Research Paper

The Impact of China Investor's Sentiment Index on Stock Market Returns and Volatilities

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ABSTRACT: *This paper uses GARCH model to estimate the parameters, and incorporates the incremental variables of China investor's sentiment index into the mean equation and variance equation, attempts to explore the impact of investor sentiment on the returns and volatilities of three major indexes in China stock market. Our empirical results found that the China investor's sentiment index has a positive relationship with stock market returns, that is, when the China investor's sentiment index increases, stock market returns will increase. Moreover, the effect of Chinese investor's sentiment index on the volatility of the stock market also shows a positive relationship, indicating that when the Chinese investor sentiment index increases, the volatility of the stock market also will increase.*
KEYWORDS: *China Investor Sentiment Index, Stock Market, Return and Volatility, GARCH model*

I.   INTRODUCTION

Behavioral finance theory combines finance with psychology. The innovation of this theory is that it makes the assumption of finitude, which breaks the "rational man hypothesis" of traditional finance and makes finance more practical. Traditional finance theories believe that the markets are efficient, which means that every investor is rational when making investment, making rational decisions and pursuing profit maximization at the same time. However, behavioral finance theory believed that investors are not fully rational due to the noise traders exist. This theory believes that investors' own psychological factors often affect their investment decisions when they conduct transactions. Therefore, behavioral finance theory focuses on the study of the investment psychological activities of market participants. De Long et al. (1990) found that investors are not completely rational because of the noise traders exist. In the Noise Deal, noise traders will wrongly predict the future trend of assets, which will have a direct and inevitable impact on the change of investor sentiment. Based on this premise, behavioral finance theory constructs a new theoretical assumption of "investor sentiment".

In recent years, there is a large number of empirical and theoretical researches have been indicated to the investigation of the relationship among the investor sentiment, stock returns and price volatility. However, there are two conflicting voices about whether investor sentiment has a significant impact on stock market returns and volatility. One side holds that investor sentiment has a significant impact on stock returns and volatility. Lee et al. (1991) suggested that investor sentiment affects security price. Sayim and Rahman (2015) shown that there is a significant spillover effect of investor sentiment on stock return and volatility. Yang and Wu (2011) indicated that sentiment indices relate to individual investors exert the most significant influence on price volatility. The other side holds that investor sentiment has little or no influence on stock market returns and volatility.[1]

More recently, researchers have worked on the aspects of the stock market and trading which are affected by the investor sentiment. Baker and Wurgler (2007) found that sentiment affects the cost of capital, especially stocks that are difficult to arbitrage or to value are most affected by sentiment. Chi et al. (2012) found

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[1] See, for example, Rehamn (2013); Kim and Kim (2014); Kim and Park (2015).

that investor sentiment has a tremendous impact on stock returns in the China stock market by using mutual fund flows. Hu et al. (2015) demonstrated that trading frequency appears to increase in periods of rising market, suggesting that investor sentiment–driven trading increases market trading frequency without relying on past experiences to conduct trading behavior.

With the development of behavioral finance and the in-depth study of investor sentiment, many studies have shown that investor sentiment has a predictive effect on stock market returns and volatility. Ruan et al. (2020) shown that a new investor sentiment indicator (ISI) based on Artificial Intelligence (AI) which can predict subsequent stock returns better. Audrino et al. (2020) suggested that sentiment have predictive power for the future volatility when controlling for a large set of economic and financial variables. On the other hand, some empirical studies also provide strong support for this view. (Lee et al., 2002; Ho and Hung, 2012; Seo and Kim, 2015)

There has been a large body of studies which probe into the impact of investor sentiment on the returns and volatility of stock markets and major market indices in different countries[2]. However, there is little research on the impact of investor sentiment on returns and volatility in Chinese stock markets (Chi et al., 2012). Therefore, this study focuses to explore the impact of investor sentiment on the returns and volatility of three major indexes in China stock market.

In order to explore the impact of investor sentiment on the returns and volatility of three major indexes in China stock market, this paper incorporates the incremental variables of the China investor's sentiment index into the GARCH model. Our empirical results find that the China investor's sentiment index has a positive relationship with stock market returns. When the China investor's sentiment index increases, stock market returns will increase. Moreover, the effect of Chinese investor's sentiment index on the volatility of the stock market also shows a positive relationship, indicating that when the Chinese investor sentiment index increases, the volatility of the stock market will increase.

II. DATA AND METHODOLOGY

The China stock market is relatively late in development, with a development history of only over 30 years. We have a good case to explore the impact of investor sentiment on the stock market because more noise trader in China stock markets (Chi et al., 2012). We collect the monthly data for the three major indexes of the China stock markets from the iFind database, including Shanghai composite index (SHCI), Shenzhen component Index (SZCI), as well as Shanghai and Shenzhen 300 Index (CSI300). Moreover, we obtain the monthly China investor sentiment index from the National School of Development of the Beijing University. Our empirical data for the period from January 2003 to December 2020, thereby providing 216 data periods, with the exception of CSI300, which was compiled in January 2005.

Generalized Autoregressive Conditional Heteroskedasticity (GARCH) was initially developed by Bollerslev (1986) and Taylor (1986), which has the ability to model the volatility depends upon past residual squared observation and past variance of the series. GARCH models constitute a seminal innovation in the field of financial modeling by taking into account some of the stylized effects of financial data (Perlin et al., 2021). Following Bollerslev (1986) and Taylor (1986), we consider monthly logarithmic returns, and define a GARCH (1,1) model as follows:

$$r_t = c + \varepsilon_t \text{ with t=1,...,T} \qquad (1)$$

$$\sigma_t^2 = \alpha_0 + \alpha_1 \varepsilon_{t-1}^2 + \beta_1 \sigma_{t-1}^2 \qquad (2)$$

where c is constant and $\varepsilon_t = \sigma_t c_t$, where $\varepsilon_t = N(0, \sigma_t^2)$; where α_0 is constant, α_1 and β_1 are ARCH and GARCH effect. The conditional variance of the error is defined to be dependent on its own forecasted variance rom the last period, σ_{t-1}^2 and previous period squared error ε_{t-1}^2.

De Long et al., (1990) suggested that investors are not fully rational due to the noise traders exist. Noise trading may cause by one irrational factor - investor sentiment, which denote the expectations of market participants of investment returns (Brown and Cliff, 2004). Verma et al. (2008) demonstrated that positive effects of past stock market returns on irrational sentiments but not on rational sentiments. Moreover, many researchers have suggested that investor sentiment plays an important role in the asset returns and their volatility (Baker and Wurgler, 2006; Seo and Kim, 2015; Sayim and Rahman, 2015; Corredor et al., 2015; and Chu and

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[2] See, for example, Hu et al., (2015); Schneller et al.,(2018); Ho and Hung (2012); Kim and Park (2015); Ruan et al., (2020); Verma et al., (2008); Chi et al., (2012); Sayim and Rahman (2015); Yang et al., (2016).

Qiu, 2019). Therefore, this paper attempts to explore the influence of investor sentiment on returns and volatility for China stock markets. We incorporate China investor sentiment index into the conditional average equation and conditional variance equation of the GARCH model, respectively, with the following specification:

$$r_t = c + \rho\Delta\text{CISI} + \varepsilon_t \qquad (3)$$

$$\sigma_t^2 = \alpha_0 + \alpha_1\varepsilon_{t-1}^2 + \beta_1\sigma_{t-1}^2 + \theta\Delta\text{CISI} \qquad (4)$$

where $\Delta CISI$ denotes augment value of the China Investors' Sentiment Index.

III.   IMPRICIAL RESULTS

In this section, we conduct an empirical analysis to explore the impact of China investor's sentiment index on stock market returns and volatility. Table 1 provides descriptive statistics of the major indexes and the CISI for China stock market, including the mean, median, maximum, minimum, standard deviation, skewness and kurtosis.

As reported in Table 1, the averages of the overall monthly returns are 0.004 for the SHCI; 0.007 for the SZCI; 0.009 for the CSI 300 and the standard deviation are 0.077 for the SHCI; 0.087 for the SZCI; 0.085 for the CSI 300. Meanwhile, the monthly augment value of the CISI has a mean of 0.030 and the standard deviation of 0.259, respectively.

Table 1. Descriptive statistics of the major indexes and CISI for China stock market

Parameter	Index			
	SHCI	*SZCI*	*CSI 300*	*ΔCISI*
Mean	0.004	0.007	0.009	0.030
Median	0.007	0.011	0.011	-0.010
Max.	0.243	0.240	0.246	1.583
Min.	-0.283	-0.296	-0.299	-0.483
Std. Dev.	0.077	0.087	0.085	0.259
Skew	-0.578	-0.403	-0.510	2.794
Kurtosis	5.090	4.101	4.664	15.497

Notes: SHCI denotes returns of Shanghai composite index; *SZCI* denotes returns of Shenzhen component Index; *CSI* 300 denotes returns of Shanghai and Shenzhen 300 Index; *ΔCISI* denotes augment value of the China Investors' Sentiment Index.

Table 2 reports the results of estimates using GARCH model of the major indexes for China stock market. We pay attention to the significance of its parameters. In the variance equation for SHCI, we find that the estimates of α_1 and β_1 are statistically significant at the 1% level. Additionally, the sum of the values of α_1 and β_1 equals 0.9733, indicating that the existence of highly persistent volatility. It's also beneficial to capture the characteristics of volatility. The similar situation of highly persistent volatility dependence is also discernible for SZCI and CSI300.

After adding ΔCISI on the basis of the GARCH model (GARCH-type model), we re-estimate the major indexes of Chinese stock market. In Panel A of Table 3, we add ΔCISI into the mean equation to illustrate the impact of ΔCISI on the stock market returns. The estimates for ρ for the SHCI, SZCI, CSI 300 in the GARCH-type model are found to be positively and statistically significant at the 1% level. Our empirical results reveal that the China investor's sentiment index has a positive impact on the stock market returns of the three major indexes. The empirical findings are in line with those of Ruan et al. (2020) which indicated that when the investor sentiment is higher, the stock market will have a positive return.

Table 2. Results of estimates using GARCH model of the major indexes for China stock market

Equation	Variable	Index		
		SHCI	*SZCI*	*CSI 300*
	GARCH model: $r_t = c + \varepsilon_t \; \sigma_t^2 = \alpha_0 + \alpha_1 * \varepsilon_{t-1}^2 + \beta_1 * \sigma_{t-1}^2$			
Mean Equation	c	0.0005 (0.0041)	0.0025 (0.0051)	0.0058(0.0051)
Variance Equation	α_0	0.0003* (0.0002)	0.0005 (0.0003)	0.0003 (0.0002)
	α_1	0.2286*** (0.0721)	0.1625* (0.0948)	0.2263***(0.0778)
	β_1	0.7447*** (0.0647)	0.7811*** (0.1084)	0.7427***(0.0699)

Notes: SHCI denotes returns of Shanghai composite index; *SZCI* denotes returns of Shenzhen component Index; *CSI* 300 denotes returns of Shanghai and Shenzhen 300 Index. Figures in parentheses are standard error. *** indicates significance at the 1% level; ** indicates significance at the 5% level; and * indicates significance at the 10% level.

Table 3. Results of estimates using GARCH-type model of the major indexes for China stock market

Equation	Variable	Index		
		SHCI	*SZCI*	*CSI 300*
Panel A	GARCH-type model: $r_t = c + \rho * \Delta\text{CISI} + \varepsilon_t \; \sigma_t^2 = \alpha_0 + \alpha_1 * \varepsilon_{t-1}^2 + \beta_1 * \sigma_{t-1}^2$			
Mean Equation	c	0.0005 (0.0042)	0.0021 (0.0048)	0.0053(0.0052)
	ρ	0.0949*** (0.0191)	0.1022*** (0.0221)	0.1071***(0.0193)
Variance Equation	α_0	0.0002* (0.0002)	0.0004 (0.0003)	0.0002(0.0002)
	α_1	0.1585** (0.0784)	0.1277 (0.0790)	0.1471*(0.0797)
	β_1	0.8046*** (0.0836)	0.8168*** (0.1107)	0.8187***(0.0954)
Panel B	GARCH-type model: $r_t = c + \varepsilon_t \; \sigma_t^2 = \alpha_0 + \alpha_1 * \varepsilon_{t-1}^2 + \beta_1 * \sigma_{t-1}^2 + \theta * \Delta\text{CISI}$			
Mean Equation	c	0.0004 (0.0039)	0.0029 (0.0049)	0.0054(0.0049)
Variance Equation	α_0	0.0003** (0.0001)	0.0004 (0.0002)	0.0003(0.0002)
	α_1	0.1421** (0.0721)	0.1149 (0.0760)	0.1380*(0.0715)
	β_1	0.7935*** (0.0762)	0.8186*** (0.0899)	0.8021***(0.0812)
	θ	0.0043** (0.0021)	0.0055 (0.0033)	0.0048** (0.0024)

Notes: SHCI denotes returns of Shanghai composite index; *SZCI* denotes returns of Shenzhen component Index; *CSI* 300 denotes returns of Shanghai and Shenzhen 300 Index. Figures in parentheses are standard error. *** indicates significance at the 1% level; ** indicates significance at the 5% level; and * indicates significance at the 10% level.

In panel B of Table 3, we add ΔCISI into the variance equation to illustrate the impact of ΔCISI on the stock market volatility. With the exception of θ for the SZCI, the estimates of θ for the SHCI and CSI 300 in the GARCH-type model are found to be positively and statistically significant at the 5% level. The results reveal that the China investor's sentiment index has a positive impact on the stock market volatility of the SHCI and CSI 300, indicating that when the investor sentiment is higher, the stock market volatility is higher.

IV. CONCLUSIONS

This study has set out in this study with the primary aim of exploring the impact of investor sentiment on the returns and volatility in China stock markets, incorporating the China investor's sentiment index into the GARCH model for the three stock indices of three major indexes in China stock markets.

The findings of our study are two-fold. First of all, we demonstrate that the China investor's sentiment index has a positive impact on the stock market returns of these three major indexes, implying that when the China investor's sentiment index is higher, the stock market will have a positive return. Secondly, we also found that the China investor's sentiment index has a positive impact on the stock market volatility of the SHCI and CSI 300, indicating that when the China investor's sentiment index is higher, the stock market volatility is also higher.

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