Public Debt in America

Xinyan Luo
University at Buffalo, Buffalo 14260, US

Abstract: This Article finds that U.S. public debt ratio has a positive impact on GDP growth at a decreasing rate. Moreover, Moreover, debt ratio is influenced by other variables: military spending, bank nonperforming loans, and government expenditure on education.
Keywords: Debt Ratio; GDP Growth; America

Introduction

"The United States debt, foreign and domestic, was the price of liberty. The faith of America has been repeatedly pledged for it... To justify and preserve their confidence; to promote the increasing respectability of the American name." ---------Alexander Hamilton, 1790, First report on the public credit.

One hundred years after the first report on public credit, the U.S. has the most public debt among all the countries in the world, about 80 thousand per capita, although the percentage of public debt over GDP is not the highest, about 126.4% of GDP in 2020(The World Bank, 2023). Through issuing debt, the government can greatly positively influence the economy, even though the government needs to pay interest to consumers who buy public debt. The profit is much more than the interest, which is the reason that lots of countries want to publish more and more public debt. However, lots of scholars doubt that there are positive effects on GDP growth from public debt, especially when the public debt to GDP ratio exceeds a certain value. The 2022 IMF's report about Public Debt and Real GDP proposes that high debt ratios may influence economic growth rate negatively and slow down the recovery from the pandemic. (Constance, Reina and Mengxue, 2022). How does public debt influence GDP growth rate? Does high debt ratio have a negative effect on GDP growth rate? Which variables will influence public debt? This brings us to the big question that we endeavor to explore with this paper: Will the US government publish more public debt?

1. Data Analysis about GDP Growth Rate and Public Debt.

1.1 literature review

Is it really good for economy when the debt ratio is high? Many scholars have investigated this.Yan-Ling and Siew-Ping find a negative association between GDP growth rate and the debt- GDP ratio by analyzing the data from 1991 to 2013 in Malaysia(Sew Peng & Yan Ling, 2015). Reinhart and Rogoff find that when gross external debt reaches 60 percent of GDP, the annual growth declines by about two percent. It will be cut in half for debt ratio higher than 90% (Reinhart&Rogoff,2010). Moreover, Chechenia and Rother find that there was a nonlinear relationship between debt ratio and GDP growth rate. Baum and Rother find that The short-run impact of debt on GDP growth is positive, but decreases to close to zero and loses significance beyond public debt-to-GDP ratios of around 67%(Chechenia&Rother, 2013). Kumar and Woo find a negative relationship between Debt ratio and GDP growth, which will increase as a higher debt ratio(Manmohan&Jarjoon,2010). In conclusion, the debt ratio may have a positive effect on GDP growth. However, GDP growth will decrease with a higher debt ratio.

1.2 The definition of variables

According to the conclusion of these articles, we use a set of variables that influences GDP growth. The basic estimation equation is as follows:

$$gGDP=\beta 0 +\beta 1lGDP +\beta 2Debt\text{-}sq +\beta 3Debt +\beta 4Saving +\beta 5Population+\varepsilon t$$

The dependent variable:

GDP growth rate (GGDP)

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	6	0.00606	0.00101	15.19	0.0021
Error	6	0.00039903	0.00006651		
Corrected Total	12	0.00646			

Root MSE	0.00816	R-Square	0.9382
Dependent Mean	0.02196	Adj R-Sq	0.8765
Coeff Var	37.13046		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Heteroscedasticity Consistent Standard Error	Heteroscedasticity Consistent t Value	Heteroscedasticity Consistent Pr > |t|
Intercept	1	90.49196	19.26064	4.70	0.0033	17.51547	5.17	0.0021
DEBT	1	1.60776	0.26270	6.12	0.0009	0.21624	7.43	0.0003
debt2	1	-0.73146	0.11155	-6.56	0.0006	0.08874	-8.24	0.0002
rate	1	-0.13108	0.21476	-0.61	0.5640	0.13861	-0.95	0.3808
pop	1	-0.05748	0.02108	-2.73	0.0344	0.01682	-3.42	0.0142
lgdp	1	1.66864	0.34528	4.83	0.0029	0.31011	5.38	0.0017
trend	1	-0.05435	0.01146	-4.74	0.0032	0	-Infty	<.0001

The independent variables:

Ln(GDP) (LGDP)

Debt ratio (DEBT)

Debt ratio-sq (DEBT2)

savings/consumption ratio, (consumer desire) (RATE)

The growth rate of population (POPULATION)

The year of each observation in the data (TREND)

This model analyzes U.S.'s data from 2008 to 2020. The U.S.'s debt ratio was over 60% for the first time in 2008

1.3 Empirical findings

This quadratic model is used to estimate the effect of increasing debt ratio on GDP growth. After controlling for heteroskedasticity, the coefficient of debt and debt2 is significant at 1% level. Moreover, the coefficient of debt is positive and the coefficient for debt-squared is negative, which means that there is an increasing at a decreasing rate: As debt ratio increases, the growth rate of GDP will decrease. The R-square is 0.9378, which means 93.78% of the variation in GDP growth can be explained by this model.

In conclusion, this model proves the result of others: there was a nonlinear relationship between debt ratio and GDP growth rate. And the short-run impact of debt ratio on GDP growth is positive, but it decreases as a higher debt ratio.

2. Data Analysis Concerning a High Debt Ratio

2.1 literature review

Rinaldi and Sanchis found that household non-performing loans had a positive and significant impact on debt ratio in 2006. Smyth and Kumar's findings are that a 1% increase in military expenditure generates a 1.1% to 1.6% increase in external debt in the long run(Smyth & Kumar, 2009). Military spending is part of government expenditure. High debt ratio helps government raise more money to sustain more military spending. Aizenman and Marion also found that inflation reduces the value of debt(Aizenman&Marion,2011). In their research, they found that an inflation rate of 6% would reduce the debt ratio by up to 20% over four years. However, Gargouri and Keantini found a positive impact on export, military, and bank nonperforming loans, but no impact on inflation. Moreover, they also found a negative impact of import and GDP growth rate (2016). Manmohan and Harjoon found that a

10 percentage point increase in public debt is associated with a 0.4 percentage point decrease in GDP (Manmohan and Harjoon,2015). And they found initial years of schooling has a positive effect on debt ratio.

2.2 Model and variables.

The majority of empirical studies find that in advanced countries, a high debt ratio(above 90) has a significant impact. This model collects data about nine advanced countries from 2012 to 2020: Austria(AUT), Belgium(BEL), United Kingdom(GBR), Greece(GRC), Ireland(IRL), Singapore(SGP), United States(USA). We also exclude some advanced counties with excessive debt ratio, such as Japan(JPN) and Iceland(ISL). The mean of debt ratio is 117%. The maximum is 208.83%(GRC,2018) and minimum is 69.7% (IRL,2019). We use panel data to study the impact of exogenous variables on public debt ratio, which can account for the differences between countries and regions also over time. The basic estimation equation is as follows:

$$debt=\beta 0 +\beta 1mili +\beta 2gdp+\beta 3infla +\beta 4bank+\beta 5debt2+ \beta 6edu +\beta 7import+\beta 8export+\varepsilon t+ \varepsilon i$$

This model is used to estimate the relationship between debt ratio and other variables. Among these variables, bank nonperforming loans representing income and debt ratio in the last year reflects the auto-correlation. εt is the time effect and εi is the country effect. Moreover, we use other variables that are generally considered in theory as determinants of public debt.

The dependent variable:

Weight: hhat

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	9	1.42835	0.15871	8.29	<.0001
Error	62	1.18626	0.01913		
Corrected Total	71	2.61461			

Root MSE	0.13832	R-Square	0.5463
Dependent Mean	1.02138	Adj R-Sq	0.4804
Coeff Var	13.54278		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	-58.63960	16.77793	-3.50	0.0009
year	1	0.02923	0.00829	3.53	0.0008
mili	1	0.17585	0.02736	6.43	<.0001
infla	1	-0.01333	0.01697	-0.79	0.4349
bank	1	0.02466	0.00533	4.63	<.0001
debt2	1	-0.52624	0.09765	-5.39	<.0001
edu	1	0.15717	0.03278	4.80	<.0001
import	1	0.00771	0.00431	1.79	0.0784
export	1	-0.00588	0.00488	-1.20	0.2330
country	1	-0.01949	0.01114	-1.75	0.0851

Research by xinyan

Public debt (% of GDP) (DEBT)

The independent variables:

Last year's debt ratio (DEBT2)

Government expenditure on education (% of government expenditure) (EDU)

Military spending (% of GDP) (MILI)

Inflation (INF)

Imports of goods and services (% of GDP) (IMPORT)

Exports of goods and services(% of GDP) (EXPORT)

Bank nonperforming loans to total gross loans (%) (BANK)

2.3 Empirical findings

The main results show that the coefficient of our model is significant (F-value= 8.29 & P-value < 0.0001). About 54.63% of the data can be explained by this model. We find there is impact of military spending, import and bank nonperforming loans. The result is in conformity with Gargouri&Keantini's study and Smyth&Kimar's. In addition, as a part of government expenditure, education

expenditure has a positive impact on debt-ratio. Also, the p-value of the coefficient of inflation is 0.43, which has a negative sign,which p-value is not significant. the coefficient of import is positive but not significant. And the coefficient of export is negative, which p-value is not significant. Other variables are significant at 1% level. Furthermore, the p-value of the coefficient of last year's debt ratio is significant, which means public debt of different years has autocorrelation.

We can conclude that the debt ratio has a positive impact on GDP growth in the short run but negative in the long run. The positive effect will be cut if debt ratio is higher than 90%. Moreover, debt ratio is influenced by other variables: military spending, bank nonperforming loans, and government expenditure on education.

3. The present of U.S. debt

President Joe Biden unveiled a nearly $1.9 trillion fiscal year 2024 budget request on Mar.9, including $ 842 billion for the defense Department-$26 billion more than Congress appropriated for the department in the December omnibus spending bill (NDIA, Mar.9). According to President Joe Biden's budget play for fiscal year 2024, the budget for the Cybersecurity and infrastructure Security Agency(CISA) and the Federal Bureau of Investigation(FBI) will increase. As expenditures increase, the U.S. debt increases further and further. Moreover, the national debt will surge from $31.5 trillion to $51trillion in 2033. Manmohan and Harjoon underline that country needs to take action to stabilize public debts and place them on a downward trajectory (Manmohan&Harjoon,2015). America is trying to expedite this process. In the short run, public debt still has a positive impact on GDP growth. However, this rate of increase will start to decrease at a high debt ratio.Furthermore, more and more countries have realized that America is able to secure huge profits for very little costs by means of increasing its interest rate of public debt. However, dollar still dominates the market and U.S. debt is still popular in the world, although their roles are gradually weakening.

References

[1] Aizenman, J., & Marion, N. (2011). Using inflation to erode the US public debt. Journal of Macroeconomics, 33(4), 524-541.

[2] Baum, A., Checherita-Westphal, C., & Rother, P. (2013). Debt and growth: New evidence for the euro area. Journal of international money and finance, 32, 809-821.

[3] Gargouri, I., & Keantini, M. (2016). The determinants of public debt. The Romanian Economic Journal, 18(59), 111-124.

[4] Hall, G. J., & Sargent, T. J. (2015). A history of us debt limits (No. w21799). National Bureau of Economic Research.

[5] Kumar, M., & Woo, J. (2010). Public debt and growth.

[6] Lee, S. P., & Ng, Y. L. (2015). Public debt and economic growth in Malaysia. Asian Economic and Financial Review, 5(1), 119-126.

[7] Reinhart, Carmen M., and Kenneth S. Rogoff. 2009b. This Time Is Different: Eight Centuries of Financial Folly. Princeton, NJ: Princeton University Press.

[8] Reinhart, C. M., & Rogoff, K. S. (2010). Growth in a Time of Debt. American economic review, 100(2), 573-578.

[9] Rinaldi, L.,& Sanchis-Arellano, A. (2006). Household debt sustainability: What explains household non-performing loans? An empirical analysis.

[10] Smyth, R., & Kumar Narayan, P. (2009). A panel data analysis of the military expenditure-external debt nexus: Evidence from six Middle Eastern countries. Journal of peace research, 46(2), 235-250.

[11] Spilioti, S. (2015). The relationship between the government debt and GDP growth: evidence of the Euro area countries. Investment Management and Financial Innovations, 12(1), 174-178.

[12] Swamy, V. (2020). Debt and growth: Decomposing the cause-and-effect relationship. International Journal of Finance & Economics, 25(2), 141-156.

[13] Woo, J., & Kumar, M. S. (2015). Public debt and growth. Economic, 82(328), 705-739.