Asymmetric Effects of Monetary Policy in China

Liyuan Sun [a*]
[a] *Nanjing University of Science and Technology, China*
[*]Corresponding author: Liyuan Sun, Postgraduate, sunleosly@foxmail.com

Abstract
It uses VAR model to investigate the regulation effects of the tight monetary policy and the loose monetary policy around the 2008 financial crisis in China. The results demonstrate the existence of monetary policy asymmetric effect and show that tight monetary policy is more efficient. Combined with the specific situation in our country, it then analyzes the causes of the existence of asymmetry.
Key words: *monetary policy, asymmetric effect, money supply, output, general price, stock price*

1 Introduction

Whether the same extent of monetary expansion and contraction have different degree of impact on economic changes is a hot issue in the international.

In 2005, prices in China are gradually rising and caused inflation pressures, so that the tightening measures were carried out by Central Bank since the end of 2007. In the second half of 2008, the US subprime crisis evolved into a global financial crisis. China's macro-economy was changing into the downlink channel, and prices was changing from rise to fall, so that the Central Bank began to implement the loose monetary policy, issuing the 4 trillion economic stimulus plan to boost domestic demand and stimulate consumption. Therefore, based on the opponent choice of monetary policy in China around 2008, this paper studies whether monetary policy asymmetrically influences aggregate economic activities in China.

The remainder of the paper is organized as follow: Section 2 makes literature summary, introducing the literature of Chinese and foreign scholars about monetary policy asymmetry in different countries or regions; Section 3 is the empirical analysis part, mainly describing our data and methodology and examining whether China's monetary policy have asymmetric effects around 2008; Section 4 analyzes the causes of the results of empirical analysis; Section 5 concludes the paper.

2 Literature review

James Cover[1] is the founder of the empirical research about this problem, he does a research on the US money supply M_1 and real GNP, finding that the asymmetric effects of monetary policy do exist and the impact of negative currency is significant, but the impact of positive monetary is not obvious. Karras[2] draw lessons from Cover, he introduces oil price index to study 18 European countries and finds that only the influence of negative currency impact on output is very significant. Shen[3] chooses M_2 as the money supply variable and introduces the real export growth rate index to study the effect in Taiwan. He finds that the easy monetary policy is expected to have a positive effect, no effect and a negative effect on output respectively during low, high and very high inflation regimes. Senda[4] confirms the existence of monetary policy asymmetric effect in the 17 OECD countries. Comparing the results of

different countries, he finds that when inflation is beyond a certain range, the asymmetric effects will decrease.

In recent years, many Chinese scholars have seized the turning point in 2008 to study China's monetary policy effects. Yang[5] established a VAR model to have confirm the existence of asymmetry: in the short term, the effect of contractionary monetary policy effect is more significant; in the medium and long term, the effect of expansionary monetary policy is more durable; in the long term, both loose and tight monetary policy have no significant effect on China's GDP and CPI. Wu and Lee[6] use 7-day inter-bank interest rates as the proxy of monetary policy and find that: to the output, tight monetary policy can restrain overheating in the economic development, but to the price, both kinds of monetary policy have no significant impact on inflation. Wang and Liu[7] find that after the financial crisis in 2008, there is no granger causality relationship between credit balance and economic growth and price level. The credit expansion makes the price level increase and lead to inflation, but only has short time promotion for the output.

3 Empirical study

3.1 Variable and data

This paper selects money supply as a proxy indicator of monetary policy. It firstly chooses three levels of money supply--M_0, M_1 and M_2 to conduct a comprehensive inspection, and then screen out the optimal variable according to the empirical results. Using value added of industry (GDP) to measure output effect, CPI to measure inflation rate and on this basis, introducing A-share index of Shanghai Stock Exchange in China (SP) to add price effect. The sample period is from January 2007 to December 2014 with monthly data and these data are derived from the RESSET database, the website of the people's bank of China and the website of national bureau of statistics of China. This paper also conducts the CPI adjustment and X-11 seasonal adjustment method to deal with the date.

3.2 Establish VAR model

The money supply equation is suggested as

$$M_t = \alpha_0 + \sum_{i=1}^{N} \alpha_i^m m_{t-i} + \sum_{i=1}^{L} \alpha_i^y gdp_{t-i} + \sum_{i=1}^{K} \alpha_i^{p1} cpi_{t-i} + \sum_{i=1}^{W} \alpha_i^{p2} sp_{t-i} + u_i \qquad (1)$$

where M_t is the money supply at time t, gdp is value added of industry, cpi is the inflation growth rate and sp is A-share index of Shanghai Stock Exchange. α_0 is a constant, α_i are coefficients in front of each variable, u_i is the random disturbance in the money supply.

Then, separate positive and negative currency shocks from the residual sequence u_i which has been figured out from money supply equation (1) and they are positive currency shocks $pos_i = max(u_i, 0)$ and negative currency shocks $neg_i = min(u_i, 0)$.

Using VAR model, the output equation and price equation are suggested as

$$GDP_t = \beta_0 + \sum_{i=1}^{V1} \beta_i^y gdp_{t-i} + \sum_{i=1}^{V2} (\beta_i^+ pos_{t-i} + \beta_i^- neg_{t-i}) + \varepsilon_i \qquad (2)$$

$$CPI_t = \gamma_0 + \sum_{i=1}^{L1} \gamma_i^{p1} cpi_{t-i} + \sum_{i=1}^{L2} (\gamma_i^+ pos_{t-i} + \gamma_i^- neg_{t-i}) + \phi_i \qquad (3)$$

$$SP_t = \lambda_0 + \sum_{i=1}^{W1} \lambda_i^{p2} sp_{t-i} + \sum_{i=1}^{W2} (\lambda_i^+ pos_{t-i} + \lambda_i^- neg_{t-i}) + \varphi_i \qquad (4)$$

3.3 Data Tests

Via ADF test, we find that only SP is stable, CPI, GDP and M_1 are first-order single whole and M_0 and M_2 are second order single whole. Doing a cointegration test of each of the vectors (M_0,CPI,GDP,SP), (M_1,CPI,GDP,SP), (M_2,CPI,GDP,SP) respectively, finds the presence of a stable long-run equilibrium relationship within each set of variables.

The results of Granger Test shows that at the 5% significance level, M_1 is granger cause of both CPI and GDP with probability more than 98%. By comparing the probability value we can see that the granger causality is far stronger between M_1 and CPI than M_0 and M_2 and the granger causality is stronger between M_1 and GDP than M_0. According to this result and considering that the relationship between M_1 and national economic activities is very close, thus we will eliminate M_0 and M_2 from the next part. Besides, we can also find that the granger causality test between all M and SP at the 5% significance level can't reject the null hypothesis. Even the probability that M_1 is the granger cause of SP is only 69.95%. This shows that the money supply in terms of ability to explain changes in the stock price index is weak. The central bank attempts to use money supply to regulate stock market, but the effect is not significant. This is nearly consistent with the reality in China.

AR characteristic polynomial roots test also shows that the VAR model is stable.

3.4 Analysis of the empirical result

Further, we separate the positive and negative monetary shocks sequences POS and NEG from the residual sequence of the money supply equation. Then, respectively establish VAR equations of GDP, CPI and SP and the value of lag lengths successively are 2, 1 and 1.

Observe the impulse response (Fig.1) and variance decomposition diagram (Fig.2).

Positive monetary impact has one-month lagged effect on CPI and then remains stable stimulation effect; negative monetary impact produces a more stable inhibition effect on CPI. Negative impact of monetary shocks on CPI is significantly greater than the positive impact of currency. The contribution of positive monetary impact to CPI forecast error is close to zero. The contribution of negative impact is greater than the positive currency impact. To sum up, the positive and negative monetary impact has asymmetric effect on CPI.

Positive monetary impact has a two-month lagged effect on GDP, begin to have a stimulating effect on GDP from the 3rd month, and tend to be stable from the sixth month, but the effect is very weak; negative monetary impact shows sustained and stable inhibitory effect on GDP after 4-month lags, but the effect is not very obvious. Effects of both positive and negative monetary impact on GDP are very weak and there is no significant asymmetric effect. The figure of GDP variance decomposition shows that the negative monetary shocks have a gradually falling contribution to GDP forecast error. The contribution is more obvious in the first 10 month, approaching zero and remain stable after 10th month; positive monetary shocks always have a zero contribution to the prediction error of GDP. The results show that: the positive and negative monetary shocks have asymmetric effect on GDP.

The effect of positive monetary shocks on SP are gradually reduced after reaching the maximal inhibition effect in the 2nd month; negative currency shocks have increasing stimulating effect on the stock price index in the previous four months, then begins to decrease and tends to zero. Positive monetary shocks have greater effect on SP than negative monetary shocks. The contribution of negative impact to SP prediction error is always equal to zero; but the positive impact exerts gradually increasing effects on SP and remains stable after the sixth month. The results indicate the presence of asymmetry effects.
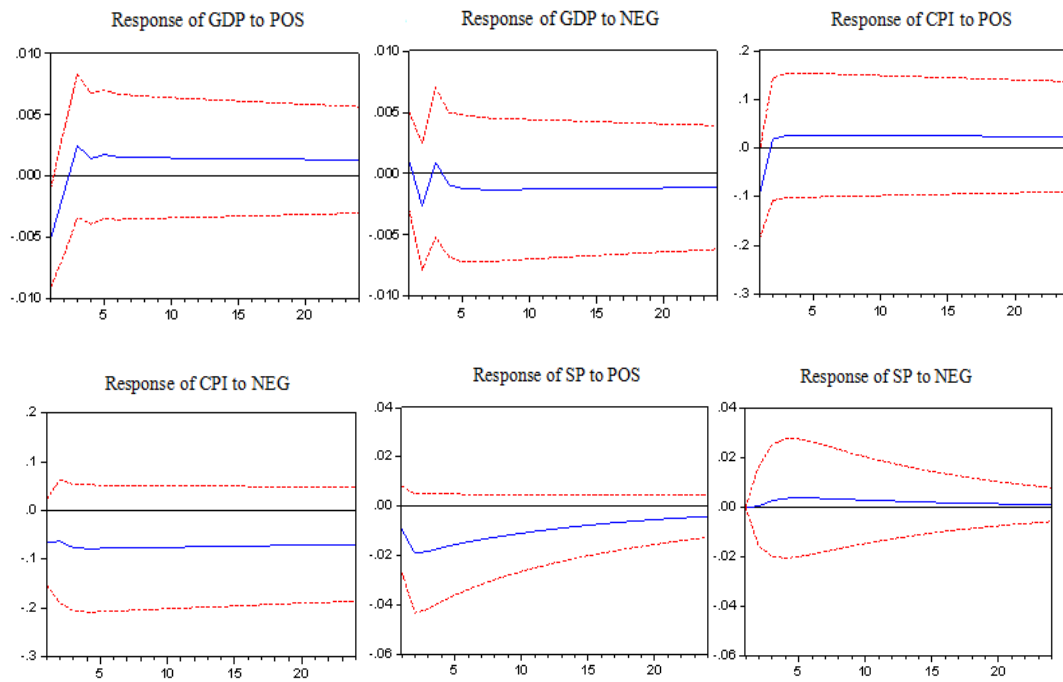

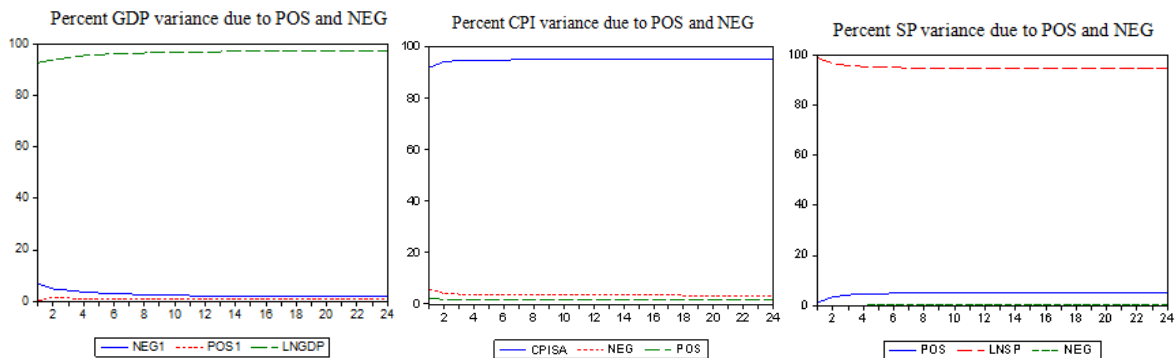*Fig.1* – Response of GDP, CPI and SP to POS and NEG

Fig.2 – Percent GDP, CPI and SP variance due to POS and NEG

In summary, via VAR model we find that: positive and negative monetary impact have asymmetric effect on GDP and CPI, but not significant, and the effect of negative monetary impact is greater; positive monetary impact has inhibitory effect on SP and negative monetary impact has stimulative effect on SP. Positive impact has more significant effect, thus we could say that there exists significant asymmetry.

4 Analyses of causes

4.1 Asymmetric effect on stock price

In fact, according to Fig.3, we can see that M_1 growth rate changes in the same trend in which SP changes. The results of granger causality test before show that M_1 is not the granger cause of SP. On the contrary, SP is the granger reason of M_1. That is to say, in fact, the rise of currency wont' the make stock market rise, but what is possible is that the money supply will increase when the stock market declines. Chen[8] does an empirical study of the monthly data from 1993 to 2009 of China by the method of dynamic metering test and comes to the similar results. Therefore, it is difficult to achieve the purpose of influence stock market prices by adjusting monetary policy.
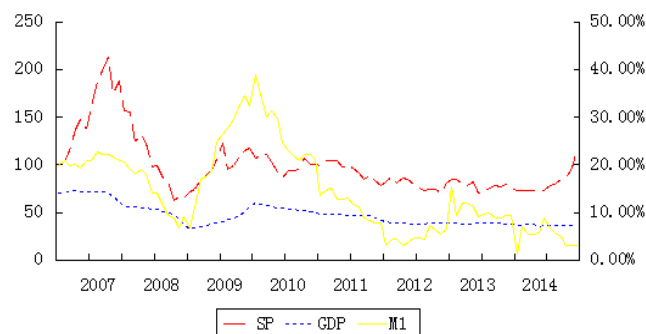

Fig.3 – Trend graph of M_1,GDP and SP

At present, there exists a gap between the money market and capital market. This is because the short history of China's stock market with small scale and is not yet mature. The market operating still exists many irregularities, thus the capital market still can't be a good transmission channel for monetary policy in China. On the other hand, public companies in China are uneven in industry distribution, so that stock market can't truly reflect the operation situation of national economy. Besides, the efficiency of resource allocation in different industries are significant different. These all have led to the non-significant impact of monetary policy on the stock market at the present stage.

4.2 Asymmetric effect on output and general price

Credit transmission channel is the main monetary policy transmission channel in China. The following analyses of the main causes of monetary policy asymmetry are based on this perspective and respectively from the angle of financial institutions and enterprises.

4.2.1 Financial institutions

Credit constraints theory is that, even if the Central Bank performs an expansionary monetary policy during recession, financial institutions will still appear loan-cherishing behavior in order to ensure the quality and safety of the loan, thus weakening the stimulating effect of positive monetary policy on the economy. In essence, the information asymmetry is the root cause of credit constraints. On the one hand, in most cases, a corporate with higher risk and poorer performance has more urgent demand for loans. However, the financial institutions are unable to accurately identify the risk preferences of lenders and control the real use of the loans. That is named adverse selection. Many enterprises, especially small and medium-sized

enterprises(SMEs), face difficulties in operation when economic downturn because financial institutions become even more cautious when lending to these enterprises.

In 2009, in response to the global financial crisis, RMB loans at the end of the year amounted to 42.6 trillion yuan, an increase of 33.0% compared to last year. Among them, the long-term loans to infrastructure industries served for 2.5 trillion yuan whose proportion of new long-term loans is up to 50.0%. That is to say, more loans had been invested in state-owned sector. In contrast, loans distributed to private SMEs are fewer and harder to obtain. The result is that real economic recovery had slowed and loose monetary policy effectiveness greatly reduced.

4.2.2 Enterprises

Most companies mainly rely on financial institution loans, but have a low proportion of issuing stocks and bonds. In 2009, the proportion of loans accounted for 80.5% of the total financing, although there was a slight decline in the proportion compared with 2008, but still more than 80% and become the main mode of financing. This is mainly due to too few financing channels and too many restrictions caused by too much and that is because China's capital market is not yet mature.

China's stock market has only 25 years of existence and can't be compared with European and American stock markets. Because of approval for issue of stocks before 2016, stock is issued with a strong administrative interference, that state-owned enterprises or enterprises which meet the government's preferences are easier to get listed qualifications. To some extent, this hinders stock market to play the role of resource allocation. So does the bond market.

In good economic times, companies need funds for expansion, but frequently a tightening monetary policy will be carried out and banks will reduce the credit, so that many enterprises in China can't find any other means of financing. They have to compress funding requirements and give up scale expansion. In this case, gross output will decline, thus inhibiting effect of tightening monetary policy is more significant.

5 Conclusion

This paper investigates the actual effect on economic regulation of tight monetary policy and easy monetary policy in China before and after the 2008 financial crisis from the perspective of the price level and economic growth. The empirical results show that: the asymmetric effects of monetary policy do exist and the inhibition effect of tight monetary policy in boom periods is greater than the stimulation effect of easy monetary policy in recession, but this asymmetric effect is not obvious compared with western developed countries.

References

1. *J. P. Cover*, Asymmetric effects of positive and negative money-supply shocks, J. Journal of Policy Modeling, 22 (2000) 197-218.
2. *G. Karras*, Why are the effects of money-supply shocks asymmetric? Convex aggregate supply or pushing on a string, J. Journal of Macroeconomics, 18 (1996).
3. *C. H. Shen*, Are the effects of monetary policy asymmetric? The case of Taiwan, J. Quarterly Journal of Economics, 23 (1992) 1261-1282.
4. *T. Senda*, Asymmetric effects of money supply shocks and trend inflation, J. Journal of Money, 33 (2001) 65-89.

5. *E. Yang*, Research on asymmetry of monetary policy in China--Empirical Evidence from 1996-2009, J. Financial Review, 4 (2010) 112-122.

6. *T. Wu , L. Lee*, The asymmetric effects of monetary policy in China, J. Oriental Enterprise Culture, 9 (2011) 249.

7. *S. J. Wang , Y. S. Liu*, Empirical analysis of the ineffectiveness of monetary policy in China after the financial crisis, J. Chinese Foreign Economic Theory Seminar, 2012.

8. *M. Chen*, Analysis of the relationship between money supply and stock price in China," Ecological Economy, 6 (2010) 75-77.