

Empirical Study on Excessive Fluctuation of Chinese Stock Market Based on Behavioral Finance Perspective

Yilun Yang

College of Finance and Statistics, Hunan University, Changsha, Hunan, 410006

Keywords: Behavioral finance, Excessive stock market volatility, Stock market intrinsic value, Policy recommendations

Abstract: This paper explores the internal causes and characteristics of the excessive volatility of China's stock market through empirical research on the correlation between China's stock market index and the intrinsic value of listed companies. This paper finds that the volatility of the stock market index is seriously deviated from its intrinsic value volatility and does not conform to the interpretation of stock market volatility by traditional economic and financial theory. Based on the perspective and method of behavioral finance, this paper explains the reasons for the excessive volatility of China's stock market through noise trading, investor psychological bias and herd behavior theory, and discusses the establishment of China's securities market stability and balance mechanism from macro, micro and personal aspects, and put up with policy recommendations for excessive stock price volatility.

1. Introduction

Volatility is the most essential feature and attribute of the stock market. It is the reason and result of investors buying and selling stocks. The stock market without fluctuations will lose the investment value and existence meaning [1]. A mature and stable stock market should have moderate volatility, but the volatility should not be too large. The traditional theory of asset pricing believes that the price of an asset is determined by the intrinsic value of the asset. It is assumed that the market is effective, the information is sufficient, the investor is rational, and the preferences are consistent. The price of financial assets such as stocks is the market's spontaneous power regulated around its intrinsic value fluctuations, and the price contains all the information about asset changes and future development [2]. However, the excessive volatility of the stock market and the manifestations of the crisis are becoming more diversified and impacting and destroying the real economy. These phenomena and problems are difficult to explain by the traditional financial asset pricing theory. Therefore, the factors and mechanisms that influence and determine the stock market volatility once again, it has attracted great attention from the government, society, and academia [3].

2. Research on the correlation between Chinese stock market price and intrinsic value fluctuation

2.1 Determination of sample data

According to financial theory and related research, this paper uses the company's earnings per share indicator to reflect the company's intrinsic value. Since the Chinese stock market has implemented the price limit since the end of 1996, and the listed companies are few before, the system is very imperfect, and the transaction is very irregular. Therefore, the time window of this paper is from the beginning of 1997 to the end of April 2009. The sample companies are selected as follows: before 1997, they were listed on the Shanghai Stock Exchange (as of January 2, 1997, a total of 267 companies listed on the Shanghai Stock Exchange), and listed in the listed companies of the SSE 180 Index, a total of 47 listed companies are all used as research samples. In the remaining 220 companies, 13 groups were randomly selected, and 13 were randomly selected from each group, and a total of 60 companies were selected as sample companies for this study.

The 60 companies are combined into a sequence, and the total assets of each company account for 60% of the total assets of the company's total assets. As a weight, each company's earnings per share is multiplied by this weight and added to the total. The sample company's earnings per share, the volatility of the sample earnings per share reflects the volatility of the intrinsic value of the listed company.

The data range of this study was from 1997 to 2009. Since there were only annual reports and semi-annual reports before 2001, the earnings per share of the annual report and semi-annual report can only reflect the company's earnings per share. From 2002, the regulatory authorities required listed companies. Disclosure of the quarterly statement of the financial statements, multiply the earnings per share for the first quarter quarter by 4, multiply the earnings per share for the semi-annual report by 2, and multiply the financial statements for the third quarter by 4/3, thus maintaining the comparability and consistency of the data.

2.2 Empirical analysis of the correlation between stock market volatility and sample listed companies

For the stock market volatility, it can be reflected by the change of the Shanghai Stock Exchange Index. The stock index changes continuously during the trading day of the stock exchange. In order to consider the difference between the stock index and the sample company's earnings per share data, this paper will take the stock index as the daily closing price of the stock market, and the company's earnings per share is the company's annual, semi-annual, quarterly financial report. Although the minimum earnings per share is quarterly, it can be considered that this quarter is the daily income. This corresponds to the daily closing price of the Shanghai Composite Index. The selection of sample company data has been introduced in the previous article. The stock market volatility is represented by the Shanghai Stock Exchange Index and is based on the daily closing price. The data range is from January 2, 1997 to March 31, 2009, for a total of 2,956 data. The above data are taken from the wind financial database.

In the following empirical analysis, X_t is used to indicate "sample company's earnings per share" and Y_t is "shanghai index daily closing price". ($t=1, 2, 3, \dots, 3145$).

(1) Analysis of long-term trends using Hodrick-Prescott filters

Since the data obtained is time-series data, it has strong seasonal dependence, and economic activities must have a certain period. Therefore, it is necessary to adjust the season or grasp the overall trend of the series before data analysis. Hodrick-Prescott filtering is a kind of widely used method. Hodrick and Prescott used this model for the first time in a paper analyzing the post-war US economic cycle. The meaning of this model can be briefly summarized as the following steps:

Let $\{y_t\}$ be an economic time series containing trend components and wave components, $\{Y_t^T\}$ is the trend component contained in it, $\{Y_t^c\}$ is the wave component contained in it, where $y_t = Y_t^T + Y_t^c$, $t = 1, 2, 3, \dots, T$.

By seeking $(Y_t - Y_2^T) + \lambda [c(L)Y_t^T]^2$ minimized solution, available trends $\{Y_t^T\}$.

The specific linear trends of the two variables are shown in Figures 1 and 2.

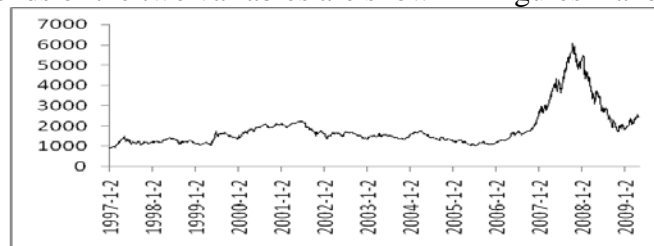


Figure 1. Shanghai Stock Exchange Index Daily Price Chart

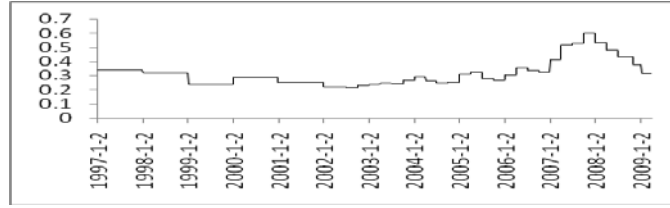


Figure 2. Sample listed company's earnings per share linear chart

Comparing the linear graphs of the two, it can be found that the Shanghai Stock Exchange Index and the listed company's earnings per share are contrary to the long-term trend, but the trend is roughly the same in 2007-08, but the Shanghai Stock Exchange Index is far more volatile than the earnings per share. The magnitude of the volatility shows that the volatility of China's stock market is seriously deviating from the operating performance of its listed companies.

(2) Unit root test

The most common way to verify the stability of a time series is the unit root adf test, the first-order difference is performed as follows:

$$\Delta x_t = \rho x_{t-1} + \sum_{i=1}^k \gamma_i \Delta x_{t-i} + \beta t + \mu_t \quad (1)$$

Hypothesis test $h_0: \rho=0$, the test statistic follows the adf distribution. If h_0 is accepted, it means time series x_t contains the unit root, thus x_t is not smooth; rejecting h_0 means x_t is smooth.

Table.1. Unit root test results

Original sequence	ADF statistic	Differential sequence	ADF statistic
X_t	-2.8622	K_t	-56.0453***
$\log(Y_t)$	-2.4288	R_t	-55.7892***

Note: 1) $\log(Y_t)$ represents the logarithm of the Shanghai Composite Index; K_t represents the difference in earnings per share of the listed company, and R_t represents the first-order logarithmic difference of the Shanghai Composite Index (That is, the logarithmic rate of return). 2) Test type (c, t, p), where c is a constant term, t is a trend term, p is a lag order, and the EVIEWS software automatically selects the lag order according to AIC; 3) *** indicates at the 1% level is significant.

It can be seen from Table 1 that the null hypothesis that there is a unit root in the earnings per share of the listed company and the logarithm of the Shanghai Composite Index is not rejected. The stationarity test of the difference sequence is significant at the 1% level, indicating that they are all stationary sequences, that is, the original sequence is the I(1) process.

(3) Cointegration test

When the time series for the test is a single process or a single-order process, we can perform the cointegration test. Johansen proposed a likelihood ratio (LR) test method for coefficient matrix cointegration. The cointegration likelihood ratio test assumes H_0 : at most r co-integration relationships; H_1 : There are m cointegration relations. Inspection traces statistics Q_r . Significant:

$$Q_r = -T \sum_{i=r+1}^k \ln(1 - \lambda_i) \quad (2)$$

among them, λ_i is the eigenvalue of the i-th row, and T is the total number of observation periods. If there is a cointegration relationship, it means that there is a long-term equilibrium relationship between the two.

In order to prove the long-term interaction between the intrinsic value of the listed company and the stock price, we need to conduct a cointegration test on them. The cointegration test is mainly to observe the long-term equilibrium relationship between two or more time series, according to the previous unit root. The test shows that these two variables are first-order single-integration processes, which meet the requirements of cointegration test, so they can be co-integrated.

Table.2. Cointegration test results

	Cointegration rank h_0	Eigenvalues	Trace statistics	5% threshold	Probability
Log (Y_t) and X_t	None	0.005223	20.57810	25.87211	0.1980
	At most 1	0.001311	4.122972	12.51798	0.7242

It can be seen from the above table that at the 5% level of significance, the p values of these two variables are not significant, and there is no cointegration relationship between them.

(4) Correlation analysis

According to the data, the correlation coefficient between x_t and y_t is only 0.03, and the correlation is very low. Further linear fitting of the sequence x_t, y_t by least squares method can be obtained:

$$Y_t = 1554.763 + 786.534X_t$$

The goodness of fit is 0.011256, indicating that only 1.25% of the stock price change is caused by changes in the company's earnings per share.

(5) Comparison of standard deviation coefficients

Table.3. Comparison of the standard deviation coefficient between the stock price index and the sample company's earnings per share

	Standard deviation coefficient
The Shanghai Composite Index	42.342341
Sample company's earnings per share	0.548902

As can be seen from the above table, the standard deviation coefficient of the Shanghai Stock Exchange Volatility is 42.3, and the standard deviation coefficient of the sample company's earnings per share change is 0.55. It can be seen that the volatility of the stock market is much greater than the volatility of the listed company's earnings per share. It can also be explained that stock market volatility is not caused by changes in the company's intrinsic value.

(6) Empirical analysis of Granger causality test

Using the Granger test provided in EViews6.0, the Granger test of the listed company's earnings per share and the Shanghai Composite Index can be obtained with the following results:

Table.4. Granger test between the earnings per share of listed companies and the Shanghai Composite Index

Null Hypothesis	Obs	F – Statistic	Probability
STOCK does not Granger Cause COM	2981	1.07351	0.3419
COM does not Granger Cause STOCK		0.98178	0.3748

From the results of the Granger test, it can be seen that the F statistic of X_t versus Y_t is 1.07351, and the F statistic of Y_t versus X_t is 0.98178, which are relatively small. It can be concluded that neither side is the other Granger.

Through the above co-integration test of stock price fluctuations and the company's intrinsic value, comparison of standard deviation coefficient, correlation analysis and Granger causality test, their correlation is very low, which also indicates that there is excessive speculation in China's stock market. This is difficult to explain in traditional financial economics theory.

3. Behavioral financial explanation of excessive stock market volatility

From the above analysis, we can see that the stock market's large fluctuations are contrary to the performance of listed companies. It can be seen that the stock price of listed companies does not fully reflect the company's value information. For the price bubble in the securities market and excessive stock price volatility, especially in the emerging markets such as ours, this paper attempts to break through the traditional economic and financial research paradigm and explain the excessive fluctuation of the stock price from the intrinsic value of the company from the perspective of behavioral finance.

3.1 Noise trading

The “noise” in the financial market is relative to the real information. It is a false or distorted signal. It is information that is not related to the value of the investment. It may be false information actively generated by market participants, or it may be participated by the market. The information that was misjudged. On the one hand, noise trading strengthens the liquidity of the market, and on the other hand, the price deviates from the basic value.

Financial economists have found that the actual stock return volatility is too high relative to the short-term real interest rate, consumption, and dividend fluctuations. The high volatility of stock prices cannot be explained by effective market theory, which Campbell (1999) calls “the mystery of stock market volatility”. Noise trading plays an important role in stock price volatility, and can explain the "mystery of stock market volatility" to some extent. Due to the existence and frequent occurrence of noise traders and their trading activities, not only the noise traders will influence the trading decisions because of imitation, but even the arbitrageurs will be affected by the noise traders and make them appear to be “rational”. The investment decision, in this way, the stock market volatility is not only not stabilized by the arbitrage activities, but the asset price deviation is greater, and the stock market risk is even greater. Among them, performance-oriented arbitrage and positive feedback transactions have increased the fluctuation of stock prices.

Shleifer and Vishny (1997) refer to the phenomenon of using past income as a criterion for evaluating fund management performance as a performance-oriented arbitrage. This arbitrage arises from the commission between investors and fund managers. Agency relationship, when the asset price deviates from its basic value, the investor does not understand what the arbitrageur wants to do. What they see is that their own money is lost, so they can infer that the arbitrageur is not like them. Start to imagine as capable, and thus refuse to add funds, and may even withdraw funds. As a result, the deviation of securities prices will not be corrected, but the degree of deviation will become greater and greater, and the role of arbitrageurs in stabilizing asset prices will not be realized. The fluctuations have further increased.

Another reason for the increase in stock price volatility is the positive feedback investment strategy adopted by noise traders. De Long, Shleifer, Summers, and Waldman (1990) argue that in the securities market, some investors buy securities when prices rise, and sell securities when prices fall. In theory, investors who conduct positive feedback trading should be irrational noise traders, and arbitrageurs, including many institutional investors, are also an important part of positive feedback traders. Arbitrage with insider information, when receiving good news, believes that the price increase in the initial stage will prompt the positive feedback trader to make a buy decision. After expecting such a purchase, the arbitrageur will buy in large quantities, thus making the price higher than the price increase brought by the basic information, and the price immediately deviates from the basic value. Even if the late arbitrageurs sell all the securities out of the stable price, the positive feedback trader will continue to purchase on the basis of the increased price in the current period, which makes the price deviate more from the basic value. Therefore, due to the existence of positive feedback transactions, the arbitrageur's behavior can not only stabilize the market price, but also make the price fluctuation more intense.

3.2 Investor's psychological bias

When investors make investment decisions, their psychological factors will change subtly with changes in the external environment, especially when the securities market is facing uncertain risks. Every investor always tries to make rational investments and wants to avoid risks. However, when investors find that they cannot grasp the reliability of investment behavior because of their limited ability, investors will turn to policy makers, media, experts or the psychological support of their own feelings, experience, etc. The more uncertain the prospect of investment behavior, the stronger the psychological support of investors, the weakness of human-specific cognitive bias, that is, despite the mental health of investors, normal people with good speculative ability may still have cognitive biases, resulting in irrational and irrational behaviors.

When the investor's upfront return is positive, the degree of loss aversion is reduced, and the degree of risk aversion is also reduced. Therefore, buying a lot of stocks with good earnings in the early stage makes the stock price rise further. When the current period of income is negative, investors should avoid further losses, when stock prices fell, a large number of stocks sold, causing stock prices to fall further, and when stock prices rose slightly, they sold stocks to lock in profits and reduce losses, resulting in a small increase in stocks. Therefore, investors show insufficient reaction when stock prices rise, and overreact when prices fall. Investors' biased psychological expectations are important factors leading to excessive stock market volatility.

3.3 Herd behavior

The “herd behavior” in the financial market refers to the same investment strategy, that is, the investor's herd behavior, due to the influence of certain investment strategies adopted by other investors. We believe that imitation and contagion between investors creates a price bubble that deviates from the basic value. The above is the behavior of the individual when the psychological deviation of the investor, while the behavior of the herd is the behavior of the group. Flock behavior is the behavior of investors imitating others, that is, when others buy, and when others sell, when there is a good news, everyone may start to buy stocks madly, so that the demand for such assets rises. In turn, the price will rise; the price increase will attract more investors to join, pushing the price up further, and ultimately far above the basic value of the asset. But at some stage, a few investors decided to sell. The market sentiment lost its upward momentum and then began to decline, as more investors realized that the bull market would not last forever, and the sale of a few people led to more people starting to sell, eventually turning into a “crash” of the market as a whole, eventually leading to securities. The price is much lower than its basic value. Therefore, herd behavior may amplify the impact of external stock price fluctuations.

The herd behavior of investment funds may make the price of capital markets more unstable, and promote the rapid changes in the price of securities, causing them to rise or fall abnormally. Most investment funds pursue a positive feedback investment strategy, which is to buy stocks with rising prices in the previous period and sell stocks with lower prices in the previous period, assuming that the price trend is unchanged. This kind of investment strategy may make stock prices farther and farther from the fundamentals, and ultimately cause bubbles and crises in the stock market.

4. Policy recommendations to curb excessive stock price volatility

From the above empirical research and analysis, if the information disclosure system of listed companies is not perfect, investors can not get sufficient information in time, which will increase their irrational behavior. Therefore, we should further improve the information disclosure system of listed companies and strengthen investor education. Moderate government intervention to maintain investor confidence. Based on the above analysis, this paper attempts to propose policy ideas from three aspects: macro, micro and personal.

4.1 Moderate government intervention

The market should rely on its own strength to solve the problems of the market itself, but when there is a huge crisis in the market, it is necessary for the government to take appropriate measures to directly intervene in the market. The government's intervention in the stock market should be an indirect regulation method with guidance and legal constraints as the main means. Combine macro and micro control, combine strict regulatory system with perfect control mechanism, and improve the trading rules of stable market. Establish a stock market leveling fund, introduce a negative feedback mechanism to correct system deviations, and ensure the long-term healthy development of China's stock market.

4.2 Improve the information disclosure system

The main reason for the blind follow-up of investors is the serious information asymmetry in the market. Therefore, the information disclosure system should be improved: (1) further improve the securities law and related laws and regulations, refine the details of stock market information disclosure, and improve the market transparency and efficiency of information disclosure; (2) improve the quality of listed companies and improve the governance structure of listed companies; (3) increase supervision over information disclosure, and establish a set of securities regulatory departments, market trading organizations and industries. The framework of the securities regulatory organization, including intermediary agencies and investor protection organizations. Try to improve information asymmetry from the source, improve the timeliness, integrity and authenticity of information.

4.3 Strengthening the education of small and medium investors

At present, the irrational investors in China's individual investors occupy the vast majority of the investment group. The phenomenon of stock market volatility caused by the irrational behavior of investors is particularly prominent in China, which is extremely harmful to the stability of China's stock market. As the internationalization of China's securities market strengthens, the quality requirements for investors will become higher and higher, and the education of these investors is particularly important. Investor education for individual investors in the securities market, the meaning is to increase the investor's knowledge stock through the provision of public goods by the government, and reduce the irrational behavior characteristics of individual investors. The goal is to construct a microscopic rationality of the securities market basis. Due to the differences in the content of investor education products, they can be divided into general and technical. General education products should be supplied by the government, while technical education products are privately produced such as consulting and training provided by the department.

References

- [1] Hu Jizhi, Yu Hua. An empirical analysis of several factors affecting price fluctuation in China's stock market [J]. Chinese Social Sciences, 1999(3): 15-17.
- [2] Li Xindan. An empirical study on the trading behavior of individual securities investors in China [J]. Economic Research, 2002(11): 58-60.
- [3] Mu Liangping, Shi Daimin. Correlation between stock market volatility and the overall performance of listed companies [J]. Finance and Economics, 2002(6): 75-76.