Jurnal Ekonomi dan Studi Pembangunan, 15 (1), 2023
ISSN 2086-1575 E-ISSN 2502-7115

Assessing Fiscal Sustainability in Indonesia

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Received: December 1, 2022; Revised: February 18, 2023; Accepted: March 10, 2023
Permalink/DOI: http://dx.doi.org/10.17977/um002v15i12023p101

Abstract

Fiscal sustainability is a concern in many economies, especially with increasing government debt in many countries, including Indonesia. This study aims to analyze fiscal sustainability in Indonesia for the 1970-2018 period. There are two methods to assess fiscal sustainability: testing the stationarity of government debt and estimating fiscal sustainability using the fiscal reaction function. Error Correction Model is used to estimate the fiscal reaction function. The fiscal sustainability test with the debt stationarity test and the fiscal reaction function had consistent results, indicating fiscal sustainability in Indonesia. The government responded well to the increase in debt by increasing the primary surplus. This study proves that the relationship between debt and primary balance is not linear or quadratic. It shows that initially, the government responds to an increase in debt by increasing its primary surplus. However, at a certain threshold, the government's ability to respond will weaken, so the government needs to pay attention and maintain the size of the government debt ratio towards Gross Domestic Product with fiscal discipline and fiscal reform through strict regulations and prudent debt management. However, strict debt regulations can limit economic growth. Therefore, an accurate threshold calculation is needed to determine the maximum debt to encourage optimal economic growth.

Keywords: *fiscal sustainability, government debt, stationarity, fiscal reaction function*
JEL Classification: E61; E62; H31; H62

INTRODUCTION

The issue of fiscal sustainability has become critical with the occurrence of the COVID-19 pandemic, which has spread to 207 countries, causing turmoil in financial markets and global economic disruption marked by the volatility index being at its highest point, the world's manufacturing and service sectors contracted at a superficial level, stock markets in developed and developing countries fell sharply, world oil prices also fell. Pressure also occurred on the domestic financial market, marked by the depreciation of the Rupiah, a decline in stock performance, and an increase in yields. Volatility in financial markets increases the risk of additional debt costs (Kemenkeu RI, 2020).

The Indonesian government has used debt as an instrument for state financing since the old order era, and the amount continues to increase yearly. After

the Asian Financial crisis in 1998, debt became a source of financing to cover the budget deficit and repay due debts.

Fiscal sustainability is when the government budget can be financed from time to time without causing an excessive increase in debt. Furthermore, fiscal sustainability is divided into static and dynamic sustainability. Static sustainability is achieved when the government can finance its budget from time to time, while dynamic fiscal sustainability is when budget financing does not encourage an increase in government debt (Adam et al., 2010).

A country's fiscal sustainability position can be seen from the primary balance.The primary balance describes the government's ability to pay principal and interest on debt using state revenues. If the primary balance is negative or there is a deficit, the government will issue new debt to pay the principal and interest on the debt. On the other hand, if the primary balance is positive (surplus), the government can use the source of state revenue to pay part or all of the principal and interest on the debt. Indonesia's primary balance has been in deficit since 2012 and continued to increase to 142.5 T in 2015, and this figure is being sought to continue to decline. In 2018 the magnitude of the primary balance deficit was 87.3 T (Kemenkeu RI, 2019).

The Government of Indonesia is committed to maintaining fiscal sustainability by enacting Law No. 17 of 2003 on State Finances, stating the budget deficit (fiscal) ratio to a maximum of 3% and a debt ratio of a maximum of 60% of GDP. However, the empirical data in Figure 1 shows that the fiscal deficit ratio fluctuated during the 2000-2018 period. For example, in 2012, it was 1.78%, then increased in 2015 to reach 2.59% and continued to decline to 1.81% in 2018. Meanwhile, the primary balance ratio since 2010 is a deficit, and the primary balance deficit reached its highest level in 2017 at 2.13%.

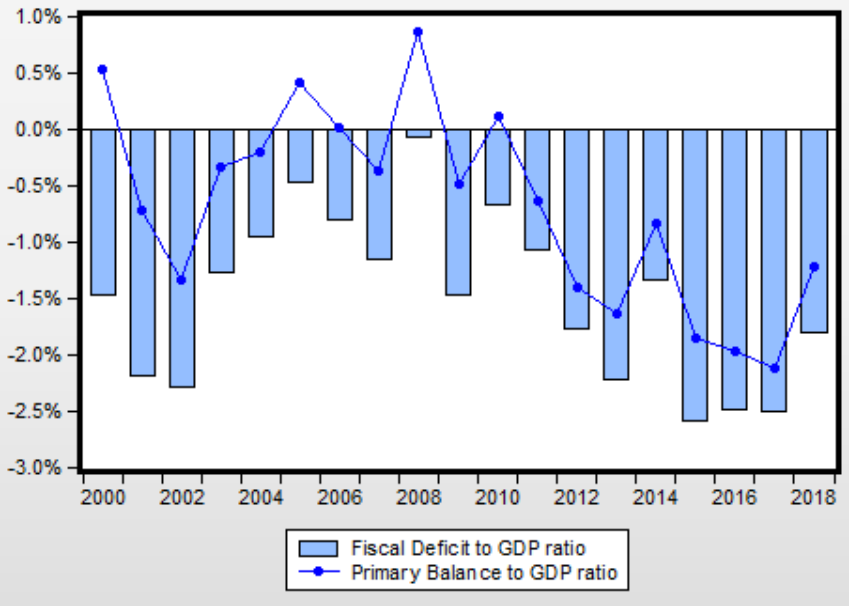

Figure 1. Development of Fiscal Deficit to GDP Ratio and Primary Balance to GDP Ratio. Source: Data processed

Government debt is intended to cover the deficit to maintain expenditures, including expenditures to increase the productivity of human resources. Although there is no consensus on the effect of government expenditures in increasing productivity on economic growth, the impact can be positive or negative. For example, several studies have found empirical evidence that the allocation of public expenditures on education, health, and infrastructure costs positively impacts economic growth, (Aschauer, 1989 and Gupta et al., 2005). On the other hand, Devarajan et al., (1996) found evidence that expenditure to increase productivity does not affect economic growth. Productive expenditure is expenditure to increase productivity of human resources are expenditure on education, health, and infrastructure (Aschauer, 1989 and Gupta et al., 2005).

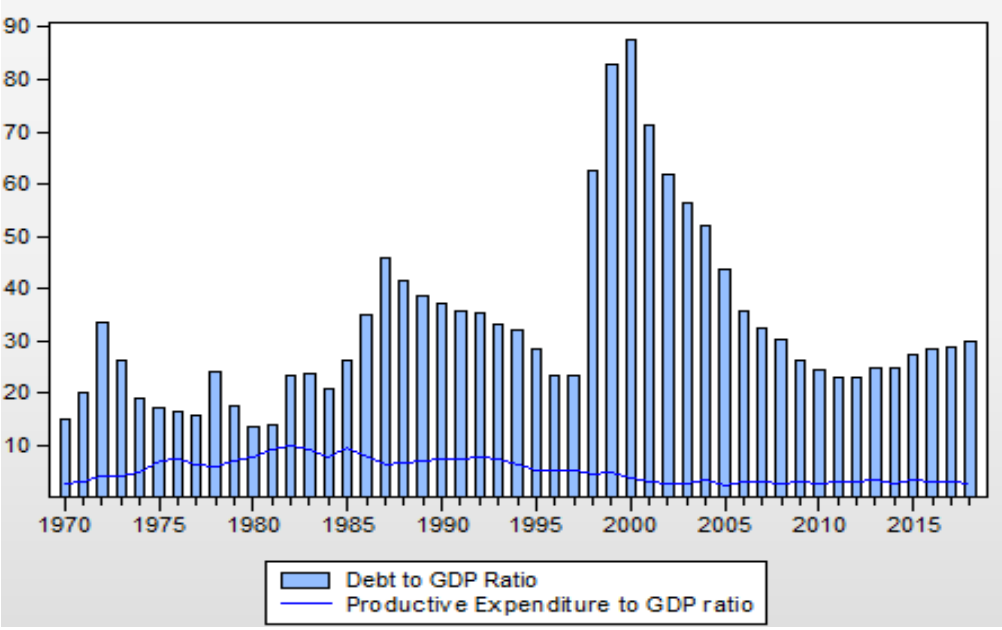

Figure 2. Debt to GDP Ratio and Productive Expenditures to GDP Ratio
Source: Data processed

Figure 2 shows the development of the government debt to GDP ratio during the 1970-2018 period. The ratio of government debt to GDP fluctuated, reaching its highest in 2000 and then experiencing a downward trend until it reached its lowest figure in 2012, namely 23%, but that figure continued to increase to 29.08% in 2018 (Kemenkeu RI, 2019a). Meanwhile, the ratio of government productive expenditures showed a downward trend and stabilized.

A high debt-to-GDP ratio that continues to grow is considered worrying. On the other hand, when there is a decrease in the debt-to-GDP ratio, it raises several assumptions. It can be due to coincidence, economic growth, or fiscal policy response factors. That can produce biased conclusions because the government implements a policy of reducing non-interest expenditures or increasing revenue, thereby preventing additional debt (Bohn, 1998; Insukindro, 2018; Pamungkas, 2016; B. Santoso, 2006).

The methods used to test fiscal sustainability include: (i) using the unit root test, testing whether the present value of discounted government debt is stationary; (ii) examining the cointegration relationship between government revenues and

expenditures in the long run; and (iii) estimate fiscal sustainability using the fiscal reaction function. This research uses first and third method to assed fiscal sustainability.

Fiscal sustainability in this study reflects the long-term relationship between the primary deficit and government debt, both internal and external debt. One way to test fiscal sustainability is to estimate the fiscal reaction function. The fiscal reaction function is used to examine fiscal policy response to changes in the debt ratio and the ratio of the primary balance to GDP.

The fiscal reaction function introduced by Bohn (1998) explains that the fiscal reaction function is a behavioral function, namely government behavior, obtained from the intertemporal budget constraint function Stoian et al., (2007) explain that the fiscal reaction function can show the government's ability to obtain a primary surplus in the short term that can meet budgetary constraints over time in the long term.

The fiscal reaction function examines the primary balance reaction to government debt and the previous year's primary balance by adding the output gap variable as a control variable to show that the government is trying to achieve short-term stabilization (Bohn, 1998; Burger & Marinkov, 2012; de Mello, 2008). Further research on the fiscal reaction function is developing the Bohn (1998) model by including the relevant control variables, both social and economic. The method used is adjusted to the studied data's characteristics and patterns. The methods that can be used include Ordinary Least Square (OLS), Vector Autoregression (VAR), General Method of Moment (GMM), and Vector Error Correction Model (VECM).

The trend of increasing government debt and fluctuations in indicators of fiscal sustainability in Indonesia have raised concerns from various parties regarding fiscal sustainability. Estimating the standard fiscal reaction function measures the response of fiscal policy to changes in government debt and the primary balance and output gap (Bohn, 1998; Burger & Marinkov, 2012; de Mello, 2008). In addition, control variables were added, including government revenues and expenditures (Adams et al., 2010; de Mello, 2008; Uctum et al., 2006), economic growth and inflation (de Mello, 2008; B. Santoso, 2006), interest rates ((de Mello, 2008; Everaert & Jansen, 2018; Pamungkas, 2016), exchange rates (Insukindro, 2018; Pamungkas, 2016). The difference between this study and previous research is that the control variable includes the productive expenditure variables of education, health, and capital.

This study aims to: 1) Analyze fiscal sustainability in Indonesia 2) estimate fiscal sustainability using the fiscal reaction function.

Hypothesis

The hypothesis proposed in this study considers the theoretical basis, empirical data, and previous empirical research. The hypothesis to answer the objective of the first method on fiscal sustainability in Indonesia during the 1970-2018 period is that during the observation period, fiscal imbalances occur in Indonesia. This answer is based on consideration of several previous research results and data on the ratio of government debt and the ratio of the primary balance to GDP. Although the ratio of government debt to GDP continues to decline, the

primary balance deficit that has occurred since 2011 shows the government's inability to pay debts using the primary surplus.

The hypothesis to test the effect of government debt variables and other macro variables on the primary balance are: Changes in the government's primary balance influenced by the primary balance of the previous year, government debt one year earlir, non-linearly by the square of the government's debt in the previous year, the output gap, the rupiah exchange rate and the productive expenditures.

METHOD

Stationarity and Cointegration Test

According to Gujarathi (2022), a variable is said to be stationary if the variable has a constant mean, variance, and autocovariance. Therefore, stationarity identification is made by testing whether the variables used in this study are stationary at {I(0)} or not stationary at {I(1)}. If the variables are I(1), then the sufficient conditions for fiscal sustainability are met, but the necessary conditions have not been met, thus requiring the following stage approach, namely the cointegration test (Bohn, 2007a, 2007b; Insukindro, 2018; Muzenda, 2014).

Fiscal Reaction Function Estimation Method

Appropriateness of data analysis techniques is very important in research. This study uses appropriate techniques to ensure robustness and explores variations in data from various aspects. The technique that can be done if the data is stationary is to use the OLS estimation method, but if the data is not stationary, use the ECM model. The data may contain simultaneity, non-linearity, or more complex interactions between the variables, so it is possible to estimate the fiscal reaction function using the VAR, GMM, and TAR models. The VAR model can describe the complexity of the interaction between variables, and estimation using GMM can be used to estimate the correlation between explanatory variables and error terms that are non-linear or simultaneous relationships (Burger & Marinkov, 2012).

From the results of the stationarity and cointegration tests, an estimation technique can be chosen to be carried out. If there is no cointegration, then the estimation is carried out by Ordinary Least Square (OLS), while the estimation technique used is Autoregressive Distributed Lag (ADL). However, if there is cointegration between the variables, the Error Correction Model (ECM) method is used, and the estimation technique used is Two Stage Least Square (TSLS).

If the cointegration test indicates that the observed variable is cointegrating, the VECM or Vector Error Corrections Model can test the policy reaction function (Bohn, 2007a, 2007b; Insukindro, 2018; Muzenda, 2014). The advantage of the VECM model is that the restricted VAR (Vector Autoregression) is designed to be used for cointegrated data and is easy to interpret for both short-term and long-term relationships. The VECM method can analyze the observed variables' behavior in the long and short term. The VECM method develops the a-theory VAR and SVAR models of Gujarathi (2022), while VECM is built on the theory.

Government Debt Stationarity Test Approach

One method to measure fiscal sustainability is to test debt stationarity using government budget constraints (Adams et al., 2010; Uctum et al., 2006).

The hypotheses on the debt stationarity test are H_o: the debt pattern does not tend to return to the average value (not stationary); H_a: the debt pattern tends to return to the average value (stationary).

Fiscal policy is considered sustainable if the unit root test null hypothesis is rejected or the alternative hypothesis is accepted, showing a stationary debt pattern with no trend (zero-trend) or negative trend. A stationary debt pattern has an average value and variance constant over time or moves steadily and converges around its average value with a specific range (slight deviation). The stable debt pattern shows that fiscal sustainability conditions are met.

Estimation of Fiscal Reaction Function

Fiscal Reaction Function Estimation Model

The second stage of analyzing fiscal sustainability is to estimate the fiscal reaction function. This function is the behavioral equation of the observed fiscal variables with other applicable macroeconomic variables and fiscal and economic conditions.

Fiscal sustainability in this study reflects the long-term relationship between the primary deficit and government debt, both internal and external debt. Burger & Marinkov (2012) measure fiscal sustainability using a fiscal reaction function approach. Burger & Marinkov (2012) refer to Bohn (1998), explaining that the fiscal reaction function is a behavioral function, namely government behavior obtained from the intertemporal budget constraint function. Stoian et al. (2007) explain that the fiscal reaction function can show the government's ability to obtain a primary surplus in the short term that can meet budgetary constraints over time in the long term.

The estimation model used is an error correction model (ECM). The use of the ECM model requires two conditions: the data is not stationary at the level but stationary at the same degree of integration or in the same order, and the variables are cointegrated. The ECM model is used to see the short-term and long-term effects and to test the suitability of the empirical model with economic theory. The empirical model used is:

Long term equation

$$s_t = \alpha_1 + \alpha_2 s_{t-1} + \alpha_3\, d_{t-1} + \alpha_4\ \hat{y}_t + \alpha_4\, d_{t-1}^2 + \alpha_5\, X_{1t} + \alpha_6\, X_{2t} + \alpha_7\, X_{3t} + \varepsilon_t$$

Short Term Equation

$$\Delta s_t = \alpha_1 + \alpha_2 \Delta s_{t-1} + \alpha_3\, \Delta d_{t-1} + \alpha_4\ \widehat{\Delta y}_t + \alpha_4\, \Delta d_{t-1}^2 + \alpha_5\, \Delta X_{1t} + \alpha_6\, \Delta X_{2t} + \alpha_7\, \Delta X_{3t} + ECT_{t-1} + e_t$$

Information:

s_t : ratio of primary balance to GDP
d_{t-1} : ratio of government debt to GDP
$\hat{y}_t$: output gap
X_{1t} : ratio of productive expenditures to GDP
X_{2t} : Rupiah exchange rate
X_{3t} : Inflation

ε_t, e_t : error term
ECT_{t-1} : error correction component
α_1 : Constant
α_{1-7} : regression coefficient

Error Correction Model (ECM)

According to Gujarati and Porter (2012), a regression between two non-stationary variables will get a spurious estimate. However, if the two variables are cointegrated, the linear regression between the two is not spurious. Two variables are cointegrated if, in the long term, there is a long-term relationship or equilibrium between the two. The cointegration test is a test of the possibility of a balanced long-term relationship between variables in the econometric model.

Data

This study uses secondary data from the 1970-2018 period obtained from various sources.

The description of each variable is as follows:

1) The fiscal reaction function is defined as a behavioral function that describes the government's response to changes in the debt-to-GDP ratio by creating a primary balance in the State Revenue and Expenditure Budget (Pamungkas, 2016; Stoian et al., 2007).
2) The primary balance is the difference between government revenues and expenditures, excluding interest payments on debt (Ministry of Finance, 2020). The primary balance shows the government's ability to pay interest and principal debt using state revenues. The ratio of the primary balance to GDP, denoted by GDP s_t:

$$s_t = \frac{Primary\ balance_t}{Total\ Gross\ Domestic\ Product_t} x100\%$$

Data obtained from the Ministry of Finance.

3) Government debt is debt as a whole, including government debt, central bank debt, and debt of State-Owned Enterprises[1] (Suspi, 2014). The ratio of Government Debt to GDP, denoted *d*, is the ratio of total government debt, both domestic and foreign, to GDP.

$$d_{t-1} = \frac{Total\ government\ debt_{t-1}}{Total\ Gross\ Domestic\ Product_{t-1}} x100\%$$

Data obtained from International Financial Statistics.

4) The value of the output gap is obtained from nominal GDP using the Hodrick-Prescott (HP) filter. Economic fluctuations can be shown by measuring the

[1] Public debt is the obligation of the government, central bank and state-owned enterprises to residents and non-residents. However, based on the legal aspects that apply in Indonesia (Constitutional Court Decision No.77/PUU-IX/2011 dated 17 September 2012) it is stated that BUMN is a business entity that has assets separate from state assets, so that the authority to settle BUMN debt is subject to the Act. Limited Liability Company No. 40 of 2007. Thus, the debt of SOEs is not legally a public sector debt (Suspi, 2014).

difference between actual output Y_t and potential output Y_t^p, the result is the output gap $\hat{Y}_t$, calculated by the formula:

$$\hat{Y}_t = \frac{Y_t - Y_t^p}{Y_t^p} \text{ x}$$

The output gap is the difference between potential output and actual output. One method that can be used to calculate the potential output is the Hodrik-Prescott (H-P) filter.

5) Productive expenditures are government expenditures aimed at education, health, and capital. The ratio of Productive Expenditures to GDP (X_{1t}):

$$X_{1t} = \frac{Total\ Government\ Expenditure\ for\ education,health\ and\ capital_t}{Total\ Gross\ Domestic\ Product_t} x100\%$$

Data were obtained from the Indonesian State Revenue and Expenditure Budget (*APBN*) Year 1969/1970 to 2004 and Central Government Financial Statements (*LKPP*) Year 2004 to 2019.

6) Inflation is inflation that is calculated using the Consumer Price Index.

$$X_{2t} = \frac{IHK_t - IHK_{t-1}}{IHK_t} x100\%$$

Data obtained from Bank Indonesia.

7) Exchange rate of US$ to Indonesian Rupiah (X_{3t}). Data obtained from Bank Indonesia

RESULTS AND DISCUSSION

Stationarity Test of Government Debt to GDP Ratio Variable

In this study, fiscal sustainability testing was carried out in two stages. The first stage is carried out by unit root testing, and the second is the fiscal reaction function.

Table 1. Stationarity Test Results of Government Debt Ratio to GDP (At Level)

	Augmented Dickey-Fuller (ADF)		**Philip-Peron (PP)**	
		Lag		**Lag**
Trends and Intercepts	-2,9073 (0,17)	1	-2,2036 (0,48)	2
Intercept	-2,8592 (0,06)	4	-2,2695 (0,18)	2
None	-0,8981 (0,32)	2	-0,7524 (0,39)	4

Note: *significant at 10%, **significant at 5%, ***significant at 1%
Source: Data processed

The results of the stationarity test of government debt variables using the ADF and PP tests are presented in Table 1. These results indicate that the value of the variable ratio of government debt to GDP is not stationary. According to research by Adams et al., (2010); Chen, (2006); and Uctum et al., (2006), the use of the standard unit root test to test the stationarity of the debt-to-GDP ratio has a weakness due to the possibility of extraordinary events such as the economic crisis affecting the test results. Therefore, a unit root test was carried out with endogenous

breaks (breakpoint unit root test) to check whether stationarity occurs when the break (economic shock occurs) is considered. Unit root test use Zivot and Andrews procedure (ZA) with the *trend* specifications are *intercept* and *trend and intercept*; while the *break* specification are *intercept, trend and intercept*, and *trend*

The results of the unit root test with endogenous breaks (breakpoint unit root test) are presented in Table 2. The ADF (minimize Dickey-Fuller t-statistic) value in the Break Specification: trend and Trend and Intercept ADF coefficient is less than the critical value or statistically significant or null hypothesis is rejected and government debt is stationary.

Table 2. Stationarity Test Results of Government Debt Ratio to GDP with Endogenous Breaks (Breakpoint Unit Root Test)

	Trend		**Trend and Intercept**	
Break Date	**2001**	**Lag**	**1997**	**Lag**
ADF t Statistics	-4,2818*	1	-9,8349***	10
$Koef_{Trend}$ (t_{Trend})	0,5346***	1	1,0112***	10
	(2,9366)		(4,3711)	
$Koef_{IntBreak}$ ($t_{IntBreak}$)		1	35,2569***	10
			(9,6977)	
$Koef_{TrendBreak}$ ($t_{TrendBreak}$)	-1,2165***		-3,0106***	10
	(-2,9053)		(-8,3257)	

Note: *significant at 10%, **significant at 5%, ***significant at 1%
Source: Data processed

Based on trend analysis, the trend coefficient value (*Koef.Trend*) is positive and significant (0.5346), and the TrendBreak coefficient (*Koef.TrendBreak*) is negative and significant (-1.2165) it indicates if the break is not considered and is based on the trend coefficient means that government debt is not sustainable. However, if the break that occurred in 2001 is considered, then government debt is sustainable.

Based on Trend and Intercept analysis, the magnitude of the trend coefficient (*Koef.Trend*) is positive and significant (0.0122), and the magnitude of the coefficient of trend and *Koef.TrendBreak* break is negative and significant (-3.0106). It also means that if viewed from the trend coefficient, then the fiscal is not sustainable, but when the break occurred in 1997, it is considered that the fiscal is sustainable. According to Uctum et al., (2006), a negative trend indicates that the government is responding to debt by increasing the primary surplus. Otherwise, if the trend is positive, fiscal sustainability will not be achieved.

The negative trend of fiscal sustainability shows that the government, as a creditor, uses the primary surplus to repay the debt of the past period. Therefore, based on the test results, it can be concluded that the conditions for fiscal sustainability cannot be fulfilled. However, when the *break* in 1997 and 2001 was considered in the test, fiscal sustainability in Indonesia could be fulfilled. In other words, Indonesia had fiscal sustainability during the 1970- 2018 period if the *break* in 1997 and 2001 were considered in the test.

As a comparison of the results of research conducted by Afonso & Jalles, (2016) in 18 OECD member countries, out of the 18 countries, eight countries fulfill fiscal sustainability when *break* is considered. The eight countries are Australia, Canada, Finland, Germany, Grece, Italy, Ireland, and the United Kingdom.

Fiscal Reaction Function Test

The next stage of testing fiscal sustainability is estimating the fiscal reaction function. This estimate aims to determine fiscal policy response to government debt through adjustment of the primary balance. Besides that, it also aims to determine the effect of government debt and other variables on the primary balance. The fiscal reaction function is estimated using the error correction model (ECM) approach.

Data Stationarity Test

The estimation of time series data is based on the assumption of stationarity. If the estimated data is not stationary, the estimation results are unreasonable and invalid. It can also produce spurious regression. The spurious regression is characterized by a high R-squared (more than 0.9) for the regression of two unrelated variables so that the regression results appear valid but are not meaningful (S. Santoso, 2017).

Table 3. ADF Stationarity Test Results with Structural Breaks (Level)

Variable	Break Date	t-statistic	Lag	Trend Specification	Break Specification
Primary Balance	1999	-6,671984***	0	I	I
Government Debt	1997	-9,834875***	10	T&I	T&I
Government Debt Squared	1997	-10,72949***	0	T&I	T&I
Inflation	1997	-8,384519***	7	I	I
Rupiah exchange rate	1996	-6,582091***	0	T&I	T&I
Output Gap	1984	-6,064431***	1	T&I	T&I
Productive Expenditures	1984	-4,085606	0	T&I	T&I

Note: *significant at 10%, **significant at 5%, ***significant at 1%
I: Intercept Only, Q&I: Trend and Intercept
Source: Processed Data

Table 4. ADF Stationarity Test Results with Structural Breaks (First Difference)

Variable	Break Date	t_statistic	Lag	Trend Specification	Break Specification
Primary Balance	1998	-7,916810***	0	I	I
Government Debt	2003	-5,225815***	1	I	I
Government Debt Squared	1985	-6,077251***	1	I	I
Output Gap	2008	-7,890186***	1	I	I
Productive Expenditures	1998	-7,496281***	0	I	I
Inflation	1998	-6,324651***	10	I	I
Rupiah exchange rate	1998	-7,451024***	0	I	I

Note: *significant at 10%, **significant at 5%, ***significant at 1%
I: Intercept Only, Q&I: Trend and Intercept
Source: Processed Data

The results of the unit root test with endogenous breaks (breakpoint unit root test) at the level are presented in Table 3. The results in the table show that

there is one variable that is not stationary, namely the productive expenditure variable, so the next test is carried out, namely the first difference stationarity test.

The results of the endogenous breaks stationarity test (breakpoint unit root test) at the first difference are presented in Table 4. The test results show that all variables are stationary at the first difference, i.e., all variables are significant at the 5% significance level or reject Ho, which means the data is stationary (does not have a unit root) at the first degree of integration. Therefore, all variables are stationary (do not have a unit root), meaning the next test can be carried out, namely the cointegration test.

Cointegration Test

The results of the stationarity test that was carried out previously showed that all the variables used in this study were stationary at the first degree (first difference), so they met the requirements for the cointegration test. The cointegration test uses the Johanson cointegration test. The test is carried out with the null hypothesis (Ho), which states that there is no cointegration relationship between the dependent variable, namely the primary balance, and all independent variables. The results of this cointegration test can be seen from the value of the trace statistic and the maximum eigenvalue statistic. If the trace statistical value or maximum eigenvalue is greater than the critical value at a significance level of 5% or 1%, then the null hypothesis is rejected, and the alternative hypothesis is accepted.

Based on the results of the Johansen Cointegration Test in Table 6 The trace statistic value of the hypothesis "At most 5" is smaller than the critical value of 0.05 (9.610728 < 15.49471), so Ho is not rejected and cannot be continued in testing the hypothesis "At most 5".

Table 6. Johanson Cointegration Test Results

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized No. of CE(s)	**Eigenvalue**	**Trace Statistic**	**0.05 Critical Value**	**Probability**
None *	0.723193	205.3674	125.6154	0.0000
At most 1 *	0.648582	144.9990	95.75366	0.0000
At most 2 *	0.550131	95.84734	69.81889	0.0001
At most 3 *	0.446332	58.30376	47.85613	0.0039
At most 4 *	0.359068	30.51782	29.79707	0.0412
At most 5	0.152951	9.610728	15.49471	0.3119
At most 6	0.037756	1.808902	3.841466	0.1786

Note: The results of trace statistics show that there are six cointegrated equations
*reject the null hypothesis at 0.05 critical value
** MacKinnon-Haug-Michelis (1999) p-values
Source: Data processed

Cointegration testing can only be carried out on non-stationary variables. In this case, it is not stationary at the level. This study uses seven variables, and one of them is not stationary at the level. From the Johanson cointegrating test results above, it can be concluded that there are a maximum of four cointegrating equations. However, one variable is not stationary at the level, so the number of cointegrating equations is 4 - 1 = 3. The conclusion is that there is cointegration

between the variables. Cointegration test results show that there is cointegration between the primary balance to GDP ratio variable as the dependent variable and all independent variables. That is a prerequisite for using the estimation method with ECM.

Long-term Equation Estimation Results

This section presents the estimation results of the long-run equation fiscal reaction function. The dependent variable is the ratio of the primary balance to GDP. Meanwhile, the independent variable consists of the ratio of the primary balance to GDP in the previous year, the ratio of government debt to GDP in the previous year, the output gap, the ratio of productive expenditures to GDP, the ratio of government debt to GDP squared, inflation, and exchange rate of US$ to Rupiah.

Classic assumption test

Residual Normality Test

The test results show that the Jarque-Bera probability value is greater than 5% in the short-term equation, so the residuals are normally distributed. However, the Jarque-Bera probability value is less than 5%, so the residuals in the long-term equation are not normally distributed.

Autocorrelation

The test results using the Durbin-Watson d Test show that the d-statistic value in the short-term regression estimation results is 1.7243, and for the long-term equation 2.0628, the value is close to two, so it can be concluded that there is no autocorrelation in the first order. Meanwhile, the test results with the Breusch-Godfrey Serial Correlation LM test (BG LM test) first-order serial correlation, the Obs*R-squared value, is greater than the 5% alpha value in the short-term equation and long-term equation so it can be concluded that in the short-term equation and long-term equations do not occur first-order serial correlation.

Heteroscedasticity Test

The results of the heteroscedasticity test developed by White (White's General Heteroskedasticity Test) for short-term equations are presented in Table 12. The test results show that the value of Obs*R-squared = 12.7327 is smaller than the value of χ_8^2 = 15.5073, so the null hypothesis states there is no heteroscedasticity in the residual accepted at α = 5%. The results of the long-term equation test are presented in Table 13. The test results show that the value of Obs*R-squared = 11.1518 is smaller than the value of χ_8^2 = 15.5073, the null hypothesis that states no heteroscedasticity exists in the residuals is accepted at α = 5%.

Multicollinearity Test

Multicollinearity is the existence of a perfect, definite, or linear relationship between the independent variables in the model. If there is near-perfect multicollinearity, the regression coefficient of the independent variables has a very high standard error. The very high standard error causes the regression coefficient to be inaccurate (S. Santoso, 2017)

The multicollinearity test was carried out using a partial correlation coefficient, with the criteria for a correlation between independent variables greater

than 0.8. The results of the partial correlation test show that there are variables with correlation coefficients > 0.8, namely between the US$ exchange rate variable against the Rupiah and inflation. Therefore, corrective steps are carried out by not using variables that cause multicollinearity, namely the inflation variable. A

Estimation Result of Long-term Equation Improved Model

One of the alternatives to improve the detected model has multicollinearity is not to use a variable detected to cause multicollinearity, namely the inflation variable. The results of the estimation of the long-term model equation that has been improved are presented in Table 7.

Table 7. Estimation Results of the Long-term Equation Improved Model

Primary Balance Dependent Variable				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
Constant	-2.1895	2.4022	-0.9115	0.3674
Primary Balance (-1)	0.4355***	0.1376	3.1646	0.0029
Government Debt (-1)	0.2572***	0.0626	4.1071	0.0002
Output Gap	6.1574*	3.4682	1.7754	0.0833
Productive Expenditures	21.3434	42.1851	0.5059	0.6156
Government Debt Squared (-1)	-0.0026***	0.0006	-4.1731	0.0002
Rupiah exchange rate	-0.3539	0.2794	-1.2666	0.2124

Note: *significant at 10%, **significant at 5%, ***significant at 1%,
R_squared: 0,538204
Adjusted R_squared: 0,470625
Durbin_Watson Stat: 1,657121
F-Statistic: 7,963979
Source: Data processed

Table 8. Residual Stationarity Test Results of Long-term Equation

Variable	**ADF (Level)**		
	Intercept	**Trend & Intercept**	**None**
Residual	-5,6530***	-5,6055***	-5,7153

Note: *significant at 10%, **significant at 5%, ***significant at 1%
Source: Data processed

The next step is to test the long-term residual stationarity of the equation. The results of the long-term equation stationarity test are presented in Table 8. The test results show that the residual variable of the long-term equation is stationary at the level and the first difference so that short-term equation estimation can be continued.

Estimation Result of Short-term Equation Improved Model

Estimation of short-term relationships is carried out by including stationary residuals in the long-term equation as one of the independent variables in the short-term equation. The estimation results are shown in Table 9.

The estimation results at Table 9 show that the residual coefficient of the long-term equation is negative and statistically significant with a significance level of 99%, so the ECM model's requirements can be met. The next step is to test the classical assumptions for the short-term equation.

Table 9. Estimation Results of the Short-term Equation Improved Model

Dependent Variable D (Primary Equilibrium)				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
Constant	-0.2116	0.1816	-1.1648	0.2512
D(Primary Balance (-1))	0.2364	0.1431	1.6526	0.1064
D(Government Debt (-1))	0.4191***	0.0555	7.5566	0.0000
D(*Output Gap*)	10.289***	2.6624	3.8646	0.0004
D(Productive Expenditures)	96.6709	69.382	1.3933	0.1714
D(Government Debt Squared (-1))	-0.0035***	0.0005	-6.4196	0.0000
D(Rupiah exchange rate)	1.7734	1.1514	1.5402	0.1316
Residual (Ect)	-0.9832***	0.2240	-4.3891	0.0001

Note: *significant at 10%, **significant at 5%, ***significant at 1%,
R_squared: 0,677555
Adjusted R_squared: 0,619680
Durbin_Watson Stat: 1,836579
F-Statistic: 11,70726
Source: Data processed

Classical Assumption Test Improved Model

Residual Normality Test

The normality test results show that the probability value of Jarque-Bera is greater than 5% in the short-term equation, so the residuals in the equation are distributed normally.

Autocorrelation Test

The test results using the Durbin-Watson d Test show that the d-statistic value in the long-term regression estimation result is 0.6571, and the short-term equation is 1.8366. The value is close to two, so it can be concluded that there is no autocorrelation in the first order. Meanwhile, in the long-term equation test results with the Breusch_Godfrey Serial Correlation LM test (BG LM test) first-order serial correlation, the Obs*R-squared value is greater than 5%, so it can be concluded that in the long-term equation, there is no first-order serial correlation.

Heteroscedasticity Test

The results of the heteroscedasticity test developed by White (White's General Heteroskedasticity Test) show that the value of Obs*R-squared = 26.1037 is greater than the value of χ_7^2 = 14.0671 so the null hypothesis that states no heteroscedasticity exists in the residual is rejected at = 5 %. Using the White test, the heteroscedasticity test shows that the assumption of homoscedasticity cannot be met. In other words, heteroscedasticity occurs. One way to improve if the assumption of homoskedasticity is not met is to use the estimation of White's Heteroskedasticity_Consistent Variances and Standard Errors introduced by Huber_White.

RESULTS AND DISCUSSION

Discussion of Short-term Equation Estimation Results

The estimation results in Table 9 show that the residual coefficient is negative and statistically significant with a significance level of 99%, so the requirements for the ECM model are met. The residual coefficient value of -0.9832

means that the speed for adjusting short-term imbalances towards long-term balance is 98.32% within one year.

The results of the F test obtained a statistical F value of 11.7073 with a probability of 0.0000, which means that all independent variables jointly affect the primary balance and are statistically significant at a significance level of 1%. The adjusted R-squared value of 0.6197 indicates that 61.97% of the variation in the primary balance in the short term can be explained by the independent variables contained in the model, and other variables outside the estimation model explain the remaining 38.03%.

Table 10. Short-term Equation Estimation Results

White heteroskedasticity-consistent standard errors & covariance				
Variable	**Coefisient**	**Std. Error**	**t-Statistic**	**Probability**
Constant	-0.2116	0.1754	-1.2063	0.2350
D(Primary Balance (-1))	0.2364*	0.1362	1.7358	0.0905
D(Government Debt (-1))	0.4191***	0.0712	5.8818	0.0000
D(Output Gap)	10.2890***	3.2019	3.2134	0.0026
D(Productive Expenditures)	96.6709	75.5719	1.2792	0.2084
D(Government Debt Squared (-1))	-0.0035***	0.0006	-6.0819	0.0000
D(Rupiah exchange rate)	1.7734	2.2339	0.7939	0.4321
Residual (ect)	-0.9832***	0.2111	-4.6580	0.0000

Note: *significant at 10%, **significant at 5%, ***significant at 1%,
R_squared: 0,677555
Adjusted R_squared: 0,619680
Durbin_Watson Stat: 1,836579
F-Statistic: 11,70726
Source: Data processed

The short-term estimation results are presented in Table 10, indicating that the primary balance ratio variable in the previous year positively affects the current year's primary balance ratio. For example, the primary balance coefficient for the previous year was 0.2364, meaning that an increase in the primary balance ratio for the previous year by 1% would increase the primary surplus in the short term by 0.2364%, ceteris paribus. This result differs from Pamungkas's (2016) findings that primary balance lag hurts primary balance.

The previous year's debt ratio variable positively and significantly affects the current year's primary balance at a significance level of 99%. The debt ratio coefficient of 0.4191 means that any increase in the previous year's debt ratio by 1% will increase the primary surplus in the short term by 0.4191%, ceteris paribus. It is in line with research conducted by Pamungkas (2016), with a coefficient of 0.047%, and Lestari (2014), who found a reaction of 0.046 for Indonesia. Also in line with the findings of de Mello (2008), with a coefficient of 0.030 in Brazil, and Burger & Marinkov (2012), with a coefficient of 0.040% in South Africa. Asiama et al., (2014) in Ghana with a coefficient of 0.016%. Mendoza & Ostry (2008) research shows that the reaction for developing countries is 0.036%, while Adams et al. (2010) found a reaction of 0.1244 for Asian countries. The strong response of the primary balance to debt indicates that fiscal policy is very responsive to debt increases to avoid debt explosions.

Meanwhile, the squared coefficient of the previous year's debt ratio was negative -0.0035 and significant at a significance level of 99%. The negative sign indicates that the previous year's debt ratio will increase the primary surplus at a decreasing rate. It can also be interpreted that the response of the primary balance to the debt ratio tends to weaken as the debt ratio increases to a higher level. This finding is in line with the results of research by IMF (2002), Mendoza & Ostry (2008), and research conducted by Adams et al., (2010) for Asian countries (33 countries) with a coefficient of -0.0009. However, in contrast to Adams et al., (2010) findings, a sample of seven Asian countries obtained a positive coefficient of 0.0011.

The output gap variable has a significant positive effect on the primary balance ratio and is significant at the 99% significance level. The output gap coefficient is positive by log (10.289030) or 1.0123, which means that if there is an increase in the output gap of 1%, it will increase the primary surplus in the short term by 1.0123%, ceteris paribus. Actual GDP is greater than potential GDP, representing better economic conditions, so increasing government revenue will increase the primary surplus. However, if the actual GDP is less than the potential GDP, the opposite will occur because it reflects a decrease in government revenue so the primary surplus will decrease.

This positive output gap coefficient is in line with the findings of Adams et al., (2010) for 33 Asian countries with a coefficient of 0.0987, but in contrast to the findings of (Pamungkas, 2016) the final research results show that the output gap does not affect the primary balance in the short term but has an effect on positive and significant in the long run. Furthermore, the positive coefficient on the variable output gap indicates that the government is implementing a pro-cycle policy. The government is encouraging spending to drive the economy during times of crisis.

The short-term equation estimation results show that productive expenditure variables consisting of capital expenditures, health expenditures, and education expenditures do not significantly affect the primary balance, meaning that the government does not respond to this increase in productive expenditures. It is in line with the research by (Burger & Marinkov, 2012) that the primary balance is more responsive to revenues than expenditures. While research conducted by Adams et al., (2010) the response of the primary balance to variations in expenditures is negative, meaning that if government expenditures increases, it will result in a decrease in the primary balance.

The effect of productive expenditures on the primary balance shows that the government does not respond to changes in productive expenditures by changing the primary balance. It could be because productive expenditures components, including the capital, health, and education, in this study were relatively small compared to the total government expenditures.

The effect of the exchange rate variable on the primary balance is insignificant. The choice of this exchange rate variable is based on the consideration that if there is a currency depreciation, it will increase income, especially from natural resources, but increase expenditures, especially import subsidies. The depreciation of the Rupiah also changed the structure of foreign debt in foreign currency units. Therefore, the rupiah exchange rate against the US dollar is an important indicator of fiscal policy.

Discussion of the Estimation Results of the Long-term Equation

The estimation results show that there is consistency between short-term and long-term estimates. Moreover, both show that the influence of exchange rate and productive expenditures variables on primary balance is insignificant. The long-term equation estimation results are presented in Table 11.

Table 11. Long-term Equation Estimation Results

Dependent Variable: Primary Equilibrium HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwidth = 4)				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Probability**
Constant	-2.1895	3.0656	-0.7142	0.4791
Primary Balance (-1)	0.4355**	0.1758	2.4779	0.0174
Government Debt (-1)	0.2572***	0.0635	4.0529	0.0002
Output Gap	6.1574*	3.6446	1.6895	0.0987
Productive Expenditures	21.3434	44.4832	0.4798	0.6339
Government Debt Squared (-1)	-0.0026***	0.0006	-4.4651	0.0001
Rupiah exchange rate	-0.3539	0.3802	-0.9308	0.3574

Note: *significant at 10%, **significant at 5%, ***significant at 1%,
R_squared: 0,538204
Adjusted R_squared: 0,470625
Durbin_Watson Stat: 1,657121
F-Statistic: 7,963979
Source: Data processed

The results of the F test obtained a statistical F value of 7.9640 with a probability of 0.0000%, which means that the independent variables jointly affect the primary balance and are statistically significant at a significance level of 99%. The adjusted R-squared value of 0.4706 indicates that 47.06% of the variation that occurs in the primary balance variable, in the long run, can be explained by the independent variables contained in the model, and the remaining 52.94% is explained by other variables in the outside the estimation model.

The primary balance ratio coefficient measures the response of the primary balance to the previous year's primary balance. The positive coefficient value is 0.4355 and is significant at a 95% degree of significance. The positive coefficient is under the research hypothesis. Each increase in the primary balance ratio of the previous year by 1% will increase the primary balance by 0.4355%, ceteris paribus. The primary balance (surplus) will increase in response to the increase in the primary balance ratio in the previous year.

The estimation results in Table 11 show that the response of the primary balance to the previous year's debt ratio was 0.2572 (positive) and significant at a significance level of 99%. The positive coefficient is following the research hypothesis. Each increase in the ratio of government debt in the previous year by 1% will increase the surplus by 0.4355%, ceteris paribus. The primary balance (surplus) will increase in response to the increase in the previous year's debt ratio to achieve fiscal sustainability.

An important coefficient that needs to be considered in the fiscal reaction function is the coefficient attached to the debt ratio, and the debt ratio coefficient measures the response of the primary balance to debt. A positive coefficient value between zero to one ($0 < \alpha\_3 < 1$) is consistent with a fiscal policy response that

stabilizes debt. Conversely, if the coefficient is negative (-1 > α_3> 0), it means that the response has the potential to be destabilizing.

The non-linear approach to measuring the primary balance's response to debt is described by the square function of the government's debt ratio. The estimation results show that the coefficient of the squared variable debt ratio is negative (-0.0026) and is statistically significant at the 99% significance level. A negative debt ratio squared coefficient means that the government debt ratio increases the primary balance at a decreasing rate. The primary balance response function as an inverted "U" (parameter adjustments initially increase and then decrease), shown in Figure 3. The fiscal response function's findings align with several other studies (Adams et al., 2010; Afonso & Jalles, 2016; Everaert & Jansen, 2018; IMF, 2002)

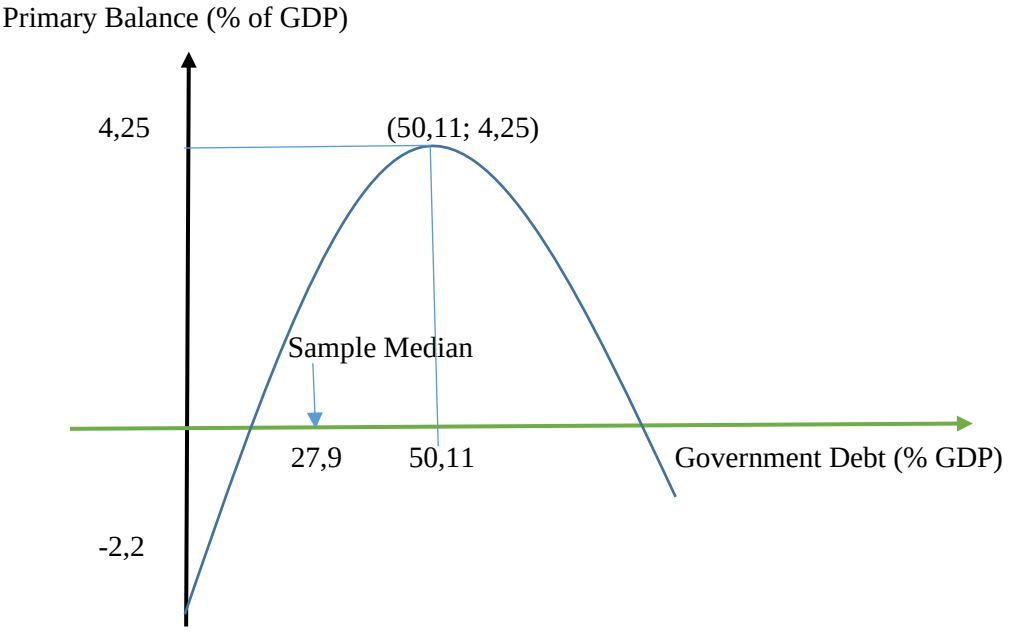

Figure 3. The function of Primary Equilibrium Response to Debt Ratio

The primary balance response function to the debt ratio is obtained from the estimation results of the long-term equation:

$$R\_Kesprim = -0{,}0026\ R\_UTANG^2(-1) + 0{,}2572\ R\_UTANG(-1) - 2{,}1895$$

Figure 3. shows that the fiscal policy response tends to weaken as the debt-to-GDP ratio increases, and the turning point (critical debt point) is above the median debt ratio. In this study, the critical point of debt is at 50.11% with a median value of 27,9%[2]. The ratio of government debt to GDP should be kept lower than the critical point. If the debt ratio exceeds the critical point, the primary balance response will be negative, in which case fiscal unsustainability occurs. It is also in

[2] Research conducted by Adam et al. (2010) in the Asian Development Bank (ADB) member countries of 33 or so-called Developing Asia for the period 1990 - 2008 showed an n shape fiscal response function curve, the debt critical point was 88.9 and the sample median was 43.4.

accordance with Law Number 17 of 2003 concerning State Finance, which states that the maximum debt ratio is 60% of GDP.

Research conducted by Adams et al., (2010) [3] with a sample of seven Asian countries gave different results from this study because it shows a tendency in the shape of the letter "U" this condition shows the primary balance response to an increase in debt at first moderate and then strengthening at a certain critical point, in the study of Adams et al., (2010) the threshold for changes in the reaction to the debt ratio is 28.8%.

The output gap has a significant positive effect on the primary balance ratio and is significant at a significance level of 99%. The positive output gap coefficient of log(6.157437) is 0.7894, which means that if there is an increase in output gap (actual GDP is greater than Potential GDP) of 1%, it will increase the primary surplus in the long term by 0.7894%, ceteris paribus. Actual GDP greater than potential GDP represents better economic conditions (good news), then an increase in government income will increase the primary surplus, but if actual GDP is smaller than potential GDP (bad news), the opposite will happen. This finding is in line with the results of research conducted (Adams et al., 2010; Pamungkas, 2016; B. Santoso, 2006).

The long-term estimation results show that the effect of productive expenditures on the primary balance is insignificant. It means that the primary balance does not respond to changes in productive expenditures. That is in line with previous research by (Burger & Marinkov, 2012), showing that the primary balance is more responsive to revenue than expenditures. Meanwhile, Adams et al., (2010) research responded to the primary balance of negative expenditures, meaning that if government expenditures increase, it will decrease the primary balance.

The effect of the rupiah exchange rate variable on the primary balance is not significant in the short or long term. However, it is slightly different from Pamungkas, (2016)[4] findings. This study uses two approaches to examine fiscal sustainability: the government debt stationarity approach and the fiscal reaction function. Both assess fiscal sustainability from different points of view. The stationarity test tests fiscal sustainability with a single variable, namely the ratio of government debt to GDP, while the fiscal reaction function tests the effect of debt and other variables on primary balance.

The testing results using both tests will show consistent results if the stationarity test concludes that the ratio of government debt is stationary and in testing the fiscal reaction function, the response coefficient of the debt ratio to balance is positive and less than one. This study's results indicate consistency between the two, so fiscal policy in Indonesia during the 1970-2018 period was sustainable. The coefficient of response to fiscal policy is positive and smaller than one. For the short term and long term, the coefficient is significant at a degree of significance of 1%.

[3] Adam et al (2010) used a sample of 33 Asian countries, the results showed an inverted "U" shape or n shape, but if a sample of 7 Asian countries was taken, the results showed a U-shaped curve. "U".

[4] Pamungkas (2016) examines the function of fiscal reactions in Indonesia using quarterly data, one of the findings is that the rupiah exchange rate against the US dollar is only in the short term while in the long term the effect of the exchange rate is not significant.

CONCLUSION

Based on the results of the analysis and discussion, it can be concluded several things as follows:

1) Testing fiscal sustainability with the stationarity test of the variable ratio of government debt to GDP using endogenous breaks (breakpoint unit root test) shows that Indonesia's fiscal sustainability for the 1970-2018 period is fulfilled if the *break* occurred in 1997 and 2001 is considered. The negative trend of fiscal sustainability shows that the government, as a creditor, will use the primary surplus to repay the debt of the past period.
2) Based on the estimation results of the fiscal reaction function using the Error Correction Model (ECM), the following results are obtained:
    a) The primary balance of the previous year has a positive and significant effect on the primary balance of the current year, which means that an increase in the primary balance (surplus) of the previous year will increase the primary balance (surplus) of the current year. In other words, the fiscal policy response to an increase in the previous year's primary balance by increasing the current year's primary balance.
    b) The previous year's government debt ratio positively affects the primary balance, meaning that fiscal policy responds to the increase in the previous year's debt ratio by increasing the current year's primary balance (surplus). The government responded to the increase in the debt-to-GDP ratio in the previous year by increasing the primary balance. It shows that the Indonesian government is implementing a fiscal sustainability strategy by responding well to the increase in debt, increasing the primary surplus to pay off debt.
    c) The square of the previous year's government debt ratio has a negative and significant effect on the primary balance (surplus), meaning that an increase in debt in the previous year will be responded to by increasing the primary balance in the current period at a decreasing pace. The estimation results obtained a quadratic function, and if described the relationship between the ratio of government debt one year earlier, the ratio with the primary balance ratio in the form of an inverted "U" letter. The increase in the government debt ratio was initially responded to by increasing the primary surplus, but at a certain threshold in this study, when the debt to GDP ratio was 50.11%, the government's ability to respond would decrease.
    d) There is a positive and significant effect between the output gap and the primary balance. If actual GDP is greater than potential GDP, it represents better economic conditions (good news), then an increase in government income will increase the primary surplus, but if actual GDP is smaller than potential GDP (bad news), the opposite will happen. It shows that the government is carrying out a pro-cycle policy, meaning that if there is an economic slowdown, the government will increase expenditures to encourage the economy.
    e) The effect of the productive expenditure variable on the primary balance is not significant in the short and long term. It is because the proportion of productive expenditures used in this study is only capital expenditure, health, and education, so the proportion is relatively small.

f) The effect of the rupiah exchange rate variable in the short and long term is not significant

3) The fiscal sustainability test with the debt stationarity test and the fiscal reaction function obtained consistent results, namely fiscal sustainability in Indonesia. That is because the government responds well to the increase in debt by increasing the primary surplus.
4) Based on the results of the analysis and discussion, several suggestions can be given, including:
   a) Fiscal sustainability has become a significant concern in almost all countries, including Indonesia, so it is necessary to carry out an appropriate assessment of fiscal sustainability to ensure a long-term debt explosion prevention strategy.
   b) This study proves that the relationship between debt and primary balance is not linear or quadratic. It shows that initially, the government responds to an increase in debt by increasing its primary surplus. However, at a certain threshold, the government's ability to respond will weaken, so the government needs to pay attention and maintain the size of the debt ratio government to GDP with fiscal discipline and fiscal reform through strict rules, and strict debt management will help the government keep its debt low. However, strict rules regarding debt can limit economic growth. Therefore, an accurate threshold calculation is needed to determine the maximum debt to encourage optimal economic growth.
   c) The primary balance in the last eight years has been in a deficit position. The primary balance ratio is also an indicator of budget resilience or the government's ability to pay interest and repay its debts. The government must seek new debt to pay due debts if there is a deficit in the primary balance. Therefore, efforts should be made to reduce the primary balance deficit gradually.
   d) The output gap variable has a positive and significant effect on the primary balance, so it is necessary to strive so that the actual output is greater than the potential output because it can improve the balance.

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