

ANALYSIS EFFECTS OF INTEREST RATE AND MONEY SUPPLY SHOCKS ON INFLATION IN INDONESIA USING STRUCTURAL VECTOR AUTOREGRESSION (SVAR) MODEL

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ABSTRACT

Inflation is one of the key macroeconomic indicators reflecting a country's economic stability. The effectiveness of these monetary instruments in influencing inflation remains a subject of debate due to the presence of structural and external economic shocks. Therefore, this study aims to examine the dynamic effects of interest rate and money supply shocks on inflation in Indonesia and identify the dominant source of inflation fluctuations. This study employs the Structural Vector Autoregression (SVAR) model using monthly data from May 2016 to March 2026. The variables include the BI Rate as the policy interest rate, broad money (M2) as money supply, and inflation measured by the Consumer Price Index (CPI). The analysis consists of stationarity testing, optimal lag selection, SVAR estimation, Structural Impulse Response Function (SIRF), and Forecast Error Variance Decomposition (FEVD). The estimation results indicate that interest rate shocks significantly reduce money supply, while the direct effects of interest rate and money supply shocks on inflation are not statistically significant. The SIRF analysis shows that the responses of money supply and inflation to monetary policy shocks are temporary and gradually converge to equilibrium. Furthermore, the FEVD results reveal that inflation fluctuations are predominantly explained by inflation's own shocks, whereas the contributions of interest rate and money supply shocks remain relatively small. These findings suggest that inflation dynamics in Indonesia are influenced not only by monetary policy but also by broader structural and external factors.

Keywords: SVAR, Interest Rate, Money Supply, Inflation, Monetary Policy

1. INTRODUCTION

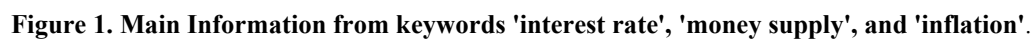
Inflation is one of the most important macroeconomic indicators because it is closely related to the economic stability of a country. High and uncontrolled inflation can reduce public purchasing power, disrupt production activities, and create economic uncertainty. Conversely, stable inflation reflects a healthy economic condition and supports sustainable economic growth. In Indonesia, inflation tends to fluctuate over time due to various factors, both domestic and global. This condition encourages the government and monetary authorities to maintain price stability through appropriate monetary policy.

In the implementation of monetary policy, Bank Indonesia uses interest rates as one of its main tools to control inflation. Changes in interest rates are expected to influence the amount of money in circulation and overall economic activity. When interest rates rise, the public tends to reduce consumption and credit demand, thereby reducing inflationary pressure. Conversely, a decrease in interest rates can increase the money supply and economic activity, which in turn can affect the inflation rate.

In addition to interest rates, money supply is also an important variable in the monetary policy transmission. According to the Quantity Theory of Money, an excessive increase in money supply can cause prices of goods and services to rise. However, the relationship between money supply and inflation is not always linear because it is influenced by economic conditions, public behavior, and the effectiveness of the monetary policy implemented. Therefore, the relationship between interest rates, money supply, and inflation needs to be analyzed more deeply to understand the dynamics of monetary policy in Indonesia.

The phenomenon of high inflation in Indonesia occurred during the 1998 crisis period. Based on data from Trading Economics, the Indonesian economy in 1998 experienced hyperinflation of up to 77.63% and an economic growth contraction of minus 13.3%. Although by 1999, the inflation rate was finally controlled along with the improvement of Indonesia's monetary conditions. Roziah et al. (2023) explained that this could not be separated from the role of Bank Indonesia's policies and the government, as well as being driven by solid policy coordination between the central and regional levels.

Previous studies have reported mixed findings regarding the relationship between interest rates, money supply, and inflation. Some studies find that monetary policy effectively controls inflation, while others suggest that inflation is also influenced by supply-side factors and external shocks. These inconsistent findings indicate that the dynamic relationship between monetary policy instruments and inflation still requires further investigation, particularly in the Indonesian context.



Source: Researcher, processed using Vos Viewer

The bibliometric analysis results for the keywords 'interest rate', 'money supply', and 'inflation' in the Scopus database show connections to other economic topics such as monetary policy, financial market, exchange rate, industrial economics, and banking system. These connections indicate that research on inflation and monetary policy remains an important focus in modern economic studies. Thus, the research topic regarding the relationship between inflation, interest rates, and money supply remains relevant and has significant scientific contribution potential.

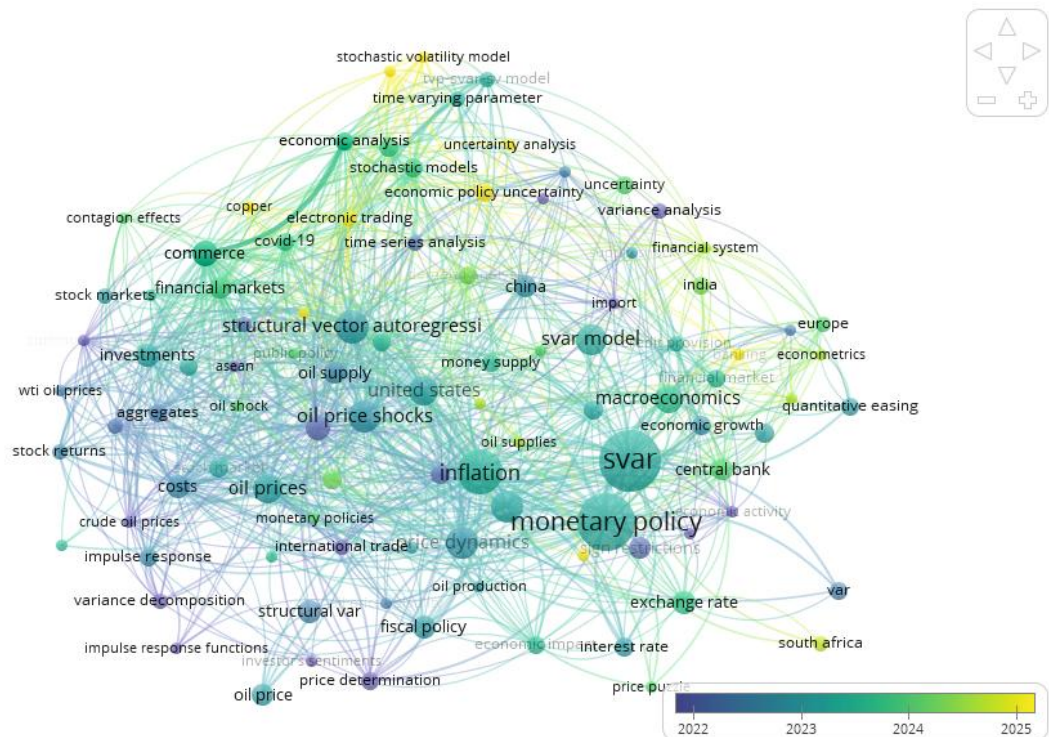


Figure 3. Overlay Visualization Results for keywords 'interest rate', 'money supply', and 'inflation'

Source: Researcher, processed using Vos Viewer

The overlay visualization results for keywords 'interest rate', 'money supply', and 'inflation' in the Scopus database show a moderate trend indicated by the green color. This research topic is also related to other relevant topics in recent years shown in green and blue. This indicates that research related to monetary policy and inflation is still actively being developed in recent years. In addition, this topic is also connected to current global economic issues such as financial stability, liquidity control, and global economic uncertainty. Thus, the research topic on inflation, interest rates, and money supply can still contribute to developing current research trends and benefiting the advancement of economic knowledge.

The urgency of this research is based on the importance of inflation stability as one of the main objectives of macroeconomic policy. Inflation instability can affect economic growth, investment levels, and public welfare. In addition, the effectiveness of monetary policy also needs to be continuously evaluated because the relationship between macroeconomic variables tends to change along with the development of global and domestic economic conditions.

Changes in monetary policy transmission patterns cause inflation responses to interest rate shocks and money supply to not always be the same in each period. Therefore, an analytical method capable of capturing dynamic relationships and structural shocks between economic variables is needed.

The research problems in this study are: (1) how the effect of interest rate shocks on inflation in Indonesia, (2) how do money supply shocks affect inflation?, and (3) which variable is the most dominant in influencing inflation. In line with these research problems, the objectives of this study are to analyze the effect of interest rate shocks on inflation, to analyze the effect of money supply shocks on inflation, and to identify the most dominant variable influencing inflation through the SVAR approach.

Based on the above description, this study aims to analyze the dynamic relationship between interest rates, money supply, and inflation in Indonesia using the Structural Vector Autoregression (SVAR) method. This research is expected to provide an overview of the effect of interest rate shocks on inflation, the response of money supply to monetary policy, and the most dominant variable influencing inflation in the short and long run. This study is expected to provide benefits both academically and practically. Academically, this research can serve as an additional reference in developing studies on monetary policy and macroeconomic analysis using the SVAR method.

2. LITERATURE REVIEW

Huang et al. (2025) in their journal entitled "*Can monetary policy tame asset price fluctuations? Evaluating the dynamic trade-offs*" investigated how monetary policy shocks have a systemic impact on money supply, asset prices, and the real economy. The study produced several findings.

First, contractionary monetary policy by raising interest rates directly reduces money supply, suppresses asset prices, while output adjusts gradually due to lags in production and investment responses. Asset prices respond faster than money supply or the real economy. However, the money supply effect will disappear quickly, while the real economic impact will persist in the medium to long run as seen from impulse analysis.

Second, from a dynamic perspective with time variation, contractionary policy shocks can consistently produce negative responses on money supply, asset prices, and output. In addition, rising interest rates shift the inflation response from initially positive to negative. The time-varying nature of this effect stems from specific market dynamics.

Third, asset price responses show a different pattern. In the period from 2014 to 2019, stock returns increased with rising prices under contractionary shocks. The policy impact caused increased market sensitivity. Conversely, the real estate response remained steady, driven by inelastic housing price expectations rooted in historical trends and policy signals. Therefore, Huang et al. emphasize that broad monetary policy alone is not sufficient to control the real estate sector, but needs to be supported by more specific structural policies.

In addition, the study calculated the sacrifice ratio to measure the efficiency of countercyclical policies. The results show that during asset price escalation periods, the control cost is relatively lower because price stabilization can be achieved with smaller output impacts. These findings suggest that proactive monetary policy intervention when asset price surges occur can help prevent economic overheating and maintain long-term economic stability.

Another study by Moreno Pérez & Minozzo (2026) in a journal entitled "*Monetary policy uncertainty in Mexico: An unsupervised approach*" also provides an overview of how policy shocks can affect macroeconomic and monetary variables in Mexico. The research results show that monetary policy uncertainty impacts on an increase in money supply represented by M3, inflation measured through the consumer price index, and interbank interest rates. In addition, increased uncertainty also causes depreciation of the Mexican peso exchange rate. These findings indicate that monetary policy uncertainty has a significant influence on monetary and price stability in a country.

The study also found that domestic uncertainty shocks have a greater impact than international uncertainty on exchange rates and interest rate policies. In addition, shocks to money supply proved to increase monetary policy uncertainty, while exchange rate appreciation reduces uncertainty. This illustrates the existence of a reciprocal relationship in the monetary policy transmission mechanism towards macroeconomic conditions.

However, this study acknowledges limitations in using the SVAR model, particularly in identifying causal relationships between variables through Cholesky decomposition. According to Lutz Kilian and Helmut Lütkepohl, the approach in this SVAR method often raises interpretation problems because the assumed variable ordering does not necessarily reflect the actual economic relationships. Nevertheless, the SVAR method remains widely used because it can explain the dynamic response of economic variables to a policy shock.

Rizqi and Oktaviarina (2025) investigated the influence of the BI Rate and the US dollar exchange rate on inflation in Indonesia by comparing the forecasting performance of VAR and VECM models using monthly data from January 2009 to December 2024. Their findings indicate that all variables became stationary after first differencing and exhibited at least one cointegrating relationship, suggesting the existence of long-run equilibrium among inflation, interest rates, and exchange rates. The study further demonstrates that the VAR(3) model outperformed the VECM(2) model in forecasting inflation, achieving a lower Mean Absolute Percentage Error (MAPE) of 12.34% compared with 15.30% for the VECM model. These results suggest that the VAR framework provides superior predictive accuracy for Indonesia's inflation under the selected variables and sample period.

Although the study offers valuable evidence regarding the predictive performance of VAR and VECM, its primary objective is forecasting inflation rather than identifying the structural transmission of monetary policy shocks. Moreover, the analysis only considers the BI Rate and the exchange rate as explanatory variables. Therefore, further research employing the Structural Vector Autoregression (SVAR) framework is needed to explicitly identify

structural monetary policy shocks and examine the dynamic responses of inflation to changes in interest rates and money supply. Such an approach provides a deeper understanding of the monetary transmission mechanism and offers stronger policy implications than forecasting-oriented models alone.

2.1 Interest Rate

Interest rate is one of the main instruments in monetary policy used by the central bank to influence the economic conditions of a country. In general, interest rate can be interpreted as the price paid for the use of a sum of money or funds over a certain period. Insani et al. (2023) define monetary policy as a structure that has the authority to set interest rates and regulate the amount of money in circulation in the economy. In this regard, interest rates function as policy signals that can influence the behavior of economic actors, both households, companies, and financial institutions.

In Indonesia, Bank Indonesia uses the BI Rate as the benchmark interest rate set through the Board of Governors Meeting every month. Sari et al. (2024) in their study explain that the BI Rate and BI 7-Day Reverse Repo Rate are the main monetary policy instruments used to control inflation and maintain exchange rate stability in Indonesia. When the central bank raises interest rates, borrowing costs increase which can reduce aggregate money demand and suppress price increases. Conversely, a decrease in interest rates encourages economic growth but risks triggering inflation if it is too low (Fauzi et al., 2023).

In the perspective of monetary policy transmission, interest rates work through several mechanisms. First, through the cost of capital channel, where an increase in interest rates will increase investment costs, thereby reducing credit demand and economic activity. Second, through the expectations channel, where announcements of interest rate changes by the central bank form market participants' expectations about future economic conditions. Third, through the exchange rate channel, where an increase in interest rates can attract capital inflows that ultimately strengthen the domestic currency. Bank Indonesia (2023) noted that the interest rate hike policy in 2022 proved effective in suppressing inflation that had reached 5.51% in the fourth quarter to 2.61% the following year. This demonstrates the effectiveness of interest rate instruments as an inflation control tool.

However, the effectiveness of interest rate policy in controlling inflation is not uniform. Hakiki et al. (2024) argue that the effectiveness of monetary policy in overcoming inflation is highly dependent on existing economic conditions and market characteristics. In addition, there is a time lag between changes in interest rates and their impact on actual inflation in the market. Setyawan and Anwar (2023) research for the period 2015Q1-2022Q4 using VECM found that monetary policy transmission through the exchange rate channel is more effective than the interest rate channel in reducing inflation in Indonesia. These findings indicate the complex relationship between interest rates and inflation that is influenced by many structural factors of the economy.

2.2 Money Supply

Money supply is the total money available and circulating in an economy of a country in a certain period. Money supply includes all payment instruments recognized and usable by the public in economic transactions. Money supply is generally classified into several categories based on their liquidity level, namely M1 which includes currency and demand deposits, and M2 which is an extension of M1 with the addition of savings and time deposits. Amaliyah and Aryanto (2022) define money supply as the amount of money circulating in the economy that directly affects the inflation rate and economic activity in aggregate.

The Quantity Theory of Money proposed by Fisher states that there is a proportional relationship between money supply and the price level in the economy. The theoretical equation is expressed in $MV = PT$, where M is money supply, V is the velocity of money circulation, P is the price level, and T is the volume of transactions. Assuming V and T are constant in the short run, then an increase in M will directly cause an increase in P. Sekarsari et al. (2024) in their analysis of inflation dynamics in Indonesia found that money supply that grows faster than real economic output growth tends to drive price increases of goods and services in the economy.

In the framework of modern monetary policy, controlling money supply is one of Bank Indonesia's initial objectives before achieving the final objective of inflation stability. Al-Syariah (2023) explains that monetary policy conducted by the central bank aims to simultaneously influence money supply and interest rates. An increase in money supply will lower interest rates, which then causes economic expansion and employment opportunities. Conversely, a reduction in money supply through contractionary monetary policy aims to slow economic activity and suppress inflation.

Research by Jawak and Sipayung (2024) shows that money supply has a negative impact on economic growth if not managed well, while Akinbobola (2012) states that money supply has a positive and significant impact on the inflation rate. Empirical data in Indonesia shows that money supply (M2) has always increased year by year in the period 2014 to 2025, yet Indonesia's inflation rate has actually experienced a significant decline. This condition creates a gap between theory and empirical reality, making it interesting to study further.

2.3 Inflation

Inflation is an economic phenomenon characterized by a general and continuous increase in prices of goods and services over a certain period. Inflation is measured using the Consumer Price Index (CPI) which reflects changes in prices of a number of goods and services consumed by households. Nova (2022) explains that inflation is caused by various factors, including an increase in the amount of money circulating in the economy. If the amount of money circulating grows faster than economic output growth, there will be more money competing for the same amount of goods and services, causing prices to rise. This condition shows that inflation is fundamentally a monetary phenomenon.

Inflation can be divided into two main categories, namely demand-pull inflation (demand side) and cost-push inflation (supply side). Demand-pull inflation occurs when aggregate demand in the economy exceeds production capacity, thereby driving price increases. Meanwhile, cost-push inflation occurs due to increases in production costs such as wages and raw material prices, which then make goods or services sold to consumers more expensive. Recent studies suggest that inflation dynamics in Indonesia are strongly influenced by supply-side factors, particularly fluctuations in food and energy prices, indicating that structural characteristics of the economy play an important role in determining inflationary pressures. This indicates that inflation dynamics in Indonesia are closely associated with raw material cost factors and the structural characteristics of the economy.

From the perspective of its impacts, high and uncontrolled inflation provides various negative effects on the economy. Hakiki et al. (2024) explain that good inflation control provides confidence to investors, which then supports economic stability. Conversely, high inflation will erode public purchasing power, distort price signals, hinder long-term investment, and increase economic uncertainty. In addition, inflation also has an impact on fixed-income and low-income groups who tend to bear a heavier inflation burden compared to wealthy groups who have real assets.

2.4 Conceptual Framework

This study adopts the monetary transmission mechanism as the theoretical basis for examining the dynamic relationship between interest rates, money supply, and inflation in Indonesia. Monetary policy implemented by Bank Indonesia through the BI Rate influences liquidity conditions and aggregate demand, which subsequently affect inflation. Changes in the policy interest rate are expected to directly influence money supply through the banking and credit channels, while both variables contribute to inflation dynamics. Based on this theoretical relationship, the interaction among the three endogenous variables is analyzed using the Structural Vector Autoregression (SVAR) model.

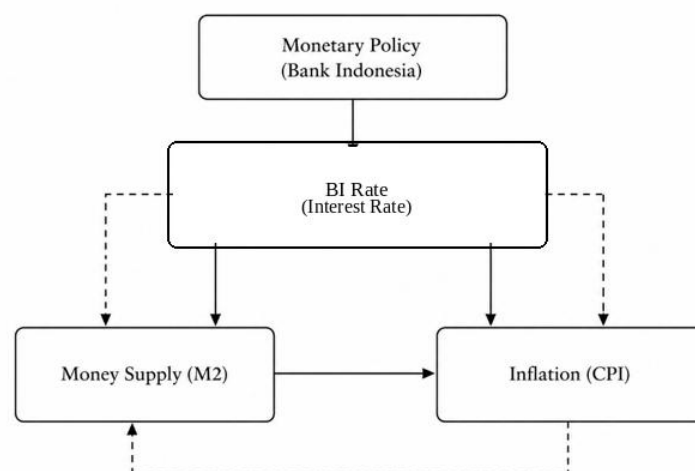


Figure 4. Conceptual Framework

3. METHOD

3.1 Research Approach

This study uses a quantitative approach with the Structural Vector Autoregression (SVAR) method. The SVAR model is a development of the standard Vector Autoregression (VAR) model introduced by Sims (1980), with additional structural restrictions derived from economic theory to identify structural shocks between variables. Kilian and Lütkepohl (2017) define SVAR as an econometric model capable of identifying contemporaneous relationships between variables based on restrictions derived from economic theory and intuition, so that the estimated shocks have clear economic interpretations. Unlike VAR which only describes reduced-form relationships between variables, SVAR explicitly models structural relationships that reflect economic policy transmission mechanisms.

Mathematically, the SVAR model is expressed in the equation: $A_0 Y_t = A_1 Y_{t-1} + A_2 Y_{t-2} + \dots + A_m Y_{t-m} + B \varepsilon_t$, where Y_t is the vector of endogenous variables, A_0 is the contemporaneous restriction matrix, A_1 through A_m are coefficient matrices, B is a diagonal matrix linking structural innovations, and ε_t is a vector of mutually uncorrelated structural shocks. SVAR model identification is done through the application of restrictions on matrix A_0 and/or matrix B . The most commonly used approach is Cholesky decomposition which applies recursive restrictions, where the ordering of variables in the model reflects assumptions about contemporaneous causal relationships between variables (Kilian and Lütkepohl, 2017).

The main advantage of the SVAR method compared to the ordinary VAR model lies in its ability to identify and separate the influence of each structural shock on variables in the system. Through the Impulse Response Function (IRF), SVAR is able to track how a shock to one variable provides a dynamic impact on other variables over a certain time period. Meanwhile, the Forecast Error Variance Decomposition (FEVD) produced by SVAR enables measurement of the relative contribution of each structural shock to the variability of each variable (Anttonen et al., 2024). Research by Kotorri and Zani (2025) confirmed that the SVAR model is effective in identifying the dynamic response of a variable to economic shocks and performing variance decomposition to determine the contribution of each shock to each variable in the system.

3.2 Research Objectives and Variables

This study aims to analyze the dynamic relationship between monetary policy instruments and inflation in Indonesia using the SVAR model. Specifically, the research objectives are: (1) to analyze the effect of interest rate shocks on inflation in Indonesia; (2) to analyze the response of inflation to money supply shocks; and (3) to identify the most dominant variable influencing inflation in both the short and long run. This study is expected to provide a comprehensive empirical overview of the monetary policy transmission mechanism in Indonesia within the ITF framework implemented since 2005.

The variables used in this study consist of three main endogenous variables, namely interest rate, money supply, and inflation. First, interest rate is represented by the BI Rate as Bank Indonesia's official policy interest rate. This variable reflects Bank Indonesia's monetary policy stance and is the main instrument in the ITF framework system. Second, money supply is represented by M2 (broad money) which includes currency, demand deposits, savings, and time deposits in the banking system. M2 was chosen because it reflects total liquidity in the economy and is directly related to public purchasing power and inflationary pressures. Third, inflation is measured using the Consumer Price Index (CPI) in the form of year-on-year (yoy) percentage changes, which is the official indicator of general inflation published by the Central Bureau of Statistics (BPS).

In the SVAR model built, the recursive ordering of variables is determined based on contemporaneous causal assumptions. Interest rate is placed first because it is assumed to be a policy variable determined by Bank Indonesia exogenously in the short run. Money supply is placed second because it responds to interest rate changes contemporaneously but does not affect interest rates in the same period. Inflation is placed last because it is assumed to respond to changes in interest rates and money supply with a certain time lag, reflecting price adjustment lags in the economy. These recursive restrictions are consistent with empirical literature on monetary policy transmission in developing countries (Kilian and Lütkepohl, 2017).

3.3 Research Target and Scope

This study focuses on the Indonesian economy as the unit of analysis. The selection of Indonesia is based on several considerations. First, Indonesia is one of the largest developing countries in Southeast Asia with complex economic characteristics, making studies on the effectiveness of monetary policy highly relevant. Second, Bank Indonesia has implemented the Inflation Targeting Framework (ITF) since 2005 and has undergone various transformations in its monetary policy instruments, including the transition from BI Rate to BI 7-Day Reverse Repo Rate in 2016. Third, Indonesia has experience facing various economic shocks, ranging from the impact of global financial crises, the COVID-19 pandemic, to global geopolitical pressures, which provide rich data variation for analysis.

The observation period of this study covers from May 2016 to March 2026 with monthly data frequency. With a ten-year timespan, the data used covers 119 monthly observations which are sufficient for statistically reliable SVAR model estimation.

3.4 Data Collection

This study uses secondary data sourced from trusted international institutions with comprehensive coverage of Indonesian macroeconomic data. The use of secondary data was chosen because the required data is already available in a structured form and can be accessed publicly through various international economic data platforms. The data used is monthly time series data for each variable in the SVAR model built.

The main data sources in this study are Trading Economics and Federal Reserve Economic Data (FRED) managed by the Federal Reserve Bank of St. Louis. Trading Economics is a global macroeconomic data platform that provides historical data for more than 196 countries, including BI Rate interest rate data, Indonesian CPI inflation, and M2 money supply. Data from Trading Economics comes from official reports of Bank Indonesia, the Central Bureau of Statistics (BPS), and international institutions such as the International Monetary Fund (IMF) and World Bank. Meanwhile, FRED provides systematically verified and curated economic data, including Indonesian macroeconomic data from IMF International Financial Statistics (IFS). The existence of two data sources enables data triangulation to ensure the accuracy and consistency of data used in the research.

3.5 Analysis Tools

SVAR model estimation in this study was performed using Stata version 17. Stata is a statistical and econometric software widely used in quantitative economic research for its ability to handle various types of data and complex analytical methods. In the context of SVAR analysis, Stata provides various commands that enable efficient model estimation and produce comprehensive output.

The analytical stages carried out in Stata include a series of systematic procedures. First, data stationarity tests were conducted using the Augmented Dickey-Fuller (ADF) test and Phillips-Perron (PP) test to ensure that the time series data used are stationary, both at level and after differencing. Data stationarity is an important prerequisite in VAR/SVAR analysis to avoid spurious regression. Second, the optimal lag length was determined using information criteria including Likelihood Ratio (LR), Final Prediction Error (FPE), Akaike Information Criterion (AIC), Schwarz Bayesian Criterion (SBC), and Hannan-Quinn Information Criterion (HQIC) through the varsoc command in Stata.

Third, model diagnostic tests were conducted to check whether all characteristic roots are within the unit circle. Fourth, after the lag length was determined, the VAR model was estimated using the var command in Stata. This VAR model was then used as the basis for SVAR model estimation using the SVAR command which allows users to define structural restriction matrices (matrix A and matrix B). Recursive restrictions based on Cholesky decomposition were implemented by setting appropriate elements in matrix A to zero. Fifth, after the SVAR model was successfully estimated, a series of further analyses were conducted including: (1) Impulse Response Function (IRF) through the irf create and irf graph commands to trace the dynamic response of each variable to a one standard deviation shock from other variables; and (2) Forecast Error Variance Decomposition (FEVD) through the "irf table" command to measure the relative contribution of each structural shock to the variability of each variable across various time horizons.

4. RESULTS AND DISCUSSION

Prior to SVAR estimation, stationarity tests and optimal lag determination were conducted to ensure model validity. The results of these model prerequisite tests will be presented in this discussion, followed by the results of VAR and SVAR estimation.

4.1 Stationarity Test

The stationarity level test was conducted using the unit root test with the ADF (Augmented Dickey Fuller) Test technique. The stationarity of variable data was tested to determine whether the data used are stationary at the level or first difference.

Table 1. Stationarity Test Results

Variable	Level/First Diff	t-Statistic	Probability	Critical Value 5%	Conclusion
Interest Rate	Level	-1.088	0.7198	-2.889	Stationary at First Diff
	First Diff	-6.192	0.0000	-2.889	
Money Supply	Level	0.577	0.9870	-2.889	Stationary at First Diff
	First Diff	-17.079	0.0000	-2.889	
Inflation	Level	-1.946	0.3109	-2.889	Stationary at First Diff
	First Diff	-9.795	0.0000	-2.889	

Based on the ADF Test results, the Interest Rate, Money Supply, and Inflation variables are all non-stationary at the level. The Interest Rate variable has a t-statistic of -1.088 with a probability of 0.7198, and a critical value at the 5% significance level of -2.889. The Money Supply variable has a t-statistic of 0.577 with a probability of 0.9870, and a critical value at the 5% significance level of -2.889. Meanwhile, the Inflation variable has a t-statistic of -1.946 with a probability of 0.3109, and a critical value at the 5% significance level of -2.889. Thus, all three variables have unit roots at the level.

Testing was then conducted at the first difference level, and all three variables Interest Rate, Money Supply, and Inflation are stationary. The Interest Rate variable has a t-statistic of -6.192 with a probability of 0.0000, and a critical value at the 5% significance level of -2.889. The Money Supply variable has a t-statistic of -17.079 with a probability of 0.000, and a critical value at the 5% significance level of -2.889. Meanwhile, the Inflation variable has a t-statistic of -9.795 with a probability of 0.0000, and a critical value at the 5% significance level of -2.889. This shows that at the first difference level, the Interest Rate, Money Supply, and Inflation variables do not contain unit roots and are stationary, so SVAR analysis can be conducted using first differences.

The ADF test results indicate that all variables become stationary after first differencing at the 5% significance level. Therefore, all variables satisfy the stationarity requirement and can be used for subsequent SVAR estimation.

4.2 Optimal Lag Test

Optimal lag determination was conducted to select the number of lag periods most capable of capturing interaction patterns and relationships between variables effectively in the model. Lag length testing uses the criteria of Likelihood Ratio (LR), Final Prediction Error (FPE), Akaike Information Criterion (AIC), Hannan-Quinn Information Criterion (HQIC), and Schwarz Bayesian Information Criterion (SBIC).

Table 2. Optimal Lag Length Test Results

Lag	LogL	LR	FPE	AIC	HQIC	SBIC
0	68.3421	NA*	0.000065	-1.12659	-1.09768	-1.05537
1	102.543	68.402*	0.000042*	-1.56109*	-1.44545*	-1.27623*
2	108.184	11.282	0.000045	-1.50318	-1.30082	-1.05537

Based on Table 2, at lag 0, the LogL value is 68.3421, the FPE value is 0.000065, the AIC value is -1.12659, the HQIC value is -1.09768, and the SBIC value is -1.05537. At lag 1, the LogL value increased to 102.543 and the LR value was 68.402. In addition, lag 1 produced an FPE value of 0.000042, an AIC value of -1.56109, an HQIC value of -1.44545, and an SBIC value of -1.27623. Meanwhile, at lag 2, the LogL value is 108.184 and the LR value is 11.282. The FPE value is 0.000045, while the AIC, HQIC, and SBIC values are -1.50318, -1.30082, and -1.05537 respectively.

The lag determination test results show that the best model is obtained at lag 1 because it received the (*) mark on most information criteria, namely LR, FPE, AIC, HQIC, and SBIC. Therefore, the SVAR model was estimated using one lag to capture the short-run dynamic interactions among the variables while maintaining model parsimony. The selection of lag 1 indicates that the dynamic relationship between interest rate, money supply, and inflation variables can be optimally explained by information from one previous period. In other words, changes occurring in each variable in the current period are more influenced by conditions one period earlier compared to conditions two or three periods earlier.

4.3 Stability Test

The stability test was conducted to ensure that the estimated VAR model meets stability conditions so that Impulse Response Function (IRF) and Forecast Error Variance Decomposition (FEVD) analysis results can be interpreted as valid. A VAR model is declared stable if all characteristic root (eigenvalue) values have a modulus of less than one and are within the unit circle.

Table 3. Stability Test Results

Eigenvalue	Modulus
0.5028618	0.502862
-0.4617743	0.461774
0.0524397	0.05244

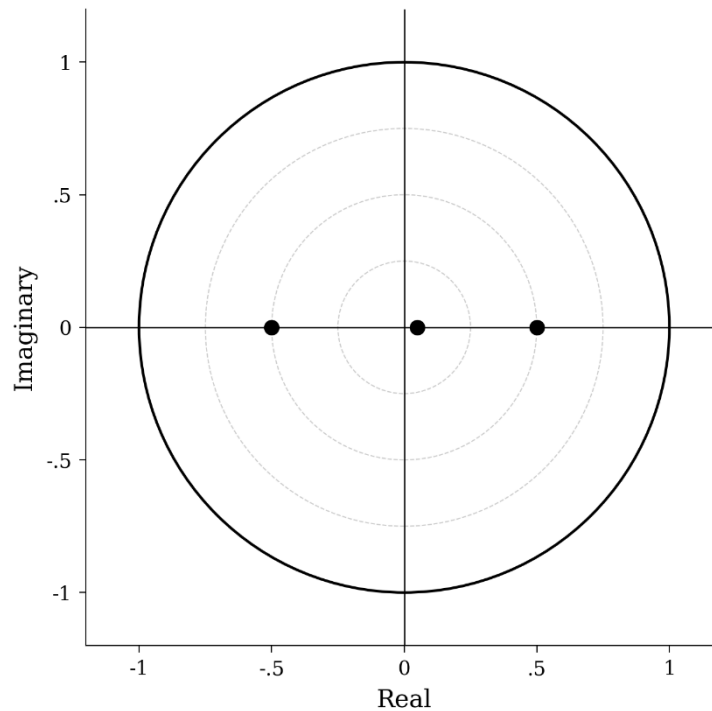


Figure 5. Stability Test Results

Based on Table 3, the modulus values of each eigenvalue are 0.502862; 0.461774; and 0.05244. All modulus values are below one ($|\lambda| < 1$). These results are also supported by the graph of Roots of the Companion Matrix, where all roots are within the unit circle and none are outside the boundary circle. Therefore, the VAR model has met the stability conditions and is suitable for further analysis, such as SVAR estimation, Impulse Response Function (IRF), and Forecast Error Variance Decomposition (FEVD).

4.4 SVAR Estimation

Subsequently, a Structural Vector Autoregression (SVAR) estimation test was conducted. The SVAR coefficient estimation results at this stage only show the direct response of a variable to shocks in one particular variable. Therefore, these results are not yet able to describe the transmission mechanism or dynamic impact of a shock on variables in the system over time.

Table 4. Matrix A Estimation Results (Contemporaneous Relationships Between Variables)

Variable Relationship	Coefficient	Std. Error	z-statistic	Prob.	Description
Interest Rate → M2	-0.1565824	0.0700618	-2.23	0.025	Significant
Interest Rate → Inflation	-0.1254383	0.2769233	-0.45	0.651	Not significant
M2 → Inflation	0.1040085	0.3593309	0.29	0.772	Not significant

Table 5. Matrix B Estimation Results (Structural Shock)

Variable	Shock Coefficient	Std. Error	z-statistic	Prob.
Interest Rate	0.1362606	0.0089459	15.23	0.000
Money Supply (M2)	0.1028208	0.0067505	15.23	0.000
Inflation	0.3979278	0.0261252	15.23	0.000

The SVAR estimation results indicate that interest rate shocks have a significant negative contemporaneous effect on money supply (M2). A coefficient of -0.1566 with a probability of 0.025 indicates that an increase in interest rates tends to reduce money supply in the same period. This finding is consistent with research by Huang et al. (2025) which states that an increase in interest rates can suppress credit demand and reduce liquidity expansion in the economy.

Meanwhile, the effect of interest rates on inflation has a coefficient of -0.1254 with a probability of 0.651, which is not significant. Similarly, the effect of money supply on inflation has a coefficient of 0.1040 with a probability of 0.772. These results indicate that inflation changes do not respond directly to changes in interest rates or money supply in the same period, so monetary policy transmission to inflation requires time to work through longer mechanisms.

4.5 Impulse Response Function (IRF) Test

To analyze the impact of shocks occurring in one of the variables in the VAR system on all other variables, the Impulse Response Function (IRF) analysis was used. The graph below represents the Orthogonalized Impulse Response Function (OIRF) of the VAR model consisting of Inflation, Money Supply, and Interest Rate variables. Each panel shows the response of a variable to a shock in a particular variable over 10 periods ahead.

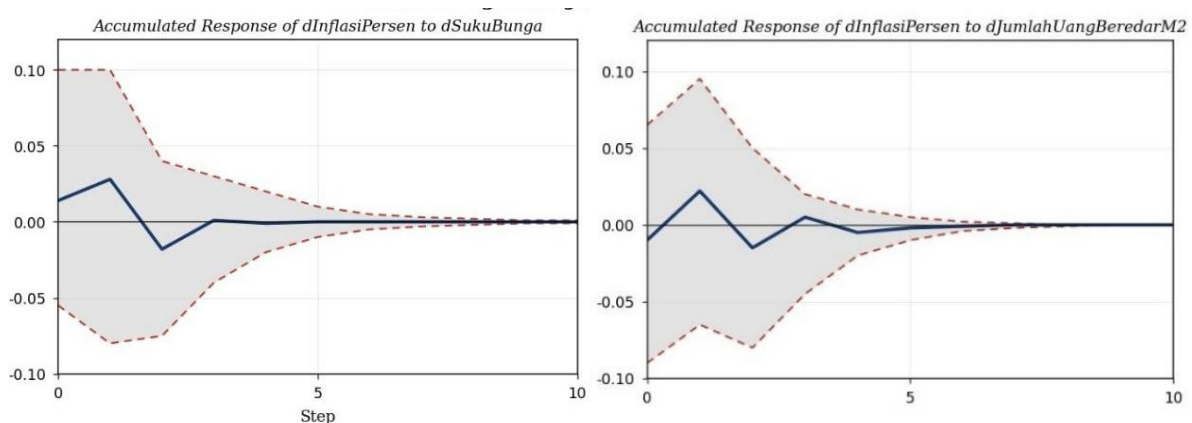


Figure 6. Impulse Response Function (IRF) Test Results

Figure 6 shows that a shock to the interest rate initially causes money supply to decline. The negative response is most pronounced during the first few periods before gradually diminishing and converging toward the equilibrium level. This indicates that higher interest rates temporarily reduce liquidity in the economy, but the effect weakens over time as money supply adjusts to its long-run equilibrium.

The figure also shows that inflation responds only slightly to an interest rate shock. Inflation initially increases before declining in the following periods and gradually converging toward zero. The relatively small magnitude of the response suggests that the effect of interest rate shocks on inflation is limited and temporary during the observation period.

Furthermore, money supply shocks generate only a modest response in inflation. Inflation experiences a slight positive response in the initial periods, followed by a gradual decline toward the equilibrium level. This finding indicates that changes in money supply do not generate persistent inflationary effects, as the response disappears after several periods.

Overall, the IRF results indicate that the responses of money supply and inflation to monetary policy shocks are temporary and gradually return to equilibrium over time, implying that the effects of monetary policy shocks are not permanent.

4.6 Forecast Error Variance Decomposition (FEVD) Test

To analyze the impact of shocks occurring in one of the variables in the VAR system on all other variables, the Forecast Error Variance Decomposition (FEVD) analysis was also used.

Table 6. Forecast Error Variance Decomposition (FEVD) of Inflation Variable (%)

Period	Interest Rate Shock	Money Supply Shock	Inflation Shock
1	0.14	0.07	99.79
5	0.76	0.45	98.79
10	0.77	0.45	98.79

Based on FEVD results, in the first period, inflation variance is almost entirely explained by its own inflation shock, namely 99.79%. The contribution of interest rate and money supply shocks are only 0.14% and 0.07% respectively. Up to period 10, the inflation shock still dominates inflation variance at 98.79%, while the contribution of interest rate and money supply shocks are only 0.77% and 0.45%. This indicates that inflation dynamics are more influenced by its own inflation shock compared to monetary policy shocks.

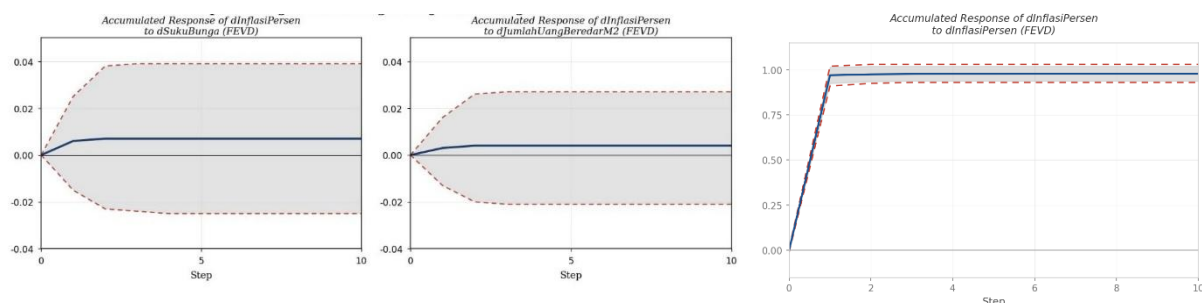


Figure 7. Forecast Error Variance Decomposition (FEVD) Test Results

Based on FEVD results, inflation variance is almost entirely explained by its own inflation shock. This is seen from the proportion of inflation shock contributions approaching

100 percent from the beginning to the end of the observation period. Meanwhile, the contribution of money supply and interest rate shocks to inflation variance is relatively very small. These findings indicate that inflation movements during the research period are more influenced by internal inflation factors compared to changes in money supply or interest rates.

Meanwhile, money supply variance at the beginning of the period is almost entirely explained by its own money supply shock. As periods progress, the contribution of inflation and interest rate shocks begins to increase, although the percentage remains relatively small compared to the money supply shock contribution. Thus, changes in money supply tend to be influenced by the internal dynamics of the variable rather than by shocks from inflation or interest rates.

Interest rate variance in most periods is dominated by its own interest rate shock with contributions approaching 100 percent. The contribution of inflation and money supply shocks to interest rate variance appears very small and relatively stable throughout the observation period. This indicates that interest rate fluctuations are more determined by factors inherent to the interest rate variable itself.

FEVD results show that up to period 10, inflation variance is still dominated by its own inflation shock at 98.79%. The contribution of interest rate shock is only 0.77%, while the money supply shock is 0.45%. Thus, in this model, inflation is more influenced by internal inflation factors compared to monetary policy instruments.

5. CONCLUSIONS AND LIMITATIONS

Impulse Response Function (IRF) analysis results show that inflation responses to interest rate and money supply shocks tend to be temporary and will return to the equilibrium point within several periods. Meanwhile, Forecast Error Variance Decomposition (FEVD) results show that inflation variance is still dominated by its own inflation shocks compared to interest rate or money supply shocks. These findings indicate that inflation dynamics in Indonesia are not only influenced by monetary policy instruments, but also by other factors outside the research model. In general, this study shows that monetary policy through interest rate instruments still plays a role in influencing money supply, but its effectiveness in controlling inflation is relatively limited. Therefore, inflation control in Indonesia requires broader coordination with fiscal policy and management of structural factors affecting both the supply and demand sides of the economy.

This study has limitations because it only uses three variables, namely interest rate, money supply, and inflation. Therefore, the model used is not yet fully capable of explaining all factors that influence inflation movements in Indonesia. For future research, it is recommended to add other relevant macroeconomic variables, such as exchange rates, Gross Domestic Product (GDP), commodity prices, government expenditures, or other external variables. The addition of these variables is expected to produce more comprehensive analysis and provide a better understanding of the monetary policy transmission mechanism on inflation in Indonesia.

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