

Shadow Banking System and Money Supply

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Abstract. In recent years, the size of China's shadow banking has been increasing. It has had an unnegligible impact on China's monetary policy. This paper examines and analyzes the dynamic relationship between the shadow bank and the money supply in our country through the establishment of Vector Autoregressive Model (VAR), cointegration test based on VAR, Granger causality test, variance decomposition and impulse response function analysis. The result shows that there is a stable co-ordination relationship between money supply and shadow banking over a long period of time, and both parties have a positive stimulating effect on each other in the long run.

Introduction

Since the outbreak of the US subprime mortgage crisis in 2007, its negative impact on the global economy has not yet been completely eliminated. The concept of “shadow banking” was first proposed by Paul Mc Culley, executive director of Pacific Investment Management in the United States at the 2007 Fed’s annual meeting, usually referring to being outside the banking system and doing something similar. A non-bank institution of traditional banking. As a result, more and more literature points the reason for the outbreak of the subprime mortgage crisis to this new financial innovation system, the Shadow Banking System. The Financial Council (2011) defines shadow banking as a credit intermediation system that is outside the banking regulatory system and may trigger systemic risks and regulatory arbitrage, including various related institutions and business activities. The International Monetary Fund (IMF2012) believes that the essence of shadow banking is risk conversion and reduce counterparty risk. The most important shadow banking behaviors include securitization and collateral intermediary. Regarding shadow banking, there is currently no uniform definition.

Since shadow banking has the function of “similar to banks”, its development will undoubtedly have an impact on the regulation effect of monetary policy. Fabio Verona (2011) and others believe that the shadow banking system has an impact on monetary policy. The long-term loose monetary policy does create a prerequisite for the boom-bust cycle, but it does not lead to this result. Ba Shusong (2009) believes that shadow banking is a double-edged sword. On the one hand, it can bring prosperity to the financial market. On the other hand, shadow banking is highly leveraged and opaque, which makes the financial system very fragile. Zhou Xiaochuan (2011), president of the People's Bank of China, pointed out that some shadow banks may have the same function as currency creation as commercial banks and participate in the amplification process of money multipliers. Li Yang (2011) pointed out that “shadow banking” increases the credit supply of society without changing the stock of money, but it goes beyond the scope of traditional monetary policy and regulatory policy, which raises the regulation and supervision. Claim. Zhou Liping (2011) believes that shadow banking may cause the currency multiplier to lose predictability. Mao Zesheng and Xu Yanmei (2015) studied the symmetrical effects of shadow banking on monetary policy. They believed that the existence of shadow banking strengthened the effect of expansionary monetary policy, but weakened the effect of tightening monetary policy and proposed to accelerate the reform of interest rate marketization. Suggestions for improving the efficiency of monetary policy. Chang Kai et al. (2017) also reached a similar conclusion that the shadow banking system can create credit and influence the transmission mechanism of monetary policy. The expansion of the shadow banking system weakens the effectiveness of monetary policy instruments.

Most of these documents are based on the credit creation mechanism of shadow banking. They believe that this will affect the regulation effect of monetary policy. There is no systematic theoretical framework support, and there is less use of models or empirical methods for verification. This paper will analyze the dynamic relationship between the shadow banking system and the money supply by establishing VAR model, cointegration test, impulse response analysis, and variance decomposition. Through the study of shadow banking, it is helpful to explore the impact of shadow banking on the money supply and the degree of influence, which will help to improve the effectiveness of monetary policy.

The Variable Description and Data Selection

Method Description.

Vector autoregressive (VAR) is not based on economic theory but based on the statistical properties of data to provide a rigorous description of the dynamic relationship between variables. VAR puts all endogenous variables in the system to the end of the model. The lag value of the variable is regressed to estimate the dynamic relationship of all endogenous variables. The model has high effectiveness for interconnected time series variable systems. It can be used to predict the interconnected time series system and analyze the dynamic impact of random disturbance on the variable system, and explain the dynamic impact on the formation of economic variables. influences. In this paper, the broad money supply and the shadow bank size are taken as endogenous variables, while other factors are used as random items to establish a vector autoregressive model (VAR). Cointegration test, Granger causality test, variance decomposition and pulse are performed on the basis of VAR. Response function analysis, etc., to investigate and analyze short-term dynamics, long-term equilibrium and causality between them.

Variable Selection and Data Description.

(1) Broad money supply M2.

This paper selects China's broad money M2 as a measure of money supply, and its data comes from the China Financial Yearbook. The broad money M2, which corresponds to the narrow money, is a form or calibre of money supply. China's broad money includes cash in circulation, bank demand deposits, time deposits, savings deposits, and securities company customer deposits. M1 only contains cash in circulation and bank demand deposits. It is a reflection of the actual purchasing power in the economy. Compared with M1, M2 not only reflects the purchasing power of reality, but also reflects the potential purchasing power and has stronger exogeneity.

(2) Shadow bank size SB.

The specific scale of shadow banking is difficult to obtain. Referring to the previous literature, this paper uses the sum of entrusted loans and trust loans as the relevant proxy variables for shadow banking. Use SK to represent the scale of China's shadow banking. In order to eliminate the heteroscedasticity that may exist in the time series and reduce the volatility of the data, the original data is logarithmized. After defining the logarithmic processing, the data is: LNM2, LNSB.

The sample interval of this paper is the data from 2001 to 2015. The processing software used is Eviews 9.0.

Empirical Analysis

Test for the Stability of the Variable.

The establishment of the VAR model and the co-integration test all require the stability of each variable in the system. Therefore, the unit root test is first performed on the selected time series data to obtain their steady state and single order. In this paper, Eviews9.0 software is used to test the unit root of LNM2 and LNSB by ADF method. The test results are shown in Table 1.

Table 1 Stationarity test of variables

| variable | detection type (C,T,L) | ADF test value | 1% significant horizontal threshold | 5% significant horizontal threshold | 10% significant horizontal threshold |
|----------|------------------------|----------------|-------------------------------------|-------------------------------------|--------------------------------------|
| LNSB | (C,T,0) | -1.4749 | -4.0044 | -3.0989 | -2.6904 |
| DLNSB | (C,0,0) | -2.1100 | -4.0579 | -3.1199 | -2.7011 |
| LNM2 | (C,T,0) | -1.3200 | -4.0044 | -3.0989 | -2.6904 |
| DLNM2 | (C,0,0) | -2.341742 | -4.8864 | -3.8290 | -3.3630 |

Note: C is a constant term, T is the trend term, and L is the hysteresis index.

As can be seen from Table 1, LNSB and LNM2 showed instability at a significant level of 10%, but showed a smoothness after the difference. This allows the cointegration relationship of the variables to be further examined on the basis of the VAR model.

Selection and Cointegration Test of VAR Model Lag Period.

This paper considers that the sample is an annual time series and the sample interval is short. The maximum lag period is selected as 2 for testing, and then according to the likelihood ratio test (LR statistic), AIC criterion, SC criterion, final prediction error (FPE) and other indicators. The selection of the optimal lag order, the test results are shown in Table 2.

Table 2 Determination criteria for optimal lag period of LNSB and LNM2 variable VAR models

| Lag period | LogL | LR | FPE | AIC | SC | HQ |
|------------|-----------|-----------|-----------|------------|------------|------------|
| 0 | -10.08899 | NA | 0.022031 | 1.859845 | 1.946761 | 1.841980 |
| 1 | 38.60455 | 74.91314* | 2.31e-05 | -5.016084 | -4.755338* | -5.069679 |
| 2 | 46.22768 | 9.382319 | 1.41e-05* | -5.573489* | -5.138913 | -5.662814* |

Note: * indicates the hysteresis order selected according to the corresponding criteria.

It can be seen from Table 2 that the lag order according to the AIC criterion model is 2nd order, and the optimal lag order according to the SC criterion and the LR criterion model is 1st order, and there is a contradiction, so the optimal lag of the VAR model The temporary positioning of the first order, that is, the establishment of the VAR (1) model, the model equation is as follows:

$$LNM2 = 0.89577LNM2(-1) + 0.07714LNSB(-1) + 0.13332$$

$$LNSB = 4.21890LNM2(-1) + 1.32283LNSB(-1) + 1.35452$$

The stable VAR model is the basis for co-integration analysis, Granger causality test, and impulse response. The necessary and sufficient condition for the stability of VAR model is that all roots of the model characteristic equation are less than 1, that is, they are all within the unit circle. The two roots of VAR(1) are 0.982 307 and 0.667 039 are all within the unit circle, so the VAR(1) model is stable and the optimal lag order is determined as 1st order.

Since LNM2 and LNSB are both I(1) sequences and the VAR(1) model is stable, a cointegration test can be performed. In this paper, a single equation cointegration test based on regression residuals is used. The common method is Engle-Granger two-step method: firstly, the OLS method is used for cointegration regression, and the residual term of the equation is obtained, which is denoted as R, and then the ADF stationarity test is performed on R.

In this paper, LNM2 is used as a regression, and LNSB is a regression regression for regression. The smooth test of R is shown in Table 3. At the 10% significance level, the residual sequence is stationary, indicating that there is a cointegration relationship between LNM2 and LNSB.

Table 3 Stationarity test of R

| variable | detection type (C,T,K) | ADF test value | 10% significant horizontal threshold |
|----------|------------------------|----------------|--------------------------------------|
| R | (C,O,O) | -1.728593 | -1.606610 |

Granger Causality Test.

The cointegration test results show that there is an equilibrium relationship between LNM2 and LNSB. In order to test whether this equilibrium relationship is a causal relationship, it is necessary to further test the causality of these variables.

Table 4 Granger causality test results of LNM2 and LNSB sequences

| null hypothesis | Number of observations | Chi-square distribution | Incidental probability |
|---|------------------------|-------------------------|------------------------|
| LNSK is not the Granger reason for LNM2 | 13 | 4.6484 | 0.0458 |
| LNM2 is not the Granger reason for LNSK | 13 | 3.3949 | 0.0856 |

As can be seen from Table 4, LNSB rejects the null hypothesis at a 5% significant level; LNM2 rejects the null hypothesis at a 10% significant level. We can think that LNSK and LNM2 are mutually Granger reasons at the 10% significant level, indicating that there is an interaction between shadow banking and broad money supply.

Analysis of impulse response function of LNM2 and LNSB.

The impulse response function can analyze the dynamic influence of the model on the system when it is subjected to a certain impact, and provide more information for the dynamic characteristics of one variable acting on the other. Based on the VAR(1) model, we use the Cholesky decomposition technique to analyze the impact of LNM2 and LNSK on the current and future values of a standard deviation.

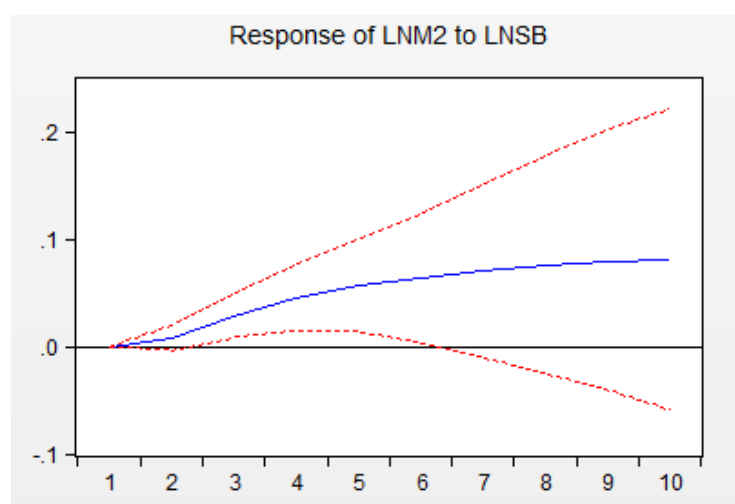


Figure. 1 Impact of LNM2 on LNSB

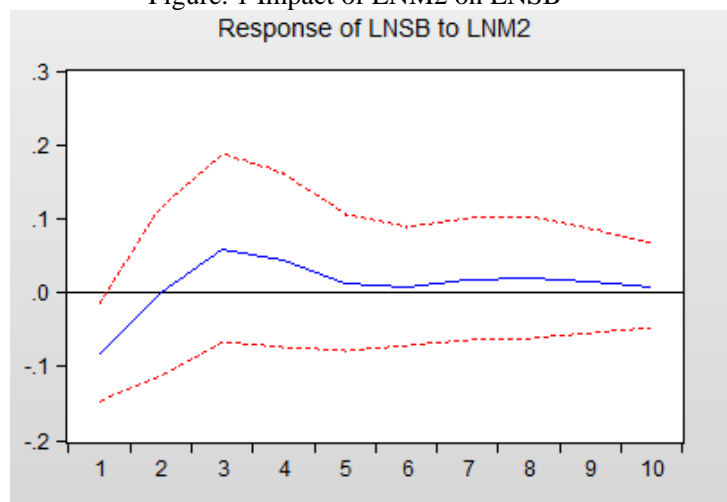


Figure. 2 Impact of LNSB on LNM2

In Fig. 1 and Fig. 2, the horizontal axis represents the number of hysteresis periods of the impact (unit: year), the solid line indicates the impulse response function, and the broken line indicates the positive and negative two standard deviation deviation bands.

Figure 1 shows the impulse response function of China's shadow banking after a standard deviation unit of broad money supply at logarithmic level. It can be seen that the broad money supply has a positive impact on the shadow banking and has increased monotonously from the first period to the fourth period, and gradually increased after the fourth period; and the shadow bank was shocked after the first period to the sixth period. The period gradually increased, followed by a slight increase and stabilized. This shows that the broad money supply has a positive impetus to the shadow banking, and its impact in the early stage is more stable in the early stage, but it has a certain short-term time lag.

Figure 2 shows the impulse response function of China's broad money supply after a standard deviation unit of shadow banking at logarithmic level. It can be seen from the figure that the impact of the broad money supply after the shadow banking shock has been increasing for the first three periods, the third to fourth periods have declined slightly, and the fifth period has stabilized; for each period, In the first period, shadow banking has a negative impact on the money supply, and has been rising since then. The second period is a positive impact, and the third period of positive impact reaches its maximum, that is, the impact on broad money supply reaches its maximum. Then it began to decline again and began to gradually stabilize after the fifth period. This shows that shadow banking will significantly affect the broad money supply in the long run, but it has a certain time lag, and its impact has a greater impact in the first few years, but it is more stable in the later period.

Variance Decomposition.

The variance decomposition shows the extent to which all variables in different lag period models contribute to changes in endogenous variables after the impact of the impact of an endogenous variable has changed. The importance of different structural shocks to this variable change can be further evaluated by variance decomposition. The empirical results are shown in Table 5.

Table 5 LNM2 variance decomposition results

| Period | S.E. | LNM2 | LNSB |
|--------|----------|----------|----------|
| 1 | 0.025736 | 100.0000 | 0.000000 |
| 2 | 0.031760 | 93.42632 | 6.573675 |
| 3 | 0.042595 | 54.12404 | 45.87596 |
| 4 | 0.063120 | 26.88607 | 73.11393 |
| 5 | 0.086296 | 18.22372 | 81.77628 |
| 6 | 0.108889 | 14.66236 | 85.33764 |
| 7 | 0.130882 | 12.11202 | 87.88798 |
| 8 | 0.152483 | 10.24062 | 89.75938 |
| 9 | 0.173076 | 9.016556 | 90.98344 |
| 10 | 0.191941 | 8.216537 | 91.78346 |

From the variance decomposition results of LNM2, the variance of LNM2 in the spot is mainly derived from itself, and then the periods are gradually decreasing, but the decreasing extent gradually tends to be moderated; correspondingly, the contribution of LNSK to the variance of LNM2 is gradually increasing. The magnitude of the increase is gradually easing; there is a shift between the two. This shows that the impact of shadow banking on broad money supply is persistent and significant, and the short-term impact is more severe, which fully indicates that shadow banks challenge the central bank's approach to M2 as the intermediate target of monetary policy.

It can be seen from the results of the upper difference decomposition that the variance of the shadow bank mainly comes from itself, and the influence of the broad money supply on it has been decreasing, and the proportion is relatively small. This shows that the broad money supply has a certain degree of influence on shadow banking, but the impact is not significant enough, and the degree of influence is declining. This may be related to the fact that China's shadow banking system is not developed enough and the scale is not strong enough.

Table 6 variance decomposition of LNSB

| Period | S.E. | LNM2 | LNSB |
|--------|----------|----------|----------|
| 1 | 0.133620 | 37.59300 | 62.40700 |
| 2 | 0.193268 | 17.96955 | 82.03045 |
| 3 | 0.230359 | 19.35981 | 80.64019 |
| 4 | 0.250454 | 19.33630 | 80.66370 |
| 5 | 0.267354 | 17.16751 | 82.83249 |
| 6 | 0.285507 | 15.12431 | 84.87569 |
| 7 | 0.301314 | 13.90805 | 86.09195 |
| 8 | 0.313128 | 13.27934 | 86.72066 |
| 9 | 0.321710 | 12.77169 | 87.22831 |
| 10 | 0.328144 | 12.34427 | 87.65573 |

Conclusion

First of all, from the results of the cointegration test, the money supply and the shadow bank have a long-term stable cointegration relationship, and the two sides have a positive pulling effect in the long run. Secondly, from the results of Granger causality test, we can easily conclude that there is a two-way Granger causal relationship between shadow banking and money supply in China, that is, shadow banking is the Granger cause of money supply, and the money supply is also the shadow bank's Granger. the reason. This also shows that the development of shadow banking has prompted the monetary authorities to expand the supply of money, and the release of money supply has further promoted the development of shadow banking, and the former has a greater intensity than the latter. Thirdly, from the results of the impulse response function analysis, the impact of money supply on the shadow banking has a positive positive impact. Although the degree of influence is slightly larger in the previous periods, the overall level is relatively flat; the impact of shadow banking on the money supply is The reverse effect is present in the short term, but the third period is positively affected; both sides exhibit long-term stability and a certain degree of time lag in the mutual impact (the lag period is generally two or three). Finally, from the results of variance decomposition, at the logarithmic level, the fluctuation of shadow banking is mainly affected by its own, and is less affected by the money supply; the money supply is greatly affected by its own in the early stage, which is affected by shadow banking. Small, but later affected by shadow banks, and less affected by their own.

Fourth, Policy Recommendations

Investigate Statistics, Strengthen Relevant Data on a Regular Basis, and Pay Close Attention to the Operational Development of Shadow Banking.

Due to the unique operating mechanism of shadow banking, and most of them are products of evading financial supervision, they are concealed. Our investigation and statistics can start from the aspects of financial institution business innovation and related accounting statement processing, and make the bank off-balance sheet credit project explicit, and carry out sub-account management and classification management for products of different risk types in the fund pool-asset pool. . Some financial products with basic functions of money are included in the category of monetary statistics, and the liquidity created by shadow banks is included in the scope of generalized liquidity when necessary.

Give Full Play to the Function of Shadow Banking Credit Creation.

China's shadow banking has supplemented the shortcomings of the banking system to a certain extent, providing huge liquidity for SME funds. The key point is to introduce corresponding measures to strengthen the supervision of shadow banking. Since shadow banking is composed of a variety of institutions, it cannot be generalized. Instead, it must be divided and ruled up, and a sound and detailed supervision rule should be established to bring the development of shadow banking to the right path from the top down.

Vigorously Develop Open Market Business and Improve the Transmission Mechanism of Monetary Policy.

Improve the existing market mechanism, support the development of the real economy, and develop financing channels for SMEs. Promote the establishment of a modern enterprise organization structure for SMEs so that they can obtain funds from traditional commercial banks. At the same time, it will guide commercial banks to strengthen financing support for SMEs and establish more “small” banks suitable for SMEs.

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