# GOVERNMENT DEBT AND ECONOMIC GROWTH

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**DECLARATION OF ORIGINALITY OF WORK**

I admit that this Graduation Exercise is my own work except the information, excerpts and references used have been acknowledged. I also admit that the contents of the Graduation Exercise are original and have not been submitted to the University of Malaya or other institutions for any other purposes. I am solely responsible for all the contents of this Graduation Exercise. Faculty of Economics and Administration and University of Malaya shall be absolved from any form of legal actions arising from this research.

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Date: 03/06/2020

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## ABSTRACT

The level of Malaysia government debt have been hiking in recent years which leads to controversies regarding the sustainability of the debt level. The question that borrowings will stimulate or inhibit the economy remains as an important issue to be addressed. This paper examines the impact of government debt on economic growth in Malaysia. Utilizing the macroeconomic data between 1970 and 2018, we first apply an autoregressive distributed lag (ARDL) framework to examine the relationship between government debt and economic growth. The short term and long term relationship as well as cointegrating relationship between government debt and economic growth were examined. Next, quantile regression was employed to investigate the impact of government debt on economic growth of Malaysia at different stages of development. The most important finding of this paper is the negative relationship between government debt and economic growth in short term and long term. The results contradict the previous evidences showing the nonlinear relationship between government debt but are consistent with the existing literature stating the negative impact of government debt on economic growth. Besides, the results of quantile regression show that the negative impact of government debt on economic growth become significant starting at quantile 0.9. These findings indicate that the government should engage in fiscal consolidation to ensure sustainable economic growth.



**Keyword**: Government debt, Economic Growth, ARDL

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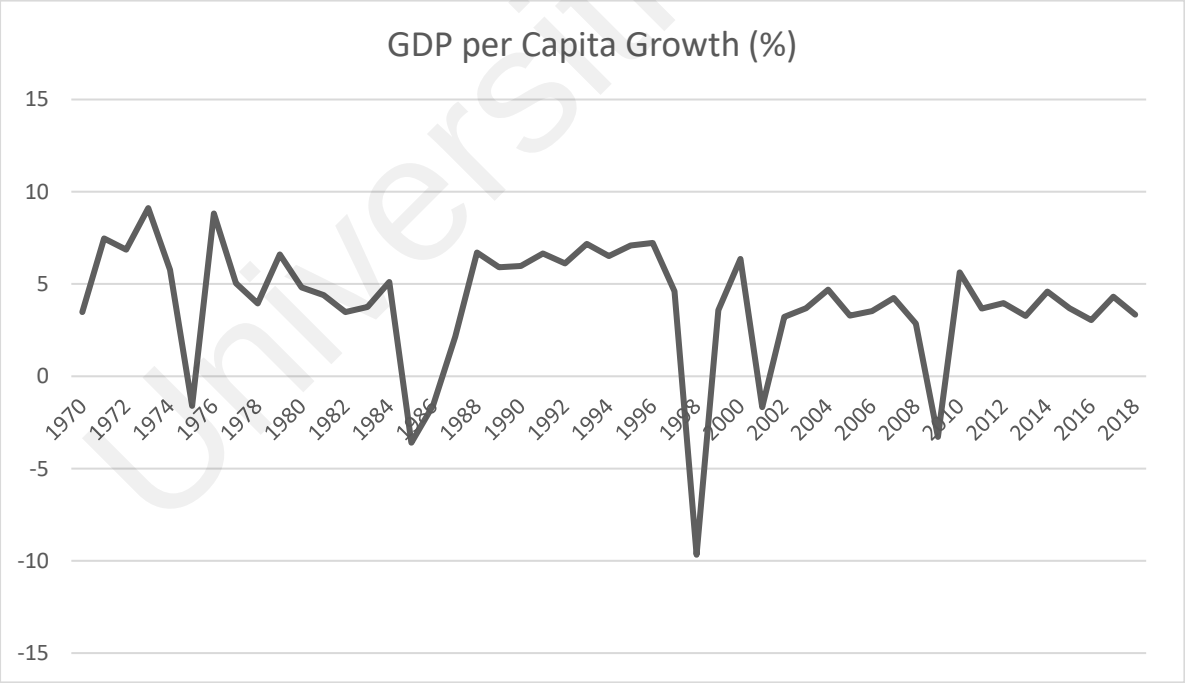
| | |
|---|---|
| ADF | Augmented Dickey-Fuller |
| AFC | Asian Financial Crisis |
| ARDL | Autoregressive Distributed Lag |
| CS | Commodity Shock |
| DEBT | Government Debt |
| GCF | Gross Capital Formation Rate |
| GDP | Gross Domestic product |
| GFC | Global Financial Crisis |
| GNI | Gross National Income |
| INF | Inflation Rate |
| KPSS | Kwiatkowski, Phillips, Schmidt and Shin |
| P | Population Growth Rate |
| TRADE | Trade Openness Ratio |
| US | Unites States of America |

# Chapter 1: Introduction

## 1.1 Background

Malaysia has been experiencing steady economic growth. Figure 1 plots the levels of real Gross Domestic Product (GDP) per capita in Malaysia from 1970 to 2018. The economy recorded positive growth in most of the times other than the period in which economic shocks happened. From 1988 to 1997, the economy experienced a rapid growth between the occurrence of two crises. The rapid development of the manufacturing sector signifying the transformation of the economy at the period is fuelled by new foreign and domestic investment. The obvious downturns happened in 1985, 1997 and 2008 in which the economy experienced the Commodity Shock, Asian Financial Crisis and Global Financial Crisis. Meanwhile, the economic growth moderate to 4.7% in 2018, slightly lower than the government's target of 4.8%. It is mainly due to the increase in both private consumption and government spending, contribution by positive net exports, offset by the supply side shocks and further contraction of fixed investment. Due to the unfavoring macroeconomic climate, the economic growth in 2018 is notably lower compared to the growth of 5.9% in 2017.

Figure 1: GDP per capita growth in Malaysia, 1970 - 2018



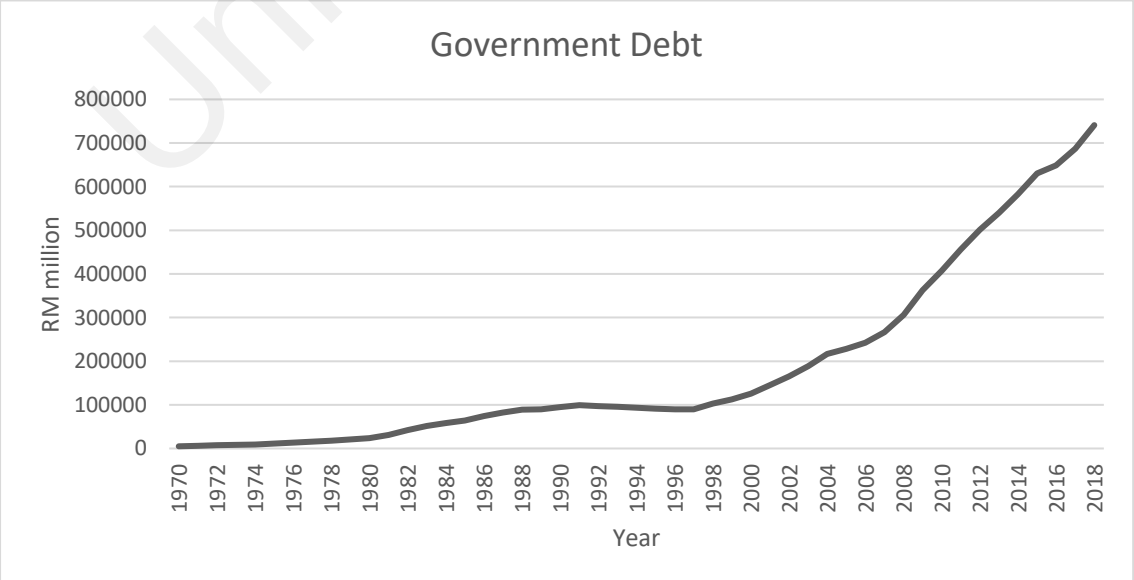

*Source*: World Development Indicators by World Bank

On the other side, the rising level of government debt in Malaysia is an important issue to be studied together with the economic growth. Government debt is defined as "the entire stock of direct government fixed-term contractual obligations to others outstanding on a

particular date. It includes domestic and foreign liabilities such as currency and money deposits, securities other than shares, and loans. It is the gross amount of government liabilities reduced by the amount of equity and financial derivatives held by the government. Because debt is a stock rather than a flow, it is measured as of a given date, usually the last day of the fiscal year." (World Bank, 2018). There are a several terminologies used to represent national debt in the literature namely, government debt, external debt, and public debt. In this paper, government debt will be used as the standardized term as it is most widely used by researchers in Malaysia and Bank Negara Malaysia defined Central Government Debt as the official term used in Malaysia.

Figure 2 plots the government debt level in Malaysia from 1970 to 2018. The debt level has been rising steadily since 1970 but started to fall for the first time in 1992 continuously until 1996. This decline of government debt level is the results from the rapid growth of economy during that period and the surpluses of the governmental budget (Burhanudin, Muda, Nathan, & Arshad, 2017). In 1997, Malaysia is hit by the Asian Financial Crisis with a depreciation of ringgit against the US dollar by almost 50%. To stabilize the economy in recession with peaked inflation rate and unemployment rate, the government introduced fiscal stimulants which includes income tax waive, tax breaks for industries, reduction of duties and raise of public investment. As a result, the fiscal deficit increases from 1.6% in 1998 to 6.6% in 2000 and was financed through issuing government debt. In 2008, the fiscal stimulus introduced to alleviate the impact of global financial crisis and great decline of oil prices contributed to the jump of debt level since 2009 (Athukorala, 2010). Since 1998, the government debt has been escalating by eight folds to RM741050 million in 2018.

Figure 2: Government Debt in Malaysia, 1970 - 2018

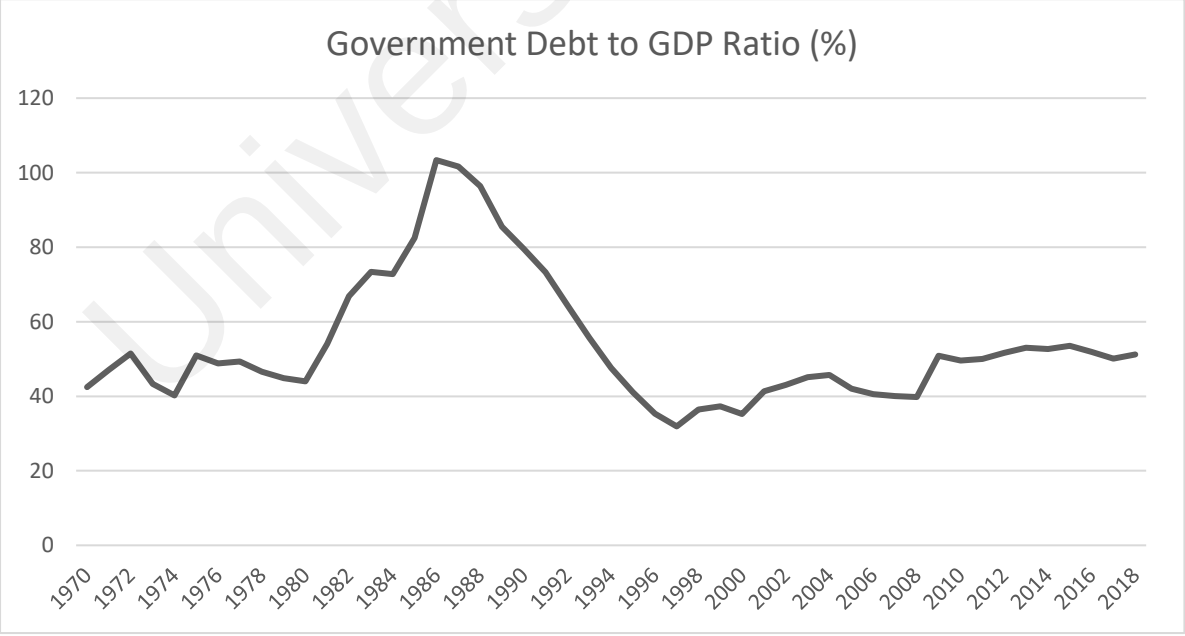


*Source*: Department of Statistics Malaysia

Figure 3 plots the government debt to GDP ratio in percentage of Malaysia from 1970 to 2018. The fluctuations of debt level over the years can be seen more clearly through the measurement in terms of the ratio to GDP. In the 1980s, the debt ratio hike rapidly as the government implemented the expansionary policy to boost the economy. For instance, The First Industrial Master Plan launched in 1986 to expand and advance the heavy industries involve high costs of production which results in high fiscal deficit and debt level. Consequently, the debt ratio reached a new high at 103.4% in 1986 where the commodity shock greatly affects the economy of Malaysia.

After 1986, the economy experiences a great fall of debt level due to rapid expansion of economy and short period of fiscal surplus. In 1997, the debt ratio reached one of its lowest point at 31.9% but rebounded due to the impact of Asian Financial Crisis. In 2018, the government debt has reached the ratio to GDP at 51.2%, a slight increase compared to 50.1% in 2017. Although the current debt ratio is still below its self-imposed limit of 55%, the ratio is quite high compared to countries with sovereign credit rating of A as the median for A-rated sovereign is 41%. Malaysia faces risk of slowdown in economic growth if government debt continues to rise rapidly or external shocks occur that could weaken the ringgit.

Figure 3 : Government Debt to GDP Ratio in Malaysia, 1970 - 2018




*Source*: Author's calculation based on data from Department of Statistics Malaysia and the World Bank

Generally, debt can be used to stimulate long term economic growth and prosperity up to an optimal level. Meanwhile, excessive amount of government debt associated with severe consequences on the economy and will further lead to the debt overhang situation in which additional debt cannot be taken when the debt level is too high. This is supported by a study of Pattillo, Poirson & Ricci (2004) which indicates that debt has different effect at high levels and low levels respectively. Debt levels higher than a certain threshold will generate an adverse impact on growth through the channels of capital accumulation and productivity growth.

One of the significant examples is the European Debt Crisis that affect several eurozone countries. In 2009, Greece, Portugal, Spain, and Italy faced extremely high debt ratios resulted from the accumulation of budget deficits and global financial crisis. Greece and Portugal found themselves unable to repay the debt and then were forced to accept the bailout packages by International Monetary Fund. Throughout few years before Global Financial Crisis, Greece particularly has experienced deterioration of debt crisis due to the appreciation of euro and the consequent loss of competitiveness, which then lead the country into a long period of recession (Beker , 2014). Another example of countries suffering from debt crisis is Argentina that experienced a great depression from 1998 to 2002. Argentina then undergo economic reformation and debt restructuring to repay its debt (Damill, Frenkel, & Rapetti, 2005).

Cecchetti, Mohanty, and Zampolli (2011) concluded that debt ratio higher than 85% is harmful for economy. On average, a 10% increase of debt level will decrease economic growth by over 0.1%. As debt level increases, the repayment ability of a nation will become increasingly sensitive to the drop of income and increase of interest rate which will increase the volatility and financial fragility. Reinhart and Rogoff (2010) and Checherita and Rother (2010) found that debt level higher than 90% generally lead to significantly lower growth rate. However, Cohen (1997) found a much lower threshold of debt ratio at 50% for emerging economies. The differences between the evidence shown for developed and developing countries indicate the need to study the effect of debt in different stages of economic development.

While most of the research have been focusing on the long term impact, Baum, Checherita-Westphal, and Rother (2012) focus on examining the short run effect of government debt on economic growth. According to their findings, the short term relationship between debt and GDP growth is positive before the debt level reached 67% of GDP.

Therefore, it would be pertinent to look into long and short term separately to determine whether the effect of debt will differ between long run and short run.

Meanwhile, Daud (2016) concluded a nonlinear relationship between government debt and economic growth which is an inverted-U shape in the case of Malaysia. Any increase in debt level higher than the optimal level will have adverse impacts on economic growth. This is because the borrowings were not allocated efficiently to investment and the debt repayment will reduce the return of investment. Burhanudin, Muda, Nathan, and Arshad (2017) indicate that debt is generally positively associated with growth in Malaysia. They induce that the allocation of borrowings on productive expenditures will stimulate productivity and aggregate demand. However, Lee and Ng (2015) found the presence of negative impact of government debt on economic growth. Obviously, the studies done on Malaysia show inconclusive results as some researchers found nonlinear relationship between debt and growth, while other researchers presented findings of positive and negative relationship respectively. Therefore, this study is conducted to produce new empirical evidence on the long term and short term impact of government debt on the economic growth of Malaysia as well as an alternate perspective of studying the relationship at different stages of economic development.

## 1.2 Problem Statement

Appropriate amounts of debt can stimulate growth, but excessive debt will generate negative effect on the economic growth. At relatively low level of government debt, the accumulation of debt will help in boosting the economy if the resources are allocated efficiently on the productive public capital formation. However, debt beyond optimal level constraints growth as high interest costs crowd out investments and affect the capital accumulation. The economy will be more fragile in funding markets due to difficulty in getting lending once the accumulated debt level is too high. The risk originated from the tightening of global financial conditions and unmanageability of rising debt level will make the economy extremely vulnerable to any external shocks. Hence, it is crucial to study the relationship between government debt and economic growth in Malaysia.

Moreover, the adverse consequence of government debt on developing countries is greater than that on developed countries. Developing countries have limited borrowing capacity due to immature domestic financial markets and weak access to international capital markets. Thus, it is also crucial to examine the effect of debt on growth at different stages of economic development for the case of Malaysia.

Therefore, this study is aimed at examining the relationship between government debt and economic growth in Malaysia. As an emerging economy, Malaysia has accumulated a relatively high ratio of government debt in recent years which is resulted from the budget deficit for many consecutive years. The consistent rise in government debt level is worrying as 2008 global financial crisis is triggered by debt.

### 1.3 Research Questions

The following are the questions arise from the issue discussed:

General Question:

What is the relationship between government debt and economic growth in Malaysia?

Specific Questions:

1. What is the short term and long term relationship between government debt and economic growth in Malaysia?
2. What is the relationship between government debt and economic growth in Malaysia in different stages of economic development?

### 1.4 Research Objectives

Based on the research questions, the following are the objectives of this study:

General Objective:

To analyse the relationship between government debt and economic growth in Malaysia.

Specific Objectives:

1. To analyse the short term and long term relationship between government debt and economic growth in Malaysia.
2. To analyse the relationship between government debt and economic growth in Malaysia in different stages of economic development.

### 1.5 Significant of The Study

The findings of this study will have a great benefit to society given the knowledge about the current situation of Malaysia's government debt and its potential relationship with the economic growth. A deeper understanding about the significance of government debt could help the society in evaluating the appropriateness and effectiveness of government policies. Findings regarding the debt level that is optimum for economic growth is pertinent for policymakers to control the debt burden at a manageable level by avoiding the fiscal deficit. It is also crucial for policymakers to understand whether or not continuous increase of government debt has any short run or long run adverse effects on both investment and growth. Therefore, policymakers can formulate sound fiscal and monetary policy to maintain government debt at a sustainable level, thus ensure long term economic growth.

# Chapter 2: Literature Review

## 2.1 Introduction

Over the last few years, the persistent increase of Malaysia government debt has sparked discussions and controversies. As the national debt reached a shockingly high level, people started to question whether it is sustainable for a country to have it in the long run. Generally, debt can be used to stimulate the aggregate demand and boosting the economy. However, evidences show that high level of government debt will results in severe consequences on the economy in a longer time dimension. Besides, public debt overhang will occur when debt accumulates beyond a certain level and will results in the deterioration of economy. Therefore, it is imperative to deeply investigate the effects of high debt level on the growth of Malaysian economy.

This chapter is divided into 4 sections. The first section will discuss about the definition of the main concepts namely government debt and economic growth. The definition covers both conceptual and operational definitions of the two terminologies. The third section review the relevant concepts of debt, while the fourth section presents the empirical evidences of the relationship between government debt and economic growth. Lastly, the fifth section review how the previous studies specified the growth model and the methods used to analyse the method.

## 2.2 Definitions

### 2.2.1 Government Debt

There are a few terminologies related to government debt in the literature, namely national debt, external debt, and public debt. “Central government debt is the entire stock of direct government fixed-term contractual obligations to others outstanding on a particular date. It includes domestic and foreign liabilities such as currency and money deposits, securities other than shares, and loans. It is the gross amount of government liabilities reduced by the amount of equity and financial derivatives held by the government. Because debt is a stock rather than a flow, it is measured as of a given date, usually the last day of the fiscal year.” (World Bank, 2018). Debt is incurred to finance the federal deficit, when the expenditures are higher than the revenue generated. Normally, debt is reported in the form of ratio to GDP so its magnitude can be evaluated easier in terms of the ability of the nation to pay it off.

According to Chartered Accountants Australia and New Zealand (2016: 9), “public debt (alternatively, national debt or sovereign debt) is debt owed by the public sector, that is, by governments and their agencies. Gross debt of the public sector, usually the highest quoted number and often presented as the signal indicator of public debt, represents the total financial liability of the public sector, that is, General Government debt of the Commonwealth, States, Territories and local governments and their public trading enterprises.” From this definition, it can be seen that public debt has wider scope than the government debt and national debt, as it does not include borrowings by federal government, but also the borrowings by the state government and local government.

According to US Department of the Treasury (2014: 9), national debt refers to direct liabilities of the government. It is defined as public debt securities issued by the treasury which consists of marketable Treasury securities, savings bonds and special securities issued to state and local governments. A portion is debt held by the public and a portion is debt held by government accounts.

Although there are many terminologies as an alternative for government debt which bear similar definitions, however, the term used in Malaysia is government debt according to the data set provided by Bank Negara Malaysia. Therefore, Daud (2016), Haris and Mohammad (2015), Burhanudin, Muda, Nathan, and Arshad (2017) who studied the case of Malaysia used the term government debt.

Many empirical studies looking into government debt have used face value and net present value of debt as measurement for debt. For instance, Pattillo, Poirson, and Ricci (2004) use both face value and net present value of debt to represent the debt variable. The former is used most frequently in general which the results generated can be compared directly while the latter can measure the expected burden of debt more accurately. Cordella, Ricci, and Ruiz-Arranz (2005) also used the present value of debt to measure the debt variable. Meanwhile, most of the other researchers (Kumar & Woo, 2010; Baum, Checherita-Westphal, & Rother, 2012; Checherita & Rother, 2010; Curutchet, 2005) used the face value of debt instead of net present value of debt due to the availability of data. Since the only measurement of debt available in Malaysia is the present value of debt, Daud (2016), Haris and Mohammad (2015) and Burhanudin, Muda, Nathan, and Arshad (2017) represent the debt variables using the face value of government debt.

In summary, government debt can be understood as the total outstanding borrowing by the federal government. Although there are few ways to measure growth, it is mostly represented by the government debt measured at the face value of original maturity.

### 2.2.2 Economic Growth

Next, we are going to look into the definitions of economic growth. According to Haller (2012: 66), economic growth is defined as "an increase of the national income per capita, and it involves the analysis, especially in quantitative terms, of this process, with a focus on the functional relations between the endogenous variables; in a wider sense, it involves the increase of the Gross Domestic Product (GDP), Gross National Product (GNP) and National Income (NI), therefore of the national wealth, including the production capacity, expressed in both absolute and relative size, per capita, encompassing also the structural modifications of economy."

According to Ivic (2015: 55), "economic growth include changes in material production and during a relative short period of time, usually one year. In economic theory, under the concept of economic growth implies an annual increase of material production expressed in value, the rate of growth of GDP or national income." The statement by Ivic (2015) has indicated GDP as the most suitable measurement for economic growth. This measurement has been adopted by many past researches including Pattillo, Poirson, and Ricci (2004), Daud (2016), Lee and Ng (2015) and Kumar and Woo (2010).

Generally, the definition of economic growth the increase of national income or output per capita in a period of time. Among many ways to measure it, real GDP per capita is the standardized measurement of the economic growth in most of the studies.

## 2.3 Review of Relevant Concepts

The most dominant theory discussing the destructive impacts of debt on growth is the debt overhang concept first suggested by Krugman (1988). Debt overhang is a financial term used when the amount of debt accumulation is too excessive that an entity cannot borrow more money. This term applies to entities that are profitable enough to repay its debt over time. Meanwhile, public debt overhang is a condition of a nation where the debt level is too high and the nation is unable to make the repayment in the future, mainly due to a weak economic growth triggered by the excess accumulation of debt. As a result, the funds available for spending in key economic activities will reduce, thus the living standards of people will be downgraded and economic growth will be slowed down as well.

On top of that, the concept of debt overhang can be presented using the Debt Laffer Curve which illustrates the relationship between the nominal value and market value of debt. Generally, the total repayments will decline beyond a threshold level of debt due to the efficiency losses. One of the reasons leads to efficiency losses is the heavy tax burden resulting from the high level of debt that will be imposed on the future returns of current investment projects (Claessens, 1990).

Another major concept also explaining the adverse impacts of debt on growth is the crowding out effect. When the government issues debt, the interest rate will be driven up and subsequently the private investment will be crowded out. As a result, the accumulation of capital stock will be affected, and thus the productivity growth will also be slowed down (Kumar & Woo, 2010). Baldacci and Kumar (2010) found that debt has evidently increased the long term interest rates and borrowing costs.

Meanwhile, Arai, Kunieda and Nishida (2012) highlighted that both crowd-in and crowd-out effect need to be taken into consideration. Crowd-in effect occurs when the higher interest rate prevents less productive agents from production activities, production resources are utilized intensively by more productive investors. Plus, bonds with higher interest rate become more profitable and provides better saving alternative for the less productive investors. Thus, private investment is crowded in. The authors found out that the crowding in effect will overcome the crowding out effect if the debt ratio is below the threshold level, thus the debt accumulation can stimulate growth. On the other side, The crowd-out effect will dominate the crowd-in effect if the debt ratio is above the threshold level, thus the debt accumulation will inhibit growth. Besides, the authors rejected Ricardian Equivalence due to imperfections of financial market. Besides, Woodford (1990) also recognize the crowd-in effect as a liquidity effect of debt in a financially constrained economy.

On top of that, Pattillo, Poirson, and Ricci (2004) pointed out that debt accumulation can generate adverse impact on national output through capital accumulation and total factor productivity growth. The effects of debt on capital accumulation is shown through the debt overhang concept in which the investors will expect heavy taxation in the future to repay the debt. The expected returns generated from the current investment opportunities will decrease and thus discouraging both domestic and foreign investment and slow down the capital stock accumulation. Besides, the investors are uncertain about which portion of debt that will be allocating in productive investment projects as well as the uncertainties about future policy decisions and therefore lose their confidence in the domestic market.

Meanwhile, the total factor productivity growth will be affected as the willingness of government to undertake policy reform which is beneficial to future growth decreases. This is in light of the fact that the future benefits of the investment projects will be subjected largely to the creditors and debt relief will also be needed in the future. As such, the poor policy environment resulted will greatly undermine the productivity and efficiency of investment. Moreover, the high level of uncertainties and instabilities will reduce the incentives to improve technology and efficiently utilize resources. For example, the government may misallocate the resources on investment projects with low risk and quick returns, instead of the long term, higher risk projects that are beneficial for the long term productivity growth (Diwan & Rodrik, 1992).

Cecchetti, Mohanty, and Zampolli (2011) indicates that the repayment ability of a nation will become increasingly sensitive to the drop of income and increase of interest rate as debt level increases. This increases the real volatility and financial fragility. The country has a higher probability of defaulting during shocks as well as becoming less creditworthy. As soon as the lenders stop lending, the consumption and investment will reduce. As a result, the nation will end up not being able to repay the debt. Consequently, they conclude that debt at low levels is important as a source of economic growth and stability, but high levels of debt is unfavorable for growth.

Cochrane (2010) found out that government debt can result in inflation together with the economy stagnation instead of a boom. When the countries experience low growth rate and high tax rates, adding on the government distortions and policy uncertainties, investors will lose confidence on the government and thus start to sell the government bond they hold. As a result from the selling pressure in bond market, the interest rate will increase and people will anticipate the inflation. Stagflation with low growth and rising prices will most likely occur, with a significant example of Stagflation in the US during 1970s.

Teles and Mussolini (2014) pointed out that the extent to which debt will affect growth depends on the debt level. That is to say, if the fund obtained from debt is allocated on productive expenditures for example infrastructure, education and healthcare will boost the economy assuming a low debt level. Meanwhile, debt is destructive to the economy if the debt fund is allocated on unproductive expenditures for example subsidies and pensions. This statement is supported by Modigliani (1961) stating that debt can be offset when it is used to finance public capital formation that could contribute to the future growth.

Barro (1974) concluded about the concept of Ricardian equivalence hypothesis. The household is forward looking and will internalize the budget deficit in their consumption decisions. When the government finance the budget deficit through debt, the household will anticipate greater tax burden in the future to repay the debt. Therefore, the household will increase their saving instead of consuming more. As a result, the aggregate demand and output of the economy will remain unchanged even after the government have implemented an expansionary policy. Furthermore, the increase of private saving will compensate for the excess demand of fund in the market, thus the interest rate and total investment can remain unchanged as well. This theory suggests that the negative consequences of debt on investment can be balanced out in certain circumstances while at the same time implying that debt cannot improve the economy.

However, Gale and Orszag (2003) questioned the Ricardian Equivalence concept demonstrated by Barro (1974) with few reasons. Firstly, the assumption that the households are fully rational and forward looking could not hold as evidence shows that households violate the perfect rationality. Besides, it is not true that households do not face liquidity constraints as they face borrowing constraints and liquidity taxes. Also, household evidently saved for precautionary reasons. Therefore, findings show that household do respond to fiscal policy, for example tax cuts.

### 2.4 Empirical Evidences

Previous researchers have analysed the relationship between debt and growth. The results (Pattillo, Poirson, & Ricci, 2004; Diwan & Rodrik, 1992; Cecchetti, Mohanty, & Zampolli, 2011; Reinhart & Rogoff, 2010; Kumar & Woo, 2010) indicates that debt is inversely related to economic growth after a certain threshold. However, for research specified on the case of Malaysia, the findings are inconclusive. Daud (2016), Daud, Ahmad, & Azman-Saini (2013) found out that the government debt contributed positively to growth until an optimum level and will become harmful to the economy after that level. Burhanudin, Muda, Nathan, and Arshad (2017) and Haris and Mohammad (2015) indicate that debt is generally positively associated with growth. However, Lee and Ng (2015) and Choong, Liew, Lau, and Puah (2010) found negative impacts of debt on growth.

According to Pattillo, Poirson, and Ricci (2004), low level and high level of government debt has very different impacts on the output growth respectively. Generally, excessive

amount of debt will have a great adverse impact and low level of debt will generate positive yet insignificant impacts on growth. The implications are consistent with the theory indicating negative effects of high debt level which can be shown in the decrease of investment and good policies, in the light of the fact that the return on such actions is expected to accrue partly to creditors instead of benefitting the citizens. Meanwhile, decreasing debt level will improve the economy as it can stimulate productivity growth and capital accumulation, but it may not have the desired effects when binded by other political constraints or structural distortions.

According to Cecchetti, Mohanty, and Zampolli (2011), higher debt levels lead to greater risk. When the government debt to GDP ratio achieves the threshold at 85%, further increases in debt will start to generate significant consequences which will harm the economy. On average, when debt increases by 10%, economic growth will decrease by over 0.1%.

Reinhart and Rogoff (2010) examined the relationship between debt and growth. The authors pointed out that the relationship is relatively weak at average debt levels. Besides, their study shows that the relationship is identical across advanced economies and emerging economies. The main finding indicates that debt ratio above 90% generally lead to significantly lower growth rate. They found that countries that rely extremely on short-term borrowings are remarkably vulnerable to financial crises that can attack very suddenly and unexpectedly.

In another panel study, Reinhart, Reinhart, and Rogoff (2012) examined 26 advanced countries with high debt levels and discovered that 23 of those countries faced stagnant economic growth for more than a decade. They concluded that cumulative increase in public debts will undermine economic growth.

Baum, Checherita-Westphal, and Rother (2012) concluded that government debt is beneficial to the economy in the short run. However, the positive effects decrease to near zero and lose its significance when the debt ratio reaches a point as high as 67%. For debt ratios higher than 95%, the impact of further rise in debt level will generate negative effect on the economy. They conclude that reducing debt level with initial debt level higher than 95% is beneficial for growth and vice versa.

Checherita and Rother (2010) analyse the relationship between government debt and GDP growth across 12 countries in euro area for 30 years started from 1970. It indicates a nonlinear relationship between debt and growth rate with the threshold level of debt ratio at roughly 90%. However, the turning point is an average measured for the 12 euro countries,

so the confidence level may be as low as only 70% of GDP. These results indicate that the current debt levels of many countries may already have destructive impacts on the economy.

Similarly, Cohen (1997) finds that debt is bad for growth when its level reaches 50% of GDP or 200% of exports. According to Cordella, Ricci, and Ruiz-Arranz (2005), emerging economies with external debt above 15% to 30% is correlated with weaker GDP growth. According to Kumar and Woo (2010), government debt ratios above 90% for developed and developing countries are associated with weaker output growth. A 10% increase will slow down the growth rate at 0.15% to 0.2% in advanced economies but 0.3% to 0.4% in emerging economies. In fact, the deterioration in growth performance is mainly caused by reduced investment slower capital accumulation.

Other than research for the overall worldwide trend, there are also several studies carried out specifically on Malaysia only. For instance, Daud (2016) concluded that nonlinear relationships between debt and growth are present in Malaysia. It can be represented by a curve of inverted-U shape. Thus, it indicates the presence of positive relationship between accumulation of debt and growth rate before reaching an optimal level, which is the debt level that the federal government should hold. Any increase in debt level higher than the optimal level will have adverse impacts on the economy. Moreover, the findings also show that the debt level of Malaysia is currently located in the downward-sloping section of the inverted-U-shaped curve where any rise of debt level will generate adverse impact on the growth rate. She also indicated that the adverse impact of high debt levels is relevant when the borrowings were not allocated efficiently to investment and the debt repayment might squeeze out the investment. Daud, Ahmad, and Azman-Saini (2013) in their study indicates similar findings that the increase of external debt level will have positive contribution on Malaysia's economy before reaching the threshold level.

According to Burhanudin, Muda, Nathan, and Arshad (2017), the debt is positively associated with the sustainable economic growth of Malaysia which is significant in both short run and long run. Besides, they also pointed out that there is no significant evidence to prove the presence of an adverse impact of high debt level on the economic growth. If the fund obtained from debt is allocated on productive expenditures, it will help to stimulate productivity and boost the economy in both short and long term. Haris and Mohammad (2015) also stated that the government debt generates positive effect on productivity growth. The authors also pointed out that debt contributes most effectively to the productivity growth in the short term.

However, the study of Lee and Ng (2015) demonstrates a completely opposite result. Their findings show that the government debt at all levels will generate adverse impacts on output growth. They stated that at the time of writing, the accumulation of debt level in Malaysia is higher than the GDP growth rate. Besides, Choong, Liew, Lau, and Puah (2010) also stated the negative relationship between government debts and national output is significant in the long term.

### 2.5 Review of Methods

There are mainly two ways of examining the debt and growth link, namely panel data and time series data analysis. Panel data analysis use data from multiple countries with different specifications used by the researchers including simple OLS, fixed effects, differenced and system GMM. Time series analysis is used to focus on the relationship between growth and debt for a single country. Under time series analysis, ARDL model and cointegration test are commonly employed. If the results show that the relationship is nonlinear, a threshold analysis will be employed to examine the optimum debt level for the country. In this subchapter, we are going to look into how previous research specified the growth model and the variables used. On top of that, statistical tests used in the model will also be mentioned briefly.

Cordella, Ricci and Ruiz-Arranz (2005) investigates nonlinear relationships between debt and sources of growth in 79 emerging economies. The model has the economic growth as dependent variable. The conditioning variables include investment rate, secondary school enrolment rate, population growth which were all in logs. For debt variables, debt stock ratios used were nominal debt to GDP and net present value (NPV) of debt to GDP.

The spline function is used to estimate the non-linear relationship between debt and growth:

$$y_{it} = \alpha_{it} + \beta_1 X_{it} + \beta_2 D_{it} + \beta_3 (D_{it} - D_{it}^{*}) Z + \varepsilon_{it}$$

where y is the logarithmic difference in GDP and X is a list of control variables. D represents the debt level. D* represents the debt threshold which they drew on results from their previous paper. Meanwhile, Z is a dummy variable, which will be computed as 1 if the debt level is above the threshold and 0 if debt level is below the threshold.

Daud (2016) examined the relationship between government debt and economic growth in Malaysia. The author employed a basic growth model as shown:

$$Y_t = \beta_0 + X_t\beta_1 + \varepsilon_t$$

Where $Y_t$ is the dependent variable and $X_t$ included a list of explanatory variables. Y measures economic growth by using real GDP per capita and X represent the investment rate, labour force rate and federal government debt. ε represents the error term. The author also examines the direct relationship between government debt and investment rate to determine the effect of debt on capital accumulation, and consequently the output growth.

$$I_t = \alpha + X_t\beta + \varepsilon_t$$

I is the investment rate and X representing the independent variables includes labour force, trade openness and federal government debt. Following the Ordinary Least Squares estimation, she employed the Autoregressive Distributed Lag (ARDL) that involved cointegration bound test, estimation of the coefficients and the lagged error correction term to determine the long run and short run relationship.

Besides, a hypothesis test suggested by Hansen (2000) is performed to test the linear regression against a threshold regression analysis in and the threshold variable is represented by the threshold of federal government debt.

Choong, Liew, Lau, and Puah (2010) examined the effects of debt on GDP growth of Malaysia by employing the model below:

$$Y_t = \alpha + \sum \beta_j X_{t,j} + \sum \delta_k X_{t,k} + \varepsilon_t$$

Where Y represents the per capita real GDP growth rate. X includes a list of j conditioning variables which includes inflation rate, government budget deficit to GDP ratio, trade openness ratio, and debt to GDP ratio. Meanwhile, α is the constant term, j represents the coefficients of the condition variables, k is the coefficients of the debt variables and ε is the error term.

The authors performed the unit root test which includes the Augmented Dickey-Fuller (ADF) test and the Kwiatkowski, Phillips, Schmidt and Shin (KPSS) test to check on the stationarity of the variables. Next, the cointegration test is performed to study the long run

relationship between the variables by employing the multivariate cointegration technique introduced by Johansen and Juselius (1990). As a final step to examine the short run causal relationship, this paper applies the error-correction model by performing a multivariate Granger causality test.

According to Huang, Zhang, Chen, and He (2017), the normal regression model capture the relationship using mean based on the assumptions that the effects of independent variable are constant across the distribution of dependent variable. Quantile regression allow the examination of group differences across the entire distribution instead of measuring the average. Simoes (2015) use a threshold Quantile Regression model to study the impact of debt according to the different stages of economic growth. The appropriate debt threshold is depending on the performance of the economy whether it is in times of crisis or economic expansion. Murched (2017) also employs the semi-parametric method of quantile regression that identify the relationship between debt and growth at different points of distribution.

Meanwhile, Lin (2014) studied the sustainability of external debt at 21 OECD countries by employing the quantile autoregression (QAR). The author pointed out that the ordinary least square (OLS) model may not be a suitable method as he rejected the assumption stating the presence of a common threshold across countries.. Lima, Gaglianone and Sampaio (2008) also examine debt ceiling by employing QAR model to separate nonstationary observations from stationary observations. Thus, the author constructed a debt ceiling which illustrate the highest level of debt that can be allowed without harming the economy.

In conclusion, the studies conducted to analyse the relationship between government debt and economic growth in Malaysia is bounded in terms of methodology employed. In addition, the findings contradict each other. As such, this study will be analysing the relationship between government debt and economic growth in Malaysia to fill the gap in literature. This paper differs from the existing literature in several aspects. Firstly, short run and long run relationship as well as the cointegrating relationship between government debt and economic growth are examined using ARDL model in this paper. Secondly, quantile regression which have not yet been employed in research specified in Malaysia, will also be employed to provide a new perspective of examining the impact of debt in Malaysia. Thirdly, recent dataset up to 2018 is used in the analysis. Fourthly, new variables indicating three economic crises respectively is incorporated in the analysis model to better encompass the fluctuations of economic growth over different periods.

## Chapter 3: Methodology and Data Specification

### 3.1 Introduction

This paper examines the relationship between government debt and economic growth in Malaysia. Therefore, the purpose of this chapter is to provide an overview on the research methodology that will be employed in this paper. The research framework, research design, data collecting methods will be discussed in this chapter.

### 3.2 Data

Data source employed in this study is secondary resources which is obtained from The World Bank and Department of Statistics Malaysia. The observation takes data of 49 years from 1970 to 2018. The data availability of the independent variables and dependent variable involved in the regression model dictated the sample size. The list of variables employed in the analysis model is shown in Table 1.

Table 1: List of variables

| Variables | Description | Unit of Measurement | Source |
|---|---|---|---|
| **Dependent variable** | | | |
| GDP | Real GDP per capita | Ringgit Malaysia | WDI |
| **Independent variable** | | | |
| DEBT | Government debt | Ringgit Malaysia | DOSM |
| **Conditioning variables** | | | |
| P | Population growth rate | Annual change in percentage | WDI |
| GCF | Gross capital formation rate | Percentage of GDP | WDI |
| INF | Inflation rate | Percentage of GDP | WDI |
| TRADE | Trade openness ratio | Percentage of GDP | WDI |
| **Dummy variables** | | | |
| CS | Commodity shock (1985) | Period from 1985 to 1986 coded as 1, and 0 otherwise | - |
| AFC | Asian Financial Crisis (1997) | Period from 1997 to 1998 coded as 1, and 0 otherwise | - |
| GFC | Global Financial Crisis (2008) | Period from 2008 to 2009 coded as 1, and 0 otherwise | - |

Notes: Sample Period: 1970 – 2018. All series are annual data.
WDI denotes World Development Indicators developed by World Bank.
DOSM denotes Department of Statistics Malaysia.

In this study, the real GDP per capita is used as a proxy of economic growth. The government debt data in this model is derived by taking the natural logarithm growth rates to study the annual growth of debt as well as taking into account the compounding effects. The conditioning variables include population growth rate, gross capital formation rate, inflation rate and trade ratio to better explain the dependent variable of the model. Besides, the model has incorporated three dummy variables to capture the economic downturn during shocks in

different time periods which are the Commodity Shock in 1985, Asian Financial Crisis in 1997 and Global Financial Crisis in 2008 respectively. The expected signs of all independent variables are listed in Table 2.

Table 2: Expected Signs of the Independent Variables

| Variables | Descriptions | Expected Signs |
|---|---|---|
| DEBT | Government debt | - |
| P | Population growth rate | - |
| GCF | Gross capital formation rate | + |
| INF | Inflation rate | - |
| TRADE | Trade openness ratio | + |
| CS | Commodity shock (1985) | - |
| AFC | Asian Financial Crisis (1997) | - |
| GFC | Global Financial Crisis (2008) | - |

First and foremost, the government debt is expected to have negative relationship with GDP per capita mainly due to crowding out effect. When government raises funds through issuing bonds, the increase of loanable fund demand will bid up the interest rate, which indicates an increase of borrowing cost. As a result, private investment will be crowded out and eventually slowing down the capital accumulation and output growth of a nation (Kumar & Woo, 2010).

The expected relationship between population growth rate and GDP is also negative. According to the neoclassical growth model developed by Solow (1956), population growth will diminish the growth of output per capita when the growth rate of saving and capital stock is low. Meanwhile, the gross capital formation rate is expected to affect the GDP per capita adversely because capital formation is an important factor of economic growth. Capital formation leads to technological progress and efficient utilization of natural resources, thus increasing the total factor productivity and output growth (Gibescu, 2010).

Besides, inflation rate is expected to have a negative relationship with GDP per capita. According to Andres and Hernando (1997), inflation will decrease the rate of return of investment which will negatively affect the confidence of investors. Moreover, inflation will also increase the menu costs for firms and reduce the optimum amount of cash held by households. As a result, the efficient allocation of resources will be affected. Next, the expected sign for the relationship between trade openness ratio and GDP per capita is positive. This is because

trade encourages firms to increase production scale. The increase of economies of scale and specialization will increase the profits of firms (Idris, Yusop & Habibullah, 2016).

Lastly, all three economic shocks that occurred in the sample period is expected to have a negative sign. This is because shocks generate negative impact on output growth and aggregate demand of an economy.

### 3.3 Empirical Framework

This theoretical framework is concluded from the literature review and the model is specified as:

$$LnGDP_t = \beta_0 + \beta_1 LnDEBT_t + \beta_{2i} X_t + \beta_3 CS_t + \beta_4 AFC_t + \beta_5 GFC_t + \varepsilon_t \quad (1)$$

Where,
GDP = Real GDP per capita
DEBT = Natural log growth rate of government debt
X = A set of conditioning variables which includes:
X1 = Natural log of population growth rate
X2 = Gross capital formation (% of GDP)
X3 = Inflation rate
X4 = Trade openness ratio (sum of exports and imports to GDP ratio)
CS = Dummy variable that indicate Commodity Shock (1985 - 1986)
AFC = Dummy variable that indicate Asian Financial Crisis (1997 - 1998)
GFC = Dummy variable that indicate Global Financial Crisis (2008)

Y is the dependent variable; X is a list of condition variables and the subscripts t represents period from 1970 to 2018 respectively. Meanwhile, $\beta_0$ is the constant term, $\beta_1$ are the coefficients of the government debt variable, $\beta_{2i}$ are the coefficients of the four condition variables while $\beta_3$ , $\beta_4$ and $\beta_5$ are the coefficients of the three dummy variables. The coefficients may be either positive or negative.

In this study, the Autoregressive Distributed Lag (ARDL) framework is employed to analyse the long run and short run relationship between government debt and economic growth. Before employing the ARDL model, the stationarity properties of the variables are examined by employing the Augmented Dickey-Fuller (ADF) unit root test and the Kwiatkowski-Phillips-Schmidt-Shin (KPSS) stationarity test. The order of integration for each of the variables will be determined from the results of the stationarity test. Following the ARDL

estimation, quantile regression analysis will be employed to examine the impact of government debt at different stages of economic development.

### 3.3.1 Augmented Dickey-Fuller Unit Root Test

The ADF unit root test is used to examine the presence of unit root in time series data (Dickey & Fuller, 1981). In this step, the ADF test will be specified with intercept and trend. The equation of ADF test is as below:

$$\Delta y_t = f_0 + f_1 t + f_2 y_{t-1} + \sum_{i=1}^{k} d_i \Delta y_{t-1} + \varepsilon_t \quad (2)$$

Where,

$f_0$ = intercept constant

t = time trend

$\varepsilon$ = residual

The null hypothesis of the ADF test states that the series has a unit root. Thus, the series is proven to be stationary and do not have unit root if the null hypothesis is rejected. In this step, the null hypothesis will only be rejected at 5% significance level following a stricter standard.

### 3.3.2 Kwiatkowski-Phillips-Schmidt-Shin Stationary Test

To check on the robustness of the ADF unit root test result, the KPSS test developed by Kwiatkowski, Philips, Schmidt and Shin (1992) will be carried out as a complementary analysis. The null hypothesis states that the variable is stationary. The data set is proven to be not stationary if the null hypothesis is rejected. In this step, the null hypothesis will only be rejected at 5% significance level following a stricter standard.

### 3.3.3 Autoregressive Distributed Lag (ARDL) Model

To examine the presence of cointegrating relationship between variables, the bound test developed by Pesaran et al. (2001) is applied with null hypothesis stating that the model has no long run relationship (H0:0=1=2=3=4=5=0). The F-test statistics is benchmarked against critical values bound I(0) and I(1). If the test statistics goes upon the upper bound, the null hypothesis will be rejected indicating the presence of a long run relationship. Conversely, if the test statistics is lower than the lower bound, then the evidence proves the absence of long run relationship.

Next, the analysis of ARDL model will proceeds with the estimation of long run coefficients. Banerjee, Dolado, Galbraith and Hendry (1993) pointed out that the ARDL model can be transformed into an error correction model (ECM) to estimate the short term impacts of debt. The equation for the error correction model can be specified as below.

$$\Delta LnGDP_t = \beta_0 + \zeta_1 LnGDP_{t-1} + \beta_1 LnDEBT_{t-1} + \beta_2 X_{t-1} + \sum_{i=0}^{a} \alpha_i \Delta LnGDP_{t-i} + \sum_{p=0}^{b} \gamma_p \Delta LnDEBT_{t-p} + \sum_{j=0}^{c} \delta_j \Delta X_{t-j} + \beta_3 CS_t + \beta_4 AFC_t + \beta_6 GFC_t + \beta_7 ECT_{t-1} + \varepsilon_{1t} \quad (3)$$

$\Delta$ denotes that first difference operator, while X denotes a vector of conditioning variables. To verify on the robustness of this results, gross national income (GNI) per capita is selected as the dependent variable to substitute the GDP per capita in the long run and short run estimation of the ARDL model.

The error correction term (ECT) is formulated by subtracting the long-run coefficients in Eq. (1). As such:

$$ECT_t = LnGDP_t - \beta_0 - \beta_1 LnDEBT_t - \beta_{2i} X_t - \beta_3 CS_t - \beta_4 AFC_t - \beta_5 GFC_t \quad (4)$$

3.3.4 Quantile Regression

One of the weaknesses of the ARDL model is that this approach only estimates the average coefficients for the relationship between the variables. Therefore, to compensate for the weakness of the ARDL model, quantile regression introduced by Koenker and Bassett (1978) is carried out to divide GDP into different distribution which represents different stages of economic development in Malaysia. This approach will give a meaningful interpretation on the relationship between debt and growth. Besides, quantile regression generates results which are relatively robust to outliers compared to the standard mean regression models as it minimizes the weighted sum of absolute residuals instead of the sum of squared residuals.

In the basic quantile regression model, the conditional quantile is specified as a linear equation of the independent variable. The equation is as below:

$$y_t = x_t' \beta_0 + u_{\theta t}, 0 < \theta < 1 \quad (5)$$

$$Quant_{\theta}(y_t|x_t) = x_t\beta_{\theta} \quad (6)$$

Where y is the dependent variable, x include a list of the independent variables, and u is the error term. $Quant_{\theta}(y_t|x_t)$ signifies the $\theta$th quantile of y conditional on x. The interpretation for a coefficient $\beta_{\theta j}$ with the $j_{th}$ independent variable in the vector $x_t$, called $x_{tj}$, is "how $y_t$ in its $\theta$th conditional quantile reacts to a marginal change in $x'_{tj}$". Therefore, the quantile regression framework can help to determine the impact of government debt at different locations in the conditional distribution of the independent variable, which is the GDP per capita growth.

The $\theta$th conditional quantile estimate, $\beta_{\theta}$, which will be solved by the following minimization problem through linear programming:

$$\min_{\beta} \sum_{y_t \geq x'_t\beta} \theta|y_t - x'_t\beta| + \sum_{y_t < x'_t\beta} 1-\theta|y_t - x'_t\beta| \quad (7)$$

Meanwhile, the median regression will be obtained by setting $\theta$= 0.5. The estimation for other quantiles of distribution can be obtained by computing the variations of $\theta$. To study the relationship between the independent variables across the distribution of economic growth, the estimations for the 5th, 10th, 20th, 25th, 50th, 75th, 90th, 95th quantiles will be recorded.

## Chapter 4 Results and Discussion

In this chapter, the results of the analysis will be discussed. Firstly, descriptive statistics and the results of the stationarity test will be analysed to examine the properties of the variables. Next, the ARDL framework will be constructed to answer the first objective of the study, which is the long term and short term relationship between government debt and economic growth. After that, quantile regression will further study the impact of debt at different stages of economic development.

### 4.1 Empirical Results

#### 4.1.1 Descriptive Statistics

Descriptive statistics present the information which included mean, standard deviation, skewness, kurtosis and Jarque-Bera that indicate the properties of each variable. Table 2 presents the results of descriptive statistics for each variable.

Table 3: Descriptive statistics

| Variables | Mean | Std. dev | Skewness | Kurtosis | J-B statistic | Obs |
|---|---|---|---|---|---|---|
| **Dependent variable** | | | | | | |
| GDP | 21441.33 | 10428.33 | 0.395336 | 2.009075 | 3.281149 | 49 |
| **Independent variable** | | | | | | |
| DEBT | 186308612244 | 208457205059 | 1.338009 | 3.539039 | 15.21376 | 49 |
| **Conditioning variables** | | | | | | |
| P | 2.234490 | 0.469818 | -0.656247 | 2.422731 | 4.197421 | 49 |
| GCF | 27.96521 | 6.596312 | 0.992549 | 2.860765 | 7.920000 | 49 |
| INF | 3.518344 | 2.905535 | 2.692887 | 12.50529 | 238.7143 | 49 |
| TRADE | 144.5980 | 42.97266 | 0.166367 | 1.801300 | 3.095189 | 49 |

Notes: All statistics are based on original data values.

The data series of GDP per capita (GDP) and government debt (DEBT) have high volatility with high standard deviation which signifies that the data are further apart from the mean. Besides, the inflation rate (INF) has extremely high Jarque-Bera statistics indicating that its errors are not normally distributed.

#### 4.1.2 Unit Root Test Results

Table 4 presents the results of the ADF and KPSS test.

Table 4: Unit root and stationarity tests

| Variables | ADF | | KPSS | | Results |
|---|---|---|---|---|---|
| | Level | 1st Difference | Level | 1st Difference | |
| Ln GDP | -2.562365 (0) | -6.027127 (0)*** | 0.156396 (5)** | 0.056503 (2) | I(1) |
| Ln DEBT | -2.820542 (0) | -7.135024 (0)*** | 0.128748 (4)* | - | I(1) |
| Ln P | -2.380110 (0) | -6.066826 (0)*** | 0.149374 (5)** | 0.060591 (0) | I(1) |
| GCF | -1.677473 (6) | -7.398842 (0)*** | 0.065388 (3) | - | I(1) |
| INF | -0.198580 (3) | -7.366972 (2)*** | 0.227749 (5)*** | 0.050901 (3) | I(1) |
| TRADE | -0.034729 (0) | -5.281063 (0)*** | 0.188165 (5)** | 0.155146 (2)** | I(1) |

Note: *, ** and *** denote 10%, 5% and 1% significance level, respectively.
Ln denotes that the series has transformed into a natural logarithm.
Figures in parentheses indicate lag length chosen.

The results of ADF indicate that all variables have a unit root at level and reject the null hypothesis signifying the presence of unit root after taking first difference. Meanwhile, the results of KPSS shows that all variables is not stationary at level, except government debt (DEBT) and gross capital formation rate (GCF), but also become stationary after taking the first difference.

The variables DEBT and GCF are integrated differently between ADF unit root test and KPSS stationarity test. In this case, the more conservative I(1) will be taken as a result for these variables. Therefore, all variables are integrated at I(1).

4.1.3 Autoregressive Distributed Lag (ARDL) Results

Table 5 shows the F-statistics of the ARDL bounds tests, Schwarz model selection criterion, serial correlation LM test and the heteroskedasticity test for the fixed lag length of 1, 2 and 3 respectively. Based on results shown on table 5, lag length of two is most optimal to be used in the ARDL model.

Table 5: Cointegration test

| | Fixed Lag | | |
|---|---|---|---|
| | 1 | 2 | 3 |
| ARDL Bounds test | 2.795886 | 4.317096** | 2.456386 |
| Schwarz criterion | -4.704300 | -4.852494 | -4.813659 |
| Serial Correlation LM test | 2.172309* | 0.943214 | 5.861721*** |
| Heteroskedasticity test | 0.720995 | 1.683588 | 0.943208 |

Note: *, ** and *** denote 10%, 5% and 1% significance level, respectively.
Breusch-Pagan-Godfrey test is used for heteroskedasticity tests.

As observed in Table 5, the null hypothesis stating the absence of cointegration is rejected at lag two which indicates the presence of long run relationship between economic growth and the explanatory variables. Besides, the results also signify that serial

autocorrelation and autoregressive conditional heteroskedasticity is evidently absent if lag length of two is applied. Besides, the Schwarz criterion shows the lowest value for lag length at two.

Table 6: ARDL Long-run relationship estimation

| Variables | Coefficient | Standard Deviation | p-value |
|---|---|---|---|
| Ln DEBT | -2.749132 | 1.091564 | 0.0168** |
| Ln P | -1.309197 | 0.195213 | 0.0000*** |
| GCF | 0.024926 | 0.010266 | 0.0208** |
| INF | -0.028854 | 0.025168 | 0.2599 |
| TRADE | 0.002068 | 0.001581 | 0.1999 |
| CS | -1.078506 | 0.511230 | 0.0426** |
| AFC | -0.716062 | 0.396935 | 0.0804* |
| GFC | -0.005992 | 0.220037 | 0.9784 |
| Intercept | 10.986797 | 0.439968 | 0.0000*** |

Notes: *, ** and *** denote 10%, 5% and 1% significance level, respectively.
A maximum lag length of two was used, following the results of the cointegration tests.
The optimal lag structure for the resulting ARDL model was chosen using Schwarz criterion.

Table 6 presents the results of ARDL estimation with a lag structure of (1,0,2,2,0,0). According to the results of the estimation, long run relationship between government debt (DEBT) and economic growth which is negative is present at 5% significance level. When DEBT increases by 1%, GDP per capita growth decreases by 2.749% in the long run. Meanwhile, population growth rate (P) and gross capital formation rate (GCF) will generate significant effects on economic growth. When population growth rate (P) increases by 1%, economic growth will decrease by 1.309%. When the gross capital formation rate (GCF) increases by 1%, it will boost the economy by 0.025%. However, the other conditioning variables, inflation rate (INF) and trade openness ratio (TRADE) do not have significant relationship with the economic growth. Besides, all dummy variables representing the economic shocks will also generate adverse impact on economic growth, except Global Financial Crisis (GFC) in 2008. Commodity shock (CS) in 1985 decreases the GDP per capita by 1.079% at 5% significance level, while Asian Financial Crisis (AFC) in 1997 decreases the economic growth rate by 0.0716% at 10% significance level.

Table 7: ARDL Short-run dynamics estimation

| Variables | Coefficient | Standard Deviation | p-value |
|---|---|---|---|
| ΔLn DEBT | -0.157354 | 0.073287 | 0.0388** |
| ΔLn P | -0.096512 | 0.113246 | 0.3999 |
| ΔGCF | 0.003527 | 0.001559 | 0.0299** |
| ΔINF | -0.001695 | 0.001875 | 0.3720 |
| ΔTRADE | 0.000283 | 0.000435 | 0.5193 |
| ΔCS | -0.057709 | 0.020327 | 0.0075*** |
| ΔAFC | -0.042772 | 0.021618 | 0.0558* |
| ΔGFC | -0.005532 | 0.018480 | 0.7664 |
| $\mathbf{ECT_{t-1}}$ | -0.056619 | 0.006022 | 0.0000*** |
| **Diagnostic checks** | | | |
| Serial correlation LM test | 3.954402 | | |
| Heteroskedasticity test | 2.073345* | | |
| CUSUM Test | Stable | | |

Notes: *, ** and *** denote 10%, 5% and 1% significance level, respectively.
Δ denotes first difference.
A maximum lag length of two was used, following the results of the cointegration tests.
The optimal lag structure for the resulting ARDL model was chosen using Schwarz criterion.
Breusch-Pagan-Godfrey test is used for heteroskedasticity tests.

Table 7 shows the result of ARDL short run dynamics estimation. The results indicate that short run relationship between DEBT and GDP per capita is negative at 5% significance level. There will be a decrease of 0.157% in GDP per capita for each percent increase of debt. Meanwhile, the results have also proven the presence of relationship between all conditioning variables and GDP per capita, but only the relationship with gross capital formation rate (GCF) is significant at 1% confidence level. When the gross capital formation rate (GCF) increases by 1%, the output growth will increase by 0.004%. Moreover, the results also show a short run negative relationship between all three economic shocks and economic growth. Commodity Shock in 1985 has a short run adverse effects of 0.058% on GDP per capita growth at 1% significance level. Meanwhile, Asian Financial Crisis (AFC) in 1997 decreases the GDP per capita growth by 0.043% at 10% significance level.

Next, the coefficient of error correction term (ECT) measures the magnitude of adjustment back to the long term equilibrium level. From the results shown, the GDP growth will restore by 0.057% each year when there is a short run deviation of GDP. Meanwhile, the results do not show any evidence for the presence of autocorrelation, but the rejection of null hypothesis indicates the presence of heteroskedasticity in the model at 10% significance level.

The cumulative sum control chart (CUSUM) is carried out to examine the stability of the model. Evidence shows that the model is stable.

4.1.4 Robustness Test Results

To verify the robustness of the test carried out, robustness tests are carried out by substituting the dependent variables, real GDP per capita with real gross national income (GNI) per capita in the ARDL model.

Table 8 presents the result of the ARDL long-run relationship estimation with GNI per capita as dependent variable.

Table 8: ARDL Long-run relationship estimation

| Variables | Coefficient | Standard Deviation | p-value |
|---|---|---|---|
| Ln DEBT | -2.687593 | 0.733643 | 0.0009*** |
| Ln P | -1.237408 | 0.169708 | 0.0000*** |
| GCF | 0.013779 | 0.006137 | 0.0320** |
| INF | -0.053900 | 0.015853 | 0.0019*** |
| TRADE | 0.003342 | 0.001053 | 0.0034*** |
| CS | -0.842689 | 0.311652 | 0.0110** |
| AFC | -0.498973 | 0.252205 | 0.0568* |
| GFC | -0.000386 | 0.174269 | 0.9982 |
| Intercept | 10.991387 | 0.316074 | 0.0000*** |

Notes: *, ** and *** denote 10%, 5% and 1% significance level, respectively.
A maximum lag length of two was used, following the results of the cointegration tests.
The optimal lag structure for the resulting ARDL model was chosen using Schwarz criterion.

Table 9 shows the result of the ARDL short-run dynamics estimation with GNI per capita as dependent variable.

Table 9: ARDL Short-run dynamics estimation

| Variables | Coefficient | Standard Deviation | p-value |
|---|---|---|---|
| ΔLn DEBT | -0.172868 | 0.075225 | 0.0275** |
| ΔLn P | -0.015402 | 0.126783 | 0.9040 |
| ΔGCF | 0.004868 | 0.001309 | 0.0007*** |
| ΔINF | -0.000315 | 0.001344 | 0.8162 |
| ΔTRADE | 0.000295 | 0.000462 | 0.5265 |
| ΔCS | -0.038449 | 0.021433 | 0.0812* |
| ΔAFC | -0.042289 | 0.022967 | 0.0738* |
| ΔGFC | -0.008881 | 0.019757 | 0.6557 |
| $\mathbf{ECT_{t-1}}$ | -0.058856 | 0.012612 | 0.0000*** |
| **Diagnostic checks** | | | |
| Serial correlation LM test | 0.686536 | | |
| Heteroskedasticity test | 2.917415** | | |

| | |
|---|---|
| CUSUM Test | Stable |

Notes: *, ** and *** denote 10%, 5% and 1% significance level, respectively.
∆ denotes first difference.
A maximum lag length of two was used, based on the results of the cointegration tests.
The optimal lag structure for the resulting ARDL model was chosen using Schwarz criterion.
Breusch-Pagan-Godfrey test is used for heteroskedasticity tests.

The estimation results shown in Table 8 and 9 shows consistency with the previous results recorded in Table 6 and 7. The relationship between DEBT and GNI per capita is negative and significant in short term and long term. Therefore, the evidence proves that the results of the ARDL estimation are robust to different dependent variable.

### 4.1.5 Quantile Regression Results

Table 10: Quantile Regression Results

| Quantile | 0.05 | 0.10 | 0.20 | 0.25 | 0.5 | 0.75 | 0.9 | 0.95 |
|---|---|---|---|---|---|---|---|---|
| Intercept | 9.882122 | 9.972611 | 9.889687 | 9.819454 | 10.13284 | 10.64369 | 10.67079 | 10.75097 |
| | (0.316669)*** | (0.300393)*** | (0.354782)*** | (0.340195)*** | (0.288694)*** | (0.288832)*** | (0.242408)*** | (0.238801)*** |
| Ln DEBT | -1.068168 | -1.097161 | -0.512825 | -0.697802 | -1.088297 | -1.021184 | -1.167933 | -1.290743 |
| | (0.812759) | (0.759570) | (0.771673) | (0.726903) | (0.594603)* | (0.630769) | (0.579044)* | (0.586248)** |
| Ln P | -1.774902 | -1.692193 | -1.667677 | -1.644065 | -1.479256 | -1.374005 | -1.376101 | -1.315911 |
| | (0.167360)*** | (0.168067)*** | (0.188722)*** | (0.175619)*** | (0.150482)*** | (0.149531)*** | (0.108079)*** | (0.097007)*** |
| GCF | 0.009604 | 0.008357 | 0.011153 | 0.016656 | 0.010267 | 0.003450 | 0.002695 | 0.000783 |
| | (0.007455) | (0.007336) | (0.008394) | (0.008004)** | (0.007198) | (0.007570) | (0.006316) | (0.006808) |
| INF | -0.003226 | -0.007457 | -0.012329 | -0.015647 | -0.023917 | -0.037750 | -0.019767 | -0.019119 |
| | (0.015490) | (0.014764) | (0.016705) | (0.016615) | (0.015704) | (0.015126)** | (0.015558) | (0.015012) |
| TRADE | 0.007006 | 0.006493 | 0.006427 | 0.006154 | 0.005308 | 0.003481 | 0.003510 | 0.003170 |
| | (0.000898)*** | (0.000863)*** | (0.001008)*** | (0.000997)*** | (0.000891)*** | (0.001014)*** | (0.000889)*** | (0.000796)*** |
| CS | 0.453135 | 0.374712 | 0.308120 | 0.251554 | 0.230184 | -0.017303 | -0.017354 | -0.056254 |
| | (0.130217)*** | (0.133318)*** | (0.157260)* | (0.150383) | (0.130261)* | (0.117812) | (0.093627) | (0.080047) |
| AFC | 0.214523 | 0.206361 | 0.169757 | 0.041419 | 0.158036 | 0.177747 | 0.092102 | 0.091646 |
| | (0.064206)*** | (0.066122)*** | (0.083506)** | (0.091251) | (0.081014)* | (0.094727)* | (0.111416) | (0.109952) |
| GFC | 0.347212 | 0.347551 | 0.283755 | 0.319060 | 0.306263 | 0.262313 | 0.170280 | 0.165740 |
| | (0.049915)*** | (0.049386)*** | (0.054550)*** | (0.059493)*** | (0.074570)*** | (0.087868)*** | (0.097711)* | (0.095392)* |

Table 10 gives summary statistics about the results of quantile regression at each quantile. The negative relationship between DEBT and GDP per capita growth is only significant at quantile 0.5, 0.9 and 0.95. At stages with relatively low growth, the economic growth of Malaysia will not be affected significantly. According to World Bank (2019), Malaysia is currently categorised in the class of upper middle income country, which is represented by the quantile 0.75. At the quantile 0.75 in which Malaysia situated in current stages, the impact of DEBT on GDP per capita growth is negative but insignificant. At quantile 0.9 which signifies a high growth stage, the increase of government debt (DEBT) by 1% will decrease economic growth by 1.168% at 10% significance level. Meanwhile, at quantile 0.95, the GDP growth will decrease even more by 1.291% at 1% significance level.

In the case of Malaysia, population growth rate (P) and trade openness ratio (TRADE) always have an adverse impact on GDP per capita at 1% significance level throughout all quantiles recorded. Meanwhile, there is no evidence showing the presence of significant relationship between gross capital formation rate (GCF), inflation rate (INF) and economic growth throughout all distributions. The Commodity Shock (CS) in 1985 and Asian Financial Crisis (AFC) in 1997 have an adverse effect on growth at lower quantile but become insignificant when it reaches higher quantile. Besides, the Global Financial Crisis (GFC) has a positive relationship with economic growth which is significant throughout all distributions.

### 4.2 Discussion

The most important finding of the study is the adverse effects of government debt on economic growth which is significant in both short and long term. This finding confirms the work of Lee and Ng (2015) and Choong, Liew, Lau, and Puah (2010) which also show a negative impact of debt on growth. From the comparison between short term and long term coefficients, it is thus obvious that the short term impact of debt on growth is relatively small, while the long run impact of debt on growth is tremendous and destructive.

The most acceptable explanations to this finding would be the crowding out effects. Kumar and Woo (2010) indicates states that the high interest rate resulting from debt would discourage private investment. Thus, the process of capital accumulation will slow down which then leads to impact on productivity growth. Furthermore, the private investment might also be affected as the foreign and domestic investors face higher uncertainties and risk about the government policies and return of investment (Pattillo, Poirson, & Ricci, 2004).

This phenomenon also corroborates the work of Devarajan et al. (1996) which states that the impact of increase in debt level depends on the type of expenditure it funds. If the

government expenditure is allocated on unproductive or purely consumptive expenditure, the long term impact on growth is expected to be adverse.

Besides, the significant finding of this study that proved the strictly negative relationship between government debt and GDP per capita in short term and long term contradicts the finding of Daud (2016), Daud, Ahmad, and Azman-Saini (2013) which found the non-linear relationship between debt and output growth. Also, the findings are also contrastive with the studies by Burhanudin, Muda, Nathan, and Arshad (2017) and Haris and Mohammad (2015) that concluded the positive impact of debt on growth.

On top of that, the results of quantile regression also suggest that government debt is harming the economy. To be specific, the negative impact of debt on growth in Malaysia will become increasingly significant as Malaysia is progressing into the high income economy. This indicate that debt is considered destructive to growth in the current stage and will generate even greater impact in the future as Malaysia experiences higher growth of income.

Other than debt, evidence also shows that the population growth rate have a significantly inverse relationship with GDP per capita in the long term, but the negative relationship is insignificant in the short term. This finding confirms the work by Dao (2012) which concluded the inverse relationship between population growth and economic growth. This phenomenon is well explained by the neoclassical growth model developed by Solow (1956). The model states that the population growth together with the stagnant growth of savings and capital stock will diminish the per capita output growth.

Next, the gross capital formation is always positively associated with the economic growth no matter in short or long run. According to Gibescu (2010), capital formation or investment as an important factor of economic growth is large-scale projects invested to carry out economic activity and trade. It leads to technical progress and adequate exploitation of natural resources which then increase productivity and output.

In Malaysia, evidences show that the relationship between inflation rate and economic growth is negative, but it is insignificant in short run and long run. Andres and Hernando (1997) pointed out that inflation can harm economic growth through few channels. Firstly, investment effect happens when inflation decreases the rate of return of investment and erodes the confidence of investors. Secondly, efficiency channel states that inflation affects the efficient allocation of resources through increasing menu costs for firms and reducing the optimal level of cash held by households.

Meanwhile, trade openness ratio is contributing positively to economic growth, but it is insignificant as well in short run and long run. Trade openness encourages the increase of production scale thus better yield from increase of economies of scale and specialization (Idris, Yusop & Habibullah, 2016). However, Zahonogo (2016) pointed out that the impact of trade on growth is depending on the force of comparative advantage and technological constraints of the economy through the endogenous growth models. This inference resonates the insignificance of the positive relationship between trade openness and economic growth.

The commodity shock in 1985 to 1986 generated an adverse effect on the economy of Malaysia. The sharp rise of development expenditure in 1980s and the appreciation of real exchange rate led to a massive current deficit. The crisis started when the economic downturn in developed countries developed into a massive collapse of world commodity trade. The terms of trade slumped heavily and the economy contracted sharply with -1% growth rate in 1985 compared to the annual growth rate of 7% in the early 1980s (Athukorala, 2010).

Evidence also shows that there is inverse relationship between Asian Financial Crisis in 1997 and the economic growth of Malaysia. The liberalization initiatives of the capital market in the early 1990s resulted in the accumulation of large capital inflows which made Malaysia vulnerable to speculative attack of Thai baht. Consequently, the ringgit under heavy selling pressure depreciated tremendously and the KLSE composite index plunged more than 50%. The economy then walked itself into a recession.

However, the results show that the Global Finance Crisis (GFC) in 2008 did not have a significant impact on Malaysia economy. Triggered by the bursting of the US housing bubble caused by the speculations, the magnitude of the economic downturn was much lower than the impact of Asian Financial Crisis. This is due to the fact that the financial sector has become more resilient after recovering from the Asian Financial Crisis through the financial sector reforms and capacity building. Besides, there is sufficient liquidity in the financial system and well-built reserve position that made Malaysia less affected by the crisis.

# CHAPTER 5 CONCLUSION

This chapter will present the summary of main findings on the relationship between government debt and economic growth in Malaysia. The policy implications, limitations of study and recommendation for future studies will also be discussed in this chapter.

## 5.1 Summary of Main Findings

There are several studies conducted to examine the relationship between government debt and economic growth in Malaysia but the findings are inconclusive as some indicated the nonlinear relationship between debt and growth, some found negative relationship, and others found positive relationship. The difference between different findings are likely because of the use of different methodology and sample period. Thus, this purpose of this study is to fill the literature gap which will determine the relationship between government debt and economic growth of Malaysia from 1970 to 2018. The main objectives of this study are to analyse the short term and long term relationship between government debt and economic growth of Malaysia and to analyse the relationship between government debt and economic growth of Malaysia at different stages of economic development.

Secondary data from the Word Bank and Department of Statistic Malaysia is obtained for the analysis. This study employed the autoregressive distributed lag (ARDL) framework which included the examination of short run dynamics, long run coefficients and cointegration. The findings indicate a negative relationship between government debt and economic growth which is significant in short term and long term. The robustness test conducted has further confirmed the findings. Next, quantile regression model is employed to determine the impact of government debt on economic growth of Malaysia in different stages of economic development. The finding shows that government debt has adverse impact on economic growth which will become significant at the high income stage.

## 5.2 Policy Implications

According to the findings, the impact of government debt on economic growth is destructive at any level of debt. Therefore, the government should enhance the fiscal consolidation efforts to avoid fiscal deficits and the accumulation of debt. To take care of the budget balance, the government should implement effective tax system and keep the government expenditure low. The government should focus on implementing progressive tax

and ensure efficient government agencies. The government should also actively engage in debt repayment to reduce the debt level over time.

## 5.3 Limitations of Study

There are two main limitations of the study. First and foremost, the study did not take into account the recent events after the Pakatan Harapan government took over power in 2018 as the data obtained is from 1970 to 2018. The PH government have started initiatives to alleviate the debt burden and reform but the effect of such events could not be captured in the analysis. Besides, the fiscal situation of Malaysia may have worsened due to few stimulus packages that have been announced recently to alleviate the economic impact of the COVID-19 pandemic. Secondly, this study failed to differentiate between impact of domestic and external debt. This risk associated for debt financed by domestic and foreign funding is rather different and should be taken into consideration.

## 5.4 Recommendations for Future Studies

There are few recommendations for the future studies. Firstly, it is pertinent to study the channel in which government debt affects economic growth, especially how will debt inhibit the capital accumulation and productivity growth. The interest rate and various type of investment are all possible mechanisms of debt having an impact on the output growth.

Secondly, the effect of domestic debt and external debt on economic growth are quite different. Countries that are involved in debt crisis are associated with extremely high sovereign debt, while the external debt ratio of Malaysia is much lower. The future studies may specifically examine the economic impact of external debt by building upon the current methodology.

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