

**Early Draft**

# **The Effect of Fiscal Policy in Indonesia: Structural VAR Analysis**

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## **Abstract**

This paper is an attempt to investigate the effect of fiscal policy on output in Indonesia using Structural Vector Autoregression (SVAR) methodology for the period 1983:1 – 2010:1. We use contemporaneous restriction and follow Blanchard and Perotti (1999) technique to identify structural fiscal policy shocks in Indonesia. The estimation results show that the government spending shocks are found to have relatively small (though positive) but insignificant effect on output. Moreover, the spending composition matters as government investment gives better impact on output than government consumption. In this study, we investigate also the effect of fiscal policy on GDP component in term of private component and private investment. The results also show similar story with the aggregate level in which give positive sign but insignificant on both components. Overall, the findings indicate the less potent fiscal policy to stimulate output while putting upward pressure on nominal interest rate.

**Key words** : fiscal policy, government spending, structural VAR, crowding out

## 1.1. Introduction

The intent of fiscal policy is essentially to stimulate economic and social development by pursuing a government budget policy stance that ensures an optimum balance between revenue, spending and borrowing which is consistent with sustainable economic growth. However, the extent to which fiscal policy can effectively stimulate economic activity continues to attract intense debate both among academics and policy makers.

Indeed, the debate has persisted so many years as there has not been any clear agreement over the effect of fiscal policy on economic activities both in theoretical and empirical ground. The activists fiscal policy argue that fiscal policy either through public spending, taxes or transfer can effectively stimulate economic activity during downturn, especially to the extent that it is due to aggregate demand shock instead of reacting to the changes of fundamental factors such as productivity. Meanwhile, the skeptics contend that fiscal policy actions are either ineffective or make things worse, because the actions are in general not timely or they create damaging distortions.

Unfortunately, prior to the onset of the global financial crisis (the GFC), the skeptic's view has dominated the debate over the past three decades. As a consequence, fiscal policy has taken a backseat to monetary policy as most of the discussion on the stabilization policy was centered on monetary policy (Blinder, 2001). Compared to the large number studies on monetary policy, fiscal policy has gained relatively less attention (Perotti, 2005 and Krugman, 2009).

The resurgent interest in the role of fiscal policy as both expansionary and stabilization instrument for government can be traced back since the emergence of the European Monetary Union (EMU). Under Monetary Union, fiscal policy is become the only stabilizing instrument available to individual member countries to address country specific shock as monetary policy is in the hand of European Central Bank (ECB). The 1997 Asian financial crisis (the AFC), the Japan's prolong experience of near zero interest rate in a slumping economy, and in particular latest 2008 global financial crisis (the GFC), have also highlighted potential roles that fiscal policy can play.

As a result of this resurgent interest, the empirical works on the topic is growing as well as the approach used. Prior to early last decade, the empirical literature on the effect of fiscal policy on economic growth mostly focused on cross-country regression approach<sup>1</sup>. However, cross country studies on fiscal policies suffer from some drawbacks as addressed by Levine and Renelt (1992) and (Tanzi and Zie) 1997. In their widely cited critique, Levine and Renelt (1992) emphasize on two reasons for non-robustness; (i) the overall size of government cannot capture the different implications of government activities, and (ii) they ignore aspect of government

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<sup>1</sup> Among others are Landau (1983), Barro (1991), Engen and Skinner (1993), Folster and Henrekson (2001), Barro and Sala-i Martin (2004)

efficiency. These drawbacks naturally lead to single country studies using simple time series approach<sup>2</sup>. However, this approach also suffers from well-known problem of endogeneity<sup>3</sup>. Sims (1980) argued that there is no variables can be deemed as exogenous in the presence of forward looking agents implying that all macroeconomics variables are interrelated.

In the latest development, since the seminal work of Blanchard and Perotti (2002), the use of vector autoregression (VAR) approach, which removes the endogeneity problem of the simple time series approach, gains more popular in analysis of the effect of fiscal policy<sup>4</sup>. The use of fiscal stimulus in response to the 2008 GFC around the world has made the VAR approach even more popular among academics.

At present, however, bulk of the empirical works on the effectiveness of fiscal policy is concentrated on the advanced and the OECD countries, a likely overwhelming the relative abundance of available models for these groups of countries. In contrast, it is difficult to find empirical literature on the effectiveness of fiscal policy in developing countries of Asia, whereas these countries are interesting for their economic dynamic and importance role of government in the economy.

In case of Indonesia, despite of the remarkable economic performance during past three decades, indeed the economy has experienced several disruptions. The oil boom in 1973 to 1975, followed by sharp fall oil price in the late 1970s, the AFC in 1997, and lately the 2008 GFC are among the major episodes that had significant impact to the economy. In all cases, fiscal measures are among key instruments of the adjustment policy pursued by the government. However, though there have been a number of empirical literatures on the economy of Indonesia, we can hardly find one focused on the effectiveness of fiscal policy. Most of the literatures on the adjustment policies in Indonesia have been focused on the effectiveness of monetary policy<sup>5</sup>. As a result, unlike monetary policy in which the transmission mechanisms have relatively been studied and well understood, transmission mechanism of fiscal policy in Indonesia has been lack of explanations. The major reason is perhaps due to the accessibility or availability of reliable, high frequency, and long government budget data.

Therefore, this study is an attempt to fill some literature gaps. This study is aimed to

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<sup>2</sup> Time-series studies of single countries include Grossman (1988) for the annual data of the US over 1929-1982, Peden and Bradley (1989) for the US annual data of the post-war period, and Angelopoulos and Philippopoulos (2005) for Greece annual data over 1960 – 2000.

<sup>3</sup> The effect of government expenditure might be biased due to endogeneity if larger public spending is triggered by negative income shock. An attempt to investigate the link between output and government size in Indonesia by Ramayandi (2003) using simple time series of the ECM on annual data of Indonesia, indeed suffer from potential endogeneity problem based on the result of two stages of Hausman specification test.

<sup>4</sup> Previously the VAR approach is standard only for monetary policy analysis.

<sup>5</sup> Sadeq and Kapur (1990), Chowdhury and Siregar (2004), Gultom (2008) and Sugema and Bakhtiar (2010), are among others.

investigate the effect of fiscal policy on economic growth using latest developed model, structural VAR, in Indonesia over the years. It is basically a reaction to the recent growing popularity of using SVAR in modeling the impact of fiscal policy impact in advanced and OECD countries<sup>6</sup>. The SVAR model is a very useful empirical tool which describes the economy as a dynamic stochastic system responding both present and past shocks.

Methodologically, it may contribute to the current literatures in two ways. *Firstly*, unlike the original model of Blanchard and Perotti (1999) which includes only three variables (public spending, taxes and GDP), following the standard IS – LM and the AD – AS model, in this study, we investigate also the channel through which fiscal policy shocks are transmitted such as interest rates and price. In addition, while the original model considered only aggregate output (GDP), in this study we take into account the effect of fiscal policy on the GDP component; private consumption and investment. Hence, the base line model will consist of 4 variables of total public spending ( $G_t$ ), private GDP ( $PY_t$ ), price level ( $P_t$ ), and interest rates ( $R_t$ ). Then, two alternative models will follow to account the effect of fiscal policy shock on private consumption and private investment by substituting private GDP with each of them sequentially in the base line model. *Secondly*, to account for the spending composition effect, government spending will also be distinguished into two components; consumption spending and capital spending. Each of these will enter the base line model sequentially to substitute the government spending. While government consumption will enter the model to investigate its effect on private consumption, the government investment will enter the model to account its effect on private investment.

## **1.2. Research Question**

The main questions to be answered in this study are as follows:

1. What has been the effect of fiscal policy (government spending) on the Indonesian economy, in particular on output, price level and interest rates as well as on the GDP components (private consumption and investment)?
2. How is the dynamic path of the effect of fiscal policy shocks on the Indonesian economy, in particular on output price level and interest rates as well as on the GDP components (private consumption and investment)?

## **1.3. Research objectives**

Based on the questions outlined above, the objectives of this study are as follows:

1. To investigate the effect of fiscal policy (government spending) on Indonesian economy, in particular on output, price level, and interest rates as well as on the GDP components (private consumption and investment).

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<sup>6</sup> Blanchard and Perotti (1999) pioneered the use of structural VAR on the study of the effect of fiscal policy shock on economic growth.

2. To investigate the dynamic path of the effect of fiscal policy shocks on Indonesian economy, in particular on output, price level, and interest rates as well as on the GDP components (private consumption and investment).

## **2. Review of Literature**

Unlike the consequence of monetary policy changes that have been relatively well understood and there has been consensus about their effects, the role of fiscal policy in influencing economic activity is still under intense debate as there has not a clear agreement yet regarding its effects both in theoretical and empirical front. On the theoretical front, the sign and magnitude of the effect of fiscal policy on output depends on a number of key assumptions with different model resulting often opposite conclusions<sup>7</sup>. On the empirical ground, there has not been a common picture either, with some studies reported positive effect while others comes up with inconclusive or negative effect.

There are two main schools of thought on the debate over the effect of fiscal policy in economic activity. One argues that fiscal policy, either through taxes, transfer or government expenditure, can effectively be used to stimulate the economic activity during downturn, especially to the extent that it is due to aggregate demand shock instead of fundamental factors such as productivity. The other contends that fiscal policy actions are generally either not timely or creating damaging distortions.

In the literatures, the debate is generally centered on a more specific effect of fiscal policy such as on investment (crowding in vs. crowding out) and consumption (Ricardian vs. non-Ricardian equivalence) as well as their underlying factors (interest rate and prices). The theoretical overview presented below is intended to discuss the existing debate on fiscal policy particularly related to those issues<sup>8</sup>.

### **2.1. Theoretical debate**

The very standard and simple literature on the effect of fiscal policy is Keynesian multiplier. Under price rigidity and excess capacity, it postulates that a fiscal expansion has a multiplier effect on aggregate demand and output which is larger than one. An increase of government spending or tax cut will increase consumption and investment (aggregate demand) as they are determined solely by income.

Direct crowding out hypothesis, however, argues that, to the extent that government produce goods and services, larger government expenditure will

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<sup>7</sup> Key assumptions commonly used in the analysis are including; the interest rate elasticity of investment, the interest rate and income elasticity of money demand, the degree of openness of the economy, the exchange rate regime, the elasticity of labor supply, the presence of the forward looking agent (rational expectation), the magnitude of the wealth effect, the nominal rigidities in the economy and institutional factors (Beetsma, 2008)

<sup>8</sup> Beetsma (2008) and Hemming et al. (2002) provide comprehensive theoretical as well as empirical review in their survey of the literatures.

substitute goods and services provided by private sector, and hence leading to crowding out effect. Also, as Keynesian multiplier is based on an assumption that consumption is positive function of current income, the presence of forward-looking agents lead to the so called Ricardian Equivalence (RE) hypothesis (Barro, 1994). Agents are assumed to be fully aware of the government's inter-temporal budget constraint. They will anticipate that fiscal expansion today (increase spending or tax cut), financed by government bond, will result in higher tax in the future. Hence, in the absence of liquidity constraint and perfect capital market, consumption will not be affected.

The IS – LM model expands the simple Keynesian multiplier model by introducing interest rate as a channel through which the effect of fiscal shocks are transmitted. In the standard IS – LM model, private investment depends negatively on interest rates, and therefore a fiscal expansion financed through borrowing that leads to higher interest rates reduces investment (crowding out effect)<sup>9</sup>. The magnitude of fiscal multiplier depends on the responsiveness of investment to interest rates. Fiscal multiplier is likely to be smaller if investment is highly responsive to interest rate. In contrast, if investment is an increasing function of income, fiscal multiplier is likely to be higher.

Another factor determining the magnitude of fiscal multiplier in the IS – LM model is money market. Indeed, crowding out through interest rates hinges the assumption that money demand is a function of interest rates and income. The more sensitive money demand is to interest rates the less effective is fiscal expansion to stimulate aggregate demand. However, the government can offset the increasing tendency of interest rates as a consequence of fiscal expansion by an easing of monetary policy.

The present debate related to this theoretical framework is whether or not fiscal expansion drives up interest rates. Under Keynesian view, the presence of interest rates in the model will only affect the magnitude but will not change the sign. However, some scholars argue that the presence of interest rate premia and credibility may turn the sign to negative. Risk premia on interest rate is an important channel through which debt accumulation may affect the magnitude of fiscal multiplier. As government debt builds up with fiscal expansions, risk premia that reflect mounting risk of default will reinforce crowding out effect through interest rate. Sizable risk premia may turn fiscal multiplier to negative<sup>10</sup>. Developing countries facing with debt problem are likely to suffer from high interest rate premia.

The standard IS – LM model is based on a fixed price assumption. Relaxing price to vary ends up with the AD (aggregate demand) – AS (aggregate supply) model. While the AD curve is downward sloping derived from the IS – LM interaction, the shape of

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<sup>9</sup> The extent of crowding out, here, only affects the magnitude of fiscal multiplier and does not change the sign.

<sup>10</sup> One of main explanations of positive effect of fiscal policy contraction reported Giavazzi and Pagano (1990) and Alesina and Perotti (1997).

the AS curve depends on the assumption of time horizon regarding the output behavior. There are two schools of thought in this regard; *Keynesian* and *Classical*. According to Keynesian, in the short run, prices are sticky which leads to a flat (horizontal in extreme case) short run AS curve. Changes in aggregate demand therefore, do have effect on output. Meanwhile, according to classical view, in the long run, output is determined by the amount of capital and labor and the available technology which leads to a steep (vertical in extreme case) AS curve. Hence, changes in aggregate demand will affect only on prices but not the output. The debate on this issue, therefore, centered on whether the shape of the AS curve is relatively flat or steep which leads to further related question of whether fiscal expansion causes higher inflation or not.

While the Keynesian view analysis of fiscal policy in general centered on the demand side, the neo-classical view analysis on the other side emphasizes the supply side channel or even both under the equilibrium framework. If the supply side channel is the main interest, the analysis is centered on whether fiscal policy have role to deal with capacity constraints in order to shift the aggregate supply curve outward. Tax on labor and capital income and public spending are among channels through which fiscal policy may affect output through supply side channel. To the extent that tax on labor income affects labor supply behavior remains a controversial issues in the economic literature. Meanwhile, public spending composition is important as it directly or indirectly may have effect on labor supply quality and in turn productivity.

Under the equilibrium framework of neo-classical view, the analysis of fiscal policy effect on economic activity could be explained with a standard one-sector neo-classical model<sup>11</sup>. The main feature of this model involves an optimizing representative agent who faces an intertemporal budget constraint as well as flexible wages and prices. It assumes that there are two goods available in the economy; a consumption good and leisure.

Under this framework, change of government consumption (spending) will affect the economy through wealth effect. As government spending increases, representative agent faces a higher present value (PV) of taxes and lower wealth. In turn, he consumes less of both leisure and consumption good (under normal goods assumption). Assuming that the representative agent knows that the increase in government spending is temporary, the decrease in private consumption is smaller than the increase in government spending resulting in a higher aggregate expenditure. As in the standard IS – LM and AD – AS model, higher aggregate expenditure pushes both the interest rate and price level upward.

As consumption of leisure declines, labor supply increases, real wage falls, and employment raises. The effect of the increase in government spending on private investment is either positive or negative. Whereas the increase of interest rate pushes investment down, the increase in labor supply pushes investment upward as

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<sup>11</sup> More comprehensive discussion can be found in ...

labor and capital are assumed to be complimentary in production. As in the standard Keynesian model, the result again by and large depends on the validity of the assumptions used<sup>12</sup>.

Another issue that has long occupied the debate is related to its genuine nature of fiscal policy, *lags*. It takes time to recognize that fiscal policy needs to be changed then to put appropriate fiscal measures in place (inside lag). In addition, it takes time also for fiscal measures to feed through aggregate demand (outside lag)<sup>13</sup>. Long lags will reduce short term fiscal multiplier.

## **2.2. Empirical Review**

Up to the end of 1990s, empirical works on the effect of fiscal policy are quite few compared to the large number literature on the effect of monetary policy. The emergence of the European Union in early of this decade has triggered academics and policy makers to pay more attention on fiscal policy as it is the only instrument left independently to the member countries though still bounded with the Maastricht Treaty. The global financial crisis in the late of 2000s has made the subject even popular both among policy makers and academics.

A number of studies have been done to assess the effect of fiscal policy shock to the output. We may loosely group the studies into four categories according to the approach used: (i) general equilibrium based studies, (ii) survey based studies, and (iii) econometric based studies, in which divided into 2 strands: cross country (panel) and time series based studies.

Pioneering empirical work on the effect of fiscal policy on economic activity using general equilibrium approach is the one by Baxter and King (1993). They used one-sector calibrated general equilibrium model of US data from 1930-1985. They found that there is positive response of output to the increase in government expenditure. The standard channel is through the decrease of wealth as government expenditure increases. As wealth decreases, consumption declines. Assuming that the leisure is a normal good, labor supply increases leads to decrease in real wages. This in turn will increase the marginal rate of capital. In the long run this will increase the investment and output and in turn increases capital stock. Baxter and King found that the long run effect is higher than that of in the short run. Another important finding is that the source of financing is important. Tax financing will reduce incentive to work and to invest that in turn reducing the tax base. With tax financing, they found negative spending multiplier.

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<sup>12</sup> Baxter and King (1993) showed that the effect predicted by one-sector neoclassical model is sensitive to the assumption used.

<sup>13</sup> According to Hemming et al. (2002), inside lag is a function of political process and the effectiveness of fiscal management while the outside lag varies depending on the measures, for example transfer takes relatively shorter to feed through the aggregate demand.



Similar study using the average data of EU 1965 – 1995 was conducted by Ardagna (2001) by comparing permanent effect of debt-financed increase in government expenditure on final goods and employment. He found that the increase of government spending which financed by debt on final goods has positive but small effect in output. Meanwhile the increase of spending on public employment has negative impact on output. He explains that higher public employment reduces labor input in private sector.

The OECD and IMF are the two prominent organizations which usually use large macroeconomic modeling to investigate the effect of fiscal policy in multi-country case. Richardson (1988) used large macroeconomic model of OECD, called *OECD Interlink Model*. He found that a sustained increase in government consumption of 1 percentage point of GDP has significant impact on output both in the short run and long run indicated by the figures of fiscal multipliers which are higher than one in US. Meanwhile, in Germany, he found that spending multipliers is only 1 in the short run and 0.6 in the long run. He concludes that in general, government spending has positive impact on economic growth.

A latest study investigating the impact of massive fiscal stimulus in China was conducted by Hee et al (2009). They use both IO and the Global Integrated Monetary and Fiscal Model, GIMF built by IMF. Using IO table analysis, they reported that fiscal stimulus of RMB2 trillion in 2009 could increase directly around RMB1.7 trillion of output, implying a fiscal multiplier around 0.84. In addition, it could potentially create around 18 – 20 million new jobs in non-farming sectors. On the other hand, using GIMF model, their findings also confirm the earlier result. A fiscal shock of 1 percent of GDP is expected to increase output growth by 0.8 percentage points in the first year. The effect wears off rapidly after the first year.

Forni et al (2009) use a dynamic stochastic general equilibrium (DSGE) model featuring a fraction of non-Ricardian agents in order to estimate the effect of fiscal policy in Euro area. Based on their policy simulation, they found mild Keynesian impact of fiscal policy. Government purchases of goods and services and compensation for public employees have small and short – lived expansionary effects on private aggregate demand via consumption. On the revenue side, the decrease on labor income and consumption tax rate has sizable effect on consumption and output, while reduction in capital income tax rate favors investment and output in the medium run.

Though general equilibrium approach provides a consistent comparative analysis of policies scenario, its notorious deficiency is related to somewhat tautological construction in which all the results are implicitly linked to the assumptions and calibration made. Validity of assumptions and calibration hence are crucial in the model. As admitted by Baxter and King (1993) the effects of fiscal policy predicted by the model (in their case one-sector neoclassical model) can be very sensitive to the assumptions used, in particular of whether taxes are lump-sum or not. In large sector CGE model, market perfection assumption and lack of bottom-up representation of production sector are among the weaknesses. In case of the DSGE,

some weaknesses are also identified. The difficulty in parameterization, calibration that frequently does not match with the actual data, and assumption of identical representative agent which exaggerates individual rationality and foresight are among factors that undermine the DSGE results.

Saphiro and Slemrod (2001) are among scholars pioneering the use of household survey approach to investigate the effect of fiscal policy on economic activities. Using monthly household (consumers) survey data, Saphiro and Slemrod (2003) evaluated the effect of tax rebate policy on consumption and saving behavior in 2001 USA. They found that spending response to the 2001 tax rebate policy was quiet low. They reported that only around 22 percent of households receiving the tax rebate used it to increase spending while the rest used it either for repaying debt or saving. Among those who did not use the rebate for spending, 59 percent of them used it for repaying the debt and the rest of 41 percent used it to increase their saving.

Using the same approach Saphiro and Slemrod (2009) repeat their studies in 2001 to investigate the effect of tax rebate policy as part of fiscal stimulus package in USA in response to the global financial crisis. The result again reconfirms their previous study that spending response to the tax rebate policy was quiet low. The finding shows that 20 percent of those who receiving the money will spend the tax rebate, 32 percent will save the money, and the other 48 percent will use the money to repay the debt. Household survey response approach is also used by Leigh (2009) to assess the effect of fiscal stimulus on consumption in Australia which found larger figures than that of in USA by Saphiro and Slemrod (2003 and 2009).

Though survey response approach provides a more real portrait of consumer behavior, it has limitation particularly dealing with the sample representation. While Saphiro and Slemrod (2009) used only 2508 households in USA, Leigh (2009) used only 817 households receiving tax rebate<sup>14</sup>. Scholars are skeptical whether the true consumer behavior can be captured through interviews as it is difficult to reveal true level of spending as well as saving<sup>15</sup>. In addition, it is quite difficult to map the survey findings to economic theory.

From the econometric approach, the studies are broadly divided into two streams; large cross country and time series studies. The use of large cross country (panel) data had been very popular among scholars to conduct studies of the effect of fiscal policy on output up to early 2000s. Landau (1983 and 1986), Barro (1991), Engen and Skinner (1992), Easterly and Rebelo (1993), Folster and Henrekson (2001), and

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<sup>14</sup> In Australia, the tax rebate under 2009 fiscal stimulus package known as tax bonus.

<sup>15</sup> Epley et al (2006) conducted experimental studies to those who received 2001 tax rebates to investigate the impact of income framing on spending on saving. They found that those who exposed with the proposition that tax rebate is “a withheld income” spent only 25 percent and saved 75 percent of the 2001 tax rebate, while those who exposed with the proposition that tax rebate is “a bonus income” spent 87 percent and saved the rest. This findings, somehow, indicates an inconsistency of consumer’s responses.

Barro and Sala-i-Martin (2004) are among others. The majority of the studies using large cross country data found negative association between fiscal policy variables and output or indicating crowding out.

An obvious shortcoming of cross country studies and panel studies is that they rely on the assumption of common coefficients across countries although different countries have different structures. In addition, cross country and panel studies suffer from some drawbacks as addressed by Levine and Renelt (1992) and (Tanzi and Zie) 1997. In their widely cited critique, Levine and Renelt (1992) emphasize on two reasons for non-robustness; (i) the overall size of government cannot capture the different implications of government activities, and (ii) they ignore aspect of government efficiency.

These drawbacks naturally lead to single country studies using time series approach. Angelopoulos and Philippopoulos (2005), Kweka and Morissey (1999), Ramayandi (2003), and Werner (2004) are among others using this approach to examine the relationship between fiscal policy variable and economic growth. Using data of Greece spanning from 1960 – 2000, Angelopoulos and Philippopoulos (2005) found significant negative relationship between government size as measured by share of government expenditure in GDP and GDP per capita growth. When turn to the composition of expenditure, they found positive relationship for capital expenditure but negative for government wages expenditure.

Similarly, using annual data of Indonesia for period 1969 – 1999, Ramayandi (2003) found negative relationship between government size (share of government expenditure in GDP) and per capita GDP. When investigating the composition of government expenditure, he found both consumption and capital expenditure share have negative effect on economic growth.

For the case of developed countries, Werner (2004) used Autoregressive Distributed Lag (ADL) model in Japan to provide explanation of why fiscal policy in Japan was disappointed in 1990s to pull out the economy from the recession. By allowing the interaction between standard Keynesian model and the credit creation, he found that fiscal policy had been very ineffective to stimulate the aggregate demand in 1990s due to the lack of the credit creation.

One major concern of the earlier time series approaches is that it suffers from the very famous critique of Sims (1980), endogeneity problem<sup>16</sup>. According to Sims (1980), no variables can be deemed as exogenous in a world of forward looking agents. Sims (1980) suggested vector autoregression (VAR) model when we are unsure that the variables are actually exogenous<sup>17</sup>. Since the seminal work of Sims (1980), the use of VAR model becomes popular particularly to forecast

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<sup>16</sup> Indeed, as admitted, the study of Indonesia by Ramayandi (2003) suffers from endogeneity problem indicated by the result of the two stages Hausman specification test on his paper.

<sup>17</sup> All variables are treated symmetrically in which all are endogenous with equal lag length (Enders, 1995).

macroeconomic time series, to study the sources of economic fluctuation, and to assess the effect of policy shock. VAR method has become standard in monetary policies analysis since then.

The use of VAR model for fiscal policy analysis has just been recently since the seminal work of Blanchard and Perotti (1999). They introduced an identification technique utilizing institutional information characterizing fiscal policy in their VAR model – called structural vector autoregression (SVAR) model. Using quarterly data of USA for period 1947:1 – 1997:4, they examined the effect of fiscal shock represented by government spending ( $G$ ) and tax revenue ( $T$ ) on GDP ( $Y$ ) under SVAR methodology or 3-SVAR model. They found that there is positive response of output to the government spending shock and negative response to the taxation. They reported that fiscal multiplier is close to one.

Puzzling with the ineffective fiscal policy stimulus in Japan in 1990s, Kuttner and Posen (2001) applied Blanchard and Perotti (1999) model in Japan. Their findings suggest that both tax cut and government expenditure have expansionary effect. To support their findings, they examine the Ricardian equivalence hypothesis by conducting regression on saving as a function of fiscal variables. Their result shows no evidence of Ricardian equivalence supporting the evidence of effective fiscal policy. According to them, one reason that could explain why there is no evidence of Ricardian equivalence hypothesis is that in the short run, households in Japan are not afraid of public debt. Therefore, saving behavior is relatively independent of fiscal policy.

Other replications of Blanchard and Perotti (1999) method are carried out by Hoppner (2001) for Germany and Clause et al (2006) for New Zealand. Though the magnitude varies, in term of the sign of the parameters, in general, their results are consistent with Blanchard and Perotti (1999) findings for USA. In a slightly modified model, Creel et al (2005) assessed the effect of fiscal policy on output and price level. Their result confirms the standard textbook effect of fiscal expansion. They also reported positive relationship between fiscal variable and price level, consistent with the theoretical prediction of fiscal theory of the price level (FTPL) model.

As indicated above, most of studies in the effect of fiscal policy on the economy using SVAR model are carried out in advanced countries or OECD. One reason, perhaps, is due to the availability of reliable and non-interpolated quarterly data of fiscal variables in quite long series as it is required in SVAR methodology. In this study, we will use SVAR method to analyze the effect of fiscal policy on economic activity in Indonesia using quarterly data of government budget. The data is based on monthly cash disbursement of government budget for period 1983:1 – 2010:2 drawn from the so called *Buku Merah* (Red Book) at the Ministry of Finance of Indonesia that has never been released to the public. Therefore, this study so far is the first effort to assess the effect of fiscal policy on the economy in Indonesia.

### 3. Empirical Methodology

#### 3.1. Model Specification

Vector autoregression (VAR) is a particular econometric device to model multivariate time series. Particular here refers to three distinct features of VAR<sup>18</sup>; (i) all variables of interest are endogenous, (ii) all equations use same explanatory variables, and (iii) explanatory variables are mainly lagged variables. Another interesting feature of VAR model is its dynamic characteristic which can be captured through impulse response function and variance decompositions, considered as the hallmark of VAR analysis. Since the seminal work of Sims (1980) the use of VAR approach became increasingly predominant in the empirical literature, in particular on the effect of monetary policy. However, it is difficult to find empirical work on fiscal policy using VAR model until late 1990s.

One major critique commonly addressed to VAR model is dealing with the fact that the dynamic feature of VAR model is obtained by a mechanical technique that some believed is unrelated to economic theory (*a-theory*). This criticism led to the development of a new generation of VAR referred as structural VAR (SVAR) in the middle of 1980s<sup>19</sup>. This technique allows the researcher to use economic theory to transform the standard VAR into SVAR. Specifically, related to fiscal policy, if we consider that fiscal policy may work through three components; (i) *automatic stabilizers*, (ii) *systematic discretionary fiscal rule*, and (iii) *random policy shift*<sup>20</sup>, the VAR approach is only valid to deal with the third component (Auerbach, 2005). Since VAR approach cannot separate the effect of the first two components with the third one, hence VAR approach is not valid model to assess the effect of fiscal policy on economic activity. In contrast, SVAR methodology is capable to identify the underlying sources of policy shocks through identification technique.

There are two major identification techniques in the literature. *First*, the one developed by Ramey and Saphiro (1998) in which assumes that certain large policy changes in response to external events are both unanticipated and exogenous with respect to concurrent output, for example military builds-up in USA in 1980s. Thus, for these observations, shocks to government purchases are treated as policy shocks, and their subsequent impact on the economy can be traced out.

*Second*, a method proposed and implemented by Blanchard and Perotti (1999) in which assumes that discretionary policy does not react to contemporaneous output

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<sup>18</sup> Detailed discussion of VAR and SVAR model can be found in Enders (1995) and Lutkepohl (2005)

<sup>19</sup> Bernanke (1986), Blanchard and Watson (1986) and Sims (1986) are among the pioneers introducing structural VAR approach.

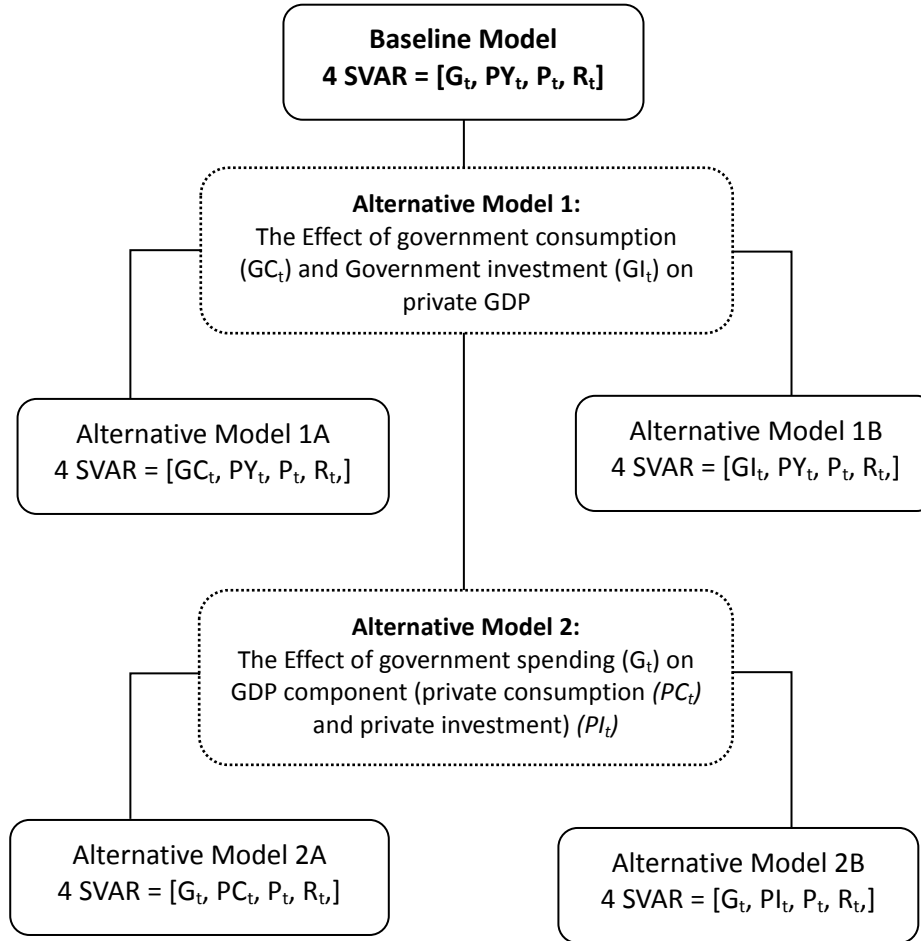
<sup>20</sup> Automatic stabilizer refers to components of fiscal system that react automatically to output and other macroeconomic variables without explicit policy reform. Discretionary policy rules reflects how fiscal policy responds to changes in the economic environment (by design/rule). Meanwhile, the third component reflects changes in policy that are not dependent on observable economic conditions (for example unpredictable policy shift).

changes, and then use auxiliary information about the automatic response of policy to output to identify policy shocks. Then, the effect of policy shocks can be traced out.

Though SVAR approach was developed in the middle of 1980s, its application on fiscal policy analysis has just begun recently after the seminal work of Blanchard and Perotti (1999). The large number empirical literature using SVAR have been on the monetary policy effects. One major reason is perhaps dealing with characteristic of fiscal policy as having three components mentioned earlier that needs particular technique of identification.

This study will employ SVAR methodology based on the identification technique developed by Blanchard and Perotti (1999) on Indonesian data for period 1983:1 – 2010:2. Unlike the original model of Blanchard and Perotti (1999), we will include different categories of public spending, namely public consumption ( $GC_t$ ) and public investment ( $GI_t$ ) besides the total government spending. In additions, to assess the transmission channel through which fiscal policy affect the output, as discussed in standard Keynesian model (both IS-LM and AD-AS model), two variables will be added in the analysis: price level ( $P_t$ ) and interest rate ( $R_t$ ). The base line model then will consist of four variables: government spending ( $G_t$ ), private GDP ( $Y_t$ ), price level ( $P_t$ ) and interest rate ( $R_t$ ). The main reason not to include taxes in the analysis is because Indonesia as well as other developing countries has never used tax policy to stimulate aggregate demand such as tax rebate in US in 2001 and 2008 and tax bonus in Australia in 2009. Furthermore, to account for the effect on the GDP components, we will add separately private consumption ( $PC_t$ ) and private investment ( $PI_t$ ) in the analysis to replace the private GDP in different model. Thus, we will have two other alternative models with 4 variables; one with private consumption ( $PC_t$ ) and the other one with private investment ( $PI_t$ ). The following chart describes the summary of estimation framework in this study.

**Chart 1**  
**The Structural VAR Estimation Framework**



The model specification of SVAR is started from the standard dynamic system of simultaneous equations which models the dynamic relationship between endogenous variables and exogenous variables. The empirical work applied here is an SVAR model composed of a system of four equations, depicting the relationship between main macroeconomic indicator of Indonesia; government expenditure ( $G_t$ ), real private GDP ( $Y_t$ ), the price level ( $P_t$ ) and nominal interest rates ( $R_t$ ). The structural model of this study is described by the following dynamic system of simultaneous equations (1a – 1d).

$$G_t = b_{10} - a_{12}Y_t - a_{13}P_t - a_{14}R_t + \sum_{i=1}^p b_{11}^i G_{t-i} + \sum_{i=1}^p b_{12}^i G_{t-i} + \sum_{i=1}^p b_{13}^i Y_{t-i} + \sum_{i=1}^p b_{14}^i R_{t-i} + e_t^G \quad (1a)$$

$$Y_t = b_{20} - a_{21}G_t - a_{23}P_t - a_{24}R_t + \sum_{i=1}^p b_{21}^i G_{t-i} + \sum_{i=1}^p b_{22}^i G_{t-i} + \sum_{i=1}^p b_{23}^i Y_{t-i} + \sum_{i=1}^p b_{24}^i R_{t-i} + e_t^Y \quad (1b)$$

$$P_t = b_{30} - a_{31}G_t - a_{32}Y_t - a_{34}R_t + \sum_{i=1}^p b_{31}^i G_{t-i} + \sum_{i=1}^p b_{32}^i G_{t-i} + \sum_{i=1}^p b_{33}^i Y_{t-i} + \sum_{i=1}^p b_{34}^i R_{t-i} + e_t^P \quad (1c)$$

$$R_t = b_{40} - a_{41}G_t - a_{42}P_t - a_{43}R_t + \sum_{i=1}^p b_{41}^i G_{t-i} + \sum_{i=1}^p b_{42}^i G_{t-i} + \sum_{i=1}^p b_{43}^i Y_{t-i} + \sum_{i=1}^p b_{44}^i R_{t-i} + e_t^R \quad (1d)$$

where

$$\begin{pmatrix} e_t^G \\ e_t^Y \\ e_t^P \\ e_t^R \end{pmatrix} \sim i.i.d. \left[ \begin{pmatrix} 0 \\ 0 \\ 0 \\ 0 \end{pmatrix}, \begin{pmatrix} \sigma_G^2 & 0 & 0 & 0 \\ 0 & \sigma_Y^2 & 0 & 0 \\ 0 & 0 & \sigma_P^2 & 0 \\ 0 & 0 & 0 & \sigma_R^2 \end{pmatrix} \right]$$

In matrix form, after collecting terms, equations 1a – 1d can be written as follow.

$$\begin{pmatrix} 1 & a_{12} & a_{13} & a_{14} \\ a_{21} & 1 & a_{23} & a_{24} \\ a_{31} & a_{32} & 1 & a_{34} \\ a_{41} & a_{42} & a_{43} & 1 \end{pmatrix} \begin{pmatrix} G_t \\ Y_t \\ P_t \\ R_t \end{pmatrix} = \begin{pmatrix} b_{10} \\ b_{20} \\ b_{30} \\ b_{40} \end{pmatrix} + \begin{pmatrix} b_{11} & b_{12} & b_{13} & b_{14} \\ b_{21} & b_{22} & b_{23} & b_{24} \\ b_{31} & b_{32} & b_{33} & b_{34} \\ b_{41} & b_{42} & b_{43} & b_{44} \end{pmatrix} \begin{pmatrix} G_{t-i} \\ Y_{t-i} \\ P_{t-i} \\ R_{t-i} \end{pmatrix} + \begin{pmatrix} e_t^G \\ e_t^Y \\ e_t^P \\ e_t^R \end{pmatrix} \quad (2)$$

where  $i=1,2,\dots,n$ .

In more compact way, the equation system of (2) can be expressed in a vector form as follows.

$$AX_t = B_0 + BX_{t-i} + e_t \quad (3)$$

where :

- $X_t$  = an  $(n \times 1)$  vector containing each of variables included in the SVAR. In our case, it consists of 4 variables; government spending ( $G_t$ ), GDP ( $Y_t$ ), price level ( $P_t$ ), and interest rate ( $R_t$ ).
- $A$  = an  $(n \times n)$  matrices of contemporaneous coefficients
- $B_0$  = an  $(n \times 1)$  vector of intercept terms
- $B$  = an  $(n \times n)$  matrices of coefficients
- $e_t$  = an  $(n \times 1)$  vector of error terms

Both GDP ( $Y_t$ ) and government spending ( $G_t$ ) are expressed in real term. While the real term GDP ( $Y_t$ ) is available from the source (Indonesian Bureau of Statistic, BPS), the real government spending is derived using the government consumption deflator from the national account data. The price level ( $P_t$ ), measured by the GDP deflator, and interest rate ( $R_t$ ) are in nominal term. Furthermore, all variables are expressed in log form.

From the equation (3), it follows that the reduced form of VAR can be derived by pre-multiplying both right hand side (RHS) and left hand side (LHS) with  $B^{-1}$  to obtain:

$$X_t = A^{-1}B_0 + A^{-1}BX_{t-i} + A^{-1}e_t \quad (4)$$

Defining  $F_0 = A^{-1}B_0$ ,  $F_1 = A^{-1}B$ , and  $u_t = A^{-1}e_t$ , yields the multivariate generalization of VAR, as follows.

$$X_t = F_0 + F_1X_{t-i} + u_t \quad (5)$$

In matrix form, equation (5) can be written as follow.



$$\begin{pmatrix} G_t \\ Y_t \\ P_t \\ R_t \end{pmatrix} = \begin{pmatrix} f_{10} \\ f_{20} \\ f_{30} \\ f_{40} \end{pmatrix} + \begin{pmatrix} f_{11} & f_{12} & f_{13} & f_{14} \\ f_{21} & f_{22} & f_{23} & f_{24} \\ f_{31} & f_{32} & f_{33} & f_{34} \\ f_{41} & f_{42} & f_{43} & f_{44} \end{pmatrix} \begin{pmatrix} G_{t-i} \\ Y_{t-i} \\ P_{t-i} \\ R_{t-i} \end{pmatrix} + \begin{pmatrix} u_t^G \\ u_t^Y \\ u_t^P \\ u_t^R \end{pmatrix} \quad (6)$$

Equation (5 or 6) is a standard reduced form VAR in which we can estimate with OLS, since the right hand side (RHS) consists of predetermined variables and the error terms are white noise. The errors are serially uncorrelated but correlated across equations. We can not use OLS to estimate SVAR, equation (2 or 3), because of contemporaneous effects, which are correlated with the structural shocks ( $e_t$ 's).

Following the so-called AB-model of Amisano and Gianini (1997), the relation between the reduced form residuals  $u_t$  (5) and the objects of interest, structural shocks  $e_t$ , equation (2 or 3), can be expressed as follows.

$$u_t = A^{-1}B e_t \quad (7)$$

or in the matrices form, equation (7) can be expressed as:

$$\begin{pmatrix} u_t^G \\ u_t^Y \\ u_t^P \\ u_t^R \end{pmatrix} = \begin{pmatrix} 1 & a_{12} & a_{13} & a_{14} \\ a_{21} & 1 & a_{23} & a_{24} \\ a_{31} & a_{32} & 1 & a_{34} \\ a_{41} & a_{42} & a_{43} & 1 \end{pmatrix}^{-1} \begin{pmatrix} b_{11} & b_{12} & b_{13} & b_{14} \\ b_{21} & b_{22} & b_{23} & b_{24} \\ b_{31} & b_{32} & b_{33} & b_{34} \\ b_{41} & b_{42} & b_{43} & b_{44} \end{pmatrix} \begin{pmatrix} e_t^G \\ e_t^Y \\ e_t^P \\ e_t^R \end{pmatrix} \quad (8)$$

as defined earlier ( $n \times n$ ) matrices A describes the contemporaneous relation between the variables while ( $n \times n$ ) matrices B defines how the structural shocks affects the variables. To investigate the impact of an isolated shock, the structural shocks are assumed to be orthogonal<sup>21</sup>.

Following Blanchard and Perotti (1999), the estimation proceeds in three steps. *Firstly*, we estimate the reduced form VAR presented on equation (5) or equations (6) using OLS on quarterly data for the period March 1983 to June 2010. This will produce the reduced form residuals,  $u_t = [u_t^G, u_t^Y, u_t^P, u_t^R]$ . As mentioned by Blanchard and Perotti (1999), the innovations (residuals) in the fiscal variable,  $u_t^G$ , can be thought of as a linier combination of three type of shocks: (i) *the automatic or cyclical response* of government spending to macroeconomic shocks (real output, inflation, and interest rate shocks) within a quarter, (ii) systemic, *discretionary response* of fiscal policy to macroeconomic shocks, and (iii) *the random, discretionary* fiscal policy to shocks, which are the underlying structural shocks to be identified.

The identification of structural shocks then proceeds with the following expression.

$$u_t^G = a_{12}u_t^Y + a_{13}u_t^P + a_{14}u_t^R + e_t^G \quad (9)$$

<sup>21</sup> The estimation procedure of SVAR specification refers to Enders (1995)

$$u_t^Y = a_{21}u_t^G + e_t^Y \quad (10)$$

$$u_t^P = a_{31}u_t^G + a_{32}u_t^Y + e_t^P \quad (11)$$

$$u_t^R = a_{41}u_t^G + a_{42}u_t^Y + a_{43}u_t^P + e_t^R \quad (12)$$

where  $e_t^G$  is the structural shocks to government expenditure we want to recover. Here, we rely on Blanchard and Perotti (1999) observation that the fiscal authority needs more than one quarter to react to macroeconomic shocks. By using quarterly data, as discretionary fiscal decision is assumed to take time to implement (with lag more than one quarter), the second channel (discretionary fiscal policy) can be ignored. As consequence, the coefficients  $a_{12}$ ,  $a_{13}$  and  $a_{14}$  (9) only capture the automatic or cyclical response of fiscal variables to changes in economic activity.

From the equation (9) to (12), the coefficients of impact multiplier of government spending on macroeconomic variables are captured in  $a_{21}$ ,  $a_{31}$  and  $a_{41}$  in equation (10), (11) and (12), respectively. Given that the reduced form residuals,  $u_t$ 's, are correlated with the structural shocks,  $e_t$ 's, it is not possible to simply estimate equation (9) – (12) using OLS. Hence, the OLS regression will not generate consistent estimate of the coefficients of interest ( $a_{21}$ ,  $a_{31}$  and  $a_{41}$ ). Therefore, we will obtain  $a_{21}$ ,  $a_{31}$  and  $a_{41}$  using an instrumental variable constructed from independent estimates of the automatic contemporaneous elasticity of government spending to real output, inflation rate and interest rate to compute spending multipliers ( $a_{12}$ ,  $a_{13}$  and  $a_{14}$ ).

Furthermore, given that the interest payment on government debt are excluded from the government spending, the elasticity of automatic response of government spending with respect to interest rate shock,  $a_{14}$ , can be set to zero<sup>22</sup>. With regards to the elasticity of government expenditure with respect to real output, notably government consumption and investment, it is hard to think about any automatic response of government expenditure to real output. In particular, for Indonesian case, there is no single component of expenditure considered to be automatic stabilizer such as unemployment benefits which react automatically to business cycle, as in more advanced countries. Therefore, it is justifiable to assume that the elasticity of automatic government spending to real output shock,  $a_{21}$ , is zero. The case of price elasticity is different. Some share of purchases of goods and services are likely to respond to price level. In addition, though the wages component is not typically indexed to the CPI, the government always adjusts the wage rate annually to keep up with the inflation rate, but there is still a year delay. In this study, we will use the independent estimate of the elasticity of government spending to price shock<sup>23</sup>.

*Secondly*, using the independent estimates of  $a_{12}$ ,  $a_{13}$  and  $a_{14}$ , we calculate the cyclically adjusted reduced-form government spending ( $u_t^{G-adj}$ ) residuals as

<sup>22</sup> Similar assumption is used in Fernandes and de Cos (2007)

<sup>23</sup> Perotti (2004) set the price elasticity of government spending to 0.5

follows.

$$u_t^{G-CA} = u_t^G - b_{12}u_t^Y - b_{13}u_t^P - b_{14}u_t^R = u_t^G - a_{13}u_t^P \quad (13)$$

As Blanchard and Perotti (1999) noted, the cyclically adjusted reduced form residuals  $u_t^{G-CA}$  is then used as an instrument variable as they are not correlated with other structural shocks. Thus, we can estimate other structural coefficients in the equations of macroeconomic variables.

Finally, using the cyclically adjusted reduced form residuals  $u_t^{G-CA}$  as an instrumental variable for  $u_t^G$ , we estimate the remaining coefficients of the equations for the macroeconomic variables, equation (10) – (12). The coefficients of impact multiplier of government spending on macroeconomic variables are captured in  $a_{21}$ ,  $a_{31}$  and  $a_{41}$ , in equation (10), (11) and (12) respectively.

The identification procedure based on Blanchard and Perotti (1999) and Perotti (2004) in this case leads to the following **AB model** structure presented in equation (8) and equation (9) – (12).

$$\begin{pmatrix} u_t^G \\ u_t^Y \\ u_t^P \\ u_t^R \end{pmatrix} = \begin{pmatrix} 1 & 0 & a_{13} & 0 \\ a_{21} & 1 & 0 & 0 \\ a_{31} & a_{32} & 1 & 0 \\ a_{41} & a_{42} & a_{43} & 1 \end{pmatrix}^{-1} \begin{pmatrix} b_{11} & 0 & 0 & 0 \\ 0 & b_{22} & 0 & 0 \\ 0 & 0 & b_{33} & 0 \\ 0 & 0 & 0 & b_{44} \end{pmatrix} \begin{pmatrix} e_t^G \\ e_t^Y \\ e_t^P \\ e_t^R \end{pmatrix} \quad (14)$$

This AB model structure is exactly identified as it has equals amount of free elements to be estimated with the reduced form of 4 variables VAR<sup>24</sup>. The elements on the main diagonal of the B matrix are the standard deviation of the structural shocks.

Having identified and estimated all the coefficients ( $a$ 's and  $b$ 's), we can construct the A and B matrix which are used to compute the impulse response functions (IRF) to assess the dynamic effect of fiscal shocks, which trace out the time path of the effect of structural shocks on the variables under investigation. The impulse responses are computed using the structural moving average representation of the VAR defined in equation (5) as follow<sup>25</sup>.

$$X_t = (I - F_1)^{-1}A^{-1}BU_t \quad (15)$$

in which the polynomial  $F_1$  comes from the OLS estimation of the reduced form VAR and the matrix A and B are defined above. The reduced form moving average representation of the VAR is described by the polynomial  $(I - F_1)^{-1}$ .

<sup>24</sup> In order to be exactly identified, the two matrix in the AB model structure have to have  $nx(n+1)/2$  free parameters.

<sup>25</sup> We do not include the constant term to simplify the expression

## 3.2. Estimation Strategy

### 3.2.1. Stationary and Cointegration Test

Data properties is one of major concerns in time series econometrics as most macroeconomic variables, in particular in level, contain non-stationary process (Nelson and Plosser, 1998 and Hendry and Juselius, 2000). Applying OLS regression on non stationary variables will end up with a spurious regression.

There are several versions of testing stationary or the presence of unit roots. Broadly, they can be classified into two strands of test. *First*, the one that developed based on the Dickey-Fuller method (Dickey-Fuller based test). Including in this strand are the standard ADF, Phillip-Perron (PP), and the DFGLS (DF generalized least square) test. *Second*, the one that considers the presence of structural break. The Zivot-Andrews (ZA) test (Zivot and Andrew, 1992) is among others belonged to this version. In this study we will employ the ADF to represent the Dickey-Fuller based tests and the ZA test to examine the presence of the unit roots.

The formal ADF test proceeds by estimating following specification.

$$\Delta y_t = \alpha_1 + \alpha_2 T + \rho y_{t-1} + \sum_{i=2}^p \beta_i \Delta y_{t-1+i} + e_t, t=1, \dots, n \quad (10)$$

Where  $y_t$  is the variable under examination,  $\alpha_1$  is the intercept and  $T$  is the time trend. The parameter of interest here is  $\rho$ . The null hypothesis is  $H_0 : \rho = 0$  or the variable constitutes unit root. The critical value of this hypothesis test follows the ADF critical value as the standard  $t$  statistic is not applicable. The decision of accepting or rejecting the null hypothesis is carried out by comparing the  $t$  statistic of the estimated parameter with the critical value. We will reject the null hypothesis of non-stationary if the  $t$  statistic is larger (in absolute) than the critical value (ADF statistic).

Although, the DF based tests are the most common tool of examining time series properties, it has some limitations. The DF based tests are known to suffer potentially finite sample power and size problems. In additions, when there is possibility of the presence of structural break in the series, the DF based tests is bias towards the rejection of the null hypothesis of non-stationary (Perron, 1989). Taking into account the possibility of the presence of the structural breaks in the series due to several extreme shocks occurred in Indonesia such as oil shock in the late 1970s, significant economic reform in early 1980s and Asian financial crisis in the late 1990s, this study will employ the ZA test.

While the standard ADF test is simple and available in almost all statistical package, the ZA test is a bit more complicated and just recently included in certain statistical package. In practice, the ZA unit root test involves three different regressions (Model A, Model B and Model C). Model A, includes a dummy variable into the regression such that the intercept can shift at certain point in time. Model B allows a one-time change in slope of trend function. Model C combines both model A and Model B allowing both changes in intercept and in slope. Model C of the ZA test is as

follows:

$$\Delta y_t = c + \alpha y_{t-1} + \beta t + \theta DU_t + \gamma DT_t + \sum_{j=1}^k c_j \Delta y_{t-j} + e_t \quad (11)$$

where  $DU_t$  is a dummy variable for a mean shift occurring at each possible break date ( $T_B$ ) while  $DT_t$  corresponds to trend shift variable. Model A only includes  $DU_t$  while Model B includes only  $DT_t$ . The possible values for dummy variables can be summarized formally as follows:

$$DU_t = \begin{cases} 1: \dots \text{if } t > T_B \\ 0: \dots \text{otherwise} \end{cases}$$

$$DT_t = \begin{cases} 1 - T_B \dots \text{if } t > T_B \\ 0: \dots \text{otherwise} \end{cases}$$

As shown by Sen (2003) that Model C is considered to be more superior than the other two, in this study we will employ Model C to carry out the ZA unit root test.

While the preceding test examines the presence of the unit root of each individual variable, cointegration test will check the stationary of linear combinations of those variables as a group. The concept of cointegration is particularly important in VAR and SVAR analysis, since it is closely related to the existence and relevance of long run equilibrium relationship among non-stationary variables being studied. The cointegration test will be a starting point for a SVAR specification. Therefore, when we deal with the cointegrated non-stationary variables, estimating a SVAR model where the series are expressed in first differences would be inappropriate. One reason is that first differencing would remove important information about the behavior of the variables contained in the common trend.

To carry out the co-integration test, in this study, we will employ the Johansen (1988) test. The Engle – Granger (1987) approach is inappropriate in the case of model with more than 2 variables<sup>26</sup>. Johansen (1988) developed a maximum likelihood estimation procedure that allows one to test for the number of cointegrating relations. The Johansen (1998) procedure provides two statistics to test whether or not the variables is cointegrated, which are *maximum eigenvalue* and *trace statistic*.

### 3.2.3. Lag Order Selection

An important step in the estimation of the SVAR model is the lag selection. This matters not only for the OLS estimates of the autoregressive coefficients but also in impulse-response functions analysis. In order to get the appropriate lag length, this study will use the multivariate generalization of the Akaike Information Criteria (AIC), Schwarz Information Criteria (SIC), and other information criteria statistic available on the statistical package used in this study. However, whenever the autocorrelation exists, the lag length is determined using parsimonious method to eliminate the autocorrelation problem. The test criteria, for the case AIC and SIC, are as follow.

<sup>26</sup> The brief discussion on several drawbacks of the Engle – Granger test for multivariate case is found in Verbeek (2008).

$$AIC = T \log|\Sigma| + 2N \quad (12)$$

$$SIC = T \log|\Sigma| + N \log(T) \quad (13)$$

where:

- T = number of usable observations
- $|\Sigma|$  = determinant of the variance/covariance matrix of the residuals
- N = total number of parameters estimated in all equations of VAR

Thus, if each equation in an n-variable VAR has p lags and an intercept,  $N = n^2p + n$ , in which each of the n equations has np lagged regressors and intercept. The rule of these test criteria is to select the model with the lowest AIC or SBC value.

### 3.2.4. Diagnostic Test

Post-estimation test needs to be carried out to check the model adequacy. In a SVAR model, there are at least three tests commonly performed to check the model adequacy; Lagrange-multiplier (LM) test for autocorrelations, stability, and normality of the model.

The LM test for autocorrelation in this study follows Johansen (1995). The test statistic for lag order p is computed by running an auxiliary regression of the residuals  $u_t$  on the original right hand side regressors and the lagged residual  $u_{t-h}$ , where the missing first h values of  $u_{t-h}$  are replaced with zero<sup>27</sup>. Under the null hypothesis of no serial correlation of order h, the LM statistic is asymptotically distributed  $\chi^2$  with  $k^2$  degree of freedom (df) which is number of equation in the VAR system.

To test for model stability is carried out by verifying the stationary condition of the VAR models. This formally tests that the impulse responses converge following a shock. The stability test that will be applied here is based on the inverse roots (the eigenvalues of companion matrix) of the characteristic of autoregressive (AR) polynomial. Luthkepol (2005) and Hamilton (1994) both show that the estimated SVAR is stable if all roots have modulus less than one and lie inside the unit circle. If the SVAR is not stable, the impulse response standard errors are not valid.

The third diagnostic check that need to be performed is the normality of the residuals. To test the multivariate normality of the residual  $u_t$ , Luthkepol (2005) suggests the multivariate extension of the Jarque-Berra test on estimated residual,  $\widetilde{u}_t$ . This tests the skewness and kurtosis properties of the  $u_t$  against those of a multivariate normal distribution of the appropriate dimension under the null hypothesis of normal distribution.

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<sup>27</sup> For further discussion on the formula of LM test see Johansen (1995) and Luthkepol (2005)

### 3.3. Data Sources and Properties

#### 3.3.1. Data and Variable Definition

The data used in the study is quarterly data of government budget and the National Account spanning from 1983:1 through 2010:1<sup>28</sup>. The quarterly data of government budget is based on monthly budget disbursement of “Buku Merah (*the Red Book*)” from Fiscal Policy Office (FPO), Ministry of Finance of Indonesia (MoFI). Until now, the document has never been released to public. Government spending in this study is defined as total central government spending minus interest payment of government debt. In this study, the government spending is broken down into two components; government consumption which is defined as government spending on goods and wages only and government investment which is government capital expenditure.

The GDP and its component, in particular private consumption and private investment, come from the National Accounts produced by the Central Board of Statistic which is available online through the China Economic Information Centre (CEIC) data base. The GDP and its components in constant price (real term) are available in different base year. Hence, they have to be linked to make them in a single base year price. To express government budget variables in real term, we will deflate them using government consumption deflator which is derived from the national account. Table 1 below summarizes the data, variable definition, and their sources.

**Table 1**  
**Data and Variables Definition**

No	Variables	Explanation	Sources
1	LPY	Log of real private GDP, which is derived as total GDP minus government consumption (G), seasonally adjusted using census X12 method developed by the U.S. Census Bureau.	Indonesian Bureau of Statistic and CEIC data base
2	LPC	Log of private consumption	Indonesian Bureau of Statistic and CEIC data base
3	LPI	Log of private investment, seasonally adjusted using census X12 method	Indonesian Bureau of Statistic and CEIC data base
4	LCG	Log of total central government expenditure which is derived as total central government expenditure minus interest payment, seasonally adjusted using census X12 method.	“Buku Merah”, FPO, MoFI
5	LGC	Log of central government consumption	“Buku Merah”, FPO, MoFI

<sup>28</sup> We focus only on central government as quarterly data in the regional level is unavailable. Besides that, the proportion of central government transfer takes up around 90 percent of budget funding in most regional government.

		expenditure which comprises only spending on wages and goods, seasonally adjusted using census X12 method.	
6	LGI	Log of central government investment (capital expenditure), seasonally adjusted using census X12 method.	" <i>Buku Merah</i> ", FPO, MoFI
7	LP	Log of GDP deflator to measure inflation. Derived from the national account	Indonesian Bureau of Statistic and CEIC data base
8	LIR	Log nominal interest rate, measured with the SBI-3 month	Statistik Ekonomi Keuangan Indonesia (SEKI), Bank of Indonesia

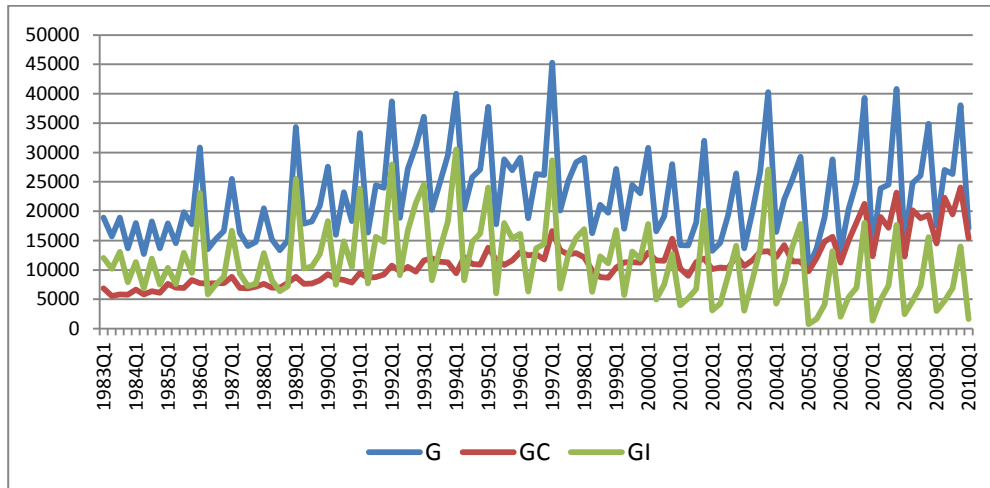
### **3.3.2. Data Properties**

Before we formally test the time series properties, we will firstly do the visual inspection of the data that will be used in this study. To begin with, we will observe first the government spending data. Figure 1 below shows the quarterly disbursement of the total spending, consumption spending, and capital spending of central government of Indonesia in real term. As shown in Figure 1, total government spending and government capital spending exhibit quite strong seasonal pattern in which always low in q1, increasing in q2 and q3, and dramatically peaking up in q4.

In term of the degree of the seasonal pattern, based on the characteristic of each category, one will expect that government capital expenditure will exhibit the strongest seasonal pattern while consumption spending is the least. Long process of procurement of government investment project combined with a weak budget execution lead to a concentrated budget disbursement at the end of the year. In almost a decade, around 50 percent of the annual disbursement of the capital expenditure is in q4.



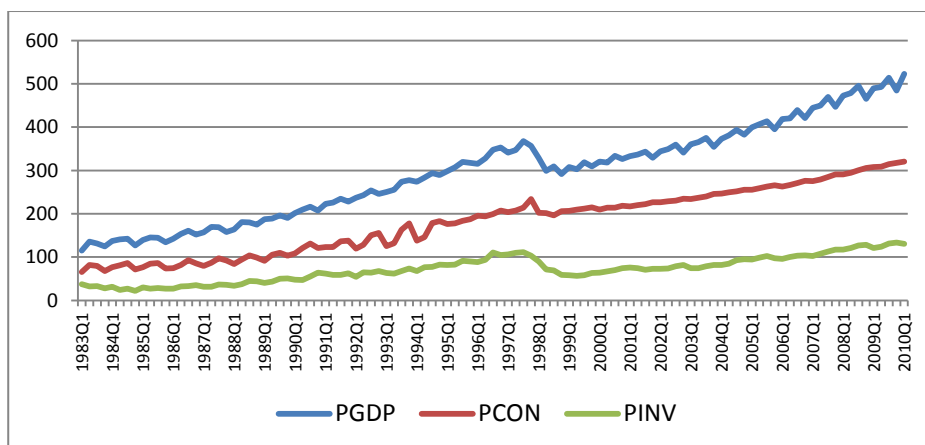
**Figure 1**  
**Total Government Spending (G), Government Consumption Spending,**  
**and Government Capital Spending (billion Rp), 1983:1 – 2010:1**



Source: Ministry of Finance of Indonesia

Though not as apparent as the government spending data, seasonal pattern is also found in the aggregate series of private GDP as well as its component in particular private investment. Based on Figure 2 below, besides the seasonal pattern, the series have grown overtime suggesting an upward trend. As Indonesia was hit hardly by the Asian Financial Crisis in 1997, the GDP series exhibit significant break in quarter 2 of 1998.

**Figure 2**  
**Quarterly Real Private GDP, Consumption and Investment, 1983:1 – 2010:1**  
**(Rp Trillion)**



Sources: Central Bureau of Statistic of Indonesia

The exploration of the data properties gives us useful information for model specification in SVAR analysis. Since we deal with variables that shows high seasonal

pattern, we need to adjust the series by removing their seasonal component before proceeding to estimation. As Sim (1974) suggested that the presence of seasonal noise, particularly in quarterly data, will lead to an asymptotic bias, in turns fallacious inference when they are not seasonally adjusted. Further, Harvey and Scott (1994) proved that treating seasonal noise with dummy may lead to dynamic misspecification when seasonal effect changes gradually over time. Hence, in this study, to remove the seasonal component of the series, we will employ the X12 method developed by the US Bureau of Census that available in some statistical packages.

Furthermore, we should account for the presence of time trend in the model specification as it apparently exists in some series. Sims (1980), Dungey and Pagan (2000) and Blanchard and Perotti (1999) included time trend in their SVAR analysis. Blanchard and Perotti (1999) included both time and squared time trend as deterministic trend in their study. The inclusion of the squared time trend in the model is to account for the non-linear trend.

Besides the visual inspection, formal test of time series properties of the variables under investigation is required in order to get an appropriate model specification including determining whether an SVAR in level or in difference. The following section will discuss the formal test of the time series properties of the variables used in the study.

## **4. Estimation Results**

### **4.1. Stationary Test**

The stationary test is the very first step to be carried out in time series analysis to check whether the series have unit root or not in order to avoid spurious regression. Two versions of unit root tests are used in this study; the standard Augmented Dickey-Fuller (ADF) and the Zivot-Andrew (ZA) test. The ADF test used here takes into account the presence of time trend but ignores the possible existence of structural break. Hence, we present the ADF statistic both with and without trend in the equation. Meanwhile, the ZA test is considered here to account for the possible presence of the structural break as it has been shown apparently in the visual inspection before. The unit root test for each category of government spending and other variables under investigations are reported in Table 4.1 below.

**Table 4.1**  
**The ADF and Zivot-Andrew (ZA) Test of Stationary**

Variables	ADF Stat.		Zivot - Andrews (1992)	
	Without Trend	With Trend	ZA Stat.	Break Point
LPY	-1.261 (2)	-2.143 (0)	-8.793(1)***	1998q1
LPI	-2.019(5)	-2.856(5)	-7.190(3)***	1998q1
LPC	-2.047(3)	-3.996(0)***	-4.666(3)**	1995q2
LG	-3.219(0)**	-10.503(0)***	-6.619(1)***	1989q1
LGC	-3.098(0)**	-4.990(0)***	-5.156(2)**	1998q1
LGI	-4.628(0)***	-5.305(0)***	-5.394(1)**	1989q1
LP	-0.528(0)	-2.472(1)	-10.665(1)***	1998q1
LIR	-3.380(3)**	-4.143(3)***	-6.319(2)***	1997q3

Notes:

The critical value of the ZA test for equation with break on intercept for 1% and 5% are -5.43 and -4.80, respectively. For equation with break on trend for 1% and 5% are -4.93 and -4.42, respectively. And for equation with break on both intercept and trend (regime shift) for 1% and 5% are -5.57 and -5.08. The Critical values are taken from Zivot and Andrew (1992). The critical values of the ADF test are based on McKinnon (1996).\*\* and \*\*\* indicate significant level at 5 and 1 percent, respectively.

From Table 4.1, the ADF statistic without trend suggests that some variables are stationary and some are not. While all government expenditures categories are stationary at least at 5 percent level test, except log nominal interest rates, all macroeconomic variables under examination (LPY, LPI, LPC, and LP) are non-stationary. However, under the ADF statistic with trend, one more variable, LPC, becomes stationary at 1 percent level test, leaving LPY, LPI, and LP non-stationary.

As discussed before, in the presence of the structural break in the series, the ADF test is biased towards the rejection of the null hypothesis of non-stationary (Perron, 1999). The visual inspection before indicated the presence of the structural break in some of macroeconomic variables. These are confirmed with the ZA statistic in which suggests that those variables which initially non-stationary under the ADF test become stationary. Thus, under the ZA test all variables under examination are stationary or I(0). The break points resulted from the ZA test point to periods around the AFC in 1998 in particular for macroeconomics variables as also indicated in the visual inspection earlier.

As the unit root test suggests that the variables under investigation are stationary, we do not need to do cointegration test. Thus, we can employ the SVAR model in level using short run restriction. In addition to account for the presence of the trend and structural break, these two factors will be included in the SVAR model as exogenous variables.

## 4.2. Diagnostic Checking

Adequacy of the model needs to be checked using several diagnostic tests in order to get the valid result and inference. The last four rows of Table 4.3 below reports the results of the diagnostic test statistics. Firstly, the lag order selection of the SVAR model. Instead of only using one particular test, we use several information criteria methods as they are available in STATA package which is used in this study. Then, we choose the one that free from autocorrelation problem. For Model 1 and Model 1A, the optimal lag length are both 5 based on the Final Predictor Error (FPE) as well as Akaike information Criteria (AIC) for multivariate versions (details test results are in Appendices A). For Model 1B, The FPE, AIC and Hanan-Quinn Information Criteria (HQIC) choose 3 lags to be included in the model. However, when we do the autocorrelation test, the problem exists and hence we decided to use 4 lags as the autocorrelation problem disappear as we add one more lags in the model. Meanwhile the last two models (Model 2a and 2B) choose 4 lag length based on the FPE and AIC test. In summary, the lag length of the model in this study has been chosen following the formal procedure of standard test commonly used in the multivariate time series analysis.

The next test required to check the adequacy of the model is the autocorrelation test. In this study we use Lagrange Multiplier (LM) statistic to check the autocorrelation problem in the residuals. All the models reported in Table 4.2 do not exhibit autocorrelation up to lag 8 (detail of the LM test of autocorrelation for each model is reported in the Appendices A).

Another important test that needs to be carried out is the model stability. This is carried out by verifying the stationary condition of the VAR models. We compute the value of root from the eigenvalue of the companion matrix derived from the parameter estimates. The model is considered to be stable if the values of the root are less than one or lie inside the unit circle. The result of the stability test of each model is reported in Appendices A. All the models presented in Table 4.2 are stable as all the values of the root of each model lie inside the unit circle.

To check the possible misspecification problem, we carry out normality test of the residuals. This tests the skewness and kurtosis properties of the  $u_t$  against those of a multivariate normal distribution of the appropriate dimension under the null hypothesis of normal distribution. The multivariate extension of Jarque-Berra test is used in this study and reported in Appendices A. Except of Model 1B and 2A, all model are satisfy the normality test. In many cases, normality assumption in multivariate studies frequently can not fully be satisfied (Claus et al, 2006). However, as noted by Luthkepol (2005), the asymptotic properties of the VAR parameter estimators do not depend on the normality assumption. In addition, if the goal is to built the confidence interval for forecasting, then we must really concern with the normality assumption.

To summarize, in general the models employed in this study are robust to the extent that they satisfy the model adequacy tests.

### 4.3. Contemporaneous Effects

Having checked the adequacy of the model, we may proceed to discuss the estimation results. Table 4.3 reports the estimated contemporaneous coefficients of the relationship between government spending shock and other macroeconomic variables; private GDP, price level and nominal interest rate. Hence, parameter of  $a_{21}$ ,  $a_{31}$  and  $a_{41}$  represent the impact of government spending shock on private GDP, price level and nominal interest rates, respectively. All the coefficients can be thought as elasticities as well as the impact multipliers.

**Table 4.3**  
**Contemporaneous Effect of Government Spending: SVAR Estimation Results**

Model	Models				
	Model 1	Model 1A	Model 1B	Model 2A	Model 2B
<b>Coefficients of Interest</b>					
$a_{21}$ (effect on private GDP)	0.010 (0.008) <i>P(0.26)</i>	-0.056 (0.016) <i>P(0.00)</i>	0.005 (0.006) <i>P(0.41)</i>	0.007 (0.170) <i>P(0.69)</i>	0.014 (0.026) <i>P(0.60)</i>
$a_{31}$ (effect on price level)	-0.039 (0.015) <i>P(0.00)</i>	0.060 (0.033) <i>P(0.08)</i>	-0.019 (0.012) <i>P(0.11)</i>	-0.046 (0.018) <i>P(0.01)</i>	-0.051 (0.017) <i>P(0.00)</i>
$a_{41}$ (effect on interest rate)	0.103 (0.052) <i>P(0.05)</i>	0.056 (0.118) <i>P(0.64)</i>	0.036 (0.036) <i>P(0.32)</i>	0.093 (0.053) <i>P(0.08)</i>	0.123 (0.050) <i>P(0.02)</i>
<b>Diagnostic Checking</b>					
Lag length (information criteria)	5	5	4	4	4
Autocorrelations (LM test)	No	No	No	No	No
Stability (roots of companion matrix)	Stable	Stable	Stable	Stable	Stable
Normality (J-B test)	Normal	Normal	Non-normal	Non-normal	Normal

Notes:

- \* Figures in parenthesis in second row of each cell is the standard error, while those in the last row of each cell preceded with P are the p-value.
- \* Model 1 is a base line model which includes 4 variables SVAR (LCG, LPY, LP, and IR). The other models are as follow:
  - Model 1A: LGC, LPY, LP, and LIR
  - Model 1B: LGI, LPY, LP, and LIR
  - Model 2A: LCG, LPC, LP, and LIR
  - Model 2B: LCG, LPI, LP, and LIR.

Under Model 1, which includes total central government spending ( $LCG_t$ ) to represent the fiscal shock and private GDP ( $LPY_t$ ), the estimated coefficient of  $a_{21}$  has positive sign (0.01) which is consistent with theory. However, besides the magnitude is very small compared to the standard Keynesian multiplier, the coefficients are not statistically significant at any reasonable level. For quarterly data, the magnitude is comparable with other studies in several advanced countries as compiled in Table 4.4 below given the fact that Indonesia is developing countries. In the case of USA as reported by Blanchard and Perotti (1999), the magnitude of fiscal is close to 1 as predicted by Keynesian supporters. Similar study in Germany,

Spain, and New Zealand found comparable figure, around 0.1. Study by IMF(2008) using dynamic panel regression on annual data for emerging economies found only 0.08, implying only 0.02 on quarterly average which is comparable with Indonesia in this study.

Table 4.4

Contemporaneous Effect of Fiscal Policy Shock on GDP in Several Studies

Sources	Methodology	Country	Fiscal multiplier (G)
Blanchard and Perotti (1999)	Quarterly SVAR without explicit control of monetary policy (interest rate)	USA (1960q1 – 1997q4) - deterministic trend - stochastic trend	0.96 0.98
Hóppner (2001)	Quarterly SVAR without explicit control of monetary policy (interest rate)	Germany	0.08
IMF (2008)	Dynamic panel regression on annual data	Advanced economies Emerging economies	0.15 0.08
Claus et al. (2006)	Quarterly SVAR without explicit control of monetary policy (interest rate)	New Zealand - deterministic trend - stochastic trend	0.14 0.13
de Castro Fernandez and Hernandes de Cos (2007)	Quarterly SVAR with explicit control of monetary policy (interest rate)	Spain - with respect to GDP - with respect to interest rate - with respect to price level	0.1 0.06 0.06

Meanwhile, the coefficient of  $\alpha_{31}$  which represents the impact of total central government spending on price level has negative sign (-0.04) and is statistically significant at 5% level. This means that 1 percent shock on total central government spending contemporaneously decreases price level in Indonesia by 0.04 percent. In term of the magnitude, it is comparable with the figure in Spain though has different sign as reported in Table 4.4 above.

The effect of government spending shock on price level in Indonesia seems to contradict with what the standard theory says. One possible factor that might explain this result is the fact that some components of central government spending in Indonesia are intended either directly or indirectly to control upward pressure of domestic price level. For example, various subsidies, in particular fuel oil and electricity subsidy, in central government budget are intended to help stabilize price level in Indonesia. Food subsidy either through subsidized input or direct market intervention by BULOG through special market operation for rice have contributed to downward pressure on domestic price in many years. In early 2007, when the domestic price of vegetable oil was going up, the government decided to control it by bearing the VAT on the domestic sales of vegetable oil<sup>29</sup>. Furthermore, frequently the government even had to forms an ad hoc team assigned specifically to stabilize food price in any occasions. For example, during period 2007 – 2009, under the Economic Coordinating Ministry, there is an inter-ministerial team to tackle the

<sup>29</sup> Officially called “DTP (*Di Tanggung Pemerintah*)” in which the government pay the firm’s VAT liabilities to prevent the inflationary pressure.

inflationary pressure due to drought, the impact of the surge of commodity price (palm oil) and the GFC. The most recent government policy is to put explicitly Rp1 trillion on 2011 budget to provide support for domestic food price stabilization program. It seems that the government of Indonesia reacts more to inflationary pressure at all cost than to output. This is ironic since controlling inflation in Indonesia is the sole job of Bank Indonesia since the adoption of the inflation targeting framework.

Meanwhile, as reported in Table 4.3, the estimated coefficient of  $a_{41}$  has positive sign (0.1) and is significant statistically at 5 percent level. This indicates that positive shock in central government spending tends to put upward pressure on nominal interest rates. This is consistent with the standard theory (IS – LM Model) in which says that an increase in government spending will drive up the interest rates. The magnitude is slightly higher compared to that of in Spain.

With regard to the result of  $a_{31}$  which has negative sign in Model 1, we estimate Model 1A in which include only government consumption component (public wages plus expenses on goods and services). Therefore, this category of spending isolates the possible effect of other spending such as subsidies. Based on Table 4.3, the estimated coefficient of  $a_{21}$  in the Model 1A turns out to be negative (-0.06) and is significant at 1 percent level implying that one percent increase in government consumption leads to 0.06 percent lower private GDP. The changing sign of  $a_{21}$  from positive into negative could be due to the upward pressure on domestic price following the increase of government consumption as indicated by the estimated coefficient of  $a_{31}$  which turns out to be positive and significant at 8 percent level. The coefficient of  $a_{31}$  further confirms the possible explanations on the negative impact of total central government spending shock on price level. When we isolate the effect of spending categories that have possible downward pressures on price level such as subsidies, indeed we get the expected sign of the estimated coefficient of  $a_{31}$ . Meanwhile, the coefficient of  $a_{41}$  is also positive (0.06) though insignificant statistically.

Furthermore, we modify Model 1A by replacing government consumption (LGCT) with government capital spending (LGI<sub>t</sub>) to account for the productive and unproductive hypothesis of government spending. Based on Table 4.3, though the sign of the estimated coefficients similar to Model 1, none is statistically significant suggesting that government expenditure does not have strong impact on private GDP. This could be due to the relatively small size of government investment in Indonesian economy while at the same time even declining over time.

The last two models are presented to account for the effect of government spending on GDP components particularly private consumption and investment. In Model 2A, we replace private GDP in Model 1 with private consumption (LPC<sub>t</sub>) while later in Model 2B, we replace it with private investment (LPI<sub>t</sub>). Base on Table 4.2, under Model 2A, the estimated coefficient of  $a_{21}$  is insignificant though the sign is positive as expected. This implies that a shock in total central government expenditure does not have significant contemporaneous impact on private consumption. However,

the contemporaneous effect on price level is negative and significant statistically consistent with Model 1 as we use total central government spending ( $LCG_t$ ) in the model. The estimated effect of coefficient  $a_{41}$ , the contemporaneous effect on nominal interest rate is consistent with Model 1 in which has positive sign and is significant at 8 percent level.

Under model 2B in which we investigate total central government spending effect on private investment ( $LPI_t$ ), the estimated result of coefficient  $a_{21}$  has positive sign but insignificant statistically implying that a shock in total central government spending does not have significant effect to drive up the private investment. The contemporaneous effect on price level ( $a_{31}$ ) as well as on nominal interest rate ( $a_{41}$ ) are also consistent with Model 1 in which have negative sign for  $a_{31}$  and positive for  $a_{41}$  and both are significant statistically.

To summarize, in general a shock in government spending does not have significant impact in driving up the aggregate demand (private GDP, consumption or investment) in Indonesia. Meanwhile, as the theory predicts, a shock in government spending is followed with the upward pressure in nominal interest rate which might be the factor that has muted the expansionary effect of central government spending shock though at the same time followed with the decrease of price level. From Table 4.2, the coefficients of contemporaneous effect on interest rate are stronger than those of price level. For the case of government consumption, the effect is even negative on private GDP followed with upward pressure on both price level and nominal interest rate indicating the crowding out effect. This could be related to the efficiency factor of government consumption in Indonesia.

#### 4.4. Dynamic Impact

Next, the impulse response functions are assessed to trace out the time path of the effect of structural shocks of fiscal policy on the economy. Here, the responses of private GDP, price level and nominal interest rates to a spending shock for each model are considered.

In the case of Model 1, the response of private GDP to total central government shock appears very small throughout the path as shown in the lower-right corner of Figure 4.4. There is slight increase up to 8 quarters but disappears since then. Besides the response is very small, it is short lived. On the other side, it appears that total central government shock tends to have downward pressure effect on domestic price level as shown in the lower-left corner of Figure 4.4. The slight decreasing effect lasts until the 5<sup>th</sup> quarter and disappears since then. The possible explanation of this slight decreasing effect is due to the high share of subsidy which mainly intended to contain the upward pressure of domestic price level. Meanwhile, a positive shock on total central government expenditure causes an increase in nominal interest rate but decreases after the 3<sup>rd</sup> quarter. As the model is stationary, the effect of the shocks goes to zero after certain periods of time.



Figure 4.4

The Structural Impulse Response Function of Model 1

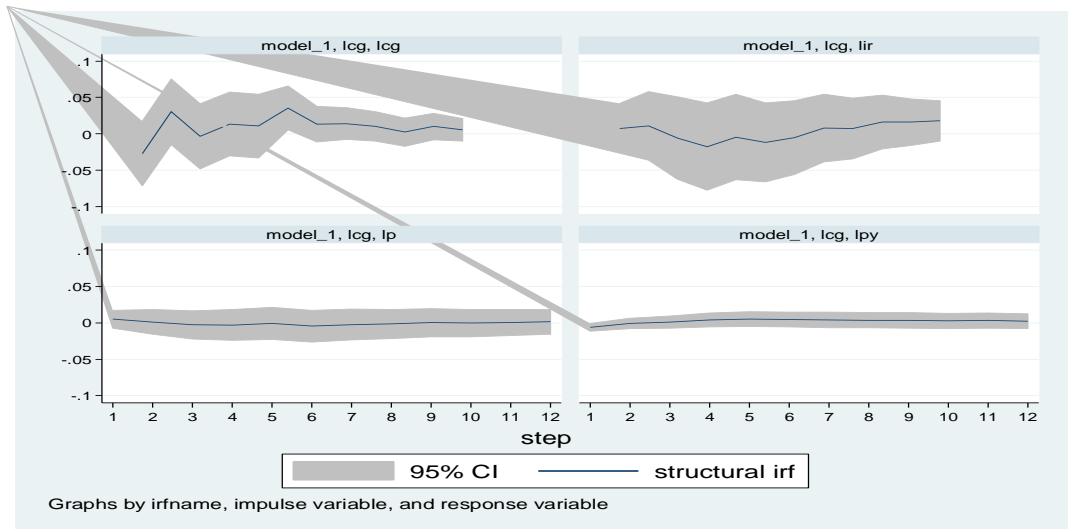


Figure 4.5

The Structural Impulse Response Function of Model 1A

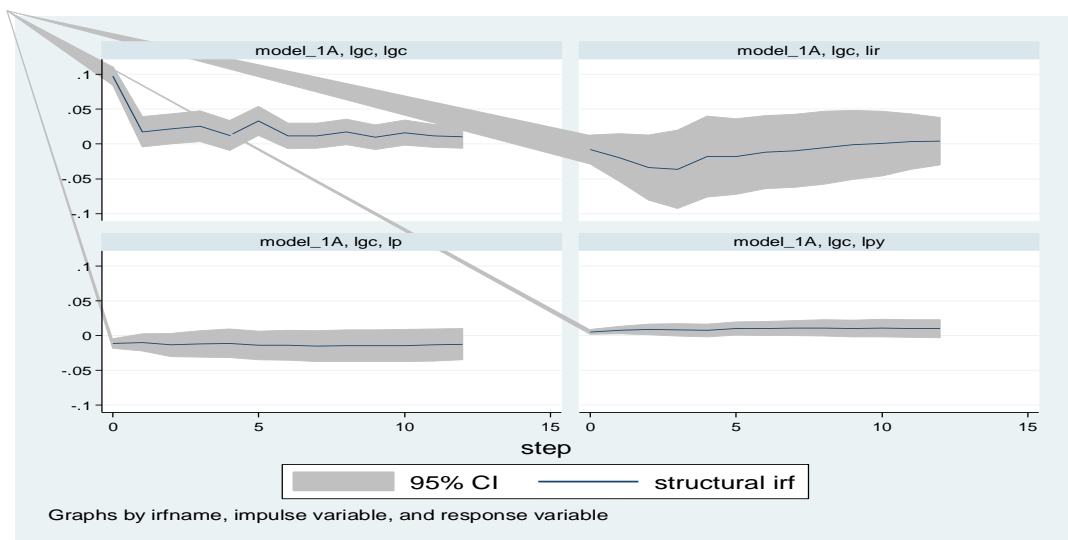
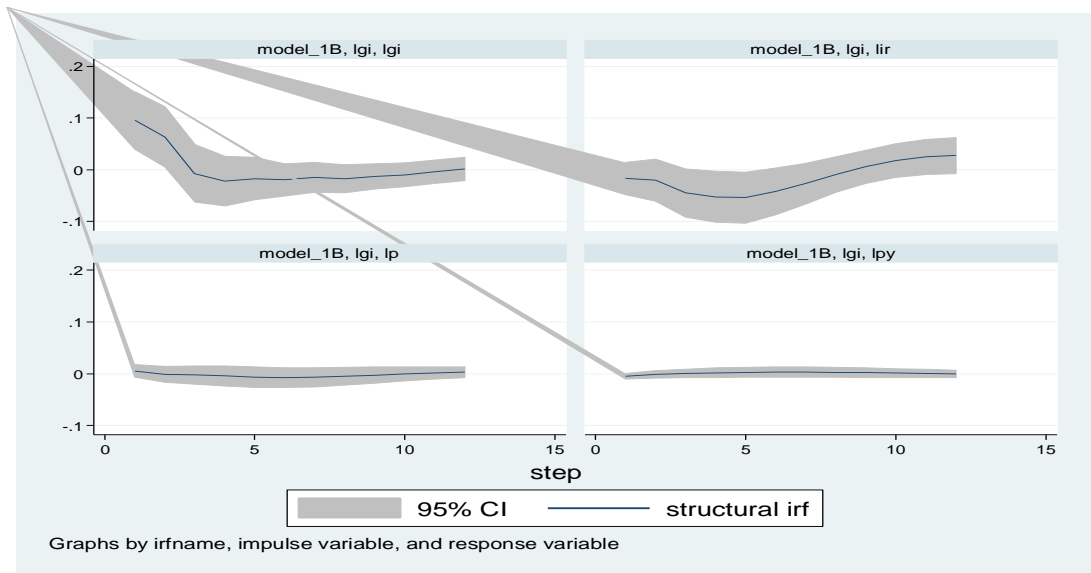


Figure 4.6

The Structural Impulse Response Function of Model 1B



Model 1A and 1B, both are presented to investigate the effect of government spending composition in term of government consumption and government investment. As shown in Figure 4.5 and 4.6 above, both category of spending seems to have small effect on private GDP. The response of the nominal interest rate to positive shocks on both categories appears to be similar in which slightly decreases in the first three quarters but increases since then.

Figure 4.7

The Structural Impulse Response Function of Model 2A

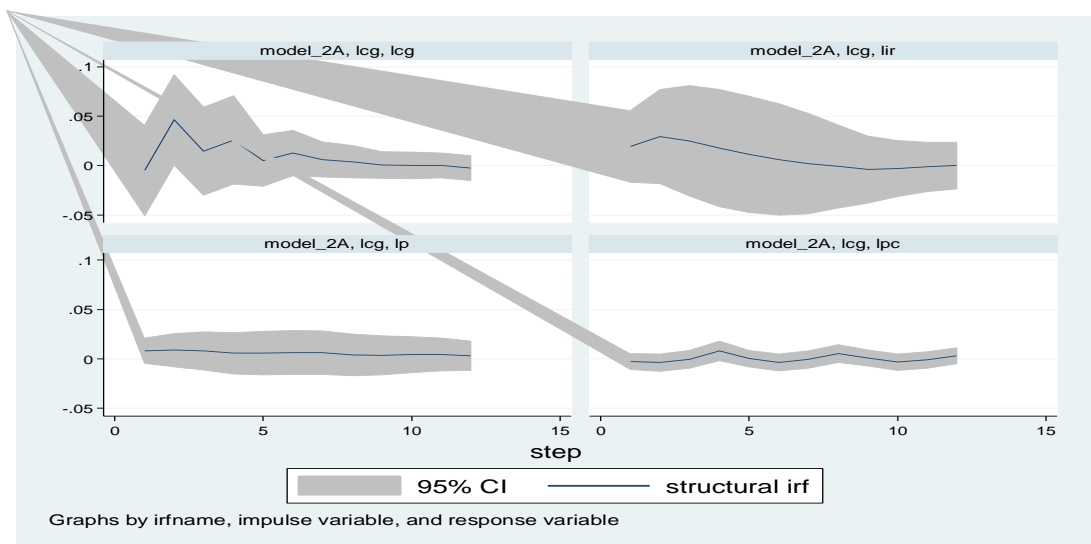
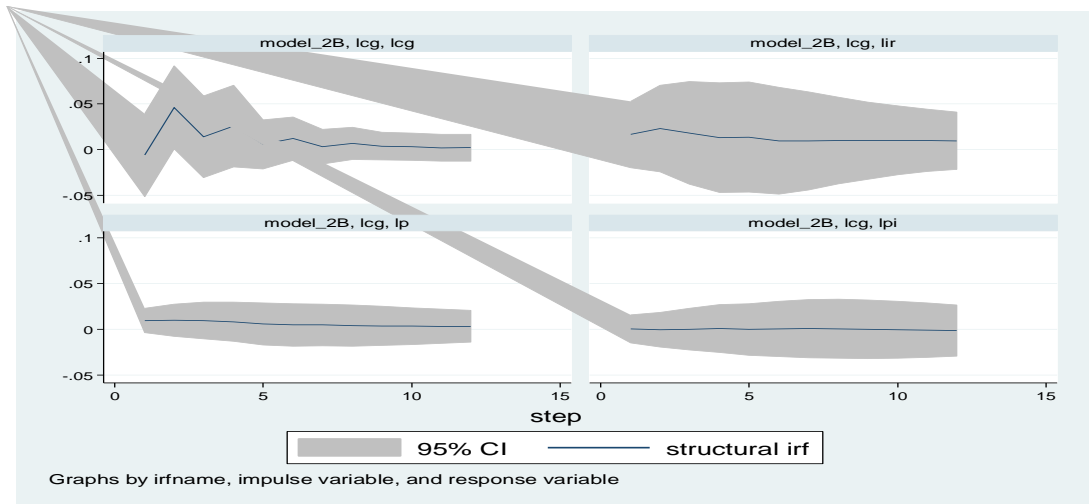


Figure 4.8

The Structural Impulse Response Function of Model 2A



The structural IRF of the last two models, Model 2A and Model 2B, are presented to observe the dynamic effect of total central government spending shock on GDP component in term of private consumption and private investment. From Figure 4.7 (lower-right corner) above, it seems that positive shock on total central government spending causes private investment to increase in the first 4 quarter. The effect then oscillates around the long run path before disappearing after 12<sup>th</sup> quarter. Meanwhile, based on Figure 4.8 (lower-right quarter) above, the effect of total central government shock on private investment is somewhat neutral and slightly become negative after 11<sup>th</sup> quarter.

Overall, the structural impulse response analysis show that the effect of government spending shock on private GDP is relatively weak indicating that fiscal measures to stimulate aggregate demand in Indonesia seems does not work well. Weak budget execution in which strengthen the internal lags could be a factor behind this impotent of fiscal policy to stimulate aggregate demand.

## 5. Conclusion

Despite of the remarkable economic performance during past three decades, the economy of Indonesia has experienced several disruptions. The oil shocks in 1970s, the AFC in 1997, and lately the 2008 GFC are among the major episodes that had significant impact to the economy. Along with monetary policy, fiscal measures instruments have been frequently used by the government to tackle those disruptions. However, though there have been a number of empirical literatures on the effectiveness of monetary policy in Indonesia, we can hardly find one on fiscal policy. This research investigates the effect of government spending shock on output, price level and interest rates using a SVAR methodology on quarterly data of

Indonesia.

This study is an attempt to investigate the effect of fiscal policy in Indonesian economy using a structural VAR based on identification technique developed by Blanchard and Perotti (1999). Besides in the aggregate level of government spending and output, this study is aimed to investigate the impact of government spending composition to address the productive and unproductive hypothesis of government spending. The effect of government spending on GDP component in term of private consumption and investment, price level and interest rates are also of interest of this study.

Based on the contemporaneous coefficients estimation, we found that the government spending shocks have small and insignificant impact on private GDP though the sign is consistent with the standard Keynesian theory. The rather shocking impact is on the price level which shows negative sign. However, it seems justifiable given the fact that significant portion of total central government budget allocated to control inflationary pressure either directly or indirectly (subsidies, tax expenditure, reserved fund, and other programs). This is somewhat ironic as controlling inflationary pressure is the sole task of Bank Indonesia since the adoption of inflationary targeting framework in 1999. From the contemporaneous coefficient, the spending composition matters. Government investment has better impact on the economy indicated by positive sign on its effect on private GDP though insignificant whilst government consumption has negative sign as it is followed with the upward pressure on domestic price level. On the effect on GDP component, though the coefficients are positive both on private consumption and investment, they are insignificant implying ineffectiveness of fiscal policy to stimulate aggregate demand.

The small and insignificant effect of the government spending shocks on private GDP could be due to the muted effect of the nominal interest rate as it tends to increase following positive shock on government spending. With regard to the effect on domestic price level, it seems very odd as it contradicts with the standard theory. However, after isolating only government consumption (include only spending on goods and public wages) in the model, the effect turns out to be positive implying that certain components of government spending has role on domestic price stabilization. Fuel oil and electricity subsidy which takes a large portion in government budget are basically intended for price stabilization. In additions, rice price for poor family and subsidy on agricultural inputs are considered to have downward pressure on food price both from demand and supply side which is a major component of domestic inflation.

The analysis of structural impulse response functions also confirms the ineffectiveness of government spending measures to stimulate private GDP indicated by the small and short lived of the effect.

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