Analysis of Influencing Factors of Consumer Price Index in Chinese Residents Based on VAR Model

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Keywords: consumer price index; influence factor; VAR model; monetary policy

Abstract: Consumer Price Index measures the average change in retail prices of more than 200 different types of goods and services over time. The relationship between the growth and fall of consumer price index has a far-reaching impact on the daily living standard of residents, the stability of economic system and the implementation of national policies. This paper is based on the importance of influencing factors of consumer price index. Based on the data of consumer price index, money supply and fixed assets investment in China from 1981 to 2015, this paper establishes a three-dimensional VAR model and uses the VAR model to analyze the influence factors of CPI and their degree of influence. It is found that the influence of money supply on CPI is very sensitive and strong, which indicates that monetary policy is the necessary and main regulation to effectively regulate the consumer price index. However, the impact of fixed assets investment on money supply is much smaller. It is believed that the role and effectiveness of regulating and controlling the scale of fixed assets in balancing China's price consumption index is small. Compared with monetary policy, fixed assets investment can only be used as a supplementary regulatory tool.

1. Introduction

The consumer price index (CPI) is a macroeconomic index reflecting the change of the price level of consumer goods and services purchased by households. It measures the relative change of the price level of a group of representative consumer goods and services over time in a specific period of time. It is used to reflect the change of the price level of consumer goods and services purchased by households. Studying the influencing factors of CPI has an important impact on understanding the daily living standards of the residents, the stability of economic system and the implementation of national policies.

2. Vector Auto regression model

The VAR method constructs the model by taking every endogenous variable in the system as a function of the lag value of all endogenous variables in the system. VAR model is often used to predict interconnected time series systems and analyze the dynamic effects of random disturbances on variable systems. This unstructured method can be used to analyze the influencing factors of dynamic variables such as CPI. Therefore, this paper establishes a VAR model to investigate and study the influencing factors of CPI.

2.1 Determination of samples and indicators

Money supply (M) is an important factor affecting the change of demand. According to the theory of money quantity, inflation comes from the growth rate of money, so it has endogeneity to some extent. Investment in fixed assets (IA) determines the price of products to a great extent. Fixed assets investment is mainly supported by the government, so it will not change significantly because of the change of monetary policy. In this model, money supply is regarded as an endogenous variable, and because fixed asset investment determines the changes of interest rate and money supply, the growth rate of fixed assets is also considered as an endogenous variable.

Based on the literature and the data provided by Oriental Wealth Network, this paper investigates the annual data of consumer price index, money supply and fixed assets investment scale in China

  DOI: 10.25236/etmhs.2019.306

from 1981 to 2015. Eviews 8.0 is the data analysis and processing software.

2.2 Unit root test

In this paper, ADF test is used to test the stability of the above sequences.The ADF statistics of CPI are less than the ADF threshold at the 5% significance level, which indicates that the sequence is stable under the 5% confidence level. After the first order difference, PA and M are stable under 95% confidence level.

2.3 Construction of VAR model

Based on the variables selected in this paper: PID, DM and DPA, this paper constructs a three-dimensional vector autoregressive model. In order to determine the lag order of the VAR model, the criterion of determining the lag structure of the model is used to screen the results as shown in the table. According to the principle of minimum selection for each index, the lag order is determined to be 2 and the model is set to VAR (2).

Table 1 Definition Criteria for Delay Period of Vector Autoregressive Model

Lag period	LogL	LR	FPE	AIC	SC	HQ
0	-371.05	NA	9.18e+17	49.8743	50.01591	49.87279
1	-307.38	93.38939	6.52e+14	42.58435	43.15079	42.57832
2	-275.53	10.87493*	2.26e+14*	40.73859*	42.15469*	40.72351*
3	-291.85	16.56619	3.32e+14	41.71358	42.70485	41.70302
4	-596.62	13.38044	2.69e+15	43.83650	45.67528	44.41238

According to the result of vector autoregression, the equation is constructed as follows.

$$\begin{bmatrix} CPI_t \\ DM_t \\ DIA_t \end{bmatrix} = \begin{bmatrix} 319.1 \\ -801.1 \\ 277.7 \end{bmatrix} + \begin{bmatrix} -0.99612 & -1.5005 & 7.09605 \\ 136.6558 & 0.9220 & 0.066227 \\ 59.34266 & 3.8123 & 1.078374 \end{bmatrix} \begin{bmatrix} CPI_{t-1} \\ DM_{t-1} \\ DIA_{t-1} \end{bmatrix}$$

$$+ \begin{bmatrix} -0.83618 & 0.001669 & -0.53264 \\ 428.1988 & 0.373101 & -0.00022 \\ -218.217 & 0.397061 & -0.85751 \end{bmatrix} \begin{bmatrix} CPI_{t-2} \\ DM_{t-2} \\ DIA_{t-2} \end{bmatrix} + \varepsilon_t$$

Since all the unit roots are in the circle, the fitting effect of the model is better.

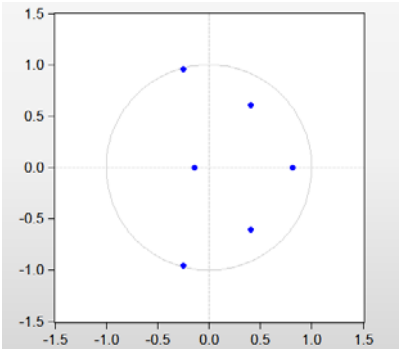

Figure 1 Model Stability Test Chart in Lag Period 2

2.4 Granger causality test

In order to determine the relationship between variables, Granger causality test is applied to the variables in VAR model. The test results are shown in the following form.

Table 2 result of Granger causality test

Null Hypothesis:	Obs	F-Statistic	Prob.
DM does not Granger Cause CPI	35	1.78753	0.2127
CPI does not Granger Cause DM		3.12336	0.0843
DPA does not Granger Cause CPI	35	1.53897	0.2575
CPI does not Granger Cause DIA		4.6776	0.0339
DIA does not Granger Cause DM	35	2.74737	0.1077
DM does not Granger Cause DIA		13.1863	0.0012

As shown in Table 2, money supply (M) is the Granger cause of consumer price index (CPI), and consumer price index (CPI) is also the Granger cause of money supply (M) at the 5% significant level, which proves that the CPI and money supply interact with each other. Fixed asset investment (IA) is the consumer price index at the 5% significant level. The Granger cause of CPI, but CPI is not the Granger cause of IA, which indicates that China's investment in fixed assets can indeed affect China's consumer price index. Fixed assets investment (IA) is the Granger cause of money supply (M), while money supply (M) is not fixed at the 5% significant level. Granger Reason of Asset Investment (IA) indicates that the impact of fixed asset investment on money supply is single, and there is a single causal relationship between them.

2.5 The analysing of impulse response function

In this paper, impulse response function is used to analyze the impact of a standard deviation innovation on endogenous variables.

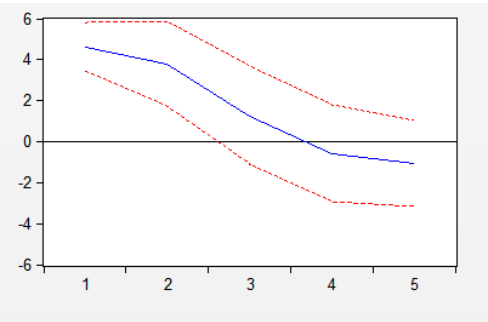

Figure 2 The effect of CPI on itself

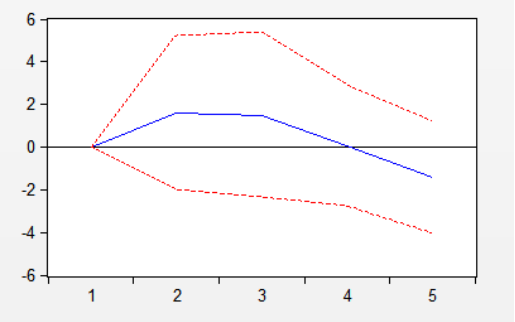

Figure 3 The effect of DIA on CPI

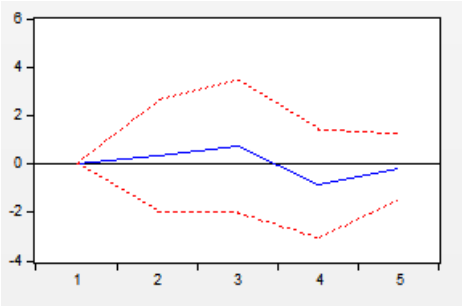

Figure 4 The effect of DM on CPI

The transverse axis represents the number of periods and the longitudinal axis represents the size of the impulse response function. The solid line represents the impulse response function, and the dotted line represents the standard deviation band (+2S.E). Because there are only 35 groups of sample data and the research data are annual data, the selected period is only 5 periods. The analysis results of impulse response function are as follows:

The influence of CPI on itself shows that the change of CPI is positive in the first three phases and begins to be the highest point. After the three phases, it becomes negative to oneself and

gradually converges thereafter. Analyzing the impact of IA on CPI, this shows that fixed asset size plays a positive role in the consumer index at the beginning, and the impact gradually decreases in the third period, and it turns from zero to negative in the fourth period. Analyzing the impact of money supply on the consumer index, it's summarized that the first three periods have a positive impact on the consumer index, but all of them are weak, and reach the highest value in the middle of the third period. From the fourth period, the money supply has a negative impact, and tends to be stable in the subsequent periods. This shows that the impact of money supply on the consumer price index of our country is much smaller than that of the consumer price of our country. The lattice index itself and the influence of fixed assets investment on it.

2.6 Variance decomposition analysis

In the previous impulse response function analysis, this paper analyzed the impact of consumption structure, industrial structure and economic growth on the disturbance impact. Next, this paper use variance decomposition to further analyze the contribution of each shock to the change of endogenous variables, and then understand the relative importance of each random disturbance to the endogenous variables in the VAR model.

Table 3 Variance Decomposition of CPI

Period	S.E.	CPI	M	PA
1	3.757844704	100	0	0
2	5.371623877	77.35317194	22.29616501	0.350663049
3	6.394604359	54.69076671	43.85610254	1.45313075
4	6.639154113	51.30006292	45.71494915	2.984987933
5	6.641188572	51.26972861	45.68792778	3.042343607

The standard deviation of a new stochastic quantity of the size of the standard deviation of CPI is mainly induced by the consumer price index from the second year. But its influence on itself shows a gradual decreasing trend, and in the fourth period, it almost reduces to about 51% of the lowest. Secondly, money supply, which contributes to the consumer price index, shows an increasing trend. By the fifth year, the proportion of money supply reaches the highest, 45.7%, which is consistent with the results of impulse response analysis.

Table 4 Variance Decomposition of DM

Period	S.E.	CPI	M	PA
1	0.084656	0.021879	99.97812	0
2	0.179717	4.009416	95.95675	0.033832
3	0.248758	7.878484	91.38628	0.735231
4	0.291807	10.648	88.33197	1.020031
5	0.318996	13.00074	85.83609	1.163172

The standard deviation of a stochastic new quantity with the size of standard deviation of M is mainly induced by the itself and CPI, but the impact is small within five years. The contribution of the CPI to the change of M increases to 13% in the fifth year, which is considered as a long-term effect.

Table 5 Variance Decomposition of DIA

Period	S.E.	CPI	M	PA
1	3938.284	9.48E-06	3.078349	96.92164
2	3950.846	0.028083	3.367937	96.60398
3	5035.352	0.61505	10.85751	88.52744
4	5307.84	0.688143	13.42919	85.88267
5	5665.685	0.835848	17.18302	81.98113

For a stochastic new quantity of standard deviation of PA, the standard deviation is mainly induced by the itself and M. But the impact is small within 5 years, the contribution of M to the change in M increases to 17% in the fifth year, which is considered as a long-term effect, but its impact far exceeds the impact of the CPI.

3. Conclusion and suggestion

Based on the analysis of the VAR model above, we can drawn the following conclusions:

First, the impact of the consumer price index on itself is very obvious, but this impact will gradually decrease in three years, down to zero at the end of the third year and the beginning of the fourth year. This reflects the rising trend of price around equilibrium fluctuations, and also shows that the rise of consumer price index does not have long-term.

Second, the money supply in first-order difference has a certain impact on the consumer price index, and the effect is quite significant, far greater than the impact of fixed-asset investment. This shows that appropriate monetary policy plays an important role in balancing the consumer price index. Different as the impact of consumer price index on itself, this kind of shock will rise in the first year, and then decrease after reaching the highest point in the second year, and will drop to zero by the end of the third year and the fourth year. To curb the excessive consumer price index, monetary policy is an important and effective adjustment tool.

Third, the consumer price index and the money supply have very little reaction to the scale of fixed asset investment. Even in the fifth year, the sum of the consumer price index and the money supply has not increased to 20%. Therefore, controlling the scale of fixed asset investment is not an effective policy for balancing a country's consumer price index, in another way, the impact between the consumer price index and fixed asset investment is small.

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