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VECM MODEL IN MEASURING THE IMPACT OF MONETARY POLICY INTERVENTION ON ECONOMIC GROWTH IN INDONESIA FROM 2009 TO 2022

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Keywords
Exchange Rate, Inflation, Interest Rate, Money Supply, Vector Error Correction Model (VECM)

ABSTRACT
This research was conducted to determine the short-term and long-term effects of inflation, exchange rates, interest rates, and the money supply on economic growth in Indonesia from 2009 to 2022 using the Vector Error Correction Model (VECM) method. The VECM method is used to analyze the interaction between these variables over different time horizons, offering valuable insights into their respective roles in influencing economic growth. The results show that in the short run, the exchange rate variable does not have a significant effect on the economic growth, while in the long run the interest rate variable has a positive impact on the economy with a negative coefficient value. The short run variable interest rates do not have significant effects on the growth of the economy, but in the longer run interest rates have an important effect on growth. In conclusion, the effect of exchange rates on the Indonesian economy is still a controversial research topic. The findings enhance the current literature on macroeconomic policy and provide a foundation for policymakers to design more effective economic strategies, especially in addressing the challenges posed by inflation and exchange rate volatility in both the short and long terms.

INTRODUCTION

Between 2009 and 2022, Indonesia's economic growth fluctuated significantly, with a notable decline in 2020 due to the COVID-19 pandemic. The first quarter of 2019 saw a slight growth of 5.07%, but by the second quarter of 2020, economic growth plunged to -5.32%. This downturn was attributed to the negative impact of the pandemic on all components of GDP. However, the government, in collaboration with Bank Indonesia, implemented accommodative policies and relaxed monetary strategies to stimulate economic recovery, which led to growth in 2021, reaching 7.07%. During this period, inflation levels fluctuated as well, peaking at 8.60% in 2013 before decreasing, with inflation hitting a low point during the pandemic, despite stagnant economic growth. This period also saw the Rupiah fluctuate significantly against the US dollar, experiencing appreciation in 2010 and sharp depreciation in 2013 and 2020 due to global economic pressures and the pandemic. Similarly, Bank Indonesia responded to economic challenges by continuously adjusting interest rates, reducing them from 6.58% in 2009 to 3.50% in 2021 (Nuraeni & Ismiyatun, 2021).

The data from 2009-2022 highlights the complex interaction between inflation, exchange rates, interest rates, and economic growth in Indonesia. While inflation remained low during the COVID-19 crisis, it failed to stimulate economic growth, indicating the need for government intervention. The exchange rate faced significant pressure due to global economic shifts, particularly during the pandemic, while the interest rate was adjusted to ensure economic stability (Chang et al., 2023; Delardas et al., 2022; McKibbin & Vines, 2020; Song & Zhou, 2020; Wullweber, 2020). These macroeconomic factors

played crucial roles in shaping Indonesia's economic landscape, with significant policy responses from the government and Bank Indonesia. As the country faced both internal and external challenges, the fluctuating economic indicators highlight the importance of adaptive policies to manage inflation, stabilize the Rupiah, and ensure sustainable economic growth in the face of global uncertainties.

The money supply in the first quarter of 2010 amounted to Rp 493,087 which decreased compared to the fourth quarter of 2009 amounted to Rp 549,404 the decrease was caused by the aftermath of religious holidays and long holidays at the end of the year so that people kept their money in banks. However, in the second quarter of 2010 it increased by Rp 533,052 and continued to increase in the fourth quarter of 2010. The decrease in money supply again occurred in the first quarter of 2013 to Rp 794,821 from previously in the fourth quarter of 2012 amounted to Rp 806,035. Entering early 2015, along with the end of the holiday season, the money supply decreased by Rp 934,502. The movement of the money supply in 2019 was not much different in 2018 and in the midst of the Covid-19 pandemic, the money supply remained under control which can be seen in the first quarter of 2020 of Rp 1,546,191 which previously in the fourth quarter of 2019 was Rp 1,540,882. The increase in the money supply is expected by the government so that people spend more money so that economic turnover occurs.

This research was conducted to determine the short-term and long-term effects of inflation, exchange rates, interest rates, and the money supply on economic growth In Indonesia in 2009-2022 using the VECM method. The research contributes to the understanding of the dynamic relationship between macroeconomic variables and economic growth in Indonesia, specifically by examining the short-term and long-term effects of inflation, exchange rates, interest rates, and money supply on economic growth from 2009 to 2022. By employing the Vector Error Correction Model (VECM) method, the study provides a robust analysis of how these variables interact over different time horizons, offering valuable insights into their respective roles in influencing economic growth. The findings enhance the current literature on macroeconomic policy and provide a foundation for policymakers to design more effective economic strategies, especially in addressing the challenges posed by inflation, exchange rate volatility, and interest rate fluctuations in both the short and long terms. Furthermore, the study's use of the VECM method contributes a quantitative approach to understanding the econometric relationships between these key variables, expanding the scope of empirical research on the Indonesian economy.

The hypotheses used were:

1) H0: It is suspected that inflation, exchange rates, interest rates, and money supply have a significant effect on economic growth in Indonesia
2) H1: It is suspected that inflation, exchange rates, interest rates, and money supply do not have a significant effect on economic growth in Indonesia

METHODS

The data used in this study is secondary data. In this study, secondary data obtained came from Bank Indonesia's monthly report, BPS annual report, other data sourced from literature study references through journals, papers, artiket, or other materials from supporting websites. The data used in this study is in the form of quarterly time series data from January 2009 – December 2022.

Based on the research objectives that have been described, the data analysis technique used in the study is the Vector Error Correction Model (VECM). The analysis model serves to understand the relationship between the short and long term. The short-term dynamic relationship of a variable is influenced by a deviation from the long-term equilibrium called the Error Correction Term (ECT) in the form of the equation:

$ECT = Y1t - \beta 0 - \beta 1Y2t - \cdots - \beta lYlt.$

While the general form of VECM used referring to research conducted by Sadeghi and Alevi (2011) is:

$$\Delta Yt = \beta 1 \Delta Yt\text{-}1 + \ldots + \beta p\text{-}1 \ \Delta Yt\text{-}p+1 + \Pi Yt\text{-}p + Ut$$

$$\Pi = \alpha\beta'$$

From the general model of VECM used, it can be described as follows:

$$\Delta PDBt = \beta 1 \Delta PDBt\text{-}1 + [\alpha 11 \ \alpha 12][\beta 11 \ \beta 12]PDBt\text{-}1 + U1t$$

$$\Delta INFt = \beta 1 \Delta INFt\text{-}1 + [\alpha 21 \ \alpha 22][\beta 21 \ \beta 22]INFt\text{-}1 + U2t$$

$$\Delta KURSt = \beta 1 \Delta KURSt\text{-}1 + [\alpha 31 \ \alpha 32][\beta 31 \ \beta 32]KURSt\text{-}1 + U3t$$

$$\Delta SBt = \beta 1 \Delta SBt\text{-}1 + [\alpha 41 \ \alpha 42][\beta 41 \ \beta 42]SBt\text{-}1 + U4t$$

ΔJUBt = β1ΔJUBt-1 + [α51 α52][β51 β52]JUBt-1 + U5t

According to Basuki & Prawoto (2016), the VECM analysis model goes through several stages, including:

1) Stationarity Test: Data stationarity tests can be performed using the Phillips Perron method. This test is carried out to see whether or not there are unit roots in the data used. If there is no unit, the data can be said to be stationary, while if there is a root unit the data is said to be nonstationary. Stationary tests are performed on each variable of the data. A variable is said to be stationary if the Prob value < α 0.05.
2) Determination of Lag Length: VAR model estimation starts with finding the right lag length. Determination of optimal lag length is very important in VAR modeling. If the optimal lag entered is too short, it is feared that it cannot explain the dynamics of the model thoroughly. However, an optimal lag that is too long will result in inefficient estimation due to reduced degrees of freedom (Winarto et al., 2021). Some criteria in determining optimal lag include sequential modified Likelihood Ratio test statistics (LR), Final Prediction Error (FPE), Akaike Information Criterion (AIC), Schwarz Information Criterion (SC), and Hannan-Quinn Information Criterion (HQ). The optimal lag selection can be seen from the largest LR value, or at the smallest AIC, SC, FPE, and HQ values.
3) VAR Stability Test: Before conducting further analysis, the VAR satibility test needs to be tested first. If the VAR estimation results are unstable, then Impulse Response Function and Variance Decomposition become unstable.
4) Integration Test: The cointegration test is carried out to determine whether there is a balance in the long run, namely there is a similarity in movement and stability of the relationship between variables in the study. One of the cointegration tests carried out is the Johansen Cointegration Test. If the data is cointegrated, the data will be analyzed using the Vector Error Correction Model (VECM), while if there is no cointegrity, the data is analyzed using Vector Autoregression (VAR).
5) VECM estimation: VECM is a form of VAR that is restricted because the form of data is not stationary but there is cointegration in it. VECM is often referred to as VAR for nonstationary series that have a form of cointegration. VECM restricts the long-term relationships of endogenous variables from converging into their cointegration relationships, while allowing short-term dynamic existence.
6) Impulse Response Function (IRF) Analysis: The function of IRF analysis is to explain the impact of shock on one variable on another variable, in this analysis not only in the short term but can be analyzed as long-term information (Basuki & Prawoto, 2016).
7) Variance Decomposition (VD) Analysis: VD analysis is used to see how changes in a variable are indicated by changes in error variance influenced by other variables. With this method, it can be seen the strength and advantages of each variable in influencing other variables over a long period of time (Basuki & Prawoto, 2016).

RESULTS

Stationarity Test

The first step taken in estimating a time-series data model is to test whether the data is stationary or not. The data is said to be stationary if the prob value < 0.05. If the data is not stationary at the level level, a stationary test will be carried out at the level of 1st difference. The stationarity test used in this study uses the Phillips Platform test with the following results:

Table 1. Stationer Phillip Platform Test Results At Level Level

Variable	Prob	Information
ON	0.0410	Stations
INF	0.0354	Stations
Exchange rate	0.9396	No Stationer
SB	0.2278	No Stationer
JUB	1.0000	No Stationer

Source: Eviews (processed data)

Based on table 1 above, the stationarity test at the level level there are two variables whose probability value is less than 0.05, namely the variables Economic Growth and Inflation. However, for the variables Exchange Rate, Interest Rate, and Money Supply are not stationary because the probability value is more than 0.05. So it is necessary to do a stationary test at the level of 1st difference to find out whether the data of all stationer variables or not. Here are the results of the stationary test at the 1st difference level:

Table 2. Phillips Perron Stationer Test Results Level 1st Difference

Variable	Prob	Information
ON	0.0000	Stations
INF	0.0000	Stations
Exchange rate	0.0002	Stations
SB	0.0279	Stations
JUB	0.0000	Stations

Source : Eviews (data processed)

It can be seen from table 2 above, the results of the stationarity test at the level of 1st *difference* can be concluded all variables namely Economic Growth, Inflation, Exchange Rate, Interest Rate, and Money Supply are declared stationary because the probability value is < 0.05. So that research can be continued at the next stage, namely the Optimal Lag Test stage.

Determination of Lag Climbing

Determination of Optimal Lag is important in VAR modeling. If the optimal lag entered is too short, it is feared that it will not be able to explain the dynamics of the model as a whole. However, if the lag is too long, it will result in inefficient estimation due to reduced degrees of freedom (Winarto et al., 2021). The results of determining the optimal lag can be seen as follows.

Table 3. Results of Optimum Lag Determination

Was	LogL	LR	FPE	AIC	SC	HQ
0	-1448.495	ON	1.31e+18	55.90366	56.09128	55.97559
1	-1164.607	502.2636	6.23e+13	45.94643	47.07214*	46.37800*
2	-1138.926	40.49683	6.23e+13	45.92024	47.98405	46.71146
3	-1119.748	26.55490	8.37e+13	46.14414	49.14605	47.29500
4	-1072.746	56.04081*	4.13e+13*	45.29791*	49.23792	46.80842

Source : Eviews (data processed)

The results of determining the optimum lag from table 4.3 above can be seen that according to the criteria of optimum lag length (LR, FPE, AIC, SC, and HQ) there are most asterisks located in lag 4. Thus, it can be concluded that lag 4 is set as the optimum lag and can be used in all subsequent stages of analysis.

Stability Test

Before entering the further stages of analysis, it is necessary to conduct a stability test first. If the stability test is unstable, the IRF and VD analysis becomes invalid. The stability test is said to be stable if the modulus value is < 1. Here are the results of the VAR stability test in this study.

Table 4. Stability Test Results

Root	Modulus
1.057693	1.057693
-1.035030	1.035030
0.745632 - 0.518324i	0.908090
0.745632 + 0.518324i	0.908090
0.218614 + 0.861411i	0.888719
0.218614 - 0.861411i	0.888719
0.868893	0.868893
0.803495 - 0.217899i	0.832517

0.803495 + 0.217899i	0.832517
-0.544651 + 0.568287i	0.787144
-0.544651 - 0.568287i	0.787144
0.679828 - 0.359398i	0.768982
0.679828 + 0.359398i	0.768982
-0.034814 - 0.664231i	0.665142
-0.034814 + 0.664231i	0.665142
-0.472139 - 0.253192i	0.535744
-0.472139 + 0.253192i	0.535744
0.348087 + 0.399938i	0.530202
0.348087 - 0.399938i	0.530202
0.023804	0.023804

Source : Eviews (data processed)

Based on the results of the stability test above, it can be seen that there are sixteen complex roots and two other real roots with a modulus of < 1. However, in the other two real roots there are two moduluses whose values > 1, where the condition of stability is the value of modulus < 1. However, it does not allow the data to be transformed that the root is equal to one or not outside the unit circle, so VECM is considered to reach the stability requirement to be continued in IRF and VD analysis.

Cointegration Test

A cointegration test is performed to see if there is a long-term equilibrium. The criteria for the cointegration test is that if the trace statistic value is greater than the critical value, there is a cointegration which means that VAR cannot continue, but must use the VECM model (Winarto, 2021). Here are the results of the cointegration test.

Table 5. Cointegration Test Results

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistics	0.05Critical Value	Prob.**
None*	0.691676	114.3953	60.06141	0.0000
At most 1 *	0.445864	54.38855	40.17493	0.0011
At most 2 *	0.259886	24.28095	24.27596	0.0499
At most 3	0.111457	8.932468	12.32090	0.1730
At most 4	0.055381	2.905662	4.129906	0.1044

Table 5 above shows that the trace statistic value is greater than the critical value with a significant level of 5% or a probability value of < 0.05. A larger trace statistic value can be seen from the acentric sign (*). Where the trace statistic value of 114.3953 is greater than the critical value of 60.06161 with a significant level of > 0.05. Similarly, the value of 54.38855 > 40.17493 with a significant level of > 0.05. So in this study there is cointegration or has a long-term balance relationship, so that then this study uses Vector Error Correction Model (VECM) analysis.

VECM estimation

The Vector Error Correction Model (VECM) estimation is used to look at long-term and short-term analyses of each variable. The results of the VECM estimation can be seen in the table below.

Table 6. Short-Term VECM Estimation Results

Variable	Coefficient	t statistic	t table	Information
ECT	0.080948	1.05840	1.968	Insignificant
D(INF(-1))	0.079786	0.21979		Insignificant
D(EXCHANGE RATE(-1))	-0.001207	-1.23091		Insignificant
D(SB(-1))	0.642668	0.58260		Insignificant
D(JUB(-1))	1.33E-05	1.08877		Insignificant

Source : Eviews (data processed)

Based on table 6 above, the Error Correction Term (ECT) value is 0.080948, which is not significant, which can be seen from the statistical t value of 1.05840 is smaller than the t table value of 1.968. Due to the insignificance of the ECT value in the VECM model, in the short term there is no relationship between inflation, exchange rate, interest rate, and money supply variables to economic growth in Indonesia in 2009-2022. Therefore, in the short run there is no adjustment process that occurs in economic growth if there is a change in its independent variables, namely inflation, exchange rates, interest rates, and money supply.

Short-Term Analysis of Inflation on Economic Growth

Based on table 6, it is known that in the short run the inflation variable does not have a significant effect on economic growth. Because, the statistical t value of the inflation variable is smaller than the value of the t table (0.21 < 1.96). Based on the hypothesis contained in this study, H0 is rejected and H1 is accepted. This means that in the short run inflation does not have a significant effect on economic growth. Based on the data used, in 2009 inflation declined sharply but economic growth in that year slowed. Similarly, in 2011-2012 even though inflation was relatively low, economic growth continued to slow. When Covid-19 hit, inflation in Indonesia remained stable but economic growth declined. This research is not in line with research conducted by Chindengwike (2023) which says in the short term inflation affects economic growth, but this research is in line with research conducted by Sari & Baskara (2018) where in the short term inflation does not have a significant effect on economic growth.

Inflation is an important economic indicator, and its growth rate is always kept low and stable to avoid causing macroeconomic problems. Inflation has a significant impact on achieving several macroeconomic policy goals, such as economic growth, employment opportunities, income distribution, and balance of payments (Ahiadorme, 2022; Girdzijauskas et al., 2022). In the short term, rising inflation indicates economic growth, but in the long term, high inflation can have negative effects. Therefore, it can be inferred that in the short term, inflation can have a positive impact on economic growth, but in the long term, it can have negative effects. Policymakers need to keep inflation low and stable to avoid macroeconomic problems and promote sustainable economic growth.

Short-term analysis of exchange rates on economic growth

In the exchange rate variable, in the short run it does not have a significant effect on economic growth which can be seen from the statistical t value smaller than the table t value (-1.23 < 1.96). In 2011-2012 economic growth in the world experienced a slowdown, so that although the exchange rate strengthened, Indonesia's economic growth was still slow. The global economic recovery process still presents risk factors, raising concerns about the future outlook. Similarly, in 2018-2019 the exchange rate appreciated but economic growth declined. Entering 2020, the Rupiah exchange rate continued to strengthen on the back of Indonesia's improving balance of payments performance, but due to the outbreak of Covid-19 cases, Indonesia's economic growth showed weakening. Based on the hypothesis in the study, H0 is rejected and H1 is accepted. This research is in line with research conducted by Zuhroh (2022) in the short term, the exchange rate does not have a significant effect on economic growth.

The relationship between exchange rates and economic growth is complex and can be influenced by various factors. Here are some key points from the search results:

1) In the short term, a depreciating exchange rate can have a positive impact on economic growth, while an appreciating exchange rate can have a negative impact
2) In the long term, a stable exchange rate is generally considered to be more conducive to economic growth than a volatile exchange rate
3) The exchange rate can affect various aspects of the economy, such as inflation, trade, and investment
4) Inflation and economic growth can also have an impact on the exchange rate.

Overall, it can be concluded that the relationship between exchange rates and economic growth is complex and multifaceted. While a depreciating exchange rate can have a positive impact on economic growth in the short term, a stable exchange rate is generally considered to be more conducive to long-term economic growth. Policymakers need to carefully consider various factors when formulating exchange rate policies to promote sustainable economic growth.

Short-Term Analysis of Interest Rates on Economic Growth

Based on table 6, variable interest rates in the short run do not have a significant effect on economic growth. Where the statistical t value contained in the interest rate variable is smaller than the table t value (0.58 < 1.96). Based on the hypothesis in the study, H0 is rejected and H1 is accepted. Interest rates are often neither as expected nor relatively slow as banks consider liquidity and risk. The assumption is that financial stability is not achieved due to low demand for credit and ultimately does not have a significant impact on economic growth. This research is supported by research conducted by Zuhroh (2022) where in the short term interest rates do not have a significant effect on economic growth. Short-term interest rates can have an impact on economic growth. According to a study on the impact of short-term and long-term changes in interest rates and the Rupiah exchange rate on stock prices in Indonesia, high domestic interest rates and positive economic growth have attracted short-term foreign capital inflows. However, a short-term analysis shows that monetary policy actions do not have a direct effect on savings interest rates and credit interest rates.

Retail bank interest rates are less responsive to changes in interest rates, and the effect of monetary policy on the economy is smaller because changes in benchmark interest rates have reduced the sensitivity of interest rates. In a study on the long-term and short-term analysis of macroeconomic variables in stabilizing inflation in Indonesia, it was found that interest rates have a positive effect on inflation pressure in the short term (Silasa, 2016). Another study on the effect of capital expenditure, credit distribution, and interest rates on economic growth in North Sulawesi Province found that the short-term interest rate did not have a significant effect on economic growth. Therefore, the impact of short-term interest rates on economic growth may vary depending on the specific economic conditions and the time frame being analyzed.

Short-term analysis of the money supply on economic growth

The variable money supply in the short run has no significant effect on economic growth with a statistical t value smaller than the table t value (1.08 < 1.96) thus H0 is rejected and H1 is accepted. Although the money supply continues to increase every year, economic growth does not increase significantly because based on the data used, when the money supply increases, interest rates increase, so people tend to keep their money in banks and reduce the desire to consume. This causes the money supply does not have a significant effect on economic growth. The results of this study are supported by research conducted by Zuhroh (2022) which says that in the short term the money supply does not have a significant effect on economic growth.

The analysis of the short-term money supply on economic growth in Indonesia is discussed in several studies. In a short-term and long-term analysis of macroeconomic variables in stabilizing inflation in Indonesia, it was found that the money supply has a positive effect on inflation pressure in the long term. In contrast, a study on the effect of the money supply and population on economic growth in Indonesia found that in both short-term and long-term analyses, the money supply has a negative and significant effect on economic growth. Therefore, the impact of the money supply on economic growth may vary depending on the specific economic conditions and the time frame being analyzed. It is important to consider other factors that may affect economic growth, such as inflation, interest rates, investment, and exchange rates

Table 7. Long-Term VECM Estimation Results

Variable	Coefficient	t statistics	t table	Information
INF(-1)	0.716198	0.75467	1.968	Insignificant
EXCHANGE RATE(-1)	0.003611	4.27770		Significant
SB(-1)	-4.287250	-3.80900		Significant
JUB(-1)	-3.51E-05	-4.93783		Significant

Source : Eviews (data processed

Long-Term Analysis of Inflation on Economic Growth

The inflation variable in the long run does not have a significant effect on economic growth, judging from the statistical t value which is smaller than the t table value (0.75 < 1.96) thus H0 is rejected and H1 is accepted. However, there has been no research in line with the results of this study. In the long run, inflation does not have a significant effect on economic growth because when inflation decreases, economic growth in Indonesia does not experience a significant increase and even tends to

remain. In addition, when Covid-19 hit, inflation remained stable but economic growth declined dramatically.

Inflation can have a significant impact on long-term economic growth. A study on the impact of inflation on economic growth in Indonesia found that inflation has a positive effect on economic growth in the short term, but in the long term, it has a negative effect on economic growth. Another study found that high rates of inflation above 10% have deleterious effects on long-term economic growth. Inflation can also lead to banking sector losses, prompting banks to reduce lending and investment, which can depress GDP in the short term.

In addition, long-lasting episodes of high inflation are often the result of lax monetary policy, which can lead to a decrease in the purchasing power of the currency and a rise in prices.Therefore, the relationship between inflation and economic growth is complex and depends on various factors, such as the level of inflation, the time frame being analyzed, and the specific economic conditions. While some inflation can be beneficial for economic growth in the short term, high and persistent inflation can have negative effects on both short-term and long-term economic growth. It is important to maintain a balance between inflation and economic growth to ensure sustainable economic development.

Long-Term Analysis of Exchange Rates on Economic Growth

In the long run, exchange rate variables have a significant effect on economic growth with a positive coefficient value. Where the statistical t value is greater than the table t value (4.27 > 1.96). If the exchange rate increased by 1% in the previous year, then economic growth increased by 0.0036%. An appreciating exchange rate causes economic growth to increase, because if the exchange rate strengthens it is seen as a positive perception by investors of the domestic economy. This will encourage foreign capital flows to increase so that there is an increase in economic growth in Indonesia. Thus, in this study H0 was accepted and H1 was rejected. The results of this study are supported by the results of research conducted by Zuhroh (2022) which said that in the long run, the exchange rate has a significant influence on economic growth.

Exchange rates can affect economic growth in the long run. Several studies in Indonesia show that exchange rates have an influence on economic growth. One study shows that when the Rupiah depreciates (the dollar appreciates), economic growth declines. Other studies have shown that the Rupiah exchange rate has a negative and significant influence on foreign direct investment in Indonesia (Putri et al., 2021).

In addition, unstable exchange rates can cause uncertainty and undermine investor confidence, which can hinder investment and long-term economic growth. However, other studies have shown that low exchange rates can boost exports and economic growth. In conclusion, the effect of exchange rates on economic growth in Indonesia is still a controversial research topic. Some studies show that exchange rates have a negative influence on economic growth, while other studies show that low exchange rates can promote economic growth. Therefore, further research is needed to understand the effect of exchange rates on economic growth in Indonesia.

Long-Term Analysis of Interest Rates on Economic Growth

In the long run variable interest rates have a significant effect on economic growth with a negative coefficient, then according to the hypothesis in this study H0 is accepted and H1 is rejected. These results can be seen from the value of t statistics that are greater than t table (-3.80 > 1.96). That is, if in the previous year interest rates increased by 1%, then economic growth will decrease by -4.28%. This is because if there is an increase in interest rates, it will shift people's interest from consumption to saving. As a result, people's purchasing power decreases and results in a decrease in economic growth. This research is in line with research conducted by Srithilat & Sun (2017) which says that in the long run interest rates have a significant effect on economic growth in Laos.

Interest rates can affect economic growth in the long run in Indonesia. From the results of the analysis, it can be concluded that interest rates have a significant influence on economic growth in Indonesia in the long run. High interest rates can reduce economic growth, while low interest rates can boost economic growth. Therefore, the government and Bank Indonesia need to take action to keep interest rates low and stable in order to support sustainable economic growth.

Long-Term Analysis of the Money Supply on Economic Growth

The variable money supply in the long run has a negative coefficient value and has a significant effect on economic growth which can be seen from the statistical t value which is greater than the t table value (-4.93 > 1.96). So in this study H0 was accepted and H1 was rejected. If the money supply in the previous year increased by 1%, then economic growth decreased by -3.51%. If the money supply continues to increase in the long run, it can decrease economic growth because it causes high inflation. The results of this study are in line with research conducted by Zuhroh (2022) which said that in the long run the money supply has a significant effect on economic growth. Similarly, research conducted by Srithilat & Sun (2017), in the long run the money supply has a significant effect on the money supply in Laos.

The money supply can affect economic growth in the long run in Indonesia. Several studies show that the money supply has a positive influence on economic growth in Indonesia. However, other studies have shown that the effect of the money supply on economic growth in Indonesia is still a controversial research topic. Research that shows a positive influence between the money supply and economic growth shows that the more the money supply increases, the more Indonesia's economic growth will increase. However, studies that show different results show that the effect of the money supply on economic growth in Indonesia still needs further investigation. In conclusion, the effect of the money supply on economic growth in Indonesia is still a controversial research topic. Some studies show that the money supply has a positive influence on economic growth in Indonesia, while other studies show different results. Therefore, further research is needed to understand the effect of money supply on economic growth in Indonesia.

Impulse Response Function (IRF) Analysis

IRF analysis is used to explain the impact of shocks on one variable on another. IRF analysis also serves to see how long the influence lasts. In IRF analysis there are two axes, namely the horizontal axis which is the period in years, and the vertical axis shows the response value in percentage. Here is an image from the IRF analysis.

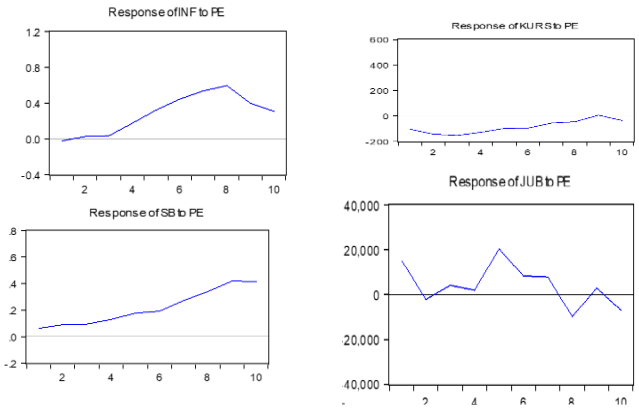

Figure 1. Impulse Response Function Analysis
Source : Eviews (data processed)

The response shown by each variable to economic growth shocks shows different variations. Figure one shows the reaction shown by inflation when economic growth experiences a *shock*. At the beginning of the period, inflation showed a low shock with a positive response. Entering the fourth period, the shocks shown began to increase until the eighth period. In the ninth period, inflationary shocks to economic growth began to decline until the tenth period. However, until the end of the period has not reached a balanced state.

On the other hand, the exchange rate shows a negative reaction. The exchange rate responds to shocks that occur in economic growth from the beginning of the period to the ninth period with negative response movements. Although in the ninth period it reached an equilibrium point, in the tenth period the value decreased with a negative response.

The response shown by interest rates when economic growth experiences shocks can be seen in figure three. Where, from the beginning to the end of the period shows a positive response that continues to increase in each period and has not reached a balance point. While the response shown by

the money supply to shocks that occur in economic growth which can be seen in figure four, shows an unstable response. At the beginning of the period it shows a decreased response until it crosses the horizontal line, but increases in the third period. However, in the seventh period showed a negative response until the eighth period and until the end of the period had not reached an equilibrium point.

Analysis of Variance Decomposition (VD)

Variance Decomposition (VD) analysis aims to see the magnitude of the contribution of the influence of each variable. Here is an image from the VD analysis.

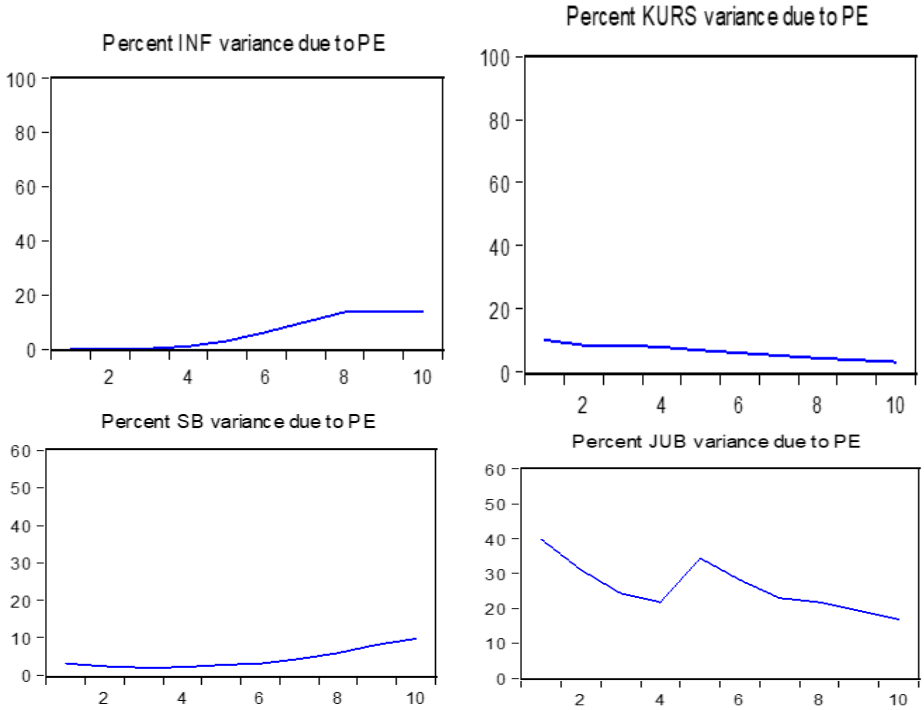

Figure 2. Analysis of Variance Decomposition
Source : Eviews (data processed)

Based on figure 2 above, it can be explained that of the four variables that contribute to economic growth, the inflation variable and the interest rate variable is more capable in explaining when compared to the exchange rate variable and the money supply variable. This can be seen from figure one, where inflation at the beginning of the period has increased economic growth even though in the eighth to the end period it has not increased or stabilized. While in the third picture, namely interest rates, although at the beginning of the period the influence was not too large, but in the seventh period to the final period continued to increase.

CONCLUSION

The research findings concluded that inflation does not significantly impact economic growth in both the short and long term. While the exchange rate has no short-term effect, it positively influences economic growth in the long term. Similarly, interest rates do not significantly affect economic growth in the short term, but they have a negative impact in the long term. The money supply does not significantly affect economic growth in the short term, but in the long term, it exerts a negative effect. Future research could explore additional variables such as government fiscal policies, labor market dynamics, and technological innovation, and conduct comparative studies across different regions to assess varying macroeconomic influences. Further investigation into the transmission mechanisms of these variables, industry-specific impacts, time lags, and nonlinear effects could deepen the understanding of their long-term effects on economic growth.

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