4438
IPON	0.3203	0.4435	0.1815	-0.6903
L_IPOR	0.2462	0.4273	-0.8333	0.2052
L_NIA	0.4293	0.0977	0.2598	0.2838
L_PE	0.4301	0.3494	0.315	0.1448
L_SFS	-0.46	0.3064	0.1607	0.0394
EX	0.3598	-0.5722	-0.2324	-0.4259

$$SENT = 0.152 * DCEF_{t-1} + 0.105 * IPON_t + 0.052 * IPOR_{t-1} + 0.227 * NIA_{t-1} + 0.258 * PE_{t-1} - 0.063 * SEF - 0.076 * EX$$

To further examine the removal of some lead or lag variables, I obtained the correlation between the index1 from all 14 lead and lag variables and index2 from 7 variables selected. The results showed high correlation so it is acceptable to remove half variables and only chose whichever has higher correlation with the index1.

Table 7 Correlation between Index1 and Index2

	Index1	Index2
Index1	1	
Index2	0.9107	1

3.4 Improvement of Investor Sentiment Index(including macroeconomic factors)

Some of the sentiment proxies reflect economic fundamentals to some extent and the SENT built above does not eliminate the effects of macroeconomic fluctuations and the rational elements. To remove such influence, I regress each variables with a set of macroeconomic indicators using the same way of Baker and Wurgler: growth in total retail consumption, growth in industrial production, growth in employment and the Macroeconomic Climate Index. Then, the residuals of the above seven variables are analyzed by principal component analysis. In this case, the first 2 components are selected as they already accounts 86.52% of cumulative variance. SENT_{Tr} equation is finally obtained.

Table 8 PCA eigenvalue and proportion results (including macroeconomic factors)

Component	Eigenvalue	Proportion	Cumulative
Comp1	4.78182	0.6831	0.6831
Comp2	1.27505	0.1822	0.8653
Comp3	0.888092	0.1269	0.9922
Comp4	0.0550295	0.0079	1.0000
Comp5	0	0	1.0000
Comp6	0	0	1.0000
Comp7	0	0	1.0000

Table 9 PCA loading results (including macroeconomic factors)

Variable	Comp1	Comp2	Comp3	Comp4
L_DCEF	0.4469	-0.0031	-0.1988	0.4209
IPON	0.3723	0.4816	-0.2139	0.1342
L_IPOR	0.336	0.5801	0.1862	0.0851
L_NIA	0.2978	-0.4532	0.5807	0.5148
L_PE	0.3958	0.0563	0.5054	-0.6043
L_SFS	-0.4085	0.3493	0.2056	0.4073
EX	0.3697	-0.3178	-0.4951	-0.039

$$SENT_r = 0.161 * DCEF_{t-1} + 0.224 * IPON_t + 0.230 * IPOR_{t-1} + 0.023 * NIA_{t-1} + 0.153 * PE_{t-1} - 0.082 * SEF + 0.074 * EX$$

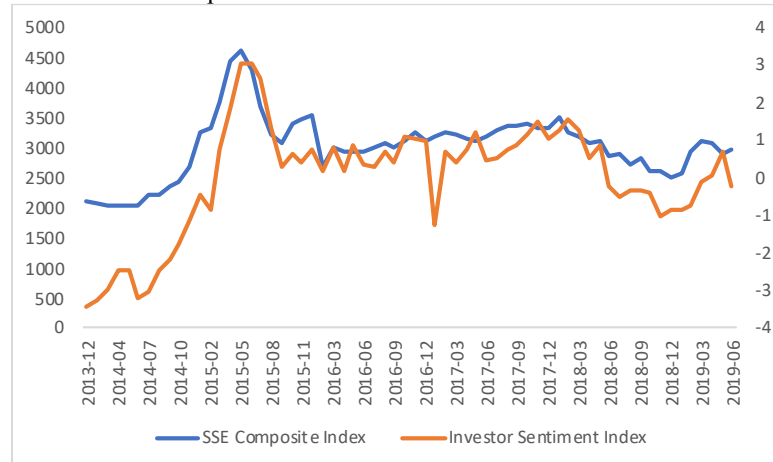
CHAPTER 4

EMPIRICAL RESULTS

4.1 Does the Sentiment Index Reflect Fluctuation of Market? An Eyeball Test

Behavioral finance holds view that investor sentiment can influence the fluctuation of capital market. The most intuitive manifestation of the relationship is an eyeball test. SSE composite index is a stock market index of all stocks that are traded at the Shanghai Stock Exchange. It is commonly regarded as the market index of China stock market. From Figure1 we can see that SSE Composite Index and Investor Sentiment Index demonstrate very similar trend in the past time especially several crests and troughs. In 2015, the Chinese stock market staged a magnificent roller coaster market. In the six months from December 2014 to June 2015, the SSE Composite Index surged 60%, but then fell into an avalanche in the second half year. Similarly, the investor sentiment index also experience significant up and down during the whole year. Particularly, the trend of investor sentiment index seems to precede the trend of stock indexes so it is speculated that the stock market return may have effect on investor sentiment in reverse. I will continue examine their causality relationship next.

Figure 1 Comparison of SSE Composite Index and Investor Sentiment Index



4.2 Deeper Test of the Relationship Between Sentiment Index and Stock Market

4.2.1 Augmented Dickey–Fuller test (ADF)

In statistics and econometrics, an augmented Dickey–Fuller test (ADF) tests the null hypothesis that a unit root is present in a time series sample. If the calculated test statistic is less (more negative) than the critical value, then the null hypothesis is rejected and no unit root is present. In the results of ADF test, all the p values are very close to zero so we can conclude that all the time series of variables are stationary.

In the following analysis, SENTr is the investor sentiment index, SSE is SSE Composite index, SSER is the monthly return of SSE Composite index. DSENTr, DSSE and DSSER are the first order difference of SENTr, SSE and SSER.

Table 10 ADF Test Results

Variables	Test Statistic	p value	Whether stationary
SENTr	-8.740	0.0000	YES
SSE	-6.213	0.0000	YES
SSER	-11.900	0.0000	YES
DSENTr	-16.056	0.0000	YES
DSSE	-12.003	0.0000	YES
DSSER	-16.458	0.0000	YES

4.2.2 Granger Causality Test

The Granger causality test is a statistical hypothesis test for determining whether one time series is useful in forecasting another. From the test results we can see that SSE composite index does cause the fluctuation of investor sentiment as already found in the eyeball test. Furthermore, the return of SSE composite index also has effect on investor sentiment.

Table 11 Granger Causality Test Results

Null Hypothesis	Obs	F-Statistic	Prob>F	Results
SENTr does not Granger-cause SSE	65	2.20	0.1432	Can't reject at 5% level
SSE does not Granger-cause SENTr	65	31.02	0.0000	Reject
SENTr does not Granger-cause SSER	65	0.89	0.3480	Can't reject at 5% level
SSER does not Granger-cause SENTr	65	6.20	0.0155	Reject
DSENTr does not Granger-cause DSSE	65	0.30	0.5848	Can't reject at 5% level

DSSE does not Granger-cause DSENTr	65	13.23	0.0000	Reject
DSENTr does not Granger-cause DSSER	65	0.38	0.5391	Can't reject at 5% level
DSSER does not Granger-cause DSENTr	65	1.16	0.2699	Can't reject at 5% level

It is surprising that the investor sentiment does not significantly influence the whole China stock market but the fluctuation of stock market itself has significant effect on the willingness of investors to participate in stock market. One plausible reason is that as China market is kind of “policy market”, retail investors account for a larger proportion than other markets. And in “policy market” investors' investment ideas are excessively speculative, short-term, lack of independent analysis and judgment capabilities, and are greatly affected by market news. As a result, many retail investors are greatly affected by the overall investment atmosphere of the market, and market anomalies such as the herd effect are more common. If the market is booming, irrational retail investors have more passion risking themselves to earn potential profits. And if the return level is low or even negative, irrational retail investors tend not to trade.

4.2.3 Time Series Analysis: Relationship Between Sentiment and Stock Market

Return

In order to find out the relationship between sentiment index and the whole stock market return, I run a time series regression of the sentiment index (SENTr) I built and the return of SSE Composite Index (SSER) using the lag forms of sentiment index up to 12 months. The results show that there is significant positive relationship between investor sentiment and the contemporaneous return of SSE Composite Index. And the sentiment negatively relates to most future returns, except lag one period which is not significant however. For most of the lagged variables, the negative relationships are significant at 5% level. This result is consistent with finding of Baker and Wurgler (2007) who suggest that average returns following a period of high investor sentiment will be lower than bond-like stocks.

Table 12 Regression Results of Sentiment Index and The Return of Stock Market

Independent Variables	Coefficient	p value	Results
SENT	0.0000265	0.083	Significant at 10% level
L1_SENT	0.0000169	0.258	Not Significant at 10% level
L2_SENT	-0.0000311	0.035	Significant at 5% level
L3_SENT	-0.0000428	0.004	Significant at 5% level
L4_SENT	-0.0000511	0.000	Significant at 5% level
L5_SENT	-0.0000478	0.001	Significant at 5% level
L6_SENT	-0.0000442	0.003	Significant at 5% level
L7_SENT	-0.0000390	0.011	Significant at 5% level
L8_SENT	-0.0000306	0.050	Significant at 5% level
L9_SENT	-0.0000283	0.076	Significant at 10% level
L10_SENT	-0.0000208	0.198	Not Significant at 10% level
L11_SENT	-0.0000191	0.243	Not Significant at 10% level
L12_SENT	-0.0000175	0.282	Not Significant at 10% level

4.3 The Effect of Investor Sentiment on Stocks with Different Characteristics

4.3.1 Descriptive Analysis

Shenwan indexes are used in the following analysis of relationship between investor sentiment and return of stocks with different characteristics. Shenwan indexes include stock price series index, market cap series index, price-earnings ratio series index and price-book ratio series index. Indexes are compiled based on the following rules: based on the corresponding characteristics ranking of all companies, the highest 200 stocks are selected for the compilation of high eigenvalue indexes, the lowest 200 stocks are selected for the compilation of low eigenvalue indexes, and the 200 stocks around the medium are selected for middle eigenvalue index. The constituent stocks of the Shenwan Indexes are updated at least twice a year, so the index can fully reflect the dynamics of the stock market, and also ensure the difference between the high and low indexes, which can well represent the corresponding company characteristics. The time

range of these index returns is consistent with the time range of investor sentiment index.

Table 13 Descriptive Statistics of Stock Index Returns with different Characteristics

Index	Variables	Obs	Mean	Std.Dev.	Min	Max
Large-cap Index	LC	65	0.0113	0.0763	-0.205	0.284
Middle-cap Index	MC	65	0.0134	0.0796	-0.277	0.194
Small-cap Index	SC	65	0.0147	0.0889	-0.297	0.241
High-price Index	HP	65	0.0137	0.0773	-0.176	0.195
Middle-price Index	MP	65	0.0107	0.0731	-0.155	0.189
Low-price Index	LP	65	0.0198	0.0776	-0.175	0.265
High-P/E Index	HPE	65	0.00594	0.0902	-0.183	0.235
Middle-P/E Index	MPE	65	0.0125	0.0808	-0.172	0.219
Low-P/E Index	LPE	65	0.0207	0.0694	-0.144	0.283
High-P/B Index	HPB	65	0.00846	0.0871	-0.196	0.232
Middle-P/B Index	MPB	65	0.013	0.074	-0.16	0.19
Low-P/B Index	LPB	65	0.0193	0.0713	-0.16	0.279

From the above statistics, we can see that average return of small-cap index is higher than large-cap and middle-cap, which can reflect the small cap effect. In price index series, low-price index generates higher return than high-price and middle price, reflecting cheap stock effect. In P/E and P/B index series, lower ratio indexes also have higher return which is in line with observation in reality.

4.3.2 Augmented Dickey–Fuller test (ADF)

The returns of different style indexes are stable time series, and subsequent regression analysis can be directly performed.

Table 14 ADF Test Results of Stock Index with different Characteristics

Variables	Test Statistic	p value	Whether stationary
LC	-10.832	0.0000	YES
MC	-11.596	0.0000	YES
SC	-11.289	0.0000	YES
HP	-11.275	0.0000	YES
MP	-11.428	0.0000	YES
LP	-11.901	0.0000	YES

HPE	-10.384	0.0000	YES
MPE	-11.460	0.0000	YES
LPE	-13.388	0.0000	YES
HPB	-11.082	0.0000	YES
MPB	-11.902	0.0000	YES
LPB	-12.934	0.0000	YES

4.3.3 The Model

In the following regression, I want to compare sentiment beta of different stock index returns in terms of different characteristics. Then I can examine whether the change of investor sentiment have different effect on index with different characteristics. The single-factor regression model is defined as

$$R_i = \alpha + \beta * DSENT + \varepsilon$$

Where \overline{R}_i is the return of different index and DSENT is the first difference value of investor sentiment index.

4.3.4 Effect of Sentiment on Stock Index in terms of Market Caps

From the regression result for stock index in terms of market caps, we can see that the change of investor sentiment index has no significant effect on large-cap stock index, but have significant effect on middle-cap stock index and small-cap stock index at 90% confidence level. The coefficients are surprisingly all negative, which means the returns of market cap indexes tend to decline as investor sentiment index improves. However, this negative relationship could be doubted as the model are only significant at 10% significant level. And the effect from sentiment is more obvious for smaller cap index with higher absolute value of coefficient.

Table 15 Regression Results of Market Cap Indexes

Characteristics	Variables	Coefficient	SE	t-Statistics	Prob.
Large-cap Stock Index	LC	-0.0224263	0.0138319	-1.62	0.11
Middle-cap Stock Index	MC	-0.0264108	0.0144838	-1.82	0.073
Small-cap Stock Index	SC	-0.027921	0.0163933	-1.7	0.094

4.3.5 Effect of Sentiment on Stock Index in terms of Market Prices

The results for market price indexes are all significant at 1% level. The sentiment betas are all positive and low-price stock index has the largest sentiment beta, which means that low-price index is more easily affected by the change of investor sentiment. Researchers have recognized low price effect that in several financial markets that low priced shares significantly outperform high priced shares on a risk-adjusted return basis. And it does make sense that the investors sentiment have larger positive effect on the returns of lower price index which leads to a higher return level for low-price stock.

Table 16 Regression Results of Price Indexes

Characteristics	Variables	Coefficient	SE	t-Statistics	Prob.
High-price Stock Index	HP	0.0398317	0.0135864	2.93	0.005
Middle-price Stock Index	MP	0.0403772	0.012441	3.25	0.002
Low-price Stock Index	LP	0.0478136	0.0134203	3.56	0.001

4.3.6 Effect of Sentiment on Stock Index in terms of PE Ratio

All the sentiment beta coefficients are positive significant for P/E stock index at 1% level. And the betas are higher for high-P/E stock index. Generally, a high P/E ratio indicates that investors expect higher future earnings. And people are positive about the future growth of the stock and would like to pay more for one unit of company earnings. It is reasonable that high-P/E ratio index is more affected by investor sentiment considering situation that in China market many retail investors are not rational enough and they like to chase overpriced stock.

Table 17 Regression Results of P/E Indexes

Characteristics	Variables	Coefficient	SE	t-Statistics	Prob.
High-P/E Stock Index	HPE	0.0498016	0.0157119	3.17	0.002
Middle-P/E Stock Index	MPE	0.0435971	0.0140206	3.11	0.003
Low-P/E Stock Index	LPE	0.035752	0.0118946	3.01	0.004

4.3.7 Effect of Sentiment on Stock Index in terms of PB Ratio

All the sentiment beta coefficients are positive and significant at 1% level. Similar to P/E index, the higher the P/B ratio, the more the index is affected by investor sentiment. The change of investor sentiment has more positive effect on the return of high-P/B ratio stock index. The reason is also due to the irrationality of investors.

Table 18 Regression Results of P/B Indexes

Characteristics	Variables	Coefficient	SE	t-Statistics	Prob.
High-P/B Stock Index	HPB	0.0440024	0.0155417	2.83	0.006
Middle-P/B Stock Index	MPB	0.0409998	0.0125942	3.26	0.002
Low-P/B Stock Index	LPB	0.0399168	0.0121188	3.29	0.002

4.4 Cross-time Effect of Investor Sentiment on Stocks with Different Characteristics

In order to find out the cross-time effect of investor sentiment on stock indexes with different characteristics, I run a series of regression of the sentiment index and the return of Shenwan indexes using the lag forms of sentiment index up to 12 months. From the results we can find that sentiment positively relates to contemporaneous return of stock indexes. And sentiment negatively relates to most of the future stock index returns. For stock index with different characteristics, sentiment has larger influence on lower-price stock index, higher-P/E stock index and higher-P/B stock index with larger absolute value of coefficients in most cases.

Table 19 Regression Results of Sentiment Index and The Return of Stock Indexes in terms of Price

	High-price Stock Index		Middle-price Stock Index		Low-price Stock Index	
Variables	Coefficient	p value	Coefficient	p value	Coefficient	p value
SSE	0.0000431	0.017	0.000027	0.118	0.0000373	0.041
L1_SSE	0.0000327	0.067	0.0000195	0.242	0.0000249	0.172
L2_SSE	-0.0000159	0.380	-0.0000294	0.076	-0.0000295	0.105
L3_SSE	-0.0000317	0.080	-0.0000432	0.009	-0.0000482	0.007
L4_SSE	-0.0000446	0.013	-0.0000534	0.001	-0.0000604	0.001
L5_SSE	-0.0000337	0.065	-0.000045	0.007	-0.0000624	0
L6_SSE	-0.0000326	0.077	-0.0000359	0.035	-0.0000573	0.002
L7_SSE	-0.0000268	0.153	-0.0000267	0.126	-0.0000548	0.003
L8_SSE	-0.0000208	0.278	-0.0000183	0.302	-0.0000455	0.016

L9_SSE	-0.0000183	0.348	-0.0000171	0.34	-0.0000443	0.021
L10_SSE	-0.0000092	0.642	-8.17E-06	0.652	-0.000035	0.072
L11_SSE	-0.0000085	0.671	-9.44E-06	0.607	-0.0000312	0.113
L12_SSE	-0.0000131	0.517	-0.000013	0.48	-0.0000310	0.115

Table 20 Regression Results of Sentiment Index and The Return of Stock Indexes in terms of P/E Ratio

Variables	High-PE Stock Index		Middle-PE Stock Index		Low-PE Stock Index	
	Coefficient	p value	Coefficient	p value	Coefficient	p value
SSE	0.0000409	0.054	0.000035	0.066	0.0000258	0.116
L1_SSE	0.0000284	0.176	0.0000256	0.17	0.0000211	0.181
L2_SSE	-0.0000239	0.259	-0.000022	0.243	-0.000027	0.086
L3_SSE	-0.0000440	0.037	-0.0000381	0.042	-0.0000386	0.014
L4_SSE	-0.0000616	0.003	-0.0000525	0.005	-0.0000475	0.002
L5_SSE	-0.0000559	0.008	-0.0000405	0.033	-0.0000446	0.005
L6_SSE	-0.0000483	0.024	-0.0000335	0.082	-0.0000413	0.01
L7_SSE	-0.0000392	0.072	-0.0000247	0.209	-0.0000375	0.021
L8_SSE	-0.0000312	0.161	-0.0000184	0.359	-0.0000284	0.086
L9_SSE	-0.0000308	0.171	-0.0000186	0.36	-0.0000281	0.093
L10_SSE	-0.0000178	0.431	-8.81E-06	0.667	-0.0000248	0.146
L11_SSE	-0.0000173	0.450	-1.08E-05	0.603	-0.0000219	0.204
L12_SSE	-0.0000239	0.302	-0.0000159	0.447	-0.0000212	0.216

Table 21 Regression Results of Sentiment Index and The Return of Stock Indexes in terms of P/B Ratio

Variables	High-PB Stock Index		Middle-PB Stock Index		Low-PB Stock Index	
	Coefficient	p value	Coefficient	p value	Coefficient	p value
SSE	0.0000489	0.016	0.000027	0.123	0.0000241	0.153
L1_SSE	0.0000363	0.074	0.0000194	0.251	0.0000168	0.303
L2_SSE	-0.0000141	0.497	-0.0000264	0.118	-0.0000323	0.046
L3_SSE	-0.0000314	0.129	-0.0000387	0.021	-0.000046	0.004
L4_SSE	-0.0000449	0.029	-0.0000518	0.002	-0.0000536	0.001
L5_SSE	-0.0000315	0.133	-0.0000433	0.011	-0.000053	0.001
L6_SSE	-0.0000265	0.21	-0.0000368	0.033	-0.000048	0.003
L7_SSE	-0.0000209	0.332	-0.0000287	0.103	-0.0000447	0.007
L8_SSE	-0.0000192	0.381	-0.0000207	0.25	-0.0000342	0.044
L9_SSE	-0.0000196	0.378	-0.0000194	0.286	-0.0000328	0.058
L10_SSE	-0.0000101	0.652	-8.83E-06	0.629	-0.0000276	0.116
L11_SSE	-0.000013	0.566	-0.0000107	0.564	-0.0000244	0.169
L12_SSE	-0.0000213	0.353	-0.0000147	0.43	-0.0000223	0.203

CHAPTER 5

CONCLUSION

China is one of the biggest developing countries and expected to become more important to global investors. The “policy market” feature can be found in the Chinese stock market, which demonstrates close relationship of market with the policies issued by the government. Specifically, the majority of investors are retail investors and investors' investment ideas tend to be speculative and lack of independent analysis and judgment capabilities, and are greatly affected by market news. And there is a strong convergence in the adjustment of investment behaviors.

This thesis constructs the investor sentiment index of China stock market using Baker and Wurgler's approach. After construction of investor sentiment index, I first perform an eyeball test and find similar trend for investor sentiment and the SSE composite index especially during several crests and troughs. Then the granger causality test proves that the change of SSE composite index could lead to the change of investor sentiment index, which can be explained considering that China is kind of “policy market” and have a larger portion of retail investors who are excessively speculative and greatly affected by the overall investment atmosphere of the market. In order to examine whether the investor sentiment have different effect on stock returns in terms of different characteristic, I run a single-factor model and got the sentiment betas for these style indexes. The results show that the change of investor sentiment has significant positive effect on lower price index, higher-P/E ratio index and higher-P/B ratio index. It proves that investor sentiment does have effect on the return of stocks and stocks with lower price, higher Price to Earnings ratio and higher Price to Book ratio are more easily affected by investor sentiment. It is consistent with the market anomaly that behavior finance has demonstrated such as low price effect and herd effect. Overall, it is

important for us to take investor sentiment into consideration when investing in the market. The significant relations of investor sentiment and stock return indicate that investor sentiment is not only important complements in an policy market as Chinese stock market but also strongly support theories in behavioral finance area to further explain about market anomalies.

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