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The Influence of Money Supply (M2), Interest Rates (r), and Inflation (I) on Indonesia's Economic Growth: A Study During the COVID-19 Pandemic Period (2020–2022)

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ABSTRACT

This study aims to determine the partial and simultaneous or partial influence of the amount of money in circulation (JUB), interest rates (r) and inflation (I) on Indonesia's economic growth : a study on SARS, Bird Flu (H5N1) and Covid-19 Period 20 1 0-2022 and analyze the policies set by Bank Indonesia when SARS, Bird Flu (H5N1) and Covid-19 occurred . This type of research uses quantitative descriptive research, namely research that provides an overview of the influence of the amount of money in circulation (JUB), interest rates (r) and inflation (I) on Indonesia's economic growth: a study on SARS, Bird Flu (H5N1) and Covid-19 Period 2010-2022 This research was conducted in Indonesia because it is a country that is directly affected by the SARS, Bird Flu and Covid-19 viruses which have an impact on economic development in the last ten years. The research process includes several stages, namely, the preparation of research proposals which are divided into compiling research proposals, implementing research which is divided into the interview process, as well as analysis, data processing, and writing research reports. In this study, the objects of research are the amount of money in circulation, interest rates and inflation as independent variables and economic growth as the dependent variable . The results of this study show that the variables of Money Supply, Interest Rates, and Inflation have a significant effect on economic growth. The results of this analysis indicate that BI's monetary policy, especially in managing the amount of money in circulation and interest rates, plays an important role in maintaining economic stability and encouraging economic growth during the Covid-19 pandemic period 2020-2022.

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Indonesian Economic Growth,
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Introduction

Economic growth refers to an increase in national income accompanied by a rise in per capita income over a specific period of time. According to Kuznets (1955), economic growth is defined as a long-term increase in a country's ability to provide a wider variety of economic goods to its population. This ability grows in line with technological advances and the necessary institutional and ideological adjustments. Sukirno (2015) explains that the term economic growth is used to describe or measure the performance of economic development. In economic activity, economic growth signifies the development of fiscal production of goods and services within a country, such as increased production in the services sector and capital goods. However, using various types of production data may not clearly reflect the achieved economic growth.

To measure a country's economic stability, one approach involves using macroeconomic indicators. Changes in macroeconomic indices affect economic growth and can potentially lead to inflationary pressures. The classical school of economics asserts that there is a correlation between the money supply and prices: if the quantity of goods remains constant while the money supply doubles, then prices will also double. When inflation rises significantly, the Central Bank typically increases interest rates to curb inflation. Higher interest rates raise borrowing costs, discouraging loans and reducing the money supply (Sukirno, 2015). Inflation may be driven by various factors, including an excessive money supply (M2), rising wages, energy crises, budget deficits, and economic growth.

One of the main causes of inflation is the amount of money in circulation. The money supply consists of all physical currency and demand deposits circulating in the economy and used by the public for transactions. Controlling the money supply is not easy, as public demand for money can change rapidly. Consequently, the amount of money in circulation may exceed necessary levels if public demand increases, or fall short if demand decreases (Budi, 2020). The money supply is crucial as it acts as a driver of economic activity. A high money supply may lead to high inflation, which can destabilize the economy. Therefore, the money supply must be kept stable. Bank Indonesia is responsible for controlling the money supply, as it significantly affects other macroeconomic variables.

The emergence of flu-like viruses has hindered economic activities, especially affecting the livestock trade, as a large portion of Indonesia's population works in livestock farming. The spread of avian influenza disrupted economic activity among poultry farmers. Indonesia's tropical climate offers a comparative advantage in livestock farming, potentially

opening export opportunities. However, avian flu poses a 100% fatality risk in infected livestock, halting production.

During the pandemic, the money supply and inflation became major factors influencing Indonesia's economic growth. The rapid spread of COVID-19 in Indonesia significantly affected both public health and the national economy. The continued surge in COVID-19 cases sparked panic among the public, government, and business sectors (Haryanto, 2020). The pandemic disrupted global economies, including Indonesia's, leading to numerous economic challenges. Since the onset of the pandemic, Indonesia's inflation rate declined monthly, reaching a low of 1.68% in October 2020. Other Asian countries were also affected: Malaysia contracted by 17.1% (yoy), the Philippines by 16.5% (yoy), Thailand by 12.2%, and Indonesia by 5.3% (yoy) (Putra, 2020).

The drop in inflation in Indonesia was mainly due to weakened consumer purchasing power. The virus's high transmission rate prompted the government to implement strict measures, such as large-scale social restrictions (PSBB), requiring remote work (WFH), online schooling, and limited public interaction. Inflation can recover if people resume normal daily activities, which would boost purchasing power. In 2020, inflation hit a low of 1.68%, with inflation recorded in 9 months and deflation in 3 months—July, August, and September. These deflationary months coincided with heightened social restrictions, slowing the economy. July and August typically see high inflation due to education and recreational needs but instead saw deflation. Some families may have postponed education due to dissatisfaction with online learning. Additionally, recreation, sports, and cultural sectors—normally major contributors to inflation—experienced a downturn due to restrictions. Recreation centers closed, sports events were suspended, and cultural parades were canceled (Bank Indonesia, 2020).

To contain COVID-19, the Indonesian government closed schools, implemented work-from-home policies, suspended public transport, and enforced lockdown measures. These restrictions slowed the economy and disrupted the financial market (Haryanto, 2020). The pandemic affected not only Indonesia but economies worldwide. The Finance Minister noted that the global economy declined due to lockdowns and mobility restrictions, resulting in economic recessions and weakened international trade (www.kemenkeu.go.id). During the pandemic, the government sought to stabilize the financial system by encouraging the performance of the real sector through monetary policy and financial institutions. In Indonesia's financial system, banks play a key role in maintaining financial stability. Bank Indonesia issued policies aimed at stabilizing the money market and financial system to promote economic recovery (Novalina, Rusiadi, & Nasution, 2020). The Central

Statistics Agency (BPS) stated that Indonesia's 2020 inflation rate was the lowest on record. In 2021, inflation remained low at 1.87%, driven by weak domestic demand due to the pandemic and mobility restrictions imposed to curb virus transmission (www.bi.go.id).

At the end of 2019, Indonesia—along with the rest of the world—faced a new viral outbreak: the novel coronavirus (COVID-19). The virus entered Indonesia in March 2020, disrupting nearly every aspect of life, especially the already vulnerable regional economies. COVID-19 spreads via respiratory droplets from coughing or sneezing. Instead of a strict lockdown, Indonesia opted for social restrictions due to the large number of citizens relying on daily wages. Lockdowns would have prevented many people from earning a living. Social restrictions included working, studying, and worshiping from home. The pandemic caused financial market turmoil, leading to severe investor losses. Exchange rates, which represent the relative value between currencies, were also affected. A stronger currency boosts investor interest in domestic stocks, increasing demand and driving up prices (Nopirin, 2013).

Between March 2 and September 30, 2020, the rupiah depreciated against the US dollar from 2.75% to 4.57%. Before the dollar strengthened due to COVID-19, the rupiah traded between IDR 13,572 and 14,347 from January to February. It then weakened from mid-March to the end of May, reaching IDR 14,000–16,600 per USD. The rupiah later rebounded from early June to late September, trading between IDR 13,870 and 14,900. To address this volatility and safeguard the economy, the government and the central bank implemented various policy measures aimed at sustaining Indonesia's economic growth.

This study aims to examine both the simultaneous and partial effects of money supply (M2), interest rate (r), and inflation (I) on Indonesia’s economic growth: a study on the SARS, Avian Influenza (H5N1), and COVID-19 outbreaks during the period of 2010–2022, as well as the policies enacted by Bank Indonesia in response to each outbreak.

Literatures Review

Money Supply

Money is a medium of exchange with a specific unit of account that serves as a legal means of payment in various transactions and is valid within a particular territory. The money supply is the product of base money and the money multiplier. The amount of money circulating in society can be illustrated as a market process. The money supply is also closely related to deposit interest rates; the greater the money supply in circulation, the more attractive investment becomes compared to saving in deposit accounts.

The definition of money supply is divided into two categories:

Narrow money (M1): The amount of money circulating, which consists of currency, demand deposits, and savings deposits;

Broad money (M2): Broad money includes narrow money (M1) plus savings, time deposits in rupiah, demand deposits and foreign currencies, as well as securities issued by the monetary system held by the private sector.

Money Supply and Inflation

The money supply refers to the total currency issued by the central bank, including coins and paper money, savings, and foreign currency accounts owned by the domestic private sector (Ningsih and Kristiyanti, 2018). The inflation rate is explained by the quantity theory, which states that inflation occurs when there is an excessive amount of money circulating, necessitating control measures due to its impact on other macroeconomic indicators. Ningsih and Kristiyanti (2018) conducted an analysis showing that the money supply has a significantly negative effect on inflation in Indonesia. However, these findings are not supported by the study of Muhson (2015), which indicates that the money supply does not have a significant influence on inflation in Indonesia.

Interest Rate

According to Sunariyah (2004), the interest rate is the price of borrowing money. Interest is a measure of the cost of resources used by the debtor, which must be paid to the creditor (Permatasari, 2015). The interest rate is one of the most closely monitored variables in the economy due to its broad impact. It directly affects daily life and plays a significant role in determining the overall health of the economy (Fahrika, 2016).

Interest rates are a key component in determining the cost of capital in both the money market and the capital market. Moreover, interest rates are part of the resource allocation mechanism within the economy. Therefore, interest rates significantly influence the volume of money in circulation. When interest rates are low, the money supply tends to increase because the cost of capital decreases, encouraging people to borrow money for either consumption or investment purposes. Conversely, when interest rates are high, the money supply tends to decrease because the policy of raising interest rates usually reflects an unstable economic condition, such as rising inflation. Such situations carry higher risk, causing investors to delay investments and prefer to save instead (Fahrika, 2016).

Inflation

Inflation refers to a condition in which the prices of goods increase due to various factors that subsequently drive up the prices of other goods. Inflation is positively correlated with the exchange rate of the rupiah. When inflation rises sharply, currency

depreciation may be necessary to counteract it. In certain cases, if the exchange rate appreciates, the prices of imported goods become cheaper, thus increasing public purchasing power.

According to Susmiati, Rediatni, and Senimantara (2021), while such a situation may lead to higher economic growth, it can also contribute to rising inflation, prompting the government to implement relevant policies. Inflation is a process rather than a static condition of high or low prices. In other words, high prices do not necessarily indicate inflation. Inflation is considered to occur when the increase in prices happens continuously and is mutually reinforcing. The term inflation is also used to describe an increase in the money supply, which is sometimes seen as the cause of rising prices (Halim, 2018). Inflation can therefore be defined as a condition characterized by a general and sustained increase in prices over time

Exchange Rate Concept

The exchange rate is the relative value of one currency compared to another in a currency exchange transaction involving two different currencies. Such transactions generate demand and supply for specific currencies. In this exchange between two types of currencies, a comparison of value or price between the two currencies occurs—this comparison is referred to as the exchange rate (Nopirin, 2012). The role of the exchange rate is particularly important in international transactions, especially in export and import activities, as it determines the relative price of currencies between different countries.

Methods

This research employs a quantitative descriptive approach, utilizing quantitative research methods in which the data analysis involves numerical or statistical data. The data used in this study are secondary data obtained from Statistics Indonesia (BPS), the Indonesian Economic and Financial Statistics (SEKI) published by Bank Indonesia, and other relevant literature.

The study uses three independent variables: Money Supply (X1), Interest Rate (X2), and Inflation (X3), with the dependent variable being Economic Growth (Y). The method of data analysis applied in this research is multiple regression analysis using the ARCH/GARCH model, along with hypothesis testing, both partial (t-test) and simultaneous (F-test).

The method used to achieve the research objectives is outlined as follows:

Basic Model of the Study:

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + e$$

Reformulated Model:

$$Y = \alpha + \beta_1 JUB + \beta_2 IR + \beta_3 Inf + e$$

Description of Variables:

Y = Economic Growth (dependent variable)

X_1 (JUB) = Money Supply

X_2 (IR) = Interest Rate

X_3 (Inf) = Inflation

α = Constant

$\beta_1 - \beta_3$ = Coefficients of the independent variables

e = Error term (residual value)

Thus, the final model used in this research is formulated as:

$$\text{Economic Growth} = \alpha + \beta_1(JUB_t) + \beta_2(i_t) + \beta_3(\text{Inflation}_t) + e$$

Results

A country's economic progress can be observed through its economic growth, which is marked by an increase in the production of goods and services, as well as the overall welfare of its population. Economic growth serves as an important benchmark in evaluating the success of a nation's economic development.

One of the ways to stimulate economic growth in a region is by increasing national income. Fundamentally, economic growth is a continuous process of increasing real GDP or real per capita income.

The following presents data on the development of Indonesia's economic growth based on GDP growth at constant prices.

Table 1: Economic Growth in Indonesia for the Period 2010–2022

Year	Economic Growth (%)
2010	6.22
2011	6.17
2012	6.03
2013	5.56
2014	5.01
2015	4.88
2016	5.03
2017	5.07
2018	5.17
2019	5.02

2020	2.97
2021	3.69
2022	5.31

Source: Statistics Indonesia (BPS), 2024

Table 1 presents data on Indonesia's economic growth from 2010 to 2022. In general, Indonesia's economic growth experienced fluctuations, showing a downward trend from 2010 to 2015, followed by an upward trend until 2019.

In 2020, there was a significant decline in economic growth to 2.97 percent due to the COVID-19 pandemic. After 2020, Indonesia's economic growth returned to a positive trend. These data indicate that Indonesia managed to recover from the impacts of the COVID-19 pandemic.

Unit Root Test

This test aims to observe the coefficients in the autoregressive model. If the estimated value is equal to 1, the data is said to be stationary; otherwise, it is not. The unit root test in this study uses the Augmented Dickey-Fuller (ADF) method. The test is first conducted at the level form. If the probability (p-value) of the alpha is below 0.05, the data is considered stationary. Conversely, if the value is above 0.05, the testing continues at the first difference level, and if necessary, proceeds to the second difference level. The testing stops once the p-value falls below 0.05.

This test is applied to all four variables: Money Supply (M2), Interest Rate, Inflation, and Economic Growth in Indonesia. Table 2 presents the results of the unit root test.

Table 2: Results of Unit Root Test

Variabel	**ADF**	
	t-Statistic	**Prob.**
Money Supply	-3.447137	0.0352
Interest Rate	-3.366865	0.0397
Inflasi	-4.163907	0.0121
Pertumbuhan Ekonomi	-3.990760	0.0157

Source: 2024

Table 2 presents the results of the unit root test for four variables: Money Supply, Interest Rate, Inflation, and Economic Growth. The test uses the Augmented Dickey-Fuller (ADF) method to determine whether the time series data are stationary or not. Stationary data are those with a constant mean and variance over time. Non-stationary data can lead to spurious regression results in econometric analysis.

In Table 2, the ADF t-statistic values and their corresponding probability values (Prob.) are presented for each variable. The probability value indicates the likelihood of obtaining the observed ADF t-statistic under the null hypothesis (that the data are non-stationary). If the probability value is less than the chosen significance level (typically 0.05), the null hypothesis is rejected and the data are considered stationary.

Based on the results in the table, all variables have probability values below 0.05, indicating that all variables are stationary at the 5 percent significance level. This means the data for all variables have been transformed into stationary form by taking the first difference of the original data. Therefore, the data can be used for further analysis without being affected by the presence of a unit root.

Granger Causality Test

To determine whether there is a causal relationship between two variables, the Granger Causality method is used. This method tests whether past information of one variable can be used to predict the future value of another variable. If the prediction is accurate, a causal relationship is assumed to exist. Therefore, the number of lag periods analyzed should be sufficiently long.

Table 3: Granger Causality Test

Null Hypothesis:	Obs	F-Statistic	Prob.
Interest Rate does not Granger Cause Money Supply	11	0.21138	0.8152
Money Supply does not Granger Cause Interest Rate		3.22245	0.1121
Inflasi does not Granger Cause Money Supply	11	0.14851	0.8651
Money Supply does not Granger Cause Inflasi		5.21732	0.0487
Inflasi does not Granger Cause Interest Rate	10	13.5567	0.0299
Interest Rate does not Granger Cause Inflasi		2.82773	0.2080
Economic Growthdoes not Granger Cause Money Supply	11	4.41533	0.0662
Money Supply does not Granger Cause Pertumbuhan Ekonomi		4.38296	0.0671
Economic Growthdoes not Granger Cause Interest Rate	11	0.57597	0.5904
Interest Rate does not Granger Cause Pertumbuhan Ekonomi		0.04391	0.9573
Economic Growthdoes not Granger Cause Inflasi	10	5.56126	0.0963
Inflasi does not Granger Cause Pertumbuhan Ekonomi		0.09442	0.9581

Source: Data processed by the researcher, 2024.

The results of the Granger causality test in the table above indicate the following:

1) There is no causal relationship between the interest rate and the money supply. This is indicated by a probability value of 0.8152 > 0.05 (alpha); similarly, there is no causal relationship from the money supply to the interest rate, as shown by the probability value of 0.1121 > 0.05 (alpha).

2) There is no causal relationship from inflation to the money supply, as indicated by the probability value of 0.8651 > 0.05 (alpha). However, there is a causal relationship from the money supply to inflation, as indicated by the probability value of 0.0487 < 0.05 (alpha).

3) There is a causal relationship from inflation to the interest rate, as shown by a probability value of 0.0299 < 0.05 (alpha). On the other hand, there is no causal relationship from the interest rate to inflation, with a probability value of 0.2080 > 0.05 (alpha).

4) There is no causal relationship between economic growth and the money supply, as shown by the probability value of 0.0662 > 0.05 (alpha); likewise, there is no causal relationship from the money supply to economic growth, with a probability value of 0.0671 > 0.05 (alpha).

5) There is no causal relationship between economic growth and the interest rate, as indicated by the probability value of 0.5904 > 0.05 (alpha); similarly, the interest rate does not Granger-cause economic growth, with a probability value of 0.9573 > 0.05 (alpha).

6) There is no causal relationship between economic growth and inflation, as indicated by a probability value of 0.0963 > 0.05 (alpha); likewise, there is no causal relationship from inflation to economic growth, with a probability value of 0.9581 > 0.05 (alpha).

Johansen Cointegration Test

The Johansen cointegration test is a statistical method used to determine whether there is a long-term relationship between two or more time series variables. This study employs the Johansen Cointegration Test to assess such relationships. The results of the test are presented in the following table:

Table 4: Johansen Cointegration Test

Hypothesized No. of CE(s)	Trace Statistic	0.05 Critical Value	MES	0.05 Critical Value
None *	52.07516	47.85613	25.99549	27.58434
At most 1	26.07967	29.79707	19.79148	21.13162
At most 2	6.288196	15.49471	6.078666	14.26460
At most 3	0.209530	3.841466	0.209530	3.841466

Source: Data processed by the researcher, 2024.

In conducting the cointegration test using the Johansen method, two approaches can be applied: the trace statistic and the maximum eigenvalue statistic (MSE). Table 4 shows that, based on the trace statistic approach, there is evidence of one cointegrating relationship at the 0.05 significance level. This is indicated by the trace statistic value under the "None" hypothesis, which is 52.07516—greater than the critical value of 47.85613 at the 5% level of significance. This result suggests that the variables in the study—money supply (X1), interest rate (X2), inflation (X3), and economic growth (Y)—are cointegrated, implying a long-term equilibrium relationship among them.

However, the results based on the maximum eigenvalue statistic (MSE) approach indicate that no cointegrating relationship exists among the variables at the 0.05 significance level. This is evidenced by the fact that the MSE values at all four levels are lower than their corresponding critical values.

ARCH/GARCH Analysis

ARIMA Analysis

ARIMA (Autoregressive Integrated Moving Average) is a statistical model used to analyze and forecast time series data. This model combines three components: AR (Autoregressive), which takes into account past values of the data; I (Integrated), which involves differencing the data to achieve stationarity; and MA (Moving Average), which incorporates past forecast errors into the model. By combining these three components, ARIMA can model various time series data patterns and produce accurate forecasts.

Table 5: ARIMA Test Results

Model ARIMA	Error			Adjusted R-Squared
	AIC	SC	HC	
(0,1,1)	2.627862	2.749089	2.582979	0.262470
(1,1,0)	2.918461	3.039688	2.873579	-0.221159
(1,1,1)	2.785643	2.947278	2.725799	0.161632

Source: Data processed by the researcher, 2024.

Table 5 presents the results of the ARIMA test using three different models: (0,1,1), (1,1,0), and (1,1,1). The criteria used to evaluate the best model include adjusted R-squared, AIC, SC, and HC. Adjusted R-squared measures how well the model explains the variation in the data, with higher values indicating a better model. AIC (Akaike Information Criterion), SC (Schwarz Criterion), and HC (Hannan-Quinn Criterion) evaluate the trade-off between goodness of fit and model complexity. Models with lower AIC, SC, and HC values are generally preferred.

Based on the table, the ARIMA (0,1,1) model has the highest adjusted R-squared value (0.262470) and the lowest AIC, SC, and HC values. This indicates that ARIMA (0,1,1) is the best model among the three tested models.

The ARIMA (0,1,1) model is then selected for further analysis using the ARCH/GARCH test. The ARCH/GARCH test is employed to detect and model heteroskedasticity, which refers to non-constant variance in the model residuals. Since the ARIMA (0,1,1) model includes an MA(1) component, GARCH models such as GARCH(1,0) and GARCH(1,1) are used. This test helps determine whether there are ARCH/GARCH effects in the data and whether a GARCH model is needed to improve forecasting accuracy. Overall, the ARIMA and ARCH/GARCH analyses aim to build an accurate model for forecasting time series data and understanding the presence of heteroskedasticity in the dataset.

ARCH/GARCH

The ARCH/GARCH models are used to model time series data with time-varying volatility. The ARCH (Autoregressive Conditional Heteroskedasticity) model was first introduced by Engle in 1982 and later developed into the GARCH (Generalized Autoregressive Conditional Heteroskedasticity) model by Bollerslev in 1986. These models assume that the variance of the current error term depends on the variances of previous error terms.

Table 6: Estimation Results of GARCH(1,0), GARCH(1,1), E-GARCH(1,0), and E-GARCH(1,1)

Variabel	GARCH (1,0)		GARCH(1,1)		E-GARCH (1,0)		E-GARCH (1,1)	
	Coef	Prob	Coef	Prob	Coef	Prob	Coef	Prob
C	0.268540	0.6936	-2.098380	0.4795	-1.983992	0.0000	-1.889946	0.0000
Money Supply	-8.00E-08	0.0031	2.59E-07	0.2570	2.41E-07	0.0004	2.30E-07	0.0000
Interest Rate	0.044077	0.6720	0.110333	0.8468	0.087129	0.0007	0.086581	0.3724

Inflasi	-0.092957	0.0000	0.039107	0.8708	0.020398	0.4772	0.011584	0.8881
MA(1)	-0.381788	0.0205	-0.142652	0.8956	-0.220501	0.1180	-0.223227	0.4912
Variance Equation								
C								
Money Supply	(-)	Signifikan	(+)	Tidak Sig.	(+)	Signifikan	(+)	Signifikan
Interest Rate	(+)	Tidak Sig.	(+)	Tidak Sig.	(+)	Signifikan	(+)	Tidak Sig.
Inflasi	(-)	Signifikan	(+)	Tidak Sig.	(+)	Tidak Sig.	(+)	Tidak Sig.
MA(1)	(-)	Signifikan	(-)	Tidak Sig.	(-)	Tidak Sig.	(-)	Tidak Sig.
C	-2.60E-06	0.9996	0.257248	0.8948				
RESID(-1)^2	11.89302	0.4041	-0.115677	0.8952				
GARCH(-1)			0.575325	0.8728				
C(6)					0.239824	0.8584	0.695571	0.7042
C(7)					-3.575654	0.0080	-3.414971	0.0036
C(8)					2.428692	0.0175	1.392605	0.2623
C(9)							0.070624	0.9521
Adjusted R-Squared	-0.954394		-0.400653		-0.325767		-0.328535	
Akaike info criterion	1.624860		2.811736		2.151254		2.228885	
Schwarz criterion	1.907722		3.135007		2.474525		2.592565	
Hannan-Quinn criter.	1.520134		2.692050		2.031568		2.094237	

Source: Data processed by the researcher, 2024.

Table 6 presents the estimation results for the GARCH(1,0), GARCH(1,1), E-GARCH(1,0), and E-GARCH(1,1) models. The GARCH(1,0) model has the largest number of statistically significant variables compared to the other models. Furthermore, the AIC, SC, and HQ values for the GARCH(1,0) model are also lower than those of the other models. Therefore, it can be concluded that the GARCH(1,0) model is the best model for modeling the time series data in this study.

Based on the estimation results in Table 6, the GARCH(1,0) model was selected as

the most appropriate model. This model was then further estimated to derive the equation for the GARCH(1,0) model. The equation indicates that the inflation variable and the MA(1) component significantly influence economic growth. In addition, the conditional variance equation for the GARCH(1,0) model shows that the current error variance is influenced by the past error variance.

Table 7: Estimation Results of the GARCH(1,0) Model

Variabel	**Coeficient**	**z-Statistic**	**Prob.**
C	0.268540	0.394029	0.6936
Money Supply	-8.00E-08	-2.960327	0.0031
Interest Rate	0.044077	0.423403	0.6720
Inflasi	-0.092957	-4.862250	0.0000
MA(1)	-0.381788	-2.317197	0.0205
Adjusted R-Squared	-0.954394		

The GARCH(1,0) model is a GARCH model with an order of (1,0), which means that the variance of the current error depends on the variance of the error from the previous period and the current error variance. This model is used to model time series data with volatility that changes over time.

Table 7 presents the estimation results of the GARCH(1,0) model. The GARCH(1,0) equation can be formulated as shown in Table 8. This equation illustrates the relationship between the variables—namely money supply, interest rate, and inflation—and economic growth. The GARCH(1,0) equation is as follows:

Table 8: GARCH(1,0) Equation

$$\text{Pertumbuhan Ekonomi} = 0.268540 - 0.00000008\ \text{Money Supply} + 0.044077\ \text{Interest Rate} - 0.092957\ \text{Inflasi} - 0.381788\ \text{MA}(1) + e$$

(0.394029) (-2.960327)*** (0.423403) (-4.862250)*** (-2.317197)**

Description:
(***) : significant at α=1 %
(**) : significant at α=5 %
(*) : significant at α=10 %

Source: Data processed by the researcher, 2025.

Table 8 presents the GARCH(1,0) equation derived from the estimation results shown in Table 7. This equation demonstrates that the variables Money Supply, Interest Rate, and Inflation have a significant effect on economic growth. The conditional variance equation for the GARCH(1,0) model is presented as follows.

Table 9: Conditional Variance Equation of the GARCH(1,0) Model

$\ln \sigma^2 = \mathrm{C} + \mathrm{RESID}(-1)^2\ \sigma_{t-1}^2$ $\ln \sigma^2 = -0{,}0000026 + 11.89302\ \sigma_{t-1}^2$ (0.9996) (0.4041)
Description: (***) : significant at α=1 % (**) : significant at α=5 % (*) : significant at α=10 %

Source: Data processed by the researcher, 2025.

Table 9 presents the conditional variance equation for the GARCH(1,0) model. The conditional variance equation illustrates the relationship between the variance of the current period's error term and the variance of the previous period's error term. This equation indicates that the variance of the error term in the current period is influenced by the variance of the error term in the previous period. Table 9 also shows that RESID(-1)^2 and the error terms of the independent variables do not have a significant effect on economic growth in the model.

Data Analysis

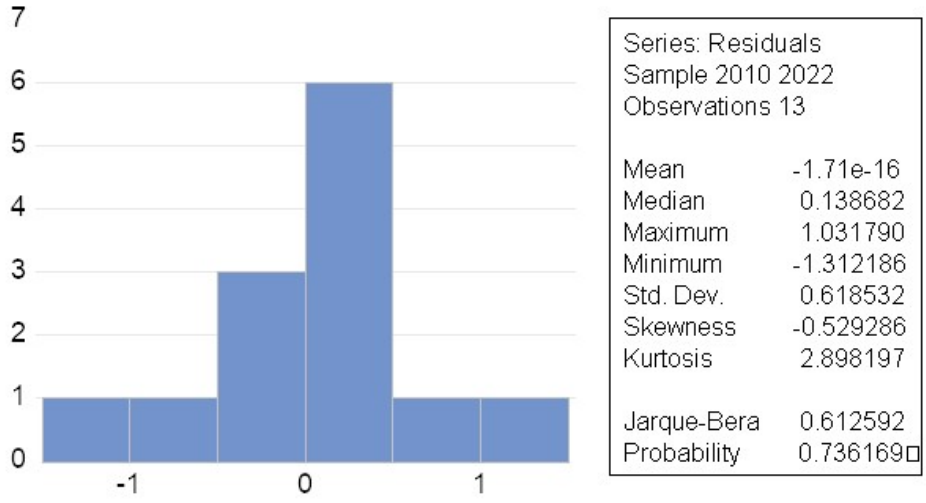
Classical Assumption Tests
Normality Test

In regression analysis, the normality test is conducted to ensure that the dependent and independent variables have a normal or approximately normal data distribution. This can be observed by examining the data spread on the Normal P-P Plot graph. If the data points follow a diagonal line pattern on the graph, it can be concluded that the data is normally distributed.

Imam Ghozali explains that in regression models, the data distribution is considered normal if the plotted points representing the actual data form a pattern that follows the diagonal line on the graph. The classical assumption test for normality was conducted using

EViews 10 software, employing the Jarque-Bera test method. The results can be seen in the following figure

Figure 1.



Source: Data processed by the researcher, 2025.

Figure 1 shows the normality plot. It can be observed that the Jarque-Bera Probability value is 0.736, which is above the 0.05 significance level. Therefore, it can be concluded that the data is normally distributed or passes the normality test.

Multicollinearity Test

The classical assumption test for multicollinearity was conducted using EViews 12 software. The results can be seen in Table 10, as follows.

Table 10: Multicollinearity Test

Variable	Coefficient Variable	Uncentered VIF	Centered VIF
C	2.689	68.530	NA
Money Supply	1.927	14.542	1.601
Interest Rate	0.063	55.153	2.953
Inflasi	0.019	12.030	2.398

Source: Data processed by the researcher, 2025.

Table 10 shows that the Variance Inflation Factor (VIF) values for the independent variables are all below 10.00, indicating that the classical assumption test for multicollinearity is fulfilled, or in other words, the model passes the multicollinearity test.

Heteroscedasticity Test

The heteroscedasticity test is used to examine whether the residual variance in the regression model is consistent or varies across observations. This test ensures whether there is a difference in the variability of prediction errors at each data point.

This study employs the ARCH method, which stands for Autoregressive Conditional Heteroscedasticity. The heteroscedasticity test was conducted using EViews 12 software. The results of the heteroscedasticity test can be seen as follows.

Table 11: Heteroscedasticity Test

F-Statistic	Obs*R-Squared	Probability F(1,10)	Probability Chi-Square(1)
0.346	0.401	0.569	0.526

Source: Data processed by the researcher, 2025.

Table 11 shows that the Probability of Chi-Square (1) value is 0.5263 (>0.05), which indicates that the classical assumption test for heteroscedasticity is fulfilled, or in other words, there is no heteroscedasticity present.

Autocorrelation Test

The autocorrelation test is used to examine whether there is a relationship or correlation among the residual errors in a linear regression model. The method employed to detect autocorrelation is the Breusch-Godfrey test. The autocorrelation test was conducted using EViews 12 software. The results of the autocorrelation test are presented as follows.

Table 12: Autocorrelation Test

F-Statistic	Obs*R-Squared	Probability F(2,7)	Probability Chi-Square(2)
2.713	5.677	0.134	0.058

Source: Data processed by the researcher, 2025.

Based on the Probability Obs Chi-Square (2) value of 0.0585 (>0.05), it can be concluded that the data passes the autocorrelation test, indicating that there is no autocorrelation problem.

Multiple Linear Regression Analysis

The multiple linear regression analysis in this study was conducted using EViews 12

software. This analysis is used to examine the effect of independent variables on the dependent variable, both individually (partial) and simultaneously (joint effect). The partial effect is assessed using the t-statistic or its probability value; if the probability is less than 0.05, the effect is considered statistically significant, otherwise it is not. Similarly, the simultaneous effect is evaluated by observing the joint probability value; if it is less than 0.05, it indicates a significant combined effect of the independent variables (Money Supply, Interest Rate, and Inflation) on the dependent variable, Economic Growth. The regression output from EViews 12 for the multiple linear regression analysis is presented in Table 13 as follows.

Table 13: Multiple Linear Regression Analysis

Variable	Coefficient	Standar Error	T-Statistic	Prob.
C (konstan)	5.828	1.639	3.554	0.006
Money Supply	−0,000000268	0.000000268	-1.933	0.085
Interest Rate	0.0399	0.252	0.154	0.880
Inflasi	0.095	0.141	0.675	0.516

Source: Data processed by the researcher, 2025.

Based on Table 13, the multiple linear regression equation is obtained as follows.

Table 4.17: Multiple Linear Regression Equation

$$Y = 5{,}828196 - 0{,}000000268X_1 + 0{,}039024X_2 + 0{,}095240X_3$$
$$(3.554)***(-1.933)\ (0.154)\ (0.675)$$

Description:
(***) : significant at α =1 %
(**) : significant at α =5 %
(*) : significant at α =10 %

Sumber: Lampiran

The variable of money supply (X_1) against economic growth in Indonesia shows a significance value of 0.0852, which is greater than 0.05. This indicates that the money supply (X_1) is negatively related and does not have a significant effect on economic growth in Indonesia (Y). This means that when the money supply increases, economic growth decreases.

The interest rate variable (X_2) against economic growth in Indonesia shows a significance value of 0.8805, which is greater than 0.05. This means that the interest rate (X_2) is positively related but does not have a significant effect on economic growth in Indonesia (Y). This implies that when the interest rate increases, economic growth also increases.

The inflation variable (X_3) against economic growth in Indonesia shows a significance value of 0.5164, which is greater than 0.05. This means that inflation (X_3) is positively related but does not have a significant effect on economic growth in Indonesia (Y). This implies that when inflation increases, economic growth also increases.

Discussion

Based on the data analysis, the researcher employs the GARCH(1,0) model because it can effectively model time series data with volatility that changes over time. The estimation results of the GARCH(1,0) model yield an equation showing that money supply, interest rate, and inflation significantly affect economic growth. These findings indicate that Bank Indonesia's monetary policies, especially in managing money supply and interest rates, play a crucial role in maintaining economic stability and fostering economic growth during the Covid-19 pandemic.

Bank Indonesia's Policies During the Pandemic

Control of Money Supply

Control of Money Supply (JUB) as a Monetary Policy Instrument by Bank Indonesia (BI) during Pandemics. The control of money supply (JUB) is one of the monetary policy instruments used by Bank Indonesia (BI) to maintain economic stability, especially in facing crises such as the SARS pandemic, Avian Influenza (H5N1), and Covid-19. The money supply includes currency in circulation (cash) and demand deposits circulating within the community, and its proper management can influence inflation rates, interest rates, and economic growth. During the period of 2010-2022, BI faced significant challenges in managing the money supply, particularly during the Covid-19 pandemic, which caused a decline in economic activity and purchasing power.

During the pandemic, BI tended to implement an expansionary monetary policy to stimulate economic growth. However, data analysis indicates that an increase in the money supply actually had a negative impact on economic growth. This suggests that BI needs to be cautious in managing the money supply to avoid triggering inflation, which can hinder economic growth. During the Covid-19 pandemic, BI also took comprehensive monetary policy measures, including strengthening exchange rate policies. Bank Indonesia intervened in the foreign exchange market to maintain the stability of the rupiah exchange rate.

Research by Ningsih and Kristiyanti (2018) found that the money supply has a significant effect on inflation in Indonesia. They discovered that an increase in the money

supply could cause high inflation if not matched by adequate economic growth. This aligns with the findings in this study, where the increase in the money supply negatively affected economic growth, especially during the pandemic. This shows that although BI implemented loose monetary policy to stimulate economic growth, uncontrolled increases in the money supply could trigger inflation and hinder growth.

During the Covid-19 pandemic, BI took comprehensive monetary policy steps, including reinforcing exchange rate policies and intervening in the foreign exchange market to stabilize the rupiah. These policies aimed to prevent depreciation of the rupiah, which could worsen economic conditions. However, data analysis shows that the increase in money supply negatively affected economic growth, indicating that BI must carefully manage the money supply to avoid inflation that could impede economic growth.

According to Prasasti and Slamet (2020), effective monetary policy in managing the money supply can stimulate economic growth by increasing investment and consumption. However, they also emphasize the importance of coordination between monetary and fiscal policies to achieve optimal results. In the context of the pandemic, BI needs to consider more flexible monetary policies, including tighter control of the money supply to prevent uncontrolled inflation.

Furthermore, research by Utami (2019) indicates that the money supply significantly influences economic growth, especially in the long term. Utami recommends that BI consider other factors such as exchange rates and government expenditure when managing the money supply. This is consistent with the findings of this study, where an increase in the money supply negatively impacted economic growth, particularly during the pandemic. Therefore, BI needs to adopt more comprehensive monetary policies, including tighter money supply control, to prevent uncontrolled inflation.

In facing the pandemic, BI also implemented policy more macroprudential loose, including loosen provision ratio *Loan to Value* (LTV) and *Financing to Value* (FTV) for credit property and vehicles motorized. Policy This aiming for push growth credit in the sector property and automotive, which is expected can push growth economy. However, from research data analysis, it can be seen that JUB increase instead impact negative on growth economy. This is show that BI needs consider policy more monetary flexible, including more JUB control strict for prevent inflation that is not under control.

regression results on the GARCH(1,0) model show that money supply influential in a way significant to growth economy. Where, JUB can lower growth economy. The Covid-19 pandemic has caused Lots sector economy experience decline activities, including the disappearance field job losses massive. Like sector tourism, transportation, retail and

manufacturing caught impact significant, so that Lots companies that carry out layoffs or reduce working hours. High unemployment rate reduce Power buy society, which ultimately lower consumption House stairs which are component main in growth economy. In addition, uncertainty economy make business postpone investment, slow down recovery economy. The domino effect of job losses has worsened the economic recession during the pandemic. Bank Indonesia responded crisis with apply policy monetary expansive for push growth economy. BI lowered benchmark interest rate (BI 7-Day Reverse Repo Rate) to its lowest level in history For make it easier access credit for the business world and consumers. In addition, BI is easing policy macroprudential with reduce minimum reserve requirement ratio (GWM) for banks, increasing liquidity in the market. BI also buys state debt securities (SUN) in frame financing recovery economy and government stimulus programs. Policies *quantitative easing* (QE) aiming guard financial market stability and encourage growth through improvement liquidity. Steps This help reduce pressure recession, although challenge recovery still big consequence uncertainty pandemic. Policy This issued for guard money supply in safe level for condition economy at the moment pandemic and not cause crisis.

Decrease in Interest Rates

The reduction of the benchmark interest rate (BI Rate) is one of Bank Indonesia's monetary policy instruments to stimulate economic growth. Lower interest rates can increase investment and consumption, thereby driving economic growth. In the context of the pandemic, lowering interest rates aimed to reduce the interest burden on businesses and the public, thus encouraging economic activities that were previously hindered by the pandemic.

During the Covid-19 pandemic, Bank Indonesia implemented comprehensive monetary policy measures, notably by aggressively lowering the benchmark interest rate. This policy aimed to ease the interest burden on businesses and the public, with the expectation of boosting investment and consumption. Bank Indonesia aggressively cut the benchmark rate from 5.00 percent at the beginning of 2020 to 3.50 percent by the end of 2021. This policy was a response to the weakening economic activity caused by social restrictions and a decline in global demand. The interest rate reduction was expected to stimulate the real sector, especially small and medium enterprises (SMEs), which are the backbone of Indonesia's economy. With lower interest rates, borrowing costs decrease, encouraging investment and consumption.

According to research by Ambarwati, Sara, and Aziz (2021), the reduction in interest

rates has a positive impact on economic growth, particularly in the short term. Their study shows that lower interest rates can increase private investment, which in turn drives economic growth. This aligns with classical economic theory, which states that low interest rates encourage investment and consumption, thereby increasing economic output. However, the study also notes that the effect of lowering interest rates may not always be significant in the long term, especially when faced with high economic uncertainty, such as during the pandemic. Additionally, research by Komalasari, Fatmasari, and Suharto (2024) found that the interest rate cuts during the Covid-19 pandemic positively impacted economic growth, although the effect was less than expected. This was due to other factors such as declining global demand and high market uncertainty. The study also emphasizes the importance of coordination between monetary and fiscal policies to achieve optimal results in stimulating economic growth.

BI implements policy monetary measurable expansion for balancing between stimulation growth economy and control inflation. In addition to lowering interest rates, BI loosens minimum reserve requirement ratio (GWM) for increase liquidity banking, at the same time carry out quantitative easing (QE) with buy government and corporate debt. Policy This help guard financial market stability and encourage recovery economy. However, BI is also alert to risk inflation with strengthen coordination policy together government, including stabilization price food and energy through intervention supply.

Decrease interest rates during the pandemic succeed push growth economy through improvement liquidity and credit, but also creates dilemma when inflation start to rise. BI must ensure that inflation still controlled in the range target (2–4%) so as not to to grind Power buy society and inhibit recovery economy. In 2021, when pressure Global inflation increases, BI maintains low interest rates while strengthen policy macroprudential for prevent economic overheating. By approach this, BI succeeded balancing between support recovery economy and maintain stability price, although challenge from factor external like increase price global commodities and financial market turmoil still become risk.

Inflation Control

Inflation control is one of the main policies of Bank Indonesia (BI) in maintaining economic stability, particularly during pandemic periods such as SARS, Avian Influenza (H5N1), and Covid-19. Controlled inflation is a critical prerequisite for fostering sustainable economic growth. Throughout the 2010–2022 period, BI faced various challenges in managing inflation, particularly during pandemics that affected both market demand and supply. Maintaining inflation within a manageable range is a key component of BI's mandate to ensure price stability, especially to avoid hindering economic growth during crises.

During the SARS pandemic (2002–2003), inflation in Indonesia remained relatively stable, with limited impact on the national economy due to the minimal spread of SARS within the country. However, during the Avian Influenza (H5N1) outbreak in 2005, inflation rose due to decreased production in the livestock and agricultural sectors. In response, BI raised interest rates to curb inflation, although this measure also slowed down economic growth. According to a study by Ningsih and Kristiyanti (2018), the tight monetary policy during the Avian Flu period was effective in stabilizing inflation, but it also led to a decline in consumption and investment. In contrast, during the Covid-19 pandemic (2020–2022), Indonesia experienced a significant drop in inflation, reaching a historic low of 1.68 percent in 2020. This was mainly due to a decline in demand caused by social restrictions and decreased consumer purchasing power. BI responded by easing its monetary policy, including lowering the benchmark interest rate and relaxing the Loan to Value (LTV) ratio to encourage economic recovery. According to Prasasti and Slamet (2020), this accommodative monetary policy succeeded in keeping inflation low, although economic growth remained sluggish due to a global decline in economic activity.

Bank Indonesia also intervened in the foreign exchange market to stabilize the rupiah exchange rate, which indirectly contributed to inflation control. Additionally, BI promoted economic and financial digitalization as part of efforts to support national economic recovery. Research by Novalina, Rusiadi, and Nasution (2020) indicates that monetary policy integrated with government fiscal measures helped establish greater economic stability during the Covid-19 pandemic.

BI also coordinated with the government to control the prices of basic commodities, particularly during the Covid-19 crisis. This policy aimed to prevent price shocks that could trigger inflation. According to Utami (2019), coordination between monetary and fiscal policies is crucial in managing inflation, especially during crises such as pandemics. This aligns with findings by Nahida (2018), which highlight that controlled inflation supports long-term economic growth.

In a broader context, research by El-Khodary (2024) suggests that effective inflation control can drive economic growth, particularly in developing countries like Indonesia. This is also supported by Komalasari, Fatmasari, and Suharto (2024), who state that stable inflation enhances investor confidence and promotes long-term economic growth. Thus, BI's inflation control policies during pandemic periods can be regarded as appropriate measures to maintain Indonesia's economic stability.

During Covid-19 pandemic, inflation and interest rates interest rates play a role role important in influence growth economy. Initially, the pressure inflation tend low

consequence weakening request aggregate along with decline consumption House stairs and investment. However, in the midst of pandemic, disruption chain global supply and increase price commodity especially food and energy trigger volatile inflation, especially in 2021. Meanwhile that, Bank Indonesia (BI) lowered the benchmark interest rate (BI 7-Day Reverse Repo Rate) to its lowest level for push growth economy with make it cheaper cost loan. Policy low interest rates This aiming increase liquidity, encouraging credit banking, and support recovery sector business. However, inflation risks remain as demand begins to recover, while supply remains limited. Inflation and interest rates during the Covid-19 pandemic affect economic growth through demand and supply mechanisms. BI's expansionary policies, including interest rate cuts and liquidity easing, play an important role in driving economic recovery. However, BI must also be vigilant about inflation risks by maintaining macroeconomic stability. Coordination of monetary, fiscal, and sectoral policies is key to ensuring sustainable economic recovery without sacrificing price stability.

Conclusion

Based on results analysis and formulation problem from study This can be withdrawn conclusion as following:

1. simultaneous test on the GARCH (1,0) model show that in a way together Money Supply, Interest Rates and Inflation influential to Economic growth.
2. regression results on the GARCH (1,0) model show that JUB is influential negative and significant to growth economy. The interest rate level is not influential to growth economy and inflation influential negative and significant to growth economy. Inflation and money supply during The Covid-19 pandemic has affected growth economy through mechanism demand and supply. BI's expansionary policy, including decline interest rates and easing liquidity, plays a role important in push recovery economy. However, BI must also alert to risk inflation with maintain stability macroeconomics. Coordination policy monetary, fiscal and sectoral become key for ensure recovery sustainable economy without sacrifice stability price. BI applies policy monetary measurable expansion for balancing between stimulation growth economy and control inflation. In addition to lowering interest rates, BI loosens minimum reserve requirement ratio (GWM) for increase liquidity banking, at the same time do *quantitative easing* (QE) with buy government and corporate debt. Policy This help guard financial market stability and encourage recovery economy. However, BI is also alert to risk inflation with strengthen coordination policy together government, including stabilization price food and energy through intervention supply.

Suggestion

There are several suggestions after the researcher has completed this research, as follows.

1. This study has limitations in terms of data coverage and variables used. Therefore, it is recommended for further research to expand the research period and add other relevant variables, such as exchange rates, government spending, and investment, to obtain a more comprehensive picture of the influence of various factors on economic growth. In addition, it is also necessary to consider the use of more sophisticated econometric models to analyze data and test research hypotheses, so that they can produce more accurate and *robust conclusions*.

2. Further research can also consider analyzing the impact of Bank Indonesia's policies more specifically and in depth, for example by comparing the effectiveness of various types of monetary policies in dealing with the crisis, or by examining the impact of these policies on certain economic sectors. Thus, the results of the study can provide more targeted and useful policy recommendations for decision makers.

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