

U.S. Monetary Policy Spillovers and Macroeconomic Adjustment in ASEAN-4

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Received: November 2025 | Revised: March 2026 | Accepted: June 2026

Abstract

The increase in the Federal Funds Rate (FFR) by the United States increases the potential for spillovers to the macroeconomic stability of developing countries, particularly in the ASEAN region, which has a high level of trade openness and financial integration. This study aims to analyze the transmission mechanism of US monetary policy spillovers to macroeconomic fundamentals in Indonesia, Malaysia, the Philippines, and Thailand through the interest rate, exchange rate, and investment channels. The study uses quarterly data for the 2005–2024 period using a Vector Autoregression (VAR) approach supported by the Impulse Response Function (IRF) and Forecast Error Variance Decomposition (FEVD) to evaluate the dynamic relationships, responses to shocks, and the relative contribution of each variable. The results show that US monetary policy spillovers are heterogeneous and are transmitted more predominantly through the monetary channel than the real sector. VAR estimates indicate that the Federal Funds Rate (FFR) transmission is most consistent through the domestic interest rate channel in Malaysia, the Philippines, and Thailand, while Indonesia is more responsive through the exchange rate channel to inflation. However, this influence does not continue significantly on investment or economic growth. The IRF analysis shows that Indonesia, the Philippines, and Thailand exhibit convergent adjustment mechanisms to FFR shocks, while Malaysia exhibits an unstable response. The FEVD results confirm that variations in economic growth in Indonesia, the Philippines, and Thailand are still dominated by domestic shocks. This finding confirms that the effectiveness of global monetary policy transmission is largely determined by domestic economic fundamentals, policy credibility, and the structural characteristics of each country. Therefore, strengthening the mix of monetary, fiscal, and macroprudential policies, as well as deepening financial markets, are key to increasing macroeconomic resilience to global monetary shocks.

Keywords: Federal Funds Rate; monetary policy spillover; Vector Autoregression; Impulse Response Function; Forecast Error Variance Decomposition

JEL classification: E52; E58; F42; F44; C32

How to Cite: Indrawati, Y., Sabirin, M. T., Annegrat, A. M. (2026). U.S. Monetary Policy Spillovers and Macroeconomic Adjustment in ASEAN-4, *Jurnal Ekonomi Pembangunan*:

1. INTRODUCTION

Episodes of monetary tightening in the United States (US) have repeatedly influenced global macroeconomic conditions. When inflation rises, the US Federal Reserve (The Fed) increases the Federal Funds Rate (FFR) to restore price stability. These policy changes affect not only the US but also other economies. Emerging and developing countries, particularly those that rely heavily on international trade and capital flows, are often the most affected by US monetary tightening (Nguyen, 2020). The global financial cycle hypothesis explains this transmission mechanism. According to Miranda-Agrippino and Rey (2020), US monetary policy shapes global leverage, risk premia, and capital flows, transmitting contractionary shocks even to countries with flexible exchange rate regimes. Similarly, Georgiadis (2016) finds that US monetary shocks generate significant output spillovers across countries, with the magnitude of these effects depending on factors such as trade openness, financial integration, exchange rate regimes, and institutional characteristics.

The financial sector is highly sensitive to global policy changes, allowing shocks to spread rapidly across economies, particularly in developing countries. Changes in US monetary policy are often followed by policy adjustments in its trading partners and other developing economies to preserve macroeconomic stability (Willems, 2020; Yoldas, 2024). Both monetary easing and tightening in the US increase uncertainty in global financial markets and generate macroeconomic shocks across countries (Bartocci et al., 2024; Kallianiotis, 2019; Tillmann, 2020). In developing economies, capital flows volatile amplify these external shocks, weakening macroeconomic fundamentals through exchange rate volatility, inflationary pressures, and reduced investment (Cecchetti et al., 2020). The dominant role of the US dollar further strengthens the international transmission of US monetary policy, reducing the effectiveness of independent monetary policy in developing countries while exerting significant spillover effects on domestic economic activity.

As the Federal Reserve (Fed) continues monetary policy normalization in response to stronger economic and labour market conditions, emerging economies require greater policy resilience. Comprehensive policies that identify early signs of global financial stress can reduce the impact of external shocks, particularly on trade and financial markets. Diversifying trade and financial partnerships is equally important to reduce dependence on the US market, especially as the Fed's balance sheet reduction may weaken US import demand and reduce export opportunities for developing countries (Jump & Michell, 2023). Tighter US monetary policy also lowers capital inflows by increasing the attractiveness of returns in advanced economies. Combined with weaker commodity prices and slowing global trade, these developments intensify pressure on domestic economies. Strengthening domestic financial markets and increasing demand for local financial assets can therefore reduce external dependence and improve economic resilience.

Recent studies identify several transmission mechanisms through which US monetary policy affects emerging markets. Perego et al. (2024) introduce the commodity-finance

channel, showing that global interest rate shocks amplify financing constraints across commodity-dependent sectors, even in economies with limited direct financial integration. Similarly, Ahmed et al. (2021) find that higher US interest rates may generate moderate positive spillovers for emerging economies with strong macroeconomic fundamentals but adverse effects for more vulnerable economies. Miranda-Agrippino & Rey (2020) further demonstrate that contractionary US monetary policy reduces global credit supply, lowers international capital flows, appreciates the US dollar, weakens household balance sheets, and increases corporate funding costs through higher risk premia.

Empirical evidence consistently confirms these spillovers. US monetary tightening rapidly affects interest rates in emerging markets (Edwards, 2010), influences sovereign bond yields through changes in term premia (Albagli et al., 2019), and contributes to exchange rate depreciation, reserve depletion, and tighter liquidity conditions (Sikhwil, 2024). Even unconventional US monetary policy measured by shadow rates generates significant macroeconomic effects (Wu & Xia, 2016). Such policies also create negative spillovers for Asian economies by reducing inflation, output, stock market performance, and commodity demand (Fan & Chen, 2024; Tran & Pham, 2020).

Evidence from China highlights how these shocks extend to the real sector. Contractionary US monetary policy suppresses innovation, particularly among export-oriented firms with high exposure to the US market, reducing productivity and output (Feng et al., 2024). Zhang et al. (2024) identify trade, exchange rate, and financial channels linking US tightening to inflation and output contraction, while Tian et al. (2023) show that higher US interest rates reduce capital inflows and economic activity through capital flow channels. Eklou (2023) argues that foreign exchange intervention, liquidity instruments, and macroprudential policies strengthen monetary transmission and help maintain domestic price stability during global monetary tightening.

Recent literature also emphasizes heterogeneous spillover effects. Financial stress increases with US monetary tightening, but the magnitude depends on domestic monetary independence (Sen & Sensarma, 2026). US monetary policy uncertainty intensifies exchange rate volatility (Sosa et al., 2025), while the transmission mechanism varies according to the origin of shocks and the degree of commodity dependence (Cheng & You, 2025; Perego et al., 2024). Moreover, dependence on US dollar liquidity increases vulnerability during tightening cycles (Jump & Michell, 2023), indicating that the impact of US monetary policy is shaped not only by external shocks but also by domestic economic structures and policy credibility.

The existing literature consistently shows that US monetary tightening increases macro-financial vulnerability in emerging markets through exchange rate depreciation, capital outflows, bond yield volatility, financial stress, and slower economic growth. However, most studies focus on short-term responses and often interpret these effects as evidence of long-term structural dependence (Lastauskas & Nguyen, 2024). External shocks from major economies can spread through trade, macroeconomic, and spatial linkages. For example, the US-China trade war significantly affected Indonesia's inflation, exports, imports, and exchange rate, demonstrating how global tensions can increase volatility and complicate macroeconomic management (Retnasih & Syahda, 2025). Similarly, economic shocks

propagate across ASEAN economies through regional macroeconomic interdependence, influencing inflation, money supply, and unemployment (Retnasih & Herdianti, 2023). Spillovers also occur through structural linkages across regions, reinforcing the systemic nature of transmission effects (Khotiawan et al., 2023).

Despite strong evidence of spillovers, an important gap remains. Few studies explicitly distinguish between temporary cyclical adjustments and persistent structural dependency. In practice, US monetary shocks operate through interconnected channels: exchange rate depreciation affects inflation, inflation influences domestic interest rates, tighter policies reduce investment and output, and capital flow volatility feeds back into financial stability. Without examining these linkages jointly, conclusions regarding structural dependency remain incomplete.

This issue is particularly relevant for ASEAN-4 countries (Indonesia, Malaysia, Thailand, and the Philippines), which share similar characteristics in trade openness, commodity exposure, inflation-targeting frameworks, and financial integration. The Impossible Trinity framework states that countries cannot simultaneously maintain exchange rate stability, free capital mobility, and independent monetary policy (Obstfeld & Rogoff, 1995; Aizenman et al., 2013). Although ASEAN-4 economies remain vulnerable to Federal Funds Rate (FFR) increases through capital outflows and currency depreciation, recent studies suggest that exchange rate flexibility, foreign exchange reserves, macroprudential policies, and credible monetary frameworks can reduce these trade-offs (Rey, 2013; Aizenman et al., 2013). Therefore, this study examines whether institutional reforms have strengthened ASEAN-4 resilience across US monetary tightening cycles, highlighting how adaptive policy mixes can mitigate external shocks while preserving domestic stability.

The impact of US monetary tightening on developing countries is diverse, affecting financial stability, economic output, and exchange rates. Tightening of US monetary policy, such as interest rate hikes, often leads to capital outflows from developing countries, leading to currency depreciation and increased financial market volatility. The Financial Accelerator Theory (Bernanke et al., 1999) explains that the impact of global monetary shocks is amplified or mitigated by financial sector conditions through the balance sheet and credit channels. An increase in the FFR increases global funding costs, triggers capital outflows, and weakens the exchange rate. This worsens corporate balance sheets and increases the external finance premium, making banks more selective in disbursing credit, ultimately slowing investment and consumption in the real sector. Conversely, countries with deep financial systems, strong capitalization, and effective macroprudential policies are able to mitigate this financial accelerator effect (Bruno & Shin, 2015; Miranda & Rey, 2020). In the ASEAN-4 context, this theory explains why the impact of US monetary tightening on the macroeconomy can vary. The level of vulnerability of each country is determined not only by the magnitude of the FFR increase, but also by the strength of domestic financial fundamentals and the health of its private sector balance sheet in absorbing external shocks. US monetary tightening can lead to increased financial market volatility in developing countries, as seen during the 2013 taper tantrum and the 2022 dollar tightening cycle (Jump

& Michell, 2023). Capital outflows from developing countries are inevitable, directly contributing to exchange rate depreciation and financial instability. Increases in US interest rates significantly reduce output in emerging markets, with a lasting decline in economic growth (Lastauskas & Nguyen, 2024). Developing countries often experience currency depreciation due to capital outflows, which can increase the cost of servicing dollar-denominated debt. Heterogeneity in responses to US monetary policy is influenced by factors such as the exchange rate regime and central bank independence. Measures of financial depth and activity are crucial in assessing vulnerability to external shocks (Jump & Michell, 2023).

The New Open Economy Macroeconomics (NOEM) perspective explains that global monetary shocks are transmitted through financial and trade channels. In contrast to the traditional model, NOEM emphasizes that changes in the real exchange rate trigger an expenditure-switching mechanism, namely a shift in demand between domestic and foreign goods (Obstfeld & Rogoff, 1995). In the ASEAN-4 region, an increase in the FFR triggers capital outflow and depreciates the domestic currency, where this condition on the one hand increases the competitiveness of exporters, but on the other hand increases import costs and triggers inflation (exchange rate pass-through).

Research on US monetary policy spillovers has extensively demonstrated that changes in the Federal Funds Rate (FFR) affect exchange rates, capital flows, inflation, and economic growth in developing countries (Harjes et al., 2020; Klau & Mohanty, 2011; Tian et al., 2023; Fan & Chen, 2024; Akpa et al., 2024). However, most studies have focused on estimating the average impact across countries or evaluating only one or two transmission channels separately. This approach fails to explain how the transmission mechanism of US monetary policy operates dynamically across countries, given that each country has different economic structure characteristics, financial market depth, and monetary policy responses. Furthermore, previous research has generally focused on the magnitude of spillovers on specific macroeconomic variables without comparing the speed of adjustment, the persistence of shocks, and transmission channels across emerging market countries. Consequently, understanding whether a country's response to US monetary policy tightening is temporary or reflects varying levels of macroeconomic resilience remains limited. This gap forms the basis for this study, which analyzes and compares the transmission mechanisms of US monetary policy across each ASEAN-4 country using a Vector Autoregression (VAR) approach.

Based on this research gap, this study offers two key innovations. First, this study not only measures the spillover impact of US monetary policy but also compares the transmission mechanisms across the four ASEAN-4 countries (Indonesia, Malaysia, Thailand, and the Philippines) individually, thereby identifying the characteristics of each country's response to Federal Funds Rate shocks. This approach allows for a more in-depth analysis of the differences in transmission channels through exchange rates, domestic interest rates, inflation, investment, exports, and output. Second, this study uses a Vector Autoregression (VAR) approach combined with the Impulse Response Function (IRF) and Forecast Error Variance Decomposition (FEVD) to evaluate the magnitude of the response, the speed of

adjustment, the persistence of shocks, and the relative contribution of each transmission channel within each country. Thus, this study not only explains the existence of spillovers but also reveals how the level of cyclical vulnerability and structural resilience of each ASEAN-4 country is reflected in the dynamics of its response to US monetary policy shocks.

This study makes three main contributions. Theoretically, this study enriches the literature on international monetary policy transmission by integrating the perspectives of the Impossible Trinity, Financial Accelerator, and New Open Economy Macroeconomics (NOEM) to explain the spillover channels of US monetary policy on developing economies. Methodologically, this study provides a different approach by estimating individual VAR models for each ASEAN-4 country, allowing for a more comprehensive analysis of differences in transmission dynamics, responses to shocks, and macroeconomic adjustment characteristics that cannot be captured through panel estimations that produce average effects. Practically, the research findings are expected to provide a basis for central banks and governments in ASEAN-4 countries in formulating monetary and fiscal policy mixes that are more appropriate to each country's domestic characteristics. Furthermore, the findings regarding differences in transmission channels and levels of macroeconomic resilience can be used as a reference in strengthening financial system stability and improving the ability to withstand global monetary policy tightening cycles.

2. METHODS

This research is built on a conceptual framework that places changes in the Federal Funds Rate (FFR) as the main source of spillover of United States monetary policy on the ASEAN-4 economies. Based on the Impossible Trinity theory, FFR increases affect international capital flows and put pressure on exchange rates in countries with managed floating exchange rate regimes and high levels of financial openness. Furthermore, the Financial Accelerator Theory explains that increasing funding costs and weakening private sector balance sheets will tighten credit distribution, thereby suppressing investment and economic activity. While the New Open Economy Macroeconomics (NOEM) explains that exchange rate changes affect export competitiveness and aggregate demand through the expenditure switching mechanism, which ultimately affects inflation, domestic interest rates, investment, exports, and economic growth. The research period of 2005 2nd quarterly – 2024 3rd quarterly was chosen because it covers the main cycles of global monetary policy, starting from the period before the Global Financial Crisis (2008), quantitative easing, Taper Tantrum (2013), interest rate normalization 2015–2018, easing during the COVID-19 pandemic, to the monetary tightening cycle 2022–2024, thus providing a comprehensive empirical context for observing the dynamics of US monetary policy spillovers.

To analyze the transmission mechanism, this study uses a time series analysis of Vector Autoregression (VAR) approach estimated separately for each ASEAN-4 country. This approach was chosen because it treats all variables as endogenous, thus capturing the dynamic interdependence between macroeconomic variables without establishing a priori causality (Sims, 1980; Lütkepohl, 2005). Furthermore, the Impulse Response Function (IRF) and Forecast Error Variance Decomposition (FEVD) are used to identify the magnitude of

the response, the persistence of shocks, and the relative contribution of US monetary policy spillovers, allowing for a comparison of the transmission mechanism and the levels of macroeconomic vulnerability and resilience in Indonesia, Malaysia, Thailand, and the Philippines.

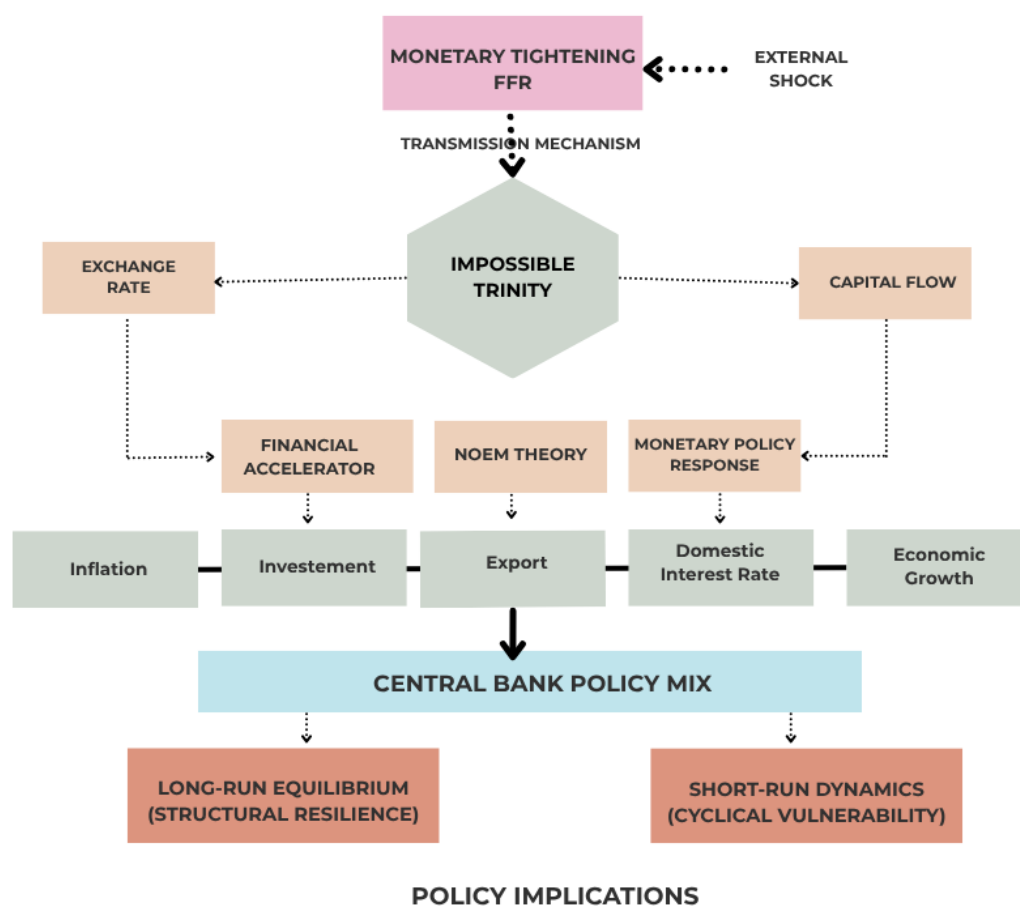


Figure 1. Flowchart for Conceptual Framework

This study uses a quantitative method with a sample of ASEAN-4 countries including Indonesia, Malaysia, the Philippines, and Thailand, which have similar economic patterns and structures, including significant dependence on the primary sector and producers of major commodities exported to the US market, making them highly vulnerable to fluctuations in global commodity prices. In addition, the development of the service and manufacturing sectors, which are currently starting to creep up in these countries, also requires foreign investment to expand the market, so this international capital flow is also vulnerable to the dynamics of global policies, especially monetary policies in developed countries, including the US, which is the benchmark for the global economy. The data used is panel data sourced from ASEAN Development Bank Statistics, International Monetary

Fund Statistics, and the World Bank. The data is in the form of quarterly panels starting from the 2nd quarterly of 2005 – the 3rd quarterly of 2024. This period is used because it is able to represent a complete cycle of US monetary policy dynamics and its transmission of shocks to developing countries, particularly the ASEAN-4. This period covers conditions before the Global Financial Crisis (2008) as a baseline, followed by the post-crisis quantitative easing (*QE*) phase that increased global liquidity and capital flows to developing countries, the Taper Tantrum (2013) that triggered capital flow reversals and exchange rate volatility, and the normalization of monetary policy (2015–2018) through gradual increases in the FFR. Furthermore, this period also includes monetary easing during the COVID-19 pandemic (2020–2021) and an aggressive monetary tightening cycle in 2022–2023 due to a surge in global inflation. Thus, the 2005–2024 timeframe encompasses various global monetary policy regimes, providing a comprehensive empirical context to evaluate whether the Fed's monetary policy spillovers to the ASEAN-4 only create short-term cyclical vulnerability or reflect long-term structural resilience.

Based on the research objectives, VAR was chosen as the econometric approach to analyze the dynamic transmission mechanism of US monetary policy spillovers on macroeconomic fundamentals in each ASEAN-4 country. Unlike conventional regression models that distinguish dependent and independent variables, VAR treats all variables as endogenous, thus capturing the dynamic interdependence and shock transmission mechanisms between variables simultaneously without establishing a priori causality (Sims, 1980; Lütkepohl, 2005). This approach is considered appropriate for explaining how changes in the Federal Funds Rate (FFR) are transmitted through various macroeconomic channels, such as the exchange rate, inflation, domestic interest rates, investment, exports, and economic growth, in accordance with a conceptual framework that integrates the Impossible Trinity Theory, Financial Accelerator Theory, and New Open Economy Macroeconomics (NOEM). Therefore, the VAR model is able not only to identify the direction and magnitude of US monetary policy spillovers but also to compare the transmission dynamics and response characteristics in each ASEAN-4 country.

Before estimation is carried out, each VAR model first goes through a series of tests including stationarity tests using Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP), determination of optimum lag, and VAR stability tests to ensure model validity before dynamic analysis is carried out (Lütkepohl, 2005; Enders, 2015). Furthermore, the Impulse Response Function (IRF) is used to identify the magnitude, direction, and duration of the response of each macroeconomic variable to the Federal Funds Rate (FFR) shock as an indicator of cyclical vulnerability, while the Forecast Error Variance Decomposition (FEVD) is used to measure the relative contribution of the FFR shock to the variation of each macroeconomic variable, so that it can describe the level of structural resilience of each country in facing global monetary shocks. The variables used include the Federal Funds Rate (FFR) as a proxy for United States monetary policy, the Investment to GDP Ratio (*INV*) as a proxy for international capital flows, the Export to GDP Ratio (*EXP*) as a proxy for international trade, the Consumer Price Index (CPI) as an indicator of price stability, the domestic interest rate (IR) as a proxy for domestic monetary policy, the exchange rate (*ER*)

as an indicator of the foreign exchange market, and Gross Domestic Product (*GDP*) as a proxy for economic output performance.

$$Y_t = \begin{bmatrix} CPI_t \\ IR_t \\ ER_t \\ GDP_t \\ INV_t \\ EXP_t \\ FFR_t \end{bmatrix}$$

If all variables are integrated of order level $I(0)$ and order one, $I(1)$ then the general form of the PVAR is:

$$Y_t = A_0 + \sum_{k=1}^p A_k Y_{t-k} + \lambda_t + \varepsilon_t$$

There is:

Y_t = vector of endogenous variables for period t ; t ;

A_0 = vector of constants;

A_k = matrix of coefficients for the lag $ke-k$;

p = lag optimum;

λ_t = Time effect;

ε_i = error term

3. RESULTS AND DISCUSSIONS

Before conducting VAR estimation, a series of preliminary tests are required to ensure that the data meets the basic assumptions of the model so that the estimation results obtained are valid and can be interpreted economically. Before interpreting the dynamic relationships between variables, this study first evaluates the statistical properties of the data through stationarity tests.

Table 1. Unit Root Test

Variable	Country			
	Indonesia	Malaysia	Phillipines	Thailand
<i>IR</i>	0.0592	0.0842	0.0553	0.0001**
<i>ER</i>	0.0000**	0.0000**	0.0000**	0.0023
<i>CPI</i>	0.0000**	0.0006	0.0075	0.0503
<i>EX</i>	0.0118	0.0000**	0.0161	0.0144
<i>FFR</i>	0.0010**	0.0010**	0.0010**	0.0010**
<i>GDP</i>	0.0000**	0.0000**	0.0000**	0.0000**
<i>INV</i>	0.0777	0.0599	0.0000**	0.0000**

Source: Data processed, 2026

Based on the results of the Augmented Dickey-Fuller (ADF) stationarity test, each variable shows a different level of stationarity in each country. In general, the FFR and GDP are the most consistent variables because they are stationary at the level level across all study countries. In Indonesia, the stationary variables include ER, CPI, FFR, and GDP; in Malaysia, they are ER, EX, FFR, and GDP; in the Philippines, they include ER, FFR, GDP, and INV; while in Thailand, they consist of IR, FFR, GDP, and INV. This difference indicates that the characteristics of macroeconomic data across countries are not completely uniform, so some variables still contain unit roots at the level level. Considering that the VAR model requires all variables to be stationary, all variables in this study were transformed into first differences before the estimation process. This approach is carried out to equalize the degree of integration of all variables, avoid spurious regression, and ensure that the estimated dynamic relationships reflect short-term responses between variables, in accordance with the objectives of VAR analysis as recommended by Hamilton (1994) and Lütkepohl (2005).

Table 2. Optimum Lag	
Country	Optimum Lag
Thailand	Lag 2
The Philippines	Lag 1
Malaysia	Lag 1
Indonesia	Lag 4

Source: Data processed, 2026

Determining the lag length is a crucial step in VAR estimation because it directly affects the validity of the estimated dynamic relationship, as well as the results of the Impulse Response Function (IRF) and Forecast Error Variance Decomposition (FEVD). Although the information criterion results indicate different optimum lags across countries, with lag 1 for Malaysia and the Philippines, lag 2 for Thailand, and lag 4 for Indonesia, this study sets lag 2 uniformly across all models. This decision based on methodological and academic considerations to maintain a balance between model parsimony, the ability to capture the dynamics of monetary policy transmission, and the comparability of results across countries. The use of lag 4 in Indonesia has the potential to reduce degrees of freedom and increase the risk of overfitting, especially with a limited number of observations. While the use of lag 1 in Malaysia and the Philippines is feared to be unable to capture the lagged effect of global monetary policy transmission on the real sector. Furthermore, the application of a uniform lag allows each country to be analyzed within the same time horizon, resulting in more consistent and objective comparisons in cross-country studies. Thus, the choice of lag 2 is not solely based on the statistical results of each country, but is a methodological compromise aimed at producing a model that is more stable, efficient, and has stronger comparability in explaining the spillover mechanism of US monetary policy in ASEAN-4.

Table 3. VAR Estimation Results

Transmission	Variable Lag	Indonesia		Malaysia		Phillipines		Thailand	
		Coeff	t-Stat	Coeff	t-Stat	Coeff	t-Stat	Coeff	t-Stat
FFR to IR	FFR lag 1	0.1869	1.0692	0.3225	5.5845	0.388	2.7549	0.2217	2.7135
IR to GDP	IR lag 1	0.0084	1.2186	0.3336	0.8237	0.0516	0.4173	0.0144	1.7945
FFR to ER	FFR lag 1	-0.0141	-1.032	-0.0085	-0.705	-0.0136	-1.5351	-0.0195	-2.3568
ER to CPI	ER lag 1	-12.701	-2.2190	6.2601	1.3792	-10.813	-1.8142	-5.7331	-0.8222
CPI to GDP	CPI lag 1	-0.0014	-0.6881	-0.0421	-0.789	-0.007	-0.2053	-0.0031	-2.0174
IR to INV	IR lag 1	366.516	0.1482	19212.37	0.9704	4634.796	0.4150	1415.374	0.6737
INV to GDP	INV lag 2	4.2185	1.0597	-4.5871	-1.831	-7.3498	-0.8216	1.1581	0.2016

Note: Bolded values indicates that *t*-stat > critical value (1.998)

The VAR estimation results show that the spillover mechanism of US monetary policy through changes in the FFR exhibits different transmission characteristics in each ASEAN-4 country. In Indonesia, the three tested transmission channels interest rate, exchange rate, and investment were unable to transmit the FFR's influence to economic growth. The only significant relationship was the effect of the exchange rate on inflation, indicating that external transmission only achieved a pass-through exchange rate mechanism without having a significant impact on the real sector. In Malaysia, the FFR was shown to significantly affect domestic interest rates, but this influence was not transmitted to investment or economic growth, while the exchange rate and inflation channels also showed no significance. A nearly identical pattern was found in the Philippines, where the response to the FFR was only seen in domestic interest rate adjustments, while the transmission channels to investment, inflation, and economic growth were ineffective. In contrast to these three countries, Thailand showed a stronger response to global monetary shocks, indicated by the significant influence of the FFR on interest rates and exchange rates, as well as the influence of inflation on economic growth. However, the insignificant relationship between the exchange rate and inflation and the interest rate and investment means that the transmission mechanism remains unable to operate fully and stimulate real sector activity.

Overall, these findings indicate that US monetary policy spillovers in the ASEAN-4 region predominantly affect monetary variables rather than real variables, resulting in transmission effectiveness tending to cease early in the policy mechanism. These results indicate that although financial markets in Malaysia, the Philippines, and especially Thailand are quite responsive to changes in the FFR, while Indonesia is more responsive through the exchange rate channel to inflation, the ability of each country to transmit these shocks into increased investment and economic growth remains relatively limited. These findings reinforce the view that the effectiveness of international monetary transmission is determined not only by the magnitude of external shocks but also by the structural characteristics of the domestic economy, such as the effectiveness of banking intermediation, financial market depth, exchange rate flexibility, the investment climate, and the coordination of monetary and fiscal policies. Therefore, strengthening the domestic transmission mechanism is a crucial prerequisite for global monetary policy spillovers to be

reflected not only in adjustments to monetary indicators but also to generate a more tangible impact on sustainable economic growth.

Table 4. Stability Test

Country	Maximum Modulus	Stability
Indonesia	0.741	Stable
The Philippines	0.974	Stable
Thailand	0.879	Stable
Malaysia	1.554	Relatively unstable

Source: Data processed, 2026

Based on the results of the AR Roots stability test, the VAR models for Indonesia, the Philippines, and Thailand meet the stability assumption because all characteristic roots lie within the unit circle. This condition indicates that the system's response to external shocks, including changes in the FFR, is convergent and gradually returns to equilibrium. Thus, the IRF and FEVD results for these three countries have adequate statistical validity. Meanwhile, the Malaysian model exhibits a maximum modulus value of 1.554350 (> 1), indicating more volatile system dynamics than other countries. This condition does not necessarily indicate that the VAR model cannot be used, but rather indicates that the response of Malaysian macroeconomic variables to external shocks during the study period is more persistent and sensitive.

In the context of cross-country research, the Malaysian findings can be understood as a reflection of the characteristics of an economy undergoing structural change and being more exposed to external dynamics, such as changes in capital flows, international trade, and global monetary policy. Therefore, the use of VAR was retained because the primary objective of the study was not to conduct long-term forecasting, but rather to analyze the transmission mechanisms and short-term dynamic responses to US monetary policy shocks. The interpretation of the Malaysian results was more conservative, emphasizing the direction and pattern of responses between variables, rather than the absolute magnitude of long-term effects. Furthermore, the consistent use of the VAR(2) specification across countries still provides methodological advantages in the form of cross-country comparability in identifying differences in FFR spillover sensitivity across ASEAN countries.

After the VAR model met the stability testing stage, the analysis continued with IRF and FEVD to identify the transmission mechanisms and the magnitude of the contribution of US monetary policy shocks to domestic macroeconomic variables. The IRF test was used to examine the dynamic response of each variable to a shock to the FFR over time, including the direction, magnitude, and duration of the impact until it returns to equilibrium. Meanwhile, the FEVD is used to measure the proportion of variation in an economic variable

that can be explained by FFR shocks compared to the contribution of shocks from other variables in the VAR system.

In the context of this research, the combination of IRF and FEVD results serves as the primary instrument for evaluating the effectiveness of US monetary policy spillovers through three transmission channels: the interest rate, exchange rate, and investment channels, on economic growth in ASEAN-4 countries. Unlike VAR coefficient estimates, which only describe the relationship between variables at a specific lag period, IRF and FEVD are able to capture the dynamic characteristics of transmission, including the lag effect and the sensitivity of each country to changes in the FFR. Therefore, these two analyses serve as the primary basis for comparing how Indonesia, Malaysia, the Philippines, and Thailand respond to changes in global monetary conditions and identifying countries that are relatively more vulnerable or more resilient to US monetary policy shocks.

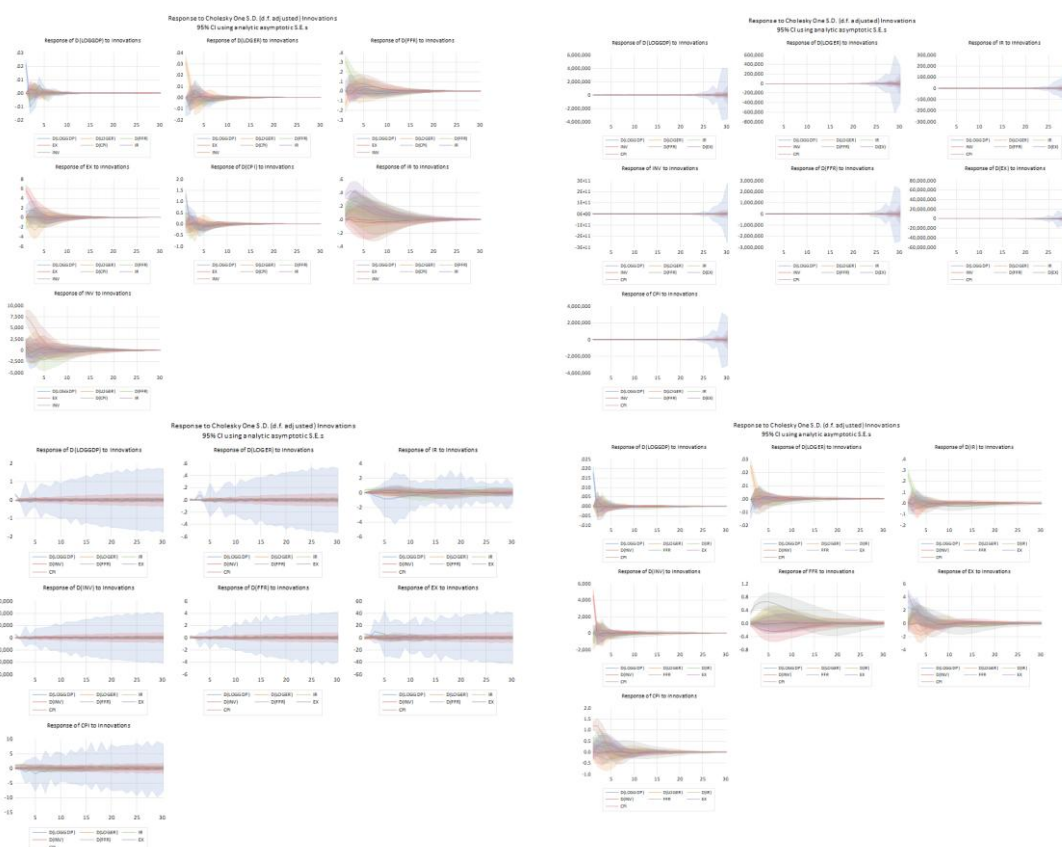
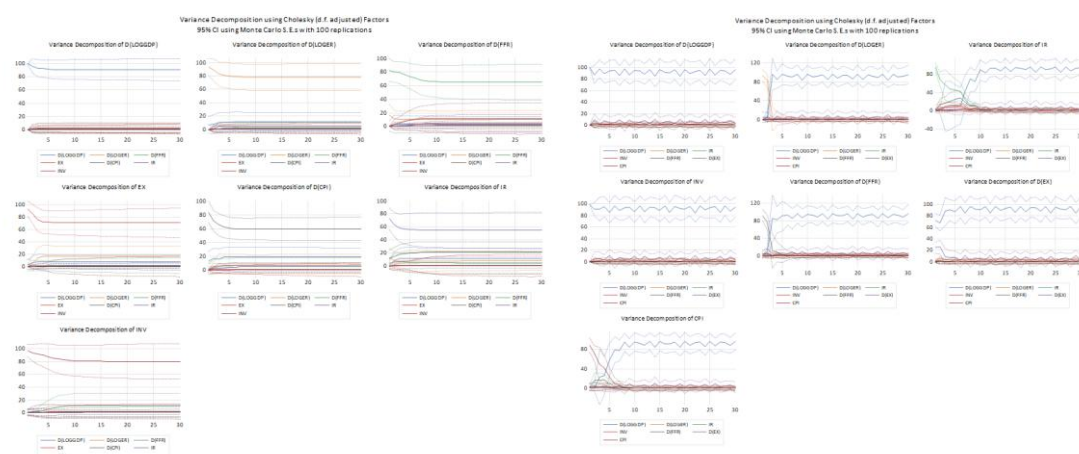


Figure 2. Impulse Response Function for ASEAN-4

Source: Data processed, 2026

The IRF results indicate that the ASEAN-4 economies' responses to FFR shocks are generally consistent with the VAR estimation results and model stability tests. Indonesia exhibits an effective transmission mechanism, with FFR and domestic

interest rate shocks suppressing economic growth and investment in the short term, while exchange rate depreciation boosts exports by increasing competitiveness. The inflation response, which is immediately followed by interest rate adjustments, reflects the effectiveness of Bank Indonesia's Inflation Targeting Framework (ITF). The Philippines exhibits a relatively small response and a rapid return to equilibrium, indicating a strong shock absorber capacity to external shocks. Meanwhile, Thailand is the most responsive country to FFR shocks, primarily through the interest rate and exchange rate channels, which temporarily impact investment and economic growth contraction before all variables converge again. The convergence pattern of these three countries toward a steady state around the 10th to 12th period reinforces the results of the AR Roots test, indicating that the VAR model is stable and adequately captures short-term transmission dynamics. In contrast to these three countries, Malaysia exhibits a non-convergent response pattern, with macroeconomic variable fluctuations widening over the long-term horizon without a tendency to return to equilibrium. This finding aligns with the stability test results, which indicate characteristic roots outside the unit circle, and the VAR estimation results, which only found a significant effect of the FFR on domestic interest rates without any transmission to the real sector. Overall, the synthesis of the VAR estimations, stability tests, and IRF indicates that US monetary policy spillovers in the ASEAN-4 are transmitted more quickly through monetary variables than through real variables, with Indonesia, the Philippines, and Thailand having relatively effective adjustment mechanisms in absorbing shocks, while Malaysia exhibits higher shock persistence. This finding confirms that the effectiveness of international monetary policy transmission is strongly influenced by the domestic adjustment capacity and structural characteristics of each country.



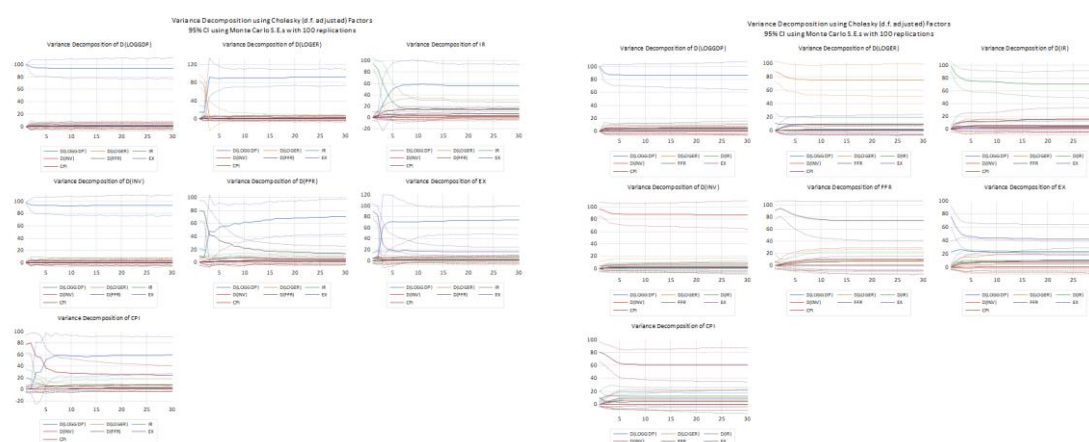


Figure 3. Forecast Error Variance Decomposition (FEVD) for ASEAN-4

Source: Data processed, 2026

The FEVD results confirm the findings of the VAR and IRF analyses, showing that US monetary policy spillovers differ across ASEAN-4 countries. In Indonesia, economic growth is primarily driven by domestic shocks, while the influence of the Federal Funds Rate (FFR) becomes more evident on investment and exports over the medium and long term. This suggests that US monetary tightening affects the external sector and investment more than overall economic growth. The stable variance pattern is also consistent with the AR Roots test, indicating a stable model. A different pattern is observed in the Philippines and Thailand. In the Philippines, most macroeconomic fluctuations remain dominated by domestic economic growth, which subsequently influences the exchange rate, inflation, interest rates, and exports. This indicates relatively strong domestic resilience and limited spillover from US monetary policy. Thailand, however, exhibits a more diversified transmission mechanism. Although GDP and investment are still mainly influenced by domestic shocks, exports, exchange rates, inflation, and interest rates are affected by both domestic and external factors, reflecting Thailand's greater integration with global trade and financial markets. Despite being more responsive to FFR shocks, Thailand maintains overall macroeconomic stability. Malaysia shows the most volatile pattern. Variations in macroeconomic variables are heavily concentrated on GDP shocks, while the non-converging IRF pattern and instability indicated by the AR Roots test suggest that the results should be interpreted with caution. Overall, the combined evidence from the VAR, IRF, and FEVD analyses shows that US monetary policy spillovers in the ASEAN-4 are heterogeneous and asymmetric, with stronger effects on the monetary sector than the real sector. FFR changes are transmitted mainly through domestic interest rates in Malaysia, the Philippines, and Thailand, while Indonesia is more affected through the exchange rate and inflation channel. Although FFR shocks influence investment, exchange rates, and exports, economic growth remains largely determined by domestic factors. These findings suggest that international monetary policy transmission in the ASEAN-4 is concentrated in financial channels, while

strong domestic fundamentals remain the key determinant of long-term economic growth and resilience (Huang, 2010).

These findings align with Hélène Rey's Global Financial Cycle theory, which explains that changes in US monetary policy are transmitted primarily through global financial markets, such as interest rates, exchange rates, capital flows, and financing conditions, before affecting the real sector. These findings are also consistent with a recent study by the International Monetary Fund (2023); Davis & Zlate (2017); Escolano et al, (2014) which showed that US monetary policy tightening increases financial market volatility and tightens financing conditions in developing countries, but its impact on economic growth is highly dependent on the strength of domestic fundamentals. Similarly, the Bank for International Settlements (2023) found that spillovers from the Fed's interest rate are transmitted more quickly through financial markets than through the real sector. Conversely, these findings differ from the findings of Obstfeld and Qureshi (2017), who showed that in developing countries with high dependence on external financing and foreign currency debt, an increase in the FFR can significantly reduce investment, consumption, and economic growth. These differences indicate that the effectiveness of spillovers is not universal but is influenced by the structural characteristics of each country, including financial market depth, exchange rate flexibility, monetary policy credibility, and the composition of economic financing sources. From a comparative perspective, this study shows that Indonesia and the Philippines exhibit relatively stronger domestic resilience, reflected in the dominance of internal shocks over variations in economic growth and a rapid return to equilibrium in the IRF response pattern. Conversely, Thailand exhibits a higher level of openness, resulting in a stronger response to the FFR through the interest rate and exchange rate channels, while still maintaining system stability. Meanwhile, Malaysia exhibits a different pattern, as the IRF and FEVD results indicate a non-convergent response, consistent with the stability test results, which show characteristic roots outside the unit circle. These findings indicate that the level of economic openness is not always synonymous with high vulnerability to spillovers, but is strongly influenced by the effectiveness of domestic transmission mechanisms and the capacity of policies to absorb external shocks. Thus, this study extends the literature on international monetary policy transmission by demonstrating that ASEAN countries' responses are not homogeneous despite facing the same source of global shocks.

The policy implication of this study is that responding to changes in the FFR cannot simply rely on policy interest rate adjustments, but requires a policy mix that integrates monetary, macroprudential, fiscal, and exchange rate stabilization policies. For Indonesia and the Philippines, policy focus should be on strengthening domestic demand and investment productivity to prevent external spillovers from hampering economic growth. Thailand needs to maintain exchange rate stability and export competitiveness given its high sensitivity to global markets, while Malaysia needs to strengthen domestic transmission mechanisms to prevent external shocks from developing into persistent volatility. More broadly, this study confirms that domestic macroeconomic resilience is a key determinant in mitigating global monetary policy spillovers. Therefore, strengthening economic fundamentals, deepening financial markets, diversifying sources of growth, and coordinating

monetary and fiscal policies are more effective strategies than simply responding to changes in US interest rates.

4. CONCLUSIONS

This study provides empirical evidence that the spillover effects of US monetary policy, proxied by changes in the FFR, on ASEAN-4 macroeconomic fundamentals are heterogeneous, asymmetric, and transmitted mainly through monetary rather than real-sector channels. Results from the VAR, IRF and FEVD consistently show that FFR changes have stronger effects on domestic interest rates and exchange rates than on investment and economic growth. These findings suggest that the magnitude of monetary spillovers depends not only on external shocks but also on domestic economic fundamentals, financial market development, monetary policy credibility, and structural adjustment capacity. Consequently, this study extends the international monetary transmission literature by demonstrating that developing countries respond differently to global monetary tightening according to their domestic characteristics and policy frameworks.

The findings imply that strengthening macroeconomic resilience requires coordinated monetary, fiscal, macroprudential, and exchange rate policies, supported by deeper financial markets and higher real-sector productivity. Nevertheless, the results should be interpreted with caution because the analysis is limited to four ASEAN countries, employs a linear VAR model with constant parameters, and uses the FFR as the sole proxy for global monetary policy. Future research should incorporate broader measures of global financial conditions, expand the country and time coverage, and apply more flexible econometric approaches, such as Panel VAR (PVAR), Global VAR (GVAR), or Time-Varying Parameter VAR (TVP-VAR), to better capture cross-country heterogeneity and evolving transmission dynamics.

5. ACKNOWLEDGEMENT

The authors declare that this work was completed independently and no external assistance or funding was involved

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