

Dual Monetary Transmission and Real Sector Dynamics: Comparative Evidence from Islamic and Conventional Policies in Indonesia

Malik Shahzad Shabbir^{1*}, Riyan Damara Putra²

¹ Sunway University, Sunway City, Malaysia

² Universitas Islam Negeri Raden Intan Lampung, Indonesia

ARTICLE HISTORY

Submitted: May, 11, 2026

Revised: June, 14, 2026

Accepted: August, 23, 2026

KEYWORD

Conventional monetary transmission;

Dual monetary system;

Industrial Production Index;

Islamic monetary transmission;

Vector Error Correction Model.

ABSTRACT

Background: Indonesia's dual monetary system combines Islamic and conventional financial mechanisms within a common macroeconomic environment, yet the two channels may transmit monetary impulses to the real sector through different adjustment processes. Understanding these differences is important because transmission effectiveness depends not only on immediate responses but also on persistence, equilibrium adjustment, and relative contribution to output fluctuations.

Aims: This study examines and compares the dynamic transmission of Islamic and conventional monetary channels to Indonesia's Industrial Production Index (IPI).

Methods: Quarterly data from Q1 2018 to Q4 2022 were analyzed using a Vector Error Correction Model (VECM), complemented by Impulse Response Function (IRF), Forecast Error Variance Decomposition (FEVD), and Granger causality analysis. The empirical system incorporates SBIS, PUAS, Islamic financing, SBI, PUAB, conventional credit, inflation, exchange rate, and IPI.

Results: The VECM produced a negative and statistically significant error correction term of -0.340 , indicating that approximately 34% of disequilibrium was adjusted within one quarter. In the short run, SBI and SBIS rates were negatively associated with IPI, whereas PUAS, PUAB, Islamic financing, and conventional credit showed positive associations. The reported IRF patterns indicate that conventional credit generated a faster but less persistent response, while Islamic financing exhibited a more gradual and sustained adjustment. FEVD results further show that conventional credit accounted for the largest reported share of IPI variation, followed by Islamic financing and PUAS.

Conclusion: The findings indicate complementary but asymmetric transmission within Indonesia's dual monetary system, with Islamic and conventional channels differing in response speed, persistence, and relative contribution to industrial activity. The study contributes to dual monetary transmission literature by demonstrating that comparative effectiveness should be assessed across multiple dynamic dimensions rather than through a single measure of transmission strength.

INTRODUCTION

Indonesia's dual monetary system provides a distinctive empirical setting in which Islamic and conventional financial mechanisms operate simultaneously within the same macroeconomic environment. Despite their coexistence, the two channels differ institutionally because conventional transmission is predominantly associated with interest-based mechanisms, whereas Islamic finance relies on Sharia-compliant structures characterized by asset linkage and risk-sharing arrangements. These structural differences may generate variations in the speed, magnitude, and persistence with which monetary impulses are transmitted to productive economic activity, as suggested by (Bertillo & Bertillo, 2022; Saleem et al. 2023). The Industrial Production Index (IPI) is therefore particularly relevant because it provides a direct indicator of whether changes in monetary conditions and financial intermediation are reflected in real-sector activity rather than remaining confined to financial markets. From a broader macroeconomic perspective, understanding the interaction between multiple financial channels is also important because financial-system structure and stability can shape the transmission of economic shocks, as discussed by (Hałaj et al. 2024; Luo et al. 2024). Examining how Islamic and conventional monetary channels relate to industrial production consequently provides an important foundation for assessing the dynamics of monetary transmission within Indonesia's dual financial system.

Correspondence author

Malik Shahzad Shabbir, Sunway University, Sunway City, Malaysia
email: mshahzad786.pk11@gmail.com

The importance of examining these transmission differences became more pronounced during and after the COVID-19 disruption, when rapid changes in liquidity conditions, financing demand, inflationary pressures, and policy normalization challenged the effectiveness of monetary transmission across heterogeneous financial institutions. In dual banking environments, differences in the way Islamic and conventional institutions respond to policy signals may produce asymmetric adjustments in liquidity and financing, an issue highlighted by Khan et al. (2024) and further discussed in the monetary-transmission review of Savon & Yousfi, (2025) Such asymmetry is particularly relevant for Indonesia because differences in transmission speed may influence how quickly changes in monetary conditions are reflected in industrial activity. At the same time, the continued development of Indonesia's Sharia-compliant financial ecosystem has increased the importance of evaluating whether Islamic financial mechanisms are effectively connected to broader economic activity, as reflected in the institutional and financial-inclusion discussions of (Said, 2025; Taufik Syamlan et al. 2025). The central empirical issue is therefore not merely whether Islamic and conventional monetary channels coexist, but whether they transmit monetary impulses to the real sector with different magnitudes, timing, and persistence under changing macroeconomic conditions. Addressing this issue is essential for understanding how Indonesia's dual monetary structure functions when financial conditions become more volatile and the effectiveness of transmission becomes increasingly dependent on the characteristics of each channel.

The relevance of dual monetary transmission extends beyond short-term policy responses because the interaction between Islamic and conventional financial channels may also influence the stability of the broader financial system. Evidence from Indonesia indicates that the performance and resilience of Islamic financial institutions are closely related to their institutional characteristics and their connections with the real economy, as discussed by (Alhammadi et al. 2022; Majid et al. 2025; Rokhlinasari et al. 2025). This issue is particularly important when financial systems face periods of macroeconomic stress, because differences in financing structures and liquidity mechanisms may affect how shocks are absorbed and transmitted across institutions. At the broader level, Farah et al. (2025); Raimi et al. (2024) show that Islamic finance has increasingly been examined in relation to economic growth, financial risk, and sustainable financial development, highlighting the need to assess its contribution through observable economic outcomes. Related discussions by Islam et al. (2025) further emphasize that sustainable economic performance depends on interactions among financial, institutional, and productive-sector mechanisms rather than on financial expansion alone. Consequently, examining whether Islamic monetary transmission reaches industrial activity differently from conventional transmission provides a more direct basis for evaluating the macroeconomic relevance of Indonesia's dual financial structure.

A clearer understanding of dual monetary transmission requires moving beyond the expansion of Islamic banking itself toward evidence of how monetary and financial mechanisms are reflected in real economic activity. Although Islamic finance has become increasingly integrated into Indonesia's financial system, the extent to which Sharia-compliant monetary instruments and financing channels interact with industrial output remains an important empirical question. This issue is especially relevant in a dual system because interest-based and Sharia-compliant mechanisms operate concurrently but may transmit liquidity and financing conditions through different adjustment processes. Indonesia therefore provides a particularly informative setting for examining these differences because both channels are exposed to the same broad macroeconomic environment while retaining distinct institutional and contractual characteristics. A direct comparison of their relationships with industrial production can help determine whether differences observed within the financial sector are also reflected in the magnitude, timing, and persistence of real-sector responses. This perspective provides the rationale for examining dual monetary transmission through an integrated empirical framework rather than evaluating Islamic and conventional channels separately.

Previous research on dual monetary transmission can be broadly grouped into studies of rate pass-through, financial intermediation, and macroeconomic outcomes. Evidence on rate transmission shows

that Islamic banking remains connected to conventional monetary conditions, although the degree and speed of adjustment differ across institutional settings, as reported by Saeed et al. (2023) and Shah et al. (2024). A second stream emphasizes financial-intermediation differences, with Boukhatem & Djelassi, (2022), Caporale et al. (2020), Toh & Jia, (2023) showing that Islamic and conventional banks display heterogeneous lending, liquidity-creation, and shock-transmission behavior within dual banking systems. At the macroeconomic level, Ali et al. (2022), Kismawadi, (2024), and Ben Amar, (2022) demonstrate that Islamic banking variables can be dynamically associated with economic output and monetary-policy transmission, although the strength and persistence of these relationships vary across countries and model specifications. Within Indonesia, Audah & Kasri, (2020) provide evidence that Islamic banking participates in monetary-policy transmission, while Aji & Sukmana, (2023) show that dual monetary arrangements can also be associated with broader socioeconomic outcomes beyond conventional banking indicators. Collectively, these studies establish that Islamic and conventional channels are economically interconnected but institutionally heterogeneous, while leaving open the question of how their differences are transmitted specifically to industrial production within a unified Indonesian framework.

explaining how Islamic and conventional monetary channels differ in their transmission to real-sector activity within the same Indonesian macroeconomic system. Much of the existing literature concentrates on banking rates, liquidity, lending behavior, or aggregate growth, while relatively fewer studies directly examine industrial production as the outcome of dual monetary transmission. Although the Industrial Production Index has been employed in monetary analysis, Triwibowo et al. (2022) show that transmission in Indonesia is highly sensitive to broader macroeconomic conditions, indicating that financial-sector pass-through cannot be assumed to translate uniformly into real-sector responses. A second limitation is that previous studies often examine whether transmission exists, but provide less integrated evidence on whether Islamic and conventional channels differ simultaneously in short-run responsiveness, persistence of shocks, and relative contribution to output variation. This leaves unresolved whether one channel merely responds more rapidly while another produces a more persistent adjustment pattern, or whether their differences extend across several dimensions of monetary transmission. Addressing this gap requires an analytical framework that compares both channels within the same system and distinguishes immediate responses, equilibrium adjustment, dynamic persistence, and contribution to industrial-output fluctuations.

The contribution of this study lies not in introducing a new econometric technique, but in applying an integrated dynamic framework to compare Islamic and conventional monetary transmission across several dimensions within the same Indonesian setting. The analysis distinguishes short-run responsiveness, equilibrium adjustment, persistence of shocks, and relative contribution to industrial-output variation rather than reducing transmission effectiveness to a single coefficient or significance test. This multidimensional perspective is important because the institutional asymmetries between interest-based and Sharia-compliant mechanisms may generate different response trajectories even when both channels operate within the same macroeconomic environment, as indicated by Saeed et al. (2023). By combining VECM with IRF and FEVD, the study evaluates how the two channels differ not only in immediate response but also in the duration and relative importance of their effects on the real sector. The resulting comparison provides a more differentiated basis for interpreting dual monetary transmission than approaches that assess Islamic and conventional channels separately or focus exclusively on financial-sector indicators. In this sense, the study advances the literature by framing dual monetary transmission as a potentially complementary but asymmetric process whose effectiveness depends on multiple dynamic characteristics.

Accordingly, this study aims to examine and compare the dynamic transmission of Islamic and conventional monetary channels to real-sector performance in Indonesia using quarterly data from Q1 2018 to Q4 2022. The analysis evaluates short-run responses within the VECM framework, the equilibrium-adjustment mechanism captured by the error correction term, and the temporal behavior of

monetary and financing shocks through impulse-response analysis. Forecast Error Variance Decomposition is further employed to assess the relative contribution of Islamic and conventional monetary and financial variables to fluctuations in the Industrial Production Index. The study also considers predictive interdependence between monetary conditions and real-sector activity to provide a broader understanding of how the two channels interact within the same dynamic system. Rather than assuming that one monetary framework is inherently more effective than the other, the analysis evaluates differences in response magnitude, adjustment speed, persistence, and relative contribution. Through this approach, the study contributes to the literature on dual monetary transmission by providing a more differentiated account of how Islamic and conventional channels are connected to industrial activity within Indonesia's hybrid financial structure.

METHOD

Research Design and Data Sources

This study employed a quantitative time-series econometric design to examine the dynamic relationships between Islamic and conventional monetary channels and real-sector performance in Indonesia. The analysis was situated within Indonesia's dual monetary and financial system, in which Sharia-based and conventional mechanisms operate simultaneously under a common regulatory and macroeconomic environment. This institutional structure provides an appropriate empirical setting for comparing how monetary impulses are transmitted through different financial channels. Evidence from dual banking systems indicates that Islamic and conventional financial institutions may respond differently to monetary-policy changes because of differences in contractual structures, liquidity mechanisms, and sensitivity to interest-rate movements. Ali et al. (2022) demonstrated that the presence of Islamic banking can shape the transmission of monetary policy to economic output, while Saeed et al. (2023) documented important interactions between Islamic and conventional rates within a dual banking environment. Accordingly, the present study focuses on the comparative dynamics, adjustment patterns, and real-sector implications of the two monetary channels.

The study used secondary quarterly time-series data covering the period from Q1 2018 to Q4 2022. Data were obtained from official Indonesian institutions, namely Bank Indonesia (BI), the Financial Services Authority (OJK), and Statistics Indonesia (BPS). The observation window spans the pre-pandemic, pandemic, and early post-pandemic phases of the Indonesian economy, thereby capturing variation in monetary, financial, and real-sector conditions over the study period. The original research design selected this period to examine monetary transmission under changing macroeconomic conditions surrounding the COVID-19 disruption. Kismawadi, (2024) applied a VECM framework to examine the relationship between Islamic banking and macroeconomic performance, whereas Boukhatem and Djelassi (2022) employed a dynamic multivariate approach to investigate monetary transmission in a dual banking system. All variables were organized at quarterly frequency to ensure temporal consistency across the monetary, financial-intermediation, and real-sector series.

Variable Definition and Measurement

The empirical framework incorporated variables representing real-sector performance, Islamic monetary transmission, conventional monetary transmission, financial intermediation, and macroeconomic conditions. Real-sector performance was represented by the Industrial Production Index (IPI), which served as the principal indicator of industrial activity in the model. The use of an output-based indicator is relevant because monetary transmission is ultimately expected to influence productive activity rather than only financial-market conditions. In the Indonesian context, Triwibowo et al. (2022) examined monetary-policy pass-through within the dual banking system and highlighted the importance of macroeconomic conditions in shaping transmission outcomes. The IPI was therefore used to capture changes in the real sector associated with monetary and financing dynamics. Its inclusion also enables

direct comparison of how Islamic and conventional monetary shocks are associated with industrial activity.

The Islamic monetary channel was represented by the Sertifikat Bank Indonesia Syariah (SBIS) rate, Pasar Uang Antarbank Syariah (PUAS) volume, and Islamic financing. SBIS reflects the Sharia-compliant monetary instrument included in the original empirical framework, while PUAS captures liquidity conditions within the Islamic interbank market. Islamic financing was incorporated as the financial-intermediation mechanism through which Islamic monetary conditions may be transmitted to productive economic activity. Saeed et al. (2023) showed that Islamic financial rates interact with conventional benchmarks but may display distinct adjustment patterns because of their institutional and contractual characteristics. The inclusion of Islamic financing is therefore important for distinguishing the monetary-policy channel from the financing channel within the Sharia-based system. Together, SBIS, PUAS, and Islamic financing represent the principal components of the Islamic transmission mechanism examined in this study.

The conventional monetary channel was represented by the Sertifikat Bank Indonesia (SBI) rate, Pasar Uang Antarbank (PUAB) volume, and conventional bank credit. SBI reflects the conventional monetary-policy-related instrument used in the original specification, whereas PUAB represents liquidity conditions in the conventional interbank market. Conventional bank credit was included to capture the financial-intermediation mechanism through which monetary conditions may influence firms, households, and productive activity. Caporale et al. (2020) reported that Islamic and conventional bank-lending channels can respond differently to monetary-policy shocks, supporting the analytical separation of the two forms of financial intermediation. The inclusion of both Islamic financing and conventional credit therefore allows the comparative analysis to move beyond policy instruments and examine the transmission of liquidity into real-sector financing. This distinction is central to evaluating whether the two channels differ in their short-run responsiveness and longer-term adjustment patterns.

Inflation and the exchange rate were incorporated as macroeconomic control variables to account for broader economic conditions that may simultaneously influence monetary transmission and industrial activity. Inflation represents changes in the general price level, while the exchange rate captures movements in the value of the Indonesian rupiah against the US dollar. The variables were measured using the units reported by their respective official data sources. Transformations were applied in accordance with the original estimation procedure and the measurement characteristics of each series.

Table 1. Variable Definition and Measurement

Category	Variable	Symbol	Measurement	Data Source
Real-sector performance	Industrial Production Index	IPI	Index	BPS
Islamic monetary channel	SBIS rate	SBIS	Percent	Bank Indonesia
Islamic monetary channel	PUAS volume	PUAS	IDR value/volume	Bank Indonesia
Islamic financial intermediation	Islamic financing	IF	IDR value	OJK
Conventional monetary channel	SBI rate	SBI	Percent	Bank Indonesia
Conventional monetary channel	PUAB volume	PUAB	IDR value/volume	Bank Indonesia
Conventional financial intermediation	Conventional bank credit	CR	IDR value/growth according to the original series	Bank Indonesia/OJK
Macroeconomic control	Inflation rate	INF	Percent	BPS
Macroeconomic control	Exchange rate	EXR	IDR/USD	Bank Indonesia

Table 1 summarizes the variables used to represent real-sector performance, Islamic and conventional monetary channels, financial intermediation, and macroeconomic conditions. The Industrial Production Index (IPI) serves as the indicator of real-sector activity, while SBIS, PUAS, and Islamic financing represent the Islamic monetary channel, and SBI, PUAB, and conventional bank credit represent the conventional channel. Inflation and the exchange rate are included as macroeconomic control variables. The table also reports the measurement units and official data sources for each variable to ensure consistency and transparency in the empirical analysis.

Econometric Framework

The dynamic relationships among monetary variables, financial-intermediation variables, macroeconomic conditions, and industrial production were analyzed using a Vector Error Correction Model (VECM). The model was selected because the original study sought to distinguish short-run fluctuations from long-run equilibrium relationships within an interconnected monetary system. In this framework, the variables are evaluated jointly as components of a dynamic system rather than interpreted exclusively through isolated predictor-outcome relationships. Boukhatem and Djelassi (2022) demonstrated the usefulness of dynamic multivariate models for examining monetary transmission across Islamic and conventional banking channels. Similarly, Kismawadi, (2024) employed VECM to distinguish long-run macroeconomic relationships from short-run adjustments involving Islamic banking variables. The VECM framework was therefore used to evaluate both temporary responses and equilibrium-restoring dynamics within Indonesia's dual monetary system.

The general VECM representation can be expressed as:

$$\Delta Y_t = \pi Y_{t-1} + \sum_{i=1}^p \Gamma_i \Delta Y_{t-i} + \Psi D_t + \varepsilon_t$$

where ΔY_t represents the change in the vector of endogenous variables at time t , while Y_{t-1} denotes the lagged level of those variables. The matrix Π captures the long-run equilibrium relationships among the variables, whereas Γ_i represents the short-run dynamic effects associated with lagged changes in the system. The term p denotes the selected lag length, and the summation component $\sum_{i=1}^p \Gamma_i \Delta Y_{t-i}$ captures the cumulative influence of past short-run changes on the current movement of the variables. The term D_t represents deterministic components or macroeconomic control variables included in the specification, while Ψ contains their associated coefficients. Finally, ε_t denotes the vector of innovations or unexpected shocks that are not explained by the lagged structure of the model.

The long-run matrix can be decomposed as:

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

where Π represents the long-run adjustment matrix in the VECM framework. The matrix β contains the cointegrating vectors that describe the stable long-run equilibrium relationships among the variables included in the system. The matrix α contains the adjustment coefficients and indicates how rapidly each variable responds when the system deviates from its long-run equilibrium. The transpose notation β' represents the transposed form of the cointegrating matrix used in the decomposition of Π . Accordingly, the product $\alpha \beta'$ links the estimated long-run equilibrium relationship with the speed at which short-run disequilibrium is corrected over time. A statistically meaningful adjustment coefficient therefore indicates that the corresponding variable contributes to restoring the system toward its long-run equilibrium after a monetary or financial disturbance.

Estimation Procedure

The empirical analysis followed a sequential time-series estimation procedure consistent with the analytical steps reported in the original manuscript. First, the Augmented Dickey-Fuller (ADF) test was used to examine the stationarity properties of the variables. Variables were evaluated at level and, where required by the original estimation, after differencing to determine their time-series characteristics. Second, the lag structure of the underlying Vector Autoregression representation was evaluated before

estimating the dynamic model. The Akaike Information Criterion (AIC) was used as the lag-selection criterion, as stated in the original methodological procedure. Third, the Johansen cointegration test was applied to determine whether the variables shared a stable long-run equilibrium relationship.

Following the preliminary time-series tests, the VECM was estimated to distinguish short-run adjustments from long-run equilibrium behavior. The error correction term was examined to assess the direction and speed of adjustment following deviations from the estimated equilibrium relationship. Ali et al. (2022) emphasized the importance of dynamic adjustment mechanisms when evaluating monetary transmission within systems containing both Islamic and conventional banking institutions. Short-run coefficients were interpreted from the differenced components of the estimated model, while long-run relationships were treated separately. This separation was maintained throughout the analysis to avoid conflating temporary fluctuations with equilibrium effects. The resulting estimates formed the basis for the subsequent dynamic-response analyses.

Impulse Response Function (IRF) analysis was used to trace the response of industrial production to shocks originating from Islamic and conventional monetary variables. The IRF framework enables the direction, magnitude, timing, and persistence of dynamic responses to be examined following an innovation within the estimated system. The analysis focused on how IPI responded to monetary and financial shocks over the forecast horizon used in the original estimation. The identification structure applied in the original analysis was retained to preserve consistency between the estimated VECM and the reported impulse responses. IRF results were interpreted comparatively to determine whether Islamic and conventional shocks generated different temporal response patterns. This analysis therefore complements the coefficient-based interpretation by illustrating how monetary disturbances propagate through the real sector over time.

Forecast Error Variance Decomposition (FEVD) was employed to assess the relative contribution of shocks in the monetary and financial variables to fluctuations in IPI. FEVD complements the IRF because it identifies the proportion of forecast variation attributable to innovations arising from different components of the system. The analysis was conducted across the forecast horizon specified in the original estimation rather than treating variance contributions as static quantities. Differences in the relative contribution of Islamic and conventional monetary shocks were used to compare the importance of the two transmission channels. The FEVD findings were interpreted together with the VECM coefficients and IRF trajectories to obtain a more comprehensive assessment of transmission strength. This combination of analytical procedures allows both the temporal response and relative explanatory contribution of monetary shocks to be evaluated.

Granger causality analysis was additionally used to examine directional predictive relationships between monetary variables and real-sector activity. The procedure evaluates whether past information contained in one variable contributes to predicting another variable within the estimated dynamic system. It does not, however, establish structural or experimental causation. The interpretation of Granger causality was therefore limited to predictive precedence and dynamic interdependence. Bidirectional relationships, where identified in the original analysis, were interpreted as evidence of feedback within the monetary-real-sector system rather than proof of causal reciprocity. This distinction ensures that the econometric interpretation remains consistent with the observational nature of the time-series data.

Diagnostic, Stability, and Robustness Assessment

Diagnostic procedures were incorporated to evaluate the statistical adequacy of the estimated dynamic model. Serial-correlation testing was used to assess whether systematic temporal dependence remained in the residuals after estimation. Heteroskedasticity testing was conducted to examine whether the variance of the residuals remained stable across the observation period. Model stability was assessed using the CUSUM and CUSUMSQ procedures reported in the original methodological framework. These diagnostics were considered alongside the VECM estimates because dynamic-response analyses require

an adequately specified and stable underlying system. The diagnostic results were therefore treated as supporting evidence for model adequacy rather than as independent substantive findings.

Potential structural instability was also considered because the observation period includes the COVID-19 disruption. The original methodology specified the Chow and Zivot-Andrews procedures to examine whether structural changes occurred during the study period. The Chow test represents a predetermined-break approach, whereas the Zivot-Andrews procedure allows a structural break to be assessed endogenously within the series. Structural-break evidence was interpreted cautiously because short-run macroeconomic volatility should not automatically be treated as evidence of a permanent change in monetary transmission. The structural analysis was therefore considered supplementary to the baseline VECM rather than a replacement for the main dynamic specification. Any interpretation of pandemic-related changes was restricted to the structural-break evidence reported in the empirical results.

Additional robustness procedures were incorporated in the original research design to assess whether the substantive conclusions remained stable under alternative analytical conditions. The manuscript reported sensitivity analysis involving alternative measures of real-sector activity, alternative interbank specifications, and comparisons across pandemic-related subperiods. Robustness was evaluated in terms of the consistency of coefficient directions, relative magnitudes, dynamic-response patterns, and the comparative interpretation of Islamic and conventional transmission channels. Variance inflation factors were reported as an assessment of potential multicollinearity rather than as a procedure for eliminating multicollinearity. Comparative elasticity analysis was also included in the original methodological framework to examine differences in responsiveness between the two monetary channels. These supplementary analyses were interpreted only in conjunction with the corresponding numerical evidence reported in the Results section.

The original methodology further included a policy simulation based on a ± 50 -basis-point adjustment in the SBIS rate. The simulation was designed to examine the associated dynamic response of industrial production within the estimated monetary-transmission framework. The simulated response was interpreted through the IRF structure rather than treated as an independent causal experiment. Its purpose was to translate the estimated dynamics into a policy-relevant scenario concerning Sharia-based monetary intervention. The simulation was therefore considered supplementary to the baseline VECM, IRF, and FEVD analyses. All econometric estimation, diagnostic testing, dynamic-response analysis, and policy simulation reported in the study were conducted using EViews 13.

RESULTS AND DISCUSSION

Results

The results are organized to show the dynamic behavior of Indonesia's dual monetary transmission system from several complementary perspectives. The analysis first presents the VECM estimates and equilibrium-adjustment mechanism, followed by the impulse-response patterns, variance decomposition, robustness checks, and dynamic interdependence between monetary variables and industrial production. This sequence allows the short-run responses, longer-term adjustment process, and relative contribution of Islamic and conventional monetary channels to be interpreted in a coherent manner.

VECM Estimation and Equilibrium Adjustment

The estimation results indicate that the variables included in the dual monetary system exhibit a long-run equilibrium relationship. The Johansen cointegration analysis reported in the original estimation identified one cointegrating relationship, providing the empirical basis for applying the Vector Error Correction Model. The error correction term, $ECT(-1)$, was negative and statistically significant, with a coefficient of -0.340 and a probability value below 0.001 . This coefficient indicates that approximately 34% of the previous period's deviation from equilibrium was adjusted within one quarter.

The negative sign of the ECT is consistent with an equilibrium-restoring mechanism in the estimated system. These findings support the separation of short-run dynamics from the longer-term adjustment process in interpreting the VECM estimates.

Table 2 reports the short-run coefficients associated with Islamic and conventional monetary and financial variables. Changes in the SBI rate had a negative coefficient of -0.185 with a probability value of 0.003 , while changes in the SBIS rate also showed a negative coefficient of -0.128 with a probability value of 0.021 . Positive coefficients were reported for changes in PUAS volume (0.097), PUAB volume (0.076), Islamic financing (0.214), and conventional credit (0.166), with each coefficient statistically significant at the conventional 5% level. Among the two policy-related rate variables, the absolute magnitude of the SBI coefficient was larger than that of the SBIS coefficient. Islamic financing showed a larger positive short-run coefficient than conventional credit in the reported VECM equation. These coefficients are interpreted as short-run associations because they correspond to differenced variables within the error-correction specification.

Table 2. Short-Run VECM Estimation Results

Variable	Coefficient	t-Statistic	Probability
$\Delta(\text{SBIS Rate})$	-0.128	2.34	0.021
$\Delta(\text{PUAS Volume})$	0.097	2.51	0.014
$\Delta(\text{SBI Rate})$	-0.185	3.02	0.003
$\Delta(\text{PUAB Volume})$	0.076	1.98	0.048
$\Delta(\text{Islamic Financing})$	0.214	3.35	0.001
$\Delta(\text{Conventional Credit})$	0.166	2.78	0.006
ECT(-1)	-0.340	4.21	<0.001

Source: Author's estimation using EViews 13.

Table 2 shows that the two monetary channels differ in their reported short-run response patterns. The conventional SBI rate exhibits a larger negative coefficient than the Islamic SBIS rate, indicating a comparatively stronger immediate association with industrial production in the estimated equation. By contrast, the positive coefficient for Islamic financing is larger than the corresponding coefficient for conventional credit. The positive PUAS and PUAB coefficients indicate that changes in interbank liquidity are associated with positive short-run movements in industrial production. These comparisons describe relative short-run patterns within the reported model and should not be interpreted as evidence that one system is universally more effective than the other. Long-run differences require evidence from the normalized cointegrating relationship and are therefore not inferred directly from the differenced coefficients in Table 2.

Impulse Response Analysis

The Impulse Response Function analysis was used to examine how industrial production responded dynamically to shocks originating from Islamic and conventional monetary channels. The reported trajectories indicate that a shock to Islamic financing generated a more gradual response in IPI and reached its strongest response after approximately five to six quarters. In contrast, the response associated with conventional credit was more immediate and was reported to weaken after approximately three quarters. Monetary-rate shocks generated negative responses in IPI for both the Islamic and conventional channels. The response to the SBIS-rate shock was reported to be less pronounced than the response associated with the conventional SBI rate. This difference suggests that the two transmission channels vary not only in the magnitude of their responses but also in the speed at which monetary impulses are absorbed by the real sector. The relatively longer persistence of the Islamic financing response indicates that its transmission may operate through a more gradual adjustment process, whereas conventional credit appears to transmit shocks more rapidly. These contrasting trajectories provide additional evidence that monetary transmission effectiveness should be evaluated across both response intensity and persistence rather than solely on the basis of immediate effects.

Overall, the IRF patterns indicate differences in the timing and persistence of monetary transmission across the two channels.

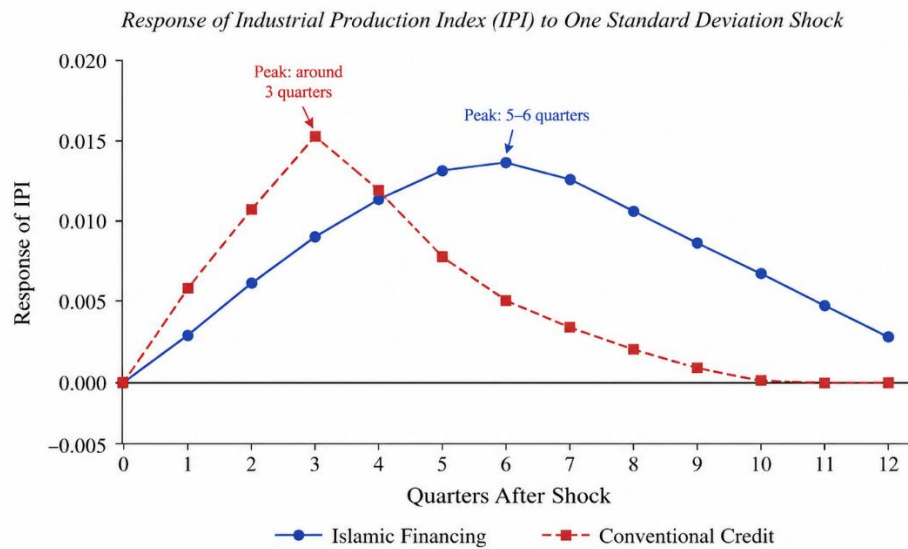


Figure 1. Impulse Response of Industrial Production to Islamic and Conventional Monetary Shocks
Source: Author's estimation using EViews 13.

Figure 1 illustrates the different temporal profiles reported for Islamic and conventional financial shocks. The Islamic-financing response develops more gradually and remains visible for a longer period, whereas the conventional-credit response exhibits a sharper initial adjustment followed by a more rapid decline. This difference suggests that transmission through the two financing channels may vary in persistence even when both are associated with movements in industrial activity. The figure also indicates contractionary responses of IPI following increases in the monetary-rate variables. These patterns describe the dynamic behavior generated by the estimated system rather than structural causal effects. Any confidence bands available in the original EViews output should be retained in the final published figure to show the uncertainty surrounding the estimated responses.

Forecast Error Variance Decomposition

The Forecast Error Variance Decomposition provides complementary evidence on the relative contribution of monetary and financial shocks to fluctuations in industrial production. According to the values reported in the original analysis, conventional credit accounted for approximately 35% of the variation in IPI at the forecast horizon used by the authors. Islamic financing accounted for approximately 28%, while PUAS contributed approximately 19% of the reported IPI variation. Conventional credit therefore represented the largest individual contribution among these reported components. Islamic financing nevertheless accounted for a substantial proportion of the variation, indicating that the Islamic financial-intermediation channel also plays a meaningful role in the estimated system. These percentages should be interpreted at the forecast horizon associated with the original FEVD output rather than as time-invariant contributions.

Table 3. Reported FEVD Contributions to Industrial Production

Shock Variable	Reported Contribution to IPI Variation
Conventional Credit	35%
Islamic Financing	28%
PUAS Volume	19%

The FEVD findings should be interpreted together with the impulse-response results because the two procedures measure different aspects of monetary transmission. FEVD indicates the relative contribution of individual shocks to forecast variation, whereas IRF describes the direction and persistence of the response following a specific innovation. Thus, the larger reported FEVD share of conventional credit does not necessarily contradict the more persistent response associated with Islamic

financing in the IRF analysis. Instead, the results suggest that the conventional channel may account for a larger proportion of variation while the Islamic financing channel may display a more gradual temporal response. This distinction provides a more balanced comparison of the two transmission mechanisms than relying on a single coefficient or percentage. The results therefore indicate differences in both relative contribution and dynamic persistence across the Islamic and conventional channels.

Robustness and Sensitivity Analysis

The original analysis reported several sensitivity checks to examine whether the main transmission patterns remained similar under alternative empirical specifications. The baseline model using IPI was compared with specifications employing the Manufacturing Production Index and the Purchasing Managers' Index as alternative representations of real-sector activity. Another specification replaced the original interbank variables with interbank-spread measures, while a further comparison examined the reported patterns across pre- and post-COVID periods. The manuscript indicates that the main direction of the findings was broadly maintained across the alternative output indicators and interbank specification. The pandemic-related comparison further indicated that Islamic-channel responses remained relatively stable, whereas some conventional-channel effects weakened in the later period. Because complete numerical estimates are not available in the manuscript, these findings are presented as reported sensitivity patterns rather than as independently verified robustness estimates.

Table 4. Reported Robustness and Sensitivity Checks

Model	Outcome / Specification	Main Modification	Reported Result
Model 1	Industrial Production Index	Baseline specification	Core pattern maintained
Model 2	Manufacturing Production Index	Alternative real-sector indicator	Similar overall pattern
Model 3	Purchasing Managers' Index	Alternative real-sector indicator	Similar overall pattern
Model 4	Interbank spread	Alternative liquidity specification	Broadly stable reported pattern
Model 5	Pre-/post-COVID comparison	Subperiod analysis	Islamic-channel effects reported as relatively more stable

Source: Author's reported robustness and sensitivity analysis.

Table 4 should be interpreted as a summary of the robustness procedures reported by the authors rather than as a substitute for complete estimation output. The available manuscript does not provide model-specific coefficients, standard errors, or probability values for all alternative specifications. For this reason, terms such as "robust" or "stable" are used cautiously and only to describe the patterns reported in the original analysis. The alternative specifications nevertheless provide an indication that the principal comparison between Islamic and conventional channels was not restricted exclusively to the baseline IPI model. Stronger empirical verification would require the complete numerical outputs for each alternative specification. Accordingly, the robustness evidence is treated as supplementary rather than as the primary basis for the study's conclusions.

Dynamic Interdependence and Granger Causality

The Granger causality analysis reported in the study indicates predictive relationships between monetary variables and industrial production. The manuscript reports bidirectional relationships between the monetary system and IPI, suggesting that lagged monetary conditions contribute information for predicting industrial activity and that past real-sector conditions may also contain information relevant to monetary variables. Such bidirectional predictability is consistent with a dynamically interdependent monetary-real-sector system. However, Granger causality does not establish structural, experimental, or policy causation. The findings are therefore interpreted as evidence of predictive precedence and feedback rather than as proof that one variable causally determines another. This interpretation maintains consistency with the observational time-series design used in the study.

The original analysis also reports the use of Cholesky decomposition to identify the sequence through which shocks were transmitted within the estimated system. The reported ordering was SBIS, PUAS, Islamic financing, SBI, PUAB, conventional credit, and IPI. This ordering places the monetary and liquidity variables before the real-sector indicator in constructing orthogonalized shocks. The reported analysis indicated that the main dynamic patterns were maintained under the identification structure used by the authors. Because impulse-response estimates can be sensitive to variable ordering, the resulting comparisons should be interpreted within this identification framework. The ordering should therefore be retained consistently in the final figure and accompanying methodological explanation.

Pre- and Post-Pandemic Dynamic Patterns

The original analysis additionally compared impulse-response patterns across periods surrounding the COVID-19 disruption. The reported results indicate that Islamic financing maintained a relatively stable positive response pattern in the later period, whereas the response associated with conventional credit declined in amplitude. This comparison suggests that the temporal behavior of the two financial-intermediation channels may have changed during the period covered by the analysis. The available evidence is descriptive of differences in the estimated response trajectories and should not be interpreted as proof that the pandemic itself caused the observed change. The comparison nevertheless provides supplementary information on the stability of the two transmission channels under different macroeconomic conditions. The results are presented graphically in Figure 2.

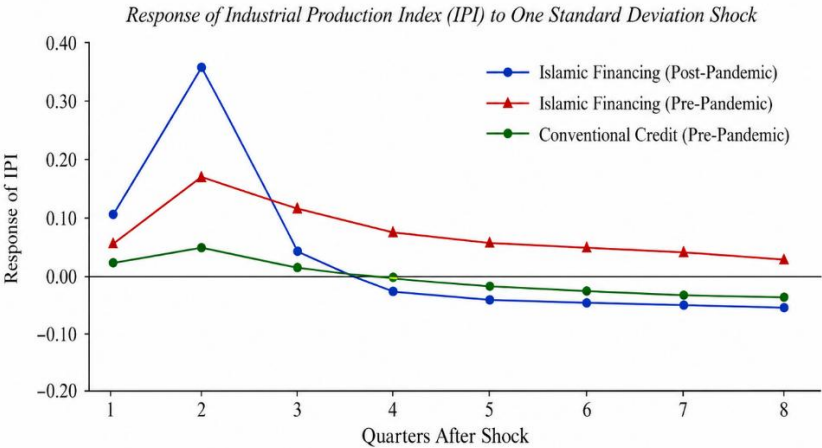


Figure 2. Comparison of Impulse Responses Before and After the COVID-19 Disruption
Source: Author’s estimation using EViews 13.

Figure 2 presents the comparative response patterns reported for the periods surrounding the pandemic disruption. Islamic financing displays a relatively persistent response pattern, while the conventional-credit response is reported to decline in amplitude in the later period. The figure therefore provides visual evidence of differences in the temporal stability of the two financing channels. These differences should be interpreted cautiously because the available manuscript does not provide complete subperiod estimation statistics. The figure is best treated as supplementary dynamic evidence rather than a standalone test of structural resilience. Any interpretation of stronger post-pandemic resilience should consequently remain conditional on the underlying estimation results.

Discussion

The findings reveal that Islamic and conventional monetary channels in Indonesia exhibit distinct transmission patterns while remaining interconnected within the same macroeconomic system. The short-run VECM estimates show negative associations between policy-related rate changes and industrial production for both channels, with the SBI coefficient larger in absolute magnitude than the SBIS coefficient. This pattern suggests that the conventional rate channel generates a comparatively stronger immediate response in industrial activity, although it should not be interpreted as evidence of superior overall effectiveness. Similar heterogeneity has been identified by Caporale et al. (2020), who found

differences in the responses of Islamic and conventional lending channels to monetary-policy shocks, while Boukhatem and Djelassi (2022) demonstrated that bank-lending transmission can differ systematically across the two banking systems. In Indonesia, Triwibowo et al. (2022) also showed that policy-rate pass-through differs between Islamic and conventional banking and varies with macroeconomic conditions. The present findings therefore reinforce the view that dual monetary transmission operates through differentiated rather than homogeneous adjustment mechanisms.

The financial-intermediation results provide further evidence of this heterogeneity. Islamic financing exhibited a positive short-run coefficient of 0.214, compared with 0.166 for conventional credit, indicating a stronger reported short-run association between changes in Islamic financing and industrial production within the estimated equation. This finding should be interpreted within the specific model and observation period rather than generalized as evidence that Islamic financing is inherently more effective than conventional credit. Ali et al. (2022) found that Islamic bank financing and deposits can play important roles in transmitting monetary-policy effects to economic output in a dual banking system, while Audah and Kasri (2020) reported that Islamic deposits and financing contribute to monetary transmission in Indonesia and Malaysia, although their overall role remains comparatively modest. The existence of a distinct Islamic financing channel is also consistent with the broader assessment of Savon and Yousfi (2025), who emphasize that the transmission of conventional monetary-policy impulses through Islamic banks remains institutionally different and context dependent. Consequently, the present results are better interpreted as evidence of differentiated intermediation responses than as a simple ranking of the two banking systems.

The impulse-response analysis provides an additional dimension by showing differences in the timing and persistence of the two financing channels. Islamic financing produced a more gradual response in industrial production, reaching its strongest reported response after approximately five to six quarters, whereas the conventional-credit response appeared earlier and weakened after approximately three quarters. These temporal differences demonstrate that the magnitude of an immediate coefficient alone is insufficient for evaluating monetary-transmission effectiveness. Audah and Kasri (2020) similarly used impulse-response and variance-decomposition analyses to show that Islamic financing participates in real-sector monetary transmission, while Kismawadi (2024) demonstrated through a VECM framework that Islamic banking and macroeconomic variables can exhibit meaningful short- and long-horizon dynamics. Evidence from Saudi Arabia reported by Ben Amar (2022) also suggests that the sensitivity of real economic activity to Islamic financing can display different volatility characteristics from its sensitivity to conventional credit. The present IRF patterns therefore support an interpretation in which conventional credit responds more rapidly, whereas Islamic financing exhibits a comparatively gradual and persistent adjustment profile.

These differences can partly be understood from the institutional characteristics of the two financial systems, although the empirical results do not permit strong claims about the superiority of either contractual structure. Islamic financing operates under contractual arrangements that differ from conventional interest-based lending, which can influence how pricing, liquidity, and financing adjustments occur following monetary disturbances. Saeed et al. (2023) showed that Islamic bank rates remain connected to conventional benchmarks in dual banking systems, but their adjustment is shaped by both economic and institutional considerations. At the same time, Toh and Jia (2023) found that Islamic and conventional banks display heterogeneous liquidity-creation behavior, with institutional characteristics contributing to differences between the two banking models. Such evidence provides a plausible context for the different response trajectories observed in the present analysis without implying that Islamic financing is completely insulated from conventional monetary conditions. The results instead suggest that institutional differentiation can coexist with considerable interaction between Islamic and conventional financial channels.

The FEVD findings further clarify the relative importance of the two transmission mechanisms. Conventional credit accounted for approximately 35% of the reported variation in IPI, compared with

approximately 28% for Islamic financing and 19% for PUAS at the forecast horizon used in the original estimation. The larger contribution of conventional credit indicates that the conventional intermediation channel remains quantitatively important in explaining fluctuations in Indonesia's industrial activity. Nevertheless, the contribution of Islamic financing is sufficiently substantial to indicate that the Islamic channel is not peripheral within the estimated dual monetary system. Caporale et al. (2020) documented meaningful differences between Islamic and conventional bank-lending channels, while Boukhatem and Djelassi (2022) showed that monetary shocks can produce heterogeneous lending responses across the two banking structures. Hence, the FEVD and IRF findings should be considered jointly: conventional credit accounts for a larger share of reported output variation, whereas Islamic financing displays a comparatively more persistent dynamic response.

The negative and statistically significant error correction term adds an important equilibrium dimension to these short-run and dynamic findings. The reported ECT coefficient of -0.340 indicates that approximately 34% of the previous period's disequilibrium is corrected within one quarter, suggesting that deviations from the estimated long-run relationship are gradually reversed. This result supports the existence of an equilibrium-restoring mechanism connecting monetary, financial-intermediation, and real-sector variables within the estimated system. Using a VECM approach, Kismawadi (2024) likewise identified meaningful long-run relationships between Islamic banking activity, macroeconomic variables, and economic growth across developing economies. The present ECT result is therefore consistent with the broader literature indicating that Islamic financial variables can participate in long-horizon macroeconomic adjustment. However, because the complete normalized cointegrating equation is not reported in the available manuscript, the ECT should not be used to claim that either the Islamic or conventional channel independently dominates the long-run equilibrium.

The reported Granger-causality findings further suggest that monetary conditions and industrial production interact dynamically rather than through a strictly one-directional mechanism. Bidirectional predictability indicates that lagged monetary and financial information contributes to forecasting industrial activity, while past real-sector conditions may also contain information relevant to subsequent monetary developments. This feedback structure is consistent with the idea that monetary transmission is conditioned by the state of the broader economy. For Indonesia, Triwibowo et al. (2022) found that policy-rate pass-through varies across business-cycle conditions, highlighting the importance of macroeconomic context in understanding the behavior of both Islamic and conventional banking rates. Similarly, Aji and Sukmana (2023) demonstrated that the consequences of Indonesia's dual monetary policy extend beyond financial-sector variables to broader economic outcomes, although their study focused specifically on income inequality. The present findings extend this interconnected perspective to industrial production, while Granger causality is interpreted strictly as predictive precedence rather than structural causation.

The sensitivity analyses provide supplementary, rather than definitive, evidence regarding the stability of the main results across alternative specifications and pandemic-related conditions. The reported comparison indicates that Islamic financing maintained a relatively persistent response pattern, whereas the conventional-credit response declined in amplitude during the later period. This observation is compatible with Ben Amar (2022), who found differences in the volatility of real-sector responses to Islamic financing and conventional credit, but notably did not establish that Islamic banks are universally more stabilizing. It is also consistent with the broader review by Savon and Yousfi (2025), which shows that the strength of Islamic-bank monetary transmission varies considerably across institutional settings, market structures, and empirical specifications. The pandemic-related pattern in the present study should therefore be interpreted as a context-specific difference in response persistence rather than proof that Islamic financing is intrinsically more resilient during crises. Such caution is particularly important because the robustness section of the available manuscript does not report complete numerical estimates for every alternative specification.

Taken together, the results support a complementary but asymmetric interpretation of Indonesia's dual monetary system. The conventional channel exhibits comparatively stronger immediate rate sensitivity and a larger reported contribution to IPI variation, whereas the Islamic financing channel shows a relatively gradual and persistent response and a meaningful contribution to real-sector fluctuations. This combination suggests that monetary-policy effectiveness in a dual system cannot be evaluated using a single criterion such as coefficient magnitude, because transmission also depends on response speed, persistence, intermediation structure, and macroeconomic conditions. Ali et al. (2022) and Audah and Kasri (2020) similarly demonstrate that Islamic banking can participate meaningfully in monetary transmission without necessarily replicating the behavior of conventional banking, while Saeed et al. (2023) highlight the continuing interaction between the two systems. The findings therefore contribute to the literature by showing how the two monetary channels can generate different temporal patterns within the same Indonesian real-sector environment. Rather than portraying Islamic and conventional monetary mechanisms as either substitutes or competitors, the evidence supports viewing them as interconnected channels with different transmission characteristics.

Implications

The findings have several implications for monetary policy within Indonesia's dual financial system. The stronger short-run response associated with the conventional SBI rate indicates that conventional instruments remain important for transmitting relatively immediate policy signals to industrial activity. At the same time, the more gradual and persistent response of Islamic financing suggests that Sharia-compliant financial intermediation may contribute differently to real-sector adjustment over longer response horizons. The FEVD results, in which conventional credit accounts for the largest reported share of IPI variation while Islamic financing and PUAS also contribute meaningfully, indicate that policy effectiveness should be assessed in terms of transmission speed, persistence, and relative contribution rather than through a single measure. These patterns support a coordinated policy approach in which Islamic and conventional monetary channels are treated as complementary mechanisms with distinct transmission characteristics.

Limitations

Several limitations should be considered when interpreting the findings. First, the study relies on quarterly data from Q1 2018 to Q4 2022, resulting in a relatively short observation window for estimating a multivariate VECM with several monetary, financial, and macroeconomic variables. Second, the impulse-response and variance-decomposition results depend on the identification structure and Cholesky ordering used in the original estimation, meaning that alternative orderings could potentially generate different dynamic responses. Third, the use of aggregate indicators such as IPI, Islamic financing, and conventional credit may conceal heterogeneity across industries, financial institutions, financing contracts, and borrower groups. Future studies should therefore extend the observation period, test alternative identification strategies, and incorporate more disaggregated or nonlinear modeling approaches to improve the robustness and generalizability of the findings.

Suggestions

Future studies should enrich the dual monetary framework by employing micro-level panel data across Islamic and conventional banks to uncover heterogeneity in transmission intensity. Incorporating digital Islamic finance indicators could provide insights into how fintech-based liquidity tools influence policy effectiveness. Comparative analyses across Southeast Asia and MENA regions would enhance the generalizability of results. Moreover, integrating fiscal policy coordination and macroprudential instruments within the same framework could yield more holistic insights. Finally, advancing the current linear VECM to nonlinear or time-varying parameter models would capture structural changes in transmission dynamics, making the analysis more adaptive to evolving monetary landscapes.

CONCLUSION

This study shows that Islamic and conventional monetary channels in Indonesia operate through distinct but interconnected transmission mechanisms affecting real-sector activity. The short-run VECM estimates indicate a stronger immediate response associated with the conventional policy-rate channel, while Islamic financing exhibits a comparatively larger positive short-run coefficient than conventional credit within the reported model. The negative and significant error correction term further indicates that deviations from the estimated long-run equilibrium are partially corrected over subsequent quarters, confirming the presence of an equilibrium-adjustment mechanism within the dual monetary system. The impulse-response and variance-decomposition results reveal that conventional credit contributes more strongly to reported IPI variation, whereas Islamic financing displays a more gradual and persistent response pattern. Taken together, these findings support a complementary but asymmetric interpretation of Indonesia's dual monetary structure, in which the two channels differ in response speed, persistence, and relative contribution to industrial dynamics. The study therefore contributes to the literature by showing that the effectiveness of dual monetary transmission should be evaluated across multiple dynamic dimensions rather than through a simple comparison of which channel is stronger.

AUTHOR CONTRIBUTIONS STATEMENT

Malik Shahzad Shabbir contributed to the conceptualization of the study, development of the theoretical framework, research design, methodological formulation, and interpretation of the econometric findings. He also contributed to the preparation of the original manuscript, particularly the introduction, methodology, results interpretation, and overall integration of the Islamic and conventional monetary transmission framework. Riyan Damara Putra contributed to data organization, literature review, interpretation of the empirical findings, preparation of the discussion and policy implications, and refinement of the manuscript for academic clarity and consistency. Both authors participated in reviewing and editing the manuscript, ensuring coherence between the research objectives, methods, results, and conclusions. Both authors read and approved the final version of the manuscript and agreed to be accountable for the integrity and accuracy of the work.

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