

Dynamics of export imports oil and gas and non-oil and gas to indonesia's foreign exchange reserve: a vector autoregressive approach

Panji Kusuma Prasetyanto^{1✉}, Dinar Melani Hutajulu², Ryan Apriyadi³

Economics Development Department, Economics Faculty Tidar University, Magelang.

Abstract

Foreign exchange reserves can be interpreted as a number of foreign currencies that are kept by the central bank to meet development financing needs and other country's dependents, namely export financing and foreign debt financing or other activities. Indonesia's foreign exchange reserves in the last ten years from January 2010 to January 2021 fluctuated, but experienced an upward trend. Oil and gas exports decreased by 7.11 percent and non-oil and gas exports decreased by 13.24 persen. Meanwhile, oil and gas imports increased by 4.73 percent and non-oil and gas imports decreased by 9.00 percent. The decline in Indonesia's oil and gas and non-oil and gas exports by category of goods in January 2021 compared to December 2020. This study aims to identify the relationship, shock response and variation between oil and gas and non-oil and gas imports and exports in foreign exchange reserves during January 2010 to January 2021. The variable in this study is the position of foreign exchange reserves, exports of oil and gas, exports of non-oil and gas, imports of oil and gas and imports of non-oil and gas. This study uses secondary data obtained from the official website of Bank Indonesia (BI) during January 2010 to January 2021. Data analysis uses the Vector Error Correction Model (VECM) analysis method. Granger Causality Test results show that there is a one-way relationship between EMI and ENM variables on PCD. While the other variables do not have a relationship. The average shock response occurred at the beginning and the middle of the next 12 periods, except for the shock response of non-oil and gas imports to the position of reserve reserves which tended to be stable. At the end of the next 12 periods, the contribution of PCD in explaining PCD Diversity itself has decreased by 80.97 percent, followed by IMI at 6.10 percent, INM at 4.98 percent, EMI at 4.67 percent and ENM at 3.26 persen

Key words: Foreign exchange reserves; oil and gas exports; non-oil and gas exports; oil and gas imports; non-oil and gas imports

INTRODUCTION

International trade plays an important role for the economies of countries in the world, especially in the era of globalization. An increase in the level of activity in the capital and money market factors, production and goods market, and the flow of expenditure and income may occur due to increased imports and exports. The size of exports and imports is based on state requests multilaterally or bilaterally (Djarmiko & Nugroho, 2019:88). During the 19th to early 20th centuries, international free trade was often referred to as the "engine of growth" that succeeded in advancing the economic development of several countries. This is because free trade has many positive sides, including increasing overall static economic efficiency and optimizing resource allocation (Todaro, 2011:190).

Increasing foreign exchange reserves is one of the goals of a country through international trade. The position of foreign exchange reserves can indicate the extent to which international trade activities will generate added value in the economy of a country in a certain period. According to Tambunan, foreign exchange reserves are also a measure of how a country's economy is, because these reserves also guarantee the achievement of macro and monetary stability in a country (Ikrima, 2019:1).

Indonesia is a developing country with an open economic system. Not a few developments in all aspects that have been carried out by Indonesia to increase the level of people's welfare. Foreign exchange is also a source of funding for the sustainability of national development which is kept and accounted for by the central bank, namely Bank Indonesia (Ikrima, 2019:1).

The basic principle in managing and maintaining foreign exchange reserves is to get the maximum and best income. Regulations regarding institutions that have the right to regulate foreign exchange reserves in Indonesia are stipulated by Law on Bank Indonesia Number 23 of 1999 which later became Law Number 3 of 2004. According to Article 13 of the aforementioned Law, Bank Indonesia in carrying out monetary policy has authority in managing foreign exchange reserves. When managing foreign exchange reserves, Bank Indonesia can receive loans and carry out various foreign exchange transactions (Benny, 2013:1408).

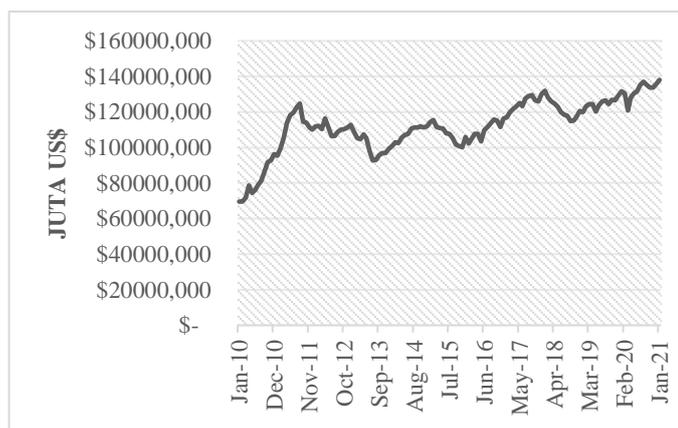


Figure 1.

Position of Indonesia's Foreign Exchange Reserves

Viewed from Figure 1, it can be concluded that the position of Indonesia's foreign exchange reserves in the last ten years from January 2010 to January 2021 experienced fluctuations, but experienced an upward trend. The lowest position of decline was in July 2013 amounting to 92,671.05 Million US. The cause of the decline in foreign exchange reserves was due to the distribution of dividends in the US, repayment of company loans, and import activities. The non-receipt of foreign exchange supplies from exports also added to pressure on foreign exchange reserves (Wijayanti, 2013).

In the next period, the position of Indonesia's foreign exchange reserves continued to fluctuate with a trend that tends to rise slowly until finally in July 2017 it managed to surpass its highest position in August 2011 of US 127,758.58 million. The reason is the increase in foreign exchange earnings originating from international bonds (global bonds), tax revenues, foreign exchange for oil and gas exports from the government and the results of the auction of Surat Berharga Bank Indonesia (SBBI) in foreign currency (Tempo.co, 2017). In the next period, it continued to increase until it was in the position of US 131,979.64 million in January 2018 due to an increase in foreign exchange receipts from taxes,

the government's share of oil and gas exports, withdrawal of government foreign loans and the results of foreign currency SBI auctions (Asmara, 2018).

As for the position of the highest increase experienced in January 2021, which amounted to 138,004.88 million US. This amount is the highest amount of foreign exchange reserves in history. Foreign exchange reserves in January 2021 are commensurate with ten and a half months or ten months of import financing and repayment of government loans in other countries, and exceeds international adequacy standards or three months of imports (Haryono, 2021).

For Indonesia itself, the results of natural resources, both non-oil and gas commodities and oil and gas commodities, are the basis of comparative advantage, so that these commodities can be traded through exports. Trading activities with foreign parties will provide various advantages, such as buying goods from foreign parties at lower prices which can then be processed so that these goods can be traded again using higher prices in other countries. One of the reasons why international trade often appears is because there are differences in the prices of goods in each country (Djatmiko & Nugroho, 2019:88).

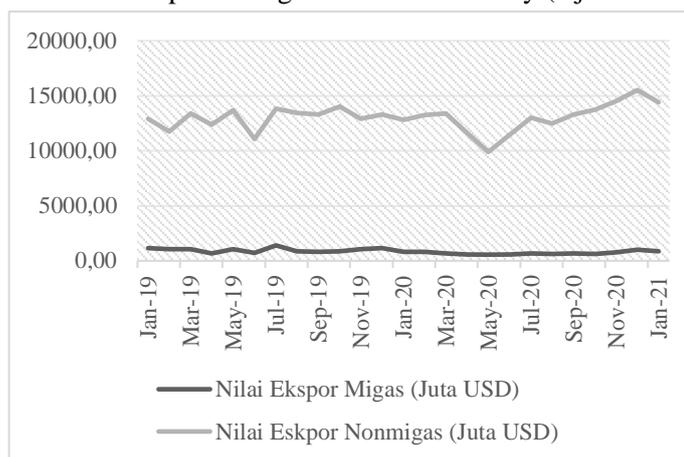


Figure 2.
Indonesia's Oil and Gas & Non-Oil Export Value

Figure 2. shows the value of Indonesia's oil and gas & non-oil and gas exports for the period January 2019 to January 2021. The figure shows that Indonesia's exports in January 2021 of US\$15,300.7 million have decreased by 7.4 percent compared to December 2020 of US\$16,538, 3 million. The decline in value was due to non-oil and gas exports which decreased by 7.11 percent from US\$15,519.5 million to US\$14,416.8 million. This decrease occurred due to the decline in palm oil prices by 2.56 percent and rubber prices by 1.28 percent compared to the previous month. Meanwhile, oil and gas exports decreased by 13.24 percent from US\$1,018.8 million to US\$883.9 million. The decline in value was due to rising commodity prices in Indonesia, such as crude oil, kernel oil, coal, tin, nickel and gold. Meanwhile, when compared to January 2020, Indonesia's exports increased by 12.24 percent from US\$13,632.0 million to US\$15,300.7 million.

Indonesia's oil and gas exports which fell by category of goods in January 2021 compared to December 2020 were the largest experienced by crude oil, which was 29.00 percent. This decrease was caused by the price of crude oil which increased by 11.26 percent compared to the previous month. Then followed by gas at 3.68 percent and oil yields at 2.31 percent. When compared to January 2020, there has been a very large increase in crude oil of 673.52 percent against January 2021.

Meanwhile, the decline in Indonesia's non-oil and gas exports by category of goods in January 2021 compared to December 2020 was experienced by ore, slag and metal ash, which amounted to 44.39 percent. This decrease is the impact of the regulation of Law Number 3 of 2020 concerning mineral mining with the stipulation that all types of minerals from within the country to be exported must be purified first through a refining facility (smelter). Then followed by coffee, tea and spices by 33.14 percent and iron and steel by 17.40 percent. Meanwhile, the largest increase was experienced by copper and goods thereof, which was 47.49 percent, followed by wood pulp by 19.05 percent and mineral fuel by 8.72 percent.

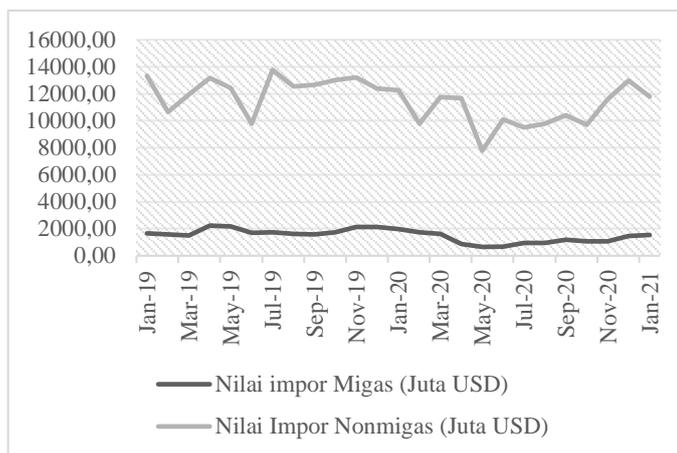


Figure 3.

Value of Indonesian Oil and Gas & Non-Oil and Gas Imports

Figure 3. shows the value of Indonesia's oil and gas & non-oil and gas imports for the period January 2019 to January 2021. The figure shows that Indonesia's imports in January 2021 amounted to US\$14,438.4 million, decreased by 7.59 percent compared to December 2020 of US\$13,342, 2 million. The decline was caused by a 9.00 percent decrease in non-oil and gas imports from US\$12,956.6 million to US\$11,730.2 million. Meanwhile, oil and gas imports increased by 4.73 percent from US\$1,481.8 million to US\$1,552.0 million. This decline in imports occurred due to the consumption of domestic goods which contracted due to the COVID-19 virus pandemic. Meanwhile, when compared to January 2020, Indonesia's imports decreased by 6.49 percent from US\$14,268.7 million to US\$13,342.2 million.

The increase in Indonesia's oil and gas imports by category of goods in January 2021 compared to December 2020 was experienced by crude oil, which was 73.90 percent. This increase was due to the domestic industry starting to operate again after the COVID-19 virus pandemic, thereby increasing domestic oil demand. Meanwhile, the largest decline in oil and gas imports was experienced by gas by 17.75 percent and oil yields by 10.86 percent. When compared to January 2020, there has been a large decline in gas and oil yields of 38.66 percent and 26.41 percent, respectively.

Meanwhile, the decline in Indonesia's non-oil and gas imports by category of goods in January 2021 compared to December 2020 was experienced by ships, boats and floating structures, which was 72.16 percent and followed by food industry dregs/waste at 42.19 percent and optical devices. photography, cinematography and medicine by 36.53 percent. Meanwhile, the largest increase was experienced by pharmaceutical products, which was 133.78 percent, followed by sugar and confectionery by 111.02 percent and seeds and fruit containing oil by 43.14 percent.

If seen from the graphs above, it can be concluded that oil and gas and non-oil and gas exports decreased in the period from December 2020 to January 2021, as well as non-oil and gas imports while oil and gas imports increased, but the position of Indonesia's foreign exchange reserves in the same period actually experienced a decline. rise even to the highest point in history.

Several studies have tested the hypothesis of export and import driven growth in foreign exchange reserves, findings from the empirical literature suggest the possibility of some kind of relationship between exports, imports and foreign exchange reserves. Among them is Ikrima (2019:1), conducting related research to be able to determine the effect of import and export activities on Indonesia's foreign exchange reserves in 2009-2017. The study found that imports have a significant negative effect on foreign exchange reserves while exports have a significant positive effect on foreign exchange reserves, it can be understood that if imports increase, foreign exchange will decrease and if exports increase, foreign exchange will increase.

Djatmiko & Nugroho (2019:87), conducted a study aimed at understanding and analyzing the effect of oil and gas exports and non-oil exports on the position of Indonesia's foreign exchange reserves partially in 1996 - 2017 with twenty-two data each year using SPSS 24. The results are obtained if Partially, oil and gas exports and non-oil and gas exports have a significant positive effect on Indonesia's foreign exchange reserves.

Sulasmiyati (2019: 217), conducted research aimed at understanding and explaining the stable value of foreign exchange reserves due to factors from macroeconomic variables, such as foreign

investment, net exports, and loans in other countries. The results show that simultaneously foreign investment, net non-oil exports, net exports of oil and gas, and foreign loans have a significant effect on the volatility of Indonesia's foreign exchange reserves during 2006 - 2016. Partially, foreign loans have a significant effect on foreign exchange reserves, while foreign investment, net exports oil and gas, and non-oil and gas net exports did not have a significant effect on Indonesia's foreign exchange reserves in 2006 – 2016.

Jalungono, et al. (2020:171), conducted a study aimed at analyzing the effect of exchange rates, imports, and exports on Indonesia's foreign exchange reserves in 2004 - 2018. The results of the partial analysis prove that the exchange rate and exports have a significant positive effect on foreign exchange reserves, while imports have no significance. influence on foreign exchange reserves. Simultaneous F test proves the analysis of the results if the exchange rate, imports, and exports simultaneously have a significant effect on foreign exchange reserves.

From these various studies, there are still contradictions regarding the relationship between exports and imports in foreign exchange reserves, whether shocks to exports and imports will also shake foreign exchange reserves, and whether the shocks that occur will be consistent in the short and long term, and whether they are one-way or two-way. So when viewed from the background of the problem, the authors take the title of the research “Dynamics of Export Imports Oil and Gas and Non-Oil and Gas to Indonesia's Foreign Exchange Reserve: A Vector Autoregressive Approach”.

METHOD

In this study, the authors used a quantitative approach. According to Sugiyo (Janizfati, 2020:59), quantitative research methods are defined as research methods based on the philosophy of positivism, used to examine certain populations or samples, collecting data using research instruments, analyzing quantitative/statistical data with the aim of testing hypotheses that have been established. set. The method in the quantitative approach uses time series data processing with Vector Error Correctional Model (VECM) and Vector Autoregression (VAR) models. In this study, a library approach is also used, namely research using literature such as research that has been done before, notes, or books in its implementation. (Syaputra, 2017:67).

The variables used only include oil and gas exports, non-oil exports, oil and gas imports and non-oil and gas imports. The reason is because these variables are considered to have a large contribution to the position of Indonesia's foreign exchange reserves. Meanwhile, there are many other variables that can relate to the position of Indonesia's foreign exchange reserves such as foreign debt, the rupiah exchange rate, etc.

The data in this study uses time series data and is secondary data. Secondary data is data obtained indirectly through a second party source. The second party used as a source in this research is Bank Indonesia (BI) as the central bank of Indonesia which is accessed through the official BI website on Indonesian Financial Economic Statistics (SEKI).

However, if the variables are not stationary and the variables are cointegrated with each other, then the appropriate model to use is VECM which is nothing but a VAR model with constraints. This limitation occurs because the variables used are not stationary but are cointegrated with each other. VECM is often also known as the VAR model for non-stationary variables with cointegration relationships (Febrianti, 2019:1). The VECM and VAR equations in the study are as follows:

$$\begin{aligned}
 PCDt &= A0 + A1PCDt-p + A2EMIt-p + A3ENMt-p && + A4IMIt-p + A5INMt-p + et1 \\
 EMIt &= B0 + B1EMIt-p + B2PCDt-p + B3ENMt-p && + B4IMIt-p + B5INMt-p + et2 \\
 ENMt &= C0 + C1ENMt-p + C2PCDt-p + C3EMIt-p && + C4IMIt-p + C5INMt-p + et3 \\
 IMIt &= D0 + D1IMIt-p + D2PCDt-p + D3EMIt-p + && D4ENMt-p + D5INMt-p + et4 \\
 INMt &= E0 + E1INMt-p + E2PCDt-p + E3EMIt-p + && E4ENMt-p + E5IMIt-p + et5
 \end{aligned}$$

where:

- PCDt : Foreign Exchange Reserve Position at the current time.
- PCDt-p : Position of Foreign Exchange Reserves at the previous time.
- EMIt : Oil and Gas Exports at the present time.
- EMIt-p : Oil and Gas Exports in the past.
- ENMt : Non-oil and gas exports at the present time.
- ENMt-p : Non-oil and gas exports in the past.
- IMIt : Import of Oil and Gas at the present time.

IMIt-p	: Import of Oil and Gas in the past.
INMt	: Non-oil and gas imports at the present time.
INMt-p	: Non-oil and gas imports in the past.
A0.... E0	: Constant or intercept
A1.... E5	: Coefficient
et1.... et5	: Error term

RESULTS AND DISCUSSION

Stationarity Test

After testing the stationarity with the ADF test at the level level, based on the results of the stationary test, it can be concluded that there are no stationary variables at the level level. Therefore, testing is needed to the next level, namely at the 1st difference level.

Based on the results of the stationary test at the 1st difference stage, it was found that the PCD, EMI, ENM and IMI variables were stationary at the 1st difference level which was indicated by the ADF statistical value greater than the MacKannon Critical Value in the 5 percent significance level. However, the INM variable is still not stationary, which is indicated by the ADF statistical value which is still smaller than the MacKannon Critical Value in the 5 percent significance level. Therefore, a stationary test is needed at the next stage, namely the 2nd difference stage.

Based on the results of the stationary test at the 2nd difference stage, it can be concluded that all variables have been stationary at the 2nd difference level which is indicated by the ADF statistical value greater than the MacKannon Critical Value in the 5 percent significance level. This indicates that the pure VAR model can no longer be used. The model that may be used is the VAR in difference or VECM model.

Optimum Lag Determination

Based on the results of the optimum lag test, it can be shown that there are the most asterisks in the lowest lag in the 3rd lag. Therefore, it can be concluded that the optimum lag occurs in the 3rd lag. This optimum lag will be used in the future steps of this research.

Cointegration Test

Based on the results of the cointegration test, it shows that there have been five trace statistics in this research model. This explains that there is a possibility of a long-term relationship. Therefore, the right model to be used in this research is the Vector Error Correction Model (VECM).

Granger Causality Test

Based on the results of the Granger causality test, there are six significant relationships between variables. This is evidenced by the probability value which is smaller than the 5 percent level of significance. For more details are as follows:

There is a statistical one-way relationship between the EMI variable and the PCD variable. Where statistically the PCD variable significantly affects EMI as evidenced by the Prob value. 0.0006 is smaller than 5 percent. On the other hand, the EMI variable did not significantly affect PCD as evidenced by the prob value. 0.2022 is greater than 5 percent.

There is a statistically one-way relationship between the ENM variable and the PCD variable. Where statistically the PCD variable significantly affects ENM as evidenced by the Prob value. 0.0058 is smaller than 5 percent. On the other hand, the ENM variable did not significantly affect PCD as evidenced by the prob value. 0.9833 is greater than 5 percent.

There is no statistical relationship between the IMI variable and the PCD variable. Where statistically the IMI variable does not significantly affect PCD as evidenced by the Prob value. 0.0700 is greater than 5 percent. Likewise, the PCD variable did not statistically significantly affect the BMI as evidenced by the prob value. 0.5045 greater than 5 percent.

There is no statistical relationship between the INM variable and the PCD variable. Where statistically the INM variable does not significantly affect PCD as evidenced by the Prob value. 0.3341 is greater than 5 percent. Likewise, the PCD variable did not statistically significantly affect INM as evidenced by the prob value. 0.4066 is greater than 5 percent.

VECM Model Estimation Analysis

Based on the VECM estimation results, there is an Adjust R-squared value of 0.668147. This can show that about 67 percent of the variable position of foreign exchange reserves (PCD) can be explained

by the variables of oil and gas exports (EMI), non-oil exports (ENM), oil and gas imports (IMI) and non-oil and gas imports (INM). As for the rest, it is explained by other variables outside of these variables such as foreign debt, rupiah exchange rate, inflation, etc. The VECM estimation results also show that there are fifteen variables that are significantly related to PCD. More details can be seen as follows:

Long Term Relationship

Based on the long-term estimation results, the results of the long-term t-table calculation with a significance level of 5 percent are 1.978671. There are only two variables that are significantly related to the variable position of foreign exchange reserves (PCD). The first is oil and gas imports (IMI) with a t-count value of -2.03389, which means that the IMI variable has a significant negative effect on the PCD variable. The second is the non-oil and gas import variable (INM) with a t-count value of 12.9449, which means that the INM variable has a significant positive effect on the PCD variable. Meanwhile, for oil and gas exports (EMI) and non-oil and gas exports in the long term, it is not significantly related to the PCD variable.

Short Term Relationship

Based on the short-term estimation results, the results of the t-table calculation with a significance level of 5 percent in the short term are 1,98080. In the short term there are 13 variables that are significantly related to the position of foreign exchange reserves (PCD). These variables are CointEq1 with a t-count value of -2.63703, CointEq2 with a t-count value of -2.00401 and CointEq3 with a t-count value of -3.17866. The existence of an alleged significant error correction parameter proves the existence of a negative adjustment mechanism from the short term to the long term.

The next variables are PCD in lag one with a t-count value of -14.0223, PCD in lag two with a t-count value of -9.51594 and PCD in lag three with a t-count value of -6.74383 which all have a significant negative effect on the PCD variable itself. Next is the EMI variable in lag one with a t-count value of 2.21946 and the EMI variable at lag 2 with a t-count value of 2.17375 which has a significant positive effect on the PCD variable. Next, the ENM variable in lag 1 with a t-count value of 2.80497 and the ENM variable in lag 2 with a t-count value of 2.49242 which has a significant positive effect on the PCD variable.

Then the IMI variable in lag 1 with a t-count value of -3.77157, the IMI variable in lag 2 with a t-count value of -3.32153 and the IMI variable at lag 3 with a t-count value of -2.89360 49242 which significantly negatively affects the PCD variable. As for the INM variable, there is no significant effect on PCD.

Impulse Response Function (IRF) Analysis

Impulse Response Function (IRF) analysis is an analysis that functions to analyze the shock response of endogenous variables in the VAR and VECM models. IRF can respond to a change of one standard deviation by tracing the impact of a disturbance of one standard error as an innovation in one endogenous variable on another endogenous variable.

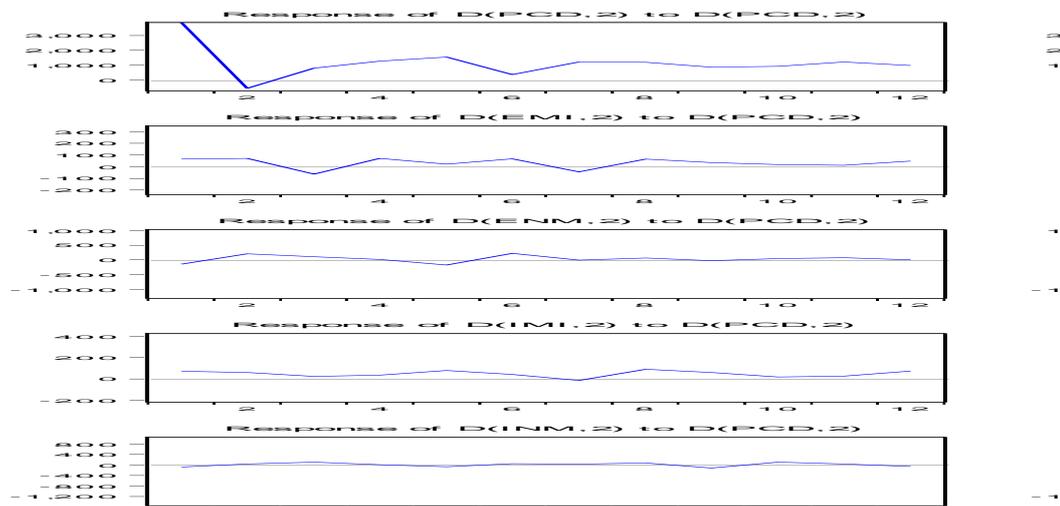


Figure 4.
Impulse Response Function (IRF) Results

The figure above is an illustration of the response of EMI, ENM, IMI and INM to PCD in the next 12 periods. In the PCD shock response to PCD, the shock response in the initial period to period 2 experienced a significant decrease to a negative point. In the next period, the shock response rose to a positive point which fluctuated and remained stable at a positive point until the end of the period.

Furthermore, the response of EMI shocks to PCD for the next twelve periods showed stable at the positive point at the beginning of periods 1 and 2. However, in period 3 there was a significant decline to the negative point and rose significantly again to a positive point in period 4. In the following period tends to be stable at a positive point until there is a decline and increase again as before in periods 6 to 8 and stabilizes again to a positive point in the next period until the end of the period. The ENM shock response to the PCD for the next 12 periods shows that the shock response starts from a negative point at the beginning of the period and increases to a positive point until period 2. Then in the next period there is a slow decline until it returns to a negative point in period 7. then to a positive point and tends to be stable until the end of the period.

The response of the IMI shock to the PCD for the next twelve periods shows that from the beginning to the end of the period it tends to be stable at a positive point even though it fluctuates. However, there was a decline to almost the negative point in period 7. Meanwhile, the INM shock response to PCD for the next 12 periods showed a tendency to be stable and fluctuating around the equilibrium line. This continues until the end of the period and ends at a negative point.

Forecast Error Variance Decomposition (FEVD) Analysis

Based on the results of the FEVD, the diversity of Indonesia's foreign exchange reserve (PCD) position in the first period is still explained by the position of foreign exchange reserves itself of 100 percent. It was only in the next period that PCD diversity began to decrease to 87.96 percent and other variables began to increase, such as EMI at 0.25 percent, ENM at 2.43 percent, IMI at 5.63 percent and INM at 3.71 percent. This continues slowly and fluctuates until the end of the next period, namely period 12. At the end of period 12, the contribution of PCD in explaining the diversity of PCD itself has decreased by 80.97 percent, followed by IMI variable by 6.10 percent, INM by 4.98 percent, EMI by 4.67 percent and ENM by 3.26 percent.

Discussion

Oil and Gas Exports in Indonesia's Foreign Exchange Reserves

Based on the results of the research above, the results of the Granger causality test show that there is a statistical one-way relationship between the EMI variable and the PCD variable. Where statistically the PCD variable significantly affects EMI as evidenced by the Prob value. 0.0006 is smaller than 5 percent. On the other hand, the EMI variable did not significantly affect PCD as evidenced by the prob value. 0.2022 is greater than 5 percent. This means that only the EMI variable affects the PCD variable and not the other way around. This is in accordance with previous theories which state that there is a relationship and influence between oil and gas exports and foreign exchange reserves. Several previous studies have also stated about the relationship between exports and foreign exchange reserves including research conducted by Julainsyah, et al. (2020:32), Uli (2016:15) and Sianturi (2011:69) which state that there is a relationship between the two variables.

The estimation results of the VECM model in the long term show that there is no significant effect between oil and gas exports and the position of Indonesia's foreign exchange reserves. However, in the short-term estimation results, there is a significant effect that occurs in lags 1 and 2. The short-term estimation results show that the EMI variable in lag 1 has a positive effect on the 5 percent significance level of 8.33 each. This means that if there is an increase in oil and gas exports in the previous 1 month, it will increase the position of foreign exchange reserves to 8.33 percent. As for the EMI variable at lag 2, it has a positive effect on the 5 percent significance level of 5.41 percent each. This means that if there is an increase in oil and gas exports in the previous 2 months, it will increase the position of foreign exchange reserves to 5.41 percent.

Non-Oil and Gas Exports in Indonesia's Foreign Exchange Reserves

Based on the results of the research above, the results of the Granger causality test show that there is a statistical one-way relationship between the ENM variable and the PCD variable. Where statistically the PCD variable significantly affects ENM as evidenced by the Prob value. 0.0058 is smaller than 5 percent. On the other hand, the ENM variable did not significantly affect PCD as evidenced by the prob value. 0.9833 is greater than 5 percent. This means that only the ENM variable affects PCD and not the

other way around. This is in accordance with previous theories which state that there is a relationship between non-oil and gas exports and foreign exchange reserves. Several previous studies have also stated about the relationship between exports and foreign exchange reserves including research conducted by Julainsyah, et al. (2020:32), Uli (2016:15) and Sianturi (2011:69) which state that there is a relationship between the two variables.

The estimation results of the VECM model in the long term show that there is no significant effect between non-oil and gas exports and the position of Indonesia's foreign exchange reserves. However, in the short-term estimation results there is a positive significant effect that occurs in lags 1 and 2. The short-term estimation results show that the ENM variable in lag 1 has a positive effect on the 5 percent significance level of 4.54 each. This means that if there is an increase in oil and gas exports in the previous 1 month, it will increase the position of foreign exchange reserves by 4.54 percent. Meanwhile, the ENM variable at lag 2 has a positive effect on the 5 percent significance level of 2.66 each. This means that if there is an increase in oil and gas exports in the previous 2 months, it will increase the position of foreign exchange reserves by 2.66 percent.

Oil and Gas Imports in Indonesia's Foreign Exchange Reserves

Based on the results of the research above, the results of the Granger causality test show that there is no statistical relationship between the IMI variable and the PCD variable. Where statistically the IMI variable does not significantly affect PCD as evidenced by the Prob value. 0.0700 is greater than 5 percent. Likewise, the PCD variable did not statistically significantly affect the BMI as evidenced by the prob value. 0.5045 greater than 5 percent. This means that there is no relationship between IMI and PCD variables. This is not in accordance with previous theories which state that there is a relationship between oil and gas imports and foreign exchange reserves. The increasing foreign debt of Indonesia is suspected to be one of the factors behind it. This happens because there are still many oil and gas import activities financed by foreign exchange originating from foreign loans.

The estimation results of the VECM model in the long term show that there is a significant negative effect between oil and gas imports and the position of Indonesia's foreign exchange reserves. The long-term estimation results show that the IMI variable has a negative effect on the 5 percent level of significance, each -91.02. This means that if there is an increase in oil and gas imports in the long term, it will reduce the position of foreign exchange reserves by up to 91.02 percent. Vice versa, if there is a decrease in oil and gas imports in the long term, it will increase the position of foreign exchange reserves by up to 91.02 percent.

Non-Oil and Gas Imports in Indonesia's Foreign Exchange Reserves

Based on the results of the research above, the results of the Granger causality test show that there is no statistical relationship between the INM variable and the PCD variable. Where statistically the INM variable does not significantly affect PCD as evidenced by the Prob value. 0.3341 is greater than 5 percent. Likewise, the PCD variable did not statistically significantly affect INM as evidenced by the prob value. 0.4066 is greater than 5 percent. This means that there is no relationship between INM and PCD variables. Similar to oil and gas imports, Indonesia's increasing foreign debt is thought to be one of the underlying factors. This is also due to the large number of non-oil and gas import activities financed by foreign exchange originating from foreign loans.

The estimation results of the VECM model in the long term show that there is a significant negative relationship and influence between non-oil and gas imports and the position of Indonesia's foreign exchange reserves. The long-term estimation results show that the INM variable has a positive effect on the 5 percent significance level, respectively, 199.01. This means that if there is an increase in non-oil and gas imports in the long term, it will increase the position of foreign exchange reserves up to 199.01 percent. Meanwhile, the estimation results of the VECM model in the short term show that there is no significant effect between non-oil and gas exports and the position of Indonesia's foreign exchange reserves.

CONCLUSIONS

Based on the results of research and discussion in research on the effect of oil and gas and non-oil and gas exports and imports on Indonesia's reserve position, several things can be concluded as follows:

Granger Causality Test results show that there is a statistical one-way relationship between the EMI variable and the PCD variable where EMI can affect PCD. There is a statistical one-way relationship between the ENM variable and the PCD variable where ENM can affect PCD. There is no statistical relationship between the IMI variable and the PCD variable. There is no statistical relationship between the INM variable and the PCD variable;

The estimation results of the VECM model in the long term show that there is no significant effect between oil and gas exports and the position of Indonesia's foreign exchange reserves. However, in the short-term estimation results there is a significant effect that occurs in lags 1 and 2;

The estimation results of the VECM model in the long term show that there is no significant effect between non-oil and gas exports and the position of Indonesia's foreign exchange reserves. However, in the short-term estimation results there is a positive significant effect that occurs in lags 1 and 2;

The estimation results of the VECM model in the long term show that there is a significant negative effect between oil and gas imports and the position of Indonesia's foreign exchange reserves. The long-term estimation results show that the IMI variable has a negative effect on the 5 percent level of significance, each -91.02. Meanwhile, in the short-term estimation results, there is a significant negative effect that occurs at lags 1, 2 and 3; and

The estimation results of the VECM model in the long term show that there is a significant negative effect between non-oil and gas imports and the position of Indonesia's foreign exchange reserves. The long-term estimation results show that the INM variable has a positive effect on the 5 percent significance level, respectively, 199.01. Meanwhile, the estimation results of the VECM model in the short term show that there is no significant effect between non-oil and gas imports and the position of Indonesia's foreign exchange reserves.

The average shock response occurred in the early and mid-term in the next 12 periods, except for the shock response of non-oil and gas imports to the position of foreign exchange reserves which tended to be stable. At the end of the next 12 periods, although it cannot be said to be stable, the response to shocks in the position of foreign exchange reserves towards itself has decreased slightly towards the point of stability. Meanwhile, the response to shocks in oil and gas exports and imports of oil and gas to the position of foreign exchange reserves at the end of the next 12 periods is even further away, which means that the shock response will continue after the next 12 periods. And the response to shocks for non-oil and gas exports and imports has reached a point of stability at the end of the next 12 periods.

The diversity of Indonesia's foreign exchange reserve (PCD) position in the 1st period in the next 12 periods is still explained by the position of foreign exchange reserves itself of 100 percent. It was only in the next period that PCD diversity began to decrease to 87.96 percent and other variables began to increase, such as EMI at 0.25 percent, ENM at 2.43 percent, IMI at 5.63 percent and INM at 3.71 percent. This also continues slowly and fluctuates until the end of the next period, namely period 12. At the end of the next 12 periods, the contribution of PCD in explaining the diversity of PCD itself has decreased by 80.97 percent, followed by the IMI variable by 6.10 percent, INM by 4.98 percent, EMI of 4.67 percent and ENM of 3.26 percent.

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