

# An Empirical Analysis between Chinese Interest Rate and Stock Price

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## **Abstract**

The impact of the interest rate adjustment is achieved by changing stock investors' re-evaluating. I give one empirical analysis between Chinese interest rate and stock price by related data. The research indicates that Chinese interest rate can change stock price, rather than the reverse. It means that interest rate becomes one effective measure for the monetary policy maker and the monetary must be prudent.

**Key words:** *interest rate; stock price; empirical analysis; monetary policy; liquidity*

## **1 Introduction**

In general, monetary policy influences the stock market by means of money supply and interest rate. According to the efficient market hypothesis, the stock price would not have a big change if the interest rate adjustment has long been expected. But if the interest rate adjustment is beyond the expectation of the public, the current stock price will decline because people will sell the stock and hold money to prepare for the future buying according to the theory of liquidity preference, and vice versa anti. Tobin(1969)<sup>1</sup> gave another channel that the interest rate influenced the stock price with his theory of asset selection. According to the asset substitution effect, the stock price will rise because the public is more willing to hold relatively high income shares when the interest rate descends. And according to accumulation effect, the stock price will also price when the interest rate descends, because the public will buy more risky assets of high returns for achieving the goal of the wealth accumulation.

In monetary assets combination model (Rozeff, 1974),<sup>2</sup> the money for portfolio investor is regarded as an asset, and the investor will select desired currency holdings between money and other assets replacement when a shock of money supply occurs. Generally speaking, there is a time lag for investor's response to monetary policy which helps to predict stock returns. It has been supported by a series of empirical findings(Sprinkel, 1964;<sup>3</sup> and Jaffee, Homa, 1971,<sup>4</sup>etc.). However, this conclusion is in conflict with the later efficient market theory of Fama(1970)<sup>5</sup> which holds that the current stock price can reflect all the information that can be obtained. If the investor is rational, he will adjust his portfolios and the market will maintain a clearing state which leads to no excess returns in the market. Therefore, the change of monetary policy can not become the basis for predicting future earnings. The subsequent research finds that there is no value for predicting the future

earnings by the change in the past money supply, but rather a Grainger causal relationship. Many scholars (Cooper, 1974;<sup>6</sup> Rozeff, 1974<sup>2</sup>) found that the stock return was the Grainger reason for the change of money supply.

It is a challenge to analysis the relation between Chinese interest rate and stock market. I will discuss this topic in detail in the following chapters.

## 2 An Analysis Between Chinese Interest Rate and Stock Price

It is necessary to deal with the related data before my analysis. I think the stock price is replaced by the circulated value of A-share stocks, compared with the index of Shanghai and ShenZhen stock market. Nr is the nominal one-year interest rate and Rr is the real one-year interest rate. The data of Nr and Rr can be obtained from the quarterly journal of statistics of Chinese center bank. Nc is the circulated value of A-share stocks and the data comes from Chinese stock market research database.

According to the original date preprocessing, i give a seasonal adjustment for the above variables and take the natural logarithm. Time span is from the fourth quarter of 2006 to the first quarter of 2015. Eviews 6.0 is one effective processing tool.

### 2.1 Unit Root Test

First of all, ADF unit root test is adopted for the variables of Nr, Rr and Nc. The level-value and first-order differential to all variables must be tested by means of Eviews 6.0. The lag is determined by AIC criterion. The result is shown in table 1.

Table 1 – Adf test

Variable	ADF Statistics	Inspection form	Critical value (5%)
Nr	-0.668	(C,T,1)	-3.548
Rr	-0.617	(C,T,1)	-3.548
NC	-1.726	(C,T,2)	-3.553
$\Delta$ Nr	-5.479	(C,0,0)	-2.951
$\Delta$ Rr	-5.495	(C,0,0)	-2.951
$\Delta$ Nc	-3.702	(0,0,1)	-1.951

The result shows that the log values to three variables are not steady, but the first order differences are adopted by ADF test. It indicates that three variables are I (1) sequence. Therefore, the ordinary regression analysis is not suitable to test the correlation between such economic variables. A Further co-integration is used as fellows.

### 2.2 Johansen Co-integration Test<sup>7</sup>

Johansen co-integration test is given to two sets of variables which include (Nr, Nc) and (Rr, Nc). The result is given in table 2.

Table 2– Johansen co-integration test

(Nr, Nc)			
hypothesis of co-integration	eigenvalue	trace test statistic	Critical value (5%)
None*	0.417	22.758	15.495
At most 1*	0.122	4.423	3.841
(Rr, Nc)			
hypothesis of co-integration	eigenvalue	trace test statistic	Critical value (5%)
None*	0.401	21.674	15.495
At most 1*	0.118	4.257	3.841

Test results show that there are collaborators relations between two sets of variables under 5% significance level. It also means that there is a certain equilibrium relationship in the long run.

### 2.3 Granger Causality Test<sup>8</sup>

Granger causality test can effectively test if Nr can affect Nc ,or vice versa anti. The test is conducted under the nonstationary sequence. The result is given in table 3.

Table 3 – Granger causality test

(Nr, Nc)			
Null hypothesis	observation	F statistic	probability
Nc is not the Granger cause of Nr	34	0.514	0.604
Nr is not the Granger cause of Nc		2.807 *	0.077
(Rr, Nc)			
Null hypothesis	observation	F statistic	probability
Nc is not the Granger cause of Rr	34	0.471	0.629
Rr is not the Granger cause of Nc		2.442*	0.105

According to table 3, there is an one-way causal relationship from Nr and Rr to Nc. Namely, Nr, together whit Nr, is an important variable for Nc. But Nr is more prominent to explain Nc in statistical point of view.

### 2.4 Error Correction Model

Error correction model is mainly used to investigate the regulation of long-term and short-term relations between variables. With such model, the correlation that how the interest rate influences the stock price is explored. Given the interest rate is a dependent variable, the correlation coefficient shows that the current interest rate affects the later 1th, 2th, 3th and 4th quarter stock price. In this segment, Nr is a dependent variable and Rr is not one because of Granger causality test.

Table 4 – Error correction model (Nr, Nc)

	CointEq1	D(Nr(-1))	D(Nr(-2))	D(Nr(-3))	D(Nr(-4))	C
D(Nc)	-0.212400	0.001762	-0.156200	b-0.169625	-0.173543	-0.012980

According to table 4, the correlation coefficient is positive and relative very small(0.001762) in short-term (1th quarter). But it is negative and is relatively stable (-0.156200, -0.169625, -0.173543) in long-term( 2th, 3th and 4th quarter).

### **3 Conclusion**

According to traditional theory, the interest rate is the most important fact that affects the stock price. Two significant conclusions can be inspected. Firstly, the interest rate is a Granger cause of the stock price. Secondly, that how the interest rate affects the stock price is basically consistent with the traditional theory in long-term. Therefore, we can make a conclusion that the interest rate is a relative variable by which monetary policy transmits to the stock market. But a detailed analysis must be used to fully understand the role of the interest rate in the transmission.

Firstly, the interest rate as an intermediary goal to monetary policy is effective if it is a Granger cause of the stock price. If the interest rate changes, many enterprises, residents and banks will make a corresponding decision. Throughout the 1990's, one striking feature of Chinese monetary policy is the frequent adjustment to the interest rate. Despite the adjustment to the interest rate is not just to stimulate the stock market, much more macroeconomic factors such as social capital supply and demand , bank profits and social enterprise cost are taken into account. But no matter what, the adjustment to the interest rate may make the stock price rise or fall to some extent every time. Of course, some scholars also challenge the effect on the grounds that Chinese interest rate is strictly controlled. All in all, the impact of the interest rate to stock market is obvious and it is untenable to suspect the impact because of the controlled policy.

Secondly, in addition to the time lag of Chinese interest rate policy, investors' expected effect may be an important factor that can explain there is a positive correlation between interest rate and stock price in the short term. Investors' expectation depends on not only their information, but also macroeconomic policy-makers' judgment to the current economic situation. In reality, Chinese investors negatively react to cut interest rate. Therefore, stock price usually declines in the later day the interest rate cuts. This is contrary to tradition economic theory. One probable reason is that non market- based interest rate makes the policy effect discounted. Of course, different investors may make different judgments with the same policy. It is difficult to comply with the strictly negative correlation between Chinese interest rate and stock price.

Thirdly, there is a negative correlation between Chinese interest rate and stock price in long term. It conforms to the traditional theory because of the substitution effect of interest rate and stock price effect. The correlation is in long time not short time because of time lag.

All in all, Chinese interest rate has significant impact on stock price. In order to improve the effect of Chinese monetary policy, one way is to carry out a market-based interest rate and another way is to maintain a stable monetary policy with which investors form expected reaction.

## **References**

1. *J. Tobin*, A General Equilibrium Approach to Monetary Theory, *Journal of Money, Credit and Banking*, 1969, 1: 15-29.
2. *M. S. Rozeff*, Money and Stock Prices, *Journal of Financial Economics*, 1974, 1: 245-302.
3. *B. W. Sprinkel*, Money and Stock Prices, Homewood, IL: Richard D. 1964.
4. *D. M. Jaffee, K. E. Homa*, The Supply of Money and Common Stock Prices, *Journal of Finance*, 1971, 26: 1056-1066.
5. *E. F. Fama*, Efficient Capital Market: A Review of Theory and Empirical Work, *Journal of Finance*, 1970, 25: 383-417.
6. *R. V. L. Cooper*, Efficient Capital Markets and the Quantity Theory of Money, *Journal of Finance*, 1974, 29: 115-146.
7. *S. Johansen*, Statistical Analysis of Cointegration Vectors, *Journal of Economic Dynamics and Control*. 1988, 12: 231-254.
8. *R.E. Engle, C.W.J. Granger*, Integration and Error Correction: Representation Estimation and Testing. *Economics*, 1987, 55: 251-276.