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THE RELATIONSHIP BETWEEN GROSS DOMESTIC PRODUCT WITH INTERNATIONAL BALANCE OF PAYMENT: EMPIRICAL EVIDENCE FROM INDONESIA

Adya Utami Syukri*

*Department of Management, STIE Tri Dharma Nusantara, Indonesia

ABSTRACT

This research aims to determine the relationship between gross domestic product, exports, imports, foreign exchange reserves, and foreign debt in Indonesia from 1978 – 2018. As a developed country, Indonesia must know the interrelatedness between the GDP and the variable in the international balance of payment to move the economy well. This research using the Vector Autoregression (VAR) method that includes ADF Test, Granger Causality, Johanssen Co-integration, Vector Error Correction Model (VECM), and forecasting with Impulse Response Function (IRF) and Variance Decomposition (VD). From the Granger causality test results that have been carried out among the five variables, it is concluded that there is no causality relationship, but there are six one-way relationships. Simultaneously, the cointegration test from the Johanssen Co-Integration test results in the five variables tested. Forecasting for the next ten years through the IRF and VD tests shows that GDP positively responds to foreign debt and exports. Exports provide a positive response to GDP and imports. Imports give a positive response to exports, GDP, and foreign exchange reserves. At the same time, foreign debt gives a positive reaction to GDP and imports. Then foreign exchange reserves provide a positive response to exports and foreign debt. The government needs to allocate funds from foreign debt to the export sectors to increase GDP.

Keywords: *Causality, VECM, Gross Domestic Product, Exports, Foreign Debt*

JEL Classification: *F14, F41, C01*

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*Correspondence:
Adya Utami Syukri
E-mail:
adya.utami@gmail.com

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Introduction

International trade is one of the essential things in this new era of globalization and free trade. International trade can increase economic growth in the country where there is a connection between one state and another country. They have the symbiosis of mutualism where all of the international trade activities, record in the global balance of payment for each country.

Al-Shayeb & Hatemi-J (2016) study on the United Arab Emirate (UAE) found that economic growth or recession does not impact the trade openness in the UAE's case in any direction. These empirical conclusions are supported by the conducted asymmetric causality tests and the estimated asymmetric impulse response functions.

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The balance of payments (BoP) is the international balance sheet of a nation that records all international transactions in goods, services, and assets over a year. That is why this BoP is usually under the International Transactions Accounts in national statistical data. The BoP is a simple accounting tool, similar to balance sheets of companies that report transactions such as goods bought and sold or assets borrowed and acquired. After we have studied all components of the BoP, we will find that it serves as the most important statistics in the open economy since it summarizes precisely how the domestic economy interacts with the rest of the world.

The developing country has the same way. They need a developed country to increase their economic growth and the wealth of their state. Debt is one of the ways to make the relationship between them. However, many countries get stuck with the trap of foreign debt.

To pay the debt in the future, the country that wants to make foreign debt must calculate their financial capacity before deciding to accept foreign debt. This financial capacity is essential to ensure that the government can collapse if they do not pay the debt. Usually, the financial capacity must be larger than the foreign debt. For Indonesia, in UUD 1945, the debt maximum 60% of gross domestic product (GDP). In 2018, the ratio between debt and GDP in Indonesia was about 32%.

Foreign debt is a part of total debt in the country from the creditor in another country. Foreign debt in the country can be the government, private sector, or personal. Like International Monetary Fund (IMF), the creditor, World Bank, Asian Development Bank (ADB), and many more.

Foreign debt (external debt) is a variable that can drive the economy while inhibiting economic growth. Encouraging the economy means if the obligations are used to open employment and investment in development, promoting an economy while inhibiting growth if the debts are not utilized optimally. There is still a lack of supervisory functions in charge of debts itself.

Ulfa & T.zulham (2017) state that the Gross Domestic Product (GDP) has a positive and significant effect on Indonesia's foreign debt. The estimation illustrates that foreign debt forecasting has increased in line with the increase in gross domestic product. Based on this research, the Indonesian government must have good debt management and consider when taking foreign loans in the following years.

A different matter was expressed by Rachmadi & Lukman (2013), stating that Indonesia's foreign debt was able to drive Indonesia's economic growth. The economic sectors that absorb foreign debt are relatively high, proven to show increasing GDP growth. Although Indonesia's foreign debt to GDP is still around 30% in 2018, this should be considered further. Lest we only pass down debt to the next generation.

One factor driving the growth of GDP is the export side. Both have a positive relationship where an increase in exports will cause an increase in GDP. When used to encourage the growth of the production sector in Indonesia, foreign debt indirectly participates in increasing exports and foreign exchange reserves.

Batubara & Saskara (2015) state a one-way relationship between exports to foreign debt and GDP to foreign debt. At the same time, Putra & Indrajaya (2013) suggested that partially foreign debt positively and significantly affected Indonesia's foreign exchange reserves in 1996-2011.

Nehen (2012) explains that one of the advantages of international trade is that through exports, a country can obtain foreign exchange reserves, which can then be used for import purposes. On the other hand, Tambunan & Sikumbang (2011) argues that the high foreign debt of most developing countries is one which is caused by the low value of exports and the high value of imports, which makes the country's foreign exchange reserves one of which is used to pay off foreign debt will be thinned. In this case, it will impact the country's lower ability to promptly repay foreign debt, thereby increasing the long run's foreign debt burden.

The accumulation of foreign exchange reserves has emerged as a monetary tool, especially after the 1997 East Asian crisis, which can stimulate the economy and stabilize the most vulnerable variables such as exchange rates, debt, and deficits (Rizvi, Naqvi, Ramzan, & Rizavi, 2011). The development of exports and imports in Indonesia, which tend to fluctuate, needs to be reviewed so that it can contribute to foreign exchange reserves in the future.

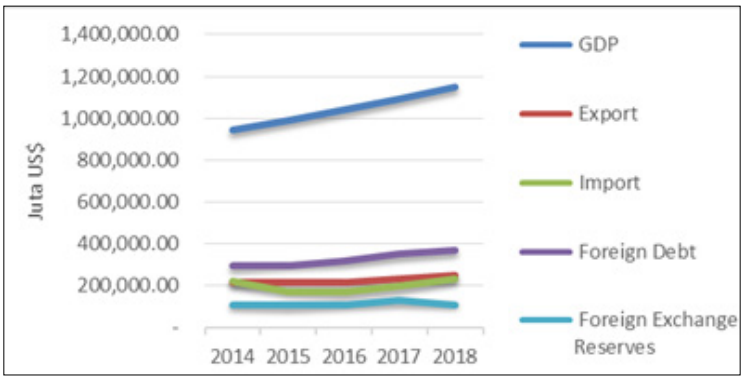

Figure 1: Trend of GDP and International BoP

Source: Data Processed, 2020

The five variables are interrelated to advance the Indonesian economy. But it is still unclear how the direction of the relationship is formed. Based on the above, this study aims to analyze the relationship between gross domestic product, exports, imports, foreign exchange reserves, and foreign debt in Indonesia from 1978 – 2018.

Literature Review

Gross Domestic Product

Gross Domestic Product (GDP) is the most considered economic statistics because it is regarded as the best single measure of public welfare. The underlying thing is that GDP measures two things simultaneously: the total income of all people in the economy and the total expenditure of the state to buy goods and services resulting from the economy. GDP can measure total income and spending because, for an economy as a whole, payment must be equal to expenditure (Mankiw, 2000).

One way to calculate GDP is through the expenditure method like this GDP = C + I + G + (X-M), where C is consumption, I is an investment, G is Government Expenditure, X is exported, and M is imported (Mankiw, 2000).

GDP measures the monetary value of final goods and services produced in a country in a given period. It counts all of the output generated within the borders of a nation. GDP is composed of goods and services produced for sale in the market and includes some nonmarket production, such as defense or education services. An alternative concept, gross national

product, or GNP, counts all the output of a country's residents. So if a German-owned company has a factory in the United States, the production of this factory would be included in U.S. GDP but in German GNP (Callen, 2020).

Exports

Boediono (1994) argues that the pen suggests that the effect of GDP on exports can be explained through the concept of vent for surplus initially proposed by Adam Smith. An increase in the production surplus marked by GDP growth will encourage exports to increase because excess domestic output will be channeled through exports. In contrast, Muana (2002) states that exports are part of the calculation of GDP (Y) as in the equation Y = C + I + G + (X-M). The addition to exports (X) by itself will increase GDP (Y).

Based on the Law of the Republic of Indonesia Number 17 of 2006, export is the release of goods from the customs area, buyers come from abroad and sellers come from within the country. Export of goods can be assessed based on free on board (FOB) prices. The calculation of the export of goods can be done by multiplying the value of the goods (according to the export of goods or PEB) by the exchange rate (Kartikasari, 2017).

Imports

Basri & Subri (2003) suggested that one of the foreign debt functions is to meet the needs of imports of capital goods and intermediate goods, which are expected to support export goods' growth.

On the other hand, Tulus (2011) points out that most developing countries' high foreign debt is one of them caused by the low value of exports and the high value of imports. Which makes the country's foreign exchange reserves, one of which is used to pay off foreign debt, will be thinner. It will impact the country's lower ability to repay a foreign debt on time, thereby increasing the foreign debt burden in the long run. Nopirin (2009) suggests that the higher the national income level, the greater the possibility of importing. On the other hand, according to the Keynesian flow, imports will reduce Y or GDP. However, Nehen (2012) and Lindert (1994) argue that in the long run, if a country prioritizes the import of capital goods that support capital processes that support the production of goods for export purposes, it will have a positive impact on the country's economic growth.

Foreign Exchange Reserves

Foreign exchange reserves are assets originating from abroad within a certain period and controlled by the monetary authority. Carbaugh (2004) explains that foreign exchange reserves' primary purpose is to facilitate the government in carrying out market interventions to stabilize the exchange rate. The more open the country's economy, the country's need for foreign exchange reserves tend to be, the greater the amount used to finance trade transactions conducted.

Hady (2001) explained that the country's foreign exchange reserves could be grouped into 1) Official foreign exchange reserves, namely foreign exchange reserves owned by the state, which are managed, controlled, organized, and administered by the Central Bank / Bank Indonesia. 2) National foreign exchange reserves (country forex reserve), namely all foreign exchange owned by individuals, agencies, and institutions, especially banks, which are monetary assets of national wealth (including those of national commercial banks). 3) Bank Indo-

nesia periodically announces net foreign reserves of the Net International Reserve (NIR). The difference between gross foreign assets and NIR, namely gross foreign assets, is Bank Indonesia bills to foreign residents consisting of gold, monetary, demand deposits, deposit on-call, time deposits, investment in securities, and other accounts.

Foreign exchange reserves are defined as all foreign assets controlled by the monetary authority used to finance the balance of payments balance or in financial stability by intervening in the foreign exchange market and for other purposes. Based on this definition, the benefits of a country's foreign exchange reserves can be used to maintain the exchange rate's stability and to finance deficits in the balance of payments (Benny, 2013).

Foreign Debt

Government foreign loans are debt held by the central government, consisting of bilateral, multilateral debt, export, commercial credit facilities, leasing, and Government Securities (SBN) issued overseas and domestically owned by non-residents. SBN consists of Government Securities (SUN) and Government Sharia Securities (SBSN). SUN consists of Government Bonds with maturities of more than 12 months and Government Treasury Bills (SPN) with a maturity of up to 12 months. Meanwhile, SBSN consists of long-term SBSN (Ijarah Fixed Rate / IFR) and Global Sukuk.

Aryani & Subiyantoro (2006) argue that developing countries' foreign loans are needed following development theory and growth theory to industrialize and accelerate growth. The theoretical framework can explain foreign loans' discussion that the deficit in private investment financing occurs because savings are smaller than investment (I - S = resource gap), and trade deficits are caused by exports that are smaller than imports (X - M = trade gap). There is still an investment deficit in the government budget because government revenue from taxes is more diminutive than government expenditure (T - G = fiscal gap).

Todaro (1998) argues that the accumulation of foreign debt is a natural phenomenon that is reasonable. Low domestic savings do not allow adequate investment, so developing country governments must withdraw loans and investment funds abroad. Foreign aid can play an essential role in the country's efforts to reduce the main obstacles in the form of foreign exchange shortages and enhance the level of economic growth.

The IMF and World Bank define the sustainability of a country's foreign debt as its ability to meet current and future obligations in full without the need for rescheduling or arrears. Meanwhile, the European Union has a fiscal-financial program to guide its member countries' financial, fiscal stability. Continuity of a country's fiscal-financial program is defined as the absence of default risk. Namely, the debt level must be smaller than the present value of all primary budget surpluses in the future (Buiter & Grafe, 2003).

The IMF & The World Bank (2003) state that the management of government debt is a strategy and tactic adopted to manage government debt portfolios based on risks and costs that arise effectively and efficiently to meet government financing needs and achieve the objectives of Government debt management.

Data and Research Methods

The data used in this study were sourced from the World Bank and Statistics Indonesia. All variables use units of Million / US$ and then converted to log natural form before

processed by Eviews.

Vector Autoregression or VAR is a time series method often used in research, especially in economics. VAR is considered capable of analyzing the interdependence relationships between several variables. With VAR, there is no need to distinguish which endogenous variables are exogenous so that all variables are assumed to be endogenous in VAR analysis.

One of the VAR analyzes information on the causal relationship between GDP, exports, foreign exchange reserves, and foreign debt analyzed by the Granger causality test. Granger causality test is used to see the direction of the relationship of a variable with other variables. How does X's effect on Y by seeing whether Y's present value can be explained by the historical significance of Y and seeing whether adding X lag can improve the ability to explain the model? The Granger causality equation can be written as follows (Gujarati & Porter, 2006):

$$Yt = \sum aiY_{t-i} + bjX_{t-j} + v_t \text{ ; X causes Y if bj> 0} \quad (1)$$

$$Xt = \sum ciY_{t-1} + \sum djX_{t-j} + u_t \text{ ; Y causes X if dj> 0} \quad (2)$$

Where:

Yt = Dependent variable in period-t

Xt = Independent variable in period-t

$\sum aiY_{t-1}$ = regression coefficient lag for all Y variables if Y is the dependent variable

$\sum bjX_{t-j}$ = regression coefficient lag for all variables X if Y is the dependent variable

$\sum ciY_{t-i}$ = regression coefficient lag for all variables Y if X is the dependent variable

$\sum djX_{t-j}$ = regression coefficient lag for all variables X if X is the dependent variable

v_t, u_t = independent random vector with zero mean and limited covariance matrix

From the regression results of equations (1) and (2), we can produce four possible values of the regression coefficients. Each coefficient value is:

1. If the total lag value of $\sum aiY_{t-1}$ is significantly ≠ 0, and the total lag value of $\sum bjX_{t-j}$, then there is one-way causality from Y to X.
2. If the total lag value of $\sum ciY_{t-i}$ is significantly ≠ 0, and the total lag value of $\sum djX_{t-j}$, then there is a one-way causality from X to Y.
3. If statistically the total lag value of $\sum aiY_{t-1}$ is significantly = 0, and the total lag value of $\sum bjX_{t-j}$ =0, then Y and X do not affect each other.
4. If statistically, the total lag value of $\sum aiY_{t-1}$ is significantly ≠ 0, and the total lag value of $\sum bjX_{t-j}$ ≠ 0 is significant, then Y and X influence each other.

The next step of analysis is the cointegration test through the Johansen Co-Integration Test to determine whether there is a long-term relationship or cointegration between the variables lngdp, lnexsport, lnimport, foreign exchange reserves, foreign debt.

VAR analysis will usually be done if there is no cointegration. However, if it is proven that

there is cointegration, the research that must be done is the Vector Error Correction Model (VECM) analysis. Forecasting is done through the Impulse Response Function (IRF) and Variance Decomposition (VD) study to support Granger causality test results and the Johansen Co-Integration. Previously, to avoid lancing regression, it was necessary to do a unit root test through the Augmented Dickey-Fuller (ADF) test.

Finding and Discussion

Stationarity Test (Augmented Dickey-Fuller)

The use of time-series data sometimes results in a linear regression, which is seen from a sizeable R-Square value but only in the form of a relationship due to similarity in trend. Therefore, it is necessary to have a unit or static root test to see the mean, variance, and covariance consistency.

The stationarity test for this study was carried out using the Augmented Dickey-Fuller method or the ADF test. The data to be tested is at the 1st difference level. Based on the ADF test in table 1, it appears that at an alpha level of 5%, the variable gross domestic product, exports, imports, foreign exchange reserves, and foreign debt is greater than the alpha value. Hence, it is feasible to use VAR or VECM analysis.

Table 1: Augmented Dickey Fuller Test at First Difference Level

Method	Statistic	Prob. **
ADF-Fisher Chi-Square	87,1114	0,0000
ADF-Choi Z-Stat	-7,7346	0,0000
Note: ** significant in 5%		

Source: data processed by Eviews, 2020

Lag Optimum

Furthermore, for the VAR analysis, the optimum lag is determined. It is to determine the information criteria recommended by the smallest value of Final Prediction Error (FPE), Akaike Information Criterion (AIC), Schwarz Information Criterion (SC), and Hannan-Quinn Information Criterion (HQ).

Table 2 shows the optimum lag test results, which show that FPE, AIC, SC, and HQ give asterisks in lag 1. Thus, lag 1 is the optimum lag which shows in (*) and will be used at all stages in the next VAR analysis.

Table 2: Lag Optimum Test

Lag	LogL	LR	FPE	AIC	SC	HQ
0	50,17496	NA	6,38E-08	-2,37763	-2,16216	-2,30097
1	244,4632	327,2208*	8,74e-12*	-11,2875*	-9,99466*	-10,8275*
2	263,5492	27,12339	1,28E-11	-10,9763	-8,60608	10,133
3	290,5398	31,25231	1,40E-11	-11,081	-7,63349	-9,85443

*Note: *indicate lag order optimum*

Source: data processed by Eviews, 2020

Causality Test (Granger Causality)

The next stage is the causality test were in this study using Granger Causality to see the relationship between all of the variables. It is done by comparing the probabilities of each test with alpha 0.01; 0.05; or 0.1.

Table 3 shows the results of the Granger Causality test. Table 3, the first part between the GDP and export variables, indicates that the Granger exports do not cause GDP, while GDP in Granger causes exports with alpha 0.01. There is only a one-way relationship from GDP to exports, without a causal relationship. This result is contrary to Bakari (2018), where he found that exports have causality towards GDP in Canada.

In the second part, between the GDP and import variables, Granger imports do not cause GDP and vice versa. GDP in Granger does not cause implications. From these results, it can be concluded that there is no relationship between imports and GDP. From this result, maybe the government can consider when decided to make an import. We have so many resources that we can use to create a product. This result in line with Uğur (2008) that conducted the study in Turkey.

For the third part of the Granger test between the GDP and foreign debt, Granger foreign debt does not cause GDP, but GDP in granger causes foreign debt with alpha 0.05. The results of this test indicate a one-way relationship from GDP to foreign debt. This result is inversely proportional to what is expected. We hope that our GDP will increase when we owe, but it turns out based on statistical results that GDP causes debt. It is important to note again the allocation of debt that has been done. The debt should be used for activities that drive the economy. The study from Mohamed Mahmoud (2015) found that GDP and external debt has a positive relationship. But, Al Kharusi & Ada (2018) and Shkolnyk & Koilo (2018) found a negative relationship between GDP and external debt.

The fourth part between the variable foreign exchange reserves with GDP shows that the Granger foreign exchange reserves do not cause GDP. Still, the Granger GDP causes foreign exchange reserves with alpha 0.1. There is a one-way relationship from GDP to foreign exchange reserves, without a causal relationship. This result in line with Chowdhury & Islam, Shariful (2018) that conducted a study in Bangladesh.

The next part of the variable between imports and exports giving Granger implications does not cause exports, nor does Granger exports generate meanings. There is no relationship between the two variables.

In the sixth part of the Granger test, between the variable external debt and exports yields Granger foreign debt results in exports with an alpha of 0.05. At the same time, Granger exports do not cause foreign debt. There is a one-way relationship from foreign debt to exports. From this part, we can argue that the allocation of foreign debt positively impacts exports in Indonesia. On the other hand, Ahwireng-Obeng & Ahwireng-Obeng (2019) found that deficit (domestic debt and external debt) and exports are essential macroeconomic drivers of sovereign bond market development in African.

Next is the seventh part of the Granger test between foreign exchange reserves and exports. The table shows that Granger foreign exchange reserves do not cause exports, while Granger exports cause foreign exchange reserves with alpha 0.01. There is a one-way relationship from exports to foreign exchange reserves. It is in line with the theory that the increase in exports can increase foreign exchange reserves.

For the Granger test, the eighth part is between foreign debt and imports. The test results show that Granger's foreign debt has no implications, but Granger's substances cause foreign debt with an alpha of 0.05. There is a one-way relationship between meaning and foreign debt.

In the ninth part of the test is the Granger between foreign exchange reserves and imports. It can be seen that Granger's foreign exchange reserves led to imports with an alpha of 0.05. At the same time, Granger imports did not generate foreign funds. One-way relationship occurs from foreign exchange reserves to the senses.

The final part of the Granger test is between foreign exchange reserves and foreign debt. The test results show that Granger's foreign exchange reserves do not cause foreign debt and that Granger's foreign debt does not cause foreign exchange reserves. There is no relationship between the two variables.

Table 3: Granger Causality Test

Null Hypothesis	Obs	F-Statistic	Prob.
EXPORTS does not Granger Cause GDP	40	0,23002	0,6343
GDP does not Granger Cause EXPORTS		13,3088	0,0008***
IMPORTS does not Granger Cause GDP	40	0,0904	0,7654
GDP does not Granger Cause IMPORTS		1,84994	0,182
FOREIGN DEBT does not Granger Cause GDP	40	0,9592	0,3338
GDP does not Granger Cause FOREIGN DEBT		5,8128	0,021**
FOREIGN EXCHANGE RESERVES does not Granger Cause GDP	40	1,61894	0,2112
GDP does not Granger Cause FOREIGN EXCHANGE RESERVES		3,14621	0,0843*
IMPORTS does not Granger Cause EXPORTS	40	1,97624	0,1681
EXPORTS does not Granger Cause IMPORTS		3,87406	0,0566*
FOREIGN DEBT does not Granger Cause EXPORTS	40	5,28129	0,0273**
EXPORTS does not Granger Cause FOREIGN DEBT		0,28893	0,5941
FOREIGN EXCHANGE RESERVES does not Granger Cause EXPORTS	40	2,26612	0,1407
EXPORTS does not Granger Cause FOREIGN EXCHANGE RESERVES		16,8082	0,0002***
FOREIGN DEBT does not Granger Cause IMPORTS	40	0,26938	0,6068
IMPORTS does not Granger Cause FOREIGN DEBT		4,21461	0,0472**
FOREIGN EXCHANGE RESERVES does not Granger Cause IMPORTS	40	10,1723	0,0029**
IMPORTS does not Granger Cause FOREIGN EXCHANGE RESERVES		0,55379	0,4615
FOREIGN EXCHANGE RESERVES does not Granger Cause FOREIGN DEBT	40	0,13861	0,7118
FOREIGN DEBT does not Granger Cause FOREIGN EXCHANGE RESERVES		0,91702	0,3445
Note: * significant in 10%, ** significant in 5%, and *** significant in 1%			

Source: data processed by Eviews, 2020

Cointegration Test (the Johanssen Cointegration)

In this study, the cointegration test was carried out using the Johanssen method. The test results are shown in table 4 by comparing the Trace Statistics value with the critical value at alpha 0.05. Based on table 4, it can be seen that the value of the Trace Statistics of 77.60529 is greater than the vital importance of 0.05 of 69.81889, which shows that in the system, there

is a cointegrated equation.

Table 4: the Johanssen Cointegration

Hypothsized No. of CE(s)	Eigenvalue	Trace Statistic	0,05 Critical Value	Prob. **
None*	0,600946	77,60529	69,81889	0,0105
At most 1	0,417618	41,77763	47,85613	0,165
At most 2	0,242755	20,69313	29,79707	0,3771
At most 3	0,222752	9,848452	15,49471	0,2926
At most 4	0,000529	0,020617	3,841466	0,8857

Note: * denotes rejection of the hypothesis at the 0,05 level

**MacKinnon-Haug-Michelis (1999) p-values

Source: data processed by Eviews, 2020

Through Johanssen Cointegration, the cointegration test shows that the five variables, namely GDP, Exports, Imports, Foreign Debt, and foreign exchange reserves in the period 1978 - 2018, have a long-term or co-integrated relationship. Then the Vector Error Correction Model (VECM) will be analyzed next.

Vector Error Cointegration Model (VECM)

Because there is cointegration between the five variables, a VECM analysis is performed. The VECM analysis is performed using lag one by the optimum lag test results.

In the VECM test performed by comparing the statistical value of t calculated results with the amount of t table df (0.01; 41-1), t table df (0.05; 41-1), and t table df (0.1; 41- 1). Based on t table data, the value of the t-table at the 1% significance level is 2.42326, at the 5% significance level is 1.68385 and, t table at the 10% significance level is 1.30308.

The first lag VECM test results in table 5 show that GDP has a positive and significant effect at the 1% significance level on exports as indicated by the t value of 2.83336> t table of 2.42326. Conversely, exports have a negative and significant effect on the significance level of 10% of GDP, where the t value is -1,45145> t table is -1,30308. While imports have a positive and significant effect on the significance level of 5% of GDP as seen from the t value of 1.99536> t table of 1.68385. On the other hand, foreign debt has a positive and significant effect at 10% on imports because the t value is 1.41299> t table is 1.30308. Unlike exports that have a negative and significant impact on the significance level of 1% on imports, it can be seen from the t value of -2.80558> t table of -2.42326.

Table 5: Vector Error Correction Model

Error Correction	D(GDP)	D(EXPORTS)	D(IMPORTS)	D(FOREIGN DEBT)	D(FOREIGN EXCHANGE RESERVES
D(GDP(-1))	0,287957	1,645086	1,853425	0,294682	0,51633
	(0,21431)	(0,58061)	(0,81894)	(0,38619)	(1,01061)
	[1,34367]	[2,83336]***	[2,26319]**	[0,76306]	[0,51091]
D(EXPORTS(-1))	-0,111042	0,020274	-0,82021	-0,03754	0,250248
	(0,0765)	(0,20727)	(0,29235)	(0,13786)	(0,36077)
	[-1,45145]*	[0,10005]	[-2,80558]*	[-0,27232]	[0,69365]
D(IMPORTS(-1))	0,107547	0,044173	0,390939	-0,08728	-0,09809

Error Correction	D(GDP)	D(EXPORTS)	D(IMPORTS)	D(FOREIGN DEBT)	D(FOREIGN EXCHANGE RESERVES
	(0,0539)	(0,14603)	(0,20597)	(0,09713)	(0,25417)
	[1,99536]**	[0,30250]	[1,89808]**	[-0,89866]	[-0,38591]
D(FOREIGN DEBT(-1))	0,089766	0,06346	0,583781	0,223918	0,05763
	(0,10812)	(0,29292)	(0,41315)	(0,19483)	(0,50985)
	[0,83027]	[0,21665]	[1,41299]*	[1,14931]	[0,11303]
D(FOREIGN EXCHANGE RESERVES(-1))	0,022661	0,013315	0,140305	-0,04127	-0,15379
	(0,04416)	(0,11963)	(0,16874)	(0,07957)	(0,20823)
	[0,51318]	[0,11130]	[0,83148]	[-0,51865]	[-0,73854]

Note: * significant in 10%, ** significant in 5%, and *** significant in 1%

Source: data processed by Eviews, 2020

Forecasting by Impulse Response Function (IRF) and Variance Decomposition (VD)

IRF

IRF analysis is performed to see the effect of shock of a variable on the variable itself and other variables in the model. The IRF shows the impact of a surprise in a variable on other variables to know the duration of the shock effect and the response of the variables.

In the IRF analysis using graphics, there are vertical axes and horizontal axes. On the vertical axis is a standard deviation value that shows the variable's response to other variables. Simultaneously, the horizontal axis is the time or period (years) of answering.

GDP response based on IRF analysis for ten years can be seen in Figure 2. Figure 2 shows that when there is a shock, the GDP response to GDP is the highest response, with a standard deviation of 0.05. A positive response is also indicated by the GDP response to exports and foreign debt, although it tends to fluctuate. However, the GDP response to imports and foreign exchange reserves gave a negative response, below the zero standard deviation from the third year to the tenth year.

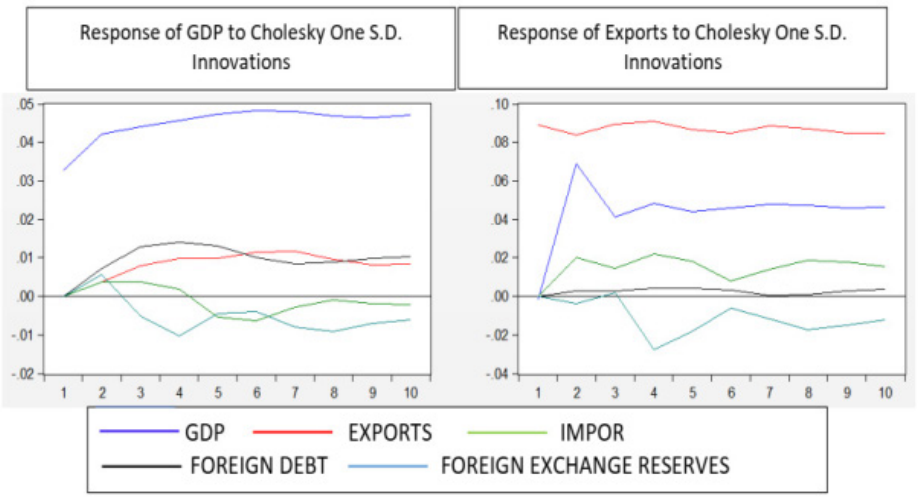

Figure 2: IRF Graphics of Response GDP and Exports

Source: data processed by Eviews, 2020

The export response based on IRF analysis for ten years shows that the highest answer is the export response to the export itself, the export response to GDP, and the export response to imports. All three are at a standard deviation above zero, so that it gives a positive response. Regarding the export response to foreign debt, despite sharing a positive reaction, it has been around zero deviation for ten years to respond barely. While the export response to foreign exchange reserves is at a sub-zero level, giving a negative response from the third year to the tenth year.

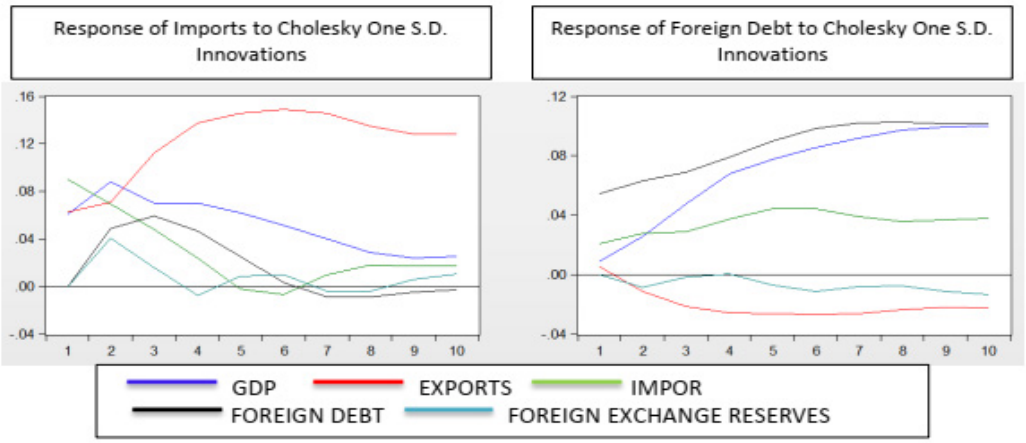

Figure 3: IRF Graphics of Response Imports and Foreign Debt

Source: data processed by Eviews, 2020

IRF analysis that responds to import variables is shown in Figure 3. For ten years, exports' import response was the highest response despite a decline in the seventh year but returned to stable until the tenth year. The import response to GDP has declined in the fourth to eighth years and has stabilized in the tenth year. Likewise, the import response to foreign debt has decreased to a negative deviation from the sixth year until the tenth year. The same thing was experienced by the import response to foreign exchange reserves, which negatively diverged in the fourth and seventh to eighth years. The reaction of imports to imports shows a declining trend and has been below zero in the fifth and sixth years.

IRF analysis for ten years in which foreign debt responded showed that foreign debt to foreign debt and GDP was the highest response, which increased until the tenth year. Simultaneously, the reaction of foreign debt to imports tends to stagnate but could fluctuate in the third year to the coming year. The adverse response was given the foreign debt to exports and foreign exchange reserves from the first year until the tenth year. Even the reaction of foreign debt to exports was the lowest.

IRF analysis with foreign exchange reserves as a response for ten years is shown in Figure 4. The reaction of foreign exchange reserves to foreign exchange reserves is the highest response, followed by foreign exchange reserves' response to exports and foreign exchange reserves' response to foreign debt. All three gave positive responses and tended to be stable in the fifth to tenth years. The reaction of foreign exchange reserves to imports tends to be zero deviation from the fourth year to the tenth year. Simultaneously, foreign exchange reserves' response to GDP is a negative response, characterized by being at sub-zero departures from the first year to the tenth year.

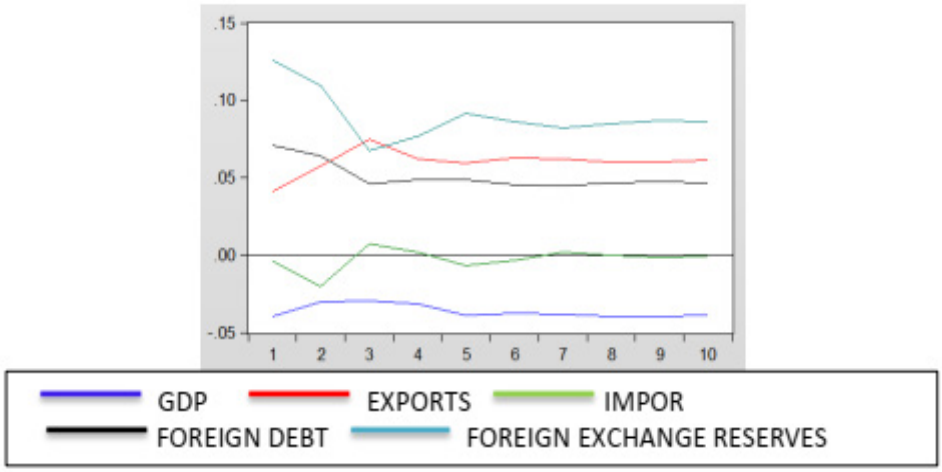

Figure 4: IRF Graphics of Response Foreign Exchange Reserves

Source: data processed by Eviews, 2020

VD

Variance Decomposition (VD) provides results that support the results of previous tests. In VD, an estimate of the magnitude of a variable's contribution to changes in other variables and the variable itself in the future can be seen as a percentage.

Table 6: VD Test of GDP and Imports

VD of GDP						
Period	S.E.	GDP	EXPORTS	IMPORTS	FOREIGN DEBT	FOREIGN EXCHANGE RESERVES
1	0,032898	100,000000	0,000000	0,000000	0,000000	0,000000
2	0,054553	96,251300	0,472906	0,449316	1,795849	1,030623
3	0,072078	92,651150	1,499794	0,518495	4,230953	1,099610
4	0,087676	89,771280	2,303920	0,391914	5,436750	2,096131
5	0,101148	89,225920	2,682509	0,573946	5,742420	1,775208
6	0,113382	89,182030	3,147837	0,775872	5,361992	1,532273
7	0,124279	89,191790	3,493531	0,694922	4,926112	1,693648
8	0,133786	89,237030	3,538479	0,605586	4,703892	1,915016
9	0,142375	89,411310	3,461028	0,551088	4,642671	1,933908
10	0,150659	89,587030	3,398832	0,512997	4,614238	1,886898
VD of IMPORTS						
Period	S.E.	GDP	EXPORTS	IMPORTS	FOREIGN DEBT	FOREIGN EXCHANGE RESERVES
1	0,125713	23,540230	25,075570	51,384200	0,000000	0,000000
2	0,19346	30,676460	23,922480	34,575310	6,352165	4,473576
3	0,247011	26,892660	35,300200	24,980590	9,656310	3,170244
4	0,29621	24,332510	46,144090	18,025810	9,226681	2,270915
5	0,336848	22,239080	54,300120	13,943730	7,693583	1,823477
6	0,372126	20,143390	60,517040	11,460920	6,312455	1,566199

7	0,401856	18,246130	65,053060	9,885173	5,462215	1,353416
8	0,42536	16,740830	68,118650	9,004146	4,919128	1,217243
9	0,445231	15,570210	70,432190	8,366633	4,503440	1,127523
10	0,464436	14,602010	72,349450	7,821176	4,142513	1,084854

Source: data processed by Eviews, 2020

For the GDP variable, VD analysis shown in table 6 shows that it is estimated that over the next ten years. The variable with the most significant influence on GDP is GDP itself with an average value of 91.45%, the foreign debt of 4.14%, exports valued at 2.39%, foreign exchange reserves averaged 1.49%, and imports had an average value of 0.5%.

VD test for import variables for ten years can be seen in Table 6. It is estimated that the most influential variable is exported by 52.12%, GDP with an average value of 21.29%. Also, Imports have an effect of 18.94%, foreign debt amounted to 5.82%, and the foreign exchange reserves had an impact of 1.80%.

VD test for export variables for ten years can be seen in Table 7. It is estimated that the most influential variable is exported by 77.24%, GDP with an average value of 17.02%. Also, imports have an effect of 2.20%, foreign exchange reserves affect amounted to 1.35%, and foreign debt amounted to 0.068%.

Table 7: VD Test of Exports and Foreign Debt

VD of EXPORTS

Period	S.E.	GDP	EXPORTS	IMPORTS	FOREIGN DEBT	FOREIGN EXCHANGE RESERVES
1	0,089128	0,018267	99,981730	0,000000	0,000000	0,000000
2	0,14197	23,442370	74,391580	2,061930	0,040445	0,063674
3	0,173612	21,381710	76,410640	2,102929	0,049899	0,054826
4	0,204823	20,861030	74,543470	2,657133	0,076476	1,861887
5	0,228213	20,522350	74,469580	2,782526	0,095541	2,130004
6	0,248023	20,835500	74,741090	2,457185	0,101104	1,865129
7	0,268234	20,978310	74,780560	2,370757	0,086546	1,783834
8	0,287168	21,005110	74,495660	2,502956	0,076641	1,919635
9	0,303851	21,040478	74,335880	2,582065	0,078236	1,963037
10	0,319445	21,140150	74,286540	2,569066	0,083766	1,920477

VD of FOREIGN DEBT

Period	S.E.	GDP	EXPORTS	IMPORTS	FOREIGN DEBT	FOREIGN EXCHANGE RESERVES
1	0,059282	2,169554	0,798260	12,011890	85,021730	0,000000
2	0,095418	8,056434	1,707699	13,090560	76,306400	0,838904
3	0,132035	17,263260	3,523039	11,563150	67,195950	0,454601
4	0,174244	24,970060	4,235911	11,245300	59,287620	0,261117
5	0,217122	28,766850	4,224305	11,413570	55,321310	0,273959
6	0,258705	31,164810	4,064186	10,993810	53,395660	0,381533
7	0,2968	33,251300	3,866068	10,067890	52,450430	0,364308
8	0,331497	35,218570	3,606284	9,236367	51,591170	0,347603
9	0,363432	36,808710	3,366101	8,720214	50,716870	0,388108
10	0,393054	37,936030	3,210826	8,390812	50,012900	0,449436

Source: data processed by Eviews, 2020

VD test for foreign debt variable for ten years can be seen in table 7, where it is estimated that the most influential variable is a foreign debt of 60.13%, GDP with an average value of 25.56%. Imports have an effect of 10.67%, exports amounted to 3.26%, and finally, foreign exchange reserves had an impact of 0.37%.

VD test for foreign exchange reserve variables for ten years can be seen in table 8. It is estimated that the most influential variable is that foreign exchange reserves had an effect of 55.19%, exports by 18.91%, and the foreign debt of 18.34%. Also, GDP with an average value of 7.01%, and finally, imports have an effect of 0.53%.

Table 8: VD Test of Foreign Exchange Reserves

VD of FOREIGN EXCHANGE RESERVES

Period	S.E.	GDP	EXPORTS	IMPORTS	FOREIGN DEBT	FOREIGN EXCHANGE RESERVES
1	0,155136	6,576760	7,063415	0,084148	20,849380	65,426300
2	0,21146	5,561823	11,196650	0,962820	20,380720	61,897980
3	0,240517	5,819083	18,256480	0,840933	19,374770	55,708730
4	0,266467	6,137728	20,283250	0,691602	19,139260	53,748160
5	0,294652	6,767125	20,630970	0,625048	18,346010	53,630840
6	0,318749	7,185076	21,484930	0,546367	17,686630	53,097000
7	0,340144	7,562344	22,192770	0,482269	17,277790	52,484830
8	0,360929	7,925185	22,461550	0,428340	17,017800	52,167130
9	0,38101	8,196645	22,650980	0,385338	16,794980	51,972060
10	0,400026	8,386442	22,882180	0,350218	16,600250	51,780910

Source: data processed by Eviews, 2020

Conclusion

From the Granger causality test results that have been carried out among the five variables, namely gross domestic product, exports, imports, foreign debt, and foreign exchange reserves, it is concluded that there is no causality relationship. Still, there are six one-way relationships between GDP to exports, GDP to foreign debt, foreign debt to export, exports to foreign reserves, imports to foreign debt, and foreign funds to implications. Simultaneously, the cointegration test from the Johanssen Co-Integration test gives the result that the five variables tested are cointegrated.

Forecasting for the next ten years through the IRF and VD tests shows that GDP positively responds to GDP, foreign debt, and exports. Exports provide a positive response to exports, GDP, and imports. Then, Imports give a positive response to exports, GDP, imports, and foreign exchange reserves. In contrast, foreign debt gives a positive reaction to foreign debt, GDP, and imports. Then foreign exchange reserves provide a positive response to foreign exchange reserves, exports, and foreign debt.

The relationship that ensues implies that when there is a shock to GDP, it will impact foreign debt and exports. This matter needs to be considered by the government on managing foreign debt to benefit the state, not only increase state funding. The increase in imports also gave a positive response to exports, GDP, and foreign exchange reserves. An increase in imports that occurs if used to import raw material goods for industrial purposes will encourage growth in domestic production, which, in the long run, will have an impact on increasing these three variables. The government needs to consider the decision to import consumption materials.

It is supported by foreign debt, which has a positive impact on imports. It happens when foreign debt is used to import raw materials for production. The positive influence of foreign exchange reserves on exports then arises from importing raw materials for production rather than consumer goods.

This study's results can be used as a reference in making a model about the effect of each variable because we know how the relationship is. A virtual extension of this study could be pursued in future research: a comparison study in ASEAN Country and their economic integration include the political economy.

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