

Investor sentiment, Uncertainty, and Stock-market yields

Zhe Yang *

Nanjing University of Science and Technology, Jiangsu, China

* Corresponding Author Email: yangzheaisha@163.com

Abstract. Due to internal and external events, the stock market will fluctuate frequently, which makes investors face the uncertainty of the stock market. However, the majority of investors in Chinese stock market are retail investors. As an important investor noise, investors will make irrational investment behavior when the uncertainty is high. Therefore, it is necessary to analyze the correlation between uncertainty, investor sentiment and the stock market yield. Based on this, this paper chooses the Shanghai Composite Index as the research object, and uses a simple time series prediction regression to explore the prediction ability of investor sentiment to predict the cumulative excess returns of the future stock market under different degrees of stock market uncertainty. The empirical results suggest that investor sentiment, amid high stock market uncertainty, will lead to greater mispricing, thus leading to more corrections in the future.

Keywords: investor sentiment; uncertainty; forecast; yield.

1. Introduction

As a country with the second largest stock market value in the world, its stock market has undergone rapid development in just a few decades, from scratch, from small to large. Its economic status has been gradually recognized by people, and it has become an emerging investment market attracting the world's attention. China's A-share market is dominated by individual investors, and the huge group of individual investors makes the A-share market more susceptible to irrational investor sentiment. Behavioral finance theory points out that irrational individual investors are likely to be swayed by emotions, thus making asset prices deviate from fundamentals. De Long et al. [1] believe that investor sentiment is a systemic risk affecting the pricing of the capital market, and the influence of market investor sentiment on the cross-section and time series characteristics of stock returns has therefore become a topic of great research significance. In addition, emotionally retail traders tend to act collectively, who tend to trade the same stock at the same time and in the same direction. Cost-intensive and risky retail collective trading can have a big impact on the trading price, so sentiment-based trading may lead to long-term deviations from the base value. The reason is that in the domestic stock market, most individual investors and retail investors have unstable and immature investment concepts due to their limited ability, less research time, a low professional level and less information access channels, are most likely to make irrational decisions due to mood swings. Therefore, it is of great significance to study the psychological activities of investors. Whether investor sentiment will affect stock price and return is the focus of the debate between modern financial theory and behavioral financial theory. Many scholars focus on whether investor sentiment can make predictions on stock return and whether the changes in investor sentiment will bring about systemic trading risks.

At the same time, in recent years, the frequent occurrence of external events such as Sino-US trade friction, COVID-19, and the War between Russia and Ukraine has significantly intensified the volatility of China's stock market, that is, uncertainty. These external events cause stock price fluctuations, which sometimes affect the healthy development of the stock market, cause losses to investors, and have a negative impact on the real economy. In the severe and complex situation, it is the key issue of the state to investigate the dynamic and time-changing impact of uncertainty on the stock market, guarantee financial stability, and prevent and resolve financial risks. It has important theoretical and practical significance.

A high uncertainty index prevents stock market participants from forming accurate expectations of stock price movements. Because humans naturally feel safe and close to familiar things, fear of uncertain things, and reflect this emotion into the stock market, which causes the stock market to change. Based on this, this paper empirically tests whether investor sentiment varies in their ability to predict stock market returns under different degrees of uncertainty.

2. Literature References

2.1. Investor sentiment and stock returns

In the history of the development of the stock market, the occurrence of major events has led to drastic fluctuations in the stock market, and it seems that it cannot be explained by the traditional financial theory. According to the traditional financial theory, the investment behavior of rational investors always makes the asset price level in the capital market consistent with the present value of the expected future cash flow, but this is not the case in practice. Based on this, the researchers of behavioral finance have been committed to trying to study the role of irrational behavior on investor decision-making from the perspective of human behavior and psychology.

De Long [1] first put forward: investor sentiment is a key factor must be considered in the process of capital asset pricing, put forward the famous DSSW model, that investors is not the neoclassical economics think rational, not the interference of emotion, calm and rational analysis of valuable information, strictly in strict accordance with the theoretical model to calculate the reasonable price of securities. There are many noise traders in the actual stock market, and the investment behavior will be seriously restricted by the investment sentiment. The surge of the stock market is mostly driven by the overly optimistic investor sentiment, which brings about the stock market bubble and irrational prosperity. Similarly, when valuations are low, they are mostly driven by overly pessimistic investment sentiment. Brown and Cliff [2] Using the direct investor sentiment index, it is found that there is a short-term positive and long-term negative correlation between investor sentiment and future stock returns in the US stock market. Sun Peiyi [3] through the VAR model regression analysis, found that investor sentiment will have a positive impact on the stock market earnings, and when the more optimistic, higher potential, the main reason is that investor sentiment is too high, means that investors are more willing to participate in trading, enthusiasm for stock trading, more and more people will open an account. Tian Yunzhu, et al. [4] Empirically found that the volatility of the stock market yields caused by the volatility of investor sentiment is very rapid. The fluctuation of investor sentiment caused by the volatility of the stock market is relatively slow, but then the response of investor sentiment is relatively strong. Lin Fengjiao [5] selected the overnight yield as a measure of investor sentiment of individual stocks, and found that there was a significant positive correlation between the overnight yield rate of individual stocks (the sum of the average overnight yield or the overnight yield) and the return of individual stocks in the next month.

2.2. Uncertainty and stock earnings

At present, there are rare studies on the impact of uncertainty impact on stock market linkage, which mainly focuses on the relationship between economic policy uncertainty index and the stock market of developed countries such as Europe and the United States. For example, Ye Wuyi et al. [6] analyzed the dependency between the stock markets in China, the United States and Italy and the other seven countries, and the results showed that the implied volatility index (VIX) has a significant impact on the linkage of the stock market. Zhang Zongxin et al. [7] found that there is a significant positive correlation between the liquidity of stocks and bonds, and the increase of economic policy uncertainty has a negative impact on it, but the direction of its influence will change at the inflection point of the financial cycle.

2.3. Investor sentiment and uncertainty

The uncertainty research in China generally focuses on the economic policy uncertainty. Zeng Fazhou [8] As a research sample, the study found that the economic policy uncertainty will have a corresponding promotion effect on the equity concentration, and investor sentiment acts as an intermediary variable in this process. Liu Zhifeng et al. [9], based on the GARCH-S model and the time-varying spillover index model, pointed out that investor sentiment and economic policy uncertainty also have a significant impact on the crash risk spillover. Foreign studies point out that investor's irrationality will have the greatest impact in an uncertain environment. In the cross-section of stocks, Hirsh Leifer [10] believes that if the prediction of a group of stocks is more uncertain, then it will bring greater irrational impact on investors. Baker and Wurgler [11] show that the stocks is the most uncertain valuations. This paper makes a time series prediction of investor sentiment, and the evidence shows that when valuations are more subjective, sentiment shows stronger asset pricing effects, which leads to a relatively large correction of mispricing caused by investor sentiment.

3. Data and variables

3.1. Rate of return

This paper uses the Shanghai Composite Index as Chinas stock market. The dependent variable in this paper is the excess return of the holding period in the next 3, 6, 9 and 12 months. The excess return is the return rate of the Shanghai Composite Index minus the risk-free return, and the data is processed by log transformation. The sample period was February 2003 — March 2023. Although the yield data can be traced back to an earlier period, the data availability of investor sentiment indicators is used, since the data started in February 2003. The data are all obtained from the National Taian database.

3.2. Investor sentiment

In this paper, the measure of investor sentiment is composite index, specifically, use Yi Zhigao and Mao Ning [12] based on closed-end fund discount, IPO number and listed on the first day of earnings, consumer confidence index and new investors account six single mood indicators, constructed a measure of Chinas stock market investor sentiment composite index, CICSI. The index is a monthly variable. The higher the CICSI value, the higher the mood.

3.3. Uncertainty

The measures of uncertainty are varied, or have no uniform and perfect measure. In the United States, scholars usually use the stock market uncertainty index of the VIX. The VIX is the stock market volatility that the Chicago Stock Exchange (CBOE) expects for the S & P 500 index for the next 30 days. However, since there is no similar index in China, I selected the alternative uncertainty agent of average stock total volatility (TVOL) and average stock turnover (TO). High overall volatility can be considered as the predictability of stock returns is more difficult. When the overall investor disagreement is higher, the turnover rate should increase, indicating a period of higher uncertainty. Specifically, I used the monthly earnings volatility of the past six months to calculate the monthly TVOL, with the average monthly turnover of the past year as the monthly TO.

3.4. Descriptive statistics

Table 1 reports the descriptive statistical results for the main variables. The first behavior of investor sentiment index CICSI, the second line and the third behavior of two uncertainty agents. I normalized all variables so that they have a mean of 0 and a standard deviation of 1. This was done to facilitate the interpretation of the coefficient of the subsequent empirical results.

Table 1. Descriptive statistics

	Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
CICSI	-1.898 7	-0.698 2	0.03131	0.0000	0.6250	3.6332
TVOL	-1.3950	-0.7419	-0.2397	0.0000	0.3504	2.7237
TO	-1.0626	-0.6769	-0.3517	0.0000	0.4002	3.4180

Table 2 shows the correlation coefficient matrix between the variables. CICSI lower correlation with uncertainty measurement — no absolute value greater than 0.2. However, the uncertainty variables were highly correlated with each other, with a correlation of 0.62 between TVOL and TO.

Table 2. Correlation coefficient

	CICSI	TVOL	TO
CICSI	1.0000000	-0.1932560	-0.1800794
TVOL	-0.1932560	1.0000000	0.6164408
TO	-0.1800794	0.6164408	1.0000000

I, in Table 3, divide the samples into high and low uncertainty subsamples according to the median of TVOL and TO, and observe the descriptive statistics of CICSI. It can be observed that investor sentiment is similar at the minimum, maximum, first and third quintiles, regardless of the degree of uncertainty.

Overall, the above results suggest that emotions and uncertainty can capture different aspects.

Table 3. Descriptive statistics by samples

	Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
TVOL above	-1.8339	-0.7197	-0.1687	-0.1890	0.4090	2.5637
TVOL below	-1.8987	-0.5509	0.3420	0.1890	0.9969	3.6332
TO above	-1.8987	-1.0158	-0.3375	-0.3459	0.4403	1.8362
TO below	-1.5478	-0.2492	0.3420	0.3459	0.9723	3.6332

4. Empirical results

4.1. Model setting

To examine the extent to which uncertainty affects the relationship between mood and future returns, consider the following prediction regression:

$$R_{t+1,t+\tau} = \alpha + \beta_0 \text{CICSI}_t + \beta_1 \text{Uncertainty}_t + \beta_2 (\text{CICSI}_t \times \text{Uncertainty}_t) + \epsilon_{t+1,t+\tau} \quad (1)$$

$R_{t+1,t+\tau}$: The cumulative abnormal returns of the market (CSI Index) from $t+1$ to $t+\tau$ months.

CICSI_t : The investor sentiment in t -month.

Uncertainty_t : uncertainty indicator in t -month. There are two agents: TVOL and TO.

Specifically, the range of τ is 3, 6, 9, and 12 months into the future. The mechanism of this equation is to test whether sentiment leads to greater mispricing when uncertainty is simultaneously high, by examining how the ability of sentiment to predict subsequent corrections to mispricing depends on uncertainty. If high uncertainty is associated with high pricing when sentiment is high, one should expect a negative coefficient of the interaction term, reflecting a larger subsequent correction of mispricing.

4.2. Analysis of the empirical results

Figure 1 shows the parameter estimation of the market cumulative excess return forecast using equation (1) for the next 12 months, that is, the prediction ability of sentiment to return reversal β_1 . High and uncertainty correspond to parts of the uncertainty proxy variable distribution above the 90th and below the lower 10th percentile, respectively, with CISCII on the X-axis and the cumulative excess return of the market over the next 12 months on the Y-axis. When TVOL is used to measure the degree of uncertainty, under the condition of high uncertainty, the decline of sentiment predicts the increase of income. In contrast, when uncertainty is low, there is a weak positive correlation between sentiment and future returns. Although the slope of both the low and high groups is negative when using TO measure the degree of uncertainty, the negative correlation between emotion and future return is more significant when the TO is high.

Table 4 panel A reports the univariate regression results. The future forecast period of 3,6,9, and 12 months was selected. Emotion and uncertainty variables were standardized to a mean of 0 and a standard deviation of 1. The sentiment coefficient of all four forecast periods was significantly negative, indicating that in the period of high sentiment, the market is overvalued and the market needs to be corrected in the future. This result is in line with previous expectations.

Table 4 panel B then adds the uncertainty proxy TVOL, and its interaction term with emotion. The results in column (1) show that when the uncertainty is at its average level, a one standard deviation drop in CISCII predicts a 3.64 basis point increase in the cumulative market excess return over the next three months. But when the uncertainty is one standard deviation above the mean, a standard deviation reduction in CISCII predicts a cumulative market excess return of 6.47 ($0.036435 + 0.028256$) basis point increase over the next three months. Such results suggest that the predictive power of emotions is doubled during periods of high uncertainty, compared to periods with mild uncertainty.

Column (2) - (4) shows that the predictive power and uncertainty of emotion are stronger during longer future holding periods. In column (4), an increase in one standard deviation of TVOL increases the predictive effect of emotion by 6 bps relative to the average level of uncertainty. All interaction term coefficients in panel B are significant at the 1 0% level. The coefficients of TVOL are all significantly negative, which may be due to the increased valuation difficulty of the highly uncertain time and the increased arbitrage restrictions, resulting in increased mispricing.

Panel C changes the uncertainty indicator to the TO. Compared with TVOL, TO has a more powerful effect on emotion prediction ability in both economic utility and statistical terms. The coefficients of the interaction terms were all negative and significant at the 1% level. Column (4) indicates that when the uncertainty is at its average level, a one standard deviation drop in CISCII predicts a 15-basis point increase in cumulative excess market returns over the coming year. When uncertainty is one standard deviation above the mean, a standard deviation reduction in CISCII predicts a 40-basis point increase in cumulative excess market returns over the coming year.

The evidence in Table 4 shows that sentiment is more predictive of market returns under uncertainty conditions.

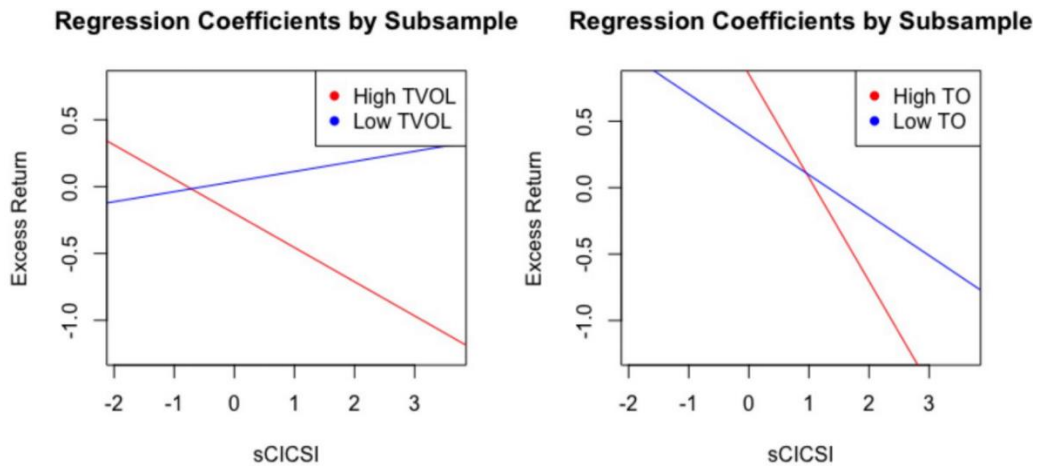


Figure 1. Regression line

Table 4. Return to the results

Panel A	U nivar iate			
	(1) R_{t+3}	(2) R_{t+6}	(3) R_{t+9}	(4) R_{t+12}
CISCI	-0.021783* (-2.405)	-0.045943** (-3.222)	-0.082672*** (-4.521)	-0.118025*** (-5.541)
Intercept	0.002021 (0.223)	0.003597 (0.251)	0.005462 (0.296)	0.006907 (0.320)
N	241	238	235	232
AdjustedR ²	0.01955	0.03808	0.07671	0.1139
Panel B	TVOL			
	(1) R_{t+3}	(2) R_{t+6}	(3) R_{t+9}	(4) R_{t+12}
CISCI	-0.036435*** (-3.643)	-0.069785*** (-4.475)	-0.114168*** (-5.695)	-0.150630*** (-6.385)
TVOL	-0.028240** (-3.132)	-0.054812*** (-3.906)	-0.065379*** (-3.627)	-0.065160** (-3.081)
CISCI×TVOL	-0.028256* (-2.154)	-0.040760* (-1.995)	-0.057892* (-2.205)	-0.060946* (-1.976)
Intercept	-0.003434 (0.009195)	-0.004243 (-0.295)	-0.005775 (-0.310)	-0.005124 (-0.233)
N	241	238	235	232
AdjustedR ²	0.06606	0.1013	0.1339	0.1541
Panel C	TO			
	(1) R_{t+3}	(2) R_{t+6}	(3) R_{t+9}	(4) R_{t+12}
CISCI	-0.038522*** (-4.256)	-0.07711*** (-5.545)	-0.12932*** (-7.541)	-0.17687*** (-9.137)
TO	-0.022855* (- 2.587)	-0.05731*** (-4.222)	-0.09804*** (-5.853)	-0.13222*** (-7.005)
CISCI×TO	-0.079531*** (- 5.489)	-0.13227*** (-5.947)	-0.18450*** (-6.729)	-0.22338*** (-7.230)
Intercept	-0.012211 (-1.37)	-0.01983 (-1.442)	-0.02689 (-1.576)	-0.03206 (-1.657)
N	241	238	235	232
AdjustedR ²	0.1307	0.187	0.278	0.3492

5. Robustness test

The main results in Section 4 suggest that emotions are more predictable for market returns at higher uncertainty, and weak or absent as predictive at lower uncertainty. This section further explores the effect of high and low uncertainty on emotion by substituting uncertainty dummy variables for the continuous uncertainty variable used in the main uncertainty variable, taking a value of 1 when the uncertainty is in the highest quintile of its historical distribution or 0 otherwise.

Table 5 reports the results for using the uncertainty dummy variable. Looking at panels A and B, the coefficient for CISCII is small and less significant in the short-term prediction period than in the long-term prediction period. However, the coefficients on all the interaction terms are statistically significant and economically large. The results suggest that CISCII may have strong predictive power during periods of high uncertainty.

Table 5. Results of binary variable regression for uncertainty

Panel A	TVOL			
	(1) R_{t+3}	(2) R_{t+6}	(3) R_{t+9}	(4) R_{t+12}
CISCII	-0.015875 (-1.746)	-0.03879** (-2.730)	-0.07552*** (-4.161)	-0.11296*** (-5.350)
TVOL indicator	-0.060886** (-2.587)	-0.13061*** (-3.685)	-0.18813*** (-4.153)	-0.23331*** (-4.428)
CISCII×TVOL indicator	-0.133160*** (-3.408)	-0.18973** (-3.112)	-0.21793** (-2.801)	-0.20042* (-2.218)
Intercept	0.010204 (1.033)	0.02446 (1.574)	0.03769 (1.886)	0.04969* (2.124)
N	241	238	235	232
AdjustedR ²	0.07086	0.1017	0.1448	0.1813
Panel B	TO			
	(1) R_{t+3}	(2) R_{t+6}	(3) R_{t+9}	(4) R_{t+12}
CISCII	-0.010570 (-1.157)	-0.02480 (-1.768)	-0.05593** (-3.131)	-0.08904*** (-4.281)
TO indicator	-0.062379** (-2.732)	-0.12201*** (-3.483)	-0.17560*** (-3.933)	-0.22281*** (-4.287)
CISCII×TO indicator	-0.147329*** (-4.734)	-0.27893*** (-5.848)	-0.36293*** (-5.977)	-0.40722** (-5.770)
Intercept	0.007076 (0.728)	0.01417 (0.944)	0.02299 (1.194)	0.03246* (1.439)
N	241	238	235	232
AdjustedR ²	0.1028	0.1631	0.2076	0.2401

5.1. Summary

This paper takes the Shanghai Composite Index as the market studied in this paper, and uses one investor sentiment index and two uncertainty indicators to explore the return predictability of investor sentiment in different periods of uncertainty. Furthermore, I also validate the benchmark regression results by converting the uncertainty variables from continuous variables to binary variables. The results show that when investor sentiment is high, the market price is overvalued, and the future correction of yields makes the negative correlation between investor sentiment and the future cumulative market returns. However, when considering the degree of uncertainty, the results show

that, under high uncertainty, the investor sentiment has a stronger ability to predict the market cumulative excess returns, that is, the investor sentiment can lead to greater mispricing.

References

- [1] J Bradford. De Long et al. 1990. Noise Trader Risk in Financial Markets. *Journal of Political Economy*, 98 (4): 703-738.
- [2] Brown G.W. and M.T. Cliff, 2005, "Investor sentiment and asset valuation", *Journal of Business*, 78, pp. 405 - 440.
- [3] Sun Peiyi. Investor sentiment influence on stock returns [J]. *Journal of modern business*, 2022, No. 630 (5): 80 - 82.
- [4] Tian Yunzhu, Li Yawen, Wang Xinyue. The relationship between investor sentiment and stock market returns [J]. *National Circulation Economy*, 2023, No.2350 (10): 156 - 159.
- [5] Lin Fengjiao. A study on the relationship between investor sentiment and stock returns: Based on overnight returns [J]. *Journal of Investment Research*, 2019, 41 (11): 137 - 159.
- [6] Ye Wuyi, Zeng Haige, Miao Boqi. An empirical study on the impact of VIX Index on the intercorrelation of stock markets [J]. *Statistical Research*, 2018, 35 (6): 68 - 76.
- [7] Zhang Zongxin, Lin Hongyi, Li Xinyue. How does economic policy uncertainty affect the coordinated liquidity movement among financial markets? -- From the perspective of China's financial cycle [J]. *Statistical Research*, 2020, 37 (2): 37 - 51.
- [8] Zeng Fazhou. A study on the influence of economic policy Uncertainty on equity concentration: Mediating effect based on investor sentiment [J]. *China Prices*, 2023, No. 408 (04).
- [9] Liu Zhifeng, Zhang Ziwei, DAI Pengfei et al. Study on the spillover effect of crash risk between carbon market and stock market: the COVID-19 pandemic, investor sentiment and economic policy uncertainty [J]. *Systems Engineering Theory and Practice*, 2019, 43 (03): 740 - 754.
- [10] Hirshleifer, D., 2001. Investor psychology and asset pricing. *J. Finance* 56 (4), 1533 – 1597.
- [11] Baker, M., Wurgler, J., 2006. Investor sentiment and the cross-section of stock returns. *J. Finance* 61 (4), 1645 – 1680.
- [12] Yi Zhigao and Mao Ning, 2009, "Measurement of Investor Sentiment in Chinese Stock Market: The Construction of CICSI", *Finance Research*, 11, 174 - 184.