THE EFFECT OF FISCAL POLICY ON NATIONAL DEBT - A VAR APPROACH

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DECLARATION

We hereby declare that:

(1) This undergraduate research project is the end result of our own work and that due acknowledgement has been given in the references to ALL sources of information be they printed, electronic, or personal.

(2) No portion of this research project has been submitted in support of any application for any other degree or qualification of this or any other university, or other institutes of learning.

(3) Equal contribution has been made by each group member in completing the research project.

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ABSTRACT

The aim of this thesis is to study how the fiscal adjustments affect the national debt, solely on Malaysia. The reason of choosing Malaysia as our research object is that the Malaysia's national debt has increased drastically after the European sovereign debt crisis at 2008-09. The increasing debt level of Malaysia had raised our concern and motivated us to conduct an empirical analysis to determine whether government spending cuts or tax increases will contribute to debt reduction in both short and long run. Firstly, we take into account different component of government spending and taxes by using quarterly data starting from first quarter of 1999 to third quarter of 2013. We used Augmented Dicky-Fuller (ADF) test, Phillips-Perron (PP), and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) to examine the stationarity of our data. Subsequently, we construct Autocorrelation LM test and VAR Stability Condition Check for diagnostic checking. We also exploit Granger Causality test to verify the causality between different spending component and tax on government debt. Impluse Response Function (IRF) is used to identify the response of debt towards different government spending component as well as tax. Next, we used Variance Decomposition to determine the percentage of contribution of each source in explaining the variability of debt. Our empirical studies showed that fiscal consolidation does not play an important role in reducing national debt in the case of Malaysia.

CHAPTER 1: RESEARCH OVERVIEW

1.0 Introduction

This section has begun with the research background that has inspired us to carry out this research by discussing about the crisis associated with European's economy. With the aids of graphical analysis, we understand about the trend of Malaysia's debt. Several issues have been highlighted in the research background in an attempt to form the problem statement of our research. After formulated the problem statement, research objectives and research questions are identified in respect of how the study will be carried out. At last, the significance of study is discussed in this section as well.

1.1 Research Background

1.1.1 What motivates us?

People have often discussed about the causes and effects of high government public debt, by looking into cases in Europe countries which have high government public debt, we can understand more about the relationship between government debt and the health of a country's economy. As some of the European countries had experienced two major crises which were global financial crisis and sovereign debt crisis, they have been suffering from it by having higher than average debt level and experienced negative impacts on their economy due to high public debt level.

Initially, financial crisis occurred in European countries from year 2008-2009 as a result of the greed and blindness of financial markets and institutions as

well as unsustainable macroeconomic strategies undertaken. This crisis has caused public debt and deficits of these European countries to rise intensely as they have to involve in order to preserve the financial system. As a result, these countries have to spend more on unemployment, reduce tax revenue as well as have to finance measures to support activities. Therefore, public debt of European countries increased significantly due to these reasons.

Looking at the high debt level of several European countries, there was a reflection of sovereign debt crisis in these countries. It is undeniable that this crisis would seriously hurt their economy in different aspect. In the early of year 2010, sovereign debt crisis in several European countries which include Greece, Ireland, Portugal, Spain and Italy has brought about economic and social consequences in their country. Following the association of distinct financial and macroeconomics development, the sovereign spreads in these European countries have been broadened. In these European countries, credit has become more costly and scarce, as well as the unemployment rate boost up which resulted from the reduction in economic activity.

Through diverse channels sovereign debt crisis has affected the economy. First and foremost, sovereign debt crisis may discard a country from international capital markets whereby in subsequent it may have adverse effects on trade and investment activities. According to Richmond and Dias (2008), a country repossessed access to international capital markets only after about five years of exclusion. These researchers have examined the duration of exclusion from international capital markets between year 1980 and 2005 by a sample of sovereign debt default. Next, there was an implication of international trade collapse as a result of sovereign debt crisis. Rose (2005) found that there was an approximately 8 percent of reduction every year in mutual trade due to the sovereign debt default. Furthermore, there was a direct effect on the banking sector and subsequently on the economy. Financial stability of banks was affected and may be at risk if governments were to default on their debt since banks are major creditors of governments. Banks' access to funding was worsened especially on the international wholesale markets, impeding their ability to supply credit to the economy as well as undermine the transmission of monetary policy.

The creditworthiness of the whole Euro area is at risk since all members of the European Monetary Union (EMU) have given loan assurance to each another. Subsequently, all Euro member states have been downgraded or tied up with the name of negative rating by international rating agencies. Even those countries with sound public finances were also losing their investment grade status due to this crisis. Stock market has declined even before the first country was downgraded into non-investment grade status. In the European countries, sovereign debt crisis as well has a significant effect on the global financial markets which occurs outside the Euro zone whereby the global risk aversion escalate associated with a great negative equity returns. Last but not least, the Euro currency depreciated due to this crisis. However, other key bilateral exchange rate such as the US dollar- Swiss franc was only slightly affected.

Since Malaysia is also experiencing high debt level as these European countries, people might be interested to know whether Malaysia's economy will experience the same consequences as these European countries. We might be also interested to examine the best way of solution in an attempt to reduce our country's government debt. In order to obtain a primary understanding of Malaysia's debt level throughout the years, we have plotted the series graphically. Besides, Malaysia's budget deficit and public debt will be discussed in the following section.

1.1.2 What's going on in Malaysia?

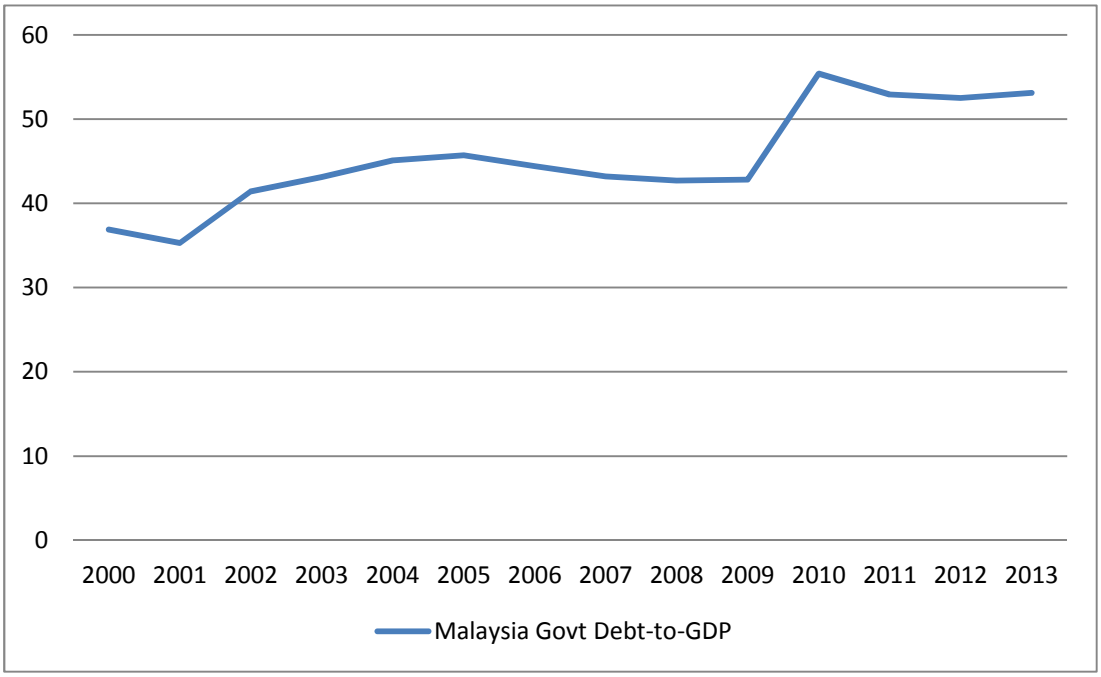
From table 1.1, we can see that Malaysia is continuously experiencing cash deficit throughout the years, it simply means that government spending exceeds its tax revenue. Since Malaysia is experiencing cash deficit, in order to finance a deficit, government has to borrow money by issuing bonds and thereby government debt will increase. As government borrows money, interest payment has to be paid to holders of government bonds and other securities. Therefore, in the long run, high level of government borrowing will adds to the accumulated national debt. This may be the reason of increasing national debt level in Malaysia.

Table 1.1 Malaysia Budget Balance

Year	Cash surplus/deficit (% of GDP)
1999	-3.83002563
2000	-4.12418631
2001	-3.50568327
2002	-4.90145167
2003	-4.85231715
2004	-4.12404625
2005	-3.76082181
2006	-2.95949185
2007	-3.1745542
2008	-4.40884346
2009	-6.13335504
2010	-5.15176044
2011	-4.75925174
2012	-4.52629083

Figure 1.1 shows that there is an increasing trend in Malaysia's debt-to-GDP throughout the years starting from year 2001 until year 2005. However, it shows a slight diminishing trend of government debt-to-GDP in year 2005 onwards. After that, government debt-to-GDP boosts up significantly to 55.4% in year 2010 and reaches its peak. Government debt-to-GDP remains at 53.1% in year 2013. Based on the graph above, we observed that Malaysia has obtained the highest debt level as compared to the past and this incident has caught our attention. Therefore, we would like to investigate whether fiscal policies play an important role in debt reduction.

Figure 1.1 Malaysia Government Debt-to-GDP



1.1.3 Current Issues

As people realized that Malaysia's national debt is increasing throughout the years in the sense that Malaysia has considerably high level of debt and fiscal balance ratios, the discussion about its consequences has appeared to be public's consideration. It is undeniable that few crises experienced by Malaysia have brought significant impact on Malaysia's economy throughout the years.

Since the debt level is rising, Malaysians would be living dangerously with high debt in the sense that Malaysians with medium or low income would have to be alert on their poor financing planning. Statistically, the rising debt will result in an increase in the cost of goods and services as well as the cost of living. For instance, population with middle and lower income are facing the pinch by having school going children, payment of house rental or house loan, car and credit card which absorb a sizable portion of the net income. As a matter of fact, Federation of Malaysian Consumers Associations Chief Executive Datuk Paul Selva Raj has mentioned that 47% of young Malaysians were currently in "serious debt" whereby debt payments amounts to 30% or more of their gross income. According to Teles and Mussolini (2014), the level of public debt-to-gross domestic product

ratio would adversely impact the effect of fiscal policy on growth as government indebtedness draw a part of young people's savings in order to pay interest on debts.

Based on the financial analyst Jesse Colombo in the Forbes online magazine, it is suggesting that Malaysia's high government and household debt would contribute to the credit bubble. He emphasized that Malaysia's bubble would likely to pop when China's economic bubble pops and/or as global and local interest rates continue to rise which caused the country's credit and asset bubble in the first place. He has explained further by emphasizing on the resumption of US Federal Reserve's QE taper plans may put pressure on Malaysia's financial markets in the near future. Besides, it appears to be another worrisome development as Malaysia has rapidly deteriorating current account surplus due to weaker exports. He raised a concern whereby the coming economic crisis could be far worse than the 1997 Asian Financial Crisis due to weak global economy. His concern is supported by the reason that there are more countries involved such as Latin America, China and Africa, and the global economy is in a far weaker state now than it was during the heady days of late-1990s.

According to Bloomberg study, Malaysia has now become the second highest public debt-to-GDP ratio among 13 emerging Asian countries where Sri Lanka has the highest. It is noting that Malaysia's high public debt burden had led to a sovereign credit rating outlook downgrade by Fitch in July 2003. Moreover, Fitch had warned that Malaysia's long term foreign and local currency ratings could be downgraded in the future if Malaysia's fiscal performance continued to deteriorate and constrain its sovereign ratings. Consequently, it will generate a risk that Malaysia will have to borrow money from abroad with relatively expensive path. Not to mention the investment flow to Malaysia's equity and bond markets would be dampen due to lower rating.

Furthermore, Malaysian households are bringing on debt which caused Malaysia's ratio of household debt to GDP to hit a record of 83%. It is reported as highest household debt load in Southeast Asia which rose from 70% in year 2009. Other than that, another worrisome trend is that Malaysia's lending rate is at

record low has led to an inflating household debt bubble. In details manner, the ultra-low interest rates have caused Malaysia's private sector loans to boost up by over 80% since year 2008. Besides, Malaysian corporate leverage which included corporate bonds and banks loans had been achieved at an alarming rate. It has reached 95.8% of GDP in year 2013 from79.9% in year 2007.

As we notice that Malaysia are currently facing numbers of issues due to high debt level, we might concern about whether or not Malaysia's economy may follow those Europe countries such as Portugal, Italy, Ireland, Spain and Greece if the debt level continues to rise. Therefore, we are conducting empirical tests in this research paper in order to examine the suitable instruments in reducing public debt.

1.1.4 The Solutions

Based on Malaysia's situation which is experiencing large and increasing debt level, government has conducted fiscal policy as the problems solution. Theoretically, we understand that different fiscal policies would have different impacts on Malaysia's economy while solving the increasing debt issue.

The public debt ratios increase sharply since year 2008 and the credible policies are needed for debt reduction in almost all OECD countries. Generally, we know that monetary policy and fiscal policy are two vital policy tools to influence a nation's economic performance. Monetary policy is normally managed by our Central Bank which is also known as Federal Reserve, an independent agency of the Federal Government. The changes in interest rates and money supply refer to the actions of Central Bank in an attempt to achieve the goals such as full employment, price stability as well as stable economic growth. On the other hand, fiscal policy is under the control of federal government. The adjustments of government tax and spending can affect a nation's economy such as an improvement in economic growth.

One of the strategies that may be implemented by governments is to keep the interest rate low in order to stimulate the economy, increase tax revenue and

reduce the government debt ultimately. It encourages individuals and businesses to borrow money from banks and spend the money on goods and services. Hence, the nation is able to decrease unemployment rate and increase tax revenue. However, there are only some degrees of success looking at the results of Unites States, the United Kingdom, the European Union and other nations. This proved that it is not a panacea to keep the interest rate low in the long run in order to decrease the government debt.

Moreover, governments may issue bonds to avoid increasing taxes and receive the money at the same time to stimulate the economy by spending, theoretically collecting the extra tax income from taxpayers and prosperous businesses. However, it seems to be not extremely effective for the nation to reduce its government debt in the long run but economic boost to other countries. This is because government must pay interest to its creditors and also repaid the borrowed money at some point.

Based on John Maynard Keynes (1883-1946), a British economist, he believed that governments could implement fiscal policy to control the economics performance by adjusting tax rates and government spending. Therefore, the most acceptable way to reduce the government debt without hurting the economy much is by implementing the fiscal policy in the nation, which is the composition of spending cuts and tax increases.

However, many scholars found that decrease in government spending are much more effective in reducing the ratio of debt to GDP than increase in tax. Therefore, they argued that changes of economics performance such as reducing debt and raising economic growth can be achieved by spending cuts. For examples, in 1990s, Canada cut its budget deficit to zero within three years and reduced one-third of its government debt within five years without increasing taxes by establishing a deep spending cuts which was around 20% or more within four years. In contrast, France had increased its taxes up to 70% or more to try to reduce budget deficit recently. However, higher marginal tax rates had reduced the incentive of citizen to work in France and the tax revenue increased lesser than planned.

Garett Jones (2012) has concluded the findings of an IMF paper that studied 173 fiscal consolidations in rich countries and discovered that nations will be much better by cutting government spending instead of raising taxes as they need to suffer about twice as much as other nations when taxes increase. Many researches had shown the results that positive government spending shocks may cause a positive effect on output, whereas positive tax shocks may cause a negative effect on output.

Furthermore, the effect on reducing the government debt will be more efficient when the governments employ consolidation programs of better composition. According to Heylen, Hoebeeck and Buyse (2013), the public debt ratio will be reduced substantially within the fiscal consolidation program when government wage bill has been cut principally in low public sector efficiency. Yet, decreasing in public investment sector will bring a counterproductive effect on bringing down the public debt ratio. Overall, the different compositions of government expenditures may provide the different effects on reduction of government debt ratio.

In addition, the costs of fiscal adjustment may be aggravated in terms of output loss when a front-loaded or regressive consolidation is taken during a recession. The debt-to-GDP ratio may also drastically delay on its reduction which cause the market sentiment become worse in a sovereign at times of low confidence and revolt the efforts of fiscal austerity completely. These effects are even more real if the public spending cuts are more ostentatiously in the case of fiscal consolidations. Hence, a gradual fiscal adjustment will be more successful in achieving a lower debt-to-GDP ratio. The chances to have a successful fiscal consolidation increase with a balanced composition of spending cuts and tax raises. Monetary disinflations are likely to mitigate the subsequent effects of fiscal withdrawal by decreasing the real interest rate proactively.

Theoretically, we have understood that spending cut is more likely to act as an effective tool in national debt reduction. Therefore, we are interested to examine whether different components of fiscal consolidation would bring about different impact to our country's national debt. Hereby, we will be conducting an empirical analysis in order to answer our curiosity towards the findings above.

1.2 Problem Statement

Based on the graphical analysis in research background, we understand that Malaysia's total debt level has risen continuously throughout the years. It is undeniable that increasing country's debt obligation will bring negative impact to our economy. For instance, higher government debt means higher interest rate for government as well as individual or businesses in the economy. Other than that, country with high debt will experience the depreciation in its currency and consequently increase the cost of commodities such as food, oil and others. Not to mention that country's debt have to be inherited by future generation as well as cost of borrowing.

In Europe, there are many countries suffered greatly from obtaining high proportion of debt such as Greece, Portugal, Spain and so on. Generally, Greece has obtained total debt of around €356bn (£290bn) which is about 165 percent of the country's gross domestic product. Its high level of debt has carried the meaning that investors are wary of lending it more money as well as demand a higher premium for doing so. Consequently, its unemployment rate reached at a record level. Due to numerous of negative impacts on Greece's economy, it results in incapability of Greece in repaying its debt as it is in the throes of a deep recession. Since Malaysia is also experiencing high debt level as these European countries, people might be interested to know whether Malaysia's economy will experience the same consequences as these European countries.

It has therefore driven our attention as we would like to determine how components of fiscal policies which are government spending and taxes stand a role in debt reduction. Since we are not able to answer this question based on graphical analysis, empirical analysis has become an unavoidable method to answer our curiosity. Throughout the empirical analysis, we are expecting to obtain the result of whether tax or government spending is relatively effective in debt reduction. It is very important to determine its relationship in order for us to understand how these fiscal components might contribute to debt reduction, either positively or negatively as well as ambiguously. Therefore, we expect the empirical findings to provide us with a clear picture.

1.3 Research Objectives

Our research aims to investigate whether the implementation of fiscal adjustments will result in reduction of Malaysia's national debt.

1.3.1 General Objective

The increasing trend of Malaysia's government debt has motivated us to carry out an empirical analysis in an attempt to find solution of national debt reduction. Hence, the general objective of our research is to investigate the dynamic effects of changes in government spending and taxes on Malaysia's national debt.

1.3.2 Specific Objectives

We are interested to know whether which component of spending and tax has a greater impact on the national debt. There are six specific objectives we aim to investigate in our research:

1. To investigate the dynamic effects of changes in government development expenditure on Malaysia's national debt.
2. To investigate the dynamic effects of changes in government operating expenditure on Malaysia's national debt.
3. To investigate the dynamic effects of changes in government wage expenditure on Malaysia's national debt.
4. To investigate the dynamic effects of changes in government non-wage expenditure on Malaysia's national debt.
5. To investigate the dynamic effects of changes in government direct tax on Malaysia's national debt.
6. To examine whether spending cuts or tax hikes or both composition are effective in reducing national debt if fiscal consolidation is implemented.

7. To examine the impact of fiscal policy on national debt across different time periods.

1.4 Research Questions

With the general and specific research objectives clearly stated above, we aim to answer several research questions in respect to our problem statement. There are six research questions which act as a guidance for the arguments and inquiries of our research:

1. What is the impact of changes in government development expenditure on Malaysia's national debt?
2. What is the impact of changes in government operating expenditure on Malaysia's national debt?
3. What is the impact of changes in government wage expenditure on Malaysia's national debt?
4. What is the impact of changes in government non-wage expenditure on Malaysia's national debt?
5. What is the impact of changes in government direct tax on Malaysia's national debt?
6. Does composition of spending cuts and tax hikes in fiscal consolidation effective in reducing national debt?
7. What is the impact of fiscal policy on national debt across different time periods?

1.5 Significance of the Study

Our empirical research aims at contributing to the literature by examining the dynamic effects of changes in government spending and taxes on Malaysia's national debt. By empirically investigating the dynamic effects of fiscal policy implementation on Malaysia's government debt, the findings of our study will help to answer the questions of our research.

Our studies will also bring about contribution to policymakers as they will now understand better about different policy instruments in reducing national debt. As economy is unstable without appropriate policy implementation, the understanding of dynamic effects of different spending and tax components on national debt is important for policymakers in implementing policies. Therefore, our research contributes to policymakers by displaying a clear picture on how different policy implementation might reduce national debt.

CHAPTER 2: LITERATURE REVIEW

2.0 Introduction

The significant increase of public debt in Malaysia has became one of the major issues to be concerned with. Recognizing the consequences of high public debt to a country, the government need to develop and implement well designed fiscal consolidation packages to reduce debt ratio. To discuss the problem, there are numerous literature studies exist regarding the effects of fiscal consolidation from multiple perspectives. This chapter consisted of two sections, the first part providing the literature studies about the effects of fiscal consolidation, particularly the composition of the fiscal adjustments, while the second part providing the literature reviews regarding the use of vector autoregressive(VAR) model in studying the effects of fiscal policy.

2.1 The Emergence of Fiscal Consolidation?

Giavazzi and Pagano (1990), one who among the first that analyzed the effects of fiscal consolidation, studied the successful implementation of fiscal consolidation in Denmark and Ireland. For conventional or Keynesian view, any fiscal contraction will reduces real aggregate demand in the shorter run. This view, generally emphasizing the direct effects. In contrast, the German view or "expectations" view, claimed that former view is a misleading idea as it doesn't take into account the role of expectations. Thus, the German view proposed that fiscal contraction should be seen as the premise of expansion, instead of recession, stressing the role of current changes in government spending or taxation as a signal of possible changes in the future. In their next paper, Giavazzi and Pagano (1995), they found that fiscal adjustments can be expansionary, that is non-Keynesian effects, if the changes are sufficiently large and protracted, regardless of government spending and taxation sides. Also, they stated that non-Keynesian effects work, at least partly, by triggering private sector expectations.

Eyraud and Weber (2013) has examined the effect of fiscal consolidation on the debt ratio by first evaluate the importance of fiscal multiplier assumption between fiscal consolidation, growth and debt reduction. It has found that fiscal consolidation is likely to raise the debt ratio in the short run in most advanced countries when multiplier closes to 1 in current environment. The debt ratio could be resulting in response slower to fiscal adjustment if financial market concentrates on its short term behavior. Basically, this article has come out with three main conclusions which are particularly associated with Europe today.

First and foremost, unpleasant surprises would be occurred if fiscal multipliers have been underestimated. Generally, fiscal tightening may initially raise the debt ratio when a fiscal consolidation participates in a depressed economic environment with relatively high multipliers. By not concerning the multipliers explicitly as well as underestimating their value, it could consequently affect the decision in setting achievable debt targets. Not to mention that there could be a miscalculation in amount of adjustment which necessary to curb the debt ratio.

Furthermore, debt ratio could be reflected as an operational fiscal target which presents risk. A particular country which concentrates on the short term behavior of the debt ratio may subsequently engage in repeated rounds of tightening in an effort to converge debt ratio into official target, undermining confidence, eliminating the vicious circle of slow growth, deflation and further tightening. Hence, monitoring of debt ratios as well as setting debt targets in cyclically adjusted terms appears to be a possible solution.

Last but not least, adverse loops which involved fiscal tightening and short term debt dynamic can be minimized by an appropriate design of consolidation packages. For instance, it is important by setting the consolidation in the right pace. The results have indicated that size and duration of the fiscal adjustment's impact on growth would be prevailed by delaying the consolidation effort until more normal economic conditions. Moreover, it has indicated that short term effects of fiscal policy on economic activity are the sole factor which is required to be considered during the determination of appropriate pace for fiscal consolidation. As additional, multipliers are varying across countries and time. In

some cases, negative impact of fiscal tightening on growth may be partially eliminated by confidence effects.

2.2 Does spending cut or tax hikes matter?

Findings from Alesina and Perotti (1997) indicated the composition of fiscal adjustments does matter regardless of probability of success and macroeconomic consequences. This is consistent with Clinton et al. (2011) that the results are subject to the composition scheme in evaluating the trade-off between pain in short run and gain in long run. Also, Alesina and Ardagna (1998), the authors indicated that their evidence is more towards the view that fiscal adjustments are expansionary depending on the composition of the adjustment, which is tax increases or spending cuts, or share of different cuts.

There are numerous literature studies claimed that spending based fiscal adjustments are associated with favorable results in relative to tax based fiscal adjustments (Alesina and Perotti, 1995, Alesina and Perotti, 1997, Ardagna and Silvia, 2004, Ardagna, 2009, Larch and Turrini, 2011, Alesina et.al, 2012, Papageorgiou, 2012, Cogan et al., 2013, Heylen et al, 2013, Erceg and Linda, 2013, Heylen et al., 2013, Akanbi, 2013). Also, spending based consolidation is found to have shorter period than tax based consolidation during the implementation, hereby spending cuts are more effective, preferable and shorten the duration of the implementation (Agnello et al., 2013).

Using the full sample of OECD countries and 3 countries, which are Denmark, Ireland and Italy separately, Alesina and Perotti (1997) found that expenditure cuts that focused primarily on transfers and emoluments are more likely to success and the results are expansionary while adjustments based on tax increases and cuts in government investment will not persist and resulting in contractionary effects.

Using yearly panel data on OECD countries covering from year 1960 to 2002, Ardagna (2009) showed that countries with high levels of budget deficit, spending cut based fiscal adjustments will resulting in permanent and substantial

reduction in government debt, consistent with Alesina and Ardagna (2009) that focusing on spending cuts only is more effective in reducing budget deficits as well as debt-to-GDP ratio as compared to adjustments based on tax increases only.

Larch and Turrini (2011) highlighted that current primary expenditure cut is more preferable, producing a lasting effect as compared to increase in tax or large cuts in government investment in the Europe experience. However, the authors explained that this cut is getting less effective or weakened starting 1990s. In detailing to composition of government expenditure cuts, the result showed that significant cuts in public wages play a crucial role in the recipe of success as this cuts contribute to wage moderation. But, the former only involved a comparatively minor role where the main contributors for primary expenditure cuts are transfers and non-wage government consumption. As a whole, the authors concluded that although the options for consolidation has increased, still, most of the successful consolidation cases rely more on expenditure cuts instead of revenue based.

Meanwhile, Afonso and Jalles (2014) found that considering different level of government debt, cuts in final government consumption would boost up private consumption in the short run under fiscal consolidation and the debt ratio is above the cross-country mean. Also, in the presence of fiscal consolidation and financial crises, it increases the non-Keynesian effects of total tax revenues.

Papageorgiou (2012) who quantified the macroeconomic effects of fiscal reforms in Greece, found that tax reforms that reduce tax rate on employee income and increase consumption tax can resulting gains in output and welfares. Besides, the results also indicated that high public investment is recommended for the macroeconomy, while low public consumption is good for driving economy and promoting welfare. Moreover, the authors highlighted that spending based consolidation policy has the smallest impact on the output while has the biggest effect in debt-to-GDP ratio reductions. It is not for the case of Alesina and Perotti (1995) who investigated the case of fiscal adjustments in OECD countries, concluded that tax based fiscal adjustment, particularly increase in direct tax, failed to permanently reduce the public debt. The authors further showed that

most of the successful fiscal adjustments are those that aggressively focusing on expenditure side, taking the case of Ireland is the best example of it.

Heylen et al. (2013) examined the impacts of fiscal consolidation in the 21 OECD countries, with years ranging from 1981 to 2008, with extensive study on the role public sector efficiency and numerous other institutional variables. The precision of expenditure cuts is very crucial. The results suggesting that cut in subsidies, and cut in public wages when the public sector efficiency in administration is low, both will contributing to reduction in debt. Besides, it is advised that in an effort to reduce debt-to-GDP ratio, one should not cuts in public investments as it is highly counterproductive. Lastly, the authors highlighted that in an effort in reducing national debt, the government efficiency is very important in affecting the success of fiscal consolidation.

Cogan et al. (2013) quantified the macroeconomic effects of fiscal consolidation in U.S. in which government spending is cut gradually over time with aimed to cut down budget deficits as well as the government debt. According to their calibrated model, it showed that spending cut leads to increase GDP in short run as well as long run. The authors explained several reasons regarding this expansionary effect, which is lower government spending in the future imply lower taxes as well, resulting higher standard of living. Lower taxes in the future in turn boost up employment and productivity, hence output. Also, exchange rate is reduced through lower spending and debt level, thereby boost up net export, offsetting the portion of spending cut. Besides, credible and gradual spending cut causing private sector to react smoothly without any disruptions.

Botman et al. (2009) indicated that cumulative impact of consolidation on growth is nonetheless positive through the net present value calculations. The positive effect is shown based on reduction in transfer, rising in consumption tax or combination of expenditure cuts and tax increases. In another word, increasing in corporate taxes or personal income taxes would results in negative cumulative impact on strategies.

In Akanbi (2013), the author using explicit and robust macroeconometric modeling, the author analyzed the macroeconomic effects of fiscal policy in South Africa, found that expenditure based fiscal consolidation implementation will be

more effective in an economic environment with no structural supply constraints and tax based fiscal consolidation implementation will be more effective in an economic environment with major structural supply constraints.

Besides, Alesina and Ardagna (2009) examined the composition of fiscal adjustments in OECD countries, tax cut is likely to stimulate growth as compared to those on the spending perspective. The result is quite consistent with Coenen et al. (2007) that tax reduction will have an expansionary impact on overall economic performance.

However, Forni et al. (2010) studied the macroeconomic effects of fiscal consolidation in Euro area countries. By focusing on German and Belgian where their fiscal authority marked 10 percentage point of debt ratio to be reduced over 5 years period. Using dynamic general equilibrium model, the authors found that, the best approach to reduce debt-to-GDP ratio is that both spending expenditures and tax rates are cut at the same time, which will achieve long-run steady-state expansionary effect on output. Their research contribute more towards non-Keynesian effects of fiscal policy, in such a way that fiscal adjustments based upon spending side than taxation side and large adjustments will tend to have non-Keynesian effects. Cogan et al. (2013) also suggested that lower tax should be implemented together with spending cut if the process needed to be fastened to convince markets, thereby taking an early advantage of improved incentives at initial stage. Erceg and Linda (2013) also proposed the "mixed" strategy in which a sharp but temporary tax increases with gradually and persistent spending cuts over time. Through this combined strategy, both output costs can be minimized regardless of short term or long term, but only workable if public is convinced that increase in tax is only temporary. The authors stated that lower tax should be implemented together with spending cut if the process needed to be fastened to convince markets, thereby taking an early advantage of improved incentives at initial stage.

2.3 The effects through different time horizons

Using yearly panel data on OECD countries covering from year 1960 to 2002, Ardagna (2009) showed that countries with high levels of budget deficit, spending cut based fiscal adjustments will resulting in permanent and substantial reduction in government debt. The higher the initial government spending-to-GDP ratio, the higher the expansionary effect of spending cut. The expansionary effect is not contemporaneous, but rather accrued gradually over time (Barry and Devereux, 2003). Also,Ardagna and Silvia (2004) suggested that the higher the cut in the deficit, the higher the chances that fiscal contractions will lead to reduction in debt-to-GDP ratio. Meanwhile, Afonso and Jalles (2011) discovered that such fiscal contraction is workable in bring down debt-to-GDP ratio if only economic growth is high and output gap increases. Bi et al. (2012) found that at low level of debt, both of fiscal adjustments, spending cut and tax increases, are effective at stabilizing public debt. However, at high level of debt, the results can be quite different depending on expectations toward the composition of the fiscal adjustments.

Alesina and Perotti (1995) claimed that even serious fiscal adjustments are not linked with major recessions. It is quite contrast to the findings of Alesina et al. (2012) that tax-based fiscal adjustment can induces deep and long lasting recessions with the reason provided is that the confidence of investors decreases for few years after adjustment in tax, resulting a slump in output. Also, Alesina and Ardagna (2009) suggested that adjustments based upon spending side instead of tax side is preferable as the former is less likely to induce recessions.

In Alesina and Ardagna (1998), the authors claimed that the results are mixed when it comes to the questions that which side of adjustments, spending or taxation, will leads to contractionary or expansionary. But, the authors informed that fiscal adjustments that rely on the spending side, particularly emoluments and welfare spending are long lasting while the effect from tax hikes is only short-term, consistent with the findings from Papageorgiou (2012), Clinton et al. (2011), Coenen et al. (2008), Botman et al.(2009), Heylen et al. (2013) and Erceg and Linda (2013).

According to Papageorgiou (2012), regardless of spending based or tax based consolidation policies in reducing debt, both have negative impacts on output during debt stabilization period, but positive effects toward medium and long run.

Coenen et al. (2008) studied short run costs and long run benefits of fiscal consolidation in the Europe area, found that both spending based and tax based consolidation can have benign impacts on macroeconomic aggregates in the long run. The magnitude of impact, however, is depending crucial on the consolidation scheme. In evaluating short run costs, the authors found that fiscal consolidation has no expansionary in short run as what non-Keynesian effects claimed.

Botman et al. (2009) has showed the result that short run design of fiscal adjustment is matter for growth. It has stated that short term output losses may persist for some period before being fully recovered. Moreover, it has also stated that a front-loaded consolidation which is accounted for the purpose of stabilizes the debt ratio would entails greater long term benefits. In contrast, the adjustment that targets on primary balance instead is entailing lower long term benefits. Somehow, on the other hand, this strategy would have carried larger short term output costs. For instance, short-term output costs would be limited through a less front-loaded strategy, but yet longer-term benefits would also been reduced.

Heylen et al. (2013) found that permanent in both government spending cuts and tax increases can significantly reduce debt in the longer run, though the former effects are stronger.

Erceg and Linda (2013) examined the effects of tax based and expenditure based fiscal consolidation in a currency union. In this paper, the difference is that they take into account of monetary policy. The results showed that if monetary policy can provides sizeable support then spending based consolidation is in favor as it has smallest output costs under all circumstances. Meanwhile, when monetary policy is constrained by currency union membership as well as the zero level bounding, tax based consolidation may incur considerably smaller output costs, at least for few years. The results is consistent with the findings from Alesina et al. (1998) that in long term, fiscal adjustments tend to rely mostly on spending cuts while tax based fiscal adjustments most suitable for short term.

Given that tax based consolidation induces a smaller short term output loss, but a considerably higher output contraction

The authors stated that when designing the composition of fiscal adjustments, constraints on monetary policy must be taken into account due to the fact that the potential results for implementing same strategies might be different across different countries. Besides stressing the importance of monetary constraints, the authors claimed that when applying this wide array of fiscal adjustments based upon spending and tax into the real economy, the results or the implementation of alternative fiscal measures might be different from what the authors considered, with potentially important consequences for the composition of fiscal adjustments. Thus, the authors illustrated that cuts in government spending, such as development and education cuts, will impose contractionary effect on the long term potential output, in which the model doesn't consider. In other words, it is very crucial to identify which cuts in the components of government spending because different components cut will resulting in different consequences, but not only general spending cut.

Cogan et al. (2013) quantified the macroeconomic effects of fiscal consolidation in U.S. in which government spending is cut gradually over time with aimed to cut down budget deficits as well as the government debt. According to their calibrated model, it showed that spending cut leads to increase GDP in short run as well as long run. The authors explained several reasons regarding this expansionary effect, which is lower government spending in the future imply lower taxes as well, resulting higher standard of living. Lower taxes in the future in turn boost up employment and productivity, hence output. Also, exchange rate is reduced through lower spending and debt level, thereby boost up net export, offsetting the portion of spending cut. Besides, credible and gradual spending cut causing private sector to react smoothly without any disruptions. The expansionary short run effects, is similar with claims of Alesina and Ardagna (1998) fiscal consolidation can be expansionary even in the short-run.

Last but not least, credibility does play an important role, as according to Clinton et al. (2011) and Erceg and Linda (2013). Clinton et al. (2011) highlighted that the credibility is an important factor in determining the short term costs while

Erceg and Linda (2013) informed that credibility plays a crucial role for the success of fiscal consolidation.

2.4 Using VAR model to identify fiscal shocks

In Blachard and Perotti (2002), the authors proposed the VAR approach in identifying the fiscal shocks. The authors explained that this VAR approach is suitable to study the dynamic effects of fiscal policy because government spending and tax rates move for several reasons, implying there are exogenous fiscal shocks. Also, with high frequency data such as quarterly data, upon receiving unexpected movements or shocks, there is little or no discretionary response of fiscal policy. Thus, one can estimate the automatic effects of those unexpected movements, that is fiscal shocks through institutional information in the data. The authors employed a 3 variables VAR, which are GDP, government expenditure and net revenue to study the effect of fiscal policy in U.S., and found out several conclusions, first was that it was consistent with standard wisdom, meaning that when the government spending increases, the output will increase. Conversely, the output will drop when the taxes increases. Next, they found that the multipliers were small in most cases, mostly close to one. The proximate explanation was in the opposite effects for the case of spending shocks whereas when the spending shocks were increased by private consumption, the private investment was crowded out to a considerable extent, exports and imports dropped together as well. Lastly, they found that the response of consumption was hard to compromise with the neoclassical approach to fiscal policy, as well as the response of investment, which was also difficult to compromise with the Keynesian approach.

Perotti (2002) applied the same methodology to identify the fiscal shocks in 5 OECD countries, that is U.S., West Germany, British, Canada and Australia by employing 5 variables VAR, including GDP, the GDP deflator, government expenditure, net revenue and the interest rate. As a results, they found that the impacts of fiscal shocks are getting weaker in the last 20 years, the tax multipliers are small and negative, there effect of government spending on prices is negative

and significant, shocks from government spending on the interest rate is significant, however with certain signs. Also, Shocks from net revenue have only small impact on prices. However, the author claimed that the results for the case of U.S. are not representative of the other OECD countries used in the study as U.S. is an outlier in many dimensions.

Hur (2007), Castro and Hernández (2008), Giordano et al.(2007), Tang et al.(2013) and Heppke-Falk et al.(2006) studied the effects of fiscal policy in Korea, Spain, Italy and the selected ASEAN countries, which are Indonesia, Malaysia, Philippines, Singapore, and Thailand and Germany respectively. Meanwhile, Fatás and Mihov (2006) explored the dynamic effects of fiscal policy on consumption and employment. It is noted that when Heppke-Falk et al.(2006) differentiate between wage and non-wage spending, they discovered that non-wage spending have a significant and persistent positive impacts on output while it is not the case for wage spending. Among those studies, it is surprisingly that Hur (2007) found no significant regarding the effectiveness of fiscal policy in Korea, thus remaining an issue to be discovered.

Furthermore, Estevão and Samake (2013) found that in most countries and regions, fiscal consolidation is able to provides certain medium term growth benefits. Also, there is negative relationship between the positive effects of fiscal consolidation and a country's stage of development. Furthermore, tax based fiscal consolidation has better long run impacts on output in relative to spending based fiscal consolidation in low income countries, particularly highly indebted poorer countries, although the authors claimed that there is some mid income countries as well. For advanced and emerging market economies, the result confirmed that fiscal consolidation will damage short run and medium run output.

Again, the authors highlighted the importance of the composition of fiscal consolidation. The result showed that in some Central American countries, low income countries as well as highly indebted poor countries, increase in tax leads to higher medium term output growth in relative to spending cut. However, 2 calibrated results, that is Nicaragua and Honduras, indicated that current spending cut is better than increase in tax. Lastly, the authors claimed that capital spending

cut leads to significant hurt in short term as well as medium term while current spending cut would increases output.

CHAPTER 3: METHODOLOGY

3.0 Introduction

This chapter discusses the methodology that we had used to carry out our research. In first, we defined the variables that we use in our research. In our study, we employed Vector Autoregressive (VAR) model. Augmented Dickey-Fuller (ADF) test and Phillips-Perron (PP) test are carried out to determine there is unit root in the regression model and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) is used to confirm the results of ADF and PP. Breusch-Godfrey serial correlation LM test had been used in testing the autocorrelation problem and we check the roots of characteristic polynomial to ensure the model is "dynamically" stable. Lastly, we applied Toda and Yamamoto (1995) procedure in our estimation.

3.1 Data Collection

Our data was obtained from two sources, including Datastream from our campus's library, and also Central Bank of Malaysia. We used a sample size of 59 starting from year 1999 Q1 until year 2013 Q3. We have chosen to use quarterly data as the same proposed to use quarterly data in our employed methodology (Blanchard and Perotti, 1999). Indeed, there are several advantages in using quarterly data. Firstly, quarterly data allows for important intra-year dynamics as fiscal decisions are adopted along the year based on preliminary information. Therefore, quarterly data will be better in capturing the rich dynamic pattern of decision-making process than yearly data whereby yearly data often brings large contemporaneous effects that complicate the analysis as well as interpretation of results. Secondly, in the VAR model, quarterly data also helps to alleviate the problem of decreasing degrees of freedom by increasing the sample size. Thirdly, robustness of empirical results can be improved by concentrating on a period that has comparatively stable economic policy.

Generally, government spending can be defined as an action which includes all government consumption and investment without transfer payments. In a more details manner, there are a few components that can be used to define government spending. The acquisition of goods and services for the purpose of current use in order to satisfy individual or the community directly is considered as government final consumption expenditure. Meanwhile, the acquisition of goods and services in order to create future benefits such as research spending and infrastructure investment is considered as government investment. Last but not least, those government expenditures which are solely represented by transfers of money instead of acquisition of goods and services are known as transfer payment. In other words, transfer payments are expenditures without any exchange of goods or services. In our data, we defined government spending variable as government direct expenditure on goods and services, that is government operating and government development expenditures. The other expenditures items, that are grants and transfers and interest payments, are subtracted from total revenues (direct tax + indirect tax + non-tax revenue) to obtain net taxes variable.

We considered several disaggregation of the government budget. From the spending perspective, firstly, we separated government operating expenditure and government development expenditure in order to estimate them specifically. Second, we differentiate between wage spending (emoluments) and non-wage spending in our estimation.

Meanwhile, taxation is the act of levying taxes by taxing authority. Governments finance their spending by collecting money from their citizens and corporate entities. Any revenue collected from citizens and corporate entities is so called “taxes”. Also, we examine the effect of direct tax, which are net taxes vs. direct tax.

Public debt, which is also known as government debt, is the total amount of money owed at any given time by any branch of the government. There are several types of debt that make up the public debt. The two main types of debt are internal debt and external debt. External debt is the debt borrowed from foreign lenders which includes commercial banks, governments or international financial institutions whereas internal debt is the money owed by the government to lenders

which come from the same country. Regardless of whether debt is internally or externally financed, interest rate will be paid on the principal borrowed as well as repayment of principal at an agreed future date. Debt is also a source of income for government to fund development expenditure for the people's welfare besides getting revenue through taxation.

When government spending exceeds its tax revenues, budget deficit occurs. Since budget deficit might lead to higher public debt in a country, government can either decreases government spending or increases tax in order to finance budget deficits in a country to ensure fiscal sustainability. Furthermore, if a country is having high debt-to-GDP ratio, government might possibly decreases spending or increases tax, that is implementing fiscal consolidation, in an effort to reduce government debt.

All data are normalized our data using GDP. Normalization referred to the process of organizing data in a database efficiently. Basically, implementation of normalization served for two purposes. Redundant data can be eliminated by normalizing our data. It also ensures that data dependencies are making sense. After all, both of these are worthy goals in a way that the amount of space a database consumes can be reduced, not to mention that data would be stored logically. Moreover, normalization is important in the sense that it serves to remove duplication from the database records.

If we plot our data in graphs, we can see the trend of the data as below:-

Figure 3.1 Government Expenditures to GDP

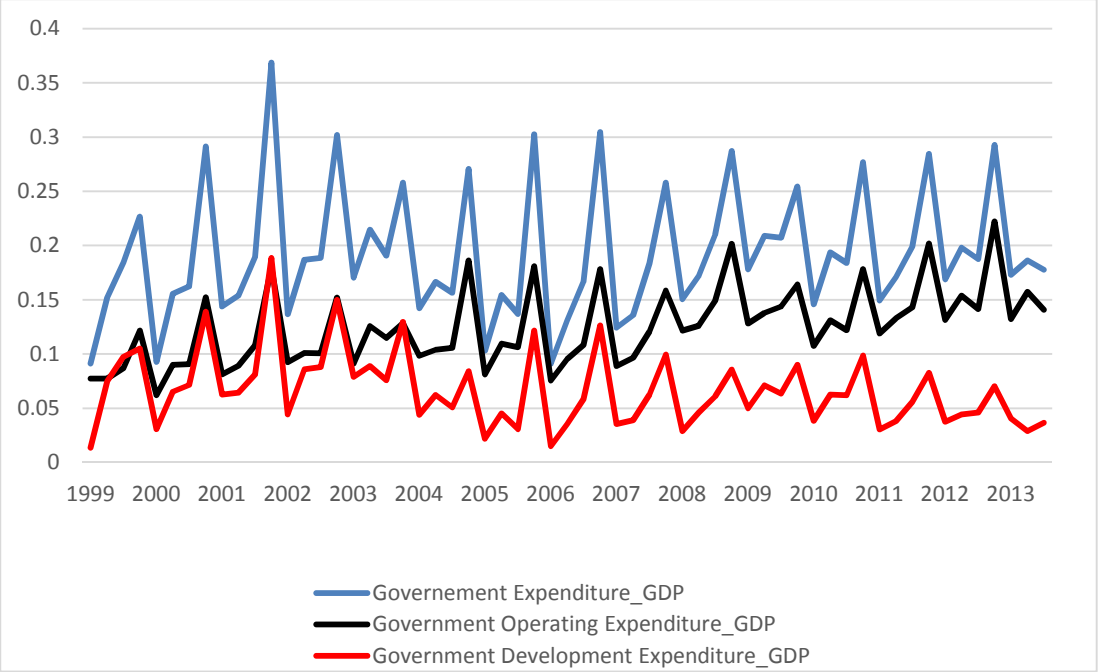


Figure 3.2 Wage and Non-Wage to GDP

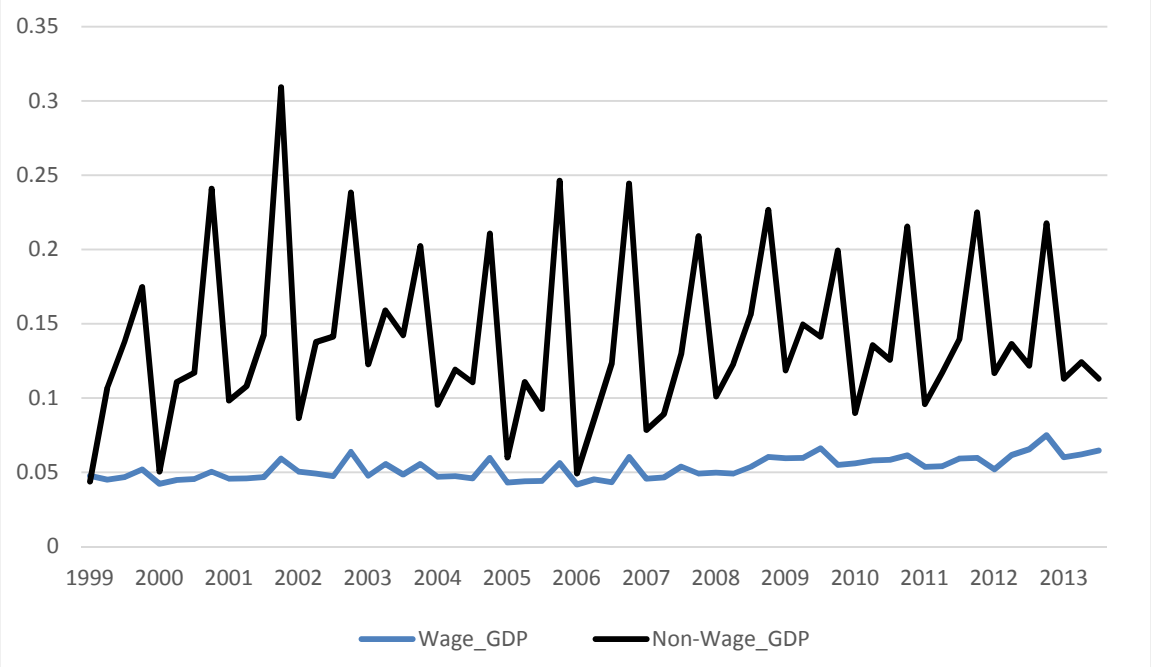


Figure 3.3 Tax Revenue to GDP

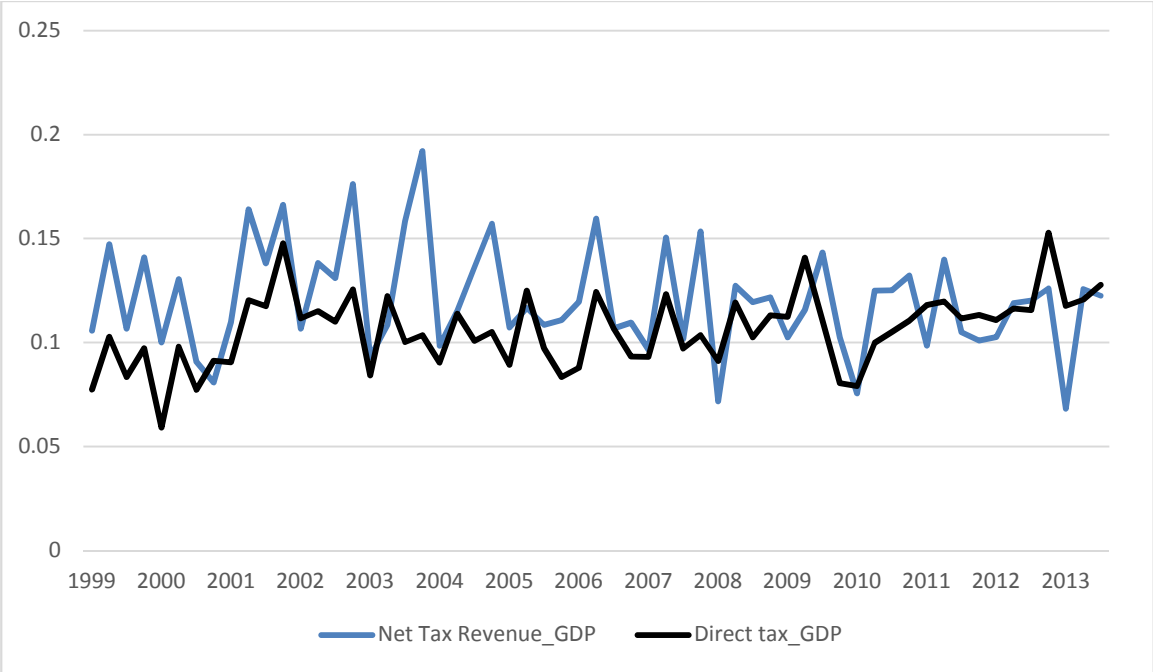
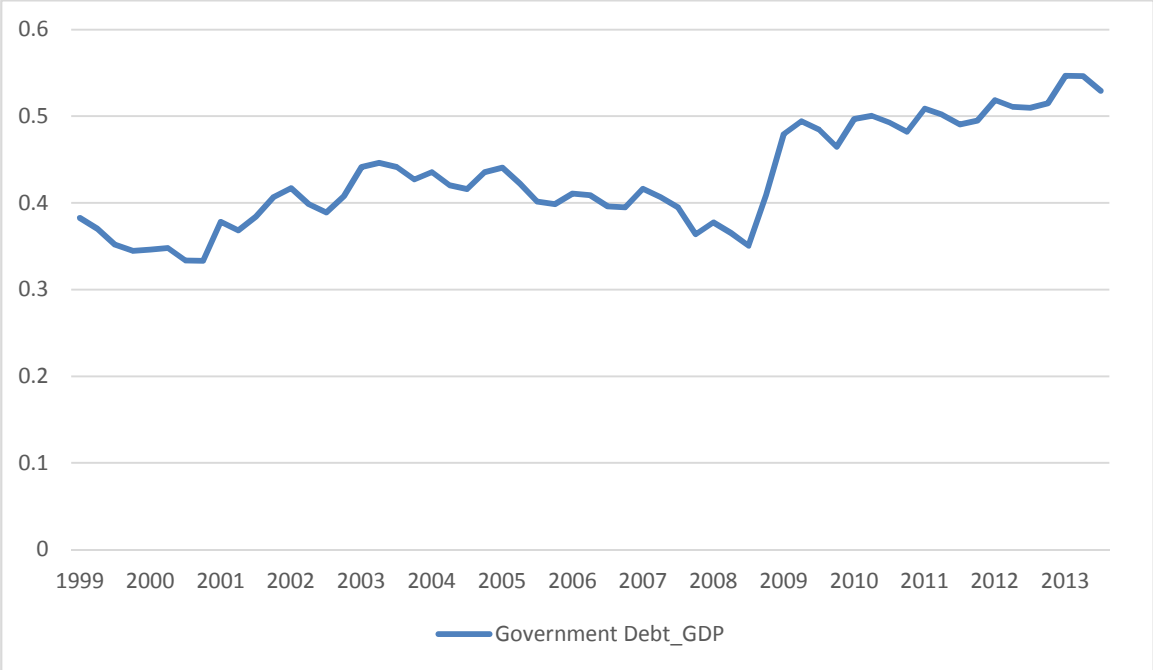


Figure 3.4 Government Debt to GDP



3.2 The Vector Autoregressive (VAR) Model

In Blanchard and Perotti (1999), the authors proposed the use of VAR methodology to identify the fiscal shocks.

Vector Autoregressive (VAR), a model ppopularized by Christopher Sims (1980), has solved the problems faced by the macroeconometricians two decades ago. The VAR model is a multivariate model, that is n-equation, n-variable linear model in which each variable is explained by its own lagged values, plus current and lagged values of n-1 variables. According to him, a set of variables should be treated equally if there is true simultaneity among them. There should be no a-priori distinction between endogenous and exogenous variables. The model manages to complete the four things that macroeconometricians do normally at once, which are describe and summarize microeconomic data, forecasting the macroeconomic factors, analyze the policy and quantify the structure of the macroeconomy. VARs has proven to perform better and more reliable tools in terms of forecasting and data description, yet for structural inference and policy analysis is more on "depends" as they require differentiating between correlation and causation, which is the identification problem in terms of econometrics. It is mostly economic theory or institutional knowledge to solve the related problem.

There are numerous studies about the effect of fiscal shocks using VAR approach. Amongst, Perotti (2002), Hur (2007), Tang et al. (2013), Heppke-Falk et al.(2006), Fatás and Mihov(2006), Giordano et al.(2007) and Castro and Hernández(2008) studied the effects of fiscal policy using the same methodology.

The benchmark model specification and estimation:

In our study, we employ 3 variable vector autoregressive (VAR) model. Now, for simplicity, consider the lag length 1, thus our system equations as follow:-

$$G_t = \alpha_{10} - \alpha_{12}T_t - \alpha_{13}D_t + \beta_{11}G_{t-1} + \beta_{12}T_{t-1} + \beta_{13}D_{t-1} + \varepsilon_{1t} \quad \text{------(1)}$$

$$T_t = \alpha_{20} - \alpha_{21}G_t - \alpha_{23}D_t + \beta_{21}G_{t-1} + \beta_{22}T_{t-1} + \beta_{23}D_{t-1} + \varepsilon_{2t} \quad \text{------(2)}$$

$$D_t = \alpha_{30} - \alpha_{31}G_t - \alpha_{32}T_t + \beta_{31}G_{t-1} + \beta_{32}T_{t-1} + \beta_{33}D_{t-1} + \varepsilon_{3t} \quad \text{------(3)}$$

or in vector form:-

$$\begin{pmatrix} 1 & 0 & 0 \\ X & 1 & 0 \\ X & X & 1 \end{pmatrix} \begin{pmatrix} G_t \\ T_t \\ D_t \end{pmatrix} = \begin{pmatrix} \alpha_{10} \\ \alpha_{20} \\ \alpha_{30} \end{pmatrix} + \begin{pmatrix} \beta_{11} & \beta_{12} & \beta_{13} \\ \beta_{21} & \beta_{22} & \beta_{23} \\ \beta_{31} & \beta_{32} & \beta_{33} \end{pmatrix} \begin{pmatrix} G_{t-1} \\ T_{t-1} \\ D_{t-1} \end{pmatrix} + \begin{pmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \\ \varepsilon_{3t} \end{pmatrix}$$

where G_t = government spending/GDP, T_t = net taxes/GDP, and D_t = national debt/GDP. The structural shocks, $\varepsilon_{it} = [\varepsilon_{1t}, \varepsilon_{2t}, \varepsilon_{3t}]$ are unobservable IID zero mean error terms and zero covariance. The error terms are only correlated across equations. Noted that each variable is an endogenous variable in respective equation which is depending on lagged values of itself and other variables. Every equation has the same regressors, which are lagged values of variables.

For instance, as suggested by Sim (1980), using recursive VAR, we then impose zero restriction on some of the parameters. As shown in our matrix form, we restrict α_{12}, α_{13} and α_{23} = 0. With zero restrictions, we can say that G_t is affected by its own structural shocks only in equation (1). In other words, this meant that T_t and D_t do not contemporaneously affectG_t. For equations (2), G_t and T_t have contemporaneous effects onT_t. Lastly, in equations (3), D_t is affected by structural shocks of G_t, T_t, and D_t. Meanwhile, α_{21}, α_{31} and α_{32} are values in the matrix to be estimated. Thus, this is called Cholesky decomposition.

If we simplify our structural VAR in vector form:-

$$BY_t = \phi_0 + \phi_1 Y_{t-1} + \varepsilon_t \quad \text{----------(7)}$$

Equation (7) is the structural VAR or the Primitive System. With equation (7), we multiple it with inverse B in order to normalize the right hand side vector.

$$Y_t = B^{-1}\phi_0 + B^{-1}\phi_1 Y_{t-1} + B^{-1}\varepsilon_t \quad \text{----------(8)}$$

$$Y_t = \theta_0 + \theta_1 Y_{t-1} + U_t \quad \text{----------(9)}$$

Equation (9) is a VAR in standard form or reduced-form VAR where Y_t is denoted the vector of endogenous variables, that is $Y_t = [G_t, T_t, D_t]$ is a 3

dimensional vector in the logarithms or normalization of quarterly spending, net taxes and public debt. U_t= [u_{1t}, u_{2t}, u_{3t}] is the vector of reduce-form residuals. If the reduced form VAR is written in matrix form:-

$$\begin{pmatrix} G_t \\ T_t \\ D_t \end{pmatrix} = \begin{pmatrix} \pi_{10} \\ \pi_{20} \\ \pi_{30} \end{pmatrix} + \begin{pmatrix} \pi_{11} & \pi_{12} & \pi_{13} \\ \pi_{21} & \pi_{22} & \pi_{23} \\ \pi_{31} & \pi_{32} & \pi_{33} \end{pmatrix} \begin{pmatrix} G_{t-1} \\ T_{t-1} \\ D_{t-1} \end{pmatrix} + \begin{pmatrix} u_{1t} \\ u_{2t} \\ u_{3t} \end{pmatrix}$$

Extension of studies:

In our extended studies, model 2 and model 3 considered disaggregation of government spending variable, which are government operating expenditure and government development expenditure. Rewritten the VAR models 2 and 3 in matrix form:

Model 2:

$$\begin{pmatrix} OG_t \\ T_t \\ D_t \end{pmatrix} = \begin{pmatrix} \theta_{10} \\ \theta_{20} \\ \theta_{30} \end{pmatrix} + \begin{pmatrix} \theta_{11} & \theta_{12} & \theta_{13} \\ \theta_{21} & \theta_{22} & \theta_{23} \\ \theta_{31} & \theta_{32} & \theta_{33} \end{pmatrix} \begin{pmatrix} OG_{t-1} \\ T_{t-1} \\ D_{t-1} \end{pmatrix} + \begin{pmatrix} u_{1t} \\ u_{2t} \\ u_{3t} \end{pmatrix}$$

where OG_t = government operational expenditure/GDP, T_t = net taxes/GDP, and D_t = national debt/GDP.

Model 3:

$$\begin{pmatrix} DG_t \\ T_t \\ D_t \end{pmatrix} = \begin{pmatrix} ¥_{10} \\ ¥_{20} \\ ¥_{30} \end{pmatrix} + \begin{pmatrix} ¥_{11} & ¥_{12} & ¥_{13} \\ ¥_{21} & ¥_{22} & ¥_{23} \\ ¥_{31} & ¥_{32} & ¥_{33} \end{pmatrix} \begin{pmatrix} DG_{t-1} \\ T_{t-1} \\ D_{t-1} \end{pmatrix} + \begin{pmatrix} u_{1t} \\ u_{2t} \\ u_{3t} \end{pmatrix}$$

where DG_t = government development expenditure/GDP, T_t = net taxes/GDP, and D_t = national debt/GDP.

Asides from that, we also look into government spending variable from another perspective. Following Heppke-Falk et al. (2006), we distinguish between

wage and non wage spending to see if there is significant difference is affecting national debt. Therefore, with models 4 and 5 in vector form:

Model 4:

$$\begin{pmatrix} W_t \\ T_t \\ D_t \end{pmatrix} = \begin{pmatrix} £_{10} \\ £_{20} \\ £_{30} \end{pmatrix} + \begin{pmatrix} £_{11} & £_{12} & £_{13} \\ £_{21} & £_{22} & £_{23} \\ £_{31} & £_{32} & £_{33} \end{pmatrix} \begin{pmatrix} W_{t-1} \\ T_{t-1} \\ D_{t-1} \end{pmatrix} + \begin{pmatrix} u_{1t} \\ u_{2t} \\ u_{3t} \end{pmatrix}$$

where W_t = wage spending/GDP, T_t = net taxes/GDP, and D_t = national debt/GDP.

Model 5:

$$\begin{pmatrix} NW_t \\ T_t \\ D_t \end{pmatrix} = \begin{pmatrix} €_{10} \\ €_{20} \\ €_{30} \end{pmatrix} + \begin{pmatrix} €_{11} & €_{12} & €_{13} \\ €_{21} & €_{22} & €_{23} \\ €_{31} & €_{32} & €_{33} \end{pmatrix} \begin{pmatrix} NW_{t-1} \\ T_{t-1} \\ D_{t-1} \end{pmatrix} + \begin{pmatrix} u_{1t} \\ u_{2t} \\ u_{3t} \end{pmatrix}$$

where NW_t = non-wage spending/GDP, T_t = net taxes/GDP, and D_t = national debt/GDP.

Lastly, instead of estimating the effect of net taxes on national debt, we tend to examine the impact of direct tax itself in our baseline model. Hence, in model 6, we actually replace the net taxes variable with direct tax.

Model 6:

$$\begin{pmatrix} G_t \\ DT_t \\ D_t \end{pmatrix} = \begin{pmatrix} €_{10} \\ €_{20} \\ €_{30} \end{pmatrix} + \begin{pmatrix} €_{11} & €_{12} & €_{13} \\ €_{21} & €_{22} & €_{23} \\ €_{31} & €_{32} & €_{33} \end{pmatrix} \begin{pmatrix} G_{t-1} \\ DT_{t-1} \\ D_{t-1} \end{pmatrix} + \begin{pmatrix} u_{1t} \\ u_{2t} \\ u_{3t} \end{pmatrix}$$

where G_t = government spending/GDP, DT_t = direct tax/GDP, and D_t = national debt/GDP.

3.3 Cholesky Ordering

One could question our Cholesky ordering in arrange the fiscal variables. Thus, it is probably a question that government spending or net taxes should be come first? In fact, it is very important to arrange the ordering due to the zero restrictions we imposed in the model.

F $\acute{a}$ tas and Mihov (2006) took government spending variable as predetermined in response to macroeconomic shocks and unanticipated changes in taxes, following Blanchard and Perotti (1999). The authors claimed that there is always reasons for any changes in government development expenditure, wage or non-wage spending, other than contemporaneous response to macroeconomic situations. This claim, or assumption perhaps, might probably argues that any tax decision is taken only after the spending side is determined. Although this is untestable hypothesis, but it seems logical and makes sense. Moreover, the authors explained that any changes in tax is decided on a yearly basis and always will be preannounced to public, an argument that in favor of this claim. Thus, they should be properly captured by the expectations variables on the right hand side. If there is an unanticipated tax hikes, the assumption implies that the change has deficit implications, but does not lead to contemporaneous spending adjustments.

3.4 Toda and Yamamoto (1995) Procedure

In Toda and Yamamoto (1995), the authors claimed that a economic series could has different orders of integration or don't have conintegration or both. Thus, they claimed that the error correction model (ECM) is not appropriate for Granger causality tests. Hence, they developed an alternative test, namely Toda and Yamamoto (1995) augmented Granger causality.

Theoretically, when employing vector autoregressive model, we firstly need to examine whether the data is stationary or not. When the data is stationary, then we shall proceed with VAR-in-levels. If the data is not stationary, we must different the data into first order, I(1). Then we shall check the data to see if the series are cointegrated. With cointegrated series, we shall apply the data with

vector error correction model (VECM). Otherwise, we proceed with VAR-in-Difference.

However, with differentiated series to ensure its stationary, if u proceed with VAR-in-Difference or VECM, it would be inappropriate to test for Granger causality test unless the sample size is very large. The rationale is that it is totally non-standard with the test statistics asymptotic distribution. In other words, the Granger causality test does not follow its normal asymptotic chi-square distribution under the null.

According to Toda and Yamamoto (1995) procedure, we firstly must determine the maximum order of integration for the series. For example, a group of series is integrated at first order, I(0), then m=1.

Next, regardless of the order of integration of the series, we precede the non-stationary data (if integrated at first order or above) with VAR-in-levels. Lastly, we add in m=1 additional lag for variables in the VAR model. It is noted the coefficient of the additional "m" lag is not included when the Granger causality test is performed. It is there to fix the asymptotes. After adjusted with Toda and Yamamoto (1995) procedure. The Granger causality test will be normally asymptotically chi-square distributed under the null. Last but not least, according to Professor of Economics from the University of Victoria, without using the Toda and Yamamoto (1995) procedure or other equivalent approach, then the usual Granger causality test will be wrong and meaningless, even asymptotically.

3.5 Unit Root Test

Augmented Dickey-Fuller (ADF) Unit Root Test is used to difference the time series data to make it stationary. The value which used in the test is a negative number. The more negative it is, the greater the possibility of rejecting the hypothesis where there is a unit root at some level of confidence. The initial Dickey Fuller (DF) unit root tests assumed that the first differences in the series are serially uncorrelated when under the unit root null hypothesis, but when first

differences the macroeconomic time series, most of them will serially correlated, thus the DF has been developed into ADF test. It relies on a parametric transformation of the model that removes the serial correlation in the error term, leaving the asymptotic distributions of the various τ statistics.

Phillips-Perron(PP) test is another test similar to ADF test, a unit root test as well, which is being used in time series analysis to test the null hypothesis that the series is an integrated of order 1. The PP test is different from ADF test, as ADF test relies on a parametric transformation, while PP test proposes a nonparametric transformations of the τ statistics from the original DF regressions, where the transformed statistics have DF distributions when under the unit root null. The PP test does not need to specify the form of the serial correlation of Δy_tunder the null, and it also does not need the condition of homoskedastic for the ε's.

Though ADF test and PP test has been widely used nowadays, there are several criticisms on those tests. The main is that if the process is stationary but a root is close to the non-stationary boundary, then the power of tests will be low. This is even obvious when the sample size is small, it is harder to detect the root properly. Thus, to overcome this problem, KPSS test is proposed. KPSS test is used to find out whether the model has a deterministic trend or stochastic trend. It able to converge to three different distributions: trend-stationary, level-stationary or zero-mean stationary. Hence, we able to compare the results with the ADF/PP test to check whether we achieve the same conclusion or not.

However, it is noted that the unit root is not our main concern, mainly due to 2 reasons. First, we are not estimating the coefficients, but rather estimating the dynamic effects of the variables, thus we tend to let the unit root problem exists in the data so that it we can better capture the dynamic effects. Next, we only run unit root test to determine the maximum order of integration, which is one of the key step in applying Toda and Yamamoto (1995) procedure.

3.6 Stability Conditions

Before estimating our VAR model, in order to make sure that the model is "dynamic" stable, it is essential to check the stability conditions. One way to determine if an AR(p) process is stationary is by looking at the roots of the characteristic equation. Again, for simplicity, let us consider a simple equation, AR(1):-

$$Y_t = \beta_1 Y_{t-1} + u_t \quad \text{----------(10)}$$

Equation (10) is an equation that involves variable at different point of times, called differences equation. Now, express the equation (10) in term of the lag operator L, we get characteristic equation:

$$Y_t = \beta_1 L Y_t + u_t \quad \text{----------(11)}$$

or $(1 - \beta_1 L)\, Y_t = u_t$ ----------(12)

With characteristic equation, which is equation (11) or (12), in order to find characteristic root, we replace the lag operator L by a variable(let assume it is Z), then we cancel out Y_t and set the resulting polynomial, that is $u_t = 0$,:

$(1 - \beta L) = 0$ ----------(13)

$(1 - \beta Z) = 0$ ----------(14)

$| Z | = \frac{1}{\beta}$ ----------(15)

Finally, the value of Z is the characteristic roots that solve our stability conditions. If all the roots "lie outside the unit circle", then the absolute figures of Z are >1, | Z | > 1, then we can conclude that the AR(1) process, Y_t is stationary. In order words, the model is "dynamic" stable. In contrast, if we consider inverse roots of AR characteristic polynomial, that is Z^{-1}, then Y_t will be stationary if all roots lie inside the unit circle.

3.7 Breusch-Godfrey serial correlation LM test

Autocorrelation is the cross-correlation of a signal with itself. It shows the similarity between the variables over the time. Generally, Breusch-Godfrey serial correlation LM test is used to test for the autocorrelation problems in a regression model. The null hypothesis of Breusch-Godfrey serial correlation LM is that there is no serial correlation up to the specified number of lags and there is serial correlation up the specified number of lags at the alternative hypothesis.

CHAPTER 4: DATA ANALYSIS

4.0 Introduction

This chapter reports the results of our research. In section 4.1, Unit Root Tests will be performed using ADF, PP, and KPSS tests. Section 4.2 includes the lag length selection and Section 4.3 includes diagnostic checking. Granger causality tests are reports in Section 4.4, which emphasizes on whether spending or tax granger cause debt. The interpretation of Impulse Response Function (IRF) and Variance Decomposition are reported in Section 4.5 and Section 4.6 respectively.

4.1 Unit Root Test

The results of the Argumented Dickey Fuller (ADF), Phillips-Perron (PP), and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) tests for unit root on level and first difference are shown in table 4.1, table 4.2, and table 4.3 respectively. Based on the table 4.1, most of the series have unit root at level and the results for first difference show that all series are stationary at significance level 10%, 5%, and 1%. However, based on the table 4.2, most of the series are stationary at level and the results for first difference show that all series are stationary at significance level 10%, 5%, and 1%. Since ADF and PP tests provide different results, we proceed to KPSS test to confirm the stationarity of series. Based on the table 4.3, we can conclude that all series are stationary at first difference and significant at significance level 10%, 5%, and 1%.

Table 4.1 Results for Unit Root (ADF)

Variables	ADF stat. Intersect & no trend	ADF stat. Intersect & trend
Level		
G_GDP	-1.879833	-1.794376
T_GDP	-2.660763*	-6.433265***
D_GDP	-0.737081	-1.934
OG_GDP	-3.126119**	-3.472824*
DG_GDP	-0.716615	-3.613806**
NW_GDP	-2.139671	-2.015502
W_GDP	-0.064009	-1.550900
Direct Tax_GDP	-3.454336**	-3.847655**
First difference		
G_GDP	-28.19960***	-27.99510***
T_GDP	-11.54568***	-11.42610***
D_GDP	-6.825073***	-6.759933***
OG_GDP	-13.88714***	-13.75474***
DG_GDP	-21.62853***	-21.55650***
NW_GDP	-28.68424***	-28.59975***
W_GDP	-10.96238***	-11.04404***
Direct Tax_GDP	-4.7295831***	-13.39647***

Note: *, **, *** denotes significant level at 10%, 5%, and 1% respectively.

Table 4.2 Results for Unit Root (PP)

Variables	PP stat. Intersect & no trend	PP stat. Intersect & trend
Level		
G_GDP	-13.23257***	-18.86925***
T_GDP	-8.351718***	-10.01129***
D_GDP	-0.725504	-2.509887
OG_GDP	-8.445303***	-9.753486***
DG_GDP	-7.755400***	-9.058703***
NW_GDP	-18.09869***	-18.29239***
W_GDP	-4.372554***	-6.798072***
Direct Tax_GDP	-5.860444***	-6.440626***
First difference		
G_GDP	-37.89107***	-38.50625***
T_GDP	-33.19004***	-32.18779***
D_GDP	-7.185722***	-7.435165***
OG_GDP	-31.13854***	-31.77817***
DG_GDP	-27.35678***	-27.73801***
NW_GDP	-37.89288***	-39.15368***
W_GDP	-30.17087***	-31.53535***
Direct Tax_GDP	-49.021156***	-50.03403***

Note: *, **, *** denotes significant level at 10%, 5%, and 1% respectively.

Table 4.3 Results for Unit Root (KPSS)

Variables	KPSS stat. Intersect & no trend	KPSS stat. Intersect & trend
Level		
G_GDP	0.330049***	0.101142***
T_GDP	0.288393***	0.500000
D_GDP	0.710904*	0.126685**
OG_GDP	0.474975*	0.500000
DG_GDP	0.746277	0.339413
NW_GDP	0.156090***	0.100939***
W_GDP	0.783050	0.187639*
Direct Tax_GDP	0.473885*	0.095520***
First difference		
G_GDP	0.303370***	0.202014*
T_GDP	0.109743***	0.103918***
D_GDP	0.122071***	0.079012***
OG_GDP	0.087841***	0.085270***
DG_GDP	0.284271***	0.168795*
NW_GDP	0.326601***	0.201238*
W_GDP	0.144450***	0.092498***
Direct Tax_GDP	0.123318***	0.120601**

Note: ***, **, * denotes significant level at 10%, 5%, and 1% respectively.

G_GDP = Government Spending normalized by GDP
T_GDP = Net Taxes normalized by GDP
D_GDP = Government Debt normalized by GDP
OG_GDP = Government Operating Expenditure normalized by GDP
DG_GDP = Government Development Expenditure normalized by GDP
NW_GDP = Government Non-Wage Expenditure normalized by GDP
W_GDP = Government Wage Expenditure normalized by GDP
Direct Tax_GDP = Government Direct Tax normalized by GDP

4.2 Lag Length Selection

We determined the number of lag lengths according to the sequential modified LD test statistic (LR), Final prediction error (FPE), Akaike Information Criterion (AIC), Schwarz Information Criterion (SIC), and Hannan-Quinn Information Criterion (HQ). These criterions suggest different lag length in the estimation of different variables. Most of the estimations suggested lag length of 4 and 5. In the estimation of the effects of Direct Tax_GDP, G_GDP, and NW_GDP on debt, the lag length suggested is 5. The model that takes into account the

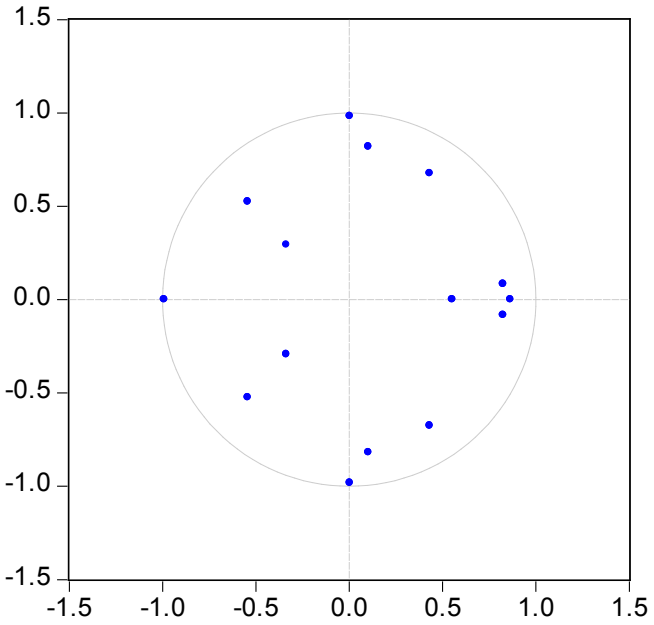
effects of OG_GDP on debt is not dynamic stable even the lag length suggested is 5. Therefore, we reduce lag length to 2 in order to ensure that the model is dynamic stable. In the estimation of the effects of DG_GDP and W_GDP on debt, the lag length suggested is 4.

Based on the unit root test, our variables are stationary at I(1). Therefore, when applying Toda-Yamamoto (T-Y) procedure, we add in m=1 additional lag length for each of the independent variable into each of the equations. Just for clarification, when we estimate our VAR model using EViews, the last added lag length will not straight away included into the endogenous variable, but rather treated as "exogenous" variable. This is because according to Dave Giles, Professor of Economics from University of Victoria, if this extra lag is included in the endogenous variables and all the coefficients are counted to perform Granger Causality subsequently, it would be incorrect, that is the test statistic will not have its usual asymptotic chi-square null distribution.

4.3 Diagnostic Checking

Based on figure 4.1, it shows that the baseline model (government spending, net taxes, and government debt) is dynamic stable as the inverse characteristic roots are all below 1.

Figure 4.1 Stability condition of baseline model



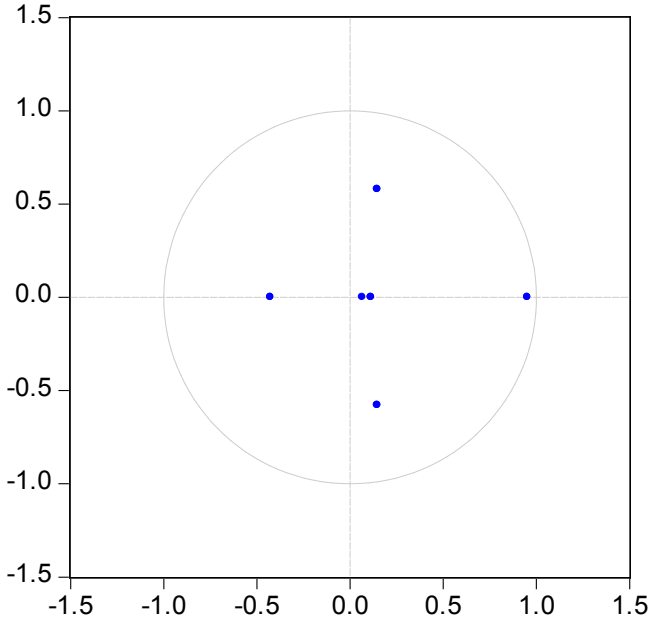
From table 4.4, the results showed that the baseline model has no autocorrelation problem. Since the lag length suggested is 5 in this baseline model, the p-value of LM Tests is 0.1482. As the p-value is greater than significance level 1%, 5% and 10%, we do not reject Ho, and thereby there is no autocorrelation problem.

Table 4.4 Breusch Godfrey Serial Correlation LM Tests of baseline model

Lags	Prob.
1	0.6291
2	0.8348
3	0.1409
4	0.2252
5	0.1482
6	0.5216

Based on figure 4.2, since the inverse characteristic roots are all below 1, the second model (government operating expenditure, net taxes, and government debt) is dynamic stable.

Figure 4.2 Stability condition of second model



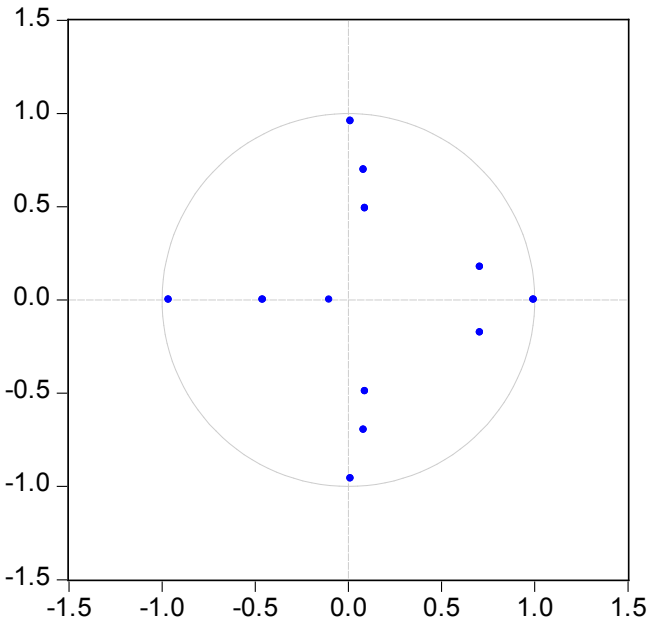
From table 4.5, we can see that the second model has no autocorrelation problem as the lag length suggested is 2 in this model. The p-value (0.2776) is greater than all three significance level and hence we do not reject Ho. Therefore, we conclude that there is no autocorrelation problem.

Table 4.5 Breusch Godfrey Serial Correlation LM Tests of second model

Lags	Prob.
1	0.0447
2	0.2776
3	0.6052
4	0.0001
5	0.0908
6	0.2967

Based on figure 4.3, the inverse characteristic roots are all below 1 and therefore the third model (government development expenditure, net taxes, and government debt) is dynamic stable.

Figure 4.3 Stability condition of third model



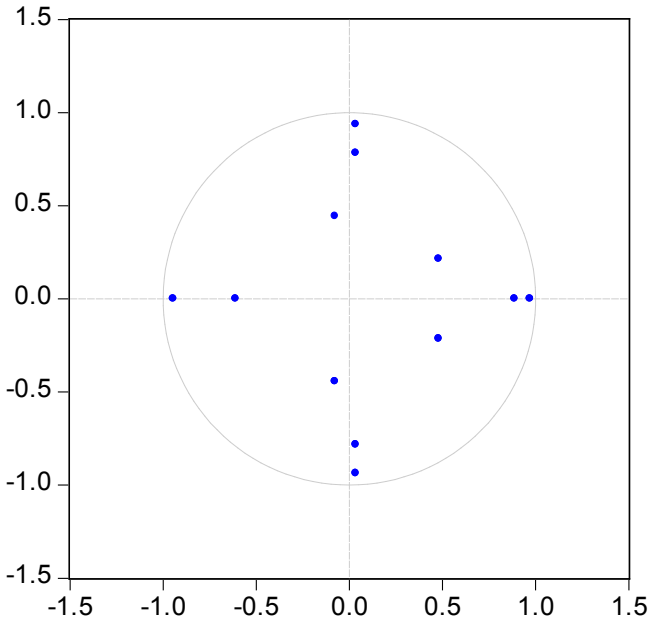
Based on table 4.6, we can see that the third model has no autocorrelation problem. Since the lag length suggested is 4 in this model, the p-value (0.6135) is greater than all three significance level and therefore we can conclude that there is no autocorrelation problem in this model.

Table 4.6 Breusch Godfrey Serial Correlation LM Tests of third model

Lags	Prob.
1	0.5824
2	0.8928
3	0.4355
4	0.6135
5	0.8845
6	0.9337

From figure 4.4, we can see that the inverse characteristic roots of fourth model (government wages expenditure, taxes and government debt) are all less than 1. It showed that this model is dynamic stable.

Figure 4.4 Stability condition of fourth model



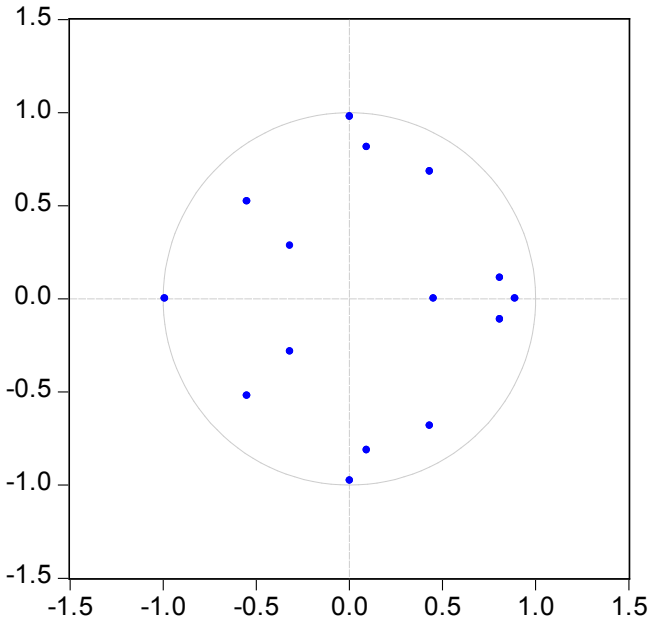
We chose lag length 4 in this model. Therefore, based on the table 4.7, its showed that the probability of lag length 4 is more than the significance level of 10%, 5% and 1% and it is no autocorrelation in fourth model.

Table 4.7 Breusch Godfrey Serial Correlation LM Tests of fourth model

Lags	Prob.
1	0.2054
2	0.1547
3	0.4118
4	0.3244
5	0.9315
6	0.9231

The inverse characteristic roots of fifth model (government non-wages expenditure, taxes and government debt) are less than 1 as we can see from figure 4.5. Therefore, we can confirm that the fifth model is dynamic stable.

Figure 4.5 Stability condition of fifth model



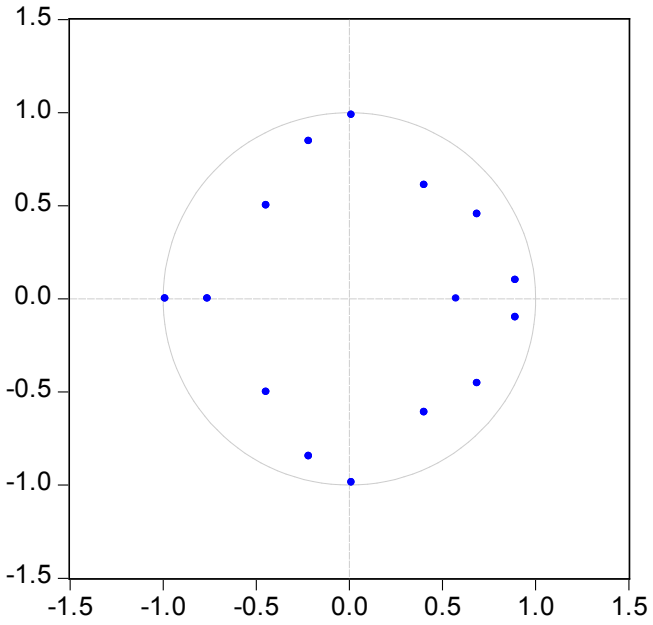
In fifth model, the selected lag length is 5. From table 4.8, we can observe that the fifth model is no autocorrelation as the probability of lag length 5 is greater than the significance level of 10%, 5% and 1%.

Table 4.8 Breusch Godfrey Serial Correlation LM Tests of fifth model

Lags	Prob.
1	0.7162
2	0.8628
3	0.1349
4	0.2357
5	0.2296
6	0.5051

Based on figure 4.6, the sixth model (government spending, direct tax and government debt) is dynamic stable since the inverse characteristic roots are all under 1.

Figure 4.6 Stability condition of sixth model



The selected lag length of sixth model is 5. Based on Table 4.9, the probability of lag length 5 is larger than the significance level of 10%, 5% and 1%. Therefore, we can conclude that the sixth model is no autocorrelation.

Table 4.9 Breusch Godfrey Serial Correlation LM Tests of sixth model

Lags	Prob.
1	0.9929
2	0.2860
3	0.1073
4	0.3936
5	0.2045
6	0.7628

4.4 Granger Causality

Regarding to the Granger causality test, we set Ho = There is no granger causality, H1 = There is granger causality. By using 1%, 5% and 10% level of significance, if any of the P-values for the coefficients were less than 0.01, 0.05 or 0.10, then we shall reject H0 and conclude that Granger causality is present. In

another way, we would conclude that Granger causality is not present when P-value is larger than 0.01, 0.05 or 0.10 respectively. In this part, we are particularly focusing on the results which we set debt as dependent variable. We have placed the remaining results at appendix since the empirical results of debt appear to be our main concern in this research paper.

Based on the table below, we can see that government operating expenditure and non-wage expenditure Granger cause debt at all three level of significance due to lower P-value (0.0000<0.10/ 0.05/ 0.01). In contrast, net taxes do not Granger cause debt at all three level of significance due to higher P-value (0.8175>0.10/ 0.05/ 0.01) when measured together with government operating expenditure.Meanwhile, as measured with, non-wage expenditure, it is resulting differently which net taxes Granger cause debt at significance level of 10% and 5% but do not Granger cause debt at 1% level of significance due its P-value (0.10/ 0.05<0.0379<0.01).

Furthermore, we found that government spending Granger cause debt at all three levels of significance due to lower P-value (0.0000<0.10/ 0.05/ 0.10) while net taxes Granger cause debt at 10% level of significance due to lower P-value (0.0732<0.10). However, net taxes do not Granger cause debt at 1% and 5% level of significance due to higher P-value (0.0732>0.05/ 0.01).

Somehow, we found that government spending has only Granger caused debt at 5% and 10% level of significance when we applied it with direct tax instead of net taxes due to lower P-value (0.0171<0.10/ 0.05). Government spending does not Granger cause debt at 1% level of significance due to higher P-value (0.0171>0.01). On the other hand, direct tax does not Granger cause debt at all three levels of significances due to higher P-value (0.9767>0.10/ 0.05/ 0.01).

By looking at the table, government development expenditure does not Granger cause debt at all three levels of significance due to higher P-value (0.6055>0.10, 0.05, 0.01). At this point, net taxes do not Granger cause debt at all three levels of significance due to higher P-value (0.4897>0.10/ 0.05/ 0.01).

Last but not least, wages does not granger cause debt at all three levels of significance due to higher P-value (0.4277>0.10/ 0.05/ 0.01). Meanwhile, net

taxes do not Granger cause debt at all three levels of significance due to higher P-value (0.8921>0.10/ 0.05/ 0.01).

Table 4.10 Granger Causality Tests

Null Hypothesis / Variable	G does not Granger cause D	T does not Granger cause D
	P-value	P-value
(i) G + T	0.0000	0.0732
(ii) OG + T	0.0000	0.8175
(iii) DG + T	0.6055	0.4897
(iv) W + T	0.4277	0.8921
(v) NW + T	0.0000	0.0379
(vi) G + Direct Tax	0.0171	0.9767

Note:
G = Government Spending normalized by GDP
T = Net Taxes normalized by GDP
D = Government Debt normalized by GDP
OG = Government Operating Expenditure normalized by GDP
DG = Government Development Expenditure normalized by GDP
NW = Government Non-Wage Expenditure normalized by GDP
W = Government Wage Expenditure normalized by GDP
Direct Tax = Government Direct Tax normalized by GDP

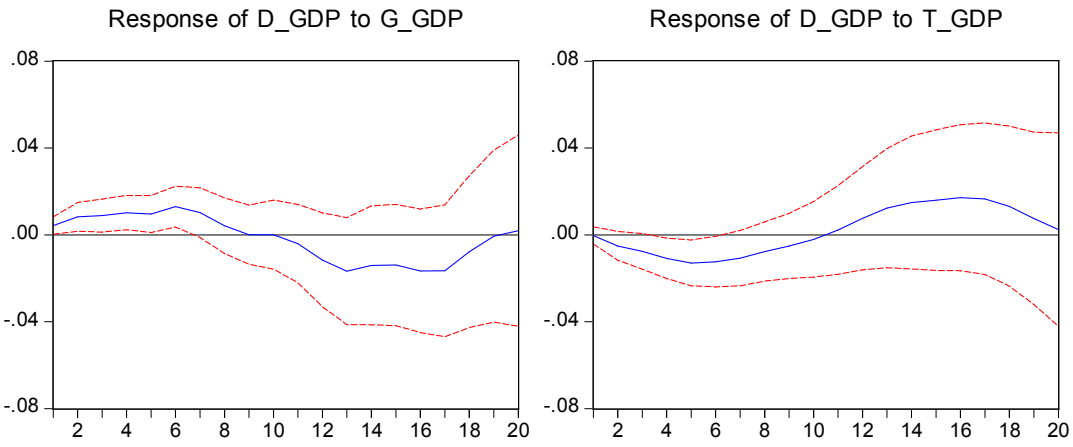
4.5 Impulse Response Function (IRF)

4.5.1 The Role of Different Spending Components

From figure 4.7, it is showed that the government spending shocks causing debt ratio to increase in the short run. However, the effect is started to diminish.

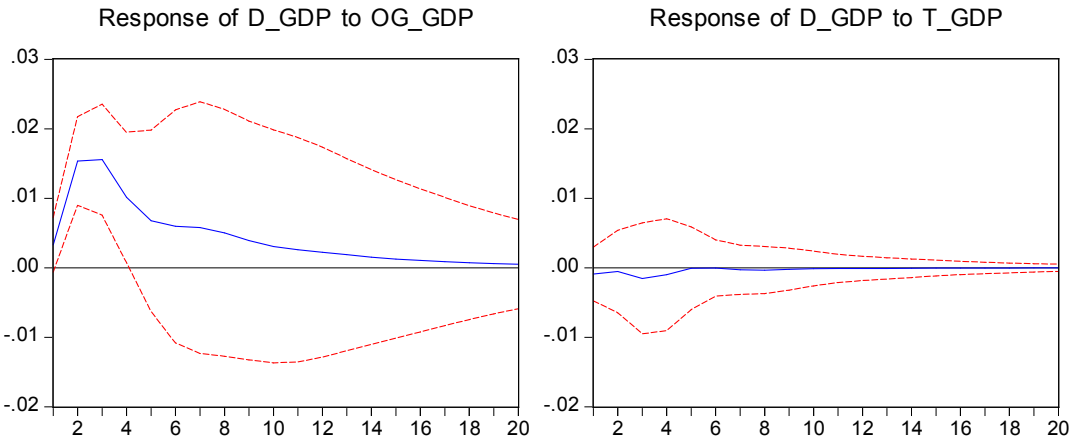
At 11th quarter to 19th quarter, the graph is showed the negative impact of government spending shock on debt ratio. After that, the response of government debt to government expenditure was back to be positive in the long run. In contrast, the tax shocks caused debt ratio to decrease in the short run and yet increase in the long run.

Figure 4.7 Impulse response of Government Debt to Government Expenditure and Net tax Revenue



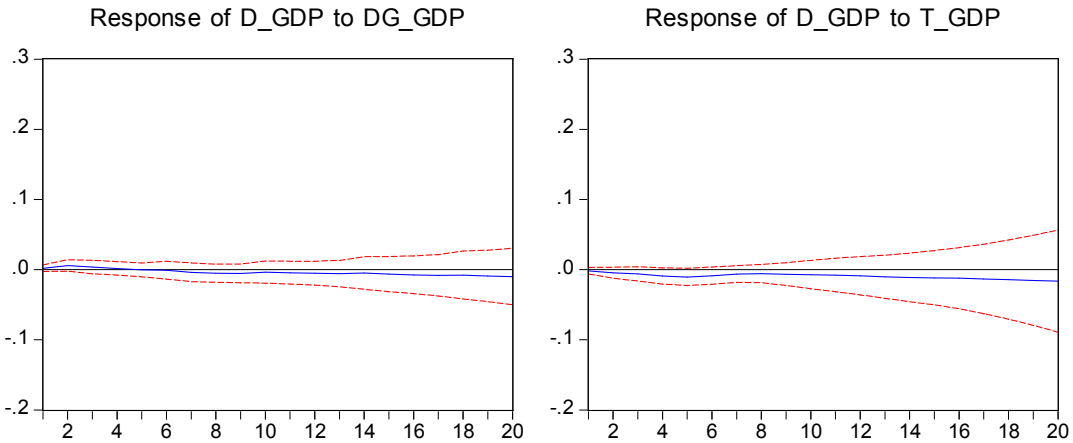
From figure 4.8, the government operating spending shock had been showed that it has a positive effect on influencing debt ratio in the short run. However, the effect is diminishing from 4th quarter to the end of the period in the long run. On the contrast, the tax shock is seemed to be insignificant on affecting the debt ratio.

Figure 4.8 Impulse response of Government Debt to Government Operating Expenditure and Net Tax Revenue



In figure 4.9, we can see that the impulse response's values of government debt to government development expenditure and net tax revenue are all close to zero. It is indicated that both of the government development expenditure shock and tax shock are insignificant on affecting the debt ratio in either short or long run.

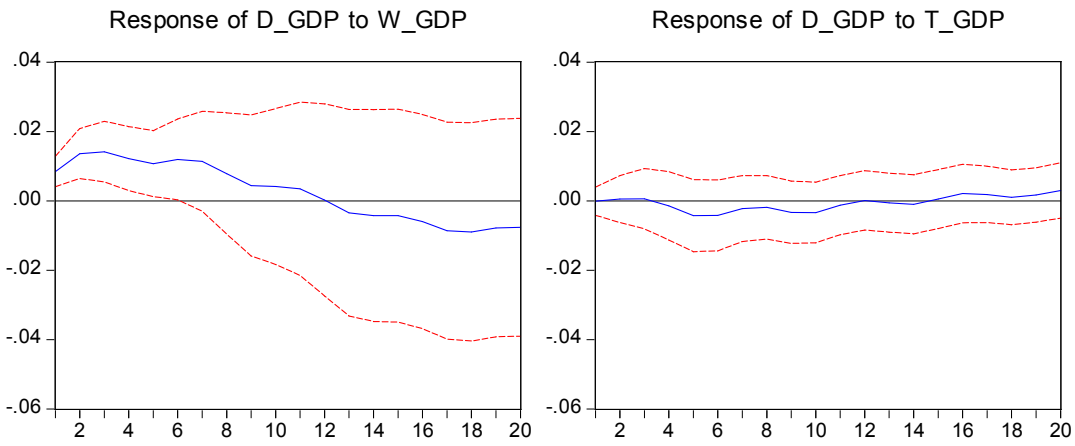
Figure 4.9 Impulse response of Government Debt to Government Development Expenditure and Net Tax Revenue



From figure 4.10, it is showed that the wage expenditure shock has positive effect on affecting the debt ratio in the short run and medium run. When it came to 13th quarter, the effect of wage expenditure shock on affecting the debt

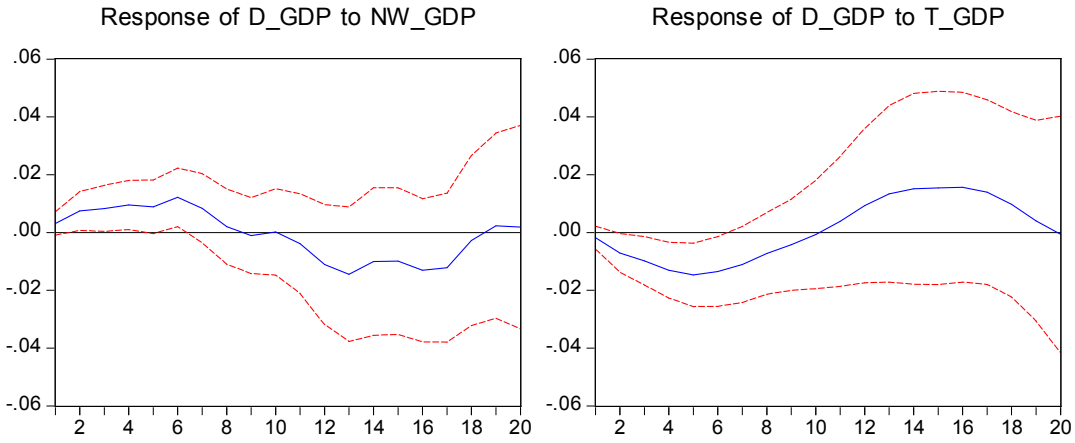
ratio became negative in the long run. On the contrast, the tax shock has no significant effect on influencing the debt ratio.

Figure 4.10 Impulse response of Government Debt to Government Wage Expenditure and Net Tax Revenue



In figure 4.11, as we can see, the effect of non-wage expenditure on influencing debt ratio is similar with the effect of government expenditure in figure 4.1. The debt ratio is increasing in the short run as it affected by non-wage expenditure. The diminishing effect happened at 7th quarter and it caused the negative impact of non-wage expenditure shock at 9th quarter to 18th quarter on debt ratio. After that, the response of debt ratio to government expenditure was back to be positive in the long run. In contrast, the tax shocks caused debt ratio to decrease in the short run and yet increase in the long run.

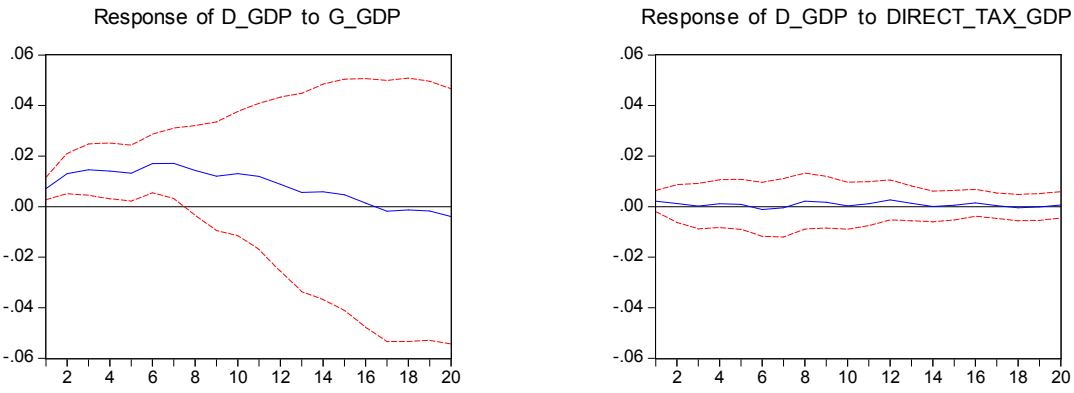
Figure 4.11 Impulse response of Government Debt to Government Non-Wage Expenditure and Net Tax revenue



4.5.2 The Role of Direct Tax

From figure 4.12, it is showed the response of Government Expenditure and Direct Tax Revenue on Government Debt. At left panel, we can see that the government expenditure shock has positive effect on effecting debt ratio in short and medium run. In the long run, the effect is started to diminish and became negative. In contrast, the tax shock is insignificant on affecting debt ratio as showed at the right panel.

Figure 4.12 Impulse response of Government Debt to Government Expenditure and Direct Tax Revenue



4.6 Variance Decomposition

According to table 4.11, we can see that the percentage of contribution of government spending to the variability of debt is relatively low during the first quarter which carries only 8.22%. However, the role of government spending in explaining variability of debt has increased significantly in the medium run and it persists over the long run. In terms of tax, it plays little role in explaining the variability of government debt during the short run. However, the percentage of contribution of tax increased substantially over the medium and long run.

When we disaggregate government spending into different component, we found different results. For government operating expenditure (table 4.12), the percentage of contribution to the variability of debt is low for the first quarter. However, it increases significantly to almost 50% of contribution over the medium and long run. Therefore government operating expenditure is an important government spending component in explaining the variability of debt. When we take into account government operating expenditure component in the estimation, tax shows almost no role in explaining the variability of debt. For government development expenditure (table 4.13), the percentage of contribution to the variability of debt is relatively low either in short, medium, and long run. Tax as well plays no important role in explaining the variability of debt.

Another component of government spending is the wage expenditure. From table 4.14, initially, the percentage of contribution of this component to the variability of debt is only 24.11% in the first quarter. After that, it increases significantly over the medium run and reaches its peak at 61.21%. This component continues to play an important role in explaining the variability of debt during the long run. In this case, tax does not play an important role in explaining the variability of debt. When we take into account the non-wage expenditure (table 4.15) in our estimation, both non-wage expenditure and tax basically plays a role in explaining the variability of debt. Both components initially has lower percentage of contribution in explaining the variability of debt, however, it substantially increase over the medium and long run.

Lastly, when we take into account the direct tax (table 4.16) in our estimation, it plays no important role to explain the variability of debt whereas the government spending plays an important role. Almost 70% of contribution of government spending can be used to explain the variability of debt over the long run.

Table 4.11 Variance Decomposition of D_GDP to G_GDP, T_GDP, and D_GDP

Period	S.E.	G_GDP	T_GDP	D_GDP
1	0.014977	8.226201	0.040122	91.73368
2	0.023356	15.90589	4.798696	79.29542
3	0.027381	21.98670	11.29243	66.72087
4	0.031301	27.46060	20.65237	51.88703
5	0.035214	29.05962	29.88924	41.05114
6	0.039579	33.73109	33.42966	32.83925
7	0.042644	34.82587	35.17167	30.00247
8	0.044517	32.82294	35.28724	31.88982
9	0.046109	30.59594	34.15473	35.24933
10	0.048013	28.21720	31.68847	40.09433
11	0.050364	26.30044	28.99308	44.70648
12	0.053988	27.50491	27.22983	45.26526
13	0.058624	31.47289	27.48413	41.04298
14	0.062354	32.93464	29.96827	37.09710
15	0.065890	33.95759	32.70953	33.33288
16	0.070101	35.60396	34.83775	29.55829
17	0.074444	36.53033	35.83813	27.63154
18	0.077262	34.93852	36.16062	28.90086
19	0.079439	33.05673	35.10922	31.83405
20	0.081618	31.37020	33.34393	35.28587

Note:

G_GDP = Government Spending normalized by GDP
T_GDP = Net Taxes normalized by GDP
D_GDP = Government Debt normalized by GDP

Table 4.12 Variance Decomposition of D_GDP to OG_GDP, T_GDP, and D_GDP

Period	S.E.	OG_GDP	T_GDP	D_GDP
1	0.014859	4.942811	0.371381	94.68581
2	0.026525	35.04424	0.159807	64.79595
3	0.032539	46.13467	0.328910	53.53642
4	0.034802	48.79407	0.370503	50.83543
5	0.036011	49.10067	0.346586	50.55274
6	0.037017	49.05533	0.328132	50.61653
7	0.037836	49.27952	0.320245	50.40023
8	0.038386	49.57982	0.318975	50.10120
9	0.038718	49.74710	0.316816	49.93609
10	0.038934	49.81151	0.314307	49.87418
11	0.039091	49.84746	0.312473	49.84007
12	0.039205	49.88280	0.311453	49.80574
13	0.039283	49.91257	0.310885	49.77655
14	0.039335	49.93167	0.310452	49.75788
15	0.039370	49.94289	0.310111	49.74700
16	0.039395	49.95036	0.309872	49.73977
17	0.039413	49.95597	0.309718	49.73431
18	0.039425	49.96006	0.309616	49.73033
19	0.039433	49.96282	0.309544	49.72764
20	0.039439	49.96464	0.309493	49.72586

Note:

OG_GDP = Government Operating Expenditure normalized by GDP
T_GDP = Net Taxes normalized by GDP
D_GDP = Government Debt normalized by GDP

Table 4.13 Variance Decomposition of D_GDP to DG_GDP, T_GDP, and D_GDP

Period	S.E.	DG_GDP	T_GDP	D_GDP
1	0.017284	1.222935	0.959799	97.81727
2	0.028452	4.760533	2.858045	92.38142
3	0.034566	4.343629	5.095615	90.56076
4	0.038908	3.606205	9.407537	86.98626
5	0.042609	3.016874	13.96767	83.01546
6	0.045535	2.684170	15.84937	81.46646
7	0.048381	3.013721	15.79270	81.19358
8	0.051626	3.682495	15.13618	81.18133
9	0.055881	4.105276	14.30027	81.59445
10	0.060794	3.815740	13.46302	82.72124
11	0.066311	3.659490	12.67585	83.66466
12	0.072110	3.596422	12.20043	84.20315
13	0.078395	3.570552	12.04188	84.38757
14	0.084853	3.376360	12.02973	84.59391
15	0.091723	3.379856	11.93173	84.68841
16	0.099005	3.466878	11.77546	84.75766
17	0.107019	3.565603	11.62246	84.81193
18	0.115575	3.505956	11.50030	84.99374
19	0.124934	3.531888	11.34899	85.11912
20	0.135018	3.559283	11.20527	85.23545

Note:

DG_GDP = Government Development Expenditure normalized by GDP
T_GDP = Net Taxes normalized by GDP
D_GDP = Government Debt normalized by GDP

Table 4.14 Variance Decomposition of D_GDP to W_GDP, T_GDP, and D_GDP

Period	S.E.	W_GDP	T_GDP	D_GDP
1	0.017187	24.11309	0.004354	75.88256
2	0.026763	35.83767	0.035614	64.12672
3	0.031603	45.79605	0.057964	54.14599
4	0.034211	51.70646	0.228080	48.06546
5	0.036293	54.66753	1.595854	43.73661
6	0.038464	58.29755	2.624721	39.07773
7	0.040255	61.20577	2.707614	36.08661
8	0.041530	61.06682	2.752140	36.18104
9	0.042453	59.51582	3.247110	37.23707
10	0.043345	57.99543	3.722057	38.28251
11	0.044333	56.04009	3.640551	40.31936
12	0.045583	53.01132	3.444244	43.54444
13	0.046858	50.70474	3.273767	46.02149
14	0.047878	49.36366	3.180195	47.45615
15	0.048789	48.30772	3.073068	48.61921
16	0.049972	47.49407	3.105178	49.40075
17	0.051314	47.86865	3.073184	49.05817
18	0.052363	48.92365	2.989014	48.08733
19	0.053078	49.79425	3.009667	47.19609
20	0.053776	50.52865	3.237432	46.23392

Note:

W_GDP = Government Wage Expenditure normalized by GDP
T_GDP = Net Taxes normalized by GDP
D_GDP = Government Debt normalized by GDP

Table 4.15 Variance Decomposition of D_GDP to NW_GDP, T_GDP, and D_GDP

Period	S.E.	NW_GDP	T_GDP	D_GDP
1	0.014852	4.426927	1.488134	94.08494
2	0.023498	11.86137	9.753398	78.38523
3	0.028086	17.02688	19.11402	63.85910
4	0.032593	21.15957	30.24056	48.59987
5	0.036834	22.35903	39.58786	38.05311
6	0.041089	26.71735	42.64859	30.63406
7	0.043491	27.51314	44.57043	27.91643
8	0.044537	26.43756	45.13199	28.43046
9	0.045337	25.57054	44.43709	29.99237
10	0.046411	24.40181	42.42511	33.17309
11	0.048147	23.31781	40.05704	36.62515
12	0.051455	25.08261	38.32605	36.59134
13	0.055581	28.26414	38.62111	33.11474
14	0.058648	28.32603	41.31903	30.35494
15	0.061505	28.36445	43.83210	27.80345
16	0.064798	29.63546	45.31250	25.05203
17	0.067620	30.45410	45.88321	23.66269
18	0.068962	29.44185	46.10197	24.45618
19	0.069899	28.77121	45.20535	26.02344
20	0.070865	28.06170	43.99007	27.94822

Note:

NW_GDP = Government Non-Wage Expenditure normalized by GDP
T_GDP = Net Taxes normalized by GDP
D_GDP = Government Debt normalized by GDP

Table 4.16 Variance Decomposition of D_GDP to G_GDP, Direct Tax_GDP, and D_GDP

Period	S.E.	G_GDP	DIRECT_TAX_GDP	D_GDP
1	0.016819	18.03378	1.687165	80.27906
2	0.027630	28.99151	0.809113	70.19937
3	0.033588	38.55646	0.550396	60.89314
4	0.037266	45.62781	0.544794	53.82739
5	0.039713	51.22813	0.530253	48.24161
6	0.043227	58.68672	0.515894	40.79738
7	0.046501	64.27263	0.456985	35.27039
8	0.048703	67.22921	0.613163	32.15762
9	0.050189	69.02319	0.695694	30.28111
10	0.051891	70.90533	0.654134	28.44054
11	0.053418	71.94388	0.660796	27.39532
12	0.054456	71.86674	0.869806	27.26345
13	0.054945	71.63303	0.909618	27.45735
14	0.055471	71.39458	0.892520	27.71290
15	0.055960	70.84383	0.886582	28.26959
16	0.056313	70.02460	0.941822	29.03358
17	0.056530	69.58516	0.938551	29.47629
18	0.056707	69.20420	0.938516	29.85728
19	0.056900	68.82400	0.932827	30.24318
20	0.057175	68.62980	0.936965	30.43323

Note:

G_GDP = Government Spending normalized by GDP
Direct Tax_GDP = Government Direct Tax normalized by GDP
D_GDP = Government Debt normalized by GDP

Chapter 5: Conclusion

5.0 Introduction

Our main objective of this research paper is to study whether the implementation of fiscal adjustments will result in reduction of Malaysia's national debt. By using the data from 1999Q1 to 2013Q3, we would like to investigate whether which side of adjustment, government spending or net taxes. Furthermore, we disaggregate the government spending into operational spending and development spending, wage and non-wage spending. In contrast, we also replace net taxes with direct tax to see if the result is different.

5. 1 Summary of Result

Based in various tests that we have conducted in Chapter three and Chapter four, the empirical study has managed to answer the entire research question which we have set in Chapter one. First and foremost, we had conducted Toda and Yamamoto (1995) augmented Granger causality in methodology. Based on the unit root test, our variables are at least stationary at I(1). Therefore, when applying Toda-Yamamoto (T-Y) procedure, we add in m=1 additional lag length for each of the independent variable into each of the equations. Afterwards, granger causality test, variance decomposition and Impulse Response Function (IRF) have been conducted to examine the relationship between varies of variables and debt. Hence, the results for relationship between each variable and debt are explained as below.

Based on the result, we found that direct tax does not Granger cause debt. This is quite consistent that direct tax shock is insignificant in affecting debt ratio which shown in variance decomposition. In another word, we can say that direct tax component does not play an important role in reducing government debt. After that, we found that the net taxes have shown ambiguous result when we carry the results of net taxes with different components such as wages, non-wages and

others. For instance, net taxes are significant when the result is carried with government spending. While, the results show differently as we conduct it with government operating expenditure. Therefore, we are not able to determine whether net taxes stand an important role in debt reduction.

Regarding to government spending, we found that government spending is insignificant in debt reduction during short run but it appears to be significant in debt reduction over medium run. In another word, decrease in government spending will reduce debt in the short run; somehow it will result in an increase of debt over the medium and long run. As we have categorized the government spending into few components, therefore we have also obtained the result of impact of each component on debt respectively.

By looking at the result, we had observed that government development expenditure is insignificant on affecting the debt ratio in either short or long run. Meanwhile, we have found that decrease in government operating expenditure will result in debt reduction in the short run. However, the effect on debt reduction will be diminishing over the long run. After that, we have also observed that decrease in both wage and non-wage expenditure will lead to debt reduction in the short run. Somehow, it will eventually result in growth of debt over the long run.

After all, we shall conclude that changes in spending side adjustment would appear to be more effective in debt reduction as compare to taxes side adjustment. However, we found that reduction in government spending will only workable in debt reduction during the short run. Based on our calibrated results, we are unable to identify the effect of fiscal policy on debt reduction towards medium and long run.

5.2 Policy implication

Based on our calibrated results, fiscal consolidation appears to be an alternative instrument in debt reduction for Malaysia, at least in short term. Basically, fiscal consolidation means reduction in government spending or tax increment. By looking at our results, we notice that reduction in government spending able to reduce debt in the short run. Besides, we were not able to determine whether or not increase in tax will result in debt reduction due to ambiguous result.

Furthermore, we could advise that policy makers should focus on government spending if they intend to reduce debt. For instance, decrease in government spending would lead to debt reduction during the short run. However, reduction in government spending would eventually result in debt rising over medium run. By looking at different components of government spending, which are government development expenditure and government operating expenditure, we found that government development expenditure stands as insignificant role in affecting debt level. Therefore, government development expenditure shouldn't be a concern for policy makers in debt reduction. In contrast, reduction in government operating expenditure will lead to debt reduction in short run. Somehow, the effect of debt reduction is diminishing over the medium run. On the other hand, we found that the reduction in wage and non-wage expenditure will be resulting in debt reduction in short run but the effect of the debt reduction is diminishing over the medium run.

After that, we found that direct tax plays an unimportant role in affecting debt in all short, medium and long run. This has implied that policy makers shouldn't increase direct tax when they intend to reduce government debt. For instance, the action of Malaysia government which has planned to implement Government Service Tax (GST) in 2015 might stand no role in debt reduction. Perhaps, Malaysia government should emphasize in other variables when there is an intention of debt reduction.

5.3 Limitation and Future Recommendation

In our estimation using VAR approach, we only use 59 observations, covering from 1999 quarter 1 until 2013 third quarter. This is mainly because that we face difficulty in obtaining quarterly data, or larger sample size. Our case is quite similar to Perotti(2002). According to Perotti(2002), he claimed that using VAR approach to examine the effects of fiscal policy is less popular in relative to using the same approach to examine the effects of monetary policy. This is simply because the high frequency fiscal policy data, particularly quarterly data is very hard to collect or even don't exist in some countries. Thus, if possible, increase the sample size for better estimation.

Besides, in our research studies, we only examined the effect of fiscal policy itself, generally government spending and net taxes in reducing national debt. It is noted we have neglect other variables, such as cost of borrowing, in our study. Hence, we recommend that perhaps more relevant variables shall be included in the future.

Robustness checking

Using VAR approach, different Cholesky ordering can has different results. We have estimated different VAR model using different Cholesky ordering. As a whole, our results still remain the same, thus we make sure that our results are robust to ordering.

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