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SVAR AND DSVAR MODEL WITH SHORT TERM IMPLEMENTATION IN INDONESIA

Qodariah, SE, MM *Lect.Management at*
Budi Luhur University Jakarta, Indonesia

Teguh Sugiarto
Lect. Acc.at Budi Luhur Univ. Jakarta, Indonesia
Email : teguh_cpconsulting@yahoo.com

ABSTRACT

This study aims to see how the relationship between macroeconomic variables that exist in Indonesia, using large-scale models SVAR and DSVAR. Using the Structural VAR Model (SVAR) and Different Structural VAR (DSVAR) in estimating reserves and the exchange rate in Indonesia. Root Cointegration test is a test and the test data to be done before the test SVAR and DSVAR run. For the data used in this study using a period of time from the start of 1982; IV until 2012; IV.

Results of the research that has been done can be concluded that by using SVAR and DSVAR models look that variable foreign exchange reserves and the exchange rate in Indonesia significant, with the application of short-term models that exist in structural VAR models. Results innovation of restriction in the model of the model used SVAR significant influence, including the effect of exchange rates and foreign

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exchange reserves with a coefficient of -0.6877 and -0.578322 for variable exchange rate to foreign exchange reserves

Keywords: SVAR, DSVAR, Root Test, Cointegration, Reserves and Foreign Exchange.
Jel Classification : C39, C01, B49

I. PRELIMINARY

Some debate about economic problems in Indonesia that highlights many important areas of success where a study, which is explicitly aimed at a literary: sectoral effects of monetary policy. The research was done on the assumption that the economic problems in Indonesia is considered as an important issue for several reasons. First, the impact of monetary policy on sectoral output presenting other macroeconomic challenges in the form of the Indonesian economy, given the Indonesian state has an uneven geographical distribution in the economy and other sectors. Second, heterogeneity if significant in sensitivity is the foreign exchange reserves and the exchange rate, then the capacity of monetary policy to effectively and evenly to stabilize overheating or economic slowdown, which in turn will depend on the relative size of the rate sensitive sectors such as the interest rate as one the proportion of Gross Domestic Product (GDP) and regional concentration. Third, the future is expected to examine the degree of dispersion in the sensitivity of the exchange rate and foreign reserves in sectors that are likely to explain the nature of the transmission mechanism, which should things are still in a 'black box', although many facts that monetary policy in developed countries is considered a line next in a macroeconomic management.

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As was said above that monetary policy is the front line of a macro-economic management in Indonesia. It is therefore understandable that the monetary policy transmission mechanism generates a lot of interest. However, for the most part, research has concentrated on the economic monetary aggregates and ignores important differences that can occur at different levels. Although the primary objective of monetary policy in Indonesia is to achieve the inflation rate of 2-3 percent, and expects the exchange rate under $ 6,000 over the medium term, but a secondary objective remains important to keep output near a more 'natural'. Although monetary neutrality implies that the monetary variables do not affect real variables in the long term (Lewis and Mizen 2000, P.18), it is widely accepted that changes in monetary variables can affect the real economy in the short term.

II. LITERATURE REVIEW

Vector autoregressive models (VAR) was first introduced by C.Sims (1980), which is an alternative model for a form of economy that the traditional large-scale air. VAR model is an econometric model that is widely used in order to capture the dynamics and interactions between multiple time series. All variables are treated symmetrically, while the dependent variable in each equation described by equation form lags of all variables in the model, the dependent variable is no exception itself. VAR was developed in response to the argument Sims (1980) 'that there is no a priori guide or great economic reasoning to justify treating certain variables as exogenous variables in the modeling process, and therefore all should be treated as an endogenous variable.

This is reflected in the fact that the dynamics of the VAR model is driven by unexpected changes, or shocks, the endogenous variables. In contrast, the dynamics of the traditional large-scale macroeconomic models tend to be a lot to bring the results of

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changes in exogenous variables. In Lenz et al, (2000) who conducted the research VAR, shocks are identified by applying the 'recursive' structure in contemporary interactions between variables using the decomposition Choleski lower triangular. The impact of economic shocks can then be summarized neatly through the impulse response function and the estimation error variance decomposition. While the impulse response is used to interpret the wide dynamic behavior of the economic system, the estimated error variance decomposition indicates the importance of the different shocks to determine the proportion of variation in each variable associated with shock. There are some important things, which can distinguish between use of a VAR model and the structural VAR. Although the standard reduced form VAR model is a useful tool to describe the stylized facts about the data, the lack of structure makes it difficult to interpret their results. Cooley and LeRoy (1985) criticizes atheoretical recursive identification scheme used in most of the initial VAR model, they noted that the estimated responses to shocks will vary based on the sequence of variables, most of which can be considered something that is arbitrary. A particular weakness with recursive VAR models is their inability to identify the 'right' of monetary policy shocks, because they do not differentiate between endogenous and exogenous components of monetary policy.

In some other cases, the occurrence of a monetary authority endogenous reaction to changes in other variables that can not be controlled, and the possibility of there being some reverse causation between the use of variables such as interest rates, output and prices. To overcome these problems, in a study done by Bernanke (1986) and Sims (1986) enforces identification scheme non-recursive on the interaction of contemporary between variables, it will allow the model 'structure' to be imposed on the model and wider consistent with existing economic theory. In the model, the non-recursive impose restrictions on short-term, so-called non-recursive structural VAR (Hamilton, 1994, p.330). Actually in the VAR model and svar has been used extensively to model the

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impact of monetary policy in the context of a closed economy in (Sims, 1986; Gali, 1992; Gordon and Leeper, 1994; Bernanke and Mihov, 1995; Christiano, Eichenbaum and Evans, 1996, and Sims and Zha, 1998a, b) and an open economy context (Sims, 1992; Eichenbaum and Evans, 1995; Cushman and Zha, 1997; Kim and Roubini, 2000). A structural VAR models allow for examination shocks 'large', such as unexpected changes in the monetary policy stance. However, to do this, need to make an imposition of restriction rules that will catch on the occurrence of a shock. The purpose of the monetary policy shocks reveal something specification rules generally require a broader systematic policy, which reflects the behavior of the monetary authority, as proposed by Taylor (1993). Given this opens the door to a number of literature on the policy rules, which will reflect the behavior of a central bank that is more systematic. If we see in Brischetto and Voss (1999, p.6), indicating the restrictions imposed on the SVAR contemporary relationships that may be more accurate if they are taken from the scale or in the context of perekonmian large, in terms of macroeconomic models is entirely determined by policy makers.

Very often in practice, the restrictions imposed are generally based on intuition are largely consistent with conventional macroeconomic theory and adjusted to produce a model of the dynamics that makes sense. In a study done by Leeper, Sims and Zha (1996) argues that this approach is justified as long as the reasons that underlie specification of the model that will be explained and must be disclosed. Nevertheless, it is still a little difficult to distinguish between the characteristics of the model are determined by the restrictions imposed and defined as form data used in Uhlig, (1997, p.383).

In Brunner (2000) and Rudebusch (1998) questioned whether the model svar adequate to be able to see the impact of monetary policy shocks, and therefore whether this approach is useful for policy analysis. There are two main criticisms that continue to challenge the VAR literature. The first criticism involves the need to specify restrictions

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on the central bank's policy reaction function, where there is little agreement. While the VAR model successfully isolate the components 'exogenous' monetary policy (in order to remove the reverse causality between variables that can lead to changes in interest rates) that exogenous shocks monetary policy is actually produced within the framework of svar which reflects an unexpected, systematic changes to monetary policy, which is not always an accurate reflection of the central bank's policy decisions. While in another study conducted by Brischetto and Voss (1999), Dungey and Pagan (2000), Bruney and Rudenbusch and Berkelmans (2005) provide guidance on how to avoid the 'puzzle' - the results of SVAR are not in accordance with conventional theory or empirical observation. Four puzzles commonly observed in models svar: influence liquidity puzzle, puzzle discounts, price index, exchange rate, and the puzzle of foreign reserves and the rate of bias in Kim and Roubini (2000). According to Leeper, Sims and Zha (1996), the abolition of the two puzzles are generally regarded as the minimum requirement for a justification process that identifies a monetary policy shock. Puzzle liquidity refers to the unexpected relationship between the money supply and interest rates. Assumptions, when the monetary policy shock is identified as an innovation in the money supply, a contractionary policy will result in lower, not higher, to interest rates. In another study, however discussed the price puzzle that occurs when the contraction of monetary policy shocks in inflation rates higher despite reasonable response of output and money supply. Incident in terms of price exchange puzzle manifests itself as the depreciation of the domestic currency immediately after the contractionary monetary shock in the country. Advanced puzzle discounts occur when the exchange rate moves in the direction anticipated following a monetary policy shock, but the changes are far more persistent than expected under uncovered interest parity. In another study using the model SVAR showed that the variables that control for the central bank's expectations of future inflation help to reduce the 'price puzzle'. In foreign research, oil prices are often used for that purpose in Kim and Roubini (2000). But in SVAR other

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models in offering an alternative, using a broad index of commodity prices in Christiano, Eichenbaum and Evans (1998); Hayo and Uhlenbrock, (1999); Suzuki, 2004; Berkelmans, (2005).

Actually there are two models of popular approach to identify a reaction on economic policy in a country, but rather to look at the elements of monetary policy (i) following the policy rules, such as the 'Taylor Rule' (Taylor, 1993) or (ii) allowing the central bank to Concurrent respond as much relevant information as possible at the time of their decision Zha, (1997). The main advantage of using SVAR models is the ability to define both types of policy reaction function in contemporary matrix, which can be controlled for the relationship between endogenous prices, output and interest rates. To model SVAR literature in Indonesia have not been many highlights the inclusion of many different variables that interest rate, exchange rate, foreign exchange reserves are very influential for economic activities. For example, Brischetto and Voss (1999) felt the need to incorporate the exchange rate and the federal funds rate. They also include oil prices and monetary aggregates, and opted to exclude output and the price level, although conformity to the economy by targeting inflation. Instead, Berkelmans (2005) enables simultaneous monetary policy to respond to commodity price, credit and exchange rate, while Dungey and Pagan (2000) only include the Gross National Expenditure (GNE) and inflation in a policy reaction function.

III. RESEARCH METHOD

Time and Data Research

The research was conducted by the author at the time in August-October 2015. The data in this study using a variable foreign exchange reserves and the exchange rate in

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Indonesia period in 1982; IV until 2012; IV. Data once in the can by the authors first processed, before analyzed using a statistical assisted.

Research Data Analysis Techniques

The model used in this research is the development of models SVAR and DSVAR in the short-term models SVAR contained in the matrix, but before the model is done first conducted test data using a test root and Cointegration Test. SVAR early models possess equation form as follows: (1). As emphasized by Levy-Yeyati and Sturzenegger (2004), the exchange rate and foreign reserves are included in the model to conclude setting the exchange rate. Although the foreign exchange reserves are the most important policy instrument to control the exchange rate, other important policy instruments, interest rates, are also often used to control the exchange rate. As a result, past studies such as Calvo and Reinhart (2001) also examined the ordinary bunga.Seperti rate changes in the structural VAR analysis, structural representation identified by imposing some restrictions on the estimated reduced form. VAR equations reduced form (for models that include the exchange rate (F) and reserves (FR) is:

$$(1)\quad \begin{bmatrix} \Delta F_t \\ \Delta FR_t \end{bmatrix} = \begin{bmatrix} A_{11}(L) & A_{12}(L) \\ A_{21}(L) & A_{22}(L) \end{bmatrix} \begin{bmatrix} \Delta F_{t-1} \\ \Delta FR_{t-1} \end{bmatrix} + \begin{bmatrix} \varepsilon_{E,t} \\ \varepsilon_{FR,t} \end{bmatrix}$$

Let where F is the log of the exchange rate, FR is the log of foreign exchange reserves, A (L) 's is a polynomial in the lag operator L, eE and EFR is a residue in each equation, e is 2 by 1 vector of residuals, ie, e = (eE EFR) ', and var (e) = S. For simplicity of exposition, the constant term was dropped in equation (1). I use pure preliminary data of

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each variable (not the log-level) for the following reasons. First, most past studies, for example, Calvo and Reinhart (2002), Levy-Yeyati and Sturzenegger (2004), Hernandez and Montiel (2003), Baig (2001) and Reinhart and Rogoff (2003), using the percentage change is not level or log-level, and would like to have better results as compared to previous studies.

Two variables in the model, we can achieve the goal by separately identifying two orthogonal structural shocks namely the (structural) shocks the exchange rate (that react foreign exchange reserves to stabilize the exchange rate) and (structural) shocks reserves (which affects the exchange rate). However, the identification method popular impose zero restrictions on the parameters of contemporary structure (developed by Sims (1980, 1986), Bernanke (1996), and Blanchard and Watson (1996)) and imposed restrictions to zero in the long term effect (developed by Blanchard and Quah (1989)) it is difficult to apply in this case. Structural equation shape in the form of vector moving average is:

$$(2)\quad \begin{bmatrix} \Delta F_t \\ \Delta FR_t \end{bmatrix} = \begin{bmatrix} C_{11}(L) & C_{12}(L) \\ C_{21}(L) & C_{22}(L) \end{bmatrix} \begin{bmatrix} e_{E,t} \\ e_{FR,t} \end{bmatrix}$$

where C (L) 's is a polynomial in the lag operator LeE and EFR is a surprise structural exchange rate and shocks structural reserves, respectively, e is 2 by 1 vector shocks structural, ie, e = (eE EFR) 'var (e) = W, and W is a diagonal matrix. The sign restrictions in wear on this model is the C11 (0) ³0, C12 (0) ³0, C21 (0) £ 0, and C22 (0) ³0.

To conclude the level of stabilization of the exchange rate, I calculate dynamic policy reaction function, which shows the reaction of foreign exchange reserves at the rate from time to time in the presence of exchange rate shocks. From equation (2), the

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impulse response of the exchange rate and foreign exchange reserves against exchange rate shocks:

(3) $\Delta F_t(e_E) = C_{11}(L)e_{E,t}$

(4) $\Delta FR_t(e_E) = C_{21}(L)e_{E,t}$

Where and are defined as the exchange rate and foreign exchange reserves before the change in the exchange rate shocks only. By combining (3) and (4),

(5) $\Delta FR_t(e_E) = \dfrac{C_{21}(L)}{C_{11}(L)}\Delta E_t(e_E)$

The coefficient on DET (eE), Det (eE), DET-1 (eE), DET-2 (eE), ... this (5) shows how much percentage of the foreign exchange reserves of exchange rate changes over time in response to a 1% depreciation the exchange rate in the face of exchange rate shocks. Equation shape of the structure in the form of auto-regression vector is:

(6) $\begin{bmatrix} B_{0,11} & B_{0,12} \\ B_{0,21} & B_{0,22} \end{bmatrix} \begin{bmatrix} \Delta F_t \\ \Delta FR_t \end{bmatrix} = \begin{bmatrix} B_{11}(L) & B_{12}(L) \\ B_{21}(L) & B_{22}(L) \end{bmatrix} \begin{bmatrix} \Delta F_{t-1} \\ \Delta FR_{t-1} \end{bmatrix} + \begin{bmatrix} e_{E,t} \\ e_{FR,t} \end{bmatrix}$

where B0 is a constant and B (L) 's is a polynomial in the lag operator L. The shape of the structural coefficient vector moving average shape (2) and form auto-regression vector (6) associated with C (L) = (B0 - B (L) L) -1. It can be shown that the restriction sign on impulse responses also imply restrictions as marked on the contemporary

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structure parameters, namely B0, 11 ³ 0, B0, £ 12 0, B0, 21 ³ 0, and B0, 22 ³ 0. The restrictions on the structural parameters contemporary B0 can easily be interpreted as follows. Increased foreign exchange reserves depreciate in value, while the authority to mitigate foreign exchange reserves policy as a reaction to the depreciation of the exchange rate to stabilize the exchange rate (in the policy reaction function). From the second equation (6) :

$$(7)\quad \begin{aligned} & B_{0,22}\Delta FR_t = -B_{0,21}\Delta F_t + B_{21}(L)\Delta F_{t-1} + \\ & B_{22}(L)\Delta FR_{t-1} + e_{FR,t} \end{aligned}$$

Reorganization of the equation (7),

$$(8)\quad \begin{aligned} & \Delta FR_t = \left(B_{0,22} - B_{22}(L)L\right)^{-1} \\ & \left[\left(B_{0,21} - B_{21}(L)L\right)\Delta E_t + e_{FR,t}\right] \end{aligned}$$

In the model above, imposing restrictions that positive surprises with rate decrease reserves devisar (assuming if due to an increase in foreign exchange reserves could make the domestic currency more attractive), while positive shocks to the exchange rate increase international reserves (assuming if for policy authorities to try to stabilize the exchange by lowering the exchange rate). That is, in the form of vector moving average:

$$(9)\quad \begin{bmatrix} \Delta E_t \\ \Delta R_t \end{bmatrix} = \begin{bmatrix} C_{11}(L) & C_{12}(L) \\ C_{21}(L) & C_{22}(L) \end{bmatrix} \begin{bmatrix} e_{E,t} \\ e_{R,t} \end{bmatrix}$$

where R is the foreign exchange reserves, ER and ER was a surprise structural exchange rate and shocks structural against reserves, respectively, and restriction signs are

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imposed on this model is the C11 (0) ³ 0, C12 (0) £ 0, C21 (0) ³ 0 and C22 (0) ³ 0. this limitation also implies some limitations marks on the contemporary parameters in structural equation like equation (6), namely B11 (0) ³ 0, B 12 (0) ³ 0, B21 (0) £ 0, and B22 (0) ³ 0. Policy reaction function that is built based on impulse responses to shocks to the exchange rate as in the first model.

IV. RESULT AND DISCUSSION

Usually when will do an analysis of time series data, a set of values of a variable are taken at different times. Any data collected periodically at different intervals, it is necessary to test and cointegration stationeritas over the data on the data, but the author considers the data that is in use already meet both the proficiency level test, so the test can be carried out SVAR and DSVAR.

SVAR and DSVAR Short Run Model

Here there are two SVAR model results are displayed, SVAR restriction model with short-run and short-run capital DSVAR the restriction as well. Here's how it looks:

Table 1 : SVAR Test with short run model

Structural VAR Estimates

	Coefficient	Std. Error	z-Statistic	Prob.
C(2)	0.687795	1.200114	0.573108	0.5666
C(1)	1352.255	184.0185	7.348469	0.0000

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C(3)	8432.627	1147.535	7.348469	0.0000
Log likelihood	-515.3563			
Estimated A matrix:				
1.000000	0.000000			
-0.687795	1.000000			
Estimated B matrix:				
1352.255	0.000000			
0.000000	8432.627			

Sources : Proceed by author

B0 test results of the VAR model of the model matrix Bernanke and Mihov (BM) presented in the table above. Seen on the table that some variables that are used as the innovation of the restriction in the model BM S VAR significantly, include the impact of foreign exchange reserves and the exchange rate with a coefficient of -0.6877. While the coefficient 1 shows the form of a matrix that is used. Here we see the results for the model DS VAR.

Table 1 : DSVAR Test with short run model

Structural VAR Estimates

	Coefficient	Std. Error	z-Statistic	Prob.
C(2)	0.578322	1.337382	0.432429	0.6654
C(1)	1358.371	188.3722	7.211103	0.0000

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C(3)	9263.191	1284.573	7.211103	0.0000

Log likelihood	-498.8288
Estimated A matrix:	
1.000000	0.000000
-0.578322	1.000000
Estimated B matrix:	
1358.371	0.000000
0.000000	9263.191

Sources : Proceed by author

Similarly, the VAR model, to a model SVAR also use matrix short run, the exchange rate ranged at -0.5783, this figure is slightly higher than the svar models that we use in the beginning.

If we look at where is the foreign exchange reserves and exchange rate, eE and ER was a surprise structural exchange rate and shocks structural against reserves, respectively, and restriction signs are imposed on this model is the assumption C11 (1.00000) ³ 0, C12 (-0.578322) £ 0, C21 (0) ³ 0 and C22 (1.00000) ³ 0 for the coefficient matrix A. It can be concluded that the shock or the influence of foreign exchange reserves and the exchange rate in describing the shape and the result of matrix A and matrix multiplication.

Impulse response function (IRF) SVAR Model

SVAR can also be used to look at the impact of the changes of the variables in the system of the other variables in the system dynamically. The trick is to give a shock

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(shock) on one of the endogenous variables. Shocks are given usually by one standard deviation of the variables or commonly called innovation. Search the effect of one standard deviation shock experienced by a variable in the system against the values of all variables current and future periods as a technique called Impulse Response Function.

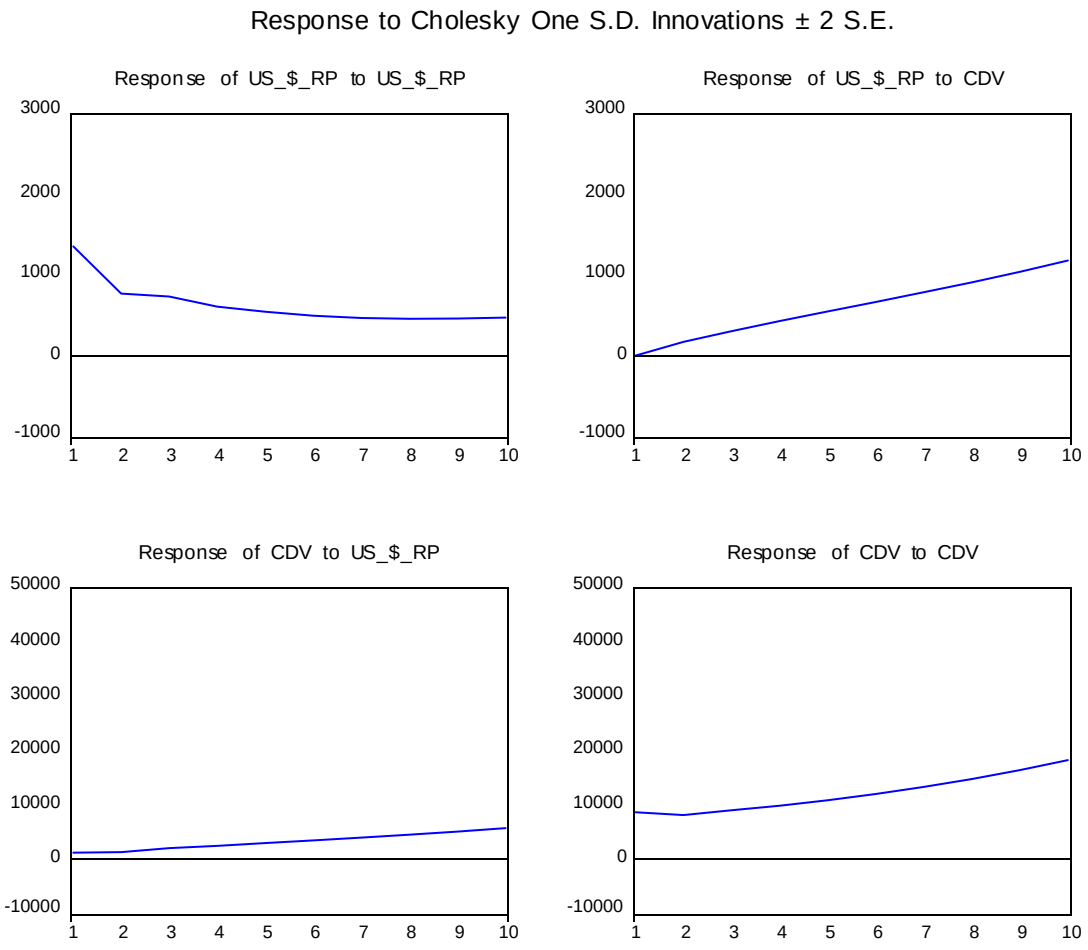

Figure1 : Impulse Response Function

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We can see how the response to the foreign exchange reserves and exchange rate, and vice versa response to the exchange rate of foreign exchange reserves during the period of approximately 10 years. In the first movement, the response rate and foreign exchange reserves away from the balance point, toward the tenth year approaching the point of balance, so does the response of foreign exchange reserves against exchange rate initially approached the balance point, then away from equilibrium.

Varianes error factor decomposition (FEVD) svar Model

Analysis FEVD in the SVAR Model aims to predict the contribution percentage of the variance of each variable due to changes in certain variables in the VAR system and SVAR or DSVAR. Pada previous impulse response function analysis is used to look at the impact of shocks from one variable to another variable. Due to the presence of orthogonal innovation which consists of several components, donated by shock. On variance decomposition is called the variance decomposition of the forecast error variance. The following matrix multiplication result FEVD of foreign reserves and exchange rate.

Variance Decomposition of US_$_RP:

Period	S.E.	US_$_RP	CDV
1	1352.255	100.0000	0.000000
2	1563.730	98.82730	1.172696
3	1752.790	96.07062	3.929379
4	1903.033	91.61557	8.384427
5	2052.763	85.69734	14.30266

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6	2213.121	78.69228	21.30772
7	2393.327	71.08090	28.91910
8	2599.168	63.32627	36.67373
9	2835.225	55.81367	44.18633
10	3105.444	48.81679	51.18321

Variance Decomposition of CDV:

Period	S.E.	US_$_RP	CDV
1	8483.763	1.201871	98.79813
2	11622.94	1.419806	98.58019
3	14677.84	2.304487	97.69551
4	17695.08	3.124165	96.87584
5	20827.54	3.943539	96.05646
6	24148.71	4.690975	95.30903
7	27723.03	5.358450	94.64155
8	31607.16	5.940594	94.05941
9	35856.85	6.440940	93.55906
10	40529.23	6.865993	93.13401

Cholesky Ordering: US_$_RP CDV

Figure 2 : FEVD

Based on the picture above shows that an important source of variation of foreign exchange reserves are reserves itself shocks, exchange rate shocks while relatively smaller. In the first occurrence of shocks, variations in reserves 0% and contributed by

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the exchange rate of 100%, in the second month variase predictive value of 98% was contributed by the exchange rate amounted to only 1.172% and so on until the tenth month.

V. CONCLUSION

Research carried propose a structural approach to estimate the Structural VAR on foreign exchange reserves and exchange rate. This definition is different from the traditional to the feedback between foreign exchange reserves and exchange rate. Another advantage of this approach is that both the reserves and the exchange rate can be estimated simultaneously. Estimates in the study of foreign reserves and the exchange rate is based on the following assumptions: there are two correlated interference that can be distinguished by the possibility of the effects on foreign exchange reserves in the first interruption panjang. Possibility term does not have long-term effects on the foreign exchange reserves, but in the short term can The second variable is cointegrated ascertained, while the latter may be. Estimated reserves should relate to the first interruption in this case the exchange rate. This study provides some insight into the movement of foreign exchange reserves and exchange rate.

Seen that the response to the foreign exchange reserves and exchange rate, and vice versa response to the exchange rate of foreign exchange reserves during the period of approximately 10 years. In the first movement, the response rate and foreign exchange reserves away from the balance point, toward the tenth year approaching the point of balance, so does the response of foreign exchange reserves against exchange rate initially approached the balance point, then away from equilibrium.

From the test results used models svar seen that some variables that are used as the innovation of the restriction in the model of the model used svar significant influence,

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including the effect of exchange rates and foreign exchange reserves with a coefficient of -0.6877 and -0.578322 for variable exchange rate to foreign exchange reserves.

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