The Effects of the Fiscal Policy on Economic Activity in Saudi Arabia: An Empirical Analysis

By

Kablan Alkahtani

Submitted to the Department of Economics and the Graduate Faculty of the University of Kansas in partial fulfillment of the requirements for the degree of Doctor of Philosophy

---

Mohamed El-Hodiri (Chair)

Elizabeth Asiedu

Gautam Bhattacharyya

Jianbo Zhang

Jacquelene Brinton

Date Defended: 6th December, 2013

The Dissertation Committee for Kablan Alkahtani

certifies that this is the approved version of the following dissertation:

THE EFFECTS OF THE FISCAL POLICY ON ECONOMIC ACTIVITY IN

SAUDI ARABIA

AN EMIRICAL ANALYSIS

Chairperson: Mohamed El-Hodiri

Date approved: 6th December 2013

Abstract

The fiscal policy has been studied extensively, but only as a one shot deal and with emphasis on developed economies. The study of fiscal policy as a trajectory and of its consequences, also, as trajectory has been pioneered by Blanchard and Perotti (2002). This study applies the Blanchard-Perotti concept to Saudi Arabian economy. We used structural vector autoregression (SVAR) technique. The results show that government spending shocks have positive effects on GDP and private consumption, but they have negative effects on private investment (i.e., crowding out), exports and imports, while net tax revenue has a negative effect on GDP. When we extended the model by including inflation and interest rates, we obtained similar results. The government spending shocks are found to have positive effects on inflation and interest rates. As a check on our methodology, similar analyses are performed on Indonesia, Malaysia, and Norway and we found that they validate our findings.

Key words: Fiscal policy, fiscal multiplier, growth, Saudi Arabia

Acknowledgements

I would like to express my sincere gratitude and appreciation to my advisor, Prof. Mohamed El-Hodiri, for his endless support, encouragement, and guidance. I also would like to thank my dissertation committee, Prof. Elizabeth Asiedu, Prof. Gautam Bhattacharyya, Prof. Jianbo Zhang and Prof. Jacquelene Brinton, for their valuable comments and suggestions.

I would like to extend my gratitude to all my friends, here in the City of Lawrence for their support and help.

My special gratitude goes to my family members, specially my mom, for their help and support through my whole academic experience. Special gratitude extended to my brothers and sisters.

Finally, my deepest thanks and appreciation go to my wife for her endless support. Without her help and support, this dissertation will not be possible. I would like to dedicate this work for her and my son, Abdulaziz.

Table of Contents

List of Tables

List of Figures

CHAPTER 1

INTRODUCTION

1. 1 Overview

Fiscal policy is a financial instrument used by the government as a deliberate manipulation of government receipts and expenditures to achieve economic and social objectives and maintain stable growth (Cristina and Mihaela, 2009). Tanzi (2008) mentioned that the main objectives of fiscal policy are to allocate resources, stabilize the economy and redistribute income. He also states that the main tools of fiscal policy are government spending and taxation. To measure the effect of fiscal policy on output, economists usually use the fiscal multiplier. This is defined as the ratio of a change in output (ΔY) to an exogenous change in the fiscal variables (as ΔG or $-\Delta T$), and it takes different approaches (Spilimbergo et al., 2009). The approach we are using in this research is that the fiscal policy multiplier is defined as the peak response of output 20 quarters after the shock since our data is on a quarterly basis (Swisher and Scott, 2010). In this dissertation, we aim to measure the effects of fiscal policy on economic activity in Saudi Arabia using the structural VAR (SVAR) model. We will follow the seminal work of Blanchard and Perotti (2002)[1], which was the first attempt to use the SVAR model in studying the fiscal policy effects, and extend the model to account for inflation and interest rates. Indonesia, Malaysia and Norway will be included for validation purpose.

1. 2 Statement of the problem

Generally speaking, this dissertation aims to empirically characterize the dynamic effects of fiscal policy on the economic activity of Saudi Arabia's economy. Indeed, it will measure the effects of fiscal policy on real gross domestic product per capita (GDP), and its

[1] Blanchard, & Perotti (2002),An Empirical Characterization of the Dynamic Effects of Changes in Government Spending and Taxes on Output.

components, such as real private consumption, real private investment, real exports and real imports, all per capita. We will also add inflation and interest rates to account for monetary policy effect. Finally, for validation, Indonesia, Malaysia and Norway will be included.

1. 3 Research Questions

In this dissertation, we will address the following questions:

1- What effect does fiscal policy (i.e., use of government spending and receipts) have on output (i.e., GDP), inflation and interest rates in Saudi Arabia?

2- What is the dynamic path of the effects of fiscal policy structural shocks on output (i.e., GDP), inflation and interest rate of the Saudi economy?

Related to the above questions, how does fiscal policy affect the components of GDP, such as private consumption, investment, exports and imports? This question is extremely important since it indicates which economic school our fiscal policy effects follow. Keynesian economists believe that, in the short run, an increase in government expenditure or tax cuts lead to an increase in private consumption, the aggregate demand, and thus higher output. Classical economists believe that fiscal policy is ineffective at boosting demand because markets usually settle at equilibrium. In contrast with the Keynesian view, neoclassical economists believe that fiscal policy might hinder economic growth due to the crowding out effects on consumption and investment based on the rational expectation assumption.

3- Is it necessary to include inflation and/or interest rates in our model? How might these two variables affect our analysis? What is the effect of fiscal shocks on the GDP and the GDP components with and without these variables?

4- For validation and robustness, if we include Indonesia, Malaysia, and Norway, what lessons can be learned to apply to the Saudi economy? What can we learn from successful fiscal policy stories of the above countries?

1. 4 Significance of the Study

Although many papers have been written examining the effects of monetary policy, little research has been done to study fiscal policy effects in general. Most research done on examining the effects of fiscal policy was concentrated on the US economy with little attention to developing countries (Perotti, 2007). This dissertation is an attempt to fill this gap by studying the effects of fiscal policy on the Saudi economy. Furthermore, since the Saudi currency (Riyal) is pegged to the US dollar, fiscal policy is the main stabilizing tool for the government. Hence, this study aims to provide applicable recommendations for policymakers to enhance the Saudi economy and maintain stable growth rates.

1. 5 Data and Methodology

For characterizing the dynamic effects of fiscal policy on the Saudi economic activity, quarterly data were used for studying the period 1993-2011. Similarly, we used quarterly data for the same period for Indonesia and Malaysia. For Norway, we used the period 1996-2011. The following variables were used:

1- Real Gross Domestic Product (GDP)
2- Real Government Expenditure (GE)
3- Real Government Revenue (GR)
4- Real Private Consumption (CONSS)
5- Real Private Investment (INV)
6- Real Exports (EXPO)
7- Real Imports (IMP)
8- Consumer Price Index (i.e., inflation rate) (π_t)
9- Interest Rate (i_t)

The variables GDP, GE, GR, CONSS, INV, EXPO and IMP are all in logarithm and real terms, and are in per capita terms using the population data.

1. 6 Organization of the study

This study is provided in seven chapters. Chapter one is the introduction.

Chapter two provides a brief assessment of a recent literature review of fiscal policy. At the beginning, the literature review covers the theoretical foundations of fiscal policy. Then, it sheds more light on the applied approaches to analyze the effects of fiscal policy. The applied approaches follow three different techniques as (1) simulations based on both large-scale macroeconomic models (such as IMF MULTIMOD and OECD INTERLINK) and computational general equilibrium models; (2) econometric methods based on survey data; and (3) econometric methods based on time series data.

Chapter three introduces a brief outline for the methodology and different specifications and models that will be used with an overview of the SVAR model. First, the property of time series data being stationary should be examined and confirmed. Second, lag order must be specified carefully by estimating the reduced-form VAR model, which is Model (1). Lastly, after obtaining the reduced–form residuals, we can get the structural shocks, impulse responses and variance decompositions. We will examine the effects of fiscal policy on the GDP in Model (1) and then, later, on its components: private consumption, private investment, exports and imports provided by Model (2). Similarly, we will extend the model to include inflation and interest rates as in Perotti (2005) in Model (3).

Chapter four introduces the economy of Saudi Arabia and how fiscal policy is applied during a crisis.

Chapter five documents the empirical analysis of the effects of the fiscal policy in Saudi Arabia.

Chapter Six applies a similar analysis used in Chapter Five to the countries of Indonesia, Malaysia, and Norway. This analysis is performed to validate our results in the case of Saudi Arabia. It is also used as a robustness check. For each country, we covered Model (1), Model

(2) and Model (3). Model (2) was extended to add private consumption, private investment, exports and imports each time. Model (3) extended Model (1) by adding inflation and interest rates. Interestingly, for all countries, the results of the impulse response functions indicate that responses of the output to fiscal policy shocks reconciled with the standard wisdom (i.e., the Keynesian view): when government spending rises, output increases; when government taxes increase, output falls. Thus, it has the same results as Saudi Arabia. After disaggregating the GDP components, the response of private consumption to fiscal policy follows the Keynesian view for all countries.

Chapter seven, lastly, provides the conclusion.

CHAPTER 2

LITRATURE REVIEW

This chapter provides a brief assessment of recent literature review of the fiscal policy and how it is related to the output and its components (i.e., economic activity). At the beginning, the literature review covers the theoretical foundations of the fiscal policy. Then, it sheds more lights on the applied approaches to analysis the effects of the fiscal policy. The applied approaches follow three different techniques as (1) Simulations based on both large-scale macroeconomic models (such as IMF MULTIMOD and OECD INTERLINK) and computational general equilibrium models; (2) econometric methods based on survey data; and (3) econometric methods based on time series data.

Fiscal Policy is a financial instrument used by the government as a deliberate manipulation of government receipts and Expenditures to achieve economic and social objectives and maintain a stable growth (Cristina and Mihaela, 2009). For the main objectives of the fiscal policy, Tanzi (2008) mentioned that these objectives are to allocate resources, stabilize the economy and to redistribute income. He also states that the main tools of the fiscal policy are the government spending and taxation. To measure the effect of the fiscal policy on the output, economists usually use the fiscal multiplier. The fiscal multiplier is defined as the ratio of a change in output (ΔY) to an exogenous change in the fiscal variables (as ΔG or $-\Delta T$) and it takes different approaches (Spilimbergo et al, 2009). The approach that we are using, in this research, is that the fiscal policy multiplier is defined as the peak response of output 20 quarters after the Shock since our data is in quarterly basis (Swisher and Scott, 2010)

Theoretically, the macroeconomic effects of fiscal policy remain mostly under the views of the Classical school and the Keynesian school. Then, to address microeconomic foundations and inter-temporal aspects, modern approaches were derived from the former two schools. These modern approaches are Neoclassical and the new Keynesian. Below is a brief review of the above approaches.

At market clearing, and based on the equilibrium view in classical models, it is believed that the economy, without any intervention, can quickly return to full capacity after a disturbance takes place, under the assumption of flexibility of prices, and the supply curve is always vertical. Hence, markets are always in a general equilibrium. According to this approach, changes to fiscal or monetary policy have no potential to stabilize or otherwise affect the economy and have no role in affecting the aggregate demand. Furthermore it is assumed that any government intervention would aggravate business-cycle fluctuations. Government spending and taxation are considered as only procedures to convey resources from the private sector to the public sector.

After the revolutionary work of Keynes, "The General Theory of Employment, Interest, and Money" (1936), macroeconomic provision expands economic knowledge and Keynesian models have been followed and evolved (Gaber *et al.*, 2013). After the Great Depression, the Keynesian view became more favorable since the classical view failed to provide definite explanations for the Great Depression. Relative to the Great Depression, Keynes found the short-term analysis more compelling than the long-run and advised governments to enhance aggregate demand through spending. Adopting an expansionary policy of spending would raise the aggregate demand and real output (Al-Abdulkarim, 2004).

Under price rigidity and excess capacity assumptions, the simplest Keynesian model determines that the fiscal multiplier affects the output positively through aggregate demand (i.e., consumption and investment), and this multiplier is commonly larger than one. The government spending multiplier is usually larger than the tax multiplier. The crowding out effect can be accounted for as a result of changes in interest rates and exchange rate. Crowding out can be influenced by the following features:

Based on determinants of private investment**,** crowding out might be greater if investment is objectively sensitive to interest rates. However, if investment is an increasing function of current income, the fiscal multiplier becomes larger even with the existence of crowding out through interest rates. On the other hand, crowding out depends upon the assumption that money demand is a function of interest rates and income. If money demand is more sensitive to income, then it is less sensitive to interest rates. Hence, more crowding out will occur. Finally, in an open economy, if the exchange rate is very flexible and perfect capital mobility exists, then the crowding out would be complete and the fiscal policy would be ineffective. But if the exchange rate is fixed, the fiscal policy will be effective.

Both above approaches, however, have their shortcomings and have been criticized for their lack of microeconomic foundations and neglect of inter-temporal aspects of fiscal policy changes (Asfaw, 2012; Beetsma, 2009; Shaheen and Tuner, 2009; Mançellari, 2011). To overcome the revealed flaws, two modern models addressed the inter-temporal aspects. These models are the Neo-classical and the new Keynesian.

Neoclassical economists theoretically believe that the fiscal expansion policy will result in a negative effect on private consumption as based on rational expectations of households and firms. With a fiscal expansion policy of cutting taxes or increasing government spending, households and firms would expect higher taxes in the future. Assuming lump-sum tax to finance government spending, Baxter and King (1993) explained how the effects of discretionary fiscal policy affect the macro economy in a neo-classical model. They showed that a government spending shock leads to lower consumption and output.

New Keynesian models allow for price flexibility and assume the existence of imperfect competition. Therefore, they assume price flexibility but nominal rigidities remain if prices do not adjust quickly in order to clear markets (Hemming et al., 2002). Crowding out effect differs based on the openings of the economy. In an open economy with a flexible exchange rate, the extent of crowding out depends on domestic prices changes to exchange rate changes. Crowding out will be less if domestic price changes with the exchange rate. In a closed economy, under fiscal expansion policy, crowding out would occur with price rigidity through interest rate.

Three techniques were used to assess the effects of fiscal policy on economic activity:

(1) Simulations based on large-scale macroeconomic models (such as IMF MULTIMOD and OECD INTERLINK) and (2) computational general equilibrium models; (3) econometric methods based on survey data; and (4) econometric methods based on time series data. Here are these techniques in more detail:

2. 1 Simulations based on large models

Simulations based on large-scale macroeconomic models: In the 1970s and 1980s, large-scale macroeconomic models were generally applied to measure some standard macroeconomic shocks[2]. Among popular models used in empirical work during that era were the INTERLINK model, the IMF MULTIMOD model, the McKibbin-Sachs Global model and John Taylor's multi-country model. Most large-scale models are based on the short-run assumption of the Keynesian view (i.e., focusing on aggregate demand, prices are presumed to be fixed for business-cycle analysis and excess capacity is a feature of the economy), whereas some apply long-run features of the neo-classical models.

The aforementioned large-scale macroeconomic models serve as useful tools in examining interactions and spillovers between economies and studying the sudden shocks of

[2] These are government spending and taxation shocks, nominal interest rates shocks, exchange rate shocks, and oil & commodity prices shocks.

oil prices, interest rates and exchange rates. They also examine government spending and taxation effects (i.e., the fiscal multipliers). Dalsgaard, Andre and Richardson (2001) used the OECD INTERLINK model to examine macroeconomic shocks including government spending and taxation effects. Indeed, the INTERLINK model is a huge empirical macroeconomic project covering the OECD and some non-OECD countries operated by the OECD Economic Department[3]. This model follows the traditional assumption of short-term features supported by the Keynesian approach along with long-run neo-classical properties. Adopting this revised version of the INTERLINK model,[4] Dalsgaard et al. (2001) estimated government spending and tax multipliers across the G-7 countries. They found that a permanent increase in the government spending resulted in instantaneous increases in domestic demand and in real GDP with high inflation. This high inflation leads to a decline in net exports and destruction of the current account, which finally decreases investment (i.e., a case of crowding-out) and affects consumption negatively. However, some countries have experienced a positive effect of higher exports and higher GDPs with improvements of the current account. According to them, this positive effect results from the size and the policy to open the economy (i.e., an open economy with free international trade and a potential economic environment). Surprisingly, they found that the spending multiplier in Japan is larger than in the United States and Europe because of the high short-term sensitivity of investment to output changes in Japan. In Japan, the GDP increased by 1.7 percent as a result of a 1 percent increase in government spending, whereas the overall fiscal multipliers in the United States and the Euro area were 1.1 percent and 1.2 percent respectively. In general, the taxation effect was lower than the government spending influence, where a 1 percent tax cut leads to 0.5 percent increase in the GDP. They claim that this result might be because part of

---

[3] The OECD, the Organization for Economic Co-operation and Development (OECD), includes 34 countries established in 1961 for economic development.
[4] Forward-looking behavior was implemented as well as recent structural unemployment changes to the model. For more details, see Richardson *et al., (*2000).

the tax cut is saved rather than spent, thus resulting in a decline in the initial effect on the domestic demand. They also suggested that the potential benefit of the supply side to tax cuts is neglected where it is accounted for in the government spending case.

The MULTIMOD (MULTI-region econometric MODel) was introduced by Masson and others (1988) as part of *Staff Studies for the World Economic Outlook*. This model was initially designed to measure the effects of policies of industrial countries on main macroeconomic variables, and it was applied in both the developed and developing countries. The main purpose was to capture the policy effects on the world through external channels and since the MULTIMOD is maintained by the International Monetary Fund (IMF), they can use it to evaluate and address economic policies for developing countries. In the original version of MULTIMOD, they included three industrial countries (the United States, Japan and the Federal Republic of Germany). The remaining industrial countries were divided into two blocks: the first block contains larger industrial countries, France, the U.K., Italy and Canada; the second block has the smaller industrial countries. A third group comprises both high-income oil exporting countries and developing countries.

This original MULTIMOD model has been updated and revised to reduce forecasting measurement errors. Masson, Symansky and Meredith (1990) created MULTIMOD Mark Ⅱ. MULTIMOD Mark Ⅱ contains two blocks. The first block includes the eight largest industrial countries (name them?), and the second block was divided into high-income oil developing countries and the remaining developing countries. MULTIMOD Mark Ⅱ was a very successful tool for measuring economic shocks not only by the IMF, but also by central banks; economists have commonly used it in their analysis and forecasting. Bartoini, Razin, and Symansky (1995) applied the IMF MULTIMOD model to examine the effect of fiscal consolidations on the output of the G-7 countries in the early 1990s. They found that tax increases and spending cuts affect output negatively with higher costs in the short-run but relatively lower costs in the long-run and even with a positive impact over time.

For large-scale models, Bryant and others (1988) used several models such as the IMF's MINIMOD, the IMF's MULTIMOD, the McKibbin-Sachs Global model and models of John Taylor. These large-scale models are based on the Keynesian approach (assumption of price rigidity and excess capacity) that assumes output is determined by aggregate demand. However, these models do not take into account the supply side. Economists following the new classical approach see the shortcomings of the Keynesian approach as mainly a lack of microeconomic foundations. They claim that the fiscal policy effects should be examined through the supply side. Criticizing models that study fiscal effects based on the Keynesian approach, Blanchard and Perotti (2002) states that, "They largely postulate rather than document an effect of fiscal policy on activity" (p.1329).

In addition, related to Bryant and others (1988), a paper was written by Frankel comparing ten large-scale models in simulations at the Brookings conference[5]. For comparison, he used the reduced-form policy for both the fiscal and monetary policy multipliers. Assuming all other factors held constant, he examined, within models, the effects of a change in government expenditure and money supply. It was commonly believed that disagreements on the effect of the fiscal policy on exchange rates would be found in different models. Surprisingly, simulations displayed little difference. For the U.S. fiscal expansion, the ten models gave roughly the same appreciation of the U.S. dollar

2. 2 Simulations based on computational general equilibrium models

In the early 1980s, many studies applied the dynamic general equilibrium models to measure the long-run effects of fiscal policy on aggregate macroeconomic factors including output. Baxter and King (1993) used one-sector calibrated general equilibrium model for the

[5] This paper is included in Bryant and others (1988).

period 1930-1985 of the US data. They found a positive effect of output on the increase in government expenditure. In a similar vein, Ardagna (2001) used the average data of the EU6 for the period 1965-1995 and compared the permanent effects of debt financed by the increase in government expenditure on final goods and employment. They found that government spending has a positive but small effect on output. Forni et al., (2009) used a dynamic stochastic general equilibrium (DSGE) model estimating the effect of fiscal policy in Euro countries. They found a small positive effect on private aggregate demand through consumption. Although the general equilibrium approach delivers a comprehensive policy analysis, critics link its deficiency to the implicit calibration and assumptions made when these models were constructed. Therefore, the validity of the assumptions and calibration are crucial and are very sensitive to these models. In addition, some weakness has been identified with respect to DSGE models. Frequently, calibration does not match the actual data and exaggerated assumptions have been identified.

2. 3 Econometric methods based on survey data

Using household survey data, economists have measured the effect of fiscal policy on economic activity, mainly on consumption and saving behavior. Saphiro and Slemrod (2001, 2003, and 2009) are the pioneers in using household surveys. They assessed the effect of the 2001 tax rebate in the U.S. Leigh (2009) used the same approach in Australia surveying 817 households receiving the tax rebate. These studies conclude that the effect of the tax rebate is low. However, some scholars are skeptical about the consistency of consumers' responses to those surveys and to the reconciling of its findings with economic theory (Hemming et al 2002).

[6] EU is the European Union, which is an economic and political union of 28 European countries.

2. 4 Econometric methods based on time series data

Based on time series data, economists subsequently analyzed macroeconomic indicators in single countries. Ramey and Shapiro (1998), Kweka and Morissey (2000), Ramayandi (2003), Werner (2004) and Angelopoulos and Philippopoulos (2005) are among the scholars to use the time series method to measure the relationship between fiscal policy variables and economic activity. Ramey and Shapiro (1998) measured the effects of fiscal policy on U.S. economic activity using government spending during specific events. Their paper was among the first written on fiscal policy issues. First, they built a two-sector neoclassical model with costly capital allocation between sectors. They argued for using the two-sector model because government spending was often concentrated in specific industries, i.e., including ordnance, engines and turbines, communication equipment, aircraft, and assorted lab tools. Second, they applied an event study analysis, i.e., using dummy variables for specific events. To measure the effects of government spending transmitted through the various U.S. military buildups, they augmented the dummy variables for each buildup into one composite dummy variable. Indeed, events of the U.S. buildups were accounted for by the exogenous increase in defense spending for the following incidents: the Korean War, 1950:3, the Vietnam War, 1965:1, and the Carter-Reagan defense build-up, 1980:1. They used the univariate VAR model, where the composite dummy was embedded for each dependent variable. Indeed, some parameters were assumed similar to common practice. The logarithm of leisure was set to 2, time endowment was normalized to equal 200, the discount rate was set to be 0.04 and, lastly, the annual depreciation rate was set at 0.1. Using the Cobb-Douglas technology production function, the effects of government spending on output and private output were positive but with low magnitude. Investment delivered a positive effect; however, private consumption displayed a decline in the short-run. Later, instead of using the Cobb-Douglas function, they used the Leontief technology production function, which gave similar results to the Cobb-Douglas function. Finally, the effect of the U.S. military buildup spending on the GDP growth was positive for some quarters and then declined to vanish over time.

Similarly, Werner (2004) applied the Autoregressive Distributed Lag (ADL) model to understand why the fiscal policy in Japan during the 1990s failed to end the recession. He found that fiscal policy was ineffective because of the lack of credit creation during that period. Angelopoulos and Philippopoulos (2005) used data from Greece for the period 1960-2000, and they found a negative relationship between government size and GDP per capita growth. However, the earlier time series studies suffer from an endogeneity problem as the well-known paper by Sims (1980) indicates. Sims claims that no variables can be deemed exogenous if the agent's behavior is forward looking. He suggests using the Vector Autoregression (VAR) when we are not sure whether variables are actually exogenous or not. Since this seminal work of Sims, the VAR models have become more popular among scholars to study the source of economic fluctuations and to assess the effects of policy shocks.

Since Sims (1980), most economists focused substantially on studying the effects of monetary policy. These economists included Bernanke and Blinder (1992), Bernanke and Mihov (1998) Christiano and Eichenbaum (1996), Christiano, Eichenbaum and Evans (1998), Leeper, Sims and Zha (1996), Kim (1999), and Uhlig (2005). However, the fiscal policy effects were carried out in the 1990s, early 2000s and much empirical research has recently been written. Fatás and Mihov (2001) found a strong evidence supporting the claim that the size of government is often significantly correlated with the volatility of the output (the GDP), and they particularly indicated that large government could reduce the volatility of the output. Thus, choosing a large government can be a prudent policy to stabilize the economy and mitigate business cycle fluctuations.

Before using the VAR model to measure the discretionary fiscal policy effects for the U.S. data, Fatás and Mihov performed basic Ordinary Least Squares (OLS) regressions examining relationships between different components of the fiscal and other macroeconomic variables as the growth of the GDP in a sample of 20 OECD economies. First, they ran regressions of different fiscal variables on the growth of the economy, separately for each fiscal variable and each country. They found that net taxes and transfers are smoothing the disposable income, thus, the business cycle. This result is similar and comparable to estimates of Bayoumi and Masson (1995) and Asdrubali et al. (1996). Second, they implemented a cross section regression of the 20 OECD countries. Using the regression, they run the volatility of the real GDP on three alternatives fiscal variables, each of them as a proxy for the government size, and these variables were expenditures, taxes, and transfers. Interestingly, all the coefficients are statistically significant and negative, i.e., these fiscal variables are negatively correlated with the volatility of the business cycle. Third, the authors were skeptical about the endogeneity of government size and the necessity to find conceivable instrumental variables for the government size. This was argued earlier by Rodrik (1998), Alsina and Wacziarg (1998), and Persson and Tabellini (1998). Following the previous papers to eliminate the endogeneity problem and to choose the appropriate instruments, Fatás and Mihov used a sample from 1960 to 1997 and ran a regression of government expenditure as government size on openness of the economy (the sum of exports and imports relative to the GDP), the GDP per capita, the dependency ratio in 1990, urbanization in 1990 and elections. As a result, they used the above regressors as instruments for the government size, and they ran the volatility of the GDP on government expenditures based on chosen instruments and the coefficient was statistically significant with a good fit.

Regarding the discretionary fiscal policy effects, the authors followed Blanchard (1993) and Alesina and Perotti (1995) using the VAR model, but they used the GDP instead of unemployment. They included price level and interest rates, and used the U.S. quarterly data for the period 1960:01 to 1996:04. Also, they examined the effects on the components of the GDP, which to some extent is related to this research. It is important to mention that, for the fiscal episodes, the data includes major changes in the U.S. economy, such as the Kennedy-Johnson tax cut in 1964, the Reagan tax cut of 1981 and the Gulf war in 1990. They found that fiscal expansion has positive and persistent impacts on economic activity, i.e., the GDP reacts positively when a fiscal shock takes place. Both investment and consumption also increase as well.

Since the seminal work of Blanchard and Perotti (2002) on characterizing the effects of fiscal policy on economic activity using the SVAR method, enormous applied work has been done following the same methodology. Although, many articles result in similar findings to Blanchard and Perotti (2002), others differ based on their economic structure and because of the lack of non-interpolated quarterly data. Restrepo and Rincón (2006) apply the SVAR models and Structural Vector Error Correction Models (SVEC) to identify the dynamic effects of fiscal policy on economic activity in Chile and Colombia. For Chile, data cover the period 1989:1 through 2005:4, where in Colombia they choose data from 1990:1 and 2005:2. They follow Blanchard and Perotti (2002) for the SVAR by including government spending, taxes and GDP, with one exception for Chile regarding the data. They used it based on accrual accounting[7]. The impulse response of fiscal structural shocks, in the case of Chile, comes with standard wisdom: when government spending increases, output increases; and when government taxes increase, output decreases. Indeed, when government taxes increase by one Chilean peso, the GDP falls by 40 cents; an increase of government spending by one Chilean peso, the GDP rises by $1.90. Despite the findings of Chile, the

[7] Cerda, González and Lagos (2005) used cash-based data for analyzing the fiscal policy effects of Chile.

effects of government spending and taxes result in small effects on the GDP. For instance, an increase in government spending leads to only a 12-cent increase in the output.

Similar to Restrepo and Rincón (2006), Yadav et al. (2012) analyzed the impact of the fiscal policy shocks on the Indian economy using the SVAR methodology and covering the period of 1997Q1 to 2009Q2. Beside the Blanchard and Perotti (2002) identification, Yadav et al. also used the recursive approach (i.e. the Chelosky decomposition). Their findings of the impulse responses were similar to Blanchard and Perotti, but fiscal multipliers differ. Indeed, the tax multiplier was larger than the government spending multiplier. They found that the tax multiplier was -2.95; a tax increase of one rupee led to a decline in the real GDP by 2.95 in quarter 4. In the same manner, the government spending multiplier was 1.14 in the same quarter.

The SVAR approach with augmenting inflation and interest rate variables was used to investigate the effects of fiscal policy on the GDP, inflation and interest rates in five OECD countries: the U.S., West Germany, the UK, Canada, and Australia. Significantly, inflation and interest rates were embedded to account for the monetary policy effect and how it is interrelated with fiscal policy, which generally would enrich the analysis of macroeconomic insight toward recent global occurrences.

Related to Perotti (2004), the GDP deflator was used for inflation, and a 10-year nominal interest rate was also included in the model. Perotti argues that using a 10-year interest rate is more appropriate than a short-term interest rate since the former is more related at determining private consumption and investment. Including inflation and interest rates are extremely helpful.

Here is an extension of the literature review shedding more lights on Blanchard and Perotti (2002): Blanchard and Perotti applied the structural VAR model to overcome the following challenges: (1) the endogeneity problem; (2) the deficiency of the large-scale models because they rely heavily on sum assumptions based on the Keynesian view; (3) criticisms of econometric methods based on survey data, and (4) continuing attacks on the unrestricted VAR models due to a lack of economic theoretical basis. Blanchard and Perotti (2002) used the structural VAR (SVAR) model to investigate effects of fiscal policy on the economic activity of the U.S. at the post-war period. The Dummy variable was included in the VAR specification to account for the large legislated tax cut by the government in the second quarter of 1975. They used the structural VAR (SVAR) model to determine the effects of shocks on government spending and net taxes on economic activity in the U.S. in the post-war period from 1960:1 to 1997:4. In their model, government expenditures and net taxes were used along with the GDP. They defined the government expenditure variable as total purchases of goods and services (government consumption and investment), and for short they called it "spending". The revenue variable as "net taxes" is defined as total taxes less transfers (but interest payments were included). These three variables are in log, real terms, and per capita[8]. Most of the data used were for the period 1960:1 to 1997:4.

They started by introducing their basic VAR model (i.e., the reduced-form) under two alternative specifications akin to "Time Trends"; the deterministic trend (DT) and the stochastic trend (ST) specifications. Their basic model is:

$$Y_t = A(L,q)Y_{t-1} + C\,X_t + u_t \qquad (1)$$

where $Y_t \equiv (T_t, G_t, GDP_t)'$ is a three-dimensional vector of endogenous variables in the logarithm of quarterly net taxes, government spending and output (the GDP), all in real, per capita terms. Since the reduced form residuals are linear combinations of the structural shocks, the authors state that without loss of generality, we can write the equations as

$$u_{T,t} = a_1\, u_{GDP,t} + a_2\, e_t^g + e_t^t \qquad (2)$$

$$u_{G,t} = b_1\, u_{GDP,t} + b_2\, e_t^t + e_t^g \qquad (3)$$

[8] GDP deflator was used to express variables in real terms.

$$u_{GDP,t} = c_1 u_{T,t} + c_2 u_{G,t} + e_t^{gdp} \quad (4)$$

Equation (2) states that unexpected movements in taxes ($u_{T,t}$) in the same quarter could be a result of an automatic response to unexpected movements in the GDP measured by ($a_1 u_{GDP,t}$), a response to the structural shock to spending, obtained by ($a_2 e_t^g$), or the structural shocks to taxes, captured by e_t^t. Similarly, in equation (3), in the same quarter, unexpected movements in spending ($u_{G,t}$) can be related to three factors, (1) an automatic response to unexpected movements in the GDP measured by ($b_1 u_{GDP,t}$), (2) a response to the structural shock to taxes, obtained by ($b_2 e_t^t$), and (3) the structural shocks to spending, captured by (e_t^g). Finally, in equation (4), the unexpected movements in the GDP can be caused by unexpected movements in taxes ($c_1 u_{T,t}$), unexpected movements in spending ($c_2 u_{G,t}$), or the structural shock to GDP (e_t^{gdp}). In matrix form, the system of equations (2), (3) and (4) can be written as

$$\begin{bmatrix} 1 & 0 & -a_1 \\ 0 & 1 & -b_1 \\ -c_1 & -c_2 & 1 \end{bmatrix} \begin{bmatrix} u_{T,t} \\ u_{G,t} \\ u_{GDP,t} \end{bmatrix} = \begin{bmatrix} 1 & a_2 & 0 \\ b_2 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} e_t^t \\ e_t^g \\ e_t^{gdp} \end{bmatrix} \quad (5)$$

The matrix notation in (5) is known as the AB model; $Au_t = Be_t$ (Amisano, G., and Giannini, G. (1997), Topics in Structural VAR Econometrics). In general, the variance-covariance matrix of reduced-form shocks is defined by $\sum_u = E[u_t , u_t']$ with 6 known parameters (i.e., 6 independent equations) and the variance-covariance matrix of structural innovations $\sum_{\boldsymbol{e}} = E[e_t , e_t']$ are assumed to be a diagonal matrix. Based on the AB model, we have $u_t = A^{-1}Be_t$.Thus, $\sum_u = E = E[\, A^{-1}Be_t e'_t B' A^{-1\prime}]$

$$= A^{-1}BE(e_t e_t{}')B'A^{-1\prime} = A^{-1}B \textstyle\sum_e B'A^{-1\prime}$$

From the AB model in (5), we have 9 parameters to estimate; however, we only have 6 known parameters provided by $\sum_u$. They imposed 3 restrictions for the system to be identified. In short, these imposed restrictions are (1) setting $b_1 = 0$, (2) a_1 were estimated to be around 2.08 and (3) either setting a_1 to 0 and estimate b_2 or vice versa. These restrictions can be detailed in three steps as follow:

Step (1): To construct coefficients $a_1\ and\ b_1$, Blanchard and Perotti relied on institutional information about taxes, transfers, and spending programs. They claim that these two coefficients would capture the effects of economic activity on taxes and spending through two channels. The first channel captures the automatic effects of GDP movements on taxes and spending as working with tax and transfer systems, and this channel is plausible. However, the second channel uses discretionary adjustments to fiscal policy to respond to unexpected shock in the GDP, which is excluded by quarterly data since implementations of fiscal policy usually take more than a quarter. In other words, for constructing $a_1\ and\ b_1$, Blanchard and Perotti only focus on the first channel. As said, the first channel only measures the automatic effects of GDP movements on taxes and spending, which indicates elasticity of taxes and spending respectively. To construct the elasticities of spending and net taxes to the output (the GDP), they estimated the elasticity of spending to the GDP as $b_1 = \frac{\Delta G}{\Delta GDP}\frac{GDP}{G} \approx \frac{logG}{logGDP} \approx o\ (b_1 = 0)$ from the U.S. data. Meanwhile, within a quarter, the elasticity of net taxes with respect to output (the GDP) is the coefficient a_1, which is calculated as $a_1 = \sum_{i \in I} \eta T_i B_i\ \ \eta T_i X\ \frac{\tilde{T}_i}{\tilde{T}}$, where I is the set of tax types , $\eta T_i B_i$ refers to the elasticity of taxes of type i to tax base B_i, and $\eta T_i X$ is the elasticity of the tax base to the output. Also, $\tilde{T}_i$ is the tax associated with the tax base B_i and the total level of net taxes is $\tilde{T} = \sum_{i \epsilon I} \tilde{T}_i$. On average, a_1 is reported to be equal to 2.08 during the period 1947:1-1997:4.

Step (2): From equation (4), $u_{GDP,t} = c_1\, u_{T,t} + c_2\, u_{G,t} + e_t^{gdp}$, both $u_{T,t}\ and\ u_{G,t}$ are possibly endogenous and correlated with the error term e_t^{gdp}. Therefore, they provide instrumental variables (IVs) for both $u_{T,t}\ and\ u_{G,t}$. First, they estimated the reduced-form

VAR and obtained the residuals u_t. Second, they constructed cyclically adjusted reduced form net taxes and spending residuals as $u'_{T,t} = u_{T,t} - a_1 u_{GDP,t}$ and $u'_{G,t} = u_{G,t} - b_1 u_{GDP,t}$. It is obvious that $u'_{T,t}$ and $u'_{G,t}$ might be correlated, but they are no longer correlated with the structural shock to GDP (e_t^{gdp}). Thus, $u'_{T,t}$ and $u'_{G,t}$ variables were perfect IVs for $u_{T,t}$ and $u_{G,t}$, and they run $u_{GDP,t}$ on $both$ $u'_{T,t}, u'_{G,t}$ to estimate c_1 and c_2.

Step (3): For the remaining coefficients a_2 and b_2, the authors cannot confirm whether the spending decision comes before the tax decision or the other way around. Therefore, they practice an agnostic approach.They identified the model under two alternative assumptions: in the first, tax decisions assumed to come first, which means $a_2 = o$ and $u'_{T,t} = e_t^t$. Then they run $u'_{G,t}$ on $u'_{T,t}$ and obtain b_2; in the second, they assumed the spending decision comes first, so b_2 and similarly they estimate a_2.

CHAPTER 3

SPECIFICATIONS AND METHODOLOGY

Generally speaking, this research studies the effects of fiscal policy shocks on the economic activity in Saudi Arabia for quarterly data. First, the property of time series data being stationary should be examined and confirmed. Second, lag order must be specified carefully by estimating the reduced-form VAR model, which is Model (1). Lastly, after obtaining the reduced–form residuals, we can get the structural shocks, impulse responses and variance decompositions. We will examine the effects of fiscal policy on the GDP in Model (1) and then, later, on its components: private consumption, private investment, exports and imports provided by Model (2). Similarly, we will extend the model to include inflation and interest rates as in Perotti (2005) in Model (3). Due to the lack of data, interpolated quarterly data for the period 1993:01- 2011:04 are obtained for Saudi Arabia using the E-VIEWS program[9]. Below is an overview of the SVAR model and its identification.

SVAR econometric model and Identification: Blanchard and Perotti claim that the structural VAR models are more suitable for studying fiscal policy than monetary policy for two reasons. The first reason is that movements of fiscal variables are based on tax and spending decisions, which usually are set for specific goals, but not related to stabilizing the output, i.e. there are exogenous fiscal shocks with respect to the GDP movements. The second reason is because the usual lag implementation of fiscal policy through legislation delays makes weak or no discretionary response of current fiscal policy to the unexpected instantaneous volatility of economic activity within a specific period, as at high frequencies data (e.g. quarterly data), where monetary policy instead is more responsive to the

[9] We use the Cubic-match last frequency method.

movements of the GDP. This concludes that there should be fiscal policy shocks to the GDP movements and they can be identified after the automatic effects (i.e. the mentioned elasticities). A brief of the SVAR model and identification process is explained as follows:

The reduced-form VAR can be written as:

$$Y_t = \Gamma_1 Y_{t-1} + \cdots\cdots + \Gamma_p Y_{t-p} + u_t \qquad (4.1)$$

where Y_t is the n-dimensional vector of endogenous variables, Γ_i , $i = 1, \ldots, p$, is the $(n \times n)$ matrix of coefficients, u_t is the n-dimensional vector of reduced form residuals with zero mean and variance-covariance matrix $\sum_u = E[u_t , u_t']$. For convenience, we omit the constant term, time trends and exogenous variables for now. The structural form of the VAR in (1) is needed and can be obtained by pre-multiplied by (1) by a $(n \times n)$ matrix A as

$$A\, Y_t = A\Gamma_1 Y_{t-1} + \cdots\cdots + A\Gamma_p Y_{t-p} + Au_t \qquad (4.2)$$

Then, leads to

$$A\, Y_t = C_1 Y_{t-1} + \cdots\cdots + C_p Y_{t-p} + Be_t \qquad (4.3)$$

where B and C are $(n \times n)$ matrices of coefficients, matrix A captures the contemporaneous relations among the endogenous variables and e_t is the n-dimensional vector of the structural shocks that we want to recover. In Blanchard and Perotti (2002), the structural shocks e_t are assumed to be mutually uncorrelated, i.e., the variance-covariance matrix of the structural shocks $\sum_e = E[e_t , e_t']$ is a diagonal and fixed matrix; however, we assume the structural shocks e_t to be standardized at 1, i.e., the variance-covariance matrix of the structural shocks e_t is an identity matrix ($E[e_t , e_t'] = I$). The relation between the structural shocks e_t and the reduced form residuals u_t can be described by the AB model[10] as follows:

$$Au_t = Be_t \qquad (4.4)$$

We then get the following:

[10] For the SVAR analysis, the AB model is commonly used in applied work (see, e.g., Amisano and Giannini (1997), Lütkepohl 2005, Enders 2010, and others)

$$\sum_u = E[u_t , u_t'] = A^{-1}B \, E[e_t , e_t'] \, B'A^{-1'} \qquad (4.5)$$

$$\sum_u = A^{-1}B \, I \, B'A^{-1'} \qquad (4.6)$$

The variance-covariance matrix of reduced-form shocks $\sum_u$ provides $\frac{n(n+1)}{2}$ free elements (independent equations), $A \; and \; B$ have $2\,n^2$ unknown elements. Therefore, for the system to be identified, we need to impose $2\,n^2 - \frac{n(n+1)}{2} = \frac{n(3n-1)}{2}$ restrictions.

3. 1 Model (1): The Blanchard and Perotti approach

Following Blanchard and Perotti (2002), we introduce the basic VAR model (the reduced-form) as in equation (1) as follows:

$$Y_t = \Gamma_1 Y_{t-1} + \cdots + \Gamma_p Y_{t-p} + u_t \qquad (4.7)$$

where $Y_t \equiv (GR_t, GE_t, GDP_t)'$ is a three-dimensional vector of endogenous variables in a logarithm of quarterly government revenue[11], government expenditures, and output (GDP), all in real, per capita terms[12]. After estimating equation (4.7), reduced-form residuals $u_t \equiv (u_{gr,t}, u_{ge,t}, u_{gdp,t})'$ can be obtained and expressed as linear combinations of structural shocks $e_t \equiv (e_t^{gr}, e_t^{ge}, e_t^{gdp})'$ as in $Au_t = Be_t$

$$\begin{bmatrix} 1 & 0 & -a_{13} \\ 0 & 1 & -a_{23} \\ -a_{31} & -a_{32} & 1 \end{bmatrix} \begin{bmatrix} u_{gr,t} \\ u_{ge,t} \\ u_{gdp,t} \end{bmatrix} = \begin{bmatrix} b_{11} & b_{12} & 0 \\ b_{21} & b_{22} & 0 \\ 0 & 0 & b_{33} \end{bmatrix} \begin{bmatrix} e_t^{gr} \\ e_t^{ge} \\ e_t^{gdp} \end{bmatrix} \qquad (4.8)$$

According to equation (4.6), $\sum_u = A^{-1}B \, B'A^{-1'}$, $\sum_u$ contains $\frac{n(n+1)}{2} = \frac{12}{2} = 6$ free elements. Some restrictions should be imposed on A and B. Using this equation $2\,n^2 - \frac{n(n+1)}{2} = \frac{n(3n-1)}{2} = \frac{24}{2} = 12$ restrictions should be imposed for the system to be identified. From (4.8), $A \; and \; B$ have three 1's and six 0's, adding up to 9 restrictions; three resections should be imposed. $a_{13} \; and \; a_{23}$ are the elasticity of government revenue to the GDP and the

[11] Notice that Blanchard and Perotti defined government revenue as net taxes, where some developing countries do not use taxes based on economic structure (e.g., most Arab countries including Saudi Arabia).

[12] We use the GDP deflator to transform variables to be in real terms.

elasticity of government expenditure to the GDP, respectively, and can be estimated. The last restriction forms two specifications of model (4.8); the first specification sets $b_{21} = 0,$ $and\, b_{12} \neq 0,$ where the second specification set $b_{12} = 0,\ and\, b_{21} \neq 0.$ As mentioned before, the first specification indicated that the government expenditure decision comes before the government revenue decision; the second specification indicates government revenue decision comes before government expenditure decision. As an agnostic test, we will perform a Granger Causality test between government revenue and government expenditure. The diagonal elements of matrix B are the standard deviations of the structural shocks since we assumed the latter shocks are standardized at 1.

3. 2 Model (2): Extended 4-VAR model

Model 2 extends Model 1 by adding a part of the GDP to the basic model each time. For instance, for examining the effects of fiscal policy on GDP components, we should add one component to the model each time, i.e., adding private consumption once, and then replacing it with private investment in another specification and so on. The following model includes the private consumption as follows:

$$\begin{bmatrix} 1 & 0 & -a_{13} & 0 \\ 0 & 1 & -a_{23} & 0 \\ -a_{31} & -a_{32} & 1 & 0 \\ -a_{41} & -a_{42} & 0 & 1 \end{bmatrix} \begin{bmatrix} u_{gr,t} \\ u_{ge,t} \\ u_{gdp,t} \\ u_{con,t} \end{bmatrix} = \begin{bmatrix} b_{11} & b_{12} & 0 & 0 \\ b_{21} & b_{22} & 0 & 0 \\ 0 & 0 & b_{33} & 0 \\ 0 & 0 & 0 & b_{44} \end{bmatrix} \begin{bmatrix} e_t^{gr} \\ e_t^{ge} \\ e_t^{gdp} \\ e_t^{con} \end{bmatrix} \qquad (4.9)$$

By this relation, $Au_t = Be_t,$ we need to impose restrictions for the system to be identified. We have 10 free elements in $\sum_u$ and 2 n^2 unknown and, in general, $e_t^{gdp} and\ e_t^{con}$ are correlated. Hence, we have 32 unknown parameters and 22 restrictions are needed. Besides 0’s and 1’s restrictions, three restrictions will be imposed on $a_{13}, a_{23}\ and\ b_{12} = 0$ or the other way $a_{13}, a_{23}\ and\ b_{21} = 0.$

Similarly, the above specification will be applied to private investment, total exports and total imports. This specification is crucial for analyzing the fiscal policy effects since it will show whether our empirical results align with Keynesian models, classical models or neo-classical models. For instance, if government spending has a positive effect, both standard classical and the Keynesian models are supported, whereas neoclassical models are not.

3. 3 Model (3): Extended 5-VAR model

Mainly, we follow Blanchard and Perotti (2002)'s identification with accounting for the impact of inflation and interest rate variables since government revenue and government expenditures might be influenced by nominal factors. Thus, inflation rate π and interest rate i will be included in the model, and endogenous variables become as follows:

$Y_t \equiv (GR_t, GE_t, GDP_t, \pi_t, i_t)'$ as a 5-dimintional vector. After estimating the reduced-form VAR, residuals $u_t \equiv \left(u_{gr,t}, u_{ge,t}, u_{gdp,t}, u_{\pi,t} u_{i,t}\right)'$ can be obtained and expressed as linear combinations of structural shocks $e_t \equiv \left(e_t^{gr}, e_t^{ge}, e_t^{gdp}, e_t^{\pi} e_t^{i}\right)'$ as follow

$$u_{gr,t} = a_{13}\, u_{gdp,t} + + a_{14}\, u_{\pi,t} + b_{15}\, u_{i,t} + b_{12}\, e_t^{ge} + e_t^{gr} \tag{4.9}$$

$$u_{gr,t} = a_{23}\, u_{gdp,t} + + a_{24}\, u_{\pi,t} + b_{25}\, u_{i,t} + b_{21}\, e_t^{gr} + e_t^{ge} \tag{4.10}$$

$$u_{gdp,t} = a_{31}\, u_{gr,t} + a_{32}\, u_{ge,t} + e_t^{gdp} \tag{4.11}$$

$$u_{\pi,t} = a_{41}\, u_{gr,t} + + a_{42}\, u_{ge,t} + b_{43}\, u_{gdp,t} + e_t^{\pi} \tag{4.12}$$

$$u_{i,t} = a_{51}\, u_{gr,t} + + a_{52}\, u_{ge,t} + b_{53}\, u_{gdp,t} + a_{24}\, u_{\pi,t} + e_t^{\pi} \tag{4.13}$$

Equations (4.10) – (4.13), as usual, can be presented by the following matrix form:

$$\begin{bmatrix} 1 & 0 & -a_{13} & -a_{14} & -a_{15} \\ 0 & 1 & -a_{23} & -a_{24} & -a_{25} \\ -a_{31} & -a_{32} & 1 & 0 & 0 \\ -a_{41} & -a_{42} & -a_{43} & 1 & 0 \\ -a_{51} & -a_{52} & -a_{53} & -a_{53} & 1 \end{bmatrix} \begin{bmatrix} u_{gr,t} \\ u_{ge,t} \\ u_{gdp,t} \\ u_{\pi,t} \\ u_{i,t} \end{bmatrix} = \begin{bmatrix} b_{11} & b_{12} & 0 & 0 & 0 \\ b_{21} & b_{22} & 0 & 0 & 0 \\ 0 & 0 & b_{33} & 0 & 0 \\ 0 & 0 & 0 & b_{44} & 0 \\ 0 & 0 & 0 & 0 & b_{55} \end{bmatrix} \begin{bmatrix} e_t^{gr} \\ e_t^{ge} \\ e_t^{gdp} \\ e_t^{\pi} \\ e_t^{i} \end{bmatrix} \tag{4.14}$$

To identify the above system, we need to impose additional restrictions. The variance-covariance $\sum_{\boldsymbol{u}}$ contains 15 free elements (i.e., 15 independent equations) and 50 unknown elements in matrices $A\ and\ B$ along with a diagonal matrix of standard deviations of the structural shocks e_t . That leads to 35 needed restrictions. Recall that in Blanchard and Perotti (2002) and Perotti (2004), the reduced-form of fiscal variables $(u_{gr,t}, u_{ge,t})$ are linear combinations of (1) the automatic response of fiscal variables to shocks in GDP, inflation rate, and interest rate; (2) systemic discretionary responses of fiscal policy by policymakers to innovations in macroeconomic variables in the model; and (3) random discretionary shocks.

From the AB model in (4.14), elasticities of fiscal variables (i.e., government revenue and government expenditure) to GDP, inflation rate and interest rates will be estimated. Indeed, they are $a_{13}, a_{14}, a_{15}, a_{23,} a_{24}\ and\ \ a_{25}$ (i.e., 6 elements in matrix A). One restriction could be added as $b_{12} = 0$ if government expenditure comes first or $b_{21} = 0$ if government revenue comes first. With these 7 restrictions and 28 restrictions on 0's and 1's, the system is just identified.

3. 4 Stationary Test

In time-series analysis, a variable, included in the model, should be a stationary[13] and this is a prerequisite for analysis to be valid. It is crucial because if the OLS regression is applied with non-stationary variables (i.e., existence of unit root), it would lead to a spurious regression. I use the augmented Dickey-Fuller (ADF) test by Dickey and Fuller (1979) analyzing the unit root existence. The ADF test can be obtained by estimating the following specification:

$$\Delta Y_t = \alpha_1 + \alpha_2 t + \rho Y_{t-1} + \textstyle\sum_{i=2}^{p} \beta_i \Delta Y_{t-1+i} + e_t \,, t = 1, \dots\dots, n \qquad (4.15)$$

[13] As documented in Time-series textbooks (e.g. Applied Econometrics Time Series, Enders, 2008) that a time-series variable Y_t is a stationary, for all t, if :
$E\ (Y_t) = constant$
$Var\ (Y_t) = constant$;and
Cov $(Y_t, Y_{t+k}) = constant)\ for\ all\ k \neq o$

Where Y_t is the variable we need to test, α_1 is the intercept, and *t* is the time trend. According to Dickey and Fuller (1979), the null hypothesis is $H_o\colon \rho = 0$ or the variable has a unit root. Notice that, particularly in this test, we do not use *t* statistic for the critical value of the hypothesis test. Instead, we use the ADF critical values, and we reject the null hypothesis of non-stationary if the t statistic of the estimated parameter is larger (in absolute) than the critical value of the ADF statistic.

3. 5 Lag Order Selection

By the reduced-form VAR model, we might find some first-differenced variables because they were non-stationary or have unit roots. It is important to mention that having more lags, we can detect the dynamic structure among all variables more accurately; however, we will lose more degrees of freedom. I apply the sequential modified likelihood ratio test by Lükepohl (1991) by choosing the optimal lag order. Relatively speaking, I will assign a high lag number, then decrease it each time until we get the first rejection. Then, the alternative lag order is the optimal. Lükepohl (1991) uses the test statistics with chi-squared distribution specified as follows:

$$LR = (T - m)\{log|\Omega_{l-1}| - log|\Omega_l|\} \sim \chi^2(\text{q}) \qquad (4.16)$$

Where T = the number of observations

m = the number of the parameters included in every equation in the VAR model

q = the total of restricted parameters

Ω_l, Ω_{l-1} = the variance-covariance matrices from the VAR model at lag1 and 1-1 respectively. The first rejection indicates the optimal lag length at 5 % significance level.

3. 6 Model Misspecification

It is imperative to detect the serial correlation in the estimated reduced-form VAR model for the model to be well specified. I use the multivariate LM test statistics with chi-squared distribution by Johansen (1995). In the LM test, we regress the estimated residuals on the residuals lagged h and the explanatory variables in the VAR model. That is:

$$LM(h) = \left[T - pk - m - p - \frac{1}{2}\right] log \frac{|\breve{\Omega}|}{|\widehat{\Omega}|} \sim \chi^2(p^2) \qquad (4.17)$$

Where T = the number of observations

p = the number of endogenous variables in the VAR model

k = the lag number in the VAR model

m = the number of deterministic terms in the VAR model

$\widehat{\Omega}$ = the variance-covariance matrix from the VAR model

$\breve{\Omega}$ = the variance-covariance matrix from the auxiliary regression

By the above test, the null hypothesis of no serial correlation at lag order h can be tested and the lag h should equal one fourth of the total observation.

CHAPTER 4

ECONOMY OF SAUDI ARABIA

Overview

Saudi Arabia is recognized as one of the leading figures in the world oil market because of its capacity and reserves of oil. According to the EIA[14], Saudi Arabia has about one-fifth of the world's proven oil reserves, and also was the world's largest oil producer and exporter of petroleum liquids in 2012.

The Saudi government is the sole owner of all oil resources in the country, which gives it the capability of controlling and maintaining the economy. Hence, it is recognized as an oil-based economy. During the last three decades, the Saudi government has used many policies to maintain the economy, enhance growth, and diversify revenue sources by not depending solely on oil income. A quick overview of the Saudi economy would be an ideal step to display the broad events that occurred during the period 1970-2010.

Joharji (2009) illustrates the broad events that happened in the period 1970 to 2005. He indicated that the Saudi economy witnessed three different phases, with specific circumstances at each time. These phases are demonstrated as follows:

The first phase covered the period 1970-1982. During this phase, the economy witnessed high levels of growth with a surplus in balances, which coincided with oil prices rising at the same time. As a result, many infrastructure projects and industries were built and the government promoted the non-oil sector through subsidies and low tax rates and others.

The second phase covered the period from 1983 to the end of the 1990s. This period witnessed a decline in economic growth as a result of falling oil prices followed by a stable

[14] EIA is The U.S. Energy Information Administration (EIA)

yet low growth rate. As mentioned in the first phase, where growth rate was escalating tremendously because of the oil boom, the government built huge programs for infrastructure and the expanding economy, yet with not enough funds to complete these projects. Therefore, a current account deficit was predominant in spite of fiscal consolidation policies used by the government. As a result, the government issued some development bonds and increased some public fees to cover the deficit and finish up these projects.

The third phase covers the period 1999-2005. Generally speaking, the government experienced a surplus budget coincident with high oil prices. Public spending reached its peak, and was adopted substantially through huge initiated projects such as the six economic cities, some railroad systems, a new seaport, and other projects.

Working with our time series, it is important to sketch a broad idea of the Saudi economy as a whole, with specific demonstrations for each variable which will be used in the study. A quick overview of the Saudi economy was provided earlier. Gross Domestic Product (GDP), both oil and non-oil sectors will be displayed. Government expenditure, government revenue and inflation will be detailed in order.

As mentioned earlier, the real GDP experienced substantial jumps in its growth rate during the first phase (1970-1981), averaging about 13% per year. At the second phase (1982-1999), severe recession with deficit occurred overlapping with declining oil prices and the Gulf War during1990-1991. The growth rate averaged around only 1%. However, the third phase (2000-2010) had impressive economic performance because of high growth rates coinciding with rising oil prices. The growth rate this time averaged about 4%. These events can be seen in Figure 1 and figure 2.

The government always makes policies to diversify the economy by being more effective in the non-oil sector. Generally speaking, they were successful with the best outcome when non-oil GDP reached 76% in 1985, then non-oil GDP prevailed during the period 1985-2010 with 66% of GDP. (Figure 3 and Figure 4)

In Saudi Arabia, the government expenditure is mainly allocated through two channels: current expenditure and capital expenditure. Current expenditures are the sources spent in consumption, subsidized salaries, and wages for the capital sector; meanwhile, capital expenditures are specifically spent on the government sector fixed investments.

Whenever there is a current account deficit, the government sometimes reduces its expenditure to cover the deficit and that happened in 1998 when the government reduced it by 27% (Alwagdani, 2004).

As we earlier stated, the Saudi economy is an oil-based economy, so the government expenditure approximately follows oil prices. Whenever oil prices rise or decline, the government expenditure rises or declines respectively.

Total government revenue consists of oil revenue and non-oil revenue, where the latter are investment income and domestic revenue, such as selling or renting property, and receipts through customers' duties. Oil revenue captures almost 80% of the total government revenue on average during the period 1969-2010 (Figure 5).

The policy of the government toward budget balancing is on its reserves or reducing development expenditure. Therefore, whenever there is a deficit, the government consolidates its expenditure by reducing fiscal expenditure or by using its reserves. On the other hand, in case of a surplus, they add it to the accumulated budget surplus (Elmallakah, 1982).

As we stated, at the second phase, the deficit was a prevailing case. During the period 1983-1988, the government drew on its foreign exchange reserves at the beginning, but after 1986, it was forced to sell government bonds to local commercial banks and financial institutions (Alwagdani, 2004).

In 2007-2008, the government assigned an annual allowance of 5% for all government employees (Jharji, 2009) but other gulf countries increased their employee salaries by 70% or more and there was high inflation, which we will discuss below.

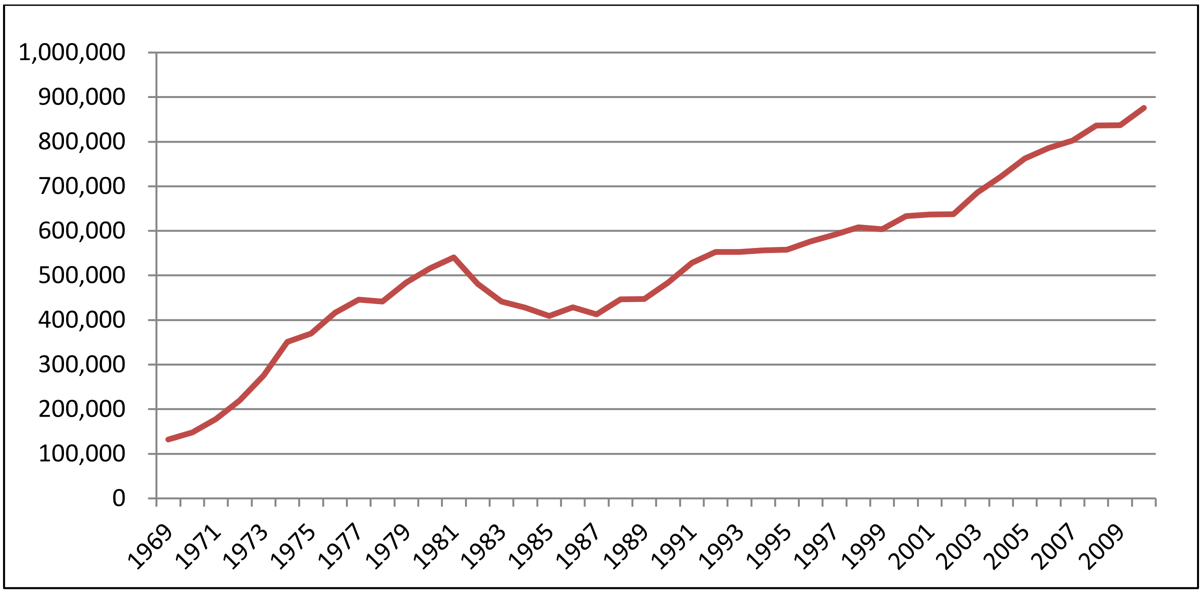

Figure 1: Real GDP, Saudi Arabia

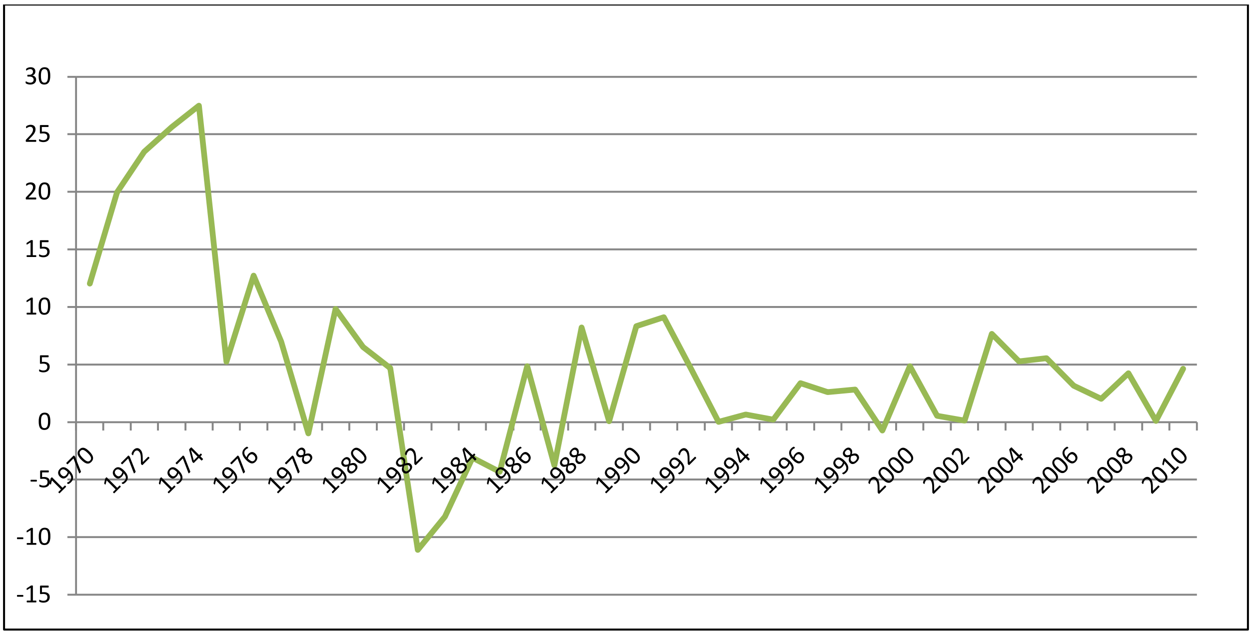

Figure 2: GDP growth rate, Saudi Arabia

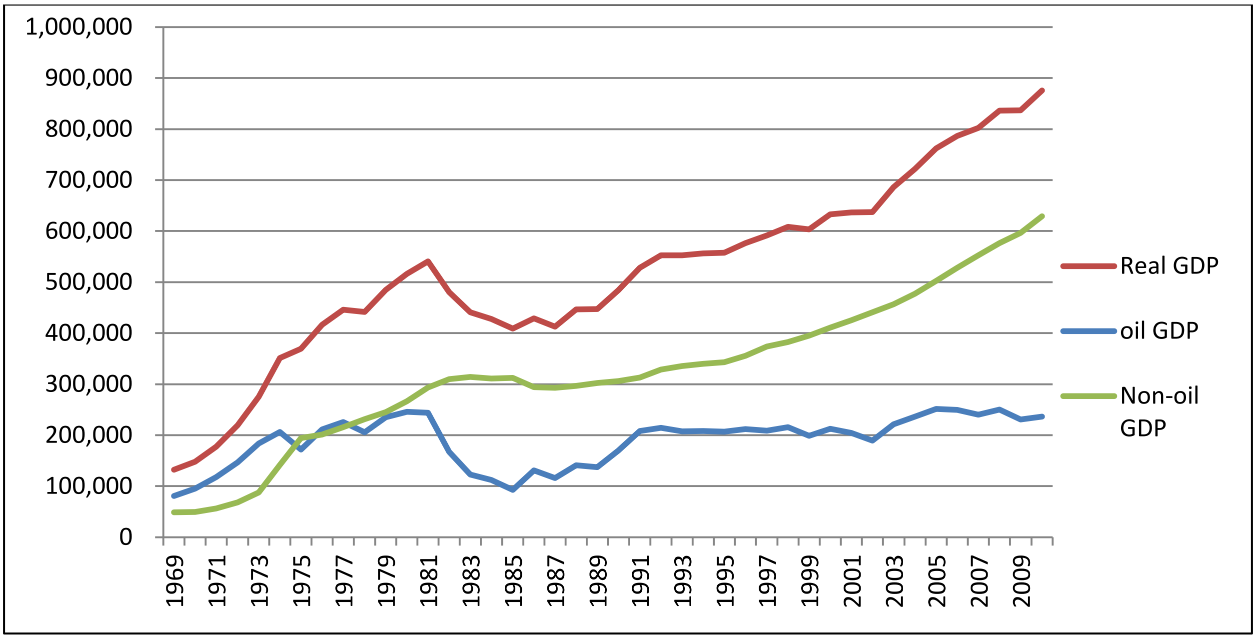

Figure 3: Oil GDP, Non-Oil GDP, Real GDP

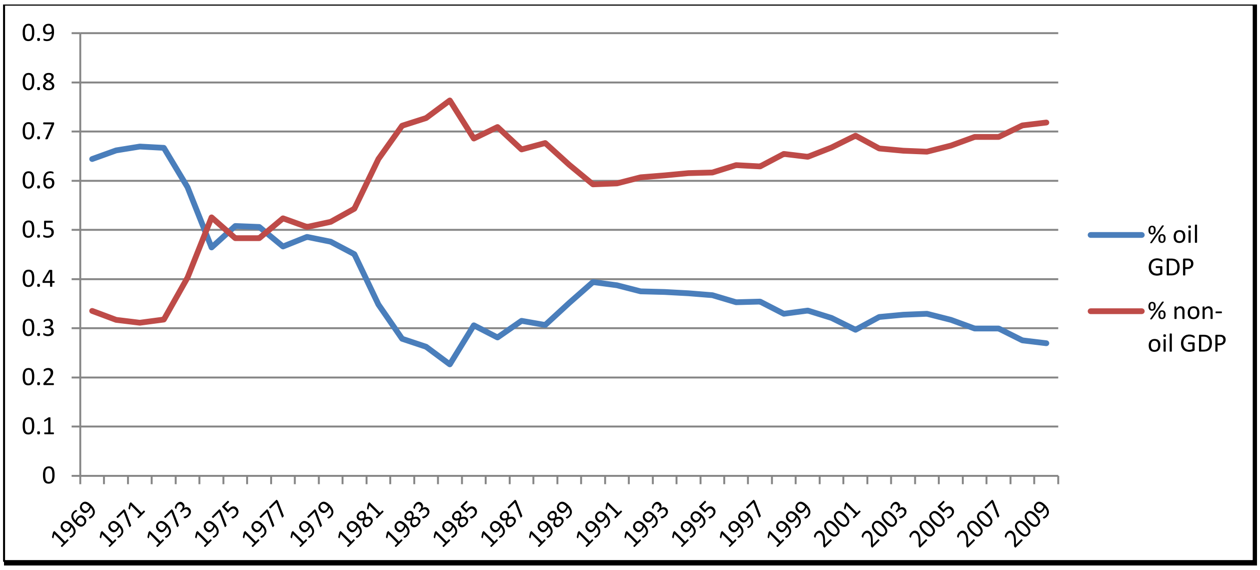

Figure 4: Oil and Non-Oil GDP shares to GDP

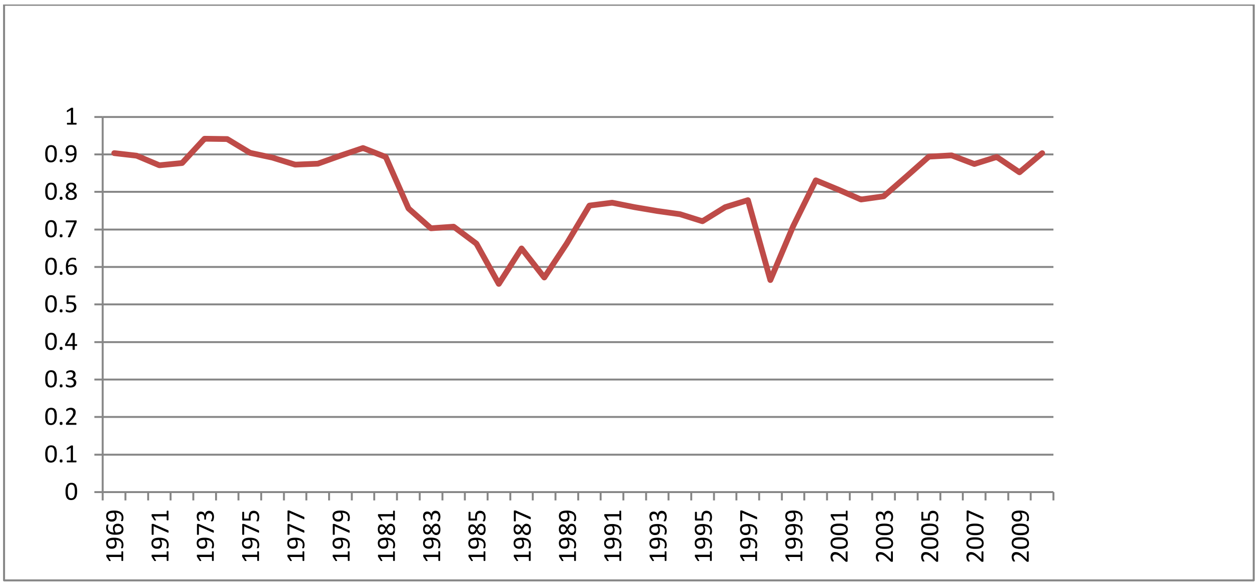

Figure 5: Oil Government Revenue (% of GDP)

CHAPTER 5

EMPIRICAL ANALYSIS RESULTS

A brief review of Saudi Economy is provided, then, a comprehensive empirical analysis of the effects of fiscal policy on Saudi Economy is documented in this chapter. We will apply Model (1), Model (2) and Model (3) as explained in chapter three.

This is a short review of principal fiscal indicators of the Saudi Arabian economy during the period 1993-2011. The ratio of government revenue to GDP fluctuated during the whole period, with an average of 36.9%; and also government's spending ratio to GDP had an average of 33.9%. In the same vein, the overall budget deficit ratio to GDP had an average of 2.9%, which is very low and indicates a prudent fiscal policy.

Saudi Arabia is recognized as one of the leading figures in the world oil market because of its capacity and reserves of oil. According to the EIA[15], Saudi Arabia has about one-fifth of the world's proven oil reserves, and also was the world's largest oil producer and exporter of petroleum liquids in 2012.

The Saudi government is the sole owner of all oil resources in the country, which gives it the capability of controlling and maintaining the economy. Hence, it is recognized as an oil-based economy. During the last three decades, the Saudi government has used many policies to maintain the economy, enhance growth, and diversify revenue sources by not depending solely on oil income. A quick overview of the Saudi economy would be an ideal step to display the broad events that occurred during the period 1970-2010.

[15] EIA is The U.S. Energy Information Administration (EIA)

Unit Root Test

Table 1: *The Augmented Dickey-Fuller Test of Saudi Arabia*

- Level

	Specification	Test-Statistic	P-value	Optimal Lag	Results
GDP	Constant and Trend	-0.450022	0.7397	4	Non-stationary
GR	Constant and Trend	-3.473447	0.4124	3	Non-stationary
GE	Constant and Trend	-4.090602	0.0243	3	Non-stationary

- First-Difference

	Specification	Test-Statistic	P-value	Optimal Lag	Results
GDP	constant	-6.766760	0.0000	3	Stationary
GR	Constant and Trend	-8.192599	0.0000	2	Stationary
GE	Constant and Trend	-8.171344	0.0000	2	Stationary

As can be seen in table 1, the GDP, GR and GE are non-stationary (i.e., they have unit roots). Since their p-values are 0.7397, 0.4124 and 0.0243, respectively, larger than 5%, they need to be differenced to be used in the VAR reduced-form.

Lag order: As mentioned, in the methodology section, the lag selection is critical in the analysis, and we apply the sequential likelihood ratio test by Lükepohl (1991). Table 5 shows that the maximum lag was determined to be six and the first rejection was at the third lag. Indeed, the optimal lag is three at 5% significance level.

Model Specification: Based on the methodology section, to do the LM test, we assign 23 as the optimal lag order for h since 23 is one fourth of the total observation (i.e., 71). In Table 6, we accept the null hypothesis $\boldsymbol{H_o}$ or there is no serial correlation and the model is well specified. The p-values of lags 16, 17, and 18 are 0.4856, 0.0912, and 0.0631, respectively and all of them are larger than 0.05.

Model (1): The Blanchard and Perotti approach

For Saudi Arabia, after we checked the property of time series and lag of the VAR model, we start by the reduced-form of Model (1) as explained in chapter four. We run the following model:

$$Y_t = \Gamma_1 Y_{t-1} + \cdots + \Gamma_p Y_{t-p} + u_t \qquad (4.7) \text{ ; where, } Y_t \equiv (GR_t, GE_t, GDP_t)'$$

Notice that the optimal lag is 3 and all GDP, GE and GR are used in their first difference forms. The time trend t is included along with the constant intercept. The reduced-form VAR result can be found in Appendix A. In addition, Table 7 shows the result of our structural VAR model as model (1).

Stability of the reduced-form VAR model: I claim that the reduced-form VAR model is stable because all roots have a modulus less than one and lie inside of the unit circle as in Figure 10.

After we obtained the reduced-form residuals, we can obtain the structural shocks, and then be able to find the impulse response and variance decomposition. To do so, the following form must be identified:

$$\begin{bmatrix} 1 & 0 & -a_{13} \\ 0 & 1 & -a_{23} \\ -a_{31} & -a_{32} & 1 \end{bmatrix} \begin{bmatrix} u_{gr,t} \\ u_{ge,t} \\ u_{gdp,t} \end{bmatrix} = \begin{bmatrix} b_{11} & b_{12} & 0 \\ b_{21} & b_{22} & 0 \\ 0 & 0 & b_{33} \end{bmatrix} \begin{bmatrix} e_t^{gr} \\ e_t^{ge} \\ e_t^{gdp} \end{bmatrix} \qquad (4.8)$$

Three restrictions should be imposed for the model to be identified. We obtain $\boldsymbol{a_{13}}$ by regressing log (GR) on c and log (GDP), and $a_{13} = -0.85$. We set $a_{23} = 0$ and $b_{21} = 0$. The latter means that government spending decisions come before government revenue.

Impulse Response Function: The Impulse Response Function (IRF) examines the response of macroeconomic variables to the fiscal shocks of GR and GE. In the case of Saudi Arabia, we focus more on the government spending multiplier since the tax receipts are low (Joharji, 2009). Figure 11 depicts the responses of macroeconomic variables within 20 periods (or 5 years). It is obvious that the response of output (GDP) to the tax shock, on impact, dropped by 0.27% and its response was negative and significant for the first eight periods; then it has been insignificant and dies out for the rest periods. The GDP response to the spending shock, on the other hand, is positive and significant for the first three periods and dies out afterward. The fiscal multiplier, in general, is defined as the peak response of output across at least five years after the shock took place; and in the same vein, the government revenue multiplier (or the tax multiplier) is the peak response of the GDP to the government taxes shock. Indeed, the tax multiplier was -0.27% in the first quarter, and the spending multiplier was 0.56% in the second quarter. This result is consistent with common wisdom as Keynes claimed. An increase in government spending shock, as in figure 11, increases the output (GDP) by 0.5% and was positive and significant for 3 periods, then days out, which is also consistent with classical Keynesian view.

Variance Decomposition (VD): Researchers usually use variance decomposition (VD) to relate the variation on macroeconomic variables to the underlying shocks. In VAR, it is important to check the VD to characterize the variation of variables included. Table 8 shows the movement in the output (GDP) and how it is related to the shocks. We notice that, for the first 5 periods, 70-75% of the variation in GDP is related to GE, the government spending shocks. It indicates that the Saudi government should focuses more on government spending polices and reforms to get the optimal policy and eventually high growth, especially as the Saudi economy is known to be an oil-based economy. VDs of other variables can be found in Appendix A.

Model (2): Extended 4-VAR model

<u>Adding private consumption</u>: It is extended to model (1) only by adding a component of GDP and determines what the effect of the fiscal shocks is on the chosen component. Below is the SVAR we need to eventually obtain.

$$\begin{bmatrix} 1 & 0 & -a_{13} & 0 \\ 0 & 1 & -a_{23} & 0 \\ -a_{31} & -a_{32} & 1 & 0 \\ -a_{41} & -a_{42} & 0 & 1 \end{bmatrix} \begin{bmatrix} u_{gr,t} \\ u_{ge,t} \\ u_{gdp,t} \\ u_{con,t} \end{bmatrix} = \begin{bmatrix} b_{11} & b_{12} & 0 & 0 \\ b_{21} & b_{22} & 0 & 0 \\ 0 & 0 & b_{33} & 0 \\ 0 & 0 & 0 & b_{44} \end{bmatrix} \begin{bmatrix} e_t^{gr} \\ e_t^{ge} \\ e_t^{gdp} \\ e_t^{con} \end{bmatrix} \quad (4.9)$$

After estimating the reduced-form VAR, we have $a_{13} = 0.80, a_{23} = 0 \; and \; b_{21} = 0$

The four variable added is log(cons), which is the log of real, per capita private consumption, and it is found to be stationary after first-differenced at 5%. Using the sequential likelihood ratio test by Lükepohl (1991), the optimal lag is 3, and the results of the reduced-form VAR of 4 variables are the following:

Vector Autoregression Estimates
Date: 09/03/13 Time: 21:21
Sample (adjusted): 1994Q1 2011Q4
Included observations: 72 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	LGR_1	LGE_1	LGDP_1	LCONSS_1
LGR_1(-1)	0.399836	-0.936982	0.741980	1.101666
	(0.80636)	(0.82496)	(0.37765)	(0.97917)
	[0.49586]	[-1.13579]	[1.96474]	[1.12510]
LGR_1(-2)	1.031766	1.443820	-0.990978	-1.367777
	(1.35454)	(1.38579)	(0.63438)	(1.64484)
	[0.76171]	[1.04188]	[-1.56211]	[-0.83156]
LGR_1(-3)	-1.042008	-0.762506	0.833431	0.644133
	(0.84367)	(0.86314)	(0.39513)	(1.02449)
	[-1.23509]	[-0.88341]	[2.10928]	[0.62874]
LGE_1(-1)	0.201649	1.540093	-0.496544	-0.816696
	(0.79872)	(0.81715)	(0.37407)	(0.96990)
	[0.25247]	[1.88472]	[-1.32740]	[-0.84204]
LGE_1(-2)	-0.834603	-1.205570	0.762161	1.439582
	(1.35172)	(1.38291)	(0.63306)	(1.64142)
	[-0.61744]	[-0.87176]	[1.20392]	[0.87703]
LGE_1(-3)	0.494223	0.201055	-0.783459	-0.570790
	(0.82962)	(0.84877)	(0.38855)	(1.00743)
	[0.59572]	[0.23688]	[-2.01639]	[-0.56658]
LGDP_1(-1)	-0.272227	-0.330925	0.230943	-0.247727
	(0.26716)	(0.27333)	(0.12512)	(0.32442)
	[-1.01896]	[-1.21073]	[1.84573]	[-0.76360]
LGDP_1(-2)	-0.103336	-0.117965	-0.221343	-0.852274
	(0.25999)	(0.26599)	(0.12176)	(0.31571)
	[-0.39747]	[-0.44350]	[-1.81783]	[-2.69957]
LGDP_1(-3)	-0.269405	-0.271893	-0.035337	-0.852407
	(0.24217)	(0.24776)	(0.11342)	(0.29407)

	[-1.11247]	[-1.09742]	[-0.31157]	[-2.89866]
LCONSS(-1)	-0.361241	-0.368624	-0.091911	0.311854
	(0.10035)	(0.10267)	(0.04700)	(0.12186)
	[-3.59966]	[-3.59040]	[-1.95557]	[2.55907]
LCONSS(-2)	0.231853	0.236236	0.154607	0.174380
	(0.11923)	(0.12198)	(0.05584)	(0.14478)
	[1.94464]	[1.93672]	[2.76882]	[1.20445]
LCONSS(-3)	-0.089310	-0.061187	-0.088346	0.248162
	(0.09736)	(0.09960)	(0.04560)	(0.11822)
	[-0.91734]	[-0.61430]	[-1.93757]	[2.09910]
C	2.013277	1.783958	0.237317	2.468020
	(0.70442)	(0.72067)	(0.32991)	(0.85539)
	[2.85807]	[2.47541]	[0.71935]	[2.88526]
T	0.002277	0.002092	0.000578	0.003271
	(0.00060)	(0.00062)	(0.00028)	(0.00073)
	[3.78153]	[3.39492]	[2.05095]	[4.47350]
D97	-0.045086	-0.043568	-0.015589	-0.100275
	(0.01917)	(0.01962)	(0.00898)	(0.02328)
	[-2.35139]	[-2.22099]	[-1.73600]	[-4.30670]
D08	-0.034946	-0.030357	-0.004122	-0.041127
	(0.01489)	(0.01523)	(0.00697)	(0.01808)
	[-2.34754]	[-1.99327]	[-0.59129]	[-2.27512]
R-squared	0.653243	0.603311	0.574742	0.922531
Adj. R-squared	0.560362	0.497055	0.460834	0.901781
Sum sq. resids	0.051733	0.054148	0.011347	0.076285
S.E. equation	0.030394	0.031096	0.014235	0.036908
F-statistic	7.033098	5.677901	5.045651	44.45817
Log likelihood	158.4158	156.7735	213.0323	144.4345
Akaike AIC	-3.955996	-3.910375	-5.473119	-3.567626
Schwarz SC	-3.450070	-3.404449	-4.967194	-3.061700
Mean dependent	0.007962	0.008723	0.007236	9.382700
S.D. dependent	0.045840	0.043847	0.019386	0.117768

Determinant resid covariance (dof adj.)	4.33E-15
Determinant resid covariance	1.58E-15
Log likelihood	818.1648
Akaike information criterion	-20.94902
Schwarz criterion	-18.92532

Structural VAR Estimates
Date: 09/03/13 Time: 21:21
Sample (adjusted): 1994Q1 2011Q4
Included observations: 72 after adjustments
Estimation method: method of scoring (analytic derivatives)
Convergence achieved after 6 iterations
Structural VAR is over-identified (1 degrees of freedom)

Model: Ae = Bu where E[uu']=I
Restriction Type: short-run pattern matrix
A =

1	0	-1.29	0
0	1	0	0
C(1)	C(3)	1	0

	C(2)	C(4)	0	1
B =				
	C(5)	C(6)	0	0
	0	C(7)	0	0
	0	0	C(8)	0
	0	0	0	C(9)

	Coefficient	Std. Error	z-Statistic	Prob.
C(1)	17.56011	12.76207	1.375960	0.1688
C(2)	-1.204902	0.829447	-1.452656	0.1463
C(3)	-17.02849	12.33159	-1.380884	0.1673
C(4)	0.645116	0.810742	0.795711	0.4262
C(5)	0.018357	0.001530	12.00000	0.0000
C(6)	0.027374	0.003144	8.707019	0.0000
C(7)	0.031096	0.002591	12.00000	0.0000
C(8)	0.084046	0.058917	1.426515	0.1537
C(9)	0.032721	0.002727	12.00000	0.0000
Log likelihood	781.3637			
LR test for over-identification:				
Chi-square(1)	1.223632		Probability	0.2686

Estimated A matrix:			
1.000000	0.000000	-1.290000	0.000000
0.000000	1.000000	0.000000	0.000000
17.56011	-17.02849	1.000000	0.000000
-1.204902	0.645116	0.000000	1.000000
Estimated B matrix:			
0.018357	0.027374	0.000000	0.000000
0.000000	0.031096	0.000000	0.000000
0.000000	0.000000	0.084046	0.000000
0.000000	0.000000	0.000000	0.032721

Impulse Response Function: Figure 12 shows the impulse response functions in this model, where private consumption is added. It is clear that the response of private consumption is positive and significant for both government spending and government revenue shocks for early periods. This is consistent with the Keynesian wisdom. It is not surprising that the impulse of private consumption to government revenue is positive since taxes are a low portion of revenue, where oil receipts are considered to be almost 90% of the government revenue. There is a negative effect of private consumption on output (GDP), but it is small and insignificant.

Variance Decomposition (VD): VD can demonstrate the variation of the variables and their relationship to the underlying shocks. Table 9 shows the only variance decomposition of the

GDP, and we notice that indeed the government revenue shock takes the most percentage of variability to the GDP. VDs of other variables can be found in Appendix A.

Adding Private investment: After the linv (the log of real private investment, per capita) has been examined, it is stationary at 5% significant level and the p-value was 0.0085. We then ran the reduced-form to get the residual shocks to be used for the structural shocks.

Impulse Response Function: Figure 13 shows the impulse response functions in this model, where private investment is added. It is clear that the response of private consumption is negative and significant for government spending shock for the first four periods. The private investment response to the government spending shock declined, on impact, by 0.1%, and its multiplier is 0.6% at quarter 4. Hence, it can be reconciled with the neo-classical models (i.e., crowding out).

Variance Decomposition (VD): VD can demonstrate the variation of the variables and their relationship to the underlying shocks. Table 10 shows the only variance decomposition of the GDP, and we notice the government spending shock takes the most percentage of variability to the GDP with percentages within 20-25% for investment shocks. VDs of other variables can be found in Appendix A.

Adding Exports: When we checked the unit root test of the variable lexpo (log of real, per capita exports), we found the p-value equals 0.0716. Thus, we reject the null hypothesis $\boldsymbol{H_o}$, which means the variable is not stationary at level, although it is stationary after we take first-difference.

Preparing for the reduced-form VAR model, the lag order is four. Along with the three variables in Model (1), we add exports this time. The results of the reduced-form are the following:

Vector Autoregression Estimates
Date: 09/04/13 Time: 10:42
Sample (adjusted): 1994Q4 2011Q4
Included observations: 69 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	LGR_1	LGE_1	LGDP_1	LEXPO_1
LGR_1(-1)	0.681672	-0.844619	0.872258	-0.654405
	(0.96274)	(0.96583)	(0.42651)	(2.42953)
	[0.70805]	[-0.87450]	[2.04509]	[-0.26935]
LGR_1(-2)	-1.146942	-0.741898	-0.734481	1.181226
	(1.77635)	(1.78205)	(0.78696)	(4.48272)
	[-0.64567]	[-0.41632]	[-0.93331]	[0.26351]
LGR_1(-3)	1.798055	2.568385	-0.357221	-5.506793
	(1.78528)	(1.79102)	(0.79092)	(4.50527)
	[1.00715]	[1.43404]	[-0.45165]	[-1.22230]
LGR_1(-4)	-0.969552	-1.457807	0.767357	1.939822
	(1.76427)	(1.76994)	(0.78161)	(4.45225)
	[-0.54955]	[-0.82365]	[0.98176]	[0.43569]
LGR_1(-5)	-1.384494	-1.337145	0.116697	3.920603
	(1.87698)	(1.88300)	(0.83154)	(4.73666)
	[-0.73762]	[-0.71011]	[0.14034]	[0.82771]
LGR_1(-6)	0.875516	0.907115	-0.385990	-4.903065
	(1.25917)	(1.26321)	(0.55784)	(3.17760)
	[0.69531]	[0.71810]	[-0.69194]	[-1.54301]
LGE_1(-1)	-0.579792	0.929461	-0.721797	1.198402
	(0.94948)	(0.95253)	(0.42064)	(2.39607)
	[-0.61064]	[0.97578]	[-1.71595]	[0.50015]
LGE_1(-2)	1.472876	1.119987	0.598694	-2.879399
	(1.74419)	(1.74978)	(0.77271)	(4.40156)
	[0.84445]	[0.64007]	[0.77480]	[-0.65418]
LGE_1(-3)	-2.238574	-3.001317	0.259381	6.513758
	(1.74094)	(1.74653)	(0.77127)	(4.39336)
	[-1.28584]	[-1.71845]	[0.33630]	[1.48264]
LGE_1(-4)	0.572184	1.043724	-0.771169	-1.848262
	(1.75843)	(1.76407)	(0.77902)	(4.43750)
	[0.32540]	[0.59166]	[-0.98992]	[-0.41651]
LGE_1(-5)	1.595448	1.518924	-0.080912	-4.557238
	(1.86266)	(1.86864)	(0.82520)	(4.70053)
	[0.85654]	[0.81285]	[-0.09805]	[-0.96952]
LGE_1(-6)	-1.026650	-1.035536	0.325388	4.764880
	(1.20285)	(1.20671)	(0.53289)	(3.03546)
	[-0.85352]	[-0.85815]	[0.61062]	[1.56974]
LGDP_1(-1)	0.073251	0.058964	-0.001667	0.933910
	(0.36942)	(0.37061)	(0.16366)	(0.93226)
	[0.19828]	[0.15910]	[-0.01019]	[1.00177]
LGDP_1(-2)	0.350756	0.286098	-0.160178	1.023217

	(0.38331)	(0.38454)	(0.16981)	(0.96730)
	[0.91508]	[0.74400]	[-0.94326]	[1.05781]
LGDP_1(-3)	0.330148	0.373912	0.055455	1.184605
	(0.34896)	(0.35008)	(0.15459)	(0.88061)
	[0.94610]	[1.06809]	[0.35871]	[1.34521]
LGDP_1(-4)	0.925226	0.894764	0.184341	-0.320466
	(0.34998)	(0.35110)	(0.15505)	(0.88319)
	[2.64367]	[2.54845]	[1.18893]	[-0.36285]
LGDP_1(-5)	-0.444082	-0.458067	0.031781	1.860111
	(0.36013)	(0.36129)	(0.15955)	(0.90882)
	[-1.23310]	[-1.26786]	[0.19919]	[2.04673]
LGDP_1(-6)	0.142394	0.154473	0.203118	0.698439
	(0.35040)	(0.35153)	(0.15523)	(0.88426)
	[0.40637]	[0.43944]	[1.30846]	[0.78986]
LEXPO_1(-1)	-0.155803	-0.160532	-0.069078	0.244303
	(0.06945)	(0.06967)	(0.03077)	(0.17526)
	[-2.24339]	[-2.30408]	[-2.24513]	[1.39394]
LEXPO_1(-2)	-0.025947	-0.017480	-0.045864	-0.005661
	(0.07017)	(0.07040)	(0.03109)	(0.17709)
	[-0.36976]	[-0.24830]	[-1.47531]	[-0.03197]
LEXPO_1(-3)	0.105940	0.100916	-0.054793	-0.529574
	(0.07442)	(0.07466)	(0.03297)	(0.18780)
	[1.42354]	[1.35170]	[-1.66194]	[-2.81983]
LEXPO_1(-4)	-0.022381	-0.014809	-0.042986	-0.033531
	(0.07055)	(0.07078)	(0.03126)	(0.17804)
	[-0.31724]	[-0.20924]	[-1.37534]	[-0.18834]
LEXPO_1(-5)	0.130111	0.117432	-0.022268	0.015019
	(0.06178)	(0.06198)	(0.02737)	(0.15590)
	[2.10609]	[1.89478]	[-0.81363]	[0.09634]
LEXPO_1(-6)	0.017003	0.006838	-0.025909	-0.117108
	(0.06255)	(0.06275)	(0.02771)	(0.15785)
	[0.27182]	[0.10897]	[-0.93496]	[-0.74188]
C	-0.009315	-0.007567	0.005776	-0.007465
	(0.01292)	(0.01297)	(0.00573)	(0.03261)
	[-0.72077]	[-0.58365]	[1.00883]	[-0.22889]
T	7.75E-05	3.38E-05	0.000288	-0.001985
	(0.00055)	(0.00055)	(0.00024)	(0.00139)
	[0.14017]	[0.06089]	[1.17456]	[-1.42313]
D97	0.013867	0.013929	-0.010672	0.083850
	(0.02592)	(0.02600)	(0.01148)	(0.06541)
	[0.53500]	[0.53565]	[-0.92931]	[1.28189]
D08	-0.020790	-0.017470	-0.005138	-0.019942
	(0.01987)	(0.01994)	(0.00880)	(0.05015)
	[-1.04621]	[-0.87633]	[-0.58367]	[-0.39767]
R-squared	0.724193	0.695104	0.694469	0.648633
Adj. R-squared	0.542564	0.494319	0.493266	0.417245
Sum sq. resids	0.041017	0.041281	0.008050	0.261210

S.E. equation	0.031629	0.031731	0.014012	0.079818
F-statistic	3.987215	3.461926	3.451584	2.803227
Log likelihood	158.3551	158.1340	214.5306	94.48381
Akaike AIC	-3.778408	-3.771999	-5.406685	-1.927067
Schwarz SC	-2.871814	-2.865405	-4.500091	-1.020473
Mean dependent	0.008079	0.009357	0.007154	0.006188
S.D. dependent	0.046765	0.044621	0.019684	0.104559

Determinant resid covariance (dof adj.)	2.41E-14
Determinant resid covariance	3.01E-15
Log likelihood	761.9461
Akaike information criterion	-18.83902
Schwarz criterion	-15.21264

Impulse Response Function: The impulse response functions in the above model are shown in Figure 14. For the exports, the revenue multiplier and the spending multiplier were negative for the first three periods, and then volatile with different patterns. The negative result here is common in economic research literature.

Variance Decomposition (VD): VD can demonstrate the variation of the variables and their relationship to the underlying shocks. Table 11 shows the only variance decomposition of the GDP, and we see the government spending shock takes the most percentage of variability to the GDP.

Adding Imports: It is obvious that the variable limp (log of real, per capita imports) is stationary at 1% significance level. The p-value was 0.0060; thus, we fail to reject the null hypothesis $\boldsymbol{H_o}$, which means that there is no unit root.

Now we form a VAR system of four variables, adding the limp variable to the GDP, GE and GR variables. The results of the reduced-form of the 4-VAR model are as follows:

Vector Autoregression Estimates
Date: 09/19/13 Time: 12:48
Sample (adjusted): 1994Q1 2011Q4
Included observations: 72 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	LGR_1	LGE_1	LGDP_1	LIMP
LGR_1(-1)	0.588768	-0.780633	0.612215	-0.011514
	(0.85268)	(0.85777)	(0.35972)	(2.03988)
	[0.69049]	[-0.91007]	[1.70192]	[-0.00564]
LGR_1(-2)	0.575923	0.988168	-0.679822	-1.670099

	(1.45788)	(1.46658)	(0.61503)	(3.48769)
	[0.39504]	[0.67379]	[-1.10534]	[-0.47886]
LGR_1(-3)	-0.886583	-0.585119	0.575427	-0.438407
	(0.92082)	(0.92632)	(0.38847)	(2.20289)
	[-0.96282]	[-0.63166]	[1.48128]	[-0.19901]
LGE_1(-1)	-0.192528	1.162749	-0.433130	0.630584
	(0.85008)	(0.85515)	(0.35862)	(2.03364)
	[-0.22648]	[1.35970]	[-1.20777]	[0.31008]
LGE_1(-2)	-0.176807	-0.561018	0.615084	0.155512
	(1.44157)	(1.45018)	(0.60815)	(3.44869)
	[-0.12265]	[-0.38686]	[1.01140]	[0.04509]
LGE_1(-3)	0.163215	-0.138592	-0.633765	1.542167
	(0.89584)	(0.90119)	(0.37793)	(2.14314)
	[0.18219]	[-0.15379]	[-1.67694]	[0.71958]
LGDP_1(-1)	-0.320439	-0.325655	-0.022452	1.076702
	(0.31285)	(0.31472)	(0.13198)	(0.74844)
	[-1.02425]	[-1.03474]	[-0.17011]	[1.43860]
LGDP_1(-2)	0.104370	0.111894	-0.245047	1.159243
	(0.29898)	(0.30076)	(0.12613)	(0.71525)
	[0.34909]	[0.37203]	[-1.94281]	[1.62075]
LGDP_1(-3)	0.068880	0.104066	-0.063821	0.518636
	(0.27022)	(0.27183)	(0.11400)	(0.64645)
	[0.25490]	[0.38283]	[-0.55985]	[0.80229]
LIMP(-1)	-0.122629	-0.121751	-0.063804	1.133227
	(0.05285)	(0.05317)	(0.02230)	(0.12644)
	[-2.32030]	[-2.29001]	[-2.86169]	[8.96292]
LIMP(-2)	0.199566	0.210202	0.043114	-0.478366
	(0.07155)	(0.07198)	(0.03019)	(0.17117)
	[2.78915]	[2.92037]	[1.42832]	[-2.79466]
LIMP(-3)	-0.084982	-0.083805	-0.042529	0.134834
	(0.05272)	(0.05304)	(0.02224)	(0.12612)
	[-1.61194]	[-1.58018]	[-1.91218]	[1.06907]
C	0.068540	-0.038199	0.535282	1.759861
	(0.37156)	(0.37377)	(0.15675)	(0.88888)
	[0.18447]	[-0.10220]	[3.41492]	[1.97987]
T	0.000839	0.000705	0.000677	-0.000507
	(0.00051)	(0.00051)	(0.00021)	(0.00121)
	[1.66135]	[1.38660]	[3.17771]	[-0.41931]
D97	-0.023902	-0.020415	-0.017092	0.043646
	(0.01981)	(0.01993)	(0.00836)	(0.04739)
	[-1.20663]	[-1.02451]	[-2.04527]	[0.92102]
D08	-0.029352	-0.024565	-0.002157	0.018299
	(0.01574)	(0.01583)	(0.00664)	(0.03765)
	[-1.86489]	[-1.55148]	[-0.32486]	[0.48601]
R-squared	0.606168	0.564393	0.608103	0.824167
Adj. R-squared	0.500677	0.447713	0.503131	0.777068
Sum sq. resids	0.058757	0.059460	0.010457	0.336273

S.E. equation	0.032392	0.032585	0.013665	0.077491
F-statistic	5.746165	4.837092	5.792978	17.49888
Log likelihood	153.8330	153.4044	215.9734	91.03033
Akaike AIC	-3.828694	-3.816789	-5.554816	-2.084176
Schwarz SC	-3.322768	-3.310863	-5.048890	-1.578250
Mean dependent	0.007962	0.008723	0.007236	8.541467
S.D. dependent	0.045840	0.043847	0.019386	0.164122
Determinant resid covariance (dof adj.)	2.58E-14			
Determinant resid covariance	9.45E-15			
Log likelihood	753.8933			
Akaike information criterion	-19.16370			
Schwarz criterion	-17.14000			

Impulse Response Function: I add the limp (log of real, per capita imports) to the 3-VAR model to gauge how the shocks affect imports. The response of the imports was volatile and statistically insignificant for all periods. The results are not reliable (See Figure 15).

Model (3): Extended 5-VAR model

I extend Model (1) by adding the interest rate (i_t) and inflation (π_t) variables. It is important to include them to account for volatility on prices and because government revenue and government expenditures might be influenced by nominal factors. The endogenous variables become as follows: $Y_t \equiv (GR_t, GE_t, GDP_t, \pi_t, i_t)'$ as a 5-dimintional vector

Primarily, we follow Blanchard and Perotti's (2002) identification with accounting for impact of inflation and interest rate variables. Thus, inflation rate π and interest rate i will be included in the model, and after estimating the reduced-form VAR, residuals $u_t \equiv \left(u_{gr,t}, u_{ge,t}, u_{gdp,t}, u_{\pi,t} u_{i,t}\right)'$ can be obtained and expressed as linear combinations of structural shocks $e_t \equiv \left(e_t^{gr}, e_t^{ge}, e_t^{gdp}, e_t^{\pi} e_t^{i}\right)'$ as follow

$$u_{gr,t} = a_{13}\, u_{gdp,t} + + a_{14}\, u_{\pi,t} + b_{15}\, u_{i,t} + b_{12}\, e_t^{ge} + e_t^{gr} \qquad (5.1)$$

$$u_{gr,t} = a_{23}\, u_{gdp,t} + + a_{24}\, u_{\pi,t} + b_{25}\, u_{i,t} + b_{21}\, e_t^{gr} + e_t^{ge} \qquad (5.2)$$

$$u_{gdp,t} = a_{31}\, u_{gr,t} + a_{32}\, u_{ge,t} + e_t^{gdp} \qquad (5.3)$$

$$u_{\pi,t} = a_{41}\, u_{gr,t} + + a_{42}\, u_{ge,t} + b_{43}\, u_{gdp,t} + e_t^{\pi} \qquad (5.4)$$

$$u_{i,t} = a_{51}\, u_{gr,t} + + a_{52}\, u_{ge,t} + b_{53}\, u_{gdp,t} + a_{24}\, u_{\pi,t} + e_t^{\pi} \qquad (5.6)$$

Equations (5.1) – (5.6), as usual, can be presented by the following matrix form:

$$\begin{bmatrix} 1 & 0 & -a_{13} & -a_{14} & -a_{15} \\ 0 & 1 & -a_{23} & -a_{24} & -a_{25} \\ -a_{31} & -a_{32} & 1 & 0 & 0 \\ -a_{41} & -a_{42} & -a_{43} & 1 & 0 \\ -a_{51} & -a_{52} & -a_{53} & -a_{53} & 1 \end{bmatrix} \begin{bmatrix} u_{gr,t} \\ u_{ge,t} \\ u_{gdp,t} \\ u_{\pi,t} \\ u_{i,t} \end{bmatrix} = \begin{bmatrix} b_{11} & b_{12} & 0 & 0 & 0 \\ b_{21} & b_{22} & 0 & 0 & 0 \\ 0 & 0 & b_{33} & 0 & 0 \\ 0 & 0 & 0 & b_{44} & 0 \\ 0 & 0 & 0 & 0 & b_{55} \end{bmatrix} \begin{bmatrix} e_t^{gr} \\ e_t^{ge} \\ e_t^{gdp} \\ e_t^{\pi} \\ e_t^{i} \end{bmatrix} \quad (5.7)$$

To identify the above system, additional restrictions need to be imposed. The variance-covariance $\sum_u$ contains 15 free elements (i.e., 15 independent equations) and 50 unknown elements in matrices $A \; and \; B$ along with a diagonal matrix of standard deviations of the structural shocks e_t . That leads to 35 needed restrictions. Recall that in Blanchard and Perotti (2002) and Perotti (2004), the reduced-form of fiscal variables $(u_{gr,t}, u_{ge,t})$ are linear combinations of (1) the automatic response of fiscal variables to shocks in GDP, inflation rate, and interest rate; (2) systemic discretionary responses of fiscal policy by policymakers to innovations in macroeconomic variables in the model; and (3) random discretionary shocks.

From the AB model in (5.7) elasticities of fiscal variables (i.e., government revenue and government expenditure) to GDP, inflation rate and interest rates will be estimated. Indeed, they are $a_{13}, a_{14}, a_{15}, a_{23,} a_{24} \; and \; a_{25}$ (i.e., 6 elements in matrix A). One restriction could be added as $b_{12} = 0$ if government expenditure comes first, or $b_{21} = 0$ if government revenue comes first. With these 7 restrictions and 28 restrictions on 0's and 1's, the system is just identified.

Here is the VAR reduced-form of the above model:

Vector Autoregression Estimates
Date: 10/31/13 Time: 22:20
Sample (adjusted): 1994Q3 2011Q4
Included observations: 70 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	LGR_1	LGE_1	LGDP_1	LP_1	I_1
LGR_1(-1)	3.471039	-0.527679	0.841012	-1.837857	33.37554
	(0.89659)	(0.18615)	(0.19517)	(0.93215)	(24.1648)

	[3.87139]	[-2.83476]	[4.30905]	[-1.97163]	[1.38117]
LGR_1(-2)	0.972615	-0.249390	0.214514	1.012919	-6.484039
	(0.92535)	(0.19212)	(0.20144)	(0.96206)	(24.9401)
	[1.05107]	[-1.29811]	[1.06493]	[1.05286]	[-0.25998]
LGR_1(-3)	0.761548	-0.144555	0.125932	-2.203488	25.89828
	(0.90692)	(0.18829)	(0.19742)	(0.94290)	(24.4433)
	[0.83971]	[-0.76772]	[0.63788]	[-2.33693]	[1.05952]
LGR_1(-4)	-2.605355	0.422907	-0.679224	3.206772	-10.30248
	(0.89614)	(0.18605)	(0.19508)	(0.93169)	(24.1527)
	[-2.90731]	[2.27305]	[-3.48184]	[3.44190]	[-0.42656]
LGR_1(-5)	-1.720815	0.231340	-0.449769	-0.345764	-13.41713
	(0.83474)	(0.17330)	(0.18171)	(0.86785)	(22.4977)
	[-2.06151]	[1.33488]	[-2.47521]	[-0.39842]	[-0.59638]
LGE_1(-1)	6.100239	-0.343523	1.791362	-5.204581	122.0161
	(2.67281)	(0.55492)	(0.58183)	(2.77883)	(72.0374)
	[2.28233]	[-0.61905]	[3.07884]	[-1.87294]	[1.69379]
LGE_1(-2)	6.085992	-1.293991	1.414509	2.811982	-25.98082
	(3.17574)	(0.65933)	(0.69131)	(3.30171)	(85.5923)
	[1.91640]	[-1.96258]	[2.04613]	[0.85167]	[-0.30354]
LGE_1(-3)	0.433322	0.063974	0.111499	-6.605945	95.73183
	(3.09087)	(0.64171)	(0.67284)	(3.21348)	(83.3049)
	[0.14019]	[0.09969]	[0.16572]	[-2.05570]	[1.14917]
LGE_1(-4)	-3.960848	0.405608	-1.191638	10.49506	-85.27366
	(3.02861)	(0.62879)	(0.65928)	(3.14875)	(81.6270)
	[-1.30781]	[0.64506]	[-1.80747]	[3.33308]	[-1.04467]
LGE_1(-5)	-6.271803	1.048867	-1.509900	-2.374351	-52.10798
	(2.56348)	(0.53222)	(0.55803)	(2.66517)	(69.0907)
	[-2.44660]	[1.97075]	[-2.70576]	[-0.89088]	[-0.75420]
LGDP_1(-1)	-9.729409	1.927354	-2.226191	4.263469	-43.11684
	(2.16608)	(0.44971)	(0.47152)	(2.25201)	(58.3801)
	[-4.49171]	[4.28575]	[-4.72127]	[1.89319]	[-0.73855]
LGDP_1(-2)	-0.344281	0.254943	0.012926	-1.372309	13.25180
	(2.08944)	(0.43380)	(0.45484)	(2.17232)	(56.3144)
	[-0.16477]	[0.58770]	[0.02842]	[-0.63172]	[0.23532]
LGDP_1(-3)	-2.010243	0.551289	-0.189288	3.201199	-41.26580
	(2.04432)	(0.42443)	(0.44502)	(2.12542)	(55.0985)
	[-0.98333]	[1.29888]	[-0.42535]	[1.50615]	[-0.74895]
LGDP_1(-4)	6.134422	-1.066839	1.636099	-4.746433	-17.36199
	(2.02100)	(0.41959)	(0.43994)	(2.10117)	(54.4700)
	[3.03534]	[-2.54256]	[3.71889]	[-2.25895]	[-0.31874]
LGDP_1(-5)	3.444370	-0.369536	1.003970	-0.972555	10.02729
	(1.85961)	(0.38608)	(0.40481)	(1.93337)	(50.1201)
	[1.85220]	[-0.95714]	[2.48011]	[-0.50304]	[0.20007]
LP_1(-1)	0.346135	-0.036662	0.070501	0.196387	-0.135096
	(0.14289)	(0.02967)	(0.03110)	(0.14855)	(3.85106)
	[2.42246]	[-1.23586]	[2.26661]	[1.32199]	[-0.03508]

LP_1(-2)	0.312027	-0.047612	0.077464	0.272992	-3.163487
	(0.16530)	(0.03432)	(0.03598)	(0.17185)	(4.45506)
	[1.88768]	[-1.38736]	[2.15282]	[1.58852]	[-0.71009]
LP_1(-3)	-0.197835	0.056812	-0.035442	-0.018571	-4.179216
	(0.16646)	(0.03456)	(0.03623)	(0.17306)	(4.48629)
	[-1.18852]	[1.64393]	[-0.97812]	[-0.10731]	[-0.93155]
LP_1(-4)	-0.603524	0.113278	-0.127282	0.266417	-6.158255
	(0.15444)	(0.03206)	(0.03362)	(0.16056)	(4.16241)
	[-3.90786]	[3.53289]	[-3.78602]	[1.65925]	[-1.47949]
LP_1(-5)	-0.215986	0.030793	-0.046275	-0.006470	-1.273264
	(0.15566)	(0.03232)	(0.03388)	(0.16183)	(4.19525)
	[-1.38758]	[0.95285]	[-1.36568]	[-0.03998]	[-0.30350]
I_1(-1)	-0.010418	0.002017	-0.002856	0.004609	0.352199
	(0.00548)	(0.00114)	(0.00119)	(0.00570)	(0.14773)
	[-1.90063]	[1.77207]	[-2.39402]	[0.80886]	[2.38410]
I_1(-2)	-0.004243	0.000474	-0.000463	0.010718	-0.059182
	(0.00583)	(0.00121)	(0.00127)	(0.00606)	(0.15721)
	[-0.72747]	[0.39127]	[-0.36461]	[1.76738]	[-0.37646]
I_1(-3)	-0.009557	0.001700	-0.001973	-0.005212	0.063015
	(0.00631)	(0.00131)	(0.00137)	(0.00656)	(0.16999)
	[-1.51531]	[1.29863]	[-1.43695]	[-0.79492]	[0.37070]
I_1(-4)	-0.010015	0.001613	-0.002097	0.006308	0.115775
	(0.00643)	(0.00134)	(0.00140)	(0.00669)	(0.17340)
	[-1.55667]	[1.20721]	[-1.49761]	[0.94306]	[0.66767]
I_1(-5)	0.013930	-0.002769	0.003212	-0.004798	0.269767
	(0.00659)	(0.00137)	(0.00143)	(0.00685)	(0.17750)
	[2.11518]	[-2.02507]	[2.24033]	[-0.70080]	[1.51982]
C	0.001216	-0.001660	8.45E-05	-0.000363	0.086337
	(0.00660)	(0.00137)	(0.00144)	(0.00686)	(0.17778)
	[0.18435]	[-1.21223]	[0.05888]	[-0.05294]	[0.48564]
R-squared	0.780736	0.818710	0.809998	0.499148	0.557197
Adj. R-squared	0.656155	0.715704	0.702043	0.214573	0.305604
Sum sq. resids	0.008855	0.000382	0.000420	0.009571	6.432220
S.E. equation	0.014186	0.002945	0.003088	0.014749	0.382344
F-statistic	6.266871	7.948193	7.503071	1.754010	2.214679
Log likelihood	214.8094	324.8540	321.5387	212.0862	-15.77455
Akaike AIC	-5.394553	-8.538685	-8.443964	-5.316750	1.193559
Schwarz SC	-4.559398	-7.703530	-7.608809	-4.481594	2.028714
Mean dependent	-0.002165	-0.003616	-0.002347	0.003440	-0.056571
S.D. dependent	0.024193	0.005524	0.005657	0.016642	0.458829

Determinant resid covariance (dof adj.)	3.61E-21
Determinant resid covariance	3.54E-22
Log likelihood	1232.117
Akaike information criterion	-31.48906
Schwarz criterion	-27.31328

Impulse Response Function: Figure 16 shows the impulse response functions in this model, where inflation and interest rate have been added. The response of interest rate to government revenue shock was positive in the first three periods with a multiplier of 3%. In the same vein, its response to government spending was positive but higher with a multiplier of 6% in quarter 4. In addition, the inflation rate's response to government revenue and spending was positive.

Variance Decomposition (VD): VD can demonstrate the variation of the variables and their relationship to the underlying shocks. Table 12 shows the only variance decomposition of the GDP, and we notice, after inflation and interest rates are added, the percentage of government spending and receipts declines to around 50-60%.

CHAPTER 6

VALIDATION

In view of the special character of the Saudi Economy, it is needed to try to apply the model to economies which have “standard” structures but also has economy similar to Saudi Arabia. We apply similar analysis used in chapter five to countries of Indonesia, Malaysia, and Norway. This analysis is performed to validate our results in Saudi Arabia case. It is used also as a robustness checks. For each country, we covered Model (1), Model (2) and Model (3). Model (2) was extended to add private consumption, private investment, exports and imports at each time. Model (3) extended Model (1) by adding inflation and interest rates. Interestingly, for all countries, the results of the impulse response functions indicate that responses of the output to fiscal policy shocks reconciled with the standard wisdom (i.e., the Keynesian view): when government spending rises, output increase; when government taxes increase, output falls. Thus, it has the same results as Saudi Arabia. After disaggregating the GDP components, the response of private consumption to fiscal policy follows the Keynesian view for all countries; however, the response of private investment to fiscal policy reconciles with the neo-classical view in Saudi Arabia and Malaysia, where it does not in Indonesia and Malaysia.

Indonesia

This is a brief history of key fiscal indicators of the Indonesian economy during the period 1982-2010. The ratio of government revenue to GDP fluctuated during the whole period, with an average of 17.3%; and similarly, the government’s spending ratio to GDP had an average of 18.7%. In the same vein, the overall budget deficit ratio to GDP had an average of 1.4%, which is very low compared with most developed countries and some developing countries. These mentioned indicators fluctuated in different patterns before and after the economic crisis in 1997/98, the Asian financial crisis. Therefore, during the period 1982-1995, government spending to GDP ratio fluctuated with a diminishing trend and an average of 19.26% of GDP. Similarly, the ratio of government revenue to GDP fluctuated with an average of 17.47% of GDP. The budget deficit ratio also has a diminishing trend with an average of 1.79% of GDP. Three years prior to the Asian financial crisis, on the other hand, the Indonesian economy experienced a budget surplus.

In spite of the importance of the above indicators, the public debt to GDP ratio is of great importance, akin to pursuing the fiscal policy. During the period 1982-1996, the period prior to the Asian financial crisis, the debt ratio is averaged at 35.25%; however, after the Asian financial crisis, it increased rapidly and peaked at 95.90% in 1999. This rapid increase of the debt to GDP ratio can be viewed as a result of the costs providing liquidity and efforts exerted bailing out the banking system (Kurniawan, 2012). Since 2001, the debt to GDP ratio has been declining, with 27% of GDP in 2010.

Unit Root Test

Table 2: *The Augmented Dickey-Fuller Test, Indonesia*

- Level

	Specification	Test-Statistic	P-value	Optimal Lag	Results
GDP	constant	-0.150098	0.9392	1	Non-stationary
GR	Constant and Trend	-3.473447	0.4124	3	Non-stationary
GE	Constant and Trend	-4.090602	0.0243	3	Non-stationary

- First-Difference

	Specification	Test-Statistic	P-value	Optimal Lag	Results
GDP	constant	-5.506840	0.0000	1	Stationary
GR	Constant and Trend	-7.192599	0.0000	3	Stationary
GE	Constant and Trend	-7.171310	0.0000	3	Stationary

In Indonesia, Table 2 indicates that GDP, GR, and GE are non-stationary or have unit roots since their p-values are 0.9392, 0.412, and 0.0243 respectively, and more than 0.01. Therefore, we fail to reject (or accept) the null hypothesis at 1% significance level. After differencing the data, we reject the null hypothesis at 1%. That means all GDP, GR, and GE are now stationary and ready to be used into the reduced-form VAR model.

Lag order: As mentioned earlier, the lag selection is of great importance and we apply the sequential likelihood ratio test by Lükepohl (1991). Table 13 indicates that the maximum lag was set to six and the first rejection was at the fourth lag. Indeed, the optimal lag is four at 5% significance level.

Model Specification: To do the LM test, we assign 17 as the optimal lag order for h since 17 is one fourth of the total observation (i.e., 71). Table 14 confirms that we accept the null hypothesis H_o or there is no serial correlation and the model is well specified. It is obvious that p-value of lags 16, 17, and 18 are 0.8149, 0.2230, and 0.9828, respectively, and all of them are larger than 0.05.

Model (1): For Indonesia, after we checked the property of time series and lag of the VAR model, we start by the reduced-form of Model (1) as explained in Chapter Four in more detail. We run the following model:

$$Y_t = \Gamma_1 Y_{t-1} + \cdots + \Gamma_p Y_{t-p} + u_t \qquad (4.7) \text{ ; where, } Y_t \equiv (GR_t, GE_t, GDP_t)'$$

Notice that the optimal lag is 4 and all of GDP, GE and GR are first differenced. Also, we included time trend t and dummy variables as D97, D08 because of two well-known incidents.

The reduced-form VAR result can be found in Appendix A. In addition, Table 15 shows the results of our structural VAR model as Model (1). You can see that C(1) and C(2) are insignificant, which was the same as in Blanchard and Perotti (2002).

Stability of the reduced-form VAR model: I claim that the reduced-form VAR model is stable because all roots have a modulus less than one and lie inside of the unit circle as in Figure 17.

After we obtained the reduced-form residuals, we can obtain the structural shocks, and then be able to find the impulse response and variance decomposition. To do so, the following form must be identified:

$$\begin{bmatrix} 1 & 0 & -a_{13} \\ 0 & 1 & -a_{23} \\ -a_{31} & -a_{32} & 1 \end{bmatrix} \begin{bmatrix} u_{gr,t} \\ u_{ge,t} \\ u_{gdp,t} \end{bmatrix} = \begin{bmatrix} b_{11} & b_{12} & 0 \\ b_{21} & b_{22} & 0 \\ 0 & 0 & b_{33} \end{bmatrix} \begin{bmatrix} e_t^{gr} \\ e_t^{ge} \\ e_t^{gdp} \end{bmatrix} \quad (4.8)$$

Three restrictions should be imposed for the model to be identified. We obtain a_{13} by regressing log (GDP) on c and log (GDP), and $a_{13} = 1.29$. set $a_{23} = 0$ and $b_{21} = 0$. The latter means that government spending decisions come before government revenue.

Impulse Response Function: The Impulse Response Function (IRF) examines the response of macroeconomic variables to the fiscal shocks of GR and GE. Figure 18 depicts the responses of macroeconomic variables within 20 periods (or 5 years). It is obvious that the response of output (GDP) to the tax shock, on impact, dropped by 1.4% and its response was negative and significant for the first two periods; then it has been insignificant and dies out for the rest of the periods. The GDP response to the government spending shock, on the other hand, is positive and significant for the first three periods and dies out afterwards. The fiscal multiplier, in general, is defined as the peak response of output across at least five years after the shock took place; and in the same vein, the government revenue multiplier (or the tax multiplier) is the peak response of the GDP to the government taxes shock. Indeed, the tax multiplier was -1.4% in the first quarter, and the spending multiplier was 0.6% in the second quarter. This result is consistent with common wisdom as Keynes claimed.

Variance Decomposition (VD): Researchers usually use variance decomposition (VD) to relate the variation on macroeconomic variables to the underlying shocks. In VAR, it is important to check the VD to characterize the variation of variables included. Table 16 shows the movement in the output (GDP) and how it is related to the shocks. We notice that, for the first 5 periods, 60-80 % of the variation in GDP is related to GR, the government revenue shocks. It indicates that the Indonesian government should focus more on tax policies and reforms to get the optimal policy and eventually high growth. VDs of other variables can be found in Appendix A.

Model (2). Adding Private consumption: It is extended to Model (1) only by adding a component of GDP and determining what the effect of the fiscal shocks is on the chosen component. Below is the SVAR we need to eventually obtain:

$$\begin{bmatrix} 1 & 0 & -a_{13} & 0 \\ 0 & 1 & -a_{23} & 0 \\ -a_{31} & -a_{32} & 1 & 0 \\ -a_{41} & -a_{42} & 0 & 1 \end{bmatrix} \begin{bmatrix} u_{gr,t} \\ u_{ge,t} \\ u_{gdp,t} \\ u_{con,t} \end{bmatrix} = \begin{bmatrix} b_{11} & b_{12} & 0 & 0 \\ b_{21} & b_{22} & 0 & 0 \\ 0 & 0 & b_{33} & 0 \\ 0 & 0 & 0 & b_{44} \end{bmatrix} \begin{bmatrix} e_t^{gr} \\ e_t^{ge} \\ e_t^{gdp} \\ e_t^{con} \end{bmatrix} \quad (4.9)$$

After estimating the reduced-form VAR, we have $a_{13} = 1.29, a_{23} = 0$ and $b_{21} = 0$

The four variable added is log(cons), which is log of real, per capita private consumption, and it is found to be stationary at level at 5%. Using the sequential likelihood ratio test by Lükepohl (1991), the optimal lag is 3, and the results of the reduced-form VAR of 4 variables are the following:

Vector Autoregression Estimates
Date: 09/03/13 Time: 21:21
Sample (adjusted): 1994Q1 2011Q4
Included observations: 72 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	LGR_1	LGE_1	LGDP_1	LCONSS
LGR_1(-1)	0.399836	-0.936982	0.741980	1.101666
	(0.80636)	(0.82496)	(0.37765)	(0.97917)
	[0.49586]	[-1.13579]	[1.96474]	[1.12510]
LGR_1(-2)	1.031766	1.443820	-0.990978	-1.367777
	(1.35454)	(1.38579)	(0.63438)	(1.64484)
	[0.76171]	[1.04188]	[-1.56211]	[-0.83156]
LGR_1(-3)	-1.042008	-0.762506	0.833431	0.644133
	(0.84367)	(0.86314)	(0.39513)	(1.02449)
	[-1.23509]	[-0.88341]	[2.10928]	[0.62874]
LGE_1(-1)	0.201649	1.540093	-0.496544	-0.816696
	(0.79872)	(0.81715)	(0.37407)	(0.96990)
	[0.25247]	[1.88472]	[-1.32740]	[-0.84204]
LGE_1(-2)	-0.834603	-1.205570	0.762161	1.439582
	(1.35172)	(1.38291)	(0.63306)	(1.64142)
	[-0.61744]	[-0.87176]	[1.20392]	[0.87703]

LGE_1(-3)	0.494223	0.201055	-0.783459	-0.570790
	(0.82962)	(0.84877)	(0.38855)	(1.00743)
	[0.59572]	[0.23688]	[-2.01639]	[-0.56658]
LGDP_1(-1)	-0.272227	-0.330925	0.230943	-0.247727
	(0.26716)	(0.27333)	(0.12512)	(0.32442)
	[-1.01896]	[-1.21073]	[1.84573]	[-0.76360]
LGDP_1(-2)	-0.103336	-0.117965	-0.221343	-0.852274
	(0.25999)	(0.26599)	(0.12176)	(0.31571)
	[-0.39747]	[-0.44350]	[-1.81783]	[-2.69957]
LGDP_1(-3)	-0.269405	-0.271893	-0.035337	-0.852407
	(0.24217)	(0.24776)	(0.11342)	(0.29407)
	[-1.11247]	[-1.09742]	[-0.31157]	[-2.89866]
LCONSS(-1)	-0.361241	-0.368624	-0.091911	0.311854
	(0.10035)	(0.10267)	(0.04700)	(0.12186)
	[-3.59966]	[-3.59040]	[-1.95557]	[2.55907]
LCONSS(-2)	0.231853	0.236236	0.154607	0.174380
	(0.11923)	(0.12198)	(0.05584)	(0.14478)
	[1.94464]	[1.93672]	[2.76882]	[1.20445]
LCONSS(-3)	-0.089310	-0.061187	-0.088346	0.248162
	(0.09736)	(0.09960)	(0.04560)	(0.11822)
	[-0.91734]	[-0.61430]	[-1.93757]	[2.09910]
C	2.013277	1.783958	0.237317	2.468020
	(0.70442)	(0.72067)	(0.32991)	(0.85539)
	[2.85807]	[2.47541]	[0.71935]	[2.88526]
T	0.002277	0.002092	0.000578	0.003271
	(0.00060)	(0.00062)	(0.00028)	(0.00073)
	[3.78153]	[3.39492]	[2.05095]	[4.47350]
D97	-0.045086	-0.043568	-0.015589	-0.100275
	(0.01917)	(0.01962)	(0.00898)	(0.02328)
	[-2.35139]	[-2.22099]	[-1.73600]	[-4.30670]
D08	-0.034946	-0.030357	-0.004122	-0.041127
	(0.01489)	(0.01523)	(0.00697)	(0.01808)
	[-2.34754]	[-1.99327]	[-0.59129]	[-2.27512]
R-squared	0.653243	0.603311	0.574742	0.922531
Adj. R-squared	0.560362	0.497055	0.460834	0.901781
Sum sq. resids	0.051733	0.054148	0.011347	0.076285
S.E. equation	0.030394	0.031096	0.014235	0.036908
F-statistic	7.033098	5.677901	5.045651	44.45817
Log likelihood	158.4158	156.7735	213.0323	144.4345
Akaike AIC	-3.955996	-3.910375	-5.473119	-3.567626
Schwarz SC	-3.450070	-3.404449	-4.967194	-3.061700
Mean dependent	0.007962	0.008723	0.007236	9.382700
S.D. dependent	0.045840	0.043847	0.019386	0.117768

Determinant resid covariance (dof adj.)	4.33E-15
Determinant resid covariance	1.58E-15
Log likelihood	818.1648
Akaike information criterion	-20.94902
Schwarz criterion	-18.92532

Structural VAR Estimates
Date: 09/03/13 Time: 21:21
Sample (adjusted): 1994Q1 2011Q4
Included observations: 72 after adjustments
Estimation method: method of scoring (analytic derivatives)
Convergence achieved after 6 iterations
Structural VAR is over-identified (1 degrees of freedom)

Model: Ae = Bu where E[uu']=I
Restriction Type: short-run pattern matrix

A =

1	0	-1.29	0
0	1	0	0
C(1)	C(3)	1	0
C(2)	C(4)	0	1

B =

C(5)	C(6)	0	0
0	C(7)	0	0
0	0	C(8)	0
0	0	0	C(9)

	Coefficient	Std. Error	z-Statistic	Prob.
C(1)	17.56011	12.76207	1.375960	0.1688
C(2)	-1.204902	0.829447	-1.452656	0.1463
C(3)	-17.02849	12.33159	-1.380884	0.1673
C(4)	0.645116	0.810742	0.795711	0.4262
C(5)	0.018357	0.001530	12.00000	0.0000
C(6)	0.027374	0.003144	8.707019	0.0000
C(7)	0.031096	0.002591	12.00000	0.0000
C(8)	0.084046	0.058917	1.426515	0.1537
C(9)	0.032721	0.002727	12.00000	0.0000

Log likelihood	781.3637			
LR test for over-identification:				
Chi-square(1)	1.223632		Probability	0.2686

Estimated A matrix:

1.000000	0.000000	-1.290000	0.000000
0.000000	1.000000	0.000000	0.000000
17.56011	-17.02849	1.000000	0.000000
-1.204902	0.645116	0.000000	1.000000

Estimated B matrix:

0.018357	0.027374	0.000000	0.000000
0.000000	0.031096	0.000000	0.000000
0.000000	0.000000	0.084046	0.000000
0.000000	0.000000	0.000000	0.032721

Impulse Response Function: Figure 19 shows the impulse response functions in this model, where private consumption is added. It is clear that the response of private consumption is positive and significant for both government spending and government revenue shocks for most periods. There is a negative effect of private consumption on output (GDP), but it is small and insignificant.

Variance Decomposition (VD): VD can demonstrate the variation of the variables and their relationship to the underlying shocks. Table 17 shows the only variance decomposition of the GDP, and we notice that indeed the government revenue shock takes the most percentage of variability to the GDP.

Adding Private investment: After the linv (the log of real private investment, per capita) is been examined, it needs to be first difference to be stationary. The p-value was 0.3978. We then ran the reduced-form to get the residual shocks to be used for the structural shocks.

Impulse Response Function: It is clear that the response of private consumption is positive and significant for government spending shock for most periods. The private investment response to government spending shock rises, on impact, by 1.1%, and it is the multiplier. Hence, it can be reconciled with the Keynesian models and is at odds with the neo-classical models (similar results to Blanchard and Perotti (2002), Perotti (2004).

Adding Exports: When we checked the unit root test of the variable lexpo (log of real, per capita exports), we found the p-value equals 0.0716. Thus, we reject the null hypothesis H_o, which means the variable is not stationary at level, but it is stationary after we take first-difference.

Preparing for the reduced-form VAR model, the lag order is four, based on Table 18 results. Along with the three variables in Model (1), we add exports this time. The results of the reduced-form are the following:

Vector Autoregression Estimates
Date: 09/04/13 Time: 10:42
Sample (adjusted): 1994Q4 2011Q4
Included observations: 69 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	LGR_1	LGE_1	LGDP_1	LEXPO_1
LGR_1(-1)	0.681672	-0.844619	0.872258	-0.654405
	(0.96274)	(0.96583)	(0.42651)	(2.42953)
	[0.70805]	[-0.87450]	[2.04509]	[-0.26935]
LGR_1(-2)	-1.146942	-0.741898	-0.734481	1.181226
	(1.77635)	(1.78205)	(0.78696)	(4.48272)
	[-0.64567]	[-0.41632]	[-0.93331]	[0.26351]

LGR_1(-3)	1.798055	2.568385	-0.357221	-5.506793
	(1.78528)	(1.79102)	(0.79092)	(4.50527)
	[1.00715]	[1.43404]	[-0.45165]	[-1.22230]
LGR_1(-4)	-0.969552	-1.457807	0.767357	1.939822
	(1.76427)	(1.76994)	(0.78161)	(4.45225)
	[-0.54955]	[-0.82365]	[0.98176]	[0.43569]
LGR_1(-5)	-1.384494	-1.337145	0.116697	3.920603
	(1.87698)	(1.88300)	(0.83154)	(4.73666)
	[-0.73762]	[-0.71011]	[0.14034]	[0.82771]
LGR_1(-6)	0.875516	0.907115	-0.385990	-4.903065
	(1.25917)	(1.26321)	(0.55784)	(3.17760)
	[0.69531]	[0.71810]	[-0.69194]	[-1.54301]
LGE_1(-1)	-0.579792	0.929461	-0.721797	1.198402
	(0.94948)	(0.95253)	(0.42064)	(2.39607)
	[-0.61064]	[0.97578]	[-1.71595]	[0.50015]
LGE_1(-2)	1.472876	1.119987	0.598694	-2.879399
	(1.74419)	(1.74978)	(0.77271)	(4.40156)
	[0.84445]	[0.64007]	[0.77480]	[-0.65418]
LGE_1(-3)	-2.238574	-3.001317	0.259381	6.513758
	(1.74094)	(1.74653)	(0.77127)	(4.39336)
	[-1.28584]	[-1.71845]	[0.33630]	[1.48264]
LGE_1(-4)	0.572184	1.043724	-0.771169	-1.848262
	(1.75843)	(1.76407)	(0.77902)	(4.43750)
	[0.32540]	[0.59166]	[-0.98992]	[-0.41651]
LGE_1(-5)	1.595448	1.518924	-0.080912	-4.557238
	(1.86266)	(1.86864)	(0.82520)	(4.70053)
	[0.85654]	[0.81285]	[-0.09805]	[-0.96952]
LGE_1(-6)	-1.026650	-1.035536	0.325388	4.764880
	(1.20285)	(1.20671)	(0.53289)	(3.03546)
	[-0.85352]	[-0.85815]	[0.61062]	[1.56974]
LGDP_1(-1)	0.073251	0.058964	-0.001667	0.933910
	(0.36942)	(0.37061)	(0.16366)	(0.93226)
	[0.19828]	[0.15910]	[-0.01019]	[1.00177]
LGDP_1(-2)	0.350756	0.286098	-0.160178	1.023217
	(0.38331)	(0.38454)	(0.16981)	(0.96730)
	[0.91508]	[0.74400]	[-0.94326]	[1.05781]
LGDP_1(-3)	0.330148	0.373912	0.055455	1.184605
	(0.34896)	(0.35008)	(0.15459)	(0.88061)
	[0.94610]	[1.06809]	[0.35871]	[1.34521]
LGDP_1(-4)	0.925226	0.894764	0.184341	-0.320466
	(0.34998)	(0.35110)	(0.15505)	(0.88319)
	[2.64367]	[2.54845]	[1.18893]	[-0.36285]
LGDP_1(-5)	-0.444082	-0.458067	0.031781	1.860111
	(0.36013)	(0.36129)	(0.15955)	(0.90882)
	[-1.23310]	[-1.26786]	[0.19919]	[2.04673]
LGDP_1(-6)	0.142394	0.154473	0.203118	0.698439

	(0.35040)	(0.35153)	(0.15523)	(0.88426)
	[0.40637]	[0.43944]	[1.30846]	[0.78986]
LEXPO_1(-1)	-0.155803	-0.160532	-0.069078	0.244303
	(0.06945)	(0.06967)	(0.03077)	(0.17526)
	[-2.24339]	[-2.30408]	[-2.24513]	[1.39394]
LEXPO_1(-2)	-0.025947	-0.017480	-0.045864	-0.005661
	(0.07017)	(0.07040)	(0.03109)	(0.17709)
	[-0.36976]	[-0.24830]	[-1.47531]	[-0.03197]
LEXPO_1(-3)	0.105940	0.100916	-0.054793	-0.529574
	(0.07442)	(0.07466)	(0.03297)	(0.18780)
	[1.42354]	[1.35170]	[-1.66194]	[-2.81983]
LEXPO_1(-4)	-0.022381	-0.014809	-0.042986	-0.033531
	(0.07055)	(0.07078)	(0.03126)	(0.17804)
	[-0.31724]	[-0.20924]	[-1.37534]	[-0.18834]
LEXPO_1(-5)	0.130111	0.117432	-0.022268	0.015019
	(0.06178)	(0.06198)	(0.02737)	(0.15590)
	[2.10609]	[1.89478]	[-0.81363]	[0.09634]
LEXPO_1(-6)	0.017003	0.006838	-0.025909	-0.117108
	(0.06255)	(0.06275)	(0.02771)	(0.15785)
	[0.27182]	[0.10897]	[-0.93496]	[-0.74188]
C	-0.009315	-0.007567	0.005776	-0.007465
	(0.01292)	(0.01297)	(0.00573)	(0.03261)
	[-0.72077]	[-0.58365]	[1.00883]	[-0.22889]
T	7.75E-05	3.38E-05	0.000288	-0.001985
	(0.00055)	(0.00055)	(0.00024)	(0.00139)
	[0.14017]	[0.06089]	[1.17456]	[-1.42313]
D97	0.013867	0.013929	-0.010672	0.083850
	(0.02592)	(0.02600)	(0.01148)	(0.06541)
	[0.53500]	[0.53565]	[-0.92931]	[1.28189]
D08	-0.020790	-0.017470	-0.005138	-0.019942
	(0.01987)	(0.01994)	(0.00880)	(0.05015)
	[-1.04621]	[-0.87633]	[-0.58367]	[-0.39767]
R-squared	0.724193	0.695104	0.694469	0.648633
Adj. R-squared	0.542564	0.494319	0.493266	0.417245
Sum sq. resids	0.041017	0.041281	0.008050	0.261210
S.E. equation	0.031629	0.031731	0.014012	0.079818
F-statistic	3.987215	3.461926	3.451584	2.803227
Log likelihood	158.3551	158.1340	214.5306	94.48381
Akaike AIC	-3.778408	-3.771999	-5.406685	-1.927067
Schwarz SC	-2.871814	-2.865405	-4.500091	-1.020473
Mean dependent	0.008079	0.009357	0.007154	0.006188
S.D. dependent	0.046765	0.044621	0.019684	0.104559

Determinant resid covariance (dof adj.)	2.41E-14
Determinant resid covariance	3.01E-15
Log likelihood	761.9461
Akaike information criterion	-18.83902
Schwarz criterion	-15.21264

Impulse Response Function: The impulse response functions in the above model are shown in Figure 20. With respect to the GDP, the government revenue and spending multipliers were previously similar. The government revenue multiplier is -0.44% at the first quarter and the spending multiplier is 1.22% at the first quarter. For exports, the revenue multiplier was -3.0% at the third quarter, where the spending multiplier was 3.6% at the fourth quarter. For both, after the fifth quarter, the impulse response dies out.

Variance Decomposition (VD): VD can demonstrate the variation of the variables and their relationship to the underlying shocks. Table 19 shows the only variance decomposition of the GDP, and we notice now, instead, that the government spending shock takes the most percentage of variability to the GDP. VDs of other variables can be found in Appendix A.

Adding Imports: It is obvious that the variable limp (log of real, per capita imports) is stationary at 1% significance level. The p-value was 0.0060; thus, we fail to reject the null hypothesis H_o, which means that there is no unit root.

We form, now, a VAR system of four variables, adding the limp variable to the GDP, GE and GR variables. Table 20 indicates that the optimal lag is three. The results of the reduced-form of the 4-VAR model are as follows:

Vector Autoregression Estimates
Date: 09/19/13 Time: 12:48
Sample (adjusted): 1994Q1 2011Q4
Included observations: 72 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	LGR_1	LGE_1	LGDP_1	LIMP
LGR_1(-1)	0.588768	-0.780633	0.612215	-0.011514
	(0.85268)	(0.85777)	(0.35972)	(2.03988)
	[0.69049]	[-0.91007]	[1.70192]	[-0.00564]
LGR_1(-2)	0.575923	0.988168	-0.679822	-1.670099
	(1.45788)	(1.46658)	(0.61503)	(3.48769)
	[0.39504]	[0.67379]	[-1.10534]	[-0.47886]
LGR_1(-3)	-0.886583	-0.585119	0.575427	-0.438407
	(0.92082)	(0.92632)	(0.38847)	(2.20289)
	[-0.96282]	[-0.63166]	[1.48128]	[-0.19901]
LGE_1(-1)	-0.192528	1.162749	-0.433130	0.630584

	(0.85008)	(0.85515)	(0.35862)	(2.03364)
	[-0.22648]	[1.35970]	[-1.20777]	[0.31008]
LGE_1(-2)	-0.176807	-0.561018	0.615084	0.155512
	(1.44157)	(1.45018)	(0.60815)	(3.44869)
	[-0.12265]	[-0.38686]	[1.01140]	[0.04509]
LGE_1(-3)	0.163215	-0.138592	-0.633765	1.542167
	(0.89584)	(0.90119)	(0.37793)	(2.14314)
	[0.18219]	[-0.15379]	[-1.67694]	[0.71958]
LGDP_1(-1)	-0.320439	-0.325655	-0.022452	1.076702
	(0.31285)	(0.31472)	(0.13198)	(0.74844)
	[-1.02425]	[-1.03474]	[-0.17011]	[1.43860]
LGDP_1(-2)	0.104370	0.111894	-0.245047	1.159243
	(0.29898)	(0.30076)	(0.12613)	(0.71525)
	[0.34909]	[0.37203]	[-1.94281]	[1.62075]
LGDP_1(-3)	0.068880	0.104066	-0.063821	0.518636
	(0.27022)	(0.27183)	(0.11400)	(0.64645)
	[0.25490]	[0.38283]	[-0.55985]	[0.80229]
LIMP(-1)	-0.122629	-0.121751	-0.063804	1.133227
	(0.05285)	(0.05317)	(0.02230)	(0.12644)
	[-2.32030]	[-2.29001]	[-2.86169]	[8.96292]
LIMP(-2)	0.199566	0.210202	0.043114	-0.478366
	(0.07155)	(0.07198)	(0.03019)	(0.17117)
	[2.78915]	[2.92037]	[1.42832]	[-2.79466]
LIMP(-3)	-0.084982	-0.083805	-0.042529	0.134834
	(0.05272)	(0.05304)	(0.02224)	(0.12612)
	[-1.61194]	[-1.58018]	[-1.91218]	[1.06907]
C	0.068540	-0.038199	0.535282	1.759861
	(0.37156)	(0.37377)	(0.15675)	(0.88888)
	[0.18447]	[-0.10220]	[3.41492]	[1.97987]
T	0.000839	0.000705	0.000677	-0.000507
	(0.00051)	(0.00051)	(0.00021)	(0.00121)
	[1.66135]	[1.38660]	[3.17771]	[-0.41931]
D97	-0.023902	-0.020415	-0.017092	0.043646
	(0.01981)	(0.01993)	(0.00836)	(0.04739)
	[-1.20663]	[-1.02451]	[-2.04527]	[0.92102]
D08	-0.029352	-0.024565	-0.002157	0.018299
	(0.01574)	(0.01583)	(0.00664)	(0.03765)
	[-1.86489]	[-1.55148]	[-0.32486]	[0.48601]
R-squared	0.606168	0.564393	0.608103	0.824167
Adj. R-squared	0.500677	0.447713	0.503131	0.777068
Sum sq. resids	0.058757	0.059460	0.010457	0.336273
S.E. equation	0.032392	0.032585	0.013665	0.077491
F-statistic	5.746165	4.837092	5.792978	17.49888
Log likelihood	153.8330	153.4044	215.9734	91.03033
Akaike AIC	-3.828694	-3.816789	-5.554816	-2.084176
Schwarz SC	-3.322768	-3.310863	-5.048890	-1.578250
Mean dependent	0.007962	0.008723	0.007236	8.541467
S.D. dependent	0.045840	0.043847	0.019386	0.164122

Determinant resid covariance (dof adj.)	2.58E-14
Determinant resid covariance	9.45E-15
Log likelihood	753.8933
Akaike information criterion	-19.16370
Schwarz criterion	-17.14000

Impulse Response Function: I add the limp (log of real, per capita imports) to the 3-VAR model to gauge how the shocks affect imports. The response of the imports to the revenue shock is negative for the first 4 periods, and then dies out afterwards. The revenue multiplier is -2.5% at the third quarter. Similarly, the spending multiplier is 3.7% and the response dies out afterwards (See Figure 21). Variance decompositions can be found in Table 21 in appendix A.

Model (3): I extend Model (1) by adding the interest rate (i_t) and inflation (π_t) variables. It is important to include them to account for volatility on prices and because government revenue and government expenditures might be influenced by nominal factors. The endogenous variables become as follows:

$Y_t \equiv (GR_t, GE_t, GDP_t, \pi_t, i_t)'$ as a 5-dimintional vector

Primarily, we follow Blanchard and Perotti's (2002) identification with accounting for impact of inflation and interest rate variables. Thus, inflation rate π and interest rate i will be included in the model, and after estimating the reduced-form VAR, residuals $u_t \equiv \left(u_{gr,t}, u_{ge,t}, u_{gdp,t}, u_{\pi,t} u_{i,t}\right)'$ can be obtained and expressed as linear combinations of structural shocks $e_t \equiv \left(e_t^{gr}, e_t^{ge}, e_t^{gdp}, e_t^{\pi} e_t^{i}\right)'$ as follow

$$u_{gr,t} = a_{13}\, u_{gdp,t} + + a_{14}\, u_{\pi,t} + b_{15}\, u_{i,t} + b_{12}\, e_t^{ge} + e_t^{gr} \quad (5.1)$$

$$u_{gr,t} = a_{23}\, u_{gdp,t} + + a_{24}\, u_{\pi,t} + b_{25}\, u_{i,t} + b_{21}\, e_t^{gr} + e_t^{ge} \quad (5.2)$$

$$u_{gdp,t} = a_{31}\, u_{gr,t} + a_{32}\, u_{ge,t} + e_t^{gdp} \quad (5.3)$$

$$u_{\pi,t} = a_{41}\, u_{gr,t} + + a_{42}\, u_{ge,t} + b_{43}\, u_{gdp,t} + e_t^{\pi} \quad (5.4)$$

$$u_{i,t} = a_{51}\, u_{gr,t} + + a_{52}\, u_{ge,t} + b_{53}\, u_{gdp,t} + a_{24}\, u_{\pi,t} + e_t^{\pi} \qquad (5.6)$$

Equations (5.1) – (5.6), as usual, can be presented by the following matrix form:

$$\begin{bmatrix} 1 & 0 & -a_{13} & -a_{14} & -a_{15} \\ 0 & 1 & -a_{23} & -a_{24} & -a_{25} \\ -a_{31} & -a_{32} & 1 & 0 & 0 \\ -a_{41} & -a_{42} & -a_{43} & 1 & 0 \\ -a_{51} & -a_{52} & -a_{53} & -a_{53} & 1 \end{bmatrix} \begin{bmatrix} u_{gr,t} \\ u_{ge,t} \\ u_{gdp,t} \\ u_{\pi,t} \\ u_{i,t} \end{bmatrix} = \begin{bmatrix} b_{11} & b_{12} & 0 & 0 & 0 \\ b_{21} & b_{22} & 0 & 0 & 0 \\ 0 & 0 & b_{33} & 0 & 0 \\ 0 & 0 & 0 & b_{44} & 0 \\ 0 & 0 & 0 & 0 & b_{55} \end{bmatrix} \begin{bmatrix} e_t^{gr} \\ e_t^{ge} \\ e_t^{gdp} \\ e_t^{\pi} \\ e_t^{i} \end{bmatrix} \qquad (5.7)$$

To identify the above system, additional restrictions need to be imposed. The variance-covariance $\sum_{\boldsymbol{u}}$ contains 15 free elements (i.e., 15 independent equations) and 50 unknown elements in matrices $A\ and\ B$ along with a diagonal matrix of standard deviations of the structural shocks e_t . That leads to 35 needed restrictions. Recall that in Blanchard and Perotti (2002) and Perotti (2004), the reduced-form of fiscal variables $(u_{gr,t}, u_{ge,t})$ are linear combinations of (1) the automatic response of fiscal variables to shocks in GDP, inflation rate, and interest rate; (2) systemic discretionary responses of fiscal policy by policymakers to innovations in macroeconomic variables in the model; and (3) random discretionary shocks.

From the AB model in (5.7) elasticities of fiscal variables (i.e., government revenue and government expenditure) to GDP, inflation rate and interest rates will be estimated. Indeed, they are $a_{13}, a_{14}, a_{15}, a_{23,} a_{24}\ and\ \ a_{25}$ (i.e., 6 elements in matrix A). One restriction could be added as $b_{12} = 0$ if government expenditure comes first, or $b_{21} = 0$ if government revenue comes first. With these 7 restrictions and 28 restrictions on 0’s and 1’s, the system is just identified.

Structural VAR Estimates
Date: 09/26/13 Time: 20:33
Sample (adjusted): 1994Q3 2011Q4
Included observations: 70 after adjustments
Estimation method: method of scoring (analytic derivatives)
Convergence achieved after 12 iterations
Structural VAR is just-identified

Model: Ae = Bu where E[uu']=I

Restriction Type: short-run pattern matrix

A =

1	0	-1.29	-0.24	0
0	1	0	-0.26	0
C(1)	C(4)	1	0	0
C(2)	C(5)	C(7)	1	0
C(3)	C(6)	C(8)	C(9)	1

B =

C(10)	C(11)	0	0	0
0	C(12)	0	0	0
0	0	C(13)	0	0
0	0	0	C(14)	0
0	0	0	0	C(15)

	Coefficient	Std. Error	z-Statistic	Prob.
C(1)	4.678684	1.342711	3.484506	0.0005
C(2)	0.899183	0.335577	2.679515	0.0074
C(3)	33.87304	29.95887	1.130651	0.2582
C(4)	-4.842946	1.335569	-3.626130	0.0003
C(5)	0.140231	0.340402	0.411957	0.6804
C(6)	-36.11962	29.06276	-1.242815	0.2139
C(7)	-0.010538	0.153895	-0.068474	0.9454
C(8)	-34.82495	13.15897	-2.646480	0.0081
C(9)	-7.852739	10.26994	-0.764633	0.4445
C(10)	0.014331	0.001211	11.83216	0.0000
C(11)	0.031701	0.003180	9.968850	0.0000
C(12)	0.040627	0.003434	11.83216	0.0000
C(13)	0.022768	0.005901	3.858176	0.0001
C(14)	0.012843	0.001094	11.74022	0.0000
C(15)	1.099210	0.092900	11.83216	0.0000
Log likelihood	741.3159			

Estimated A matrix:

1.000000	0.000000	-1.290000	-0.240000	0.000000
0.000000	1.000000	0.000000	-0.260000	0.000000
4.678684	-4.842946	1.000000	0.000000	0.000000
0.899183	0.140231	-0.010538	1.000000	0.000000
33.87304	-36.11962	-34.82495	-7.852739	1.000000

Estimated B matrix:

0.014331	0.031701	0.000000	0.000000	0.000000
0.000000	0.040627	0.000000	0.000000	0.000000
0.000000	0.000000	0.022768	0.000000	0.000000
0.000000	0.000000	0.000000	0.012843	0.000000
0.000000	0.000000	0.000000	0.000000	1.099210

Impulse Response Function: Figure 22 shows the impulse response functions in this model, where inflation and interest rate have been added. The response of interest rate to government revenue shock was negative in the first three periods with a multiplier of 2.1%. In the same vein, its response to government spending was negative, too, with a multiplier of 2.2% in quarter 4. In addition, the inflation rate's response to government revenue and spending was negative for most periods.

Variance Decomposition (VD): VD can demonstrate the variation of the variables and their relationship to the underlying shocks. We notice, after inflation and interest rates have been added, the percentage of government spending and receipts declines to around 50-60%.

Malaysia

The fiscal policy in Malaysia has followed the New Economic Policy (NEP) since 1971 when it was first announced. The NEP was to achieve socio-economic goals besides maintaining economic growth objectives (Economic Planning Unit, Malaysia, 2013).

Commodity prices were declining in the early 1980s as a result of a recession which was related to the tightness of liquidity from the US side. Thus, Malaysian trade fell by 17% in 1982, and the current account deficit was at 14% at the same time. A prudent policy was taken by the Malaysian government through cutting back on spending because the recession seemed to take more time. The Heavy Industries Corporation of Malaysia (HICOM) fortunately did not suffer from the government's spending cut policy because they kept borrowing from foreign companies. Most of HICOM's operations were mainly financed by Japanese companies. In addition, prices of oil and equipment dramatically declined and stayed low during the 1980s, which resulted in a high ratio of debt to GDP with a peak of 112.3% of GDP in 1986. The debt to GDP ratio obviously had a diminishing trend beginning in 1980 and prior to the Asian financial crisis in 1997/98. It was 93% of GDP in 1989, dropped to a 77.2 % in 1992, and reached 33.7% in 1997 (See Figure 6). The decline in the ratio of debt to GDP was a result of prudent policies taken by the government. These policies included privatization and liberalization of foreign direct investment (Doraisarni, 2011).

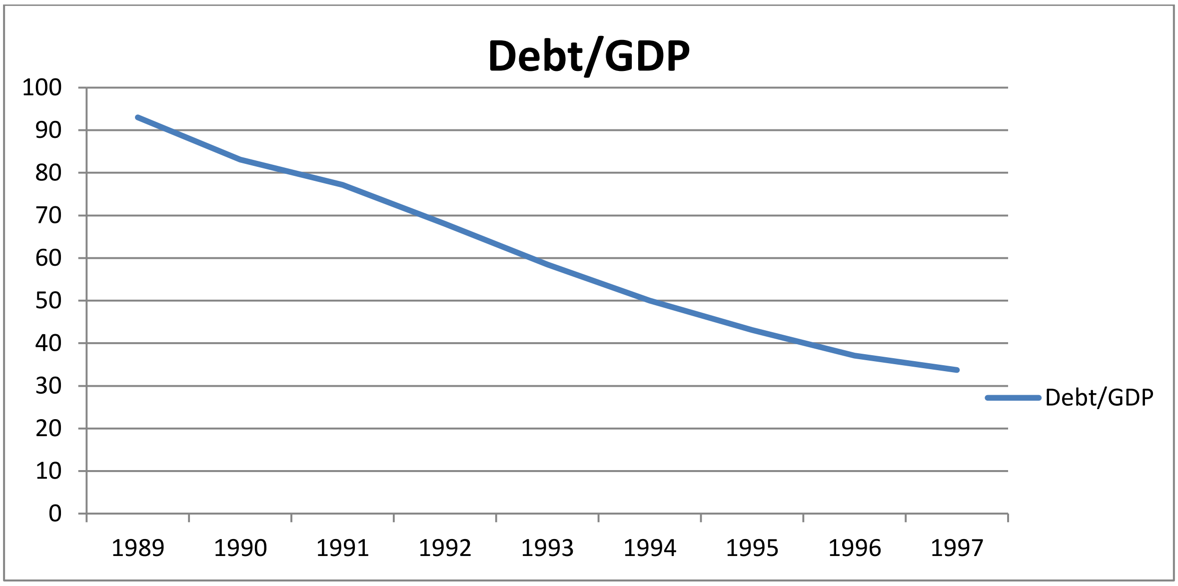

Figure 6: Debt/GDP, Malaysia

The New Economic Policy (NEP) of Malaysia: The NEP was an ambitious program introduced by the government in 1971. Its main goal is to increase property of Malaysians by redistributing the wealth. Besides that, they enhanced the Heavy Industries Corporation of Malaysia (HICOM) by adjusting open market legislations. They facilitated and simplified regulations to finance the HICOM by foreign companies (mostly Japanese companies) during recessions.

Unit Root Test

Table 3: *The Augmented Dickey-Fuller Test, Malaysia*

- Level

	Specification	Test-Statistic	P-value	Optimal Lag	Results
GDP	Constant and Trend	-3.293602	0.0753	1	Non-stationary
GR	Constant	-3.252935	0.0208	1	Stationary
GE	Constant and Trend	-1.962240	0.6144	4	Non-stationary

- First-Difference

	Specification	Test-Statistic	P-value	Optimal Lag	Results
GDP	Constant and Trend	-5.822142	0.0000	1	Stationary
GE	Constant and Trend	-8.360152	0.0000	3	Stationary

For Malaysia, unit root tests and results are performed and indicated by the above table 3. It indicated that the GDP and GE ate non stationary at 5% of significance level, where the GR is stationary at level. The GDP and GE become stationary after being first -differenced and their p-values are all 0.0000.

Lag order: For the lag selection, I apply the sequential likelihood ratio test by Lükepohl (1991), and I assign 6 for the maximum lag. At 5% significance level, lag four is the chosen lag (see table 22).

Model Specification: To assure that there is no serial correlation, the LM test is provided in table 22. We accept the null hypotheses, i.e., there is no serial correlation. The p-values of 20, 19 and 18 are greater than 0.05; thus, we fail to reject the null hypothesis H_o.

Model (1): Similarly, for Malaysia, the GR, GE and GDP are included in model (1). Since the Malaysian economy is very similar to Indonesian economy, and they have faced the same financial crisis, we included the time trend t, and the dummies variables, D97, D08. Here is the result of the reduced-form VAR model:

Vector Autoregression Estimates
Date: 09/06/13 Time: 18:12
Sample (adjusted): 1994Q2 2011Q4
Included observations: 71 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	LGR	LGE_1	LGDP_1
LGR(-1)	0.420135	0.099880	-0.002499
	(0.13347)	(0.18069)	(0.02814)
	[3.14790]	[0.55277]	[-0.08879]
LGR(-2)	0.259647	0.154263	-0.014948
	(0.14151)	(0.19158)	(0.02984)
	[1.83481]	[0.80521]	[-0.50094]
LGR(-3)	-0.059158	-0.201689	-0.010288
	(0.14106)	(0.19097)	(0.02974)
	[-0.41938]	[-1.05612]	[-0.34589]
LGR(-4)	-0.085487	-0.305092	-0.015575
	(0.13413)	(0.18159)	(0.02828)
	[-0.63733]	[-1.68009]	[-0.55067]
LGE_1(-1)	0.070276	-0.746208	-0.004613
	(0.08820)	(0.11940)	(0.01860)
	[0.79681]	[-6.24951]	[-0.24806]

LGE_1(-2)	0.040224	-0.732827	0.003993
	(0.10385)	(0.14059)	(0.02190)
	[0.38734]	[-5.21251]	[0.18236]
LGE_1(-3)	0.070155	-0.509007	0.011766
	(0.10295)	(0.13937)	(0.02171)
	[0.68147]	[-3.65218]	[0.54202]
LGE_1(-4)	-0.035289	-0.466447	0.005818
	(0.08623)	(0.11675)	(0.01818)
	[-0.40922]	[-3.99538]	[0.31995]
LGDP_1(-1)	0.306315	-1.643420	0.227290
	(0.60468)	(0.81863)	(0.12750)
	[0.50658]	[-2.00753]	[1.78263]
LGDP_1(-2)	-0.714183	0.611760	-0.108663
	(0.63269)	(0.85654)	(0.13341)
	[-1.12881]	[0.71422]	[-0.81451]
LGDP_1(-3)	0.301738	-0.484041	-0.030163
	(0.63355)	(0.85771)	(0.13359)
	[0.47627]	[-0.56434]	[-0.22579]
LGDP_1(-4)	0.614032	0.170933	-0.274476
	(0.59518)	(0.80576)	(0.12550)
	[1.03168]	[0.21214]	[-2.18707]
C	1.019615	0.504538	0.108337
	(0.28113)	(0.38060)	(0.05928)
	[3.62683]	[1.32563]	[1.82756]
T	0.002178	0.002460	0.000607
	(0.00107)	(0.00145)	(0.00023)
	[2.02849]	[1.69222]	[2.68216]
D97	-0.116422	-0.021165	-0.033230
	(0.04677)	(0.06332)	(0.00986)
	[-2.48919]	[-0.33426]	[-3.36946]
D08	0.009401	-0.049204	-0.014190
	(0.03756)	(0.05085)	(0.00792)
	[0.25029]	[-0.96761]	[-1.79159]
R-squared	0.655415	0.530713	0.337974
Adj. R-squared	0.561437	0.402726	0.157422
Sum sq. resids	0.336795	0.617288	0.014975
S.E. equation	0.078253	0.105941	0.016501
F-statistic	6.974153	4.146613	1.871891
Log likelihood	89.21450	67.70637	199.7299
Akaike AIC	-2.062380	-1.456518	-5.175489
Schwarz SC	-1.552481	-0.946618	-4.665589
Mean dependent	2.191943	0.005013	0.007248
S.D. dependent	0.118164	0.137081	0.017976

Determinant resid covariance (dof adj.)	1.79E-08
Determinant resid covariance	8.31E-09
Log likelihood	358.2684
Akaike information criterion	-8.739955
Schwarz criterion	-7.210256

Stability of the reduced-form VAR model: As depicted in Figure 23, all roots lie inside the unit circle, and have a modulus less than one. It means that the system is stable and the model is well specified. After the reduced-form residuals are obtained, we are able to get the structural shocks. Therefore, the impulse response functions and variance decomposition are documented in order.

The following form must be identified:

$$\begin{bmatrix} 1 & 0 & -a_{13} \\ 0 & 1 & -a_{23} \\ -a_{31} & -a_{32} & 1 \end{bmatrix} \begin{bmatrix} u_{gr,t} \\ u_{ge,t} \\ u_{gdp,t} \end{bmatrix} = \begin{bmatrix} b_{11} & b_{12} & 0 \\ b_{21} & b_{22} & 0 \\ 0 & 0 & b_{33} \end{bmatrix} \begin{bmatrix} e_t^{gr} \\ e_t^{ge} \\ e_t^{gdp} \end{bmatrix} \quad (4.8)$$

In the same vein, a_{23} sets to be zero; anda_{13}, estimated by a simple regression, equals 1.29. I set$b_{21} = 0$, which means that government spending decisions comes before tax decision.

Impulse Response Function: For the above model (1), the Impulse Response Function (IRF) examines the response of macroeconomic variables to the fiscal shocks of GR and GE. Within 20 periods (or 5 years), figure 24 represents the responses of macroeconomic variables. As expected, the output (the GDP) dropped by 0.60%, on impact, as a response to the tax shock. The response of the GDP, on the other hand, to the spending sock is positive and its spending multiplier is 0.1%. However, both the tax multiplier and the spending multiplier are statistically insignificant. The variance decomposition is neglected since the above results are insignificant.

Model (2). Adding Private consumption: I extend model (1), by adding a component of GDP and, similarly, determines what the effect of the fiscal shocks is on the chosen component. Below is the SVAR we need to eventually obtain.

$$\begin{bmatrix} 1 & 0 & -a_{13} & 0 \\ 0 & 1 & -a_{23} & 0 \\ -a_{31} & -a_{32} & 1 & 0 \\ -a_{41} & -a_{42} & 0 & 1 \end{bmatrix} \begin{bmatrix} u_{gr,t} \\ u_{ge,t} \\ u_{gdp,t} \\ u_{con,t} \end{bmatrix} = \begin{bmatrix} b_{11} & b_{12} & 0 & 0 \\ b_{21} & b_{22} & 0 & 0 \\ 0 & 0 & b_{33} & 0 \\ 0 & 0 & 0 & b_{44} \end{bmatrix} \begin{bmatrix} e_t^{gr} \\ e_t^{ge} \\ e_t^{gdp} \\ e_t^{con} \end{bmatrix} \qquad (4.9)$$

After estimating the reduced-form VAR, we have $a_{13} = 1.29, a_{23} = 0$ and $b_{21} = 0$

The variable number 4,which we added to model(1), is log(cons), which is the log of real, per capita private consumption. At level of 5%, I found the lcons variable to be non-stationary, and it needs to be first differenced. It is stationary in first difference. For the lag order, I chose lag 4 based on the sequential likelihood ratio test by Lükepohl (1991) (See Table 24 in the appendix). The reduced-form results are included in the appendix.

Impulse Response Function: Figure 25 shows the impulse response functions in this model, where private consumption is added. We neglect the response of private consumption to government spending shock since the effect is around the zero and insignificant. However, the response to taxes shock is negative with a multiplier of 0.8% at quarter five.

Variance Decomposition (VD): VD can demonstrate the variation of the variables and their relationship to the underlying shocks. Table 25 shows the only variance decomposition of the GDP, and we can notice that around 70-80 % of the variance decomposition of the GDP is related to the unexpected movement in the GDP itself.

Adding Private Investment: The unit root test is performed and the linv (the log of real private investment per capita) is non-stationary at level. However, after we took the first difference, it become stationary with p-value of 0.0000. For the lag order, I chose lag 6 based on the sequential likelihood ratio test by Lükepohl (1991) (See Table 26 in the appendix). The reduced-form results are included in the appendix.

Impulse Response Function: Figure 26 shows the impulse response functions in this model, where private investment is added. We neglect the response of private consumption to the government revenue shock since the effect is around the zero and insignificant. However, the response of private investment to the government spending shock is negative with a multiplier of 1 % at quarter three. This result came at odd with the Keynesian models and reconciled with the neo-classical models.

Variance Decomposition (VD): VD can demonstrate the variation of the variables and their relationship to the underlying shocks. Table 27 confirms that around 70-80 % of the variance decomposition of the GDP is related to the unexpected movement in the GDP itself.

Adding Exports: When we checked the unit root test of the variable lexpo (the log of real, per capita exports), we found the p-value equals 0.0171. Thus, we fail to reject the null hypothesis H_o, which means the variable is stationary at level. Along the three variables in model (1), we add exports this time. We chose four for the lag order to run the reduced-form VAR model.

Impulse Response Function: The impulse response functions in the above model are shown in Figure 27 where we added export. We neglect the response of exports to the government shock since the effect is around the zero and insignificant; however, the response of exports to taxes shock is negative with a multiplier of 1.5 % at quarter three.

Variance Decomposition (VD): VD can demonstrate the variation of the variables and their relationship to the underlying shocks. Table 28 shows the only variance decomposition of the GDP, and we notice, as before, the variance decomposition of the GDP is related mostly to unexpected movements in the GDP itself.

Adding Imports: It is obvious that the variable limp (log of real, per capita imports) is stationary at 1% significance level. The p-value was 0.0060; thus, we fail to reject the null hypothesis H_o, which means that there is no unit root.

Now we form a VAR system of four variables, adding the limp variable to the GDP, GE and GR variables. Table 29 indicates that the optimal lag is one. The results of the reduced-form of the 4-VAR model are as follows:

Vector Autoregression Estimates
Date: 09/19/13 Time: 12:48
Sample (adjusted): 1994Q1 2011Q4
Included observations: 72 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	LGR_1	LGE_1	LGDP_1	LIMP
LGR_1(-1)	0.588768	-0.780633	0.612215	-0.011514
	(0.85268)	(0.85777)	(0.35972)	(2.03988)
	[0.69049]	[-0.91007]	[1.70192]	[-0.00564]
LGR_1(-2)	0.575923	0.988168	-0.679822	-1.670099
	(1.45788)	(1.46658)	(0.61503)	(3.48769)
	[0.39504]	[0.67379]	[-1.10534]	[-0.47886]
LGR_1(-3)	-0.886583	-0.585119	0.575427	-0.438407
	(0.92082)	(0.92632)	(0.38847)	(2.20289)
	[-0.96282]	[-0.63166]	[1.48128]	[-0.19901]
LGE_1(-1)	-0.192528	1.162749	-0.433130	0.630584
	(0.85008)	(0.85515)	(0.35862)	(2.03364)
	[-0.22648]	[1.35970]	[-1.20777]	[0.31008]
LGE_1(-2)	-0.176807	-0.561018	0.615084	0.155512
	(1.44157)	(1.45018)	(0.60815)	(3.44869)
	[-0.12265]	[-0.38686]	[1.01140]	[0.04509]
LGE_1(-3)	0.163215	-0.138592	-0.633765	1.542167
	(0.89584)	(0.90119)	(0.37793)	(2.14314)
	[0.18219]	[-0.15379]	[-1.67694]	[0.71958]
LGDP_1(-1)	-0.320439	-0.325655	-0.022452	1.076702
	(0.31285)	(0.31472)	(0.13198)	(0.74844)
	[-1.02425]	[-1.03474]	[-0.17011]	[1.43860]
LGDP_1(-2)	0.104370	0.111894	-0.245047	1.159243
	(0.29898)	(0.30076)	(0.12613)	(0.71525)
	[0.34909]	[0.37203]	[-1.94281]	[1.62075]
LGDP_1(-3)	0.068880	0.104066	-0.063821	0.518636
	(0.27022)	(0.27183)	(0.11400)	(0.64645)
	[0.25490]	[0.38283]	[-0.55985]	[0.80229]
LIMP(-1)	-0.122629	-0.121751	-0.063804	1.133227
	(0.05285)	(0.05317)	(0.02230)	(0.12644)
	[-2.32030]	[-2.29001]	[-2.86169]	[8.96292]
LIMP(-2)	0.199566	0.210202	0.043114	-0.478366
	(0.07155)	(0.07198)	(0.03019)	(0.17117)
	[2.78915]	[2.92037]	[1.42832]	[-2.79466]
LIMP(-3)	-0.084982	-0.083805	-0.042529	0.134834
	(0.05272)	(0.05304)	(0.02224)	(0.12612)
	[-1.61194]	[-1.58018]	[-1.91218]	[1.06907]
C	0.068540	-0.038199	0.535282	1.759861

	(0.37156)	(0.37377)	(0.15675)	(0.88888)
	[0.18447]	[-0.10220]	[3.41492]	[1.97987]
T	0.000839	0.000705	0.000677	-0.000507
	(0.00051)	(0.00051)	(0.00021)	(0.00121)
	[1.66135]	[1.38660]	[3.17771]	[-0.41931]
D97	-0.023902	-0.020415	-0.017092	0.043646
	(0.01981)	(0.01993)	(0.00836)	(0.04739)
	[-1.20663]	[-1.02451]	[-2.04527]	[0.92102]
D08	-0.029352	-0.024565	-0.002157	0.018299
	(0.01574)	(0.01583)	(0.00664)	(0.03765)
	[-1.86489]	[-1.55148]	[-0.32486]	[0.48601]
R-squared	0.606168	0.564393	0.608103	0.824167
Adj. R-squared	0.500677	0.447713	0.503131	0.777068
Sum sq. resids	0.058757	0.059460	0.010457	0.336273
S.E. equation	0.032392	0.032585	0.013665	0.077491
F-statistic	5.746165	4.837092	5.792978	17.49888
Log likelihood	153.8330	153.4044	215.9734	91.03033
Akaike AIC	-3.828694	-3.816789	-5.554816	-2.084176
Schwarz SC	-3.322768	-3.310863	-5.048890	-1.578250
Mean dependent	0.007962	0.008723	0.007236	8.541467
S.D. dependent	0.045840	0.043847	0.019386	0.164122

Determinant resid covariance (dof adj.)	2.58E-14
Determinant resid covariance	9.45E-15
Log likelihood	753.8933
Akaike information criterion	-19.16370
Schwarz criterion	-17.14000

Impulse Response Function: I add the limp (log of real, per capita imports) to the 3-VAR model to gauge how the shocks affect imports. The response of the imports to the revenue shock is negative for the first 4 periods, and then dies out afterwards. The revenue multiplier is -1% at the third quarter. Similarly, the spending multiplier is 0.5 % and the response dies out afterwards (See Figure 28).

Model (3): **Extended 5-VAR model**

I extend Model (1) by adding the interest rate (i_t) and inflation (π_t) variables. It is important to include them to account for volatility on prices and because government revenue and government expenditures might be influenced by nominal factors. The endogenous variables become as follows

$Y_t \equiv (GR_t, GE_t, GDP_t, \pi_t, i_t)'$ as a 5-dimintional vector

Primarily, we follow Blanchard and Perotti's (2002) identification with accounting for impact of inflation and interest rate variables. Thus, inflation rate π and interest rate i will be included in the model, and after estimating the reduced-form VAR, residuals $u_t \equiv (u_{gr,t}, u_{ge,t}, u_{gdp,t}, u_{\pi,t} u_{i,t})'$ can be obtained and expressed as linear combinations of structural shocks $e_t \equiv (e_t^{gr}, e_t^{ge}, e_t^{gdp}, e_t^{\pi} e_t^{i})'$ as follow

$$u_{gr,t} = a_{13}\, u_{gdp,t} + + a_{14}\, u_{\pi,t} + b_{15}\, u_{i,t} + b_{12}\, e_t^{ge} + e_t^{gr} \quad (5.1)$$

$$u_{gr,t} = a_{23}\, u_{gdp,t} + + a_{24}\, u_{\pi,t} + b_{25}\, u_{i,t} + b_{21}\, e_t^{gr} + e_t^{ge} \quad (5.2)$$

$$u_{gdp,t} = a_{31}\, u_{gr,t} + a_{32}\, u_{ge,t} + e_t^{gdp} \quad (5.3)$$

$$u_{\pi,t} = a_{41}\, u_{gr,t} + + a_{42}\, u_{ge,t} + b_{43}\, u_{gdp,t} + e_t^{\pi} \quad (5.4)$$

$$u_{i,t} = a_{51}\, u_{gr,t} + + a_{52}\, u_{ge,t} + b_{53}\, u_{gdp,t} + a_{24}\, u_{\pi,t} + e_t^{\pi} \quad (5.6)$$

Equations (5.1) – (5.6), as usual, can be presented by the following matrix form:

$$\begin{bmatrix} 1 & 0 & -a_{13} & -a_{14} & -a_{15} \\ 0 & 1 & -a_{23} & -a_{24} & -a_{25} \\ -a_{31} & -a_{32} & 1 & 0 & 0 \\ -a_{41} & -a_{42} & -a_{43} & 1 & 0 \\ -a_{51} & -a_{52} & -a_{53} & -a_{53} & 1 \end{bmatrix} \begin{bmatrix} u_{gr,t} \\ u_{ge,t} \\ u_{gdp,t} \\ u_{\pi,t} \\ u_{i,t} \end{bmatrix} = \begin{bmatrix} b_{11} & b_{12} & 0 & 0 & 0 \\ b_{21} & b_{22} & 0 & 0 & 0 \\ 0 & 0 & b_{33} & 0 & 0 \\ 0 & 0 & 0 & b_{44} & 0 \\ 0 & 0 & 0 & 0 & b_{55} \end{bmatrix} \begin{bmatrix} e_t^{gr} \\ e_t^{ge} \\ e_t^{gdp} \\ e_t^{\pi} \\ e_t^{i} \end{bmatrix} \quad (5.7)$$

To identify the above system, additional restrictions need to be imposed. The variance-covariance $\sum_u$ contains 15 free elements (i.e., 15 independent equations) and 50 unknown elements in matrices $A \text{ and } B$ along with a diagonal matrix of standard deviations of the structural shocks e_t . That leads to 35 needed restrictions. Recall that in Blanchard and Perotti (2002) and Perotti (2004), the reduced-form of fiscal variables $(u_{gr,t}, u_{ge,t})$ are linear combinations of (1) the automatic response of fiscal variables to shocks in GDP, inflation rate, and interest rate; (2) systemic discretionary responses of fiscal policy by policymakers to innovations in macroeconomic variables in the model; and (3) random discretionary shocks.

From the AB model in (5.7) elasticities of fiscal variables (i.e., government revenue and government expenditure) to GDP, inflation rate and interest rates will be estimated. Indeed, they are $a_{13}, a_{14}, a_{15}, a_{23,} a_{24}$ and a_{25} (i.e., 6 elements in matrix A). One restriction could be added as $b_{12} = 0$ if government expenditure comes first or $b_{21} = 0$ if government revenue comes first. With these 7 restrictions and 28 restrictions on 0's and 1's, the system is just identified.

The lcpi (log of consumer price index) is inflation rate and the variable i is the interest rate. Both are non-stationary at level and, after taking the first difference, they become stationary and can be used in the VAR model.

Impulse Response Function: Figure 29 shows the impulse response functions in this model, where inflation and interest rate have been added. The response of interest rate to government revenue shock was positive in the first six periods then dies out with a multiplier of 6%. In the same vein, its response to government spending was positive but higher with a multiplier of 7% in quarter 4. In addition, the inflation rate's response to government revenue and spending was positive. Finally, the response of inflation to fiscal shocks was negative and insignificant.

Norway

Norway is an open economy and is known as the world's third largest oil exporting country (Pieschacon, 2008). Thus, oil plays a tremendous role in sustaining high growth rate in the Norwegian economy alongside a prudent investment procedure that has been taken by the government since the 1990s. Fluctuations in oil prices can affect an economy as Norway with unexpected shocks, which can result in unfavorable economic consequences. To avoid such consequences, the Norwegian government pursued a successful policy. They shield their economy from fluctuations in oil prices by transferring all the oil cash money to the Government Pension Fund (GPF). The GPF was established in the 1990s and called the GPF since 2006. As a successful procedure, the government also determines that the payments to the government spending in the budget consolidation cannot exceed the expected real return on the fund (Hannesson, 2001; Skancke, 2003; Davis et al., 2003; Coutinho, 2011).

Following the above successful policy, the Norwegian economy has witnessed a relatively high and stable growth rate since the 1980s. For the period 1981-1989, its growth rate was 2.6%; and during the period 1991-2007, it was 3.1%. For the whole period from 1981 to 2007, on average the growth rate was 3.0%.

In addition to the growth rate key, the ratios of the government spending, the government revenue and the overall budget deficit to the GDP are of great importance in analyzing the fiscal policy stance in Norway. First, the government spending (GE – government expenditures) ratio to the GDP fluctuates with volatile patterns during the whole period. The former ratio fluctuates with an average of 87.5 % (See Figure 7).

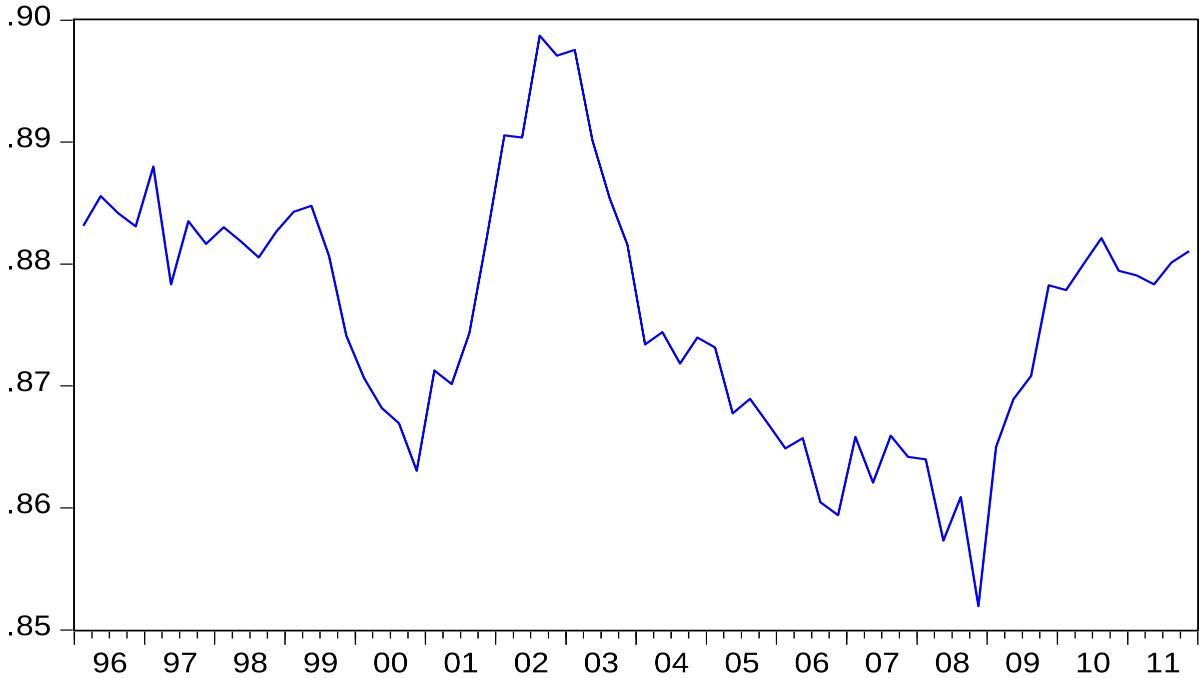

Figure 7: GE/GDP ratio, Norway

As can be seen from Figure 8, the ratio of government revenue to GDP fluctuates from 88% to the 93% with an average of 90.9%.

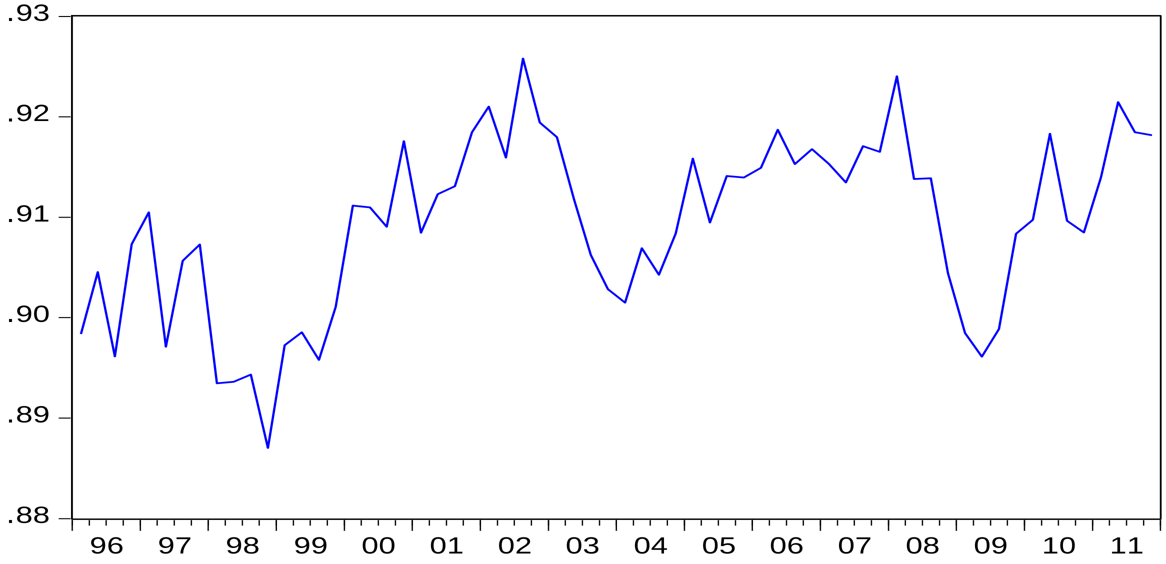

Figure 8: GR/GDP ratio, Norway

Finally, the ratio of debt to GDP fluctuates from 1% to 6%. As shown in Figure 9, debt to GDP ratio fluctuates with an average of 3.3%.

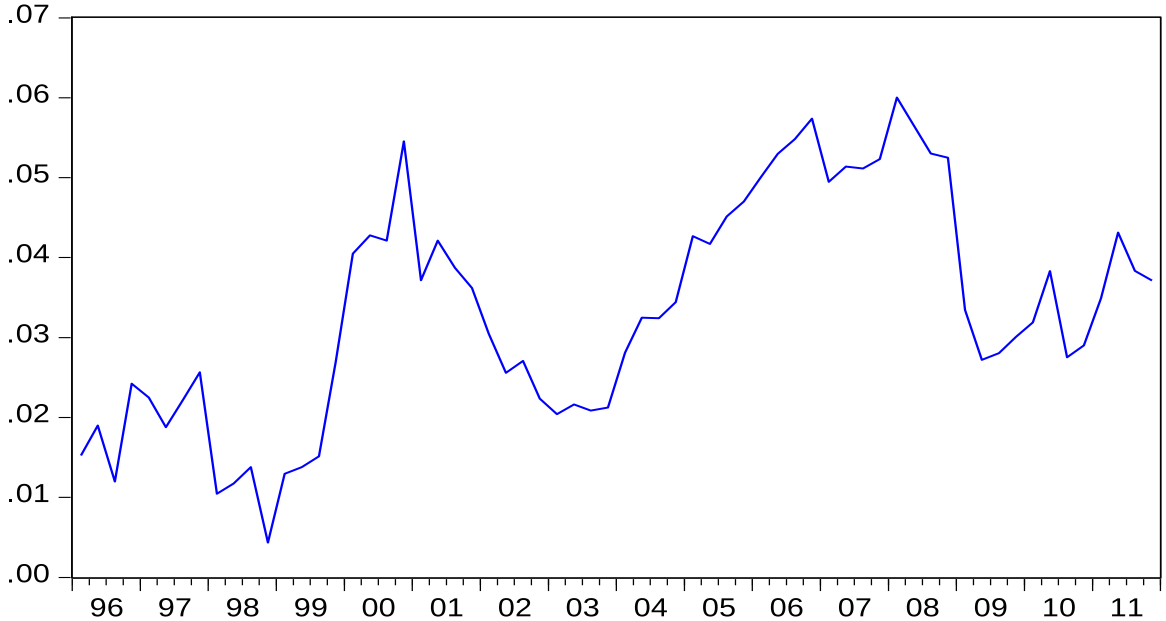

Figure 9: The debt/GDP ratio, Norway

Funds of Norway and its Fiscal policy: Two separate sovereign wealth funds were owned by government as follows:

The Government Pension Fund – Global (GPF-G)

The Government Pension Fund – Norway

Formally, the GPF-G was established in 1990 and it called by the government Petroleum Fund. Its resource was only oil receipts. Recently, in 2006, they updated with the new name as The Government Pension Fund – Global (GPF-G). As of 2011, the GPF-G was the largest pension fund in the world. The total value of the GPF-G was $783.3 billion on September 30th 2013.

Regarding its fiscal policy, they shield their economy from fluctuations in oil prices by transferring all the oil cash money to the Government Pension Fund (GPF). The GPF was established in the 1990s and called the GPF since 2006. As a successful procedure, the government also determines that the payments to the government spending in the budget consolidation cannot exceed the expected real return on the fund (Hannesson, 2001; Skancke, 2003; Davis et al., 2003; Coutinho, 2011; Gylfason, 2011).

Unit Root Test

Table 4: *The Augmented Dickey-Fuller Test, Norway*

- Level

	Specification	Test-Statistic	P-value	Optimal Lag	Results
GDP	Constant	-2.848953	0.0574	1	Non-stationary
GR	Constant	-2.126163	0.2354	0	Non-stationary
GE	Constant	-3.905737	0.0034	3	Non-stationary

- First-Difference

	Specification	Test-Statistic	P-value	Optimal Lag	Results
GDP	constant	-13.66937	0.0000	1	Stationary
GR	Constant	-8.130898	0.0000	0	Stationary

Table 4, for Norway, indicates that GDP and GR are non-stationary or have unit roots since their p-values are 0.0574 and 0.2354 respectively, and more than 0.01. Therefore, we fail to reject (or accept) the null hypothesis at 1% significance level. The GE is stationary at 1 % significance level. After differencing the data, we reject the null hypothesis at 1%. That means GDP and GR are now stationary and ready to be used into the reduced-form VAR model.

Lag order: For the lag selection, I apply the sequential likelihood ratio test by Lükepohl (1991). The maximum lag was set to five and the first rejection was at the first lag (see table 30). Indeed, the optimal lag is one at 5% significance level.

Model Specification: To do the LM test, we assign 16 as the optimal lag order for h since 16 is one fourth of the total observation (i.e., 64). We confirm that we accept the null hypothesis H_o or there is no serial correlation and the model is well specified. It is obvious that p-value of lags 15, 16, and 17 are 0.0517, 0.8841, and 0.6355, respectively, and all of them are larger than 0.05.

Model (1): Similarly, for Norway, after we checked the property of time series and lag of the VAR model, we start by the reduced-form of Model (1) as explained in Chapter Four in more details. We run the following model:

$$Y_t = \Gamma_1 Y_{t-1} + \cdots + \Gamma_p Y_{t-p} + u_t \quad (4.7) \text{ ; where, } Y_t \equiv (GR_t, GE_t, GDP_t)'$$

Notice that the optimal lag is one and the GDP and GR are first differenced. Also, we included time trend. The reduced-form VAR result can be found in Appendix A. In addition, Table 31 shows the result of our structural VAR model as Model (1).

Stability of the reduced-form VAR model: I claim that the reduced-form VAR model is stable because all roots have a modulus less than one and lie inside of the unit circle as in Figure 30.

After we obtained the reduced-form residuals, we can obtain the structural shocks, and then be able to find the impulse response and variance decomposition. To do so, the following form must be identified:

$$\begin{bmatrix} 1 & 0 & -a_{13} \\ 0 & 1 & -a_{23} \\ -a_{31} & -a_{32} & 1 \end{bmatrix} \begin{bmatrix} u_{gr,t} \\ u_{ge,t} \\ u_{gdp,t} \end{bmatrix} = \begin{bmatrix} b_{11} & b_{12} & 0 \\ b_{21} & b_{22} & 0 \\ 0 & 0 & b_{33} \end{bmatrix} \begin{bmatrix} e_t^{gr} \\ e_t^{ge} \\ e_t^{gdp} \end{bmatrix} \quad (4.8)$$

Three restrictions should be imposed for the model to be identified. We obtain $\boldsymbol{a_{13}}$ by regressing log (GDP) on c and log(GDP), $\boldsymbol{a_{13} = 1.38}$ and set $\boldsymbol{a_{23} = 0}$ and $\boldsymbol{b_{21} = 0}$. The latter means that government spending decisions comes before government revenue.

Impulse Response Function: The Impulse Response Function (IRF) examines the response of macroeconomic variables to the fiscal shocks of GR and GE. Figure 31 depicts the responses of macroeconomic variables within 20 periods (or 5 years). It is obvious that the response of output (GDP) to the tax shock, on impact, dropped by 0.7 % and its response was negative and significant for the first period; then it has been insignificant and dies out for the rest of periods. The GDP response to the spending shock, on the other hand, is positive and significant for the first period and dies out afterwards. The fiscal multiplier, in general, is defined as the peak response of output across at least five years after the shock took place; and in the same vein, the government revenue multiplier (or the tax multiplier) is the peak response of the GDP to the government taxes shock. Indeed, the tax multiplier, in this case, was - 0.7 % in the first quarter, and the spending multiplier was 0.3 % in the first quarter. This result is consistent with common wisdom as Keynes claimed. An increase in government spending shock, as in figure 31, increases the output (GDP) by 0.3% and was positive and significant.

Variance Decomposition (VD): Researchers usually use variance decomposition (VD) to relate the variation on macroeconomic variables to the underlying shocks. In VAR, it is important to check the VD to characterize the variation of variables included. Table 32 shows the movement in the output (GDP) and how it is related to the shocks. It is clear that the variance decomposition of the GDP is mostly related to the unexpected shocks in the GDP itself by roughly 77%. Hence, fiscal policies are to limit in Norway.

Model (2). Adding Private consumption**:** It is extended to model (1) only by adding a component of GDP and determines what the effect of the fiscal shocks is on the chosen component. Below is the SVAR we need to eventually obtain

$$\begin{bmatrix} 1 & 0 & -a_{13} & 0 \\ 0 & 1 & -a_{23} & 0 \\ -a_{31} & -a_{32} & 1 & 0 \\ -a_{41} & -a_{42} & 0 & 1 \end{bmatrix} \begin{bmatrix} u_{gr,t} \\ u_{ge,t} \\ u_{gdp,t} \\ u_{con,t} \end{bmatrix} = \begin{bmatrix} b_{11} & b_{12} & 0 & 0 \\ b_{21} & b_{22} & 0 & 0 \\ 0 & 0 & b_{33} & 0 \\ 0 & 0 & 0 & b_{44} \end{bmatrix} \begin{bmatrix} e_t^{gr} \\ e_t^{ge} \\ e_t^{gdp} \\ e_t^{con} \end{bmatrix} \quad (4.9)$$

After estimating the reduced-form VAR, we have $a_{13} = 1.38, a_{23} = 0 \; and \; b_{21} = 0$

The four variable added is lconss, which is the log of real, per capita private consumption, and it is found to be stationary at level at 5%. Using the sequential likelihood ratio test by Lükepohl (1991), the optimal lag is 5, and the results of the reduced-form VAR of 4 variables are the following:

Vector Autoregression Estimates
Date: 11/04/13 Time: 00:25
Sample (adjusted): 1997Q3 2011Q4
Included observations: 58 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	LGR_1	LGE	LGDP_1	LCONSS
LGR_1(-1)	-0.079884	0.245948	0.100824	-0.140754
	(0.17895)	(0.09752)	(0.07463)	(0.12214)
	[-0.44641]	[2.52212]	[1.35102]	[-1.15243]
LGR_1(-2)	0.004705	0.270829	0.171187	-0.138511
	(0.19473)	(0.10611)	(0.08121)	(0.13291)
	[0.02416]	[2.55224]	[2.10800]	[-1.04217]
LGR_1(-3)	0.094071	0.051423	0.071531	-0.317057
	(0.20731)	(0.11297)	(0.08646)	(0.14150)
	[0.45377]	[0.45518]	[0.82735]	[-2.24074]
LGR_1(-4)	-0.218449	0.164864	0.046565	-0.057102
	(0.20882)	(0.11379)	(0.08709)	(0.14253)
	[-1.04612]	[1.44879]	[0.53470]	[-0.40065]
LGR_1(-5)	-0.176400	0.006029	-0.043410	0.044921
	(0.16696)	(0.09098)	(0.06963)	(0.11395)
	[-1.05654]	[0.06626]	[-0.62345]	[0.39420]
LGE(-1)	-0.008792	0.508600	-0.164075	-0.080836
	(0.28744)	(0.15664)	(0.11987)	(0.19618)
	[-0.03059]	[3.24702]	[-1.36875]	[-0.41204]
LGE(-2)	0.281697	0.503758	0.172714	0.295091
	(0.28993)	(0.15800)	(0.12091)	(0.19789)
	[0.97160]	[3.18844]	[1.42843]	[1.49122]

LGE(-3)	-0.129928	-0.069214	-0.018828	0.068948
	(0.30835)	(0.16804)	(0.12860)	(0.21046)
	[-0.42136]	[-0.41190]	[-0.14641]	[0.32761]
LGE(-4)	-0.513871	-0.408323	-0.131851	-0.415360
	(0.28219)	(0.15378)	(0.11768)	(0.19260)
	[-1.82103]	[-2.65531]	[-1.12039]	[-2.15659]
LGE(-5)	0.236747	0.354583	0.206921	0.282536
	(0.24338)	(0.13263)	(0.10150)	(0.16612)
	[0.97273]	[2.67347]	[2.03862]	[1.70083]
LGDP_1(-1)	0.771428	-0.342842	-0.641215	0.038260
	(0.38491)	(0.20975)	(0.16052)	(0.26271)
	[2.00419]	[-1.63451]	[-3.99459]	[0.14564]
LGDP_1(-2)	-0.221588	-0.759760	-0.452698	0.414373
	(0.50012)	(0.27254)	(0.20857)	(0.34135)
	[-0.44307]	[-2.78773]	[-2.17049]	[1.21394]
LGDP_1(-3)	-0.348470	-0.492727	-0.354154	-0.077841
	(0.55972)	(0.30502)	(0.23343)	(0.38203)
	[-0.62258]	[-1.61541]	[-1.51720]	[-0.20376]
LGDP_1(-4)	-0.114372	-0.032622	-0.183352	0.024197
	(0.51264)	(0.27936)	(0.21379)	(0.34989)
	[-0.22310]	[-0.11677]	[-0.85762]	[0.06915]
LGDP_1(-5)	0.601392	-0.164759	0.082683	0.070704
	(0.41274)	(0.22492)	(0.17213)	(0.28171)
	[1.45708]	[-0.73253]	[0.48036]	[0.25099]
LCONSS(-1)	-0.119683	0.414065	0.028960	0.572281
	(0.24553)	(0.13380)	(0.10239)	(0.16758)
	[-0.48745]	[3.09470]	[0.28283]	[3.41500]
LCONSS(-2)	0.367951	-0.143966	0.064579	-0.122935
	(0.14902)	(0.08120)	(0.06215)	(0.10171)
	[2.46922]	[-1.77287]	[1.03916]	[-1.20872]
LCONSS(-3)	-0.223609	-0.074200	-0.040663	-0.086873
	(0.16162)	(0.08807)	(0.06740)	(0.11031)
	[-1.38356]	[-0.84249]	[-0.60330]	[-0.78754]
LCONSS(-4)	0.094351	-0.180731	-0.016139	0.625389
	(0.14269)	(0.07776)	(0.05951)	(0.09739)
	[0.66123]	[-2.32427]	[-0.27121]	[6.42148]
LCONSS(-5)	0.178740	-0.393419	-0.107231	-0.609153
	(0.22953)	(0.12508)	(0.09572)	(0.15666)
	[0.77872]	[-3.14530]	[-1.12021]	[-3.88834]
C	-1.002032	2.983736	0.056589	2.895112
	(1.23237)	(0.67157)	(0.51395)	(0.84113)
	[-0.81309]	[4.44292]	[0.11011]	[3.44194]
T	6.55E-06	-3.37E-06	-0.000387	-0.000386
	(0.00043)	(0.00023)	(0.00018)	(0.00029)
	[0.01524]	[-0.01441]	[-2.16084]	[-1.31523]
R-squared	0.409460	0.927156	0.588273	0.835247

Adj. R-squared	0.064978	0.884663	0.348099	0.739141
Sum sq. resids	0.048136	0.014295	0.008372	0.022424
S.E. equation	0.036567	0.019927	0.015250	0.024958
F-statistic	1.188626	21.81928	2.449363	8.690907
Log likelihood	123.4325	158.6428	174.1579	145.5857
Akaike AIC	-3.497671	-4.711821	-5.246824	-4.261576
Schwarz SC	-2.716124	-3.930273	-4.465277	-3.480029
Mean dependent	0.004049	6.062048	0.001701	6.103227
S.D. dependent	0.037816	0.058675	0.018887	0.048865

Determinant resid covariance (dof adj.)	5.54E-14
Determinant resid covariance	8.22E-15
Log likelihood	611.3476
Akaike information criterion	-18.04647
Schwarz criterion	-14.92028

Impulse Response Function: Figure 32 depicts the impulse response functions in Model (2) when we added private consumption. The response of private consumption to the government spending shock is positive with a multiplier of 0.6%. This result reconciles with the Keynesian models.

Variance Decomposition (VD): Table 33 shows the only variance decomposition of the GDP, and we notice that indeed its VD is mostly related to the unexpected shocks in the GDP itself with a lower portion as of 50-60 %.

Adding Private Investment**:** We extended Model (1) by adding a component of GDP as the fourth variable. The added variable four is linv, which is the log of real, per capita private investment, and it is found to be non-stationary in level at 5%; however, it is a stationary after first difference. Using the sequential likelihood ratio test by Lükepohl (1991), the optimal lag is 2, and the results of the reduced-form VAR of 4 variables are as follow:

Vector Autoregression Estimates
Date: 11/04/13 Time: 02:22
Sample (adjusted): 1996Q4 2011Q4
Included observations: 61 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	LGR_1	LGE	LGDP_1	LINV_1
LGR_1(-1)	-0.049624	0.122538	0.070456	-0.224882
	(0.14193)	(0.10023)	(0.05627)	(0.16772)
	[-0.34963]	[1.22252]	[1.25217]	[-1.34083]
LGR_1(-2)	-0.043544	-0.000555	0.099433	0.188576
	(0.13469)	(0.09512)	(0.05340)	(0.15916)

	[-0.32329]	[-0.00584]	[1.86216]	[1.18481]
LGE(-1)	0.012638	0.961864	-0.101564	0.034024
	(0.19123)	(0.13505)	(0.07581)	(0.22597)
	[0.06609]	[7.12244]	[-1.33972]	[0.15057]
LGE(-2)	-0.054568	-0.085631	0.116339	0.059400
	(0.19034)	(0.13442)	(0.07546)	(0.22492)
	[-0.28668]	[-0.63703]	[1.54174]	[0.26409]
LGDP_1(-1)	0.510820	-0.361253	-0.585616	-0.285400
	(0.32649)	(0.23057)	(0.12943)	(0.38581)
	[1.56458]	[-1.56678]	[-4.52449]	[-0.73975]
LGDP_1(-2)	0.053799	-0.516461	-0.376240	1.188488
	(0.32219)	(0.22753)	(0.12773)	(0.38072)
	[0.16698]	[-2.26985]	[-2.94566]	[3.12167]
LINV_1(-1)	-0.015455	0.052155	-0.094182	0.097729
	(0.10995)	(0.07765)	(0.04359)	(0.12993)
	[-0.14056]	[0.67168]	[-2.16070]	[0.75219]
LINV_1(-2)	0.030004	-0.038769	0.089174	-0.299459
	(0.11126)	(0.07857)	(0.04411)	(0.13147)
	[0.26968]	[-0.49343]	[2.02178]	[-2.27777]
C	0.259572	0.754160	-0.073362	-0.563121
	(0.56824)	(0.40129)	(0.22527)	(0.67147)
	[0.45680]	[1.87932]	[-0.32566]	[-0.83863]
T	-6.75E-05	-2.28E-05	-0.000329	-4.27E-05
	(0.00032)	(0.00022)	(0.00013)	(0.00038)
	[-0.21282]	[-0.10165]	[-2.61883]	[-0.11384]
R-squared	0.075281	0.805978	0.504386	0.280395
Adj. R-squared	-0.087904	0.771738	0.416925	0.153406
Sum sq. resids	0.079687	0.039742	0.012524	0.111272
S.E. equation	0.039528	0.027915	0.015670	0.046710
F-statistic	0.461323	23.53960	5.766974	2.208026
Log likelihood	115.9806	137.1993	172.4203	105.7977
Akaike AIC	-3.474775	-4.170470	-5.325256	-3.140909
Schwarz SC	-3.128730	-3.824425	-4.979211	-2.794864
Mean dependent	0.004732	6.059436	0.002480	0.003452
S.D. dependent	0.037898	0.058428	0.020522	0.050766

Determinant resid covariance (dof adj.)	4.39E-13
Determinant resid covariance	2.15E-13
Log likelihood	543.4609
Akaike information criterion	-16.50692
Schwarz criterion	-15.12274

Impulse Response Function: As can be seen from figure 33, the response of private investment to the government spending shock is positive with a multiplier of 0.6%. This result reconciles with the Keynesian models and came at odd with the neo-classical models.

Variance Decomposition (VD): Similarly, Table 34 shows the only variance decomposition of the GDP, and we notice that indeed its VD is mostly related to the unexpected shocks in the GDP itself with a lower portion as of 64 %.

<u>Adding Exports:</u> The lexpo, the log of real exports per capita, is non-stationary at level, and its p-value was 0.0966, which indicates that there is a unit root. Although it is stationary after we take the first difference. We added the lexpo variable to the previous three variables in Model (1), and we got the following results for the reduced-form:

Vector Autoregression Estimates
Date: 09/22/13 Time: 17:26
Sample (adjusted): 1997Q3 2011Q4
Included observations: 58 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	LGR_1	LGE	LGDP_1	LEXPO_1
LGR_1(-1)	-0.189123	0.068422	0.016751	0.469974
	(0.16196)	(0.11425)	(0.06890)	(0.21901)
	[-1.16770]	[0.59888]	[0.24311]	[2.14594]
LGR_1(-2)	-0.080534	0.087700	0.077917	0.610456
	(0.19259)	(0.13586)	(0.08193)	(0.26042)
	[-0.41816]	[0.64554]	[0.95100]	[2.34410]
LGR_1(-3)	-0.076564	-0.112786	0.008816	0.416783
	(0.21735)	(0.15332)	(0.09246)	(0.29390)
	[-0.35226]	[-0.73562]	[0.09535]	[1.41812]
LGR_1(-4)	-0.241212	-0.011035	0.073425	0.221422
	(0.20382)	(0.14378)	(0.08671)	(0.27561)
	[-1.18343]	[-0.07675]	[0.84678]	[0.80338]
LGR_1(-5)	-0.228602	-0.064721	-0.022875	0.011047
	(0.15727)	(0.11094)	(0.06690)	(0.21266)
	[-1.45359]	[-0.58340]	[-0.34190]	[0.05195]
LGE(-1)	0.325840	0.697751	-0.004657	-0.074927
	(0.29520)	(0.20824)	(0.12559)	(0.39917)
	[1.10378]	[3.35070]	[-0.03708]	[-0.18771]
LGE(-2)	0.261619	0.615943	0.099432	-0.227934
	(0.33752)	(0.23809)	(0.14359)	(0.45639)
	[0.77513]	[2.58704]	[0.69249]	[-0.49943]

LGE(-3)	-0.397245	-0.140998	-0.120954	-0.340334
	(0.31378)	(0.22134)	(0.13349)	(0.42429)
	[-1.26602]	[-0.63702]	[-0.90611]	[-0.80213]
LGE(-4)	-0.547852	-0.553027	-0.171560	0.492354
	(0.30207)	(0.21309)	(0.12851)	(0.40847)
	[-1.81363]	[-2.59531]	[-1.33500]	[1.20538]
LGE(-5)	0.397760	0.213447	0.241221	0.325908
	(0.24174)	(0.17053)	(0.10284)	(0.32688)
	[1.64541]	[1.25170]	[2.34558]	[0.99703]
LGDP_1(-1)	0.138081	0.172042	-0.710974	-0.801374
	(0.41077)	(0.28976)	(0.17475)	(0.55544)
	[0.33615]	[0.59374]	[-4.06854]	[-1.44277]
LGDP_1(-2)	-0.433712	-0.357019	-0.335645	-0.271824
	(0.50187)	(0.35403)	(0.21351)	(0.67863)
	[-0.86418]	[-1.00845]	[-1.57205]	[-0.40055]
LGDP_1(-3)	-0.419661	-0.092387	-0.172761	-0.592661
	(0.49785)	(0.35119)	(0.21179)	(0.67319)
	[-0.84295]	[-0.26307]	[-0.81570]	[-0.88038]
LGDP_1(-4)	-0.144440	-0.003042	-0.026552	-1.212578
	(0.45156)	(0.31854)	(0.19210)	(0.61060)
	[-0.31987]	[-0.00955]	[-0.13822]	[-1.98587]
LGDP_1(-5)	0.416296	-0.355792	0.084884	-0.406262
	(0.36647)	(0.25852)	(0.15591)	(0.49555)
	[1.13595]	[-1.37629]	[0.54446]	[-0.81983]
LEXPO_1(-1)	0.358299	-0.146843	0.059484	-0.014353
	(0.16748)	(0.11814)	(0.07125)	(0.22647)
	[2.13934]	[-1.24292]	[0.83487]	[-0.06338]
LEXPO_1(-2)	0.262962	-0.029625	0.036439	-0.430189
	(0.17763)	(0.12530)	(0.07557)	(0.24019)
	[1.48040]	[-0.23643]	[0.48222]	[-1.79104]
LEXPO_1(-3)	0.013226	-0.035610	-0.005567	-0.459105
	(0.18909)	(0.13339)	(0.08044)	(0.25569)
	[0.06994]	[-0.26697]	[-0.06921]	[-1.79555]
LEXPO_1(-4)	0.184472	-0.036171	-0.045990	0.279554
	(0.19220)	(0.13558)	(0.08177)	(0.25990)
	[0.95978]	[-0.26678]	[-0.56246]	[1.07564]
LEXPO_1(-5)	0.002637	0.191817	-0.091088	-0.385216
	(0.18385)	(0.12969)	(0.07821)	(0.24861)
	[0.01434]	[1.47902]	[-1.16459]	[-1.54950]
C	-0.231804	1.014637	-0.245171	-1.011121
	(0.77740)	(0.54839)	(0.33072)	(1.05120)
	[-0.29818]	[1.85022]	[-0.74132]	[-0.96188]
T	-0.000176	-1.60E-06	-0.000368	-0.001102
	(0.00041)	(0.00029)	(0.00017)	(0.00055)
	[-0.42880]	[-0.00554]	[-2.11225]	[-1.98899]
R-squared	0.453019	0.886942	0.603160	0.565914
Adj. R-squared	0.133946	0.820991	0.371670	0.312697

Sum sq. resids	0.044585	0.022186	0.008069	0.081522
S.E. equation	0.035192	0.024825	0.014971	0.047587
F-statistic	1.419798	13.44853	2.605558	2.234898
Log likelihood	125.6545	145.8949	175.2259	108.1540
Akaike AIC	-3.574294	-4.272239	-5.283652	-2.970829
Schwarz SC	-2.792747	-3.490692	-4.502105	-2.189281
Mean dependent	0.004049	6.062048	0.001701	0.002746
S.D. dependent	0.037816	0.058675	0.018887	0.057400
Determinant resid covariance (dof adj.)		1.20E-13		
Determinant resid covariance		1.78E-14		
Log likelihood		588.8800		
Akaike information criterion		-17.27172		
Schwarz criterion		-14.14553		

Impulse Response Function: Figure 34 shows the impulse response functions in the above model, where exports variable is added. The response of exports to the government spending shock is negative on impact with a multiplier of 2.6 %, and then responds cyclically afterwards. The negative outcome for exports is common in economic research literature.

Adding Imports: We found the limp, the log of real imports per capita, is stationary in level at 5% significance level. For the reduced-form VAR model, we added imports and chose lag four at optimal.

Impulse Response Function: From figure 35, we notice that the response of imports to the government spending shock, on impact, is negative as of 1%. For imports, the government spending multiplier was 1.3 % in quarter two.

Model (3): I extend Model (1) by adding the interest rate (i_t) and inflation (π_t) variables. It is important to include them to account for volatility on prices and because government revenue and government expenditures might be influenced by nominal factors. The endogenous variables become as follows: $Y_t \equiv (GR_t, GE_t, GDP_t, \pi_t, i_t)'$ as a 5-dimintional vector.

Impulse Response Function: Figure 36 shows the impulse response functions in this model, where inflation and interest rate have been added. The response of interest rate to the government spending shock was negative in the first nine periods with a multiplier of 13 %. In the same vein, its response to government taxes was positive with a multiplier of 11% in quarter 4. In addition, the inflation rate's response to government revenue and spending was positive for the first three periods, and then dies out afterwards.

CHAPTER 7

CONCLUSION

This dissertation empirically characterizes the dynamic effects of fiscal policy shocks on standard macroeconomic variables in Saudi Arabia. The SVAR model is used following the Blanchard and Perotti approach. The impulse response functions and variance decompositions have been used for analyzing the effect of government spending and revenue on the output (the GDP), inflation rate and interest rate.

The results of the impulse response functions indicate that responses of the output to fiscal policy shocks reconciled with the standard wisdom (i.e., the Keynesian view): when government spending rises, output increase; when government taxes increase, output falls. After disaggregating the GDP components, the response of private consumption to fiscal policy follows the Keynesian view; however, the response of private investment to fiscal policy reconciles with the neo-classical view. For validity, included countries provide similar results to Saudi Arabia.

Examining the effect of fiscal policy in developing countries is limited compared with studies written in developed countries. This study came as a foundation on pursuing the path to analyze effects of fiscal shocks in developing countries.

Since the government spending, in Saudi Arabia, is a public investment, we focus in diversification of the economy to minimize depending on oil. For instance, enhancing heavy industries corporations as Yanbu and Al jubail is similar to the Malaysian experience in the last twenty years. In addition, it is recommended to establish a government fund of oil receipts. This recommendation is similar to the successful government fund of Norway.

REFERENCES

Al-Abdulkarim, B. B. (2004). *An analysis of macroeconomic fluctuations for a small open oil-based economy: The case of Saudi Arabia.* (3151551 Ph.D.), Clark University, Ann Arbor. ProQuest Dissertations & Theses Full Text database.

Al-Kawaz, A. (2005). Forward-looking approach for fiscal sustainability: a case of Egypt, Indonesia, Kuwait, Saudi Arabia and the United Arab Emirates. *OPEC Review: Energy Economics & Related Issues, 29*(1), 1-36. doi: 10.1111/j.0277-0180.2005.00141.x

Alesina, A., & Perotti, R. (1996). Fiscal adjustments in OECD countries: composition and macroeconomic effects: National Bureau of Economic Research.

Alesina, A., & Wacziarg, R. (1998). Openness, country size and government. *Journal of Public Economics*, *69*(3), 305-321.

Alwagdani, O. (2004). *Two essays on the sources of macroeconomic fluctuations and fiscal policy sustainability in oil-based economies: The case of Saudi Arabia.* (3150394 Ph.D.), University of Kansas. ProQuest Dissertations & Theses Full Text database.

Amisano, G., & Giannini, C. (1997). Topics in structural VAR econometrics. *Berlin/Heidelberg*.

Angelopoulos, K., & Philippopoulos, A. (2005). The role of government in anti-social redistributive activities.

Ardagna, S. (2001). Fiscal policy composition, public debt, and economic activity. *Public Choice, 109*(3-4), 301-325.

Asdrubali, P., Sørensen, B. E., & Yosha, O. (1996). Channels of interstate risk sharing: United States 1963–1990. *The Quarterly Journal of Economics, 111*(4), 1081-1110.

Asfaw, D. A. (2012). *Empirical Characterization of the Dynamic Effects of Fiscal Policy Shock on Key Macroeconomic variables in Ethiopia.* Addis Ababa University.

Baxter, M., & King, R. G. (1993). Fiscal Policy in General Equilibrium. *American Economic Review, 83*(3), 315-334.

Bayoumi, T., & Masson, P. R. (1995). Fiscal flows in the United States and Canada: lessons for monetary union in Europe. *European Economic Review, 39*(2), 253-274.

Bernanke, B. S., & Blinder, A. S. (1992). The Federal Funds Rate and the Channels of Monetary Transmission. *The American Economic Review*, *82*(4), 901-921. doi: 10.2307/2117350

Bernanke, B. S., & Mihov, I. (1998). Measuring monetary policy. *The Quarterly Journal of Economics*, *113*(3), 869-902.

Blanchard, O. (1993). *Patterns of Success: Twentieth Century Entrepreneurs in the Dictionary of Business Biography*. Centre for Economic Performance, LSE, CEP Discussion Papers.

Blanchard, O., & Perotti, R. (2002). An Empirical Characterization of the Dynamic Effects of Changes in Government Spending and Taxes on Output. *The Quarterly Journal of Economics, 117*(4), 1329-1368. doi: 10.2307/4132480

Blöndal, J. R., Hawkesworth, I., & Choi, H.-D. (2009). Budgeting in Indonesia. *OECD Journal on Budgeting, 2009*(2).

Bryant, R. C., Henderson, D. W., Holtham, G., Hooper, P., & Symansky, S. (1988). *Empirical macroeconomics for interdependent economies* (Vol. 2): Brookings Institution Washington DC.

Christiano, L. J., Eichenbaum, M., & Evans, C. (1994). The effects of monetary policy shocks: some evidence from the flow of funds: National Bureau of Economic Research.

Christiano, L. J., Eichenbaum, M., & Evans, C. L. (1999). Monetary policy shocks: What have we learned and to what end? *Handbook of macroeconomics, 1*, 65-148.

Coutinho, L. (2011). The Resource Curse and Fiscal Policy. *Cyprus Economic Policy Review, 5*(1), 43-70.

Dalsgaard, T., André, C., & Richardson, P. (2001). Standard shocks in the OECD Interlink model: OECD Publishing.

Davis, J. M., Ossowski, R., & Fedelino, A. (2003). *Fiscal policy formulation and implementation in oil-producing countries*: International Monetary Fund.

Doraisami, A. (2011). The global financial crisis: Countercyclical fiscal policy issues and challenges in Malaysia, Indonesia, the Philippines, and Singapore.

Edelberg, W., Eichenbaum, M., & Fisher, J. D. M. (1999). Understanding the Effects of a Shock to Government Purchases. *Review of Economic Dynamics, 2*(1), 166-206.

Enders, W. (2008). *Applied econometric time series*: John Wiley & Sons.

Fatas, A., & Mihov, I. (2003). The Case for Restricting Fiscal Policy Discretion. *Quarterly Journal of Economics, 118*(4), 1419-1447.

Forni, L., Monteforte, L., & Sessa, L. (2009). The general equilibrium effects of fiscal policy: Estimates for the Euro area. *Journal of Public Economics, 93*(3–4), 559-585.

Furceri, D., & Sousa, R. M. (2011). The Impact of Government Spending on the Private Sector: Crowding-out versus Crowding-in Effects. *Kyklos, 64*(4), 516-533.

Gaber, S., Gruevski, I., & Gaber, V. (2013). The effects of discretionary fiscal policy on macroeconomic aggregates. *BEH-Business and Economic Horizons, 9*(1), 33-40.

Gylfason, T. (2011). Natural resource endowment: A mixed blessing?

Hannesson, R. (2001). *Investing for Sustainability: The Management of Mineral Wealth*: Springer.

Hemming, R., Kell, M., & Mahfouz, S. (2002). *The Effectiveness of Fiscal Policy in Stimulating Economic Activity--A Review of the Literature* (Vol. 2): International Monetary Fund.

Hill, H., & Shiraishi, T. (2007). Indonesia After the Asian Crisis*. *Asian Economic Policy Review, 2*(1), 123-141.

Joharji, G. A. (2009). *Examining government expenditure and economic growth in a natural resource based economy: Case study of Saudi Arabia.* (3430287 Ph.D.), The American University, Ann Arbor. ProQuest Dissertations & Theses Full Text database.

Kim, S. (1999). Do monetary policy shocks matter in the G-7 countries? Using common identifying assumptions about monetary policy across countries. *Journal of international economics, 48*(2), 387-412.

Kurniawan, R. Sustainability of fiscal policy and government revenue-expenditure nexus : the experience of Indonesia.

Kweka, J. P., Morrissey, O., Development, U. o. N. C. f. R. i. E., & Trade, I. (2000). *Government Spending and Economic Growth in Tanzania, 1965-1996*: Centre for Research in Economic Development and International Trade, University of Nottingham.

Leeper, E. M., Sims, C. A., Zha, T., Hall, R. E., & Bernanke, B. S. (1996). What does monetary policy do? *Brookings papers on economic activity, 1996*(2), 1-78.

Leigh, A. (2009). How Much Did the 2009 Fiscal Stimulus Boost Spending? Evidence from a Household Survey. *Evidence from a Household Survey (October 14, 2009).*

Perotti, R. (2004). Estimating the effects of fiscal policy in OECD countries. *IGIER Working Paper No. 276*.

Pieschacon, A. (2008). *Oil Prices and Fiscal Policy in Small Open Economies*: ProQuest.

Ramayandi, A. (2003). Tracing the Monetary Policy Reaction Functions for the Case of a Small Developing Economy: Department of Economics, Padjadjaran University.

Ramey, V. A., & Shapiro, M. D. (1998). *Costly capital reallocation and the effects of government spending.* Paper presented at the Carnegie-Rochester Conference Series on Public Policy.

Restrepo, J., & Rincón, H. (2006). Identifying fiscal policy shocks in Chile and Colombia. *Available at SSRN 2005164*.

Rodrik, D. (1996). Why do more open economies have bigger governments? : National Bureau of Economic Research.

Shapiro, M. D., & Slemrod, J. (2003). Did the 2001 Tax Rebate Stimulate Spending? Evidence from Taxpayer Surveys. *Tax Policy and the Economy, 17*, 83-109. doi: 10.2307/20140505

Shapiro, M. D., & Slemrod, J. B. (2009). Did the 2008 tax rebates stimulate spending? : National Bureau of Economic Research.

Sims, C. A. (1980). Macroeconomics and Reality. *Econometrica, 48*(1), 1-48. doi: 10.2307/1912017

Skancke, M. (2003). Fiscal policy and petroleum fund management in Norway. *Fiscal Policy Formulation and Implementation in Oil-Producing Countries, 316*, 318-320.

Symansky, S. A., Bartolini, L., & Razin, A. (1995). *Fiscal Restructuring in the Group of Seven Major Industrial Countries in the 1990s: Macroeconomic Effects*. International Monetary Fund, IMF Working Papers: 95/35.

Tanzi, V. (2008). The role of the state and public finance in the next generation. *OECD Journal on Budgeting, 8*(2), 7-27.

Uhlig, H., & Mountford, A. (2002). What are the Effects of Fiscal Policy Shocks? *Available at SSRN 306321*.

Werner, R. A. (2004). Why has fiscal policy disappointed in Japan?-revisiting the pre-Keynesian view on the ineffectiveness of fiscal policy. *University of Southampton, Work in Progress, January, werner@ soton. ac. uk*.

Yadav, S., Upadhyay, V., & Sharma, S. (2012). Impact of fiscal policy shocks on the Indian economy. *Margin: The Journal of Applied Economic Research*, *6*(4), 415-444.

APPENDICES

Saudi Arabia

Table 5: *Lag order of LGDP,Saudi Arabia*

VAR Lag Order Selection Criteria
Endogenous variables: LGR LGE LGDP
Exogenous variables: C T
Date: 09/17/13 Time: 18:15
Sample: 1993Q1 2011Q4
Included observations: 70

Lag	LogL	LR	FPE	AIC	SC	HQ
0	730.5178	NA	2.05e-13	-20.70051	-20.50778	-20.62395
1	941.6832	392.1643	6.37e-16	-26.47666	-25.99484	-26.28528
2	979.5726	67.11843	2.80e-16	-27.30207	-26.53116	-26.99586
3	998.8314	32.46484*	2.10e-16	-27.59518	-26.53518*	-27.17414*
4	1008.091	14.81544	2.10e-16	-27.60260	-26.25350	-27.06672
5	1018.758	16.15213	2.03e-16*	-27.65022	-26.01203	-26.99951
6	1027.913	13.07955	2.06e-16	-27.65466*	-25.72738	-26.88912

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Table 6: *Model Specification, Saudi Arabia*

VAR Residual Serial Correlation LM Tests
Null Hypothesis: no serial correlation at lag order h
Date: 09/17/13 Time: 18:25
Sample: 1993Q1 2011Q4
Included observations: 73

Lags	LM-Stat	Prob
1	22.66506	0.0070
2	10.19469	0.3350
3	15.12076	0.0877
4	16.84187	0.0513
5	10.52410	0.3097
6	13.51046	0.1408
7	6.213861	0.7183
8	16.16466	0.0635
9	13.38619	0.1459
10	7.260367	0.6100
11	16.42260	0.0586
12	7.262466	0.6098
13	11.15471	0.2653
14	22.12987	0.0085
15	14.30742	0.1118
16	8.489747	0.4856
17	17.51654	0.0412
18	16.18647	0.0631
19	18.89697	0.0261
20	6.747976	0.6633

21	8.414758	0.4929
22	6.721831	0.6661
23	7.679736	0.5667

Probs from chi-square with 9 df.

Vector Autoregression Estimates
Date: 09/17/13 Time: 18:33
Sample (adjusted): 1993Q4 2011Q4
Included observations: 73 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	LGR	LGE	LGDP
LGR(-1)	0.968896	-0.031998	0.029229
	(1.01090)	(0.16199)	(0.31344)
	[0.95845]	[-0.19753]	[0.09325]
LGR(-2)	0.146891	-0.030963	-0.139804
	(1.54069)	(0.24689)	(0.47771)
	[0.09534]	[-0.12541]	[-0.29266]
LGR(-3)	-0.761188	0.133188	0.269198
	(1.00723)	(0.16140)	(0.31230)
	[-0.75573]	[0.82518]	[0.86198]
LGE(-1)	-6.846067	3.281546	2.263569
	(7.61615)	(1.22046)	(2.36147)
	[-0.89889]	[2.68879]	[0.95854]
LGE(-2)	7.500973	-2.798550	-2.319459
	(13.4541)	(2.15596)	(4.17158)
	[0.55752]	[-1.29805]	[-0.55601]
LGE(-3)	-1.835247	0.635463	0.358771
	(7.19518)	(1.15300)	(2.23094)
	[-0.25507]	[0.55114]	[0.16082]
LGDP(-1)	3.018683	-1.195378	0.068611
	(6.27079)	(1.00487)	(1.94433)
	[0.48139]	[-1.18959]	[0.03529]
LGDP(-2)	-1.756522	1.047705	0.218133
	(10.5009)	(1.68273)	(3.25593)
	[-0.16727]	[0.62262]	[0.06700]
LGDP(-3)	-1.956018	0.197252	0.837766
	(5.82940)	(0.93414)	(1.80747)
	[-0.33554]	[0.21116]	[0.46350]
C	17.88838	-1.685553	-4.144956
	(12.8365)	(2.05700)	(3.98010)
	[1.39356]	[-0.81942]	[-1.04142]
T	-0.008594	0.000799	0.001988
	(0.00629)	(0.00101)	(0.00195)
	[-1.36626]	[0.79292]	[1.01944]
R-squared	0.905863	0.997687	0.986426
Adj. R-squared	0.890680	0.997314	0.984237

Sum sq. resids	0.045640	0.001172	0.004388
S.E. equation	0.027132	0.004348	0.008413
F-statistic	59.66166	2674.685	450.5668
Log likelihood	165.6934	299.3598	251.1755
Akaike AIC	-4.238176	-7.900269	-6.580150
Schwarz SC	-3.893039	-7.555131	-6.235013
Mean dependent	6.782183	6.843301	7.319118
S.D. dependent	0.082059	0.083895	0.067005

Determinant resid covariance (dof adj.)	1.43E-16
Determinant resid covariance	8.78E-17
Log likelihood	1038.718
Akaike information criterion	-27.55391
Schwarz criterion	-26.51849

Table 7: *SVAR Results_Model (1), Saudi Arabia*

Structural VAR Estimates
Date: 09/10/13 Time: 12:51
Sample (adjusted): 1993Q4 2011Q4
Included observations: 73 after adjustments
Estimation method: method of scoring (analytic derivatives)
Convergence achieved after 11 iterations
Structural VAR is just-identified

Model: Ae = Bu where E[uu']=I
Restriction Type: short-run pattern matrix

A =

1	0	-0.85
0	1	0
C(1)	C(2)	1

B =

C(3)	C(4)	0
0	C(5)	0
0	0	C(6)

	Coefficient	Std. Error	z-Statistic	Prob.
C(1)	0.130837	0.009019	14.50639	0.0000
C(2)	-1.127824	0.056279	-20.03985	0.0000
C(3)	0.006642	0.000550	12.08305	0.0000
C(4)	-0.033574	0.002885	-11.63621	0.0000
C(5)	0.004348	0.000360	12.08305	0.0000
C(6)	0.000461	3.83E-05	12.04128	0.0000

Log likelihood 1020.834

Estimated A matrix:

1.000000	0.000000	-0.850000
0.000000	1.000000	0.000000
0.130837	-1.127824	1.000000

Estimated B matrix:

0.006642	-0.033574	0.000000
0.000000	0.004348	0.000000
0.000000	0.000000	0.000461

Table 8: *VD of GDP, Saudi Arabia*

Variance Decomposition of LGDP_1: Period	S.E.	Shock1	Shock2	Shock3
1	0.006274	18.53807	79.74819	1.713740
2	0.006879	15.59738	73.35789	11.04474
3	0.007068	18.57100	70.49725	10.93175
4	0.007273	21.40263	66.98457	11.61280
5	0.007314	22.09645	66.32489	11.57866
6	0.007379	22.12661	66.32660	11.54679
7	0.007438	21.83705	66.79677	11.36618
8	0.007535	22.11379	66.35882	11.52738
9	0.007568	22.62559	65.86769	11.50673
10	0.007579	22.58619	65.70783	11.70598
11	0.007597	22.79957	65.48976	11.71066
12	0.007616	23.11507	65.19462	11.69031
13	0.007626	23.21075	65.11814	11.67111
14	0.007629	23.22836	65.06875	11.70290
15	0.007637	23.26838	64.98719	11.74443
16	0.007650	23.37695	64.78709	11.83596
17	0.007656	23.45419	64.70177	11.84404
18	0.007659	23.51436	64.64214	11.84350
19	0.007666	23.62802	64.52931	11.84267
20	0.007673	23.75346	64.42061	11.82593

Table 9: *VD of GDP_LCONSS, Saudi Arabia*

Variance Decomposition of LGDP_1: Period	S.E.	Shock1	Shock2	Shock3	Shock4
1	0.006046	18.63569	79.35408	2.010226	0.000000
2	0.006765	15.39062	68.09931	11.62746	4.882614
3	0.007002	15.88641	66.63826	11.14920	6.326132
4	0.007309	17.28715	63.26023	12.01564	7.436987
5	0.007375	17.73925	62.14234	11.84853	8.269873
6	0.007523	17.90346	62.02721	11.74453	8.324803
7	0.007619	17.70138	61.74041	11.51673	9.041480
8	0.007720	18.85127	60.52301	11.80813	8.817590
9	0.007876	19.84625	58.83158	11.46160	9.860580
10	0.007914	19.96673	58.30062	11.46932	10.26333
11	0.008034	20.49222	56.99505	11.33303	11.17970
12	0.008119	21.22045	55.93678	11.28004	11.56273
13	0.008141	21.35718	55.85063	11.26442	11.52777
14	0.008148	21.34400	55.86968	11.24965	11.53667
15	0.008159	21.35422	55.72121	11.22584	11.69872
16	0.008171	21.46538	55.63205	11.23601	11.66656
17	0.008194	21.53544	55.46523	11.17438	11.82495
18	0.008210	21.65684	55.25181	11.15013	11.94122

19	0.008243	21.80870	54.83658	11.11975	12.23498
20	0.008263	22.00344	54.58209	11.09895	12.31551

Table 10: *VD of GDP_LINV, Saudi Arabia*

Variance Decomposition of LINV_1: Period	S.E.	Shock1	Shock2	Shock3	Shock4
1	0.006290	8.712072	4.921378	0.067961	86.29859
2	0.014489	10.74049	9.633302	3.037013	76.58919
3	0.022482	11.49669	10.52979	4.535298	73.43822
4	0.028360	12.45275	11.60192	5.936864	70.00846
5	0.031567	13.06991	13.33530	6.926498	66.66829
6	0.032787	13.33253	15.37671	7.422062	63.86871
7	0.033089	13.27293	16.61044	7.396372	62.72026
8	0.033394	13.03404	16.72410	7.339459	62.90240
9	0.033889	12.71865	16.25686	7.548107	63.47639
10	0.034337	12.42575	15.90283	7.932867	63.73855
11	0.034600	12.23781	15.92446	8.282901	63.55483
12	0.034720	12.20944	16.14912	8.441874	63.19957
13	0.034810	12.34127	16.31036	8.436529	62.91184
14	0.034922	12.55088	16.32347	8.383112	62.74253
15	0.035030	12.74074	16.25685	8.350529	62.65188
16	0.035100	12.86861	16.19372	8.345519	62.59215
17	0.035130	12.93417	16.16798	8.348959	62.54889
18	0.035137	12.95737	16.16631	8.348732	62.52759
19	0.035140	12.96076	16.16685	8.348062	62.52432
20	0.035144	12.95799	16.16315	8.351629	62.52723

Table 11: *VD of GDP_LEXPO, Saudi Arabia*

Variance Decomposition of LGDP_1: Period	S.E.	Shock1	Shock2	Shock3	Shock4
1	0.005894	23.21773	74.93906	1.843209	2.38E-30
2	0.006509	19.39084	64.55894	9.395388	6.654830
3	0.006754	19.25231	65.79712	8.763761	6.186804
4	0.007009	20.35336	63.17602	9.606006	6.864614
5	0.007156	20.21603	60.69241	9.289232	9.802324
6	0.007268	20.23510	60.09255	9.020857	10.65149
7	0.007319	20.56889	59.56451	8.909012	10.95758
8	0.007549	22.18799	56.02696	8.714324	13.07072
9	0.007780	23.09564	53.47482	8.242463	15.18707
10	0.007865	22.87106	52.65227	8.149550	16.32712
11	0.007968	22.92457	51.86345	7.965174	17.24680
12	0.008026	23.68136	51.24185	7.854551	17.22224
13	0.008067	23.53697	51.59453	7.822381	17.04613
14	0.008091	23.45360	51.46184	7.848457	17.23610
15	0.008096	23.42596	51.39794	7.840468	17.33564

16	0.008102	23.40256	51.31943	7.906847	17.37116
17	0.008109	23.36413	51.23285	7.975180	17.42785
18	0.008115	23.33644	51.17844	8.034376	17.45075
19	0.008132	23.32267	51.10796	8.052253	17.51712
20	0.008145	23.53611	50.95142	8.044063	17.46840

Table 12: *VD of GDP_ Extended 5-VAR model, Saudi Arabia*

Variance Decompo sition of LGDP_1: Period	S.E.	Shock1	Shock2	Shock3	Shock4	Shock5
1	0.003088	51.16866	27.71344	21.05043	0.067471	8.64E-30
2	0.003943	43.89951	22.57435	21.40099	5.735774	6.389376
3	0.004972	32.34723	39.27114	19.78134	4.579320	4.020972
4	0.005249	32.49140	36.31461	21.00879	4.144547	6.040650
5	0.005798	31.48327	30.76662	20.56697	9.002015	8.181120
6	0.006103	31.33319	27.93995	20.52907	12.47385	7.723946
7	0.006190	30.49818	29.36396	20.31651	12.15373	7.667625
8	0.006246	30.63166	29.01211	20.17320	12.57402	7.608999
9	0.006259	30.57338	29.00082	20.14047	12.55119	7.734150
10	0.006337	31.38378	28.45933	19.65232	12.93720	7.567374
11	0.006402	31.20861	28.96831	19.40833	12.92670	7.488054
12	0.006468	31.04987	29.22440	19.47810	12.84847	7.399165
13	0.006522	30.86919	29.64199	19.53527	12.67586	7.277681
14	0.006558	30.54410	29.91842	19.80028	12.53784	7.199356
15	0.006578	30.37591	29.89903	20.08817	12.46708	7.169803
16	0.006587	30.28618	29.87406	20.21407	12.47618	7.149505
17	0.006597	30.19860	29.82918	20.34745	12.46222	7.162546
18	0.006602	30.19106	29.79578	20.39566	12.44187	7.175632
19	0.006607	30.17669	29.78106	20.43969	12.42384	7.178719
20	0.006614	30.13721	29.76826	20.49581	12.40370	7.195015

Indonesia

Table 13: *The lag order of LGDP, Indonesia*

VAR Lag Order Selection Criteria
Endogenous variables: LGR_1 LGE_1 LGDP_1
Exogenous variables: C T D97 D08
Date: 12/22/13 Time: 21:55
Sample: 1993Q1 2011Q4
Included observations: 69

Lag	LogL	LR	FPE	AIC	SC	HQ
0	485.9850	NA	2.17e-10	-13.73870	-13.35016	-13.58455
1	549.4002	113.9636	4.49e-11	-15.31595	-14.63600	-15.04619
2	599.1649	85.10482	1.38e-11	-16.49753	-15.52618*	-16.11217
3	618.0852	30.71119	1.04e-11	-16.78508	-15.52232	-16.28410
4	632.8375	22.66303*	8.95e-12*	-16.95181*	-15.39765	-16.33523*
5	634.9115	3.005682	1.11e-11	-16.75106	-14.90549	-16.01886
6	636.0172	1.506322	1.44e-11	-16.52224	-14.38527	-15.67443

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)

Table 14: *Model Specification, Indonesia*

VAR Residual Serial Correlation LM Tests
Null Hypothesis: no serial correlation at lag order h
Date: 09/04/13 Time: 10:00
Sample: 1993Q1 2011Q4
Included observations: 71

Lags	LM-Stat	Prob
1	2.629728	0.9772
2	2.947001	0.9664
3	3.600250	0.9357
4	10.26390	0.3295
5	10.09366	0.3430
6	8.036114	0.5305
7	2.003043	0.9914
8	18.10600	0.0340
9	7.298885	0.6060
10	13.50494	0.1411
11	8.118725	0.5222
12	12.62441	0.1804
13	10.08738	0.3435
14	2.284518	0.9861

15	10.35474	0.3225
16	5.218521	0.8149
17	11.83165	0.2230
18	2.425293	0.9828
19	8.125313	0.5216
20	12.86661	0.1687
21	1.483633	0.9973
22	7.909615	0.5433
23	12.98879	0.1631
24	19.13644	0.0241

Probs from chi-square with 9 df.

Table 15: *SVAR Results_Model (1), Indonesia*

Structural VAR Estimates
Date: 09/03/13 Time: 19:26
Sample (adjusted): 1994Q2 2011Q4
Included observations: 71 after adjustments
Estimation method: method of scoring (analytic derivatives)
Convergence achieved after 5 iterations
Structural VAR is just-identified

Model: Ae = Bu where E[uu']=I
Restriction Type: short-run pattern matrix

A =

1	0	-1.29
0	1	0
C(1)	C(2)	1

B =

C(3)	C(4)	0
0	C(5)	0
0	0	C(6)

	Coefficient	Std. Error	z-Statistic	Prob.
C(1)	12.37559	6.559854	1.886565	0.0592
C(2)	-12.39448	6.499858	-1.906884	0.0565
C(3)	0.018770	0.001575	11.91638	0.0000
C(4)	0.025613	0.003096	8.274287	0.0000
C(5)	0.031622	0.002654	11.91638	0.0000
C(6)	0.061158	0.030936	1.976956	0.0480

Log likelihood 624.6570

Estimated A matrix:

1.000000	0.000000	-1.290000
0.000000	1.000000	0.000000
12.37559	-12.39448	1.000000

Estimated B matrix:

0.018770	0.025613	0.000000
0.000000	0.031622	0.000000
0.000000	0.000000	0.061158

Table 16: *VD of GDP, Indonesia*

Period	S.E.	Shock1	Shock2	Shock3
1	0.014833	85.22083	8.872024	5.907144
2	0.016867	65.91091	20.46686	13.62223
3	0.017586	64.39227	20.76844	14.83929
4	0.017731	64.58595	20.44578	14.96827
5	0.018404	59.98775	23.16420	16.84804
6	0.018857	57.39199	22.67728	19.93073
7	0.019420	54.15963	21.39635	24.44403
8	0.019550	53.56357	21.14146	25.29497
9	0.019685	53.35377	21.66816	24.97807
10	0.019827	52.84226	21.56300	25.59474
11	0.020021	51.83396	21.39330	26.77274
12	0.020163	51.13678	21.09368	27.76954
13	0.020238	50.95024	20.98951	28.06025
14	0.020266	50.95896	21.03700	28.00403
15	0.020294	50.90466	21.11300	27.98234
16	0.020315	50.80332	21.08783	28.10885
17	0.020335	50.71609	21.04784	28.23606
18	0.020351	50.67280	21.04634	28.28085
19	0.020362	50.65948	21.06742	28.27310
20	0.020367	50.65669	21.08212	28.26119

Variance Decomposition of LGR_1:

Period	S.E.	Shock1	Shock2	Shock3
1	0.031676	0.122015	97.72244	2.155543
2	0.032947	2.010175	95.83646	2.153362
3	0.034612	3.523196	94.49427	1.982530
4	0.035680	3.459326	94.42915	2.111525
5	0.038737	6.354961	91.57120	2.073840
6	0.040915	7.382576	88.61947	3.997950
7	0.041976	7.977752	87.94493	4.077316
8	0.042103	7.957449	87.92909	4.113457
9	0.043146	8.392759	85.93634	5.670900
10	0.045023	8.559960	83.72689	7.713149
11	0.045940	8.716677	82.79066	8.492658
12	0.045975	8.704218	82.80565	8.490130
13	0.046339	8.728738	81.95826	9.312998
14	0.047495	8.724286	80.20624	11.06947
15	0.048466	8.656219	78.86476	12.47902
16	0.048749	8.590179	78.61978	12.79004
17	0.048774	8.610305	78.54629	12.84340
18	0.049230	8.641195	77.77446	13.58434
19	0.049983	8.580220	76.65235	14.76743
20	0.050455	8.494498	76.04901	15.45649

Variance Decomposition of LGE_1:

Period	S.E.	Shock1	Shock2	Shock3
1	0.031622	0.000000	100.0000	0.000000
2	0.033111	0.874763	96.21724	2.907998
3	0.035883	1.457032	88.99731	9.545658
4	0.037255	1.354802	87.38170	11.26350
5	0.040308	5.683623	84.16566	10.15072
6	0.042201	7.304934	82.01308	10.68199

7	0.043365	7.936740	80.84838	11.21488
8	0.043624	7.889729	80.30708	11.80319
9	0.044189	8.679758	79.80925	11.51100
10	0.045356	9.324457	79.41801	11.25753
11	0.045976	9.752677	79.04660	11.20072
12	0.046001	9.759003	79.04807	11.19293
13	0.046176	9.788950	78.78491	11.42614
14	0.046822	9.892885	78.28571	11.82141
15	0.047326	9.977629	77.93950	12.08287
16	0.047455	9.982058	77.95731	12.06063
17	0.047507	9.967008	77.80317	12.22983
18	0.047858	9.938218	77.22958	12.83220
19	0.048339	9.880597	76.61439	13.50502
20	0.048587	9.838984	76.41045	13.75056

Variance Decomposition of LGR_1: Period	S.E.	Shock1	Shock2	Shock3	Shock4
1	0.030394	0.065204	97.66035	2.274449	0.000000
2	0.034925	1.161220	85.55738	1.827230	11.45416
3	0.036590	2.070213	85.36327	1.686365	10.88015
4	0.038762	2.013465	84.08705	1.502753	12.39674
5	0.041706	3.057820	84.73417	1.413841	10.79417
6	0.044641	4.485860	84.73611	1.350853	9.427174
7	0.045704	6.777555	82.83811	1.297415	9.086917
8	0.045945	7.568949	82.14637	1.292936	8.991747
9	0.046515	7.420202	82.40112	1.364241	8.814439
10	0.047156	7.355735	82.58615	1.351015	8.707097
11	0.047382	7.496414	82.30174	1.367486	8.834363
12	0.047520	7.509546	81.91842	1.686364	8.885667
13	0.047962	7.388181	81.57333	2.295115	8.743375
14	0.048541	7.404755	81.21699	2.842078	8.536174
15	0.048891	7.586338	80.93988	3.058877	8.414908
16	0.048978	7.766142	80.78565	3.062132	8.386076
17	0.049021	7.826882	80.67104	3.111368	8.390707
18	0.049134	7.799694	80.50856	3.286282	8.405468
19	0.049246	7.764414	80.34276	3.460051	8.432777
20	0.049288	7.751960	80.25820	3.525118	8.464724

Variance Decomposition of LGE_1: Period	S.E.	Shock1	Shock2	Shock3	Shock4
1	0.031096	0.000000	100.0000	0.000000	0.000000
2	0.036778	0.873925	84.20450	4.166093	10.75549
3	0.039520	1.784411	82.25763	6.230676	9.727285
4	0.041269	1.965315	79.56826	7.447195	11.01923
5	0.043034	2.571160	80.33951	6.948110	10.14122
6	0.045004	3.402346	80.80720	6.486825	9.303634
7	0.045810	4.753373	79.21395	6.672971	9.359708
8	0.046072	5.029415	78.46409	7.158429	9.348070
9	0.046484	4.946251	78.54183	7.325457	9.186465
10	0.046921	5.120465	78.41907	7.415407	9.045061
11	0.047079	5.326917	78.03489	7.530395	9.107794
12	0.047186	5.341932	77.87322	7.629070	9.155780
13	0.047438	5.318288	77.98684	7.600783	9.094092

14	0.047705	5.470461	78.01453	7.516231	8.998775
15	0.047846	5.692322	77.83168	7.528698	8.947299
16	0.047923	5.807087	77.58275	7.689685	8.920478
17	0.048035	5.800102	77.43792	7.874873	8.887107
18	0.048151	5.774966	77.41337	7.952305	8.859359
19	0.048204	5.785179	77.42147	7.941411	8.851939
20	0.048222	5.799768	77.37026	7.981049	8.848925

Variance Decomposition of LCONSS: Period	S.E.	Shock1	Shock2	Shock3	Shock4
1	0.036908	0.064197	19.10154	2.239302	78.59496
2	0.040874	1.276765	24.50380	3.903746	70.31569
3	0.044786	10.88386	24.89491	3.571039	60.65019
4	0.051431	23.20086	21.33169	3.564698	51.90275
5	0.053184	25.69959	20.19378	4.219600	49.88703
6	0.054206	26.10193	20.19311	5.141332	48.56363
7	0.055917	25.76791	20.02037	7.402780	46.80893
8	0.057799	24.76703	20.34084	10.09790	44.79423
9	0.059614	24.02112	20.77707	12.72232	42.47949
10	0.061442	23.70116	21.26687	14.46531	40.56666
11	0.062731	23.77617	21.69970	15.00315	39.52098
12	0.063494	24.04056	22.00327	14.89136	39.06481
13	0.064065	24.39987	22.05543	14.62944	38.91526
14	0.064517	24.69844	21.91281	14.47465	38.91410
15	0.064839	24.91052	21.74207	14.41038	38.93703
16	0.065057	25.07940	21.61499	14.33039	38.97522
17	0.065219	25.18886	21.53649	14.28102	38.99364
18	0.065401	25.20559	21.49231	14.40275	38.89936
19	0.065681	25.11474	21.48034	14.76312	38.64180
20	0.066047	24.95280	21.51573	15.26294	38.26854

Factorization: Structural

Table 17: *VD of GDP_Lconss,Indonesia*

Period	S.E.	Shock1	Shock2	Shock3	Shock4
1	0.014235	91.66638	2.102373	6.231251	0.000000
2	0.016329	72.30927	14.38992	9.908823	3.391981
3	0.016631	71.76733	14.67740	10.13485	3.420421
4	0.016951	69.68088	15.30215	11.45605	3.560924
5	0.018226	60.32254	22.91614	11.70502	5.056308
6	0.018699	57.68046	23.41896	13.82537	5.075204
7	0.019017	56.59855	23.50463	14.98781	4.909011
8	0.019154	56.74463	23.17906	15.06306	5.013255
9	0.019204	56.48421	23.20382	15.07744	5.234537
10	0.019290	55.98984	23.07683	15.55112	5.382210
11	0.019381	55.50362	22.86311	15.94927	5.684007
12	0.019436	55.25751	22.76175	16.15799	5.822760
13	0.019454	55.25054	22.76325	16.15089	5.835319
14	0.019476	55.23564	22.76454	16.16836	5.831462
15	0.019509	55.09400	22.71534	16.37873	5.811932
16	0.019556	54.83856	22.63435	16.74308	5.784014
17	0.019608	54.55581	22.56048	17.12866	5.755049
18	0.019649	54.33374	22.54002	17.38608	5.740164
19	0.019673	54.21081	22.57660	17.47071	5.741881
20	0.019688	54.16126	22.62397	17.45571	5.759058

Table 18: *The lag order_LEXPO, Indonesia*

VAR Lag Order Selection Criteria
Endogenous variables: LGR_1 LGE_1 LGDP_1 LEXPO_1
Exogenous variables: C T D97 D08
Date: 09/04/13 Time: 10:41
Sample: 1993Q1 2011Q4
Included observations: 69

Lag	LogL	LR	FPE	AIC	SC	HQ
0	553.4665	NA	2.02e-12	-15.57874	-15.06069	-15.37321
1	636.0435	146.0056	2.94e-13	-17.50851	-16.47240	-17.09745
2	694.0530	95.84180	8.78e-14	-18.72617	-17.17201*	-18.10959
3	724.5577	46.86232	5.89e-14	-19.14660	-17.07439	-18.32448*
4	743.1191	26.36259*	5.65e-14*	-19.22084*	-16.63058	-18.19320
5	755.7723	16.50410	6.57e-14	-19.12383	-16.01551	-17.89066
6	761.9461	7.337056	9.43e-14	-18.83902	-15.21264	-17.40031

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)

Variance Decom of LGR_1 Period	S.E.	Shock1	Shock2	Shock3	Shock4
1	0.030394	0.065204	97.66035	2.274449	0.000000
2	0.034925	1.161220	85.55738	1.827230	11.45416
3	0.036590	2.070213	85.36327	1.686365	10.88015
4	0.038762	2.013465	84.08705	1.502753	12.39674
5	0.041706	3.057820	84.73417	1.413841	10.79417
6	0.044641	4.485860	84.73611	1.350853	9.427174
7	0.045704	6.777555	82.83811	1.297415	9.086917

8	0.045945	7.568949	82.14637	1.292936	8.991747
9	0.046515	7.420202	82.40112	1.364241	8.814439
10	0.047156	7.355735	82.58615	1.351015	8.707097
11	0.047382	7.496414	82.30174	1.367486	8.834363
12	0.047520	7.509546	81.91842	1.686364	8.885667
13	0.047962	7.388181	81.57333	2.295115	8.743375
14	0.048541	7.404755	81.21699	2.842078	8.536174
15	0.048891	7.586338	80.93988	3.058877	8.414908
16	0.048978	7.766142	80.78565	3.062132	8.386076
17	0.049021	7.826882	80.67104	3.111368	8.390707
18	0.049134	7.799694	80.50856	3.286282	8.405468
19	0.049246	7.764414	80.34276	3.460051	8.432777
20	0.049288	7.751960	80.25820	3.525118	8.464724

Variance Decomposition of LGE_1: Period	S.E.	Shock1	Shock2	Shock3	Shock4
1	0.031096	0.000000	100.0000	0.000000	0.000000
2	0.036778	0.873925	84.20450	4.166093	10.75549
3	0.039520	1.784411	82.25763	6.230676	9.727285
4	0.041269	1.965315	79.56826	7.447195	11.01923
5	0.043034	2.571160	80.33951	6.948110	10.14122
6	0.045004	3.402346	80.80720	6.486825	9.303634
7	0.045810	4.753373	79.21395	6.672971	9.359708
8	0.046072	5.029415	78.46409	7.158429	9.348070
9	0.046484	4.946251	78.54183	7.325457	9.186465
10	0.046921	5.120465	78.41907	7.415407	9.045061
11	0.047079	5.326917	78.03489	7.530395	9.107794
12	0.047186	5.341932	77.87322	7.629070	9.155780
13	0.047438	5.318288	77.98684	7.600783	9.094092
14	0.047705	5.470461	78.01453	7.516231	8.998775
15	0.047846	5.692322	77.83168	7.528698	8.947299
16	0.047923	5.807087	77.58275	7.689685	8.920478
17	0.048035	5.800102	77.43792	7.874873	8.887107
18	0.048151	5.774966	77.41337	7.952305	8.859359
19	0.048204	5.785179	77.42147	7.941411	8.851939
20	0.048222	5.799768	77.37026	7.981049	8.848925

Variance Decomposition of LCONSS: Period	S.E.	Shock1	Shock2	Shock3	Shock4
1	0.036908	0.064197	19.10154	2.239302	78.59496
2	0.040874	1.276765	24.50380	3.903746	70.31569
3	0.044786	10.88386	24.89491	3.571039	60.65019
4	0.051431	23.20086	21.33169	3.564698	51.90275
5	0.053184	25.69959	20.19378	4.219600	49.88703
6	0.054206	26.10193	20.19311	5.141332	48.56363
7	0.055917	25.76791	20.02037	7.402780	46.80893
8	0.057799	24.76703	20.34084	10.09790	44.79423
9	0.059614	24.02112	20.77707	12.72232	42.47949
10	0.061442	23.70116	21.26687	14.46531	40.56666
11	0.062731	23.77617	21.69970	15.00315	39.52098
12	0.063494	24.04056	22.00327	14.89136	39.06481
13	0.064065	24.39987	22.05543	14.62944	38.91526
14	0.064517	24.69844	21.91281	14.47465	38.91410
15	0.064839	24.91052	21.74207	14.41038	38.93703
16	0.065057	25.07940	21.61499	14.33039	38.97522

17	0.065219	25.18886	21.53649	14.28102	38.99364
18	0.065401	25.20559	21.49231	14.40275	38.89936
19	0.065681	25.11474	21.48034	14.76312	38.64180
20	0.066047	24.95280	21.51573	15.26294	38.26854

Factorization:
Structural

Table 19: *VD of GDP (lexpo), Indonesia*

Variance Decomposition of LGDP_1:

Period	S.E.	Shock1	Shock2	Shock3	Shock4
1	0.013447	10.83836	81.75404	7.407609	0.000000
2	0.016347	17.05588	57.58446	13.60106	11.75860
3	0.017852	14.35994	56.12142	13.72228	15.79636
4	0.018111	14.04480	55.01811	14.15912	16.77797
5	0.018779	14.61066	52.92464	16.65730	15.80740
6	0.019173	14.01589	51.15438	18.32283	16.50689
7	0.019629	13.39259	50.29578	20.18581	16.12582
8	0.019675	13.47672	50.06511	20.39209	16.06608
9	0.019784	14.11859	49.57035	20.17891	16.13215
10	0.019941	14.15779	48.80256	20.90320	16.13644
11	0.020142	13.99242	47.86731	22.26617	15.87411
12	0.020354	13.83140	46.89564	23.66938	15.60358
13	0.020488	13.88757	46.45623	24.00696	15.64924
14	0.020544	14.07411	46.25910	23.90796	15.75883
15	0.020572	14.12435	46.19234	23.94117	15.74214
16	0.020609	14.07276	46.02734	24.18649	15.71341
17	0.020656	14.03540	45.82585	24.38360	15.75514
18	0.020694	14.05195	45.69437	24.45526	15.79841
19	0.020709	14.06075	45.68502	24.45918	15.79505
20	0.020714	14.06076	45.69651	24.45259	15.79013

Variance Decomposition of LGR_1:

Period	S.E.	Shock1	Shock2	Shock3	Shock4
1	0.030580	71.31006	26.30636	2.383580	0.000000
2	0.033081	65.30181	22.59579	2.575696	9.526699
3	0.035225	64.93152	21.62942	2.433141	11.00592
4	0.036079	63.96583	22.06158	3.476154	10.49644
5	0.039025	67.19354	19.01054	3.377347	10.41857
6	0.041202	66.27022	17.73418	4.768675	11.22692
7	0.042275	67.14194	17.20301	4.608176	11.04688
8	0.042421	66.90611	17.11597	4.661901	11.31602
9	0.043583	65.85172	16.22207	5.938797	11.98742
10	0.045482	65.13960	15.12864	7.681300	12.05046
11	0.046327	65.18108	14.61869	8.494132	11.70609
12	0.046450	64.98985	14.61852	8.466399	11.92524
13	0.046994	63.95908	14.28590	9.238733	12.51629
14	0.048172	62.66324	13.60358	11.16223	12.57095
15	0.049089	61.87254	13.15007	12.80887	12.16852
16	0.049383	61.66758	13.09632	13.09773	12.13837

17	0.049549	61.26009	13.07037	13.13704	12.53251
18	0.050108	60.33030	12.79701	14.20416	12.66853
19	0.050852	59.40529	12.43428	15.77667	12.38376
20	0.051295	58.96047	12.28480	16.56376	12.19097

Variance Decomposition of LGE_1:

Period	S.E.	Shock1	Shock2	Shock3	Shock4
1	0.030403	69.21588	30.78412	0.000000	0.000000
2	0.033110	61.16740	26.63520	1.924767	10.27263
3	0.036061	57.07456	25.89740	5.944304	11.08374
4	0.036795	57.61227	25.10378	6.637973	10.64597
5	0.039850	61.75161	21.45208	5.991780	10.80453
6	0.041804	61.66972	19.62729	6.745474	11.95751
7	0.042958	62.28878	18.75960	7.208249	11.74338
8	0.043277	61.60780	18.49980	7.936222	11.95617
9	0.044102	61.49484	17.86018	7.649182	12.99580
10	0.045424	62.16135	16.84464	7.413135	13.58087
11	0.046029	62.67706	16.44919	7.469172	13.40457
12	0.046115	62.59529	16.38848	7.459213	13.55702
13	0.046451	62.02620	16.15530	7.640574	14.17793
14	0.047132	61.62894	15.69264	8.192769	14.48565
15	0.047579	61.61593	15.40016	8.666714	14.31720
16	0.047699	61.69359	15.33045	8.666063	14.30990
17	0.047857	61.28993	15.23037	8.896100	14.58360
18	0.048293	60.49509	14.95668	9.887698	14.66054
19	0.048768	59.87838	14.68208	10.99350	14.44605
20	0.048989	59.69321	14.58860	11.38609	14.33210

Variance Decomposition of LGDP_1:

Period	S.E.	Shock1	Shock2	Shock3	Shock4
1	0.013447	10.83836	81.75404	7.407609	0.000000
2	0.016347	17.05588	57.58446	13.60106	11.75860
3	0.017852	14.35994	56.12142	13.72228	15.79636
4	0.018111	14.04480	55.01811	14.15912	16.77797
5	0.018779	14.61066	52.92464	16.65730	15.80740
6	0.019173	14.01589	51.15438	18.32283	16.50689
7	0.019629	13.39259	50.29578	20.18581	16.12582
8	0.019675	13.47672	50.06511	20.39209	16.06608
9	0.019784	14.11859	49.57035	20.17891	16.13215
10	0.019941	14.15779	48.80256	20.90320	16.13644
11	0.020142	13.99242	47.86731	22.26617	15.87411
12	0.020354	13.83140	46.89564	23.66938	15.60358
13	0.020488	13.88757	46.45623	24.00696	15.64924
14	0.020544	14.07411	46.25910	23.90796	15.75883
15	0.020572	14.12435	46.19234	23.94117	15.74214
16	0.020609	14.07276	46.02734	24.18649	15.71341
17	0.020656	14.03540	45.82585	24.38360	15.75514
18	0.020694	14.05195	45.69437	24.45526	15.79841
19	0.020709	14.06075	45.68502	24.45918	15.79505
20	0.020714	14.06076	45.69651	24.45259	15.79013

Variance Decomposition of LEXPO_1:

Period	S.E.	Shock1	Shock2	Shock3	Shock4
1	0.078892	10.28351	2.361328	3.417919	83.93724
2	0.085206	9.746703	12.35981	2.968480	74.92501
3	0.090817	19.80307	10.89522	2.677010	66.62470
4	0.103079	22.48603	20.88494	2.111360	54.51767

5	0.107947	20.55128	21.48212	1.926867	56.03973
6	0.109145	20.66570	21.02752	2.940514	55.36626
7	0.109930	20.37367	21.86853	3.085010	54.67279
8	0.111362	20.70711	21.34668	3.247483	54.69873
9	0.113631	19.93259	20.52693	6.286629	53.25385
10	0.114786	19.71326	20.25257	7.772049	52.26212
11	0.115563	19.66282	20.01514	8.554376	51.76767
12	0.115893	19.58970	20.01882	8.508069	51.88341
13	0.116480	19.47598	19.81831	9.129763	51.57595
14	0.117278	19.21823	19.57115	10.33114	50.87948
15	0.118066	18.97607	19.35063	11.35723	50.31607
16	0.118389	18.87946	19.31661	11.58914	50.21480
17	0.118511	18.86117	19.36174	11.56668	50.21041
18	0.118642	18.82009	19.37243	11.70554	50.10195
19	0.118845	18.75872	19.30678	11.98206	49.95245
20	0.119034	18.69981	19.25402	12.20105	49.84511

Factorization: Structural

Table 20: *The lag order_limp, Indonesia*

VAR Lag Order Selection Criteria
Endogenous variables: LGR_1 LGE_1 LGDP_1 LIMP
Exogenous variables: C T D97 D08
Date: 09/19/13 Time: 12:39
Sample: 1993Q1 2011Q4
Included observations: 69

Lag	LogL	LR	FPE	AIC	SC	HQ
0	529.8244	NA	4.00e-12	-14.89346	-14.37541	-14.68793
1	632.1106	180.8539	3.29e-13	-17.39451	-16.35840	-16.98345
2	693.4494	101.3425	8.94e-14	-18.70868	-17.15452*	-18.09209
3	721.1038	42.48358*	6.50e-14*	-19.04649*	-16.97427	-18.22437*
4	734.8079	19.46375	7.19e-14	-18.97994	-16.38967	-17.95229
5	739.0535	5.537780	1.07e-13	-18.63923	-15.53091	-17.40606
6	756.7408	21.01958	1.10e-13	-18.68814	-15.06176	-17.24943

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Table 21: *VD of GDD_Limp, Indonesia*

Variance Decomposition of LGDP_1: Period	S.E.	Shock1	Shock2	Shock3	Shock4
1	0.013447	87.40427	5.188124	7.407609	0.000000
2	0.016347	59.37542	15.26492	13.60106	11.75860
3	0.017852	54.59631	15.88506	13.72228	15.79636
4	0.018111	53.61004	15.45287	14.15912	16.77797
5	0.018779	50.03434	17.50096	16.65730	15.80740
6	0.019173	48.27599	16.89429	18.32283	16.50689
7	0.019629	47.25565	16.43273	20.18581	16.12582
8	0.019675	47.10445	16.43738	20.39209	16.06608
9	0.019784	46.66770	17.02125	20.17891	16.13215
10	0.019941	45.98962	16.97073	20.90320	16.13644
11	0.020142	45.07489	16.78484	22.26617	15.87411
12	0.020354	44.23894	16.48810	23.66938	15.60358
13	0.020488	44.04102	16.30278	24.00696	15.64924
14	0.020544	44.03236	16.30085	23.90796	15.75883
15	0.020572	44.04698	16.26971	23.94117	15.74214
16	0.020609	43.88924	16.21086	24.18649	15.71341
17	0.020656	43.71337	16.14788	24.38360	15.75514
18	0.020694	43.64548	16.10084	24.45526	15.79841
19	0.020709	43.66927	16.07650	24.45918	15.79505
20	0.020714	43.68693	16.07035	24.45259	15.79013

Variance Decomposition of LGR_1: Period	S.E.	Shock1	Shock2	Shock3	Shock4
1	0.030580	0.174900	97.44152	2.383580	0.000000
2	0.033081	0.916387	86.98122	2.575696	9.526699
3	0.035225	0.982898	85.57805	2.433141	11.00592
4	0.036079	0.977378	85.05002	3.476154	10.49644
5	0.039025	3.513153	82.69093	3.377347	10.41857
6	0.041202	3.603622	80.40078	4.768675	11.22692
7	0.042275	3.830910	80.51403	4.608176	11.04688
8	0.042421	3.818000	80.20408	4.661901	11.31602
9	0.043583	4.266157	77.80763	5.938797	11.98742
10	0.045482	4.553518	75.71472	7.681300	12.05046
11	0.046327	4.878613	74.92116	8.494132	11.70609
12	0.046450	4.852857	74.75550	8.466399	11.92524
13	0.046994	4.924497	73.32048	9.238733	12.51629
14	0.048172	5.133758	71.13306	11.16223	12.57095
15	0.049089	5.193735	69.82888	12.80887	12.16852
16	0.049383	5.150963	69.61294	13.09773	12.13837
17	0.049549	5.174171	69.15628	13.13704	12.53251
18	0.050108	5.280742	67.84657	14.20416	12.66853
19	0.050852	5.308231	66.53134	15.77667	12.38376
20	0.051295	5.261125	65.98415	16.56376	12.19097

Variance Decomposition of LGE_1: Period	S.E.	Shock1	Shock2	Shock3	Shock4
1	0.030403	0.000000	100.0000	0.000000	0.000000

2	0.033110	0.059540	87.74306	1.924767	10.27263
3	0.036061	0.108516	82.86344	5.944304	11.08374
4	0.036795	0.383794	82.33226	6.637973	10.64597
5	0.039850	4.983418	78.22027	5.991780	10.80453
6	0.041804	5.536527	75.76049	6.745474	11.95751
7	0.042958	5.802885	75.24549	7.208249	11.74338
8	0.043277	5.744404	74.36320	7.936222	11.95617
9	0.044102	6.522759	72.83226	7.649182	12.99580
10	0.045424	7.270375	71.73562	7.413135	13.58087
11	0.046029	8.057751	71.06850	7.469172	13.40457
12	0.046115	8.076527	70.90724	7.459213	13.55702
13	0.046451	8.035343	70.14615	7.640574	14.17793
14	0.047132	8.199917	69.12166	8.192769	14.48565
15	0.047579	8.361850	68.65424	8.666714	14.31720
16	0.047699	8.394734	68.62931	8.666063	14.30990
17	0.047857	8.343902	68.17640	8.896100	14.58360
18	0.048293	8.289604	67.16216	9.887698	14.66054
19	0.048768	8.225800	66.33466	10.99350	14.44605
20	0.048989	8.179542	66.10226	11.38609	14.33210

Variance Decomposition of LEXPO_1: Period	S.E.	Shock1	Shock2	Shock3	Shock4
1	0.078892	0.250797	12.39404	3.417919	83.93724
2	0.085206	4.791875	17.31464	2.968480	74.92501
3	0.090817	8.066642	22.63165	2.677010	66.62470
4	0.103079	8.372900	34.99807	2.111360	54.51767
5	0.107947	9.022326	33.01108	1.926867	56.03973
6	0.109145	8.925488	32.76773	2.940514	55.36626
7	0.109930	9.543168	32.69903	3.085010	54.67279
8	0.111362	9.423753	32.63004	3.247483	54.69873
9	0.113631	9.111776	31.34775	6.286629	53.25385
10	0.114786	8.934573	31.03126	7.772049	52.26212
11	0.115563	8.825353	30.85260	8.554376	51.76767
12	0.115893	8.930491	30.67803	8.508069	51.88341
13	0.116480	8.860437	30.43385	9.129763	51.57595
14	0.117278	8.768197	30.02118	10.33114	50.87948
15	0.118066	8.704562	29.62214	11.35723	50.31607
16	0.118389	8.729587	29.46648	11.58914	50.21480
17	0.118511	8.814894	29.40802	11.56668	50.21041
18	0.118642	8.837527	29.35499	11.70554	50.10195
19	0.118845	8.809977	29.25552	11.98206	49.95245
20	0.119034	8.786127	29.16771	12.20105	49.84511

Factorization: Structural

Variance Decomposition of LGR_1: Period	S.E.	Shock1	Shock2	Shock3	Shock4
1	0.032392	73.23411	24.69445	2.071439	0.000000
2	0.036412	71.24094	19.98263	2.086793	6.689646

3	0.038891	72.40441	18.75798	2.567172	6.270438
4	0.039643	71.46542	19.48505	2.671362	6.378176
5	0.041824	70.89108	18.53658	2.550655	8.021683
6	0.044272	72.71309	17.50210	2.277780	7.507035
7	0.044851	73.14946	17.10453	2.409391	7.336613
8	0.045263	71.84140	16.85306	3.133106	8.172432
9	0.046350	70.77829	16.46868	3.906910	8.846121
10	0.047344	70.78397	16.14537	4.258028	8.812635
11	0.047717	70.99840	16.05475	4.228397	8.718451
12	0.047916	70.42800	15.92690	4.342023	9.303080
13	0.048433	69.40630	15.62135	4.893223	10.07913
14	0.049008	68.78666	15.34950	5.581029	10.28281
15	0.049286	68.60160	15.25855	5.967261	10.17258
16	0.049384	68.38715	15.23376	5.998109	10.38098
17	0.049570	67.94496	15.12419	6.005922	10.92492
18	0.049840	67.48031	14.96126	6.243186	11.31524
19	0.050028	67.18762	14.85395	6.598873	11.35955
20	0.050103	67.02689	14.81674	6.824613	11.33176

Variance Decomposition of LGE_1: Period	S.E.	Shock1	Shock2	Shock3	Shock4
1	0.032585	71.33523	28.66477	0.000000	0.000000
2	0.036607	68.42094	23.87688	1.177951	6.524226
3	0.039354	68.39156	23.29446	1.821306	6.492677
4	0.040199	67.32029	22.63294	2.520044	7.526728
5	0.042583	65.76000	20.30663	2.289788	11.64359
6	0.044888	67.23014	18.49707	2.069309	12.20347
7	0.045347	67.59222	18.13106	2.104770	12.17196
8	0.045475	67.26094	18.11329	2.117718	12.50806
9	0.046255	67.13433	17.70702	2.051198	13.10745
10	0.047034	67.38606	17.19362	1.984861	13.43546
11	0.047277	67.61689	17.01731	1.982566	13.38323
12	0.047325	67.48127	17.05604	2.047943	13.41474
13	0.047588	67.32193	17.01910	2.136787	13.52219
14	0.047901	67.41166	16.91990	2.177973	13.49046
15	0.048019	67.53214	16.87045	2.171736	13.42568
16	0.048053	67.44842	16.84668	2.201673	13.50323
17	0.048176	67.25159	16.78386	2.326686	13.63787
18	0.048338	67.14259	16.71298	2.484117	13.66031
19	0.048420	67.12809	16.68558	2.569615	13.61671
20	0.048444	67.08426	16.67779	2.575852	13.66210

Variance Decomposition of LGDP_1: Period	S.E.	Shock1	Shock2	Shock3	Shock4
1	0.013665	9.625140	83.38066	6.994203	0.000000
2	0.016040	19.21744	62.35546	9.093911	9.333190
3	0.017303	16.89486	62.02042	8.120423	12.96430
4	0.017597	16.43091	62.18494	8.605445	12.77871
5	0.018547	18.66136	59.11971	9.710228	12.50869
6	0.018924	18.80897	57.36721	11.74980	12.07402
7	0.019181	18.55046	56.73537	12.23041	12.48376
8	0.019302	18.45019	56.27373	12.12942	13.14666
9	0.019444	18.44565	55.50396	12.10739	13.94300
10	0.019572	18.52623	54.78155	12.57004	14.12217

11	0.019675	18.40845	54.22774	13.37570	13.98811
12	0.019766	18.24044	53.77200	13.96863	14.01892
13	0.019851	18.15189	53.36973	14.12399	14.35438
14	0.019920	18.09996	53.08709	14.04219	14.77076
15	0.019963	18.03984	52.93424	14.02706	14.99886
16	0.019993	17.98960	52.81711	14.16530	15.02800
17	0.020020	17.96928	52.67982	14.36362	14.98728
18	0.020044	17.95323	52.55892	14.50782	14.98003
19	0.020060	17.92750	52.49858	14.55698	15.01693
20	0.020072	17.91112	52.48045	14.54675	15.06168

Variance Decomposition of LIMP:

Period	S.E.	Shock1	Shock2	Shock3	Shock4
1	0.077491	0.881525	0.097608	0.798546	98.22232
2	0.118641	0.502937	3.327893	0.454897	95.71427
3	0.133098	3.874362	5.046355	0.447304	90.63198
4	0.142425	3.714637	11.06271	0.694895	84.52776
5	0.146161	3.527933	13.33335	2.714146	80.42458
6	0.150339	3.978112	14.11019	5.894884	76.01682
7	0.152979	4.231826	14.20142	8.147565	73.41919
8	0.153892	4.337760	14.36607	8.579576	72.71659
9	0.154398	4.309376	14.35018	8.582285	72.75816
10	0.155804	4.269673	14.09280	9.579044	72.05849
11	0.157876	4.247792	13.77813	11.59551	70.37857
12	0.159816	4.201861	13.59405	13.52011	68.68397
13	0.161190	4.146417	13.59607	14.41335	67.84416
14	0.162140	4.098070	13.67647	14.41094	67.81452
15	0.162999	4.056644	13.70076	14.32616	67.91644
16	0.163884	4.014824	13.61536	14.72908	67.64074
17	0.164709	3.975180	13.48162	15.48950	67.05369
18	0.165360	3.944234	13.39608	16.12334	66.53634
19	0.165823	3.923340	13.39803	16.35544	66.32319
20	0.166182	3.910091	13.44598	16.31150	66.33243

Factorization: Structural

Vector Autoregression Estimates
Date: 09/03/13 Time: 18:35
Sample (adjusted): 1994Q2 2011Q4
Included observations: 71 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	LGR_1	LGE_1	LGDP_1
LGR_1(-1)	0.509252	-0.977566	1.033773
	(0.84653)	(0.84508)	(0.39641)
	[0.60158]	[-1.15677]	[2.60786]
LGR_1(-2)	-0.056895	0.261064	-0.699250
	(1.46801)	(1.46550)	(0.68743)
	[-0.03876]	[0.17814]	[-1.01719]
LGR_1(-3)	0.812016	1.560162	-0.267077

	(1.54679)	(1.54415)	(0.72432)
	[0.52497]	[1.01037]	[-0.36873]
LGR_1(-4)	-1.211358	-1.599590	0.907188
	(0.98794)	(0.98626)	(0.46263)
	[-1.22614]	[-1.62188]	[1.96094]
LGE_1(-1)	-0.219152	1.245009	-0.837302
	(0.83582)	(0.83440)	(0.39139)
	[-0.26220]	[1.49210]	[-2.13928]
LGE_1(-2)	0.373529	0.084921	0.564908
	(1.45526)	(1.45277)	(0.68146)
	[0.25668]	[0.05845]	[0.82897]
LGE_1(-3)	-1.221040	-1.959317	0.285119
	(1.52288)	(1.52028)	(0.71313)
	[-0.80180]	[-1.28878]	[0.39982]
LGE_1(-4)	0.759397	1.117800	-0.913222
	(0.95870)	(0.95707)	(0.44893)
	[0.79211]	[1.16794]	[-2.03420]
LGDP_1(-1)	-0.290283	-0.305151	0.074241
	(0.28579)	(0.28530)	(0.13383)
	[-1.01573]	[-1.06958]	[0.55475]
LGDP_1(-2)	-0.217813	-0.245324	-0.151696
	(0.29641)	(0.29591)	(0.13880)
	[-0.73483]	[-0.82905]	[-1.09288]
LGDP_1(-3)	0.077502	0.121571	-0.096936
	(0.25376)	(0.25333)	(0.11883)
	[0.30541]	[0.47989]	[-0.81576]
LGDP_1(-4)	0.440385	0.456493	0.004570
	(0.23535)	(0.23495)	(0.11021)
	[1.87116]	[1.94291]	[0.04147]
C	-0.000664	-0.000251	0.003395
	(0.01051)	(0.01049)	(0.00492)
	[-0.06320]	[-0.02394]	[0.68986]
T	0.000901	0.000845	0.000354
	(0.00047)	(0.00047)	(0.00022)
	[1.92216]	[1.80718]	[1.61570]
D97	-0.022812	-0.021114	-0.012145
	(0.02005)	(0.02002)	(0.00939)
	[-1.13767]	[-1.05479]	[-1.29344]
D08	-0.037114	-0.034093	0.001504
	(0.01635)	(0.01632)	(0.00766)
	[-2.27021]	[-2.08897]	[0.19645]
R-squared	0.630061	0.596942	0.546067
Adj. R-squared	0.529169	0.487018	0.422267
Sum sq. resids	0.055184	0.054996	0.012101
S.E. equation	0.031676	0.031622	0.014833
F-statistic	6.244886	5.430464	4.410888
Log likelihood	153.4269	153.5481	207.2947
Akaike AIC	-3.871180	-3.874595	-5.388584

Schwarz SC	-3.361280	-3.364695	-4.878684
Mean dependent	0.007897	0.008826	0.007307
S.D. dependent	0.046163	0.044150	0.019515

Determinant resid covariance (dof adj.)	4.58E-12
Determinant resid covariance	2.13E-12
Log likelihood	651.8514
Akaike information criterion	-17.00990
Schwarz criterion	-15.48020

Malaysia

Table 22: *The lag order _Malaysia*

VAR Lag Order Selection Criteria
Endogenous variables: LGR LGE_1 LGDP_1
Exogenous variables: C T D97 D08
Date: 09/06/13 Time: 16:03
Sample: 1993Q1 2011Q4
Included observations: 69

Lag	LogL	LR	FPE	AIC	SC	HQ
0	294.9955	NA	5.50e-08	-8.202767	-7.814227	-8.048620
1	321.3646	47.38800	3.33e-08	-8.706220	-8.026274*	-8.436463*
2	330.3758	15.41051	3.34e-08	-8.706545	-7.735195	-8.321178
3	336.4102	9.794926	3.67e-08	-8.620585	-7.357829	-8.119608
4	**350.1861**	**21.16293***	3.23e-08*	-8.759016*	-7.204855	-8.142429
5	356.4203	9.035159	3.57e-08	-8.678850	-6.833284	-7.946652
6	365.5932	12.49644	3.64e-08	-8.683862	-6.546891	-7.836054

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Vector Autoregression Estimates
Date: 09/06/13 Time: 17:39
Sample (adjusted): 1994Q2 2011Q4
Included observations: 71 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	LGR	LGE_1	LGDP_1
LGR(-1)	0.420135	0.099880	-0.002499
	(0.13347)	(0.18069)	(0.02814)
	[3.14790]	[0.55277]	[-0.08879]
LGR(-2)	0.259647	0.154263	-0.014948
	(0.14151)	(0.19158)	(0.02984)
	[1.83481]	[0.80521]	[-0.50094]

LGR(-3)	-0.059158	-0.201689	-0.010288
	(0.14106)	(0.19097)	(0.02974)
	[-0.41938]	[-1.05612]	[-0.34589]
LGR(-4)	-0.085487	-0.305092	-0.015575
	(0.13413)	(0.18159)	(0.02828)
	[-0.63733]	[-1.68009]	[-0.55067]
LGE_1(-1)	0.070276	-0.746208	-0.004613
	(0.08820)	(0.11940)	(0.01860)
	[0.79681]	[-6.24951]	[-0.24806]
LGE_1(-2)	0.040224	-0.732827	0.003993
	(0.10385)	(0.14059)	(0.02190)
	[0.38734]	[-5.21251]	[0.18236]
LGE_1(-3)	0.070155	-0.509007	0.011766
	(0.10295)	(0.13937)	(0.02171)
	[0.68147]	[-3.65218]	[0.54202]
LGE_1(-4)	-0.035289	-0.466447	0.005818
	(0.08623)	(0.11675)	(0.01818)
	[-0.40922]	[-3.99538]	[0.31995]
LGDP_1(-1)	0.306315	-1.643420	0.227290
	(0.60468)	(0.81863)	(0.12750)
	[0.50658]	[-2.00753]	[1.78263]
LGDP_1(-2)	-0.714183	0.611760	-0.108663
	(0.63269)	(0.85654)	(0.13341)
	[-1.12881]	[0.71422]	[-0.81451]
LGDP_1(-3)	0.301738	-0.484041	-0.030163
	(0.63355)	(0.85771)	(0.13359)
	[0.47627]	[-0.56434]	[-0.22579]
LGDP_1(-4)	0.614032	0.170933	-0.274476
	(0.59518)	(0.80576)	(0.12550)
	[1.03168]	[0.21214]	[-2.18707]
C	1.019615	0.504538	0.108337
	(0.28113)	(0.38060)	(0.05928)
	[3.62683]	[1.32563]	[1.82756]
T	0.002178	0.002460	0.000607
	(0.00107)	(0.00145)	(0.00023)
	[2.02849]	[1.69222]	[2.68216]
D97	-0.116422	-0.021165	-0.033230
	(0.04677)	(0.06332)	(0.00986)
	[-2.48919]	[-0.33426]	[-3.36946]
D08	0.009401	-0.049204	-0.014190
	(0.03756)	(0.05085)	(0.00792)
	[0.25029]	[-0.96761]	[-1.79159]
R-squared	0.655415	0.530713	0.337974
Adj. R-squared	0.561437	0.402726	0.157422
Sum sq. resids	0.336795	0.617288	0.014975
S.E. equation	0.078253	0.105941	0.016501
F-statistic	6.974153	4.146613	1.871891
Log likelihood	89.21450	67.70637	199.7299

Akaike AIC	-2.062380	-1.456518	-5.175489
Schwarz SC	-1.552481	-0.946618	-4.665589
Mean dependent	2.191943	0.005013	0.007248
S.D. dependent	0.118164	0.137081	0.017976
Determinant resid covariance (dof adj.)		1.79E-08	
Determinant resid covariance		8.31E-09	
Log likelihood		358.2684	
Akaike information criterion		-8.739955	
Schwarz criterion		-7.210256	

Table 23: *Model Specification, Malaysia*

VAR Residual Serial Correlation LM Tests
Null Hypothesis: no serial correlation at lag order h
Date: 09/06/13 Time: 17:47
Sample: 1993Q1 2011Q4
Included observations: 71

Lags	LM-Stat	Prob
1	12.94812	0.1650
2	12.49914	0.1866
3	10.18257	0.3359
4	6.105506	0.7293
5	5.243401	0.8126
6	17.87760	0.0366
7	9.455771	0.3963
8	13.16729	0.1552
9	17.25957	0.0448
10	3.421995	0.9452
11	7.486849	0.5866
12	11.54275	0.2403
13	13.99814	0.1224
14	4.435456	0.8805
15	5.740141	0.7656
16	3.914756	0.9169
17	7.387560	0.5968
18	8.178370	0.5163
19	11.84968	0.2219
20	10.15731	0.3379

Probs from chi-square with 9 df.

Table 24: *The lag order_lcons, Malaysia*

VAR Lag Order Selection Criteria
Endogenous variables: LGR LGE_1 LGDP_1 LPCONS_1
Exogenous variables: C T D97 D08
Date: 09/06/13 Time: 19:29
Sample: 1993Q1 2011Q4
Included observations: 69

Lag	LogL	LR	FPE	AIC	SC	HQ
0	451.5383	NA	3.87e-11	-12.62430	-12.10624	-12.41877
1	485.5319	60.10468	2.31e-11	-13.14585	-12.10974*	-12.73479*
2	502.0057	27.21759	2.30e-11	-13.15959	-11.60542	-12.54300

3	516.0262	21.53872	2.48e-11	-13.10221	-11.02999	-12.28009
4	**536.6116**	**29.23719***	2.25e-11	-13.23512	-10.64485	-12.20747
5	555.7831	25.00629	2.16e-11*	-13.32704*	-10.21872	-12.09387
6	567.5214	13.94998	2.64e-11	-13.20352	-9.577144	-11.76482

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion

Vector Autoregression Estimates
Date: 11/02/13 Time: 21:34
Sample (adjusted): 1994Q2 2011Q4
Included observations: 71 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	LGR	LGE_1	LGDP_1	LPCONS_1
LGR(-1)	0.446306	-0.028351	-0.015043	-0.035634
	(0.13947)	(0.19161)	(0.02964)	(0.04725)
	[3.19999]	[-0.14796]	[-0.50753]	[-0.75410]
LGR(-2)	0.278982	0.138103	-0.025558	-0.065839
	(0.14570)	(0.20017)	(0.03096)	(0.04937)
	[1.91472]	[0.68993]	[-0.82538]	[-1.33370]
LGR(-3)	-0.081939	-0.089656	0.015848	0.073238
	(0.14700)	(0.20195)	(0.03124)	(0.04981)
	[-0.55740]	[-0.44394]	[0.50729]	[1.47047]
LGR(-4)	-0.009334	-0.213874	-0.008319	-0.145077
	(0.13752)	(0.18893)	(0.02923)	(0.04659)
	[-0.06787]	[-1.13203]	[-0.28466]	[-3.11367]
LGE_1(-1)	0.069160	-0.798496	-0.013004	-0.024614
	(0.09105)	(0.12508)	(0.01935)	(0.03085)
	[0.75959]	[-6.38372]	[-0.67204]	[-0.79792]
LGE_1(-2)	0.053914	-0.756244	-0.000705	0.030003
	(0.10942)	(0.15033)	(0.02325)	(0.03707)
	[0.49271]	[-5.03065]	[-0.03033]	[0.80929]
LGE_1(-3)	0.075379	-0.503443	0.007143	0.014053
	(0.10551)	(0.14495)	(0.02242)	(0.03575)
	[0.71442]	[-3.47315]	[0.31854]	[0.39310]
LGE_1(-4)	-0.057476	-0.444715	0.009369	0.032754
	(0.08622)	(0.11845)	(0.01832)	(0.02921)
	[-0.66664]	[-3.75455]	[0.51135]	[1.12127]
LGDP_1(-1)	-0.256355	-2.242179	0.077528	-0.347097
	(0.69911)	(0.96045)	(0.14857)	(0.23686)
	[-0.36669]	[-2.33451]	[0.52182]	[-1.46538]
LGDP_1(-2)	-0.887727	0.067436	-0.097085	0.228596
	(0.68018)	(0.93444)	(0.14455)	(0.23045)
	[-1.30513]	[0.07217]	[-0.67164]	[0.99195]
LGDP_1(-3)	0.797787	-0.851456	-0.164081	0.108903

	(0.68880)	(0.94628)	(0.14638)	(0.23337)
	[1.15823]	[-0.89979]	[-1.12092]	[0.46666]
LGDP_1(-4)	0.021361	0.194456	-0.275999	-0.080472
	(0.66053)	(0.90745)	(0.14037)	(0.22379)
	[0.03234]	[0.21429]	[-1.96616]	[-0.35958]
LPCONS_1(-1)	0.436318	0.356037	0.150982	0.110310
	(0.40552)	(0.55711)	(0.08618)	(0.13739)
	[1.07594]	[0.63907]	[1.75193]	[0.80287]
LPCONS_1(-2)	0.842566	0.866208	0.020091	-0.234290
	(0.39572)	(0.54365)	(0.08410)	(0.13407)
	[2.12919]	[1.59333]	[0.23890]	[-1.74747]
LPCONS_1(-3)	-0.533491	0.970738	0.180304	-0.039455
	(0.40507)	(0.55649)	(0.08608)	(0.13724)
	[-1.31703]	[1.74438]	[2.09449]	[-0.28748]
LPCONS_1(-4)	0.341287	0.168394	0.046473	-0.215541
	(0.44204)	(0.60728)	(0.09394)	(0.14977)
	[0.77207]	[0.27729]	[0.49470]	[-1.43918]
C	0.806012	0.377882	0.086637	0.389577
	(0.28795)	(0.39559)	(0.06119)	(0.09756)
	[2.79913]	[0.95523]	[1.41576]	[3.99319]
T	0.001700	0.001911	0.000524	0.001211
	(0.00107)	(0.00147)	(0.00023)	(0.00036)
	[1.59212]	[1.30270]	[2.30841]	[3.34772]
D97	-0.096154	-0.003010	-0.030615	-0.059746
	(0.04619)	(0.06346)	(0.00982)	(0.01565)
	[-2.08155]	[-0.04742]	[-3.11856]	[-3.81744]
D08	0.006234	-0.042171	-0.013874	-0.009694
	(0.03650)	(0.05015)	(0.00776)	(0.01237)
	[0.17078]	[-0.84095]	[-1.78848]	[-0.78381]
R-squared	0.701290	0.581087	0.417064	0.421529
Adj. R-squared	0.590006	0.425021	0.199892	0.206020
Sum sq. resids	0.291957	0.551029	0.013186	0.033514
S.E. equation	0.075661	0.103945	0.016079	0.025635
F-statistic	6.301806	3.723346	1.920429	1.955968
Log likelihood	94.28633	71.73738	204.2464	171.1310
Akaike AIC	-2.092573	-1.457391	-5.190040	-4.257212
Schwarz SC	-1.455198	-0.820016	-4.552665	-3.619837
Mean dependent	2.191943	0.005013	0.007248	0.006685
S.D. dependent	0.118164	0.137081	0.017976	0.028769

Determinant resid covariance (dof adj.)	7.86E-12
Determinant resid covariance	2.09E-12
Log likelihood	551.6962
Akaike information criterion	-13.28722
Schwarz criterion	-10.73772

Table 25: *VD of LGDP_lcons, Malaysia*

Variance Decomposition of LGDP_1: Period	S.E.	Shock1	Shock2	Shock3	Shock4
1	0.016079	13.45660	0.865911	85.67749	0.000000
2	0.016760	13.92761	1.809825	79.04125	5.221312
3	0.017110	15.10058	1.739097	77.84485	5.315476
4	0.017564	14.56573	2.437448	76.08610	6.910718
5	0.018179	13.77423	2.290771	77.48075	6.454254
6	0.018446	13.79695	2.233121	75.33193	8.637994
7	0.018651	13.59674	2.475277	74.54791	9.380078
8	0.018892	14.14583	2.689047	73.28605	9.879076
9	0.018956	14.48403	2.674469	73.01415	9.827352
10	0.018984	14.45146	2.666966	72.82204	10.05954
11	0.019056	14.46126	2.700934	72.56195	10.27586
12	0.019128	14.78634	2.738270	72.19589	10.27950
13	0.019146	14.88662	2.751415	72.06181	10.30016
14	0.019157	14.88603	2.749309	72.01876	10.34590
15	0.019173	14.87636	2.763367	71.99075	10.36952
16	0.019182	14.91304	2.773976	71.95203	10.36095
17	0.019185	14.91848	2.774435	71.92570	10.38139
18	0.019188	14.91503	2.775739	71.91717	10.39206
19	0.019191	14.91797	2.781082	71.90920	10.39175
20	0.019192	14.92087	2.781544	71.90440	10.39318

Table 26: *The lag order_linv, Malaysia*

VAR Lag Order Selection Criteria
Endogenous variables: LGR LGE_1 LGDP_1 LINV_1
Exogenous variables: C T D97 D08
Date: 11/02/13 Time: 23:46
Sample: 1993Q1 2011Q4
Included observations: 69

Lag	LogL	LR	FPE	AIC	SC	HQ
0	391.0781	NA	2.23e-10	-10.87183	-10.35378	-10.66630
1	441.1400	88.51524	8.35e-11	-11.85913	-10.82302*	-11.44807
2	460.5935	32.14060	7.63e-11	-11.95923	-10.40507	-11.34265
3	472.8087	18.76540	8.69e-11	-11.84953	-9.777314	-11.02741
4	494.2567	30.46233	7.67e-11	-12.00744	-9.417172	-10.97979
5	546.7019	68.40672	2.81e-11	-13.06382	-9.955500	-11.83065
6	587.0836	47.98984*	1.50e-11*	-13.77054*	-10.14416	-12.33183*

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error

AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Table 27 : *VD of LGDP_linv, Malaysia*

Variance Decomposition of LGDP_1: Period	S.E.	Shock1	Shock2	Shock3	Shock4
1	0.015424	14.00306	0.317974	85.67897	0.000000
2	0.015755	14.37312	0.321215	82.94642	2.359251
3	0.016718	12.91527	2.672334	80.08065	4.331745
4	0.016911	13.44289	3.438076	78.29484	4.824192
5	0.017540	12.81585	6.426052	75.78703	4.971070
6	0.018087	12.28056	6.835300	73.60923	7.274912
7	0.019176	11.27023	6.137217	71.16695	11.42560
8	0.020407	10.28119	9.508550	66.30608	13.90418
9	0.020597	10.11743	10.87043	65.09221	13.91993
10	0.020941	11.14630	11.14931	64.20652	13.49787
11	0.021251	11.24354	11.10808	62.60142	15.04696
12	0.021635	10.84823	11.97046	61.57026	15.61105
13	0.021692	10.91593	11.94896	61.26031	15.87480
14	0.021716	10.93833	11.96022	61.22480	15.87665
15	0.021730	10.92931	11.98495	61.17615	15.90958
16	0.021794	10.90328	11.94870	61.19660	15.95143
17	0.021800	10.91546	11.97300	61.16626	15.94527
18	0.021878	10.83787	11.92574	61.40401	15.83237
19	0.021892	10.83637	11.94509	61.37661	15.84192
20	0.021963	10.82009	11.88733	61.24137	16.05120

Table 28: *VD of LGDP_lexpo, Malaysia*

Variance Decomposition of LGDP_1: Period	S.E.	Shock1	Shock2	Shock3	Shock4
1	0.015367	22.26010	0.661521	77.07838	0.000000
2	0.015923	26.70608	1.443864	71.81336	0.036699
3	0.016563	27.40853	1.335425	66.81502	4.441029
4	0.017126	26.61034	1.529252	63.30353	8.556874
5	0.017824	24.60395	1.636089	65.84891	7.911053
6	0.017978	24.30753	1.815716	65.39157	8.485190
7	0.018120	23.97276	1.801568	64.37374	9.851931
8	0.018255	23.61973	1.777561	63.42318	11.17953
9	0.018328	23.44174	1.960083	63.31940	11.27877
10	0.018347	23.43510	1.958660	63.30695	11.29929
11	0.018385	23.46657	1.959787	63.05009	11.52355
12	0.018413	23.45233	1.957929	62.85687	11.73287
13	0.018419	23.44429	1.957168	62.83179	11.76675
14	0.018420	23.44284	1.962852	62.82830	11.76601
15	0.018421	23.44817	1.963071	62.81992	11.76884
16	0.018423	23.45400	1.972780	62.80475	11.76847

17	0.018424	23.45937	1.972786	62.79996	11.76788
18	0.018425	23.46157	1.972745	62.79821	11.76748
19	0.018425	23.46126	1.973190	62.79823	11.76732
20	0.018425	23.46122	1.973235	62.79843	11.76712

Table 29:*The lag order, limp, Malaysia*

VAR Lag Order Selection Criteria
Endogenous variables: LGR LGE_1 LGDP_1 LIMP
Exogenous variables: C T D97 D08
Date: 11/03/13 Time: 00:20
Sample: 1993Q1 2011Q4
Included observations: 69

Lag	LogL	LR	FPE	AIC	SC	HQ
0	391.7475	NA	2.19e-10	-10.89123	-10.37318	-10.68570
1	461.2441	122.8780*	4.66e-11*	-12.44186*	-11.40575*	-12.03080*
2	475.0828	22.86410	5.01e-11	-12.37921	-10.82505	-11.76263
3	486.0011	16.77296	5.93e-11	-12.23192	-10.15970	-11.40980
4	501.3148	21.74991	6.25e-11	-12.21202	-9.621755	-11.18438
5	511.1895	12.88003	7.87e-11	-12.03448	-8.926156	-10.80130
6	531.9195	24.63566	7.42e-11	-12.17158	-8.545204	-10.73288

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Norway

Table 30: *The lag order, GDP_Norway*

VAR Lag Order Selection Criteria
Endogenous variables: LGR_1 LGE LGDP_1
Exogenous variables: C T
Date: 09/19/13 Time: 11:07
Sample: 1996Q1 2011Q4
Included observations: 58

Lag	LogL	LR	FPE	AIC	SC	HQ
0	341.2640	NA	1.91e-09	-11.56083	-11.34768	-11.47780
1	400.8090	108.8236*	3.35e-10*	-13.30376*	-12.77089*	-13.09619*
2	409.2616	14.57343	3.43e-10	-13.28488	-12.43229	-12.95278
3	418.2145	14.50985	3.47e-10	-13.28326	-12.11094	-12.82662
4	425.7327	11.40691	3.70e-10	-13.23216	-11.74012	-12.65098
5	434.5945	12.52872	3.81e-10	-13.22740	-11.41563	-12.52167

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error

AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Vector Autoregression Estimates
Date: 09/19/13 Time: 11:28
Sample (adjusted): 1996Q3 2011Q4
Included observations: 62 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	LGR_1	LGE	LGDP_1
LGR_1(-1)	-0.046393	0.058312	0.019980
	(0.12751)	(0.09499)	(0.05920)
	[-0.36383]	[0.61390]	[0.33750]
LGE(-1)	-0.026151	0.872840	-0.000277
	(0.08626)	(0.06426)	(0.04005)
	[-0.30315]	[13.5829]	[-0.00691]
LGDP_1(-1)	0.459152	0.011120	-0.552688
	(0.23772)	(0.17708)	(0.11037)
	[1.93148]	[0.06280]	[-5.00775]
C	0.162694	0.767883	0.015536
	(0.51994)	(0.38732)	(0.24139)
	[0.31291]	[1.98258]	[0.06436]
T	-3.93E-05	0.000120	-0.000278
	(0.00028)	(0.00021)	(0.00013)
	[-0.13924]	[0.57164]	[-2.11983]
R-squared	0.067819	0.782066	0.326375
Adj. R-squared	0.002402	0.766772	0.279103
Sum sq. resids	0.081395	0.045168	0.017545
S.E. equation	0.037789	0.028150	0.017544
F-statistic	1.036724	51.13678	6.904209
Log likelihood	117.7286	135.9855	165.3004
Akaike AIC	-3.636406	-4.225340	-5.170980
Schwarz SC	-3.464863	-4.053797	-4.999437
Mean dependent	0.004182	6.058636	0.002933
S.D. dependent	0.037834	0.058289	0.020663

Determinant resid covariance (dof adj.)	3.27E-10
Determinant resid covariance	2.54E-10
Log likelihood	420.9638
Akaike information criterion	-13.09561
Schwarz criterion	-12.58098

Table 31: *SVAR Results_Model (1)*

Structural VAR Estimates
Date: 09/19/13 Time: 11:36
Sample (adjusted): 1996Q3 2011Q4
Included observations: 62 after adjustments
Estimation method: method of scoring (analytic derivatives)
Convergence achieved after 8 iterations
Structural VAR is just-identified

Model: Ae = Bu where E[uu']=I
Restriction Type: short-run pattern matrix

A =

1	0	-1.38
0	1	0
C(1)	C(2)	1

B =

C(3)	C(4)	0
0	C(5)	0
0	0	C(6)

	Coefficient	Std. Error	z-Statistic	Prob.
C(1)	0.242281	0.086186	2.811138	0.0049
C(2)	-0.129658	0.094945	-1.365612	0.1721
C(3)	0.041056	0.003687	11.13553	0.0000
C(4)	0.000125	0.005214	0.024053	0.9808
C(5)	0.028150	0.002528	11.13553	0.0000
C(6)	0.020880	0.002642	7.903339	0.0000

Log likelihood 413.1441

Estimated A matrix:

1.000000	0.000000	-1.380000
0.000000	1.000000	0.000000
0.242281	-0.129658	1.000000

Estimated B matrix:

0.041056	0.000125	0.000000
0.000000	0.028150	0.000000
0.000000	0.000000	0.020880

Table 32: *VD of GDP, Norway*

Variance Decomposition of LGDP_1: Period	S.E.	Shock1	Shock2	Shock3
1	0.017544	18.05427	2.390466	79.55526
2	0.019995	19.50787	2.351725	78.14040
3	0.020725	19.87187	2.334095	77.79404
4	0.020958	19.97820	2.332669	77.68913
5	0.021032	20.01261	2.330363	77.65702
6	0.021057	20.02327	2.330555	77.64617
7	0.021065	20.02694	2.330165	77.64290
8	0.021067	20.02802	2.330272	77.64171
9	0.021068	20.02843	2.330197	77.64138
10	0.021068	20.02853	2.330232	77.64124
11	0.021068	20.02858	2.330218	77.64120
12	0.021069	20.02859	2.330229	77.64119
13	0.021069	20.02859	2.330227	77.64118
14	0.021069	20.02859	2.330231	77.64118
15	0.021069	20.02859	2.330231	77.64118
16	0.021069	20.02859	2.330233	77.64118
17	0.021069	20.02859	2.330233	77.64118
18	0.021069	20.02859	2.330234	77.64117
19	0.021069	20.02859	2.330235	77.64117
20	0.021069	20.02859	2.330235	77.64117
Factorization: Structural				

Table 33: *VD of GDP_LCONSS, Norway*

Variance Decomposition of LGDP_1: Period	S.E.	Shock1	Shock2	Shock3	Shock4
1	0.015670	9.166357	1.641727	89.19192	0.000000
2	0.018955	12.74341	5.668719	76.27963	5.308239
3	0.020394	12.20851	7.199171	67.43927	13.15305
4	0.020746	15.02358	6.973199	65.25549	12.74774
5	0.020886	15.21626	6.881055	64.46636	13.43632
6	0.020904	15.29495	6.913175	64.36956	13.42231
7	0.020927	15.26935	6.903227	64.32839	13.49903
8	0.020930	15.27506	6.913160	64.31231	13.49947
9	0.020935	15.26872	6.913002	64.29373	13.52454
10	0.020936	15.27584	6.913422	64.28546	13.52528
11	0.020938	15.27372	6.916060	64.27813	13.53209
12	0.020938	15.27493	6.917724	64.27519	13.53216
13	0.020939	15.27447	6.918290	64.27349	13.53374
14	0.020939	15.27487	6.918837	64.27251	13.53378
15	0.020939	15.27470	6.919380	64.27193	13.53399
16	0.020939	15.27466	6.919789	64.27156	13.53399
17	0.020939	15.27461	6.920011	64.27135	13.53403
18	0.020939	15.27461	6.920162	64.27120	13.53403
19	0.020939	15.27459	6.920294	64.27110	13.53402

20	0.020939	15.27457	6.920390	64.27103	13.53401

Table 34: *VD of GDP_LINV, Norway*

Variance Decomposition of LGDP_1: Period	S.E.	Shock1	Shock2	Shock3	Shock4
1	0.014971	11.41469	6.422706	82.16261	1.12E-31
2	0.018699	14.20297	9.543245	74.93460	1.319188
3	0.019368	14.37458	11.51773	72.87809	1.229602
4	0.019530	14.35186	12.33663	71.84371	1.467801
5	0.019766	15.38929	12.51020	70.23667	1.863841
6	0.021066	18.53067	17.37862	62.42492	1.665777
7	0.021684	17.69727	21.56858	59.02786	1.706295
8	0.021959	17.26694	23.50417	57.56410	1.664798
9	0.022170	17.95113	23.07577	56.99333	1.979774
10	0.022269	18.24744	22.99740	56.49559	2.259572
11	0.022506	17.92391	22.52249	55.80761	3.745988
12	0.022590	17.79883	22.38862	55.81216	4.000398
13	0.022631	17.78853	22.54828	55.64765	4.015530
14	0.022713	18.05149	22.51256	55.28236	4.153589
15	0.022883	17.86411	22.50144	54.77908	4.855375
16	0.022893	17.86882	22.48376	54.76146	4.885964
17	0.022976	17.92165	22.36681	54.75048	4.961059
18	0.022999	17.88819	22.43051	54.71299	4.968305
19	0.023057	17.86933	22.35399	54.44913	5.327551
20	0.023061	17.86515	22.37495	54.43271	5.327189

Saudi Arabia

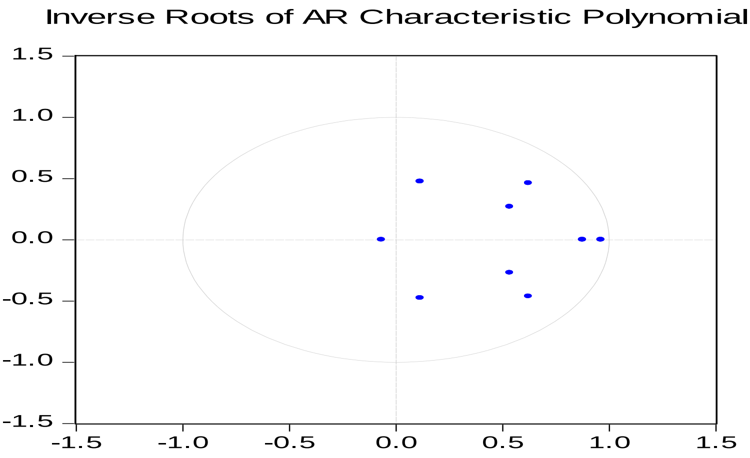

Figure 10: Stability of the reduced-form VAR model,Saudi Arabia

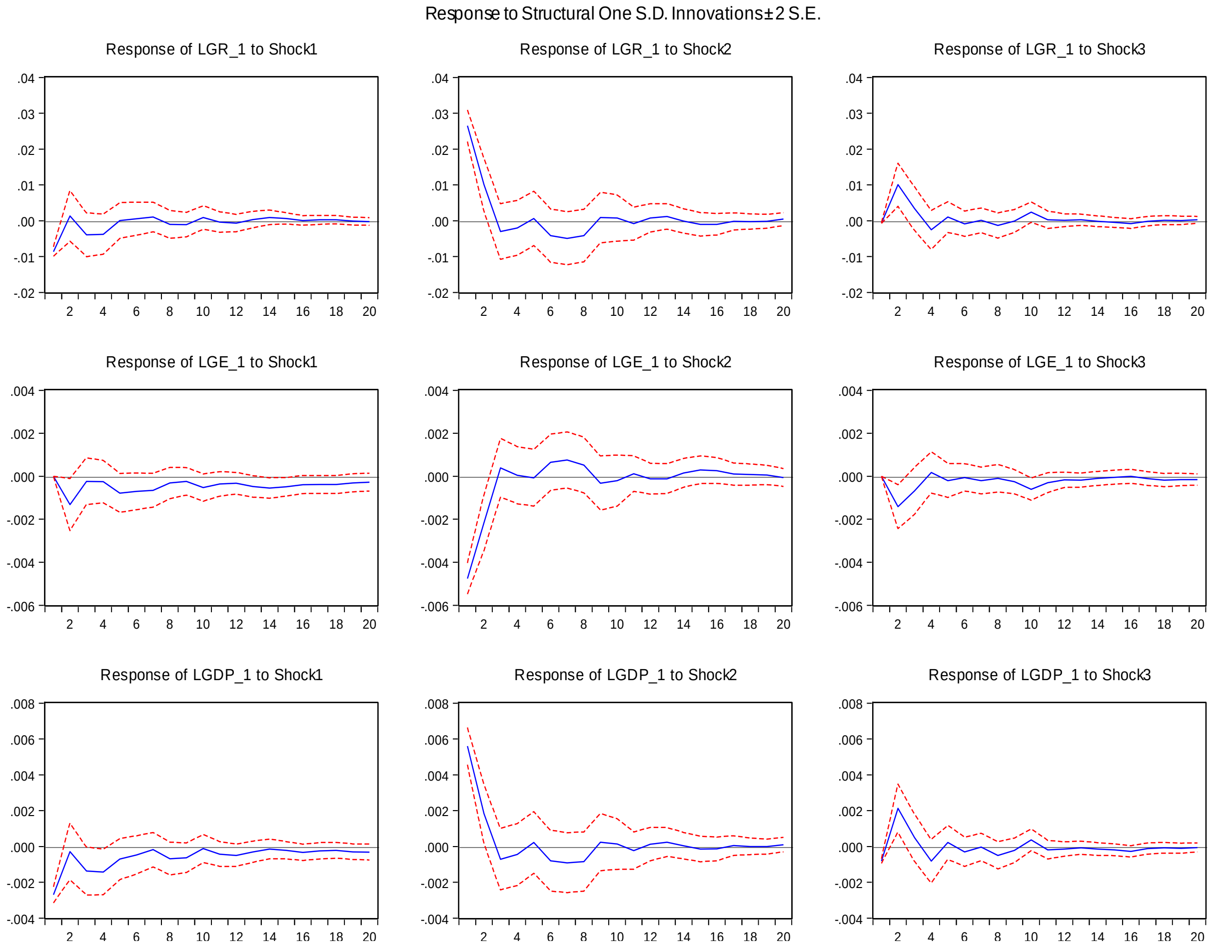

Figure 11: The IRF (GE before GR), Saudi Arabia

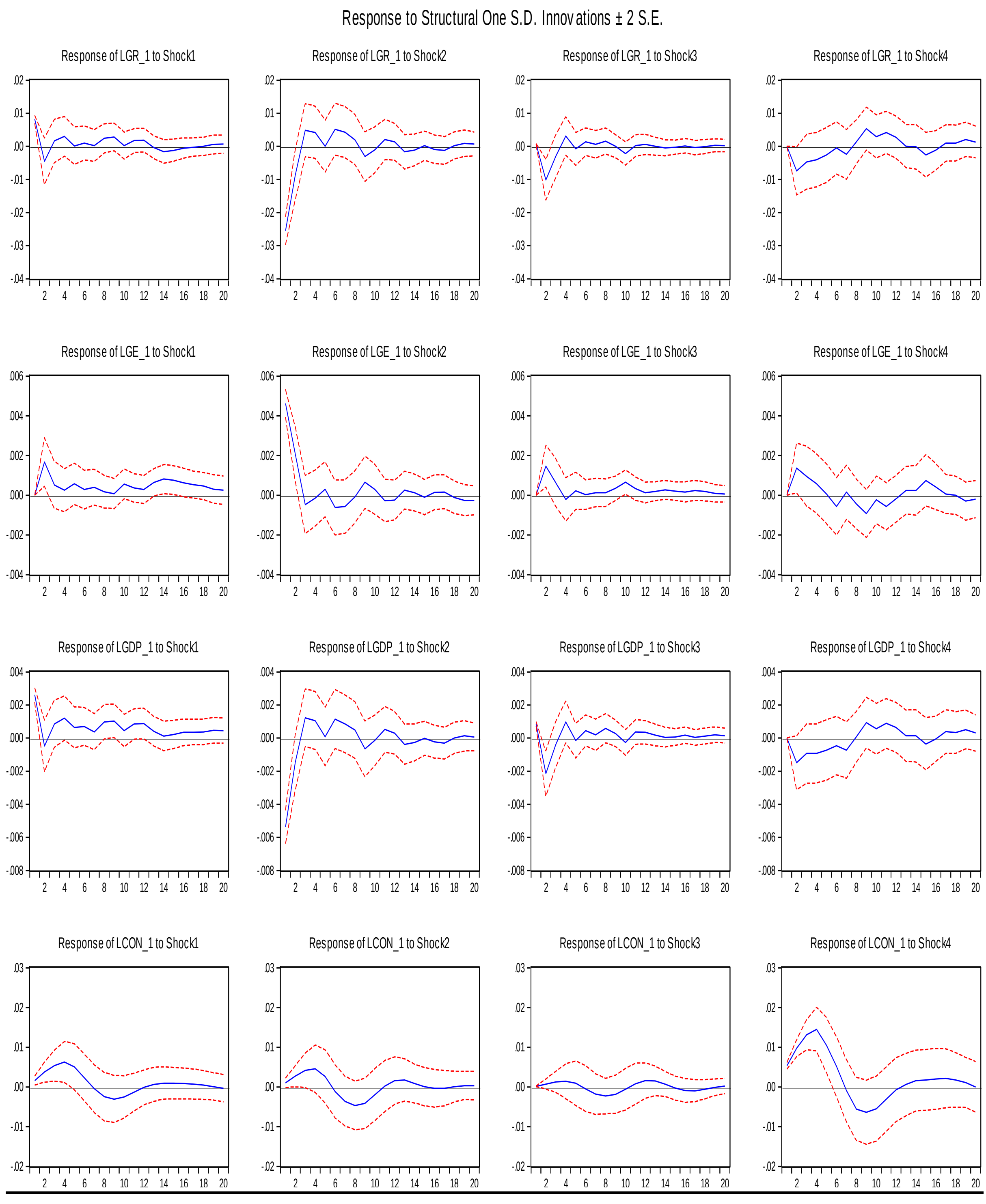

Figure 12: The IRF (GE before GR)-Private consumption, Saudi Arabia

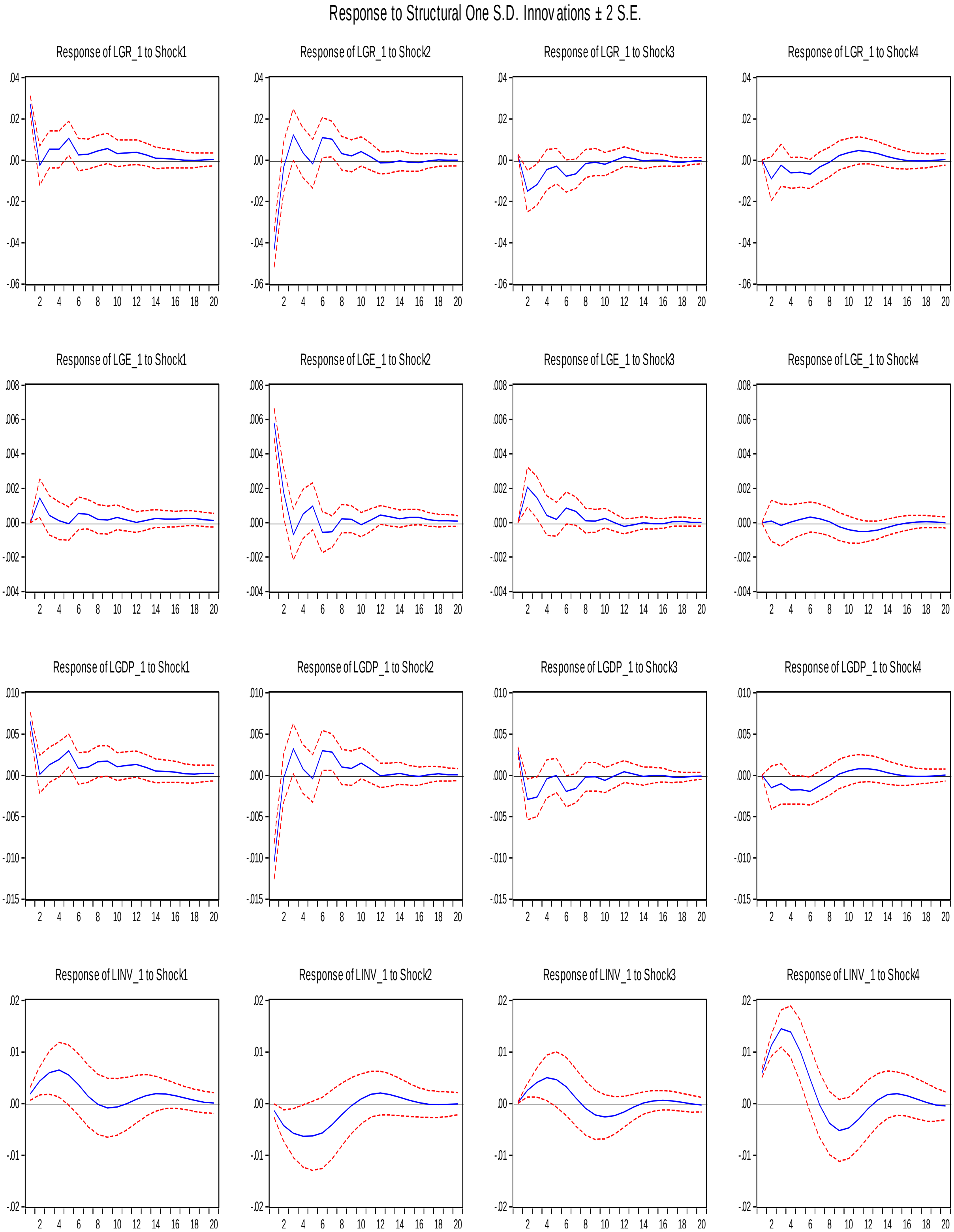

Figure 13: The IRF (GE before GR)-Private investment, Saudi Arabia

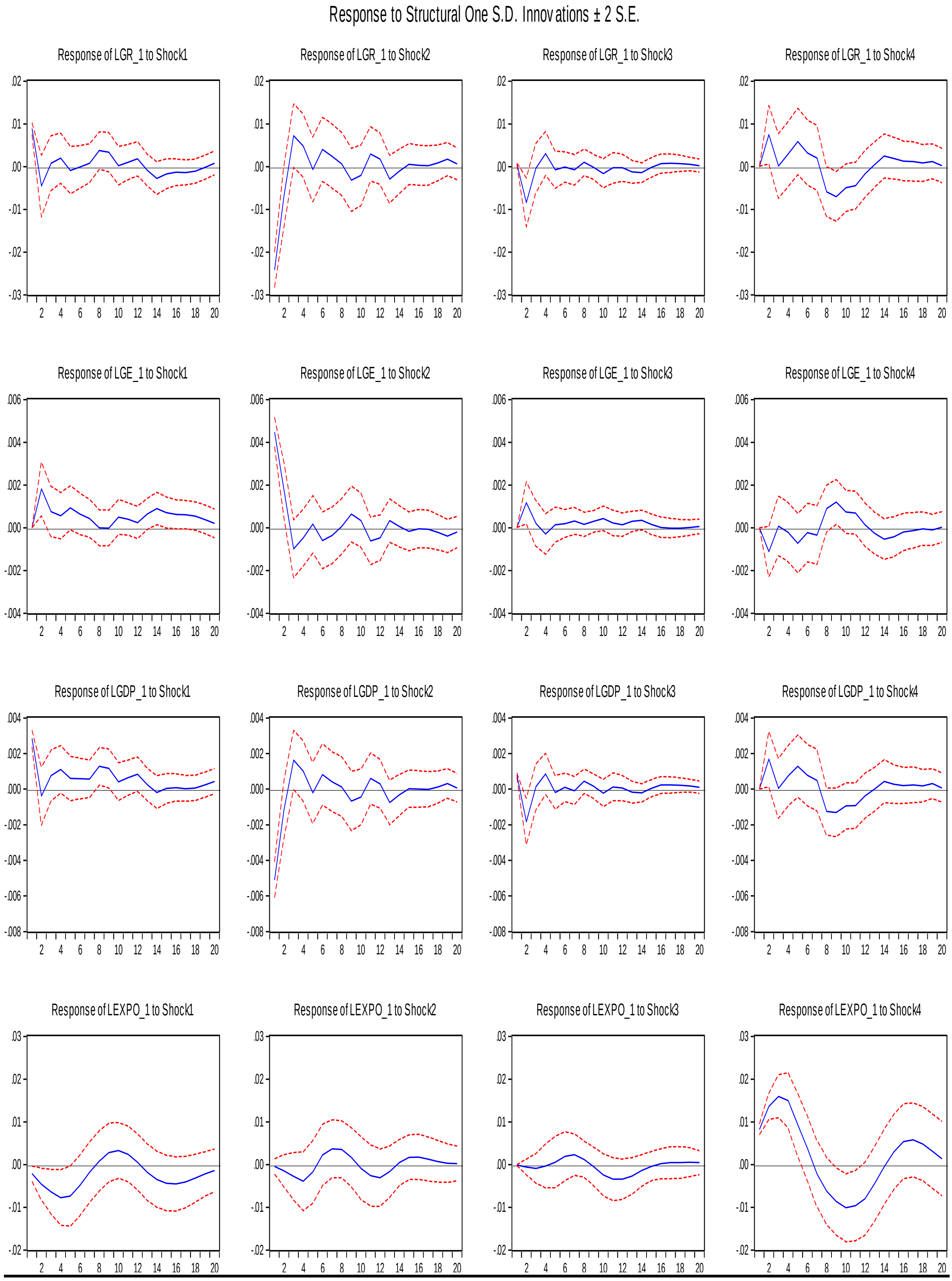

Figure 14: The IRF (GE before GR) - Exports, Saudi Arabia

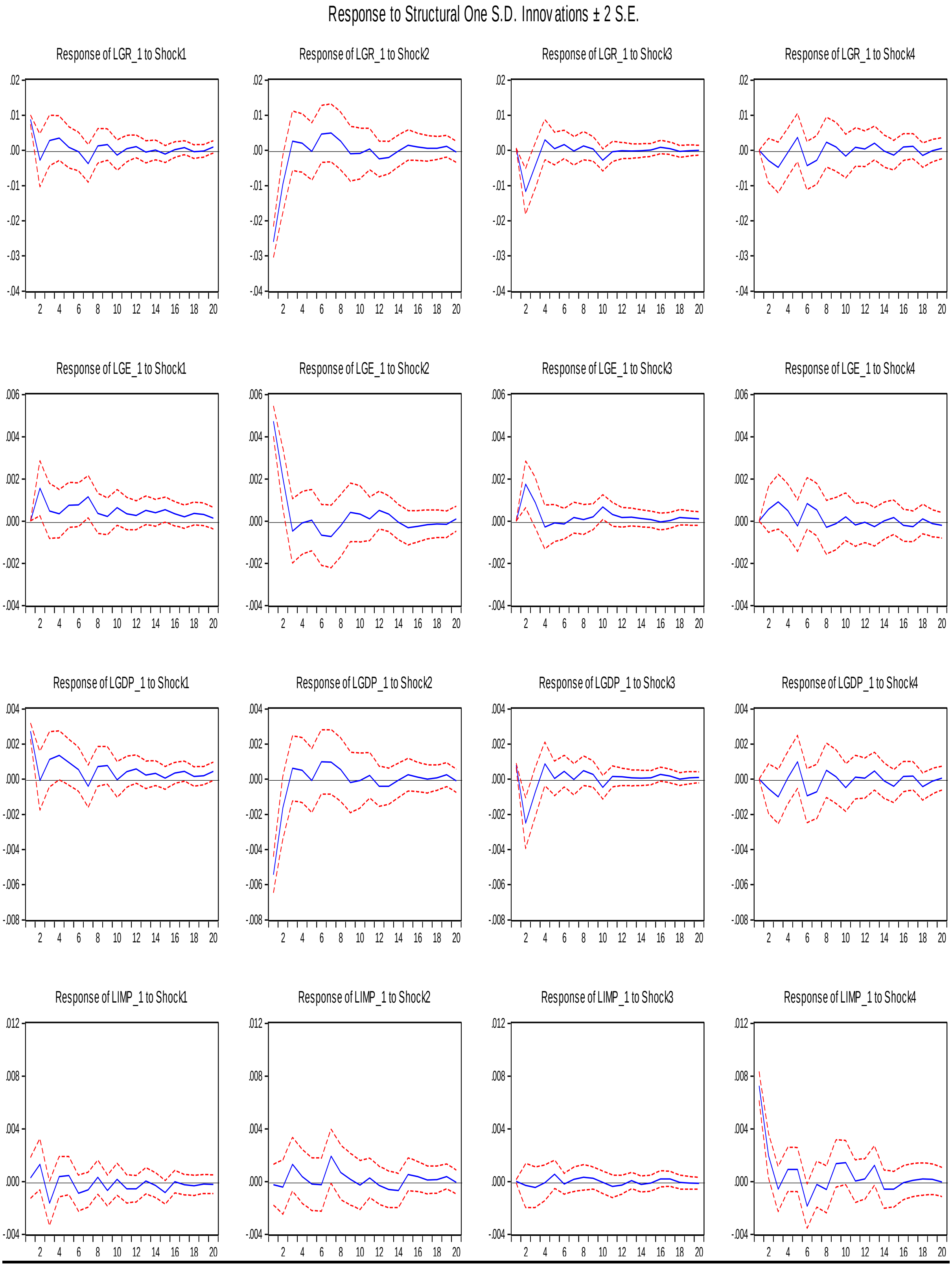

Figure 15: The IRF (GE before GR) - Imports, Saudi Arabia

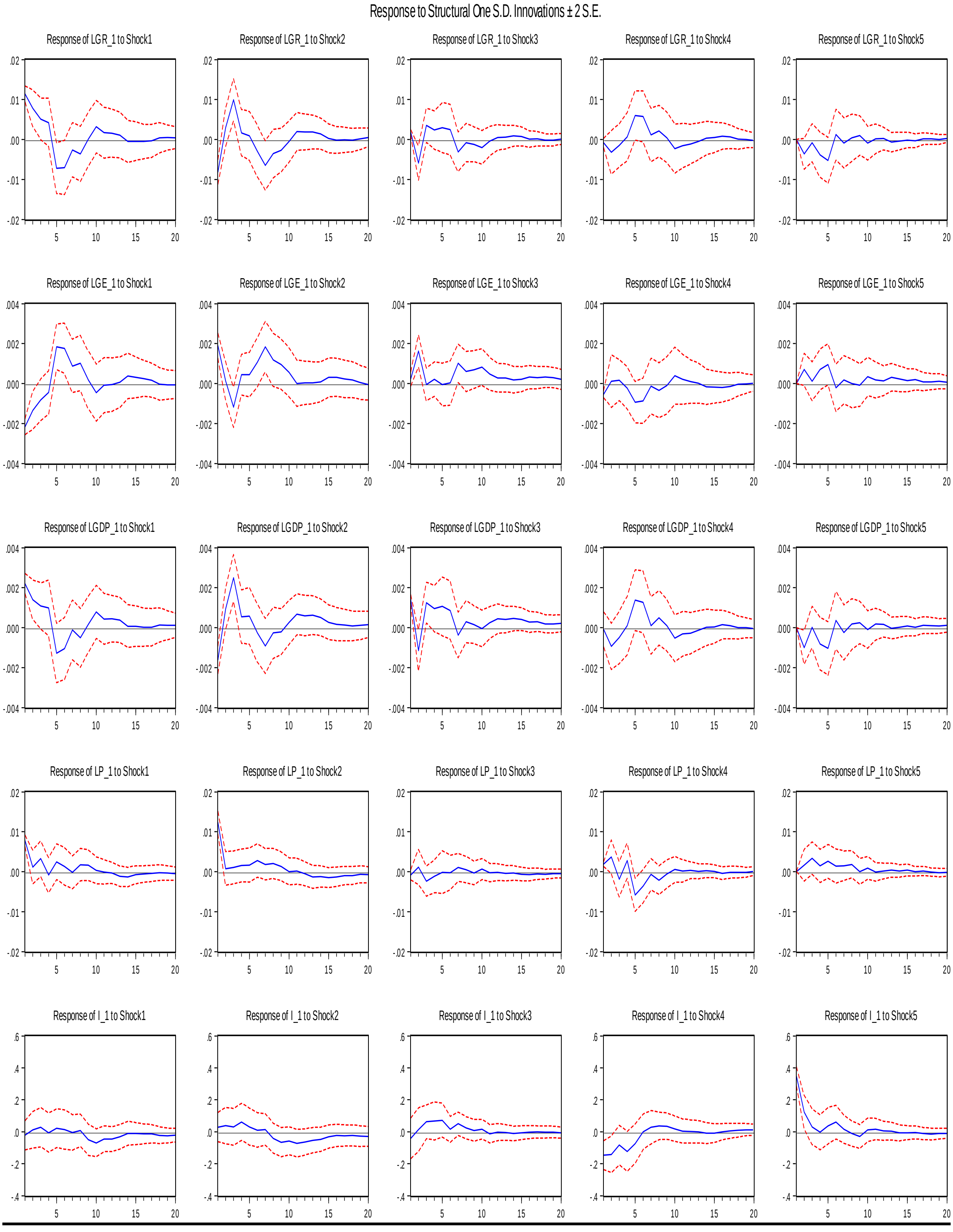

Figure 16: The IRF (Extended 5-VAR model), Saudi Arabia

Indonesia

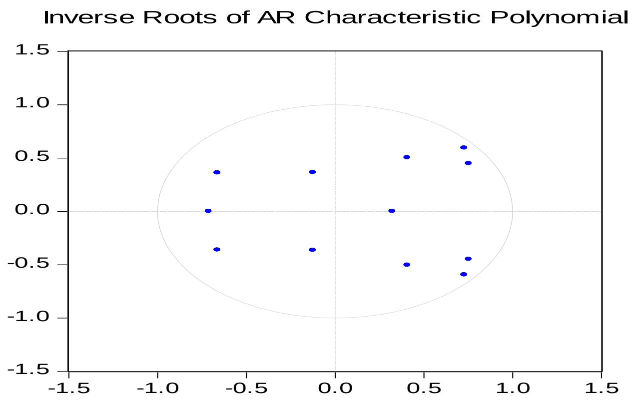

Figure 17: Stability of the reduced-form VAR model,Indonesia

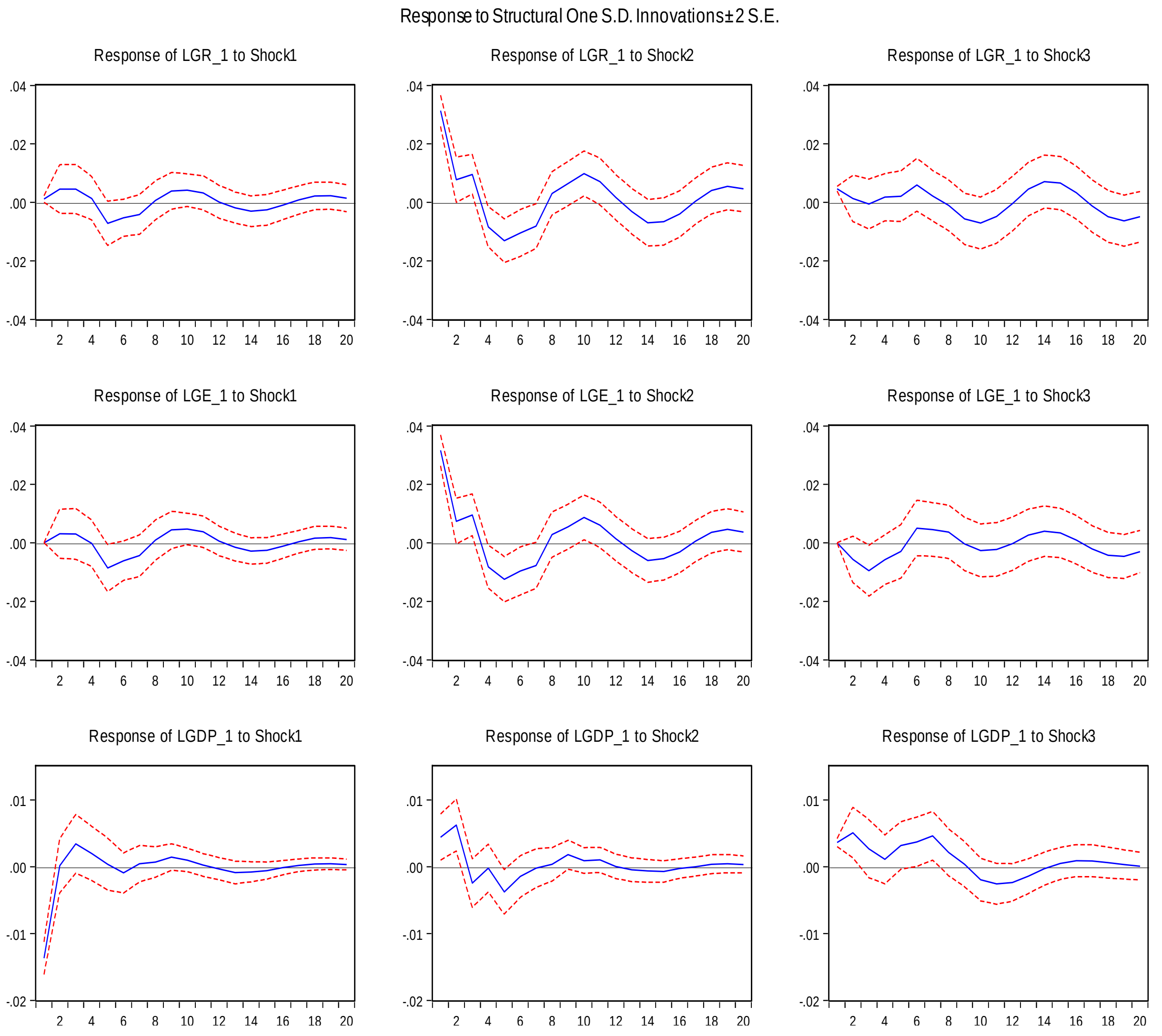

Figure 18: The IRF (GE before GR), Indonesia

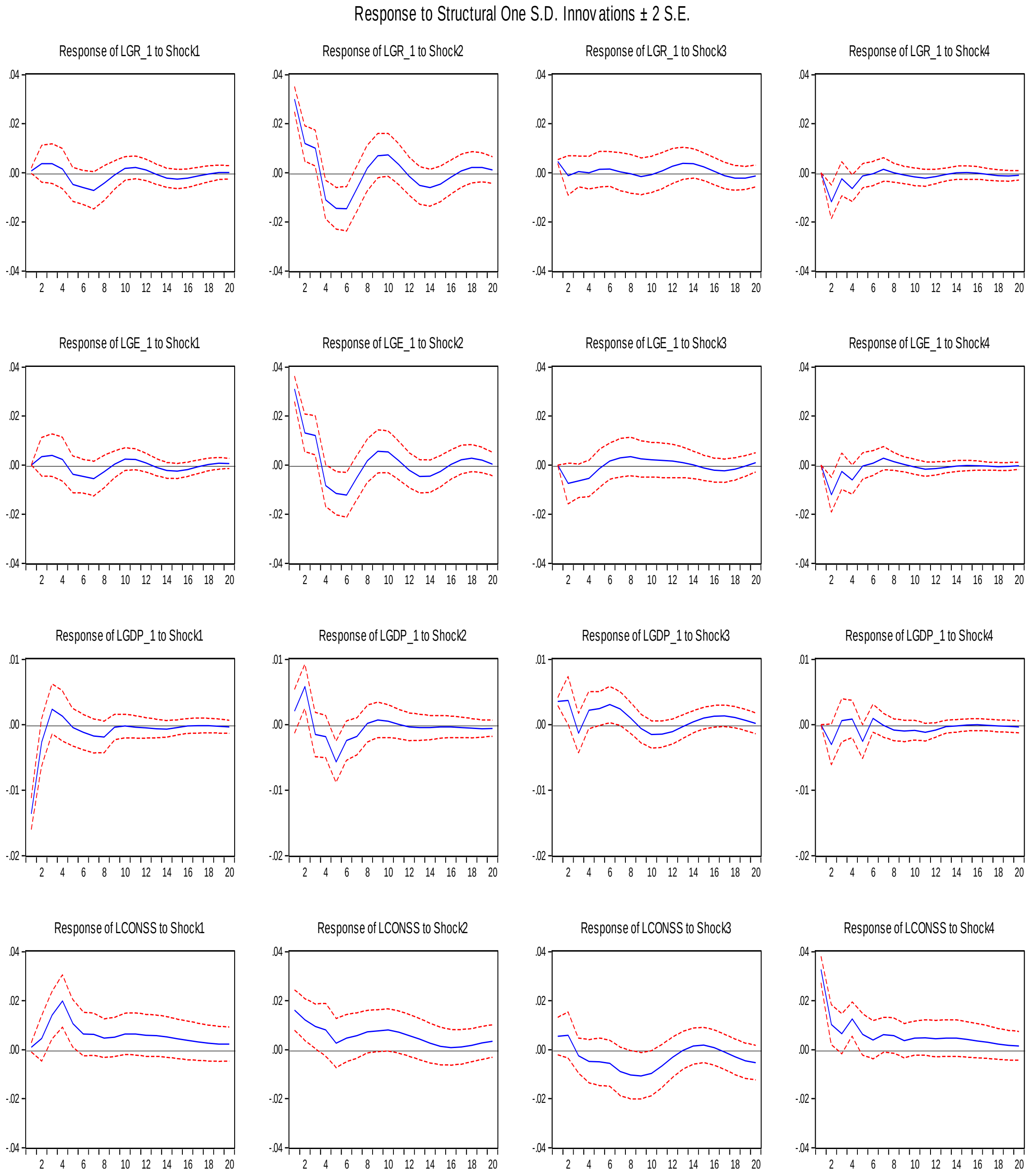

Figure 19: The IRF (GE before GR), Private consumption, Indonesia

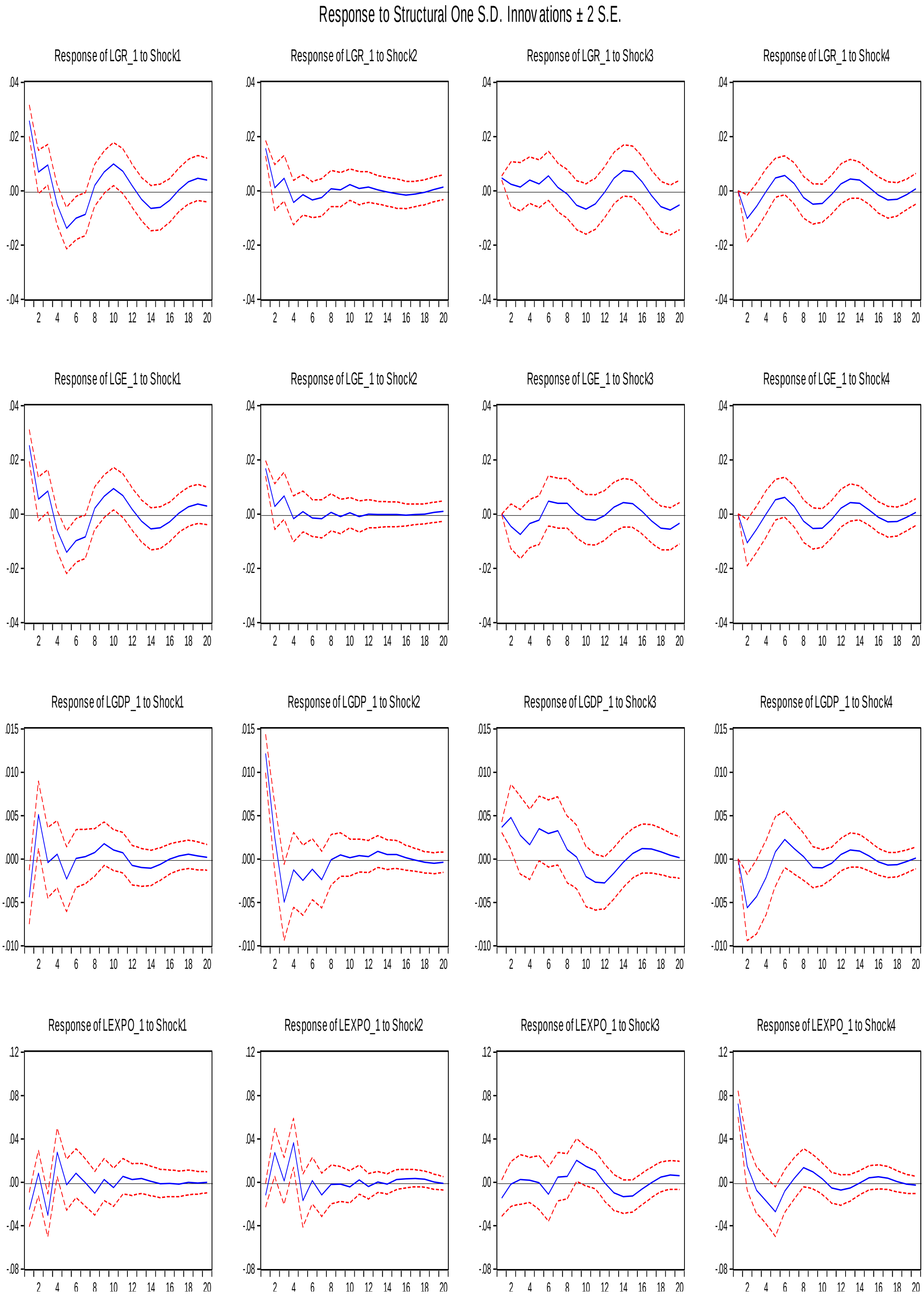

Figure 20: The IRF (GE before GR), Exports, Indonesia

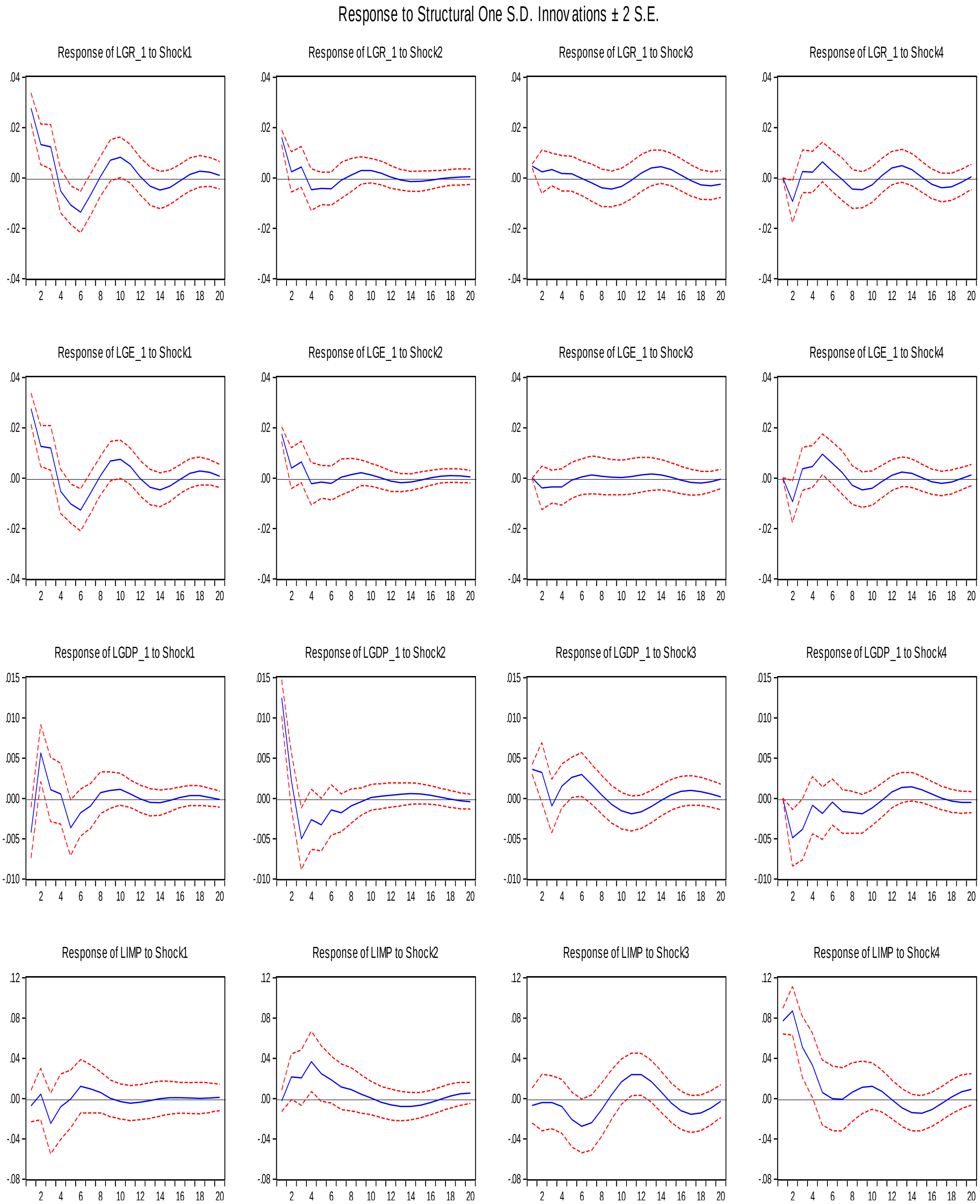

Figure 21: The IRF (GE before GR), Imports, Indonesia

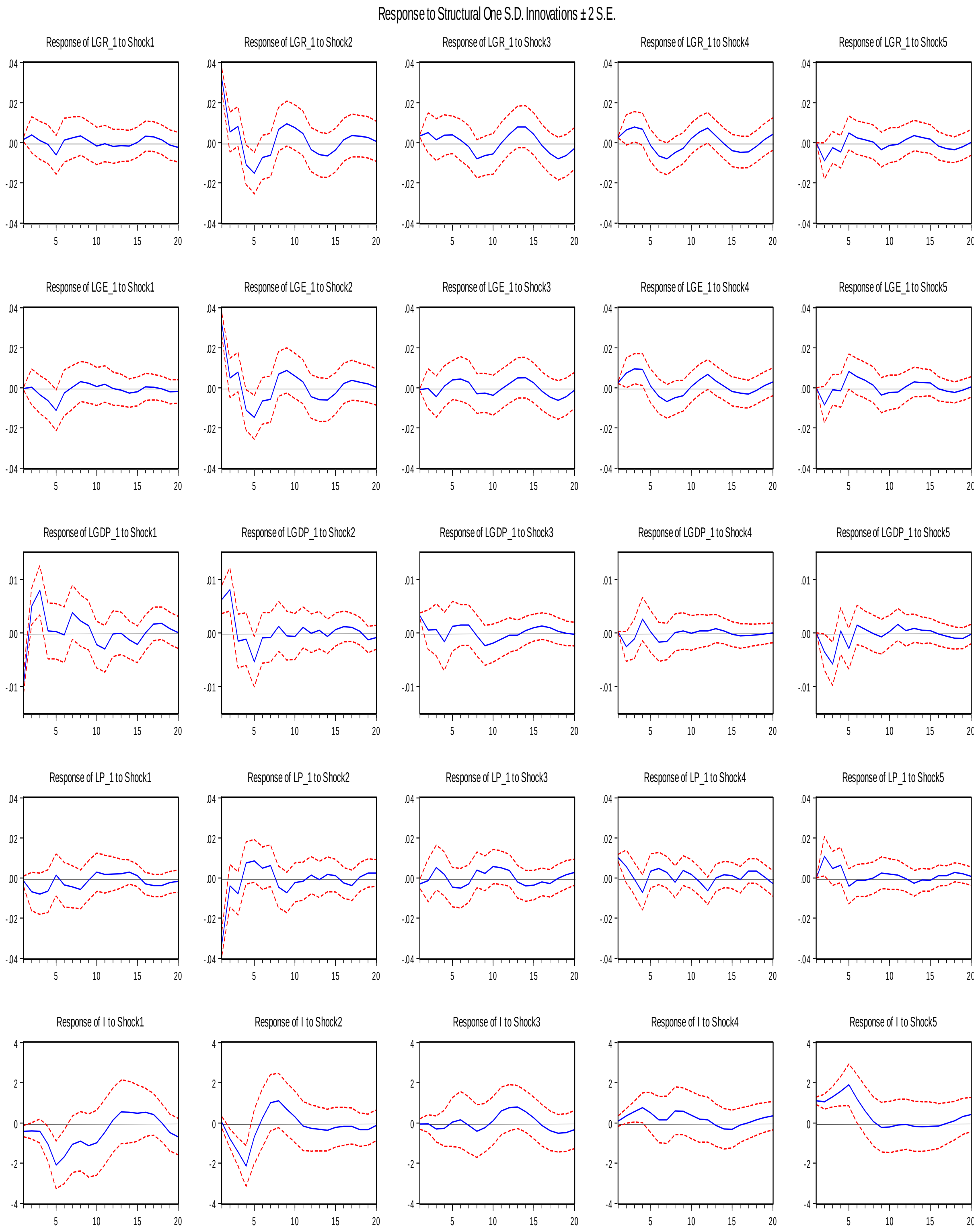

Figure 22: The IRF (Extended 5-VAR model), Indonesia

Malaysia

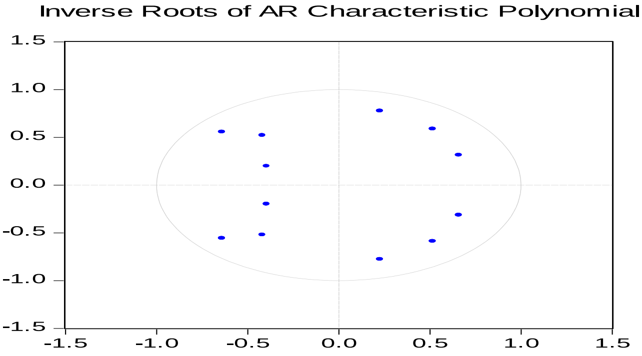

Figure 23: Stability of the reduced-form VAR model, Malaysia

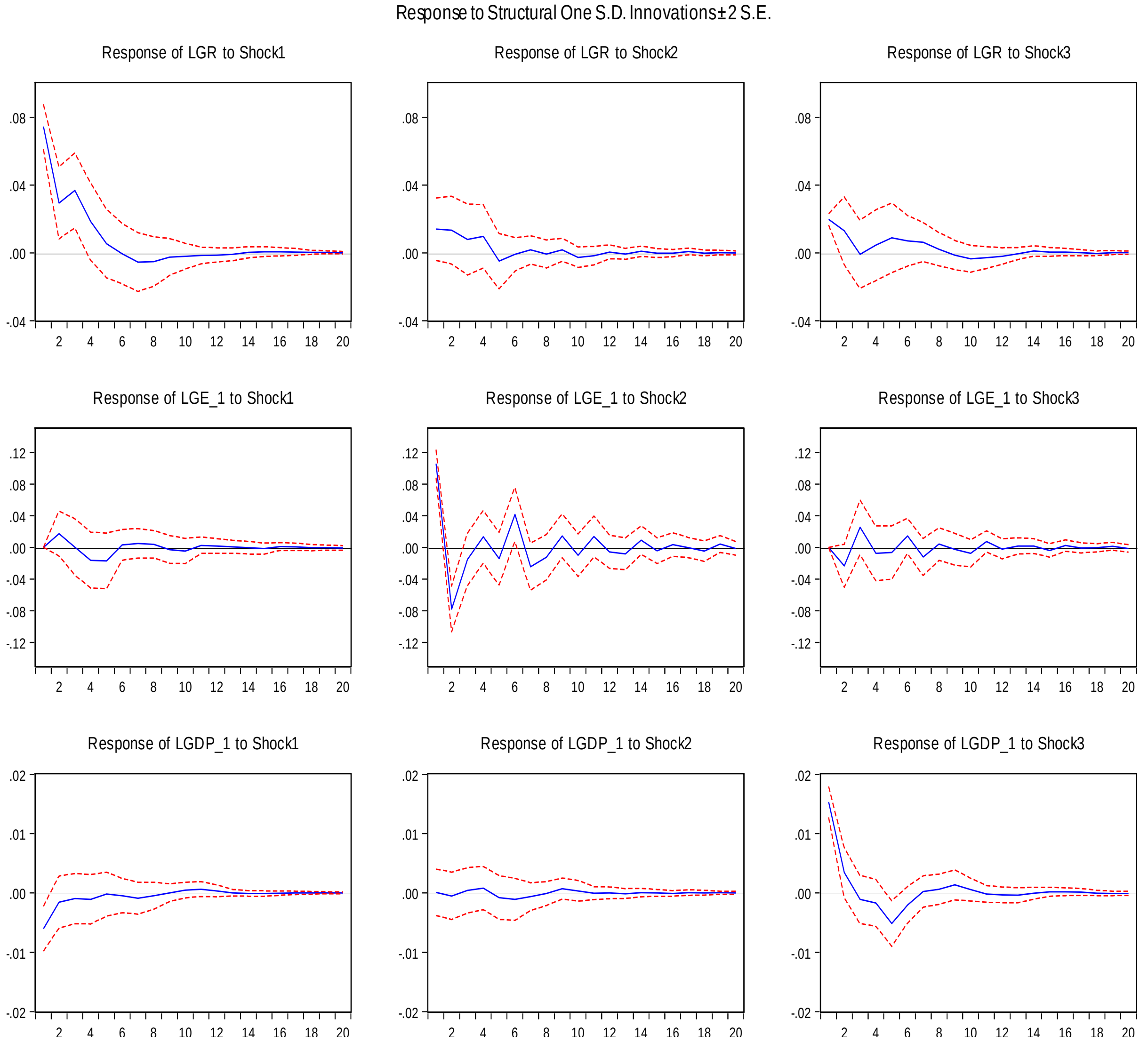

Figure 24: The IRF (GE before GR), Malaysia

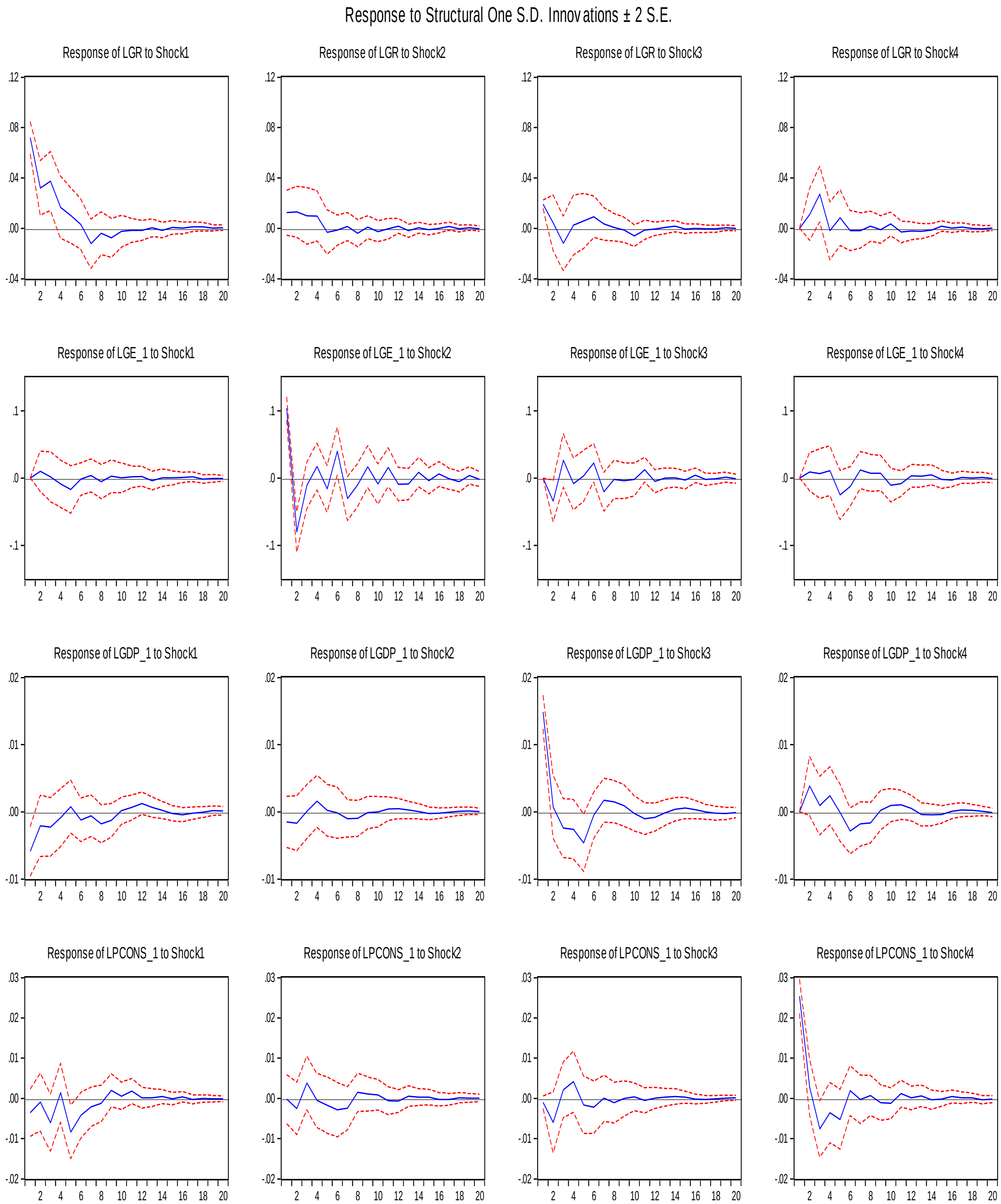

Figure 25: The IRF (GE before GR), Private consumption, Malaysia

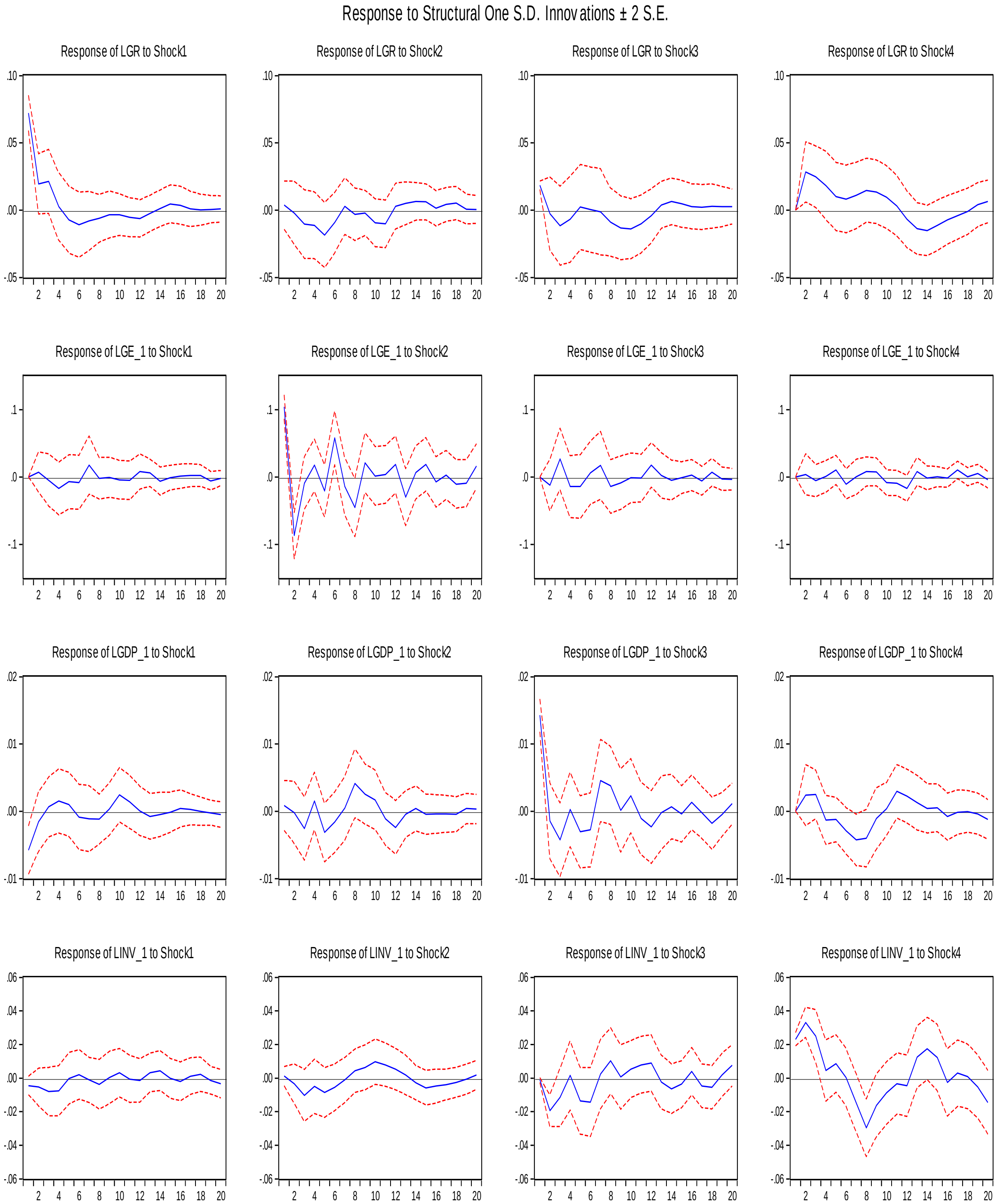

Figure 26: The IRF (GE before GR), Private investment, Malaysia

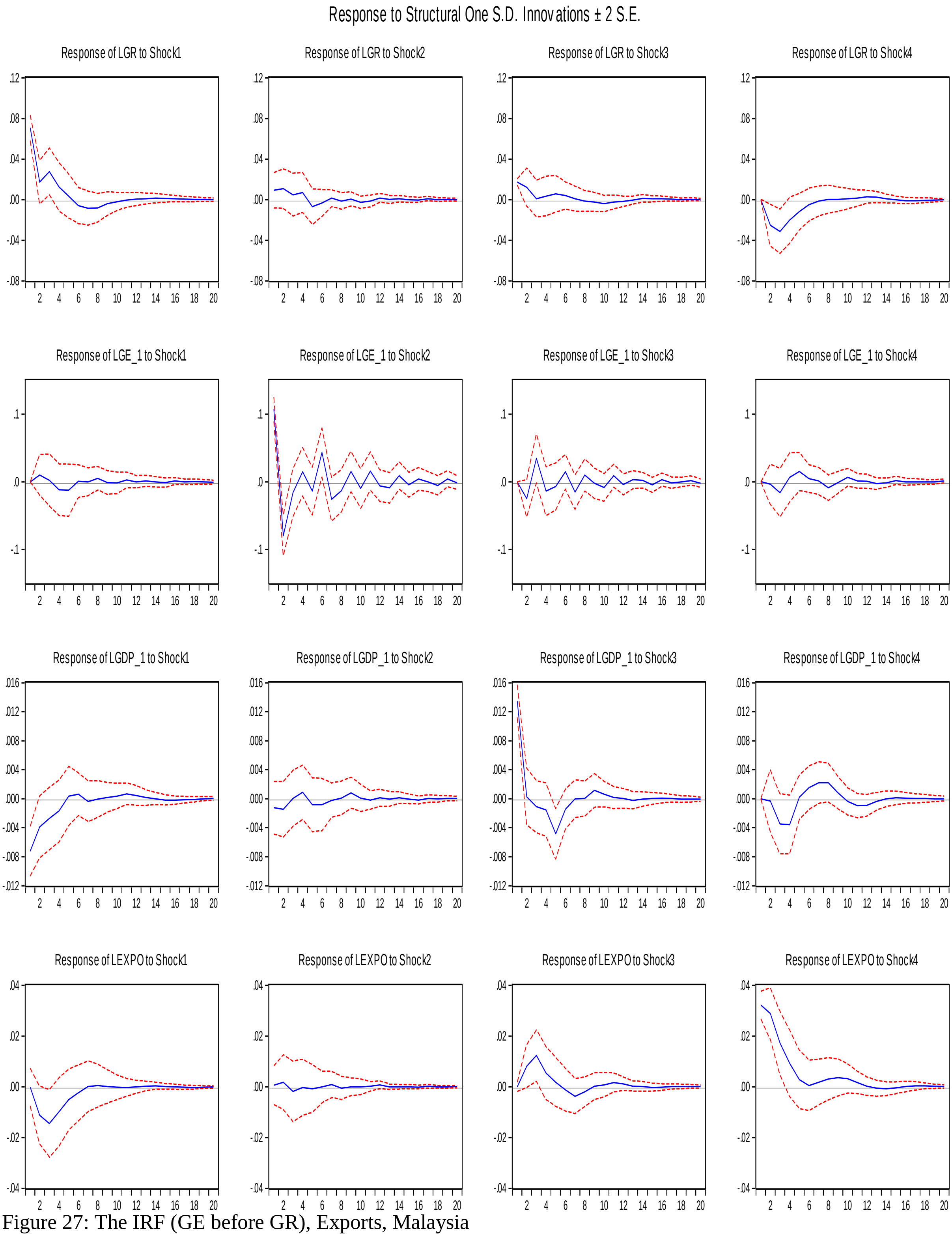

Figure 27: The IRF (GE before GR), Exports, Malaysia

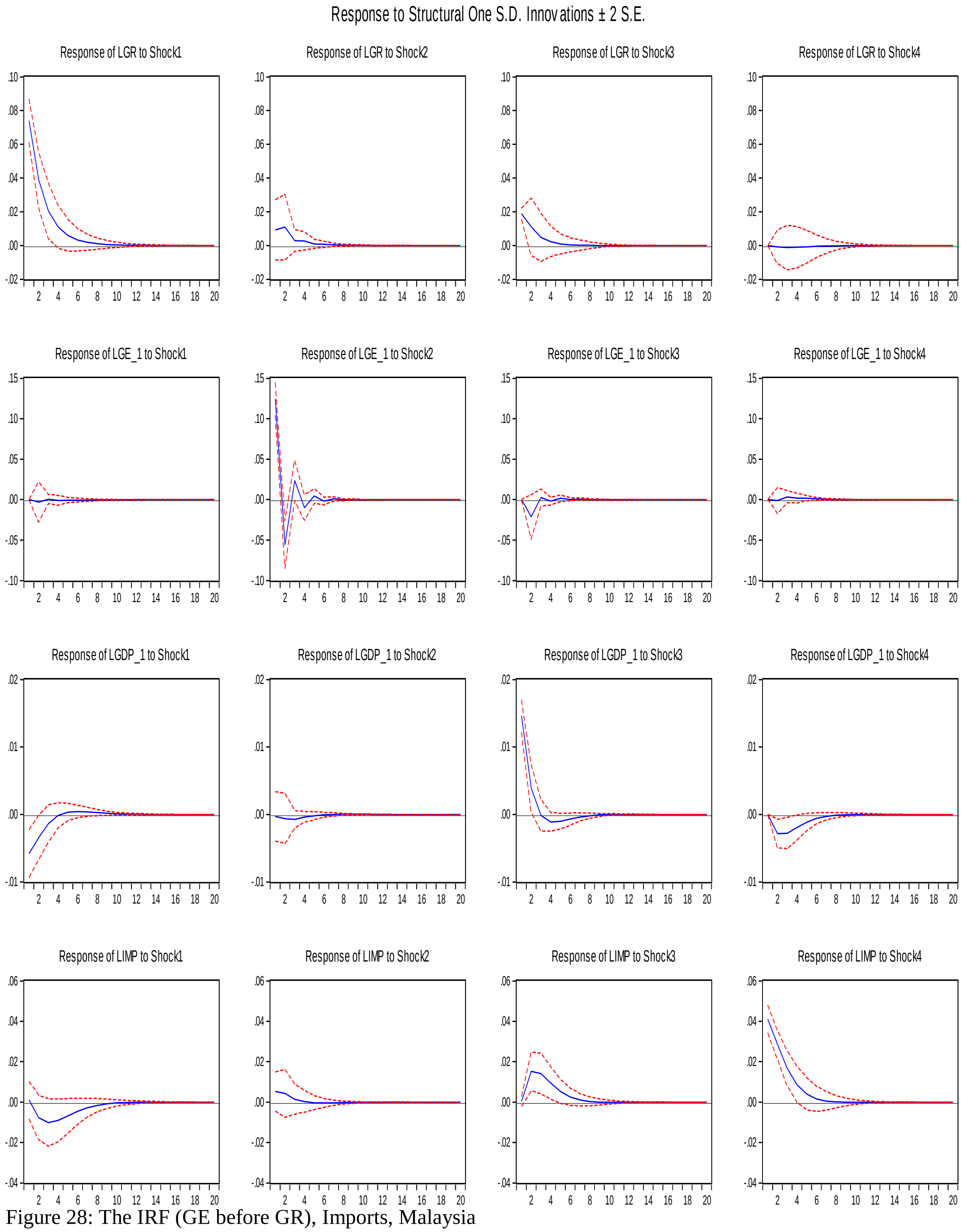

Figure 28: The IRF (GE before GR), Imports, Malaysia

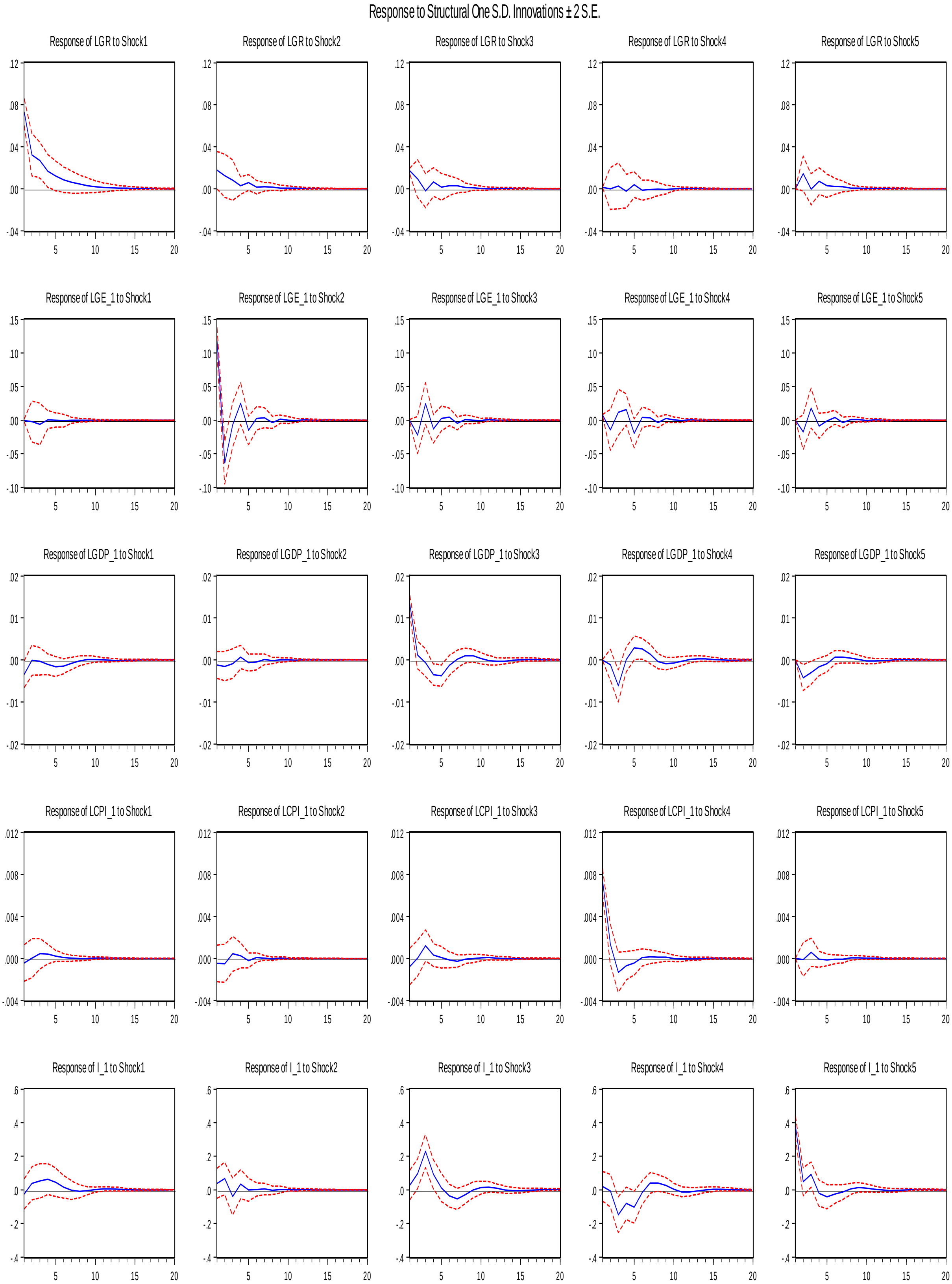

Figure 29: The IRF (Extended 5-VAR model), Malaysia

Norway

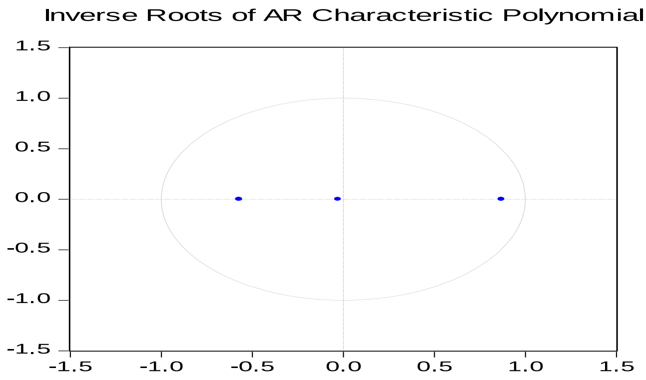

Figure 30: Stability of the reduced-form VAR model, Norway

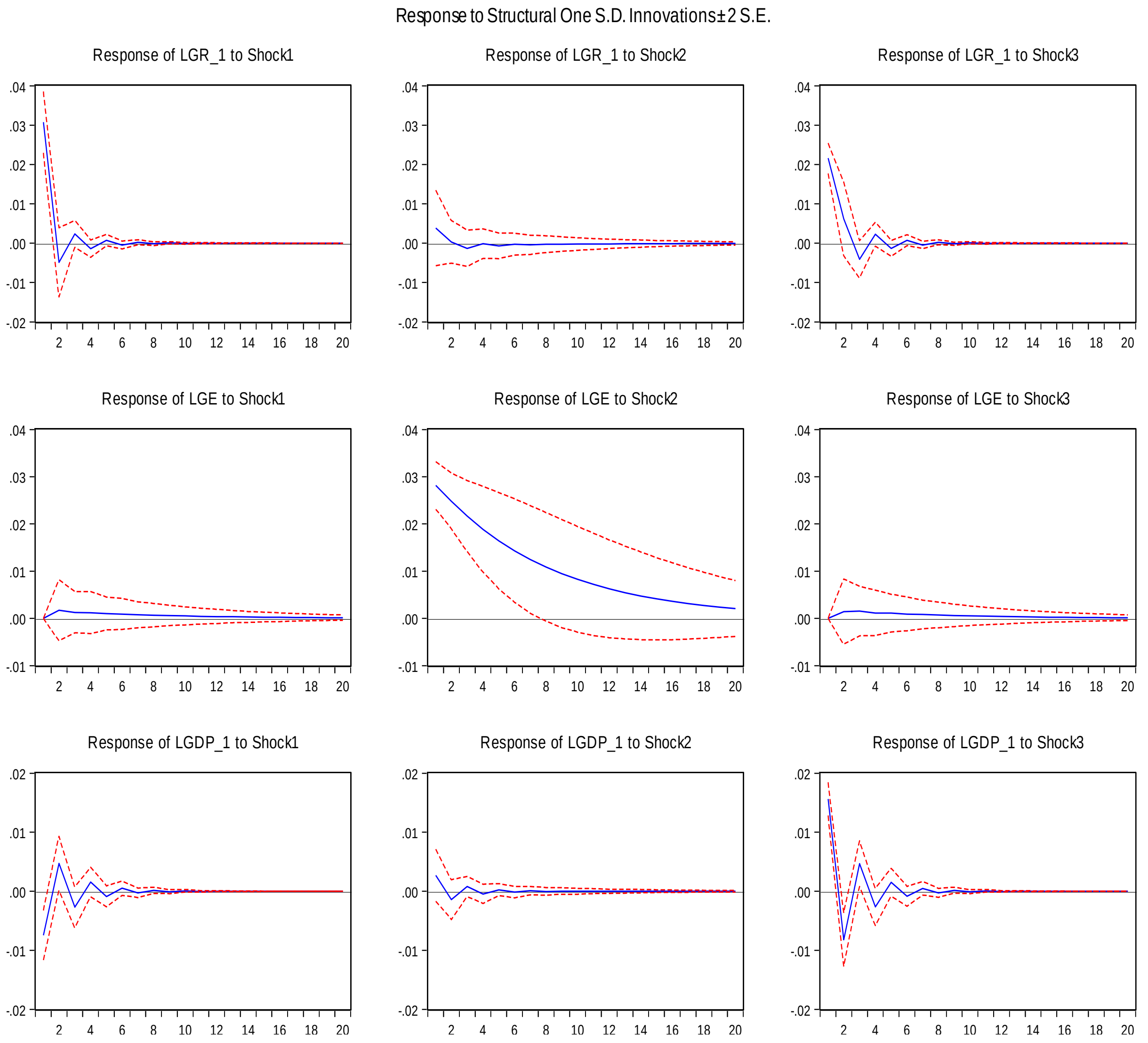

Figure 31: The IRF (GE before GR), Norway

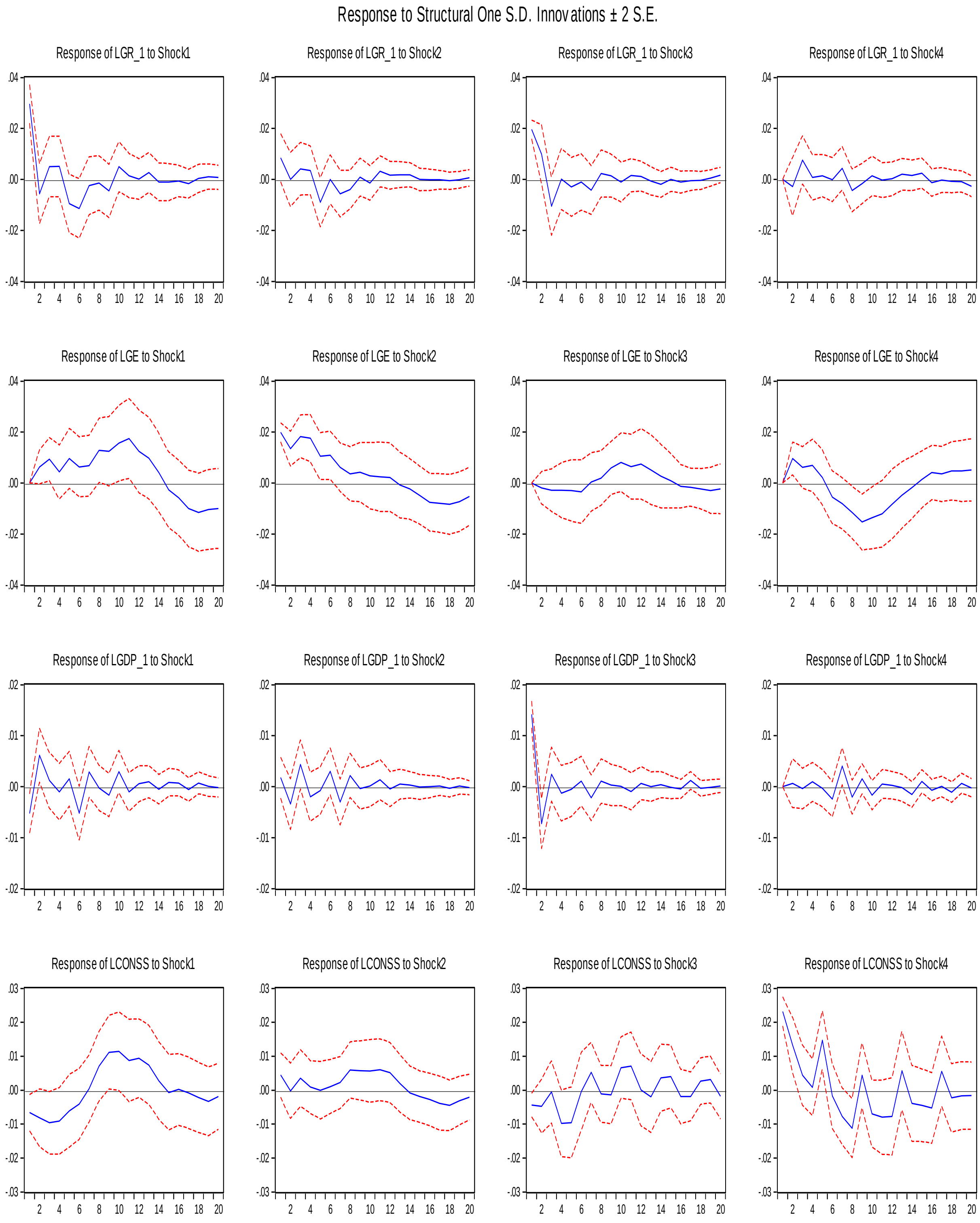

Figure 32: The IRF (GE before GR), Private consumption, Norway

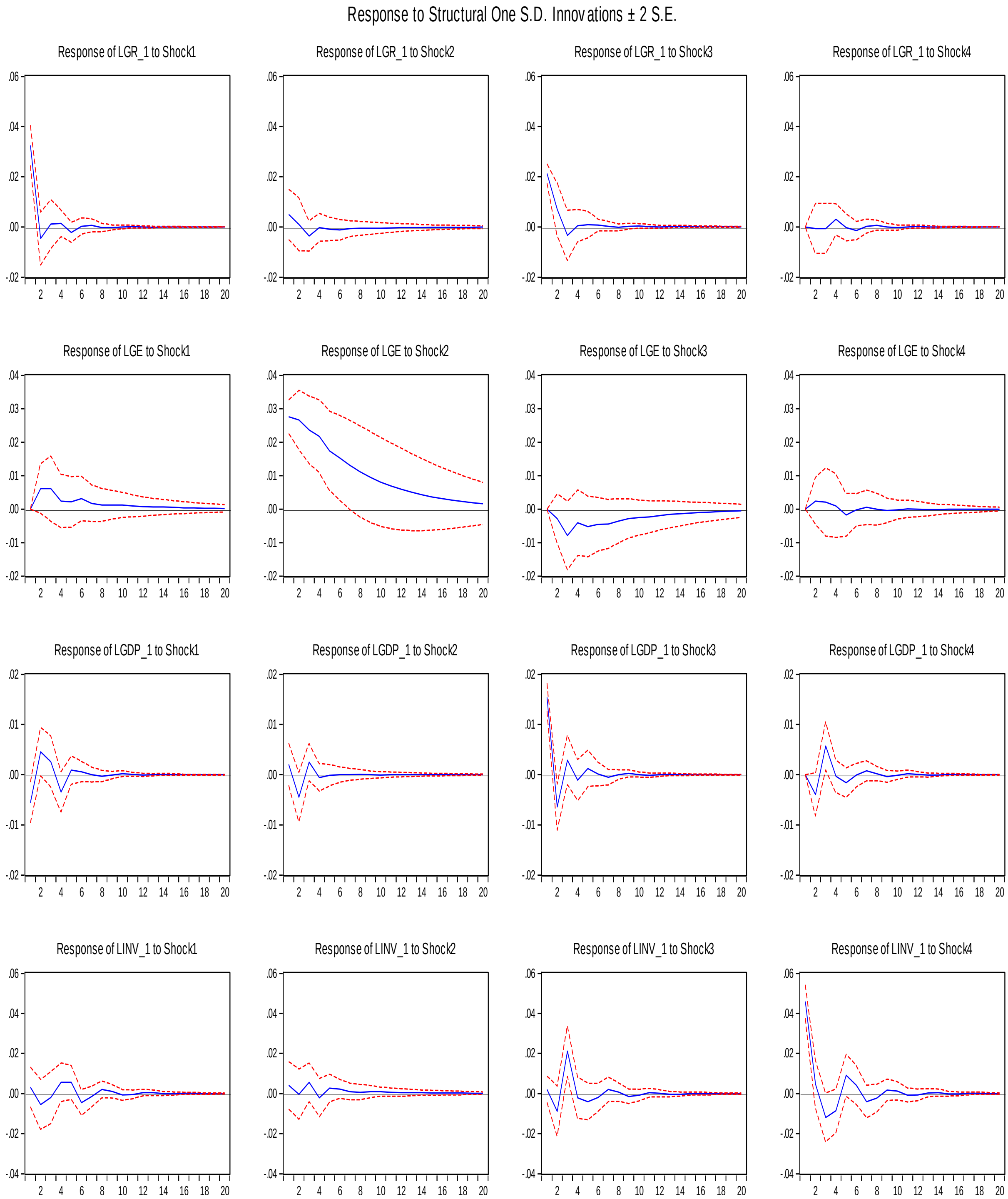

Figure 33: The IRF (GE before GR), Private investment, Norway

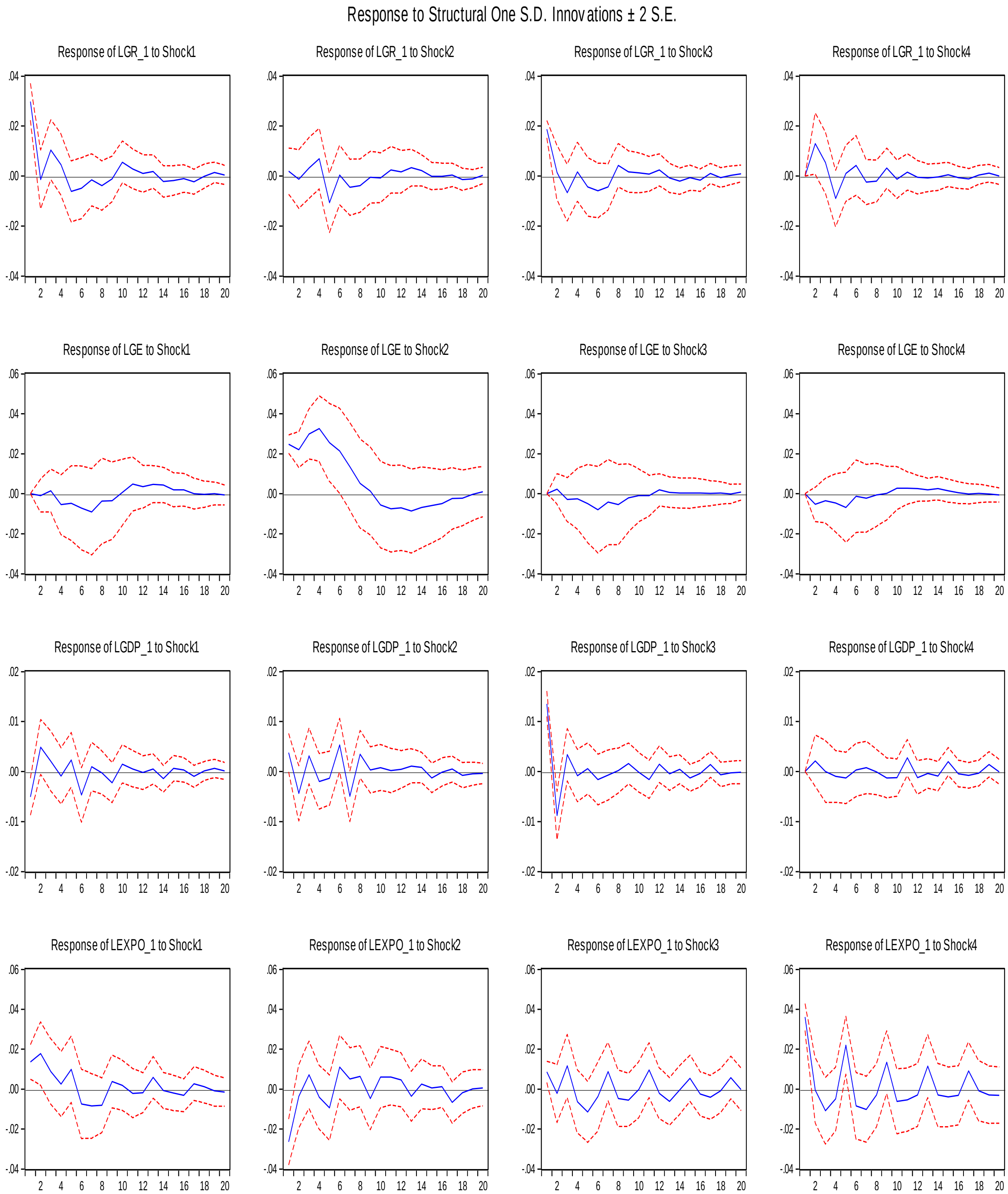

Figure 34: The IRF (GE before GR), Exports, Norway

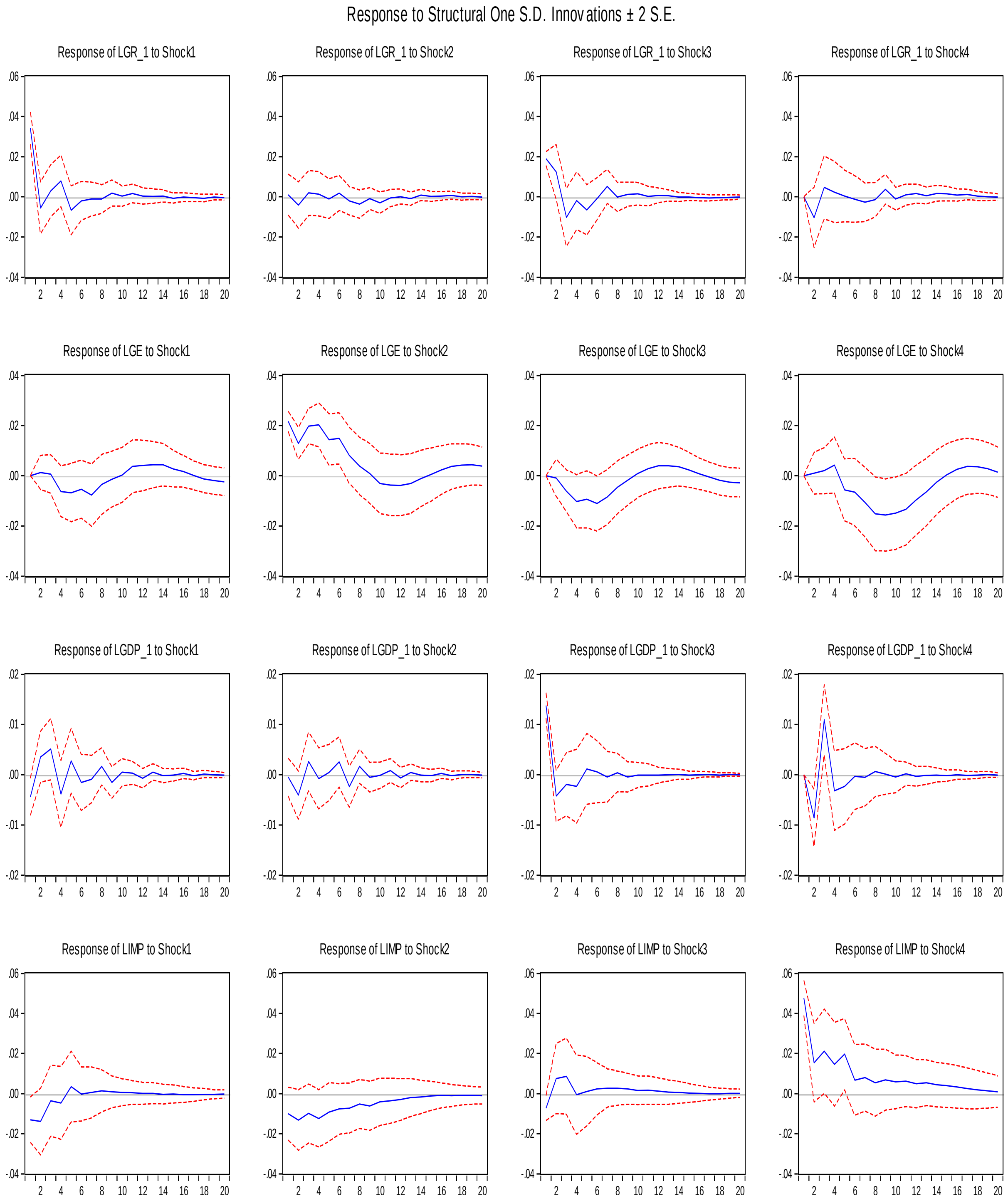

Figure 35: The IRF (GE before GR), Imports, Norway

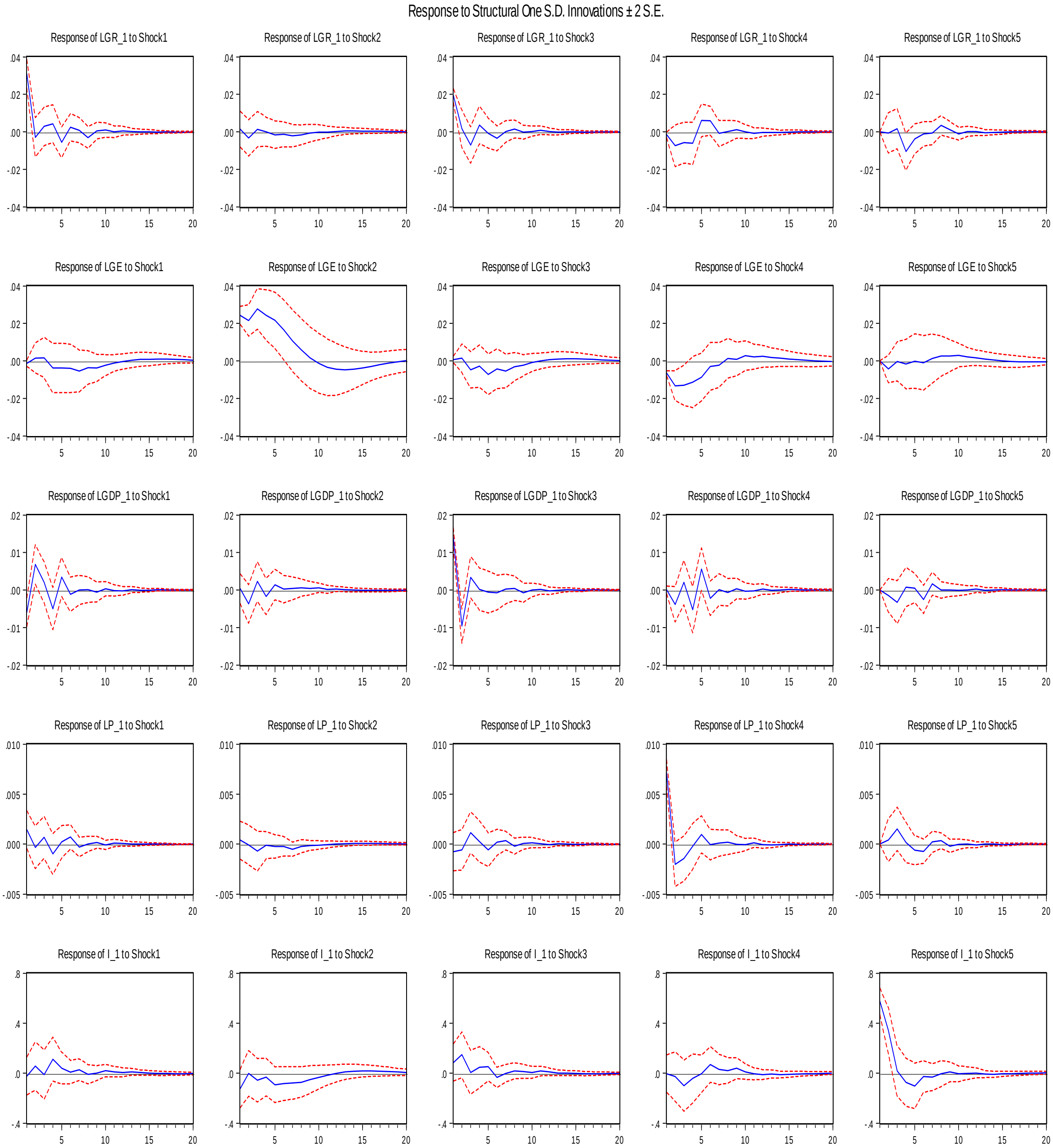

Figure 36: The IRF (Extended 5-VAR model), Norway