

A Comparative Empirical Study on the Macroeconomic Objectives and Effectiveness of Interest Rate Policies of China and U.S.

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Abstract

This paper summarizes the relevant literatures about the economic effects of interest rate policy and Taylor rules, on the basis of which macroeconomic objectives indicators of China's and U.S.'s interest rate policies are come up with. Then the macro-economic objectives and effectiveness of their interest rate adjustment policies are studied through Granger causality test and multivariate co-integration regression model. The result shows: Firstly, both of China and U.S. take economic growth, price level and employment level into consideration when adjust the benchmark interest rates. China's adjustment pays more attention to stable price level and promoting employment level, while U.S.'s adjustment focuses more on stimulating economic growth and promoting employment level. Secondly, compared with China, U.S.'s market-oriented interest rate adjustment mechanism is more effective to reflect and respond to changes in the macroeconomic situations. Thirdly, the effectiveness of U.S.'s adjustment is obviously superior to China's. U.S.'s benchmark interest rate adjustment can significantly affect the economic growth and employment level, and price level to some extent as well; while China's effectiveness is confined to price level. Therefore, China should accelerate the interest rate liberalization and learn from U.S. to reform the function mechanism of interest rate policy, so as to enhance the interest rate policy on the sensitivity and effectiveness of macro-economy.

Key words: Interest rate adjustment policy; Macro-economy; Economic growth; Price level; Employment Level

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INTRODUCTION

In July 1993, the Federal Reserve officially announced that it will no longer take any monetary variables as the intermediate target of monetary policy, which began that the interest rate played as intermediate target and the interest rate policy acted as the main monetary policy adjustment measure. Since then, U.S. started to use the open market operations and other regulations to adjust the federal funds rate and other interbank offered rates, so as to achieve its interest rate policy targets.

As for China, on the one hand, interest rate is more and more important as an intermediate target. The central bank began to exploit open market operations in 1996, and since then interest rate was started to be regarded as the intermediate target, being used among the central bank's monetary policy cluster. With the development of market economy, effectiveness of the money supply as the intermediate target of monetary policy was getting limited, and price means was getting more and more applicable. So in 2003 the central bank launched a clear interest rate market reform route, and began to put a clear emphasis on the interest rate policy as the representative of the price means. So, it's obvious that interest rate policy will play an increasingly important role in China's macro-economy regulation and adjustment.

On the other hand, China was putting forward interest liberalization. In 1996 control of interbank lending rate was released, which was the start of interest liberalization. During the period of 1996 to 1999, the bond interest rate was also gotten liberalized. From 2004 to 2012, deposit and loan interest rate was partly liberalized, among which

deposit and the loan interest rate could float to 1.1 and 0.7 times of the benchmark interest rate respectively. In July 2013 the control of the loan rate was fully eliminated. From 2014 to May 2015, the upper limit of deposit interest rates was raised three times, up to 1.5 times of the benchmark interest rate. According to the statement of advancing interest rate liberalization in the Third Plenary Session of 18th CPC National Congress, it can be expected that China's interest rate will go into total marketization.

China's interest rate policy mechanism has been worked through directly controlling deposit and loan interest rate on bank by adjusting benchmark interest rate. There will be a fundamental change because of the release of interest rate control, the government can no longer directly adjust market interest rate.

To sum up, China will put more emphasis on the interest rate policy among the monetary measure cluster to adjust macro-economy, and the function mechanism will also get reformed. Therefore, by comparing the macroeconomic objectives and effectiveness of China's and U.S.'s interest rate adjustment policy, we can make rational evaluation and get important enlightens for China's interest liberalization.

1. LITERATURE REVIEW

1.1 The Economic Effects of Interest Rate Policy

In order to provide a basis for the analysis of the macroeconomic effectiveness of interest rate policy, it is necessary to make a brief summary of the relevant literatures on the economic effects of interest rate policy of China and U.S..

Chinese scholars had controversies about the effectiveness of interest policy of China. Many of them, thought that due to imperfectness of interest rate structure, blocking of interest rate transmission channel and so on, the effectiveness and influences on the real economy of China's interest policy was limited and it play more role of conveying governmental policy intention (Wang, 1998; Jiang, 2003; Lian, 2005; Xia, 2011). A few scholars' empirical study showed that the production effects of China's interest policy could greatly influence industrial production (Tang, 2005).

As for the U.S.'s interest rate policy effects. G.A. Kahn (1989) thought the Federal short-term interest rates had significant influence on the mortgage market, international trade growth, company's asset structure, GNP growth, etc.. Some scholars thought Federal short-term interest rates could significantly adjust inflation and its expectation (Ireland, 2000). Marques (2010) found the impact of interest rates on money- market in the subprime crisis conformed to Taylor rule, which was closely related to the inflation gap and the output gap.

1.2 Objectives of Interest Rate Policy

The objective or criterion of national interest rate adjustment is always an important area of academic research. Since Kydland and Prescott (1977) introduced "time inconsistency" into macro-economy research, the

mainstream view of patterns of interest rate adjustment has turned from discretion to certain principles and goals (Wang, 2009). Taylor in 1993 proposed the Taylor rule, which had become the most influential view in both academic and practical field, providing an important reference for Federal Reserve interest rate regulation. According to the Tylor rule, central bank should set certain economic goal and adjust interest rate policy accordingly when the relevant economic indicators sway away from the target goal. The output growth, price level and employment rate are the three important goals of interest rate adjustment objectives. Interest rate shall be raised when the economy overheats and inflation rate soars, and turned down at the economic downturn and high unemployment rate.

Scholars made many theoretical and empirical study based on Tylor rule. Bryant studied whether M2, exchange rate, inflation rate and production rate influenced interest rate policy in U.S., the result showed that inflation rate, production rate was significantly relevant to interest rate adjustment (Bryant, 1993). Svensson (2000) debated about whether exchange rate should be included in objective clusters, and no consistent proposition was reached. Taylor (2000) thought for developing countries, whether monetary and interest rate should take the exchange rate into consideration depended on the specific fiscal and financial conditions.

There was controversy about whether Taylor rule adapted to China. Some scholars thought two goals of Taylor rule are reflected in China's interest rate policy (Xie, 2002; Lu, 2003; Meng, 2012). While some other scholars thought China's interest rate showed more features of discretion and little monetary policy objectives, which didn't meet the Taylor rule and was supplemented by monetary quantity policy (Liu, 2012; Zhu, 2013). Xiao found that China's interest rate adjustment lagged behind economic situations, lacked flexibility and was insensitive to M2 (Xiao, 2011). Huang added factors of money amount, asset price and exchange rate into the nonlinear Taylor rule and found the former two elements were significant in China's interest rate policy (Huang, 2012).

To sum up, there were few literatures that used united Index category to empirically and comparatively study the objectives and effectiveness of China's and U.S.'s interest rate policies. This paper aims to use economic growth, price level and employment level, which are generally agreed to be promising considerations of China's and U.S.'s interest rate policies, as the macroeconomic indicators to empirically test this issue, trying to see whether their benchmark interest rate adjustments can reflect the changes of macro-economic situations and work effectively. In this way, we can objectively and effectively assess the interest rate policies of China and U.S. under different institutional and economic situations, and provide enlightens for China's interest liberalization reform.

2. BENCHMARK INTEREST RATE ADJUSTMENTS IN CHINA AND U.S. AND EMPIRICAL METHODS

2.1 Benchmark Interest Rate Adjustments in China and U.S.

For China's benchmark interest rate, one-year deposit and loan interest rates are chosen as the proxy variable, while the federal funds rate is used in the United States. Here are the reasons.

In China, the interest rate system is composed of deposit and loan interest rates, the interbank lending market interest rates, bond market interest rates, bills discounting rates and so on. Interest rates for deposit and loan are of most importance in this system and the one-year deposit and loan interest rate, which are determined directly by the central bank, are usually regarded as the means of central bank's interest rate regulations.

In the U.S. interest rate system, the federal funds rate and the federal discount rate are the main interest rate policy instruments of the Federal Reserve. After the federal discount rate formation mechanism was changed in 2003, the Federal Reserve regulated federal funds rate mainly through open market operations, thereby affecting the financial markets and adjusting macro-economy.

The following figure reflects the changing trend of benchmark interest rates of U.S. and China. It's obvious that China's benchmark interest rates were adjusted irregularly by the central bank in accordance with the economic situation, with low frequency and drastic amplitude. While on the other hand, U.S. Federal Reserve regularly adjusts the benchmark interest rate, with high frequency and low amplitude, which reflect the characteristic of keeping within a range or trend during a particular period.

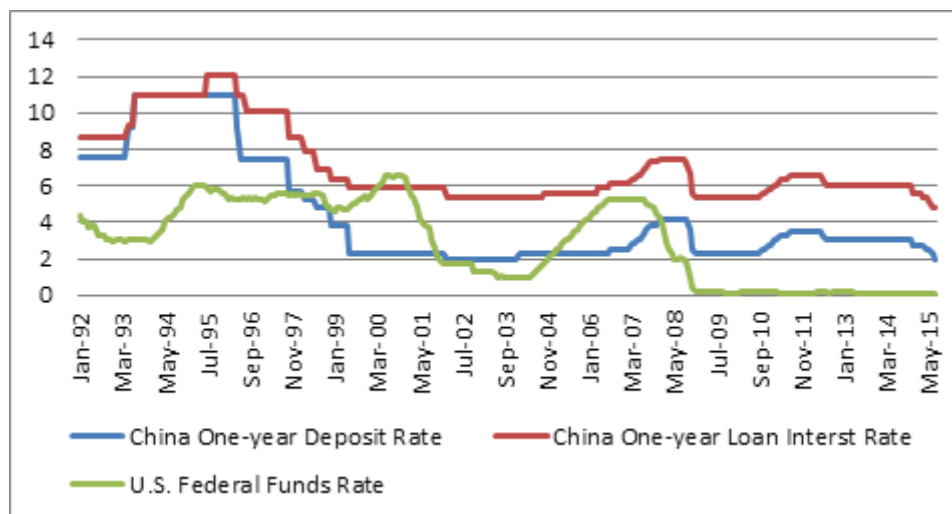


Figure 1
The Change of China's and U.S.'s Benchmark Interest Rates From January 1992 to June 2015

Note. Sources: Website of People's Bank of China and U.S. Federal Reserve Website. Monthly federal funds rate is calculated by average daily rates.

2.2 Empirical Methods

In this paper, we mainly use the cause and reason relationship as well as numerical relationship to reach research goals. Firstly we test the stationarity of the chosen variables' time series. Then Granger causality tests are used to see whether China's and U.S.'s interest rate policies regard three macroeconomic aspects as objectives and whether the benchmark interest rate adjustments can effectively influence the three economic aspects. Thirdly, multivariate co-integration regression models are built to find the numerical relationship between the nominal benchmark interest rates and three macroeconomic variables. Combining the results of Granger causality tests and regression results, we can make a judgement of

the objectiveness and effectiveness of China's and U.S.'s interest rate policies.

3. EMPIRICAL TESTS

3.1 Indicator Chosen and Data Process

In this paper, the monthly data from January 1992 to June 2015 were analyzed to guarantee the representative and effectiveness of empirical study.

In addition to the above proxy variables of rates policies, here are the proxy variables of the macroeconomic aspects. Nominal GDP growth rate is used to represent economic growth. Data is from websites of China's National Bureau of Statistics and U.S. Bureau of Economic Analysis, and let the three months have the same average value to switch quarterly data to monthly data. Registered urban unemployment rate and unemployment rate are

used to represent the employment level of China and U.S. respectively. The monthly data is from China Statistical Yearbook and database of U.S. bureau of labor. Monthly CPI is used to represent the price level, and data is from websites of China's National Bureau of Statistics and U.S. Bureau of Economic Analysis.

3.2 EMPIRICAL TESTS

ADF stationary test is launched for all variables. First test the original time series. As the Table 1 shows, all the variables are not stationary. Then test the stability of each index variable of the first order difference. As Table 2 shows, all the series are stationary. So we can see that the benchmark interest rate, GDP growth rate, CPI and unemployment rate series are single integer. So we can move forward to Granger Causality test and multivariate co-integration regression.

Table 1
ADF Test Results of All the Variables

Variable	Test formation	ADF statistics	Conclusion
Lr1	(C,0,0)	-1.419533	Not stationary
LGDP1	(C,0,0)	-2.598668	Not stationary
LCPI1	(C,0,1)	-2.541982	Not stationary
LUER1	(C,0,1)	-2.541982	Not stationary
Lr2	(C,0,0)	-1.756931	Not stationary
LGDP2	(C,0,0)	-2.828123	Not stationary
LCPI2	(C,0,1)	-1.812176	Not stationary
LUER2	(C,0,0)	-1.619762	Not stationary

Note. The threshold values of significance at .01, .05 and .1 are -4.001311, -3.430864, -3.139056, respectively. Computed by Eviews 7.

Table 2
Results of ADF Test Two

Variable	Test formation	ADF statistics	Conclusion
DLr1	(C,1,0)	-9.066219	stationary
DLGDP1	(C,1,0)	-11.19839	stationary
DLCPI1	(C,1,1)	-17.94848	stationary
DLUER1	(C,1,1)	-18.37375	stationary
DLr2	(C,1,0)	-14.18466	stationary
DLGDP2	(C,1,0)	-16.96411	stationary
DLCPI2	(C,1,1)	-8.246090	stationary
DLUER2	(C,1,0)	-13.72499	stationary

Note. The threshold values of significance at .01, .05 and 0.1 are -4.001516, -3.430963, -3.139114, respectively. Computed by Eviews 7.

On the basis of stationarity of variables' first order difference, we carry out Granger causality test between the benchmark interest rate and macroeconomic indicators. According to several tries on AIC rule, we set optimal lag period as 2. The results are shown as Table 3.

Table 3
Results of Granger Causality Test (Lag=2)

China		
Null hypothesis	F statistics	Prob.
DLGDP1 doesn't Granger cause DLr1	2.15030	0.1190
DLr1 doesn't Granger cause DLGDP1	0.46384	0.6295
DLCPI1 doesn't Granger cause DLr1	2.84960	0.0385**
DLr1 doesn't Granger cause DLCPI1	5.48385	0.0012***
DLUER1 doesn't Granger cause DLr1	4.45733	0.0127**
DLr1 doesn't Granger cause DLUER1	0.0722	0.9304
U.S.		
Null hypothesis	F statistics	Prob.
DLGDP2 doesn't Granger cause DLr2	3.65391	0.0134**
DLr2 doesn't Granger cause DLGDP2	2.63915	0.0506*
DLCPI2 doesn't Granger cause DLr2	2.07597	0.1511
DLr2 doesn't Granger cause DLCPI2	2.13770	0.1452
DLUER2 doesn't Granger cause DLr2	5.77125	0.0464**
DLr2 doesn't Granger cause DLUER2	4.7105	0.0625*

Note. ***, **, * indicate significant level at .01, .05 and .1, respectively. Computed by Eviews 7.

For China, price level (CPI) and employment rate (UER) both Granger cause benchmark interest rate(r) at the significant level of 5%, while economic growth (GDP) is comparatively not significant (but also close to 10%) as Granger cause. The benchmark interest rate only Granger causes CPI at 1% significant level, but not for GDP or UER. This shows on the one hand that China's benchmark interest adjustment mainly takes price level and employment level as the objectives, with economic growth to some extent taken into consideration. On the other hand, the benchmark interest adjustment can only significantly influence price level, but not economic growth or employment level.

For U.S., economic growth (GDP) and employment rate (UER) both Granger cause benchmark interest rate(r) at the significant level of 5%, while price level (CPI) is comparatively not significant (but also close to 15%) as Granger cause. The benchmark interest rate Granger causes both CPI and GDP at 5% significant level, and comparatively not significant for CPI (but also close to 10%). This shows on the one hand that U.S.'s interest adjustment mainly takes economic growth and employment level as the objective, and price level is to some extent taken into consideration. On the other hand, the benchmark interest adjustment can not only significantly influence economic growth and employment level, but also to some extent price level.

Then, we establish regression models to reveal the quantitative relationship between China's and U.S.'s benchmark interest rates and three macro-economic indicators. The multivariate logistic regression models are as follows, and $i = 1, i = 2$, representative China and U.S. respectively.

$$(r_i) = \alpha_i \ln(CPI_i) + \beta_i \ln(GDP_i) + \gamma_i (UER_i) + e_i$$

$i = 1, 2$

First take logarithm of each variable to eliminate heteroscedasticity and turn coefficients into elasticity magnitude. Then regress the two models and extract the residual series. Third, use ADF test is to see whether the residual series are stationary or not. The results of regression and ADF test of residual series are as Table 4 and Table 5.

Table 4
Results of Regression Estimation

Variable	r1		r2	
	Coefficient	t statistics	Coefficient	t statistics
C1	3.655027	20.22512***		
LGDP1	-0.21772	-3.662893***		
LCPI1	0.178499	13.71547***		
LUER1	-1.300589	-18.82717***		
C2			5.742334	9.603995***
LGDP2			0.763618	5.930494***
LCPI2			1.315393	8.098096***
LUER2			-4.087534	-14.48799***
F Statistics		347.5271***		148.2491***
Adjusted R ²	0.831019		0.672629	

Note. ***, **, * indicate respectively significant level at .01, .05 and .1, respectively. Computed by Eviews 7.

Table 5
ADF Test Results of Residuals of Regression Models

Variable	Test Formation	ADF statistics	Conclusion
e_1	(C,1,0)	-4.515791	stationary
e_2	(C,1,0)	-3.451942	stationary

Note. The threshold values of significance at .01, .05 and .1 are -4.001311, -3.430864, -3.139056, respectively. Computed by Eviews 7.

From Table 5 we can see that the two residual series are both of stationarity. Besides, all the variables are single integer. So we can use the original series to make co-integration regression to find the long term quantitative relationship between benchmark interest rates and GDP, CPI, UER. From Table 4, we can see that the regression results are ideal, for t statistics are all significant at 1% level, F statistic is significant at 1% level, adjusted R² are both bigger than 66%.

For China, if GDP growth rate increases one unit, r will lower 0.218 units. If CPI increases one unit, r will decrease 0.178 units. If UER increases one unit, r will decrease 1.3 units. For U.S., if GDP growth rate increases one unit, r will increase 0.764 units. If CPI increases one unit, r will increase 1.315 units. If UER increases one unit, r will decrease 4.088 units. It's necessary to note that regression results can only show long term quantitative relationship but not cause and result relationship. So,

from the absolute value we can learn: U.S. interest rate policy can be much more sensitive and can stick better to macroeconomic situation changes. For every unit's change in macro-economic indicators, the adjustment of U.S. benchmark interest rate is much bigger than China's.

From the positive and negative values of the coefficient, we can see the adjustment direction and purposes. When price level soars, benchmark interest rates will be raised to tighten monetary policy and decrease the market liquidity. When unemployment rate rises, benchmark interest rates will be lowered to release monetary policy, encourage investment and promote labor market supply. When GDP growth rate rises, the directions of China's and U.S.'s interest rate adjustment are different. China mainly increase the benchmark rate to cool down the overheated economy but U.S. mainly decrease benchmark rate to provoke economy to develop a higher speed.

CONCLUSION AND SUGGESTIONS

From empirical study, we can see that there are differences between objectives and effectiveness of China's and U.S.'s interest policies. Here are the general conclusions: (a) On policy objectives, both China and U.S. take economic growth, price level and employment level into consideration when they are considering about whether and how to adjust the benchmark interest rate. Comparatively speaking, China put more emphasis on price level and employment level while U.S. on economic growth and employment level. (b) Because China controls market interests directly through setting the benchmark interest rate at irregular intervals, interest adjustments are of lower frequency and higher amplitude compared with U.S.'s daily federal fund rate. U.S.'s interest rate policy can be much more timely adjusted according to the economic situation. (c) As for effectiveness, U.S.'s interest rate policy is much superior, for it can not only significantly promote economic growth and employment, but also to some extent adjust the price level. While China's interest rate policy can only significantly adjust the price level.

From the conclusions, we can easily get enlightens and suggestions. China should constantly put forward the process of interest rate liberalization, promoting the effectiveness and importance of interest rate policy among monetary policy cluster. Meanwhile, China should reform the function mechanism of interest rate policy, referring to U.S.'s mechanism. Give up setting compulsory benchmark interest rate to directly adjust the market interest rate, and set up a mechanism of using open market operations and referential benchmark to lead the market entities reach efficient market interest rates according to the commercial needs and economic situations. In this way, China can not only to step out of the dilemma that benchmark interest rate adjustment is insensitive to changes in economic growth and employment level, but also improve the effectiveness of interest rate policy.

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