

Analysis of Affecting Factors of China's National Debt

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Abstract—How to adjust China's national debt under the background of the new economic normality? Firstly, an empirical analysis was put forward about the impact of government debt on economic growth. Secondly, on the base of theoretical analysis, the paper studied the main factors that influence the scale of treasury bonds in different stages by piece-wise regression based on the data in 1994-2013. The results showed that there is an "inverted U" relationship between government debt and the GDP, and the main factors of China's debt are the size of our national debt budget deficit, debt accumulated balance and household savings deposits. Bond issue size is not the bigger the better. The government can adjust the issuance of treasury bonds through the fiscal deficit, the cumulative balance of national debt and residents' savings deposits.

Keywords-National Debt Scale; Economic Growth; Inverted U; New Economic Normality; Debt Risk

I. INTRODUCTION

National debt based on national credit is a kind of loan relationships, according to the international rules of issuing bonds to raise the required funds from investors such as personal and enterprise. Since the 1981 re-issue of national debt, government bonds increase year by year, its value has reached 15544 billion yuan by 2013.

The Chinese government has been advocating a new economic normality since 2014, that is, economic growth in the high-speed to high-middle speed; the optimization and upgrading of industrial structure; innovation-driven instead of investment and factor-driven. Under the background of new economic normality, China is also facing more challenges, some uncertainty risks gradually revealed, such as the potential risk of the property market, local government debt and so on. MoNan Zhang (2015) believes that the priority of China's macroeconomic management is deleveraging.^[1] In fact, any one country will face difficulties to sustain the macroeconomic through deleveraging under the background of economic recession. After the financial crisis broke out, many Western countries are trying to relieve the heavy debt burden by deleveraging, but mostly failed. Compared with developed countries, China's market economy did not have significant improvement in post-crisis era. In order to stabilize economic growth, China's macroeconomic regulation and control measures is very complex. On the one hand, China has taken an active economic policy to stimulate economic growth, causing the expansion of the scale of government debt; on the other hand, debt risks of commercial banks and other financial institutions are

more serious due to indirect financing.^[2] Although on the whole, China's debt risk does not exist, but local government debt risk has appeared with the deepening of economic reform, if treasury bonds out of control, it is likely to lead to a debt crisis.

Some foreign scholars have not studied the affecting factors of treasury bonds from theoretical or empirical aspect, but there is a lot of analysis on the national debt scale, which offers certain reference. Guoguo Su (2009) based on 20 years of China's treasury bonds data, using the index to measure the size of our national debt, analyzed the adequacy of government bonds combined with China's domestic situation.^[3] James R .Barth & Tong Li (2012) think that the excessive deficit exacerbated the historical level of debt, to reduce the fiscal deficit by reducing welfare projects is an effective way.^[4]

Many scholars of domestic have analyzed the affecting factors of treasury bonds based on different aspects.

In the theory research of national debt risk, Guoqi Pan (2013) argued that the European countries' blindly issuing bonds is the main reason for the European debt crisis, and debt burden is far more than the country's solvency. He thought that to prevent debt risk should formulate correct fiscal plan by considering the fiscal deficit and government debt.^[5] Xingxin Liu (2015), from the perspective of the necessity of issuing bonds, found that the amount of the current bond issuance is still in the controllable range.^[6]

In the empirical analysis of debt scale factors, Kaiqi Zhang (2014), setting up multiple linear regression model based on the data of 1986-2012, found that factors influencing treasury bonds are GDP, fiscal deficit, urban residents, and the accumulated national debt balance.^[7] Yongqiang Gao and Yuanqiong He (2003) found that factors in the different stages of treasury bonds vary from each other through piece-wise regression analysis, and the results showed that it is invalid to analyze our imperfect national debt market with existing theories.^[8]

From the above research can be seen that the study about the factors of treasury bonds either on the aspect of theory or empirical single, but the two have not been effective integration. Our bond market has been in a continuous improvement process and the course of bonds is divided into several stages. Although some documents have studied the affecting factors of bond issuance at different stages, the sample size is reduced and the accuracy of the model is decreased. On the basis of

analyzing the impact of the scale of national debt issuance on GDP growth, this paper studies the interaction effects of the affecting factors of bond issuance at different stages by introducing dummy variables, and explores the specific factors that affect bond issuance, and puts forward some countermeasures and suggestions on the bond issuance risk under the background of the new normal economics.

II. ANALYSIS OF THE IMPACT OF THE SCALE OF NATIONAL DEBT ISSUANCE ON THE GROWTH OF GDP IN CHINA

Many domestic and foreign documents on the scale of the national debt show that and there is not positive correlation linear relationship between the size of a country's bond issuance and the growth of GDP. The suitable size of the national debt will promote economic development; otherwise, it will have a negative effect on economic development. [9] Theoretically, the main international indicators to measure whether the bond issuance is reasonable or not are debt dependence, bond debt service rate, debt burden rate and bond loan rate, these four international indicators have certain degree of guidance for the issuance of bonds, but not effective completely. China has resumed bond issuance since 1981, and there were neither domestic debts nor foreign debts before this. If not considering the country's conditions but only depend on international index to issue government bonds, it's likely to cause harm to national economy. Therefore, it is necessary to study the effect of treasury bonds on the economy with specific data.

To this end, the paper selects treasury issuance size and GDP data from 1994 to 2013, and does empirical analysis on the impact of debt issuance to GDP growth from the perspective of total and incremental. Data selected from the *China Statistical Yearbook*, and were processed.

A. The Impact of National Debt Issuance Size on the Total GDP

In this paper, the specific data of bond issuance scale and GDP from 1994-2013 has been processed by deflator. According to the data after the flat reduction, the paper draws the scatter chart of the total impact of the national debt scale on the total GDP, and finds that there is a linear relationship between the scale of bond issuance and GDP. Therefore, we can directly establish linear regression model, the model is as follow.

$$y = c + \alpha_1 x + \alpha_2 x^2 + u \quad (1)$$

y represents the total amount of GDP; x represents bond issue size; α_1 , α_2 represents the estimated parameters respectively; u represents the random error term.

The regression equation through Eviews6.0 is as follows:

$$\hat{y} = -25060.73 + 56.240x - 0.0053x^2 \quad (2)$$

(-1.709) (4.755) (-3.093)

As can be seen, all the explanatory variables of the model were significantly tested by t , which showed that

the establishment of nonlinear regression model was correct. According to the nonlinear regression model, we draw the curve of regression equation, as shown in the Fig1, we can find that there is a "inverted U" relationship between the scale of national debt and the total GDP, which shows that the appropriate bond issuance can stimulate GDP growth, but more than a certain degree, the growth of bond issuance will produce resistance to economic growth. The appropriate scale of national debt issuance is about 25000 billion yuan according to the regression equation (2), but by 2013, China's national debt issuance amount is 15544 billion yuan, significantly lower than 25000 billion yuan, but the scale of China's bonds is still within a reasonable range, that is to say Chinese government can still use this way to stimulate economic growth.

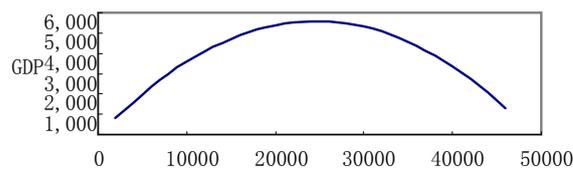


Figure 1. Scatter Diagram of Regression Equation

B. The Impact of National Debt Issuance Size on GDP Increment

Empirical research based on statistical data shows that the scale of national debt issuance is positively related to GDP increment, but it does not show the relationship of "inverted U". This shows that China's issuance of bonds is still able to stimulate economic growth at current stage. But from long-term perspective, it is likely to produce resistance to economic development if exceed the issuance of government bonds.

At present, China has entered a new economic normality, but facing the pressure of economic downturn. The results of bond issuance size of the impact on China's GDP growth show that although China can continue to rely on additional bonds to prevent the economic downturn, but should not expand bond issuance without control. In order to control the scale of national debt and prevent debt risk, we need to provide suggestions and countermeasures for China to develop a reasonable and moderate national debt scale by studying the specific factors which affect the scale of national debt issuance.

III. QUALITATIVE ANALYSIS ON THE AFFECTING FACTORS OF BOND ISSUANCE

In the qualitative aspect, we can determine the affecting factors on the scale of bond issuance from the following four angles.

A. National Debt Demand

National debt, as an important macroeconomic measure, plays a major role in maintaining economic stability and preventing excessive market volatility. [10] As raising funds often leads to inflation and goes against social stability by expanding the issuance of money directly, therefore, at present, most countries generally choose the way of issuing bonds to raise the funds to

makes up the financial deficit, and the two are relevant positively.

B. Investment Capability of National Debt Investors

Bonds issued by the central government were subscribed by two main types of investors, one category is urban and rural residents, and the other is the enterprise and other investment institutions. Individual bond subscription capacity depends on residents' savings deposits, the more deposit amount, the larger the size of the bonds residents can subscribe for. The subscription ability of various investment institutions, such as enterprise, is mainly determined by the scale of credit, the bigger the credit is, and the stronger the bond subscription is.

C. The Liability Capacity of Government

The government's debt capacity depends on two aspects. On the one hand, the higher the GDP is, the better the economic development is, and there is more space for issuing government bonds. Another is the debt burden rate. In addition to the impact of the GDP, the debt burden is also affected by the debt balance. If other factors remain unchanged, the accumulated balance of the national debt is positively related to the debt burden.

D. The Solvency of Government

The bond based on guarantee provided by Issuers is a kind of valuable documents, in order to finance the financing of the community and service their debt on time. As a "gilt edged bond", the national debt is guaranteed by government credit, and it is required to repay the debt service on schedule. Our country generally repays the maturity debt by the way of refinancing, so the bond issue amount is subject to the debt service amount of the maturity bond, the two is positively related.

Therefore, the paper determines the possible influencing factors from the qualitative aspects are as follows: GDP (+), fiscal deficit (+), bond debt service (+), the total debt accumulated (-), credit scale (+), the savings deposits (+), and other factors. These factors mentioned above are merely determined from the theoretical aspects. In fact, whether these factors have impact on bond issuance needs to do empirical testing combined with the specific data.

IV. EMPIRICAL ANALYSIS ON THE AFFECTING FACTORS ON BOND ISSUANCE

A. Data Sources and Processing

Since the founding of New China, China's bond market has been in a phase of continuous improvement and perfection. Therefore, taking the informality and smooth of data into consideration, the paper selected data range from 1994-2013, a total of 20 sets of data, from the *National Bureau of Statistics of China Website*.

B. Theoretical Model and Parameter Estimation

According to the data of 1994-2013 years, the bond issue is interpreted by variable, GDP, financial deficit; debt service, credit scale and residents' savings deposit are

interpreted as explanatory variables. The multiple linear regression models were established as Model 1.

$$\ln y_{it} = \alpha_0 + \sum_{i=1}^6 \alpha_i \ln x_{it} + \xi_t \quad (3)$$

On the base of the Model 1, it is necessary to study the factors influencing the scale of national debt issuance by piece-wise analysis considering China has experienced the Asian financial crisis and the global financial crisis. According to China's actual situation, in 2007, China has carried out reform on fiscal revenue and fiscal expenditure, the scale of national debt issuance and the financial deficit have been greatly changed, and the US sub-prime mortgage crisis is spreading to the global since 2007. Considering the factors above, the dummy variable D is introduced into the Model 1, and the segment point is determined as 2007, as shown in equation (4).

$$D = \begin{cases} 0 & 1994 \leq t < 2007 \\ 1 & 2007 \leq t \leq 2013 \end{cases} \quad (4)$$

In this paper, we add dummy variable D into multiple linear regression models respectively by the form of addition, multiplication, addition and multiplication. In the form of multiplication, addition and multiplication, the virtual variables are assumed to interact with the GDP, the financial deficit, the debt service, the accumulated balance of the national debt, the credit scale and the savings deposits. The results of regression analysis on the different models show that dummy variables introduced in the form of addition or multiplication were not pass the t test, and in addition and multiplication model, dummy variables interacted with the residents' savings deposits, so we set up model 2 as follows:

y represents the bond issuance, $x_i (i = 1, 2, 3, \dots, 6)$ represents the GDP, the financial deficits, the government bonds debt service, the national debt accumulated balance, the credit scale, and the resident's savings deposit respectively, $\alpha_i (i = 1, 2, 3, 4, 5, 6)$, $r_i (i = 1, 2)$ represents the estimated parameters, ξ_t represents the random error term.

Using the eviews 6.0 software to estimate the parameters of multiple linear regressions, the results are shown in TABLE I.

As can be seen from TABLE I, after adding dummy variable, such as the regression results shown in Model 2, $D_1, \ln x_6, d_1$ have passed t test, and F value, DW value increased, indicating that the introduction of dummy variables to improve the overall accuracy of the model, so choose the Model 2. As can be seen from the results in the regression Model 2, the coefficient of $\ln x_3, \ln x_6$ are negative, not pass the economic test, and at the 5% level, only $\ln x_2, \ln x_4$ pass t test, other explanatory variables did not pass t test, indicating that the model has multiple linear problems. After multiple linear and auto correlation correction, the regression equation of the sample of the two periods is determined as follows, and all parameters are passed the t test at the 0.05 level.

TABLE I. PARAMETER ESTIMATION RESULTS OF MULTIPLE LINEAR REGRESSION MODEL

	Model 1	Model 2
C	4.035**	-15.112*
Ln _{x1}	-2.959***	1.945
Ln _{x2}	0.125	0.553***
Ln _{x3}	-0.151	-0.022
Ln _{x4}	-0.155	-1.110**
Ln _{x5}	2.194*	1.273
Ln _{x6}	1.182	-0.592
D1		26.827***
Ln _{x6} *d1		-2.459**
R ²	0.984	0.992
F	120.155	153.024
DW	1.350	1.843

Note: * * * indicates that the variable at 0.01 level is significant, * * indicates that the variable at 0.05 level is significant, * indicates that the variable at 0.1 level is significant.

$$1994 - 2007 : \ln y_t = -6.598 + 0.322 \ln x_2 - 0.677 \ln x_4 + 1.728 \ln x_6 \quad (5)$$

$$2007 - 2013 : \ln y_t = 16.236 + 0.322 \ln x_2 - 0.677 \ln x_4 - 0.298 \ln x_6 \quad (6)$$

V. EMPIRICAL ANALYSIS CONCLUSION

Empirical analysis results show that the fiscal deficit, the accumulated balance of national debt and the resident savings deposit are the significant factors, which affect the scale of national debt issuance. But in different periods, these three factors are different to the extent of the bond issue. By carefully observing the two periods of regression function, we can find that the debt scale influence factor has the following characteristics.

- Both the results of the regression intercept and slope terms are different on 1994-2007 years and 2007-2013 years.
- China's marginal fiscal deficit is 0.322 in 1994-2013 years, changes in the same direction with the scale of the debt, that is to increase fiscal deficit in 1%, public debt increased by 0.322%; marginal accumulated balance of national debt is -0.677, the debt accumulated balance is reduced by 1%, public debt increased by 0.677%.
- Before the US sub-prime mortgage crisis in 2007, China's residents' savings deposits were 1.728 and the amount of bonds issued change in the same direction, namely household savings deposits increased by 1%, the amount of bonds issued increased by 1.728%. But after 2007, the marginal savings deposits changed into -0.298, that means savings deposits increased by 1%, the national debt issuance decreased by -0.298%.

The above analysis shows that, before and after the United States sub-prime mortgage crisis in 2007, China's marginal fiscal deficit and marginal cumulative balance of the national debt has not changed, treasury bonds are positively correlated with financial deficits, and negatively related to the cumulative balance of bonds in the two

period. That is to say the outbreak of the financial crisis has no effect on the marginal effect of financial deficits and the cumulative balance of bonds. Therefore, in the control of the size of the national debt, we should focus on adjusting the scale of these two factors.

Firstly, the state should take the size of the fiscal deficit into account during the formulation of national debt issuance policy, the high fiscal deficit will lead to potential financial risks; secondly, the issue of national debt is negatively related to the accumulated balance of national debt, this means in the implementation of expansionary fiscal policy, it should also take the national debt accumulated balance into account when increase the issuance of government bonds to prevent excess bond issuance. Once again, the residents' savings deposits as the main factor on the effect of national debt issuance provide space to national debt issuance, but should be seen that the marginal residents savings deposits become negative, which different from theoretical analysis after the outbreak of the United States sub-prime mortgage crisis in 2007.

The paper think that the impact of the residents' savings deposits on the issue of national debt deviate from the theoretical expectations after 2007 mainly for the following two reasons.

Firstly, after 2007, China's financial reform continued to increase, the financial market product types continue to increase, some of the higher and lower risk of financial derivatives are favored by residents, such as the balance of treasure, P2P platform and other network finance.

Secondly, after the financial crisis broke out, the market economy is in recession, investment, export two driving carriage failure, under the dual pressures of recession and the imperfect social system, resident's investment enthusiasm is not high.

VI. SUGGESTIONS ON THE APPROPRIATE SCALE OF NATIONAL DEBT UNDER THE NEW ECONOMIC NORMALITY

At present, China has entered the new economic normality, but under the new normal framework, the government's macroeconomic management ideas have changed significantly due to the fact that the massive stimulus of economic growth is often accompanied with environmental pressures, overcapacity, real estate bubble, debt crisis and so on. China should continue to adopt loose fiscal policy and prudent monetary policy, at the same time, we should emphasize the two degrees, that is, the positive financial policy should be strong, monetary policy should be appropriate.^[10] This two degrees is the first time to put out the coordination requirements between financial and monetary policy, that the government should adopt a loose fiscal policy, increase government spending and stabilize the economy. At the same time, the government should put forward the tightness of monetary policy to reducing the high leverage and foam risk.

National debt is a special macro-economic control measure, not only the financial policy tool, but also the monetary policy tool, and the effect of macro control through the adjustment of the national debt issuance amount is not as serious as the influence of adjusting interest rates, exchange rate, so it is adopted by many countries. But treasury bonds are not without risk, the empirical analysis shows that the amount of national debt has a "inverted U" effect to the growth of China's GDP.

While China can continue to stimulate economic growth rely on additional bonds, but too large bond issue will bring big diminish to a country and even the global economy, such as hindering economic development, increasing government debt burden, and triggering a debt crisis. Leland bankruptcy and Europe debt crisis is a clear example of the excessive amount of bond issuance.

Under the new economic normality, to prevent the debt crisis and reasonably determine the size of the bond issue may depart from the following points.

A. *Control the Budget Deficit*

The empirical analysis shows that the scale of national debt issuance is affected by the fiscal deficit, and the control of the fiscal deficit is the basic measure to prevent the risk of debt. Under the new economic normality, in order to reduce the risk of debt, the government also needs to ensure that the level of investment is reasonable and the financial expenditure is mainly used for public infrastructure construction with the process of going to leverage, which can not only prevent excessive budget deficits, but also can increase the future fiscal revenue, repayment period debt, reduce government debt burden and prevent the outbreak of the debt crisis.

B. *Strengthen the National Debt Accumulated Balance Management*

To manage debt accumulated balance, we should first consider the collocation of the financial policy and monetary policy, that is, the Government should not only consider the need for financial funding, but also need to consider the need for central banks to open market operations.^[11] Under the New normal economy, our government advocates the expansion of fiscal policy and the use of the robust monetary policy. The national debt is both the fiscal policy tool and the monetary policy tool, which can be used as a bridge between the two economic policies. At the same time, we need to pay attention to the extrusion effect. If the total amount of government debt management is too loose, it will lead to an increase in bond issuance, bring crowding-out effect to corporate bonds, leading to corporate financing difficulties, even hindering China's economic growth finally.

C. *Improve the Ability of Residents' Setting Debt*

In the short term, residents' setting ability determines the volume of treasury bonds. At present, China faces the pressure of economic downward, internal and external

shocks continues exist. Therefore, increasing household setting debt capacity should be an inevitable policy choice. The follow measures can be taken. Firstly, we can increase the accumulated balance of government bonds and reduce household savings deposits. Secondly, we should reduce government debt by improving our financial system, improving fiscal revenue total unpaid fiscal revenue and other ways. Thirdly, we should improve the social security system to stimulate residential investment spending, prompt residents' reasonable portfolio, increase residents' ability of setting debt.

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