

Influence of Interest Rates Fluctuations on the Stability of SSE Index

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Abstract From short-term and long-term aspects, this paper made an analysis of the influence of interest rate fluctuations on the stability of SSE Index in China, the study found that interest rate adjustments would be an impact on the SSE index. Falling interest have more intense influence than rising interest. Stock index and interest rate increase simultaneously two days after the interest rate adjustment; But in the long run, interest rate adjustments will help the stability of the SSE index and can effectively prevent the emergence of the stock market bubble. Therefore, in the further development of the stock market, reasonable use of interest rate as a tool can stabilize the stock market.

Key words Interest rate fluctuations ; SSE index; Stability; Influence effect

1 Introduction

In the many factors that affect the stock market movements, interest rate is a relatively sensitive factor, no other factor can produce a more far-reaching and substantial influence on the stock market than interest rate. On the one hand, interest rate fluctuations will lead to changes in the stock market investors' opportunity cost, thus cause the capital inflows or outflows of the stock market, affect the entire market's movement and make an impact on the stability of the stock market; On the other hand, interest rate fluctuations will affect the investors' investment structure and affect the flowing direction and volume of funds through reorganization of assets, thus the supply and demand of funds in the stock market and stock prices, causing the stock market fluctuations. Stock market in China was established in the early nineties in the twentieth century, in its short ten-year development history, how did interest rate actually function? What kind of impact did it have on the stability of stock market? This is an issue which is worth studying.

(Bulmash 1997) and (Trivoli 1999), (Mukherjee 1998) and (Naka 2002), (Ramin 1997) and (Tiong 1997), (Alireza 2000) and (Strauss 2001) made an empirical study on the long-run equilibrium relationship between interest rate as well as other macroeconomic variables and stock prices. Bulmash and Trivoli studied the situation in the U.S., Mukherjee and Naka made an empirical analysis of Japan's data, Ramin and Tiong, Alireza and Strauss respectively studied the cases in Singapore and European countries (including France, Germany, the Netherlands, Switzerland, United Kingdom). Although they have different research objects, they used the same research methods, that is, cointegration theory and reached the same conclusion— stock prices are negatively correlated with long-term interest rate, positively correlated with short-term interest rate. As a semi-strong-form efficient stock market, does the above-mentioned conclusion also exist in stock market in China's reaction to interest rate adjustments? This paper will use event analysis and the cointegration analysis method to analyze the influence of interest rate adjustments on the stability of Stock market in China through theoretical research and empirical research.

2 The Oretical Analysis of Influence of Interest Rate Fluctuations on the Stability of SSE Index

2.1 Short-term effects

In the short period, interest rate affects the stock market in the relatively easier way. First, In the short period, enterprises' capacity to adjust production and supply is confined, companies' total revenue in the short period will not be much affected, but the interest rate can affect the value of enterprise to influence the stock prices. Low interest rate policies are usually adopted by governments to stimulate economic development, and thus it can be predicted that the future enterprise profits will increase because of the overall economic prosperity, therefore, the stock price will fall with the rise of interest rate; On the contrary, high interest rate may be the signal of tight policy the governments use to curb inflation so that the overall economy will slowdown, which will reduce the expected profit of enterprises, the enterprises' future value which investors expect will be affected; Interest rate adjustments will affect the enterprise's financial situation, making bond yields change with stock price movements, investors may adjust their portfolios according to income changes. Second, the interest rate can affect the stock prices through

fluctuations in supply and demand in the securities market, higher interest rate leads to rising yields of stock's alternative financial asset, increasing investors' demand for alternative financial assets, reducing the demand for the stock, resulting in the decline in the stock prices; At the same time, interest rate adjustments cause fluctuations in supply and demand in the stock market and affect the stock market funds, in particular, the use of loan capital in buying and selling stocks, the sale of shares affected by the inflow and outflow of funds, thus affecting the stock prices. Third, from the perspective of policy and information, you can also consider the influence on interest rate in the short period. If the investor is expected to take into account the factors of policy fluctuations and realize these expectations, which will be absorbed, the influence on the stock market will not necessarily reflect the results of experience theory.

2.2 Long-term effects

long-term effects of interest rate on the stock market are more complicated. In the long period, enterprises have enough time to change the production scale, enterprises' operating conditions are subject to the multiple effects, such as economic cycles, investment trends, the marginal propensity to consume, the future expectations, etc. Enterprise's total income are uncertain, the effect of interest rate fluctuations on stock market prices is no longer a simple inverse relationship. As an economic variable, the interest rate adjustment will cause the changes of macro-economic environment, operating performance of listed companies and the other factors and have many-sided influence on stock price.

3 An Empirical Analysis on the Influence of Interest Rate Fluctuations on the Stability of SSE Index

The stability of the stock market depends on fluctuations in stock index, stock index also reflects the changes of stock prices in the stock market, this paper mainly analyzes stability of stock index through the analysis of influence of interest rate adjustments on the stock index changes.

3.1 The short-term effects analysis of the interest rate fluctuations influence on the stability of SSE index

3.1.1 Sample data selection

Stock markets in China have been in existence for 18 years since 1991, interest rate was adjusted many times, interest rate was low from 1990 to 1992, annual interest rate increased twice in 1993, interest rate dropped in the eight consecutive years from 1996 until 2002, rising interest rate policy was implemented from 2004 to 2008, Interest rate dropped successively four times from September 2008 onwards to the end of November. Therefore, the choice of sample data of interest rates ranges from May 5, 1993 to November 25, 2008, a total of 14 data. The interest rate we referred to here is various in the national economy, in which the benchmark interest rate is the guiding interest rate announced by the People's Bank to guide commercial deposits, loans, discount rates which is a general reference to other business in the financial markets, therefore, the one-year benchmark deposit interest rate is used as the sample data in this paper.

As the return rate sequences of the Shanghai and Shenzhen show a significant linear correlation, in this paper, only the Shanghai Composite Index is analyzed, the results also can reflect the actual situation of the Shenzhen Composite Index. The Shanghai Composite Index closing price on the day of, five days before and four days after the interest rate adjustment announcement, are selected as the stock price index.

The data are from the China Investment Great Wisdom Software, Shanghai Stock Exchange as well as the official website of People's Bank.

3.1.2 Data processing

Take the natural logarithm of one-year deposit rate announced by the Central Bank and then use the data of t period and $t-1$ period for difference, each amplitude of interest rate adjustments can be obtained.

Similarly, take the natural logarithm of the collected closing price of Shanghai Composite Index, use the data of t period and $t-1$ period for difference. In each duration of interest fluctuations, the amplitude of daily stock price movements in the selected time scope can be obtained.

3.1.3 The data analysis of the short term effects of the interest rate adjustment on the stability of SSE index

Before and after interest rate adjustments, from the comprehensive condition of the market, in the short period, market has a strong reaction to interest rate adjustments, especially before the interest rate adjustments, there are significant fluctuations. This effect is more intense two days before interest rate adjustments, the prices gradually stabilize 2-3 days later. At the same time we can see that the influence of rising interest is much more intense than the falling interest rate. Within two days after the interest rate adjustments, interest rate and stock index simultaneously increase. Meanwhile, it also confirms

what Bulmash and Trivoli, Mukherjee and Naka and the other foreign scholars had studied, the short-term interest rate adjustments and stock prices are positively correlated with stock prices.

Based on the above observation and analysis, it can be seen that in each adjustment period, market fluctuations were mainly embodied in the three days before, two days before, one day before and one day after, two days after the announcement of interest adjustments, the most prominent fluctuations appeared on the first, second day after the interest rate adjustments. Compared with other same conditions, there are significant fluctuations in stock prices. In addition, the influence of the rising interest rate policy is much bigger than the falling interest rate policy on the stock market.

3.2 An long-term effect analysis of the influence of the interest rate fluctuations on the stability of SSE Index

3.2.1 Selection of sample data and definitions of variables

Sample data range from May 5, 1993 to November 25, 2008. As Shanghai stock market covers a wider scope of industries and have large market value, it is more representative, so monthly data of the closing composite index of Shanghai stock market, represented by P, are suitable to represent the general level of stock market prices in China. In the choice of interest rate, the monthly average of one-year bank deposit rates, from May 5, 1993 to November 25, 2008, represented by R, are used as Central Banks nominal interest rate.

3.2.2 Research methods

The econometric cointegration research methods are adopted. The core idea of this approach is to seek equilibrium relationship between two or more non-smooth variables. After a unit root test, if two (or more) time sequences are found to be non-smooth, but as long as their certain linear combinations are smooth, then there are long-term equilibrium relationship (or cointegration relations) between the two (or more) non-smooth time sequences. The specific process is to conduct extended Dickey-Fuller test of the interest rate (R) and stock prices (P) to do unit root test respectively of each target sequence to determine smoothness. If they are non-smooth sequences, then carry out a first-order difference, recorded as D(P) and D(R) to determine whether a first-order difference is smooth or not, if, after a first-order difference, the two sequences are a first order single sequence, that is, they have necessary conditions to construct cointegration equations, thus we can make the long-term co-integration analysis of the individual variable sequence.

3.2.3 Cointegration test of stock prices and interest rate

Take the logarithm of interest rate (R) and stock prices (P), that is, LR, and LP. It can be seen from Table1, the statistic after testing t is -1.239271, larger than the critical value of the significance level of 1%, we can not reject the original assumptions, it can be judged that sequence of LR has unit root and is a non-smooth series. It can be seen from Table2, the statistic after testing t value is -1.662350, larger than the critical value of significance level of 1%, we can not reject the original assumptions, it can be judged sequence of LP has unit root and is a non-smooth series.

Table 1 The Unit Root Test Results of Interest Rate (LR)

ADF Test Statistic	-1.239271	1% Critical Value*	-2.5769
		5% Critical Value	-1.9415
		10% Critical Value	-1.6166

Table 2 The Unit Root Test Results of SSE Index (LP)

ADF Test Statistic	-1.662350	1% Critical Value*	-2.5769
		5% Critical Value	-1.9415
		10% Critical Value	-1.6166

Since the two series belong to non-smooth series, we need to do them a first order difference to determine whether their first order difference sequences are stable. The first order difference sequences of LR and LP are recorded respectively as DLR and the DLP, it can be seen from Table 3, the statistic of testing t value is -5.5984885, less than the level of 1% of the critical value, indicating that the original hypothesis can be rejected at least under 99% confidence level, so it can be thought that sequence DLR has no unit root and is a smooth sequence.

Table 3 Test Results of First-order Differential Sequence of the Unit Root DLR

ADF Test Statistic	-5.984885	1% Critical Value*	-3.4673
		5% Critical Value	-2.8773
		10% Critical Value	-2.5751

As can be seen from table 4, test t statistic is -6.418159, less than the critical value of 1% level, indicating that the original hypothesis can be rejected at least under 99% confidence level, so there is no unit root in sequence DLP, which is a smooth sequence.

Table 4 Unit Root Test Results of First Order Difference DLP

ADF Test Statistic	-6.418159	1% Critical Value*	-3.4673
		5% Critical Value	-2.8773
		10% Critical Value	-2.5751

From the above unit root test results, we can arrive at the conclusion that these two sequences are first order single sequences, they all have necessary conditions to construct cointegration equations. Therefore, we made a long-term cointegration analysis of the above-mentioned variable sequence. In this paper, Johansen cointegration test methods are adopted to analyze the cointegration relationship between two variables of interest rate and the SSE index, testing results are shown in Table 5. It can be seen from Table 5, there exists a first-order co-integration relationship between the interest rate and stock price, that is, there exists the long-term stable equilibrium relationship between them. Table 6 is the standardized cointegration coefficients, in Table VI the coefficient of variables LP is 1, which is the dependent variable of model equation. It can be seen from the table, interest rate and stock prices are in the long-standing negative correlation, that is, when interest rate rise, stock prices fall, interest rate fall, stock prices rise, which is similar to our previous prediction.

Table 5 Johansen Cointegration Test Results of LR and LP

	Likelihood Ratio	5 Percent Critical Value	1 Percent Critical Value	Hypothesized No. of CE(s)
0.038738	19.516957	15.41	20.04	None
0.012140	2.247378	3.76	6.65	At most 1

Table 6 Standardized Cointegration Coefficient

Normalized Cointegrating Coefficients: 1 Cointegrating Equation(s)		
LP	LR	C
1.00000	-1.607264 (0.36600)	21.0848
Log likelihood	87.085	

4 Conclusions

Through empirical analysis of the short-term and long-term effects of successive interest rate adjustments in China on the stock prices from May 1993 to November 2008, conclusions are the as follows:

First, in the short period, the interest rate adjustments will be an impact on stability of the stock market, rising interest rate has a more intense impact on the stock market than falling interest rate. Especially before the interest rate adjustments, there are obvious fluctuations which in advance reflect the fluctuations of stock price index, which are affected by the interest rate adjustment, this effect will be more intense in the first two days before the interest adjustment, 2-3 days later, the prices have continued to stabilize. Within two days after the interest rate adjustments, the stock index and interest rate simultaneously increases, which also confirms Bulmash and Trivoli, Mukherjee and Naka foreign scholars' empirical research results.

Second, in the long term, interest rate adjustments will help the stock market's stability. Through the empirical analysis, we can see that interest rate and stock prices are cointegrated, when interest rate rise, stock prices fall, interest rate fall, stock prices rise, with the constant improvement of stock market in China and the maturity of interest rate systems, the negative relationship between the two should become clear in reality. The existence of such a relationship can make countries adjust interest rate on the stock market to prevent the boom and collapse of stock prices to maintain long-term stability of the stock market. Therefore, we should give full play to the interest rate tools to stabilize the stock market, the central authorities should make use of interest rate tools to adjust the stock market, should choose the

right time and lay down the appropriate adjustments scope; And it is also necessary for investors in the market to examine the direction magnitude and time effects of interest rate on the stock market and appropriately adjust the investment strategy to avoid the risks.

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