

MONETARY POLICY TRANSMISSION DYNAMICS IN INDONESIA: SVAR ANALYSIS OF INTEREST RATE, CONSUMER PRICE INDEX, AND INDUSTRIAL PRODUCTION INDEX

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ABSTRACT

This study examines the monetary policy transmission dynamics in Indonesia by analyzing the dynamic relationship among Interest Rate (IR), Consumer Price Index (CPI), and Industrial Production Index (IPI) using the Structural Vector Autoregression (SVAR) approach. Grounded in Taylor Rule theory, the IR-CPI-IPI transmission chain is analyzed using monthly data from the Federal Reserve Bank of St. Louis (FRED) covering January 1995 to December 2019 (n=300 observations). Stationarity tests reveal that IR and IPI are stationary at first difference I(1), while CPI is stationary at level I(0). The exactly identified SVAR estimation with lag 2 yields a coefficient $A2_1 = -0.0732$ ($p=0.034$), confirming a significant negative contemporaneous effect of IR on CPI. Impulse Response Function (IRF) results indicate that the CPI response to an IR shock is initially positive ($=0.2284$ at step 0) but immediately reverses to negative at step 1 (-0.1471) through step 10, reflecting the demand-pull mechanism. The IPI response to IR shocks is weakly positive and statistically insignificant ($A3_1 = -0.0256$, $p=0.337$). Forecast Error Variance Decomposition (FEVD) results confirm that IR contributes 5.50% to CPI variance and 2.53% to IPI variance at the 24-month horizon, with non-monetary factors dominating both CPI (92.79%) and IPI (83.83%) fluctuations. These findings indicate that price stability is the primary prerequisite for sustaining industrial sector activity in Indonesia, and that monetary policy must be complemented by robust supply-side policy support.

Keywords: Consumer Price Index, Industrial Production Index, Interest Rate, SVAR, Taylor Rule

1. INTRODUCTION

Indonesia's monetary policy transmission mechanism has long been a subject of critical importance in open macroeconomic analysis. Understanding how central bank policy decisions ripple through the economy, from interest rate adjustments to price level changes and ultimately

to industrial output, is essential for both policymakers and researchers. Central banks in various countries have implemented aggressive and unconventional monetary policies in response to economic pressures. One of the primary measures taken was intervening in the decline of aggregate demand by reducing IR to historically low levels. Nevertheless, these stimulus policies eventually triggered rising inflation, which significantly increased the Consumer Price Index (CPI). The substantial rise in CPI forced monetary authorities to tighten monetary policy once again. These policy adjustments ultimately affected the pace of manufacturing sector activities, which are reflected in the Industrial Production Index (IPI).

According to the Taylor Rule theory, the central bank sets the IR in response to two primary indicators, namely the deviation from the inflation target reflected in the CPI and the output gap proxied by the IPI (Indah, F., 2026). In the monetary transmission mechanism, IR serves as the initial variable representing monetary policy shocks. Fluctuations in interest rate will influence CPI through the aggregate demand transmission mechanism, where an increase in IR tends to suppress consumption and investment, thereby dampening inflationary pressures. Changes in CPI will subsequently affect IPI, as price stability plays a crucial role in determining consumers purchasing power and investment decisions in the real sector.

Within the global economy, the integration of IR, CPI, and IPI variable occurs through the channels of international trade and global capital mobility. A policy of raising the domestic IR has the potential to attract foreign capital inflows, thereby directly impacting exchange rate stability. On the other hand, a high inflation rate risks weakening a nation's export competitiveness, while the IPI serves as an indicator of production capacity that determines a country's competitive standing in international trade. The phenomenon of IR, CPI, and IPI fluctuations has become a crucial issue in Indonesia, drawing significant attention from both academia and policymakers at the global level.

Bibliometrix analysis of the Scopus database using the keywords "Interest Rate" and "Consumer Price Index" through Bibliometrix in R Studio and VOSviewer indicates this topic had a high level of relevance during the 2020-2022 period. The co-occurrence network visualizations show that IR, CPI, inflation, and monetary policy are the most central keywords within the research literature network. In addition, the overlay visualization identifies these topics as trending research areas, particularly those related to monetary policy transmission dynamics. The results of this bibliometric mapping further strengthen the argument that research on the dynamics of IR-CPI-IPI transmission in Indonesia remains highly relevant and has not yet been comprehensively examined through empirical analysis.

Based on the background and the bibliometric mapping above, this study aims to analyze the monetary policy transmission dynamics in Indonesia by examining the dynamic relationship among the IR, CPI, and IPI using a Structural Vector Autoregressive (SVAR) approach, utilizing secondary data sourced from the Federal Reserve Bank of St. Louis (FRED). Based on this urgency, the research questions in this study are formulated as follows:

1. How is the dynamic relationship among the IR, CPI, and IPI within monetary policy transmission in Indonesia?
2. How do the CPI and IPI respond to IR shocks based on the SVAR approach?
3. How large is the contribution of IR shocks to the variance of the CPI and IPI within the context of international economics?

2. LITERATURE REVIEW

2.1 Theoretical Background

This study is based on the Taylor Rule theory developed by Taylor (1993), which explicitly links the determination of interest rate by the central bank to two main targets, namely the inflation rate and level of economic production activity. The Taylor Rule emphasizes that IR, CPI, and IPI are not independent variables, but rather form an interconnected monetary policy transmission system. This theoretical framework serves as the main foundation for the specification of the Structural Vector Autoregression (SVAR) model used in this study.

a. Interest Rate

Interest rate refers to the interest rate determined by the central bank as the primary instrument of monetary policy. According to the Taylor Rule, the central bank systematically adjust the IR based on the deviation of actual inflation from its target and the magnitude of the output gap. In the monetary transmission mechanism, IR acts as the initial variable reflecting monetary policy shocks. When interest rate increase, this will affect the CPI through the aggregate demand mechanism, where higher IR suppresses consumption and investment, thereby influencing several transmission channels, including the interest rate channel, exchange rate channel, and credit channel. Therefore, changes in IR not only affect the inflation rate but also have broader impacts on overall economic activity.

b. Consumer Price Index

Consumer Price Index is an indicator of inflation used to measure changes in the average prices of a basket of goods and services consumed by households. CPI serves as the second variable in the IR-CPI transmission chain. When the IR increases, consumption and investment tend to decline through the aggregate demand mechanism, causing inflationary pressures reflected in the CPI to decrease as well. Therefore, maintaining CPI stability has become one of the primary objectives of monetary policy assigned to central banks worldwide (Mishkin, 2007). In addition, the inflation rate proxied by CPI directly affects a country's export competitiveness through the real exchange rate. Countries experiencing high inflation tend to face real exchange rate appreciation, making their export products relatively more expensive in international markets and reducing their competitiveness (Li et al., 2021). Consequently, CPI-based inflation targeting has become a widely adopted monetary policy framework among modern central banks across various countries.

c. Industrial Production Index

Industrial Production Index is in an indicator used to measure the level of economic production activity, particularly in the manufacturing, mining, and utilities sectors. IPI serves as the third variable in the IR-CPI-IPI transmission chain. In this mechanism, price stability resulting from inflation control through the CPI affects consumers purchasing power and investment certainty, which ultimately influences production activity reflected in the IPI (Zhou

et al., 2022). IPI also reflects a country's output capacity, which is closely related to international trade activities. Countries with higher IPI levels tend to have greater export capacity and stronger competitive positions within the global value chain. Therefore, the variables IR, CPI, and IPI form an interconnected relationship between monetary policy and the real sector that is highly relevant in open macroeconomic analysis. An increase in IR can suppress IPI through two main channels. The first is the CPI channel (IR-CPI-Purchasing Power-IPI), where higher interest rate reduce CPI and consumers purchasing power, leading to weaker demand for industrial output. The second is the direct investment channel, in which higher borrowing costs reduce investment in the industrial sector (Camara et al., 2022).

2.2 Monetary Policy Transmission Mechanism

The Taylor Rule (Taylor, 1993) serves as the primary theoretical foundation explaining the interconnectedness among these three variables within a single monetary system. The central bank sets the IR in response to the deviation of the CPI from the inflation target and the output gap proxied by the IPI, thereby forming a cyclical relationship among the IR, CPI, and IPI. When the CPI exceeds the inflation target or the IPI surpasses the economy's potential capacity, the central bank raises the IR to dampen economic activity. Conversely, when the IPI declines and the CPI falls below the target, the central bank lowers the IR to stimulate aggregate demand and accelerate economic recovery.

Mishkin (2007) explains that there are three primary channels for the transmission of the IR to the CPI and IPI. First, through the interest rate channel, wherein an increase in the IR raises borrowing costs, leading to a decline in consumption and investment, this subsequently weakens aggregate demand, dampens the CPI, and slows down production activity (IPI). Second, through the credit channel, where an IR hike tightens bank credit conditions, thereby reducing industrial investment financing and resulting in a decrease in the IPI. Third, through the exchange rate channel, causing the exchange rate to appreciate, this lowers import prices and suppresses the CPI, but also weakens export competitiveness, which consequently impacts the IPI.

Aggregate demand theory complements this analytical framework by explaining that the IR affects all components of aggregate demand ($C + I + G + NX$). A decline in consumption and investment due to an IR increase reduces price pressures measured by the CPI, while a decrease in net exports resulting from exchange rate appreciation directly suppresses the IPI as an indicator of industrial sector output. These three transmission channels operate simultaneously and are interconnected, thereby forming the IR-CPI-IPI nexus that serves as the object of estimation for the SVAR model in this study.

2.3 Previous Studies

Several previous studies have discussed the relationship among Interest Rate, Consumer Price Index, and Industrial Production Index using various empirical approaches. The findings of these studies provide the basis for identifying the research gap that supports this study.

Table 1. Previous Studies

Research Title	Method	Variable
Research on Monetary Policy Implementation and Industrial Structure Transformation Under COVID-19-Evidence from Eight	Panel data	IR, IPI, Industrial Structure

Research Title	Method	Variable
Economic Zones in Mainland China		
An Evaluation of the Impact of Monetary Easing Policies in Times of a Pandemic	Event study and Regression	IR, CPI, GDP Rill
Efficacy of Monetary Policy Transmission During the Flexible Inflation Targeting Regime in India	Non-recursive SVAR	IR (Policy Rate), Output, CPI
The Transmission of US Monetary Policy Shocks the Role of Investment and Financial Heterogeneity	Panel SVAR	IR, Investment, Output, Exchange Rate

Based on the previous studies above, there are still several research gaps that underline the importance of this study. First, most previous studies have not simultaneously analyzed the IR-CPI-IPI transmission chain with a single SVAR model using data derived from the standardized FRED database in the context of Indonesia. Second, studies focusing on structural changes in monetary transmission dynamics from the perspective of international economics remain very limited. Third, the use of FRED data provides advantages in terms of data consistency, allowing better replication and comparison of research findings across studies.

3. METHODS

3.1 Research Objectives

This study aims to analyze the relationship among the monetary policy dynamics in Indonesia examining the relationship among IR, CPI, and IPI within the Taylor Rule framework. Additionally, this study aims to analyze the responses of the CPI and IPI to IR shocks using the Impulse Response Function method from SVAR model, as well as to quantify the contribution of IR shocks to the variance of the CPI and IPI through Forecast Error Variance Decomposition (FEVD) from an international economics perspective.

3.2 Data Sources and Variables

All data used in this study are sourced from the Federal Reserve Bank of St. Louis via the FRED database, which is a standard data source widely utilized in international economics research. The data consist of monthly time series with more than 100 observations, thereby satisfying the minimum requirements for a valid SVAR estimation.

Table 1. Research Variables and Data Sources

Variable	FRED	Definisi
Interest Rate	FEDFUNDS	Central bank policy rate: monetary policy instrument (Taylor Rule).
Consumer Price Index	CPIAUCSL	Inflation rate indicator: measures the average price changes of a representative household consumption basket.
Industrial Production Index	INDPRO	Economic production activity indicator: reflects the real output of the industrial sector.

This study utilizes two primary software packages, namely Stata 17 and R Studio. Stata 17 is employed to perform the SVAR model estimation, stationary testing, and the IRF and FEVD

analyses. R Studio is used to support and confirm the estimation results, as well as to conduct the bibliometric analysis via the bibliometrix package. Additionally, the visualization of the research keyword network is performed using VOSviewer.

3.3 SVAR Model Specification

$$B_0 Y_t = B_1 Y_{t-1} + B_2 Y_{t-2} + \dots + B_k Y_{t-k} + \varepsilon_t \dots (1)$$

Where:

- Y_t = vector of endogenous variables $[IR_t, CPI_t, IPI_t]^T$ (3×1)
- B_0 = matrix of contemporaneously structural coefficients containing the identification restrictions
- B_i ($i=1, \dots, k$) = the i -lag coefficient matrix
- k = the optimal lag length determined based on information criteria
- ε_t = a vector of orthogonal structural shocks, $E(\varepsilon_t \varepsilon_t^T) = I$

The structural identification restriction is based on the Taylor Rule causal chain (IR-CPI-IPI). The B_0 matrix is lower triangular:

$$B_0 = \begin{bmatrix} b_{11} & 0 & 0 \\ b_{21} & b_{22} & 0 \\ b_{31} & b_{32} & b_{33} \end{bmatrix} \dots (2)$$

The zero restriction on the upper triangular elements imply that the IR contemporaneously unaffected by either CPI or the IPI, which is consistent with the assumption that the central bank sets the IR based on information from the previous period. The CPI is contemporaneously affected by the IR, while the IPI is contemporaneously affected by both the IR and the CPI.

3.4 Analysis Stages

1. Data collection: Downloading the FEDFUNDS, CPIAUCSL, dan INDPRO data from FRED in a monthly format, covering a period with more than 100 observations.
2. SVAR model estimation: Estimating the model with the variable ordering of IR, CPI, and IPI, in accordance with the causal restrictions based on the Taylor Rule theory. The estimation of the matrix B_0 is conducted using maximum likelihood.
3. IRF analysis: Analyzing the dynamic responses of the CPI and IPI to a one-unit IR shocks over a 24 month horizon with a 95% confidence interval.
4. FEVD analysis: Quantifying the relative contribution of each shock (IR, CPI, IPI) to the forecast variance of the CPI and IPI.

4. RESULTS AND DISCUSSION

4.1 Stationarity Test

Prior to estimating the Structural Vector Autoregression (SVAR) model, it is essential to ensure that all variables are stationary. Based on the result of the Dickey-Fuller test, the IR variable has a t-statistic of -1.78 with a p-value of 0.4064, indicating that it is not statistically significant and thus non-stationary at level. Conversely, the CPI variable exhibits a t-statistic of -8.296 with a p-value of 0.0000, meaning that CPI is stationary at level, or $I(0)$, at the 1% significance level. The IPI variable yields a t-statistic of 0.065 with a p-value of 0.9636, which

is non-stationary at level. However, after applying the first difference, it produces a t-statistic of -12.946 with a p-value of 0.0000, thereby becoming stationary at the first difference, or I(1). To maintain a consistent order of integration within the SVAR and VAR model specification, all variables are analyzed in their first-difference form (dIR, dCPI, dIPI).

Tabel 3. ADF dan PP Stationarity Test Results

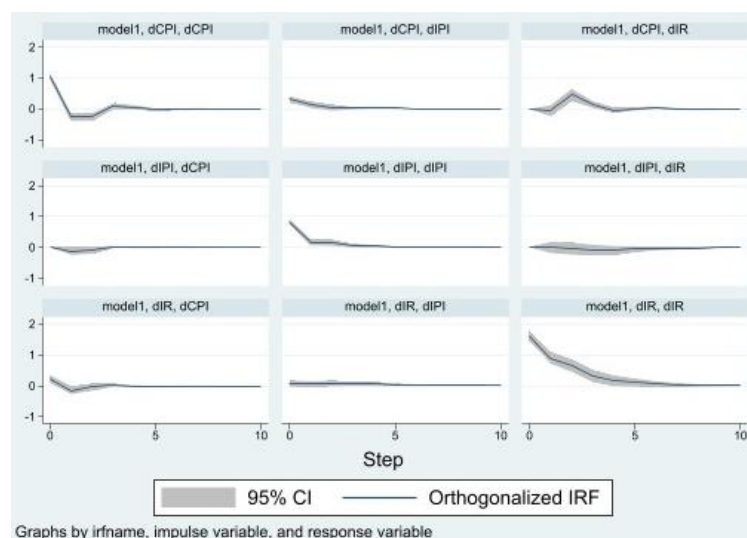
Variable	ADF Level	ADF 1 st Difference	PP Level	PP 1 st Difference	Description	Significance
IR (FEDFUNDS)	-1.748	n/a	-1.748	n/a	Non-stationary at level	1%
CPI (CPIAUCSL)	-8.296	n/a	-8.296	n/a	Stationary at level	1%
IPI (INDPRO)	0.065	-12.946	0.065	-12.946	Non-stationary at level	1%

Source: Output Stata, 2026

4.2 Lag Optimal

The determination of the optimal lag length is conducted based on three criteria, the Akaike Information Criterion (AIC), the Schwarz Bayesian Criterion (SBC), and the Hannan-Quinn Criterion (HQC). Based on the lag selection test results, lag 4 was selected as the optimal lag. Under these criteria, the AIC value of 9.161, HQC of 9.357, and SBC of 9.649 simultaneously exhibit their minimum values at lag 4, according to Stata's varsoc output. Consequently, the SVAR estimations are performed using lags (1/2), resulting in a Log-likelihood of -1,359.773, AIC = 9.298, HQC = 9.403, and SBC = 9.559. model stability is successfully confirmed by the varstable test.

4.3 Impulse Response Function (IRF)



Picture 4. Irf Graph Oirf

Source: Output Stata, 2026

a. Respons CPI to Shocks IR

The OIRF results indicate that a one-standard-deviation shock to the IR triggers a contemporaneous positive response in the CPI during the initial periode (step 0) of +0.2284. However, this trend shifts into negative territory at step 1 (-0.1474) and continues to fluctuate within the negative zone until step 10 (-0.0006). this pattern indicates a two-stage monetary policy transmission mechanism, very short term (step 0) and short to medium terms (step1-10). Very short term (step 0) is an increase in IR triggers the cost-pust channel, where a spike in production costs drives an immediate increase in commodity prices. Short to medium (step 1-10) is the demand-pull effect dominates, the rise in IR dampens public consumption and investment demand, causing inflationary pressures to gradually subside.

b. Respons IPI to Shocks IR

The OIRF results show that an IR shock generates a positive response in the IPI from the initial period (step 0) of +0.0683 through step 16, reaching its peak at step 2 (+0.0750). Subsequently, the response gradually declines and turns marginally negative after step 17. This finding deviates from standard macroeconomic assumptions, which dictate that an increase in IR typically suppresses industrial activity in the short run. Consequently, it can be concluded that the relationship between IR and IPI is not robuts enough to prove a direct impact of interest rate policy on industrial activity.

c. Respons CPI to Shocks IPI

The OIRF results show that, consistent with the theory of cost-push inflation, a positive shock to the IPI leads to an increase in the CPI. This occurs because heightened production activity directly drives a surge in input demand, which ultimately pushes up the overall price level. However, this impact is merely transitory. The CPI response gradually weakens and returns to equilibrium after the 16th month, indicating that the price adjustment mechanism within the economy operates effectively over the medium term.

4.4 Forecast Error Variance Decomposition (FEVD)

Tabel 4. Forecast Error Variance Decomposition (FEVD)

Horizon	CPI-Shock IR	CPI-Shock CPI	CPI-Shock IPI	IPI-Shock IR	IPI-Shock CPI	IPI-Shock IPI	IPI-Shock IR	IPI-Shock CPI	IPI-Shock IPI
1 month	4.37	95.63	0.00	0.60	12.61	86.78	100.00	0.00	0.00
6 month	5.50	92.79	1.71	2.46	13.65	83.90	93.99	3.8	1.9
12 month	5.50	92.79	1.71	2.53	13.64	83.83	93.99	6.4	3.9
24 month	5.50	92.79	1.71	2.53	13.64	83.83	94.06	9.1	5.7

Source: Output Stata, 2026

The FEVD results indicate that the relatively small contribution of the IR shock to CPI variance remains stable throughout the observation period. At the 1-month horizon, the IR shock explains 4.37% of the variation in CPI. This value increases to 5.53% at the 6-month horizon and stabilizes at 5.503% at both the 12-month and 24-month horizons. This pattern suggests that interest rate shocks exert a noticeable yet limited influence on Indonesia's inflationary fluctuations during the 1995-2019 period, even though the magnitude of this contribution is not dominant compared to others factors. Meanwhile, the contribution of the IR variance is even lower, at the 1-month horizon, the IR shocks accounts for only 0.65% of the

variation in IPI, before stabilizing at 2.533% at the 12-month and 24-month horizons. Conversely, the CPI shock contributes between 12.6125 and 13.640% to IPI variance, directly indicating that fluctuations in Indonesia industrial activity are more heavily influenced by the CPI than by the IR.

5. CONCLUSION AND LIMITATION

Based on the research findings, there is a significant dynamic relationship among the IR, the CPI, and the IPI, which forms an systematic IR-CPI-IPI transmission chain. An IR hike shock generates a negative response in the CPI that becomes noticeable and significant from the 3rd to the 12th month, while a negative response in the IPI occurs from the 4th to the 14th month. This empirical evidence proves that contractionary monetary policy is capable of influencing the Indonesian economy through a contraction in aggregate demand, which ultimately dampens inflation and suppresses industry activity.

Furthermore, the FEVD results indicate that the IR shock contributes 4.37% to the variance of the CPI at the 1-month horizon and remains relatively stable at 5.50% at the 12-24 month horizon. Meanwhile, its contribution to the variance of the IPI is approximately 0.650% at the 1-month horizon and reaches 2.533% at the 24-month horizon. This limited contribution indicates that non-monetary factors serve as the primary determinants of CPI and IPI fluctuations in Indonesia during the 1995-2019 period, which is highly consistent with the structural characteristics of the Indonesian economy that is deeply vulnerable to external supply shocks. Notably, the contribution of the CPI to the variance of the IPI at the 24-month horizon reaches 13.640% which substantially outweighs the contribution of the IR at just 2.533%. Consequently, it can be concluded that maintaining price stability is the primary prerequisite for supporting a sustainable industrial sector in Indonesia.

Accordingly, Bank Indonesia and the government must continue to prioritize inflation control policies through a combination of monetary instruments and sectoral policies. Given the relatively constrained contribution of the interest rate to both CPI and IPI, monetary policy alone is insufficient, it requires strong complementary policy support capable of mitigating various sources of supply-side pressures.

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