

The Influence of Shadow Banking on China's Monetary Policy Regulation System

An Empirical Analysis Based on Vector Autoregressive Model

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ABSTRACT

In recent years, the rapid development of shadow banking has affected the regulation and control of monetary policy, which has aroused widespread concern in academia and related regulatory authorities. This article selects the time series data from 2012 to 2019, and uses the Value-at-Risk (VAR) model to empirically analyze the impact of shadow banking on the monetary policy control system. The study found that changes in the size of shadow banking have caused changes in the size of credit, which has increased the amount of social money supplied, which has led to changes in the ultimate goal of monetary policy. To this end, this article makes recommendations from the perspective of monetary policy tools, monetary policy intermediary indicators, and the ultimate goal of monetary policy.

Keywords: shadow banking, monetary policy tools, monetary policy intermediary indicators, ultimate goal of monetary policy

I. INTRODUCTION

In recent years, with the opening and improvement of China's financial market, the increasing development of financial product innovation has provided a wealth of financing models for the real economy, small and medium enterprises, etc., and provided the public with a variety of asset allocation methods. Since the outbreak of the financial crisis, as one of the important forms of financial innovation, shadow banking has attracted the attention of economists. In China, shadow banking, as an important financing channel, has caused significant changes in the social financing structure, which can challenge the credit scale of commercial banks to a certain extent (Lin Lin et al., 2016). Although the development of shadow banking has forced the innovation of banking business, improved the efficiency of financial development, and injected new vitality into the long-term development of the financial industry, its development has also brought corresponding drawbacks, which have impacted the monetary policy regulation and control method of the People's Bank of China and affected the high-quality economic development. Therefore, the research on shadow banking, especially how shadow banking affects China's monetary regulation system, is worthy of attention.

II. LITERATURE REVIEW

Scholars in China and foreign countries have conducted a lot of research on shadow banking's regulatory system of monetary policy. Throughout the existing literature, most of the problems are discussed from the perspective of the intermediary goal of monetary policy, that is, the money supply. Panageas (2009) analyzed the internal operating system of shadow banking and found that the bank's new financial derivative business expanded the scope of the money supply and aggravated credit risk. Wang Zengwu (2010) found through an empirical study of bank wealth management products that the existence of shadow banking has led to an increase in the money supply, which has made it more difficult for the central bank to supervise and control the scale of credit. Luo Zhenxin and Feng Ke (2012) pointed out that the credit creation mechanism plays an important role in shadow banking, thereby increasing the scale of credit and impacting the effect of monetary policy. Moe (2014) found through empirical research that low-value collateral is the basis for shadow banks to provide credit guarantees, which leads to increased financial risks. Therefore, central banks in various countries must take relevant measures to strictly manage silver banks. Xu Yunsong (2017) demonstrated that shadow banking distorted the transmission effect of the credit mechanism from the short-term and long-term time dimensions, thereby affecting the money supply. In addition, some scholars

conduct research from the perspective of monetary policy transmission channels. Freixas and Jorge (2008) believe that shadow banking affects the effect of monetary policy in credit activities and exacerbates the occurrence of financial risks. The research of Gorton (2009) found that shadow banking has the function of credit creation, which will affect the money supply. He Jun (2011) pointed out that there is a two-way effect between shadow banking and money supply. When the Central Bank implements a tightening monetary policy, the scale of shadow banking will have an impact on money supply. Pozsar et al. (2012) believed that although there are multiple reasons for the emergence of shadow banking, in essence, shadow banking has the function of credit intermediary. Mazelis (2014) pointed out that the scale of shadow banking and monetary policy credit transmission channels have changed in a positive direction. Funke (2015) found that interest rate marketization can promote the transmission effect of monetary policy through the empirical study of the DSGE (Dynamic Stochastic General Equilibrium Model) model. Li Jianjun and Han Xun (2019) discussed the risks of shadow banking in the operation process from the perspective of corporate financialization, and analyzed the transmission mechanism of related risks in depth. Gao Bei et al. (2020) studied the differences in the development of shadow banking at different stages through theoretical models and empirical tests and found that it is necessary to deepen financial reforms and strengthen shadow banking supervision.

The possible contributions of this article are:

- Innovation from the research perspective: This article integrates monetary policy tools, monetary policy intermediary goals, and the ultimate goal of monetary policy into the monetary policy control system, and explores the impact of shadow banking on the monetary policy control system.
- Innovation of research indicators: In the study of the final goal of monetary policy, most of the existing literature only considers the impact of economic growth. This article incorporates price as one of the influencing factors into the final goal of monetary policy to make the research indicators more perfect.
- Innovation in research methods: This article uses theoretical mechanisms and VAR models to empirically analyze the impact of shadow banking scale on the monetary policy control system, and carry out further in-depth research on issues.

III. THEORETICAL MECHANISM ANALYSIS

The realization of the effect of monetary policy requires the coordination of monetary policy tools, monetary policy intermediary goals, and the ultimate goal of monetary policy. The ultimate goal of monetary policy can be better achieved by controlling the scale of new credit (Yang Xia and Zhu Ling, 2017), but the existence of shadow banking has increased the supply of social monetary credit and increased the cost of social financing. Therefore, in the face of shadow banking, how to ensure the effective implementation of monetary policy is also one of the key issues studied by many scholars in recent years. At present, the influence of China's shadow banking on different aspects of the monetary policy control system is as follows:

A. Monetary policy tools

The "three magic weapons" deposit reserve policy, rediscount policy, and open market business are the means often adopted in China's monetary policy tools. Therefore, this article studies the impact of shadow banking and monetary policy tools from these three perspectives. First, the credit creation function of shadow banking causes unexpected changes in the money supply, which in turn causes the money supply to not be effectively restricted by the legal deposit reserve. According to the currency multiplier theory, if the People's Bank of China adopts a tightening monetary policy that will lead to an increase in the legal deposit reserve ratio, then the currency multiplier will be reduced at this time, thereby reducing the money supply. However, outside of the shadow banking system and the supervision system, its activities cannot be restricted by the statutory deposit reserve. Therefore, the legal deposit reserve cannot restrict the credit creation activities of shadow banks, and it weakens the role of the currency multiplier, and reduces the control of the money supply. Secondly, the existence of shadow banking affects the effect of the rediscount policy. Shadow banking is one of the ways for commercial banks to expand funding channels. In this process, shadow banking participates in credit creation, which increases the money supply, and in turn produces a relatively loose monetary policy effect, thus leading to pressure on rediscount rates to rise. Finally, for open market business, a large number of commercial banks are the main targets of open market business. However, the rapid development of shadow banking in recent years has affected the status of commercial banks, thereby narrowing the scope of open market operations, making it lagging behind the adjustment of the money supply.

B. The intermediary target of monetary policy

Generally speaking, interest rates and money supply constitute the intermediary targets of monetary policy. But since China's interest rates have not yet formed a

complete marketization, the intermediary targets of China's monetary policy are mainly influenced by money supply (Yang Xia, 2017). As a form of financial innovation, shadow banking has broadened the financing channels of the real economy to a large extent, and helped the development of many SMEs (small and medium-sized enterprises). The credit creation function of shadow banking has led to an increase in the actual amount of money and increased actual purchasing power. However, the central bank has no way to count the purchasing power. Therefore, the actual supply of money circulating in the market is much larger than the central bank's statistics, which affects the implementation of monetary policy effects (Qiu Xiang and Zhou Qianglong, 2014). In addition, shadow banking has promoted the development of interest rate indicators in China's monetary policy intermediary targets (Lei Rui, 2019). Since shadow banking is the further marketization of the pricing of funds, there is a gradual difference between the market interest rate and the officially regulated interest rate, leading to a large number of arbitrage behaviors using exchange rate differences.

C. *The ultimate goal of monetary policy*

The ultimate goal of Chinese monetary policy is to promote economic growth and price stability, so how to promote the development of the national economy while ensuring that the value of the currency remains unchanged. At present, the loans of commercial banks in China mainly flow to state-owned enterprises and enterprises with good reputation. However, due to the limitation of the scale and reputation of small and medium-sized enterprises, shadow banking can provide them with better financial protection. This method has a double-edged sword effect on the development of the national economy. If small, medium and micro enterprises operate well, they can return loans to shadow banking on time, and shadow banking can gain interest rates, which can promote the healthy development of the national economy. However, in reality, a large number of small, medium and micro enterprises are often unable to repay their loans in the course of their operations, and they face the risk of bankruptcy, which hinders the development of the national economy. In addition, shadow banking, whose main business is bank wealth management, small loans, trust loans, etc., mainly performs financing functions. The inflows and outflows of funds from various financing entities have a certain impact on price fluctuations, which is not conducive to economic development in the long term. For a long time, it is not conducive to the improvement of the level of economic development and the improvement of people's lives.

IV. AN EMPIRICAL ANALYSIS OF THE INFLUENCE OF SHADOW BANKING ON THE MONETARY POLICY REGULATION SYSTEM

A. *Variable selection and data description*

1) *Variable selection*

a) *The scale of shadow banking:* There is currently no uniform standard for the estimation of the size of shadow banking in academia, and there is no relevant authoritative indicator system. Therefore, this article draws on the estimation method of Ren Xingwei (2019) and adopts the sum of entrusted loans, trust loans, non-discounted bank acceptance bills, corporate bonds, and Chinese domestic equity financing of non-financial enterprises in the social financing scale announced by the People's Bank of China as proxy variables for the size of shadow banking, and takes the monthly year-on-year growth rate as RSB.

b) *Monetary policy tools:* According to the foregoing, monetary policy tools are mainly based on the "three magic weapons". The operation of the "three magic weapons" mainly affects shadow banking through the scale of credit. Therefore, this article selects the scale of new credit to represent monetary policy tools, and takes the monthly year-on-year growth rate, which is recorded as RLOAN.

c) *Intermediary indicators of monetary policy:* As mentioned above, interest rates and money supply constitute the intermediary target of monetary policy. However, since China's interest rates are not yet fully market-oriented, this article only considers broad money supply (M_2) as the intermediary target of monetary policy. Similarly, to ensure the stability of the data, the amount of broad money is taken as the monthly year-on-year growth rate and recorded as RM_2 .

d) *The ultimate goal of monetary policy:* "Ensuring the stability of currency value and promoting the growth of the national economy" is the ultimate goal of China's People's Bank of Chinese monetary policy, and China's central bank is most concerned about the macro goals of economic growth and price stability. Therefore, this article takes economic growth and price stability as factors that influence the monetary policy control system of shadow banking. Due to the availability of data, the National Bureau of Statistics does not publish monthly GDP (Gross Domestic Product), so this article uses the monthly growth rate of industrial added value RGDP to represent economic growth. In addition, the consumer price index (CPI) is used to reflect changes in prices, and the monthly year-on-year growth rate is taken as RCPI.

2) *Data source:* This article selects monthly data from January 2012 to January 2019. The data are all

sourced from Guotai Junan Database, China Statistical Yearbook, National Bureau of Statistics, and the People's Bank of China website.

B. Model construction

This article mainly discusses the influence of shadow banking on the monetary policy control system, and the research mainly focuses on the dynamic relationship between time series. Therefore, the VAR model is used for empirical testing. The shadow banking scale, monetary policy tools, monetary policy intermediary indicators, and the ultimate goal of monetary policy are used as endogenous variables, and other factors are used as random items to establish the following model:

$$Y_t = \alpha_1 y_{t-1} + \alpha_2 y_{t-2} + \dots + \alpha_n y_{t-n} + \varepsilon_t$$

Among them, y_t is a column vector of four-dimensional endogenous variables, which are the size of shadow banking, monetary policy tools, monetary policy intermediary indicators, and the ultimate goal of

monetary policy. $\alpha_1 - \alpha_n$ are the estimated coefficients of the model. n is the lag period of the model, and ε is the random disturbance term.

C. Empirical analysis

1) *Unit root test of variables:* The prerequisite for using the VAR model is to test every time series variable in the system, so first perform ADF(Augmented Dickey-Fuller) unit root test on all time series variables to observe their stationarity. The test results are shown in "Table I". It can be seen from "Table I" that the variables RSB, RLOAN, RM₂, and RGDP all pass the test at the 1% significance level to verify their stability. The ADF values of RCPI are all greater than the critical value at the significance level of 1%, 5%, and 10%, indicating that this variable has not passed the stationarity test and needs to be differentiated.

TABLE I. ADF UNIT ROOT TEST

Test sequence	t statistic	1% critical value	5% critical value	10% critical value	P value	Test results
RSB	-4.135	-4.052	-3.768	-3.287	0.0032	stable
RLOAN	-4.3845	-3.153	-2.673	-2.934	0.0632	stable
RM2	-5.027	-3.614	-2.944	-2.606	0.0000	stable
RGDP	-3.512	-3.246	-2.683	-2.597	0.2262	stable
RCPI	0.774	-3.594	-2.936	-2.602	0.9912	unstable

2) *Granger causality test:* The control system of monetary policy is affected by the tools of monetary policy, the intermediary indicators of monetary policy and the ultimate goal of monetary policy. Therefore, this paper adopts the Granger causality test method to

test whether there is a relationship between various economic variables. Only when the explanatory variable is related to the explained variable can the constructed model be empirically analyzed. The results are shown in "Table II".

TABLE II. GRANGER CAUSALITY TEST RESULTS

Null hypothesis	Sample size	F statistic	P value	Test results
RSB is not the Granger cause of RLOAN	84	0.9	0.02617	Reject null hypothesis
RLOAN is not the Granger cause of RSB	84	1.23	0.0485	Reject null hypothesis
RSB is not the Granger cause of RM ₂	84	1.17	0.0160	Reject null hypothesis
RM ₂ is not the Granger cause of RSB	84	0.37	0.0388	Reject null hypothesis
RSB is not the Granger cause of RGDP	84	1.08	0.003	Reject null hypothesis
RGDP is not the Granger cause of RSB	84	5.21	0.00085	Reject null hypothesis
RSB is not the Granger cause of RCPI	84	1.08	0.4154	Accept the null hypothesis
RCPI is not the Granger cause of RSB	84	0.33	0.9750	Accept the null hypothesis

According to the results of Granger causality test, at the 5% confidence level, the scale of shadow banking, monetary policy tools, monetary policy intermediary indicators, and economic growth all reject the null hypothesis, indicating that changes in the scale of shadow banking are the Granger reasons for monetary policy tools, intermediary indicators of monetary policy,

and changes in economic growth. This means shadow banking will affect changes in the monetary policy control system.

3) *Determination of the model lag period and stationarity test:* The determination of the lag order of the VAR model has an important impact on the

empirical results of the model. In order to meet the requirements of the measurement model and ensure that the residual items of the model do not have serial correlation, this paper adopts the AIC (Akaike information criterion) information criterion and the LM (Lagrange multiplier) residual serial correlation test to comprehensively judge the optimal lag order. The steps are as follows: First, the optimal lag order of the model should be judged using the ACI information criterion, and the residual LM sequence should be used for correlation test; Second, if the test results do not have a significant serial correlation, then it can be selected as the model lag period; If the test fails, then it needs to use the above method to gradually test down from the 12-order lag period, and select the lag period with a small AIC value and serial uncorrelation as the lag order of the model. In addition, due to the conduction relationship between the intermediary goal of monetary policy and the final goal of monetary policy, in order to ensure that the established VAR model is comparable (Lei Rui, 2019), the same lag order should be selected. Based on the above analysis, this paper selects the second order as the lag order of each system.

In addition, the impulse response function analysis can only be performed when the VAR model has good stability. Therefore, the stability analysis of the VAR model shows that the reciprocals of the unit characteristic roots of the VAR model are all within the unit circle (see "Fig. 1"), indicating that the model is in

a stable state, and the next impulse response function analysis can be performed.

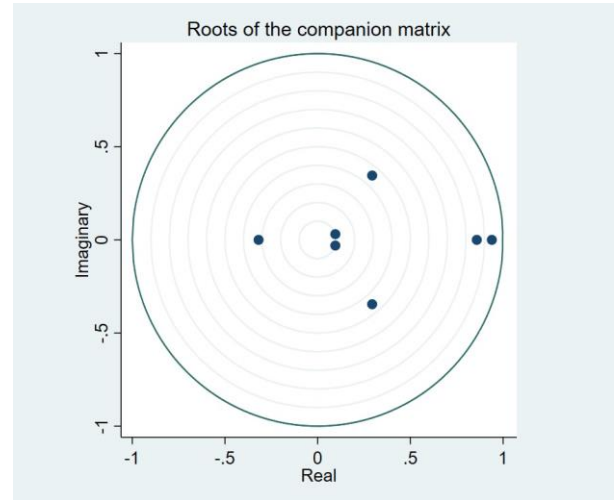


Fig. 1. Stationarity test results of VAR model.

4) *Impulse response function analysis*: The use of time series models to analyze the relationship between various variables is the basic principle of impulse response function, and can reflect the positive and negative relationship between variables. The analysis results of the impulse response function are shown in "Fig. 2". The horizontal axis in the "Fig. 2" represents the hysteresis period (unit, year) of the impact action, and the vertical axis represents the number of responses.

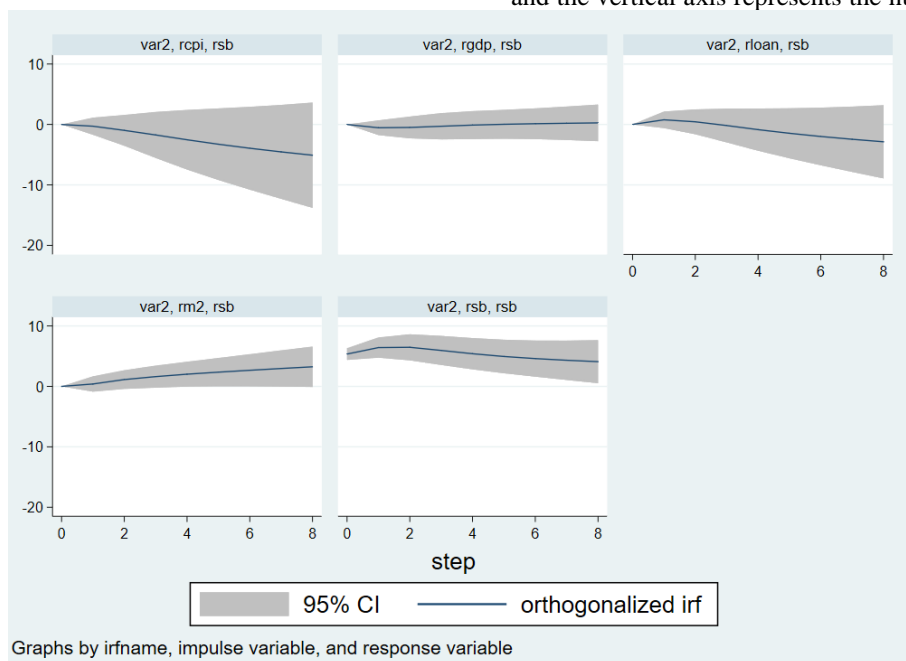


Fig. 2. Influence of shadow banking scale change of one unit standard deviation on other endogenous variables.

^a From left to right are "Fig. 2"(a), "Fig. 2"(b), "Fig. 2"(c), "Fig. 2"(d), and "Fig. 2"(e).

Changes in the scale of shadow banking have a certain impact on the ultimate goal of monetary policy, including changes in economic development and changes in price levels. As shown in "Fig. 2"(a), given the shock of one unit of standard deviation of shadow banking, the shadow banking and consumer price index show negative changes, that is, the scale of shadow banking will affect the fluctuation of prices. In addition, the impact of shadow banking on the consumer price index has been negative since the first period, and with the passage of time, the negative impact has gradually increased. This shows that the development of shadow banking is not conducive to the stability of price levels in both the short and long term, which is also consistent with the theoretical analysis above. As shown in "Fig. 2"(b), under the positive impact of the scale of shadow banking, its impact on the level of economic development has always been positive and stable. That is to say, the scale of shadow banking in a period of time has a positive effect on the development of the national economy, and the fluctuation of this influence is not very large. This shows that SMEs and other loans obtained through shadow banking can be paid off in time, and shadow banking can earn intermediate interest differentials and promote economic development. However, changes in the scale of shadow banking are relatively stable for economic development, which also verifies the double-edged sword effect of shadow banking on the development of the national economy. In addition, "Fig. 2"(c) shows that the shadow scale has a lagging effect on monetary policy tools. After a short period of rising, it continues to decline, and after the first year, it shows a continuous negative impact, indicating that the shadow scale will reduce the scale of credit in the long run, which will lead to changes in the regulatory system that affects monetary policy. It can be seen from "Fig. 2"(d) that the impact of shadow scale on money supply continues to be relatively long, and the impact of shadow banking scale on money supply is continuously positive, which shows that shadow banking has increased the supply of money in circulation through the credit transmission mechanism, and broadened financing channels for the development of the real economy.

V. CONCLUSIONS AND RECOMMENDATIONS

A. Research conclusions

This article uses time series data from 2012 to 2019 as a sample, uses the VAR model to conduct an empirical analysis of impulse response, and deeply explores the connection between shadow banking and the monetary policy control system, and draws the following conclusions: First, as far as monetary policy tools are concerned, the impact of the scale of shadow banking on the scale of credit will first increase in the short term, and then continue to decline after reaching

the maximum. Second, with regard to the intermediary indicators of monetary policy, changes in the scale of shadow banking have a positive effect on the money supply, providing sufficient capital flows for the development of SMEs and the real economy. Third, for the ultimate goal of monetary policy, the scale of shadow banking and the price level change negatively, that is, the expansion of the scale of shadow banking reduces the price level. However, the scale of shadow banking and the level of economic development have shown positive changes. In addition, it can be seen from the impulse response analysis that the impact of changes in the size of shadow banking on price fluctuations is greater than the impact on the level of economic development.

B. Policy recommendations

1) *Improving the use of monetary policy tools:* In recent years, shadow banking has developed rapidly in China. Therefore, the People's Bank of China should take shadow banking into consideration when formulating monetary policy, and gradually improve the use of monetary policy tools. First, the scope of the statutory reserve for deposits should be appropriately expanded. Because shadow banking cannot be restricted by statutory deposit reserves in the process of business processing, commercial banks will handle a large number of businesses restricted by statutory deposit reserves through shadow banking, which hinders the effect of monetary policy. Second, the rediscount policy should be strengthened. The effectiveness of the rediscount policy is largely reflected in the dependence of financial institutions on the rediscounted loans of the central bank. When commercial banks and other financial institutions are more dependent, the rediscount policy will achieve better results. Finally, the use of open market operations should be strengthened. Open market business can better regulate the funds in circulation, can effectively withdraw funds from the market, and provide guarantee for the implementation of monetary policy.

2) *Developing reasonable intermediary indicators for monetary policy:* As an intermediary indicator of monetary policy, money supply should focus on adjusting its monetary caliber. On the one hand, shadow banking, as one of the financial innovation products, has played a monetary function to a certain extent, blurring the boundaries of the currency level, resulting in a decrease in the accuracy of currency caliber statistics and affecting the role of the currency multiplier. The funds of shadow banks participate in the process of credit creation, and a large number of financial products have a deposit nature. These have increased the liquidity of currency, so the monetary

statistics should be further revised. On the other hand, the range of intermediary indicators for monetary policy should be appropriately expanded. Since the People's Bank of China proposed the scale of social financing indicators in 2010, the indicators include the creation of direct financing and shadow banking credit scale, which are more reflective of the intermediary indicators of monetary policy than money supply.

3) *Ensuring that the ultimate goal of monetary policy is achieved:* As an important aspect of Chinese financial market reform, the effective supervision of shadow banking plays an important role in ensuring the realization of monetary policy objectives. Therefore, on the basis of strengthening the financial supervision system, the ultimate goal of shadow banking monetary policy is promoted. First of all, it is necessary to expand the scope of effective supervision and build a relatively complete shadow banking indicator system. The relevant regulatory authorities can timely identify the source of risks, formulate reasonable industry standards, and improve corresponding regulatory measures. Second, the negative impact of shadow banking on prices should be reduced. The People's Bank of China should conduct comprehensive supervision of shadow banking business and consolidate the important position of commercial banks in the monetary policy control system to ensure the implementation of the ultimate goal of monetary policy. Finally, it is a must to guide shadow banking to play a positive role in economic development. Shadow banking should be correctly guided to set the rate of return for their business, so as to prevent funds from flowing to shadow banks in order to pursue high-profit returns, which would affect the healthy development of the real economy.

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