

The Empirical Analysis of Fiscal Policy in Urbanization Development

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Abstract—Urbanization is an important driving force for China's economic development, and it is inseparable from the support of fiscal policies. Therefore, establishing a modern fiscal system and deepening the reform of the tax system to promote rapid urbanization have become urgent issues. Based on the analysis of the role of fiscal policy in urbanization development, empirical analysis by using the VAR model show that there is a close co-integration relationship between urbanization development and fiscal policy. So it is important to establish a "two-way mechanism" between urbanization development and fiscal policy. The gradual and alternative effects of the two major variables of fiscal policy can promote the development of urbanization, at the same time, accelerating the process of urbanization can continuously improve the fiscal policy, such as promoting the steady growth of public fiscal revenue and the scientific allocation of public fiscal expenditure.

Keywords—urbanization; fiscal policy; VAR model

I. INTRODUCTION

Urbanization is an important symbol of national modernization and an important starting point for economic development, and it is of great significance for the victory of building a moderately prosperous society in an all-round way. The report of the 18th National Congress of Chinese Communist Party in November 2012 proposed to promote new-type urbanization, the report of the 19th CPC National Congress in October 2017 also proposed the simultaneous development of new urbanization and new industrialization, informatization, and agricultural modernization. Fiscal policy, as one of the important means of government macro-control, is an important force to promote the development of urbanization in our country, speeding up the establishment of a modern fiscal system and budget system, and deepening the reform of the tax system are the directions of fiscal policy development. Therefore, studying the mechanism of fiscal policy to promote urbanization and drawing conclusions through empirical analysis has important theoretical significance and practical value for putting forward targeted fiscal policy.

From the perspective of urbanization or fiscal policy alone,

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there are more studies on this in foreign countries, but less research on combining the two, especially the use of fiscal policy tools to promote the development of urbanization. For example, the United States Cho [1] believes that there is a close relationship between urbanization, land use regulation and public finance, he uses a polychotomous selection model to measure how land use regulation affects fiscal policy making in urbanization; George and Yi [2] believe that the key in the process of urbanization is how to effectively capitalize land, how to develop the land, and how local public policies can play a regulatory role. George [3] and others think that urbanization has entered the era of neo-liberalization, and state power reorganization, land development, and urban finance play a vital role in urbanization; Charlot [4] and others believe that controlling the size of the population and strengthening fiscal cooperation are likely to reduce tax competition and therefore increase local business tax rates, they draw lessons from French urbanization experience to assess the impact of decentralized state fiscal cooperation on local taxation, and use space and panel measurement techniques to set up a taxation model for urbanization development.

In China, the main research in recent years is new urbanization, which was first proposed by Xie Zhiqiang of the Central Party School of the Communist Party of China in the article "New Urbanization: A New Choice for China's Urbanization Road". Later, many experts and scholars have studied this one after another. Yang Deqian and others put forward financial policy innovation suggestions such as innovative public utilities, reform the industrial development, and improvement of capital guarantee for new urbanization development in less-developed areas; Xu Yingzhi and others used empirical data from 13 years of provincial panel data to analyze the effect relationship between public service provision, local fiscal capacity and new urbanization; through empirical analysis, Zhang Ning concluded that public financial expenditure plays an important role in promoting the development of new urbanization, and the effect becomes more pronounced as the number of lags increases; Zhu Boming et al. believed that as the core of the new urbanization, the urbanization of the agricultural migrant population faces a major obstacle that lies in the financial burden of the inflowing local governments, and that "central and local sharing, local-oriented" financial preparation is an inevitable choice; Peng Xuhui, etc. analyzed the variable structure co-integration of China's new urbanization development from the perspective of

fiscal decentralization, concluded that fiscal decentralization is conducive to urbanization of land but not to urbanization of the population; Fu Huan and others held that expenditure on new urbanization public services such as education, medical care, social security, health and employment has a positive effect on economic growth, while infrastructure and housing have a negative effect.

Judging from the above research content, there are few studies on the financial policy of urbanization development abroad; looking at the database of HowNet, although there are domestic studies on the financial policy of the new urbanization development, there are few studies on the fiscal policy measured by public financial revenue and public financial expenditure, and the use of VAR model to empirically analyze the internal relationship between it and the development of new urbanization. The important symbol to measure the development level of urbanization is the urbanization rate, which is usually divided into the urbanization rate of resident population and the urbanization rate of registered population. The former refers to the proportion of urban population in the total population, and the latter refers to the proportion of urban registered population in the total population. This paper studies the urbanization rate of resident population [5].

II. MECHANISM OF FISCAL POLICY TO PROMOTE URBANIZATION

A. Fiscal Policy Promotes Sustainable Urbanization

Fiscal policy mainly promotes the sustainable development of urbanization through two tools: public revenue and public expenditure. From 1978 to 2016, China's urbanization rate has a close relationship with public financial revenue and expenditure that cannot be ignored, and its trend is basically the same, both of which are keeping rising. The continuous improvement of urbanization rate is inseparable from the positive effect of fiscal policy.

Fiscal policy provides a good macro policy environment for the sustainable development of urbanization, and the development of urbanization also puts forward new requirements for fiscal policy. Fiscal policy must provide policy support and guarantee for the development of urbanization. First, the tax-sharing financial system and transfer payment system ensure sufficient local financial resources and improve the local public service system; second, a wholesome public financial expenditure system can speed up the construction of public infrastructure for urbanization and creates a good new urban atmosphere; third, the deepening reform of the household registration system has accelerated the urbanization of population and removed the institutional obstacles to urbanization; fourth, the continuously increased tax incentives efforts to create a good investment environment for urbanization. The above fiscal policies provide strong backing for the development of urbanization.

B. The Internal Mechanism of Fiscal Policy to Promote the Development of Urbanization

There is a close relationship between fiscal policy and the development of urbanization. The development of urbanization needs the dynamic mechanism of fiscal policy. The various infrastructure, public service supply and population transfer policy needed by urbanization belong to public goods, and their non-exclusivity and non-competitiveness determine that it is difficult for market provide, but should be provided by public finance. The major functions of public finance, such as resource allocation, income distribution and economic regulation can provide the needs for urbanization. Among them, the resource allocation function can effectively improve the level of infrastructure and continuously improve the supply of public services; the income distribution function can effectively improve the level of social security and reduce the income gap between urban and rural residents; the adjustment of economic functions can effectively play the role of "automatic stabilizer" and constantly adjust the macroeconomic operation. These functional roles of fiscal policy can bring urbanization income effects and substitution effects, and constantly make the main factors of labor, capital, and technology, especially the labor factors shift from the primary industry to the secondary and tertiary industries, and from rural to towns and cities. As a result, people-oriented urbanization is continuously promoted, which in turn affects economic factors, improves human capital, optimizes the industrial structure, and expands the scale of investment, etc., further accelerates the development of new-type urban economies, and sets new requirements for fiscal policies [6].

III. VARIABLE SELECTION AND MODEL SETTING

A. Selection of Data and Variables

The main indicator of urbanization development is the urbanization rate, and the most important tools of fiscal policy are fiscal revenue and fiscal expenditure. Therefore, this paper uses the urbanization rate to quantify the level of urbanization development, and public fiscal revenue and public fiscal expenditure to quantify the effects of fiscal policy. The original data is from the national data from 1978 to 2016. For the convenience of model calculation, UR is used as the urbanization rate, PFI is used for public finance income, and PFE is used for public finance expenditure. Considering that the original data may have a heteroscedasticity problem, taking a logarithm of each original data will not only eliminate this problem to a certain extent, but also increase the flexibility of the model variables and make the results more scientific and accurate. Relevant raw data and logarithmic variable values were calculated from China Statistical Yearbook (2017).

B. Model Settings

VAR was first proposed by Professor Christopher Sims in 1980. Its English name is Vector Auto-regressive, and Chinese is vector autoregression. The VAR model uses the statistical characteristics of time series as the starting point, uses the minimum economic theoretical assumptions, analyzes the shock response of the economic system, accurately reflects the dynamic characteristics of the economic system and the impact

transmission mechanism, and scientifically performs dynamic simulation and policy analysis. Let Y_t be the column vector, β_i be the parameter matrix to be estimated, ε_t be the random perturbation term, and p be the lag order of the variable, so it can be called a VAR (p) model Except for contemporaneous variables, there is no correlation between the variables and the variables on the right side of the model and their own lag values [7]. Based on the empirical analysis of urbanization development and fiscal policy in this paper, the following VAR model and parameter matrix are established:

$$Y_t = \alpha + \sum_{i=1}^p \beta_i Y_{t-i} + \varepsilon_t$$

$$Y_t = \begin{pmatrix} \ln FE_t \\ \ln FR_t \\ \ln UR_t \end{pmatrix}, \alpha = \begin{pmatrix} \alpha_1 \\ \alpha_2 \\ \alpha_3 \end{pmatrix}, \beta_j = \begin{pmatrix} \beta_{1p} \\ \beta_{2p} \\ \beta_{3p} \end{pmatrix}, \varepsilon_t = \begin{pmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \\ \varepsilon_{3t} \end{pmatrix}$$

IV. EMPIRICAL ANALYSIS OF VAR MODEL

A. Stationarity Test and Cointegration Test of Variables

For time series data, it is necessary to ensure that all variables are stable and the same integer order, otherwise co-integration tests cannot be performed and “false regression” problems may occur. Using the unit root test of EViews8 software, when the value of Prob is less than 0.05 (or 0.1), or the ADF statistical value is less than the critical value at the levels of 1%, 5%, and 10%, the variable is stable, otherwise it is non-stationary. If the zero-order difference test is not stable, you can use the first-order difference. If it is not stable, use the second-order difference, and so on, until the test is stable. In this paper, it can be seen that all three variables are stable under second-order differences and are second-order simple integers.

After the variables pass the stationary test, Johansen co-integration test is performed. When the Prob value is less than 0.05 (or 0.1) or the residual unit root test is stable, it indicates that there is a long-term co-integration relationship between the variables. As shown in Table I, after the ADF test, the residuals are stable under the second order difference, and the variables pass the Johansen cointegration test. The results show that the above three variables have a long-term cointegration relationship. The mathematical expression is:

$$E1 = LNUR + 0.5870LNPFI - 0.7746LNPFE$$

B. Establishment of VAR Model

In the relationship between urbanization development and fiscal policy, since not only the current public financial income and public financial expenditure have an impact on the urbanization rate, but also the lag value of the variable itself, it is necessary to determine the lag value of the variable. Generally, the variable lag value should be selected with reference to the optimal values of AIC and SC, but if the optimal values of the two are not in the same lag order, the LR optimal value shall prevail. It can be seen that the variable lag is determined to be 3rd order. To this end, a VAR (3) model is established, and the regression results are shown in Table I.

TABLE I. RESULTS OF VAR MODEL REGRESSION

| | LNUR | LNPFI | LNPFE |
|-----------|----------------------------------|----------------------------------|----------------------------------|
| LNUR(-1) | 1.1685 (0.1756) [6.6554] | 1.7153 (0.8512) [2.0152] | 1.1949 (0.7453) [1.6032] |
| LNUR(-2) | -0.0595 (0.2569) [-0.2317] | -2.2336 (1.2456) [-1.7931] | -1.3118 (1.0907) [-1.2027] |
| LNUR(-3) | -0.2459 (0.1493) [-1.6473] | 0.9729 (0.7238) [1.3442] | 0.5336 (0.6338) [0.8419] |
| LNPFI(-1) | 0.0023 (0.0518) [0.0454] | 1.3581 (0.2513) [5.4039] | 0.4928 (0.2201) [2.2393] |
| LNPFI(-2) | -0.0210 (0.0679) [-0.3092] | -0.9871 (0.3292) [-2.9986] | -0.6058 (0.2883) [-2.1016] |
| LNPFI(-3) | -0.0274 (0.0527) [-0.5199] | 0.5475 (0.2555) [2.1424] | 0.2790 (0.2238) [1.2471] |
| LNPFE(-1) | 0.0266 (0.0581) [0.4581] | 0.3101 (0.2816) [1.1011] | 1.3002 (0.2466) [5.2732] |
| LNPFE(-2) | 0.0544 (0.0690) [0.7888] | -0.0416 (0.3345) [-0.1245] | -0.6704 (0.2929) [-2.2892] |
| LNPFE(-3) | -0.0096 (0.0518) [-0.1848] | -0.2765 (0.2510) [-1.1019] | 0.1269 (0.2198) [0.5774] |
| C | 0.2483 (0.0993) [2.5009] | -0.7028 (0.4814) [-1.4599] | -0.6608 (0.4215) [-1.5677] |

This article takes the urbanization rate as the explanatory variable, and uses public financial income and public financial expenditure as explanatory variables. The VAR model is used to analyze the impact of fiscal policy on urbanization development. The VAR model can be written as a mathematical expression:

$$\begin{aligned} &LNUR = 1.1684 \quad LNUR(-1) = -0.0595 \quad LNUR(-2) = -0.2459 \\ &LNUR(-3) + 0.0024LNPFI(-1) - 0.0210LNPFI(-2) - 0.0274LNPFI(-3) \\ &+ 0.0266LNPFE(-1) + 0.0544LNPFE(-2) - 0.0096LNPFE(-3) + 0.2483 \end{aligned}$$

C. Stationarity Test of VAR Model

The results of the VAR model stationary test are shown in Table II and Figure1. It can be seen that the absolute value of the unit root of the VAR model is less than 1, and all fall within the unit circle. It shows that the VAR model is a stationary system, which can be analyzed by a standard deviation impulse response function.

TABLE II. RESULTS OF VAR MODEL REGRESSION

| ROOT | MODULUS |
|------------------|---------|
| 0.9992 | 0.9992 |
| 0.7379 - 0.1486i | 0.7527 |
| 0.7379 + 0.1486i | 0.7527 |
| 0.7433 | 0.7433 |
| 0.4718 - 0.4724i | 0.6677 |
| 0.4718 + 0.4724i | 0.6677 |
| 0.0062 - 0.6603i | 0.6604 |
| 0.0062 + 0.6603i | 0.6604 |
| -0.3476 | 0.3476 |

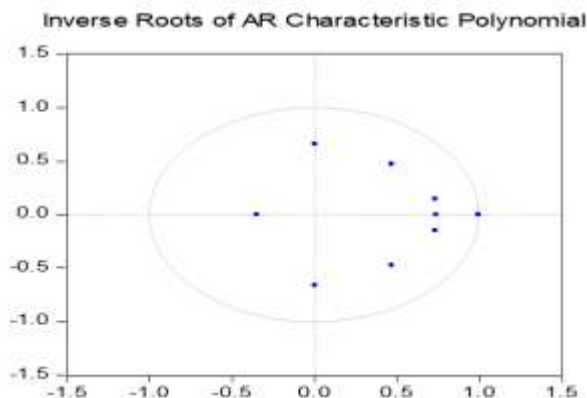


Fig. 1. Stationarity test results of VAR model

D. VAR Impulse Response Analysis

We can see the response of China's urbanization rate, public financial revenue and public financial expenditure to future information. The analysis results are:

First, the response of the urbanization rate to itself and public financial revenue and public financial expenditure. The response of the urbanization rate to itself was more intense in the first three periods, steadily increased after the third period, and reached the highest value of 0.0186 in the sixth period, after which the response declined steadily in each period; The response of the urbanization rate to public financial revenue and public financial expenditure is relatively similar, and it has only begun to appear in the second period. The reaction in the third to sixth periods is more intense, reaching the highest values of 0.0067 and 0.0104 respectively in the seventh period, and then tending to stable. It can be seen that there is a close relationship between the urbanization rate and public financial income and public financial expenditure, and the urbanization rate has a greater response to public financial expenditure [8].

Second, the response of public fiscal revenue to itself and the urbanization rate and public fiscal expenditure. The response of public financial revenue to itself was more intense in the first two periods, reaching the highest value of 0.0656 in the second period, and then steadily decreasing in each period; The response of public financial revenue to the urbanization rate was sharp in the first four periods, especially in the second period, which rose rapidly, and then each period rose steadily;

The response of public financial revenue to public financial expenditure did not respond in the first period, the second to fourth periods rose rapidly, the fifth to sixth periods fell rapidly, and then rose steadily.

Third, the response of public fiscal expenditure to itself and the urbanization rate and public fiscal revenue. The overall response of public financial expenditure to itself is stable. The first to second periods rise steadily, the third to seventh periods decline steadily, and then rise steadily. The response of public fiscal expenditure to the urbanization rate is similar to the response of public fiscal revenue to the urbanization rate; The response of public financial expenditure to public financial income was relatively drastic in the first three periods, especially in the second period, which rose rapidly, reaching the highest value of 0.0574 in the third period, and the fourth to fifth periods fell rapidly, and the subsequent periods were relatively stable.

V. EMPIRICAL ANALYSIS CONCLUSION OF VAR MODEL

Based on the empirical analysis of the VAR model of urbanization development and fiscal policy, the conclusions are as follows:

First, China's level of urbanization is still low compared to foreign countries. From the basic data, although China's urbanization development level is relatively fast, the urbanization rate increased from 17.92% in 1978 to 57.35% in 2016, it is still far below the developed countries with an average level of 82.00% and the developing countries with an average level of 65.00%. So it is of great significance to continuously improve the level of urbanization development in China.

Second, the urbanization rate has a long-term co-integration relationship with public fiscal revenue and public fiscal expenditure. According to the Johansen cointegration test, it is concluded that the three have long-term cointegration relationships of 1.000, 0.5870, and -0.7746. With the continuous development of China's economy, the increase in public financial revenue, the expansion of public financial expenditure, and the continuous optimization of the two structures will definitely promote the development of new urbanization.

Third, the effect of public financial expenditure on the development of urbanization is more obvious than public financial revenue. The average impulse response of the urbanization rate to public financial expenditure and public financial income is 0.0069 and 0.0047 respectively; and the average variance decomposition of public financial expenditure and public financial income to the urbanization rate is 9.81% and 4.66% respectively. The former response and contribution rate are more obvious.

Fourth, there is a close relationship between the development of new urbanization and fiscal policy. It is very important to establish a "two-way mechanism" for new urbanization development and fiscal policy: The gradual and alternating effects of the two major variables of fiscal policy can promote the development of new urbanization. At the same time, accelerating the process of new urbanization can

continuously improve the fiscal policy, promote the steady growth of public financial revenue and the scientific allocation of public financial expenditure.

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