

The Impact of Long- and Short-Term Interest Rate Adjustments on Stock Prices

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ABSTRACT. *On the basis of sorting out the mechanism of interest rate changes on stock prices, using data from October 1997 to March 2016, the empirical analysis of the relationship between interest rate changes and stock price fluctuations is carried out to examine the impact of short-term and long-term interest rate changes on stocks. The impact of the market. The study found that there are obvious differences between the short-term and long-term impacts of interest rate changes on my country's stock market, and it also puts forward corresponding suggestions for the institutional defects in my country's stock market that play the role of the monetary policy transmission mechanism.*

KEYWORDS: *Interest rate, Stock price, Stock price index*

1. Introduction

In recent years, the global influence of the financial market has increased. As its scale has increased, financial risks have also increased. After the outbreak of the financial crisis in 2008, the real economy and financial systems of various countries have been affected to a certain extent. In response to this crisis, all countries have adopted interest rate leverage for macro-control. From 2009 to 2016, although the U.S. economy was still at the forefront of the economies of various countries, the prolonged loose monetary policy did not make the economy recover effectively. After 2017, the Fed began to accelerate interest rate hikes and at the same time reduce balance sheet operations. These measures strengthened the endogenous growth momentum of the US economy and made the consumption engine more stable. Since then, the United States has bid farewell to the currency illusion before other economies in the world and has gradually turned to economic recovery.

Does interest rate have such a significant impact on my country's stock market? In this regard, this article uses data from Chinese listed companies to empirically test the specific impact of interest rate changes on stock price indices and index fluctuations. On the one hand, it can enable investors to better understand the impact

of interest rates on stock prices to a certain extent, enable investors to efficiently predict the trend of stock price changes, and help investors take measures to avoid certain risks in the stock market, so as to rationalize assets Allocation to minimize losses; on the other hand, it can promote the macro-control of the financial market based on the relationship between interest rates and stock indexes.

2. The mechanism by which changes in interest rates affect stock prices

Interest rate changes mainly affect the stock price through two channels: the transmission of listed companies and stock investors^[1].

(1) Interest rate changes affect stock prices through listed companies

Changes in interest rates will affect the business environment of the company, change the operating costs of the company, and change the business performance of the company, which in turn causes changes in the capital value of the company, affects investor expectations, and ultimately causes the company's stock price to fluctuate. The specific transmission channels are as follows.

Changes in interest rates will lead to changes in the total supply and demand of society, directly affect the external operating environment of the company, and then cause changes in the costs and profits of the company. The price of monetary funds is determined by interest rates, and corporate financing costs change with changes in interest rates^[2]. In addition, interest also affects residents' income and consumption activities. If the interest rate level drops, the opportunity cost of residents' current consumption will decrease, thereby increasing current consumption. This will stimulate the increase in effective demand to a large extent, significantly improve the business conditions, and ultimately promote the continuous increase of stock prices. Although the decline in interest rates will effectively promote the increase in demand, its effect will also be affected by other related factors.

First of all, many macro factors will affect the positive impact of lower interest rates on effective demand. Such as money supply, interest rate level and inflation rate^[3]. Secondly, in addition to changes in interest rates that will affect investors' expected returns, many personal subjective factors and external macro conditions will affect investors' expectations. Finally, people's marginal propensity to consume is affected by their expectations of the future. If consumers believe that the future rate of return will fall for a long period of time, the decline in interest rates at this time will cause consumers to store funds. That is, the marginal propensity to save has risen, while the marginal propensity to consume continues to decline, resulting in a decline in interest rates that cannot stimulate consumer demand to a large extent.

To a certain extent, changes in bank interest rates can have a direct impact on business management and profitability^[4]. From a narrow perspective, the reduction of bank interest rates in the short term can reduce the operating costs of enterprises to a certain extent, reduce the pressure on corporate financing, and increase the cash flow of enterprises, thereby increasing income, which is conducive to the positive movement of stock company stock prices. From a macro perspective, bank interest

rates are a reflection of the country's economic situation, monetary policy, and industrial policy during a certain period of time. The decline in bank interest rates may indicate economic downturn or domestic inflation, which is not conducive to the operation of the real economy to a certain extent, may increase the pressure of business adjustments and market expansion, and does not necessarily increase corporate profits. All things considered, the decline in bank interest rates is not of course beneficial to real companies.

(2) Investors are affected by changes in interest rates, resulting in changes in stock prices

The adjustment of bank interest rates has a complicated transmission process to the fluctuation of related stock prices in the securities market. First, changes in the interest rate of bank deposits will cause changes in the portfolio of investors' investment and wealth management products. Due to changes in interest rates, bank deposits may undergo volume adjustments, which will further affect the stock holdings in the securities market, and changes in the demand for the securities market will cause stock prices. fluctuation.

If the interest rate adjustment is larger than public expectations, a series of transmission effects will occur. The large decline in interest rates is bound to cause some investors to have a good expectation for future interest rate adjustments. Therefore, they will take the opportunity to sell stocks and obtain liquid cash, which will lay the foundation for investing in large quantities of stocks when the stock market prices are bullish in the future. Driven by their selling behavior, stock prices in the securities market will fall^[5]. However, if some investors do not have a higher expectation for future changes in interest rates, they will take the opportunity to buy stocks to deal with lower bank interest rates in the future. At this time, if the interest rate adjustment meets investors' expectations, the stock price in the securities market There will be no large-scale fluctuations.

3. Empirical research on the impact of interest rate adjustments on stock indexes

3.1 Index selection

(1) Short-Term Variable Selection

The main research purpose of this paper is to explore the impact of changes in bank interest rates on stock market prices. Therefore, the changes in the Fed's interest rates and the stock price index in the stock market are the main data referenced in this research. Although we have analyzed the extent of the impact of interest rate changes on stock prices and the issue of the average stock price changes in the next day, the above conclusions are only a supplement to the research data and do not involve other factors that affect stock price changes.

(2) Long-Term Variable Selection

The study of long-term variable selection needs to rely on the relevant changes in the one-year interest rate in the bank. The basis of this choice is that in practice, most bank deposits are mainly one-year deposits, and the one-year interest rate of financial institutions has guiding significance. In addition, from the data research point of view, the one-year annual interest rate can be calculated mathematically for the three-month and six-month periods.

3.2 Data processing

(1) Processing of Short-Term Data

First, logarithmize the daily closing price of the 8 trading days before and after each interest rate adjustment, and obtain the stock price return on the 7 trading days, the day and the 8 trading days after the announcement of the interest rate adjustment. According to $R_t = LNP_t - LNP_{t-1}$, calculate the return rate of the stock price index after the logarithmization process on the 7 trading days, the day and 8 trading days after the release of each interest rate adjustment message, and then calculate the arithmetic average of each rate of return. Observe the fluctuation range and direction of the stock index yield after adjustment; then test whether the direction of the stock price movement after the interest rate adjustment is consistent with the theory, and what is the difference between the fluctuation range and the theory. In the process of data processing, if the date on which the interest rate is adjusted is a holiday, the opening price of the first trading day after the holiday is used as the stock price on the day of interest rate adjustment.

(2) Processing of Long-Term Data

First, the daily closing prices of interest rates and stock prices are logarithmized. Calculate the rate of change from period t to period $t+1$. Then calculate the average closing price of each trading day from period t to period $t+1$. Finally, the average stock price change rate after logarithmic processing is obtained.

3.3 Short-term impact analysis

(1) Model Establishment

To establish a mathematical model to analyze the issues discussed in this article, it is necessary to determine the relationship between changes in the data. In order to explore the impact of changes in financial institutions' interest rates on stock prices in the securities market, it is necessary to select a data as a benchmark. According to the above analysis, the benchmark volume is the stock price fluctuation range on any day after the bank interest rate is adjusted. Since the bank interest rate adjustment is a relatively important time point, after removing the influence of other factors, the data from the first seven days to the first four days of the interest rate change has the most reference value. Using the range of the interest rate change during this period

as the independent variable, the regression The regression equation model of the test.

$$\Delta I_i = \alpha + \beta_1 exm + \beta_2 \Delta i + \varepsilon_i$$

In this model, ΔI_i represents the logarithm result of the stock price return obtained from the change in the stock price after the bank interest rate adjustment, and exm is the daily return of the stock price index from the 7 trading days to the 4 trading days before the interest rate adjustment. The average of the rate, Δi is the interest rate adjustment range, and ε_i is the other factors that have an effect on the change of the stock price index.

(2) Short-Term Impact Model Check

According to the above regression analysis results, we can perform regression equation calculation analysis on the experimental data obtained through long-term data and the experimental data intercepted through short-term data, where the short-term data are substituted into the three trading days before the interest rate adjustment as the dependent variable. The change range of the stock price index on 8 trading days, the interest rate adjustment range as the independent variable and the average daily return rate of stock index exm from the 7 trading days to the 4 trading days after the interest rate adjustment, the data is grouped correspondingly, and the data is grouped according to Model(1) performs calculation and regression analysis, and obtains the significance data of 14 regression equations, as shown in Table 1:

By conducting a significant study on the regression coefficients of the relevant regression equations, it can be known that the goodness of fit on the third and fourth trading days after interest rate adjustment is 0.8902 and 0.8214, respectively, indicating that the overall fitting effect of the model is relatively better. it is good. The F-test probabilities of the third trading day and the fourth trading day are both close to 0, which are 0.000693 and 0.000906, respectively, indicating that the equation is more significant. The significance level of the estimated value of the interest rate adjustment Δi parameter on the third trading day is 0.0007, and the significance level is good, indicating that changes in interest rates have a strong impact on the stock price on the third trading day after adjustment. The significance level of the interest rate adjustment range parameter on the fourth trading day is 0.0005, and the regression coefficient is more significant, indicating that the stock price on the fourth trading day after the interest rate adjustment is also affected by interest rates. The regression results show that the DW test values on the third trading day after the interest rate adjustment and the fourth trading day after the adjustment are 2.165361 and 2.15576, respectively. By querying the DW distribution table, we can see that $d_L=0.8$, $d_U=1.26$, $4-d_U=2.74$, At this time 2.165361 and 2.15576 are both greater than d_U and less than $4-d_U$, so there is no high degree of autocorrelation.

Table 1 Regression Equation Test Results

	R-2	D-W	F-stas	Prob-F	Prob
i_0	0.06150	1.77899	0.49155	0.62118	0.3423
i_1	0.02251	1.56231	0.17328	0.84255	0.5682
i_2	0.47900	1.78714	6.89677	0.00751	0.0273
i_3	0.89027	2.16536	11.35635	0.00069	0.0007
i_4	0.82134	2.15576	9.91286	0.00090	0.0005
i_5	0.03920	1.80668	0.30611	0.74079	0.8198
i_6	0.11070	1.99748	0.93435	0.41454	0.6845
i_7	0.15161	1.61554	1.34090	0.29122	0.1522
i_8	0.31637	1.88808	3.47031	0.05771	0.0394

The study of saliency is a mathematical model analysis method with regression equation coefficients as data. The saliency study of regression equation coefficients can carry out quantitative research on related influence range and degree of influence. From the data of the above regression equation coefficient significance research, it can be seen that the significance of the regression coefficient is not strong, and the fitting degree of the regression equation is poor. The reason for this phenomenon is that there are many factors that affect stock price changes in the securities market, and financial institutions The change in interest rates is only a minor factor. Therefore, from a time perspective, the data within a few days before and after the news is not accurate.

Bring the estimated values of the parameters processed by Eviews 10.1 into the regression equation of the significance test, and obtain the regression equations on the third and fourth trading days after interest rate adjustment.

$$I_3 = 0.000392 - 0.397378exm + 0.018504\Delta i$$

$$I_4 = 0.001087 - 0.990957exm - 0.015888\Delta i$$

Based on the data obtained from the above model, we can conclude the following laws: the changes in interest rates of financial institutions have a clear correlation with the changes in the stock price index on the third and fourth trading days after the news is released. If the institutional interest rate rises, the stock price index on the third trading day after the announcement of the adjustment message will rise accordingly. The interest rate will increase by one unit, and the stock index will move forward by 0.018504 units; if the interest rate is reduced by one unit, the stock index will move in reverse by 0.015888 units. The coefficient of interest rate in the regression results shows that the relationship between the changes in interest rates of my country's financial institutions and the changes in stock prices in the securities market is not obvious.

(3)The Ultimate Impact of Short-Term Interest Rate Adjustments

By observing and studying the magnitude of data changes, we can summarize the

following rules: Compared with changes in stock prices on other dates, changes in interest rates of financial institutions affect the changes in stock prices on the third and fourth trading days after adjustment. The impact is more obvious. Among them, as the interest rate of financial institutions rises, the stock price index rises on the third trading day after the adjustment, and the stock price index falls on the fourth trading day after the adjustment, and vice versa. From the perspective of data changes, the interest rate of financial institutions increased by one unit. After the adjustment, the stock price index on the third trading day increased by 0.018504 units, and the stock price index on the fourth trading day fell by 0.015888 units.

According to the coefficient of interest rate in the estimated regression equation, it can be seen that the change of interest rate in a short period of time has a certain impact on the change of stock price, but it did not cause a serious impact. Explore the reasons: One is the way of determining interest rates in my country. Our country has not implemented interest rate marketization like some western countries^[6]. Therefore, the changes in the level of interest rates in our country cannot automatically reflect the operating conditions of the market and economic development. Therefore, investors are not sensitive to changes in interest rates. Second, the development of the stock market is affected by many factors. Changes in market demand, changes in bank interest rates, personal preferences of investors, and the disclosure of stock market information can all affect stock prices. On this basis, the single fluctuation of bank interest rates will affect the stock market. Get offset.

3.4 Long-term impact analysis

(1) Serial Stationarity Test

Because the probability of false regression in the variable is very high, it is necessary to test whether the economic sequence is stable, and the ADF test method is usually used. This type of test is mainly to judge whether the time series of interest rates and stock prices are stable. In the inspection process, the inspection method should be determined by the nature of the sequence. The specific results can be seen in Table 2 and Table 3.

Table 2 Unit Root Test Results of Interest Rates

	Significance level(10%)	T	P
ADF		-2.33440	0.1733
Critical value at the significance level	1	-3.88675	
	5	-3.05216	
	10	-2.666593	

Table 3 Unit Root Test Results of Stock Prices

	Significance level(10%)	T	P
ADF		-2.82291	0.0759
Critical value at the significance level	1	-3.88675	
	5	-3.05216	
	10	-2.666593	

The results in Table 2 and Table 3 show that after the current ADF test method is used to test the interest rate series, the value is -2.334403, and the cutoff value under the significance level above 5% is -3.052169. These two sets of data can prove The unit roots in the interest rate time series are real, and the null hypothesis cannot be rejected. For the time being, it is judged that the interest rate time series is not stable. At the same time, through the above table, it can be found that after the current ADF test method is used to test the stock price series, the value is -2.822918, and the cutoff value under the significance level above 5% is -3.052169. Therefore, the same is true. Prove the hypothesis that there is a unit root in the stock price time series, and for the time being judge that the stock price time series is not stable. Then carry out the unit root test of the two respectively, and the results are shown in Table 4 and Table 5.

Table 4 First-Order Difference Unit Root Test of Interest Rates

	Significance level(10%)	T	P
ADF		-4.00034	0.0086
Critical value at the significance level	1	-3.92035	
	5	-3.06558	
	10	-2.67345	

Table 5 First-Order Difference Unit Root Test of Stock Prices

	Significance level(10%)	T	P
ADF		-5.24807	0.0010
Critical value at the significance level	1	-3.95914	
	5	-3.08100	
	10	-2.68133	

Through the analysis of Table 4 and Table 5, it can be found that after the current ADF test method is used to test the first-order difference series of interest rates, the value is -4000346, and the cutoff value under the significance level below 5% is -3.065585. Therefore, the original hypothesis that there is a unit root in the interest rate time series cannot be accepted, and it is judged that the time series of interest rates is stable after first-order difference processing. At the same time, through the above table, it can be found that after the current ADF test method is used to test the

first-order difference sequence of stock prices, the value is -5.248077, and the cutoff value under the significance level below 5% is -3.081002, so The original hypothesis that there is a unit root in the stock price time series cannot be accepted, and the stock price time series are judged to be stable. Therefore, it can be considered that these two sequences belong to the first-order single integral sequence. In order to obtain more accurate research results, we will explore whether there is a cointegration relationship between the two.

(2) Sequence Cointegration Test

The premise of cointegration test is to ensure the stability of the time series. Granger (1986) proposed that if the stability of the time series cannot be guaranteed, in this case, the use of differential methods to force it to stabilize will cause the problem of long-term information loss in its internal storage. However, the cointegration test gives a method to detect whether the long-term stability relationship exists in the variable. The author mainly uses the JJ cointegration test method to infer the cointegration relationship of variables. The reason for choosing this method is that it can roughly calculate the cointegration vector while obtaining all the information hidden in the time series, so as to give the statistics a scientific distribution.

The first-order difference sequence of interest rate and stock price obtained above is stable, and then using the co-integration point of view, it is inferred that the probability of the co-integration relationship between the two is very high. After further testing by the Johansen co-integration test method, the specific results are shown in the table 6.

By analyzing Table 6, it can be seen that the statistical value of the lag 1 period is the lowest. The cointegration test method selected in this paper is used to test the lag period, and the results are shown in Table 7.

Table 6 Statistics Results of Var Model Lag Order Judgment

Modle	VAR(1)	VAR(2)	VAR(3)	VAR(4)
SBIC	-3.242531	-2.762605	-2.271562	-2.210823
AIC	-3.536607	-3.245473	-2.932409	-3.032468

Table 7 Johansen Cointegration Test Results of Stock Price and Interest Rate

Null hypothesis	Eigenvalues	Trace statistics	Cut-off value at 5% significance level	P	Maximum eigenvalue statistics	Cut-off value at 5% significance level	P
r=0	0.52	16.6	15.49	0.0096	15.741	14.2646	0.0028
r=1	0.21	3.77	3.81	0.002	3.7749	3.81466	0.0020

According to Table 7 above, the null hypothesis $r=0$ is 16.61598 at the 5% significance level, the cut-off value at the 5% significance level is 15.4947, and the highest feature value is 15.74100, which exceeds 5. The cut-off point value at the 5% significance level is 14.26460, which means that the null hypothesis is rejected at the 5% significance level ($r=0$), which also means that the variable does have an obvious cointegration equation, and the stock price and interest rate are both. The co-integration relationship is also very stable for a long time.

(3) Serial Granger Causality Test

Through the above content, we can know that the co-integration relationship between stock price and interest rate has long-term stability. At present, many scholars and experts, in order to explore in depth whether the causality between the two in econometrics exists, they often use the Granger causality test. Through the analysis of Table 6, it can be known that the statistical value of the lag 1 period is the lowest. The Granger causality test is performed on the 1 lag period. The results are shown in Table 8.

Table 8 Granger Causality Test Results of Index and Rate

Null hypothesis	Obs	F	P
The deposit rate is not the Granger reason for the stock price index	17	3.24331	0.00294
The stock price index is not a Granger reason for deposit rates		0.29691	0.37389

From the results shown in Table 8, there is indeed a Granger causal relationship between interest rates and stock price indices, but the Granger causes of the two are unilateral, that is, the former is the cause of the latter, while the latter is not the former. The reason is that the range of stock price changes is directly related to interest rate adjustments. The actual economic benefits of bank deposits can also be known through the level of deposit interest rates, and the stock price can also reflect the level of economic benefits of stocks. In a sense, these two investment methods are interoperable and can be used interchangeably. The bank deposit interest rate determines the amount of funds investors invest in stocks. Therefore, the level of the stock price index will also be affected by it.

(3) Conclusion on the Long-Term Impact of Interest Rate Adjustments

There is indeed Granger causality between interest rate and stock price index, but the Granger cause of the two is unilateral, that is, the former is the cause of the latter, and the latter is not the cause of the former, and the error correction model can also reflect interest rates. It does have an impact on the level of the stock price index, but the relationship is negative.

(4) Establishment of Error Correction Model

Because of the long-term co-integration relationship between interest rate and

stock price index, an error correction model is established.

$$\Delta index_t = \beta_0 + \beta_1 \Delta rate_t + \lambda ec m_t + \varepsilon_t$$

Use Eviews software to output d_U and output the result, and it is estimated that:

$$\Delta index_t = 0.0014 - 0.5231 \Delta rate_t - 0.6043 ec m_{t-1}$$

The results show that the model fitting result is ideal, and the goodness of fit is 0.8213. The D-W test value is 1.7112. Since $d_U=1.26$, the D-W value is greater than d_U and less than $4-d_U$, which means that the model does not have a high degree of autocorrelation. From the results, this model can also show that there is a correlation between the stock price index and interest rate changes. When the interest rate increases by one unit, the stock price drops by 0.5231 units in the opposite direction, which is consistent with the theoretical analysis. The coefficient of the error correction term is negative, which is consistent with the reverse correction mechanism, which means that when short-term fluctuations deviate from the long-term equilibrium, the adjustment intensity of 0.6043 will change from an unbalanced state to an equilibrium state.

4. Conclusions and Policy Recommendations

4.1 Conclusions

On the basis of combing the impact mechanism of interest rate changes on stock price fluctuations, the short-term and long-term effect models are established respectively to study the short-term and long-term effects of interest rate changes on stock price fluctuations, and the following conclusions are obtained: First, from the perspective of the impact of interest rate adjustments on stock prices Look, in the third and fourth trading days after the interest rate adjustment, the stock price changes greatly, and except for these two days, the impact on the other days is very low. Among them, the impact on these two days is different, which is specifically reflected in the relationship between interest rates and stock prices, that is, the third trading day is positive and the fourth trading day is reverse. At the same time, the unit of interest rate changes, the stock price index also changed in the past two days, rising by one unit, the stock price index moved positively by 0.018504 units on the third trading day, and the stock price index moved negatively by 0.015888 units on the fourth trading day. Secondly, explore the co-integration relationship between interest rate and stock price index, and find that there is a long-term co-integration relationship between interest rate and stock price index. Finally, according to the test results, it is judged that there is a unidirectional Granger causality between interest rate changes and stock index fluctuations, that is, interest rate changes are the Granger cause of stock index changes, but the latter is not the cause of the former.

(2) Suggestions

From the above conclusions, it can be seen that there are obvious differences

between the short-term and long-term effects of interest rate changes on my country's stock market, and the significance is also different. This shows that my country's stock market has a system defect that exerts weaker monetary policy transmission. In order to promote the formation of a benign interactive development relationship between monetary policy and the stock market, the following suggestions are made.

(3) Strengthen the Reform of Interest Rate Marketization

Although my country's current nominal liberalization of market interest rates has been basically completed, due to market segmentation, interest rates cannot reflect the true status of the fund supply and demand relationship. The central bank's use of monetary policy tools to affect short-term interest rates and the overall interest rate structure is weak^[7]. Due to the unreasonable interest rate term structure and risk structure, the transmission effect of interest rate changes on stock prices is not obvious. Continuing to deepen the reform of my country's interest rate marketization and continuously improving the smoothness of the transmission mechanism of interest rates to stock prices will help achieve the government's monetary policy goals.

(4) Continue to Regulate and Improve the Stock Market

my country's stock market is currently facing many adjustments and reforms, such as irrational structure, insufficient function of optimizing resource allocation, weak market restriction mechanism, and "shortcomings" in market operation systems and mechanisms. All these have a negative impact on the quality and efficiency of the government's monetary policy transmission in the stock market, and corresponding improvements and adjustments must be made to my country's stock market as soon as possible to make it mature and standardized.

(5) Accelerate the Improvement of the Integration of the Money Market and the Stock Market

Mature financial markets are often reflected in the interdependence and mutual promotion of a country's currency market and capital market. my country has formed artificial market segmentation under the influence of many factors such as macroeconomic policies and strengthened risk management, leading to an increase in the decay rate of the timely transmission effect of the central bank's monetary policy. It is necessary to further accelerate the integration of the money market and the stock market, and continuously increase the sensitivity of the stock market to the central bank's monetary policy.

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