

## MULTI PERIOD SHOCKS ROLES ON GOVERNMENT SPENDING IN INDONESIA

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### Abstract

This paper proposes an alternative dynamic model of government spending in Indonesia. The model is based on short term disequilibrium assumption, in which multi period of shocks variables may play an important role. This research applies a loss function approach and uses optimum shock variables as the determinant for government spending during 1970-2010. The result shows that real GDP, population, and multi period shock of government spending are statistically significant. It provides evidence of the impact of multi period shocks to the realization of government spending. It implies that government faces a serious disequilibrium in determining their spending both in short and long terms.

**Keywords:** Fiscal, government spending, deficit budget, shock

**JEL classification numbers:** H53, H62, C22

### Abstrak

Makalah ini mengusulkan sebuah model dinamis alternatif untuk belanja pemerintah di Indonesia. Model ini didasarkan pada asumsi adanya ketidakseimbangan jangka pendek, dimana *multi period of shocks* memiliki peran penting. Penelitian ini menerapkan pendekatan *lost function* dan menggunakan variabel *optimum shock* sebagai penentu belanja pemerintah selama 1970-2010. Hasilnya menunjukkan bahwa GDP riil, populasi, dan *multi period of shocks* atas pengeluaran pemerintah merupakan faktor yang signifikan. Hal ini merupakan bukti dari dampak *multi period of shocks* terhadap realisasi belanja pemerintah. Ini menyiratkan bahwa pemerintah sebenarnya menghadapi ketidakseimbangan yang serius dalam menentukan pengeluaran mereka baik dalam jangka pendek dan panjang.

**Keywords:** Fiskal, belanja pemerintah, bujet defisit, shock

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### INTRODUCTION

The main challenge of economic development in Indonesia is the weakness of its fiscal management. In the last five years, fiscal policies have played important roles in supporting economic growth in Indonesia. Fiscal policies cover government reve-

nue and expenditure decisions in order to achieve an optimum economic growth and to stabilize the economy. The main source of central government revenue is tax, while the other sources have not played significant roles in increasing revenue. Government expenditure consists of operating expenditure and public expenditure. The impact of government sector on the economy is captured by its impact on various main macroeconomic indicators.

The government have applied deficit budget policy to manage the economy

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<sup>1</sup> The author acknowledges the fund provided by Dirlitabmas Directorate General of Higher Education, The Finance Minister Office of Republic of Indonesia, through The Stranas Research Grand 2010.

and to stabilize the price level. In fact, the deficit has been grown up higher and has been attacking fiscal sustainability in the last five years. An expansive fiscal policy facilitates expenditure to grow faster than government revenue, tax in particular, would give positive impact on output, but it can create a serious budget deficit. During the last ten years, the government has been experiencing sharp increases in its spending, while tax revenue growth in moderate level only. This condition has a positive impact on output, but its consequence is that the government embarked upon a potential deficit trap for several years. Theoretically, an increase in government deficit over the optimum level in the long term will lead to a fiscal crisis.

Within ten years pre the economic crisis in 1997, the average of economic growth was above 5% per year in which inflation rate could be maintained below 10% per year. Another indicator was current account that had a higher deficit rate since 1980 until 1995. The main fiscal indicator, the budget deficit, was 2.3% during 1990-1997, which was a strong warning to the government. Such economic condition was in fact followed by the higher foreign debt that was 28.0% of GDP in 1990, and was 56.9% of GDP in 1995. The economic crisis that hit Indonesia in 1997 has multiplied Indonesian foreign debt. To make it worse, the ICOR reached 4 – 5, which indicated the low economic efficiency, and including the efficiency of government finance management.

Indonesian economy has experienced several stages of economic growth and stabilization during the new era since 1998. In more than ten years of this period, the deficit fiscal policy was applied in the reason of optimizing economic growth and due of the difficulties in tax collection. Another reason was that during ten years of recent development had been shown that the monetary policy did not significantly give benefits to economic stabilization. As

an impact of this disharmonization between monetary and fiscal policies, total government spending grew up sharply. Unfortunately, the increase in government spending was not followed by a significant growth in tax revenue and a better quality in fiscal management. Furthermore, the central government should revise the budget in the mid year.

The economic growth was in a high rate since 2000s until the world financial crisis attacked several industrial countries. During the decade of 2005s, the average of economic growth was more than 5 % per year. This growth could compete until the mid of 2007s since in 2008 the world economic crisis suffered Indonesian economy as well, but by early 2009s the Indonesian economic achievement began to grow up. Generally, the economic growth during the post of new era administration was 5 % and above average per year. This level was better than that of other countries, especially in Asian developing countries that were only 3 % in average per year. This phenomenon was one of a result of the expansive fiscal policy where the government spending for infrastructures and public facilities have significantly increased.

Since the post world financial crisis 2008, government budget management as the main instrument of fiscal policy has played an important role in supporting economic growth in Indonesia. The main problem of Indonesian economic is to avoid conditions that could trigger a new economic crisis. One of the important dimensions of this challenge is to conduct fiscal policy to support a stable economic growth. Indonesian economy has gone through some early stages of economic growth and stabilization during the last ten years. Furthermore, in the last decade, the central government has applied an expansionary fiscal policy. Unfortunately, the government and the central bank fail to harmonize fiscal and monetary policies. The era of this recent development also showed insignifi-

cant impact of monetary policy on the economic growth. Interest rates, the main indicator of monetary sector, were at the high level so that investment did not increase significantly. Since then, the government has been focusing on the fiscal policy.

The rapid increase in government spending was the result of the large budget deficit. The budget deficit decreased the effective tax revenue that was paid by taxpayers for the public goods provided by the government and therefore increased the demand for those services. The relationship between various economic and non-economic variables, and government spending was particularly important for Indonesia since the public sector has suffered from substantial deficits in the last five years. Analysis of such relationship provides helpful insights to reduce the government spending and restrict the size of government deficit.

Further observation and research on the relationship between government spending and its determinant variables, especially such as shock variable in the long term period, therefore, is important to be conducted. This paper attempts to model the government spending for Indonesian, including government spending for operating, for development, and total spending. In this paper, the research applies the econometric dynamic model, such as shock absorber model, which has widely been used in economic research, especially in the analysis using monetary and macroeconomic data.

Several alternative papers have explained the relationship between government spending and other economic variables, such as tax revenue, economic growth, interest rate and government budget deficit. Merifield (1990) points out that government spending and tax revenue are simultaneously determined. Baghestoni and McNow (1994) and Tridimas, (2001) support the hypothesis that tax revenue growth is the main factor of government

spending. Catao and Terrones (2005) investigate the role of inflation in the government spending and budget deficit for developing countries with high inflation. They find a strong positive association between inflation, government spending and budget deficit.

Hondroyannis and Papapetru (2001) conducted another research on the government spending model that gives a new finding. They observed causal relationship of government spending and tax revenue using cointegration approach and Error Correction Model (ECM). The result shows that, the two variables have long term relationship. Other research, Marks (2004) found that the government spending would increase government revenues. This result implies that the deficit budget policy can be much more determined by enhancing government spending. Both researchers suggest that to enhance the efficiency of government spending, the government should decrease the government spending growth.

Berument (1994), as well as Rose and Hakes (1995) have generally suggested that government spending has positive effects on tax growth. These literatures on this topic describe a non-linear relationship that is positive when the share of government in economic activity is low, but changes downward as the relative size of government grows. In general, the government contributes to the economic growth by providing basic public goods and infrastructures. However, as government expands its scope, it will cause increasing in economic inefficiency. Higher government spending also requires an increase in tax rates, which will reduce work incentives.

The relationship between government spending and other economic variables provide insight as to how different policies might help to control the government spending growth. If the factors affecting government spending could be elaborated, then it will be important considera-

tion for government to manage the budget deficit. Contrary, the impact of budget deficit on government spending growth is also a significant consideration for government to decide the budget. These are the importance of examining the government spending model on the fiscal policy implementation (Wolfson, 1995; Schuvnecht, 2000).

After discussing several empirical evidences of role of government spending to the various macroeconomic indicators, it is important to elaborate the optimum size and the role of shock to the government spending. The optimum size of government spending will bring the economy to the optimum growth. If the government spending is higher than its optimum, it might cause a high misallocation of budget. It means the government spending is inefficient. Since the government purchase much money to the inappropriate sectors, then the value of money of budget will be lower. Consequently, in the next years the government will meet an extra budget deficit. As a result, it will be a shock to the government budget and to the economy as a whole (Hondroyannis and Papapetrou, 2001).

According to Sheehey (1993), the optimum size of government budget should refer to the demand for public's goods and services. The level of optimum demand for public goods and services could be associated as an expected demand or a long term desired level of all people in the country. Based on this assumption, it can be modelled the demand for public good and services for the certain period. Then, the specific empirical model might be assumed that it explains the long run desired or expected demand for public goods and services. The main important of public goods and services modelling is the variables that involve in the model. An empirical public goods and services demand is the other side of government spending model. Several papers have found the various economic variables that play an important role in such

models. A specific important variable in the government spending model is its shocks, which are the difference between actual government spending and its expectation. In case shock variables are significant in the model, it means that the government could not plan an appropriate level of government spending. This is a part of the reason to investigate the role of shock variables to the government spending.

## METHODS

Economic research needs an appropriate and sophisticated method to achieve effective goals. Econometrics is one of methods that play an important role in economic analysis. Using econometrics in the first step of the analysis, researcher should develop economic model to analyze economic phenomena. In the economic analysis procedure, it is possible to construct several alternative econometric models based on the one economic model. In this case, researcher must elaborate and choose the best one hypothetical econometric model to propose in empirical analysis. Generally, it needs two main steps in the process of econometric model building. First step is to verify the independent variables, while the second step is to construct the functional form according to the characteristics of the data (Engle and Granger, 1987).

In the last two decades, many papers have extensively used econometrics as a method in economic analysis. As a method, econometrics emphasizes on the economic modelling, which captures various economic variables to explain the behaviour of dependent variable. In the economic model development, it was generally applied the concept of the general to specific methodology in which the model employed independent variables as complete as possible. In the process of economic modelling, several papers focus on the derivation of loss function to develop an appropriate econometric model (Domowitz and Elbadawi, 1987; Cuthbertson et al., 1992).

In line with the recent development of econometric model, many papers focus on how to develop functional form in which it captures several economic assumptions. These assumptions are based on the economic behaviour, including adjustment mechanism that may play as a key role in the analysis process. (Feige, 1967; Carr and Darby, 1981). Researcher usually assumes that economic agents have complete information to minimize their loss according to their decisions. Due to their economic loss, it means that economic agents are under their disequilibrium in the short term. With respect to the long run equilibrium assumptions, they will adjust toward their equilibrium. Furthermore, dynamic econometric model should accommodate the difference of short and long run behaviour.

Many papers have applied the dynamic econometrics to elaborate the economic disequilibrium phenomena since the work of Feige (1967). In line with the presence of economic agents that will adjust their disequilibrium toward equilibrium point, methods of analysis in the research should accommodate this assumption (Engle and Granger, 1987; Gupta and Uwilingiye, 2008). The dynamic econometric model does not only encompass the short and long term phenomena of the model, but also represents the concept of long run relationship between two or more variables. With respect to the concept of long run equilibrium, the research needs to analyze the time series data with dynamic econometric model.

### **Model Specification for Loss Function**

There is no doubt that dynamic specification is important in the econometric analysis. In the economic context, dynamic specification models the economic phenomena through changes in the value of economic variables over time. In other words, dynamic model involves the description of the variable as a function of

many factors. The process of dynamic modelling is to develop the best empirical model in describing a proper behaviour of the variable. Several approaches of dynamic specification have been developed on how to formulate the econometric models that try to explain many factors, such as the behaviour of economic agents, the role of government policies, and the views of the builders on reality Cuthbertson (1988).

In general, economics theory suggests more on the long term behaviour than short dynamics of economic phenomena. Recent discussion on econometrics dynamic model is mainly focused on the role of lag variable, expectation, shock factors, and other exogenous variables. This approach is relevant if the economy is in disequilibrium where economic agents need to optimize their return or to minimize their loss. For this purpose, loss function approach is one rational and acceptable way to capture these several assumptions. Chow (1966) introduced an alternative single period quadratic loss function to formulate a specific econometric dynamic model. Then, in the area of econometric modelling discussion for more than five decades, this model has been known as partial adjustment model (PAM). The specific feature of this model is the role of adjustment process in the model. Under this approach, the economic agents are assumed to be in disequilibrium condition, where they adjust periodically toward their equilibrium.

Other factors that may play an important role in the dynamic econometric model are shock variables. According to Carr and Darby (1981), shock variable, for example shock of government spending, may be measured as the difference between actual data and its expectation. Expectation of government spending represents the long run desired of its level, while actual data is the realization of government spending. The main problem of using shock variable is to measure the data. The shock variables are unobserved; so that several approaches

to estimate the shock data may be applied. Several papers used the time series econometric method to estimate shock variable, for example autoregressive model (AR), moving average (MA) and vector autoregressive (VAR).

In line with the development of dynamic econometric and to capture the reality of governments decision on their spending, analysis of government spending should follow the assumptions of short and long term behaviour, role of lag variables, and the possibility existence of shock factors. Furthermore, with respect to the application of econometric dynamic model to the government spending, shock absorber model with optimum lag of shock variables (OSAM) is a reasonable alternative model (Brown, 1989; Bohl, 1999). This model attempts to answer the question of these three assumptions. It is argued that after fiscal shocks, governments have effort to find their equilibrium through adjustment in their spending. The short term behaviour of government spending may diverge from the desired level may due to the lags and shock factors. In the case of data for Indonesia, several stage of fiscal instability appeared in the last twenty years, especially in the era after monetary crisis in 1997. Based on this reason, OSAM is reasonable be applied to the analysis for the data of government spending in Indonesia.

It has been widely accepted that generally economic theory explained the long term behaviour of the economic phenomena. In line with the definition, methods of analysis used in the research should accommodate this assumption. The OSAM model approach does not only encompass both shock and lag of dependent variables in the model which capture the short and long run properties of the model, but also provides an attractive statistical framework and represents the concept of long run relationship between two or more variables. With respect to the theory of long run equilibrium, it is needed to analyze the short

and long run empirical model of among economic variables. It means that we have to satisfy ourselves although the underlying data processes are not stationary. In the case that although the variables are not stationary, the regression equations related to time series data are not spurious. It means that empirical testing for the relationship between dependent and independent variables in this model may be a valid.

A complete consideration of dynamic specification is important in construction of economic models. The dynamic analysis involves the description of endogenous and exogenous variables as a function of some set of previous endogenous and exogenous variables (Nunes and Semitsiotis, 1995; Hondroyiannis and Papapetrou, 2001). With respect to this issue, this section explains Optimum Shock Absorber Model (OSAM) that is derived from the single period loss function. The discussion will begin with introduction of the single period loss function and then, followed by the explanation of estimable OSAM.

According to Chow (1966) and Feige (1966), to illustrate the model, the economy can be assumed in disequilibrium. Generally, the government spending will be different from the planned yearly. It may be caused by shock variables that probably come from both endogenous and exogenous sources. Then, the government behaviour is assumed to be based on the single period quadratic loss function. In the case of government spending, it may consider the following loss function (*LF*):

$$LF_t = b_1(G_t - G_t^*)^2 + b_2(G_t - G_{t-1})^2 \quad (1)$$

where,  $b_1 + b_2 = 1$ ,  $G_t$  is actual government spending, and  $G_t^*$  is long run desired government spending. The first component of *LF* is disequilibrium loss with coefficient  $b_1$ , while the second one is adjustment loss with coefficient  $b_2$ . Minimization of *LF* with respect of  $G_t$  gives:

$$(\delta L F_t / \delta G_t) = 0 \quad (2)$$

$$2b_1(G_t - G_t^*) + 2b_2(G_t - G_{t-1}) = 0 \quad (3)$$

$$(b_1 + b_2) G_t = b_1 G_t^* - b_2 G_{t-1} \quad (4)$$

$$G_t = [b_1 / (b_1 + b_2)] G_t^* - [b_2 / (b_1 + b_2)] G_{t-1} \quad (5)$$

If  $\lambda = b_1 / (b_1 + b_2)$ , then government spending model can be written as follow:

$$G_t = \lambda G_t^* + (1 - \lambda) G_{t-1} \quad (6)$$

Equation (6) reflects the short term relationship between actual long run desired government spending and lags of actual government spending as independent variables with government spending as a dependent variable. In this model, the government is assumed to adjust its spending disequilibrium from previous year to next year with coefficient  $\lambda$ , where  $0 < \lambda < 1$ . This equation will be estimated based on ordinary least square (OLS).

According to the theory of government spending in the previous section, this research assumes the Government Spending ( $G_t$ ) depends on Gross Domestic Product ( $GDP_t$ ) and Population ( $POP_t$ ), which can be written as:

$$G_t = F(GDP_t, POP_t), \quad (7)$$

Based on this model, the long run desired government spending is:

$$G_t^* = \alpha_0 + \alpha_1 GDP_t + \alpha_2 POP_t + e_t \quad (8)$$

It is difficult to estimate directly equation (8) since this model is long run desired with unobserved dependent variable. Furthermore, substituting equation (8) into equation (6), and add multi period shock to the equation yields (See also: Carr and Darby, 1981; Brown, 1989):

$$G_t = \varepsilon_0 + \varepsilon_1 GDP_t + \varepsilon_2 POP_t + \varepsilon_3 G_{t-1} + \varepsilon_4 GS_t + \theta_t \sum_{i=1}^k B^i GS_t + v_t \quad (9)$$

where  $\lambda$  is  $b_1 / (b_1 + b_2)$ ,  $\varepsilon_3$  is  $(1 - \lambda)$ ,  $\alpha_0$  is  $\varepsilon_0 / \lambda$ ,  $\alpha_1$  is  $\varepsilon_1 / \lambda$ ,  $\alpha_2$  is  $\varepsilon_2 / \lambda$ ,  $\varepsilon_4$  is coefficient of shock in the short term,  $\Sigma \theta_i$  is coefficient of multi period shock in the long run,  $k$  is optimum significant lag, and  $v_t$  is error term.

Equation (9) is an estimable model (OSAM) that captures not only independent variables, but also involves short term and long run multi period shock. This model assumes that shock variables exist in the same period ( $GS_t$ ) and its previous optimum lag ( $GS_{t-n}$ ). According to Carr and Darby (1981), shocks variable is the difference between actual and its expected (Shock =  $G_t - G_t^e$ ), which it might be estimated using autoregressive model (AR). In this case, shocks variable of government spending is obtained from the empirical estimation of its autoregressive model. Level of optimum lags refer to the minimum Akaike's Information Criterion (AIC) value. Then, the data of shock variable can be obtained from the residual values of the empirical AR model.

The estimable OSAM is a simple dynamic model that explains the government spending variable in short term behaviour. It describes the relationship between  $GDP$ , population and multi period shock variables under disequilibrium condition. In line with the long run equilibrium concept, it is important to estimate the long run equation. For this purpose, the long run government spending behaviour will be explained by equation (3), which its coefficient are calculated from empirical result.

## RESULTS DISCUSSION

This paper estimates two equations, there are government spending for operating ( $GEO_t$ ), for development ( $GED_t$ ), and total spending ( $GET_t$ ) models with each model having two independent variables, Gross Domestic Product ( $GDP_t$ ) and population ( $POP_t$ ). It employs annual data, which include government spending for operating and for development, real Gross Domestic Product in constant price at 2000

for Indonesia (1970-2010), all of which are in natural logarithms. As a note, all the data are obtained from several annual reports of government budget, except data for 2010 is obtained from government budget plan.

### Optimum Shock Absorber Model (OSAM)

As it is explained in the previous section, Optimum Shock Absorber Model (OSAM) is the extension of Partial Adjustment Model (PAM) in which shock variable are added. This paper applies OSAM through two steps of estimation. First step is to estimate the model with one shock variable. The second step is to find the best empirical model with optimum lag of shock. As it is noted in the methodology, OSAM captures shock variable as its uniqueness. Furthermore, defining the shock variable is a preliminary process before estimate the OSAM. This research defines that shock variable is unanticipated government spending, which is obtained from the empirical estimation of government spending. Since this paper estimates three models, namely government spending for operating,

for development, and total government spending, consequently, shock variables also come from these three dependent variables respectively.

Table 1 presents the result of the autoregressive estimation for government spending for operating and for development to estimate their shock variables respectively. Based on the minimum Akaike's Information Criterion (AIC) value, government spending for operating has two optimum lags, while two other models have optimum lag at AR(3). Then, the data of shock variables can be obtained from the residual values of these empirical AR model.

The SAM estimates explains the relationship between all independent variables and dependent variables in the short term for three models show that generally, all independent variables are statistically significant (Table 2). These models have also under both non-serial correlating and have constant variance assumptions of error term. The estimations indicate that these three empirical models are valid based on the classical assumptions.

**Table 1:** Estimates of Autoregressive of Government Spending

Independent Variables	Dependent Variable		
	<i>LGEO</i>	<i>LGED</i>	<i>LGET</i>
Constant	06.22 <sup>a</sup>	07.15 <sup>a</sup>	10.69 <sup>a</sup>
AR (1)	1.01 <sup>a</sup>	1.13 <sup>a</sup>	1.16 <sup>a</sup>
AR (2)	-0.11	-0.22 <sup>b</sup>	-0.14 <sup>b</sup>
AR (3)	-	0.11	0.04
<i>F</i>	216.09	214.28	146.57
<i>R</i> <sup>2</sup>	0.9505	0.9371	0.9518
AIC :			
Lag 1	1.209052	-	-
Lag 2	1.148045*	0.159542	1.237793
Lag 3	1.180228	0.112310*	1.233392*
Lag 4	-	0.112312	1.273539

Notes: (1) *LX* is natural logarithm of *X* while *LX*(-1) is lag of variable *LX*. (2) Entries with the marks of <sup>a</sup> and <sup>b</sup> are significant at 1 % and 5 % significance level, respectively. (3) Entries with the mark of \* is of AIC minimum value.

Source: Data estimation.

**Tabel 2:** Estimates of Shock Absorber Model (SAM)

Independent Variables	Dependent Variable		
	<i>LGEO</i>	<i>LGED</i>	<i>LGET</i>
Constant	0.114	0.022	0.238
<i>LGDP</i>	0.026 <sup>a</sup>	0.047 <sup>a</sup>	0.011 <sup>a</sup>
<i>LPOP</i>	0.032	0.064 <sup>b</sup>	0.080 <sup>b</sup>
<i>LGE</i> (-1)	0.850 <sup>a</sup>	0.897 <sup>a</sup>	0.775 <sup>a</sup>
Shock	0.897	1.003	1.001 <sup>b</sup>
<i>F</i>	784.53	734.22	595.36
<i>R</i> <sup>2</sup>	0.9016	0.9796	0.9041
Serial correlation (Breusch-Godfrey)	$\chi^2 = (0.56)$	$\chi^2 = (0.20)$	$\chi^2 = (0.26)$
Heteroscedasticity (White test)	$\chi^2 = (0.49)$	$\chi^2 = (0.10)$	$\chi^2 = (0.12)$
Specification test (Ramsey test)	<i>LR</i> = (0.19)	<i>LR</i> = (0.09)	<i>LR</i> = (0.20)

Notes: (1) *LX* is natural logarithm of *X*, while *LGE*(-1) is lag of the dependent variable. (2) Entries in parentheses are the *p*-value. (3) Entries with the marks of <sup>a</sup> and <sup>b</sup> are significant at 1 % and 5% significance level, respectively.

Source: Data estimation.

**Tabel 3:** Long Run Estimates of Shock Absorber Model (SAM)

Independent Variables	Dependent Variable		
	<i>LGEO</i>	<i>LGED</i>	<i>LGET</i>
Constant	0.733	0.831	1.082
<i>LGDP</i>	0.173	0.427	0.050
<i>LPOP</i>	0.213	0.585	0.364

Source: Data estimation.

**Table 4:** Estimates of Optimum Shock Absorber Model (OSAM)

Independent Variables	Dependent Variable		
	<i>LGEO</i>	<i>LGED</i>	<i>LGET</i>
Constant	0.130 <sup>a</sup>	0.114	0.237 <sup>a</sup>
<i>LGDP</i>	0.014 <sup>a</sup>	0.032 <sup>a</sup>	0.022 <sup>a</sup>
<i>LPOP</i>	0.028	0.113 <sup>c</sup>	0.015
<i>LGE</i> (-1)	0.880 <sup>a</sup>	0.866 <sup>a</sup>	0.769 <sup>a</sup>
Shock	0.897 <sup>c</sup>	0.892 <sup>c</sup>	1.012 <sup>b</sup>
Shock (-1)	0.114 <sup>a</sup>	0.158 <sup>a</sup>	0.197 <sup>a</sup>
Shock (-2)	-	0.018 <sup>b</sup>	-0.0360
Shock (-3)	-	-	-0.026 <sup>a</sup>
<i>F</i>	146.05	117.93	299.87
<i>R</i> <sup>2</sup>	0.9698	0.9864	0.9889
Serial correlation (Breusch-Godfrey)	$\chi^2 = (0.57)$	$\chi^2 = (0.71)$	$\chi^2 = (0.88)$
Heteroscedasticity (White test)	$\chi^2 = (0.25)$	$\chi^2 = (0.18)$	$\chi^2 = (0.26)$
Specification test (Ramsey test)	<i>LR</i> = (0.41)	<i>LR</i> = (0.52)	<i>LR</i> = (0.46)

Notes: (1) *LX* is natural logarithm of *X*, while *LGE*(-1) is lag of the dependent variable. (2) Entries in parentheses are the *p*-value. (13 Entries with the marks of <sup>a</sup>, <sup>b</sup> and <sup>c</sup> are significant at 1 %, 5%, and 10% significance level, respectively.

Source: Data estimation.

The sign of all coefficients of are positive, which support the theory of government spending growth. The significance of lag of dependent variables indicates that

the changes in government spending adjust in the same direction to the previous period's deviation from the disequilibrium. Shock variable is important for 10% sig-

nificance level only in the total government spending model, while for the two other models is not significant. It means that one period shock variable is not an important factor in SAM estimation.

Generally, the government spending models explain that in the short term, a change in real GDP and population lead to increase in government spending, while in the long run, the previous level of government spending is also important in determining government spending. From these results, Gross Domestic Product is a substantial factor in government spending growth in Indonesia. It implies that increasing in economic activities lead to increase government sector. The fact that government spending depends on economic growth and the main source of government revenue as tax, this finding also show that central government has relates to the private sector.

Table 3 summarizes the estimation results based on long run model, which all coefficients are calculated from the short term empirical model. For these three models, all parameters estimates are positive that indicate same direction movement in the long run of all independent variables and dependent variables. These estimations describe an existing of disequilibrium in short term in which is periodically adjusted towards the equilibrium in the long run. The increases of all coefficients in the short term to the long run are the result of accumulation of the adjustment process from the previous year.

After estimating the empirical shock absorber model with one shock variable, the next step is to estimate shock absorber model with several lags of shock variable. This procedure is to find the empirical model with optimum shock (OSAM). The estimation explains the relationship between all independent variables and dependent variables in the short term for three government spending models. The results show that generally, independent variables are sta-

tistically significant in all three models (Table 4). The models have also under both non-serial correlating and have constant variance assumptions of error term. The results also indicate that these empirical models are valid based on the classical assumptions. The sign of all coefficients are positive, which support the theory of impact of income and population to government spending growth. The significance of lag of dependent variables describes the changes in government spending move in the same direction to the previous period's deviation to the equilibrium. The uniqueness of these models is the significance of multi period of shock variables. The results show that generally, shock variables are important for 5% significance level for all government spending model. It means that multi period of shock variables are an important factors to government spending growth.

Based on the empirical estimation (OSAM), more information may be explained. In the short term, a change in government spending was determined by a change in real GDP and population. In the long run, it also explains that the level of government spending not only depends on real GDP and population, but also depends on shock its dependent variable with multi period of time lag. The coefficient of adjustment for total spending is about 0.231, indicating that about 23% of the government spending disequilibrium is corrected yearly. In addition, F-tests for restriction test of multi period shock in the total spending model as independent variable was rejected in 5% significance level. It indicates that this variable cannot be dropped from the model. This implies that multi lags of shocks should be involved in the empirical model of government spending.

The importance of involving multi lags of shock variables in this model is to verify the role of unanticipated budget shock to government spending. The coefficient of short term effect of shock in total government spending is 1.012, indicating a

high effect of shock to government spending growth, where more than 1% growth of government spending was caused by shock factor. Generally, the government spending models perfectly explain that in the short term, a change in real GDP and population lead to increase in government spending, while in the long run, the previous level of government spends and shock variables play an important role in determining government spending. From these results, it can be concluded that Gross Domestic Product and lag of government spending are the main factors in government spending growth. It implies that more activities in private sector lead to increase government sectors.

Finally, it is crucial to discuss the presence of multi period of shock variables as the uniqueness of this empirical model. The existing of shock in the model also describes the sources of government spending disequilibrium for both operating and development spending. The importance of involving shock variables in this model is also to verify the role of unanticipated budget shocks to government spending growth. The average coefficient of short term effect of shock to government spending for operating and development is about 0.895, indicating about almost 1% of increasing in government spending comes from unanticipated budget.

The impact of shock to the budget will increase deficit in the long run, and it forces the government to mobilize revenue sources. In recent years, in fact the government may finance the deficit by borrowing from overseas or domestic by issuing bonds sold in domestic and international markets.

With limited income sources, in the long run the government will face difficulties in fulfilling its obligations to creditors. On the other hand, bilateral and multi lateral debt to other countries are not popular because they likely threaten the economic stability. Indonesia has experienced a serious negative impact of foreign debt for more than three decades. Particularly, foreign debt generates a long term fiscal trap, while the government likely fail to create a new tax sources. Unfortunately, increasing in tax rate likely slows down the overall business activities, thereby reducing the tax income in the next periods. The finding of the existence of shocks gives a sign that the fiscal sustainability will be threatened in the long run. This research recommends that the government should manage its spending in order to reach its balance.

One of advantage using dynamic model is the possibility estimating the long run empirical model. In the OSAM estimation, the long run coefficients are calculated from those in short term. Table 5 summarizes the estimation results based on long run model, which all coefficients are obtained from the short term empirical model. For these three models, all parameters estimates are positive that indicate same direction movement in the long run of dependent variables with their all independent variables. These estimations describe an existing of government spending equilibrium in long run because of periodically adjustment from their short term disequilibrium. The increases of all coefficients in short term to those in long run are the result of accumulation of these adjustment processes from several previous years.

**Table 5:** Long Run Estimates of OSAM

Independent Variables	Dependent Variable		
	<i>LGEO</i>	<i>LGED</i>	<i>LGET</i>
Constant	1.182	1.036	1.077
<i>LGDP</i>	0.127	0.290	0.956
<i>LPOP</i>	0.252	1.027	0.065
Multi period Shock	0.114	0.276	0.135

Source: Data estimation

Based on the long run model, more information may be explained to complete the government spending growth in Indonesia. In the long run, a change in government spending was determined by a change in real GDP, population and accumulation of budget shock. It also explains that the growth of government spending, both for operating and development not only depend on real GDP and population, but also depend on budget shock with average two period of time lag. In other hand, long term effect of accumulation shock to the spending for operating, development and total are about 0.114, 0.276, 0.135 respectively. This finding explains that 13.5 % of increase in growth of total government spending in long run comes from three previous year's budget shock. It implies the existence of vicious circle of budget deficit-government spending-budget deficit.

The fundamental finding in this research is not only explaining of the short term and long run model, but also describing the role of multi period shock to the empirical model. This paper also highlights that an elasticity of output to total government spending in the long term is higher than that in the short term. Under assumption, Indonesia has a moderate rate in tax revenue; it implies that government spending has low efficiency. In other hand, long run elasticity of population to total government spending is about three times from its short run. Consequently, government should spend more money to provide public facility and infrastructures in the next long period. These both an increase in economic activities and population are probably as sources of unanticipated budget. In other words, unanticipated budget deficit contributes to the improvement of government spending for both operating and development yearly. It gives a sign that the government has fallen into the fiscal trap in the long term, where an expansive fiscal policy has created a higher deficit that come from its shocks. Overall, this research

supports the existence of vicious circle of budget deficit-government spending-budget deficit.

## CONCLUSION

This paper identified the effect of multi period of budget shocks on government spending using an alternative shock absorber model. The main purpose of this research was to elaborate the existence of the effect of budget shock on the growth of government spending. Three separated models were estimated, namely government spending for operating, government spending for development, and total government spending. The results of estimation gave several information of government spending growth in Indonesia. In general, this paper gave information about the determinants of government spending growth in Indonesia; there are gross domestic product, population, and shock variables. As one of the dynamic models, the uniqueness of this model were in capturing the short and long run behaviour of government spending and in providing the role of multi period shock on government spending growth.

The empirical model showed that real GDP, population, and multi period of budget shock variables are statistically significant in all government spending models. In addition, the respond of GDP and population to government spending increased from short term to long term period. This paper also highlighted that an elasticity of output to total government spending in the long term is higher than that in the short term. Interpreting the coefficients, the elasticity of these independent variables to government spending in the long term was higher than that in the short term. In other hand, long run elasticity of population to total government spending is about three times from its short run. Consequently, government should spend more money to provide public facility and infrastructures in the next long period. Since

Indonesia had a difficulty in increasing tax revenue, and government spending has low efficiency, these led the government has fiscal burden in next year's.

The multi period of shock variables, as an indicator of unanticipated budget, were significant until at time lag of three. It implied the existence of the impact of budget shock accumulation to the government's decision on their spending. It could be argued that both an increase in economic activities and population were probably as sources of unanticipated budget. Under fiscal mechanism, unanticipated budget deficit contributed to the improvement of government spending for both operating and

development yearly. Generally, the effect of these shocks to fiscal performance was to create a higher deficit. It gave a sign that the government had fallen into the fiscal trap in the long term, where an expansive fiscal policy had created an additional deficit that come from its shocks. It infers that a cycle of budget deficit-government spending-budget deficit occurred yearly for this three decades. Overall, this research supported the existence of vicious circle of budget deficit-government spending-budget deficit. The implication of this research was that government should allocate its spending into sectors that are more productive in order to strengthen the fiscal performance.

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