Early Warning Model of Local Governments' Debt Risk in China Based on the Financial Perspective

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Abstract

By studying Chinese government local debt scale, analyzing cause and risk, we can draw the conclusion "local government debt in China is brewing a crisis. Apparently, it is the crisis in the financial control, but it may not only financial control crisis, and it may lead to financial overall crisis, or even cause the Government's overall governance crisis." Finally, using multilevel structure analysis and by the means of index system made from economics, social uncontrollable exogenous factors, this paper puts forward the debt risk assessment consist of "converse index" and "positive indication". At the same time, it uses the Delphi method to weight index for the purpose of reducing subjective measurement and evaluation. On this basis, we hope to give same suggestion to the government for avoiding the debt risk.

Keywords: Local government Debt, Risk, Early warning model, Risk assessment

1. Introduction

According to the China National Audit Office for the first time on the local financial revenue and expenditure audit results, as of the end of 2010, the local government debt balance is 10.7 trillion Yuan, is equivalent to 27% of the Chinese economic output. And 2012, 2013, 2014, respectively, 17.17%, 11.37%, 9.28 of the debt maturity. This means that China will enter a peak period of local debt repayment. From the foreign media, April 17, 2013, "Financial Times" said, China's local debt is out of control; April 9, one of the three major international rating agency Fitch downgraded China's sovereign credit rating; another major international rating agency Moody cut China's Sovereign credit rating outlook form positive to stable. This is the international rating agency first time downgraded China's sovereign credit since 1999. Two institutions have pointed out in its report, the rapid increase in local government debt and its opacity have a great impact in Chinese financial system's stability. So far, China's local government debt once again aroused strong concern of all over the world.

2. Chinese local government debt situation

2.1 Size of the debt

China Audit Commission released 2011 audit report data show that as of the end of 2010, Chinese national local government debt has reached a total size of the balance of 10.717491 trillion Yuan. Including government bears the responsibility to repay the debt, Government bears responsibility for the debt guarantee and other debt which the government may bear some responsibility for (see the figure 1).

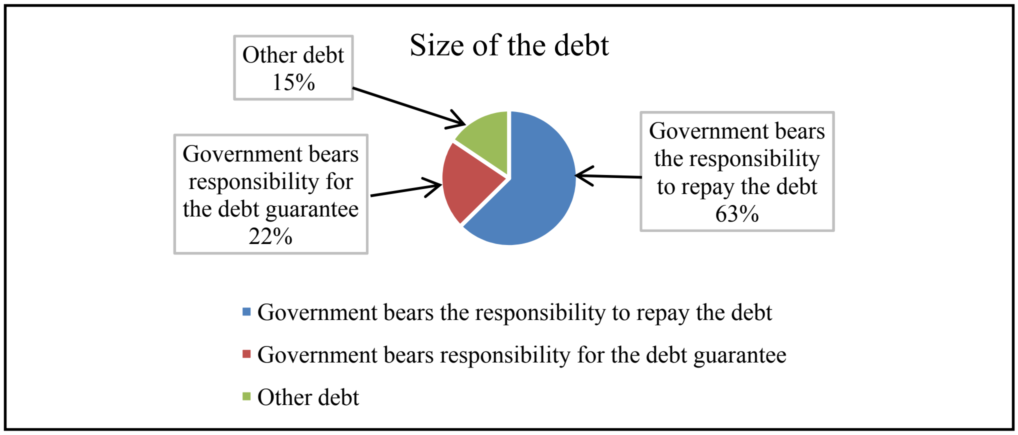

Figure 1. the scale of the national local government debt statistic

2.2 The growth of local government debt situation

In response to the Asian financial crisis, various parts of the local government response to the central government's positive fiscal policy through substantial financing to increase infrastructure and other public goods investment. So since 1997, China's local government debt has maintained a rapid growth, the average annual growth rate of 20% or more, including rapid growth in 1997-1998, one year from 24.82% in 1997, rapidly growth to 1998 of 48.20%. From 1998 to 2008, the growth rate of local government debt declined, and in 2008 reached a low point of 23.48%, which is China's economic soft landing policies adopted correspond; however, this trend made a turning point after 2008, in response to the global financial crisis, local government debt financing again played a role in making 2009 the debt balance increased by 61.92% over the previous year. With the local government debt problems gradually exposed, and by the end of 2009 China begin to start the implementation of local government debt inventory and management mechanisms, so 2010 debt balance growth rate dropped to 18.86%. November 2012 to February 2013, China National Audit Office carried out spot checks on 36 local governments, estimates, in 2012 China local government total debt about 12.1 trillion Yuan (see the figure 2).

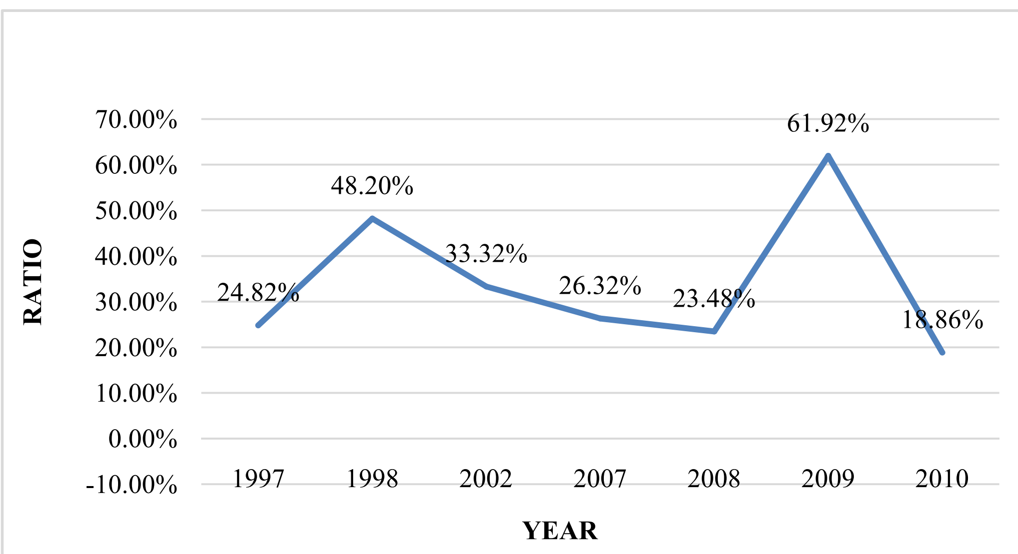

Figure 2.

2.3 Sources of local debt funding

National local government debt funding sources, the end of 2010, bank loans are the most important component of local government debt, totaled 8.467999 trillion Yuan, accounting for 79.01 percent of the debt, So the local government debt problem exist significant impact on China's financial system risks (see the figure 3).

The creditors	Amount of debt (unit: million)	Proportion
Bank loans	8467999	79.01%
Fiscal from superior government	447793	4.18%
Bonds issue	756731	7.06%
Other debt	1044968	9.75%
Total	10717491	100%

Figure 3.

2.4 Areas debt funds invest to

Debt is mainly used for municipal construction, transportation, other land and public products purchase, the proportion reached 86.54% of total debt; Specifically municipal building, the number reached 3.530104 trillion Yuan, accounting for 36.72 percent of the total (see the figure 4).

Areas debt funds invest to	Amount of debt (unit: million)	Proportion
Municipal construction	3530104	36.72%
Communication and transportation	2392446	24.89%
Land purchasing and storage	1020883	10.62%
Education, science, culture, health and low-income house	916902	9.54%
Agriculture, forestry and water conservancy construction	458410	4.77%
Ecological construction and environmental protection	273315	2.84%
Funds of defuse local financial risks	110969	1.15%
Industry	128287	1.33%
Energy	24139	0.25%
Others	757589	7.89%
Total	10717491	100%

Figure 4.

2.5 Debt repayment time

2011 to 2015 is the principal time to repay the debt, reaching 7.5 trillion, accounting for 69.79 percent of total debt; indicating that local government debt five years will be great pressure (see the figure 5).

Debt repayment time	Amount of debt (unit: million)	Proportion
2011	2624649	24.49%
2012	1840248	17.17%
2013	1219494	11.37%
2014	994139	9.28%
2015	801226	7.48%
2016 and beyond	3237735	30.21%
Total	10717491	100%

Figure 5.

3. The local government debt risk early warning model

As for Chinese local government debt situation has made the detailed introduction above, we can clearly recognize that the Chinese local government debt have certain crisis, while China's local debt funds mainly come from Chinese banking system, so once the debt crisis outbreak will caused great impact on China's financial system, therefore the assessment and early warning mechanism of local government debt risk established can make the debt management became more standard which contribute to local government implement meticulous management for debt. Establish local government debt risk model have to achieve three functions: first, early warning function, through a series of explicit and implicit data to build early warning indicators, criteria, index, in order to reach the purpose of debt risk early warning; second, timely monitoring function, monitor and control the scale and structure of all kind debt, analysis the trend of local government debt risk and comprehensive evaluation; third, the function of budget, according to each item of debt related parameters and the default rate, determine the sum of debt funds future needed to repay, which can form a long-term, rolling debt budget system.

3.1 The local government debt risk early warning index selection

We can't analysis government debt problem on local finance only from the angle of debt data. Analysis the local government debt risk has to not only based on debt data, but also need to compare the related indexes of the local political, economic and social development together. We only consider the local government debt exist security risk when it impact the local society and economic structure. In view of this, the author selects 14 indexes from three aspects of economic, political and social, which can comprehensively assess the local government debt risk. These indices include the debt burden rate, dependence degree of debt, debt borrowing rate, debt servicing rate, the local debt per capita rate, debt overdue amount, the government fiscal revenue deficit rate, the proportion of fiscal revenue, industrial economic efficiency of enterprises, local government fiscal revenue tax rate, household debt burden rate, unemployment rate, per capita GDP and the contribution rate of fiscal expenditure. The rate of debt burden, reflects the total size of the debt, which measure debt risk status from total amount. Because of the economic development level of each country is different, the proportion of debt burden rate control requirements are different, the developed countries generally believe that the debt burden rate less than 45%, the government can control the risk, while the EU debt burden rate is limited to 60%.According to 2012 China government data, China's rate of debt burden is approximately 30%. Dependence degree of debt reflects how much financial expenditure is relied on debt to achieve. International experience shows that the warning line is 20%.Debt borrowing rate (amount of new debt / the area total GDP) reflect the government's new debt accounted for the proportion of the national economy, which measure the economic risk caused by the new debt. Debt servicing ratio reflects the annual debt service burden rate, is generally believed that the debt servicing ratio warning line is 10% internationally. The local debt per capita rate reflects the local per capita burden of debt and the situation of the local government debt. Debt overdue amount reflects the situation of potential risk of debt into government debt crisis, also is the estimate of the highest debt risk of local government. The government fiscal revenue deficit rate reflects the local government's debt capacity according to their economic development, is generally believed that the government fiscal revenue deficit rate warning line is 3% internationally. The proportion of fiscal revenue reflects the ability of GDP transform into government revenue, the higher the value of index, the ability of government debt risk management is stronger. Local government fiscal revenue tax rate reflects the local enterprise's ability to bear the government debt risk. The higher household debt burden rate indicates that the government transfer of debt directly to local residents is more difficult. Unemployment rate reflects the local social stability condition. Per capita GDP reflects the region's economic development level. The contribution rate of fiscal expenditure reflects the potential contribution of government debt. Specific indicators are shown in the following table (see the figure 6).

Indexes	Formula	Counting direction
Debt Burden Rate(x_1)	Outstanding Obligation/GDP	Backward
Dependence Degree of Debt(x_2)	Debt Revenue/ Fiscal Expenditure	Backward
Debt Borrowing Rate(x_3)	Amount of New Debt/GDP	Backward
Debt Servicing Rate(x_4)	Debt Paying Ability/ Fiscal Expenditure	Backward
The Local Debt per Capita Rate(x_5)	Local Debt Balance/ The Total Population of the Local Area	Backward
Debt Overdue Amount(x_6)	Overdue Debt Balance/ Outstanding Obligation	Backward
Government Fiscal Revenue Deficit Rate(x_7)	Revenue Deficit/GDP	Backward
Proportion of Fiscal Revenue(x_8)	Fiscal Revenue/GDP	Forward
Industrial Economic Efficiency of Enterprises(x_9)	Gross output of industrial enterprises/GDP	Forward
local Government Fiscal Revenue Tax Rate(x_{10})	Tax Revenue/ Fiscal Revenue	Forward
household debt burden rate(x_{11})	Outstanding Obligation/Residents' Deposits	Backward
Unemployment Rate(x_{12})	(Working Population-Employed Population) / Working Population	Backward
per Capita GDP	GDP/Population	Forward
the Contribution Rate of Fiscal Expenditure	Fiscal Expenditure/GDP	Forward

Figure 6.

3.2 The construction of local government debt risk early warning model

Each index of local government debt risk early warning index system are reflects the local government debt risk situation, but to reflect the total situation of local government debt risk, we need to comprehensively evaluate the index. Since each indicator and measurement units of local government debt risk assessment and early warning model are not the same, so can't be simply added. Most of these indicators are just relatively indicators, and some are per capita indicators, which meaning and degree of importance is not the same, so simple sum does not reflect the degree of importance of each indicator and its role in risk assessment. I'm adopted the hierarchy analysis method to establish the index, which on the basis of the index increment. According to the local government debt risk assessment and early warning model, assuming the x_i^0 for a period of initial I index, and x^1_i for the index value at end of period, so the local government debt risk increment in the i index value are:

$$Y_i = -\frac{x_i^1}{x_i^0} \times 100 \qquad \text{(when the } x_i \text{ is forward)} \tag{1}$$

$$Y_i = \frac{x_i^1}{x_i^0} \times 100 \qquad \text{(when the } x_i \text{ is backward)} \tag{2}$$

Let Y_i be a numerical means the i index, P_i is the weight of index i, R for local government debt risk factor, there are:

$$R = \sum_i Y_i P_i \tag{3}$$

As can be seen from the above model, by comparing the initial numerical value of the local government debt risk assessment and early warning indicators whit the prior period's figure, which can get the incremental value of debt risk of index of local government debt risk in the current assessment period. Base on the consolidated results of the assessment scores, can assess the comprehensive risk of local government debts, the larger the value, the higher local government debt risk, and the greater security risks.

3.3 Determination of local government debt risk early warning index

The index weight of the model is the formula (3) P_i. Select reasonable weight or not has a decisive influence on the local government debt risk assessment and evaluation. This paper uses the method for determining the weight is the Delphi Technique. This paper uses the Delphi Technique to set the indicators very important, important, general, unimportant, very unimportant to five levels respectively. According to the important of each level are respectively set to 4 to 0 score which facilitate numerical summary ranking for each index, as shown in the following table (see the figure 7).

Grading	Score
Very important	4
Important	3
General	2
Unimportant	1
Very Unimportant	0

Figure 7.

According to the results of a questionnaire survey and expert advice, give weight to each index, and then we can calculate the local government risk factor R according to the weight and value. Establish the early risk warning rang in line accordance whit the magnitude of R. First the value of R limits can be set, calculation and analysis of the boundary values by using the GARCH model, can determine the three regions which generate three new sequences. Then according to the index value set security zone, mark as: Ysn_1; smaller risk zone, mark as: Ysn_2; high risk zone, mark as: Ysn_3.

$$S_1 = \overline{Ysn_i} + \frac{\sigma sn_2}{\sigma sn_2 + \sigma sn_1}(\overline{Ysn_1} - \overline{Ysn_2}) \tag{4}$$

$$S_3 = \overline{Ysn_2} + \frac{\sigma sn_2}{\sigma sn_3 + \sigma sn_2}(\overline{Ysn_3} - \overline{Ysn_2}) \tag{5}$$

Ysn_1, Ysn_2, Ysn_3 denote three sequences sample mean and σsn_1, σsn_2, σsn_3 denote three sequences standard deviation. S_2 is equal to the arithmetic average of S_1 and S_3, as an intermediate threshold to achieve safe separation zone and danger zone. As a middle threshold value which to separate safety zone and danger zone.

Of course, taking into account the actual economic and social environment in different part of China is different, so need to set the debt risk warning line is different, and modify the local government debt risk index system, to make the model results more correspond the actual situation of local economic operation, which can raise the debt risk early warning accuracy.

4. Local government debt crisis prevention recommendations

At present, China's local government debt at the macro level is not serious, but seriously affected the micro level, debt of Some local government have apparent exceeded the reasonable affordability. Therefore, take effective measures and scientific manage the local government debt is necessary action for the Chinese government. This article puts forward four recommendations to prevent local government debt risk from a policy and financial perspective.

4.1 Improve existing local government debt measures

Rectifying government financing platform, introduce private capital and privatize other financing platform. Implement the regulation of the bonds issued by the Ministry of Finance into the budget management requirements.

4.2 Reform the existing financial system

First, reform the government accounting system. Effectively reform the existing government accounting principles, realization of accrual basis instead of the cash basis, in order to fully reflect the Government runs all receipts and payments in one fiscal year. Second, speed up financial reform. Right to face the tax system reform, financial power move up from the local government to central, and Administrative power down from central government to local, and pay attention to the affair that the local governments insufficient financial resources. Reasonable to establish fiscal system which the financial resources match the administrative power. Redefinition of the central and local government administrative powers and financial authority, appropriate adjust the central and local revenue division, which can effectively alleviate the financial pressure on local governments.

At present, China has been in Shanghai, Zhejiang, Shenzhen, Guangdong, four pilot projects to carry out their own bonds. Specific implementation to achieve the following: Amend the budget law. Allow a certain degree of local government budget deficit, local government bonds exclusively used to cover local deficits; improve the government budget system, a variety of budgets are set up special chapter dedicated to develop detailed terms; Establish the debt budget special seal.

4.4 Establish the public fiscal system

Ensure China's fiscal can transparency operation, which is most effective way to ensure the healthy operation of local government debt, protect the prevent widespread illegal and various privileges, corruption and any unfairness and let the China debt system run smoothly.

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