Debt and Economic Growth: The Case of Japan

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Abstract. This article empirically examines whether or not public debt has an effect on economic growth in Japan. Public debt is becoming a concern all over the world. It is no longer a problem of developing countries but is becoming a serious problem for developed countries as well. In Japan, large accumulation of debtis now receiving much attention. This article focuses on the Japanese case of the relationship between public debt and growth. The results show indicate a negative relationship between public debt and economic growth in Japan, as in many existing studies. Moreover, openness of the economy is not related to economic growth. Debt should be avoided or the quantity should be reduced in future. Reduction of dependence on exportsand efforts to cut the debt is necessary to expand Japan'seconomy.

Keywords. Debt, Deficit, Economic growth.

JEL. H30, H63.

1. Introduction

This article examines empirically whether or not Japanese public debt has an effect on economic growth. Accumulation of debt has been an important question for policymakers in Japan. The concern applies not only to many developing countries but also to developed countries. Economics in general teaches that expansionary fiscal policy causes economic growth in the shortrun; however, that policy reduces the effect in the longrun. Most policymakers seem to think that high public debt reduces long-run economic growth; however, they seem to consider that expansionary fiscal policy is necessary in the shortrun even if it sometimes causes debt accumulation.

Debt is becoming a concern all over the world especially since the 1990s. It is no longer a problem of developing countries alone but is becoming a serious problem for developed countries as well. Japan is a typical case. Recently, Greece has experienced debt crisis, as are a large number of Euro area countries, and even the US Congresshas recently had problems raising debt the ceiling.

In Japan, large accumulation of public debt has received much attention. The management of public-sector debt, which is sometimes a forgotten task of a central bank, has emerged as a highprofile issue for both Japan and other developed countries (Takahashi, 2013). Also, it should be noted that in spite of the huge debt, the rating of Japanese bonds by rating firms is still high in general, and interest rates for Japanese government bonds are still quite low. Table 1 shows recent government debt as a percentage of GDP.

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Table 1. *Government debt as a percentage of GDP*

	2008	***	2013	2014	2015
Japan	171.1	***	224.6	229.6	232.5
France	79.3	***	112.6	115.1	116.1
Germany	69.9	***	85.9	83.9	79.8
Greece	122.5	***	186.0	188.7	188.2
UK	57.3	***	99.3	101.7	103.1
US	72.6	***	104.3	106.2	106.5
OECD	79.9	***	109.5	111.1	111.2

Note. Economic Outlook by OECD (4 June 2014)

The Japanese government not only conducted drastic fiscal policy but also took measures to strengthen competitiveness and economic growth. Japan has been under severe economic conditions, namely, deflation. These measures included possible policy actions to reform the economic structure, such as concentrating resources on innovative research and development, strengthening the foundation for innovation, performing regulatory and institutional reforms, and changing the tax system (raising of consumption tax and reducing corporate tax). Moreover, by strengthening coordination between the Bank of Japan (BOJ, the Japanese central bank) and the government, since 2013, the Japanese government has implemented measures to achieve a new fiscal structure to ensure the credibility of the fiscal condition. This approach is called *Abenomics* (Abe is the prime minister's name).

In Abenomics, unconventional monetary policy has been adopted to combat deflation. However, there is a lot of dispute about realizing sound fiscal conditions and economic growth at the same time. In particular, increases in consumption tax sometimes dampen economic growth and incur more debt. In reality, Japan raised its consumption tax from 5% to 8%; however, some people say that this change did not damage the Japanese economy and will contribute to a reduction in public debt accumulation. Keeping sound fiscal condition and obtaining economic growth at the same time is difficult and sometimes impossible issue to solve.

Diamond (1965) and Saint-Paul (1992) demonstrated that a negative relationship between government debt and long-run economic growth fitswell with both neoclassical and endogenous growth models. Smyth & Yu (1995) showed that economic growth and its determinants of economic growth are cointegrated and have a long-run stable relationship. Musebu (2012) showed that a significant relationship exists between external debt and GDP. Daud & Podivinsky (2014) provided empirical evidence of the contingency effect of institutional quality on the relationship between public debt and economic growth. Teles & Mussolini (2014) found that public debt could create a negative effect on economic growth if it affects the productivity of public expenditures.

Cochrane (2011) showed that debt causes expectations of future financial recession, and Laubach (2009) and Tanzi & Chalk (2000) found that public debt causes higher real interest rates and lower private investment. Miguel & Marcos (2015) provided evidence against the null hypothesis according to which government debt does not cause real GDP growth and evidence against the absence of causality from nonfinancial private (household) debt.

On the other hand, DeLong & Summers (2012) demonstrated that expansionary fiscal policies that create public debt accumulation but avoid protracted recession ends a positive effect on both short- and long-run growth. Imran & Tanzeela (2012) showed that debt has a negative impact on the growth rate of real income per capita. This study also showed that public debts should be used only for needed purposes and has the potential to attract corruption; on the other hand, expansionary fiscal policies and debts from IMF should be avoided as they worsen

the nation's economy. Zulquar & Bandi (2014) investigated financial development and economic growth and found no causal relationship between them. This finding is contrary to that of many existing studies. Ehrhart, Alexandru, & Patrick (2014) showed the existence of growth Laffer curves indexed by the levels of debt and of seigniorage.

Theoretical arguments that indicate high public debt has a negative effect on GDP are related to empirical studies that in general show a negative, nonlinear relationship between public debt and economic growth in developed and emerging economies (Checherita-Westphal & Rother, 2012; Cechetti, Mohanty, & Zampoll, 2011; Furceri & Zdzienicka, 2012; Kumar & Woo, 2010; Reinhart &Rogoff, 2009, 2010; Reinhart, Rogoff, & Rogoff, 2012).

However, correlation sometimes does not imply causation. The relationship between public debt and economic growth could be obtained by the fact that economic growth causes levels of higher debt (Reinhart et al., 2012). Empirically, causality debt as a ratio to GDP automatically leads to a negative correlation between public debt and economic growth. This negative correlation can be realized by the presence of automatic stabilizers or by discretionary countercyclical fiscal policy as noted in many existing studies. Alternatively, the observed correlation between public debt and growth could be another factor that has a joint effect on these two variables (Panizza & Presbitero, 2014). This article takes into account openness of the economy.

This paper is structured as follows. Section 2 provides a theoretical model that is used for empirical analysis. Section 3 conducts empirical analyses based on section 2. Finally, this paper ends with a brief summary.

2. Theoretical Backgrounds

As noted in the previous section, the Japanese debt ratio is higher than that of any other developed countries. Why is it possible for Japan not to cut the budget and reduce debt? There exists a specific condition for Japan that should be taken into account. The reason seems complex; however, it is in reality simple. There is a strong culture of domestic savings and an inflow of foreign capital flow from the age of global crises. It is interesting to note that a large portion of Japanese government bonds is absorbed domestically without relying on foreigners. They are owned by domestic residents. The main reason is that households savings, such as bank and postal deposits, pensions, and insurance commodities, is linked with home bias. This outlook may have prevented a crisis for Japan and might have increased the debt ratio. However, it is important to understand whether a high debt ratio dampens economic growth. Can Japan continue to have high accumulation of debt without cutting its budget deficit?

This paper starts with a basic model in which GDP growth is regressed on log of the public debt-to-GDP ratio, the log of initial GDP, and openness of the economy.

$$GROWTH = a + b(DEBT/GDP) + cTRADE + \varepsilon \tag{1}$$

where GROWTH is the growth rate of real GDP, DEBT denotes the public debt, and TRADE means the openness of the economy (trade volume/GDP). Three empirical methods, OLS (ordinary least squares), GMM (generalized method of moments), and robust least squares are used for estimation.

One problem in equations is that the use of the OLS method may include the existence of unobservable specific effects and also lagged dependent variables. This problem can be overcome with the use of the GMM. This method requires a

decision on which variables to use as instrumental variables. The J-test is also performed. This test checks whether or not the models moment matches the data. In a GMM context, when there are more moment conditions than parameters to be estimated, this chi-square test can be used to test the overidentifying restrictions. In this analysis, the lagged values of the independent variables are used as instrumental variables.

Robust estimation is unlike maximum likelihood estimation. OLS estimates for regression models are highly sensitive to outliers. Outliers are observations that do not follow the pattern of the other observations. This is not a problem if the outlier is simply an extreme observation from the tail of a normal distribution; however, if the outliers are from non-normal measurement error or some other violation of standard OLS, it compromises the validity of the regression results if a nonrobust regression method is employed. Also, VAR is performed. In addition, a Granger causality test is performed to check causality among the employed variables.

Three empirical methods are performed in the next section and the results are also examined.

3. Empirical Analysis

The sample period is from 1990Q1 to 2014Q1. The data are quarterly and all are from International Financial Statistics (IMF). The results of OLS, GMM, and robust estimation are shown in Table 2. The empirical estimations include similar results.

Table 2. *Growth and public debt*

	OLS		GMM		Robust Estimation	
	Coefficient	Prob.	Coefficient	Prob.	Coefficient	Prob.
C	2.926 (1.991)	0.055	4.083 (1.531)	0.136	2.805 (1.987)	0.046
DEBT	-0.027 (-3.728)	0.000	-0.017 (-1.853)	0.073	-0.022 (-3.134)	0.001
OPENNESS	0.514 (1.523)	0.137	0.042 (0.064)	0.948	0.424 (1.308)	0.190
Adj.R2/ Rw-squared	0.277		0.264		0.332	
D.W.	1.581		1.656			
J-statistic			0.818			
F-statistic/ Rn-squared	7.331				10.310	
Probability (F-statistic/ J-statistic/ Rn-squared)	0.002		0.365		0.005	

Note. Figures in parentheses are t-statistics.

Some of the results are not confirmative; however, it can be said that the results show a negative correlation between debt and growth. The result of GMM is significant at the 10% level; however, there is a clear negative relationship between debt and economic growth (1% level for the case of OLS and robust estimation).

Next, a linear combination of two or more nonstationary series are said to be cointegrated. The stationary linear combination may be interpreted as a long-run equilibrium relationship among the variables. The purpose of the cointegration test is to determine whether or not a group of nonstationary series are cointegrated. This section provides an unrestricted cointegration test. The lag interval is two according to Akaike Information Criterion (AIC) test. AIC can choose the length of a lag distribution by choosing the specification with the lowest value of the AIC. The sample period is during quantitative monetary easing.

VARs (vector autoregressions) are employed for further analysis. The method employed here is mainly used to forecast systems of interrelated time series and to analyze the dynamic impact of random disturbances on the employed variables. Empirical estimation and interface are complicated by the fact that endogenous variables may appear on both the left and right sides of equations. The simultaneous use of VAR means can avoid this issue. The macroeconomic variables are structurally correlated, with different possible lags. Therefore, a VAR model is used to examine the data to avoid this issue. The variables are growth, debt, and openness of the economy. The time lag sets 2.

Table 3. *VAR estimates*

	GROWTH	DEBT	TRADE
GROWTH(-1)	0.455	-0.864	0.051
	(1.708)	(-1.671)	(0.714)
GROWTH(-2)	0.188	-0.619	-0.097
	(0.876)	(-1.488)	(-1.671)
DEBT(-1)	0.038	1.228	-0.019
	(0.290)	(4.753)	(-0.531)
DEBT(-2)	-0.037	-0.254	0.026
	(-0.281)	(-0.980)	(0.714)
TRADE(-1)	-1.714	2.835	0.629
	(-2.198)	(1.874)	(2.969)
TRADE(-2)	1.516	--2.225	0.082
	(2.241)	(-1.695)	(0.448)
C	1.374	7.602	0.907
	(0.571)	(1.629)	(1.387)
Adj.R2	0.234	0.994	0.808
F-statistic	2.581	1028.018	22.779
Akaike AIC	4.615	5.940	2.010

Note. The figures in parentheses are t-statistics.

Moreover, impulse responses are performed based on this study. An impulse response function traces the effect of a one-time shock to one of the innovations on current and future values of the endogenous variables. For stationary series, the impulse responses should die out to zero and the accumulated responses should asymptote to constant. Based on the equation, the impulse response function is as shown in Figure 1.

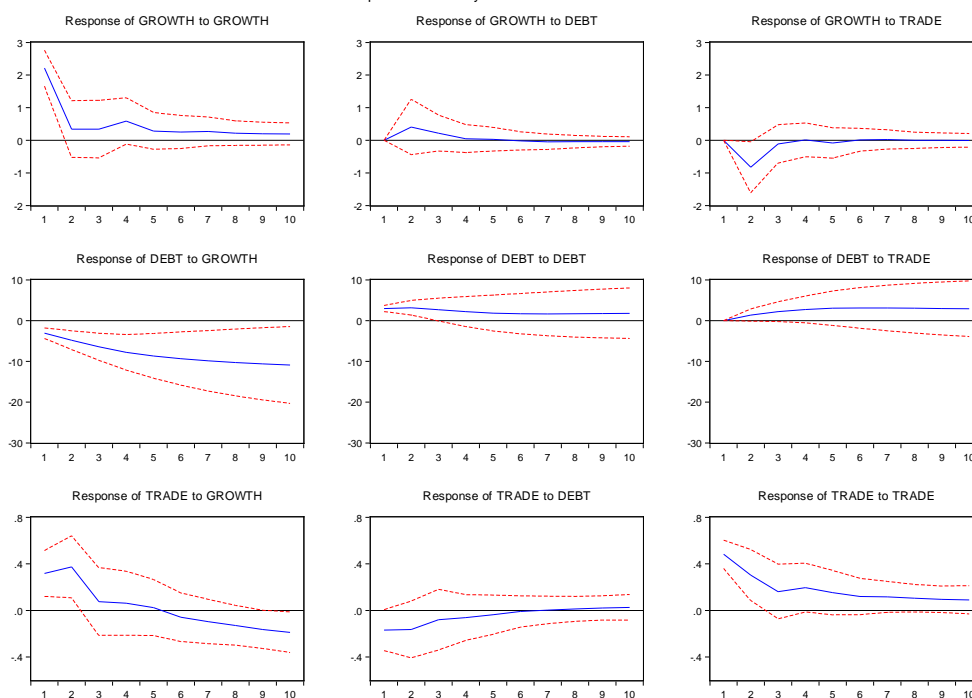Response to Cholesky One S.D. Innovations ±2 S.E.

Figure 1. *Impulse response function.*

The results show that when public debt in Japan rises, economic growth canbe seriously damaged. On the other hand, openness of the economy expands the economy; however, the effect is quite short-lived. It can thus be inferred that public debt is becoming serious problem to be solved.

Granger causality tests are performed to check the relationship among variables. The result is shown in Table 4. The results are coincide with the previous estimations.

Table 4. *Pairwise Granger causality tests*

Null Hypothesis	F-statistic	Probability
DEBT does not Granger Cause GROWTH	3.964	0.055
GROWTH does not Granger Cause DEBT	5.904	0.021
TRADE does not Granger Cause GROWTH	1.911	0.177
GROWTH does not Granger Cause TRADE	0.186	0.668
TRADE does not Granger Cause DEBT	0.179	0.674
DEBT does not Granger Cause TRADE	6.861	0.013

4. Conclusions

This article examined the relationship between public debt and economic growth. The empirical results show that there is a negative relationship between debt and economic growth as in many existing studies. Moreover, openness of the economy is not related to debt. Debt should be avoided and the quantity should be reduced in the future. This indicates that exchange rate depreciation and increased exports do not in general lead to economic growth. Too much dependence on exports is dangerous.

However, this contains some problems. The Japanese economy has been recovering in spite of the huge debt. There is some possibility that there is a debt threshold. If a country reachesthis threshold (e.g., 100% or so), the debt effect

becomes irrelevant. This nonlinear effect, when it exists, may exist only in countries with sound macroeconomic conditions and policies. On the other hand, for some developing countries and emerging countries with high inflation, debt seems a serious issue when the debt ratio is lower than that in developed countries. The origin of debt also should be examined carefully. There is some room for further study.

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