An Empirical Analysis of the Impact of Interest Rate Liberalization on the China's Interbank Bond Market Liquidity

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Abstract. The purpose of this article is to analyze the relationship between the reform of interest rate and interbank bond market liquidity. Firstly, the authors used multiple structural breakpoints test to analyze the effect of interest rate liberalization on the interbank bond market liquidity from the angle of structural mutations. Then, the researchers used Vector Auto Regressive model frame to quantitatively analyze the effect of relevant factors on the interbank bond market liquidity. The results show that the interest rate liberalization has not produced structural mutation effects on the interbank bond market liquidity; Interest rate liberalization can increase the interbank bond market liquidity in long time, however, this effect is very small and the effect gradually disappears over time.

Introduction

October 26, 2015, the central bank announced that lift the ceiling on deposit rates, which mark the end of interest rate liberalization in China. After the reform of interest rate liberalization, the price of financial assets in the financial market will be more market oriented, because the interest rate is essentially the market price of capital. Therefore, from a long-term point of view, the interest rate liberalization will influence the financial market liquidity in a certain extent. However, because of the wide influence and complex propagation path of interest rate liberalization, the actual effect has great uncertainty. As the main body of China bond market, the interbank bond market liquidity will also be influenced by the interest rate liberalization, but the specific results need to be decided by empirical models.

There are many factors that affect the interbank bond market liquidity, including the micro structure of the market and the macro economic factors. The micro structure factors mainly includes the trading system, transaction cost, investor structure, bond type and structure (Clare and Saporta, 1999; Lin Ronghui and Zhou Yan, 2006; Ma Yangbing, 2014)[1,2,3]. At present, the studies about the influence of the micro structure on the interbank bond market liquidity are mainly focused on the market maker system. The market maker system plays an active role for improving the interbank bond market liquidity because it can provide bilateral offer (Dong Qian, 2011; Rong Jingyu, 2012)[4,5]. However, competitive market maker system and the monopolistic market maker system have different application conditions. (Bagehot, 1971; Glosten et al., 1989; Zhang Ying, 2007)[6,7,8]. In addition to the market maker system, many scholars have also studied the impact of transparency on the interbank bond market liquidity. For example, Shi Wenchao(2008)[9] find that transparency does affect China's interbank bond market liquidity, but this effect will vary according to the types of securities, types of investors, transaction quantity and quality of trading tools. From a macro point of view, GDP, economic policy (fiscal policy and monetary policy), interest rates, exchange rates, the changes in related market and international capital market risk will influence the interbank bond market liquidity (Fleming and Remolona, 1997; Chordia, Sarkar and Subrahmanyam, 2003; Goyenko, 2005; Zhang Rui, Wang Chunfeng and Fang Zhenming, 2010)[10,11,12,13].

From the analysis above, we can find that there many studies about the factors influencing the interbank bond market liquidity at home and abroad. However, the studies about how interest rate liberalization influence interbank bond market liquidity are relatively scare. With the end of interest rate liberalization, the interest rates will be completely decided by the demand and supply of capital and the interest rate fluctuation frequency will also increase. As the main body of China bond market,
the level of interbank bond market liquidity is directly related to the efficiency of China bond market and the entire financial market. Based on the above considerations, this paper analyzes the influence of the interest rate liberalization on the interbank bond market liquidity from aspects of the structure and the non structure mutation.

**Data**

This paper uses turnover rate on behalf of the interbank bond market liquidity. On the one hand, turnover rate considers market transaction volume and transaction size simultaneously, and it is easy to get and calculate; On the other hand, turnover rate is applicable to the market maker system and the market maker system is the trading mechanism of the China's interbank bond market. At the same time, many domestic and foreign literature used turnover rate as a measure of market liquidity. For example, Kamara (1994) firstly used turnover rate to analysis US treasury bond market liquidity[14]. You Jing (2003), Yin Kedong, An Fengdong and Ding Lili(2003) also used turnover rate in their studies[15,16,17].

In terms of interest rate, this paper used the pledged repo rate represents the rate change. This is because the treasury is the main trading objects of interbank bond market and pledged repo is the main transaction way for treasury in interbank bond market.

In terms of sample selection, this paper used all the treasury in interbank bond market as the research objects. This is because the treasury is the main trading object in China's interbank bond market.

In order to analyze the impact of interest rate liberalization on the China's interbank bond market liquidity from the angle of non-structural mutation, the researchers used turnover rate (TR) as a representative of the interbank bond market liquidity and used exchange rate(ER), S&P500 (SP), rate of change of pledged repo rate(Δ R), Shanghai index returns (SIR) and M2(M2) as a representative of factors influencing the liquidity of the interbank bond market. The date on turnover rate, Shanghai index returns and rate of change of pledged repo rate were collected from RESSET (www.resset.cn), S&P 500 was collected from Yahoo Finance. With regard to exchange rate and M2 were from the People’s Bank of China. The monthly date used for this section pertain to 10 years from 2006 to 2015.

The time range of the data is from January 2006 to December 2015. This is because Shibor run formally on January 4, 2007 and it was the substantial start of interest rate liberalization, meanwhile the central bank allowed the deposit interest rate to float freely on October 26, 2015, which marks the completion of the reform of interest rate liberalization.

**Empirical Results and Discussion**

**Multiple Structural Breakpoints Test**

This section used multiple structural breakpoints test proposed by Bai-Perron (1998, 2003)[18,19] to investigate whether interbank bond market liquidity change following interest rate liberation.

**Results.** Table 1 shows the results of multiple structural breakpoints test.

Dmax statistic is used to estimate whether there exist structural breaks in time series. If the F-statistic is greater than the critical value, we can come to the conclusion that there exist structural breaks in time series. $\text{Sup}_T F_T (L+1 | L)$ is used to estimate the number of structural breaks. If the F-statistic is greater than the critical value, we can come to the conclusion that the number of structural breaks are $L+1$.

From table 1 we can know, that UDmax statistic and WDmax statistic are both greater than corresponding critical value at the 5 percent significance level. The result illustrates that the interbank bond market liquidity series does occur structural mutation. Meanwhile, we can come to the conclusion that there exist three structural breaks through statistic of $\text{Sup}_T F_T (L+1 | L)$ . However, the three break dates are not consistent with the process of interest rate liberation, that is the interest rate liberalization has no structural mutation effect on the interbank bond market liquidity in China.
Table 1. The results of multiple structural breakpoints test.

<table>
<thead>
<tr>
<th>B-P statistics</th>
<th>Statistic and break points</th>
<th>F-statistic</th>
<th>Critical Value**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dmax statistic</td>
<td>UDmax</td>
<td>213.1298*</td>
<td>11.70</td>
</tr>
<tr>
<td></td>
<td>WDmax</td>
<td>292.1097*</td>
<td>12.81</td>
</tr>
<tr>
<td>SupF&lt;sub&gt;T&lt;/sub&gt;(L□L+1)</td>
<td>SupF&lt;sub&gt;T&lt;/sub&gt;(1□0)</td>
<td>101.3172*</td>
<td>11.47</td>
</tr>
<tr>
<td></td>
<td>SupF&lt;sub&gt;T&lt;/sub&gt;(2□1)</td>
<td>57.4431*</td>
<td>12.95</td>
</tr>
<tr>
<td></td>
<td>SupF&lt;sub&gt;T&lt;/sub&gt;(3□2)</td>
<td>17.9162*</td>
<td>14.03</td>
</tr>
<tr>
<td></td>
<td>SupF&lt;sub&gt;T&lt;/sub&gt;(4□3)</td>
<td>6.9080</td>
<td>14.85</td>
</tr>
<tr>
<td>Break dates</td>
<td>Break date 1</td>
<td>2007/11/20 (457)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Break date 2</td>
<td>2010/3/8 (1037)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Break date 3</td>
<td>2011/11/9 (1455)</td>
<td></td>
</tr>
</tbody>
</table>

Note:* Significant at the 0.05 level
**Bai-Perron (Econometric Journal, 2003) critical values

Results Analysis. Although there exist three break dates in interbank bond market liquidity series, but the three break dates are not consistent with the process of interest rate liberation. This means the interest rate liberalization has no structural mutation effect on the interbank bond market liquidity in China. There are three main reasons for this result:

Firstly, The most active trading objects in China's interbank bond market are bonds that are newly issued. After the securities issued for a period of time, the securities are held by investors and rarely in circulation.

Secondly, institutional investors are the main investors in interbank bond market. Institutional investors have more advantage in acquiring and utilizing information and they can be more rational to deal with the release of the new policies of interest rate liberation. Therefore, the interest rate policies will not generate obvious structural mutation in the interbank bond market liquidity.

Thirdly, due to the high liquidity of treasury bonds, the main purpose of China's commercial banks to hold bonds is to improve their asset liquidity and meet the requirements of capital adequacy ratio. Therefore, the commercial banks generally tend to hold the bonds for a long time rather than for speculation, which lead to the changes in bond prices generally do not affect the quantity of bonds held by commercial banks. Therefore, interest rate liberation process will not strongly affect China's interbank bond market liquidity in short time after the policies are issued.

The VAR Framework

This section adopted Vector Auto Regressive (VAR) model and Variance Decomposition to quantitatively analyze the effect of relevant factors on the interbank bond market liquidity.

Unit Root Tests. In order to avoid pseudo regression, the researchers firstly conduct ADF unit root test to ascertain whether the individual time series are stationary and integrated of the same order. Table 2 shows the results of the ADF unit root test.

The results of ADF unit root test revealed exchange rate(ER), S&P500(SP), rate of change of pledged repo rate(Δ R) are stationary, that is, I(0). Meanwhile, turnover rate (TR), Shanghai index returns(SIR) and M2(M2) are stationary and integrated of order first, that is, I(1).

Johansen Cointegration Test. In order to know whether there exists a long-run and stationary equilibrium in their relationship or not, the researchers use Johansen cointegration test then. The lag length up to 1 was selected by Akaike Information Criterion (AIC) and Schwartz Criteria (SC). The Johansen approach to cointegration test is based on two test statistics, namely, the trace test statistic and the maximum eigenvalue test statistic, as suggested by Johansen (1988) and Osterwald-Lenum.
The null hypothesis of Johansen cointegration test is there is no integration relationship between variables. Trace test and Max-eigenvalue test both indicate 6 cointegrating eqn(s) at the 0.05 level, this means there exists long-run relationship between all variables.

The form of cointegrating equation is as follows:

\[ TR = 68.8166R + 31.6652RS + 712.2284M2 + 273.9245ER - 142.9241SP \]  \hspace{1cm} (1)

The cointegrating equation indicates there is a positive long-term stable equilibrium relationship between the turnover rate(TR) and the rate of change of pledged repo rate(\( \Delta R \)). After the reform of interest rate liberation, market interest rate is determined by the supply and demand of funds in financial markets and the interest rate volatility increases, meaning interbank bond market turnover rate (interbank bond market liquidity) will increase.

Then the researchers used the six variables to perform Vector Auto Regressive(VAR) and tested it’s stability. The result of stability analysis shows that the unit root of VAR model tribes in the unit circle, indicating that the VAR model is stationary, and we can do a standard deviation of impulse response function analysis (results are omitted).

**Impulse Response Functions.** The purpose of impulse response function is to analysis the dynamic change when the system is subjected to some kinds of shocks. This section did impulse response function analysis based on VAR model and select the lag length up to ten months. Because the purpose of this paper is to analyze the impact of interest rate liberalization on the interbank bond market liquidity, this section lists only the response of turnover rate to a shock in the rate of change of pledged repo rate(\( \Delta R \)). Among them, the abscissa represents the lag length of shock action, ordinate represents the turnover rate volatility reaction.

![Response of TR to Cholesky](image)

Figure 1 shows the transitional dynamics of the turnover rate(TR) in response to the shock of the rate of change of pledged repo rate(\( \Delta R \)). From the figure 2 we can see that the rise of \( \Delta R \) generates a drop in TR before the period of 2. Then the negative impact gradually weakened and translated into a positive impact and positive impact gradually weakened after reaching the maximum values. Ultimately, the negative impact tends to zero.

**Variance Decomposition.** In this section, the researcher uses variance decomposition to determine the proportion of the movements in the time series that are due to shocks in their own series as opposed to shocks in other variables. The results are showed by table 2.
Table 2. The results of variance decomposition.

<table>
<thead>
<tr>
<th>period</th>
<th>S.E.</th>
<th>ER</th>
<th>M2</th>
<th>ΔR</th>
<th>SIR</th>
<th>SP</th>
<th>TR</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.0141</td>
<td>0.0020</td>
<td>1.4871</td>
<td>3.6784</td>
<td>0.8223</td>
<td>0.0827</td>
<td>93.9275</td>
</tr>
<tr>
<td>2</td>
<td>0.0142</td>
<td>1.4780</td>
<td>0.9766</td>
<td>2.3658</td>
<td>1.9890</td>
<td>0.0570</td>
<td>93.1337</td>
</tr>
<tr>
<td>3</td>
<td>0.0143</td>
<td>1.5662</td>
<td>0.8069</td>
<td>2.0642</td>
<td>2.5911</td>
<td>0.0511</td>
<td>92.9205</td>
</tr>
<tr>
<td>4</td>
<td>0.0143</td>
<td>1.6308</td>
<td>0.7317</td>
<td>1.9220</td>
<td>2.8853</td>
<td>0.0492</td>
<td>92.7810</td>
</tr>
<tr>
<td>5</td>
<td>0.0143</td>
<td>1.6647</td>
<td>0.6914</td>
<td>1.8442</td>
<td>3.0456</td>
<td>0.0485</td>
<td>92.7056</td>
</tr>
<tr>
<td>6</td>
<td>0.0143</td>
<td>1.6838</td>
<td>0.6682</td>
<td>1.7996</td>
<td>3.1387</td>
<td>0.0482</td>
<td>92.6615</td>
</tr>
<tr>
<td>7</td>
<td>0.0143</td>
<td>1.6953</td>
<td>0.6542</td>
<td>1.7728</td>
<td>3.1948</td>
<td>0.0480</td>
<td>92.6348</td>
</tr>
<tr>
<td>8</td>
<td>0.0143</td>
<td>1.7025</td>
<td>0.6455</td>
<td>1.7562</td>
<td>3.2295</td>
<td>0.0479</td>
<td>92.6183</td>
</tr>
<tr>
<td>9</td>
<td>0.0143</td>
<td>1.7070</td>
<td>0.6401</td>
<td>1.7458</td>
<td>3.2513</td>
<td>0.0479</td>
<td>92.6080</td>
</tr>
<tr>
<td>10</td>
<td>0.0143</td>
<td>1.7098</td>
<td>0.6366</td>
<td>1.7391</td>
<td>3.2652</td>
<td>0.0478</td>
<td>92.6014</td>
</tr>
</tbody>
</table>

Table 2 illustrates that largest portion of variation is explained by turnover rate’s own trend in current period and the specific value is 93.93 Percent. However, the rate of change of pledged repo rate (Δ R) explains only about 3.68 percent of the variation of turnover rate. From the second period, the portion of variation of turnover rate explained by its own trend gradually decrease and remains stable at 92.6 percent. Meanwhile, from the second period, the portion of variation of turnover rate explained by the rate change of pledged repo rate (Δ R) begins to increase and remains stable at 0.64 percent. The variance decomposition analysis shows that the influence of interest rate liberation on the interbank bond market liquidity is insignificant.

Conclusions and Implications

In this paper, the influence of interest rate liberation on the interbank bond market liquidity is studied, and the analysis is carried out from two aspects: the structural mutation and the non structural mutation. Through the analysis, the paper draws the following conclusions:

Interest rate liberation has not produced structural mutation effects on the interbank bond market liquidity. This is mainly because the effect of new bonds and the types of investors in interbank bond market. Therefore, the implementation of the interest rate liberalization policy does not have a strong structural mutation effect on the interbank bond market liquidity.

There exist a positive long-term stable equilibrium relationship between the interbank bond market liquidity and the interest rate liberation and the interbank bond market liquidity will increase after the reform of interest rate liberation.

Although interest rate change has a certain impact on the inter-bank bond market liquidity, this effect is very small. And as time went by, the effect gradually disappear.

From the analysis of the above, we can see that China's inter-bank bond market liquidity is greatly influenced by the development degree of the market itself. Therefore, improving the interbank bond market mechanism is the necessary way to improve the interbank bond market liquidity. On the one hand, the government should enrich the types of investors in the interbank bond market, including securities, funds, insurance and other non financial institutions; On the other hand, the number of short-term treasury bonds should be increased which can form a complete interest rate term structure of treasury bonds.

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References


