

Local Government Debt and Economic Growth in China—An Empirical Study Based on Granger Causality Test

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Abstract

In both the theoretical and empirical levels, both at home and abroad, the research of the relativity between government debt and economic growth is still inconclusive. Combined with the practical situation of China, this article takes 31 provinces of our country from 1995 to 2014 and 18 (2005, 2013, rejecting) local government debt and economic growth data as samples. First, we conduct unit root test on two variables DEBT and GDP to ensure that data is stationary, and then, on this basis of unit root test, we conduct cointegration test to determine whether there is a long-term cointegration relationship between DEBT and GDP. Finally, on the basis of the first two steps, we conduct Granger causality test on DEBT and GDP. The results show that the local government debt and economic growth in China is the second order sequences that are of single integer. And there may not exist long-term cointegration relationship between DEBT and GDP. In the short term, the economic growth of local government is the Granger cause of local government debt, but the local government debt is not a Granger cause of economic growth of local government. In the medium term, the economic growth of local government is still the Granger cause of local government debt and its performance is more significant. However, local government debt is not the Granger cause of local government economic growth, but it is weaker than the short-term. In the long term, economic growth and government debt of local government exit Reciprocal causation relationship. According to 18 years real data of 31 provinces in China, we design empirical scheme and conduct Granger causality test in using econometric software Eviews 8. This is the possible innovation of this article.

Keywords

Government Debt, Economic Growth, Unit Root Test, Cointegration Test,

1. Introduction

1.1. Research Background

In the 10 years before the reform and opening-up policy, the Chinese government had neither internal debt nor external debt. However, with the reform and opening-up policy in 1978, the central government continued to run deficits for the next two years. Since then, and the Chinese government has once again entered the era of rapid development of debt. Since the reform and opening-up policy, especially since China established the socialist market economic system in 1992, the market economy has developed rapidly, and urbanization and industrialization have continued to advance. As China's infrastructure construction requires a large amount of capital investment, China's local government funds are scarce. Difficult to cope with this kind of funding demand, it began to finance through borrowing, guarantee or deferred payment, and transfer of treasury bonds, and various government debts were generated [1]. When the international financial crisis broke out in 2008, the scale of Chinese local government debt expanded rapidly. Showing in **Figure 1**, according to the National Bureau of Statistics, as of the end of 2014, the size of local government debt has exceeded 10 trillion yuan, and there is a growing trend. At the same time, the Chinese economy has ended the "crazy growth" of reform and open for more than 30 years, and the downward trend has gradually emerged. The local government debt problem is bound to be "unworthy."

In addition, before 2014, according to the "Budget Law of the People's Republic of China", local governments should maintain balance of payments and leave no deficits. Unless otherwise stipulated by national laws and the State Council, local government bonds may not be issued [2]. On August 31, 2014, the new "Budget Law" was voted by the 10th meeting of the Standing Committee of the 12th National People's Congress. Since 2015, the local government would be

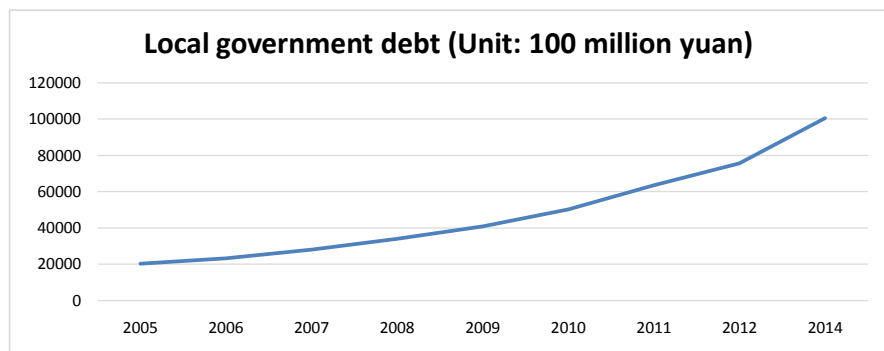


Figure 1. Scale of local government debt during the decade of 2005-2014. Data sources: National Bureau of Statistics of the People's Republic of China (data in 2013 has been removed due to unpublished).

given appropriate credits. This is the first time legally allowed local governments to conditionally borrow. And this move has once again brought the issue of government debt to the public. The new “Budget Law” has expanded the creditor’s rights of local governments, which will certainly have a certain impact on the economic development of local governments.

1.2. Research Significance

The significance of this paper is that, for many years, the academic community has always regarded local government debt and economic growth as one of the focuses. Numerous studies have shown that there is an inseparable relationship between government debt and economic growth, and specifically for China. There is very little literature focusing on the Granger causality test between China’s local government debt and its economic growth. At the same time, in recent years, the scale of local government debt has been expanding, the corresponding debt risk has been increasing, and the Chinese economy has gradually entered the “new normal”, and the downward pressure has gradually increased. In this context, studying the relationship between local government debt and its economic growth is of great significance for improving the effectiveness of local government debt in economic development, and promoting local economic development and preventing local government debt risks. It is also conducive to China’s effective response to the downward pressure on the economy, achieving medium/high-speed growth in the context of the “new normal” and successfully crossing the “middle income trap”.

2. Literature Review

2.1. Government Debt Promotes Economic Growth

After the 1930s, Local Government Debt Theory began to appear. The first generation of fiscal federalism was mainly represented by Tiebout [3] Stigler [4] and Oates [5]. They paid attention to the reasons why local governments issued credits. They pointed out that in terms of economic growth, the use of local government borrowing is the best choice for financing local investment projects. In the following half century, research on government debt and fiscal risk further enriched and developed the theory of local government debt. This period was mainly represented by scholars such as Stiglitz [6] Brixi [7] and Easterly [8]. At the end of the 20th century, de Mello and Luiz [9], Dafflon and Beer-Toth [10] explained the reasons for the serious local debt problems in some transition countries, namely, the background of fiscal decentralization and taxation. Under the local government, in order to invest in infrastructure to promote economic growth, they have to borrow heavily.

Xiaolin Miu and Runmin Fu (2013) used C-D production function and IS-LM system to take social fixed assets investment as a transmission path. Based on the local government debt construction model, they tried to explore the impact of

local government debt on economic growth. The panel data of 106 counties in Y Province from 2005 to 2010 were empirically tested. Studies have shown that, overall, local government debt can promote county economic growth.

Wenwei Zhu and Yong Chen (2014), based on two debt audit data (end of 2011 and the end of June 2013), first analyzed the mechanism of local government debt on regional economic growth, and then used descriptive statistics on the relationship between the two. The method tests and finds that government borrowing is conducive to promoting regional economic growth, and with the increase of debt ratio, regional economic growth is also accelerating, but it has a convergence characteristic [11].

Based on the neoclassical theory, the Youth Joint Research Group of the Nanchang Central Branch of the People's Bank of China (2014) conducted an empirical test on the suitability of China's government debt and economic growth. The entry point is to verify whether the government debt Laver curve exists, from the central The two dimensions of government debt and national government debt explore the threshold range of government debt in China. Studies have shown that government borrowing effectively promotes economic development, and that government debt has a significant short-term stimulus effect on economic growth and is not sustainable for a long time.

Jian Lu (2015), based on the measured data of local government debt scale, using the dynamic panel data model to examine the spatial and temporal heterogeneity of the impact of local government debt on economic growth, and to make a robust test. It is concluded that local governments can increase liquidity in the economy by borrowing money, and Official performance competitions, infrastructure investment, and local government powers are common ways for local governments to increase investment opportunities and expand investment scales. The purpose is obvious: to promote local economic growth.

2.2. The Impact of Government Debt on Economic Growth Is Neutral

Early researcher Bailey (1962) argued that if social residents are fully aware of future taxes implied by government debt, the economic effects of debt financing and taxation are completely equivalent. Tobin (1971) further believes that future taxation will increase due to repayment of government debt, which in turn will reduce private wealth, so that net wealth will not increase due to government debt.

Based on the OLG model, Barro (1974) introduced a backward cross-generational altruism, proving that government debt is equivalent to tax financing. He pointed out that if people have a positive inheritance motive, no matter how the government debt scale changes, the short-term behavior of the economy and long-term balanced growth will not be affected.

Carmichael (1982) further proves that if the cross-generational altruism motivation exists, the "Ricardo equivalence theorem" still holds. In the empirical field, Kormendi (1986, 1990, 1995) found through research that economic growth is not affected by government debt.

2.3. Government Debt Hinders Economic Growth

Ramey (1995) pointed out that government debt is high, the country's ability to formulate countercyclical policies will be limited, and the volatility of output will increase, which will slow down economic growth.

Elmendorf and Mankiw (1999) argue that in the long run, the reduction in public savings brought about by debt is not enough to be compensated by the increase in private savings, resulting in a decline in overall savings and a reduction in investment levels, which will have a negative impact on GDP growth. Negative effects may also be magnified by distorting the tax effect. According to their estimates: for every 1% increase in government debt, the steady-state total output will be reduced by 10%, of which 9 percentage points is due to the decrease in capital stock, and 1 percentage point is caused by future tax distortions, especially when debt/When the ratio of GDP reaches 100%, the average annual GDP growth rate will drop by 20 basis points in the first 20 years. Cochrane (2011) further believes that if government debt is high and uncertainty arises, it is expected that tax revenue will increase in the future, financial repression and inflation will follow, and government debt will have a greater negative impact on economic growth. It may happen even in the short term.

Yin Heng (2006) studied the relationship between economic growth and government debt on the basis of Barro's (1991) empirical study on economic growth, and concluded that government debt impedes long-term economic growth and countries with high government debt/GDP ratios. The per capita real GDP growth rate is low. It is also found that the negative impact of government debt in developing countries on economic growth is more common.

2.4. Review of Research Status

By combing the existing literature, we can find that the research on the correlation between government debt and economic growth is still inconclusive, and the research of the predecessors focused on national collection (emerging markets、 Countries or regions, developed countries or regions, members of the euro zone, OECD members, etc). And the time span is many decades or even hundreds of years. There is almost no research based on Chinese data. However, China has its particularity. The development of local government debt is relatively short. It also has obvious special characteristics in terms of formation mechanism, expenditure investment and term structure. Therefore, its research results cannot be directly applied to China.

The current domestic research on local government debt issues mainly focuses on the following three aspects: first, the estimation of the reasonable scale of local government debt; second, the analysis of the reasons for the formation of local government debt; third, the local government debt financing platform and financing methods. There is not much literature on the relationship between local government debt and economic growth. This may be due to the fact that there was almost no comprehensive domestic government debt data published

before 2010. Therefore, the existing research is either to study the economic effects of national debt, or to “avoid” government debt data, by selecting some proxy variables of government debt or avoiding government debt. From the perspective of fiscal deficit, the relationship between local government debt and China’s economic growth is indirectly studied. However, neither the national debt nor the choice of other agency variables can rigorously describe the relationship between debt and the economy, because whether it is a national debt or a fiscal deficit, its amount is far lower than the current government debt of China. So what is the relationship between local government debt and economic growth? Empirical testing is still required with the latest government debt data.

Based on the actual situation in China, this paper selects the local government debt and economic growth data of 31 provinces in China from 1995 to 2014 (data in 1995 and 2013 has been removed due to unpublished, other data are available) as a sample, and uses Granger causality test to study the causal relationship between the two. First of all, according to the Granger causality test, in order to ensure the stability of the variables, this paper carries out the unit root test on the two variables of DEBT (government debt, the same below) and GDP (economic growth, the same below). Then, based on the unit root test, a co-integration test is performed using a variety of methods to determine whether there is a long-term equilibrium cointegration relationship between DEBT and GDP. Finally, based on the first two steps, the Granger causality test is carried out on DEBT and GDP, and the research conclusions are drawn in three stages of short-term, medium-term and long-term according to the time series, and corresponding policy recommendations are put forward. This is the main content of this article.

3. Research Hypothesis

As far as the current economic environment is concerned, the construction of public infrastructure of local governments is one of the main indicators for assessing the performance of local government officials, and is also an important basis for determining the promotion of official positions. In China, because the cadre assessment and appointment system is very imperfect, the central government’s assessment of local government’s performance depends mainly on simple economic indicators, but “there are policies and countermeasures”, which makes local government officials only pay attention to immediate interests. During the term of office, he engaged in “political performance projects.” What’s more, a local investment company was set up to take charge of local project construction. The strong development desire of the government, the huge political pressure and the unsound performance evaluation system have intensified the growth of local government debt to some extent. Therefore, in order to improve their performance, local governments often borrow heavily. After the regional GDP gains, the local government has more original capital such as infrastructure construction investment. At this time, the local government will use a large

amount of construction funds held by the local government. Investing in the above types of construction, the scale, speed and increment of such construction investment are particularly prominent when the local economy is rapidly developing. Based on the above analysis, we propose the following assumptions:

H1: Local government economic growth constitutes a cause of local government debt.

As mentioned above, China's local government debt is mainly used for highway construction, urban infrastructure construction, and education investment, all of which involve local government investment behavior. This requires us to use investment as an entry point to examine the impact that government debt may have on economic growth. There is a view that government investment can produce public infrastructure such as roads and can be used as an additional investment in private capital, thereby helping to increase the marginal product of private investment. Local economic growth requires a certain amount of investment from local governments. However, the role of government investment in economic growth is not immediately obvious, but will continue to exist for a long period of time, that is, it has a lag. Specifically, the impact of local government investment behavior on the economy cannot be immediate. In this process, there is usually a time lag that takes a while to fully act on the economy. Considering that the government's investment projects are large-scale infrastructure construction projects, the scale of investment funds is large, the construction period is long, and the lag of investment is particularly obvious. It is difficult to generate considerable economic effects in the short term, combined with the lag period of the predecessors. Based on the objective fact of investment lag, this paper proposes the following hypothesis:

H2: In the short-term, due to the obvious lag of investment, local government debt does not constitute the cause of local government economic growth; in the medium term, the effect of investment is gradually emerging but may still not be enough to constitute the cause of local government economic growth; In the long run, the effect of investment is undoubted, and local government debt constitutes the cause of local government economic growth.

4. Empirical Analysis

4.1. Data Source and Sample Selection

The data selected in this paper are all derived from the statistical data published in the official website of the National Bureau of Statistics of China. The selected indicator data are the GDP and government debt of 31 provinces (excluding Hong Kong, Macao and Taiwan). The sample period is 18 years from 1995 to 2014 (note that the data for 2004, 2013 and 2015 are not available, so it is not in the sample). And use the econometric software Eviews 8 to carry out the corresponding data processing. In the text, GDP is used to represent the local government economy, and DEBT is used to represent local government debt. **Table 1**

gives descriptive statistics for the two variables, DEBT and GDP.

4.2. Unit Root Test

The unit root test refers to whether there is a unit root in the test sequence, and the unit root is a non-stationary sequence. The unit root refers to the unit root process, which can prove that the unit root process in the sequence is not stable, and there will be pseudo-regression in the regression analysis. Eviews 8 provides all six test methods. In order to ensure the robustness and accuracy of the results, this paper decided to use all six test methods to test the stability between China's local government DEBT and GDP.

From the test results in **Table 2**, it can be seen that for local government debt and economic growth, the test results of the six test methods are not significant, indicating that there is a unit root. The results of the first-order difference of DEBT show that the test results of LLC test and Fisher-PP test are significant at 5% confidence level, rejecting the null hypothesis of unit root, but the test results of Breitung test, Hadri test, IPS test and Fisher-ADF test are not significant, and the original hypothesis cannot be rejected. Therefore, DEBT1 is more likely to be unstable. The results of first-order difference in GDP show that only the results of Breitung test and Hadri test are not significant, and the test results of LLC test, IPS test, Fisher-ADF test and Fisher-PP test are all significant at the 1% confidence level, rejecting the null hypothesis of unit root, therefore, GDP1 The possibility of stability is greater. Since the test results of DEBT1 and GDP1 are not clear enough, they are tested after the second-order difference. The results of the second-order difference between DEBT and GDP show that the test results of LLC test, IPS test, Fisher-ADF test and Fisher-PP test are not significant except that the test results of Breitung test and Hadri test are not significant. Both are very significant and can negate the null hypothesis of the existence of the unit root. Therefore, the first order of local government debt and economic growth sequence may be single and second order. The test results also indicate that there may be a long-term equilibrium cointegration relationship between DEBT and GDP, which can be explained by the following further cointegration test.

4.3. Cointegration Test

Co-integration has a common tendency of randomness. The purpose of cointegration test is to determine whether a linear combination of a set of non-stationary sequences has a stable equilibrium relationship. If there is a cointegration relationship between the interpreted variable and the explanatory variable, then the inter-variable relationship is there is a stable equilibrium relationship.

Similarly, in order to ensure the robustness and accuracy of the results, this paper decided to use all seven test methods to test the cointegration relationship between DEBT and GDP of local governments in China. The original hypothesis of the Pedroni cointegration test is that there is no cointegration relationship.

Table 1. Descriptive statistics.

Variable	Mean	Median	Maximum	Minimum	Standard deviation	Sample size
DEBT	912.41	352.97	11,878.54	2.05	1417.94	556
GDP	7315.46	3628.74	67,809.85	56.11	9818.85	556

Table 2. Government Debt (DEBT) and Economic Growth (GDP) Sequence Unit Root Test.

variable	LLC	Breitung	Hadri	IPS	Fisher-ADF	Fisher-PP
DEBT	50.2278 (1.0000)	21.3854 (1.0000)	17.3518 (0.0000)	48.3166 (1.0000)	0.08421 (1.0000)	0.00673 (1.0000)
GDP	11.9507 (1.0000)	25.5477 (1.0000)	18.9369 (0.0000)	20.5587 (1.0000)	0.17629 (1.0000)	0.06378 (1.0000)
DEBT1	-4.65128 (0.0000)	5.19503 (1.0000)	13.4961 (0.0000)	1.20637 (0.8862)	67.9805 (0.1309)	83.0896 (0.0109)
GDP1	-10.2409 (0.0000)	3.07149 (0.9989)	14.6247 (0.0000)	-4.47439 (0.0000)	103.240 (0.0001)	147.138 (0.0000)
DEBT2	-36.9755 (0.0000)	2.57261 (0.9950)	29.0206 (0.0000)	-15.1841 (0.0000)	207.638 (0.0000)	298.775 (0.0000)
GDP2	-14.1463 (0.0000)	2.14351 (0.9840)	27.6271 (0.0000)	-6.96789 (0.0000)	137.813 (0.0000)	241.220 (0.0000)

Showing in **Table 3**, we can know that in the seven cointegration test methods, in addition to the Panel ADF-Statistic cointegration test results, the other six cointegration tests the test results are insignificant, that is, only the Panel ADF-Statistic cointegration test supports a cointegration relationship between DEBT and GDP, while the other six methods do not. In summary, there may be no long-term equilibrium cointegration relationship between DEBT and GDP.

4.4. Granger Causality Test

The Granger causality test is used to analyze the existence of causal relationships between two sequences and the direction of their effects. It was originally proposed to explore the relationship between multiple non-stationary sequence variables, and after the development of economists and statisticians, the theory can be applied to panel data. Considering the timeliness of the relationship between the two variables, we intend to test the DEBT and GDP causality in the short, medium and long term. The Granger causality test results in this paper are shown in **Table 4**.

From the results in the table, in the short term, GDP is the Granger cause of DEBT. From the perspective of F statistic, the 5% confidence level basically rejects the null hypothesis that “local government economic development is not the Granger cause of local government debt. “DEBT is not the Granger cause of GDP. In the medium term, GDP is still the reason for the Granger of DEBT and its performance is more significant, but DEBT is not the Granger cause of GDP, but it has a weaker trend than the short-term; in the long run, GDP and DEBT Mutual causation.

Table 3. Cointegration Test between DEBT and GDP.

Testing method	Cointegration relationship between DEBT and GDP	
	Statistics	P value
Panel v-Statistic	-2.083999	0.9814
Panel rho-Statistic	3.005311	0.9987
Panel PP-Statistic	2.858807	0.9979
Panel ADF-Statistic	-4.686763	0.0000
Group rho-Statistic	3.979191	1.0000
Group PP-Statistic	3.473592	0.9997
Group ADF-Statistic	-0.346406	0.3645

Table 4. Granger causality test between DEBT and GDP.

Null hypothesis	F Statistics					
	Short term		Medium term		Long-term	
	Lag2	Lag3	Lag5	Lag6	Lag11	Lag12
DEBT does not Granger Cause GDP	0.78715 (0.4559)	0.33865 (0.7974)	1.82185 (0.1106)	1.04341 (0.4006)	0.0000 (0.0000)	0.0000 (0.0000)
GDP does not Granger Cause DEBT	3.62534 (0.0276)	4.37247 (0.0050)	13.2832 (5.E-11)	14.2219 (3.E-12)	0.0000 (0.0000)	0.0000 (0.0000)

5. Conclusions and Recommendations

5.1. Research Conclusions

According to the actual situation in China, this paper takes the government debt and economic growth data of 31 provinces in China from 1995 to 2014 (excluding 2004 and 2013) as a sample, and uses the Granger causality test to explore the causal relationship between the two. The following conclusions are drawn:

1) China's local government debt and economic growth sequence is a second-order single-order sequence, and there may be no long-term equilibrium cointegration relationship between the two.

2) In the short term, local government economic growth is the Granger cause of local government debt, but local government debt is not the Granger reason for local government economic growth.

3) In the medium term, local government economic growth is still the Granger cause of local government debt and its performance is more significant, but local government debt is not the Granger reason for local government economic growth, but it is weaker than the short-term.

4) In the long run, local government economic growth and local government debt are mutually causal.

5.2. Policy Recommendations

5.2.1. Maintaining a Moderate Debt Scale

It can be known from the conclusion that in the short to medium term, local gov-

ernment economic growth is the Granger cause of local government debt, but local government debt is not the Granger reason for local government economic growth. China is currently at a specific stage of industrialization, informatization, urbanization, marketization and internationalization. Local governments at all levels not only undertake the arduous task of relying on infrastructure construction to improve the market economy system, but also shoulder the basic supply. Public goods such as pension, education, and medical care have a major mission to improve people's livelihood. In the short and medium term, local economic development provides local governments with a large amount of funding for infrastructure construction. Local governments will use large amounts of funds to continue to supply productive and living public goods. At this time, financing and borrowing will become local government mobilization and an important option for configuring funds. At the same time, however, some local governments are eager to seek success, regardless of risk, borrowing and issuing bonds in a short period of time. This will not only play a role in promoting economic growth, but will instead be counterproductive and inevitably bring about high places. Government debt has increased the risk of local government debt. In response to this situation, the first is to strictly implement the provisions of the Budget Law on the scale of local government debt, implement the principle of non-rescue of the central government, and strongly restrain local governments from borrowing money. Second, we must establish and improve the finance of local governments. The reporting system strengthens the effective control and management of the scale of local government debt to prevent local excessive borrowing; the third is to strengthen the monitoring of local government debt, and establish and improve the local government debt risk warning system. Only by doing this "three-pronged approach" can we ensure the security of local government debt.

5.2.2. Creating a Benign Environment for Interaction between Local Government Debt and Economic Growth

As mentioned above, in the long run, local government economic growth and local government debt are causal, so local governments should create a good environment for positive interaction between the two. The premise must be to establish a reasonable concept of local government debt scale. In accordance with the requirements of the Party Central Committee and relevant laws and regulations, the government debt scale should be maintained at the overall controllable level of risk, in order to fully utilize the role of moderate debt to promote the economy. Second, local governments should improve the system. The continuous expansion of the scale of local government debt has made the risks increasingly prominent. On the one hand, it is necessary to establish an indicator system, such as debt dependency and debt burden rate, so that local governments can prevent risks in advance; on the other hand, they must improve the cadre assessment and appointment mechanism to eliminate localities. In the short term, the government will borrow heavily and engage in "face-to-face"

practices to avoid the consequences of the rapid expansion of debt. In this way, not only can local government debt be controlled at a reasonable scale, but also promote the growth of the local economy, and prevent the adverse effects of excessive local government on the economy, thus achieving a virtuous circle.

5.2.3. Focus on the Supply Effect of Debt Expenditure

In the past few years, the “supply-side structural reform” proposed by General Secretary Xi Jinping has gradually been implemented. Similarly, government debt should also be managed and measured from this perspective. Prior to this, in the long run, local governments are borrowing more from the traditional demand side to stimulate the economy, but in fact, the role of government debt in promoting economic growth lies in its supply side, and China’s local government debt is very To a large extent, it is a productive investment. Therefore, it must pay more attention to its supply effect, reduce or prevent the distortion of the role of market allocation resources, and actively adapt to the new ideas of “supply-side structural reform” under the background of reform.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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