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Public Debt, Government Expenditure and Economic Growth in Malaysia

Nur Fadhlina Zainal Abedin[1*], Rosilawati Amiruddin[2] & Ismadi Ismail[2]

[1]Faculty of Business Management,Universiti Teknologi MARA,
Negeri Sembilan Branch, Seremban Campus

[2]Faculty of Business Management,Universiti Teknologi MARA,
Shah Alam, Selangor

[*]*nurfadhlina@uitm.edu.my*

ABSTRACT

Budget deficit especially during an economic crisis increases the demand for public finance or debt internally and externally to support government expenditure. Public debt and government expenditure are regarded as an engine that promotes economic activities and hence increases economic growth. However, is the case true for a developing country particularly Malaysia? What is the empirical causal-effect between these variables on economic growth? The past studies seem to have a mix of findings on the impact of public debt on economic growth. This makes a hard dilemma for policy decision making. Therefore, the objective of the study is to examine the long-run relationship between public debt, government expenditure and economic growth for Malaysia from the year 1980 to 2018. A time-series Vector Autoregressive (VAR) co-integration, Vector Error Correction Model (VECM) and causality tests are used in the analysis. The findings indicate that there is a significant long-run relationship between public debt and growth positively. Unidirectional causality is found between public debt-economic growth, government expenditure-economic growth and government expenditure-public debt.

Key Words: *Public debt, government expenditure, economic growth, cointegration, Granger causality*

1 INTRODUCTION

High expenditure needs than the actual budget become a problem for some countries. Wibowo (2017) states that majority of countries in the world facing this problem while adopting a deficit budget policy. A deficit budget is a situation where the public expenses are more than its revenues. The most common way to inject funds is through domestic and foreign loans. The need for loans or public debt become more demanding if the economic crisis hit the country. Malaysia is an example of an open economic system with many trading partners that are easily affected by the external crisis. For example, in August 1997, Malaysia was hit by currency speculators that declining the value of the national currency and thus sharply drop the annual growth rate. The crisis which is known as the Asian financial crisis gave a large negative impact on the economies. The economic growth in 1998 was recorded -7.35, the worsen in modern Malaysia economic history. Malaysia reacted to the crisis by adjusting the policies to boost its economic activities. This means that a huge investment has to be injected to support the development and operating expenses.

Debt injection is used to accumulate capital, develop infrastructure, human resource development, and others. It will boost economic growth if it is used in productive investment. Thus, the public debt is not too bad. It is an instrument to generate economic growth that benefits the citizens. However, in many countries, the amount of public debts increase significantly which can be compared to the size of their

gross domestic product (Sokolov & Sokolova, 2012). It creates uncertainty for the countries to ensure the ability to repay the large public debts and worriedness about the interest burden.

While the negative effect of indebtedness on growth in the long-run is hypothesized in this study as prescribe in theories and literature, it should be noted that the effect may run in the opposite direction as found by Dahal (2006). The debt-growth effect is ambiguous making it hard to draw a rough conclusion for a specific country. Thus, this study aims to examine the causal effect of public debt on economic growth in Malaysia. If debt influences growth positively, then the borrowing is encouraged since it brings many benefits to the countries that will increase the volume of output and eventually rise national income. Besides public debt, this paper also examines the effect of government expenditure on Malaysia growth.

2 EMPIRICAL EVIDENCE ON DEBT AND GROWTH

The effect of public debt on economic growth is important to guide a correct policy for the country's prosperity. It is said that high debt in the long term may burden the country where the effect is negative to growth. However, the insecurity and policy credibility may magnify the adverse effect of crowding out and lead to a situation in which expansionary fiscal policies have a positive effect on long-run growth. Evidence from empirical studies proves that the effect could be a negative correlation between these variables (Maghyereh et. al, 2003; Presbitero, 2005; Kumar & Woo, 2010; Lof & Malinen, 2014; Eberhardt & Presbitero, 2015) or conversely (Dahal, 2006). Thus the public debt effect on growth is questionable.

The analysis is started by the debt and growth study of Lof & Malinen (2014). Their study is tested for a sample of 20 developed countries, using annual data for the periods of 1954–2008 and 1905–2008. They used panel vector autoregressions (PVAR) to test the dynamic relationship between public debt and economic growth. The impulse-response functions from an estimated PVAR are run to check the relationship. The results indicate that shock to both growth rates of debt and GDP is transitory where there are no effects of a shock after a couple of years. The result shows the impact on debt after a shock to GDP and the reverse impact on growth after a shock to debt. It revealed that the negative correlation between debt and GDP is a result of the negative impact of GDP growth on debt, rather than the negative impact of debt on GDP growth. They get the same results when levels are applied instead of differences.

Some studies are interested to find the existence of the Laffer Curve. Laffer Curve is close to nonlinearity/threshold scope since it examines the presence of inverted U shape in the case study. Megersa (2015) used a case study of Sub-Saharan African (SSA) countries. The issues of high debt in SSA countries persist for a long ago. The year 1980s and 1990s show a bad debt level that burden the countries. Some were given relief schemes and debt-forgiveness campaigns. Megersa examines whether "laffer curve" type relationship exists in SSA that is derived with ordinary t-tests in STATA and Fieller confidence interval. The study used panel data of 22 low-income SSA countries, from year 1990 to 2011. The variables are per capita GDP growth, initial income, population growth, openness, school enrolment, terms of trade, investment, inflation and general government gross debt as a percent of GDP. All variables yield a positive sign to GDP growth except for initial income, population growth, inflation and public debt. A concave-down or laffer curve is shown by a significant and negative coefficient of the quadratic term of $Debt^2$. When the debt-laffer curve is fitting with quadratic prediction plots, similar patterns of concave-down relationship is obtained. Thus, the paper claimed a bell-shaped exist between public debt and economic growth relationship.

It is a fear that a large volume in stock of outstanding debt worsens the economy especially for Nepal, an economy with high borrowing from bilateral and multilateral sources. Dahal (2016) studied the effect of debt and education-centric human capital on economic growth in Nepal using the ARDL approach for year 1975-2014. The study starts with a production function by a Cobb-Douglas that considering four factors: gross fixed capital formation (GFCF), government's total debt stock (TD), a measure of education-centric human capital (HC), and labour force (L). Based on results, there exists a long term cointegrating between dependent and independent variables. Surprisingly, *lnTD* is positively significant

with growth indicating that a one percent rise in debt increases real GDP per capita by around 0.23 percent. The result is contradicted with many literatures. The results are surprising where the outstanding total shock of the government's debt in Nepal case is positively affecting the level of per worker GDP.

3 METHODOLOGY

This paper uses the annual data for the sample period from 1980 to 2018. The multivariate model consists of three variables: GDP per capita, public debt or central government debt and government expenditure. All data were gathered from World Development Indicators and prices from the World Bank. As part of the empirical design, the base estimating equation in log-linear form is specified as follows:

$$lnY_t = \beta_1 lnDEBT_t + \beta_2 lnGOV_t + u_t \quad (1)$$

where, y is GDP per capita, DEBT is public debt and GOV is government expenditure. The variables are converted into natural logs because if the variables are in logs, the first difference can be interpreted as growth rates. The expected signs of the parameters are positive. The error-term u is assumed to be independently and identically distributed. The subscript (t) indexes time.

Tests for Stationarity

The result from the Ordinary Least Square (OLS) regression is spurious if it was regressed with non-stationary data. Thus it is important to test the stationarity of the data. Several tests can be used to the stationary property of the series. In this paper, we employed the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) test. The basic Dickey-Fuller test is augmented by adding various lagged dependent variables as below:

$$\Delta y_t = (\rho - 1) y_{t-1} + \alpha_i \sum_{i=1}^{m} \Delta y_{t-i} + u_t \quad (2)$$

The lag (m) can be determined by Akaike criteria. The same criterion is used for the Phillip-Perron test. This test proposes a unit root test that controls for higher-order serial correlation in a time series.

Cointegration and Vector Error Correction Model

Ordinary Least Square (OLS) is not able to depict the long-run relationship among the variables. This long-run relationship is also known as co-integration. Engle-Granger co-integration test and Johansen Co-integration test are two mechanisms that can be applied to test the co-integration. However, when testing for multivariate co-integration, one of the approaches has been to test for co-integration using a Vector Autoregressive (VAR) approach. This assumes all the variables in the model are endogenous, although it is possible to include exogenous variables as well, these do not act as dependent variables. The main difference with the Engle-Granger approach is that it is possible to have more than a single co-integrating relationship. The test itself produces several statistics that can be used to determine the number of co-integrating vectors present. The number of co-integration using the Johansen Co-integration test can only be determined if the series are non-stationary. In this procedure, two tests namely Trace Statistic and Maximum Eigenvalue test will be used. However, in some cases, the two tests may show a different result. If that case happens, trace statistics is preferred. The number of lags is determined by the sequential likelihood ratio (LR), Akaike information criterion (AIC), Schwarz information criterion (SC), Final Prediction Error (FPE) and Hannan Quinn information criterion (HQ).

However, in the short run, the disequilibrium may happen due to shock in the economic system. To solve this problem, the Vector Error Correction Model (VECM) will be employed. A basic error correction model would appear as follows:

$$\Delta y_t = \chi_0 + \chi_1 \Delta x_t - \tau(u_{t-1}) + \varepsilon_t \quad (3)$$

where τ is the error correction term coefficient, which theory suggests should be negative and whose value measures the speed of adjustment back to equilibrium following an exogenous shock. The error

correction term u_{t-1}, which can be written as: $(y_{t-1} - x_{t-1})$, is the residual from the co-integrating relationship in Equation (1).

Test for Granger Causality

However, if the long-run relationship did exist, we do not know the direction of the causality, whether x led y or vice versa. Normally, the Granger causality test is considered a useful technique for determining whether a one-time series is good for forecasting the other. Furthermore, the number of lags should be determined before running the test because the result is sensitive to the lag. The Granger Causality test (multivariate model) can be expressed as follows:

$$\Delta Y_t = \alpha_0 + \sum_{i=1}^{m} \beta_i \Delta Y_{t-i} + \sum_{j=1}^{n} \delta_j \Delta X_{t-j} + \sum_{k=1}^{p} \chi_j \Delta Z_{t-k} + \upsilon_t \quad (4)$$

where ΔY is a change in GDP and ΔYt-i and ΔXt-j and ΔZt-k are changing or differenced lagged GDP, changing DEBT and changing GOV respectively. The Granger test assumed υt to be serially uncorrelated with zero mean. The Granger F-statistic tests the null hypothesis that lagged X and Z does not Granger-cause (predict) Y. The null is rejected if the χj coefficient and δj are significantly different from zero.

4 RESULT AND DISCUSSION

To avoid spurious result, the data need to be stationary which means that the means and variances of the data series are constant over time and covariances depend only on the distance between the two time periods. The first step of the empirical work is to know the degree of integration of each variable by using the unit root test (ADF) and Phillips-Perron test. The results in Table 1 indicates that the t-statistics are statistically insignificant to reject the null hypothesis of non-stationary at a 5 percent significance level. This indicates that these series are non-stationary at their level form. Therefore, these variables contain a unit root process or they share a common stochastic movement.

Table 1: Results of Order of Integration Test

	Test for I(0) At Level		
	lnGDP	lnDEBT	lnGOV
ADF Test	-1.818093	-1.508010	-1.868241
PP Test	-2.010565	-2.054820	-1.796314
	Test for I(1) First Difference		
	ΔlnGDP	ΔlnDEBT	ΔlnGOV
ADF Test	-5.072494*	-3.553490*	-6.573079*
PP Test	-5.072494*	-3.417433*	-6.986165*

Note: * indicates the rejection of the null hypothesis of non-stationary at 5 percent significant level

Fig. 1 visualized the series in level and first difference. From the figure, the series for GDP, DEBT and GOV appear to be trending upward or non-stationary. A remedy action if this problem occurred is by using the first difference for each variable

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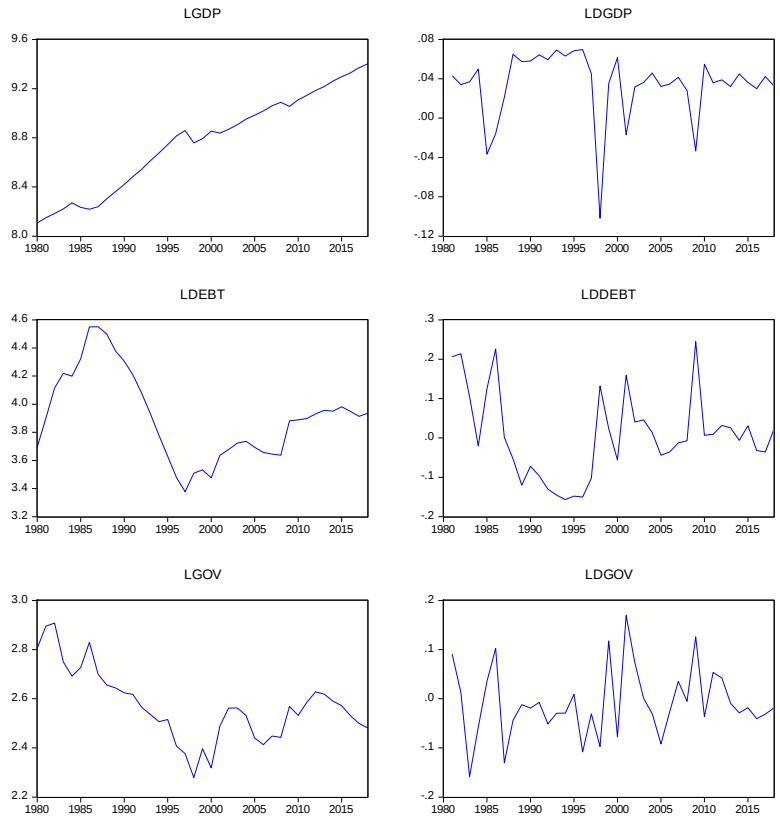

Fig 1: Data Series in Level and First Difference

The next step is to decide the number of co-integrating vectors. For this purpose, the Johansen Co-integration method is used. It is important to determine the appropriate lag length since VAR is the multivariate generalization of the autoregressive process. The number of lags can be determined by employing different criteria as shown in Table 2. Based on the selection criterion, the optimal lag of VAR to be used is four except for Schwarz information criterion (SC). Since this study uses annual data, shorter lag length by SC is preferred.

Table 2: VAR Lag Order Selection Criterion

Lag	LR	FPE	AIC	SC	HQ
0	NA	2.78e-05	-1.976948	-1.842270	-1.931019
1	254.9090	9.66e-09	-9.944504	-9.405788*	-9.760786
2	18.76905	8.31e-09	-10.11024	-9.167490	-9.788737
3	22.90690	5.63e-09	-10.53528	-9.188496	-10.07599
4	20.90089*	3.79e-09*	-11.00115*	-9.250328	-10.40407*
5	6.961212	4.92e-09	-10.85848	-8.703613	-10.12361

LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Table 3 shows the result of the Johansen Co-integration Test. The result shows that the null hypothesis of no co-integration and hypothesis of two co-integration are rejected by Trace statistics and Maximum Eigenvalue. It indicates that there is one co-integrating vector that exists. Thus, it can be concluded that there is a long-run equilibrium relationship among GDP, DEBT and GOV.

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Table 3: Results of Johansen's Cointegration Test

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	5 Percent Critical Value	1 Percent Critical Value
None *	0.525487	33.60033	29.68	35.65
At most 1	0.153804	6.763580	15.41	20.04
At most 2	0.020656	0.751420	3.76	6.65
Hypothesized No. of CE(s)	**Eigenvalue**	**Max-Eigen Statistic**	**5 Percent Critical Value**	**1 Percent Critical Value**
None **	0.525487	26.83675	20.97	25.52
At most 1	0.153804	6.012160	14.07	18.63
At most 2	0.020656	0.751420	3.76	6.65

* denotes rejection of the hypothesis at the 0.05 level
*Trace and Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level

The long-run coefficient by using likelihood estimation is displayed in Table 4. The signs of the coefficient are inversely interpreted when the normalization happens. Based on the results, there is a long-run relationship between public debt and growth positively at a 5 percent significant level, and a long-run negative relationship between government expenditure and economic growth at a 5 percent significant level.

Table 4: Normalized Cointegrating Coefficients

LGDPC	LDEBT	LGEXP
1.000000	-6.156761	24.55649
	(1.38941)	(4.17087)

Note: Standard error in parentheses

Having examined that there exists a co-integration vector among the time series, the VECM can then be applied. The short-run equation under the error correction framework is computed to include an adjustment mechanism from the short run to the long-run equilibrium. In other words, it corrects for disequilibrium. Statistically, the ECM term is significant at 5 percent level, suggesting that 1.9 percent of the discrepancy between long term and short term is corrected in the next years.

To determine which variable causes the other, pair-wise Granger causality tests are used. Table 5 summarizes empirical results of VAR Granger causality tests between three variables used in this study. Granger causality tests are very sensitive to the selection of lag lengths. For this purpose, the lag lengths are determined by the Schwarz information criterion (SC). The results show the existence of unidirectional causality between public debt and economic growth, government expenditure and economic growth, and government expenditure and public debt. For the case of public debt and growth, it can be said that the public debt Granger cause economic growth, but the economic growth does not Granger cause trade openness. Economic growth Granger cause government expenditure and not Granger cause reversely. Lastly, government expenditure Granger cause public debt, but public debt does not Granger cause government expenditure.

Table 5: VAR Granger Causality Test

Null Hypothesis:	Chi-sq	Prob.
lnDEBT does not Granger Cause lnGDP	9.694882	0.0459
lnΔGDP does not Granger Cause lnDEBT	2.474187	0.6493
lnGOV does not Granger Cause lnGDP	9.281453	0.0544
lnΔGDP does not Granger Cause lnGOV	11.15353	0.0249
lnGOV does not Granger Cause lnDEBT	11.04871	0.0260
lnDEBT does not Granger Cause lnGOV	4.961935	0.2912

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Lastly, the stability test runs to make sure all the analyzed results as discussed above are meaningful. VAR and VECM are said to be stable if the variables are less than 1 and lie inside the unit circle. In this analysis, there is no root lies outside the unit circle as shown in Fig. 2 which means that VAR satisfies the stability condition.

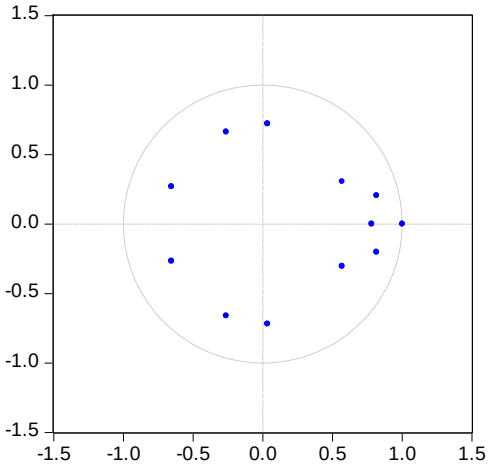

Fig. 2: Inverse root of AR Characteristic Polynomial

5 CONCLUSION

Co-integration results reflect the existence of a long-run equilibrium relationship between public debt, government expenditure and economic growth in Malaysia. The existence of a long-run positive relationship between public debt and growth suggests that public debt is considered as the policy variable to accelerate economic growth in Malaysia. The result of the Granger-causality test exhibits the unidirectional causality between public debt and economic growth, government expenditure and economic growth, and government expenditure and public debt. The presence of a causal link particularly between public debt and growth has implications of great importance on public debt strategies for the Malaysian economy. The Malaysian government should opt for a better reimbursement policy, which can ensure the productive use of the resources generated through debt.

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