China-USA Business Review, Jan. 2017, Vol. 16, No. 1, 1-13
doi: 10.17265/1537-1514/2017.01.001

External Debt and Economic Growth in Vietnam: A Nonlinear Relationship

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Most countries in the world are engaged in lending and borrowing activities regardless of their being rich or poor. For Vietnam, external loan is one of the important financial sources for investment because Vietnam's savings are still lower than investment. In the past 10 years, economic growth of Vietnam has slowed down while compared to areas, external debt still goes up continuously. This situation has raised the question whether a developing country like Vietnam should continue to borrow external resources. An empirical evidence to determine the tendency relationship between external debt and economic growth in Vietnam is necessary to decide the external debt policy in the future. This study finds out the relationship between external debt and economic growth in Vietnam between 2000Q1 and 2012Q4. Using OLS (Ordinary Least Square) method associated with the ECM model (Error Correction Model) of Johansen-Juselius, the research calculates the threshold of external debt as well as estimates the relationship between external debt and economic growth in Vietnam. The findings support the existence of non-linear (inverted U-shaped) relationship between external debt and economic growth with the threshold level of 28%. In addition, the study also quantified the effect level of external debt to economic growth if the government continues to borrow and exceed this threshold.

Keywords: debt overhang, external debt, debt threshold, non-linear external debt

Introduction

There are vast empirical evidences investigating the effect of external debt on economic growth. The existing literature also presents mixed results regarding this relationship. Most studies show that debt has a positive impact on economic growth; especially for developing countries, this impact is even greater as it shortens the gap between savings and investment needs (Chenery & Strout, 1966). Uzun, Karakoy, Kabadayi, and Emsen' s research (2012) among 19 transition economies also found a positive impact of external debt on economic growth. Meanwhile, the others demonstrate opposite results (Shabbir, 2013; Antwi, Mills, & Zhao, 2013). It is noticeable that the study of Kaminsky and Pereira (1994) named the period of 1970-1980 in Latin American countries the "lost decade", when debt crisis has depressed economic growth of those countries to more than 4 percent (from an average of 6 percent in 1970 to an average of 1.8 percent in the 1980s).

In Vietnam, most researches use the qualitative approach to analyze the structure of external debt, external

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debt strategy, debt management and debt policy, and determinants of external debt but there is a few quantitative research on the relationship between economic growth and external debt in Vietnam. Pham (2011) examined the empirical relationship between external debt and economic growth during 1986-2010. The study was conducted with 25 yearly observations of time series data, using ECM model by Engle Granger and found the existed long- and short-term relationship between external debt ratio to GDP and economic growth. H. T. Nguyen (2012) has the first research which found out the threshold in the "external debt-economic growth" relationship. In 4-page article, with 24 yearly observations from 1986-2009, this research pointed out that external debt to GDP had an impact on a nonlinear curve, and the annual external debt threshold was 65%.

Vietnam is a country that mainly relies on foreign capital, especially external debt to economic growth. In 1989, the foreign debt was of 16 billion dollars, the average economic growth was 4.68%; 1993, economic growth rose to 7.08%, foreign debt was 24.1 billion dollars; 1997, economic growth was 8.15% and foreign debt was 21.78 billion dollars.

After many years having been experienced the rapid economic growth rate, the growth rate of Vietnam tends to decrease while the amount of foreign debt has increased rapidly: in 2008, the economic growth rate dropped to 6.3% (foreign debt was USD 28.8 billion); 2010, the economic growth rate amounted to 6.4% (foreign debt was USD 48 billion); 2012, the economic growth rate of about 5.2%, foreign debt was 59 billion dollars.

Moreover, accompanied by a gradual reduction in economic growth rate, it is the rise in the number of inefficient projects, which are financed by external debt sources, such as Vinalines, Vinashines. The inconsistent conclusion from previous studies on external debt as well as this situation has raised the question: Does the relationship between external debt and economic growth invert U-shaped?

This study is designed to test the relationship between external debt and economic growth for the case of Vietnam in the period 2000-2012 with quarterly data using ECM model by Johansen-Juselius (1988). The other sections of the paper are as following: section 2 briefly reviews literature and empirical evidences existing in this area; sections 3 describes the data estimation methodology and model used in the empirical analysis; section 4 provides discussion on empirical model, and section 5 closes the research with conclusion and recommendations.

Theoretical Review on External Debt and Economic Growth

There is an inconsistency on the assessment of the impact of external debt on economic growth.

Many researches appreciated the role of external debt in filling the gap between saving and investment, government revenue and expenditure, and export and import revenue. Chenery and Strout (1966) based on the extended Harrod-Domar model, emphasized the role of national savings. Using Johansen method, Paudel and Perera (2009) found that in the long run, all the economic variables such as external debt, total trade, and labor force have a positive impact on economic growth of Sri Lanka. Boboye and Ojo (2012) found foreign debt helps offset two gap—trade deficit and savings-investment in Nigeria.

Hansen (2001), researched a sample of 54 developing countries (including 14 countries HIPCs), and concluded three explanatory variables (deficits, inflation, and the openness of the economy economic) impact on growth, whereas debt levels have no statistical impact on economic growth. Besides, many recent studies said that the foreign debt burden is the cause of poverty through negative effects on economic growth and

human development. Representative research was the study of Kaminsky and Pereira (1994), Krugman (1988), Alesina and Tabellini (1989), and Tornell and Velasco (1992), which found crowding-out effect of foreign debt investment; in particular, the foreign debt replaced part of domestic savings, loans increased government debt, and interest rates and gradually declined private investment. The result of this is that economic growth rate dropped and the pressure on government's debt repayment increased. Other studies also suggested negative impacts on economic growth (Shabbir, 2013; Antwi et al., 2013; Moser & Ichida, 2001). Debt burden will restrain private investment, increasing uncertainty in the government's debt repayment decisions (Serven, 1997). Besides, countries with high level of foreign debt are difficult to attract investment (Ajayi & Khan, 2000), which partially inhibits economic growth (Loko, Kalonji, Nallari, & Mlachila, 2003) because of volatile financial market and inherent risks. The high debt along with poor debt management and high government spending, and high budget deficits certainly negatively impact economic growth (Azam, Emirullah, Khan, & Prabharker, 2013). Antwi et al. (2013) examined the role of official development aid and macro variables affecting economic growth in Ghana. The study concluded that the coefficient on the ODA was a negative sign at 5% significance level, indicating that one percent increase of the percentage of official development aid on GDP would lead to GDP growth rate decrease by 0.038%. Therefore, the authors commented that a high rate of external debt would put a pressure on investors and manufacturers as tax payable. Policy makers are reluctant to reform policies and economic structures. F. S. Ayadi and F. O. Ayadi (2008) also concluded that increasing external debt would decrease economic growth in Nigeria and South Africa. This conclusion is similar to the findings by Fosu (1996) for sub-Saharan African countries. Ahmed and Shakur (2011) analyzed the long- and short-term relationship between external debt and economic growth of Pakistan, which also concluded that the burden of debt obligations had negative impacts on labor and capital productivity, created debt pressure, and in turn would reduce Pakistan's debt repayment capability and thereby adversely affecting the economic growth. Shabbir (2013) explained that when the expected debt obligation was higher than the economic output growth rate, return on investment in a country was considered a high interest tax that external creditors imposed on domestic economy and discouraged domestic and foreign investors; thus, the economic growth would be decreased. Reviewing official development assistance and foreign debt affect on the economic growth of Pakistan from 1972 to 2005, Malik, Hayat, and Hayat (2010) found increasing in 1% in debt services led to reduction 0.038% in economic growth rate. Were (2001) had the same conclusion in the case of Nigeria whose foreign debt is mainly multilateral and government debt.

Standing between these two schools of thoughts is the view that external debt affects economic growth in a nonlinear way. Initially, Krugman (1988) defined that debt overhang is a condition in which the amount set aside to pay external debt will decrease as the debt increases. At a reasonable level, the additional debt is expected to have a positive impact on the growth. But the theory also emphasizes that increasing cumulative debt would cause an impediment to the growth. The two directions when being combined show that debt and economic growth have a nonlinear relationship. That is, initially, the increasing debt will push the economic growth, but once at the peak, a subsequent increase in debt will put pressure on economic growth. Besides, debt overhang theory was mentioned in the study by the IMF (2003) and Pattillo, Poirson, and Ricci (2002). These studies frequently mentioned the Laffer curve. With inverted U-shaped, Laffer curve shows that external debt will impact positively on economic growth to a certain debt threshold level (threshold level) also known as "growth-maximizing level of debt" (or debt overhang).

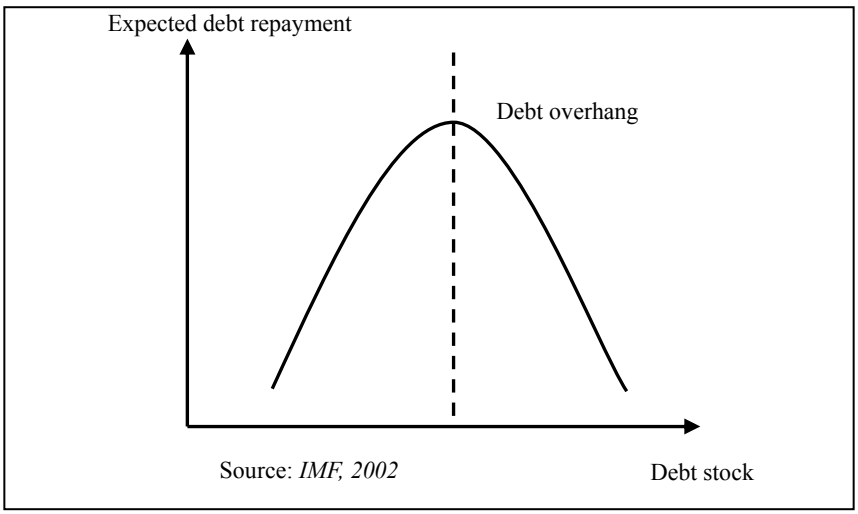

Figure 1. External debt Laffer Curve.

According to Cohen (1993), the relationship between foreign debt and investment can also be expressed as Laffer curve. The foreign debt has a positive impact on investment and economic growth only when the ratio of foreign debt is also located in the left side of the threshold. But the increase in the debt exceeds a threshold level, the debt is expected to start falling as a result of side effects of debt financing. This means that the increase in the value of debt leads to an increase in debt up to the "threshold", along the right side of the Laffer curve debt, thereby, increasing the expected payment and reducing in profits of investors. Nguyen, Clements, and Bhattacharya (2003) also mentioned this situation was the existence of the debt Laffer curve between foreign economic growth through investment. Debt overhang also falls in investment and economic growth and increases the uncertainty of the economy. If the level of a country's debt is expected to exceed the repayment capacity of the country, the government will increase revenues to serve such payments, so the growth rate of national output will decrease. Therefore, some of the profits from investing in a country's economy will be "taxed" to pay foreign creditors, so economic growth will be restrained. In addition, when the scale of debt increases, the uncertainty about the actions and policies in which the government will proceed to cover its debt obligations would cause adverse effects on investment as a job to payment of debts (Agénor & Montiel, 2008).

Fosu (1996) studied 29 countries in sub-Saharan Africa, also supported for the existence of debt overhang theory. Shabbir's study (2013) considered the direct effect of foreign debt and indirect effects (through investments) on the economic growth of over 24 developing countries and concluded that the effect of foreign debt on economic growth has a nonlinear curve. Mohd Daud, Ahmad, and Azman-Saini (2013) also confirmed the strong relationship between external debt and economic growth of Malaysia and had estimated external debt threshold for the entire period in Malaysia was 170.757 million ringgit (RM).

Maghyereh and Omet (2002) suggested that in the early stages, when the country used external debt to invest, economic growth would come faster. Then, the external debt will lower growth due to repayment pressure. The final result depends on the creditors and commitments in implementing debt-rescheduling policies. If these commitments were not settled, the prospect of tightening pressure and debts occurs. Whereby the burden of external debt creates pressure on both the investment and the economic growth of that country, leading to decline in economic growth. Osinubi, Dauda, and Olaleru (2010) did empirical research in Nigeria from 1970 to 2003, showed that the threshold ratio of external debt to nominal GDP in Nigeria was 60%. When

the ratio of external debt to GDP was lower than the threshold of 60%, that the ratio of external debt to GDP rose by 1% would increase real GDP by 64.60 (billion naira); when the ratio of external debt exceeded threshold, that the ratio of external debt to GDP rose by 1% would lower real GDP by 374.26 (billion naira), the equivalent of nearly 2 billion dollars.

Analytical framework is summarized in Figure 2.

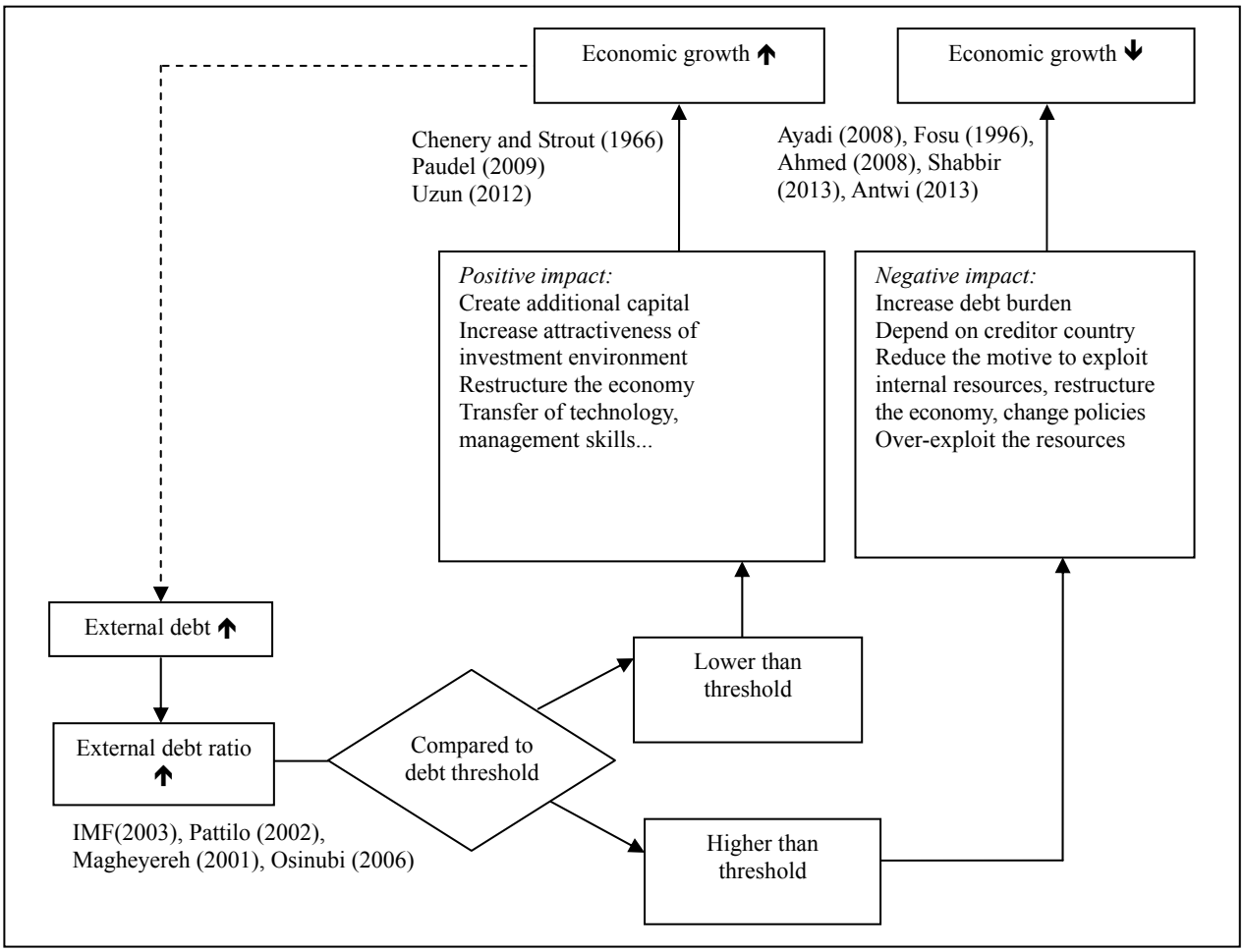

Figure 2. Analytical framework.

Research Data, Estimation Methodology and Models

Research Data

Data in the research are recorded by quarter from Q1/2000 to Q4/2012. The variables are calculated as in Table 1.

The quarterly debt showed that:

- LGDPR shows the average value and median are nearly equal, and the value of skewness and kurtosis coefficient shows standard normal distribution. Jaque-Bera test does not show the rejection of the null hypothesis. H_0-LGDPR is normally distributed with every level of significance of 1%, 5%, and 10%.
- ED has standard normal distribution with kurtosis < 3 and relatively large standard deviations (6.9625), indicating that the data have many different levels of dispersion. Skewness > 0 shows that the graph tends to

concentrate to the left and tail down towards the right. In addition, there is a large difference between the minimum value (15.46%) and maximum value (44%), which shows the volatility of external debt for different periods. In fact, the level of concentration of external debt on GDP ratio is mostly at 16%, 22%, 25%, 31%, and 34%, of which the highest concentration is at 16% and 22%. This shows a good sign of external debt to GDP ratio and debt pressure is not yet high. And the ideal ratio tends to fall in the early periods from Q1/2000 to Q4/2006. After 2006, the ratio is in high level and highest value of ED is 44%, indicating that external debt trend tends to increase in recent years. In other words, the repayment capability via national income is on a downward trend.

• OPEN. Jarque-Bera test shows that OPEN also has normal distribution. However, there is a large difference between the minimum value and a maximum value of the variable. This shows that there is a difference in the export ratio in each period, in which skewness > 0 shows right skew distribution. Vietnam's exports ratio is at 51-53% of GDP, indicating the important role of export in promoting economic growth.

Table 1

Definition of the Variables in the Model

Variables' name	Variables' description	Calculation	Source
LGDPR	Logarit of real GDP	Natural logarithm of total real gross domestic product, calculated based on GDP deflator, using 1994 as the base year	IMF, ADB
ED	External debt ratio	The ratio of external debt to GDP	ADB
DUM	Debt threshold	Equals zero when external debt ratio is below thresholds of external debts Equals the difference between external debt and external debt threshold when external debt ratio is above the threshold	Author's calculation
OPEN	The openness of economy	Is measured by the ratio of exports to GDP	IMF, ADB

Source: Author's summary.

Table 2

Descriptive Statistics of Variables

	GDPR	ED	OPEN
Mean	107,970.8000	26.0975	62.1806
Median	103,671.0000	25.3950	60.3746
Maximum	187,881.4000	44.0000	95.7834
Minimum	54,453.0000	15.4600	40.1398
Std. Dev.	32,703.4700	6.9625	13.6534
Skewness	0.4871	0.2151	0.4776
Kurtosis	2.4393	2.2057	2.4407
Jarque-Bera	2.7379	1.7678	2.6547
Probability	0.2543	0.4131	0.2652
Observations	52	52	52

Source: Retrieved from E-views 8.0.

Methodology

This study is designed for time series data based on Osinubi et al.'s research (2010), the ordinary least square (OLS) and co-integration test analysis are based on the Johansen and Juselius (1988).

Trial and error is conducted with the external debt level change 16% to 44% (equivalent to from the lowest to the highest level of foreign debt of Vietnam in the period of 2000-2012). With each level of external debt,

OLS and the co-integration test for the long- and short-term equilibrium from Q1 2000 through the end of Q4 2012 in Vietnam are conducted. After that, all the models are compared with each other based on adjusted R-square and Durbin-Watson to choose the most appropriate model. Empirical equation is indicated as follows:

$$LGDPR = \alpha_1 + \alpha_2\psi + \alpha_3 (\psi - \psi^*) \partial + \alpha_4 OPEN + u \quad (1)$$

$$LGDPRSA = \alpha_1 + \alpha_2 EDSA + \alpha_3 DUM + \alpha_4 OPENSA + u \quad (2)$$

In equation (1), LGDPR is the natural logarithm of total real gross domestic product, calculated based on GDP deflator on condition that 1994 is base year. This variable is also used in measuring external debt level modeled by Maghyereh and Omet (2002). LGDPRSA, EDSA, and OPENSA are LGDPR, ED, and OPEN variables after adjusting for the seasonal data by moving average method-multiplicative. ψ is the ratio of external debt to GDP (%). ψ^* is the external debt level under debt Laffer curve. ∂ is dummy. $\partial = 1$ if $\psi > \psi^*$, $\partial = 0$ if $\psi < \psi^*$. α_1, α_2, α_3, α_4: regression coefficients.

The difference between ψ and ψ^* $(\psi-\psi^*)\partial$ shows minor change of external debt around the threshold level; these values have different impacts on the GDP depending on the level of external debt increased or decreased.

In equation (2), DUM is zero when the external debt ratio is below the threshold and equals to the difference between the external debt versus external debt level if the external debt ratio is above the threshold. OPEN is the openness of the economy, as measured by the ratio of exports to GDP (%). Different from Osinubi et al. (2010), the openness of the economy is represented by the ratio of total value of exports and imports to GDP. The reason of this is that: (1) Vietnam's export revenue is highly correlated with import revenue. Vietnam production depends heavily on imports, especially the import of machinery and raw materials, which account for more than 90% total import revenue (GSO, 2016). Thus, using total value of exports and imports to GDP will be double counting (Nguyen, 2012); (2) This indicator was also used by Jayaraman and Lau (2009) to represent the openness of the economy when studying the effects of external debt on economic growth of Pacific countries.

Expected signs of regression coefficients: $\alpha_1 > 0$, $\alpha_2 > 0$, $\alpha_3 < 0$, $\alpha_4 > 0$ (Osinubi et al., 2010). $\alpha_1 > 0$ indicates increasing external debt ratio causing increase in economic growth; $\alpha_2 < 0$ indicates if external debt ratio exceeds the threshold, the increase in external debt ratio will cause decline in economic growth.

Research Findings on the Relationship Between External Debt and Economic Growth

Data Description

Before 2008, external debt ratio was below 30% of GDP together with increasing stable export rate and economic growth was at a high average of 7.63% (real GDP was 68,417 billion dong) (Figure 3). In 2000, the ratio of external debt was at 18.35% of GDP, export growth was at 45.72% of GDP, and economic growth was at 6.78%. In 2003, the ratio of external debt to GDP increased to 23%, the export rate increased to 50% of GDP, economic growth has increased to 7.31% (real GDP in 2003 was 84,061 billion dong). By 2007, the debt ratio increased to 27.50% and exports rose to 68.81%, and the economic growth reached its highest peak at 8.48% (respectively, real GDP was 115,361 billion dong, 1.7 times higher than in 2000). So, the increase in external debt ratio and export rate goes in parallel with increase in economic growth. In other words, in 2000-2007, the ratio of external debt remained under 30%, and an increase of external debt ratio and exports led to high and stable economic growth.

During 2008-2012, the external debt ratio exceeded 30% of GDP and economic growth was more volatile on a downward trend. In fact, the external debt ratio was 31.43% in 2008; economic growth was lowered to 6.15% (in 2007 it was 8.57%). In 2011, the ratio of external debt to GDP was 33.84%; economic growth reached 5.96%. In 2012, the rate was 32.63% and economic growth was 5.05%. In summary, during 2008-2012, the external debt ratio exceeded 30%, where economic growth saw a significant reduction; average growth rate for five years from 2008 to 2012 was 5.88% (lower than the average of previous period at 7.63%). GDP growth rate was the lowest in 2009 at 5.45% (equivalent to 129,142 billion dong), and export ratio fell to 62% of GDP (compared with the previous year: 70%). Export ratio to GDP has affected the economic growth. In short, for a period of five years from 2008 to 2012, when external debt exceeded 30% of GDP, economic growth fluctuated downward.

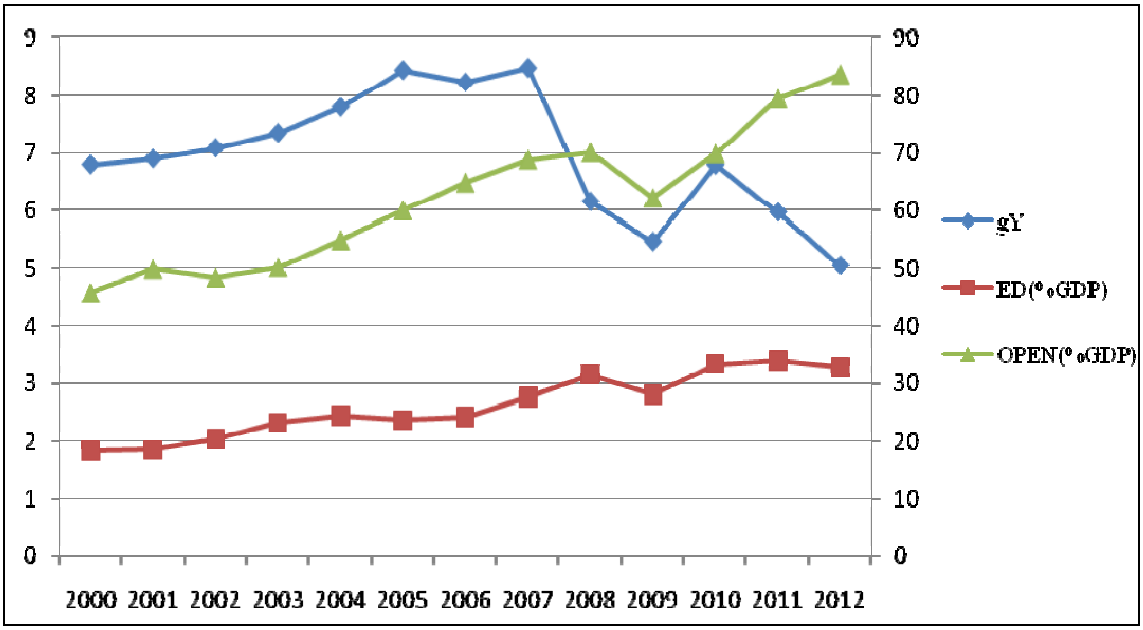

Figure 3. Economic growth, external debt and export ratio of Vietnam in 2000-2012. Source: Asia Regional Integration Center-Asian Development Bank (2013).

Unit Root Tests

Seasonality filtered time series (seasonal adjustment of ratio to moving average-multiplicative) are modeled exponentially and conducted unit root tests for each separate variable to determine the stationarity of data variables, observed. Phillips-Perron test and ADF test show that the variables are non-stationary at the zero-order while at first different levels they are stationary (see Table 3).

Estimated External Debt Threshold of Vietnam

Ordinary least squares method (OLS) is used to estimate the threshold. The threshold of external debt is tested from 16% (the lowest level of external debt) to the highest level of 44%. With each run, the threshold is increased by 1%. Similar to Osinubi et al. (2010), the study based on adjusted R-squared value and Durbin-Watson statistic selects the threshold. To limit the effects of autocorrelation, MA (1) (Moving-Average) is added to the model (Osinubi et al., 2010; T. H. Nguyen, 2009). The threshold is calculated as 28%.

$$LGDPRSA = 10.0979 + 0.0283*EDSA - 0.0346*DUM28 + 0.0125*OPENSA + 0.5075\ MA \quad (1)$$

Analyzing the Long-Term Relationship Between Macroeconomic Variables

Unrestricted Co-integration Rank Test (Trace) by Johansen-Juselius rejected the assumption of no co-integration at the significance level of 5% and 10%. Similarly, testing the maximal eigenvalues of matrix (Unrestricted Co-integration Rank Test-Maximum Eigenvalue) has rejected the assumption of no co-integration at all three significance levels of 1%, 5%, and 10% (see Table 4).

Table 3

Unit Root Tests on the Dataset

Variable	Dickey-Fuller unit root test (zero-order)		Dickey-Fuller unit root test (first-order)		Conclusion
	T-statistic	P-value	T-statistic	P-value	
LGDPRSA	-1.4119	0.5690	-10.7825	0.0000	First-order stationary
EDSA	-2.2781	0.1828	-7.2668	0.0000	First-order stationary
OPENSA	-1.1035	0.7075	-9.2761	0.0000	First-order stationary
Variable	Phillips-Perron unit root test (zero-order)		Phillips-Perron unit root test (first-order)		Conclusion
	T-statistic	P-value	T-statistic	P-value	
LGDPRSA	0.186	0.969	-10.592	0.000	First-order stationary
EDSA	-2.192	0.212	-10.864	0.000	First-order stationary
OPENSA	-1.308	0.619	-9.630	0.000	First-order stationary

Source: Retrieved from Econometrics Views 8.0.

Table 4

Results From the Co-integration Analysis

Unrestricted co-integration rank test (Trace)				
Hypothesized No. of CE(s)	Eigenvalue	Trace statistic	Critical value	Prob.**
None *	0.5781	68.6745	63.8761	0.0187
At most 1	0.3432	27.2518	42.9152	0.6664
At most 2	0.0915	7.0720	25.8721	0.9932
At most 3	0.0500	2.4654	12.5179	0.9331

Trace test indicates 1 co-integrating eqn(s) at the 0.05 level.

Unrestricted co-integration rank test (Maximum Eigenvalue)				
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	Critical Value	Prob.**
None *	0.5781	41.4227	32.1183	0.0028
At most 1	0.3432	20.1798	25.8232	0.2330
At most 2	0.0915	4.6066	19.3870	0.9921
At most 3	0.0501	2.4654	12.5180	0.9331

Max-eigenvalue test indicates 1 co-integrating eqn(s) at the 0.05 level.

Note. (*) denotes rejection of the hypothesis at the 0.05 level; (**) MacKinnon-Haug-Michelis (1999) p-values.

Source: Retrieved from Econometrics Views 8.0.

Thus the results of Johansen test show long-term relationships between economic variables.

From the co-integration test, regression results are presented in Table 5. Results showed that the variables have an impact on economic growth. In fact, external debt to GDP ratio variable affects economic growth at 10% significance level. Other variables (external debt thresholds and the openness of the economy) are

affecting economic growth at 10% and 5% significance level. The regression coefficients results are $\alpha_1 > 0$, $\alpha_2 > 0$, $\alpha_3 < 0$, $\alpha_4 > 0$, matching the theory and expectation sign.

Table 5

Long Run Equilibrium Equation

Dependent variable: lnGDP	ECM model
Explanatory variables	Regression coefficients
EDSA	-0.0052 (0.0039)*
DUM28	0.0267 (0.0040)***
OPENSA	-0.0035 (0.0012)***
@trend(00Q1)	-0.0151 (0.0014)***
_cons	-10.8372
EC	-0.2304 (0.0402)***
R2	0.9417

Note. ***, **, * Statistically significant levels are 1%, 5%, and 10%; The number in ( ) is the standard error.
Source: Retrieved from Econometrics Views 8.0.

$\alpha_1 > 0$: the economy is growing with no external borrowing ceteris paribus.

$\alpha_2 > 0$, $\alpha_3 < 0$ show that the ratio of external debt to GDP has a positive impact on economic growth and external debt threshold variable has a negative impact on economic growth ceteris paribus at $\alpha = 10\%$, confirming that there exists a nonlinear relationship between external debt and economic growth in Vietnam. In other words, if the ratio of external debt to GDP of Vietnam is lower than 28%, then an increase in external debt ratio will increase economic growth. However, if the external debt exceeds the threshold, then a subsequent increase in external debt growth will cause a decrease in economic growth.

$\alpha_4 > 0$ shows that if the ratio of exports to GDP increases by 1%, the growth rate of real GDP will increase ceteris paribus, Specifically.

$\alpha_2 = 0.0052$ shows that if other factors are constant, and external debt does not exceed the threshold of 28%, an increase by 1% would spur economic growth of 0.52%. For example, from 2000 to 2002, the external debt ratio averaged from 16% to 25%, and real economic growth in this period was from 10.91% to 11.2% .

$\alpha_3 = -0.0267$ indicates if the ratio of external debt to GDP exceeds the 28% threshold, an increase by 1% will cause real GDP per capita to fall by 2.67%. From 2007 to 2012, the external debt ratio remained at high levels from 29% to 37%, and Vietnam's economic growth fluctuated depending on the level of external debt by quarter. For example, in Q1/2011 external debt to GDP ratio was at 34%, and real GDP was 109,313 billion VND (lower than the previous quarter, 167,522 billion dong).

$\alpha_4 = 0.0035$ shows that the ratio of exports to GDP increases by 1%, and the average growth rate of real GDP increases by 0.35%. For example, in Q2/2005 export to GDP ratio was at 58.56% until Q1/2005 was 57.4%, and the economic growth 8.04% compared to previous quarter (7.44%). After that, when the ratio of export of Q3/2005 continued to increase to 60.60%, the economic growth also raised to 9.26%.

EC = -0.2304. The coefficient for error term is $-0.2304 < 0$ and is statistically significant at 5% level implying that the system corrected its previous disequilibrium period due to positive or negative shocks in one period at an adjustment speed of 23.04 percent quarterly.

Table 6

Pairwise Granger Causality Tests

Null hypothesis	Obs	F-statistic	Prob.
DEDSA does not Granger Cause DLGDPRSA	45	3.05694	0.0177
DLGDPRSA does not Granger Cause DEDSA		2.75805	0.0283
DOPENSA does not Granger Cause DLGDPRSA	45	2.89467	0.0228
DLGDPRSA does not Granger Cause DOPENSA		3.02626	0.0185
DOPENSA does not Granger Cause DEDSA	45	1.23984	0.3125
DEDSA does not Granger Cause DOPENSA		0.76434	0.6033

Source: Retrieved from Econometrics Views 8.0.

In order to determine the influence of the variables in the model, Granger causality test is used. The F-statistic results revealed that there exists a bi-directional causality between external debt and economic growth.

Conclusions and Recommendations

This research aims at testing the existence of nonlinear relationship between external debt and economic growth of Vietnam in the period of 2000-2012. The result reveals that this relationship observes the shape of Laffer curve with the peak of 28%. When debt ratio is on the left of peak 1% increase in external debt will help increase in 0.52% of economic growth; in contrast, when debt ratio is on the right of the peak, each of percentage point exceeding the peak will reduce 2.67% in economic growth.

The research does not aim to recommend the government to specify the ideal external debt to GDP ratio, because the economy is dynamic and influenced by external shocks. However, the research suggests that if the cost of loans from foreign creditors outweighs the benefits derived from it and the difference between the costs and benefits of the loan creates a debt burden pressure. Vietnamese government should limit new loans. Vietnam should define suction capacity of economy, balance of payments, term loans, and the cost of borrowing capital to make decisions optimal foreign debt levels and maintaining the positive effects of foreign debt on economic growth.

This research recommends that for a given economic growth target, and the government should recognize appropriate external debt ratio which should be below the threshold of 28% of quarterly GDP. And the result also suggests that once the external debt ratio reaches the peak of the debt Laffer curve, the Vietnamese government should focus on stabilizing or reducing debt. The Government should adopt some fiscal policy to curb trade deficit, budget deficit, and savings-investment, or attract such funds as overseas remittance, FDI to maintain a sustainable level of external debt. To obtain a higher funding for the economy, the government should look for non-debt sources of funding such as FDI and ODA grant, increase exports to promote economic growth, and improve capital management skills.

Although, the impact level of external debt on economic growth is still low -2.67%, however, over time, the external debt to GDP ratio will continue to increase to serve for the economic growth ambition of Vietnam, and that negative impact on economic growth will deepen and put the pressure of debt servicing accumulation in the future. So, Vietnamese government should take into consideration on this situation.

Research Limitations

To get the peak point, the research applies trial and error process with 1% increase in external debt ratio for every trial. Further research can use bootstrap technique to catch this point.

Due to difficulties in obtaining other quarterly macroeconomic data, the study did not take into account macro variables such as credit, interest rates, government expenditure, tax, and public debt. Further research may expand to have a comprehensive view of economic growth and external debt using other macroeconomic variables.

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