

Will Rising Debt in China Lead to a Hard Landing?

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Abstract

Moody has recently downgraded China's sovereign debt, which's Moody's first downgrade for the country since 1989. The objective of this study is to get an insight into the local and regional government debt in China, analyze the key factors, and evaluate the economic risks. Based on the published data since 1996, the granger causality test is performed to find out the relationship between local government debt level, the fiscal income, GDP growth rate and CPI. Some major findings are: i) local government debt is accumulated through more spending on economic development and less funding obtained from the revenue sharing scheme between governments. ii) fiscal income and GDP growth rate have positive impact on the increase of local government debt. iii) CPI increase shows negative impact on the local government debt. It's projected that in the coming years, slower growth and less income with a stable CPI could slow down debt accumulation. The Chinese government should monitor the risk factors closely and use risk mitigation tools to avoid a hard landing.

Keywords: government debt, China, GDP growth rate, economic risk, hard landing

1. Introduction

1.1 Background

There has been wide concerns that slowing growth and rising debts will weaken the financial strength of the world's second largest economy. On May 24, Moody's Investors Service downgraded China's long-term local currency and foreign currency issuer ratings from Aa3 to A1. The last time Moody cut China's credit rating was 1989 when the Tiananmen Square protests occurred. According to the statement issued by the rating agency, it's expected that China's financial strength will erode with economy-wide debt continues to rise as potential growth slows.

Alfred Schipke, the IMF's senior resident representative, has also suggested that the rising debt issue in China is posing high risks for the economy, especially as the country has an increasingly large, leveraged and interconnected financial system.

According to the report by the Bank for International Settlements (BIS), China has the largest credit-to-GDP gap among all reporting countries for Q1 2016. Figure 1 displays that the credit-to-GDP ratios for China and other countries from Q1 1999 to Q1 2016. The credit-to-GDP ratio measures the credit from All sectors to Private non-financial sector in term of the percentage to the GDP. Emerging market economies such as Brazil, Russia and India usually have the credit-to-GDP ratios below 80% through the years. The advanced economies such as US, Japan and European countries have the ratios over 100% with the downward trend since 2009. In contrast, China has had a sharp increase since 2009 and reached 209.8% in Q1 2016, which is the highest of all the countries listed above.

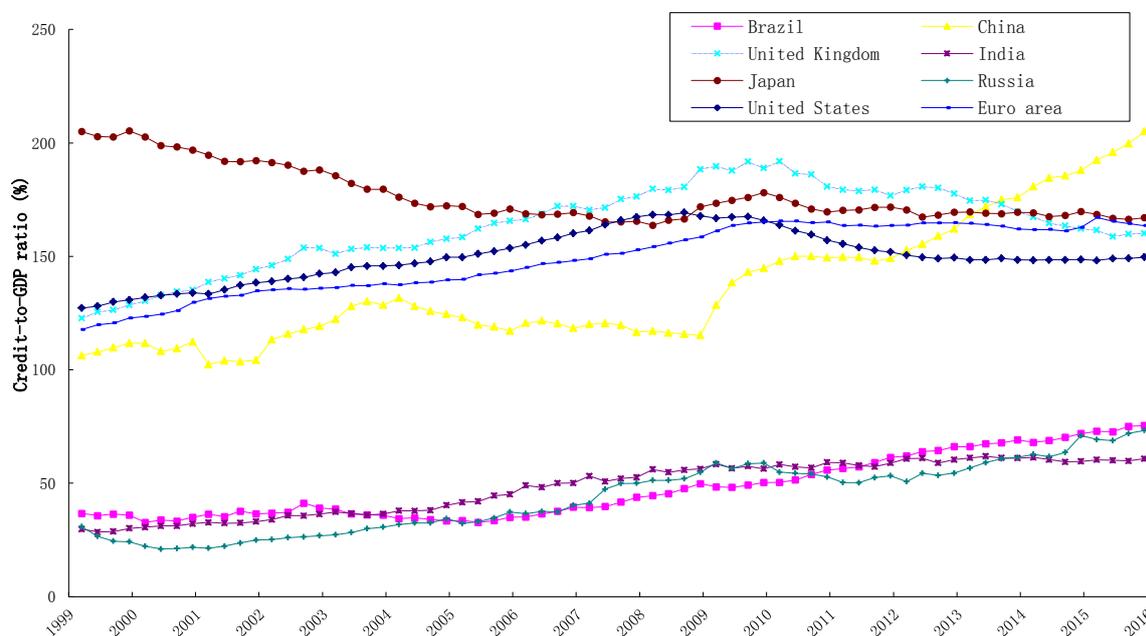


Figure 1. Credit-to-GDP ratios for China and other countries from 1999 to 2016

Note. China has the largest credit-to-GDP ratio since 2014 and reached 209.8% for Q1 2016.

1.2 Problem of Excessive Debt

Recent history provides excellent examples that excessive debt has serious impact on the economy. Ranking as the top 10 city in US, Detroit became the largest US city to file the bankruptcy with the debt of \$18 billion on July 18 2013. After multiple years of deficits, its crime rate surged into five times the national average and unemployment rate jumped to 18.3%. In Europe, Greece became the first developed country that failed to make an IMF loan repayment with the debt of €323 billion on June 30 2015. The average wage fell about 20% and unemployment rose to nearly 25%.

China's economy has grown enormously in the past three decades with the annualized GDP growth rate of over 8% each year. It's reasonable to assume that the huge amount of economic development is fueled by significant public financing efforts including all levels of government debt in China. According to the survey conducted by the national audit office in 2013, it's reported that by the end of June, government debts had reached a total of 30 trillion Yuan (\$4.78 trillion), or about 130% of the annual income. 59% of the government debts were owned by the local governments, among which 36 local governments owning an average of \$17.4 billion each, roughly the same size of debt with Detroit.

1.3 Literature Review

Economists have long discussed about policy making regarding to the government debt and economic growth. Orszag, Rubin, and Sinai (2004) made the claim that rising debt levels could alert investors and cause interest rates to spike so that higher return can be guaranteed for investors to keep financing the debt. The interest rate spike would lead to financial market disturbance or "disarray". Manasse and Roubini (2005) have reviewed the academic literature on sovereign debt defaults and found that exposure to currency risk dominates the probability of debt default or financial crisis. More recently, Carment Reinhart and Kenneth Rogoff have analyzed the Growth in a Time of Debt (GITD) issue based on the economic data from dozens of countries and across hundred of years. The conclusion in their book, "The Time is Different: Eight Centuries of Financial Folly" (2009), is that the economic growth will be hindered when the government debt to GDP or the so-called threshold debt level is over 90% while there is no necessary effect on growth at lower levels of debt.

The threshold debt level has been in a heated debate. Afonso and Jalles (2013) pointed out errors in the Reinhart-Rogoff estimation methodology. Pescatori et al. (2014) developed econometric models to test the existence of a threshold debt level. More importantly, Jonh Irons and Josh Bivens (2010) have studied the United States economy data and argued that there's no compelling reason to state that the GITD "90% threshold" for gross government debt would lead to a slower growth, and hence should not be used as a guideline for U.S. fiscal

policy. They have found that U.S. has only exceeded the 90% threshold in six of the 218 years, all of them are in the 1940s WWII period. And if removing the defense spending contributions the GDP growth is nearly double that of the low-debt years. Modern economies such as the United States can borrow in own currency and have independent monetary and exchange rate policies, using the simple ratio of public debt to GDP as a predictor variable is not wise as the situation is different comparing with the other countries through time.

However, few empirical study on government debt and economic growth in China has been reported, in particular regard to the LGD. Zhang Li (2011) claimed that rising LGDs are partially resulted from the the local government official promotion mechanism, the officials tend to raise debts for infrastructure investment and better performance evaluation. Fan Jiangyong and Mo Jiawei (2014) warned that the increasing level of LGDs would lead to higher housing cost and serious risks to the economy. On the other hand, Wu Yanrui (2014) examined the impact of LGD based on collected data and held an optimistic view given the level of government debt in China was much lower than those observed in OECD economies. The Financial Research Institute of Chinese Academy of Social Sciences (2015) released the Chinese government balance sheet report, which stated the total assets of 111.8 trillion yuan and the total liabilities of 56 trillion yuan at the end of 2013. Hence the risk was low.

From the above discussion, we can say that the research conducted on the issue of debt sustainability in the China context have majorly focused on the benefits for the local governments to raise debt rather than seeking out reasons on fiscal income. Further, there's lack of study on the contributing factors based on the time series. Therefore, our study tries to fill this research gap by analyzing the contributing factors to local government debt and evaluate the financial risks in trends using the granger causality test method.

This paper aims to explain the factors contributing to the local government debt in China with empirical study on the economic development data. It is probably the first empirical paper to analyze the rising debt issue with the discussion of China's new normal of slower growth and structural change. Policy implications are discussed, and the concluding remarks are presented at end.

2. Data and Methodology

The central and local governments in China have been sharing the tax revenues based on the centralized financial budgeting system established from the 1994 tax reform. The upper level governments have got the more stable and lucrative taxes while the lower level governments are poorly funded. Table 1 shows the revenue sharing scheme between the central and local Governments obtained from the published report of a western city in China.

Table 1. Revenue sharing scheme between the central and local governments

No.	Tax Items	Central Government	Provincial Government	City/Town Government
1	Corporate Income Tax	60%	20%	20%
2	Personal Income tax	60%	20%	20%
3	Business Tax		100%	
4	Municipal Construction Duties		100%	
5	Stamp Duty			100%
6	Town and Land Royalties		30%	70%
7	Property Tax		30%	70%
8	Educational Expenses Add-on		100%	

Note. The upper level governments have got more shares from the stable and lucrative taxes such as income tax.

With the rapid urbanization and local infrastructure development, local governments have a strong need to raise money, support and fuel the local economic growth. When the fiscal incomes mainly from the tax revenue are not enough to cover the expenses, the local governments have to borrow. However, according to the law in China, only central government can issue bonds; local governments are not allowed to borrow from the public directly. To resolve the funding problem for regional development, local governments have borrowed through the so-called shadow banks or agencies, such as state-owned enterprises (SOEs) and government controlled financial institutions. Such practice has escalated recently and led to an enormous debt with little transparency. For this reason, the national audit office conducted two nation-wide audits of government debt, in 2011 and 2013.

Figure 2 illustrates the official results for 2011 Year End and June of 2013. According to the national audit office,

there are three types of government debt, which include: 1) public holdings of debt directly owed by governments, 2) debt guaranteed by governments and 3) governments' contingent liabilities. For example, the 2295.0 billion RMB debt owned by the China Railway Corporation (CRC) belongs to category 3, which means the central government is liable if CRC can't pay its loan on time.

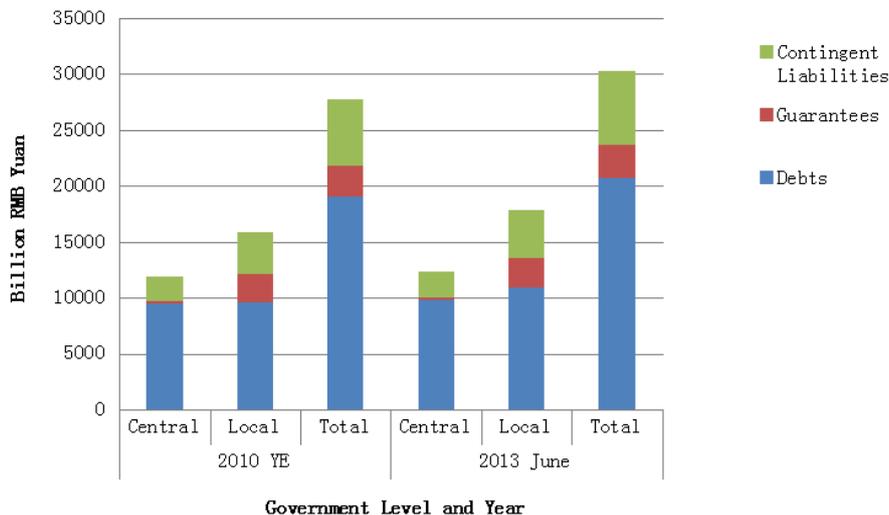


Figure 2. Government debt compositions from the national audits

Note. The national audit office lists three types of government debt and the changes from 2010 to 2013.

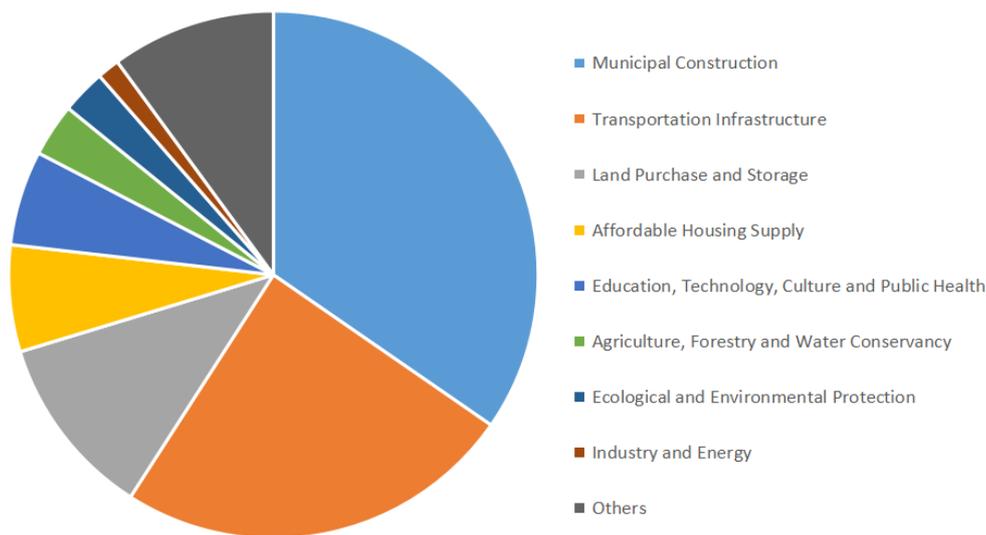


Figure 3. Type of government spending from LGD

Note. The national audit office finds most of the government debts are used for economic development.

Figure 3 shows the type of spending from the local government debts. According to the national audit conducted on 2013, over 70% of the LGDs are spent on municipal construction, transportation Infrastructure, land purchase and storage. It indicates that the majority of the LGDs are used for local economic development activities.

To find out the relationships between government debt (referred as Debt), fiscal income (referred as Income), fiscal expense (referred as Expense), GDP and interest rate (referred as R), we assume that the change of government debt is the net difference of fiscal income and fiscal expense after the payout of interest on existing debt, as described below:

$$\frac{dDebt(t)}{dt} = - [Income(t) - Expense(t) - Debt(t) * R(t)] \tag{1}$$

If Y is used to represent the yield, and P stands for the Price, then

$$GDP(t) = Y(t) * P(t) \quad (2)$$

If we use DR to represent the ratio of government debt to GDP, then

$$\frac{dDR(t)}{dt} = \frac{d[Debt(t)/GDP(t)]}{dt} = \left\{ \frac{dDebt(t)}{GDP(t)} - \frac{Debt(t)}{GDP(t)} \left[\frac{dY(t)}{Y(t)} + \frac{dP(t)}{P(t)} \right] \right\} / dt \quad (3)$$

we plug in equation (1) into (3), and it becomes

$$\frac{dDR(t)}{dt} = FR(t) - [YR(t) + IR(t) - R(t)] * DR(t) \quad (4)$$

in which we have defined the following variables:

$$\text{Debt-to-GDP ratio: } DR(t) = Debt(t) / GDP(t)$$

$$\text{Economic growth ratio: } YR(t) = dY(t) / Y(t)$$

$$\text{Inflation rate: } IR(t) = dP(t) / P(t)$$

$$\text{Fiscal deficit ratio: } FR(t) = [Expense(t) - Income(t)] / GDP(t)$$

If we assume the four ratios including YR, IR, FR and R are constant over a short period of time, then Equation (4) is a first order differential equation on DR(t). The solution is

$$DR(t) = \frac{FR}{YR + IR - R} + ce^{-(YR+IR-R)t} \quad (5)$$

in which, c can be any constant.

This means that the government debt will converge if the sum of economic growth rate and inflation rate is higher than the interest rate; otherwise, the government debt will grow out of control.

To further analyze the data, the natural logarithm system is used to model the relationship between local government debt, GDP and national financial income in this paper. The Consumer Price Index is introduced to reflect the impact of consumer price fluctuations. The higher consumer price will discourage the spending, and may impact government spending and debt level.

Hence the following auto-regressive linear equation is constructed:

$$\ln(Debt_t) = k_0 + k_1(GDPGrowth_t) + k_2 \ln(Income_t) + k_3 (CPI_t) + u_t \quad (6)$$

Here are the description of variables:

Debt: Local government debt (trillion RMB Yuan) in period t.

GDPGrowth: Gross Domestic Product growth rate (%) in period t.

Income: National fiscal income (trillion RMB Yuan) in period t.

CPI: Consumer Price Index (%) in period t.

The data for the variables listed is collected from China Economics and Social Development Statistics database. Among them, the local government debt is estimated by summing up the data reported from individual local governments. The GDP growth rate, national fiscal income and CPI are obtained directly from the database.

Table 2. Government debt, fiscal income, CPI and GDP growth rate values in China

Year	Government Debt (bln RMB)	Fiscal Income (bln RMB)	CPI	GDP Growth (%)
1996	239.94	740.80	108.8	10.0
1997	299.49	865.11	103.1	9.3
1998	443.84	987.60	99.4	7.8
1999	591.73	1144.41	98.7	7.6
2000	788.89	1339.52	100.8	8.4
2001	1051.75	1638.60	100.7	8.3
2002	1402.18	1890.36	99.0	9.1
2003	1771.23	2171.53	100.9	10.0
2004	2237.42	2639.65	103.3	10.1
2005	2826.31	3164.93	101.6	11.3
2006	3570.2	3876.02	101.5	12.7

2007	4509.83	5132.18	104.5	14.2
2008	5568.74	6133.04	105.6	9.6
2009	9016.9	6851.83	99.1	9.2
2010	10717.5	8310.15	103.2	10.4
2011	10717.5	10387.44	105.4	9.3
2012	15885.83	11725.35	102.6	7.7

Source: China Economics and Social Development Statistics database.

3. Results and Analysis

Based on the time series data above, Augmented Dickey-Fuller unit root testing (ADF) is conducted to verify the stability of the time series. Table 3 shows that for variable Ln(Debt), Ln(GDPGrowth), Ln(Income) and CPI, the critical value of unit root test statistics at 1%, 5%, and 10% significance levels are less than the value of T-statistic, and therefore the null hypothesis cannot be rejected, namely variable Ln(Debt), Ln(GDP), Ln(Income), CPI are non-stationary series. For each variable in the first order difference, the critical value of unit root test statistics are greater than the value of T-statistic. Hence after the first order difference, the time series of delta Ln(Debt), delta Ln(GDPGrowth), delta Ln(Income) and delta CPI are stable with the same integration order level, which meets the co-integration test requirement.

Table 3. ADF unit root testing result

Variable	T-statistic	1% level	5% level	10% level	Stable?	Integration order
Ln(Debt)	-1.225219	-3.920350	-3.065585	-2.673459	No	1st order
Δ Ln(Debt)	-4.264533	-3.959148	-3.081002	-2.681330	Yes	
GDPGrowth	-1.635215	-3.9203495	-3.065585	-2.673459	No	1st order
Δ GDPGrowth	-3.164997	-3.959148	-3.081002	-2.681330	Yes	
Ln(Income)	0.770552	-3.920350	-3.065585	-2.673459	No	1st order
Δ Ln(Income)	-3.626722	-4.004425	-3.098896	-2.690439	Yes	
CPI	-1.488997	-4.004425	-3.098896	-2.690439	No	1st order
Δ CPI	-4.055509	-3.769597	-3.004861	-2.642242	Yes	

Next, the residual (e_t) is inspected according to the estimation results and the residual time series. Table 4 displays the result of Augmented Dickey-Fuller unit root testing on the residual e_t .

Table 4. Residual testing result

Residual	T-statistic	1% level	5% level	10% level	Stable?
e_t	-3.064736	-3.959148	-3.081002	-2.681330	Yes

As the T-statistic value of -3.064736 is close to or less than the critical value of unit root test statistics at 5% and 10% significance levels, the residual (e_t) is considered as a stationary series. The results show that during the period from 1996 to 2012, Ln(Debt) has co-integration relationship with GDPGrowth, Ln(Income) and CPI with the co-integration vector of (0.015, 1.48, -0.041). Thus there is a long-term equilibrium relationship between Ln(Debt), GDPGrowth, Ln(Income) and CPI.

Eviews software is used to perform the analysis using the ordinary least square method. The table listed below shows the calculated result. From the R square value (0.995) and F statistics (892.27), we can see the estimated equation is pretty good.

Table 5. Regression calculation result

Variable	Coefficient	Std. Error	T-statistic	Prob.
GDPGrowth	0.014829	0.015979	0.928025	0.3703
ln(Income)	1.480163	0.029539	50.10902	0.0000
CPI	-0.041366	0.010002	-4.135664	0.0012
u	-0.004512	0.983987	-0.004585	0.9964

To further analyze the cause-effect relationship between the variables of Ln(Debt), GDPGrowth, Ln(Income) and CPI, the granger causality test is performed with Eviews and here is the result:

Table 6. Granger causality test result

Null Hypothesis	Year 1	Year 2	Year 3
GDPRATE does not Granger Cause LNDEBT	0.5477 (0.4724)	31.8717 (5.E-05)	14.3306 (0.0023)
LNDEBT does not Granger Cause GDPRATE	0.0861 (0.7738)	0.2989 (0.7480)	0.1722 (0.9118)
LNINCOME does not Granger Cause LNDEBT	2.8966 (0.1125)	4.6411 (0.0375)	6.5641 (0.0192)
LNDEBT does not Granger Cause LNINCOME	3.4575 (0.0857)	2.0294 (0.1821)	0.4901 (0.7001)
CPI does not Granger Cause LNDEBT	0.3487 (0.5650)	3.2122 (0.0837)	3.4135 (0.0820)
LNDEBT does not Granger Cause CPI	4.8442 (0.0464)	3.8409 (0.0579)	8.3795 (0.0102)

Note. p-values in parentheses.

From the result, it's clear that at Year 1 the null hypothesis is not rejected, but from Year 2 and 3 the null hypothesis is rejected. The probabilities that the GDP growth rate doesn't granger cause Debt, and the Income doesn't granger cause Debt are both below 5%, hence the GDP growth rate and Income at the Year 2 and 3 is considered as the granger cause for Debt; similarly the Debt doesn't granger cause CPI are both below 5% at Year 4, hence Debt is the granger cause for CPI at Year 3.

4. Discussion

From the above equation, it's interesting to find that the government debt level grows as the fiscal income and GDP growth rate increase. We assume that local government officials are motivated to drive economic growth. The result implies that local government with higher GDP growth rate and increased fiscal income will raise more debt. This explains that the local government have leveraged the debt for more economic growth. It's also interesting to find that CPI has a negative impact on the local government debt. When CPI increases, the cost to pay back the debts also increases, the local government tend to raise less debts to reduce the fiscal risks.

In the last couple of years, China has entered the new normal development stage of slower growth and structural change after three decades of rapid growth. This is an opportunity for China to adjust the growth rate for a better quality. It's projected that the economy is continue growing steadily and at a bit slower pace (GDP growth rate was reported at 7.7 per cent in 2013, 7.4 per cent in 2014 and 6.9 per cent in 2015). From the calculated result above, slower growth and less income with a stable CPI would lead to slower accumulation of debt levels. Hence we think the debt reduction goal and quality growth at a slower pace is achievable as China transits into the new normal stage, which is helpful to slow down local government debt accumulation though it's difficult to reverse the trend of debt increase in short time.

To avoid a hard landing, the government needs to set up an alarm system that monitors the debt default risk from time to time by collecting various economic data and analyzing their combined impact to the debt pay back capabilities of all levels of government. To increase the transparency of financial data, one suggestion is to allow local governments to issue bonds directly, which will help reduce the risks from uncertainty. Actually in 2014, ten provinces and municipalities (Beijing, Jiangsu, Shanghai, Shenzhen, Guangdong, Zhejiang, Jiangxi, Shandong, Ningxia and Qingdao) received approval from the Ministry of Finance to issue local government bonds. This represents a major change in public finance and governance and may have implications for regional economic development in China. In addition, it's been suggested to add debt reduction progress as part of the performance evaluation matrix along with the economic development and environment protection for local government official promotion. With the risks identified and quantified, the government should use tools to mitigate risk such as setting the debt limit, building the buffers and mechanisms to transfer risks. This may help reverse the trend of debt accumulation from the management level. Finally, the reform of tax revenues system with the re-balanced responsibilities and ownership between central and local governments can significantly change the way local government finance regional economic development activities, and may resolve the local

debt issues ultimately for a more balanced sustainable economic development.

As the world's second largest economy, China has seen its economy go through an immense restructure and transition over the past years to a new era of slower, more sustainable growth driven by service and consumption, which has become known as “the new normal”. Chinese government has begun to take serious measures such as promoting thrifty with reduced spending budget, and eliminating debts aggressively on a pre-set schedule. It's reasonable to state that the current debt level in China is manageable though caution and close monitoring on the status should be remained in the coming years. From the calculated result, it's shown that slower growth and less income with a stable CPI would lead to smaller accumulation of government debts. The risk of a debt crisis in China is considered to be moderate. The Chinese government should monitor the risk factors closely and use risk mitigation tools wisely to avoid a hard landing.

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