The Relationship between Inflation, Exchange Rates, Non-Oil and Gas Exports and Economic Growth in Indonesia

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ABSTRACT: Economic growth in Indonesia is still said to be fluctuating with lots factors involved contribute to increasing economic growth. The economic conditions from the monetary crisis to the COVID-19 pandemic show this the economy in Indonesia is still in level intermediate. Sectors that play a role in enhancement growth economy like activity trading international become support in growth economy. So that study this done for now is there is connection between inflation, exchange rate, non- oil and gas exports and growth economy in Indonesia. This research use approach quantitative with use VECM analysis. This research uses secondary data from Indonesian Central Statistics Agency (BPS) and World Bank. Based on study this obtained results that in period short growth economy year then influence level inflation moment this. Whereas in period long, inflation influential negative significant to growth economy, non- oil and gas exports influence no significant to growth economy and exchange rate influential not significant to growth economy. In matter this required role government for relieve problem and increase sectors indicated for donate economy, so growth the economy in Indonesia does not only fluctuating will but keep going increase each the year.

KEYWORDS: Economic Growth, Inflation, Non-Oil and Gas Exports, Exchange Rate, VECM

I. INTRODUCTION

The main key in a country's development is economic growth. The importance of economic growth requires a country to remain consistent in maintaining and increasing economic growth. Economic factors that effect on the level of economic growth of a country will have an impact in the long and short term.

Indonesia's economic growth experiences fluctuating movements so it is not certain whether it is increasing or decreasing. In 1998, Indonesia's economic growth was at -13.1 (World Bank Open Data, 2022a). This sharp decline is due to a phenomenon The monetary crisis occurred because the US dollar exchange rate weakened on moment that. Not only Indonesia, but countries all over the world are affected by this crisis. Indonesia tried to recover from the monetary crisis until in 2020 the Indonesian economy experienced another decline due to the COVID-19 pandemic which attacked countries throughout the world. The economy suddenly stalled and almost experienced an economic recession. According to the Head of the Center for Macroeconomics and INDEF, if Indonesia's economic growth can reach 7% per year, then Indonesia can be categorized as a developed country (Indonesia, 2023).

This is also reflected in Indonesia's international trade activities, especially in the field of non-oil and gas exports, which experienced a decline from 155,893.7 million US$ in the previous year to 154,940.7 million US$ (BPS, 2022). The Indonesian Central Statistics Agency recorded a decrease in non-oil and gas export value due to the inability to distribute goods and services sold abroad. The decline in the value of non-oil and gas exports was not sharp, but after the pandemic it increased sharply. In 2021, shows the value of non-oil and gas exports reached 219,362.1 million US$ and in 2022 it reached 275,906.1 million US$. According to (Adnan, 2022) the growth of export activities in a country is an effort to increase state income which will have an impact on the economy. Export activities are used as the main focus in increasing economic growth with industrialization from imports to exports. In this case, there is a causality pattern on variables non-oil and gas exports and economic growth, with the significance of economic growth influencing non-oil and gas exports (Hasmarini & Murtiningsih, 2017). Not just because of the pandemic, there are also other factors affecting the decline and increase in export activities, one of which is the exchange rate. Research (Arfiani, 2019) states that countries will be encouraged to carry out more export activities if the country's currency exchange rate shows a low position, and the opposite applies. The reason is that the income from the country's currency obtained from the low exchange rate will be more. To date, the Rupiah exchange rate to the US Dollar has shown an increase that has occurred since 2012(World

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Bank Open Data, 2022). This increase has almost reached 15,000 per 1 Dollar, so action is needed from the government to overcome this problem. The results show that exchange rate influence significant negative impact on economic growth. This shows that if the exchange rate increases, economic growth will decline (Pridayanti, 2021).

Bank Indonesia in 2023 sets the inflation target for that year at 2.5%. Bank Indonesia's goal is to reduce the rate of inflation so that macroeconomic-related problems do not occur which will impact economic instability. Research (Salim & Fadilla, 2021) shows that inflation has a significant impact on GDP so that the government always tries to suppress movements in the inflation rate. In actual conditions in 2022, inflation in Indonesia shows an increase, initially amounting to 1.87% in 2021, while in 2022 it will be 5.51% (BPS, 2019).

Previous research was carried out with the aim of finding out the influence between inflation, exchange rates, non-oil and gas exports and economic growth. There is an influence between inflation and interest rates and economic growth which is indicated by partial test results with a value of <0.05 (Idriyani, 2016). Further research conducted by (Purwaning Astuti & Juniwati Ayuningtyas, 2018) show the long-run economy exports and rupiah exchange rate influence significant impact on economic growth, while the amount of imports no effect on economic growth.

The output of previous research, it is indicated that economic growth receives many effects from changes in the rate of inflation, exchange rates, and non-oil and gas exports. These variables are the most important factors in the country's economy. In general, countries with a high economy can always be seen from low inflation, strong exchange rates, more exports than imports and continued high economic growth. However, the relationship between these 4 variables is not yet clear, so this research was conducted with the aim of finding out the relationship between these four variables. Availability of data over a sufficient period start 1992-2022.

II. LITERATURE REVIEW

Growth Economy

Economic growth according to (Samuelson & Nordhaus, 2004) is a potential increase in a country's GDP, which means that economic growth will occur if there are production activities. In determining the country's growth rate, what is calculated is the country's income which comes from Gross Domestic Product or often called GDP (Gross Domestic Product). Gross Domestic Product is used to standard instrument whether a country's overall economic performance is good or not. Gross Domestic Product is used as a measure of production results using constant prices. In research (Fatmawati, 2015) on neo- classical economic growth with an economist named Solow, it is explained regarding the use of capital and labor accumulation. The application of Solow's theory in developing countries can clearly see economic growth. The wheels of economic growth that must continue to run are the use of natural resources, human resources, capital flows and technological developments.

Trading International

From this wheel of growth, maximum production activities can occur so that trade activities can become a fulcrum for economic growth. One of the trades carried out is international trade with export and import activities. However, what brings the most profits is export activities because they sell domestic production to be sent abroad. H-O theory in the book (Salvatore, 2007) explains the differences in proportions of different production factors between countries so that international trade is carried out to meet domestic needs. This will also have an impact on the trade balance as indicated by the balance of exports and imports. From trade, a balance of payments can be obtained which can increase the country's foreign exchange reserves. The trade balance is said to be in surplus as indicated by higher exports than imports. And vice versa, if the deficit is shown by higher imports than exports.

Exchange rate

International trade requires a means of payment as a reference for making payments which is usually called the exchange rate. The comparison of the price of domestic money measured with the price of another currency is also called the exchange rate. According to Mankiw (2003) in research (Arfiani, 2019) there are 2 types of exchange rates, namely the real exchange rate and the nominal exchange rate. Relative price of goods between another countries is shown by the real exchange rate. while the relative price of currencies between two countries is shown by the nominal exchange rate. In this case, the exchange rate is divided into 3, namely:

1. Buying rate

The buying rate is the rate determined by the bank that will sell foreign currency.

2. Selling rate

The selling rate is the rate determined by the bank wishing to purchase foreign currency.

3. Middle rate

The exchange rate that is between the selling rate and the buying rate. The middle rate is only used by traders to make a profit

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from the difference between the selling rate and the buying rate.

Inflation

According to (Mankiw, 2018) an increase in the overall price of goods and services is also called inflation. The cause of inflation is demand for goods or services that exceeds the supply provided by producers. So there cannot be a balance between the demand side and the supply side. In Keynes's theory, the relationship between inflation and economic growth is shown by the AD-AS curve. Generally, inflation is expressed in percentage form. The low inflation rate is in the range below 2% - 3%. Then in the middle position, the inflation rate is usually between 4% - 10%. A country is said to have hyperinflation if the inflation rate in a year reaches tens or even hundreds of percent. In Indonesia itself, hyperinflation occurred in 1965 with the inflation rate reaching 500% and 650% in 1966. The effect of inflation on economic efficiency is because inflation distorts prices.

Previous research was carried out with the aim of finding out the influence and relationship between these 4 variables in a particular year. Research (Wiriani & Mukarramah, 2020) found that inflation has a significant negative impact on economic growth because inflation is getting higher, this causes people's purchasing power to be low and this has an impact on the economy. Meanwhile, the exchange rate influences a negative but not significant impact on economic growth. This research is in line with (Salim & Fadilla, 2021) that inflation influence significant impact on economic growth, while research by (Pridayanti, 2021) found that the exchange rate influence significant negative impact on economic growth.

Next, there is research conducted by (Arfiani, 2019) with research results showing that there is a pattern of relation between exports, imports, exchange rates and economic growth. There is a cause and effect relationship between exports and imports, for the export and exchange rate variables there is only a one-way relationship, while the cause and effect relationship between exports and economic growth gives unreliable results. Research (Razak & Jaya, 2014) shows that non-oil and gas exports influence significant positive impact on economic growth. Previous research shows variations in the relationship between inflation, exchange rates, non-oil and gas exports and economic growth. The range of years in the research also influences the research results so that this research is expected to provide a more real picture with the latest and easy to access data.

Relation between variable

The relationship between inflation and economic growth in research (Idriyani, 2016) related to the relationship between inflation and economic growth which shows the results of the influence and also the relationship between the two. To see the relationship between inflation, exchange rates, and non-oil and gas exports, it can be seen in research (Putri & Jayadi, 2023) with the results that simultaneously inflation variables, exchange rates, do not affect non-oil and gas exports. To see whether the relationship between exports and economic growth can be seen from research (Halim & Tayibnapis, 2019)with the results that there is a short-term causality relationship between exports and economic growth. While in the long-run causality relationship there is no relationship between exports and economic growth. The existence of a relationship between the exchange rate and economic growth can be seen from the results of research (Wiriani & Mukarramah, 2020)which shows the results that simultaneously the exchange rate has a significant effect on economic growth. Then, to find out the relationship between inflation and the exchange rate, it can be seen in research (Faizin, 2020) which shows that there is a long-term relationship and causality between inflation and the exchange rate. Meanwhile, in short-term relationships there is no influence between these two variables.

Frame of Mind

Economic growth in Indonesia tends to fluctuate every year. Even though there is not a long distance between years, the level of economic growth must be maintained and can be increased further. Several factors are interconnected with economic growth in Indonesia. The inflation rate in one's own country, the exchange rate related to international trade activities such as exports indirectly play a role in increasing economic growth. A high level of inflation tends to affect people's consumption levels, so that people will slightly reduce their consumption activities. This event also occurs with the exchange rate, if the rupiah exchange rate against the dollar is high then it can be concluded that the actual value of the rupiah is low. So selling goods abroad will be cheaper, and conversely if you buy goods from abroad it will feel more expensive, because the value of the rupiah is weak.

Hypothesis

In the framework of thinking, the research hypothesis can be determined as follows:
1. It is suspected that there is no causality relationship between inflation, exchange rates, non-oil and gas exports and Indonesia's economic growth.
2. It is suspected that there is a causality relationship between inflation, exchange rates, non-oil and gas exports and Indonesia's economic growth.
3. It is suspected that there is a long-term relationship between variables, namely inflation, exchange rates, non-oil and gas exports and Indonesia's economic growth.

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4.   It is suspected that there is a short-term relationship between inflation, exchange rates, non-oil and gas exports and Indonesia's economic growth.

5.   It is suspected that there is no long-term relationship between inflation, exchange rates, non-oil and gas exports and Indonesia's economic growth.

6.   It is suspected that there is no short-term relationship between inflation, exchange rates, non-oil and gas exports and Indonesia's economic growth.

III.   RESEARCH METHODS

In accordance with the research topic that has been determined, namely to determine the relation between inflation, exchange rates, non-oil and gas exports and economic growth in Indonesia, this type of research is included in quantitative research. Based on the views of (Creswell & Creswell, 2018)quantitative research aims to test specific theories by utilizing data that is already available. In the research using includes national data avaible from the official website of the Indonesian Central Statistics Agency and World Bank Open Data from 1992 - 2022. The analysis technique used in this research is Vector Autoregression (VAR).

This VAR analysis is used to analyze the interdependent relation between variables in time series data. In this analysis there is no need to differentiate which variables are exogenous and which are endogenous variables because VAR assumes that all of these variables are endogenous. Not only analyzing interdependence relationships, but there is an analysis to determine the shock of one variable to a variable through Impulse Response Function analysis and if you can see the contributes of one variable to another variable by using Variance Decomposition. This test uses the Stata 17 statistical test tool.

In the book (Widarjono, 2009) It is known that VAR modeling is carried out using 3 equations:

$$Y_{1t} = \beta_{01} + \sum_{i=1}^{p} \beta_{i1}\, Y_{1t-i} + \sum_{i=1}^{p} \alpha_{i1}\, Y_{2t-i} + \sum_{i=1}^{p} \chi_{i1}\, Y_{3t-i} + e_{1t}$$

$$Y_{2t} = \beta_{02} + \sum_{i=1}^{p} \beta_{i2}\, Y_{2t-i} + \sum_{i=1}^{p} \alpha_{i2}\, Y_{1t-i} + \sum_{i=1}^{p} \chi_{i2}\, Y_{3t-i} + e_{2t}$$

$$Y_{3t} = \beta_{03} + \sum_{i=1}^{p} \beta_{i2}\, Y_{3t-i} + \sum_{i=1}^{p} \alpha_{i3}\, Y_{1t-i} + \sum_{i=1}^{p} \alpha_{i3}\, Y_{2t-i} + e_{3t}$$

From the equation above, when applied to the variables taken in this research, the results of the equation are as follows:

$$Inflasi_t = \beta_{01} + \sum_{i=1}^{p} \beta_{i1}\, Inflasi_{t-i} + \sum_{i=1}^{p} \alpha_{i1}\, Kurs_{t-i} + \sum_{i=1}^{p} \chi_{i1}\, ENM_{t-i} + \sum_{i=1}^{p} \chi_{i1}\, PE_{t-i} + e_{1t}$$

$$Kurs_t = \beta_{02} + \sum_{i=1}^{p} \beta_{i2}\, Kurs_{t-i} + \sum_{i=1}^{p} \alpha_{i2}\, Inflasi_{t-i} + \sum_{i=1}^{p} \chi_{i2}\, ENM_{t-i} + \sum_{i=1}^{p} \chi_{i2}\, PE_{t-i} + e_{2t}$$

$$ENM_t = \beta_{03} + \sum_{i=1}^{p} \beta_{i3}\, ENM_{t-i} + \sum_{i=1}^{p} \alpha_{i3}\, Inflasi_{t-i} + \sum_{i=1}^{p} \chi_{i3}\, Kurs_{t-i} + \sum_{i=1}^{p} \chi_{i3}\, PE_{t-i} + e_{3t}$$

$$PE_t = \beta_{04} + \sum_{i=1}^{p} \beta_{i4}\, PE_{t-i} + \sum_{i=1}^{p} \alpha_{i4}\, Inflasi_{t-i} + \sum_{i=1}^{p} \chi_{i4}\, Kurs_{t-i} + \sum_{i=1}^{p} \chi_{i4}\, ENM_{t-i} + e_{4t}$$

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The units used for the variables above: inflation in percent, exchange rate per 1 US dollar in rupiah, non-oil and gas exports in million US$, economic growth using GDP at constant prices in percent.

The stages carried out when using VAR analysis are as follows:

a. Stationarity Test

The stationarity test is carried out on unknown data is stationary at level level or not. This aims to find out the type of VAR model that will be used later. If when testing the data, it is stationary, then the VAR modeling used is the VAR in Level model. However, if at the time of testing the data does not show stationary, then what must be done is to stationary the data at the difference level until the data shows stationary. So you can know the VAR modeling that will be used. This stationarity test uses the Augmented Dicky Fuller (ADF) test with data shown by the results of the absolute value of the ADF statistic > critical value,so the data shows stationary and vice versa if the absolute value of the ADF statistic

< critical value, then the data shows it is not stationary.

b. Optimal Lag Test

In determining the optimal lag length to be used in the next stage, an optimal lag test is carried out.This optimal lag length shows the degrees of freedom in the hope of getting sufficient lag so that a dynamic model will be obtained. In (Basuki, 2016) it is explained that determining the optimal lag is based on several criteria, namely, Akaike Information Criterion (AIC), Schwarz Information Criterion (SC) or Hannan Quinnon (HQ).

c. Johansen Cointegration Test

The cointegration test is run with the aim of finding out whether these variables have a long-term relationship or not. In this test, the VAR model that will be used next can also be determined. If the results show that variables have cointegration. then the VAR model used is VAR VECM, but if the results of this test do not contain cointegration then the VAR model used is VAR in Difference. To find out whether the results of the cointegration test have a long-term relationship or not, you can look at the trace statistics and critical value. It is said that a variable show cointegration if the trace statistic value > critical value, and conversely, if the variable does not show cointegration then the trace statistic value is < critical value.

d. Stability Test

The stability test is a test used to see whether the VAR estimate is stable or not so that it can be continued to carry out further tests.

e. VECM estimation

After carrying out a series of tests, it was found that there were indications of undercointegration by looking at the trace statistical values and critical values. VECM is a restricted form of VAR because the data form is not stationary but has cointegration. VECM has a restriction specification in the long-term relationship between endogenous variables so that it converges to a cointegration relationship, but still allows for short-term existence.

f. Impulse Response Function (IRF)

This test is carried out with the aim of identifying the reaction of the variable involved as a result of interference from other variables, and in this framework, the IRF test is applied.

g. Decomposition Variants

This test was carried out to illustrate the relevance of each variable in the VAR system becomes significant when a shock occurs. This test aims to predict the contribution as a percentage of each variable that may occur as a result of changes to certain variables in the model.

h. Causality Test

Causality test is a test that aims to determine causal or reciprocal relationships between variables. The results are found if the variable test results have a probability value of <0.05, then this indicates that there is causality between the variables.

IV.   RESULTS AND DISCUSSION

The initial test is the stationarity test, which shows that the exchange rate and non-oil and gas export variables do not have stationary properties at the level. This can be seen by looking at the Mackinnon approximate p-value which can be show in the table below.

Table 1. Stationarity test at level

Variable	Mackinnon P-value (Level)	Information
Inflation	0.0002	Stationary
Exchange rate	0.2958	Not Stationary

Non-Oil and Gas Exports	0.9030	Not Stationary
Economic growth	0.0010	Stationary

Because there are variables that are not stationary, namely the exchange rate variable and also the non-oil and gas export variable, the data on these variables must be stationary first at the differentiation level until the data is truly stationary. So that in transforming the data we get results like the table below:

Table 2. Stationarity test at first difference

Variable	Stationary Difference	Information
Dinflation	0.0000	Stationary
Dkurs	0.0000	Stationary
Dekspor_non oil and gas	0.0004	Stationary
DPE	0.0000	Stationary

From the results of data transformation from non-stationary to stationary at the difference level, it was found that all data was transformed at the first difference level. Therefore, in first level differentiation, all variables become stationary. Next is the test to determine the optimal lag for variables that are stationary at the first level of difference. To determine at what lag position, what you have to look at is the data with the most method positions marked with (*). So in testing the optimal lag the following results were found:

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Lag    LL       LR      df    p     FPE      AIC      HQIC     SBIC

 0   -74.7606                      .004017  5.83412   5.8912   6.0261
 1   -47.479   54.563   16  0.000  .001772  4.99844   5.28387  5.95832*
 2   -24.775   45.408*  16  0.000  .001178* 4.50185*  5.01561* 6.22963
 3   -15.0016  19.547   16  0.241  .002379  4.96308   5.70518  7.45877
```

Picture 1. Optimal Lag Test

From the results of the optimal lag test, it was found that the data was in position at lag 2 because the position at lag 2 showed the results with the most methods, marked with many (*).

The next test is to assess whether there is a long-term relationship between the variables using the cointegration test. From the results of this test, we will get the VAR model that will be used. The cointegration test used in this context is the Johansen cointegration test, which is used to emit whether the statistical trace value exceeds the trace value. Thus, the results of the cointegration test can be issued as follows:

Picture 2. Johansen Cointegration Test
Johansen tests for cointegration
Trend: Constant   Number of obs = 28
Sample: 1995 thru 2022   Number of lags = 2

Maximum rank	Params	LL	Eigenvalue	Trace statistic	Critical value 5%
0	20	-76.861431	.	101.0899	47.21
1	27	-48.64861	0.86671	44.6642	29.68
2	32	-35.195399	0.61747	17.7578	15.41
3	35	-29.876231	0.31610	7.1195	3.76
4	36	-26.316505	0.22451		

The next test it's the stability test to find out whether the VAR VECM model is stable or not before carrying out the IRF test. Information about the test results is available in the image presented below:

Picture 5. Stability Test

Eigenvalue			Modulus
-5.967e-16	+	.635845*i*	.635845
-5.967e-16	-	.635845*i*	.635845
-.3177204	+	.485181*i*	.579954
-.3177204	-	.485181*i*	.579954
.3177204	+	.485181*i*	.579954
.3177204	-	.485181*i*	.579954
.2961146			.296115
-.2961146			.296115

From the test results above, it can be seen that the VAR model is in a stable state. This is indicated by a modulus value below <1, which indicates that the VAR model is in a stable state. And if the modulus value is >1 it can be said that the VAR model is unstable according to (Gujarati, 1995) in (Sembiring, 2016).

From the output of the cointegration test, it was found that there is a long-term relation among variables, namely non-oil and gas export, exchange rate, inflation, and economic growth seen from the trace statistic value > trace value. So in the next test, what is used is VAR VECM modeling, the goal is to understand the relation among variables over long and short time periods. This result is in contrast to research (Arfiani, 2019) because the results obtained from this research were that there was no cointegration between the variables in it. Long-term and short-term test results can identify through images below:

Picture 3. Long-Term VECM Test

Cointegrating equations

Equation	Parms	chi2	P>chi2
_ce1	3	47.25588	0.0000

Identification: beta is exactly identified

Johansen normalization restriction imposed

beta	Coefficient	Std. err.	z	P>|z|	[95% conf.	interval]
_ce1						
dpe	1	.	.	.	.	.
dinflasi	-4.804371	.6989309	-6.87	0.000	-6.17425	-3.434492
dkurs	2.139867	1.571709	1.36	0.173	-.9406264	5.22036
dnilaieskpor_nonmigas	-.8786671	2.383114	-0.37	0.712	-5.549486	3.792151

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From the test results above it is known that:

Overall, inflation has a significant negative impact in the long term, with a coefficient value of -4.804371. This means that every one-unit increase in the inflation rate will result in a decrease in economic growth of -4.804371, or proportional to the coefficient value of this variable. This is supported by study (Wiriani & Mukarramah, 2020) which is explained that If inflation tall so power buy public is at on position low so that will influential on level economy. In the long term, the exchange rate has a insignificant impact of around 2.139867 on economic growth. This research is in line with (Adlu & Abdireviane, 2023) which states that the exchange rate is not significant for economic growth. This means that if the exchange rate increases or decreases it will not affect economic growth. For the non-oil and gas export variable in the long term, it shows positive results with a coefficient value of 5.04833, which is not significant for economic growth with a probability value of 0.176. This result is supported by research (Tubagus et al., 2023) that non-oil and gas exports have a positive and insignificant effect on economic growth with a coefficient value of 0.084324. This means that if non-oil and gas exports increase, economic growth will also increase. So, increasing non-oil and gas exports will increase the country's foreign exchange reserves which will increase economic growth.
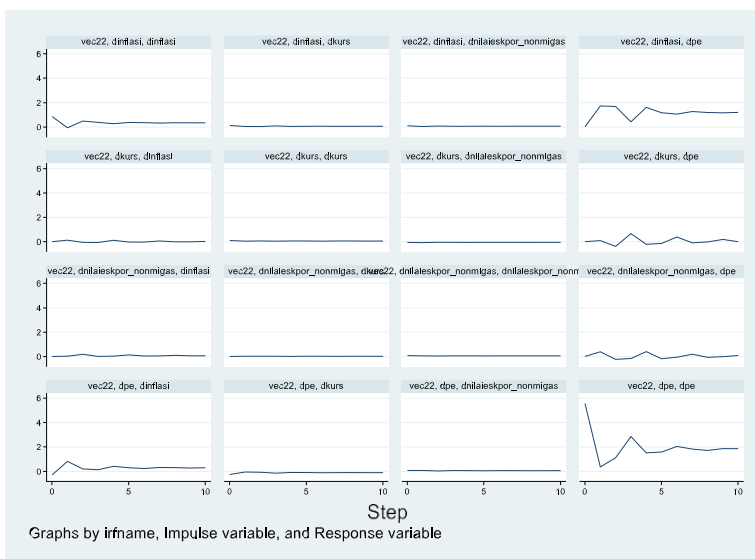
Picture 4. Short-term VECM Test

	Coefficient	Std. err.	z	P>|z|	[95% conf.	interval]
D_dpe						
ce1 L1.	-.8711943	.362352	-2.40	0.016	-1.581391	-.1609974
dpe LD.	.02497974	.3451642	0.07	0.943	-.6517121	.7013068
dinflasi						
LD.	-3.201129	1.09865	-2.91	0.004	-5.354442	-1.047815
kurs LD.	5.14754	8.790815	0.59	0.558	-12.08214	22.37722
dnilaieskpor_nonmigas						
LD.	7.138701	9.83556	0.73	0.468	-12.13864	26.41604

From results short-term testing, obtained results that Changes in GDP values 1 year ago significantly influence current inflation with a value of 0.004 < 0.05. If GDP rose 1% last year. This will cause inflation to fall this year by -3.201129. This is supported by research (Lubis, 2004) which shows a one-way short-term relationship between economic growth and inflation. Increased economic growth will affect inflation, meaning that if Indonesian people experience an increase in income, it will affect the cost level of goods and services in Indonesia that year. This result is the same as research (Wanda & Kartika, 2021) that inflation influence significant positive impact on economic growth. This indicates that if inflation enhancement, economic growth will also enhancement. This research is inversely proportional to that conducted by (Karki et al., 2020) that inflation in Nepal has a negative relation with economic growth

The next test is the IRF test, because the IRF test is an important analysis in the VAR model because it aims to determine the response of endogenous variables due to shocks from disturbance variables. Because the stability test has been carried out and shows stable results, the next step is the IRF test The results of the IRF test can be seen in the image below:

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Picture 6. Irf Test

Graphs by irfname, Impulse variable, and Response variable

1. Based on Figure 4, where the impulse variable is inflation and the response variable is GDP, it can be seen that from the beginning of the period to the 8th period, the GDP response has experienced fluctuations since the inflation shock occurred. The situation shows that fluctuations decrease in the 8th period, which means it shows stability.

2. Based on graph 8, where the impulse variable is the exchange rate and the response variable is GDP, it can be seen from the beginning of the period to the 8th period. This shows that the GDP response experienced fluctuations when a shock occurred in the exchange rate. These fluctuations tend to be small but long. Furthermore, after the 8th period and so on, fluctuations begin to decrease, meaning that GDP is no longer volatile and the graph shows a stable situation.

3. Based on graph 12, where the impulse variable is non-oil and gas exports and the response variable is GDP, it can be show that from the first period to the 8th period there were relatively small but long fluctuations, showing the response of GDP due to shocks in non-oil and gas exports. After the 8th period onwards, fluctuations tend to become smaller, which means that GDP is no longer volatile and the graph shows a stable situation.

4. Based on graphic image 12, where the variable impulse is economic growth and the variable response is economic growth itself which can be seen from the first period to the 8th period which experienced fluctuations. After the 8th period onwards, fluctuations tend to become smaller, which means that GDP is no longer volatile due to shocks and the graph shows a stable situation.

After carrying out the IRF test, the next test is the decomposition variant. Variant decomposition aims to see a picture of variables resulting from shock. The percentage contribution of variable variance due to changes in certain variables can be seen using the variant decomposition test. The results of the decomposition variant testing can be show in the image below:

Picture 7. Variant Decomposition Test

Step	(1) fevd	(2) fevd	(3) fevd	(4) fevd
0	0	0	0	0
1	0	0	0	1
2	.101349	.000429	.012068	.886155
3	.180558	.003773	.010554	.805116
4	.156389	.008543	.008699	.826369
5	.195966	.01052	.014155	.77936
6	.213077	.009899	.013101	.763924
7	.218176	.009675	.012371	.759778
8	.231543	.009698	.013163	.745595
9	.241834	.009098	.012449	.73662
10	.248533	.008523	.012131	.730814
11	.25598	.008176	.012117	.723727
12	.26273	.007742	.011741	.717787
13	.268121	.00733	.011537	.713012
14	.273211	.007009	.011404	.708375
15	.277986	.006692	.01119	.704131

The test results show that the contribution of economic growth variables to economic growth itself was 100% in the 1st period.

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For the 2nd period and so on until the 15th period, the economic growth variable gets contributions from the variables inflation, exchange rate and non-oil and gas exports. The contribution of inflation over 15 years was the largest to economic growth with a variance value of 0.224207%. For the exchange rate contribution for the next 15 years with a variance value of 0.13419% in the 7th period. Furthermore, the non-oil and gas export variable contributed to economic growth with a variance value of 0.007622% in the 6th period. The economic growth variable contributes 100% in the first period for the next 15 years. With this, it can be said that the largest variable contribution comes from inflation, followed by the exchange rate variable and also non-oil and gas exports to economic growth in Indonesia over the next 15 years. Although in the first period the contribution to economic growth came from economic growth itself, in subsequent periods it decreased and was increased by contributions from other variables.

The final step is to carry out a Granger causality test. This test is carried out to find out whether indicated a causal relation among the variables. To find out whether there is a reciprocal relationship or not, you can see the test results as below:

Picture 8. Granger Causality Test

Granger causality Wald tests

Equation	Excluded	chi2	df	Prob > chi2
dpe	dinflasi	.48215	1	0.487
dpe	dkurs	.03176	1	0.859
dpe	dnilaieskpor_no~s	.28983	1	0.590
dpe	ALL	.702	3	0.873
dinflasi	dpe	1.3124	1	0.252
dinflasi	dkurs	.05979	1	0.807
dinflasi	dnilaieskpor_no~s	1.1117	1	0.292
dinflasi	ALL	3.3327	3	0.343
dkurs	dpe	.07652	1	0.782
dkurs	dinflasi	1.3636	1	0.243
dkurs	dnilaieskpor_no~s	.44226	1	0.506
dkurs	ALL	1.3669	3	0.713
dnilaieskpor_no~s	dpe	5.3648	1	0.021
dnilaieskpor_no~s	dinflasi	.25335	1	0.615
dnilaieskpor_no~s	dkurs	1.3864	1	0.239
dnilaieskpor_no~s	ALL	6.182	3	0.103

From the results of the Granger causality test above, it can be seen that the variable that has a relationship is the non-oil and gas export variable with economic growth with a probability value of 0.021 <0.05, which means there is a one-way relationship. For other variables, because the probability value is >0.05, it can be concluded there is no reciprocal relationship between the variables or a one-way relationship. This is in accordance with research (Tubagus et al., 2023) that non-oil and gas exports have a positive effect on economic growth. If non-oil and gas exports increase, economic growth will also increase, conversely, if non-oil and gas exports decrease, economic growth will also decrease. Research (Pridayanti, 2021) also supports the results of this research that exports have a positive and significant influence on economic growth. Exports, which are divided between oil and gas and non-oil and gas exports, play a role in increasing economic growth in Indonesia.

V. CONCLUSION

In this research, the results obtained show that there is a relationship between the variables inflation, exchange rate, non-oil and gas exports and economic growth. The one-way relationship between variables is obtained from the results of the Granger causality test between non-oil and gas exports and economic growth. For other variables there is no reciprocal relationship. From the results of the short-term VECM test, economic growth has a significant influence on inflation, this is due to the increase in economic growth last year which will reduce inflation this year. Meanwhile, in the long term, inflation has a significant negative influence on economic growth, causing economic growth to decline due to inflation. Apart from that, the exchange rate in the long term also does not have a significant effect on economic growth. so that if the exchange rate strengthens it will not have an impact on economic growth. The non-oil and gas export variable also contributed slightly to economic growth with insignificant positive results. Even though the amount is small, if it continues to be increased it will contribute to the Indonesian economy and can become an economic activity with maximum results. Thus, in this case the Indonesian government can start preparing policies related to improving the economy which can take reference from research results.

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