Chapter 2

Global Monetary Policy Shocks: Spillovers and ASEAN+3 Policy Responses

Highlights

- In 2022, surging inflation led the major central banks to launch one of the sharpest monetary tightening cycles in decades. The aggressive interest rate hikes and resulting strong dollar cycle raised fears of financial stress in ASEAN+3, echoing externally driven shocks in the past like the global financial crisis and the taper tantrum.
- ASEAN+3 financial markets reacted—bond yields rose, credit conditions tightened, currencies weakened, and the stock market declined—but there was no systemic instability or institutional failure; the region adjusted without crisis, underscoring its growing resilience.
- This resilience stemmed from two factors: a decisive, well-calibrated policy mix, and stronger fundamentals. Policymakers combined monetary policy, foreign exchange (FX) interventions, and capital flow management measures with diverse stabilization tools, while deeper financial markets, healthier banks, and ample foreign reserves helped buffer the impact.
- Nonetheless, pockets of vulnerabilities persist that may magnify future shocks. Debt service could come under strain if global rates were to rise again or local currencies were to weaken, particularly in economies with high external exposure and in sectors with elevated corporate debt at risk. Financial institutions' growing exposure to market risks also heightens their sensitivity to global shocks.
- To mitigate these vulnerabilities and associated financial stability risks, ASEAN+3 should continue to take a pragmatic approach and reinforce policy frameworks—including enhanced transparency and better articulation of their policy functions—while deepening local financial markets and bolstering financial buffers. Strengthening regional financial cooperation will also be essential to fortify collective resilience and support a coordinated response to future episodes of global volatility.

This chapter is authored by Eunmi Park under the guidance of Runchana Pongsaparn, with contributions from Chenxu Fu, Yang Jiao, Ruperto Majuca, and Yoki Okawa.

I. Overview

The ASEAN+3 economies are deeply integrated into the global financial cycle. Financial market movements and conditions across the region are significantly influenced by policy developments in major advanced economies, particularly the United States (US) and the euro area. Such interconnectedness presents both opportunities and challenges. While favorable global market sentiment can contribute to supportive domestic financial conditions, sudden shifts in external monetary policy can rapidly transmit volatility and financial stress to the region.

In recent years, global monetary policy has undergone significant shifts. In the aftermath of the global financial crisis (GFC) and the European sovereign debt crisis, central banks in advanced economies—in particular the US Federal Reserve (Fed) and the European Central Bank (ECB)—implemented highly accommodative monetary policies for an extended period. These included ultra-low interest rates and large-scale asset purchases, contributing to a prolonged era of easy financing conditions. The US "taper tantrum" in 2013 triggered a brief but intense episode of global market volatility, followed by a gradual US monetary policy tightening from late 2015 through early 2019. The COVID-19 outbreak in early 2020 prompted a shift to ultra-accommodative policies. After the pandemic, the policy direction sharply reversed. Faced with surging inflation, central banks embarked on one of the most aggressive tightening cycles in recent history.

These historical episodes offer valuable insights into how global monetary policy shocks can ripple through financial markets worldwide. For ASEAN+3 economies, such episodes have been linked to shifts in market dynamics that can at times place pressure on domestic financial conditions. Understanding the transmission channels through which global monetary policy affects regional financial conditions is therefore crucial. At the same time, the magnitude of the effects also depends on domestic policy frameworks and macroeconomic fundamentals.

In this context, it is increasingly important to understand how ASEAN+3 policymakers have responded, and how underlying fundamentals have supported efforts to mitigate external spillovers and safeguard financial stability. Beyond examining transmission channels and policy reactions, it is equally important to identify potential areas of vulnerabilities. Such assessments provide a foundation for developing targeted and proactive policy recommendations aimed at mitigating external risks and enhancing financial system stability.

In this context, this chapter will:

- Examine how global monetary shocks transmit to the ASEAN+3 financial markets through key spillover channels, including capital flows, exchange rates, asset valuation, and credit markets.
- Compare the impact of the 2022–2023 tightening with earlier externally driven financial market episodes, including the GFC and the taper tantrum, to place the recent experience in context.
- Examine policy responses and underlying fundamentals across ASEAN+3 to understand how they shaped the region's ability to absorb the 2022–2023 tightening.
- Identify vulnerabilities that remain across the region, including debt serviceability pressures and external exposures that could amplify future shocks.
- Propose policy recommendations that help strengthen financial resilience and enhance the region's capacity to manage future global monetary shocks.

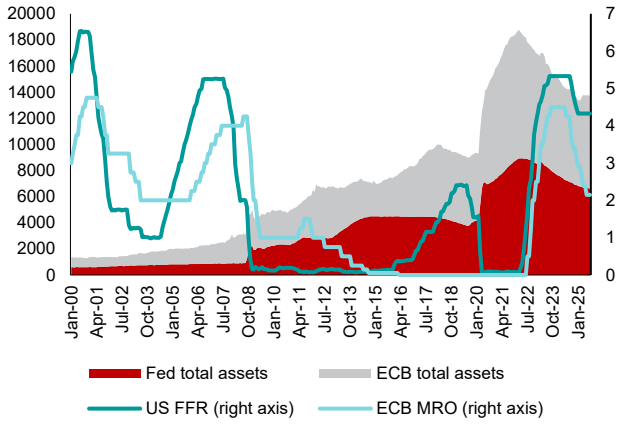
II. Assessing the Impact of Global Monetary Policy Shock on ASEAN+3—This Time Is Different

As inflation surged in 2022, many central banks launched an aggressive global tightening cycle. By 2023, the Fed had raised its policy rate to over 5 percent, while the ECB had also hiked its rate to above 4 percent (Figure 2.1).

Global financial conditions, as reflected in the financial condition indices of major advanced economies, have shifted significantly across several key global episodes—including the GFC, the European debt crisis, the COVID-19 shock, and recent global monetary tightening cycle (Figure 2.2).

Figure 2.1. US and euro area: Central Bank Assets and Policy Rates
(Billions of US dollars, percent)

After a prolonged easing cycle, global monetary policy tightened in 2022 before starting to ease again in 2024.

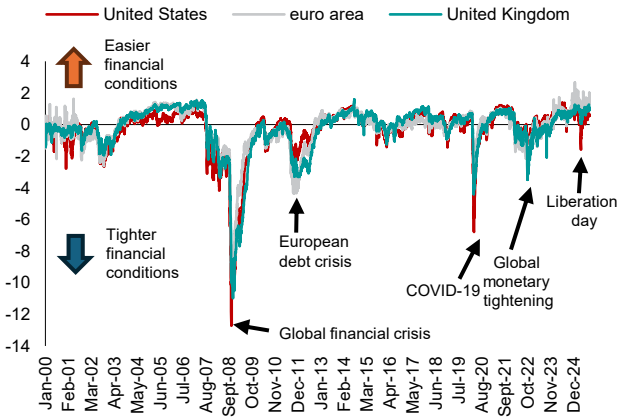


Source: Federal Reserve Bank of New York, Federal Reserve Board, European Central Bank via Haver Analytics.
Note: FRB refers to the Federal Reserve Board, ECB stands for the European Central Bank, FFR is the effective federal funds rate, and MRO denotes the Main Refinancing Operations rate.

In contrast to earlier episodes—where financial conditions deteriorated because of external shocks and were subsequently eased by accommodative policy responses—the tightening observed between 2022 and 2023 was driven directly by monetary policy actions of major central banks. This distinct episode, with the policy stance itself triggered tighter global financial conditions rather than reacting to a crisis, offers a clearer lens through which to assess the transmission of global monetary policy shifts to ASEAN+3 financial markets.

Figure 2.2. US, euro area, UK: Financial Condition Indices
(Index)

The global tightening in 2022–2023 led to tighter financial conditions, generating spillover effects on ASEAN+3.



Source: Bloomberg Finance L.P.

Market reactions: ASEAN+3 faced financial strain but no major disruption in the 2022–2023 global tightening

To assess the impact of global monetary tightening on ASEAN+3, this analysis uses the GFC and the taper tantrum as benchmarks, as both were major externally driven shocks closely tied to financial markets. The taper tantrum was unique in that expectations of future policy changes triggered volatility without immediate rate hikes. Still, it shares a key feature with the 2022–2023 tightening episode in being rooted in global monetary policy shocks, which directly influenced financial markets.

Market reactions show that ASEAN+3 faced elevated financial strain during the 2022–2023 global monetary tightening. The GFC had the most severe and broad-based impact on financial stress across the region, while the taper tantrum, though shorter-lived, caused concentrated stress in several ASEAN economies. In contrast, the global tightening cycle had a more prolonged effect, with financial stress lingering longer, particularly in open economies that were more exposed to global financial conditions. Importantly, despite these pressures, ASEAN+3 financial systems remained broadly resilient, avoiding the systemic instability or institutional failures seen in earlier episodes.

- **Financial stress index (FSI)**[1]: The FSI spiked sharply across ASEAN+3 during the GFC, reaching its highest level across most economies. The taper tantrum triggered a shorter lived but concentrated surge in financial stress, with countries like Indonesia and the Philippines experiencing higher peaks than during the 2022–2023 global tightening. By contrast, the recent tightening generated a more prolonged period of elevated stress, particularly in more open economies such as Hong Kong, Singapore, and Korea, though overall remaining well below levels in the GFC. China and Japan, which maintained accommodative or neutral policy settings during the global tightening cycle, appeared less affected by global monetary shocks (Figures 2.3 and 2.4).

- **Credit conditions:** Credit conditions in ASEAN+3 have tightened significantly since the onset of US monetary tightening in 2022. The credit-to-GDP gap—which measures the deviation of credit from its long-term trend—narrowed sharply and turned negative in 2023 for both Plus-3 (especially China and Hong Kong) and ASEAN (especially Indonesia, Malaysia, and Singapore), reflecting reduced global liquidity and higher US interest rates (Figure 2.5). This contrasts with the previous low-rate era, when abundant global liquidity helped fuel credit growth and widened the credit-to-GDP gap.

- **Bond yield movement:** ASEAN+3 bond yields surged in both the taper tantrum and the 2022–2023 tightening episodes. During the taper tantrum, expectations of Fed tapering unsettled markets, spiking US bond yields, triggering capital outflows from emerging market economies, and pressuring some ASEAN+3 currencies and financial conditions. A decade later, aggressive US rate hikes again drove up global financing costs, drawing investors toward US assets. While ASEAN+3 bond yields also climbed sharply, the increase was smaller relative to the jump in US rates due to milder inflation and less aggressive local tightening (AMRO 2025), narrowing the ASEAN+3 10 year yield spread with the US and turning it negative from 2023 onward (Figure 2.6).

- **Exchange rates:** During periods of global financial stress, the US dollar typically strengthens as a safe-haven asset. The US dollar index spiked during the GFC, taper tantrum, COVID-19, and global tightening episodes. Currency depreciation was more concentrated in ASEAN economies during the taper tantrum, whereas broader and more sustained depreciation occurred across the region during the global monetary tightening (Figure 2.7). Japan's prolonged accommodative policy also added depreciation pressure on the yen during this period, following the yen carry trade.

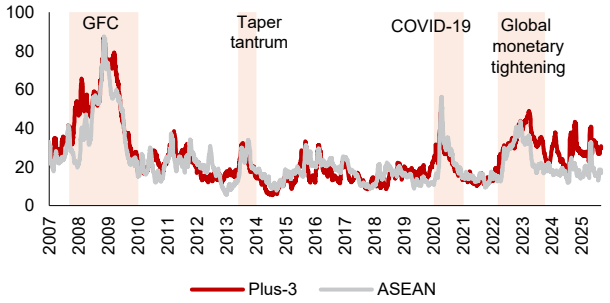
- **Stock index:** During the GFC, stock indexes plunged sharply across all markets. The taper tantrum caused only a brief, shallow dip, with markets stabilizing quickly. The COVID-19 shock triggered sharp volatility, but unprecedented policy support spurred a swift and broad based rebound. By contrast, the 2022–2023 monetary tightening led to another steep global decline; while global indexes have since surged past pre tightening levels, ASEAN+3 equity markets have shown a modest and slower recovery (Figure 2.8).

- **Capital flows:** During the taper tantrum, portfolio flows to selected ASEAN+3 economies briefly turned negative after the Fed's tapering announcement but rebounded quickly. Outflows were most notable from Indonesia, Malaysia, and Thailand, with Korea experiencing a sharp but short-lived dip. Overall, the impact was concentrated and short in duration (Figure 2.9). In contrast, the global tightening period saw more volatile and sustained capital flow movements. Inflows and outflows fluctuated frequently, marked by intermittent surges and sharp reversals as investor sentiment shifted amid persistent monetary tightening. Much of this volatility reflected capital flows in China, which are larger than those in the rest of ASEAN+3, with fluctuations most pronounced in 2022 and early 2023 before some stabilization emerged toward the end of 2023 (Figure 2.10).

[1] The financial stress index (FSI) is constructed by standardizing the volatility or variance of key financial indicators—such as stock market returns, exchange rates, bond yields, interest rates, and credit spreads—into z-scores, which are then rescaled using a min-max transformation to ensure equal contribution. These rescaled indicators are summed and normalized again on a 0–100 scale to allow for cross-country comparison, capturing fluctuations in financial stress across the stock, foreign exchange, and debt markets. For more details, refer to Chan-Lau and others (2024).

Figure 2.3. Selected ASEAN+3: Financial Stress Index (FSI) Trend
(Index)

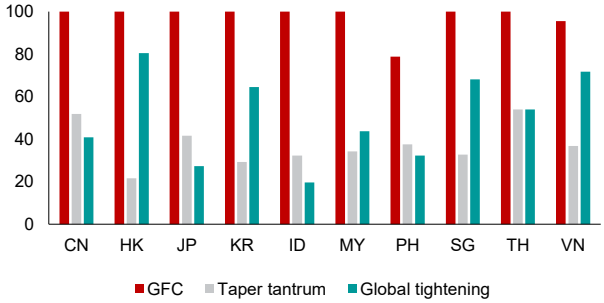
The FSI spiked during the GFC, rose briefly in the taper tantrum and COVID-19, and climbed again in monetary tightening.



Source: Chan-Lau and others (2024); AMRO staff calculations.
Note: Each group's financial stress index (FSI) was calculated as a simple average. Selected ASEAN+3 includes Plus-3 (e.g., China, Hong Kong, Japan, Korea) and ASEAN-6 (e.g., Indonesia, Malaysia, the Philippines, Singapore, Thailand, and Vietnam). GFC = global financial crisis.

Figure 2.4. Selected ASEAN+3: Financial Stress Index (FSI) Peaks During Major Financial Shock Episodes
(Index)

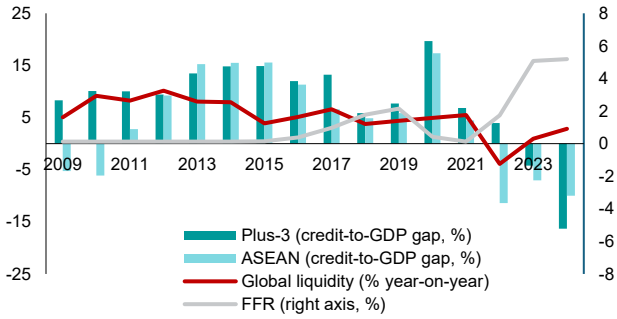
FSI peaks were highest in the GFC, with taper tantrum and global tightening impacts varying by country.



Source: Chan-Lau and others (2024); AMRO staff calculations.
Note: As FSI is based on each country's history, the global financial crisis (GFC) is not always the peak of 100; in some, like the Philippines and Vietnam, domestic shocks pushed FSI higher in other periods. CN= China; HK = Hong Kong; ID = Indonesia; JP = Japan; KR = Korea; MY = Malaysia; PH = Philippines; SG = Singapore; TH = Thailand; VN = Vietnam.

Figure 2.5. Selected ASEAN+3: Global Liquidity and Nonfinancial Credit-to-GDP Gap
(Percent/year-on-year percent change; percent)

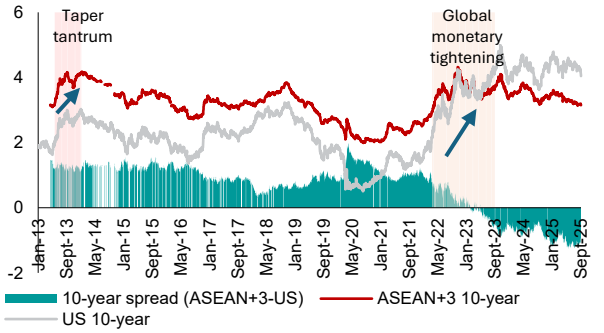
Global liquidity and the ASEAN+3 credit-to-GDP gap turned negative amid global monetary tightening.



Source: Bank for International Settlements (BIS) via Haver Analytics.
Note: Plus-3 includes China, Hong Kong, Japan, and Korea, and selected ASEAN includes Indonesia, Malaysia, Singapore, and Thailand. The nonfinancial credit-to-GDP gap is the difference between the credit-to-GDP ratio and its long-term trend. The values for each group were calculated as simple averages. Global liquidity indicates the year-on-year growth rate of credit denominated in US dollars that is extended to non-US (foreign) nonbank borrowers. FFR = federal funds target rate.

Figure 2.6. Selected ASEAN+3 and US: 10-Year Government Bond Yields and Spread
(Percent)

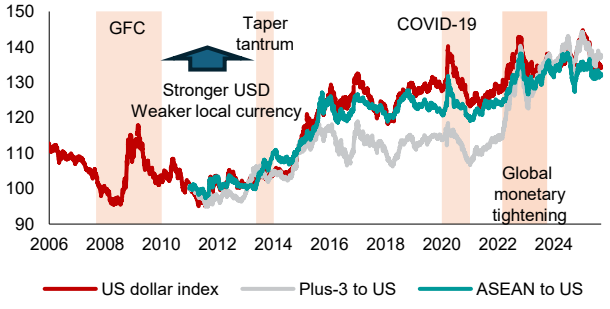
Bond yields spiked in the taper tantrum and global tightening, with the ASEAN+3-US spread turning negative in the latter.



Source: Haver Analytics; AMRO staff calculations.
Note: Selected ASEAN+3 includes Plus-3 (e.g., China, Hong Kong, Japan, Korea) and ASEAN-6 (e.g., Indonesia, Malaysia, the Philippines, Singapore, Thailand, and Vietnam). The bond yields of ASEAN+3 were calculated as simple averages. US = United States.

Figure 2.7. Selected ASEAN+3, US: Nominal FRB Dollar Index and Exchange Rate Indices against the US Dollar
(Index, 3 January 2011 = 100)

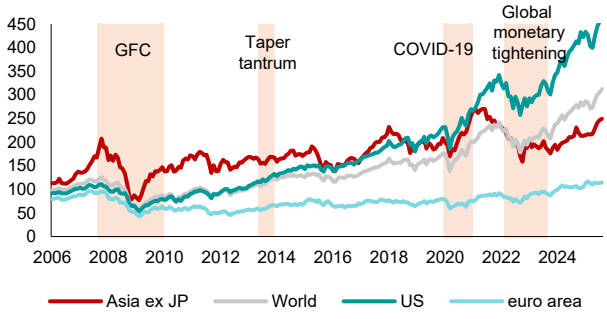
ASEAN currencies fell more during the taper tantrum, while depreciation was broader in global tightening.



Source: Federal Reserve Board; Haver Analytics; AMRO staff calculations.
Note: Plus-3 economies comprise China, Japan, and Korea, while selected ASEAN economies include Indonesia, Malaysia, Singapore, the Philippines, Thailand, and Vietnam. Exchange rate indexes against the US dollar are based on each country's bilateral exchange rate with the US dollar, and all indexes are rebased to 100 as of 3 January 2011 for comparability. Group data are calculated as simple averages. FRB = Federal Reserve Board; US = United States..

Figure 2.8. World, Selected Asia, US, euro area: Stock Index
(Index, January 2000 =100)

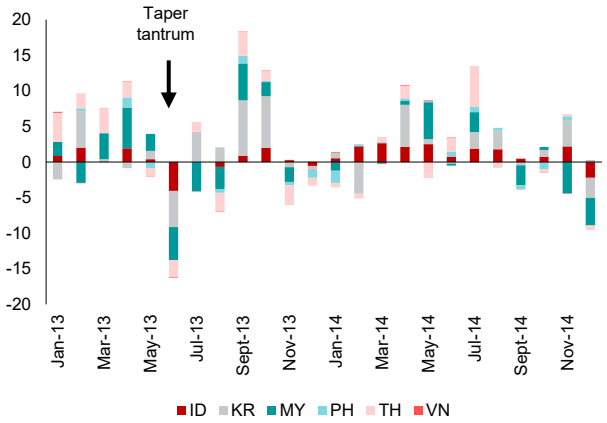
Global stocks fell in 2022; while US and world indexes rebounded quickly, ASEAN+3 saw a modest recovery



Source: MSCI indexes via Bloomberg Finance L.P.; AMRO staff calculations.
Note: The MSCI AC ASIA ex-JP index is used as a proxy for the regional stock index since the index covers the majority of ASEAN+3 economies. All indexes are recalibrated to a baseline of 100 as of January 2000, to facilitate comparisons. JP = Japan.

Figure 2.9. Selected ASEAN+3: Portfolio Flows during the Taper Tantrum Period
(Billions of US dollars)

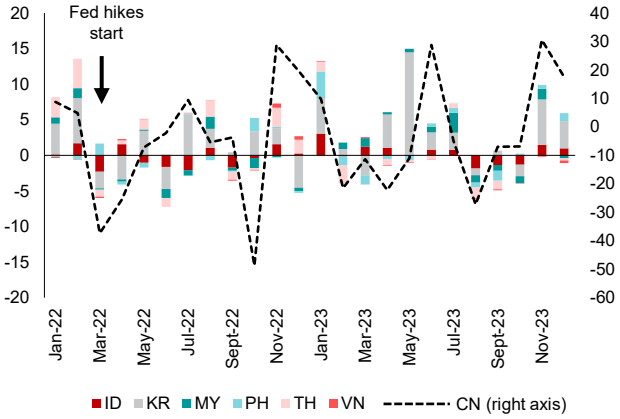
Portfolio flows sharply reversed in several ASEAN+3 economies before quickly recovering.



Source: The Institute of International Finance via Haver Analytics.
Note: China's portfolio flow data was not available during the taper tantrum period and is therefore excluded from Figure 2.9. ID = Indonesia; KR = Korea; MY = Malaysia; PH = Philippines; TH = Thailand; VN = Vietnam.

Figure 2.10. Selected ASEAN+3: Portfolio Flows during the Global Tightening Period
(Billions of US dollars)

Portfolio flows were volatile and uneven during the global tightening.



Source: The Institute of International Finance via Haver Analytics.
Note: During the global tightening period, China's capital flows had a large influence on the regional trend because of the size of its financial market. To better highlight the trends of individual ASEAN+3 economies, China's data are presented separately using a dashed line and right axis. ID = Indonesia; KR = Korea; MY = Malaysia; PH = Philippines; TH = Thailand; VN = Vietnam; CN = China

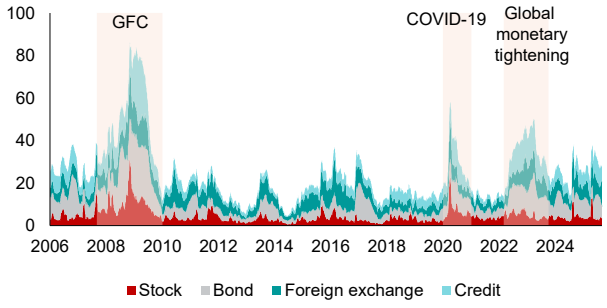
How have global monetary policy shifts/shocks created cross-border financial spillovers in ASEAN+3?

Financial stress in ASEAN+3 increased during the 2022–2023 global monetary tightening, driven mainly by bond and credit market volatility (Figure 2.11). Separately, a random-effects panel regression for ten ASEAN+3 economies was conducted to identify the key drivers of financial stress index movements (Annex 2.2). The analysis finds that Fed and ECB rate hikes significantly raised financial stress, alongside other contributors such as inflation (CPI), monetary policy uncertainty, and global volatility (VIX). Conversely, higher business activity (PMI) is associated with reduced stress (Figure 2.12).

The analysis also shows that, at the level of the economy-group, financial centers like Hong Kong and Singapore were most sensitive to Fed and ECB moves, and ASEAN countries also showed significant responses. In contrast, Plus-3 economies displayed mixed reactions: China and Japan showed weaker responses, reflecting their less correlated policy stances with the global tightening cycle as they maintained accommodative or neutral settings, whereas Hong Kong and Korea exhibited stronger reactions. Overall, the findings highlight how global monetary tightening, particularly by the Fed and ECB, drives financial stress in ASEAN+3 with varying intensity across economies.

Figure 2.11. Selected ASEAN+3: Composition of Financial Stress Index by Asset Class
(Index)

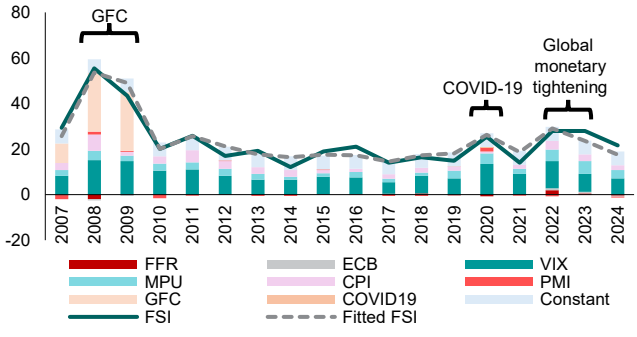
The spike in financial stress during tightening was mainly driven by bond and credit market volatility.



Source: Haver Analytics; AMRO staff calculations.
Note: The composition of the financial stress index (FSI) across asset classes is illustrated using the average FSI and its components—stock, bond, foreign exchange, and credit market volatility—for six economies (Japan, Hong Kong, Korea, Malaysia, the Philippines, and Singapore), which provide comprehensive and comparable data across all asset classes. GFC = global financial crisis.

Figure 2.12. Selected ASEAN+3: Macrofinancial Drivers of Financial Stress Index—Panel Regression Estimates
(Index)

US Fed and ECB hikes, along with high VIX, CPI, and policy uncertainty, drove financial stress in 2022–2023.

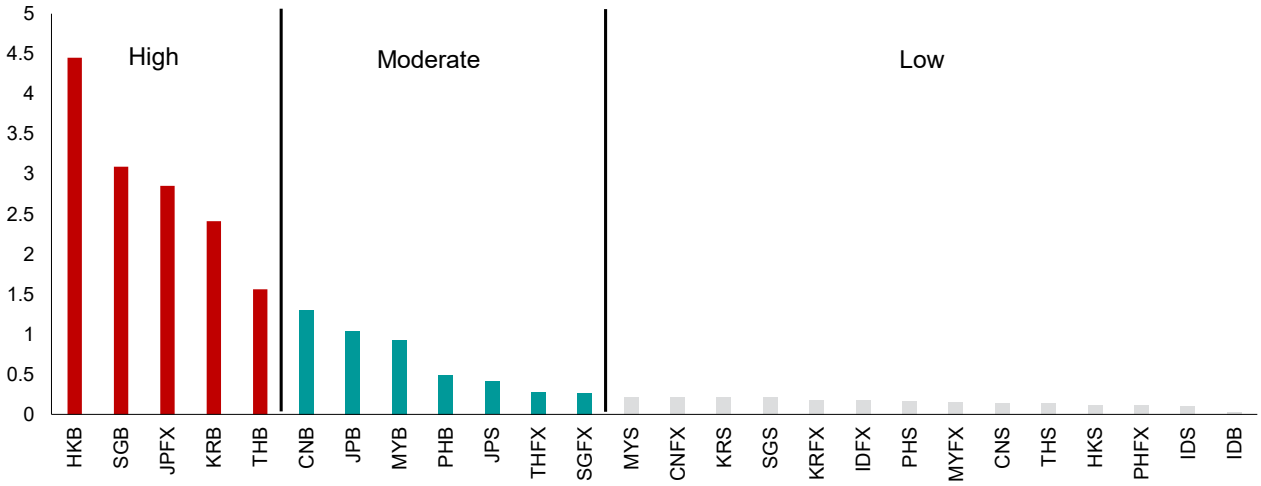


Source: AMRO staff calculations.
Note: The contributions are computed by multiplying each regression coefficient by the corresponding variable, then averaging across countries by month and year. FFR = US federal funds rate; ECB = European Central Bank main refinancing operations (MRO) rate; VIX = Chicago Board Options Exchange (CBOE) volatility index; MPU = US monetary policy uncertainty; CPI = consumer price index; PMI = purchasing managers' index; GFC = global financial crisis dummy; COVID-19 = COVID-19 pandemic dummy; FSI = financial stress index; Fitted FSI = estimated financial stress index.

To examine how US monetary policy shocks are transmitted through interconnected global channels—and which ASEAN+3 financial markets are most strongly affected—a Vector Autoregression (VAR) model was applied (Annex 2.3). Using a network-based approach to trace how movements in the US federal funds rate affect financial markets, the analysis examines daily changes in equity prices, bond yields, and exchange rates across ASEAN+3 as well as other benchmark regions. Results show that US monetary policy has the strongest spillover effects on the bond markets of Hong Kong, Singapore, Korea, and Thailand, while Japan's currency market is also highly sensitive. Moderate effects are observed in the bond markets of China, Japan, Malaysia, and the Philippines, as well as in the foreign exchange markets of Thailand and Singapore, underscoring the broad reach of US policy shifts on ASEAN+3 financial conditions (Figure 2.13).

Figure 2.13. Selected ASEAN+3 Financial Assets: Degree of Inward Spillovers from US Federal Reserve Rates
(Percent)

US monetary policy changes generate strong spillovers to bond markets in Hong Kong, Singapore, Korea, and Thailand, and Japan's foreign exchange market.



Source: AMRO staff calculations.
Note: All financial markets in the analysis are evenly categorized into high, moderate, and low spillover groups based on the relative magnitude of spillover effects from US monetary policy. However, the number of markets shown in each group appears unequal in the chart, as financial markets from other regions have been excluded for brevity. HKB = Hong Kong bond rates; SGB = Singapore bond rates; JPFX = Japan FX rates; KRB = Korea bond rates; THB = Thailand bond rates; CNB = China bond rates; JPB = Japan bond rates; MYB = Malaysia bond rates; PHB = Philippines bond rates; JPS = Japan stock returns; THFX = Thailand FX rates; SGFX = Singapore FX rates; MYS = Malaysia stock returns; CNFX = China FX market; KRS = Korea stock returns; SGS = Singapore stock returns; KRFX = Korea FX rates; IDFX = Indonesia FX rates; PHS = Philippines stock returns; MYFX = Malaysia FX rates; CNS = China stock returns; THS = Thailand stock returns; HKS = Hong Kong stock returns; PHFX = Philippines FX market; IDS = Indonesia stock returns; IDB = Indonesia bond rates. FX = foreign exchange.

Understanding how markets react immediately to US policy announcements helps assess the speed and magnitude of spillovers—an important consideration for policymakers navigating near-term volatility and shifts in investor sentiment. Impulse response functions from a local projection model (Jordà 2005) are applied to financial market data—stock returns, exchange rates, interbank rates, and bond yields. Monetary policy shocks are identified using the Jarociński and Karadi (2020) method, which isolates unexpected Fed policy changes from high-frequency futures data, stripping out information effects to better distinguish policy impacts from broader economic conditions (Annex 2.4).

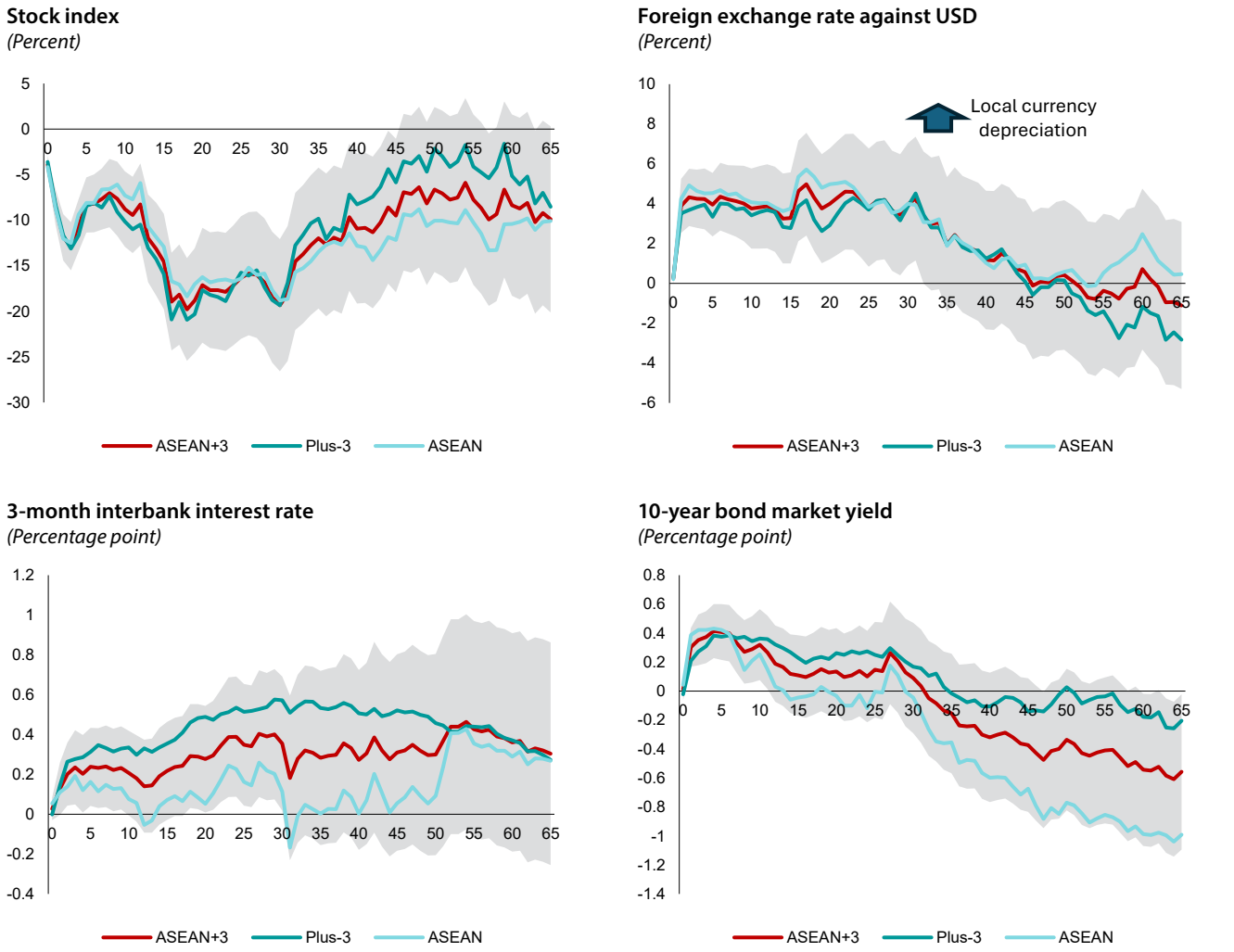
Simulated results show significant effects of pure monetary policy shocks on ASEAN+3 markets (Figure 2.14): stock prices fall, currencies depreciate, and interest rates rise following an unexpected Fed hike. These responses, strongest in the first 20–30 trading days, reflect tighter financial conditions from higher borrowing costs and capital outflows. Short-term rates remain elevated, while long-term bond yield effects fade over time.

There are notable regional differences across financial indicators. Stock indexes in the Plus-3 economies tend to recover more quickly than in ASEAN. ASEAN currencies experience deeper and more prolonged depreciation. Short-term interest rates rise more sharply and persistently in the Plus-3 economies, suggesting more sustained liquidity tightening. For long-term bond yields, ASEAN markets react more quickly but stabilize sooner, whereas the Plus-3 economies maintain elevated yields for a longer period, reflecting a more prolonged adjustment to expectations of persistently tight global financial conditions.

Despite these variations, the pattern is consistent—a tightening of US monetary policy leads to immediate and adverse impacts on ASEAN+3 markets. The analysis assumes a 100 basis point unexpected hike, a large and rare shock, making the results an upper-bound estimate of potential spillover effects.

Figure 2.14. Selected ASEAN+3 Economies: Simulated Dynamic Effects of a 100 bps Unexpected US Monetary Policy Shock on Financial Indicators

Fed hike shocks trigger immediate impacts on ASEAN+3 financial markets, causing stock declines, local currency depreciation, and higher interest rates.



Source: AMRO staff calculations.
Note: The figures show cumulative impulse responses to a 1 percentage point pure monetary policy shock identified from high-frequency data. The x-axis represents the trading days after the shock. Gray shaded areas represent 95 percent confidence intervals for ASEAN+3's impulse-response function (red lines). Estimates are based on panel local projection regressions covering 10 ASEAN+3 economies, including Plus-3 economies and ASEAN-6. For 3-month interbank interest rates for the Philippines, the interbank call loan rate was used as a proxy. 100 basis points (bps) is equal to 1 percentage point.

III. Why Is This Time Different?

As seen in the previous section, the 2022–2023 global monetary tightening put pressure on ASEAN+3 economies, yet financial markets remained orderly and no systemic disruption emerged. In contrast, past episodes of financial stress—such as the Asian financial crisis, which involved systemic banking collapses, massive capital flight, and bailouts led by the International Monetary Fund (IMF); the global financial crisis, which saw many corporate defaults and sharp credit contractions; and the 2013 taper tantrum, which triggered acute exchange rate pressures and capital outflows—resulted in far more severe dislocations in several economies. The resilience shown during the recent global tightening cycle reflects not only how authorities responded to the shock but also the support of stronger economic fundamentals.

Enhanced use of policy mix under the Impossible Trinity

The region's responses have been diverse, reflecting differences in macroeconomic conditions and institutional capacity. Rather than applying a uniform rulebook, authorities have adopted a flexible, country-specific approach—employing a mix of interest rate adjustments, foreign exchange interventions, and capital flow management (CFM) measures as well as diverse stabilization tools under the "impossible trinity" constraint.

In many cases, these tools have been used in combination to enhance effectiveness and manage policy trade-offs. For instance, rate hikes may be paired with foreign exchange intervention to curb inflation and attract capital inflows while limiting excessive volatility to avoid adverse effects on growth. Acknowledging both the synergies and trade-offs, ASEAN+3 economies have generally followed a pragmatic and coordinated approach. This approach is broadly consistent with the IMF's Integrated Policy Framework, which advocates flexible use of multiple tools tailored to specific macroeconomic conditions while promoting policy consistency across countries.

Monetary policy response with concerns over external conditions

Several ASEAN+3 economies, particularly those with inflation targeting frameworks, have relied on policy rates primarily to anchor inflation expectations, while increasingly using them to help stabilize exchange rate and safeguard financial stability.[2]

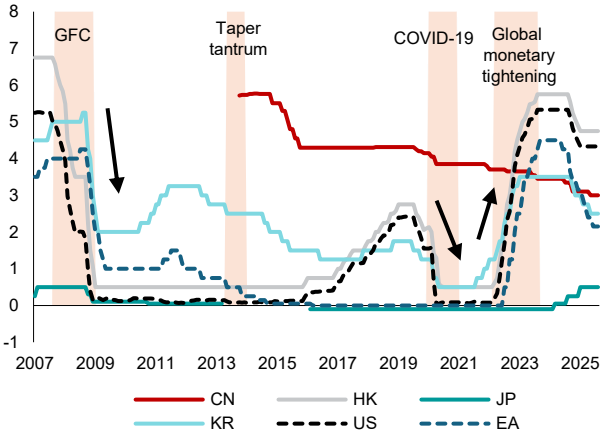
During the taper tantrum in 2013, several ASEAN economies faced sharp capital outflows and currency sell offs. Indonesia, for example, was forced to raise rates steeply to stem depreciation and restore investor confidence—an emergency measure rather than a deliberate policy choice—despite the drag on growth.

By contrast, during the 2022–2023 tightening, central banks acted earlier and more decisively (Figures 2.15 and 2.16). Korea began raising rates in 2021—well before the Fed's first hike. Other inflation-targeting economies, including Indonesia and the Philippines used policy rates to help support the currency, while Thailand also considered financial stability alongside price stability and growth in their monetary policy decisions.

Many economies also utilized a fiscal–monetary policy mix in 2022–2023 to cushion households from the adverse impact of higher interest rates and avoid excessive rate hikes. Korea introduced temporary fuel tax cuts and energy support for vulnerable groups. Indonesia expanded energy subsidies, while Thailand provided electricity and fuel subsidies along with cash transfers to ease cost pressures. The Philippines likewise offered fuel subsidies and targeted cash aid to low income households.

Figure 2.15. US, euro area, and Plus-3: Policy Rates Movement
(Percent)

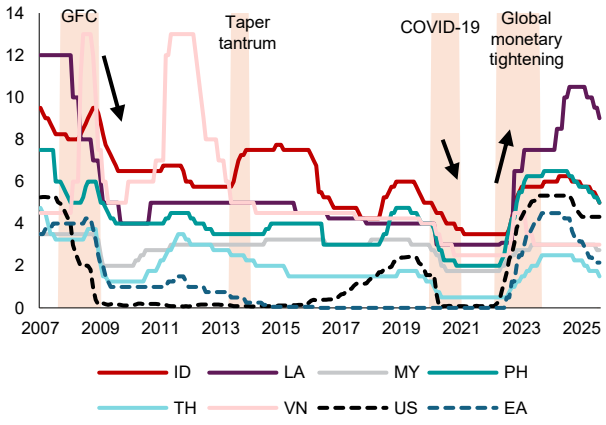
Hong Kong tracks the US, Korea broadly aligns with the global cycle, while China and Japan remain independent.



Source: National authorities via Haver Analytics.
Note: CN = China; HK = Hong Kong; JP =Japan; KR = Korea; US = United States; EA = euro area. GFC = global financial crisis.

Figure 2.16. US, euro area, and Selected ASEAN: Policy Rates Movement
(Percent)

The selected ASEAN economies have broadly aligned with global monetary policy cycles, especially since 2019.



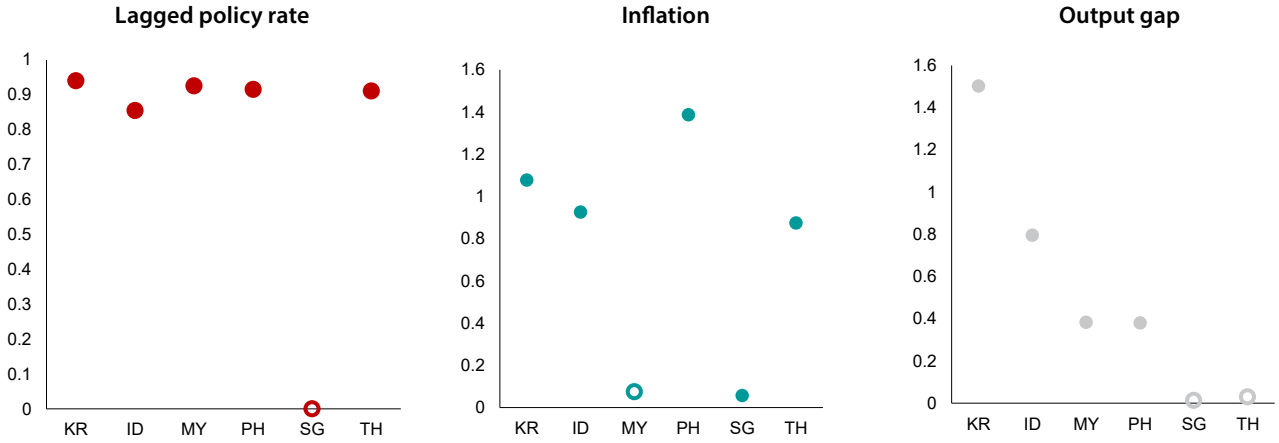
Source: National authorities via Haver Analytics.
Note: Singapore, Brunei, Cambodia, and Myanmar are excluded from the policy rate analysis. Singapore conducts monetary policy through exchange rate management without direct control on the interest rate. Brunei adopts a currency board arrangement with no independent monetary policy. Reliable policy rate data for Cambodia and Myanmar are not consistently available. ID = Indonesia; LA = Lao PDR; MY = Malaysia; PH = Philippines; TH = Thailand; VN = Vietnam; US = United States; EA = euro area. GFC = global financial crisis.

[2] The Bank of Korea (BOK) stated in 2022 that monetary policy would aim to stabilize inflation at target over the medium term, while monitoring economic growth and paying attention to financial stability (BOK 2022). Bank Indonesia (BI) stated in 2024 that monetary policy aimed to keep inflation on target while focusing on rupiah stabilization and attracting capital inflows (BI 2024). The governor of Bangko Sentral ng Pilipinas (BSP) stated in 2022 that policy decisions were guided by the need to maintain price stability, support the peso, and respond to the Fed's rate hikes (BSP 2022). The Bank of Thailand (BOT) stated in 2022 that monetary policy normalization was carefully calibrated to ensure price stability while considering financial stability and ensuring it would not derail the economic recovery (BOT 2022).

To analyze monetary policy reaction, Taylor rules were estimated for selected ASEAN+3 economies. These help assess how central banks respond to inflation, output gaps, and global spillovers. Inflation targeting economies show strong responses to inflation, while reactions to output gaps are more mixed, with strong responses from Korea and Indonesia (Figure 2.17). Results also show widespread policy inertia across the region—except Singapore, which relies on exchange rate management. This policy rate inertia reflects interest rate smoothing behavior, which—as noted by Woodford (2003)—enhances the transmission of monetary policy by allowing central banks to have strong influence on inflation and output while employing smaller, less volatile, policy adjustments. Such gradualism enables the central bank to amplify the effects of monetary policy on inflation and output while minimizing disruptive shifts in the policy instrument.

Figure 2.17. Selected ASEAN+3: Standard Taylor Rule Estimates
(Coefficient estimate)

Policy rates in ASEAN+3 economies exhibit strong inertia, with inflation-targeting economies responding more actively to inflation. Responses to the output gap are relatively mixed.



Source: AMRO staff calculations.
Note: Based on baseline regression model with inflation and output gap as regressors. For Singapore, the nominal effective exchange rate (NEER) is used as the main policy instrument—rather than a conventional policy interest rate—based on a policy regime centered on exchange rates (Annex 2.5). Bubbles with no color fill indicate not significant at the 10 percent level.
KR = Korea; ID = Indonesia; MY = Malaysia; PH = Philippines; SG = Singapore; TH = Thailand.

A further question is how ASEAN+3 central banks conduct monetary policy amid high global financial integration. While flexible exchange rates are thought to preserve policy space, global factors—like US interest rates and risk sentiments—still influence domestic settings. Frequent comovements in interest rates and asset prices raise questions about the extent of monetary autonomy.

Distinguishing responses to common global shocks from direct spillovers is key. Central banks may adjust policy in line with their domestic mandates, even when reacting to foreign developments, but autonomy may be constrained when actions diverge from domestic fundamentals.

A two-step empirical approach assesses this: first, estimating a domestic-rule-based benchmark; second, testing deviations against external variables like the US policy rate, the VIX, and exchange rates (Annex 2.5). Results show varying degrees of external influence across ASEAN+3. Economies like Korea, Indonesia, and Malaysia exhibit strong sensitivity to global factors—where an increase in the federal funds rate of 100 basis points (bps) could lead to between a 2 bps to 9 bps rise in their policy rates, with the range reflecting differences in policy frameworks and domestic policy objectives.

Table 2.1. Selected ASEAN+3: Influence of Global Factors on Policy Rate Decision

Countries	Effective Federal Funds Rate	VIX	Exchange rate versus USD (Percent change)
Korea	0.03***	-0.01***	0.00***
Indonesia	0.09***	0.00	0.03***
Malaysia	0.02**	-0.01***	0.00
Philippines	0.03*	-0.02***	0.01
Singapore	0.01	0.00	0.01
Thailand	0.04***	-0.01***	0.00

Source: AMRO staff calculations.
Note: Asterisks (*, **, ***) denote significance levels at 10 percent, 5 percent, and 1 percent.

Foreign exchange intervention

Many ASEAN+3 economies have relied on foreign exchange intervention as an integral part of their macroeconomic policy frameworks—serving as either a primary instrument or a complementary tool, depending on the exchange rate regime and broader policy objectives.

Since the Asian financial crisis, countries like Indonesia, Korea, the Philippines, and Thailand have moved toward greater exchange rate flexibility, and so enable monetary autonomy. In contrast, others continue to operate under more rigid or managed regimes. Hong Kong and Brunei maintain hard pegs, while Singapore manages the nominal effective exchange rate (NEER) within a policy band as the core of its monetary framework. In addition, countries such as Cambodia, Lao PDR, Myanmar, and Vietnam follow soft pegs or managed floats, reflecting diverse preferences for stability, control, and openness (IMF 2024).

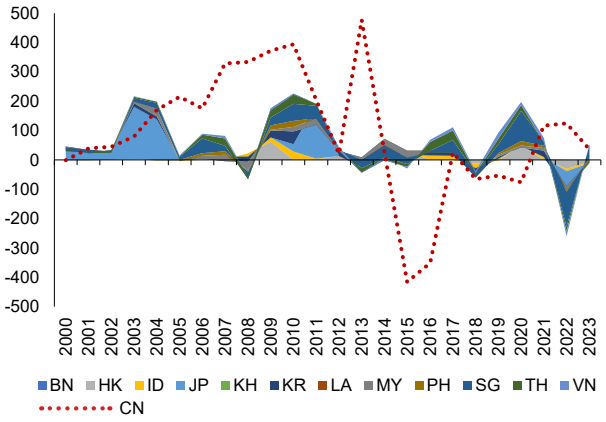
Even with flexible exchange rates, foreign exchange intervention remains a part of the toolkit to mitigate external shocks and curb excessive exchange rate volatility. Interventions are typically asymmetric and state-contingent—used more actively during episodes of capital outflows or excessive exchange rate pressures rather than to target specific exchange rate levels. Many economies in the region tend to accumulate reserves during periods of ample global liquidity. This trend was observed during the early 2000s, the recovery period after the global financial crisis, and the years leading up to the COVID-19 pandemic, when reserve accumulation was widespread.

In contrast, during periods such as the global financial crisis, the taper tantrum, and the US monetary tightening cycle in 2022, foreign exchange reserves were drawn down—partly reflecting the use of intervention to lean against depreciation pressures and restore orderly market conditions. Meanwhile, China exhibits a distinct pattern that often diverges from regional trends, possibly reflecting the country's differentiated macroeconomic conditions and policy considerations (Figure 2.18).[3]

FX intervention was used decisively during the global tightening period to curb disorderly currency moves, involving larger-scale operations than in earlier episodes. Based on publicly available data, in 2022, Japan and Korea conducted large-scale US dollar sales to counter sharp depreciation pressures driven by aggressive US rate hikes and tightening global financial conditions (Figure 2.19). These actions highlight the role of foreign exchange reserves as a defensive buffer to manage excessive volatility and safeguard financial stability during turbulent periods. It is interesting that foreign exchange operations remain relevant across a wide spectrum of policy settings—from fixed regimes, which operate under pegged exchange rate arrangements, to flexible regimes, which tend to intervene when external shocks intensify.

Figure 2.18. Selected ASEAN+3: Stacked Foreign Exchange Interventions Proxied
(Billions of US dollars)

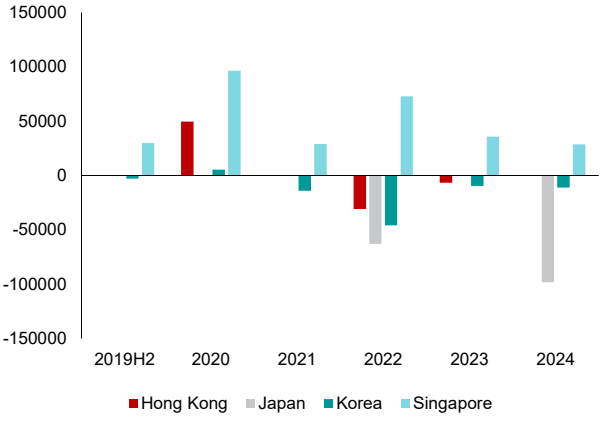
Many economies accumulate reserves during periods of ample liquidity and draw them down during global stress.



Source: Adler and others (2021) with updated data by 2023.
Note: The stacked graph shows the sum of individual economies' foreign exchange intervention estimates. For Japan and Hong Kong, published data on foreign exchange interventions are used. For all other economies, foreign exchange interventions are proxied, which may differ from official Figures. China is shown separately with a dotted line to avoid distorting the overall pattern. BN = Brunei; KH = Cambodia; CN = China; HK = Hong Kong; ID = Indonesia; JP = Japan; KR = Korea; LA = Lao PDR; MY = Malaysia; PH = Philippines; SG = Singapore; TH = Thailand; VN = Vietnam.

Figure 2.19. Selected ASEAN+3: Publicly Reported Net Foreign Exchange or US Dollar Purchases by Authorities
(Millions of US dollars)

In 2022, authorities in Japan and Korea conducted FX sales, underscoring their defensive role.



Source: National authorities via official homepages and Haver Analytics
Note: Data frequencies vary across economies—monthly for Hong Kong and Japan, quarterly for Korea, and semiannual for Singapore. To ensure consistency and comparability, all data have been adjusted to semiannual frequency for the second half of 2019 and annual frequency for 2020–2024. Hong Kong operates under a Currency Board system; the HKMA provides Convertibility Undertakings, committing to buy and sell Hong Kong dollars against US dollars upon request by banks.

[3] Foreign exchange intervention is proxied using changes in international reserves or central bank foreign assets, depending on data availability. These estimates are adjusted for valuation effects and, where possible, for interest income and other flows unrelated to intervention. Proxies may differ from official intervention data.

Capital flow management measures

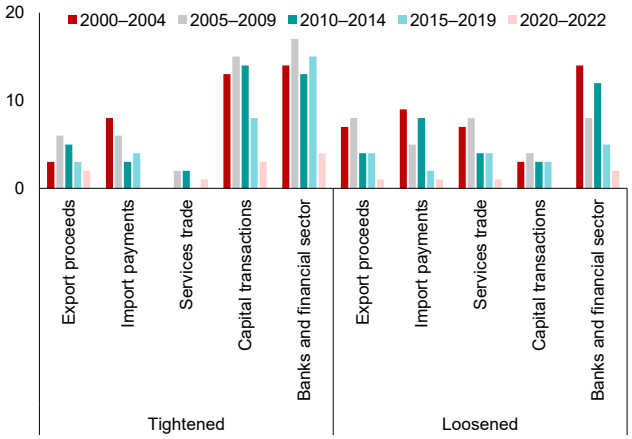
While the traditional policy consensus—rooted in the Impossible Trinity—held that flexible exchange rates could safeguard monetary autonomy without capital flow measures (CFMs), excessive volatility can make the exchange rate a shock amplifier rather than a shock absorber (Georgiadis and Zhu 2021). Episodes such as the global financial crisis, the 2013 taper tantrum, and repeated surges and reversals in capital flows to emerging markets revealed that exchange rate flexibility, while useful, offers only partial protection against externally driven financial shocks. A growing body of research—for example, Rey (2015); Miranda-Agreippino and Rey (2022); Cerutti and others (2021)—has shown that monetary policy shifts in major advanced economies transmit through a global financial cycle shaped by global risk sentiment, dollar funding conditions, and the procyclical behavior of large international bank balance sheets. These mechanisms have amplified credit and asset price cycles in recipient economies, regardless of their exchange rate regimes. As a result, targeted and temporary CFMs, coordinated with macroprudential and monetary policies, have gained acceptance for managing capital flow volatility and maintaining stability.[4]

Analysis of these measures in the ASEAN+3 region reveals a strategic rebalancing of policy tools over the past two decades. The overarching trend has been a compositional pivot away from broad controls on trade and current account payments, and toward a more granular and prudential framework for managing capital and financial sector flows (Figure 2.20). While this strategic shift is common to the region, the application and intensity of specific measures—particularly those most relevant to monetary policy—differ notably between the Plus-3 and ASEAN-5 economies (Figure 2.21).

Regarding restrictions on capital market securities, both subregions have increased their focus—particularly on portfolio flows by foreign investors. In both ASEAN-5 and Plus-3 countries, regulations on the purchase of locally issued, foreign-currency-denominated securities by nonresidents tightened between 2000 and 2022, reflecting concerns over potential capital flow volatility and currency mismatches. However, their broader approaches diverged. In ASEAN-5, new regulations on collective investment funds related to investable securities and investors were introduced in 2006 before being loosened in 2008, with all five countries imposing some restrictions and continued refinement up to 2022.[5] By contrast, the Plus-3 economies have shown a trend of gradual tightening on general capital market securities.

Figure 2.20. ASEAN+3: Changes in Exchange and Capital Flow Regulations
(Number)

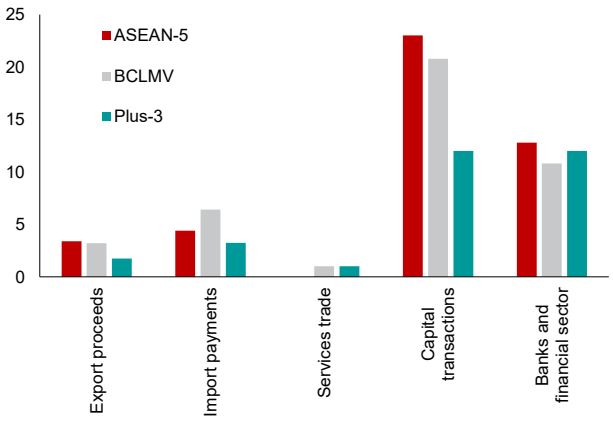
ASEAN+3 has adjusted cross-border regulations over time, especially on capital and financial sector measures.



Source: IMF Annual Report on Exchange Arrangements and Exchange Restrictions.
Note: Number of country-year pairs that revised exchange and capital-flow regulations during each five-year period. A tightened/loosened is recorded when the status of any subcategory regulation in the database changes between "yes" and "no." "Export proceeds" refers to exports and related receipts, "Import payments" refers to imports and related payments, "Services trade" covers proceeds from invisible transactions and current transfers, "Capital transactions" refers to cross-border capital account transactions, and "Banking and financial sector" includes provisions specific to the financial sector.

Figure 2.21. ASEAN+3: Exchange and Capital Flow Measures in Effect in 2022
(Number)

Measures affecting capital transactions and financial sector operations remain in place across the region.



Source: IMF Annual Report on Exchange Arrangements and Exchange Restrictions.
Note: Average number of regulations identified by the subcategory of the database. "Export proceeds" refers to exports and related receipts, "Import payments" refers to imports and related payments, "Services trade" covers proceeds from invisible transactions and current transfers, "Capital transactions" refers to cross-border capital account transactions, and "Banking and financial sector" includes provisions specific to the financial sector.
BCLMV = Brunei, Cambodia, Lao PDR, Myanmar, and Vietnam.

[4] The International Monetary Fund (IMF), in a review of the institutional view on the liberalization and management of capital flows in 2022, introduced the concept of 'pre-emptive' use of CFM measures for capital inflow, in addition to the use of CFM measures in response to surges in capital inflows or disruptive outflows which was deemed legitimate in the 2012 institutional view.

[5] Thailand introduced reserve requirements for certain capital inflows in 2006 and removed them in 2008. Malaysia added another approval process for domestic fund sales in 2006, which was removed in 2008. Philippines replaced prior BSP approval for foreign exchange purchases exceeding USD 60 million to prior notification.

Provisions targeting financial institutions related to cross-border capital flow remain a key component of the macroprudential framework for both subregions. Capital flow regulations for commercial banks have been applied across all ASEAN-5 and Plus-3 members since at least 2008. For institutional investors, ASEAN-5 has maintained a consistently high and stable level of regulation since 2000. The Plus-3 approach has been more dynamic, showing a significant tightening of general provisions for institutional investors between 2000 and a 2008 peak, followed by a slight easing by 2022, suggesting a move toward a more diversified framework.[6]

Table 2.2. Selected ASEAN+3: Examples of Capital Flow Management Measures (CFMs) and Macroprudential Policy Measures (MPMs)

Economy	Type of CFM	Description	Purpose/Target	Date/Period
China	QFII/RQFII quotas; foreign exchange repatriation rules	Controls on the amount and timing of foreign exchange repatriation for foreign institutional investors.	Prevent sudden outflows and foreign exchange instability.	2002–2020 (merged into QFI program)
Korea	Caps on FX forward positions	Limits on banks' net foreign exchange forward positions. (Domestic banks: 75 percent, foreign bank branches: 375 percent of capital)	Restrain excessive foreign exchange risk-taking by banks and reduce external funding vulnerabilities.	2010–present
	Macro-prudential stability levy	Levy on financial institutions' short-term non-deposit foreign currency liabilities.	Reduce short-term capital inflows and FX mismatches.	2011–present
Indonesia	Prudential principles for nonbank corporations' external debt	Nonbank corporates with FX debt are required to meet minimum hedging, liquidity, and credit rating standards.	Mitigate FX and liquidity risks from external debt.	2015–present
Malaysia	Prudential limits on large exposures	Licensed banks' total foreign exchange and ringgit-denominated exposures to a single counterparty capped at 25 percent of capital.	Limit credit risk and mitigate capital flow-related vulnerabilities.	2014–present
Philippines	Regulation on banks' net open position (NOP)	Banks must maintain NOP within the lower of 25 percent of qualifying capital or USD 150 million.	Mitigate banks' foreign exchange risk from external shocks.	2007–present
Thailand	Regulation on banks' net open position (NOP)	Limit banks' net foreign exchange positions up to 15 percent per currency and 20 percent in total of capital, or a minimum of USD 5 million and USD 10 million.	Limit banks' foreign exchange exposure to mitigate capital flow and foreign exchange risks.	2008–present
Vietnam	Withholding tax on nonresidents	5 percent withholding tax is imposed on dividends and interest paid to nonresident individuals. 10 percent for royalties paid to nonresidents.	Discourage speculative portfolio inflows and ensure tax compliance on cross-border income.	2015–present

Source: AMRO (2024); International Monetary Fund; national authorities; AMRO staff compilation.
Note: The date indicates the introduction of the measure, while specific parameters such as percentages or amounts may have changed over time. QFII = Qualified Foreign Institutional Investor, RQFII = RMB Qualified Foreign Institutional Investor, QFI = Qualified Foreign Investor.

[6] Korea established the scope of institutional investor classification in the 2007 Financial Investment Services and Capital Markets Act. China introduced regulations on investment positions for insurance companies in 2011 for foreign investment, and in 2016 for domestic investment. Japan removed regulation on investment positions for insurance companies in 2012.

Additional financial stabilization measures

Additional financial market stabilization tools have also been crucial in helping ASEAN+3 economies manage market disruptions during periods of stress. In recent years, authorities across the region developed and implemented stabilization measures to better withstand external shocks, such as the COVID-19 shock and global monetary tightening cycles, including the aggressive Fed rate hikes in 2022. These measures include policies to stabilize the foreign exchange market, financial market operations to help stabilize and provide liquidity to support bond and money markets, and macroprudential measures to contain systemic risks.

To alleviate foreign exchange market pressures without resorting to sustained or distortionary currency defense, several economies implemented targeted interventions beyond direct spot market intervention. For example, in 2022, Korea introduced an FX swap arrangement between the Bank of Korea and the National Pension Service, enabling the pension service to access US dollars from foreign exchange reserves for overseas investments. This measure helped reduce spot market dollar demand and eased pressure on the Korean won amid heightened global financial stress. Indonesia adopted a multipronged rupiah stabilization strategy, including foreign exchange swap operations and interventions in the domestic non-deliverable forward market, to manage onshore dollar liquidity and stabilize exchange rate expectations. The Philippines enhanced market transparency through the adoption of centralized foreign exchange trade reporting systems, which helped to improve pricing efficiency and reduce volatility. In Malaysia, the government and Bank Negara Malaysia coordinated efforts to encourage repatriation and conversion of foreign investment income, particularly from government-linked companies and government-linked investment companies, to ensure a more balanced two-way flow.

Bond market stabilization measures have also been deployed or remain available to cushion the impact of rising global interest rates and capital outflows. In Indonesia, Bank Indonesia has purchased government securities in the primary and secondary markets during periods of financial stress to inject liquidity and anchor confidence. In Korea, the Bond Market Stabilization Fund was reactivated in 2022 to address tightening credit conditions following market volatility. While not used during the 2022 US tightening, Thailand's Corporate Bond Stabilization Fund and Bond Mutual Fund Liquidity Support Facility—originally introduced during the COVID-19 shock—remain important backstop tools for use in periods of financial distress. In the Philippines, the Government Securities Repo Program and enhanced securities facility supported bond market functioning, while Malaysia benefited from a deep local bond market and strong institutional investor base to absorb shocks.

Another set of system-wide measures is aimed at mitigating external financial risks—particularly those arising from volatile capital flows and currency mismatches—which may overlap with capital flow management measures (CFMs). These include levies on banks' foreign exchange liabilities to discourage reliance on short-term external funding (as implemented in Korea) and adjustments to foreign exchange reserve requirements to help manage foreign currency liquidity risks (used in Indonesia). Limits on net open foreign exchange positions aim to reduce unhedged currency exposures and are applied in several economies, including Indonesia, the Philippines, and Korea. Hedging requirements for foreign exchange loans help ensure that borrowers manage exchange rate risks (as implemented in Indonesia). These measures can serve both financial stability and capital flow management objectives, illustrating the overlapping nature of such policy tools.

Greater resilience in fundamentals

Stronger fundamentals have been central to how ASEAN+3 economies navigated the global tightening without major disruption. Over the past decades, the region has developed deeper financial markets and more resilient economic structures. Banking systems are now better capitalized and more tightly supervised, reducing vulnerabilities that once amplified shocks. At the same time, foreign exchange reserves have been steadily accumulated and used as a self defense buffer against external pressures.

Financial market depth and resilience

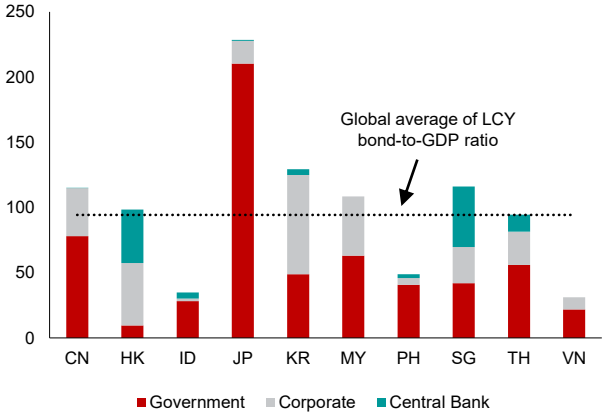
The depth and structure of regional financial markets is critical in determining how ASEAN+3 economies absorb and respond to external shocks. In particular, well-developed local currency (LCY) bond markets strengthen resilience by facilitating domestic financing, reducing reliance on foreign-currency debt, and mitigating rollover and exchange rate risks. Over the past decade, LCY bond markets in the region have expanded significantly, with the average bond-to-GDP ratio rising from 75.9 percent in 2013 to 100.5 percent in 2024, exceeding global average (Figure 2.22).[7] This growth reflects sustained capital market development, a growing domestic institutional investor base, increased infrastructure financing needs, and regional efforts to reduce foreign currency risks.

[7] The average foreign currency bond-to-GDP ratio has also increased, but at a more moderate pace—from 7.5 percent in 2013 to 9.9 percent in 2024.

Even with deeper LCY bond markets, the composition of investors remains important in determining resilience to external shocks. While foreign participation in LCY bond markets can improve liquidity and lower financing costs, a high share of foreign holdings may increase vulnerability to global monetary shocks. In periods of tightening global financial conditions or shifting investor sentiment, economies with greater foreign exposure may face capital outflows, asset price volatility, and exchange rate pressures. In recent years, foreign ownership of LCY bonds has generally declined across ASEAN+3, reflecting both policy efforts to promote a more stable domestic investor base and rising global risk aversion (Figure 2.23).

Figure 2.22. Selected ASEAN+3: Size of Local Currency Bond Market in Percent of GDP
(Percent)

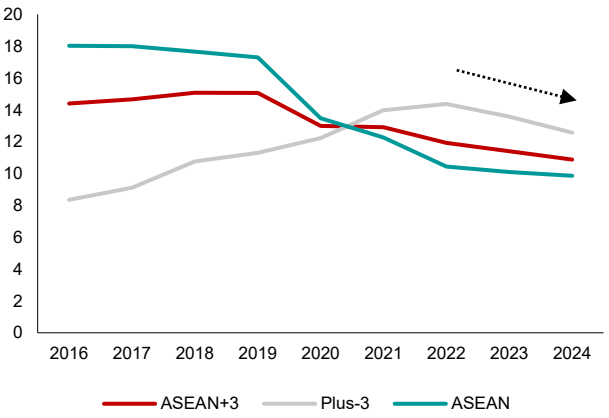
Several economies in the region have sizable LCY bond markets exceeding the global average.



Source: AsianBondsOnline; Bank for International Settlements; International Monetary Fund; AMRO staff calculations.
Note: The global average ratio is calculated as a simple average based on domestic debt securities data available in the BIS database. ASEAN+3 data are as of 2024; the global average is as of 2023. CN = China, HK = Hong Kong; ID = Indonesia; JP = Japan; KR = Korea; MY = Malaysia; PH = Philippines; SG = Singapore; TH = Thailand; VN = Vietnam. LCY = local currency.

Figure 2.23. Selected ASEAN+3: Foreign Investor Holdings in Local Currency Government Bonds
(Percent)

A declining trend has recently been observed in foreign ownership of LCY bonds.



Source: AsianBondsOnline; AMRO staff calculations.
Note: Selected Plus-3 includes China, Japan, and Korea. Selected ASEAN includes Indonesia, Malaysia, the Philippines, Thailand, and Vietnam. The values for each group were calculated as simple averages. LCY = local currency.

Banking sector resilience

Banks play a critical role as credit intermediaries, making their resilience a key pillar of broader financial system stability. Supported by regulatory improvements since the Asian financial crisis, ASEAN+3 banks have demonstrated strong resilience through major global shocks, including the global financial crisis, the European sovereign debt crisis, the taper tantrum, the COVID-19 pandemic, and the global monetary tightening in 2022.

The capital adequacy of ASEAN+3 banks provides a critical buffer against monetary policy shocks. ASEAN banks report higher capital adequacy ratios (CARs) and Tier 1 CARs compared to their global counterparts. While the CARs of the Plus-3 banks are lower than those of ASEAN banks, they remain well above regulatory requirements (Figure 2.24).[8] Asset quality in the region also remains strong, although there is variation in banking resilience across economies, and average indicators may mask underlying vulnerabilities in some jurisdictions.

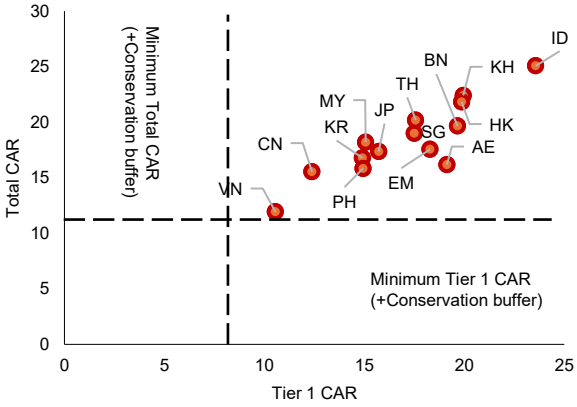
To further assess the robustness of the banking system, AMRO conducted a reverse stress test to evaluate how much deterioration in asset quality banks could withstand before their CARs fall to the Basel III minimum of 10.5 percent (Annex 2.6). The stress scenario simulates the impact of a monetary policy shock, which could reduce banks' capital buffers primarily through a rise in nonperforming loans (NPLs) and the resulting increase in provisioning costs. The results suggest that, on average, NPL ratios in ASEAN+3 economies could increase by up to 18.8 percentage points before banks' total CARs fall to the regulatory floor (Figure 2.25).

A sensitivity analysis shows that a 1 percentage point tightening in global monetary policy post-2010 would cumulatively raise NPL ratios on average in the region by only 0.1 percentage point. Given the low likelihood of further global rate hikes, with some major central banks already shifting toward easing, banks across the region appear generally resilient and remain well below the hypothetical breakeven NPL thresholds implied by the CAR floor.

[8] Japan sets different CAR for different types of banks. internationally active banks are required to meet total 2.5 percent to 5 percent extra capital buffer compared to domestic banks (Bank of Japan 2024).

Figure 2.24. Selected ASEAN+3: Total and Tier 1 Capital Adequacy Ratios in 2024
(Percent)

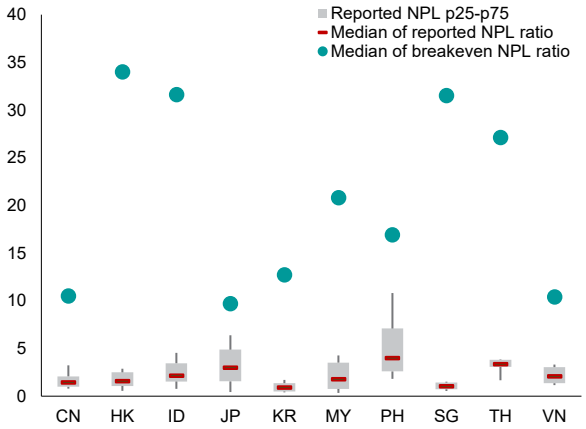
ASEAN+3 bank CARs generally exceed Basel requirements, offering a buffer against external shocks.



Source: National authorities; International Monetary Fund via Haver Analytics; AMRO staff calculations.
Note: Advanced economies (AEs) refer to selected economies in North America and western Europe. Emerging economies (EMs) refer to selected economies in Latin America and eastern Europe. For countries that have not released end-2024 data, use the latest quarter data. In the case of the Philippines, IMF FSI data differs slightly from the Bangko Sentral ng Pilipinas (BSP) figure, which places the banking system's capital adequacy ratio (CAR) on a solo basis at 16.2 percent as of end-2024. CAR = capital adequacy ratio. CN = China, HK = Hong Kong; JP = Japan; KR = Korea; ID = Indonesia; MY = Malaysia; PH = Philippines; SG = Singapore; TH = Thailand; BN = Brunei; KH = Cambodia; VN = Vietnam.

Figure 2.25. Selected ASEAN+3: Reported and Breakeven Nonperforming Loan Ratios in 2023
(Percent)

Stress tests suggest global monetary tightening would have limited impact on regional banks' asset quality.



Source: AMRO Reverse Solvency Stress Tester; AMRO staff calculations.
Note: Each candlestick represents the distribution of nonperforming loan (NPL) ratios across the economy: the bottom of the lower wick indicates the 10th percentile; the bottom of the body marks the 25th percentile; the top of the body shows the 75th percentile; and the top of the upper wick represents the 90th percentile. The reported NPL ratio refers to the ratio reported by banks in their financial statements. The reported NPL distribution is based on individual banks' balance sheet data, and may therefore differ from the aggregate figures published by the authorities. The breakeven NPL ratio is the maximum level of nonperforming loans that banks can absorb before their capital adequacy ratio falls to the regulatory minimum. NPL = nonperforming loans. CN = China, HK = Hong Kong; ID = Indonesia; JP = Japan; KR = Korea; MY = Malaysia; PH = Philippines; SG = Singapore; TH = Thailand; VN = Vietnam.

Foreign exchange reserves as self-defense

Foreign exchange reserves serve as a critical buffer, particularly during periods of global monetary policy tightening. Adequate reserves help economies manage capital flow volatility, support exchange rate stability, and maintain investor confidence in times of financial stress. As such, reserves are often viewed as a form of financial "self-defense", allowing countries to absorb external shocks without resorting to abrupt policy adjustments. Box 2.1 shows that economies with larger reserve buffers tend to exhibit lower sensitivity of domestic policy rates to external shocks, such as US policy rate hikes.

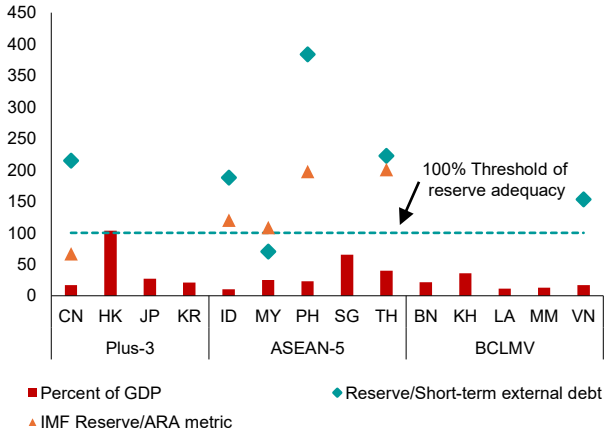
Most ASEAN+3 economies appear to maintain sufficient foreign reserves. According to the Guidotti-Greenspan rule, which sets a 100 percent threshold for the ratio of reserves to short-term external debt, most economies with available data exceed this benchmark, indicating strong liquidity positions. Notably, Indonesia and the Philippines—once severely affected during the GFC and the taper tantrum—have strengthened their positions, with the ratio now higher than in those earlier stress episodes and showing an upward trend, reflecting improved external resilience. Under the IMF's Assessing Reserve Adequacy (ARA) framework, most economies with available data exceed the 100 percent adequacy threshold (Figure 2.26).[9]

In terms of import coverage, many economies in the region also maintain reserves well above the conventional three-month threshold. Notably, China and Japan have particularly high import cover, while some BCLMV countries—such as Lao PDR and Vietnam—remain below key adequacy thresholds, suggesting higher external vulnerability (Figure 2.27). Overall, the ASEAN+3 region is in a relatively resilient position, though continuous monitoring and efforts to strengthen reserve buffers remain important for more vulnerable economies.

[9] In the case of China, the IMF's Assessing Reserve Adequacy (ARA) ratio below 100 percent does not reflect insufficient reserves but mainly due to large structural excess in broad money. Moreover, as the renminbi—along with the yen—is classified by the IMF as a freely usable currency, China's actual external resilience may be greater than what the ARA ratio suggests.

Figure 2.26 ASEAN+3: Foreign Exchange Reserves to GDP, Short-Term External Debt, and IMF ARA Metric
(Percent)

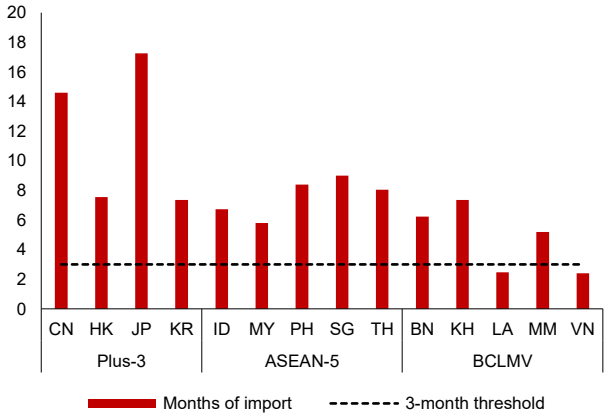
Most ASEAN+3 economies have sufficient reserves relative to short-term external debt.



Source: National authorities; CEIC Data; International Monetary Fund.
Note: Most economies' data are as of end-2024, with a few reflecting the latest available data. The 100-percent threshold for the reserves-to-short-term external debt ratio is based on the Guidotti-Greenspan Rule. CN = China, HK = Hong Kong; JP = Japan; KR = Korea; ID = Indonesia; MY = Malaysia; PH = Philippines; SG = Singapore; TH = Thailand; BN = Brunei; KH = Cambodia, LA = Lao PDR; MM = Myanmar; VN = Vietnam. ARA = IMF Assessing Reserve Adequacy ratio.

Figure 2.27. ASEAN+3, US: Foreign Exchange Reserves in Months of Imports
(Months)

Most ASEAN+3 economies maintain adequate reserves exceeding the 3-month import coverage threshold.



Source: CEIC Data.
Note: Most economies' data are as of end-2024, with a few reflecting the latest available data. CN = China, HK = Hong Kong; JP = Japan; KR = Korea; ID = Indonesia; MY = Malaysia; PH = Philippines; SG = Singapore; TH = Thailand; BN = Brunei; KH = Cambodia, LA = Lao PDR; MM = Myanmar; VN = Vietnam.

Box 2.1:

Monetary Spillovers in a Global Sample: Conditioning Factors in the Transmission of US Monetary Policy Shocks

This analysis examines how changes in the US policy rate influence domestic policy rates across a wide sample of economies and explores how country specific factors—such as external exposure and financial resilience—shape the strength of that transmission.

The analysis follows Alessandri, Jordà, and Venditti (2025), who examine the role of financial conditions in the transmission of monetary policy. The approach extends the local projection method to estimate the effects of US monetary policy shocks—specifically, changes in the federal funds rate—on domestic policy rates across countries.

The model traces how domestic policy rates respond over time (at different horizons) to a US policy rate shock using impulse response functions. Importantly, it allows these responses to vary depending on each country's financial characteristics by including interaction terms between the shock and those characteristics. In this analysis, key variables such as the share of external borrowing from the United States (US) and the level of international reserves are used to capture cross-country heterogeneity over time.

The dataset covers monthly data for 90 economies over 1990 to 2024, excluding countries with extreme monetary conditions (e.g., hyperinflation). Domestic policy rates are sourced from the International Monetary Fund's International Financial Statistics database (IMF IFS) and the Bank for International Settlements (BIS); the US policy rate is the federal funds target rate. Country-specific characteristics data include (1) external borrowing from the US (BIS locational statistics), and (2) international reserves (IMF IFS).

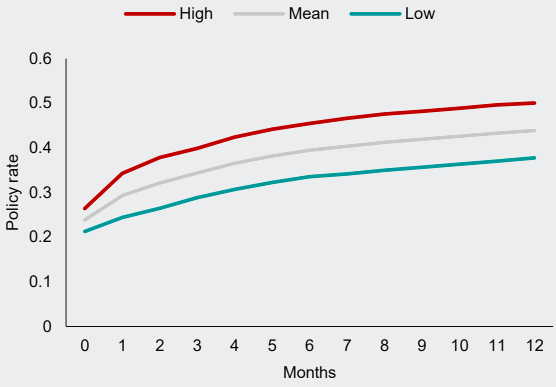
Domestic policy responses to changes in the federal funds rate tend to be both immediate and persistent, highlighting the broad reach of international monetary spillovers. However, the intensity of these responses varies significantly across countries, depending on their financial exposure to the US and the strength of their domestic buffers.

Economies with stronger financial and trade links to the US experience larger spillovers. For instance, countries with a one standard deviation higher share of external borrowing from the US exhibit a cumulative policy rate increase of approximately 0.5 percentage point after 12 months—around 0.12 percentage point higher than those with weaker links (Figure 2.1.1).

In contrast, domestic resilience—measured by indicators such as the reserve-to-GDP ratio—acts as a buffer. Countries with stronger financial buffers show a cumulative response that is about 0.18 percentage point lower over the same horizon compared to less resilient economies. These findings suggest that both external exposure and domestic financial strength play important roles in shaping the transmission of US monetary policy across a wide range of economies (Figure 2.1.2).

Figure 2.1.1. Impact of Linkage with the United States (Borrowing Share) on the Monetary Policy Spillover to the Domestic Economy
(Percentage point)

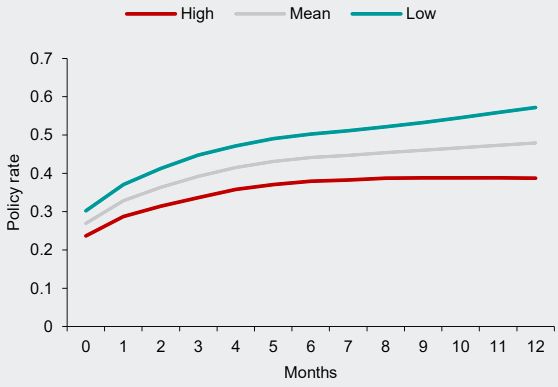
Higher US borrowing exposure leads to stronger policy rate responses.



Source: AMRO staff calculations.
Note: Cumulative multiplier of US monetary policy shock on domestic policy rate by month estimated local projection method with heterogeneous response, based on Alessandri, Jordà, and Venditti (2025) and extended to 90 countries panel setup. High corresponds to the response from countries with a one standard deviation higher external borrowing share with the US than average economies.

Figure 2.1.2. Impact of Domestic Resilience (Reserve/GDP) on the Monetary Policy Spillover to the Domestic Economy
(Percentage point)

Larger reserve buffers help dampen the sensitivity of policy rates to external shocks.



Source: AMRO staff calculations.
Note: Cumulative multiplier of US monetary policy shock on domestic policy rate by month estimated local projection method with heterogeneous response, based on Alessandri, Jordà, and Venditti (2025) and extended to 90 countries panel setup. High corresponds to the response from countries with a one standard deviation higher reserve-to-GDP ratio than average economies.

The author of this box is Yoki Okawa.

IV. Remaining Vulnerabilities: Areas for Ongoing Vigilance

Despite the region's improved resilience, several vulnerabilities remain that warrant close and continuous monitoring. While ASEAN+3 managed the recent tightening cycle well, a future round of severe shocks could test these fault lines, magnifying their impact and straining buffers. This section examines key vulnerabilities in ASEAN+3, focusing on debt serviceability and financial institutions' exposure to market risks.

Debt serviceability and exposure to external shocks

Global monetary tightening—closely associated with heightened stress in bond and credit markets—can lead to higher financing costs driven by rising interest rates and weaker exchange rates, amplifying debt service vulnerabilities in ASEAN+3 economies. Risks would be more pronounced for economies or sectors with elevated debts, underlying vulnerabilities, and substantial external exposure.[10]

External debt

ASEAN+3 economies have generally improved their external debt profiles from the Asian financial crisis, with lower overall external debt to GDP and less short-term borrowings. However, some economies, such as Lao PDR and Malaysia[11], maintain relatively high external debt, and Korea shows an upward trend (Figure 2.28).

Large amounts of external debt—particularly short-term external debt—can increase refinancing and rollover risks amid elevated global interest rates, tighter liquidity, and US dollar appreciation, though most ASEAN+3 economies appear relatively resilient compared to other economies. Financial centers aside, ASEAN+3 economies have lower external debt to GDP compared to the global average (Figure 2.29). The large external debt, short-term debt ratios, and debt issued by private sectors in Hong Kong and Singapore reflect their roles as financial centers. Japan also shows high external and short-term external debt-to-GDP ratios, driven by its globally active financial sector.

The composition of external debt varies across countries with relatively higher share of deposit-taking companies in financial centers, while in some economies such as Malaysia and Thailand would see a larger proportion of external debt issued by the corporate sector, partly reflecting the cross-border operations of large companies and their direct access to external funding.

Corporate debt

Global monetary tightening threatens financial stability by reducing corporate debt serviceability, especially for highly leveraged companies. Risks arise from higher domestic rates or increased refinancing costs on foreign currency (FCY) debt. A stress test conducted by AMRO illustrates how global monetary policy shocks could increase corporate debt-at-risk in ASEAN+3 economies (Box 2.2).

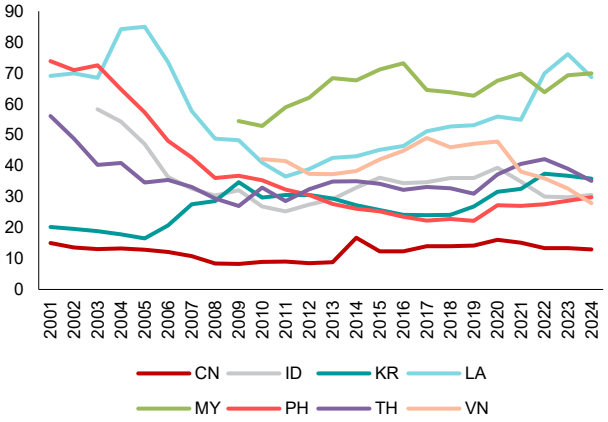
ASEAN+3 corporate bonds grew from USD 9 trillion in 2019 to over USD 12 trillion in 2024. While local currency (LCY) bonds dominate, FCY still makes up about one-fifth, exposing companies to refinancing and currency risks (Figure 2.30). China and Korea rely mainly on LCY because their domestic capital markets are deep. Japan has a balanced mix of LCY and FCY instruments, while Hong Kong and Singapore issue more FCY bonds as regional financial hubs serving as key offshore funds. Indonesia and the Philippines depend more on FCY funding because their domestic investor bases are limited or to the need to finance overseas investments—unlike Malaysia, Thailand, and Vietnam, which use more LCY instruments (Figure 2.31).

[10] While government and household debt may also be affected, they are generally considered less vulnerable, as government debt is supported by sovereign backing and both are largely denominated in local currency. For further discussion on these sectors, refer to Chapter 1.

[11] In the case of Malaysia, short-term external debts are accounted for mostly by resident banks in connection with their foreign currency liquidity operations and MNCs (including foreign banks) borrowing from their overseas parent/headquarters. These obligations can be met in the normal course of operations from their external asset holdings and do not pose any claims on BNM's international reserves.

Figure 2.28. Selected ASEAN+3: External Debt to GDP Ratio Trend
(Percent)

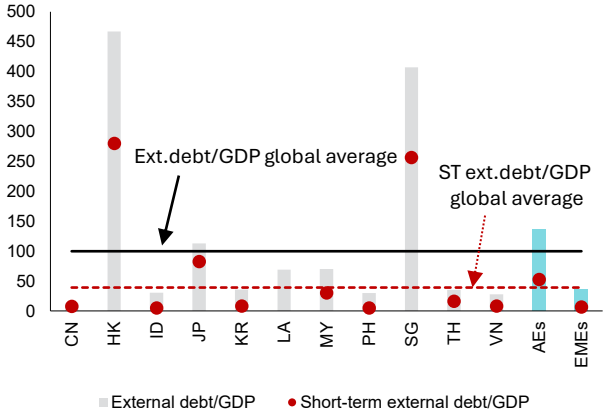
External debt ratios have stabilized overall but remain high or increasing in some economies.



Source: CEIC.
Note: The data are as of 2024 or the latest. CN = China; ID = Indonesia; KR = Korea; LA = Lao PDR; MY = Malaysia; PH = Philippines; TH = Thailand; VN = Vietnam.

Figure 2.29. Selected ASEAN+3: External Debt to GDP Ratio as of 2024
(Percent)

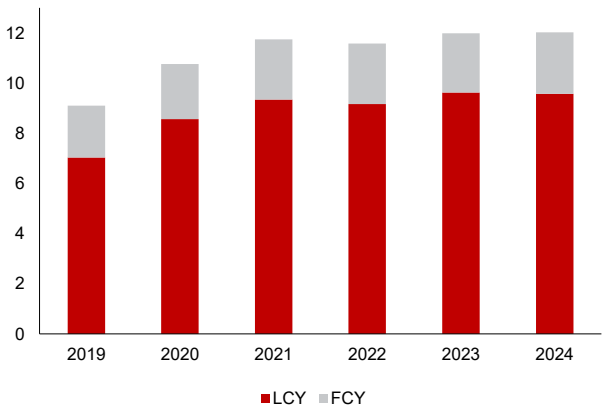
Excluding financial centers, external debt-to-GDP ratios in ASEAN+3 are generally modest.



Source: CEIC; International Monetary Fund; World Bank; AMRO staff calculations.
Note: The data are as of 2024 or the latest. The global, advanced economies, and emerging market averages are GDP-weighted measures, and advanced economies and emerging market are countries outside of ASEAN+3. CN = China; HK = Hong Kong; ID = Indonesia; JP = Japan; KR = Korea; LA = Lao PDR; MY = Malaysia; PH = Philippines; SG = Singapore; TH = Thailand; VN = Vietnam; AEs = advanced economies; EMEs = emerging market economies.

Figure 2.30. Selected ASEAN+3: Corporate bonds by Currency
(Trillions of US dollars)

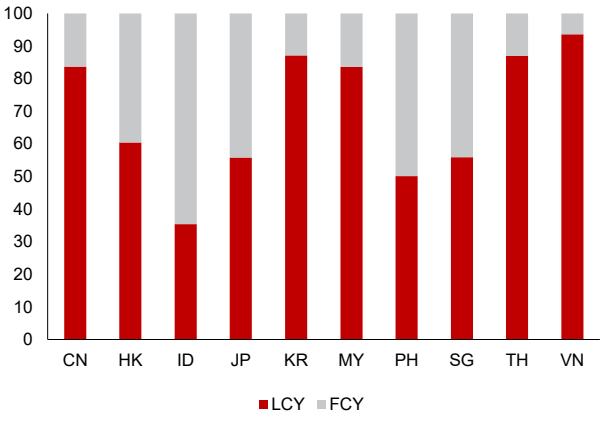
ASEAN+3 corporate bonds rose steadily, with LCY bonds dominating but FCY bonds remaining sizable.



Source: AsianBondsOnline; AMRO staff calculations.
Note: Selected ASEAN+3 includes China, Hong Kong, Japan, Korea, Indonesia, Malaysia, the Philippines, Singapore, Thailand, and Vietnam. LCY = local currency, FCY = foreign currency.

Figure 2.31. Selected ASEAN+3: Breakdown by Economies, 2024
(Percent)

FCY bonds are more prominent in some economies like Indonesia and the Philippines, and financial centers.



Source: AsianBondsOnline; AMRO staff calculations.
Note: CN = China, HK = Hong Kong, ID = Indonesia, JP = Japan, KR = Korea, MY = Malaysia, PH = Philippines, SG = Singapore, TH = Thailand, VN = Vietnam. LCY = local currency, FCY = foreign currency.

Box 2.2:

Global Monetary Policy Shock and Corporate Debt-at-risk in ASEAN+3

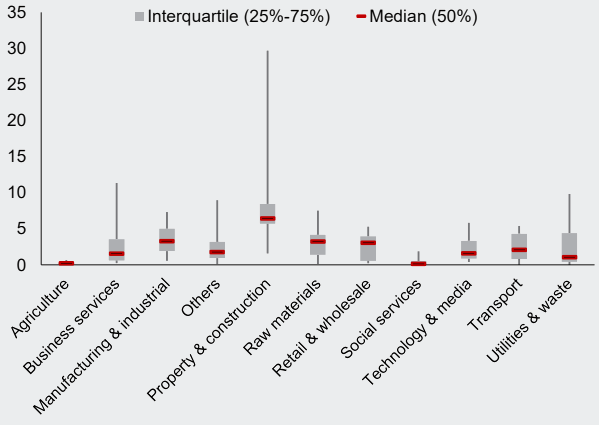
To assess the potential impact of external monetary shocks on corporate resilience, the analysis focuses on their effects on companies' interest coverage ratios (ICRs) through two main channels. First, global monetary tightening can spill over into domestic financial conditions, raising local interest rates and increasing debt servicing costs for companies with local currency (LCY) debt. Second, for companies with foreign currency (FCY) liabilities, global financial tightening directly raises refinancing costs—even without domestic rate hikes—and this burden can be further amplified by local currency depreciation.

Corporate debt-at-risk (DAR) is estimated as the share of debt held by nonfinancial companies with an ICR below 1.25, expressed as a percentage of GDP. The estimates are based on the latest available company balance sheets from Orbis (2023 or 2024), covering approximately 1.6 million companies, with coverage varying across economies.

Across ASEAN+3, corporate debt-at-risk (DAR) is concentrated in a few key sectors. Property and construction stand out as having the largest share, followed by manufacturing, and raw materials (Figure 2.2.1). At the country level, the industry mix of corporate DAR differs, but a common feature is the dominance of property and construction. For instance, the share of property and construction in corporate DAR is relatively high in economies such as Korea, Singapore, Hong Kong, and Vietnam; manufacturing shares are more prominent in Indonesia and Japan while raw materials account for a notable share in Indonesia and China, reflecting their industrial structures and corporate financing patterns (Figure 2.2.2).

Figure 2.2.1. Selected ASEAN+3: Distribution of Corporate Debt at Risk (DAR) as a Share of Total Corporate Debt, by Industry
(Percent)

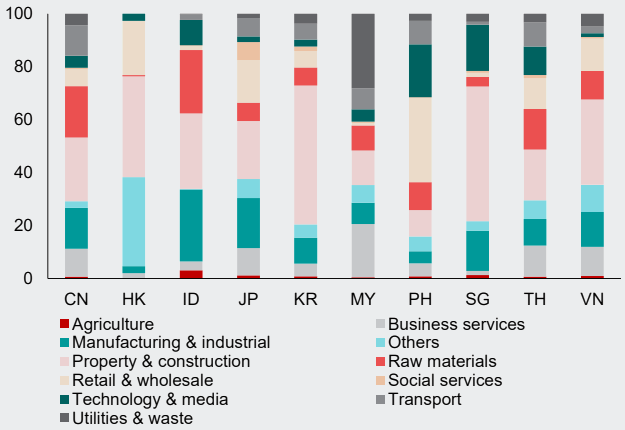
Corporate DAR is high in sectors such as property and construction, manufacturing, and raw materials.



Source: Orbis; AMRO staff calculations.
Note: Debt-at-Risk (DAR) is computed using firm-level data from Orbis at the industry level within each economy. For each economy, DAR is calculated as the sum of debt held by firms with an interest coverage ratio below 1.25, aggregated by industry, and expressed as a share of total corporate debt in the sample (DAR ratio). The chart shows the distribution of industry-level DAR ratios across ten economies (China, Hong Kong, Indonesia, Japan, Korea, Malaysia, the Philippines, Singapore, Thailand, and Vietnam). The median is shown by the red bar, and the interquartile range (25 percent–75 percent) by the gray box.

Figure 2.2.2. Selected ASEAN+3: Industry Composition in Corporate DAR by Economy
(Percent)

Corporate DAR composition differs by economy, with property and construction holding the largest portion.



Source: Orbis; AMRO staff calculations.
Note: CN = China; HK = Hong Kong; ID = Indonesia; JP = Japan; KR = Korea; MY = Malaysia; PH = Philippines; SG = Singapore; TH = Thailand; VN = Vietnam.

The author of this box is Chenxu Fu.

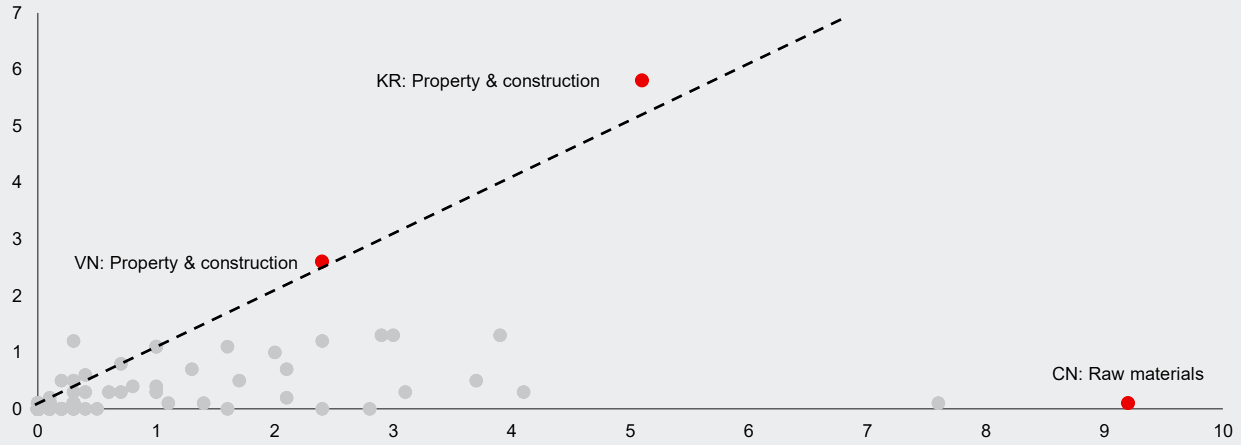
To assess the sensitivity of corporate vulnerabilities to external monetary tightening, a stress test is conducted simulating a 100 basis point global interest rate shock. The impact is transmitted through two channels: directly through higher refinancing costs for FCY liabilities, and indirectly through spillovers into domestic interest rates affecting LCY debt. For simplicity, a 100 percent pass-through is assumed for FCY debt, while a 50 percent pass-through is applied to LCY debt.[1] Accounting for each economy's debt currency composition, the effective shock translates into a weighted average increase in borrowing costs, ranging from 53 basis points to 82 basis points across economies.

In this stress scenario, the rate shock is applied only to short-term debt, reflecting the current global monetary environment—where further rate hikes are seen as unlikely, but interest rates are expected to remain elevated compared to before the COVID-19 shock. This approach is intended to capture refinancing risk, which is most relevant for short-maturity liabilities.

Estimated increases in DAR, measured in billions of US dollars, are presented in Figure 2.2.3. ICRs are assessed under two specifications: one based on earnings before interest and taxes (EBIT), and another incorporating available cash reserves. For example, in China's raw materials sector, the increase in DAR is about USD 9 billion when based on EBIT alone, but declines significantly once cash buffers are factored in. In contrast, sectors such as property and construction in Korea and Vietnam show limited deviation between the two measures, indicating that many companies in these sectors are already operating with weak or negative earnings. These results align with the findings of the 2024 *ASEAN+3 Financial Stability Report*, which highlight elevated risks among property developers in several of the region's economies.

Figure 2.2.3. Increase in Corporate Debt at Risk After a 100 bps Shock in Global Rate
(Billions of US dollar)

A global interest rate shock could significantly raise corporate debt-at- risk ratio in some industries, such as the property sector in Korea and Vietnam, and in the raw materials sector in China.



Source: Orbis, AsianBondsOnlines; AMRO staff calculations.
Note: The x-axis shows the increase in corporate debt-at-risk ratio under the scenario based on earnings before interest and taxes (EBIT), while the y-axis reflects the increase under the scenario that also accounts for cash reserves besides EBIT. bps = basis points.

[1] In the previous simulation in section II, a 100 basis point US monetary policy shock could raise short-term interest rates (e.g., 3-month interbank rate) in ASEAN+3 by approximately 30 basis points. Accounting for additional risk premiums on corporate bonds, a 50 basis point increase in LCY corporate bond yields was assumed.

Financial institution exposure to market risks

Global monetary policy shocks can cause exchange rate and interest rate movements that pose market risks to the banking sector. The impact on banks' balance sheets depends on their exposure to assets and liabilities sensitive to these market changes. The net open position in foreign exchange to capital measures the mismatch between banks' foreign currency assets and liabilities, providing an indication of the deposit-taking sector's vulnerability to exchange rate movements. Elevated ratios suggest greater exposure to currency fluctuations, where sharp exchange rate swings could materially weaken banks' financial soundness. Compared to the global average, banks in ASEAN+3 economies maintain relatively stable net open positions, generally remaining below the commonly used regulatory threshold of 20 percent. This suggests that foreign exchange risks arising from global monetary policy spillovers are likely to have a limited effect on the region's banking sectors (Figure 2.32).

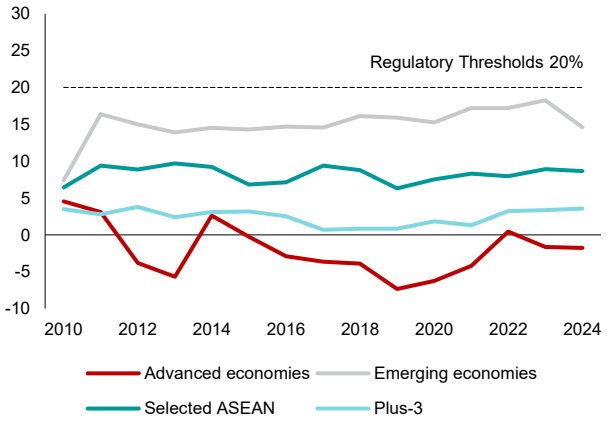
Interest rate risk is particularly important for banks' bond holdings, with the main risk stemming from the negative effect of interest rate fluctuations on bond prices. Therefore, banks with a greater share of trading debt securities in their financial assets may be more exposed to this risk. When interest rates rise, the market value of trading fixed-income securities—such as treasury bills and government bonds—declines, leading to unrealized losses in banks' investment portfolios, particularly for debt securities subject to mark-to-market valuation. This erosion of asset value can, in turn, weaken capital adequacy and earnings. Longer-duration bonds are more sensitive to such interest rate fluctuations, resulting in greater valuation volatility.

In the ASEAN+3 region, exposure to debt securities is moderate on average, ranging from 10 percent to 20 percent of total assets. Some economies—particularly Indonesia, Malaysia, and the Philippines—tend to have relatively higher exposure than before the pandemic and compared to regional peers (Figure 2.33). A significant portion of these bonds are classified as held-to-maturity, which helps mitigate short-term valuation swings and stabilize earnings. However, while held-to-maturity securities are not subject to mark-to-market accounting, their economic value can still be sensitive to interest rate movements and may incur losses if sold under stress—warranting closer monitoring amid ongoing interest rate volatility.

Nonbank financial institutions (NBFIs) are increasingly exposed to interest-rate and FX risks from global monetary shocks. Due to NBFIs' sizable holdings of investment securities, rising yields could trigger mark-to-market losses. In ASEAN+3, NBFIs have rapidly expanded their role as suppliers of dollar finance, largely through short-term secured funding in Hong Kong, Singapore, Japan, and Korea; NBFI's dollar funding from international banks has more than doubled since 2015 to above USD 500 billion, now exceeding that raised by banks (AMRO 2023). This funding model usually entails maturity transformation and FX mismatches to boost returns; consequently, rate hikes or USD appreciation can widen haircuts, trigger margin calls, drain funding liquidity, and force asset sales and deleveraging—heightening systemic risk. Given the growing role of NBFIs in regional financial systems, close monitoring of their exposures is important—although data limitations are a key constraint. Strengthening data collection and surveillance in this area should be a policy priority.

Figure 2.32. Selected ASEAN+3: Net Open Position in Foreign Exchange to Capital Ratio
(Percent)

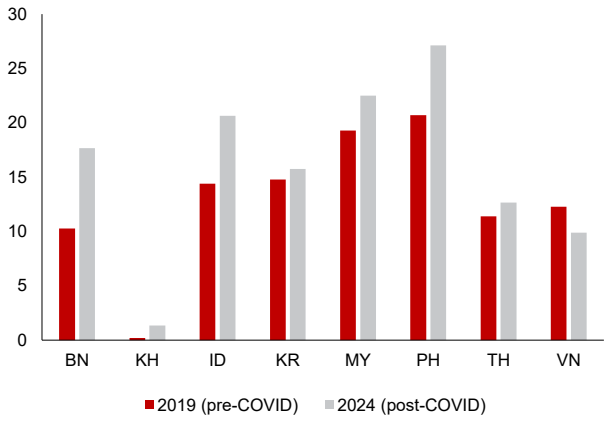
ASEAN+3 banks maintain stable net open positions, well below the regulatory threshold.



Source: International Monetary Fund; AMRO staff calculations.
Note: Selected ASEAN economies included are Brunei, Cambodia, Indonesia, Malaysia, and Philippines. Plus-3 include China, Korea, Hong Kong. Advanced economies refer to selected economies in North America and western Europe. Emerging economies refer to selected economies in Latin America and eastern Europe. For countries that have not released end-2024 data, use the latest quarter data.

Figure 2.33. Selected ASEAN+3: Banks Debt Securities to Total Asset Ratio, Pre-COVID and Post-COVID
(Percent)

ASEAN+3 banks have moderate exposure to debt securities, at 10 percent to 20 percent of total assets.



Source: International Monetary Fund; AMRO staff calculations.
Note: For countries that have not released end-2024 data, use the latest quarter data.
BN = Brunei; KH = Cambodia; ID = Indonesia; KR = Korea; MY = Malaysia; PH = Philippines; TH = Thailand; VN = Vietnam.

V. Policy Recommendations

To safeguard financial systems and mitigate spillovers from external monetary policy shocks, ASEAN+3 economies must strengthen domestic policy frameworks and bolster regional resilience. Key priorities include improving transparency and clarity of policy frameworks, deepening domestic financial markets, and strengthening regional cooperation.

Maintain a pragmatic approach to well-coordinated policy framework while enhancing transparency and clarity

A comprehensive and well-coordinated policy framework is essential to enhance financial resilience against external shocks, as demonstrated in the recent tightening cycle. To support this, surveillance and risk monitoring capabilities should be strengthened, at the same time, institutional frameworks must facilitate coordinated policy action. Clear mandates, adequate legal powers, and robust coordination between central banks, financial regulators, and fiscal authorities are critical. Mechanisms for joint risk assessment, the timely sharing of data, and the effective implementation of integrated responses—particularly amid cross-border risks and foreign exchange mismatches—will be essential to safeguard macrofinancial stability in a more volatile global environment.

While ASEAN+3 economies have effectively adopted a pragmatic approach to policy mix, market participants and public may not necessarily have a clear understanding of authorities' objectives or policy functions. Credibly articulating policy objectives and targets, how decisions are made—and under what circumstances specific tools are deployed—would help anchor expectations, reduce risk premiums, and improve policy effectiveness during global shocks. For instance, in the case where there are no clear policy targets or nominal anchor such as China, Vietnam and Lao PDR, credibility could be strengthened by clarification of the final and intermediate targets. Other examples include communication related to the use of foreign exchange intervention and capital flow measures, where clear explanation of the circumstances under which these measures will be implemented may help avoid market overreaction. Similarly, communication on the coordinated use of monetary policy and macroprudential policy can also help enhance transparency.

Effective disclosure and clear, timely communication by authorities will strengthen credibility and consistency across cycles, reinforce investor confidence, and support domestic financial stability by tempering market overreaction amid heightened uncertainty.

Deepen domestic markets and build financial buffers

To strengthen resilience against global monetary policy shocks, ASEAN+3 economies should continue deepening and diversifying their domestic financial markets. Expanding local bond markets—both government and corporate—can provide more stable and cost-effective sources of financing while reducing reliance on external debt and foreign currency exposure. Efforts to build deeper markets have been supported by regional initiatives such as the Asian Bond Markets Initiative, but further progress is needed. Addressing structural barriers—such as limited currency convertibility, fragmented legal frameworks, and differing regulatory standards—will require both domestic reform and complementary regional support.

Fostering a broader and more stable domestic investor base—such as pension funds, insurance companies, and mutual funds—can help anchor financial markets by providing long-term capital and reducing sensitivity to short-term capital flow volatility. In parallel, developing onshore hedging instruments—such as foreign exchange forward, swaps, and options—can enhance the capacity of domestic market participants to manage interest rate and exchange rate risks arising from global shocks.

Given the heightened vulnerabilities from high external exposure, it remains critical for authorities to strengthen domestic surveillance frameworks, monitor external debts, and maintain adequate foreign exchange reserves as an important financial buffer.

Strengthen regional financial cooperation

Stronger regional financial cooperation is essential for managing cross-border spillovers and ensuring timely and coordinated responses during episodes of financial stress. Initiatives such as enhanced information sharing, early warning systems, and joint policy coordination can help reduce contagion risks and improve regional resilience. Beyond crisis response, collaboration should also aim to address structural vulnerabilities and deepen financial integration across ASEAN+3.

Promoting the use of local currencies in regional trade and investment—supported by local currency settlement frameworks and bilateral swap arrangements—can help reduce foreign exchange mismatches, strengthen monetary autonomy, and limit exposure to global funding shocks. Efforts throughout ASEAN+3 to develop common infrastructure and improve interoperability will be key to advancing this agenda.

At the same time, strengthening the operational readiness of regional contingent liquidity arrangements—such as bilateral swap lines and the Chiang Mai Initiative Multilateralisation—will provide an important buffer against sudden stops and liquidity pressures during periods of global tightening.

The ASEAN+3 Finance Process has evolved beyond crisis preparedness into a core platform for coordinated regional policy communication. Complementing this, AMRO's Regional Knowledge Hub (ARKH) initiative and the ASEAN+3 Economic Cooperation and Financial Stability Forum provide a venue for regional and global exchange of knowledge and ideas on economic cooperation and financial stability. Strengthening these platforms to better align policy signals among members and offer clear guidance to the private sector will be essential for fostering a stable, integrated ecosystem capable of managing global shocks.

Annex 2.1. Monetary Policy Frameworks of ASEAN+3

Economy	Official Policy Objective	Monetary Policy Regime	De Facto Anchor	Main Instruments	Exchange Rate Regime	Operating System and Institutional Features
Brunei	Exchange rate stability	Exchange rate anchor	SGD peg (1:1)	None	Hard peg (Currency board)	Peg maintained through Currency Interchangeability Agreement with MAS
Cambodia	Price stability to facilitate economic development	Exchange rate anchor	Exchange rate stability (against USD)	Reserve requirements, liquidity instruments, FX interventions	Soft peg (Crawl-like arrangement)	Monetary Policy Committee at NBC/ Meets eight times a year
China	Price stability and economic growth	Hybrid (quantity- and price-based approach)	Domestic and external value of currency	Reserve requirements, OMOs, policy rates, relending facilities	Other managed arrangement	Monetary Policy Committee at PBC/ Meets quarterly
Hong Kong	Exchange rate stability	Exchange rate anchor	USD peg (7.75–7.85 HKD/ USD)	Base rate linked to Fed Funds Rate, FX interventions	Hard peg (Currency board)	HKMA operates under oversight of Currency Board Sub-Committee
Indonesia	Price stability	Inflation targeting framework	Inflation target of 2.5%±1%p	BI Rate, OMOs, reserve requirements	Floating	Board of Governors at BI/ Meets monthly
Japan	Price stability	Inflation targeting framework	Inflation target of 2%	Policy rate, OMOs	Free floating	Monetary Policy Board at BOJ/Meets eight times a year
Korea	Price stability	Inflation targeting framework	Inflation target of 2%	Policy rate, OMOs, reserve requirements	Floating	Monetary Policy Board at BOK/Meets eight times a year
Lao PDR	Price and financial stability	Other	Exchange rate stability	Policy rate, reserve requirements, FX interventions, BOL bills	Managed floating	BOL operates under the oversight of its Executive Board
Malaysia	Price stability, giving due regard to economic developments	No explicit anchor	Inflation target (Implicit)	OPR, OMOs, reserve requirements	Floating	Monetary Policy Committee at BNM/ Meets six times a year
Myanmar	Price stability	Monetary aggregate target	Exchange rate stability	Policy rate, Reserve requirements, FX interventions, OMOs	Soft peg (Stabilized arrangement)	Monetary Policy Committee at CBM/ Meets monthly
Philippines	Price stability	Inflation targeting framework	Inflation target of 3%±1%p	Policy rate, OMOs, reserve requirements	Floating	Monetary board at BSP/Meets bimonthly
Singapore	Price stability and growth	Exchange rate anchor	Exchange rate target (NEER band)	NEER management, FX interventions, liquidity tools	Soft peg (Crawl-like arrangement)	MAS operates without a formal MPC; policy reviewed semiannually
Thailand	Price stability	Inflation targeting framework	Inflation target of 1%–3%	Policy rate, OMOs, reserve requirements	Floating	Monetary Policy Committee at the BOT/Meets bimonthly
Vietnam	Price stability and growth	Exchange rate anchor	Exchange rate stability and Inflation target ceiling of 4.5%	Operating interest rates, OMOs, reserve requirements, FX interventions, indicative credit growth	Soft peg (Stabilized arrangement)	SBV Governor-led monetary policy decision; coordination with government agencies

Source: National authorities; International Monetary Fund; AMRO staff compilation.
Note: OMO = Open Market Operations; OPR = Overnight Policy Rate; NEER = Nominal Effective Exchange Rate; NBC = National Bank of Cambodia; MAS = Monetary Authority of Singapore; PBC = People's Bank of China; BI = Bank Indonesia; BOJ = Bank of Japan; BOK = Bank of Korea; BOL = Bank of the Lao PDR; BNM = Bank Negara Malaysia; CBM = Central Bank of Myanmar; BSP = Bangko Sentral ng Pilipinas; BOT = Bank of Thailand; SBV = State Bank of Vietnam.

Annex 2.2. Global Monetary Policy Shifts and Financial Stress in ASEAN+3[12]

This analysis examines how global monetary policy shifts—specifically, changes in the policy stance of major economies such as the United States (US) and the euro area—correspond to financial stress levels in the ASEAN+3 region. In particular, periods of global monetary tightening, marked by policy rate hikes in major economies, appear to be associated with elevated financial stress in the region. The study also explores the impact of other factors, including global variables such as US monetary policy uncertainty and global financial volatility, as well as domestic indicators like inflation and business conditions, on financial stress across ASEAN+3 economies.

Key questions this study seeks to answer include:

- How are global monetary policy shifts associated with financial stress in the ASEAN+3 region?
- What roles do other global and domestic factors play in shaping financial stress across ASEAN+3 economies?
- Are there notable differences in financial stress responses among different economy groups within the region?

Data and methodology

This study utilizes monthly unbalanced panel data from January 2007 to January 2025 for 10 ASEAN+3 economies: China, Hong Kong, Japan, Korea, Indonesia, Malaysia, the Philippines, Singapore, Thailand, and Vietnam. The analysis is conducted using a random effects panel regression model. Preliminary diagnostic tests were conducted to ensure the reliability of the model. The Variance Inflation Factor (VIF) test indicates no serious multicollinearity among the explanatory variables. In addition, panel unit root tests confirm the stationarity of the variables used in the regression.

The empirical model is specified as follows:

$$FSI_{it} = \beta_0 + \beta_1 \Delta FFR_t + \beta_2 \Delta ECB_t + \beta_3 X_{1t} + \beta_4 X_{2it} + \beta_5 GFC\ Dummy + \beta_6 COVID{-}19\ Dummy + u_i + \varepsilon_{it}$$

Where:

- FSI_{it} = Financial stress index for country *i* at time *t*.
- ΔFFR_t = Change in the effective federal funds rate at time *t*.
- ΔECB_t = Change in the effective ECB main refinancing operations (MRO) rate at time *t*.
- X_{1t} = Global common factors, including US monetary policy uncertainty (MPU_t) and global financial market volatility (VIX_t) at time *t*.
- X_{2it} = Economy-specific variables such as inflation (CPI_{it}), business conditions as measured by the Purchasing Managers' index (PMI_{it}) for country *i* at time *t*.
- β_0 = Intercept
- β_1 - β_6 = Coefficients of the explanatory variables
- u_i = Economy-specific unobserved effect (random)
- ε_{it} = Idiosyncratic error term

Table A2.2.1. Data Sources and Calculations of Variables

Variables	Data source	Calculation / Explanation
Financial stress index (FSI)	Chan-Lau and others (2024)	Transformed daily data to monthly data by averaging
US policy rate (ΔFFR)	Federal Reserve Board (FRB) via Haver Analytics	Difference with the previous month
ECB policy rate (ΔECB)	European Central Bank (ECB) via Haver Analytics	Difference with the previous month
US monetary policy uncertainty	Davis and others (2016), Economic Policy Uncertainty homepage	Monthly US monetary policy uncertainty index
Global financial uncertainty (VIX)	Chicago Board Options Exchange (CBOE) via Haver Analytics	Transformed daily data to monthly data by averaging
Inflation (CPI)	International Monetary Fund (IMF) via Haver Analytics	Year-on-year percentage change
Purchasing Managers' Index (PMI)	S&P Global via Haver Analytics	Monthly diffusion index
Global financial crisis dummy	Constructed	1 from September 2007 to December 2009, and 0 otherwise
COVID-19 dummy	Constructed	1 from January 2020 to June 2020, and 0 otherwise

[12] The author of this annex is Eunmi Park.

Main Findings

The regression results show that US monetary tightening (ΔFFR) is generally associated with increased financial stress across ASEAN+3. The impact is particularly strong and statistically significant in advanced economies, international financial centers (IFCs), and ASEAN countries, with IFCs showing the largest estimated response. In contrast, the effect is muted and statistically insignificant in Plus-3 economies and emerging market economies. The European Central Bank policy rate also contributes to financial stress in several groups, with significant effects observed in ASEAN+3, ASEAN, IFCs, and emerging market economies, but not in advanced or Plus-3 economies. This suggests broader global monetary spillovers beyond the US.

Global financial volatility (VIX) is a key driver of stress across all groups, while US monetary policy uncertainty mainly affects advanced economies and IFCs. On the domestic front, inflation (the consumer price index, CPI) generally contributes to increased financial stress, particularly in advanced economies and IFCs. Business sentiment, as measured by the Purchasing Managers' Index (PMI), typically helps ease stress.

The global financial crisis dummy is consistently positive and significant across the region, highlighting its broad and lasting impact. In contrast, the COVID-19 dummy is only significant in ASEAN, suggesting that swift policy responses—such as fiscal and liquidity support—helped limit financial stress in the region.

Table A2.2.2. Regression Results For Economy Groups in the Region

	ASEAN+3	Plus-3	ASEAN	IFC	Non-IFC	AE	EME
US policy rate (ΔFFR)	5.802*** (1.819)	3.145 (2.847)	9.592*** (2.726)	15.788*** (4.868)	2.317 (2.032)	11.930*** (3.139)	-1.976 (2.727)
ECB policy rate (ΔECB)	4.250** (1.994)	1.067 (3.231)	8.322*** (2.926)	13.364** (5.299)	2.790 (2.227)	0.035 (3.485)	7.879*** (3.017)
US monetary policy uncertainty	0.033*** (0.005)	0.046*** (0.009)	0.018** (0.008)	0.129*** (0.015)	0.008 (0.006)	0.074*** (0.010)	-0.003 (0.008)
Global financial uncertainty (VIX)	0.464*** (0.048)	0.460*** (0.072)	0.429*** (0.078)	0.339*** (0.128)	0.512*** (0.054)	0.425*** (0.081)	0.563*** (0.076)
Inflation (CPI)	0.964*** (0.125)	1.824*** (0.265)	0.331** (0.135)	-0.926** (0.384)	1.071*** (0.117)	1.103*** (0.271)	0.550*** (0.203)
Purchasing Managers' Index (PMI)	-0.503*** (0.094)	-0.591*** (0.146)	-0.189 (0.131)	0.091 (0.208)	-0.664*** (0.108)	-0.311** (0.144)	-0.493*** (0.156)
Global financial crisis dummy	25.629*** (1.298)	24.023*** (1.581)	Omitted	38.206*** (3.172)	23.068*** (1.451)	26.197*** (1.858)	28.925*** (2.425)
COVID-19 dummy	0.240 (1.722)	-2.436 (2.907)	4.547* (2.392)	5.122 (4.772)	-1.620 (1.897)	2.942 (3.172)	-1.829 (2.479)
Constant	6.084*** (1.848)	5.000* (2.914)	8.508*** (1.310)	8.168*** (2.300)	6.396*** (0.958)	4.104*** (1.460)	6.941*** (1.363)
Observations	1721	868	853	367	1354	801	753
R-squared	0.381	0.491	0.169	0.532	0.402	0.462	0.351

Source: AMRO staff calculations.
Note: As a robustness check, shadow policy rates for the Federal Reserve and the European Central Bank were used in place of the official effective rates to account for the impact of unconventional monetary policy. The main results remained qualitatively unchanged. In addition, changes in domestic policy rates were included alongside CPI and PMI to better capture domestic monetary conditions, and the core findings continued to hold. The criteria for advanced economies (AEs) and emerging market economies (EMEs) is based on IMF. International financial centers (IFCs) include Hong Kong and Singapore. Standard errors are reported in parentheses. Asterisks (*, **, ***) denote significance levels at 10 percent, 5 percent, and 1 percent. CPI = consumer price index, ECB = European Central Bank, FFR = federal funds target rate, IFC = international financial center, VIX = CBOE Volatility Index.

Annex 2.3. Measuring Cross-Border Spillovers[13]

Methodology

We follow the spillover definition introduced by Diebold and Yilmaz (2012, 2014). While their work provides a comprehensive treatment of the methodology, we highlight key elements here to ensure completeness and self-containment.

To investigate spillovers within a multivariate setting that spans multiple economies over time, we employ a vector autoregression (VAR) model of order p:

$$y_t = B(L)\, y_{t-1} + u_t \qquad (1)$$

where y_t is an n-dimensional vector of financial asset returns, $B(L)$ denotes a matrix-valued lag polynomial, and $u_t \sim N(0,\Sigma_u)$ is a vector of white noise disturbances. Under the assumption of covariance stationarity, the process y_t has a moving-average representation of infinite order:

$$y_t = \sum_{i=0}^{\infty} A_i\, u_{t-i} \qquad (2)$$

where $A(L) = (1-B(L))^{-1}$, and $A_i = 0$ for $i \leq 0$. The moving-average coefficients encapsulate dynamic interactions within the system. By transforming these coefficients, one can derive variance decompositions that quantify financial interdependence. These decompositions reveal the fraction of the forecast error variance for a given variable, at a forecast horizon H, that is attributable to innovations in other variables.

Rather than relying on standard orthogonalization techniques like the Cholesky decomposition, which are sensitive to the ordering of variables, we adopt the generalized approach proposed by Pesaran and Shin (1998), which allows for correlated shocks without requiring orthogonalization.

Specifically, the contribution of variable j to the H-step-ahead forecast error variance of variable i, using the generalized variance decomposition, is given by:

$$\theta_{ij}^{g}(H) = \frac{\sigma_{jj}^{-1} \sum_{h=0}^{H-1} (e_i' A_h \Sigma_u e_j)^2}{\sum_{h=0}^{H-1} (e_i' A_h \Sigma_u A_h' e_j)} \qquad (3)$$

where e_i is a selection vector (1 in the i-th position, 0 elsewhere), and σ_{jj} denotes the standard deviation of the innovation process. Since the rows of the variance decomposition matrix derived from equation (3) may not sum to unity (i.e., $\sum_{j=1}^{n} \theta_{ij}^{g}(H) \neq 1$), we normalize each element by its row sum:

$$\tilde{\theta}_{ij}^{g}(H) = \frac{\theta_{ij}^{g}(H)}{\sum_{j=1}^{n} \theta_{ij}^{g}(H)} \qquad (4)$$

This normalization ensures that $\sum_{j=1}^{n} \tilde{\theta}_{ij}^{g}(H) = 1$ and $\sum_{i,j=1}^{n} \tilde{\theta}_{ij}^{g}(H) = n$. Thus, $\tilde{\theta}_{ij}^{g}(H)$ offers a straightforward measure of the pairwise directional spillovers from j to i at horizon H. For a more concise notation, this is denoted as $S_{i \leftarrow j}(H)$. In addition, the net pairwise directional interconnectedness may be defined as $S_{ij}(H) = S_{i \leftarrow j}(H) - S_{i \leftarrow j}(H)$.

This can also be partially aggregated to derive the "total directional spillovers," which can be expressed in two forms: "from" and "to". These are defined as follows:

$$S_{i \leftarrow \bullet}(H) = \frac{\sum_{j=1, j \neq i}^{n} \tilde{\theta}_{ij}^{g}(H)}{\sum_{i,j=1}^{n} \tilde{\theta}_{ij}^{g}(H)} \times 100 = \frac{\sum_{j=1, j \neq i}^{n} \tilde{\theta}_{ij}^{g}(H)}{n} \times 100 \qquad (5)$$

$$S_{\bullet \leftarrow i}(H) = \frac{\sum_{j=1, j \neq i}^{n} \tilde{\theta}_{ij}^{g}(H)}{\sum_{i,j=1}^{n} \tilde{\theta}_{ij}^{g}(H)} \times 100 = \frac{\sum_{j=1, j \neq i}^{n} \tilde{\theta}_{ij}^{g}(H)}{n} \times 100 \qquad (6)$$

[13] The author of this annex is Ruperto Pagaura Majuca.

The net total directional spillovers can also be calculated as $S_i(H) = S_{\bullet \leftarrow i}(H) - S_{i \leftarrow \bullet}(H)$.

Finally, to capture the overall level of spillovers in the system, the total (or system-wide) spillover index is defined as:

$$S(H) = \frac{\sum_{i,j=1, i \neq j}^{n} \tilde{\theta}_{ij}^{g}(H)}{\sum_{i,j=1}^{n} \tilde{\theta}_{ij}^{g}(H)} = \frac{\sum_{i,j=1, i \neq j}^{n} \tilde{\theta}_{ij}^{g}(H)}{n} \quad (7)$$

Diebold and Yilmaz (2014) also illustrate that these interconnectedness indices are conceptually aligned with core notions in network theory. The variance decomposition matrix can be interpreted as the adjacency matrix of a weighted, directed network. Within this framework, individual entries represent directional spillovers, $S_{i \leftarrow j}(H)$; the sum of each row (node in-degrees) capture to total directional interconnectedness "from", $I_{i \leftarrow \bullet}(H)$; the column sums capture the total outgoing influence "to" or "out-degree," $S_{\bullet \leftarrow i}(H)$; and the average node degree provides a natural metric of aggregate system interconnectedness, $S(H)$. This network-based view reinforces the conceptual soundness and empirical utility of the spillover measures.

Data

The dataset used in this analysis includes daily observations for global variables—namely the VIX index, the US shadow policy rate, and the US nominal effective exchange rate (NEER)—alongside daily nominal local-currency stock market indexes, 10-year government bond yields, and exchange rates (expressed as local currency per US dollar). All data were sourced from Eikon Thomson Reuters Datastream (DS). Daily equity returns were computed as percentage changes over 3 January 2005 to 2 April 2025. Returns for global factors and exchange rates were calculated in the same manner.

The analysis is based on a VAR model that integrates the three global factors, alongside financial market data—covering equity, bond, and foreign exchange markets—for a broad set of economies: (1) three advanced economies outside ASEAN+3 (the United States, the United Kingdom, and the euro area), (2) two emerging market regions beyond ASEAN+3 (Latin America and the Gulf Cooperation Council), and (3) nine key economies within ASEAN+3 (China, Japan, Korea, Hong Kong, Singapore, Malaysia, Thailand, Indonesia, and the Philippines).

Below is a more detailed breakdown of the data sources used for each VAR specification, covering financial market indicators across countries and asset classes:

Global Factors
- VIX Index: sourced from CBOE
- US Shadow Policy Rate: sourced from academic databases
- US Trade-Weighted NEER Index: from JPMorgan

Developed Economies (Non-ASEAN+3)
- United States: DS Market Index; US 10-Year Government Bond Yield; USD exchange rate (base currency)
- United Kingdom: DS Market Index; UK 10-Year Government Bond Yield; GBP/USD
- euro area: DS Market Index; EUR/USD

Emerging Market Economies (Non-ASEAN+3)
- Latin America: Composite DS Market Index
- Gulf Cooperation Council (GCC): Composite DS Market Index

ASEAN+3 Economies
- China: DS Equity Market Index; 10-Year Government Bond Yield; CNY/USD
- Japan: DS Equity Market Index; 10-Year Government Bond Yield; JPY/USD
- Korea: DS Equity Market Index; 10-Year Government Bond Yield; KRW/USD
- Hong Kong: DS Equity Market Index; 10-Year Government Bond Yield; HKD/USD
- Singapore: DS Equity Market Index; 10-Year Government Bond Yield; SGD/USD
- Malaysia: DS Equity Market Index; 10-Year Government Bond Yield; MYR/USD
- Thailand: DS Equity Market Index; 10-Year Government Bond Yield; THB/USD
- Indonesia: DS Equity Market Index; 10-Year Government Bond Yield; IDR/USD
- Philippines: DS Equity Market Index; 10-Year Government Bond Yield; PHP/USD

Annex 2.4. US Monetary Policy Shock and Financial Market Indicators in ASEAN+3[14]

The objective of this analysis is to assess the short-term impact of monetary policy shocks in the United States (US) on financial market indicators in the ASEAN+3 region, including stock market indexes, exchange rates, and interest rates. Unexpected changes in US policy can serve as major external shocks for the region, often triggering notable fluctuations in local financial markets. Examining these responses provides useful insights into how ASEAN+3 markets react to global monetary developments and their exposure to international financial conditions.

Data and methodology

This study utilizes daily unbalanced panel data from 3 January 2000 to 4 March 2025 for nine ASEAN+3 economies—China, Hong Kong, Japan, Korea, Indonesia, Malaysia, the Philippines, Singapore, and Thailand. The empirical analysis is conducted using a local projection (LP) model (Jordà 2005), which estimates the dynamic response of a variable of interest to a shock without requiring the specification or estimation of a full system of equations, as in traditional vector autoregression (VAR) models. The LP approach offers flexibility in capturing impulse responses at each horizon and is robust to model misspecification, making it particularly suitable for analyzing the short-term effect of external shocks on financial market indicators.

For each horizon h = 0,1,2,…,65,[15] the following local projection equation is estimated:

$$y_{i,t+h} = \alpha_{i,h} + \beta_h m_t + \gamma'_h X_{i,t-1} + \delta'_h D_t + \varepsilon_{i,t+h}$$

Where

- $y_{i,t+h}$ = Dependent variable (e.g., stock returns, changes in foreign exchange rates, 3-month interbank rates, 10-year bond yield) for country i at horizon *h* after shock at time *t* .
- $\alpha_{i,h}$ = Country fixed effect for country i at horizon *h*.
- β_h = Coefficient on the monetary policy shock m_t; impulse response at horizon *h*.
- m_t = US monetary policy shock at time *t*.
- γ'_h = Coefficients on control variables.
- $X_{i,t-1}$ = Vector of control variables on the day before the meeting (*t-1*).
- δ'_h = Coefficients on dummy control variables.
- D_t = Vector of dummy control variables at time *t*.
- $\varepsilon_{i,t+h}$ = Error term for country i at horizon *h*.

In this analysis, the impulse variable is the pure monetary policy shock (m_t) identified by Jarociński and Karadi (2020) was used. This measure captures the unanticipated component of US monetary policy decisions—i.e., monetary policy surprises—with high-frequency financial data, such as changes in Fed fund futures and eurodollar futures around Fed announcements. In addition, it removes the information effects embedded in market expectations by exploiting the comovement between interest rate changes and stock price responses.[16] This allows the shock to isolate only the "pure" policy component, excluding any signals about the Fed's economic outlook. Compared to using actual policy rate changes, this method enables a cleaner identification of causal monetary policy effects, since policy rate moves often reflect anticipated changes and broader macroeconomic conditions.

Since the dependent variable is specified as a daily change, the cumulative impulse response function (CIRF) is calculated to assess the overall impact of the US monetary shock over time. Specifically, the CIRF at horizon h is defined as the sum of impulse responses up to that horizon ($CIRF_h = \sum_{\tau=0}^{h} \beta_\tau$).

[14] The author of this annex is Eunmi Park.
[15] We estimate the dynamic response for each horizon h = 0,1,…,65, which corresponds to up to approximately three months ahead using daily data.
[16] Under typical monetary policy transmission, an interest rate hike should lead to a decline in stock prices. However, if stock prices rise following a rate hike, it may reflect an information effect—that is, markets interpret the Fed's action as signaling.

Table A2.4.1. Data Sources and Calculations of Variables

Variables	Variable specifications	Data source/Explanation
Dependent variable (*y*)	stock index return	Haver Analytics
	foreign exchange rate against USD	
	3-month interbank rate	
	10-year bond yield	
Impulse variable (*m*)	pure US monetary shock	Jarociński and Karadi (2020)
Control variable (*X*)	3-month growth rate of the country's stock price index	Haver Analytics/AMRO staff calculations
	3-month growth rate of bilateral exchange rate (versus USD)	
	3-month growth rate of nominal effective exchange rate (NEER)	
	3-month growth rate of CBOE Volatility Index (VIX)	
	3-month growth rate of commodity price index (CMD)	
	3-month growth rate of 3-month interbank rate	
	3-month growth rate of 5-year government bond yield	
	3-month growth rate of 10-year government bond yield	
	3-month growth rate of 10-year government bonds yield spread with the US	
	VIX as of t-1	Haver Analytics
	CMD as of t-1	
Dummy variable (*D*)	global financial crisis dummy	1 from July 2007 to December 2009, and 0 otherwise
	COVID-19 dummy	1 from January 2020 to June 2020, and 0 otherwise

Additional CIRF Results for Regional Subgroups

Since the impulse responses of the main economy groups—ASEAN+3, Plus-3, and ASEAN—have been discussed in the main text of the chapter, this annex examines the impulse responses for alternative groupings, including IFCs—defined as Hong Kong and Singapore—versus non-IFC economies, and advanced economies versus emerging market economies.

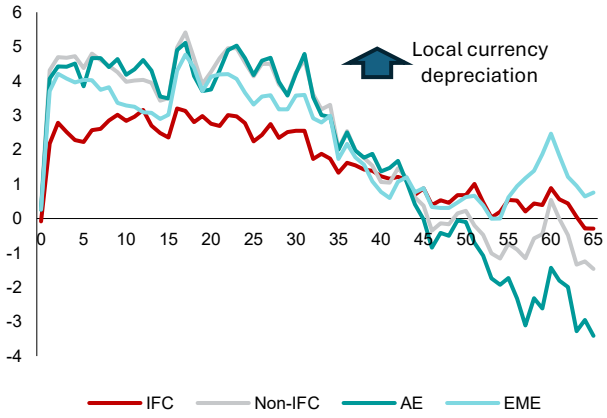
Across all economy groups, the US monetary policy shock typically results in falling stock prices, depreciation of regional currencies against the US dollar, and a rise in both short- and long-term interest rates, particularly in the initial period.

Among the groups, IFCs experience the steepest stock market decline, which is likely due to their higher exposure to global capital flows and investor sentiment. In contrast, their exchange rates show the most limited reaction, reflecting their tightly managed or fixed exchange rate regimes. The degree of currency depreciation is broadly similar between advanced economies and emerging market economies. On the interest rate side, short-term rates rise more sharply in IFCs, suggesting more responsive or integrated money markets. Long-term bond yields increase in the early periods across all groups, but the divergence observed in later horizons may be less reliable because of statistical uncertainty.

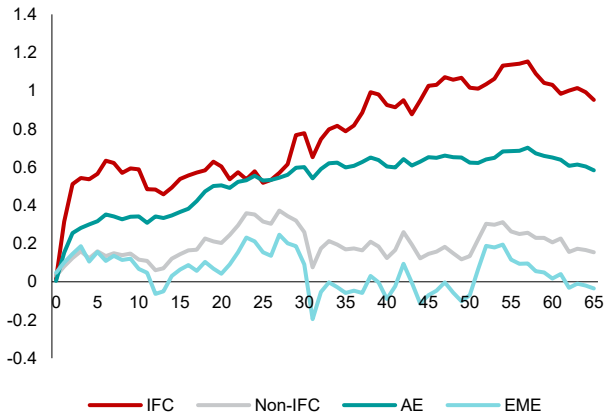
Figure A2.4.1. Selected ASEAN+3 Economies: Simulated Dynamic Effects of a 100bp Unexpected Monetary Policy Shock on Financial Indicators

Stock index
(Percent)

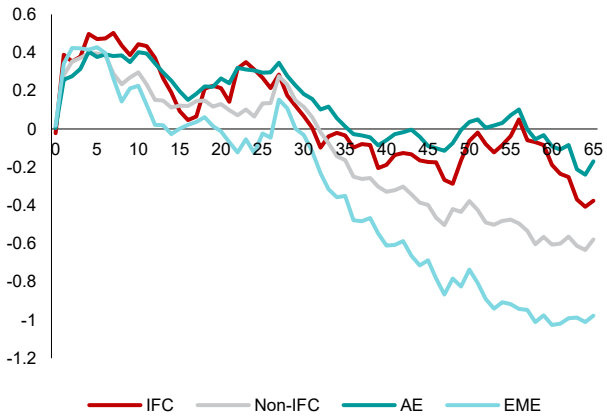
Foreign exchange rate against USD
(Percent)



3-month interbank interest rate
(Percentage point)



10-year bond market yield
(Percentage point)



Source: AMRO staff calculations.
Note: The figures show cumulative impulse responses to a 1 percentage point pure monetary policy shock identified from high-frequency data. Estimates are based on panel local projection regressions covering 10 ASEAN+3 economies including Plus-3 economies and ASEAN-6. International Financial Centers (IFCs) refer to Hong Kong and Singapore. The classification of advanced economies (AEs) and emerging market economies (EMEs) follows IMF definitions. For 3-month interbank interest rates for the Philippines, the interbank call loan rate was used as a proxy.
100 basis points (bps) is equal to 1 percentage point.

Annex 2.5. Econometric Framework for Estimating Monetary Policy Responses and Assessing the Extent of Monetary Autonomy[17]

This annex details the analytical approach employed to examine key stylized facts about the influence of macroeconomic developments on monetary policy decisions within the ASEAN+3 economies (as discussed in the main text). It further analyzes the degree of monetary policy autonomy in the region. The analysis utilizes Taylor rule estimations—a widely adopted method for succinctly capturing the complexities of monetary policy behavior—and employs a two-step estimation procedure to assess the degree of monetary policy autonomy in the region.

Taylor Rule Specification

The conventional Taylor rule is specified as follows:

$$i_t = \alpha + \rho i_{t-1} + (1-\rho)(\beta_1 \pi_t + \beta_2 \tilde{y}_t) + \epsilon_t. \quad (1)$$

In this formulation, the policy interest rate (i_t) adjusts gradually, reflecting a weighted average of its previous value and the target rate determined by current inflation (π_t) and the output gap ($\tilde{y}_t$). To mitigate end-point bias in estimating the output gap, seasonally adjusted real GDP data are extended eight quarters ahead using ARIMA forecasts, alongside incorporating earlier periods prior to estimation.

The Taylor rule can be augmented with additional explanatory variables to evaluate their effect on policy rate decisions. In this study, these include the US effective federal funds rate, the CBOE Volatility Index (VIX) as a measure of global financial market volatility, and the percentage change in the local currency–US dollar (LCU/USD) exchange rate. Such augmentations are particularly pertinent for emerging markets, where external factors can significantly influence domestic monetary policy.

Singapore's monetary policy framework, managed by the Monetary Authority of Singapore (MAS), primarily utilizes the nominal effective exchange rate (S$NEER) as its policy instrument, rather than the interest rate. Accordingly, the Taylor rule is adapted to reflect this approach:

$$\Delta S\$NEER_t = \alpha + \rho S\$NEER_{t-1} + (1-\rho)(\beta_1 \pi_t + \beta_2 \tilde{y}_t) + \epsilon_t. \quad (2)$$

Here, the percentage change in the S$NEER replaces the policy interest rate, aligning the rule with MAS's exchange-rate-centered policy strategy. This adaptation acknowledges Singapore's unique monetary policy framework, which focuses on managing the exchange rate to maintain price stability and support economic growth.

Dual-Stage Estimation Method for Evaluating Monetary Policy Independence

This section outlines a dual-stage regression methodology designed to assess the depth of monetary policy independence. The initial stage focuses on isolating the influence of domestic macroeconomic conditions by estimating the Taylor rule, as specified in equation (1). This regression captures the degree to which domestic monetary policy responds to internal macroeconomic conditions: inflation and output gap.

The second stage focuses on examining the extent to which external factors influence domestic monetary policy beyond the effects of internal domestic macroeconomic factors. This involves regressing the residuals from the first-stage model against foreign monetary policy rates and other external factors:

$$\hat{\epsilon}_t = \delta + \theta \chi_t + \varepsilon_t \quad (3)$$

In equation (3), the term $\hat{\epsilon}_t$ denotes deviations in the policy rate unexplained by domestic macroeconomic fundamentals, effectively capturing influences beyond the central bank's internal objectives. The variable χ_t encompasses external influences such as monetary policy in the United States (US), global financial market volatility, and exchange rate fluctuations. This regression framework assesses the extent to which international monetary dynamics, particularly those emanating from major economies, exert an independent effect on domestic interest rates, separate from domestic economic conditions.

To specifically evaluate the influence of US monetary policy on the domestic monetary policies of individual ASEAN+3 economies, the effective federal funds rate is incorporated as a regressor. The analysis also examines the impact of global financial market volatility, as captured by the VIX, and fluctuations in exchange rates. These external factors are considered to evaluate their independent effects on domestic interest rates, beyond the scope of domestic economic conditions.

[17] The author of this annex is Ruperto Pagaura Majuca.

Annex 2.6. Interest Rate Shock Absorption in ASEAN+3 Banks: A Reverse Stress Testing Approach to Capital Adequacy[18]

This simulation exercise estimates the extent to which ASEAN+3 banks can absorb interest rate shocks before their capital adequacy ratio (CAR) falls to the minimum regulatory requirement. It is complemented by a reverse stress test to calculate the breakeven nonperforming loan (NPL) ratio at which a bank's capital buffer is just sufficient to meet a prespecified regulatory threshold, and a panel local projection approach to flexibly trace the cumulative response of NPL ratios to changes in global monetary conditions.

The analysis covers 10 ASEAN+3 economies: China, Japan, Korea, Hong Kong, Singapore, Malaysia, Indonesia, Thailand, the Philippines, and Vietnam. These economies were selected based on data availability for key indicators, including NPL ratios, domestic lending rates, and real GDP growth. The reverse stress test incorporates bank-level data for 587 banks, accounting for 78 percent of assets and loans in the ASEAN+3 banking sector. For local projection, the estimation period begins in 2010, capturing the environment after the global financial crisis, which was marked by unconventional monetary policies and persistent global financial shocks. All data are in annual frequency.

First, estimating breakeven NPL ratio using the AMRO's Bank Reverse Solvency Stress Test (BRS) model (Ong and Jobst 2020). The BRS model is a scenario analysis tool designed to evaluate the ability of financial institutions to withstand credit shocks. Especially, it estimates the breakeven NPL ratio—defined as the NPL ratio at which a bank's capital buffer is just sufficient to meet a prespecified regulatory threshold.

For this analysis, the Basel III total CAR threshold of 10.5 percent is adopted. Banks' provisioning rates are assumed based on their coverage of Stage 3 loans, and provisioning is assumed to have no effect on risk-weighted assets.

The macro shock impacts banks' CAR mainly through the asset quality channel—i.e., by increasing NPLs and provisions. The post-shock capital buffer is calculated using the following formula:

$$CAR_{t,postshock} = \frac{Capital_t - Additional\ Provision_t}{RWA_t} = CAR_{t,postshock} = 10.5\,percent$$

where,

$$Additonal\ Provision_t = (Addtional\ NPL_t + NPL_t) \times Provisioning\ Rate_t - Provision_t$$

Then, the breakeven NPL ratio is derived as:

$$NPL\ Ratio_{breakeven} = NPL\ Ratio_t + \frac{Additional\ NPL_t}{Total\ Loans_t}$$

Second, to represent global monetary conditions, a composite global policy rate is constructed as a weighted average of the US federal funds rate (70 percent) and the European Central Bank (ECB) policy rate (30 percent). These arbitrary weights reflect the relatively higher exposure of ASEAN+3 economies to the US monetary cycle compared to the euro area. During periods when either central bank was constrained by the zero lower bound, shadow policy rates are used to more accurately reflect the stance of monetary policy (e.g., Wu and Xia 2016).[19]

The global monetary policy shock is then defined as the first difference (year-on-year change) of the composite rate:

$$\Delta GMP_t = GMP_t - GMP_{t-1}$$

This transformation captures unanticipated changes in external monetary conditions and removes trends that could otherwise contaminate the estimation.

The estimation relies on the local projection method proposed by Jordà (2005), which allows direct estimation of impulse responses over multiple horizons without imposing a full dynamic system. This approach is particularly well-suited for macrofinancial applications involving persistent shocks and heterogeneous country characteristics.

[18] The author of this annex is Yang Jiao and Chenxu Fu.
[19] Since shadow rates are only available up to August 2022, the effective federal funds rate is used thereafter.

For each forecast horizon $h \in 1,2,3$, the following specification is estimated,

$$NPL_{i,t+h} - NPL_{it} = \beta_h \Delta GMP_t + \gamma_h DomesticRate_{it} + \sigma_h Growth_{it} + FE_i + \epsilon_{i,t+h}$$

where $NPL_{i,t+h} - NPL_{it}$ is the cumulative change in the NPL ratio in country i from year t to $t+h$; ΔGMP_t is the annual change in the composite global monetary policy rate; $DomesticRate_{it}$ and $Growth_{it}$ are the domestic lending rate and real GDP growth of each country year. Lastly, FE_i and $\epsilon_{i,t+h}$ are country fixed effect and the error term.

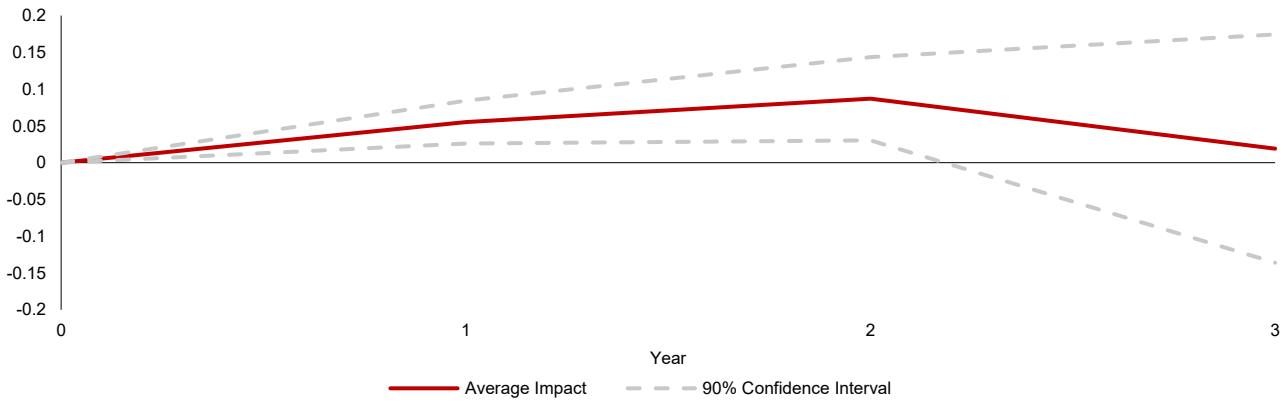
This specification captures how a change in global interest rates at time t, conditional on the domestic macrofinancial environment, affects the evolution of banking sector over a multiyear horizon. Several steps are taken to address potential endogeneity concern. First, the global monetary policy shock is assumed to be exogenous to individual ASEAN+3 economies, as it is driven by policy decisions in the US and the euro area, based on their domestic conditions. The use of first differences helps isolate unanticipated shifts in global monetary conditions and mitigates concerns about shared trends or persistent global factors.

Domestic lending rates and real GDP growth are included to account for contemporaneous domestic conditions that influence NPL ratios given the low frequency annual data. Although these variables may be partially endogenous, they are dated at time t, while the dependent variable reflects the change from year t to $t+h$. This temporal separation helps reduce simultaneity bias. Country fixed effects are included to control for structural differences in financial systems, regulatory regimes, and baselines of financial development or credit risk. This helps address omitted variable bias from unobserved time-invariant characteristics.

Time fixed effects are excluded because the global monetary shock is common across all countries. Including year dummies would absorb the very variation in the key regressor, making identification impossible. Taken together, the specification leverages exogenous variation in global monetary policy, controls for contemporaneous domestic conditions, and relies on within-country changes over time for identification.

The estimation results (Figure A2.6.1) indicate that a 1 percentage point increase in the global monetary policy rate leads to a cumulative rise of approximately 0.1 percentage point in NPL ratios over a two-year horizon, on average across the sample. While this may appear modest in absolute terms, it is economically meaningful when considered against the median NPL ratio of 1.74 percent in the sample—implying a 5.7 percent relative increase. Moreover, within domestic banking systems, asset quality varies considerably across institutions. As such, even a moderate increase in aggregate NPLs could translate into material stress for more vulnerable segments of the banking sector.

Figure A2.6.1. Estimation of a 100 bps Monetary Policy Shock on Bank NPL Ratio
(Percentage point)



Source: National authorities; International Monetary Fund via Haver Analytics; AMRO staff calculations. bps = basis points; NPL = nonperforming loan.

References

Adler, Gustavo, and others. 2021. "Foreign Exchange Intervention: A Data Set of Official Data and Estimates." IMF Working Paper WP/21/47. International Monetary Fund, Washington, DC. *https://www.imf.org/en/Publications/WP/Issues/2021/02/19/Foreign-Exchange-Intervention-A-Dataset-of-Public-Data-and-Proxies-50017.*

Alessandri, Piergiorgio, Òscar Jordà, and Fabrizio Venditti. 2025. "Decomposing the Monetary Policy Multiplier." *Journal of Monetary Economics* 152: 103783. *https://www.sciencedirect.com/science/article/abs/pii/S0304393225000546.*

ASEAN+3 Macroeconomic Research Office (AMRO). 2023. "Navigating High Debt in Low Visibility—Assessing Resilience of Financial Intermediaries." A*SEAN+3 Financial Stability Report 2023*, Chapter 4. Singapore, December. *https://amro-asia.org/wp-content/uploads/2023/12/Chapter-4.pdf*

ASEAN+3 Macroeconomic Research Office (AMRO). 2024. "Strengthening resilience to challenges ahead." *ASEAN+3 Financial Stability Report*. Singapore, October. *https://amro-asia.org/asean3-financial-stability-report-2024/.*

ASEAN+3 Macroeconomic Research Office (AMRO). 2025. "Inflation in ASEAN+3: Changing Dynamics and Policy Implications." Chapter 2. *ASEAN+3 Regional Economic Outlook*. Singapore, April. *https://amro-asia.org/asean3-regional-economic-outlook-2025*.

Bank Indonesia (BI). 2024. "BI-rate Held at 6.25%: Strengthening Stability and Maintaining Growth from Impact of Global Spillovers." BI press release, July 18. *https://www.bi.go.id/en/publikasi/ruang-media/news-release/Pages/sp_2614424.aspx?utm.*

Bank of Korea (BOK). 2022. "Monetary Policy Decision and Opening Remarks to the Press Conference." BOK Press Release, October 12. *https://www.bok.or.kr/eng/bbs/E0000634/view.do?menuNo=400069&nttId=10073229&utm.*

Bank of Thailand (BOT). 2022. "Monetary Policy Committee's Decision 4/2022". BOT Press Release, August 10. *https://www.bot.or.th/en/news-and-media/news/news-20220810.html.*

Banko Sentral Ng Pilipinas (BSP). 2022. "Safeguarding price stability amid challenging times." Philippine Economic Briefing. Washington, D.C., October 15. h*ttps://www.bsp.gov.ph/SitePages/MediaAndResearch/SpeechesDisp.aspx?ItemId=976&utm.*

Cerutti, Eugenio M., Maurice Obstfeld, and Haonan Zhou. 2021. "Covered interest parity deviations: Macrofinancial determinants." *Journal of International Economics* 130, May. *https://www.sciencedirect.com/science/article/pii/S0022199621000246.*

Chan-Lau, Jorge Antonio, Hoang Nam Nguyen, and Michael Wynn. 2024. "Financial Stress in ASEAN+3 Economies: Risk Regime Identification and Predictability." AMRO Working Paper WP/24-12. Singapore, October 25. *https://amro-asia.org/financial-stress-in-asean3-economies-risk-regime-identification-and-predictability.*

Diebold, Francis, and Kamil Yilmaz. 2012. "Better to Give than to Receive: Predictive Directional Measurement of Volatility Spillovers." *International Journal of Forecasting* 28(1): 57–66. *https://doi.org/10.1016/j.ijforecast.2011.02.006.*

Diebold, Francis, and Kamil Yilmaz. 2014. "On the Network Topology of Variance Decompositions: Measuring the Connectedness of Financial Firms." Journal of Econometrics 182(1): 119–34. *https://www.sas.upenn.edu/~fdiebold/papers/paper106/dieboldandyilmaz2011.pdf.*

Georgiadis, Georgios, and Feng Zhu. 2021. "Foreign-currency exposures and the financial channel of exchange rates: Eroding monetary policy autonomy in small open economies." *Journal of International Money and Finance* 110. February. *https://www.sciencedirect.com/science/article/abs/pii/S0261560620302217.*

International Monetary Fund (IMF). 2022. "Review of The Institutional View on The Liberalization and Management of Capital Flows — Background Note on Assessing Systemic Financial Stability Risks Due to FX Mismatches", IMF Policy Papers No. 010. *https://www.imf.org/en/Publications/Policy-Papers/Issues/2022/03/29/Review-of-The-Institutional-View-on-The-Liberalization-and-Management-of-Capital-Flows-515893.*

International Monetary Fund (IMF). 2024. *Annual Report on Exchange Arrangements and Exchange Restrictions 2023*. Monetary and Capital Markets Department. Washington, DC. *https://doi.org/10.5089/9798400260391.012*

Jarociński, Marek, and Peter Karadi. 2020. "Deconstructing Monetary Policy Surprises—The Role of Information Shocks." *American Economic Journal: Macroeconomics* 12(2): 1–43. *https://www.aeaweb.org/articles?id=10.1257/mac.20180090.*

Jordà, Òscar. 2005. "Estimation and Inference of Impulse Responses by Local Projections." *American Economic Review* 95(1): 161–182. *https://www.aeaweb.org/articles?id=10.1257/0002828053828518*.

Miranda-Agrippino, Silvia, and Hélène Rey. 2022. "The Global Financial Cycle." *Handbook of International Economics* 6: 1–43. *https://doi.org/10.1016/bs.hesint.2022.02.008*.

Ong, Li Lian, and Andreas Jobst. 2020. *Stress Testing: Principles, Concepts, and Frameworks*. International Monetary Fund. Washington, DC. *https://www.elibrary.imf.org/view/books/071/24471-9781484310717-en/24471-9781484310717-en-book.xml*.

Pesaran, H. Hashem, and Yongcheol Shin. 1998. "Generalized Impulse Response Analysis in Linear Multivariate Models." *Economics Letters* 58(1): 17–29. *https://www.academia.edu/3484327/Generalized_impulse_response_analysis_in_linear_multivariate_models*.

Rey, Hélène. 2015. "Dilemma Not Trilemma: The Global Financial Cycle and Monetary Policy Independence." NBER Working Paper W21162. National Bureau of Economic Research, Cambridge, MA. *https://www.nber.org/system/files/working_papers/w21162/w21162.pdf*.

Woodford, Michael. 2003. *Interest and Prices: Foundations of a Theory of Monetary Policy*. Princeton University Press. *https://press.princeton.edu/books/hardcover/9780691010496/interest-and-prices*.

Wu, Jing Cynthia, and Fan Dora Xia. 2016. "Measuring the Macroeconomic Impact of Monetary Policy at the Zero Lower Bound." *Journal of Money, Credit and Banking* 48(2–3): 253–91. *https://onlinelibrary.wiley.com/doi/abs/10.1111/jmcb.12300*.