

The Choice of Monetary Policy Analysis Framework under the Open Economy

Xiao Cheng^a, Yumeng Zhang^{b,*} and Luyao Wang^c

Capital University of Economics and Business

^aandchengxiao@163.com, ^b13581613621@163.com, ^cwlycueb2017@163.com

*Corresponding author

Keywords: Open Economy, Monetary Policy, Base currency rules, Monetary Policy Rules

Abstract: Since entering the new century, China's economic fluctuations have shown obvious dynamic characteristics, mainly manifested by the relative slowdown of economic fluctuations. At present, the research on optimal monetary policy at home and abroad generally focuses on theoretical research, that is, directly assume that the monetary policy selected based on a certain rule or based on the target rule of zero inflation rate is optimal, lacking the main experience of monetary policy Perspective. The purpose of this article is to use the dynamic stochastic general equilibrium model that has been widely used in recent years to analyze and study the applicability of China's monetary policy rules in order to summarize previous research work. The data in this article begins in the first quarter of 2006 and ends in the third quarter of 2018. The data has been tested for stability and logarithm. The results show that the inflation rate and interest rate series can reject the null hypothesis at the 10% significance level, that is, the inflation rate and interest rate series do not have a unit root process, but are stationary series.

1. Introduction

In the 1970s, new classical economics represented by Friedman's "single currency rule" developed rapidly. However, the effectiveness of various countries in implementing the monetary quantity target system did not meet expectations, and after 1970, monetarism gradually disappeared [1]. Since the mid-1980s, the macro-control function of monetary policy has helped many developed countries in the West spend more than 20 years of rapid development and stable inflation coexisting with the era of "great relaxation" [2]. The core idea of Taylor rule is to adjust the nominal interest rate by observing the fluctuations of inflation rate and output gap to reflect the price-based control strategy [3]. Given that most countries use interest rates as intermediary targets for macro currency control, this theoretical rule is more consistent with the central bank's approach.

In essence, the intermediary goal of monetary policy should be measurable, controllable and relevant. This first requires the central bank to quickly obtain relevant indicators and data at the currency level, and can use scientific methods to objectively analyze and monitor [4, 5]. Second, the intermediary goal of monetary policy should be operable, that is, it can be regulated through relevant tools, and the result of the regulation should be closer to the established goal [6]. Third, the intermediary goal of monetary policy should be close and relatively stable with the final goal, and have certain predictability for achieving the ultimate goal of monetary policy [7]. The gradual transformation of the economy into a "new normal" of medium- and low-speed growth highlights the important impact of internal and external shocks on China's economic fluctuations. As an important macroeconomic policy, monetary policy should play a role in buffering various shock factors at home and abroad to suppress economic fluctuations.

Then the following two questions are very important. First, under the open economic conditions, in the face of various domestic and foreign shocks, what kind of monetary policy is the best choice? Secondly, what is the direction of the monetary policy that needs adjustment in China's actual operation? Two issues have been studied in the existing literature. In the closed economy, with the expansion of the IS-LM model and IS-LM-AS model in the open economy, the MF model and MFD

model became tools for macroeconomic analysis of the open economy from the 1960s to the 1990s. . When studying currency issues in an open economy, M-F and M-F-D models are still the first choice for analysis tools due to their simplicity, ease of handling, and other advantages. With the latest development of the M-F and M-F-D models, the macroeconomics framework of the new open economy is currently difficult to apply to the monetary policy research of the transition economy.

2. Method

2.1. Monetary policy

The term monetary policy refers to actions taken by the central bank to affect monetary and other financial conditions. The purpose is to seek actions to achieve a wide range of objectives, such as sustained real output growth, high employment rates, and price stability. Sometimes, the general condition of a strong currency related to currency creation or destruction, including changes in interest rates, is also regarded as an important factor in the economic cycle. The actions of the Central Bank are intended to affect the activities of the national economy and are not based on ordinary commercial considerations such as profit-making. The standards and degree that the central bank should adopt in the implementation of monetary policy are still controversial issues. Coordination between monetary policy, fiscal policy and foreign policy is also a problem. Monetary policy framework is a specific form or strategy in the actual operation of monetary policy, which can stabilize the long-term and short-term target prices. It particularly emphasizes what nominal error monetary policy uses to achieve price stability. According to the difference in nominal price stability, the IMF divides the monetary policy framework into the following categories. Financial authorities are always prepared to buy and sell foreign exchange at a given price to keep the exchange rate within a predetermined level or range. Monetary Aggregate Target Monetary authorities use their policy tools to achieve specific growth rate targets for monetary aggregates (M1, M2, etc.), and the target aggregate becomes the nominal error and intermediary target of monetary policy.

2.2. Base currency rules and DSGE

The practice of China's monetary policy is very complicated. The intermediary goal of monetary policy needs to have the characteristics of testability, controllability and relevance. However, the central bank cannot directly regulate the currency stock, and can only regulate it indirectly through various channels. Under different macroeconomic backgrounds, the realization of monetary policy depends on the choice of different intermediary goals. Generally speaking, monetary policy intermediary targets are mainly divided into two types: quantity and price. The former mainly includes the money supply at various levels and the scale of social financing. Monetary school advocates taking money supply as the intermediary target of monetary policy. The latter mainly anchors the interest rate or exchange rate target. Interest rate is the core variable regulating the total demand is the main claim of Keynesianism. From the perspective of monetary policy practice in developed countries, the evolution of monetary policy intermediary objectives has gradually changed from quantity-based to price-based. However, many scholars have pointed out that considering the inaccurate scope of social financing methods and the difficulty in covering the new financing methods of financial innovation, it is inappropriate to use it as an intermediary target for monetary policy. The dynamic stochastic general equilibrium (DSGE) model is an iconic model in the field of macroeconomics for more than a decade. The DSGE model carefully describes the production and consumption behavior of micro-subjects over time, and obtains a description of the overall economic behavior through the summation method, and then derives the equation representing the dynamic equilibrium conditions of the economy. The perfect combination of micro foundation and macro-economic analysis. The DSGE model has become increasingly popular among economists and decision makers. More central banks use the DSGE model to analyze policy effectiveness. In the model assumptions of this paper, the world economic environment consists of countless continuous small open economies within the unit interval. In a representative country, the economy is mainly composed of three parts, namely the family sector, the production sector and the government sector.

Representative households will use their income to consume and hold money at every point in time to maximize utility.

$$E_0 \sum_{t=0}^{\infty} \beta^t U \left(C_t, \frac{M_t}{P_t}, N_t \right) \quad (1)$$

At the same time, in order to maximize the utility function to obtain the best conditions, the household sector will adjust its consumption and currency holdings at time and keep other variables at their optimal values.

3. Experiment

In order to conduct an empirical analysis of the implementation of China's monetary policy, we have referred to RBC related literature research and by comparing the fluctuation correlation coefficient between economic variables to judge the suggestion between the theoretical model and the actual data. According to this idea, we must first clarify the meaning and calculation method of "economic volatility-related index", and combine the actual data of China's economic variables to calculate the corresponding relevant index to compare each monetary policy theory with the actual relevant index. The data range of this article is from the first quarter of 2006 to the third quarter of 2018, with a total of 71 sampling points. The data in this article comes from the statistical database of China Economic Net. The GDP data obtained in this article is a nominal cumulative value, so we need to process it according to the cumulative growth rate of GDP to obtain the actual quarterly GDP value, and adjust the actual quarterly GDP value by X-12 quarterly. The inflation rate is calculated based on the consumer price index (CPI).

4. Discuss

By comparing the shock response function of output and inflation. The study found that the response curve of output and inflation level has a certain similarity. This shows to a certain extent that the stable output and inflation rate in China's monetary policy regulation are consistent. Monetary policy stabilizes one party and the other. At the same time, it can be found that in the face of monetary policy shocks, the corresponding output levels, inflation rates, and continuity of fluctuations depend on different monetary policy rules. In the short term, it can quickly and steadily return to a steady state level to a greater extent. It shows that the interest rate rule is a powerful monetary policy instrument rule, and the central bank can stabilize the economic development trend in the short term by adjusting the interest rate period. In order to compare the effects of different monetary policies on economic fluctuations, domestic and foreign research literature has established several common types of monetary policies. As the existing literature on the types and rules of monetary policy implemented by China is inconsistent, Table 1 contains both quantitative and interest rate rules. In Table 1, different monetary policies are represented by corresponding codes. The main meaning of these strategies is shown in their expression. The monetary policy rules indicated by "OP" in Table 1 are called "optimal monetary policy rules".

Table 1. Different types of monetary policy

Monetary policy code	Mathematical expression	A brief description
SCIT	$\pi_t = 0$	Zero inflation target rule
PEG	$e_t = 0$	Pegging to exchange rate rules
SDIT	$\pi_{Ht} = 0$	Domestic Zero Inflation Rate Target Rule
OP	$R_t = r_t^n + \phi_\pi \pi_{H,t} + \phi_y \tilde{y}_t$	Optimal monetary policy rule

As shown in Table 1, whether affected by domestic technology or foreign technology, the fluctuation direction of each economic variable under different monetary policies is basically the same, but the degree of fluctuation is different. Different monetary policies lead to different economic fluctuations. In addition, from a country's overall price level and inflation rate, due to a comprehensive consideration of domestic price factors, exchange rate factors and import price factors. Different monetary policies will have different effects on these factors, so they will be different in the short term. Under monetary policy, inflation rates and price levels have undergone different changes. In terms of price level, the price level of demand defined in the SCIT rules has not changed. The price level in the OP rules has increased in the short term. Since inflation is the rate of change in the price level, the pegged exchange rate rules have dropped. Therefore, under these rules, the impulse response of inflation rate and price level is similar. In order to obtain the stability of the data, Eviews7 will be used to perform the ADF unit root test on the variables selected in this paper. The specific results are shown in Figure 1.

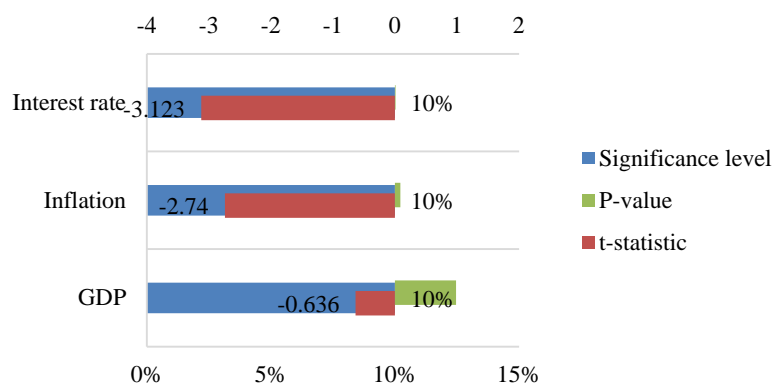


Figure 1. ADF test results

According to the ADF test results shown in Figure 1, the inflation rate and interest rate series can reject the null hypothesis at a 10% significance level. That is, the inflation rate and interest rate series do not have a unit root process, so they are a stable series. The gross national product cannot reject the null hypothesis with a significance level of 10%. It contains at least one unit root and is a non-stationary sequence. When studying currency issues in an open economy, M-F and M-F-D models are still the first choice for analysis tools due to their simplicity, ease of handling, and other advantages. With the latest development of the M-F and M-F-D models, the macroeconomic framework of the new open economy is currently difficult to apply to the monetary policy research of the transition economy.

5. Conclusion

In order to analyze China's optimal monetary policy, this article mainly conducts research in two aspects. On the one hand, the DSGE model under open economic conditions is used to simulate the economic fluctuations corresponding to different monetary policy rules under domestic and foreign shocks. On the other hand, it analyzes the status of monetary policy and combs the previous literature. On this basis, a dynamic stochastic general equilibrium model under open economic conditions is established. And add monetary policy rule equations to the model to complete the model construction under the framework of different monetary policy rules. In the model settings, this article adds external shocks, such as monetary policy shocks, inflation shocks, and real exchange rate shocks. At the same time, in order to avoid the problem of randomness and singularity, this paper selects quarterly data of China's GDP, CPI and inter-bank lending rate from the first quarter of 2006 to the third quarter of 2018 to estimate the main parameters. The inflation rate and interest rate series of the model can reject the null hypothesis at the 10% significance level, that is, the inflation rate and interest rate series do not have a unit root process, but are stationary series.

References

- [1] Kuosmanen, P., & Vataja, J. (2017). predicting economic activity with financial market data in a small open economy: revisiting stylized facts during economic turbulence. *International symposia in economic theory & econometrics*, 23, 217 - 234.
- [2] Himmels, C., & Kirsanova, T. (2018). Discretionary policy in a small open economy: exchange rate regimes and multiple equilibria. *Journal of Macroeconomics*, 56.
- [3] Epure, M., Mihai, I., Minoiu, C., & Peydro, J. L. (2018). Household credit, global financial cycle, and macroprudential policies: credit register evidence from an emerging country. *Jose-Luis Peydro*, 18(13), 1.
- [4] Adler, G., Lama, R., & Medina, J. (2017). Unconventional policies and exchange rate dynamics. *Social science electronic publishing*, 17 (237), 1.
- [5] Łukasz Goczek, & Mycielska, D. (2019). Actual monetary policy independence in a small open economy: the polish perspective. *Empirical Economics*, 56.
- [6] Alla, Z., Espinoza, R. A., & Ghosh, A. R. (2017). Fx intervention in the new Keynesian model. *Imf Working Papers*, 17 (207), 1.
- [7] Obstfeld, M., Ostry, J. D., & Qureshi, M. S. (2017). A tie that binds; revisiting the trilemma in emerging market economies. *IMF Working Papers*, 17 (130), 1.