

Analysis of Macro Economic Influence on Indonesian Trade

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ABSTRACT

This study aims to analyze the influence of macroeconomic factors on Indonesia's international trade. The variables in this study are trade values, exchange rates, exports, imports, Gross Fixed Capital Formation (GFCF), Gross Domestic Income (GDP), and foreign investment (FDI). The method used in this study is the Vector Error Correction Model (VECM). The VECM method is used in the analysis of long- and short-term relationships. The relationship studied is between the independent and dependent variables in the time series data. To find out the long-term relationship in research, researchers must analyze through the cointegration equation on the VECM test results. The data used in this study is time series data for 1991-2020 taken from World Development Indicators and the Indonesian Central Bureau of Statistics. Based on the results of the short-term analysis of the GFCF variable, imports and exports have no effect on the value of trade in Indonesia. While the FDI, GDP and import variables have a significant effect on the value of trade. In the long term, the variables of exchange rates, imports, GFCF, and FDI have a positive and significant effect on the value of trade in Indonesia.

Keywords: Dynamic Models, International Trade, Macroeconomics.

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I. INTRODUCTION

International trade is one of the main factors in increasing economic growth which is driven quite highly by foreign direct investment. Other factors that are influenced or influenced by trade are exports, imports, gross domestic product (GDP) and the exchange rate also plays a role in international trade. Investment, foreign exchange rates have a different impact on each type of investment, meaning that a foreign investment can have a negative impact as well as a positive impact, this is because it depends on the product sales market rate. On the other hand, the exchange rate also describes the economic cycle which fluctuates every period. Fluctuating exchange rates will cause instability in international payment traffic so that it can reduce trade volume (Nopirin, 1987).

There are two trades within the country, namely domestic trade, and international trade. The main differences between domestic trade and international trade are related to broader trading opportunities, the existence of national sovereignty and the use of currency exchange rates (Mankiw, 2020). Classical international trade theory is divided into two, namely Absolute Advantage Theory and Comparative Advantage Theory. The theory of international trade from the classics was pioneered and developed by Adam Smith in his book entitled "The Wealth of Nations". Furthermore, many economists who contributed to the development of classical theory including David Ricardo, Robert Torrens, and John Stuart Mill.

Modern international trade theory was developed by Swedish economists named Heckscher (1919) and Ohlin (1935). The basis of comparative advantage is that the endowment factor is the ownership of various factors of production in a country, and the intensity factor is the technology used in the production process.

One of the supporting factors of trade is foreign direct investment. Foreign direct investment has developed as the most significant area of international business in the past five decades (Paul & Feliciano, 2021). With the support of globalization, the Association of Southeast Nations (ASEAN) has opened a policy of attracting foreign direct investment to accelerate economic development. Indonesia as a member of ASEAN with practical steps the government has created a foreign investment institution called Lempaga Pengelola Investasi (LPI) or Indonesia Sovereign Wealth Fund (ISWF), this body has the authority to accelerate the rate and management of foreign direct investment.

From the explanation above, it is interesting to conduct research on the influence of exports, imports, exchange rates, national income, investment on the value of trade in Indonesia using data from 1991 to 2020.

II. PREVIOUS RESEARCH

Several studies describe the relationship and causality between trade variables including exports and imports, exchange rates, gross fixed capital formation and GDP. International trade does not show a negative impact on GDP in the long term (Tanoë, 2021), in the short-term trade influences FDI and GDP (Ma'in & Isa, 2020). The research conducted (Manoharan & Vanitha, 2020) concludes that there is a short-term causality relationship between trade and FDI and in the long term there is a causality of FDI on GDP and trade. Trade as the dependent variable, only GDP growth which shows a significant short-term effect on trade, while FDI has no effect on trade.

Research conducted by Tanoë (2021) using the Granger causality method concluded that only GDP growth in the short term has a significant impact on international trade, while FDI has no effect on international trade.

Research conducted by Auboin and Ruta (2013) concluded that the impact on international trade from exchange rate volatility has a negative (although not large) impact on trade flows. Another study conducted by Nicita (2013) is generally in line with recent literature in supporting the importance of exchange rate misalignment while finding that short-term exchange rate volatility is generally not a serious concern. The paper also provides evidence supporting the argument that trade policy is used to compensate for some of the consequences of an overvalued currency, especially about antidumping interventions. Another study was conducted by Ng *et al.* (2008). This study identified the relationship between the real exchange rate and the trade balance in Malaysia from 1955 to 2006. This study used the Vector Error Correction Model (VECM) approach, and impulse response analysis. The main finding of this paper is that there is a long-run relationship between the trade balance and the exchange rate. Other important variables that determine the trade balance such as domestic income show a long-term positive relationship to the trade balance, and foreign income shows a long-term negative relationship.

Research conducted by Zafar (2007) shows that demand from China has contributed to price increases, especially for oil and metals from Africa, and has given a boost to real GDP in Sub-Saharan Africa. Chinese aid and investment in infrastructure is bringing much needed capital to the continent. At the same time, however, China's strong oil demand is contributing to increasing import bills for many oil-importing Sub-Saharan African countries, and its low-cost textile exports, while benefiting African consumers, threaten to displace local production. China poses a challenge to good governance and macroeconomic management in Africa because of the potential Dutch disease implications of a commodity boom.

Research conducted by Maliszewska *et al.* (2020) simulated the potential impact of COVID-19 on gross domestic product and trade, using a global standard general equilibrium model that can be calculated. This model simulates shocks as a lack of utilization of labor and capital, an increase in the cost of international trade, a decrease in travel services, and diversion of demand from activities that require closeness between people. A global pandemic base scenario sees gross domestic product fall by 2 percent below the world benchmark, 2.5 percent for developing countries, and 1.8 percent for industrialized countries.

Research conducted by Nguyen (2020) shows that FDI and international trade are related to Vietnam's economic growth. However, each economic variable has a different impact. FDI has a positive and statistically significant effect on Vietnam's economic growth. Exports also have a positive and statistically significant effect on economic growth, while imports have a negative but not statistically significant effect. Another study conducted by Africano and Magalhães (2005) investigated the relationship between foreign direct investment (FDI) shares and trade flows in the Portuguese economy. Incoming FDI stocks are positively related to trade, indicating a complementarity between the two. This effect is stronger on exports than imports, so it has a positive impact on the trade balance. It was also found that the stock of outgoing FDI had no significant relationship with either Portuguese exports or imports.

III. RESEARCH METHODOLOGY

VECM (Vector Error Correction Model) is a method derived from VAR. The assumptions that need to be met are the same as VAR, except for stationarity issues. Unlike the VAR, VECM must be stationary in the first differentiation and all variables must have the same stationary, that is, differentiated in the first derivative (Zou, 2018).

Assuming $y_t = (y_1, y_2, \dots, y_{kt})'$ is a stochastic time series, $t=1,2,3,\dots,T$, and $y_t \sim I(1)$, $i = 1, 2, 3, \dots, k$ are each affected by a d -dimensional exogenous time series $x_t = (x_1, x_2, \dots, x_{dt})'$; then the VAR model can be defined as (1).

$$y_t = A_1 y_{t-1} + A_2 y_{t-2} + \dots + A_p y_{t-p} + B x_t + \mu_t, \quad t = 1, 2, \dots, T \quad (1)$$

If not affected by exogenous d-dimensional time series $x_t = (x_1, x_2, \dots, x_{dt})'$; then (1) can be written as (2).

$$y_t = A_1 y_{t-1} + A_2 y_{t-2} + \dots + A_p y_{t-p} + \mu_t, \quad t = 1, 2, \dots, T \tag{2}$$

By the cointegration transformation of formula (2), we can get (3).

$$\Delta y_t = \Pi y_{t-1} + \sum_{i=1}^{p-1} r_i \Delta y_{t-i} + \mu_t \tag{3}$$

where,

$$\begin{aligned} \Pi &= \sum_{i=1}^p A_i - 1 \\ r_i &= -\sum_{j=i+1}^p A_j \end{aligned} \tag{4}$$

If Y_t has a cointegration relationship, then $\Pi y_{t-1} \sim I(0)$ and (4) can be written as (5).

$$\Delta y_t = \alpha \beta' y_{t-1} + \sum_{i=1}^{p-1} r_i \Delta y_{t-i} + \mu_t \tag{5}$$

where $\beta' y_{t-1} = ecm_{t-1}$ is an error correction term, which reflects the long-run equilibrium relationship between variables, and (5) can be written as (6).

$$\Delta y_t = \alpha ecm_{t-1} + \sum_{i=1}^{p-1} r_i \Delta y_{t-i} + \mu_t \tag{6}$$

Equation (6) is a vector error corrected model (VECM), where each equation is an error corrected model.

The cointegration test is also used in this study because it examines the long-term relationship between two variables (foreign direct investment and real gross domestic product). The Vector Error Correction Model (VECM) is used in this study to test whether in the long run the economy converges towards equilibrium or not. In this cointegration test two approaches will be used, the model developed by Engle and Granger (1987) and another model by Johansen (1988) and Johansen and Juselius (1990).

The VECM panel model equation for $\Delta TRADE_t$ is as (7).

$$TRADE = f(EXPORT, FDI, GDP, GFCF, ER, IMPOR) \tag{7}$$

where,

Trade: trade value; Export: Export value of goods and services; GDP: Product Domestic Income; GFCF: Gross Fixed Capital Formation; ER: US Dollar Exchange Rate against Rupiah; Import: The value of imports of goods and services).

$$\Delta TRADE_t = \beta_{1.1} ecm(-1) + \beta_{2.1} \Delta EXPORT(-1) + \beta_{3.1} \Delta FDI(-1) + \beta_{4.1} \Delta GDP(-1) + \beta_{5.1} \Delta GFCF(-1) + \beta_{6.1} \Delta ER(-1) + \beta_{7.1} \Delta IMPORT(-1) + \beta_{8.1} \Delta TRADE(-1) + \mu_t \tag{8}$$

The steps for estimating VECM are as follows; 1) Data Stationarity Test, 2) Determination of Optimal Lag, 3) Cointegration Test, 4) Causality Analysis (Granger Test), 5) Vector Error Correction Modeling, 6) Impulse Response Function (IRF), and 7) Variance Decomposition (Gujarati, 2021).

IV. RESULTS AND DISCUSSION

The first step that must be passed to obtain a VECM estimate is to test the stationarity of the data for each variable, both the dependent variable and the independent variable. Stationary data is needed to influence the results of the VECM estimation test. To detect whether each variable data is stationary, the ADF (Augmented Dickey Fuller) test is used using the intercept model. The ADF stationary test is shown in Table I.

TABLE I: ADF TEST RESULTS USING INTERCEPT

Method	Level		1 st Difference	
	Statistic	Prob.	Statistic	Prob.**
Levin, Lin & Chu t*	1.47886	0.9304	-5.30561	0.0000
Im, Pesaran and Shin W-stat	1.98689	0.9765	-7.56483	0.0000
ADF - Fisher Chi-square	7.48686	0.9143	81.4899	0.0000
PP - Fisher Chi-square	10.6670	0.7120	127.797	0.0000

Source: processed data and **Significant 5%

The stationary level is achieved in the ADF test, namely at the first difference level for all variables where the p-value is smaller or less than 0.05. After the data meets stationary at the first difference level, it is continued with determining the length of the lag by looking at the value of Likelihood Ratio (LR), Final Prediction Error (FPE), Akaike Information Criterion (AIC), Schwarz Information Criterion (SC), and Hannan-Quin Criterion (HQ). The lag length included is 0 to 1, because the data used is annual (annual).

The lag length is considered sufficient to describe international trade in the period 1991 to 2020. The optimal lag length can be shown in Table II.

TABLE II: LAG LENGTH TEST

Lag	LogL	LR	FPE	AIC	SC	HQ
0	100.31	NA	3.01e-12	-6.66	-6.33*	-6.56
1	165.20	92.69*	1.08e-12*	-7.80*	-5.13	-6.98*

Source: processed data

Based on Table II, there are the most asterisks in lag 1, so this lag was chosen as the optimal lag based on the criteria (LR, FPE, AIC, and HQ). The optimal lag used for VAR estimation is located at lag 1. The optimal lag has been found, then cointegration testing can be carried out (Basuki & Prawoto, 2017).

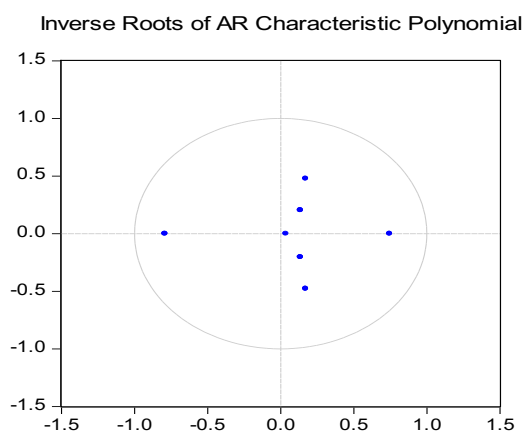


Fig. 1. AR Roots Graph Test Results.

Source: processed data

Fig. 1 provides supporting information for the lag test that the variables are included in the study because the dots are inside the circle.

The third test phase of VECM estimation is cointegration testing. The cointegration test is intended to determine the long-term relationship of each variable. The requirement in VECM estimation is that there is a cointegration relationship in it. If there is no integration relationship, then the VECM estimation is not used but must use the VAR (Vector Autoregression) model. In this study, the cointegration test used Johansen's 71 Cointegration Test method which is available in Eviews software with a critical value of 00.5. Cointegration test results are shown in Table III.

Based on Table III it can be explained that the value of the trace statistic and the maximum significant value at $r = 0$ is greater than the critical value with a significance level of 1% and 5%. This means that the null hypothesis which states that there is no cointegration is rejected and the alternative hypothesis which states that there is cointegration cannot be rejected. Based on the econometric analysis above, among the seven variables in this study, there are three rank variables related to cointegration. This can be proven from the trace statistical values of 206.0960 and 75.98921 which are greater than the critical values of 0.05, namely 125.6154 and 69.81889 which means, H_0 is rejected and H_1 is accepted or in other words, the variables used have a long-term relationship (cointegration). one another. Therefore, VECM estimation in this study can be used. Furthermore, the VECM stability test can be carried out.

TABLE III: COINTEGRATION TEST RESULTS (JOHANSEN'S COINTEGRATION TEST)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.950072	206.0960	125.6154	0.0000
At most 1 *	0.838231	125.1720	95.75366	0.0001
At most 2 *	0.677606	75.98921	69.81889	0.0148
At most 3	0.614111	45.42569	47.85613	0.0831
At most 4	0.377187	19.71615	29.79707	0.4423
At most 5	0.177542	6.931418	15.49471	0.5856
At most 6	0.059423	1.654070	3.841466	0.1984

Source: processed data

Testing the stability of the model is the next step before we use the VECM estimate. Model stability testing, intended to test the validity of IRF and VDC. Testing the stability of the VECM estimation can be shown in Table IV.

Based on Table IV the model used is stable, it can be seen from the modulus with a value less than one. Then the results of the IRF (Impulse Response Function) and VDC (Variance Decomposition) analysis are valid, and the Granger causality test can be carried out.

TABLE IV: VECM ESTIMATION STABILITY TEST RESULTS

Root	Modulus
-0.791314	0.791314
0.746519	0.746519
0.171478 - 0.476753i	0.506654
0.171478 + 0.476753i	0.506654
0.134692 - 0.204510i	0.244880
0.134692 + 0.204510i	0.244880
0.036395	0.036395

Source: processed data

The Granger causality test is meant to determine the causal relationship of each independent variable to the dependent variable. In this study, the causality test is more aimed at the factors that cause imports in Indonesia, namely the exchange rate, Gross Domestic Product, and inflation that affect imports. The test level used in this Granger causality test is at a confidence level of 0.05 (5 percent) and the length of the lag is up to lag 1 according to the optimum lag length test that has been carried out. The results of the Granger Causality test are shown in Table V. It is necessary to pay attention to the probability values contained in the Granger causality research. If the probability value is greater than 0.05, it is concluded that there is no causality between variables. Foreign Direct Investment statistically does not significantly affect exports with a Prob value greater than 0.05, namely 0.9084, thus rejecting the null hypothesis, which means that FDI does not affect exports. On the other hand, the export variable statistically significantly affects FDI with a Prob value of less than 0.05, namely 0.0041, so that it accepts the null hypothesis. Exports affect FDI. That is, when the government wants to increase FDI to capital in increasing the quantity or quality of products or services, the government will of course look at the value of exports because exports will determine the amount of FDI that will be obtained to match the economic target. Thus, it can be concluded that exports statistically significantly affect FDI and vice versa.

TABLE V: GRANGER CAUSALITY TEST

Null Hypothesis:	Obs	Lag 1	
		F-Statistic	Prob.
FDI does not Granger Cause EXPORT	29	0.01350	0.9084
EXPORT does not Granger Cause FDI	29	9.87843	0.0041***
TRADE does not Granger Cause EXPORT	29	14.1291	0.0009***
EXPORT does not Granger Cause TRADE	29	8.17760	0.0083***
GDP does not Granger Cause FDI	29	7.98277	0.0090***
FDI does not Granger Cause GDP	29	4.12231	0.0527*
GFCF does not Granger Cause FDI	29	11.2805	0.0024***
FDI does not Granger Cause GFCF	29	4.75270	0.0385**
ER does not Granger Cause FDI	29	1.97815	0.1714
FDI does not Granger Cause ER	29	17.2802	0.0003***
IMPORT does not Granger Cause FDI	29	12.1798	0.0017***
FDI does not Granger Cause IMPORT	29	0.06722	0.7975
TRADE does not Granger Cause GDP	29	0.62962	0.4347
GDP does not Granger Cause TRADE	29	7.95167	0.0091***
IMPOR does not Granger Cause ER	29	4.95768	0.0349**
ER does not Granger Cause IMPOR	29	0.35325	0.5574
TRADE does not Granger Cause ER	29	1.59714	0.2175
ER does not Granger Cause TRADE	29	7.61341	0.0105**
TRADE does not Granger Cause IMPORT	29	14.2040	0.0009***
IMPORT does not Granger Cause TRADE	29	5.78501	0.0236**

Source: processed data

The Trade variable statistically significantly influences Exports with a Prob value of 0.0009 so that it accepts the null hypothesis, which means Trade affects Exports. On the other hand, Exports statistically significantly affect Trade with a Prob value of 0.0083 so that it accepts the null hypothesis, which means that Exports affect Trade. Thus, it can be concluded that there is a two-way causality between Trade and Export variables, namely the two variables statistically influence each other.

The GDP variable statistically significantly affects FDI with a Prob value of 0.0090 so that it accepts the null hypothesis, which means that GDP affects FDI. On the other hand, FDI does not significantly affect

GDP with a Prob value of 0.0527 so that it does not accept the null hypothesis, which means that FDI does not affect GDP.

The GFCF or Gross fixed capital formation variable statistically significantly affects FDI with a Prob value of 0.0024 so that it accepts the null hypothesis, which means GFCF affects FDI. The FDI variable also statistically affects PMTB with a Prob value of 0.0385. Thus, there is a two-way causality between GFCF and FDI.

On ER and FDI Variables. The exchange rate variable is not statistically significant to FDI with a Prob value of 0.1714, but on the other hand, FDI has a statistically significant effect on the Exchange rate with a Prob of 0.0003. Thus, there is only one-way causality that FDI affects the exchange rate, not the other way around.

The import variable is statistically significant to FDI with a Prob value of 0.0017 and conversely, FDI has no statistically significant effect on imports with a Prob value of 0.7975. So, there is only one-way causality that imports affect FDI, but not vice versa.

Trade variable statistically has no significant effect on GDP with a Prob value of 0.4347 and vice versa GDP has a statistically significant effect on trade with a Prob value of 0.0091. GDP influences trade, but on the other hand, trade has no effect on GDP, meaning that international trade activities do not affect it because most of the materials for export still depend on imports, which results in many capital factors that cannot be controlled optimally.

The import variable statistically has a significant effect on the exchange rate with a Prob of 0.0349 and conversely, the exchange rate has no statistically significant effect on imports with a Prob of 0.5574. Thus, the government must consider the decision to import because it affects the exchange rate.

The trade variable statistically has no effect on the exchange rate with a Prob of 0.2175 and the exchange rate statistically influences the trade with a Prob of 0.0105. The exchange rate affects trade because any increase or decrease in the exchange rate will affect the value of an item, therefore the government is required to maintain the exchange rate or strengthen it from the US \$ currency to get high profits.

Trade variables statistically affect imports with a Prob of 0.0009 and imports statistically affect trade with a Prob value of 0.0236. Thus, there is a two-way causality between trade and imports, which means that trade affects imports and vice versa.

After carrying out a series of pre-estimation stages, namely data stationarity test, determination of lag length, cointegration test, and VECM stability, and the fact that there are three cointegration ranks in the test level of 0.05 (5 percent) in this study, the model used, namely VECM (Vector Error Correction Model). The use of VECM estimation is in accordance with the formulation of the problem in this study, which is to identify short-term and long-term relationships between the effect of the independent variables on the dependent variable. The results of the VECM estimation can be shown in Table VI.

TABLE VI: SHORT TERM VECM ESTIMATED RESULTS

Variable	Coefficient	t-Statistic	Prob.
D(LOG(EXPORT(-1)))	-0.5578	-1.068956	0.2869
D(LOG(FDI(-1)))	0.7220	2.731663	0.0071***
D(LOG(GDP(-1)))	-1.8043	-1.318722	0.1894
D(LOG(GFCF(-1)))	-0.3484	-1.281365	0.2022
D(LOG(ER(-1)))	-0.2008	-0.668734	0.5048
D(LOG(IMPORT(-1)))	1.3118	2.876866	0.0046***
D(TRADE(-1))	-0.1292	-1.680604	0.0951*
C	6.9016	0.964321	0.3365

Source: Processed data (2022)

Description: *** significant α 1%; ** significant α 5%; * significant α 10%

From Table VI the VECM estimation in the short term above, it can be explained that the Trade, FDI, and Import variables in lag 1 have a positive and significant effect on Trade. FDI has a positive and significant effect on trade, if there is an increase in FDI by one percent in the previous year, it will increase trade in the current year by 0.72 percent. The results of this analysis are in accordance with the hypothesis where the t-statistic value of the trade variable at lag 1 is -2,731 or a probability of less than 1 percent, which means that the FDI variable has a positive and significant effect on trade in the short term.

Past trade has a negative and significant effect on the current year's trade, meaning that if there is an increase in the previous year's trade by one percent, it will decrease the current year's trade by 0.13 percent. Imports affect trade value in the short term, an increase in imports by 1% will increase trade value by 1.31%.

From Table VII the long-term VECM estimation above, it can be explained that the Export, FDI, GDP, GFC, Exchange and Import variables have a significant effect on trade. exports have a positive and significant effect on trade of 0.5941. That is, if there is an increase in exports of 1% in the previous year, it will increase trade in the current year by 0.59%.

TABLE VII: LONG TERM VECM ESTIMATION RESULTS

Variable	Coefficient	t-Statistic
LOG(EXPORT(-1))	0.5941	-13.8493***
LOG(FDI(-1))	0.2578	19.6899***
LOG(GFCF(-1))	0.1344	13.9899***
LOG(ER(-1))	0.1123	10.7136***
LOG(IMPORT(-1))	0.3149	10.4820***

Source: Processed data (2022)

Description: *** significant α 1%; ** significant α 5%; * significant α 10%

FDI has a positive and significant effect on trade of 0.2578. This means that if there is an increase in FDI of 1% in the previous year, it will increase trade in the current year by 0.26%. This means that if FDI increases, trade will increase. This is due to an increase in capital to increase the quality and quantity of export capacity in international trade.

GFCF has a positive and significant effect on trade of 0.1344. This means that if there is an increase in GFCF by 1% in the previous year, it will increase trade in the current year by 0.13%. The GFCF variable has a positive and significant effect on trade in the long term.

The exchange rate has a positive and significant effect on trade by 0.11. This means that if there is an exchange rate increase of 1% in the previous year, it will increase trade in the current year by 0.11%. Exchange rate variables have a positive and significant effect on trade in the long term.

Imports have a positive and significant effect on trade by 0.31. This means that if there is an increase in imports of 1% in the previous year, it will increase trade in the current year by 0.31%. The Import variable has a positive and significant effect on trade in the long term.

After analyzing dynamic behavior through Impulse Response, we will then look at the characteristics of the model through variance decomposition. Variance Decomposition is used to compile the forecast error variance of a variable, namely how big the difference is between the variance before and after the shock, both the shock that comes from oneself and the shock from other variables to see the relative effect of the research variable on other variables. The variance decomposition procedure is to measure the percentage of surprises for each variable. The Variance Decomposition Model is used to provide a detailed explanation of how changes in one variable are affected by changes in other variables. Changes that occur in the variables are indicated by changes in the error variance. The results of the Variance Decomposition test can be seen in Table VIII.

From Table VIII, it can be explained that in the first period, trade was greatly influenced by the shock trade itself by 100 percent. Meanwhile, in the first period, the variables of exports, FDI, GDP, GFCF, exchange rates and imports had no effect on trade. Starting from the 1st to the 10th period, the proportion of shock trade itself is still increasing. However, the shock trade provides a proportion of the influence that decreases little by little on the trade itself from the 1st period to the 10th period. Furthermore, in the second period, the export variable contributed 16.29 percent and so on, it increased until the third period. In the fourth period, the exchange rate decreased with a shock of 16.64 percent. In the 5th to 10th periods, the contribution of the export shock to trade increased again with a shock of 18.99 percent in the 10th period.

TABLE VIII: VARIANCE DECOMPOSITION RESULTS

Period	S.E.	TRADE	LEXPORT	LFDI	LGDP	LGFCF	LER	LIMPOR
1	7.253	100.000	0.000	0.000	0.000	0.000	0.000	0.000
2	12.206	60.620	16.299	8.000	1.003	2.436	8.987	2.652
3	13.441	59.210	17.667	9.424	1.106	2.024	8.361	2.206
4	15.269	59.131	16.633	9.246	4.510	1.568	6.920	1.988
5	16.718	60.042	17.042	9.246	4.826	1.349	5.778	1.713
6	18.180	59.243	17.850	9.446	5.619	1.175	5.041	1.622
7	19.294	59.744	18.132	9.332	5.786	1.047	4.483	1.473
8	20.478	59.931	18.428	9.190	6.020	0.942	4.069	1.416
9	21.489	60.366	18.742	9.066	5.918	0.867	3.702	1.336
10	22.491	60.628	18.996	8.959	5.877	0.803	3.438	1.295

Source: processed data

The results of the VDC analysis in the 2nd period, the FDI variable contributed 8.00 percent to trade. The contribution of FDI to trade increased in the third period with a shock of 9.42 percent to the sixth period with a shock of 9.44 percent. However, in the 7th to 10th periods it again experienced a decline with a shock of 8.95 percent.

The results of the VDC analysis in the 2nd period, the GDP variable contributed 1.00 percent to trade. The contribution of FDI to trade increased in the third period with a shock of 1.10 percent to the 8th period with a shock of 6.02 percent. However, in the 9th to 10th periods, it again experienced a decline with a shock of 5.87 percent.

The results of the VDC analysis in the 2nd period, the GFCF variable contributed 2.43 percent to the trade. GFCF's contribution to trade decreased in the third period with a shock of 2.02 percent until the 10th period with a shock of 0.80 percent.

The results of the VDC analysis in the second period, the exchange rate contributed 8.98 percent to the trade. The contribution of the exchange rate to trade decreased in the third period with a shock of 8.36 percent until the 10th period with a shock of 3.43 percent.

The results of the VDC analysis in the second period, the import variable contributed 2.65 percent to trade. The contribution of the exchange rate to trade decreased in the third period with a shock of 2.02 percent until the 10th period with a shock of 1.29 percent.

V. CONCLUSION

In the short term, the GFCF, Export and Import variables show no effect on Indonesia's international trade. FDI, Trade and Import variables in lag 1 have significant and significant effect on international trade. FDI and import variables have a positive and significant impact on international trade. Increased imports and FDI will increase international trade. However, past trade variables have a negative and significant effect on international trade variables. In the long term, the GDP variable does not show any effect on Indonesia's international trade. The variables FDI, GFCF, exports, imports, and exchange rates have a significant effect on Indonesia's international trade. FDI, GFCF, exchange rates, imports have a positive and significant effect on Indonesia's international trade. This means that these macroeconomic variables have an important impact on increasing Indonesia's economic progress. Based on IRF analysis, it can be concluded that the response of international trade to export shocks from period 1 to period 2 experienced a positive trend, period 3 to period 5 experienced a decline, but in period 6 to 10 neither increased nor decreased. The results of the IRF analysis show that the response of international trade to FDI shocks from the 1st to the 2nd period experienced a positive trend, the 3rd to 4th period experienced a negative trend, the 6th to 10th period experienced a stagnant trend. The results of the IRF analysis show that the response of international trade to the GDP shock from the 1st to the 2nd period experienced a positive trend, the 3rd period experienced a negative trend, the 4th period experienced a positive trend, but the 5th period to the 10th period stagnant. The results of the IRF analysis show that the international trade response to the PMTB shock from period 1 to period 2 experienced a negative trend, period 3 experienced an increasing trend, but in period 4 to period 10 it was stagnant. The results of the IRF analysis show that the response of international trade to exchange rate shocks from the 1st to the 2nd period experienced a negative trend, the 3rd period experienced a positive trend, the 4th to 10th periods experienced not too sharp increases and decreases. The results of the IRF analysis show that the response of international trade to import shocks from the 1st to the 2nd period experienced a positive trend, the 3rd period showed a negative trend, the 4th to the 10th period experienced a stagnant condition.

Based on the results of the Variance Decomposition analysis, the variables of international trade itself, exports, FDI, GDP, GFCF, exchange rates, and imports each make a varied contribution to Indonesia's international trade. The highest contribution to Indonesia's international trade, namely international trade itself, contributed 60.63 percent to the end of the period.

Seeing the results of research showing that GDP, FDI, GFCF, imports, exports, and exchange rates affect Indonesia's international trade, the government must maintain macroeconomic stability to support the progress of the country's economy. The government can provide support for the creation of domestic raw materials that have competitive quality and prices for business actors so that they can increase exports without increasing imports of raw materials.

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CONFLICT OF INTEREST

Authors declare that they do not have any conflict of interest.

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