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Research on the Relationship between Money Supply, Price Index and Economic Growth

-- Empirical Analysis based on Var Model

Zhengyuan Yang[a,*], Yifan Ji[b] and Chunlu Liu[c]

School of Economics, Anhui University of Finance and Economics, Anhui,233030, China

[a,*]15951553760@163.com, [b]1060435939@qq.com, [c]1294936197@qq.com

Abstract

This article selects the sample data of China's money supply (M2), price index (CPI) and gross domestic product (GDP) from 2000 to 2018, and empirically analyzes the impact of money supply and price index on economic growth based on the var model. The results of the impulse response and analysis of variance show that the money supply M2 and the price index (CPI) have a slight fluctuation in GDP in the short term, but they have stabilized in the long term and have a positive correlation effect. The contribution is 5.13%, and the CPI contribution to GDP is stable at 4.65%.

Keywords

economic growth; price index; money supply; var model.

1. Introduction

With the advancement of China's comprehensive deepening reforms, monetary policy has become more and more important in national macroeconomic policies, and its role in promoting economic growth and maintaining price stability has become increasingly apparent. China 's economy has changed from "high-speed growth" to "high-quality growth", and monetary policy has also changed from "moderately accommodative" to "stable" today. While the central bank continues to increase the money supply, inflation expectations have further intensified, the money supply is facing camera decisions in the two goals of promoting growth and controlling prices. As an important indicator of monetary policy, how the relationship between changes in the money supply and consumer price index and economic growth is the focus of this paper. In this context, the article tries to start with time series data.

2. Literature Review

2.1. Relationship between Money Supply and Economic Growth

Stock and Watson (1989)[1],Thoma (1994) [2] and others show that currencies are non-neutral, while Barro (1978) [3] and Boshen and Mills [4] (1995) pointed out that the money supply has no effect on the economy, that is, the currency is neutral. Nahla Samargandi et al. (2016) based on the Granger causality test, vector error correction model, and co-integration model. An empirical test of the relationship between economic growth. The research results show that: M1 and M2 are both Granger reasons for economic growth; there is a co-integration relationship between M2 and economic growth in the long run, and it promotes economic growth and economic development in the short term [5]. Wen Yachang (2018) conducted an empirical analysis through an error correction model. The results show that: for every 1% increase in GDP, CPI increases by 0.54%, and m2 increases by 2.14%; every 1% increase in m2 drives CPI by 0.25% [6]. Hao Rui et al. (2019) conducted an empirical analysis of the macro data

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of 14 OECD countries from 2000 to 2017 from the perspective of virtual economy, and the results show that the money supply of OECD countries and economic growth show a clear positive correlation, and the economy The degree of virtualization and money supply positively affect economic growth significantly [7].

2.2. Relationship between Price Index and Economic Growth

Xu Xianchun (2009) through theoretical analysis, that there is no necessary relationship between price fluctuations and economic growth [8]. Xue Rui (2014) Based on the state-space variable parameter model, it is believed that the positive effect of rural price fluctuations on economic growth is greater than that of urban price fluctuations [9] .Sun Yuhuan (2017) Empirical Analysis of the Relationship between Consumption Level, Price Fluctuation and Economic Growth in Liaoning Province Based on Error Correction Model [10].The results show that the increase in the short-term price index stimulates household consumption, but continued price increases curb household consumption, which is not conducive to economic growth.

2.3. Relationship between Money Supply, Inflation and Economic Growth

In macroeconomic regulation and control, the money supply is often used as an intermediary target for monetary policy to regulate economic growth and price indices. U R Rajeshwari (2018) verified the three cointegration relationships from the perspective of empirical tests, and found that whether in the short or medium term, the money supply Volume has a significant impact on inflation, but has no significant effect on economic growth [11]

Obviously, the research conclusions about the relationship between money supply, price index and economic growth are different, so this article has certain practical significance. Through combing the literature, this article further studies the relationship between money supply, price index and economic growth. To verify the relationship between the three from an empirical perspective, I hope to further explain whether the money supply promotes economic growth or whether economic growth will affect the price index and money supply.

3. Analysis of the Relationship between Money Supply, Price Index and Economic Growth

3.1. Model Selection and Variable Selection

3.1.1. Var Model Basic Ideas

The var model is a vector autoregressive model based on data without theory. Its basic mathematical expression is

$$y_t = A_1 y_{t-1} + A_2 y_{t-2} + \cdots A_p y_{t-p} (t = 1,2\cdots)$$

among them y_t K-dimensional endogenous variable vector, A_1 - A_P for $K \bullet K$ Dimensional coefficient matrix, p Is the lag order.

3.1.2. Indicator Selection and Data Foundation

(1) Index selection

This study involves three types of variables: money supply, price index, and economic growth. This article selects GDP as an indicator of economic growth, expressed in GDP. Commonly used price index indicators are: consumer price index (CPI), production This article chooses the price index (PPI). This article chooses CPI to measure the inflation rate. According to the order of liquidity from strong to weak, the currency is m0, m2, and m2, and m2 is selected as the measure of money supply.

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(2) Data source

The data are from the China Statistical Yearbook 2000-2018 and the website of the National Bureau of Statistics. Because this article uses annual data, in order to avoid the occurrence of heteroscedasticity, the three indicators of M2, CPI, and GDP are taken as logarithms and recorded as lnM2, lnCPI, and lnGDP

3.2. ADF Unit Root Test

Before establishing the var model, first test the stability of the variables. This article uses the adf method to perform unit root tests on the variables m2, CPI, and GDP. After using the adf test, choose whether to differ, and finally choose whether to consider the intercept term and the trend term.

Table 1. ADF test results

variable	Test critical values(1% level)	T-statistic	prob	Is it smooth
CPI	-4.3743	-5.8174	0.0104	smooth
GDP	-3.6999	1.5021	0.9988	unstable
M2	-4.3393	-0.3041	0.9862	unstable
lnCPI	-4.3743	-9.4336	0.0001	smooth
lnGDP	-3.6999	-2.0788	0.0441	smooth
lnM2	-3.6999	-2.1881	0.0148	smooth

As can be seen from the above table, due to the inequality of the unit root test of CPI, GDP, and MM2 raw data, the natural logarithm is changed. The test shows that lnCPI, lnGDP, and lnM2 are all stable, and a VAR model can be constructed.

3.3. The Construction of the Var Model

The results of the VAR model obtained by running stata15 are as follows:

The test results are shown below.

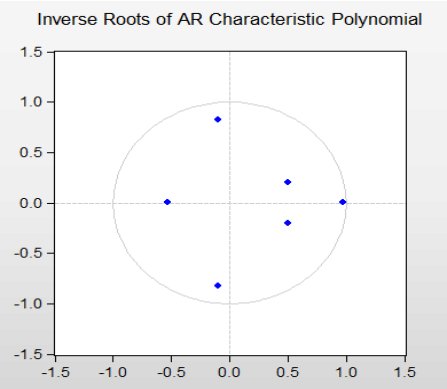

Fig. 1: Var model stationary test

According to the test results, it was found that the inverse values (blue dots) of all eigenvalues in the model fell within the unit circle, indicating that the residual term of the var model was stable, that is, the model was robust.

ISSN: 2688-9323

3.4. Impulse Response Analysis

The equation coefficients of the var model can only reflect the local dynamic relationship, and the degree of influence on the current and future values of the endogenous variables cannot capture the interaction process, so the dynamic impact between the variables is studied through the impulse response function diagram.

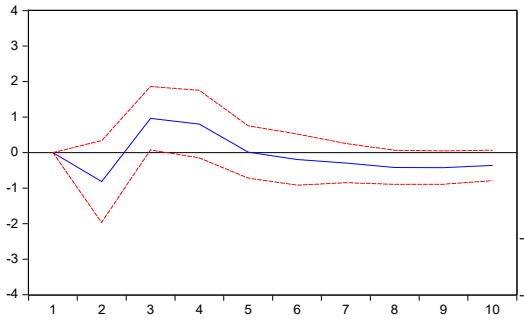

Fig. 2 Pulse response of lnm2 to lnGDP

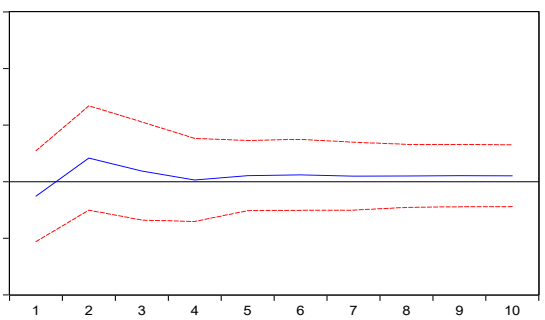

Fig. 3 Pulse response of lnGDP to lnm2

Figure 2 shows that after a standard deviation of m2, GDP immediately fluctuates downward, that is, a negative effect is generated, but it gradually weakens after the second period of shock reaches the maximum, and turns to fluctuate upward. Figure 3 shows that we can get It is known that, given the impact of a unit standard deviation of GDP, m2 will produce a positive effect, but the positive effect gradually weakens in the second to fourth periods, and eventually stabilizes.

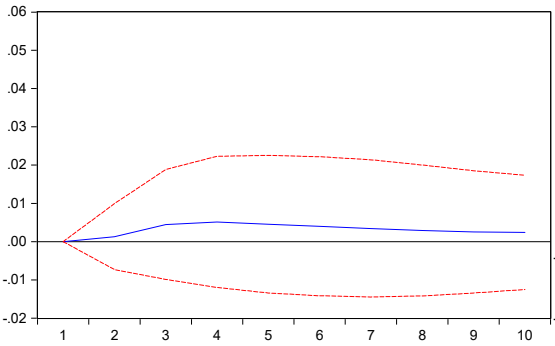

Fig. 4 lnCPI impulse response to lnGDP

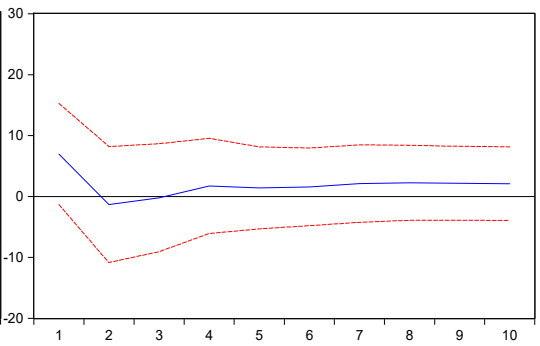

Fig. 5 lnGDP impulse response to lnCPI

Figure 4 shows that after a standard deviation of CPI, GDP fluctuates immediately downward, that is, a negative effect is generated, and the fluctuation stabilizes after the fourth period. Figure 5 shows that after a standard deviation of GDP is applied, CPI There will be a positive effect, but in the second to fourth periods, the CPI will have a negative effect, which will gradually weaken and eventually stabilize. When GDP changes, it may lead to an increase in the money supply, which in turn will lead to the price index. rise.

3.5. Variance Decomposition

Variance decomposition is a solution to the contribution of the random disturbance term to the mean square error in the var model, which reflects the impact of each variable on the dependent variable and predicts the percentage contribution of each variable to the endogenous variable. The specific results are shown in Table 2.

ISSN: 2688-9323

Table 2. Analysis of variance results

	S. E.	LNM2	LNCPI	LNGDP
1	21.691	0.000	10.313	89.687
2	26.098	5.060	7.383	87.557
3	28.134	5.602	6.359	88.039
4	30.498	5.097	5.726	89.178
5	32.456	5.061	5.239	89.700
6	33.971	5.127	4.994	89.879
7	35.386	5.097	4.955	89.948
8	36.736	5.084	4.965	89.951
9	37.988	5.098	4.965	89.937
10	39.162	5.107	4.956	89.937
11	40.265	5.113	4.929	89.958
12	41.293	5.119	4.889	89.992
13	42.247	5.123	4.845	90.032
14	43.133	5.126	4.802	90.072
15	43.958	5.127	4.765	90.108
16	44.725	5.129	4.733	90.138
17	45.443	5.130	4.706	90.164
18	46.115	5.131	4.684	90.185
19	46.746	5.132	4.665	90.203
20	47.339	5.133	4.648	90.218

It can be seen from Table 2 that the initial change in GDP is basically based on its own standard error, and its contribution rate to itself is as high as 89.69%, which then gradually decreases, and is basically stable at 90.2% by the twentieth period. Except for itself, the money supplies the largest contribution to GDP is 5.13%, and the contribution of CPI to GDP is stable at about 4.65%.

4. Conclusions and Recommendations

4.1. The Money Supply has a Significant Positive Effect on GDP

When the money supply increases, the economic growth also rises, so if you want to promote economic growth, you can appropriately increase the supply of money. However, there is a suppression effect in the later stage, which indicates that an excessive increase in the money supply will bring an opposite direction to economic growth Therefore, the central bank needs to strengthen the construction of the transmission mechanism of the money supply to economic growth and regulate the market money supply through various monetary policies.

4.2. Money Supply Contributes More to GDP

The empirical results indicate that the money supply contributes more to GDP than CPI. When the money supply in the system increases, companies can directly expand production and create more GDP; and the rise in the price index needs to be transmitted from consumers to producers in order to expand production and create GDP, the money supply can directly

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increase GDP. Therefore, based on the stabilization of the price index, high-quality economic growth can be driven by active monetary policy.

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