CHINA'S INTEREST RATE PASS-THROUGH TO GOVERNMENT BONDS AND MONETARY INDEPENDENCE

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ABSTRACT

The monetary policy has been a main driver of China's economic growth. Strong evidence shows China's monetary policy is designed to support real GDP growth. There are various and complicated monetary transmission channels. This study examines the relation between monetary independence and interest rate pass-through to government bonds in China. The sensitivity coefficients between government bond yields and the People's Bank of China's (PBC) policy rate FR007 are obtained through a series of univariate 200-trading-day rolling regressions between bond yields with different maturities and FR007. The Monetary Independence (MI) is measured as the reciprocal of the correlation of interest rates in China and the United States. 200-trading-day correlations are calculated using daily interest rate data. A simple regressions model is employed to test the relations between sensitivity coefficients and MI. The time period is between January 4, 2013 and November 30, 2016. The empirical results show that China's monetary independence is positively associated with China's interest rate pass-through to government bonds. This relation is also robust to various tests on the presence of outliers and causality. It means that the higher China's monetary independence, the greater China's interest rate pass-through to government bonds. During March 2016 – November 2016, China had been continuously suffering great capital outflows. China's monetary independence had dropped significantly during this period, and at the same time China's interest rate pass-through to government bonds had totally disappeared. The Impossible Trinity theory may provide the answer. In reality, the Chinese authorities have helped establish multiplier mechanisms that jeopardize both monetary autonomy and exchange-rate stability. The Chinese policy-makers such as finance minister Lou Jiwei also conceded that China's monetary tools were becoming less effective. Based on this study's findings, the PBC is suggested to relax its control of the exchange rate regime in order to increase the independence of the Chinese monetary policy. Accordingly, China's interest rate pass-through to government bonds will be improved, and Chinese economic growth will be more sustainable.

INTRODUCTION

The monetary policy has been playing an important role in China's economic growth. For example, Chen, Higgins, Waggoner and Zha (2016a) found strong evidence that China's monetary policy is designed to support real GDP growth mandated by Chinese central government. Also, the M2 growth is a primary instrument and the bank lending channel to investment is a key transmission mechanism for monetary policy. Chen, Higgins, Waggoner and Zha (2016b) also found that the extraordinarily expansionary regime to

combat the impact of the 2008 financial crisis accounted for as high as a 4% increase of real GDP growth rate by the end of 2009. Chen and Kang (2018) also claimed that strong Chinese output growth after the Global Financial Crisis was supported by booming credit, and China's credit growth is on a dangerous trajectory. So, study on Chinese monetary policy is very important. At the same time, monetary policy is also closely related to the exchange rate regime. Although various measures have been adopted to enhance Chinese Renminbi (RMB) exchange rate flexibility including the People's Bank of China's (PBC, China's central bank) announcement that RMB would be set according to a basket of currencies instead of the US dollar only on 11 December 2015, RMB exchange rate regime can still be regarded as fixed exchange rate regime (Liu, 2016). A fixed exchange rate may minimize instabilities in real economic activity, and eliminate exchange rate risk by reducing the associated uncertainty (Garber and Svensson, 1995). However, there are also costs. A fixed exchange rate makes it difficult to adjust the balance of trade. Also, with a fixed exchange rate, it is difficult to maintain an independent monetary policy (Suranovic, 2008).

The monetary transmission is the process by which asset prices and general economic conditions are affected as a result of monetary policy decisions. A number of studies examined China's monetary transmission mechanism. As Egan and Leddin (2016) concluded, majority of studies analysing aggregate demand in China have found little or no evidence of a relation between output and monetary policy. Ji, Zhang, Niu and Ma (2016) is the first study to examine the effectiveness of interest rate pass-through especially to lending rates. Ji et al. (2016) proposed a few institutional factors that impede the effectiveness of policy rates pass-through such as the volatilities of China's policy rates are still relatively large; the term structure of Chinese government bond yields is incomplete and ineffective; China's derivative security market is underdeveloped; and most Chinese banks still mainly reply on deposits as funding source et. Liu (2017) examined the effect of interest rate liberalisation on China's interest rate pass-through to the lending rate of commercial banks. My study will further examine this issue by for the first time exploring the effect of foreign monetary policy on China's interest rate pass-through.

CHINA'S INTEREST RATE PASS-THROUGH TO GOVERNMENT BONDS

There are various and complicated monetary transmission channels. For example, first, policy rate decisions can affect market interest rates. Second, these changes in turn affect the spending, saving and investment behaviour of individuals and firms in the economy. Third, the level of demand relative to domestic supply capacity is also a key influence on domestic inflationary pressure. Fourth, exchange rate movements have an effect on inflation (George et al., 2009) In this paper, only the monetary transmission channel between PBC's policy rate and government bond yields with different maturities is examined. A change of policy rate will signal the liquidity conditions of interbank market and change the banks' expectations on the future liquidity condition as well. Banks will adjust their asset allocation strategy accordingly. The availability of investment instruments will make the change of policy rate transmitted to other interest rates possible. China's policy rate is the 7-day Repo rate (FR007). The government bonds include 3-Month, 6-Month and 1-Year bonds. The time period is between January 4,

2013 and November 30, 2016. The below Figure 1 shows the sensitivity coefficients between PBoC's policy rate FR007 and government bond yields with different maturities. These coefficients are obtained through a series of univariate 200-trading-day rolling regressions between bond yields and FR007. Figure 1 shows that the interest rate pass-through between FR007 and government bond yields has generally become stronger, but the relations are unstable. There are some periods when the interest rate pass-through to government bonds has totally disappeared. It justifies the use of a rolling regression approach to illustrate the instability of coefficient estimates. Furthermore, during March 2016 – November 2016, China's interest rate pass-through to government bonds has totally disappeared.

FIGURE 1: CHINA'S INTEREST RATE PASS-THROUGH COEFFICIENTS BETWEEN POLICY RATE FR007 AND GOVERNMENT BONDS
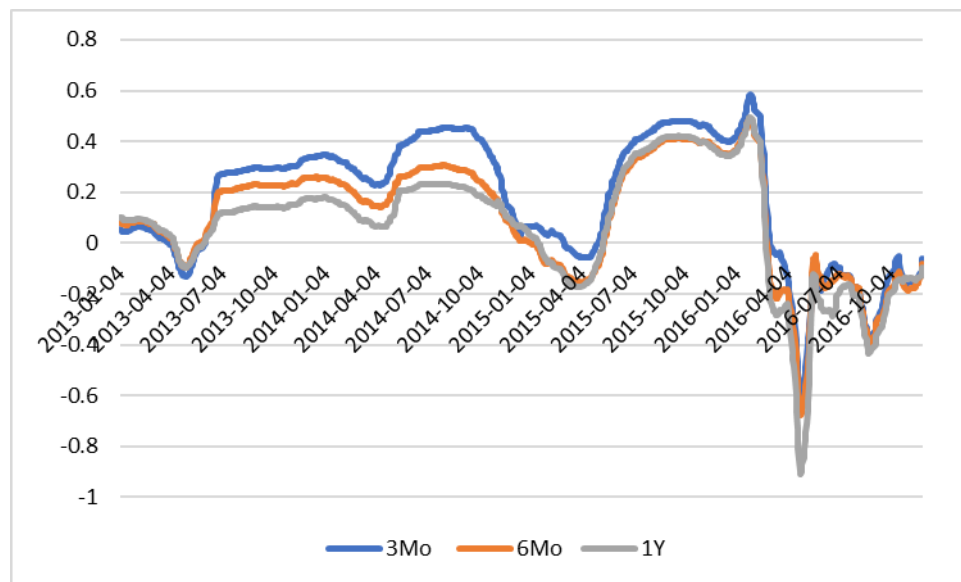
Source: Wind Info[1]
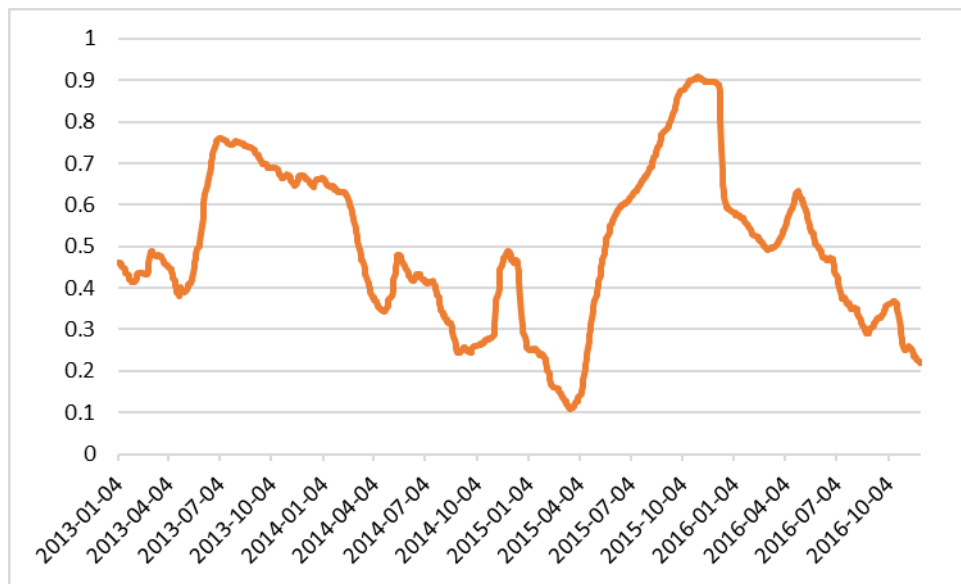
CHINA'S MONETARY INDEPENDENCE

Based on Aizenman and Sengupta (2013), the Monetary Independence (MI) is measured as the reciprocal of the correlation of interest rates in China and the base country (the United States, US). 200-trading-day correlations are calculated using daily interest rate data. China's policy rate is the 7-day Repo rate (FR007). The US' policy rate is the US dollar London Interbank Offered Rate (LIBOR). The time period is between January 4, 2013 and November 30, 2016.

The formula is as follows:

$$MI = 1 - \frac{corr(i_i, i_j) - (-1)}{1 - (-1)}$$

By definition, the index lies between 0 and 1. The highest value indicates the greatest degree of monetary independence. The plot of China's monetary independence index is shown in Figure 2.

FIGURE 2: CHINA'S MONETARY INDEPENDENCE INDEX

Source: Wind Info

The correlation coefficients between China's interest rate pass-through to government bonds coefficients and China's monetary independence index are 0.438, 0.510 and 0.452 respectively for government bonds with maturities ranging from 3 month, 6 month to 1 year. Figure 1 and Figure 2 show that there seems to be a close relation between China's interest rate pass-through to government bonds and monetary independence. For example, the trough periods of China's interest rate pass-through to government bonds in April 2013, early April 2014, March 2015 and between March 2016 – November 2016 also correspond to the trough periods of China's monetary independence. Further regression analysis is conducted in the below section.

CHINA'S INTEREST RATE PASS-THROUGH TO GOVERNMENT BONDS AND MONETARY INDEPENDENCE

The following equation is proposed to test the relation between China's interest rate pass-through to government bonds coefficients and China's monetary independence index:

$$Y_t = \alpha + \beta X_t + \varepsilon_t \tag{1}$$

Yt is China's interest rate pass-through to government bonds coefficient, and Xt is China's monetary independence index.

The below Table 1 shows the regressions results between China's interest rate pass-through to government bonds coefficients and China's monetary independence index. White heteroskedasticity-consistent standard errors & covariance are used.

TABLE 1: ESTIMATION OF CHINA'S INTEREST RATE PASS-THROUGH TO GOVERNMENT BONDS COEFFICIENTS USING CHINA'S MONETARY INDEPENDENCE INDEX. SAMPLE PERIOD: JANUARY 4, 2013 – NOVEMBER 30, 2016

Difference Choice of Monetary Transmission	3-Month Government Bond	6-Month Government Bond	1-Year Government Bond
Constant	-0.113***	-0.198***	-0.215***
Coefficients	0.573***	0.608***	0.569***
No. of observations	899	899	899
Adjusted R-squared	0.191	0.259	0.203
Akaike info criterion	-0.160	-0.430	-0.248
Schwarz criterion	-0.149	-0.420	-0.237

Note: *** means significance level at 1%

Table 1 shows that China's monetary independence is significantly (within 1% confidence level) positively associated with China's monetary transmission. The higher China's monetary independence, the greater China's interest rate pass-through to government bonds.

As to the theoretical explanation, the Impossible Trinity (Mundell, 1963) may be the answer. According to this theory, it is impossible to have all three of the following at the same time: a fixed foreign exchange rate, free capital movement and an independent monetary policy. Aizenman (2010) also pointed out understanding the mixed regimes rather than binary choices remains a challenge. Attempting to balance the three conflicting macroeconomic policy goals, China's interventions take the form of a two-pronged monetary-and-exchange-rate policy, in which the PBC (1) limits RMB appreciation by accumulating net foreign assets and (2) sterilizes this capital inflow to insulate domestic base money. A feedback loop between the exchange rate and capital inflow exists in the form of a multiplier mechanism that jeopardizes both monetary autonomy and exchange-rate stability (Wu, 2015). Aizenman (2010) also pointed out that countries hoarding international reserves may loosen in the short-run some of the Trilemma constraints. For example, the PBoC suddenly announced new reform measure of CNY central parity formation mechanism and depreciated CNY by 1.9% on August 11, 2015. During March 2016 – November 2016, China has been continuously suffering great capital outflow. China's monetary independence has dropped significantly, and China's interest rate pass-through to government bonds has totally disappeared.

ROBUSTNESS TESTS

Ordinary least squares estimators are sensitive to the presence of outliers. The sensitivity of conventional regression methods to these outlier observations can result in inaccurate coefficient estimates. First, influence statistics for equation (1) is presented to detect the presence of outliers.
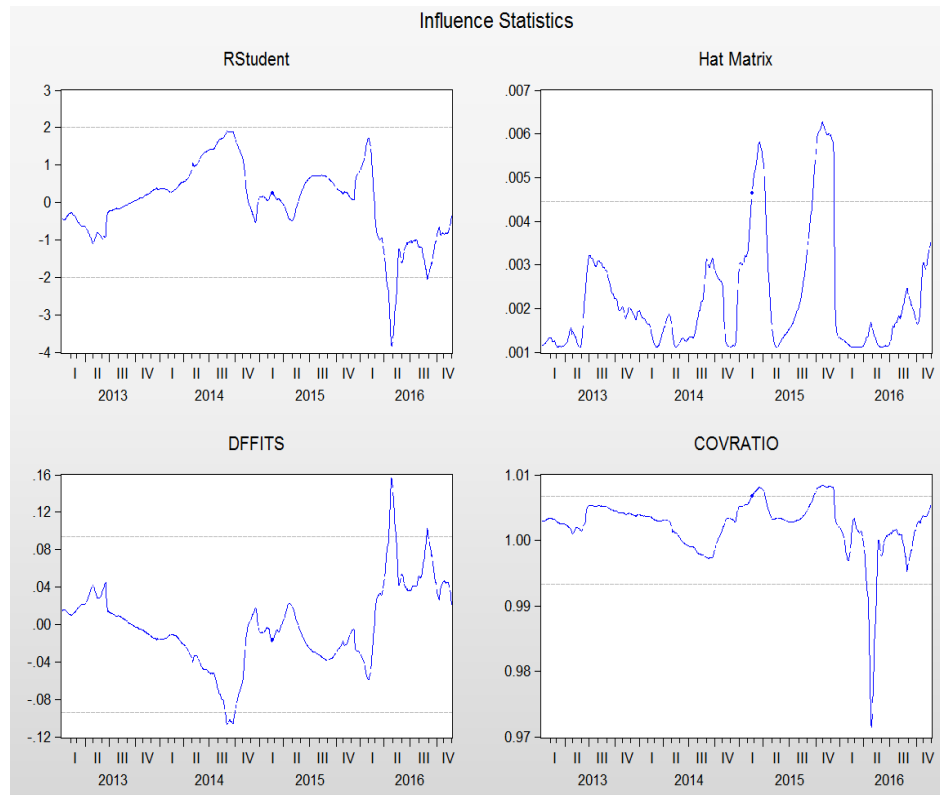
FIGURE 3: INFLUENCE STATISTICS FOR EQUATION (1)

Figure 3 shows that there are a few outliers around Q2, 2016 based on the influence measures RStudent, DFFITS and COVRATIO and in 2015 based on Hat Matrix measure. This finding is consistent with what we can find in Figure 1.

Second, M- estimation is applied to make regression methods less sensitive to outliers. M-estimation (Huber, 1973) addresses dependent variable outliers where the value of the dependent variable differs markedly from the regression model norm (large residuals). The robust regression results are presented in Table 2.

TABLE 2: ESTIMATION OF CHINA'S INTEREST RATE PASS-THROUGH TO GOVERNMENT BONDS COEFFICIENTS USING CHINA'S MONETARY INDEPENDENCE INDEX BASED ON ROBUST M-ESTIMATION. SAMPLE PERIOD: JANUARY 4, 2013 – NOVEMBER 30, 2016

Difference Choice of Monetary Transmission	3-Month Government Bond	6-Month Government Bond	1-Year Government Bond
Constant	-0.143^{***}	-0.215^{***}	-0.215^{***}
Coefficients	0.657^{***}	0.677^{***}	0.626^{***}
No. of observations	899	899	899
Adjusted R-squared	0.236	0.322	0.277

Note: *** means significance level at 1%

Turning to the coefficient estimates, we see the effect on the coefficient estimates of moving from least squares to robust M-estimation. The M-estimator produces a larger positive impact of China's monetary independence on China's interest rate pass-through to government bonds than does ordinary least squares (0.657 versus 0.573 for 3-month government bond, 0.677 versus 0.608 for 6-month government bond, and 0.626 versus 0.569 for 1-year government bond). All these results are still significant within 1% confidence level.

In addition, since a simple regressions model is adopted, there are potential causality issue. A Granger Causality Test is employed to test this issue. The results from the below Table 3 show that the hypothesis that China's interest rate pass-through to government bond coefficient does not Granger cause monetary independence have all failed to be rejected within a 10 percent confidence level. They show that there are no causality issues.

TABLE 3, GRANGER CAUSALITY TESTS (LAGS: 1; NUMBER OF OBSERVATIONS: 898)
NULL HYPOTHESIS: CHINA'S INTEREST RATE PASS-THROUGH TO GOVERNMENT BOND COEFFICIENT DOES NOT GRANGER CAUSE MONETARY INDEPENDENCE

	Prob.
3-month Government Bond	0.4028
6-month Government Bond	0.2602
1-year Government Bond	0.6294

CONCLUSIONS

The monetary policy has been a main driver of China's economic growth. So, study on Chinese monetary policy is very important. There are various and complicated monetary transmission channels. This study examines the relation between monetary independence and interest rate pass-through to government bonds in China based on data items between January 4, 2013 and November 30, 2016. The results show that China's monetary independence has dropped significantly from March 2016 to November 2016. The

interest rate pass-through to government bonds in China has totally disappeared during this period. This conclusion is generally accepted by Chinese government officials. For example, Chinese Finance Minister Lou Jiwei said that "monetary tools were becoming less effective[2]". Most importantly, this study finds that there is a positive relation between monetary independence and interest rate pass-through to government bonds. This relation is also robust to various tests on presence of outliers and causality. The PBC can relax its control of the exchange rate regime in order to increase the independence of Chinese monetary policy (Li and Tsai, 2013; Wu, 2015). Accordingly, China's interest rate pass-through to government bonds will be improved.

In a word, this paper is the first to examine the relation between monetary independence and interest rate pass-through to government bonds in China. The analysis and conclusions are unique. They provide important implications for policy makers, investors and academia.

ENDNOTES

1. Wind Info (www.wind.com.cn/en) is the mostly widely used Chinese economic and financial data and information provider. It serves more than 90% of the financial firms in the Chinese market, and 75% of the Qualified Foreign Institutional Investors in China.
2. http://www.reuters.com/article/us-g20-china-idUSKCN103043

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