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An Analysis of Relationship Between Exchange Rate and Balance of Payment for the Japanese Economy

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Abstract

The last two decades (the 90s and 00s) are considered as lost decade in Japan due to the persistent stagnancy in the economic activities. This sluggishness in economic activities proliferated when the global economic crisis hit in 2008. The current Abe government, therefore, introduces 'three arrows' policies to stimulate the economy from this stagnant situation when they came to the power. For this reason, Japanese yen depreciates a lot in recent years to support the government policies. Hence, this paper aims to evaluate the impact of yen devaluation on the BOP movements during the period 1998 to 2016 using OLS and VAR model. The estimated results reveal that exchange rate is not the main factor in determining the BOP movements in Japan. Japan is an industrialist country, so many economic factors from both inside and outside of the country are vital to determine the BOP rather than just the exchange rate.

Keywords: Exchange rate, Balance of Payment, Japanese Economy

JEL Classification: B17, F24.

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1. Introduction

The exchange rate is defined as the price of one country's currency in relation to another's (Iyoboyi and Muftau, 2014). The variation in exchange rate has significant economic implications, especially on some key macroeconomic indicators such as outputs, imports, export prices, interest rate, inflation etc. Therefore, an appropriate policy mix for the stable exchange rate is important to stimulate the economic performance as well as international transaction position of a country. On the other hand, Balance of Payment (BOP) is defined as the systematic record of transaction of a country with the rest of the world. The stability in the BOP movements of a country is very crucial to ensure not only sound economic activities but also an effective connection with the rest of the world. The current, capital and financial accounts balance are the main components of the BOP. Many economists presume the relation between exchange rate and BOP through the current account component (e.g. net export).

In recent years, the Japanese economy is going through ups and downs for both internal and external reasons. The persistent stagnation of the consumption growth, persistent deflation, changing labor force participation, changing investment behavior by the entrepreneurs, and the global economic crisis, all these factors are causing Japanese economy more volatile over the few years (Shimizu and Sato, 2015). Hence, the current government has introduced 'three arrows' policies that widely known as 'Abenomics' such as fiscal stimulus packages, monetary easing and structural change to bolster the economic activities as well as to ensure economic stability since September 2012. Moreover, the government has given a signal to the market to depreciate yen significantly with a view to promoting the effectiveness of current 'Abenomics'. This initiative of Japanese government leads to analyze the effect of yen devaluation on the Japanese economy, through BOP channel. Hence, we attempt to check the relationship between exchange rate and BOP movements in Japanese economy during the period January, 1998 to September, 2016.

The rest of the parts of this paper is proceeds as follows: (2) Theoretical Background and Brief Literature Review, (3) Recent Trends of BOP and Exchange Rate in Japan, (4) Estimation of the Impact of Exchange Rate on BOP of Japan and (5) Conclusion and Policy Implications.

2. Theoretical Background and Brief Literature Review

2.1 Theoretical Background

The traditional school of thought in economics believe that trade balance can be improved by depreciating exchange rate and consequently, mitigate BOP pitfalls and boost up output and employment, provided the Marshall-Lerner conditions are met. The Marshall-Lerner condition assumes that exchange rate devaluation would lead to the expansion in output if the sum of price elasticity of demand for imports and export is greater than unity. Here, depreciation would make export industries more competitive in the world markets; hence, stimulate domestic production of tradable goods and that lead to domestic industries to use more domestic intermediate goods and these cycles of rising production could foster the overall output in an economy.

On the other hand, the monetarists' school of thought claims that exchange rate variability has no impact on real variables in the long run. Based on this hypothesis, **Domac (1997)** noted that exchange rate depreciation affects real variables mainly via real balance effect in the short-run; however, keeps all real indicators same in the long run of an economy. This idea has come from the features of the purchasing power parity, which predicts that depreciation promotes the level of output in the short run; however, the monetary consequence of that depreciation neutralizes the rise in output and improvement in BOP by the increase in prices in the long run.

According to the IS-LM model, exchange rate has no direct effects on output, but indirectly via export, import and the money supply channels. Under this framework, the interaction between exchange rate movements and output growth cannot be determined a priori as its impact can be either positive or negative owing to the exchange rate depreciation effect on the domestic economy's interest rate. As per the IS-LM model, it is expected that depreciation would have positive impact on exports as it makes domestic goods cheaper in the world markets. In contrast, it would diminish the import because of the higher relative prices of imported goods, therefore net export rises vis-a-vis income where the Marshal-Lerner condition is satisfied.

2.2 Brief Literature Review

The investigation of the relationship between exchange rate and BOP movements is ongoing on both developed and developing country perspective. The economists and researchers have drawn very mixed results regarding the pattern of relationship between them. Some studies have observed a negative effect of depreciation on domestic output which consequently affects the BOP position negatively. Conversely, some studies have found the opposite result that is exchange rate depreciation has positive impact on BOP.

Kouri (1976) found a significant different result from the traditional views considering a connection between monetary policy, the inflow or outflow of capital through the effect of interest rate and exchange rate on output and thereby on the current account, which determines the capital account balance. He had drawn his remarks based on the interaction of exchange rate and BOP both in short run and long run period under monetary policy approach.

Imoisi (2012) got a significant relationship between BOP, exchange rate and interest rate in Nigeria. However, Iyoboyi and Muftau (2014) observed a mixed result for the interaction between these two in Nigeria over the period 1961-2012. They found the bidirectional causality between BOP and exchange rate; however, they observed a significant variation in Nigeria's BOP which is not due to change in exchange rate movements based on the variance decomposition analysis.

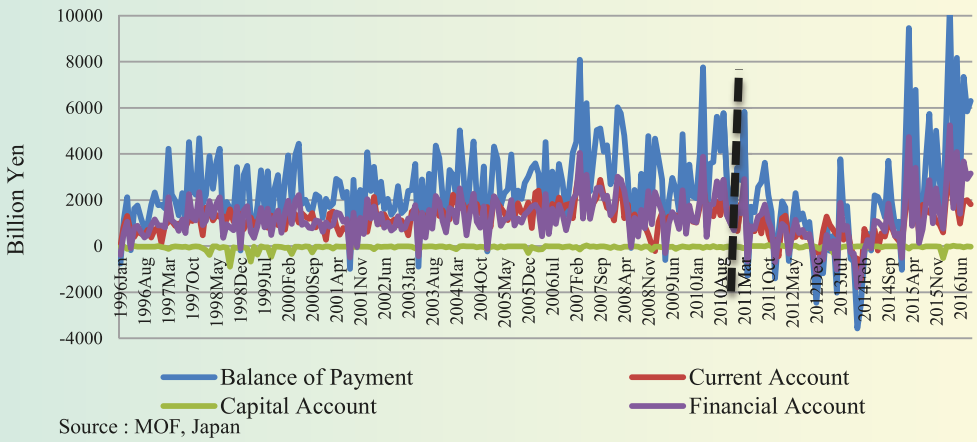
Shimizu and Sato (2015) analyzed the impact of real effective exchange rate depreciation on trade balance in Japanese economy over the period between January, 1985 to June, 2014 by using the auto-regressive distributed lag (ARDL) model and the vector error–correction model (VECM). They divided the data periods into two sub-periods such as January, 1985 to December, 1998 and January, 1999 to June, 2014 respectively. They found the J-curve phenomenon in the Japanese economy during the 1st period; however, they do not find similar impact of exchange rate on trade balance for the later period. Therefore, they stated that the slow recovery of Japan's trade balance in response to the yen devaluation can be explained by the Japanese firms' pricing behaviors as well as the changes in their production and trade structure. This new phase of firms' behavior and international division of labor is likely to hinder the positive effect of yen depreciation on trade

balance in recent years in Japan. Nguyen, & Kiyotaka (2015) employed a threshold vector autoregressive (TVAR) model to analyze a possible asymmetric behavior of exchange rate pass-through (ERPT) or pricing-to-market (PTM) in Japanese exports between the yen appreciation and depreciation regimes. They found that a decline (increase) in PTM (ERPT) in the yen depreciation regime suggests that Japanese exporters tend to lower the yen-based export price and fail to fully exploit foreign exchange gain in response to the yen depreciation, likely due to an increase in export competition in the world market. Although both these two analysis focused on the impact of yen depreciation on trade balance, however, these studies did not consider the recent two important phenomena's i.e. global economic downturn and Fukushima nuclear blasts. In this backdrop, this paper is aiming to identify the impact of yen depreciation on the behavior of BOP in Japanese economy with accounting these two vital issues.

3 Recent Trends of BOP and Exchange Rate in Japan

3.1 BOP and Its Components Movements in Japan

Fukuma, Morishita and Nakamura (2016) identify the following two noteworthy points for Japanese BOP. First, there has been a shift in exports from goods to services. And second, earnings on the accumulated stock of external assets are playing an increasingly important role as a result of an increase in Japan's outward direct investment in recent years. While Japanese firms make more profits from the stock of external assets, the rate of return on outward direct investment remains relatively low compared to the United States and United Kingdom, and depends heavily on the high rate of return in the manufacturing sector, particularly the transportation equipment industry in Asia. Figure 1 delineates the movements of BOP and its components from January, 1996 to August, 2016. It is observed that there is a fluctuation in the overall position of BOP in Japan. This volatility has increased in recent years due to the global economic downtrends and Fukushima nuclear disaster. Consequently, the overall position of BOP became negative just after the Fukushima disaster. The position of BOP was recovering afterward through the current governments' economic stimulus packages ('Abenomics').



Source : MOF, Japan

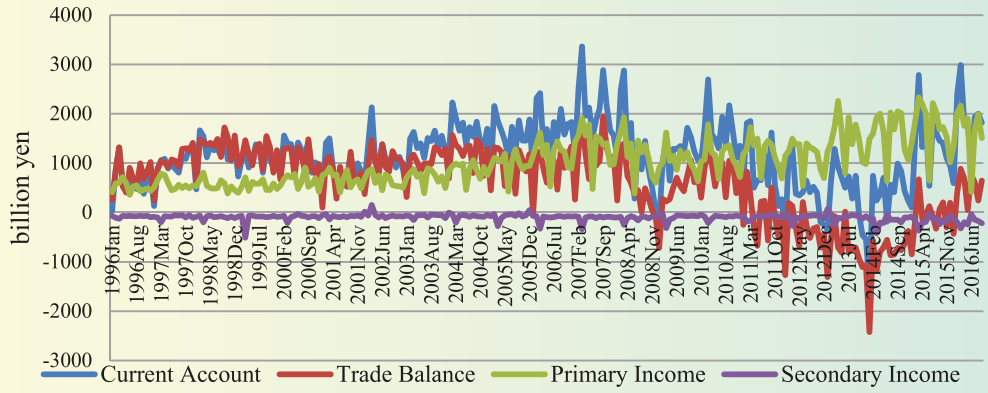
Figure 1: BOP and its Components in Japan

The capital account is stable over the periods. However, it does not have a significant impact on determining the movements of BOP in Japan. On the other hand, both the financial and current account balances follow the similar pattern with the BOP movements.

3.2 Current Account (CA) Balance and Its Components

Japan is normally current account surplus economy because of the positive net export. However, the current account was deficit in January 2009 (221.9 billion yen) due to the economic crisis in 2008 which was followed by the large trade deficit (718.7 billion yen). This trade deficit (TD) and consequently, CA deficit were proliferated when Fukushima power plant blasts occurred due to the earthquake in March 2011 (Figure 2). The large trade deficit was continued in the Japanese economy as it started to increase imports of crude oil to produce power. However, both the CAD and TD are improving in recent years followed by the economic stimulus packages in 2012. The current account surplus rocketed mainly due to a significant decrease in the deficit of goods[5]. Moreover, a reduce in the deficit on services, mainly reflecting an increase in the number of foreign visitors to Japan and heavy flow of net primary income via portfolio investment income which comes from an increase in Japanese-owned assets in abroad.

[5] See BOJ reports and research paper series on Japan's Balance of Payments Statistics for 2015 and International Investment Position at Year end 2015, Prepared by International Department, August 2016, Bank of Japan.

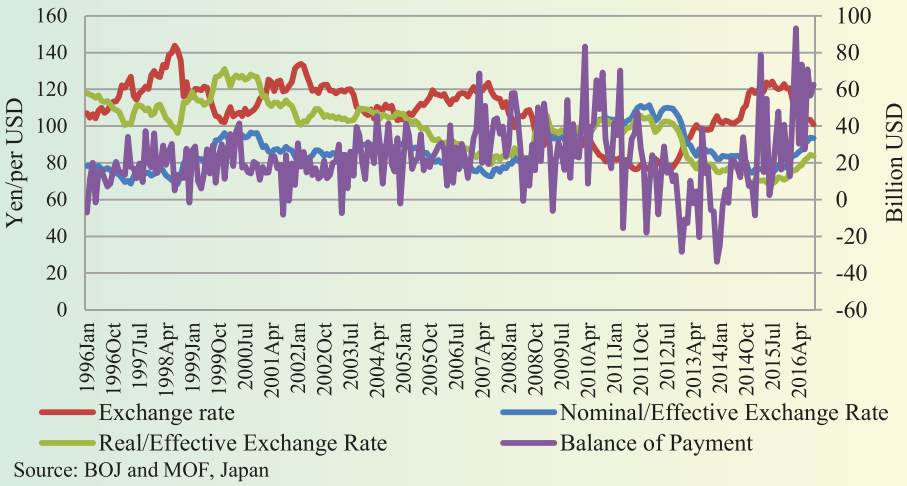


Source : MOF, Japan

Figure 2: Current Account Balance in Japan

3.3 Exchange Rate Movement in Japan

The Japanese yen started to appreciate against USD radically during the post-economic crisis period in 2008. The average exchange rate recorded 80.0 yen against per USD during 2011 to 2012; however, it's reached to record high 76.7 yen in September 2011. Thereafter, the yen again started to depreciate against USD followed by the government initiative to implement three arrows policies at the end of 2012 (Figure 3). The figure also depicts a mixed pattern of movement between exchange rate and BOP in the country. However, theoretically, it is expected that when exchange rate depreciates then the overall position of BOP should improve via stimulation of net export (Marshall-Lerner condition). Nevertheless, it is observed that there is some similar movement between these two after the government new policies in 2012. However, it is difficult to pin-down that they have positive interaction just based on this graphical trends. Hence, some econometric tools will be used to identify their relationship in the later part of this paper. Moreover, the movements of export & import items, exchange rate, and other factors (those have an impact on export and import items) are also need to check before identifying the interaction between exchange rate and BOP in Japan.

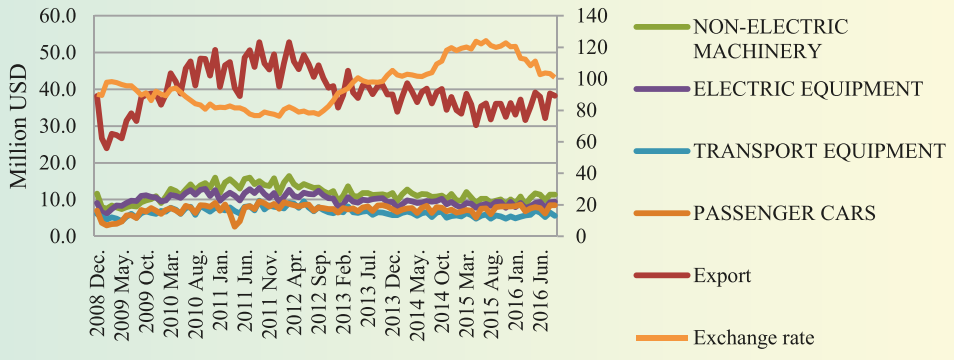


Source: BOJ and MOF, Japan

Figure 3: Exchange Rate and BOP Movement in Japan

3.4 Trends of Major Export Items and Exchange rate in Japan

Figure 4 discloses the interaction between exchange rate and export including major export items in Japan. The figure depicts that when yen depreciates then export was falling down and vice-versa. Moreover, the non-electronic machinery (major export item) was also inversely related to the exchange rate depreciation. Hence, many economists argued that Japan mainly exports heavy industrial goods in the world market. As a result, the exchange rate is not the major factor to foster Japanese export instead foreign economic characteristics is the key (e.g. movements of foreign economies business cycle).

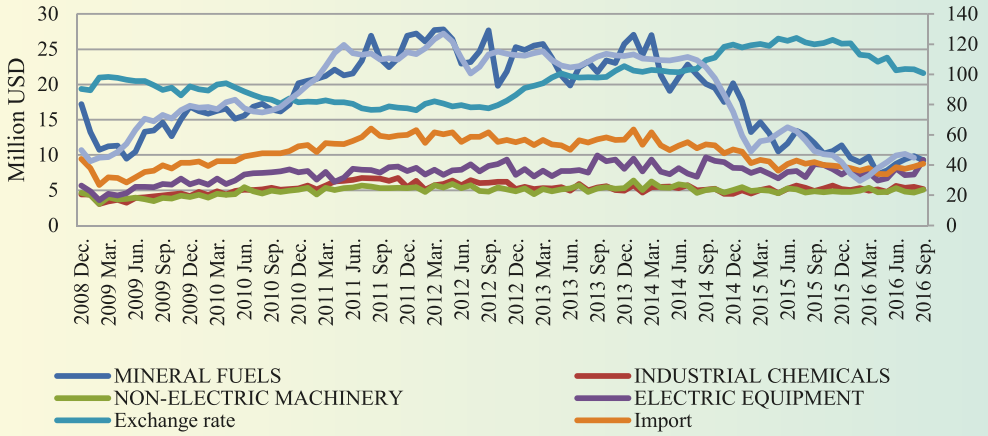


Source: BOJ and MOF, Japan

Figure 4: Movement of Major Export Items and Exchange Rate in Japan

3.5 Trends of Major Import Items, Oil Price and Exchange Rate in Japan

Figure 5 indicates that when exchange rate depreciates then the value of imports falls and vice-versa. The major import item in Japan is mineral fuels and it is observed that it was also inversely related to the exchange rate depreciation. On the contrary, it is evidenced that the value of import of mineral fuels were highly coincided with the oil price changes. So when the oil price increases then the value of mineral fuels import rises and consequently raises overall imports in Japan. Though exchange rate depreciated a lot in recent years and the value of imports decreased significantly, that is occurred by the sharp declining of the oil prices in the world market instead of depreciation of yen. Therefore, the recent hike of trade balance in Japan was not by the exchange rate depreciation rather than it was because of decreasing value of import via large plummeting of crude oil prices. Hence, it cannot be said rigorously the depreciation of exchange rate lead to improvement of BOP in Japan without any statistical analysis.



Source: BOJ and MOF, Japan Note: Oil price data collected from International Energy Agency website

Figure 5: Major Import Items, Oil Price and Exchange Rate in Japan

4. Estimation of the Impact of Exchange Rate on BOP of Japan

4.1 Data and Methodology

In order to identify the relationship between exchange rate and BOP movements in Japan, the monthly exchange rate is considered from January, 1998 to September, 2016. The data on exchange rate was collected from the Bank of Japan. BOP data was collected from Ministry of Finance website which measures

in billion dollars. The industrial production index (IIP) is also considered as Japan is an industrialist country; the BOP can be affected by the movement of IIP. IIP data was piled up from the World Bank online database. Data have been seasonally adjusted by using 3-months moving average to remove the seasonal pattern from all series. To analyze the data, first the Augmented Dickey-Fuller test will use to check the stationarity property of the data. Therefore, the simple OLS estimating technique will run to see the relationship between exchange rate and BOP in Japan. Apart from the exchange rate and IIP, the model will incorporate two dummies as independent variable to capture the impact of Lehman crisis in 2008 and Fukushima blasts in 2011on the BOP. The dummy Lehman crisis=1 from September 2008 to onwards and =0 otherwise. Similarly, Fukushima dummy=1 from March 2011 to onwards and =0 otherwise. Finally, Vector Autoregressive (VAR) methodology will be used to identify the short run relationship between exchange rate and BOP in the Japanese economy. The VAR model will take the following forms:

$$BOP_t = \alpha_0 + \alpha_1 BOP_{t-p} + \alpha_2 EXR_{t-p} + \alpha_3 IIP_{t-p} + \alpha_4 Lehman_{dummy} + \alpha_5 Fukushima_{dummy} + \in_{bop,t}$$

$$EXR_t = \beta_0 + \beta_1 BOP_{t-p} + \beta_2 EXR_{t-p} + \beta_3 IIP_{t-p} + \beta_4 Lehman_{dummy} + \beta_5 Fukushima_{dummy} + \in_{exr,t}$$

$$IIP_t = \gamma_0 + \gamma_1 BOP_{t-p} + \gamma_2 EXR_{t-p} + \gamma_3 IIP_{t-p} + \gamma_4 Lehman_{dummy} + \gamma_5 Fukushima_{dummy} + \in_{IIP,t}$$

Where, subscripts t indicates time and p is lag operator. The optimal lag length in the model will be selected by the minimum value of Akaike information criterion (AIC).

4.2 Estimated Results

4.2(a) Unit Root Test Results

In order to determine the order of integration of each variable, we have used Augmented Dickey-Fuller test statistics, a technique widely employs to check the unit root of time series data. The test statistics delineates that both BOP and exchange rate series are stationary in first difference form. However, the IIP series is stationary in the level form as the null hypothesis (unit root) is rejected by 5% level of significance. Hence, both BOP and exchange rate are integrated of order

one i.e I(1), conversely, IIP is integrated of order zero i.e I(0). Therefore, the first difference form of BOP and Exr and level form of IIP will use to develop both OLS and VAR model to determine the pattern of the relationship between BOP and EXR.

Table1: Augmented Dickey-Fuller Test Results

	Level		First Difference		
	Without Trend	With Trend	Without Trend	With Trend	Order of Integration
BOP	-1.244 (0.6553)	-1.242 (0.8985)	-6.295*** (0.0000)	-6.366*** (0.0000)	I(1)
EXR	-2.751 (0.0672)	-2.654 (0.2569)	-4.297*** (0.0006)	-4.399*** (0.0027)	I(1)
IIP	-3.441** (0.0106)	-3.510** (0.0321)	-5.277*** (0.0000)	-5.275*** (0.0001)	I(0)

Note: The null hypothesis states that the variable has a unit root. P-values are shown in the parentheses following each adjusted t-statistic. *** &** implies statistically significant at 1 and 5 percent level of significance respectively.

4.2(b) Estimated Regression Results

The estimated OLS regression results reveal that exchange rate does not affect the movement of BOP in Japan contemporaneously. The reason may be decision lag by the economic agents of the economy. However, the estimated coefficients of EXR are statistically significant at lag 1 and 2 respectively. The impact of lag 1 of EXR is negative to the BOP but positive in lag 2. Therefore, it is difficult to pin down or draw proposition that exchange rate has a significant impact on BOP movement in the Japanese economy. The optimal lag of each variable in the model has been selected based on the minimum value of AIC. The model is statistically fitted well as the coefficient of determination value (R^2) is 0.54.

$$DBOP = -0.465 + 0.129^{***}DBOP_{t-1} + 0.136^{***}DBOP_{t-2} - 0.599^{***}DBOP_{t-3} - 0.072DEXRt - 1.176^{***}DEXR_{t-1} + 0.830^{**}DEXR_{t-2} + 0.140DEXR_{t-3} + 0.509^{**}IIP_t - 1.305^{***}IIP_{t-1} + 0.994^{***}IIP_{t-2} - 0.193IIP_{t-3} + 0.428Dummy\_Fukushima + 0.269Dummy\_Lehman,$$

$$R^2 = 0.54$$

Note: *** & ** implies statistically significant at 1 and 5 percent level of significance.

4.2(c) Impulse Response Function

Based on the VAR model, generalized impulse response function is generated to identify the behavior of BOP from the short run shock in the exchange rate in

Japanese economy (Figure 6). Figure 6 unveils that the BOP falls immediately after the one standard deviation shock in the exchange rate (depreciation of Japanese yen); however, it increases gradually afterward. From the figure, it can be mentioned that the depreciation of Japanese yen has no persistent impact on the movement (either positive or negative) of BOP. Hence, it can be concluded that the recent noteworthy devaluation of the yen has no significant impact on the overall position of the BOP in Japanese economy.

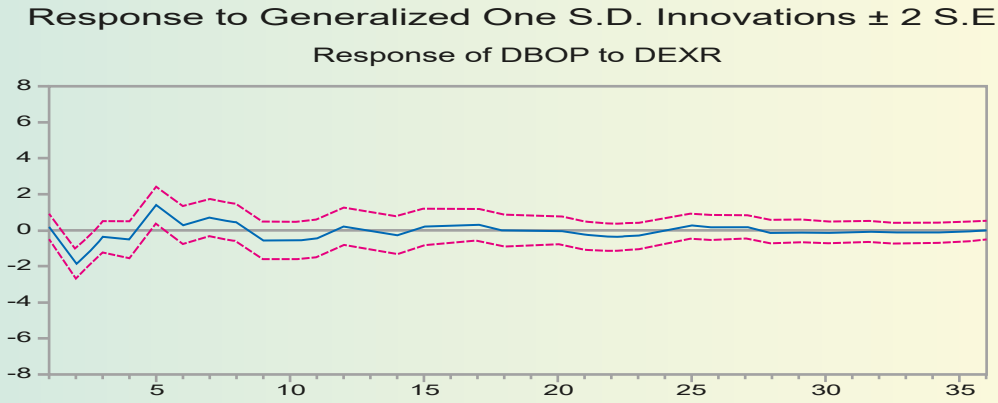


Figure 6: Impulse Response Function from VAR

5. Conclusion and Policy Implication

In this paper, the empirical relationship between Japanese yen depreciation and BOP fluctuation is investigated using time series data from January, 1998 to September 2016. The empirical analysis found a mixed (either positive or negative) impact of exchange rate depreciation on the BOP movements in Japanese economy based on OLS regression model. Moreover, the VAR model is also incorporated to retrieve the short run behavior of the BOP when yen depreciated. The impulse response function indicates that there is no considerable impact of exchange rate devaluation on the BOP. Hence, the estimated OLS regression results and impulse response function are consistent. The recent sharp depreciation of yen has no effect on the BOP because Japan's mainly exports heavy industrial good in the world markets. To this connection, exports also depend on the fluctuation of the business cycle of major Japanese trade partners. And the overall position of the BOP in Japan is improving in recent years as

economies are recovering their economic downturn from the global economic crisis in 2008. In addition, Japan experiences a huge surplus in the financial account in recent years due to the heavy flow of income from portfolio investment in the world market. Consequently, the overall balance of BOP is improving in Japan. For the above reasons, the exchange rate is not the key factor to ensure the sound and stable BOP in Japan. To ensure the stability in BOP, the Japanese government is not only required to implement a prudential policy mix for an effective exchange rate but also need to watch the movement of the business cycle of other countries. In addition, the implementation of structural change policies are urgent as the behavior of both entrepreneurs and labors are changing to the production process and labor force participation over the periods of time.

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