

## Estimation of Indonesia's Fiscal Reaction Function

### *Estimasi Fungsi Reaksi Fiskal Indonesia*

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#### Abstrak

Kebijakan fiskal merupakan faktor penting dalam strategi pengelolaan indikator ekonomi makro. Setelah mengalami krisis keuangan, banyak negara melaksanakan kebijakan fiskal dengan sangat berhati-hati untuk menjaga tingkat utang. Tulisan ini menganalisis perilaku kebijakan fiskal Indonesia melalui pendekatan fiscal reaction function, yang menggambarkan bagaimana pemerintah merespons rasio utang terhadap Produk Domestik Bruto (PDB) dengan menciptakan keseimbangan primer dalam Anggaran Pendapatan dan Belanja Negara (APBN). Data yang digunakan adalah data triwulanan dari tahun 1990 hingga 2014 dengan menggunakan analisis Autoregressive Distributive Lag (ARDL) bound test didahului dengan breakpoint unit root test sesuai dengan karakteristik data yang tidak stationer pada level yang sama. Dapat diperoleh kesimpulan bahwa pemerintah Indonesia telah merespons peningkatan rasio utang terhadap PDB dengan meningkatkan surplus primer, yang mengindikasikan perilaku yang rasional terhadap peningkatan akumulasi utang. Indikator-indikator yang berpengaruh secara signifikan pada fiscal reaction function Indonesia adalah tingkat bunga riil, nilai tukar nominal Rupiah terhadap Dolar Amerika Serikat, dan pemilihan umum. Sebagai tambahan, untuk menjaga rasio utang terhadap PDB pada level yang aman, pemerintah juga harus mempertimbangkan variabel lain selain utang untuk mencapai kebijakan fiskal yang berkelanjutan, terutama untuk mengelola guncangan pada perekonomian.

#### Abstract

Fiscal policy is a core factor in managing macroeconomic indicators strategy. Following several financial crises, both advanced and emerging countries undertook prudent fiscal policies to maintain debt sustainability. This paper investigates the fiscal policy behaviour of Indonesia through a fiscal reaction function, which represents how the government reacts to the debt to GDP ratio by the creation of primary balance in the budget. Breakpoint unit root test is conducted due to the stationarity characteristics of data variables, hence the widely used Autoregressive Distributive Lag (ARDL) bound test is employed using quarterly data from 1990 to 2014. These results indicate that the government of Indonesia has reacted to the increase in debt to GDP by generating the primary surplus due to increase in debt accumulation which shows the well-behaved fiscal policy to maintain debt sustainability. In Indonesia's fiscal reaction function, real interest rate, nominal exchange rate to US\$, and election significantly determine the primary balance behaviour. In addition to maintaining a debt to GDP ratio at a low level, the government should also consider the other variables other than debt to achieve sustainability of fiscal policy especially in managing shocks.

## 1. INTRODUCTION

Fiscal sustainability is a challenge for most countries in the world, both for advanced and emerging countries. Ensuring that the fiscal policy is on the right track is a daunting task requiring rigorous assessment. Learning from the case of Greece, poor management of debt leads to default which can cause another problem since Greece is part of the Euro area and such a financial crisis can create effects to its counterparts (Michaelides et al., 2014, p. 18). In other words, fiscal discipline or ability to manage debt plays an important role in maintaining debt sustainability (Yoshino & Vollmer 2014, p. 342).

The risk of fiscal crisis been faced by industrialized countries and could be experienced by emerging countries as well because some emerging countries still depend on foreign countries to support economic growth. In some circumstances, this can be a vicious problem, especially under global economic uncertainty. Some emerging countries may suffer from sudden reversal of funds. Funds from foreign countries are preferable to fill the fund gap.

As part of the macroeconomic strategy, monetary policy is not the sole policy to support economic growth. Solow (2005, p. 512) initiated a discussion on the role of fiscal policy. Monetary policy is not the only policy that can help correct the economy. It needs fiscal policy to deal with medium-term problems caused by various shocks. Indonesia, as an emerging country should have a strategy to deal with debt sustainability. For emerging countries, the fiscal sustainability is expected to be put in high priority. Holding the conceptual of fiscal sustainability, emerging countries have the space for economic development.

Fiscal sustainability captures the framework of static and dynamic budget constraint theoretically (Akyüz, 2007). Based on static budget constraint, current government spending is financed by revenue and fund from borrowing. The theory of intertemporal budget constraint can be determined as the present value of future primary balance is equal to outstanding debt accumulation which satisfies the concept of solvency. Hence, the value of primary balance should be positive if there is a debt in present time. It ensures the fiscal stability of emerging countries which have high risk perception and vulnerability in the economy.

Considering the nature of emerging countries that still need sources of the fund including foreign borrowing, Indonesia has to create a strategy to improve the economy without jeopardizing sustainability, especially for creating fiscal space in the budget to provide allocation budget to develop the economy. This requires a technical strategy to assess debt sustainability.

A fiscal reaction function is one of a commonly used method to assess debt sustainability. This method is derived from a basic model of intertemporal budget constraint (Bohn, 1998, p. 951) which investigates the reaction of primary surplus with respect to a change in debt accumulation of the US. This model became popular and many scholars used it for debt sustainability assessment for industrialized, developing, and even low-income countries. Furthermore, this model satisfies the dynamic concept of sustainability and emphasizes the primary surplus with respect toward indebtedness.

In this study, the fiscal reaction function of Indonesia is investigated with the identification of fundamental determinant which also affect the reaction of fiscal policy. Quarterly data from 1990 to 2014 is employed to ascertain the nexus between debt accumulation and primary balance. This study also evaluates the behavior of fiscal policy in Indonesia in accordance with the concept of fiscal sustainability. The finding shows that Indonesia has a sustainability strategy to ensure a safe level of debt accumulation. The real interest rate, nominal exchange rate, and elections are identified as the variables which affect the fiscal policy reaction in response to indebtedness.

The structure of this paper is as follows. The remainder of reviews of previous studies is in Section 2. Section 3 explains the method and data. This is followed by the results and analysis of empirical research in Section 4. Section 5 concludes and proposes several policy recommendations.

## 2. PREVIOUS STUDIES

### 2.1. Fiscal Reaction Function

Basic concepts of fiscal reaction function can be understood from the Ricardian regime of fiscal policy. The Ricardian regime is defined as a regime with the well behaved government which ensures the liabilities constantly by generating revenue in the future to match an increase in government spending in the previous period (Afonso, 2008, p. 314). Capturing the time dimension involves the intertemporal approach in explaining the debt dynamics conception. This model also includes the limitation of the budget. The concept of the intertemporal budget constraint is motivated by tax smoothing models which explain the significant relationship between debt and primary surplus (Barro, 1979, p. 949). Fischer and Easterly (1990, p. 135) emphasize the primary deficit as a key factor to understand the debt dynamic intuitively. A persistent primary deficit may lead to the debt explosion since its number is higher than the amount of seignorage, hence the number debt ratio can rise without limit. The basic concept of public debt dynamics ensures the importance of primary balance towards debt accumulation.

A fiscal reaction function model has been proposed by Bohn (1998, p. 950) which shows how the government reacts to public debt accumulation in the case of the United States. The model originates from an intertemporal budget constraint of government. The dynamics of models the government finance is:

$$D_{t+1} = (D_t - S_t) \times (1 + R_{t+1}) \quad (1)$$

where  $D$  denotes debt,  $S$  denotes tax minus non-interest spending, and  $R$  is the interest rate. Debt in the next period is the difference between debt and non-interest spending and is the so-called primary balance multiplied by the gross interest factor. Equation 1 shows that the primary balance is an important factor in reducing recent debt. If the primary surplus is small, the debt in the next period will be higher. Consequently, the debt is accumulated and tends to explode in the long run, if it is not repaid by primary surpluses. Following this, the model has been developed by incorporating output or income in the equation to adjust for the growing economy with growing revenues and expenditure, hence the form is in ratio. Thus, the equation is written as:

$$d_{t+1} = (d_t - s_t) \times x_{t+1} \quad (2)$$

where  $d$  denotes ratio of debt to output (debt to GDP ratio) and  $s$  denotes primary balance to GDP ratio. While  $x$  represents the ratio of gross return of government debt to the gross growth rate of output.

In this study, the model of primary balance is developed. The aim is to find the systematic relationship between primary balance and debt accumulation. Additionally, other determinants are incorporated in the model to avoid inconsistency in the result and estimation due to omitted variables (Bohn, 1998, p. 951).

A fiscal reaction function has been used in debt assessment for many countries. Bohn (1998) found that there is a positive relationship between primary balances and debt to GDP ratio in the US (p. 956). The primary balances will increase in response to an increase in debt to GDP ratio. Other authors have used a similar baseline model for estimation of the fiscal reaction function for the emerging countries. Ostry and Abiad (2005) conducted panel-data analysis for emerging countries. They incorporated other determinants as independent variables which are potentially important in emerging countries including commodity prices, oil prices, inflation, and elections which are important for presidential countries. They found that emerging countries respond positively to debt accumulation. Other relevant economic indicators include business cycle, inflation, commodity and oil prices. Mendoza and Ostry (2005, p. 1088) also found the similar results. The response of primary balance is 3.6 basis points while the response of the industrialized economy groups is estimated 2 basis points. Although there is a different level of response between emerging and industrialized

countries, the response of primary balances to debt is generally positive (Mendoza & Ostry, 2008, p. 1088). In other words, the government reacts to a debt increase by using primary balance adjustment.

Research on fiscal reaction function has also been developed for others specific country case. De-Mello (2005) found a positive relationship of primary balance and debt accumulation in Brazil. Similar results were found by Budina and Wijnbergen (2008, p. 136) for the case of Turkey, Burger et al. (2012, p. 217) for South Africa, Nguyen (2013) in the case of India, Asiama et al. (2014) for the case of Ghana and Lestari (2014) for the case of Indonesia. All the models have been developed from Bohn's model with additional variables. The difference is in the variable determinants which are specified specific characteristic countries.

Lestari (2014) found that Indonesia has run a sustainable strategy for debt. For every 1% increase of debt, the primary balances increase 0.046%. However, simplifying the model may lead to inaccuracies while the budget Indonesia can be affected by the other factors due to its characteristics. Nguyen (2013) found that interest rates level affects India's fiscal policy in addition to debt and the output gap. Asiama et al. (2014) examined the electoral effect captured in the model using dummies for the parliamentary and presidential election. This study seeks to analyse the behaviour of Indonesia's fiscal policy through primary balances of state budget towards the debt position and identify other factors that affect the behaviour of fiscal policy. The other determinant should also contribute to the behaviour of government toward debt in Indonesia. These factors include interest rate, inflation, exchange rate, oil and non-oil commodity price, output gap, and electoral effects.

A model of fiscal reaction function of Indonesia has been developed by Lestari (2014) employing a Vector Error Correction Model (VECM). Using annual data from 1992 to 2012, she found a positive relationship of primary balance with lagged debt. The model specification is a primary balance as the dependent variable and debt to GDP ratio and the output gap is the independent variables. For every increase of 1% of debt to GDP ratio, the primary balance reacts by increasing 4.6 basis points, while the coefficient of output is positive and statistically insignificant which represents weak pro-cyclical fiscal policy.

The results show that the government of Indonesia has already run a debt sustainable strategy. A primary balance increases to respond the debt accumulation in the previous year. By generating the primary balance, the government pays down the debt and maintains the debt through fiscal policy at a safe level. This response is a strategy to avoid debt exploding in the long run. In addition, the factors that determine Indonesia's primary balances are the lagged of primary balances themselves, debt accumulation, exchange rate, real interest rate, and elections. These determinants are also important and need to be controlled because of they also potentially affect the response of the primary balance, especially for the variable which can produce shocks.

## 2.2. Debt Profile of Indonesia

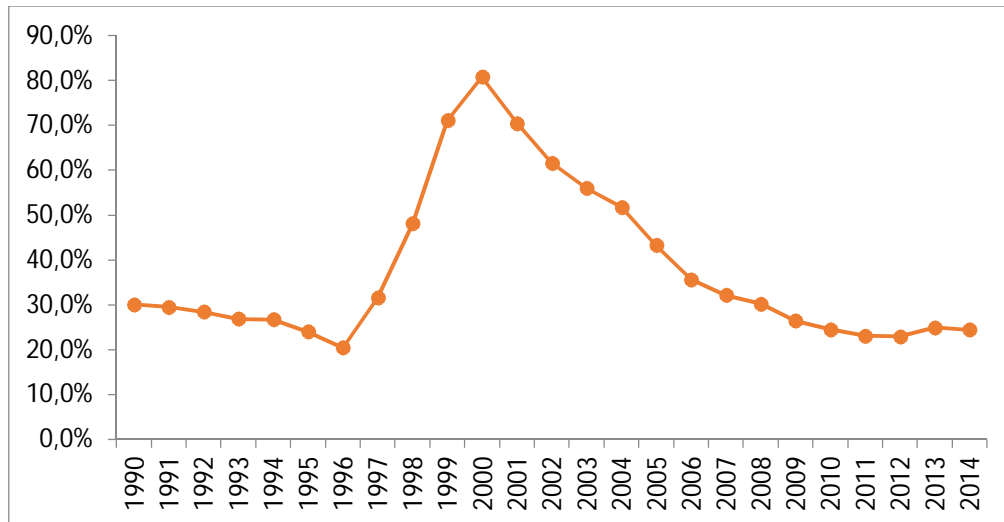
In the 1990s, Indonesia had the relatively low debt ratio to GDP hovering around 20-30%. However, this increased in the period of Asian financial crisis in 1998. In this period, Indonesia and Thailand were the countries severely hit by the crisis. Moreover, there was a multidimensional crisis because of political instability. The nominal debt accumulated of Indonesia increased from 49% to around 90% in 2000. This nominal change of debt, especially for external debt, was caused by the large depreciation of Rupiah to US Dollar. In this period, Indonesia also changed the exchange regime from pegging the currency to free-floating.

After having experienced the Asian financial crisis, Indonesia conducted a macro strategy to pay down the debt. There was a significant improvement in managing debt to achieve sustainability. The debt to GDP ratio gradually declined and continued to decrease until around 24% in 2014 from the high level of debt in the early 2000s. The prudent action of the government to reduce the debt shows the effort of the government of Indonesia to maintain the level of debt during the crisis periods.

The government also diversified the debt structure both of external and domestic debt. The diversification of debt source from domestic with domestic currency denomination can help reduce

the currency risk due to excess depreciation that may lead to uncontrolled debt. Indonesia officially passed the 2003 State Financial Law which stated that the ratio debt to GDP can not exceed 60% and budget deficit's limit is maximum 3% ratio to GDP. This threshold is set in accordance with Maastricht Treaty which is for the Euro area countries. If the level of debt or budget deficit of Indonesia exceeds the limits, there would be a revision of the budget or special occasion to deal with this problem. This threshold can guide Indonesia to follow sustainability of fiscal policy.

**FIGURE-1: Debt to GDP Ratio Indonesia, 1990-2014**



Source: Ministry of Finance of Indonesia (2015)

### 3. METHOD

#### 3.1. Model and Specification

In this paper, a model of primary balance is developed from Bohn's fiscal reaction function model. The aim is to find the systematic relationship between primary balance and debt accumulation in the case of Indonesia, considering other fundamental factors both economic and non-economic. These additional factors avoid bias due to omitted variables. The reduced form of the model is specified as:

$$s_t = \rho \cdot d_t + \alpha \cdot Z_t + \varepsilon_t \tag{3}$$

where  $s$  denotes primary balance or revenue minus non-interest expenditure,  $d$  is debt accumulation to GDP ratio,  $Z$  denotes the vector of the other determinants which varies across countries and  $\varepsilon$  is for the error terms. In this study, eight chosen variables are incorporated in the model to explain the behavioural impacts. These variables are considered as potential determinants which drive the reaction of the primary balances. Thus, the final fiscal reaction function becomes:

$$PBR_t = \alpha_0 + \alpha_1 DEBTR_{t-1} + \beta_1 GAP_t + \beta_2 INFL_t + \beta_3 RIR_t + \beta_4 LNER_t + \beta_5 WTI_t + \Delta_1 DEL + \Delta_2 DAFC + \Delta_3 DGFC + \varepsilon_t \tag{4}$$

where  $PBR$  denotes primary balance to GDP ratio,  $DEBTR$  is debt accumulation to GDP ratio,  $GAP$  represents output gap,  $INFL$  is inflation,  $RIR$  denotes real interest rate, and  $WTI$  represents the West Texas Intermediate crude oil price. There are also 3 dummy variables;  $DEL$  which denotes the dummy for election,  $DAFC$  is the dummy for Asian Financial Crisis, and  $DGFC$  is the dummy for Global Financial Crisis. In addition, each of coefficients represents the impact of each relevant variable in the model and  $\alpha_0$  denotes the intercept. The coefficient of lagged debt to GDP ratio is denoted by  $\alpha_1$ . For other additional determinants, the impacts are represented by the coefficients  $\beta_1$ ,  $\beta_2$ ,  $\beta_3$ ,  $\beta_4$ , and  $\beta_5$  for the variables of the output gap, inflation, real interest rate, nominal exchange rate and  $WTI$  oil price respectively. The coefficients  $\Delta_1$ ,  $\Delta_2$ ,  $\Delta_3$  represent the implication of the

presidential and parliamentary elections, the Asian Financial crisis, and the Global Financial Crisis respectively.

Other variables are: output gap which is added to right hand side to accommodate the government policy of demand stabilization in the short term (Bohn, 1998, p. 951) as well as inflation and interest rate which are added to capture the monetary impact on primary balance. It acknowledges the relation between fiscal and monetary policies (Nguyen 2013). In this model, the interest rate is used in the form of real interest rate.

In Indonesia's budget structure, exchange rate and oil price are also considered. The exchange rate change can lead to pressure because of Indonesia, as an emerging country, still requires more foreign funds. In other words, it captures the impact of external debt services. The exchange rate variable is the value of the domestic currency relatively compared to the US dollar. Since Indonesia has also gained revenue from natural resources, especially oil, an oil price indicator is considered to be incorporated in the fiscal reaction function model. The WTI crude oil price is chosen as a representative benchmark as a proxy for the crude price oil in Indonesia.

In this study, Indonesia's fiscal reaction function model considers the electoral effects because the government of Indonesia has a presidential system where every five years Indonesia carries out elections for the president and for the parliament members also. These elections have the potential to result in budget overruns. The other dummy variables capture the effects of the crisis period on fiscal balance. The Asian and Global Financial Crises are incorporated because they could affect the budget structure in these periods and in the post-crises periods.

### 3.2. Data

Quarterly data 1990Q1 to 2014Q4 is employed in this study. These data are obtained from the Ministry of Finance of Indonesia, Bank Indonesia, Badan Pusat Statistik Indonesia or Statistic Indonesia Agency. Some supporting data is taken from Bloomberg and Federal Reserve Economic Data (FRED). Table 1 shows the overall data sources.

TABLE-1: Source of Data

Data	Source
Primary Balance	Ministry of Finance
Nominal Debt	Ministry of Finance
Nominal GDP	Ministry of Finance
Output Gap	Ministry of Finance generated by Hodrick-Prescott (HP) Filter
Inflation	Statistics Indonesia
Exchange Rate	Bank Indonesia
Real Interest Rate	FRED
WTI oil price	Bloomberg

The primary balances and debt data are taken from the national budget of Indonesia. Primary balance is defined as total revenue minus total expenditure without interest expenditure while debt is nominal debt accumulation in 1 quarter. The primary balance and debt data are used in a ratio to GDP. The output gap is incorporated as an independent variable. It is obtained by generating value from the nominal GDP, by using the Hodrick-Prescott (HP) Filter. Output gap data is obtained by deducting the nominal GDP from this value. This study also uses selected data for the other determinants. For the monetary data, inflation and real interest rate are in percentage terms while the exchange rate is in the form of the logarithm of its nominal value. The data of WTI oil price benchmark is in US dollar terms.

In this study, the dummy for election is constructed as having a value of 1 in the fiscal year of the election. This is because of the characteristic quarterly data and annual budget cycles. The Asian

Financial Crisis is in the period from 1997Q3 to 1999Q4 while for the Global Financial Crisis is from 2008Q2 to 2009Q2.

#### 4. RESULTS AND DISCUSSION

The first step of analysis in this study is a unit root test. The unit root test is conducted to know whether data is stationary, which is useful for determining which cointegration test will be used in the next step. In order to deal with non-stationary data, a breakpoint unit root test is employed. The paper uses the Augmented Dickey Fuller and breakpoint test within the framework used by Volgesang and Perron (1998, pp. 1075-1078). The framework of cointegration analysis in this paper follows Asiana et al. (2013) and Nguyen (2013) who use the Autoregressive Distributive Lag (ARDL). The ARDL is widely used for time series data analysis. This method of analysis was introduced by Pesaran et al. (2001, p. 315) to accommodate the analysis of cointegration with different levels of integration without having a bias in the result of estimation.

##### 4.1. Unit Root Test and Breakpoint Test

Standard unit root tests are conducted before the estimation of the fiscal reaction function. The tests check whether the variables are stationary or not. The first test is the Augmented Dickey Fuller (ADF) test and the result can be seen in Table 2.

**TABLE-2: Augmented Dickey-Fuller Stationary Result Test**

Variables	5% critical value (with trend)	5% critical value (without trend)	t-statistic	Stationary
primary balance ratio (PBR)			-3.983	I(0)
debt ratio (DEBTR)			-1.120	I(1)
real interest rate (RIR)			-5.804	I(0)
log nominal exchange rate (LNER)	-3.456	-2.891	-1.544	I(1)
output gap (OUTGAP)			-5.007	I(0)
inflation (INFL)			-6.873	I(0)
WTI crude oil price (WTI)			-2.810	I(1)

Source: Author's estimation

Table 2 shows that there are three set of data that are not stationary at the level, namely debt ratio (DEBTR), log nominal exchange rate (LNER), and WTI crude oil rice (WTI). Therefore, another unit root test has to be considered. Following this, the stationarity is checked by the unit root test allowing for one trend and one intercept break. A breakpoint unit root test indicates a potential break in the non-stationary data. In this model, the breakpoint selection is obtained by minimizing Dickey-Fuller t-statistics and the break type is an innovational outlier. All these procedures can be run in E-Views 9 software.

**TABLE-3: Break point unit root result test (allowing one trend and one intercept)**

Variables	5% critical value	t-statistic	Break	Stationary
debt ratio (DEBTR)		-6.067	1999-Q1	I(0)
log nominal exchange rate (LNER)	-5.176	-8.453	1997-Q4	I(0)
WTI crude oil price (WTI)		-5.259	2004-Q3	I(0)

Source: Author's estimation

The breakpoint test result is represented in Table 3. From this table, it can be seen that the t-statistic of all variables is less than the 5% critical value which shows that by considering a structural break, the data is stationary at level. After this, a new variable as the break is introduced which

contains the break date from all individual breakpoint selection tests. The date breaks considered as the time will be incorporated in a break variable. However, the date break of debt ratio and exchange rate, cover the period of the Asian Financial Crisis. Hence, the break consists of only the date break of WTI variables. After this test, the data is available for the next analysis in estimating the fiscal reaction function by using ARDL along with the new variable of a break.

#### 4.2. Fiscal Reaction Function

The ARDL is commonly used in macroeconomic time series analysis. This model works well with stationary data. In this ARDL analysis, the data are analysed considering one structural break. The lag length criteria and model selection is considered by Akaike Information Criteria (AIC). This study also examines the existence of the long run relationship among the relevant variables. The results are represented in Tables 4 and 5. The ARDL analysis results in the optimal selection with the order ARDL (3, 4, 3, 0, 0, 1, 0). The order of the model represents the optimal model for each variable.

From the result, it can be seen that the fiscal reaction function of Indonesia is determined by the lagged the dependent variable itself, the lagged debt to GDP ratio, real interest rate, exchange rate (domestic currency to dollar US), and elections, which are all statistically significant. While output gap, inflation, and WTI oil price are statistically insignificant. The bound test shows that the model cannot reject the null hypothesis which means the existence of the long run relationship. The F-statistic is larger than the critical value of upper or I(1) bound at a significance level of 1%. The result is presented in the Appendix.

##### 4.2.1. Lagged Primary Balance and Debt to GDP Ratio

The lagged primary balance to GDP ratio is negatively correlated with the primary balance to GDP ratio. This shows that the previous debt influences the following fiscal policy. If there is an increase in the previous primary balance, the primary balance decreases. The government reacts in a stability inducing manner three periods after the fact. The coefficient of the first period lag is positive.

**TABLE-4: Results of ARDL analysis**

Variable	Coefficient	Standard Error	t-statistic
PBR(-1)	-0.411***	0.108	-3.791
PBR(-2)	-0.425***	0.095	-4.461
PBR(-3)	-0.270***	0.101	-2.676
DEBTR	-0.023	0.016	-1.411
DEBTR(-1)	0.023	0.020	1.135
DEBTR(-2)	-0.032	0.022	-1.471
DEBTR(-3)	0.003	0.023	0.113
DEBTR(-4)	0.047***	0.015	3.090
GAP	0.000	0.000	0.526
GAP(-1)	0.000	0.000	0.018
GAP(-2)	-0.000	0.000	-0.255
INFL	-0.001	0.000	-1.085
RIR	0.002**	0.001	2.379
LNER	-0.084***	0.025	-3.383
LNER(-1)	0.076***	0.027	2.848
WTI	-0.000	0.000	-1.099
DEL	-0.019***	0.007	-2.952
DAFC	0.058***	0.016	3.514
DGFC	0.027**	0.012	2.326
BREAK	-0.003	0.021	-0.142
C	0.078	0.054	1.430

Notes: \*\*, & \*\*\* denote 10, 5, & 1% significance level

Source: Author's estimation

The government responds to the debt to GDP ratio aggressively through increasing the primary balances. Primary balances react to the increase of debt in the four previous quarter periods. This shows that the level of debt in 1 previous year is responded by the increase in the primary balances. When the debt to GDP ratio increases by 1%, the primary balances to GDP ratio respond by increasing 0.047%. This is similar to the result of Lestari (2014) who finds a reaction of 0.046%. This number is even higher than the reaction compared to other countries. An increase in debt by 1% of GDP is associated with an increase in 0.030% in Brazil (De-Mello 2005), 0.040% for South Africa (Burger et al. 2012), and 0.016% in Ghana (Asiama et al. 2014). This number is also higher than the result found by Mendoza and Ostry (2008) in their panel-data estimation of fiscal reaction function for emerging countries. Their research found the reaction for emerging countries is 0.036% on average. The strong response of primary balance towards debt accumulation represents the fiscal policy requirement in the vulnerable and riskier economy (Mendoza & Ostry 2008, p. 1093). The reaction becomes critical because it also denotes the strength of the budget to prevent a debt explosion. The debt to GDP ratio reduction can be determined by the size of a fiscal adjustment (Ardagna 2004, p. 1047).

For the long run, there is a positive relationship between primary balances and the debt ratio but with a lower magnitude around 0.8 basis points. It can be concluded that the government of Indonesia has run the fiscal sustainability strategy to react properly towards the indebtedness. Even though the relationship in the long term is weak, the positive sign ensures the effort of government to generate the primary surplus and pay down the debt. This describes the behaviour of primary balances to avoid debt explosion in the long run in accordance with the principle of fiscal sustainability. The relationship shows that primary surplus ensures that there are more resources after paying the interest payment to pay down the debt principal (Feridhanusetyawan & Pangestu 2003, p. 149).

**TABLE-5: Long Run Relationship Results**

Variable	Coefficient	Standard Error	t-statistic
Debt to GDP ratio	0.008**	0.003	2.554
Output Gap	0.000***	0.000	2.829
Inflation	-0.000	0.000	-1.094
Real Interest Rate	0.001**	0.000	2.357
Log Nominal Exchange Rate	-0.004	0.003	-0.917
WTI oil price	0.000	0.000	-1.116
Dummy Election	-0.009***	0.003	-3.240
Dummy AFC	0.027***	0.008	3.586
Dummy GFC	0.013**	0.005	2.426
Break	-0.001	0.010	-0.142
C	0.037	0.026	1.442

Notes: \*, \*\*, & \*\*\* denote 10, 5, & 1% significance level

Source: Author's estimation

#### 4.2.2. Other Determinants

In addition to debt variable, this study also examines other fundamental determinants which potentially affect the primary balances behaviour. These other determinants must be incorporated in the model to avoid an inconsistency on results estimation due to the omitted variables (Bohn 1998, p. 951). For a specific country case, the determination of additional variables is important because it may differ across countries (Celasun et al. 2006). From six additional variables which are incorporated in the model, only three independent variables are statistically significant and influence the independent variable. These variables are the real interest rate, exchange rate, and election year, while output gap, inflation, and an oil price of the WTI are insignificant which is associated with weak impacts.

Real interest rate is positively correlated with the primary balance ratio to GDP. The direction between these two variables is similar because the nexus is positive. If the real interest rate increases by 1%, the primary balance ratio will also increase by 0.002%. This shows that the primary balance

reacts to the higher real interest rate which leads to higher interest of debt services. This indicates that greater fiscal effort is needed to guarantee sustainability fiscal. In addition, conversely, if the real interest rate is low, it is associated with lower borrowing cost. Likewise, in the short-term, real interest rate also affect in the long term.

Regarding of exchange rate, the nominal exchange rate affects the primary balance. Depreciation of Indonesian Rupiah to the US dollar by 1% leads to worsening by 0.03% of the primary balance. Although the coefficient is significant only at 10% level, currency depreciation influences the budget through revenue and expenditure. Depreciation of the currency will improve the revenue, especially from natural resources. However, on the spending side, fuel subsidies which are from import can be an important factor causing excess on government spending. Generally due to depreciation, an increase in nominal spending exceeds the nominal total revenue. Currency depreciation also changes the structure of external debt which is denominated in foreign currencies. Therefore, the exchange rate of the Rupiah to the US Dollar is a useful indicator in budget alteration. However, in the long run, the impact of the exchange rate is not significant. This means that the effect of changes in exchange rate appears only in the short run. This can be in the form of impacts. Since the exchange rate may fluctuate, it is necessary to manage the shocks to minimise the risk.

Fiscal policy in Indonesia is not driven by inflation. In the short run and long run, inflation has a negative correlation to the primary balance but it is insignificant. The negative sign of inflation shows that the higher inflation, the lower the primary balances. Inflation can be an alternative to reduce debt. Inflation may reduce the debt burden through the nominal value. Hence, if the debt decreases, it does not require fiscal effort. Thus, the relationship between primary balance and inflation is expected to be negative.

The output gap is not significant in determining the primary balance in the short run, but in the long run, it has a positive coefficient although the magnitude is small. Additionally, the positive coefficient of output gap represents pro-cyclical fiscal policy. During the Global Financial Crisis, Indonesia decided to boost spending to improve the economy.

The variable price of crude oil WTI does not affect the primary balances. The WTI crude price oil is assumed as a proxy for Indonesia's oil price. This variable is accounted for in the model because oil is an important part of revenue in the total revenue structure of Indonesia's budget. However, the price of oil does not impact on the primary balance. This might be caused by the difference of price change pattern between Indonesian oil price and the WTI. Additionally, the component of the budget which relates to oil prices is revenue from oil and gas and fuel subsidies on the expenditure side. The sign of the negative coefficient of price WTI means that an increase in oil price tends to decrease the primary balance because of the fuel subsidies from imports, while the revenue is affected less. This is in line with Indonesia's position as an oil importer country since 2004. A higher oil price is more likely to depress the primary balances rather than increase a surplus.

#### **4.2.3. Dummy Variables**

In this model, three dummy variables are introduced to cover the impact of the presidential and parliamentary elections, the period of Asian Financial Crisis, and the Global Financial Crisis. From the results, it can be seen that during the year of the elections, the primary balances are lower than in the year without election. Vergne (2009, p. 75) argues that public spending is affected by elections. Elections lead to budget overrun because there is an additional expenditure. Government spending increases for election rather than lower tax revenue (Schuknech, 2000, p. 115). A deficit is possible due to lower in direct tax revenue (Katsimi & Sarantides, 2012, p. 356) or indirect taxes (Ehrhart, 2013, p. 201). In the election, governments increase expenditure which leads to a deficit for the developing countries (Shi & Svensson, 2006, p. 1367; Ebeke & Olcer, 2013).

In the period of the Asian and Global Financial Crises, the primary balance shows a higher effort to stabilize the debt. During the Asian Financial Crisis, Indonesia maintained prudent fiscal policies even though they were severely affected rather than Thailand (Rosengard 2014). Generating a primary

surplus becomes a preferable strategy to reduce debt ratio to exit from the crisis rather than high economic growth. However, a comparison of primary balance response between the two periods of crisis shows that the reaction to Global Financial Crisis was lower than in the period of the Asian crisis. Sangsubhan and Basri (2012, p. 250) suggest that in the 2008 crisis the impacts were limited due to political stability and the floating exchange rate regime. Indonesia's economy was more resilient due to greater domestic demand (Hur et al., 2010).

## **5. CONCLUSION AND POLICY RECOMMENDATIONS**

Since fiscal sustainability has become a critical issue for developing countries, it is necessary to rigorously assess the debt sustainability to ensure its strategy to prevent a debt explosion in the long run. A fiscal reaction function is a common instrument for debt assessment which investigates the systematic relationship between primary balance and debt accumulation. Using the ARDL analysis, this paper estimates the fiscal reaction function of Indonesia and identifies the other fundamental factors determinants other than debt accumulation as the independent variables. The findings show that the government of Indonesia has run a sustainability strategy by responding to debt accumulation through generating surplus to stabilize the debt. The response represents the effort of fiscal policy in the short run and long run. This reaction avoids a debt explosion in the long run which can lead to a crisis because the primary surplus counteracts the higher debt accumulation in the previous period. A primary surplus represents the ability of government to pay down the debt principal. It also ensures the debt ratio does not increase without limit.

In Indonesia's fiscal reaction function, other determinants are also considered. Fundamental factors that also contribute to the primary balance model are the real interest rate, exchange rate, and elections. In the long run, the fiscal reaction function is determined by output gap while exchange rate does not affect primary balance. By assessing the other fundamental factors of fiscal reaction function, the government of Indonesia can identify the type of appropriate policy to undertake regarding the fiscal reaction function, especially for a policy of shocks management.

The evidence indicates that government needs to undertake appropriate policy and maintain the fiscal sustainability strategy considering the vulnerability of developing countries. This debt assessment can be useful to support a fiscal policy proposal, such as the strategy on tax policy and government spending structure. It also helps the government manage debt to achieve fiscal sustainability. A debt management policy should be a high priority to ensure the fiscal sustainability and reduce the possibility of the crisis. Indonesia has to maintain the macro strategy to support economic growth. Fiscal discipline and fiscal reform through strict rules and tight debt management will help the government keep the debt low. Imposing debt threshold in the law ensures attention to raising debt which leads to better management of expenditure and revenue. However, tight rules about debt may limit economy growing as high as the level of potential output. It requires an accurate threshold calculation to determine the maximum debt to boost economic growth optimally. It is also necessary to calculate the fiscal fatigue to measure the strength of the budget in general.

In addition, the Government of Indonesia has to put attention intensively to the important variables for fiscal reaction function, especially for managing external and internal shocks. Information about essential variables may help the government assess the sustainability problem, for example in an optimal allocation structure of foreign currency debt, and deciding policy action that should be undertaken under the certain circumstances. The detrimental variables should be highlighted for which lead to worsening the primary balance. The control for significant variables can lead to better management of the budget process. In general, this result can be used for future research related fiscal policies, especially to overcome the practical problems in the fiscal sustainability.

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**APPENDIX****ARDL Results Estimation**

Dependent Variable: PBR

Method: ARDL

Date: 11/12/15 Time: 03:33

Sample (adjusted): 1991Q1 2014Q4

Included observations: 96 after adjustments

Maximum dependent lags: 4 (Automatic selection)

Model selection method: Akaike info criterion (AIC)

Dynamic regressors (4 lags, automatic): DEBTR GAP INFL RIR LNER WTI

Fixed regressors: DEL DAFC DGFC C

Number of models evaluated: 62500

Selected Model: ARDL(3, 4, 3, 0, 0, 1, 0)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
PBR(-1)	-0.410558	0.107641	-3.814140	0.0003
PBR(-2)	-0.425512	0.094671	-4.494643	0.0000
PBR(-3)	-0.269823	0.100281	-2.690674	0.0088
DEBTR	-0.022679	0.016023	-1.415402	0.1611
DEBTR(-1)	0.022563	0.019787	1.140330	0.2578
DEBTR(-2)	-0.032589	0.021710	-1.501082	0.1375
DEBTR(-3)	0.002972	0.023079	0.128755	0.8979
DEBTR(-4)	0.046452	0.014932	3.110877	0.0026
GAP	8.54E-08	1.66E-07	0.515180	0.6079
GAP(-1)	6.64E-09	2.23E-07	0.029861	0.9763
GAP(-2)	-5.71E-08	2.16E-07	-0.264137	0.7924
GAP(-3)	3.65E-07	1.69E-07	2.155457	0.0343
INFL	-0.000465	0.000425	-1.095731	0.2767
RIR	0.001551	0.000643	2.411067	0.0184
LNER	-0.083619	0.024572	-3.402999	0.0011
LNER(-1)	0.076189	0.026585	2.865845	0.0054
WTI	-0.000207	0.000186	-1.108748	0.2711
DEL	-0.019449	0.006330	-3.072348	0.0030
DAFC	0.057758	0.016268	3.550389	0.0007
DGFC	0.026765	0.011453	2.337024	0.0221
C	0.077675	0.054099	1.435801	0.1552
R-squared	0.512839	Mean dependent var		0.012969
Adjusted R-squared	0.382929	S.D. dependent var		0.023936
S.E. of regression	0.018803	Akaike info criterion		-4.918971
Sum squared resid	0.026516	Schwarz criterion		-4.358020
Log likelihood	257.1106	Hannan-Quinn criter.		-4.692226
F-statistic	3.947658	Durbin-Watson stat		1.932549
Prob(F-statistic)	0.000007			

\*Note: p-values and any subsequent tests do not account for model selection.

**Result of Long Run Relationship Model**

## Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DEBTR	0.007939	0.003088	2.570644	0.0121
GAP	0.000000	0.000000	2.882491	0.0051
INFL	-0.000221	0.000200	-1.104585	0.2729
RIR	0.000736	0.000308	2.389690	0.0194
LNER	-0.003528	0.003843	-0.918061	0.3615
WTI	-0.000098	0.000087	-1.125776	0.2638
DEL	-0.009235	0.002719	-3.396375	0.0011
DAFC	0.027427	0.007567	3.624594	0.0005
DGFC	0.012710	0.005213	2.437828	0.0171
C	0.036885	0.025474	1.447905	0.1518

**Bound Test Result**

ARDL Bounds Test

Date: 11/12/15 Time: 03:34

Sample: 1991Q1 2014Q4

Included observations: 96

Null Hypothesis: No long-run relationships exist

Test Statistic	Value	k
F-statistic	12.51965	6

## Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	2.12	3.23
5%	2.45	3.61
2.5%	2.75	3.99
1%	3.15	4.43

**Correlogram Result**

Date: 11/12/15 Time: 03:35

Sample: 1990Q1 2014Q4

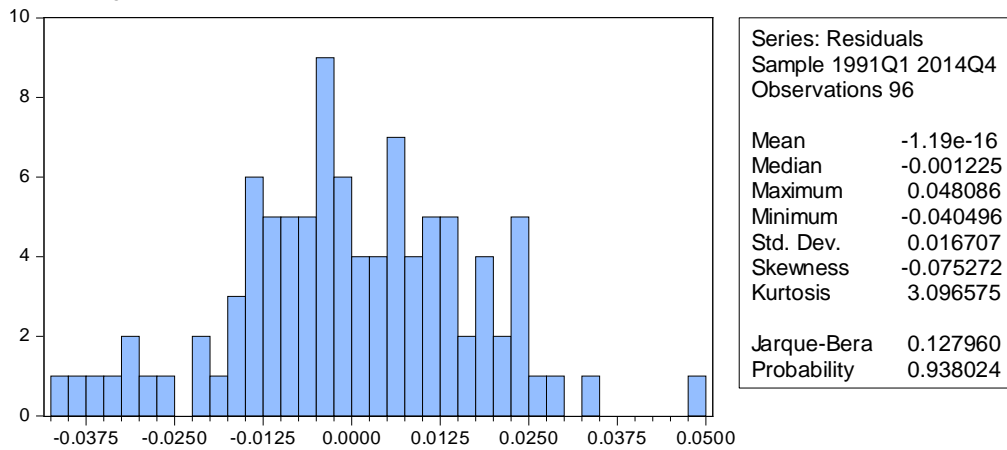
Included observations: 96

Q-statistic probabilities adjusted for 3 dynamic regressors

Autocorrelation	Partial Correlation	AC	PAC	Q-Stat	Prob*	
. .	. .	1	0.015	0.015	0.0225	0.881
. .	. .	2	-0.041	-0.041	0.1880	0.910
. .	. .	3	-0.021	-0.019	0.2306	0.973
. .	. .	4	0.055	0.054	0.5377	0.970
* .	* .	5	-0.094	-0.098	1.4599	0.918
. .	. .	6	-0.027	-0.019	1.5335	0.957
* .	* .	7	-0.069	-0.075	2.0380	0.958
. *	. *	8	0.191	0.189	5.9538	0.652
* .	* .	9	-0.092	-0.104	6.8689	0.651
* .	* .	10	-0.178	-0.174	10.326	0.412
* .	* .	11	-0.157	-0.158	13.038	0.291
. *	. *	12	0.130	0.102	14.919	0.246
* .	* .	13	-0.121	-0.109	16.588	0.219
* .	* .	14	-0.081	-0.086	17.336	0.239
. .	* .	15	-0.064	-0.082	17.817	0.272
. *	. .	16	0.127	0.043	19.700	0.234
* .	* .	17	-0.129	-0.130	21.687	0.197
* .	* .	18	-0.173	-0.179	25.278	0.117
. .	. .	19	-0.018	-0.006	25.317	0.150
. **	. *	20	0.215	0.092	31.052	0.055
. .	. .	21	0.017	0.009	31.087	0.072
* .	** .	22	-0.165	-0.230	34.536	0.043
. .	* .	23	-0.042	-0.078	34.760	0.055
. *	. .	24	0.152	0.030	37.772	0.037
. .	. *	25	0.058	0.111	38.221	0.044
. .	. .	26	-0.038	-0.039	38.414	0.055
. .	. .	27	0.072	-0.001	39.125	0.062
. *	* .	28	0.107	-0.091	40.713	0.057
. .	. .	29	0.011	0.014	40.731	0.073
* .	* .	30	-0.159	-0.076	44.348	0.044
. .	. .	31	0.017	0.024	44.389	0.056
. *	. .	32	0.177	0.063	49.005	0.028
. .	. .	33	0.024	-0.024	49.092	0.035
* .	. .	34	-0.116	-0.055	51.131	0.030
. .	* .	35	-0.034	-0.114	51.310	0.037
* .	* .	36	-0.075	-0.174	52.182	0.040

\*Probabilities may not be valid for this equation specification.

**Normality Test Result**



**Serial Correlation Test Result**

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.211291	Prob. F(4,71)	0.9314
Obs*R-squared	1.129312	Prob. Chi-Square(4)	0.8896

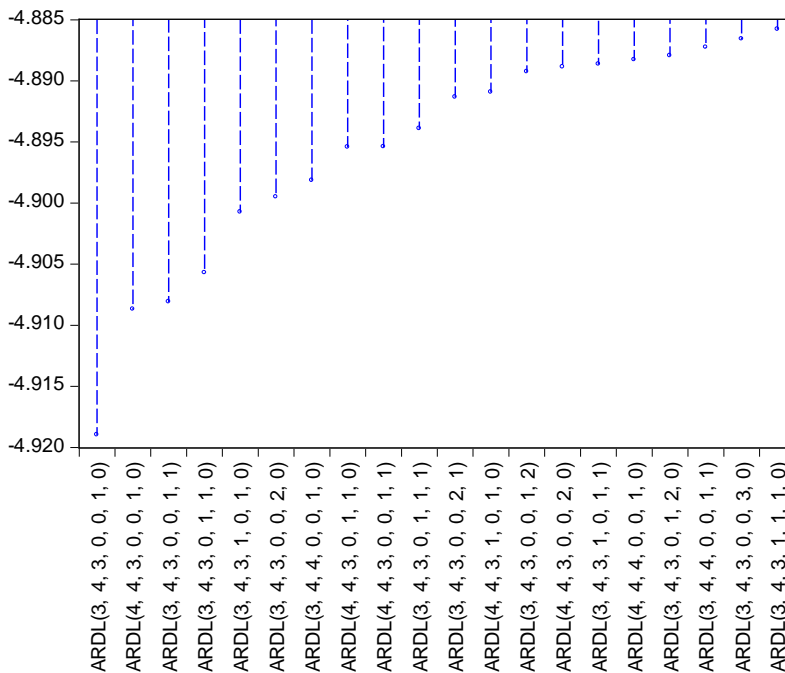
**Heteroskedasticity Test Result**

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	1.400430	Prob. F(20,75)	0.1494
Obs*R-squared	26.10292	Prob. Chi-Square(20)	0.1624
Scaled explained SS	16.70127	Prob. Chi-Square(20)	0.6723

**Model Selection Summary Table**

Akaike Information Criteria (top 20 models)



### Fitted and Residual Graph

