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DO FISCAL POLICY SHOCKS POTENTIALLY STABILIZE EXCHANGE RATES? THE CASE OF INDONESIA AFTER ASIAN FINANCIAL CRISIS

Abstract. *The impact of government expenditure shock on exchange rate is controversial. In standard macroeconomics theory of open economies, it is argued that an increase in government expenditure leads to an appreciation of the domestic currency. More recent papers, in contrast, find the opposite results. Unlike the previous studies, this paper synthesizes the two competing paradigms to empirically investigate whether it has had any relationship with the exchange rate stabilization instead of the exchange rate determination. After analyzing the quarterly data covering 1998-2012 in the case of Indonesia by employing auto-regressive distributed lag model, the study found that the impact of discretionary fiscal policy on the exchange rate stabilization typically depends on the characteristics of fiscal policy shock. In one hand, the government spending policy shock reduces the exchange rate volatility. In contrast, the discretionary of fiscal policy shock induces the exchange rate volatility. The results are robust across three types of exchange rates volatility specification. Those findings above suggest that fiscal policy should be conducted based on the fiscal rule to maintain exchange rates stabilization.*

Keywords: *discretionary fiscal policy, government spending shock, business cycle, exchange rates volatility, ardl.*

JEL Classification: E62, F31, F41, H30, O54

1. Introduction

After voluminous empirical and theoretical studies dedicated solely to the effect of monetary policy, last years have witnessed an increasing literature on the macroeconomic effects of discretionary fiscal policy in a wide set of countries. While most papers have focused on the US (Blanchard and Perotti, 2002; Fatás and Mihov, 2007; and Mountford and Uhlig, 2009; among others), growing evidence on other countries has arisen covering many aspects of fiscal policy.

However, most of those papers are fail to analyze in depth the implications of discretionary fiscal shocks on external competitiveness in developing countries. While

exchange rate are one of the most studied topics in international economics, only a few papers assess the effects of discretionary fiscal policy, mainly government spending shocks, on the nominal or real exchange rate (RER), relative prices, or the terms of trade in developing countries (De Castro and Fernández-Caballero, 2011). As a result, there is still no consensus on the size or even the sign of the effects of discretionary fiscal policy on the exchange rate movement.

For policy makers, discretionary fiscal policy could be conducted to encounter the state of business cycle so that expansionary spending is an efficient way to stabilize the economy. As the stabilizing force, the government expenditure should increase during the recession. On the other hand, it should be reduced during the economic booms. In fact, the counter-cyclicality of discretionary fiscal policy in developed countries and pro-cyclicality of fiscal policy in developing countries seem to have become the received wisdom (Kaminsky *et al*., 2004).

For academicians, the existing theories propose the differing results. The traditional and contemporary versions of open-economy macroeconomic models with nominal rigidities typically project that an expansion in government spending should be associated with appreciation (Corsetti and Pesenti 2001). On the other side, as we shall see, it is also possible to construct models in which a fiscal expansion is associated with depreciation, as in Annicchiarico (2006), Kollman (2010), Monacelli and Perotti (2010), and Ravn *et al*., (2012). Accordingly, it seems that further empirical work is desirable in order to make progress in understanding the relation between fiscal shocks and the exchange rate.

Recognizing the exact link between government spending and the exchange rate stabilization is important. Exchange rate plays a significant role in the development process of an economy. It is also a crucial element especially for small open economies as both its level and stability are important in increasing exports and private investment which are the main sources of growth in developing countries. The question that comes to mind here is whether there is the relationship between the government spending shock and the exchange rate. If the answer is yes, the subsequent one is can it potentially stabilize the exchange rate?

Indonesia provides a unique opportunity to assess the nature of government expenditure and exchange rates stabilization. Asian financial crisis in 1997/98 has directed government expenditures to focus on the economic recovery. Then, the global financial crisis in 2008, the government attempted to revive economic activity through various fiscal stimulus measures. After that, gradually Indonesia in 2010s is one of the largest developing countries to implement various economic liberalization reforms that produce strong economic growth. Therefore, lessons from Indonesia will be useful to develop a better exchange rate stabilization policy design for developing countries.

This paper enriches the literature on fiscal policy in the context of exchange rate stabilization in developing countries with focus on Indonesia. The motivation for this approach associates to the fact that Indonesia is a small-open economy in the international context so the scope for actively stabilizing international monetary conditions remains limited. Moreover, based on the experience of dramatic depreciation in mid 1997, under free floating exchange rate system, Indonesia consistently conducts some prudent macroeconomic policies to face possible depreciation in the medium term so it would be suboptimal to cut back international reserve to make more room for speculative attacks.

Also, since 1999, Indonesia has been implementing a new law for the central bank. By the law, the central bank of Indonesia has to be independent from interventions of political pressure. Accordingly, since July 2005 the central bank of Indonesia has been adopting inflation targeting in the monetary policy frameworks. All of them are subjected to achieve the single goal, i.e. Rupiah stabilization both in terms of inflation and exchange rate. Therefore, implementing pro-rebalancing monetary measures, such as increasing in the size of international reserve in order to stabilize exchange rate, is likely to require an increase in the effective support of the government spending. The rest of the paper is divided into four sections. The second section is on the theoretical framework as well as the related empirical studies. This is followed by the third section which explains the econometric procedure and data used. The last section provides some concluding remarks of this paper.

2. Literature Review

Basically, exchange rate one currency to foreign currency vis-à-vis exists when the two countries have economic relationship with each other. The goods/services to be traded have their own prices in their own currency. In standard macroeconomics theory of open economies, the demand for goods/services depends both on the interest rate and exchange rate. A decrease in interest rate increases demand for goods/services, and an increase in the exchange rate increases the demand for goods/services. Therefore, it is not surprisingly that most papers analyzing behavior of exchange rate are dominated by attempts to test the purchasing power parity theory. More specifically, in the international finance literature, the focus is rather on short-term dynamics, with an emphasis on tests of the uncovered interest parity theory.

While exchange rates are one of the most studied topics in international monetary economics, unfortunately, most papers analyzing their determinants do not focus on the fiscal variables. Entering the effect of fiscal policy on exchange rate offers some interesting results. Some explanations provide exchange rate appreciation;

the others propose the opposite conclusion or even independent. Blanchard (2003) argued that an increase in government spending leads to an increase in demand, thereby leading to an increase in output. As output increases, so does the demand for money which leads to upward pressure on the interest rate. The increase in the interest rates makes domestic bonds more attractive, which tends to cause appreciation of the domestic currency. The expansive fiscal policy like increase in government expenditure or reduction in tax revenue, leads to decrease in national saving. Decrease in national savings reduces domestic currency that could be exchanged for foreign currency, thereby increasing RER (Mankiw, 2000).

Frenkel and Razin (1996) summarized nicely the relationship between government spending and RER in an inter-temporal, neoclassical framework. In the context of a two periods, small open economy model, they note that government spending influences the private sector and the RER essentially through two channels: the resource-withdrawal and consumption-tilting channels. Regarding the first channel, the influence of government expenditure is similar to that of a negative supply shock; the effect on private consumption and RER will depend upon the proportion of government consumption spending falling on non-tradable versus that falling on tradable. Regarding the second channel, they point out that the effect of government expenditure on private consumption levels and the RER will depend upon the characteristics of the utility function.

Furthermore, in Keynesian models, an expansionary fiscal shock raises the demand for home goods and money, thereby inducing a real appreciation either through higher interest rates and arbitrage capital inflows or a rise in domestic prices as suggested by Mundell-Fleming model. However, Sachs and Wyploz (1984) argued that the Mundell-Fleming framework ignores a number of critical factors that may be associated with a different result. In real business cycle models, increases in government spending trigger a decline in domestic private consumption and an increase in labor supply leading to a real appreciation. Corsetti and Pesenti (2001) develop a baseline model of monetary and fiscal transmission in interdependent economies. The unanticipated exchange rate depreciation can be beggar-thy-self rather than beggar-thy-neighbor, as gains in domestic output are offset by deteriorating terms of trade.

More recent papers, in contrast, find the opposite results. For example, Annicchiarico (2006) proposes a continuous time optimizing general equilibrium model with finite horizon. She argued that after a fiscal expansion the respect of public solvency without money financing is not sufficient to avoid the depreciation of the exchange rate in the long-run. Ravn *et al*. (2007) develop a model of deep habit in

which an increase in government spending provides an incentive for firms to lower domestic mark ups relative to foreign markups, leading to a real depreciation.

Kollmann (2010) presents a model with incomplete financial markets that can also solve the government purchases–RER puzzle, even when government purchases are non-productive. Market incompleteness limits risk sharing, and thus exacerbates the negative wealth effect of a rise in home non-productive government purchases, which strengthens the increase in the home labor supply and output, and thus may depreciate the home RER. Alternatively, in a bonds-only economy, an increase in relative government purchases will lead to a real depreciation if the increase in spending is sufficiently persistent and/or labor supply is highly inelastic.

In addition, the composition of government spending could also matter. In particular, increases in government spending will result in a real appreciation if skewed toward non-tradable goods. The effect of public investment, on the other hand, is ambiguous. An increase in public investment may lead to a real appreciation if it raises productivity in the tradable sector through the Balassa-Samuelson mechanism. Moreover, if productivity increases symmetrically in both sectors, there will be no impact on the RER (Galstyan and Lane, 2009). Chatterjee and Mursagulov (2012) found that in the presence of gradually accumulating stock of public capital and inter-sectoral adjustment costs, public investment generates a persistent and non-monotonic U-shaped adjustment path of the RER.

Empirically, in line with the recent development of econometric methods, there are some empirical studies dealing with fiscal impact on exchange rate. Monacelli and Perotti (2006) employed structural VAR technique to examine the effect of government spending shocks on the RER and trade balance for a series of OECD countries. The result indicates that in all countries examined, a rise in government spending induces RER depreciation and a trade balance deficit. The result also show that private consumption in all countries rises in response to a government spending shock, and therefore co-move positively with the RER.

Caporale *et al*. (2008) analyzed the effects of fiscal shocks using a two-country macroeconomic model for output, labor input, government spending, and relative prices which provides the orthogonality restrictions for obtaining the structural shocks. Dynamic simulation techniques are then applied, in particular to shed light on the possible effects of fiscal imbalances on the RER in the case of six Latin American countries. They found that in a majority of cases fiscal shocks are the main driving force of RER fluctuations.

Caputo and Fuentes (2012) distinguished the impact of two important components of government expenditure -- public investment and transfers -- on the RER, which has usually been neglected. Using panel co-integration techniques, they

assess the relevance of those variables in the determination of the RER for a wide set of countries. Their results suggest that changes in either government transfers or public investment have an impact on the RER in emerging economies. In one hand, transfers tend to appreciate the RER because they induce an increase in the relative demand for non-traded goods. On the other hand, an increase in public investment generates RER depreciation.

Benetrix and Lane (2013) estimated the RER impact of shocks to government spending for a panel of member countries of the Euro area. Their key finding is that the impact differs across different types of government spending, with shocks to public investment generating larger and more persistent real appreciation than shocks to government consumption. Within the latter category, they also show that the impact of shocks to the wage component of government consumption is more persistent than that of shocks to the non-wage component.

Using a sample of 28 emerging market economies, Badia and Segura-Ubiergo (2014) found that a permanent fiscal adjustment may reduce appreciation pressures over the long term. Furthermore, the composition of public spending matters, with reductions in current spending playing a key role. Their results suggest that maintaining fiscal discipline while increasing public investment is likely to ease real appreciation pressures, highlighting the importance of tackling long-standing budget rigidities.

Those studies above deal with multiple countries primarily industrial countries. In the case of individual country in particular Indonesia, the related studies regarding the impact of fiscal policy on exchange rate are limited. Tsen (2012) found that an increase in the real oil price will lead to an appreciation of the RER in Indonesia. Compared to the real interest rate, productivity, and reserve differentials, the real oil price is relatively less important in the RER determination.

Abimanyu (1998) analyzed the relationship between the actual RER, the equilibrium RER, and other macroeconomic variables. The estimate shows that, out of nine explanatory independent variables, only government consumption and the fiscal deficit have significant effects on the RER variable. Increases in both government consumption and the fiscal deficit appreciate the RER. In short, fiscal variables matter in the exchange rate stabilization.

Regardless the positive, negative, or neutral impacts, those brief studies above in general focus on the exchange rate determination as a response of fiscal policy. In fact, they ignore the exchange rates volatility. According to Allsopp and Vines (2008), fiscal policy may help to stabilize inflation and also to target the RER. This paper contributes to the literature on fiscal policy regarding its impact on exchange rate

stabilization instead of the magnitude. We hypothesize that fiscal policy shocks potentially can reduce the exchange rates volatility.

3. Research Method

As was already noted, fiscal policy is a possible automatic stabilizer. The most important fiscal policy lever in the hands of the Indonesian government is government consumption. It would be worthwhile to see how change in government consumption impacts the final output in the economy in general and the exchange rate in particular. Following methodology used by Akitoby *et al.* (2006), we suppose there is a steady-state (or long-run path) relationship between government expenditure and output given by:

$$G = A\, Y^{\delta} \quad (1)$$

G represents government expenditure and *Y* means output. Equation (1) can also be written in log-linear form:

$$\text{Log } G = \text{Log } A + \delta \text{ Log } Y + \mu \quad (2)$$

where μ is the residual term which is independent and identical distributed.
If the adjustment of expenditure *G* to its steady-state *G** is gradual, then the level of expenditure will respond to transitory changes in output, and *G* will move gradually toward its steady-state, or equilibrium level.

Both *log G* and *log Y* respectively remain having the secular trend. To identify the stylized facts of business cycles and analyze the co-movements between the series of interest, each series must be de-trended first by removing the evolutionary (time-variant) trend within each series. De-trending makes it possible to separate fluctuations (cyclical components) around the trend of each time series.

In the light of this definition, we work with cyclical components, t_c, of seasonally adjusted series $y_t \in \{log\ G, log\ Y\}$. We begin by de-trending each series y_t to separate its trend (growth) component, τ_t, from the cyclical components, c_t:

$$c_t = y_t - \tau_t \quad (3)$$

The de-trending approach we adopt is to estimate the (unknown) trend τ_t of each series by fitting Hodrick-Prescott (HP) filter. This method is widely used among macroeconomists to obtain a smooth estimate of the long-term trend component of a series. The method was first used by Hodrick and Prescott to analyze postwar US business cycles. Technically, the HP filter is a two-sided linear filter that computes the smoothed series τ of y by minimizing the variance y of around τ subject to a penalty that constrains the second difference of τ. That is, the HP filter chooses τ to minimize:

$$\sum_{1}^{T}(y_t - \tau_t)^2 + \lambda\sum_{2}^{T-1}[(\tau_{t+1} - \tau_t) - (\tau_t - \tau_{t-1})]^2 \quad (4)$$

The first term is the sum of the squared deviations of y_t from the trend and the second term, which is the sum of squared second differences in the trend, is a penalty for changes in the trend's growth rate. The larger the value of the positive parameter λ, the greater the penalty and the smoother the resulting trend will be. As $\lambda \rightarrow \infty, \tau$ then approaches a linear trend obtained by fitting y_t to a linear trend model by OLS. Hodrick and Prescott suggest that λ = 1600 (as the default value of λ in Eviews 8) is a reasonable choice for quarterly data and that suggestion is usually followed in applied work. The remaining cyclical component (c_t) must be stationary with zero mean.

Discretionary fiscal policy is defined as a change or a reaction to fiscal policy that does not reflect a reaction to the current economic conditions (Fatás and Mihov, 2007). Fiscal policy theoretically can be categorized into three groups: (1) automatic stabilizers; (2) discretionary fiscal policy as a response to economic conditions, and (3) discretionary policy conducted for reasons other than the current macroeconomic conditions. It seems that the three categories are inter-related so it is difficult to differ form each others.

Empirically, there are many ways to measure the discretionary fiscal policy. Unfortunately, academicians have not reached agreement on the method of measurement of appropriate fiscal policy discretion (Fatás and Mihov, 2007). Blanchard and Perotti (2002), for instance, to distinguish between fiscal policy and discretionary fiscal policy, any benchmark can be used. For example, changes in inflation, interest rates, and economic growth within a certain time can be examined.

According to Fatás and Mihov (2007), the term of μ in (2) is a quantitative estimate of the discretionary policy shock in government spending (or discretionary spending policy shock). They measured the volatility of discretionary fiscal policies by looking at variations in the fiscal policy stance as the change in the cyclically adjusted primary balance to investigate the output growth volatility. Therefore, we also use the cyclical component of government expenditure as alternative measure to identify the power of discretionary fiscal policy regarding exchange rates stabilization.

Almost all of the previous studies incorporated output or productivity difference between domestic output and counterpart country's output as the main factor to analyze the exchange rate dynamics. All of them found a significant effect on the exchange rate determination. Since we concern with the exchange rates volatility, in this paper we prefer to use the cyclical component of output (*CY*) that is the difference between actual output and potential output, as a control variable. Eventually, we can construct the exchange rates volatility (*VER*) model that is a function of cyclical component of *G* (discretionary fiscal policy), cyclical component

of *Y* (representing output gap), and μ (as a measure of government spending policy shock):

$$VER = \alpha + \beta\ CG + \gamma\ CY + \delta\ \mu + \varepsilon \quad (5)$$

Equation (5) presents the long term relationship which is suitably estimated by annual data. In the short term, we use the restricted ARDL (auto-regressive distributed lag) model to accommodate some adjustments as follows:

$$\Delta\ VER_t = \alpha + \beta_1\ \Delta\ CG_t + \beta_2\ CG_{t-1} + \gamma_1\ \Delta\ CY_t + \gamma_2\ CY_{t-1} + \delta_1\ \Delta\ \mu_t + \delta_2\ \mu_{t-1} + \varphi\ VER_{t-1} + \varepsilon_t \quad (6)$$

where Δ is difference operator.

The Wald test is computed to test the null hypothesis, H_0: $\beta_2 = \gamma_2 = \delta_2 = \varphi = 0$ against the alternative hypothesis, H_a: $\beta_2 \neq \gamma_2 \neq \delta_2 \neq \varphi \neq 0$. If the Wald test value falls outside the upper bound, the null hypothesis of no co-integration is rejected. In other words, *VER*, *CG*, *CY*, and μ are said to be co-integrated. However, no conclusive inference can be made for the Wald test value falls inside the critical bounds, unless the order of integration of the variables is known. If the Wald test value falls below the lower bound, the null hypothesis of no co-integration cannot be rejected. If there is evidence of co-integration, the unrestricted model of the ARDL approach can be estimated as follows:

$$VER_t = \alpha + \beta_1\ CG_t + \beta_2\ CG_{t-1} + \gamma_1\ CY_t + \gamma_2\ CY_{t-1} + \delta_1\ \mu_t + \delta_2\ \mu_{t-1} + \varphi\ VER_{t-1} + \varepsilon_t \quad (7)$$

In the presence of co-integration, the long-run coefficients for *CG*, *CY*, and μ are derived from $(\beta_1+\beta_2)/(1-\varphi)$, $(\gamma_1+\gamma_2)/(1-\varphi)$, and $(\delta_1+\delta_2)/(1-\varphi)$ respectively. Generally, both in the short-run and the long-run, the coefficient of the cyclical component of output is expected to be positive. The coefficients of the cyclical component of government spending and discretionary of fiscal policy could be negative or positive. The coefficient of lag is expected to be positive and measures the speed of adjustment towards the equilibrium in the long run.

We employ the following indicators: government expenditure, national output, and exchange rates volatility. Since we concern with volatility, we need reliable and long span time series data on government expenditure and GDP. The GDP data are available in quarter basis. Unfortunately, the quarterly data of central government budget are publicly unavailable. Data on monthly cash disbursement of functional government budget has never been released by Ministry of Finance to the public. Regarding to the limitation, we analyzed quarterly data on government expenditure derived from the national income product account standard based on expenditure approach. This is intended that our study will be comparable to similar studies in other countries.

The term government expenditure used in this study is central government general consumption or recurrent expenditure realization (mostly allocated onto wage/salary and goods/services purchase) excluding interest payment of government debts. The recurrent expenditure dominates (almost 90 percent) to the capital expenditure (10 percent) of the total government spending. Therefore, the earlier is representative for analyzing fiscal policy. The general government spending and output are presented in 2000 constant price.

We use 3 types of exchange rates volatility: (1) nominal bilateral exchange rate US Dollar against Rupiah, (2) nominal effective exchange rate (NEER) that is an index that describes the relative strength of a currency relative to a basket of other currencies, and (3) real effective exchange rate (REER) that is NEER adjusted by relative consumer price index. The volatility of exchange rate is measured by coefficient of variation, the standard deviation to mean ratio for 4 consecutive quarters.

The reason behind those is plausible. The use of single exchange rate (let say US Dollar) implicitly assumes that the international trade only comes from a specific country or some countries that use US dollar as the official currency. In fact, the origin of goods/services entered to Indonesia varies in their own currency. Hence, the effective exchange rate can capture those diversities. Moreover, in a multilateral and highly globalize world, the effective exchange rate index is much more useful than a bilateral exchange rate for assessing changes in the competitiveness due to exchange rate movements.

The sample periods chosen for this study extend from 1998(1) to 2012(4). The total observation operationally is 60 sample points. Most of the data are taken from the central bank of Indonesia (www.bi.go.id). The exchange rate is stated in the mid rate. The data of nominal and real effective exchange rate are electronically taken from the publications of Bank of International Settlement (www.bis.org). Both the effective exchange rate data are stated on 2010 base year (2010 = 100). Most of the results are calculated in econometric program Eviews 8.

4. Results and Discussion

Table 1 presents the elementary statistics covering mean, median, and extreme (maximum and minimum) values for independent variables. The average values, as expected, are zero respectively. Each the median value is close enough to the respective mean (in particular CY). The closeness of median to the mean value preliminary indicates that all of the variables of interest are normally distributed. The symmetric distribution of the three variables is confirmed by the moderate value of skewness. Skewness measures the symmetric or normal distribution which the value is expected to be zero. The skewness values are slightly greater than 0 which indicates

that the series are skewed to the right. The upper tail of the distribution is thicker than the lower tail.

Furthermore, the CG has the greatest value of kurtosis. The kurtosis measures the peakedness of flatness of the distribution with an expected value of 3.0. The result shows that the discretionary fiscal policy satisfies the condition. It implies that the tails of the distribution are thicker than the normal (indicated by the kurtosis coefficient greater than 3, i.e. leptokurtic). The tail of the distribution of CY is moderate indicated by the kurtosis coefficient less than 3.

The Jarque-Bera test is used to test whether the random variables with unknown means and constant dispersions are normally distributed. The Jarque-Bera test has the null hypothesis of normally distributed residuals. The probability value indicates an acceptance of the null hypothesis that the errors are normally distributed. The Jarque-Bera tests confirm that those variables are symmetrically distributed (bell-shaped) indicated by probability value higher than 1 percent. In other words, the null hypotheses that all of the series data is normally distributed can be rejected in 99 percent confidence level.

Table 1. Descriptive Statistics

	CG	CY	μ
Mean	0.0000	0.0000	0.0000
Median	-0.0041	-0.0021	-0.0209
Maximum	0.3351	0.0336	0.3621
Minimum	-0.3075	-0.0311	-0.3270
Std. Dev.	0.1433	0.0151	0.1530
Skewness	0.2279	0.1605	0.4624
Kurtosis	3.3111	2.3889	3.1075
Jarque-Bera	0.7109	1.1116	2.0228
Probability	0.7009	0.5736	0.3637
N	56	56	56

Figure 1 presents the dynamics of two variables of interest, the cyclical components of output and public expenditure. The trend of cyclical component of output dropped significantly in 1997/98 corresponding to the subsequent impact of Asian financial crisis. In line with economic recovery programs, it was very low but

still positive. Coincidently, the huge government expenditure increased due to food and energy subsidies in order to secure the lower-layer income receiver households.

In the proceeding four years, the cyclical components of government spending and output remarkably fluctuated and hence there was a little synchronized pattern along with economic reformation programs. In contrast, since 2002 there was a large similarity between them even though in the opposite direction. While the fluctuation of cyclical component of national output was quite low, the fluctuation of cyclical component of government spending was high.

When we divide the sample period into pre- and post-global financial crisis, the conclusion does not substantially change. In the pre- period of global financial crisis (starting from 2008(3)), the correlation coefficient is -0.33 and that of the total period is -0.23 respectively. The statistical evaluation above confirms the relatively weak co-movement between cyclical components of output and government expenditure growth rates. This, of course, creates a negative correlation in the long-run.

As Figure 1 shows, the long-run correlation between cyclical components of output growth and government expenditure is moderate and might dominate the short-run correlation. We therefore need to control for this long-run correlation in order to derive a more accurate estimate of cyclicality of fiscal policy using the disturbance term to further analysis of the impact of expansionary fiscal policy on exchange rate stabilization.

Figure 1. Cyclical Component of Government Expenditure and Output

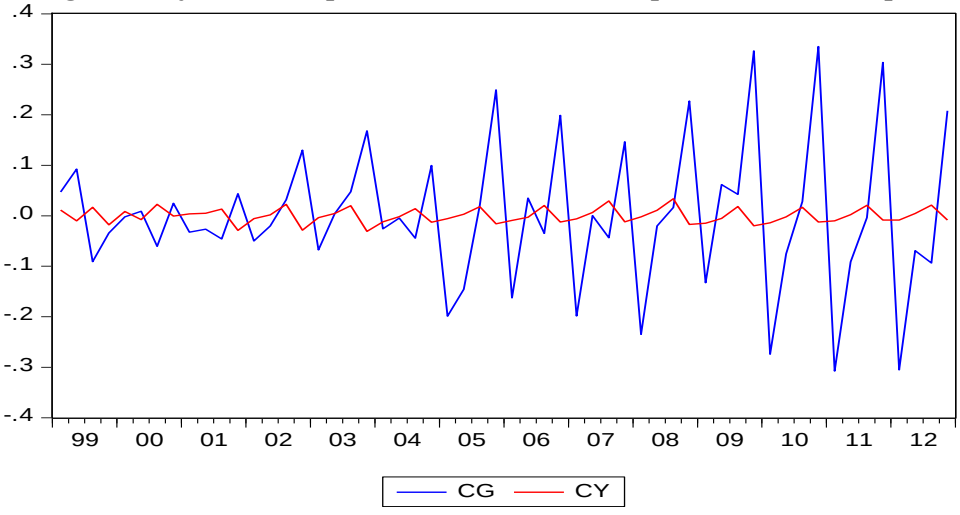
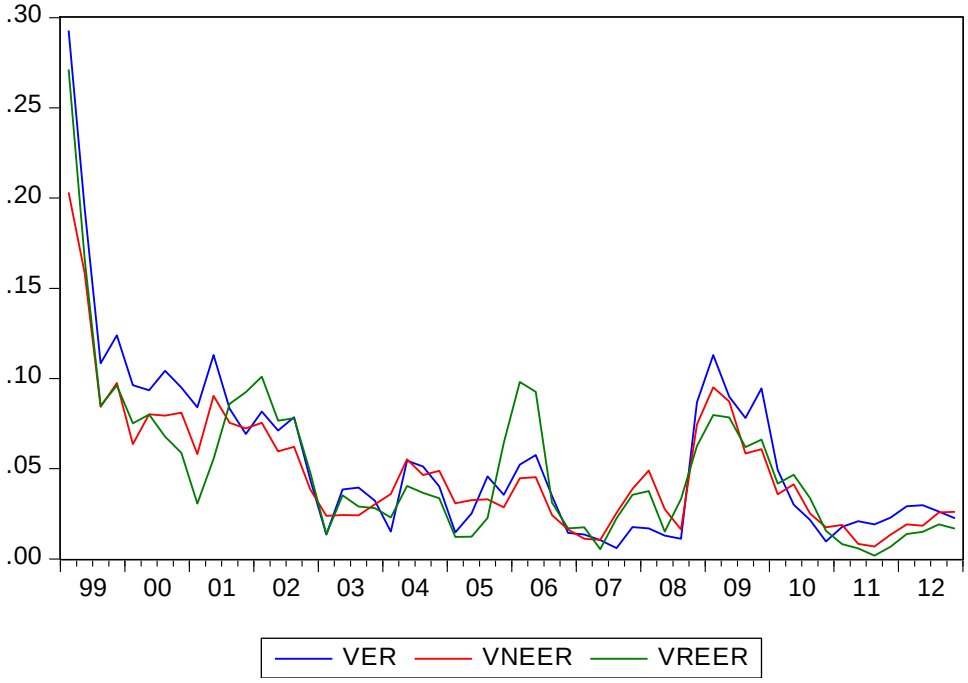


Figure 2 offers the volatility of exchange rates for each measurement. It seems that the three measurements confirm to each other. In the beginning of observation, the exchange rates volatility was remarkably high in relation to monetary crisis impacts. Even though still high, the exchange rates volatility was decreasing in the next 5 years. The volatility of exchange rates rose again in 2005/06 in accordance with the high world oil price and then followed by global financial crisis in 2008.

It is also notable that there is a similarity among the cyclical component of government spending and exchange rates volatility. After dramatic depreciation in 1997/98, the volatility of exchange rates declined substantially in line with the increase of expansionary fiscal policy. Particularly after 2005/06, the synchronous fluctuation patterns are clearer. This raises preliminary hypothesis that the expansionary fiscal policy can potentially reduce the exchange rates volatility. We shall check it again empirically later using sophisticated econometric tools.

Figure 2. Exchange Rates Volatility



In the proceeding section, we focus on the time series properties of each series. Many studies point out that using non-stationary macroeconomic variable in time series analysis causes superiority problems. It is well known in literature that applying regression on a set of non-stationary series is likely to produce a spurious estimation. Thus, a unit roots test should precede any empirical study employing such variables. We decided to make the decision on the existence of a unit roots through Augmented Dickey–Fuller (ADF) and Phillip-Perron (PP) tests.

The test is conducted 4 times for the level and the first-difference data respectively. The results of ADF and PP tests are reported in Table 2. Both tests conclude that all the variables are not entirely stationary in their level. Hence, the ADF and PP tests were applied again to the transformed series of each variable to check for the possibility of stationary in first differences. The tests confirm the stationary of all series on the first difference. In other words, in the first difference forms, all the variables become stationary.

The null hypotheses of non-stationary can be rejected which does not demonstrate the existence of a common trend in those series. All of the series in all cases were found to be stationary at 5 or even 1 percent significance level implying the series data have a unit roots. It also implies that the behavior of the variables varies around to the mean value and invariant overtime. The occurrence of unit roots in the series gives a preliminary indication of shocks having permanent or long lasting effect, thus making it very difficult for traditional stabilization policies to survive.

Table 2. Unit Roots Test

	Level		First Difference	
	ADF	PP	ADF	PP
CG	-3.2273***	-18.5845*	-4.1843*	-38.4701*
CY	-3.1158	-13.3257*	-4.3355*	-43.0134*
μ	-1.9574	-9.9076*	-3.8983**	-34.0136*
VER	-6.0022*	-5.7332*	-7.0070*	-7.3736*
VNEER	-5.0661*	-5.0661*	-7.4204*	-7.6876*
VREER	-4.5695*	-6.2227*	-6.2695*	-9.0779*

The test includes intercept and trend; (*) indicates significant at 1 percent; (**) indicates significant at 5 percent; (***) indicates significant at 10 percent

To prove our hypothesis, we estimate first the restricted ARDL model as equation (6). The results show that all of the coefficients of lagged independent variables entirely present statistically insignificant. But the coefficient of lagged dependent variable is significant. These preliminary perform the presence of co-

integration. To ensure the presence of co-integration, then we test the possibility of co-integration by implementing the bound test. The result is presented in Table 3.

The Wald test (F and χ^2 statistic) is computed to test the null hypothesis, H_0: $\beta_2 = \gamma_2 = \delta_2 = \varphi = 0$ against the alternative hypothesis, H_a: $\beta_2 \neq \gamma_2 \neq \delta_2 \neq \varphi \neq 0$. The result of the Wald test values falls outside the upper bound in the lower probability value. It means that the null hypothesis of no co-integration is rejected suggesting the presence of co-integrating relation. In other words, the volatility of exchange rates, CG, CY, and μ are said to be co-integrated.

Alternatively, using Johansen's maximum likelihood approach, we test the bi-variate between the three variables with 1 lag in all cases. The trace statistics together with maximum eigen-value (λ *max*) for testing the rank of co-integration are shown in Table 4. The results confirm to the bound test as Table 3. Hence, the three tests performs the presence of the co-integrating equations between the non stationary (or stationary at the different levels) series which means that the linear combinations of them are stationary and, consequently, those series tend to move towards the equilibrium relationship in the long-run.

Table 3. Bound Tests of Exchange Rates Volatility Co-integration Model

	VER	VNEER	VREER
F	13.5219 (0.0000)	9.0595 (0.0000)	14.5073 (0.0000)
χ^2	54.0876 (0.0000)	36.2378 (0.0000)	58.0291 (0.0000)
Conclusion	Co-integrated	Co-integrated	Co-integrated

Figure in parentheses is *p*-value

Table 4. Co-integration Test

Hypothesized No. of CE(s)	Eigen-value	Trace Statistic	0.05 Critical Value	Prob.**
Unrestricted Co-integration Rank Test (Trace): VER				
None *	0.8011	204.6488	47.8561	0.0000
At most 1 *	0.7761	117.4448	29.7971	0.0000
At most 2 *	0.3373	36.6372	15.4947	0.0000
At most 3 *	0.2343	14.4163	3.8415	0.0001
Unrestricted Co-integration Rank Test (Trace): VNEER				
None *	0.8001	204.6927	47.8561	0.0000
At most 1 *	0.7747	117.7503	29.7971	0.0000

At most 2 *	0.3073	37.2632	15.4947	0.0000
At most 3 *	0.2759	17.4347	3.8415	0.0000
Unrestricted Co-integration Rank Test (Trace): VREER				
None *	0.8023	205.3706	47.8561	0.0000
At most 1 *	0.7782	117.8425	29.7971	0.0000
At most 2 *	0.3375	36.5145	15.4947	0.0000
At most 3 *	0.2324	14.2819	3.8415	0.0002
Trace test indicates 4 co-integrating equation(s) at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
** MacKinnon-Haug-Michelis (1999) *p*-values				

Table 5 reports the OLS estimation results of three regression models as specified equation (7) in the previous section. All of variables (either lagged or contemporaneous variables) excluding constant are found to be statistically significant. Compared to the restricted model, the current result has the higher coefficient of determination (R^2) and F statistic values. Also, all of the lagged independent variables are highly significant.

The results show that the cyclical component of CG – as hypothesized – successfully reduces the exchange rates volatility indicated by negative sign of the corresponding coefficients. Statistically, they are significant for all three cases and the magnitudes are not far from each others (-3.6 – -5.6). This supports to the visual inspection on Figure 1 and 2 as explained above. They imply that the discretionary fiscal policy conducted for reasons other than the current macroeconomic conditions is helpful to decline volatility in foreign exchange market as found by Allsopp and Vines (2008). This result is in line with Abimanyu (1998) in the sense that government consumption appreciates the RER.

The output gap as expected has a positive sign representing the pro-cyclicality of exchange rates volatility. This is verified by the coefficient of CY which is statistically significant at 1 percent confidence level. When the actual output is above the potential one, the volatility of exchange rates will be higher. In such a case, the output gap rate which represents the cyclical situation in economy plays an important role in determining exchange rates fluctuation. It seems that exchange rates stabilization requires the economic stabilization. This basically confirms to most empirical studies outlined in the second section.

In contrast to the cyclical component of government expenditure, the discretionary government spending policy shock has a positive impact on exchange rates volatility. As conceptualized by Corsetti and Pesenti (2001), the unanticipated government expenditure would be considered as a surprised so that it would stimulate

the exchange rates volatility pressure. An increase in 1 percent of unanticipated government expenditure shock leads to drive up 3.58 – 5.56 standard deviations to mean ratio of exchange rate. In principle, this result is in line with Annicchiarico (2006), Kollman (2010), Monacelli and Perotti (2010), and Ravn *et al*. (2012).

The estimation of the lagged dependent variable gives the significant coefficients. The associated coefficient displays persistence. The exchange rates volatility persistence can be considered as a measure of the degree of dependence of current exchange rates volatility behavior on its own past developments. The coefficient of lagged dependent variables ranges from 0.56 to 0.61 suggesting that a change in the exchange rates volatility between quarter *t-1* and *t* drives up the volatility of the exchange rate process in *t* only 0.39 to 0.44 percent partial adjustments to respond to the desired volatility. Consequently, the exchange rates volatility tends to be less persistent than to respond to economic conditions in the short-run. This result is confirms to the study of Benetrix and Lane (2013) that government consumption is less persistent than that of government investment spending.

Table 5. The Unrestricted ARDL Estimation Results of Exchange Rates Volatility

Dep. Var:	VER		VNEER		VREER	
	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.
Constant	0.0069	0.2744	0.0077	0.1398	0.0066	0.2709
CG	-5.5789	0.0008	-3.6029	0.0058	-4.6342	0.0024
$CG_{(-1)}$	5.4352	0.0008	3.4567	0.0061	4.3909	0.0026
CY	7.3521	0.0010	4.5106	0.0097	5.9690	0.0034
$CY_{(-1)}$	-7.0767	0.0011	-4.3644	0.0099	-5.7406	0.0033
μ	5.5622	0.0008	3.5767	0.0060	4.6186	0.0024
$μ_{(-1)}$	-5.4471	0.0008	-3.4671	0.0060	-4.4030	0.0026
Lag	0.5552	0.0000	0.6100	0.0000	0.5649	0.0000
D08	0.0343	0.0041	0.0204	0.0267	0.0267	0.0167
R^2		0.8043		0.7912		0.7156
R^2-adj		0.7702		0.7548		0.0179
SEE		0.0187		0.0147		0.0147
F		23.6256		21.7826		17.9849
DW		1.8831		1.9996		1.3543
N		55		55		55

The diagnostic tests can be obtained from the author on request

Furthermore, the higher volatility of exchange rates during recessions is supported by the significance of global financial crisis dummy (D08). The coefficient of D08 is positive and statistically significant for all cases at 5 percent confidence level. It suggests that there are substantial differences characteristics of the exchange rates volatility between pre- and post-global financial crisis periods. To minimize the adverse economic impacts of global financial crisis, the central government launched fiscal stimuli amounting 73.3 trillion Rupiah (equivalently 1.7 percent of GDP) allocated mostly to the social welfare. Meanwhile, in the Asian financial crisis periods, hundreds trillion Rupiah were directed to restructure the financial intermediations. As a result, the earlier policy was nothing to do with the exchange rates market. Consequently, the volatility is higher in the consecutive quarters after the global financial crisis.

Overall, what is particularly interesting about those results above is that the effect of the discretionary fiscal policy, the cyclical component of output, and the discretionary government spending policy shock changes on exchange rates volatility appears to last almost only one quarter. Indeed, the summations of the coefficients for current and lagged dependent variables add up to zero. They imply that the type of fiscal policy shocks is not helpful to decline instantaneously the volatility in the foreign exchange market in the short-run.

Table 6. The Long-Run Estimation Results of Exchange Rates Volatility

	VER	VNEER	VREER
CG	-0.3231	-0.3749	-0.5593
CY	0.6193	0.3749	0.5249
μ	0.2588	0.2810	0.4956

Source: Table 5

So far, we have discussed the exchange rates volatility in the short-run perspective. Table 6 summarizes the results of long-run coefficient of exchange rates volatility with respect to the cyclical component of government spending, cyclical component of output, and discretionary of government spending. It could be derived from Table 5 by dividing the short-run coefficient (summation of current and lagged coefficients) by the corresponding coefficient of partial adjustment.

The long-run coefficients seem to be much higher than those in the short-run. The cyclical component of output has the highest contribution to the exchange rates volatility for about 0.32 – 0.56. On the other hand, the respond of the exchange rates volatility with respect to CG and μ is almost the same though in the opposite direction. Looking at the magnitude and the sign, the long-run coefficient of CG is slightly

higher than that of μ. Consequently, the overall net impact generated from government expenditure (broadly speaking fiscal policy) shocks on the exchange rates stabilization becomes marginal. Given that, we infer that the fiscal policy *per se* has a little support to reduce the exchange rates volatility.

5. Concluding Remarks

The aim of this paper was to provide direct empirical evidence on the relationship between discretionary government expenditure policy and exchange rates volatility in Indonesia over the period of post-monetary crisis, 1998–2012. To the best our knowledge, this is the first study that investigates the effectiveness of fiscal policy by linking both variables in the case of Indonesia. We use the ARDL models and conduct both bound and Johansen co-integration tests. We analyzed the quarterly data on government expenditure and its impact on exchange rates volatility comprising exchange rate, nominal effective exchange rate, and real effective exchange rate.

The motivation behind this paper is although the theory and empirics imply that expansionary government expenditure can either induces exchange rate appreciation or depreciation, our synthesizing approach does prove that the influence of expansionary government spending on the exchange rates volatility pressure typically depends on the characteristics of fiscal policy shock. Our results confirm that while discretionary government spending shock policy has positive pressure, the discretionary fiscal policy conducted for reasons other than the current macroeconomic conditions induce the exchange rates volatility.

The empirical study also affirms that discretionary government expenditure, cyclical component of output, fiscal policy shock, and exchange rates volatility are co-integrated implying they have a long-term relationship. In the long-term, the output fluctuation which represents the state of business cycle has the highest impact on the exchange rates volatility pressure. With respect to exchange rates volatility, the discretionary government expenditure shock and the discretionary fiscal policy have the lower impact than that of output fluctuation. However, the magnitudes of their impact are almost the same in the opposite sign. The results above are robust in all of the specified models.

Those findings provide some important economic implications. First, they suggest that political and institutional factors are the main obstacle in the short-run for government to effectively play an important role to the exchange rate market. Second, the sound and prudent fiscal policy management is necessary to avoid possible dramatic change in exchange rate in the long-term in relation to output fluctuation.

Third, as a consequence, fiscal policy should be conducted based on the fiscal rule instead of discretionary policy to maintain economic stabilization.

This paper considers mainly fiscal factors to analyze the exchange rates stabilization. Further studies are advisable to integrate fiscal policy and monetary policy frameworks. Using higher frequency data (hopefully monthly data, if any), the future research can re-check the effectiveness of fiscal policy relative to monetary policy in order to stabilize exchange rates in the long-run. Indeed, the stable exchange rate is one of the hottest issues in most developing countries and Indonesia is not an exception.

REFERENCES

[1] **Abimanyu, Y. (1998),** ***Using Indonesia's Real Exchange Rate to Test Ricardian Equivalence;*** *International Economic Journal*, 12(3): 17-29;

[2] **Akitoby, B., Clements, B., Gupta, S. and Inchauste, G. (2006),** ***Public Spending, Voracity and Wagner's Law in Developing Countries*****;** *European Journal of Political Economy*, 22(4): 908–24;

[3] **Allsopp, C. and Vines, D. (2008),** ***Fiscal Policy, Inter-country Adjustment and the Real Exchange Rate;*** *European Economy, Economic Papers*, No. 344, October;

[4] **Annicchiarico, B. (2006),** ***Fiscal Policy and Exchange Rate;*** *Journal of Economics*, 89(2): 165-85;

[5] **Badia, M.M. and Segura-Ubiergo, A. (2014),** ***Real Exchange Rate Appreciation in Emerging Markets: Can Fiscal Policy Help*****?;** IMF Working Paper No. 14/1, January;

[6] **Benetrix, A.S. and Lane, P.R. (2013),** ***Fiscal Shocks and the Real Exchange Rate;*** *International Journal of Central Banking*, 9(3), September: 1-32;

[7] **Blanchard, O. (2003),** ***Macroeconomics Theory***; 4th edition New York: *Pearson Education Limited;*

[8] **Blanchard, O. and Perotti, R. (2002),** ***An Empirical Characterization of the Dynamic Effects of Changes in Government Spending and Taxes on Output*****;** *Quarterly Journal of Economics*, 117(4), November: 1329-68;

[9] **Caporale, G.M., Ciferri, D., and Girardi, A. (2008),** ***Fiscal Shocks and Real Exchange Rate Dynamics: Some Evidence for Latin America;*** Working Paper, Brunel University, London, February 2008;

[10] **Caputo, R. and Fuentes, M. (2012),*****Government Spending and the Real Exchange Rate: A Cross–Country Perspective*****;** Banco Central De Chile Working Paper No. 655;

[11] **Chatterjee, S. and Mursagulov, A. (2012),** ***Fiscal Policy and the Real Exchange Rate;*** IMF Working Paper No. 12/52 (Washington: International Monetary Fund);
[12] **Corsetti, G. and Pesenti, P. (2001),** ***Welfare and Macroeconomic Interdependence;*** *Quarterly Journal of Economics*, 116(2): 421–45;
[13] **De Castro, F. and Fernández-Caballero, L. (2011),*****The Effects of Fiscal Shocks on the Exchange Rate in Spain*****;** Banco de España Working Paper No.1121;
[14] **Fatás, A. and Mihov, I. (2007),** ***Fiscal Discipline, Volatility and Growth*****;** In: G. Perry, L. Servén, and R. Suescún, (edt.), *Fiscal Policy Stabilization and Growth: Prudence or Abstinence?*, Washington D.C., World Bank;
[15] **Frenkel, J.A., and Razin, A. (1996),** ***Fiscal Policies and Growth in the World Economy*****;** Third Edt., Cambridge, MA: MIT Press;
[16] **Galstyan, V. and Lane, P.R. (2009),** ***The Composition of Government Spending and the Real Exchange Rate;*** *Journal of Money Credit and Banking*, 41(6): 1233-49;
[17] **Kaminsky, G., Reinhardt, C., and Végh, C. (2004),*****When It Rains, It Pours: Pro-cyclical Capital Flows and Macroeconomic Policies;*** *NBER Macroeconomics Annual*, Cambridge and London: MIT Press;
[18] **Kollmann, R. (2010),** ***Government Purchases and the Real Exchange Rate;*** *Open Economies Review*, 21(1): 49–64;
[19] **Mankiw, N.G. (2000),** ***Macroeconomics Theory*****;** 4th edition, New York: Worth Publishers, Inc.;
[20] **Monacelli, T. and Perotti, R. (2010),** ***Fiscal Policy, the Real Exchange Rate and Traded Goods;*** *Economic Journal*, 120(544), May: 437-61;
[21] **Mountford, A. and Uhlig, H. (2009),** ***What are the Effects of Fiscal Policy Shocks?*** **;** *Journal of Applied Econometrics*, 24(6): 960-92;
[22] **Penati, A. (1983),** ***Expansionary Fiscal Policy and the Exchange Rate: A Review ;*** *IMF* Staff *Papers*, 30(3), September: 542-69*;*
[23] **Ravn, M., Schmitt-Grohe, S. and Uribe, M. (2012),** ***Consumption, Government Spending and the Real Exchange Rate;*** *Journal of Monetary Economics*, 59(3): 215–34;
[24] **Sachs, J. and Wyplosz, C. (1984),** ***Real Exchange Rate Effects of Fiscal Policy;*** NBER Working Paper No. 1255 (Cambridge, Massachusetts, National Bureau of Economic Research);
[25] **Tsen, W.H. (2012),** ***The Real Exchange Rate Determination: An Empirical Study in Indonesia, Malaysia, Singapore, and Thailand*****;** Paper presented in the 13th International Convention of the East Asian Economic Association, October, 19-20, Singapore.