AMRO

ASEAN +3 MACROECONOMIC RESEARCH OFFICE

ASEAN+3 FINANCIAL STABILITY REPORT 2025

The report is produced by the ASEAN+3 Macroeconomic Research Office (AMRO) for the use of the AMRO members. Any interpretations or conclusions expressed are not necessarily those of the AMRO members. By making any designation of or reference to a particular territory or geographical area, or by using the term "member" or "country" in this report, AMRO does not intend to make any judgements as to the legal or other status of any territory or area.

Nothing herein shall constitute or be considered to be a limitation upon or waiver of the privileges and immunities of the AMRO, all of which are specifically reserved.

The factual information covers data for the period up to 8 September 2025, except when stated otherwise.

© 2025 ASEAN+3 Macroeconomic Research Office
ISSN: 3029-1771

Printed in Singapore

ASEAN+3 Macroeconomic Research Office
10 Shenton Way, #15-08 MAS Building
Singapore 079117
enquiry@amro-asia.org
www.amro-asia.org

Table of Contents

Boxes

Annexes

Figures

Tables

Foreword from the Chief Economist

Since the publication of the *ASEAN+3 Financial Stability Report* (AFSR) 2024, the global economic and financial landscape has shifted significantly. The second Trump administration's tariff measures, together with heightened geopolitical tensions, and growing concerns over fiscal sustainability in major economies, have all contributed to greater uncertainty. Global financial markets reacted sharply to these events with heightened volatility. Although pressures have eased gradually, long-term bond yields have remained elevated. A particularly notable shift has been a possible weakening of the US dollar's long-established safe-haven role, as US policy uncertainty and fiscal issues continued to undermine investors' confidence.

For the ASEAN+3 region, which is deeply integrated with the global financial environment, these developments carry important implications. The US tariff poses risks to export-oriented corporate sectors and, by extension, related financial markets in several ASEAN+3 economies. In addition, tariff measures may add inflationary pressures in the US, further complicating its conduct of monetary policy, inducing potential volatility and spillovers to the region. At the same time, re-evaluation of the US dollar status as a safe haven, in the absence of a comparable alternative, can lead to heightened uncertainty and fragmentation.

Beyond these immediate challenges, ASEAN+3 economies are also confronting deeper structural shifts. One of the most significant of these is the rapid digitalization of financial services, which offers opportunities for greater financial inclusion and efficiency but also introduces new vulnerabilities. Banking sector digitalization may affect market structure and could change the nature and distribution of financial stability risks.

Against this backdrop, AFSR 2025 highlights the risks and vulnerabilities facing the ASEAN+3 region, while assessing its policy responses and resilience.

Chapter 1: Market Conjunctural: Stay on Guard Against External Uncertainties—reviews recent market developments and examines the challenges facing ASEAN+3. Spillovers from US policy uncertainty—particularly over trade measures—have unsettled markets, while fiscal policy concerns that emerged in the US have quickly spread to other advanced and emerging economies heightening market sensitivity to fiscal risks. At the same time, emerging doubts about the dollar's safe-haven role may reduce the region's reliance on US dollar funding, but they could also fragment global financial markets, add complexity to asset pricing, and complicate liquidity management. Geopolitical tensions continue to cloud the outlook and could induce further market volatility. Although property market conditions have stabilized somewhat, vulnerabilities persist and require close monitoring.

Chapter 2: Global Monetary Policy Shocks: Spillovers and ASEAN+3 Policy Responses—examines the effects of global monetary cycles, including the sharp tightening by major central banks such as the US Federal Reserve in 2022–2023. Rising interest rates and a stronger dollar during the period raised fears of financial stress in ASEAN+3, recalling past externally driven shocks like the global financial crisis and the taper tantrum. Yet, the region avoided major disruptions, supported by well-calibrated policy mixes and stronger fundamentals across the region. These outcomes highlight ASEAN+3's growing resilience and its ability to draw lessons from past episodes. Nevertheless, pockets of vulnerability remain, particularly in economies with high external exposure and elevated corporate debt risks.

Chapter 3: Banking Sector in the Digital Age: Balancing Innovation and Stability—explores the drivers of digital transformation in the banking sector and their implications for financial stability. It underscores the opportunities digitalization brings, but also the risks—ranging from operational challenges such as cybersecurity threats and service disruptions to systemic vulnerabilities stemming from the growing role of nonfinancial companies. The chapter further notes that financial inclusion initiatives, coupled with still-developing financial systems in some ASEAN economies, may leave new players more exposed to credit and business risks. A holistic approach to the regulatory framework will be important to safeguard overall financial stability.

Despite global turbulence, the region's financial system remains broadly resilient. Policymakers have acted swiftly and decisively to cushion the impact of external shocks. Stronger banking systems, ample foreign reserves, and available policy space have provided important safeguards.

Looking ahead, ASEAN+3 authorities should continue to take a pragmatic approach and reinforce policy frameworks, enhancing transparency, deepening domestic financial markets, and bolstering buffers to guard against global volatility. At the same time, policies must adapt to the challenges of evolving structural shifts such as digitalization, ensuring that innovation is managed within a sound and prudent regulatory framework.

Finally, strengthening regional financial cooperation will be vital. Deeper integration of regional financial systems will not only increase collective resilience but also allow ASEAN+3 to respond more effectively to future episodes of global uncertainty and change. AMRO hopes that AFSR 2025 will serve as a valuable resource in our collective efforts to safeguard regional financial stability and resilience.

Dong He
Chief Economist

Acknowledgments

This report provides AMRO staff's assessment of both the conjunctural and structural financial stability issues facing the ASEAN+3 region. It covers the short-term developments, risks, vulnerabilities, and challenges facing member economies, as well as the policy options taken by or that are available to their authorities. It also presents staff's studies on longer-term issues that are pertinent to sustained financial stability in the region.

The analysis in this report was prepared by the Financial Surveillance team led by Runchana Pongsaparn. The report was peer-commented by economists from AMRO's Country Surveillance, Fiscal Surveillance, Regional Surveillance, Macro-Financial Research, and Policy Review Group. The report was reviewed and cleared by Chief Economist, Dong He. It has also benefited from the guidance of AMRO Director Yasuto Watanabe, Deputy Director Abdurohman, and other members of the Senior Management team.

Contributors to the report are Benyaporn Chantana, Chiang Yong (Edmond) Choo, Chenxu Fu, Yang Jiao, Wen Yan Ivan Lim, Leilei Lu, Ruperto Pagaura Majuca, Yoki Okawa, Prashant Pande (Chapters 1 and 3 lead), and Eunmi Park (Chapter 2 lead), with inputs from Kuchsa Dy, Shunsuke Endo, and Heung Chun (Andrew) Tsang. Ming Hui Tan provided research support.

Chiang Yong (Edmond) Choo coordinated the production of the publication, with editorial assistance from James Unwin; Hideaki Hamada, Andrea Abellon, Hui Shan Seah, Lynn Tan and Karen Wilkinson coordinated communications and outreach.

The authors would like to thank members of AMRO's Advisory Panel, chaired by Chantavarn Sucharitakul, for their useful input; private sector and official counterparts during the financial surveillance missions for their insightful observations on country and regional developments; and member authorities for their factual corrections and comments.

Finally, the views expressed in this report are those of AMRO staff and do not necessarily represent those of AMRO member authorities.

Abbreviations

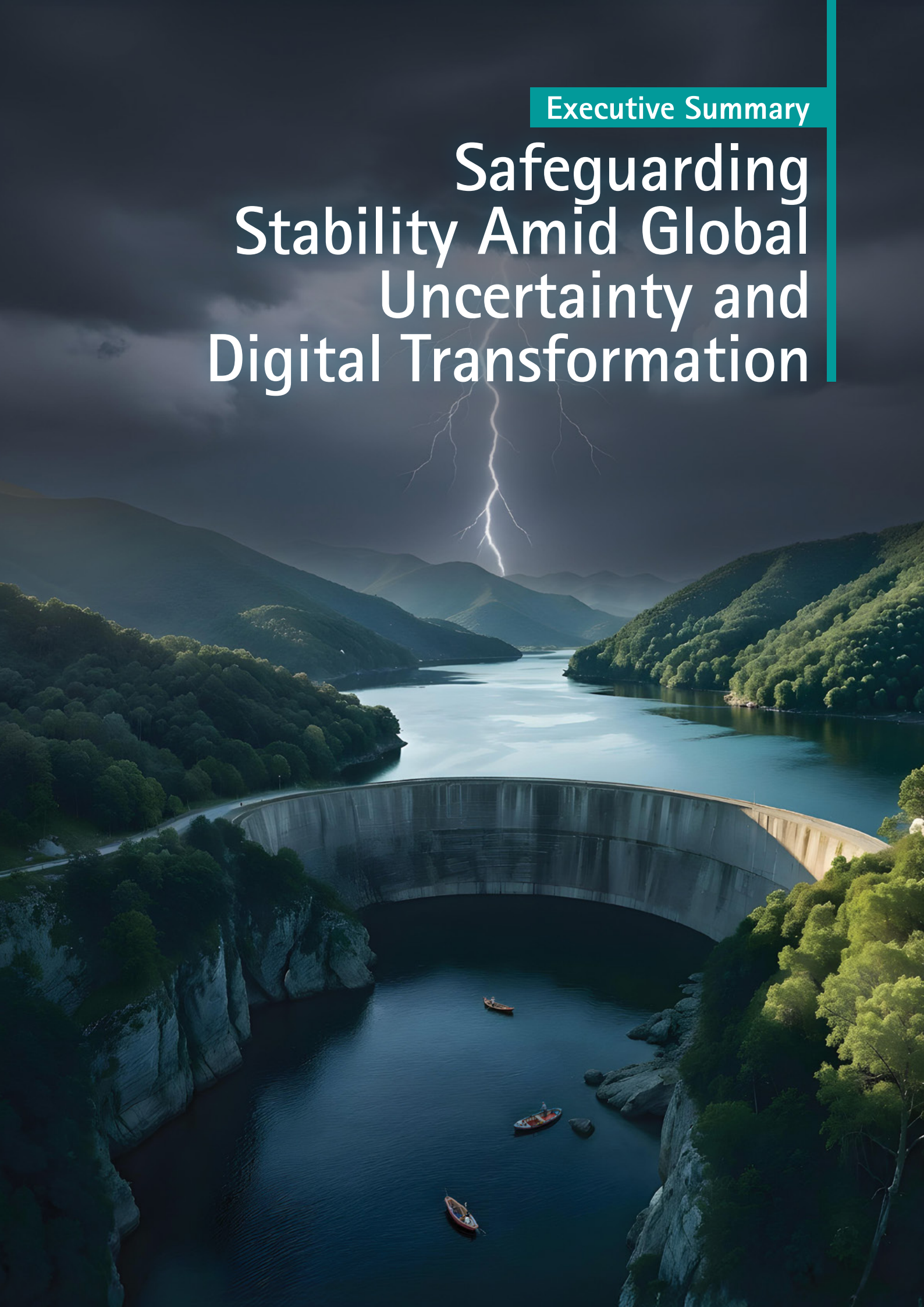
ADB	Asian Development Bank
AE	Advanced Economy
AFSR	ASEAN+3 Financial Stability Report
AI	Artificial Intelligence
AML	Anti-Money Laundering
API	Application Programming Interface
ARA	Assessing Reserve Adequacy
AREO	ASEAN+3 Regional Economic Outlook
ARKH	AMRO's Regional Knowledge Hub
ASEAN	Association of Southeast Asian Nations
ASEAN+3	ASEAN plus China (including Hong Kong), Japan, and Korea
ASEAN-5	Indonesia, Malaysia, the Philippines, Thailand, and Singapore
ASEAN-6	ASEAN-5 plus Vietnam
Asia-Pac	Asia Pacific
ATM	Automatic Teller Machine
BCLM	Brunei, Cambodia, Lao PDR and Myanmar
BCLMV	Brunei Darussalam, Cambodia, Lao PDR, Myanmar, and Vietnam
BIS	Bank for International Settlements
BN	Brunei Darussalam*
BNPL	Buy Now, Pay Later
BOJ	Bank of Japan
BOL	Bank of the Lao PDR
BOT	Bank of Thailand
BRS	Bank Reverse Solvency Stress Test
CAR	Capital Adequacy Ratio
CAGR	Compounded Annual Growth Rate
CBDC	Central Bank Digital Currency
CFM	Capital Flow Management
CFT	Combating the Financing of Terrorism
CHF	Swiss franc
CN	China
CNY/RMB	Chinese renminbi
CPI	Consumer Price Index
CSP	Cloud Service Provider
CVIX	Deutsche Bank Currency Volatility Index
DAR	Debt-at-Risk
DAX	Deutscher Aktienindex
DBS	Development Bank of Singapore
DLT	Distributed Ledger Technology
DS	Thomson-Reuters Datastream
DXY	US dollar index
EA	euro area
EBIT	Earnings Before Interest and Taxes
ECB	European Central Bank
EM	Emerging Market
EMEA	Europe, the Middle East, and Africa
ERP	Enterprise Resource Planning
EU	European Union
EUR	euro
FCI	Financial Conditions Index
FCY	Foreign currencies
Fed	US Federal Reserve
FFR	Effective Federal Funds Rate
FRB	Federal Reserve Board
FRED	Federal Reserve Bank of St Louis
FX	Foreign exchange
GCC	Gulf Cooperation Countries
GDP	Gross Domestic Product
GenAI	Generative AI
GFC	Global Financial Crisis
Govt.	Government
H1	First half of the year
H2	Second half of the year
HK	Hong Kong, China**
HKD	Hong Kong dollar
HKMA	Hong Kong Monetary Authority

* For brevity, "Brunei Darussalam" is referred to as "Brunei" in the text.
** For brevity, "Hong Kong, China" is referred to as "Hong Kong" in the text.

HTM	Held to Maturity
ICR	Interest Coverage Ratio
ID	Indonesia
IDR	Indonesian rupiah
IFC	International Financial Center
IFS	IMF International Financial Statistics
IMF	International Monetary Fund
IT	Information Technology
JGB	Japanese Government Bond
JP	Japan
JPY	Japanese yen
KH	Cambodia
KHR	Cambodian riel
KR	Korea
KRW	Korean won
KYC	Know Your Customer
LA, Lao PDR	Lao People's Democratic Republic
LATAM	Latin America
LCU	Local Currency Unit
LCY	Local currencies
LLM	Large Language Model
LP	Local Projection
MAS	Monetary Authority of Singapore
ML	Machine Learning
MM	Myanmar
MOVE	Merrill Lynch Option Volatility Estimate Index
MRO	Main Refinancing Operations Rate
MSCI	Morgan Stanley Capital International
MSME	Micro, Small and Medium Enterprise
MY	Malaysia
MYR	Malaysian ringgit
NBC	National Bank of Cambodia
NBFI	Nonbank Financial Institution/ Intermediary
NBFSA	Nonbank Financial Services Authority
NEER	Nominal Effective Exchange Rate
NIM	Net Interest Margin
NKY	Nikkei 225
NPL	Nonperforming Loan
OPEC	Organization of the Petroleum Exporting Countries
OPEC+	Organization of the Petroleum Exporting Countries and other oil-producing nations
P2P	Peer-to-Peer
PBC	People's Bank of China
PCE	Personal consumption expenditure
PH	The Philippines
PHP	Philippine peso
Plus-3	China (including Hong Kong), Japan, Korea
PMI	Purchasing Manager Index
PSP	Payment Service Provider
QR	Quick Response
REER	Real Effective Exchange Rate
ROA	Return on Assets
RPA	Robotic Process Automation
RWA	Risk-weighted Asset
S&P	Standard and Poor's
SG	Singapore
SGD	Singapore dollar
SVB	Silicon Valley Bank
TH	Thailand
THB	Thai baht
UK	United Kingdom
US	United States
USD	US dollar
VAR	Vector Autoregression
VIX	CBOE Volatility Index
VN	Vietnam
VND	Vietnamese dong
Δ	Change in

Executive Summary

Safeguarding Stability Amid Global Uncertainty and Digital Transformation

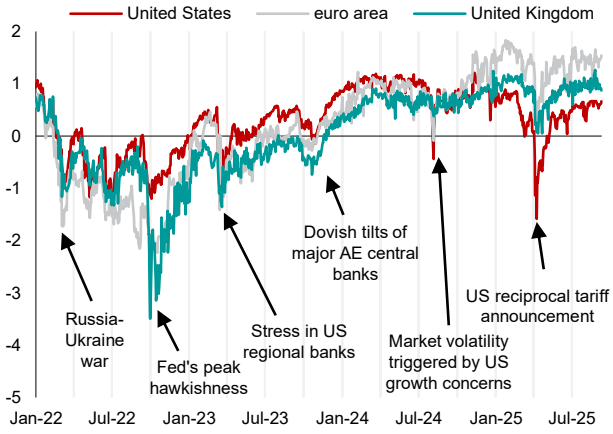


Safeguarding Stability Amid Global Uncertainty and Digital Transformation

Following publication of the 2024 *ASEAN+3 Financial Stability Report* (AFSR), global financial conditions have been volatile, reflecting heightened uncertainty over trade and economic policies from the United States (US) and escalating geopolitical tensions (Figure E.1). Since the US announced its first round of tariffs on major trading partners in February 2025, market stress has fluctuated with subsequent developments, peaking after the 'Liberation Day' tariffs on 2 April. In particular, the US dollar began sliding in February as investors questioned its safe-haven status amid expectations on tariff policies and rising fiscal concerns. Even as US equity markets and Treasury yields rebounded following the 90-day tariff pause, the dollar remained weak (Figure E.2). Apart from the trade uncertainty, geopolitical risks have made sporadic contributions to market stress.

Figure E.1. Selected Advanced Economies: Financial Conditions
(Index)

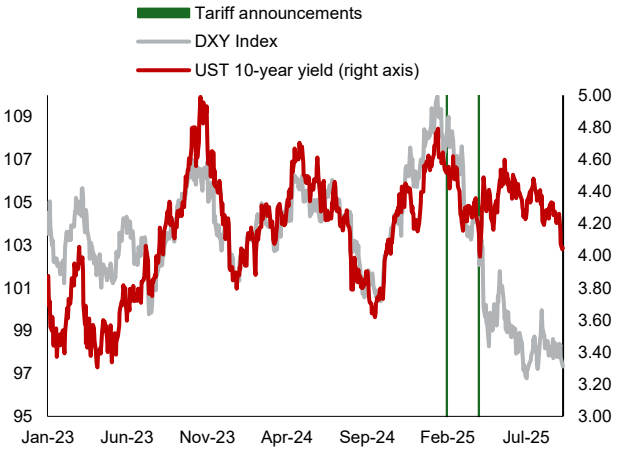
Global financial conditions tightened in early April.



Source: Bloomberg Finance L.P.; AMRO staff compilation.
Note: Higher values of the index indicate easier financial conditions.
AE = advanced economy. Data as of 8 September 2025.

Figure E.2. US Dollar and US Treasury Yield
(Index; percent)

The US dollar-US Treasury yield co-movement broke after Liberation Day.



Source: Bloomberg Finance L.P.; AMRO staff calculations.
Note: Data as of 8 September 2025.

Financial markets in ASEAN+3 responded to these external events differently depending on the degree of trade exposure to the US and the level of tariffs applied (Figure E.3). Barring idiosyncratic factors, government bond yields remained less sensitive to US Treasury yields and fell in most regional markets.

US tariffs can have a material spillover on the health of the export-oriented corporate sectors in some of the ASEAN+3 economies. Tariff announcements on 2 April led to relatively weaker stock markets in those economies with higher export exposures to the US. The impact on corporate profits could be particularly severe for smaller firms, which may have concentrated exposure to US demand, either directly or through global supply chains.

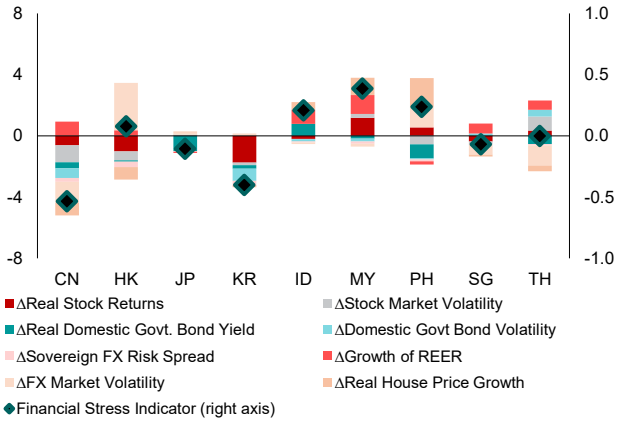
Regional currencies generally appreciated against the US dollar in the first half of 2025. The longer-term implications for financial stability in the ASEAN+3 region of the US dollar being perceived as less safe and US Treasuries losing their risk-free benchmark status need further analysis and careful monitoring. The absence of a risk-free asset could introduce higher volatilities in regional financial markets as the dollar has been a major funding currency.

Encouragingly, the ASEAN+3 region entered this period of trade policy turbulence from a position of strength and resilience. Most regional policymakers responded proactively to cushion the impact of the anticipated trade shock, and policy space remains available for further support if needed. The banking sector remains well-capitalized and sound, offering a crucial anchor for regional financial stability.

However, pockets of vulnerabilities remain in the ASEAN+3 economies. Compared to 2023, total debt-to-GDP in the region inched higher in 2024, driven by modest increase in both corporate and government borrowing (Figure E.4). Debt risks are still elevated among small and medium-sized enterprises.

Figure E.3. Selected ASEAN+3: Contributors to Change in Market Stress from January 2025 to September 2025
(Index)

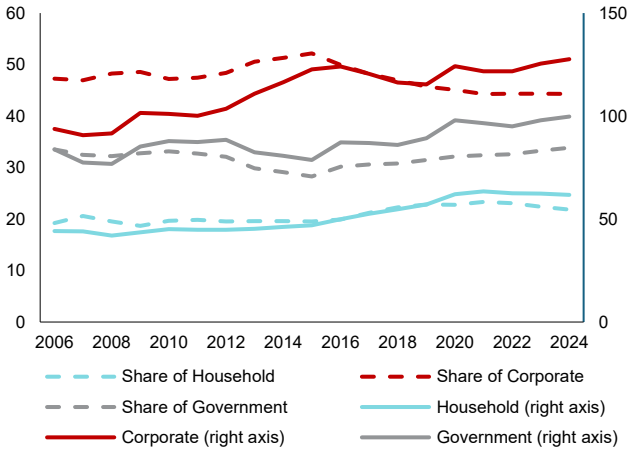
Market stress levels differed across economies.



Source: Bloomberg Finance L.P.; Haver Analytics; AMRO staff calculations.
Note: A rise in stock market volatility, real domestic government yields, domestic government bond yield volatility, sovereign foreign exchange risk spread, and foreign exchange market volatility; and a fall in real stock market returns, growth of REER and real house prices contribute to higher market stress. FX = foreign exchange; govt. = government; REER = real effective exchange rate; Δ = change in; CN = China; HK = Hong Kong; ID = Indonesia; JP = Japan; KR = Korea; MY = Malaysia; PH = Philippines; SG = Singapore; TH = Thailand. Data as of 8 September 2025.

Figure E.4. Selected ASEAN+3: Corporate, Government and Household Debt
(Percent; Percent of GDP)

ASEAN+3's total debt-to-GDP ratio rose by 4 percentage points in 2024, driven by corporate and government debt.



Source: Bank for International Settlements (BIS); AMRO staff calculations.
Note: Data covers all economies reporting nonfinancial debt data to the BIS. Selected ASEAN+3 includes China, Hong Kong, Indonesia, Japan, Korea, Malaysia, Singapore, and Thailand. Government debt data for these economies in nominal value, except for Korea, which reports market value.

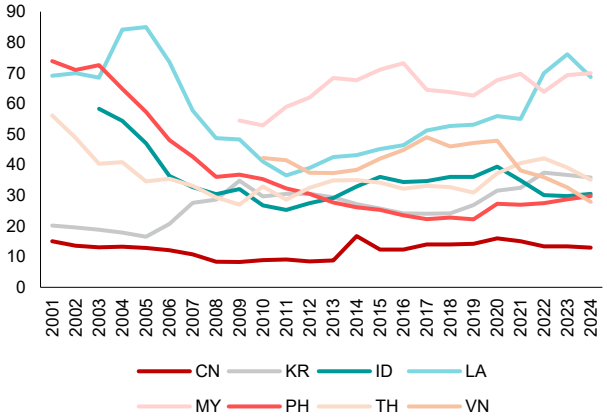
A slowdown in global demand—triggered by tariffs or other shocks—could exacerbate these strains, particularly for export-sensitive industries. Unlisted small and medium-sized firms in raw materials and manufacturing sectors have higher levels of debt-at-risk, warranting closer monitoring of financial system exposures to those firms.

Despite the US Federal Reserve (Fed) having resumed its rate-cut cycle, tariff-induced inflation and potentially higher oil prices stemming from geopolitical stress could delay or even reverse this trajectory, with spillover to regional markets. Chapter 2 examines the impact of global monetary shocks on ASEAN+3 financial stability, including the 2022–2023 global tightening. During this period, regional markets came under stress, but no systemic crisis emerged, underscoring stronger fundamentals and well-calibrated policy responses. However, vulnerabilities remain in economies with high external exposure and in firms with high debt-at-risk—such as the property and construction, manufacturing, and raw materials sectors—leaving them susceptible to renewed global rate hikes or local currency depreciation (Figure E.5). Further, rising market risk exposures among financial institutions could increase sensitivity to global interest rate shocks.

Meanwhile, the digitization of banking services continues to accelerate across the region. While offering efficiency gains, convenience and improved financial inclusion, digitalization introduces new risks or alters the nature and distribution of traditional risks in banking. Chapter 3 examines the evolving landscape in the region and its implications for financial stability. Operational risks, such as cybersecurity threats, service disruptions and fraud, remain at the forefront (Figure E.6). Systemic risks may also emerge from the growing participation of, and reliance on, nonfinancial companies in providing digital banking services. In addition, financial inclusion objectives in some ASEAN economies could expose new digital financial institutions to heightened credit and business risks.

Figure E.5. Selected ASEAN+3: External Debt to GDP Ratio Trend
(Percent)

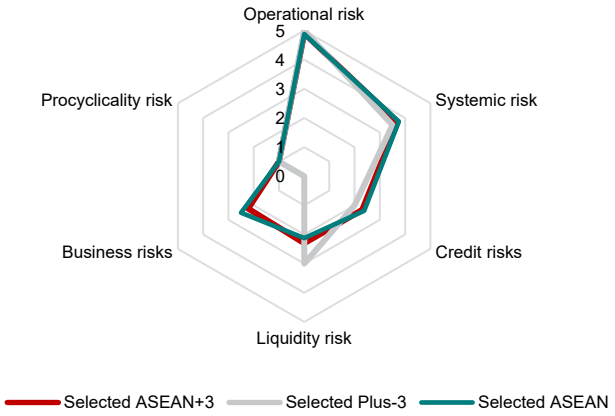
External debt ratios have stabilized overall but remain high or increasing in some economies.



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 E.6. Selected ASEAN+3: Risks Posed by Digitalization
(Risk ranking)

Operational risk is seen as the most significant risk.



Source: Authority Survey; AMRO staff compilation.
Note: Survey results for the question "Based on your qualitative assessment, please rank the following risks posed by the digitalization of banking services." The spiderweb shows the average risk rankings for the various economy groups for each specific risk, with 5 carrying the most risk and 1 the least.

Even as elevated US policy uncertainty casts a shadow over ASEAN+3's growth outlook, significant dollar weakening has helped cushion external spillovers, ease imported inflation, and provide room for supportive policy responses. A policy mix tailored to domestic conditions should be implemented prudently to preserve policy space and strengthen resilience to external shocks. Monetary policy can provide support to the economy in a broad-based slowdown, while fiscal policy can be targeted more toward vulnerable sectors. Macroprudential measures can also be activated to complement monetary and fiscal policies, should financial stability issues, such as debt buildup, arise.

Concerns over the US dollar's safe-haven status could see capital flows partially reallocated toward the ASEAN+3 region. While this may support domestic financial stability, authorities should remain vigilant for potential asset price dislocations and excessive credit growth and stand ready to implement surveillance and risk mitigation measures. Over the longer term, deeper regional financial integration could help reduce the vulnerabilities associated with heavy reliance on the US dollar as a funding currency in the region.

While managing near-term volatilities, ASEAN+3 economies should continue strengthening policy frameworks to mitigate spillovers from global shocks (Chapter 2). As the financial landscape evolves with accelerated digitalization, balancing innovation with financial stability requires a holistic, multipronged approach (Chapter 3).

Chapter 1

Market Conjunctural: Stay on Guard Against External Uncertainties

Highlights

- Since publication of the 2024 *ASEAN+3 Financial Stability Report*, volatility in global financial markets has increased because of high US policy uncertainty and sporadic spikes in geopolitical tension. Global financial conditions are expected to evolve with US trade policies and geopolitical developments—and their spillovers to global economy.

- Sustained weakness in the US dollar and the increased sensitivity of bond markets to fiscal sustainability concerns have been major developments in global financial markets since early 2025. The US dollar has weakened as markets reevaluated its safe asset status since the US announced tariffs on major trading partners along with changes to immigration and fiscal policies, and regulatory frameworks. The bond markets in some advanced economies saw a significant rise in yields because of either actual or expected increases in fiscal expenditure.

- ASEAN+3 markets were predominantly driven by trade uncertainties. Economies with higher trade exposure to the US or those subject to higher tariffs experienced more stress than others. The impact of US tariffs on corporate profits could be severe for smaller firms which may have concentrated exposure to US demand, either directly or through global supply chains. Nevertheless, the banking system remains sound and well-capitalized, thus underpinning financial stability in the region.

- Uncertainties in US trade policies will remain critical for the outlook for individual economies in the ASEAN+3 region, even as intra-regional trade and domestic demand have become more important drivers of growth. The downside risks to growth along with the US dollar weakness has reduced inflationary pressures and should allow policy makers to focus on supporting growth. However, providing policy support should be done prudently to preserve policy space and promote market stability.

- While managing the near-term uncertainties, policymakers should continue to strive toward strengthening policy frameworks and bolster domestic and regional resilience to mitigate spillover risks from global shocks. Over the medium term, with the US dollar's safe haven status under market scrutiny, deeper regional financial integration could help reduce the vulnerabilities associated with heavy reliance on the dollar.

This chapter is authored by Prashant Pande, under the guidance of Runchana Pongsaparn, with contributions from Benyaporn Chantana, Chiang Yong (Edmond) Choo, Chenxu Fu, Yang Jiao, Wen Yan Ivan Lim, Leilei Lu, Yoki Okawa, Eunmi Park, and research assistance from Ming Hui Tan.

I. Recent Developments

US policy uncertainty and geopolitical tensions cause heightened volatility in global markets

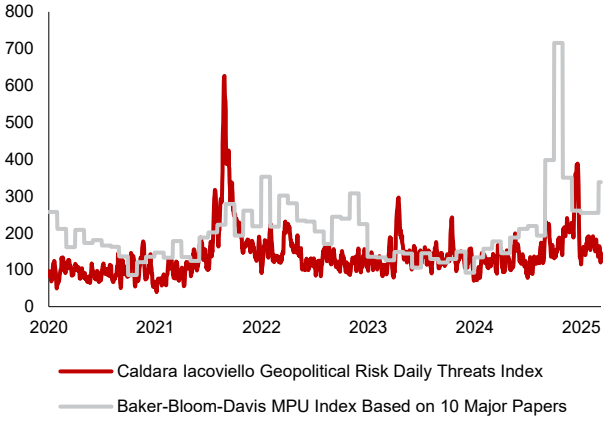
The 2024 *ASEAN+3 Financial Stability Report* was published when global markets were heading into the US presidential elections amid simmering geopolitical tensions. Since then, global markets have seen increased US policy uncertainty from elevated trade tensions and geopolitical conflicts (Figure 1.1). Global financial conditions remained largely accommodative during the last quarter of 2024 but deteriorated significantly during the first quarter of 2025 (Figure 1.2). In the days after the 2 April announcement of US reciprocal tariffs, financial conditions were at their tightest since March 2020 (market stress related to the COVID-19 pandemic) before gradually easing since then.

Trade tensions started rising after the first round of tariffs was announced by the US in early February on Canada, Mexico, and China. Negotiations and threats followed these announcements leading to the ebbs and flows of market stress in February and March. Market turbulence escalated significantly on 2 April, the so-called Liberation Day when President Trump extended reciprocal tariffs ranging from 10 percent to 50 percent on 185 countries (Financial Times 2025). A subsequent 90-day pause on most tariffs and a restart to US-China trade talks offered some relief. The tariffs were eventually imposed on 1 August after some trade deals were struck and negotiations for others continued. Multiple US shifts in its stance on tariffs since February have increased policy uncertainty. In addition, US policy uncertainty has also increased because of changes in immigration, fiscal and regulatory policies (Figure 1.3; Watson and Zars 2025).

The tariff and immigration policies in the US have raised the upside risks to inflation, downside risks to growth and have muddled the outlook for monetary policy. Overall, though the markets still expect the Fed to continue cutting rates (Figure 1.4), the timing, pace and extent of policy easing remain uncertain. In addition, public criticism of Fed Chair Powell by President Trump have raised concerns of a premature exit of Powell before his term ends in May 2026 and if materialized, will raise severe concerns around the independence of the Fed. Separately, US fiscal policy also came under market scrutiny following government proposals for a tax reduction without offsetting spending reductions, along with rising government debt and Moody's' downgrade of US ratings.

Figure 1.1. Selected Advanced Economies: Economic Uncertainty and Geopolitical Stress Indices
(Index)

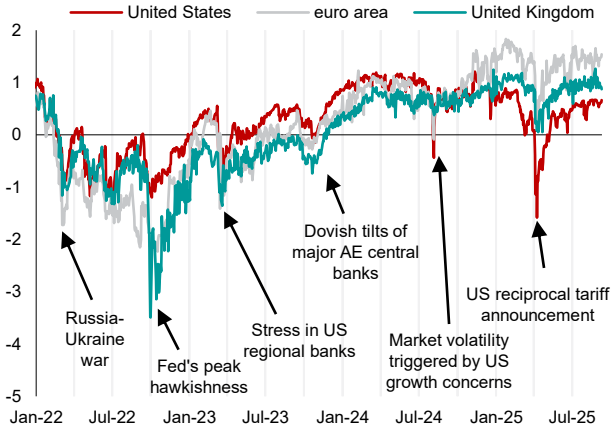
Economic and trade policy uncertainty remained elevated while geopolitical stress escalated sporadically.



Source: Bloomberg Finance L.P.; Baker-Bloom-Davis Economic Policy Uncertainty Indices; AMRO staff compilation.
Note: The seven-day moving average of the Caldara Iacoviello Geopolitical Risk Daily Threats Index is used. MPU = Monetary Policy Uncertainty. Data as of 8 September 2025.

Figure 1.2. Selected Advanced Economies: Financial Conditions Indices
(Index)

Global financial conditions tightened in early April.

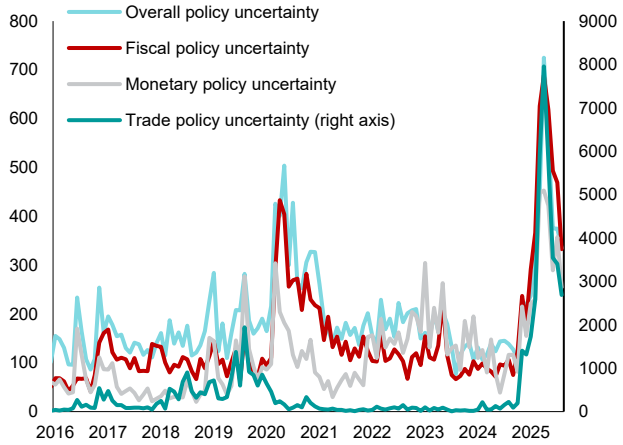


Source: Bloomberg Finance L.P.; AMRO staff compilation.
Note: Higher values of the index indicate easier financial conditions. AE = advanced economy. Data as of 8 September 2025.

Global geopolitical risks have also increased. These risks included wars and border tensions in different parts of the world. Notably, these included the flare up of tensions between Israel and Iran during the Twelve-Day War from 13 June, in which the US became involved. A ceasefire between the three countries helped calm markets soon after (Box 1.1). Separately, tensions between Ukraine and Russia intensified at the margin as Ukraine received permission from its key allies to attack targets deep into Russian territory in late May, while the efforts around a ceasefire have yielded limited results. There were also localized tensions in other parts of the world, including those between India and Pakistan, and Thailand and Cambodia.

Figure 1.3. US Policy Uncertainty Index
(Index)

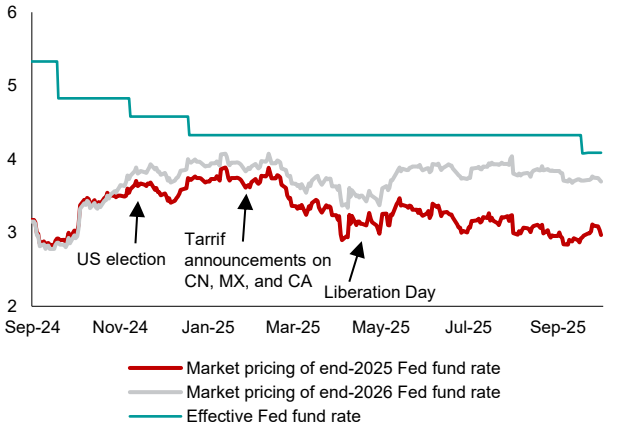
US policy uncertainty increased across the board.



Source: Bloomberg Finance L.P.; AMRO staff calculations.
Note: Data as of 31 August 2025.

Figure 1.4. Fed Rate Expectations
(Percent)

The Fed is widely expected to continue cutting interest rates.



Source: Bloomberg Finance L.P.
Note: CN = China, MX = Mexico, CA = Canada. Data as of 1 October 2025.

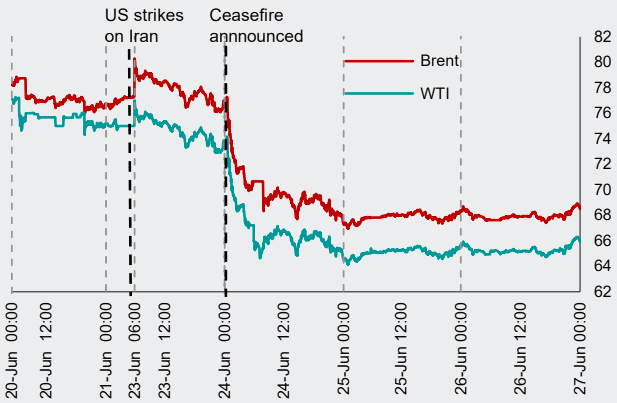
Box 1.1:

Global Market Reactions to Israel, Iran and US Conflict

Tensions between Israel and Iran in June 2025 trace back to October 2023, when Hamas and Hezbollah—allegedly funded by Iran—attacked Israel. The conflict escalated with Iran's direct involvement in April 2024, and culminated more than a year later with Israel's preemptive strikes on Iran's nuclear and military sites on 13 June 2025. A week of attacks followed, escalating when US President Donald Trump launched "Operation Midnight Hammer" on June 22, targeting three key Iranian nuclear facilities.[1] Iran attacked a US military base in Qatar on June 23, but hours later, Trump announced an immediate ceasefire between the US, Israel, and Iran. As of September, the ceasefire remains fragile, with both sides periodically testing the boundaries of the truce and external powers maintaining a critical role in stabilizing the region.

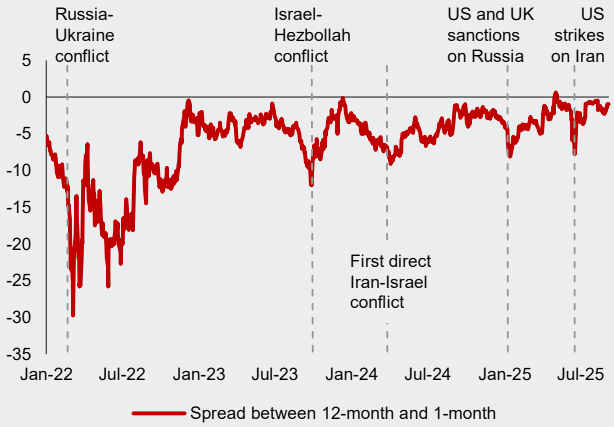
The escalation in conflict, particularly when Iran's parliament voted to close the Straits of Hormuz (Lee 2025; Parry 2025), led to a rise in oil prices as Brent crude rose from about USD 66 per barrel in early June to USD 80 per barrel after US attacked Iran (Figure 1.1.1). In the forward market, the price spread between the 12-month and 1-month contracts widened, confirming rising market concerns on tighter short-term supply. Nonetheless, the magnitude of the spread remained smaller than in past major geopolitical events in recent years (Figure 1.1.2). Both Brent crude prices and the spread normalized quickly after the ceasefire was announced.

Figure 1.1.1. Global Crude Oil Prices
(US dollars per barrel)



Source: Bloomberg Finance L.P.
Note: The timeline is based on GMT +8:00 hours. Gray dotted lines separate trading sessions. The x-axis is not to scale due to the difference in timing reported for each commodity. WTI = Western Texas Intermediate crude oil.

Figure 1.1.2. Brent Forward Spread Between 12-month and 1-month Contracts
(US dollars per barrel)



Source: Bloomberg Finance L.P.

The conflict had spillovers to global markets, including ASEAN+3. Between 12 June and 20 June, most major global equity indices weakened while the US dollar strengthened against major currencies on safe haven demand. US Treasury yields were range-bound but the breakdown of the yield components shows that the effect of rising breakeven yield (indicating domestic inflationary pressures) was offset by the fall in real yields that resulted from the safe-haven demand of Treasuries (Figure 1.1.3). Other perceived safe havens showed divergent behavior.

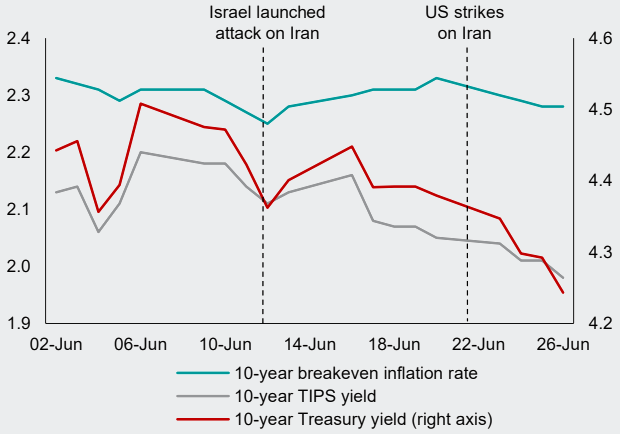
Gold spiked on 13 June following Israel attacks but gave up the gains in the following weeks. Swiss franc initially weakened against the US dollar but appreciated after the US attacks and ceasefire announcement (Figure 1.1.4).

The easing of geopolitical tensions after the ceasefire has calmed market jitters, leading to a stabilization in oil prices and Treasury yields tracking lower after June 24. The US dollar also depreciated against Swiss franc and gold rebounded.

The author of this box is Chiang Yong (Edmond) Choo.

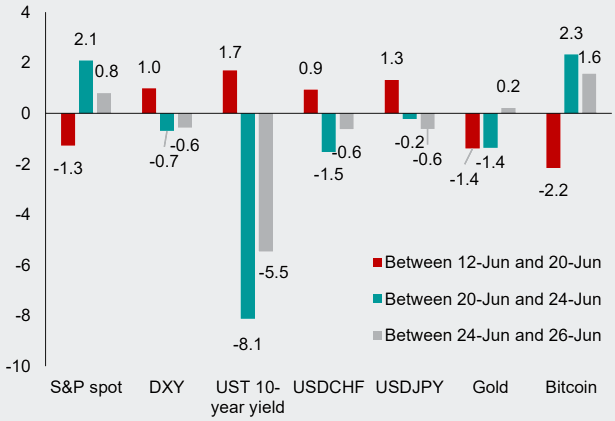
[1] The action was particularly unexpected given President Trump's longstanding position of keeping the US out of foreign conflicts. Just a day before the strikes, he had given Iran a two-week window to initiate negotiations (Liptak and others 2025, Gardner and others 2025).

Figure 1.1.3. The US 10-Year Treasury Yield and Its Components
(Percent)



Source: Bloomberg Finance L.P.; Federal Reserve Bank of St Louis FRED.
Note: TIPS = Treasury inflation-protected securities. Data until 26 June 2025.

Figure 1.1.4. Recent Change in US Asset and Commodity Price
(Change in percentage/basis points)



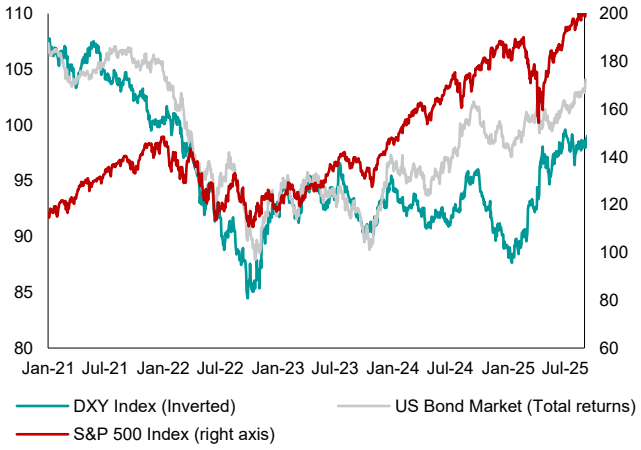
Source: Haver Analytics; AMRO staff calculations.
Note: The change for 10-year United States Treasury (UST) yield is in basis points, while the rest are in percentage change. DXY = broad dollar index; S&P spot = Standard & Poor's 500 index; USDCHF = price of one US dollar in Swiss franc; USDJPY = price of one US dollar in Japanese yen.

Global financial markets remained hostage to the policy uncertainty emerging from the US and the geopolitical tensions, leading to periods of weakness in various assets and heightened volatility (Figures 1.5 and 1.6). US equity markets reacted largely to tariff developments, reaching a trough in early April after Liberation Day before recovering to historical highs by mid-July as tariff implementations were delayed and eased for some countries.

US Treasury yields remained elevated because of expectations of delayed Fed monetary easing and concerns around mounting US debt. Fiscal concerns were not limited to the US alone. A potential rise in Europe's fiscal deficit affected European markets, causing a rise in bond yields. However, European equities and the euro gained around periods when Germany announced a potential expansion of fiscal spending (Box 1.2). The most significant market movements were in the foreign exchange space, where the US dollar depreciated sharply against major currencies and assets since mid-January (Figure 1.7). Markets grew cautious about the safe haven status of the dollar amid policy uncertainty and rising fiscal burdens.

Figure 1.5. US: Equity, Bond Market, and Foreign Exchange Indices
(Index, 1 January 2021 = 100)

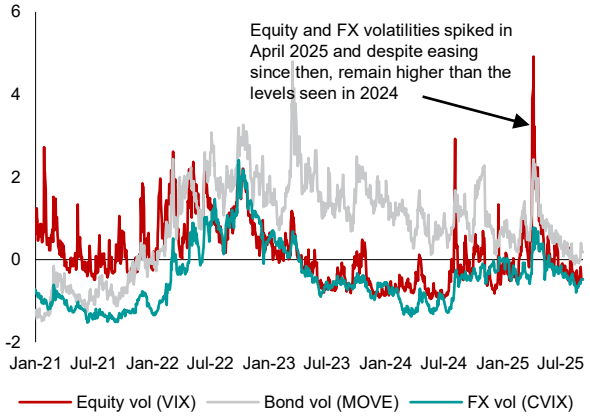
US policy uncertainty and geopolitical tensions led to periods of weakness in the US financial market...



Source: Bloomberg Finance L.P.; AMRO staff calculations.
Note: DXY index refers to the broad US dollar index. The Bloomberg US Aggregate Index is used for US bond market (total returns). The S&P 500 index refers to the Standard & Poor's 500 index. Data as of 8 September 2025.

Figure 1.6. Volatility in Key Assets
(z-score, based on data since 1 January 2010)

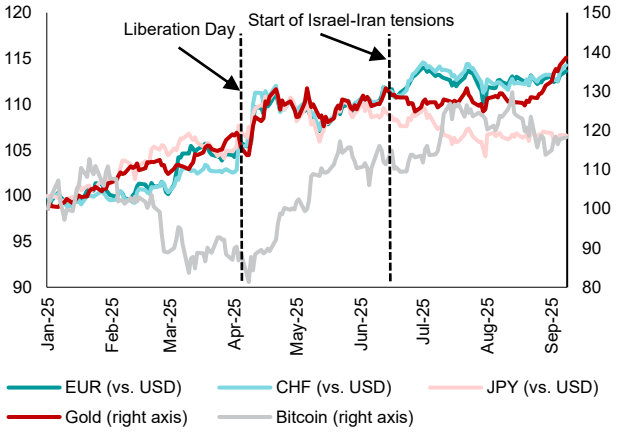
...and heightened volatility.



Source: Bloomberg Finance L.P.; AMRO staff calculations.
Note: VIX refers to Chicago Board Options Exchange's Volatility Index. MOVE refers to Merrill Lynch Options Volatility Estimate Index. CVIX refers to the Deutsche Bank Currency Volatility Index. FX = Foreign exchange. Vol = volatility. Data as of 8 September 2025.

Figure 1.7. Movements in Selected Global Currencies and Assets
(Index, 1 January 2025 = 100)

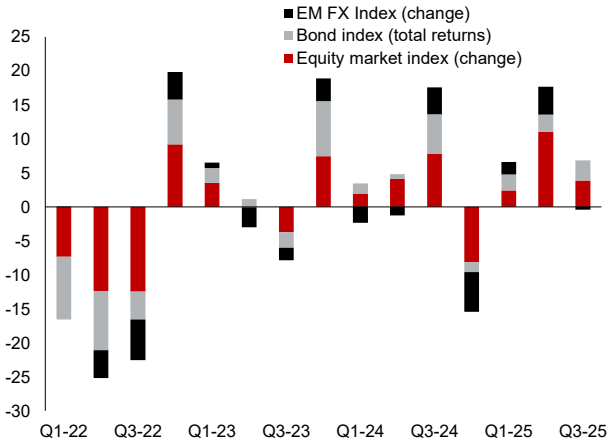
The US dollar depreciated sharply against major currencies and assets.



Source: Bloomberg Finance L.P.; AMRO staff calculations.
Note: Data as of 8 September 2025.

Figure 1.8. Emerging Markets: Equity, Bonds, and Foreign Exchange Indices
(Percent, quarter-on-quarter)

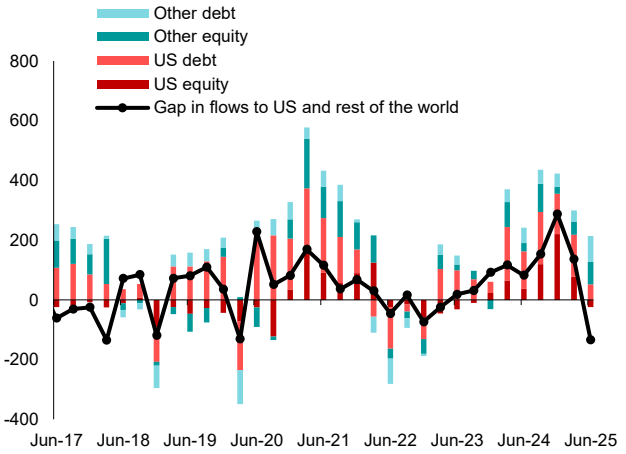
Emerging market assets rebounded in the first half of 2025.



Source: Bloomberg Finance L.P.; AMRO staff calculations.
Note: EM: Emerging markets; FX = Foreign exchange. Data for the third quarter of 2025 as of 8 September 2025.

Figure 1.9. US and Global (ex-US): Bond and Equity Flows
(Millions of US dollars)

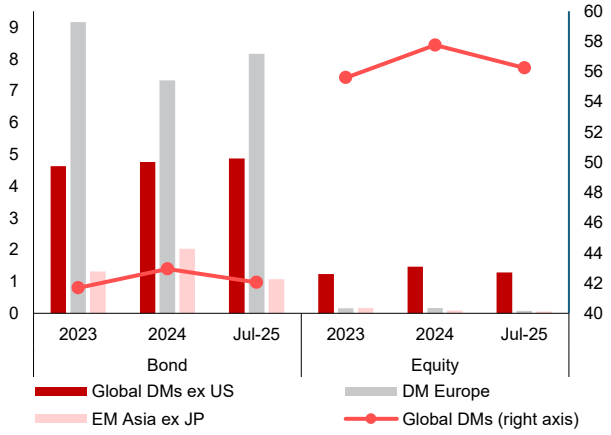
US assets attracted a larger share of funds around the US presidential election.



Source: Emerging Portfolio Fund Research; AMRO staff calculations.
Note: Total flows refer to flows of bond and equity. Data as of the second quarter of 2025.

Figure 1.10. World: Share of US Allocations in Equity and Bond Portfolio by Funds Mandated for Respective Region, Year-to-date 2025
(Percent of total portfolio)

Bond allocations were stable, but equity allocations have reduced.

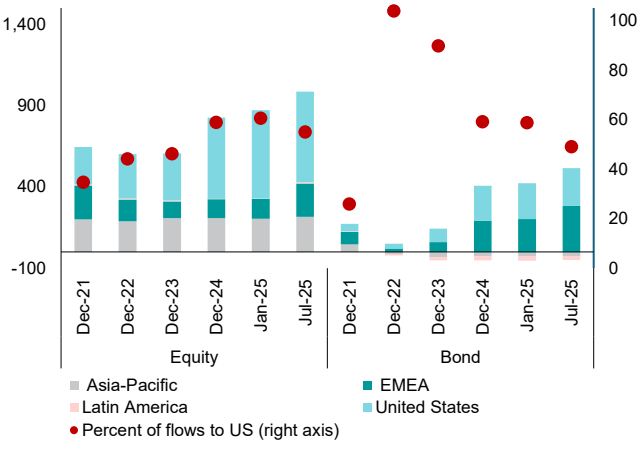


Source: Emerging Portfolio Fund Research; AMRO staff calculations.
Note: Data track funds' exposure to specific countries based on their weights in the provided funds' portfolios. DM = developed market; EM = emerging market; ex = excluding; JP = Japan; US = United States. Data as at July 2025.

Emerging market assets weakened in the fourth quarter of 2024 (Figure 1.8) as US assets attracted a larger share of funds around and after the US presidential elections (Figure 1.9) but the fund allocations to US equities have reduced in 2025 (Figures 1.10 and 1.11). Nevertheless, emerging assets have gained in 2025 despite the increased turbulence in global markets. The MSCI emerging markets index strengthened in the first and second quarters of 2025, driven by gains in equities of China, Korea, and Brazil. A weaker US dollar helped many emerging market currencies strengthen while the limited bond market spillover from advanced economies to emerging market bond markets ensured that the total returns for these markets remain positive. Emerging markets continued receiving inflows, but they were driven primarily by debt flows while equity markets saw aggregate outflows in the first two quarters of 2025 (Figure 1.12). The perceived erosion of the dollar's safe haven status may have supported the demand for emerging market debt sporadically, but the flows could see a material rise if the erosion continues amid US policy and fiscal concerns.

Figure 1.11. World and US: Cumulative Equity and Bond Inflows and Share of Inflows to the US by Foreign Domiciles
(Billions of US dollars; Percent)

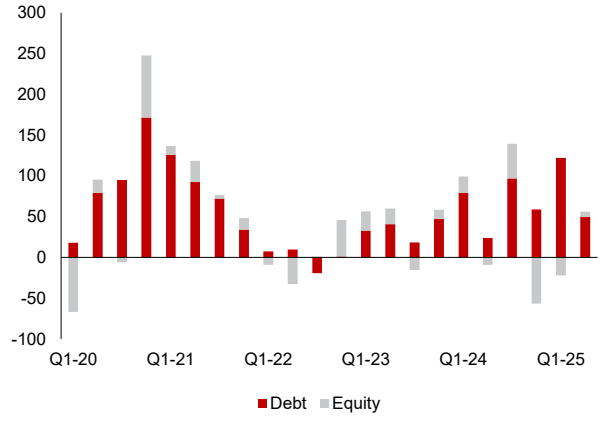
The share of US assets in global flows declined marginally in 2025.



Source: Emerging Portfolio Fund Research; AMRO staff calculations.
Note: Data for total flows refer to cumulative inflows to respective economy by foreign domicile investors since December 2020. The data cover only fund flows from exchange-traded funds and mutual funds. The percentage of inflows to the US is calculated by dividing cumulative inflows to the US by cumulative inflows to the world, including the US. EMEA = Europe, Middle East and Africa.

Figure 1.12. Emerging Markets: Portfolio Investment Flows
(Billions of US dollars)

Portfolio inflows continued in emerging markets in 2025.

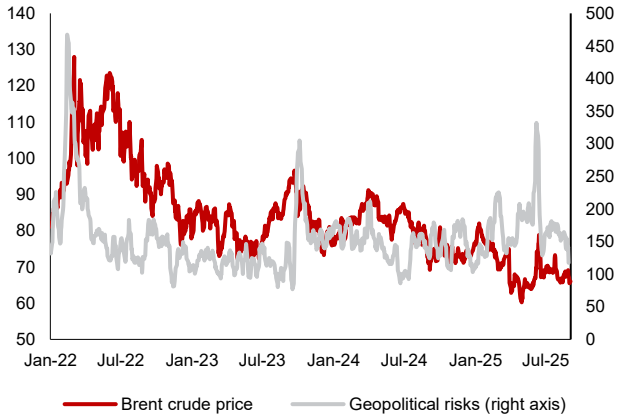


Source: Institute of International Finance via Haver Analytics; AMRO staff calculations.
Note: Data as of the second quarter of 2025.

Oil prices strengthened in periods of geopolitical stress (Figure 1.13) but otherwise have trended lower because of the outlook for supply to outstrip demand. The markets believe that the tariffs will eventually affect growth negatively leading to lower oil demand, while OPEC+ has started increasing its production, fueling expectations of a supply surplus in oil markets (Figure 1.14) (Agnolucci and Makarenko 2025).

Figure 1.13. Brent Crude Oil Price and Geopolitical Risk
(Thousands of US dollars, 7-day moving average; Index, 1985–2019 = 100)

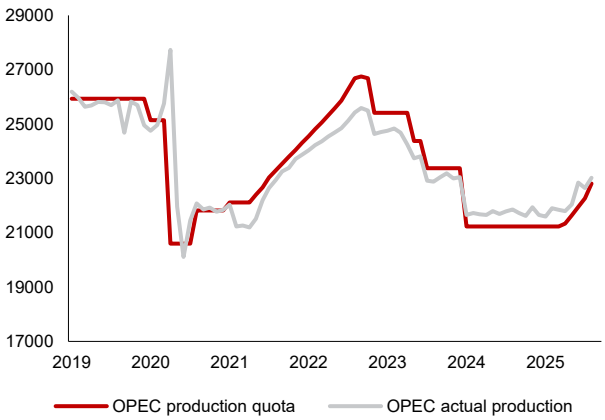
Oil prices trended downward barring geopolitical stress.



Source: Bloomberg Finance L.P.; AMRO staff calculations.
Note: The index used to gauge geopolitical risk refers to the Caldara Iacoviello Geopolitical Uncertainty Index. Data as of 8 September 2025.

Figure 1.14. OPEC Oil Production Quotas and Actual Production
(Thousands of barrels per day)

OPEC started raising its production quotas.



Source: Bloomberg Finance L.P.; AMRO staff calculations.
Note: Iran, Libya and Venezuela are exempted from production quota and excluded from Organization of the Petroleum Exporting Countries (OPEC) actual production. Data as of 8 September 2025.

Box 1.2:

Rising Fiscal Concerns in Major Economies

Bond markets reacted to developments in the fiscal stance of major global economies in 2025. The fiscal developments first came under market scrutiny in mid-December when US President Donald Trump called for abolishing the debt ceiling. The debt ceiling, which was suspended since 2023 was reinstated on 1 January 2025 (Figure 1.2.1), but the US Treasury soon started using "extraordinary efforts" to avoid an immediate default. The Treasury projected it would exhaust its resources sometime between July and October 2025 if a new deal on debt limit was not reached. Concerns around US debt flared up again when Moody downgraded US credit rating from Aaa to Aa1 on 16 May. Finally, President Trump's 'Big Beautiful Bill' raised the debt limit by USD 5 trillion, mitigating default risks in the near term but creating fiscal uncertainty in the long-term with substantial new borrowing, higher public debt, and higher interest payments.

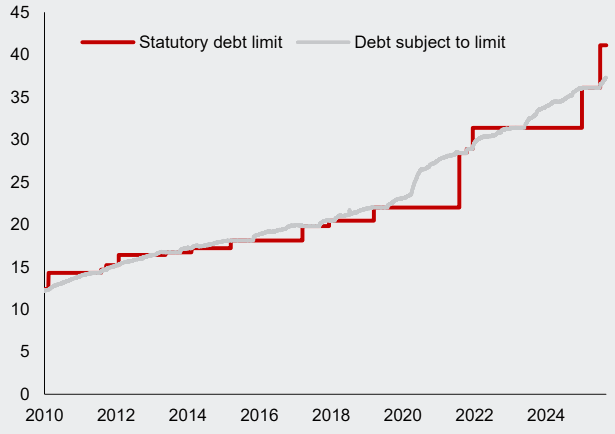
The German government bond (bund) markets saw a sharp rise in yields in early March when the newly elected coalition government proposed an overhaul of the debt brake, which restricted the federal government's structural deficit to 0.35 percent while the state governments were required to maintain a structurally balanced budget. The rule was amended to (1) exempt defense spending above 1 percent of GDP, (2) allow states to run structural deficits of up to 0.35 percent of own GDP, and (3) create a EUR 500 billion fund for infrastructure and climate investment. The proposal was seen as pro-growth and helped European equities and the euro to strengthen. In addition, some EU members invoked the National Escape Clause in March 2025 to allow greater fiscal leeway in the event of urgent security and defense spending needs.

In Japan, domestic factors were limited to market dynamics and speculations. In May, the markets believed that supply-demand dynamics were skewed toward higher long-term yields as the demand of Japanese Government Bonds from insurance companies had receded. The concerns were mitigated by strong buying by foreign investors and adjustments to issuance plans by the Ministry of Finance. In July, heading into the Upper House elections on 20 July, market participants expected economic stimulus measures if the ruling coalition loses. The uncertainty prevailed after the ruling coalition lost its majority in the election, causing the yields to stay elevated.

Bond market reactions to all these events were varied but were more prominent in the longer tenor bond yields. Most of the developments led to gradual rise in bond yields over days and weeks, such as the US debt ceiling concerns in December 2024 and Moody's downgrade of US debt in May 2025 (Figure 1.2.2). But Germany's debt brake proposal caused the sharpest single day rise in German government bond yields in almost 30 years (Figure 1.2.3). While many of these events were idiosyncratic, there were spillovers to other bond markets (Figure 1.2.4). Poor investor sentiment was also seen in bond auctions in these markets during May, June, and July, when most of the bonds for which demand was poor were longer-tenor (typically 20-year or 30-year maturity bonds).

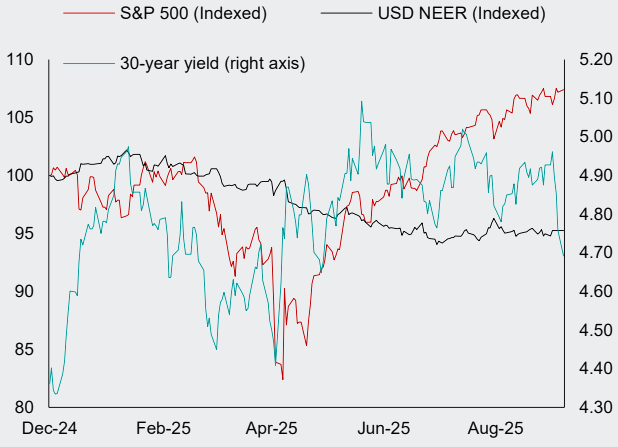
Overall, the market reactions show that investors have grown increasingly sensitive of the fiscal situation and tend to punish the bond markets in events leading to fiscal expansions. Also, reactions can also spillover to other bond markets and cause undue stress, especially if the fiscal outlook is not clear.

Figure 1.2.1. US: Statutory Debt Limit and Outstanding Debt Subject to Limit
(Trillions of US dollars)



Source: Bloomberg Finance L.P.
Note: The periods when the outstanding debt is greater than the debt limit are those when the debt limit was suspended and later reinstated at a higher level.

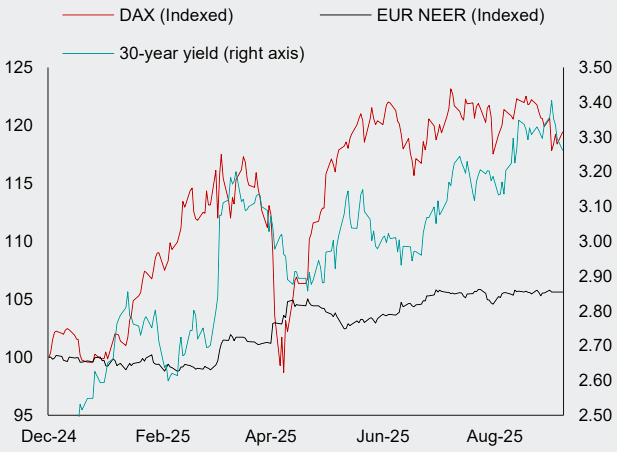
Figure 1.2.2. US: Equity, FX, and Bond Yields
(Index, 1 January 2025 = 100; percent)



Source: Bloomberg Finance L.P.
Note: S&P = Standard & Poor's; USD = US dollar; NEER = nominal effective exchange rate.

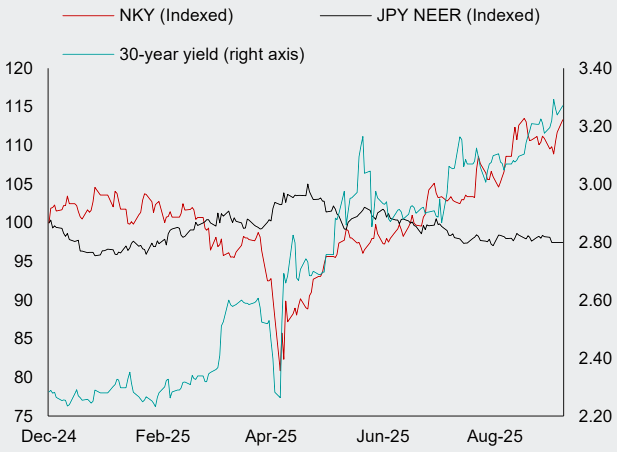
The author of this box is Prashant Pande.

Figure 1.2.3. Germany: Equity, FX, and Bond Yields
(Index, 1 January 2025 = 100; percent)



Source: Bloomberg Finance L.P.
Note: DAX = Deutscher Aktienindex; EUR = euro; NEER = nominal effective exchange rate.

Figure 1.2.4. Japan: Equity, FX, and Bond Yields
(Index, 1 January 2025 = 100; percent)



Source: Bloomberg Finance L.P.
Note: NKY = Nikkei 225 Index; JPY = Japanese yen; NEER = nominal effective exchange rate.

The evolving relationship between the US dollar and dollar-denominated assets

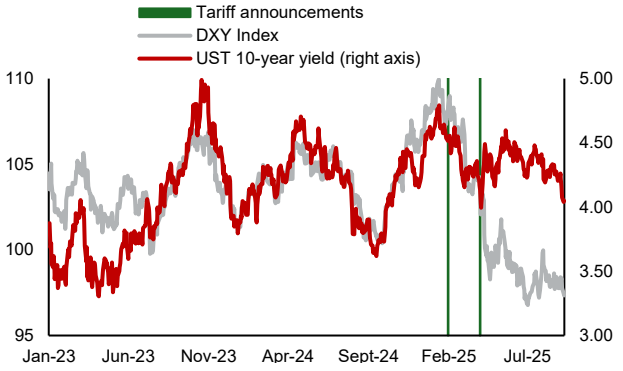
The US dollar has seen a significant shift in its behavior since the US announced tariffs on its trading partners on 1 February 2025. Unlike historical precedents (Box 1.3), the dollar fell despite a notable rise in financial market stress. The US dollar declined until the Liberation Day (April 2) along with the US Treasury yields and US equities. The lower yields and weaker equities reflected market concerns on economic growth and the Fed's response (Atkins and Mackenzie 2025). The weakness in the US dollar could be justified as it has been sensitive to interest rates for the past two years (Figure 1.15).

After the Liberation Day market reaction—which led to a sharp drop in US Treasury yields, equities, and the US dollar—yields and equities recovered in the next few sessions (Figures 1.15 and 1.16). However, the dollar continued to weaken. The subsequently announced 90-day pause was able to support equity markets but did not help the dollar. The dollar also lost its co-movement with the US Treasury yields. While US policy uncertainty, including tariffs and fiscal, led to US dollar weakness, it was probably exacerbated by micro market issues such as the increased foreign exchange (FX) hedging by non-US institutional investors (Shin, Wooldridge, and Xia 2025).

A deeper look into the foreign net purchases of US assets revealed that the markets may have differentiated between US assets and the US dollar. Though the dollar weakened in February, March and May, the buying of US assets by foreign investors remained robust (Figure 1.17), with US Treasuries constituting a large part of the inflows, despite the concerns about the US fiscal situation. Other non-US currencies and assets (perceived to be either safe assets or uncorrelated to the broader context of risk) also largely appreciated from February to June (Figure 1.18), despite elevated uncertainty because of tariffs and geopolitics.

Figure 1.15. US Dollar and US Treasury Yield
(Index; Percent)

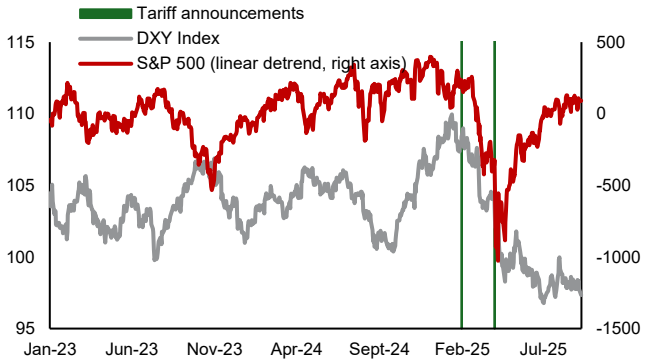
The US dollar-US Treasury yield co-movement broke after Liberation Day.



Source: Bloomberg Finance L.P.; AMRO staff calculations.
Note: DXY = broad dollar index; UST = US Treasury. Data as of 8 September 2025.

Figure 1.16. US Dollar and US Equity Index
(Index; index detrended)

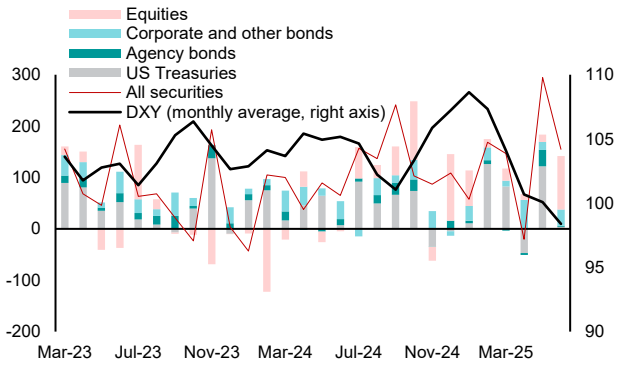
Equities recovered after Liberation Day, but the US dollar continued to slide.



Source: Bloomberg Finance L.P.; AMRO staff calculations.
Note: DXY = broad dollar index; S&P = Standard & Poor's. Data as of 8 September 2025.

Figure 1.17. Net Purchases of US Assets by Foreign Private Investors
(Billions of US dollars; Index)

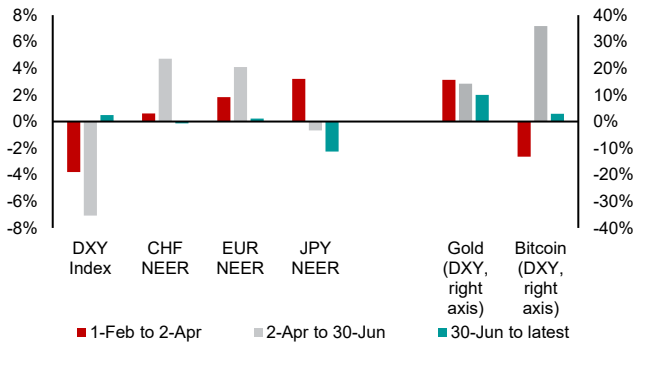
Despite the US dollar's weakness, foreign private investors bought US assets at a brisk pace.



Source: Bloomberg Finance L.P.; AMRO staff calculations.
Note: DXY = broad US dollar. Data as of June 2025.

Figure 1.18. US Dollar and Other Asset's Price Changes
(Percent; Percent)

While the US dollar weakened, other safe assets appreciated.



Source: Bloomberg Finance L.P.; AMRO staff calculations.
Note: CHF = Swiss franc; DXY = broad dollar index; EUR = euro; JPY = Japanese yen. Data as of 8 September 2025.

Box 1.3:

Is the US Dollar Still a Safe Haven Currency?

Since February 2025, the US dollar has shown signs of divergence from its traditional safe haven behavior amid rising stagflation concerns, driven by new tariffs and deep cuts in the federal workforce.[1] The divergence was exacerbated by concerns over further US protectionist trade policies and fiscal sustainability. In April, President Donald Trump's announcement of "Liberation Day" tariffs intensified the decline, fueling recession fears. Uncertainty over the budget resolution further raised concerns about US fiscal sustainability, contributing to a sharp rise in Treasury yields. On 16 May, Moody's downgraded the US credit rating from AAA to Aa1—following similar moves by Standard & Poor's (S&P) in 2011 and Fitch in 2023—deepening investor unease over US safe asset status.[2] This box examines the recent change in the dollar's behavior.

The US dollar is widely regarded as a safe-haven asset during financial turmoil. Historically, the dollar nominal effective exchange rate (NEER) has shown strong correlations with heightened stock market volatility and tightened financial conditions (Figure 1.3.1). In such conditions, investor sentiment often shifts toward a flight to safety, driving demand for perceived risk-free assets like US Treasuries. This further reinforces the strength of the dollar. For example, during the COVID-19 pandemic's "dash-for-cash", the sharp rise in risk aversion led to a stronger dollar compared to other traditional safe assets (like gold) and major reserve currencies as investors rushed to secure dollar-denominated assets, tightening liquidity conditions in that process (Figure 1.3.2).

We examine the correlation between US Financial Conditions Index (FCI),[3] the US dollar NEER and its reserve currency counterparts, gold, and selected ASEAN+3 currencies across several major crisis periods, including post-Liberation Day.

The US dollar has strengthened during all stress episodes since 2008 until the post-Liberation Day, that is, it has a negative correlation with tighter US financial conditions (Figure 1.3.3). Many other reserve, major, and ASEAN+3 currencies did not demonstrate such a consistent correlation. However, during the market stress around the Liberation Day, the correlation of the dollar and US financial conditions index turned positive as the dollar depreciated. Other currencies—notably the euro and Swiss franc—and gold exhibited stronger safe-haven properties.

Correlation patterns observed during the tariff turmoil period suggest that investors may have turned to US dollar alternatives. This shift, if sustained, may reflect increased US policy uncertainty and diminishing influence of US exceptionalism. In the euro area and Switzerland, the willingness of central banks to cut rates to stimulate growth has enhanced their attractiveness. Non-monetary assets like gold have also recently gained favor as a store of value. Bitcoin does not show a sharp tendency to appreciate when financial stress increases but tends to be less correlated with the broader market movements, acting as a diversification tool for market participants. Finally, it might be too early to conclude that the US dollar's safe haven status is eroding. As seen during the Iran-Israel conflict, the US dollar may still exhibit safe haven characteristics if the source of market stress is outside the US.

Despite these shifts, the US dollar remains dominant across economic and financial systems (AMRO 2024a). Over the longer term, if other currencies evolve to gain global recognition and usage, the dollar's traditional safe-haven role is likely to face stronger headwinds in the years ahead (Business Times 2025; Xinhua 2025)

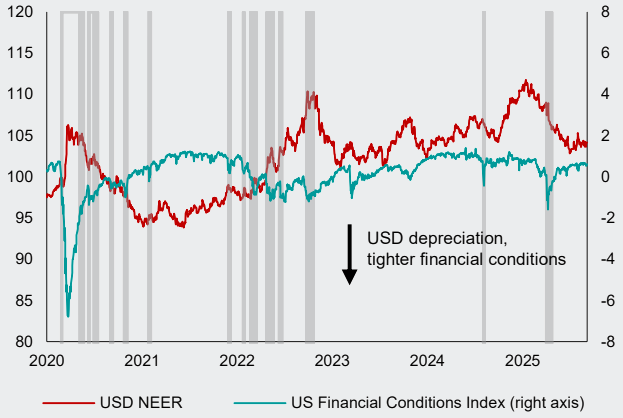
The author of this box is Chiang Yong (Edmond) Choo.

[1] A safe haven asset is one whose nominal value does not decrease during periods of stress in financial markets, and is highly liquid and carries minimal credit risk (Habib and others 2020). Common examples include the US dollar, Swiss franc, highly rated sovereign bonds, defensive stocks, and precious metals.

[2] According to Ohnsorge, Woliski, and Zhang (2014), another definition of a safe haven currency is when that country has a triple AAA credit rating from at least two of the three major rating agencies (Fitch, S&P, and Moody's).

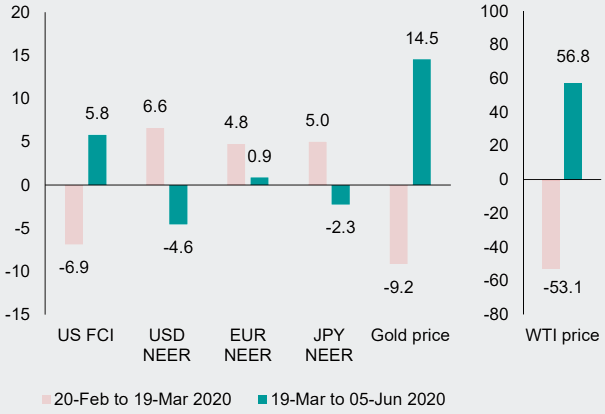
[3] The Financial Conditions Index, provided by Bloomberg Finance L.P., tracks the overall level of financial stress in the US money, bond, and equity markets to assess the availability and cost of credit. There are various weighted money market, bond market, and equity market components of the index, such as commercial paper–T-bill spread, high-yield treasury spread, VIX index, and S&P 500 stock index.

Figure 1.3.1. US Dollar NEER, 10-Year Treasury Yield and Financial Conditions
(Index; Percent/index)



Source: Haver Analytics; Bloomberg Finance L.P.
Note: Gray bars denote periods when the VIX is equal or more than 30 index points. NEER = nominal effective exchange rate; VIX = Chicago Board Options Exchange Volatility Index.

Figure 1.3.2. US FCI, Dollar NEER, Other Reserve Currencies, Gold and Oil Prices During COVID-19
(Percent)



Source: Haver Analytics; Bloomberg Finance L.P.; AMRO staff calculations.
Note: The selected period of 20 February to 19 March 2020 corresponds to the period when CBOE VIX rose from low levels to its peak, while the period between 19 March to 4 June 2020 refers to the time when VIX fell from the peak to lower than 25. EUR = euro; FCI = Financial Conditions Index; JPY = Japanese yen; NEER = nominal effective exchange rate; US = United States; USD = US dollar; WTI = Western Texas Intermediate crude oil.

Figure 1.3.3. Correlation of US Financial Conditions with Selected NEERs, Gold and Bitcoin
(Correlation, +1 = perfect correlation)

Crisis	Sample period	USD	EUR	GBP	AUD	CAD	CHF	JPY	CNY	KRW	SGD	Gold	Bitcoin
Global financial crisis	17-Jun-08 to 10-Oct-08	-0.80	0.60	0.35	0.79	0.44	-0.50	-0.92	-0.78	0.91	0.30	0.03	
2010 flash crash	23-Apr-10 to 30-Jun-10	-0.93	0.86	-0.28	0.89	0.72	-0.18	-0.93	-0.95	0.86	-0.13	-0.66	
US downgrade by S&P	22-Jul-11 to 03-Oct-11	-0.75	0.09	-0.34	0.83	0.90	0.37	-0.76	-0.76	0.72	0.54	-0.44	0.01
2015 Renminbi deval	14-Aug-15 to 24-Aug-15	-0.32	-0.95	0.71	0.95	0.83	-0.99	-0.97	0.62	0.98	0.68	-0.84	0.28
2015-2016 EM sell-off	25-Nov-15 to 11-Feb-16	-0.83	-0.92	0.92	0.83	0.77	-0.34	-0.95	0.88	0.89	0.28	-0.73	0.24
2018 Fed rate hike	03-Oct-18 to 24-Dec-18	-0.64	0.55	0.77	-0.20	0.93	-0.53	-0.44	-0.28	-0.20	-0.66	-0.81	-0.08
Covid-19 pandemic	19-Feb-20 to 24-Mar-20	-0.89	-0.89	0.95	0.96	0.97	-0.85	-0.68	-0.79	0.66	0.92	0.68	-0.11
2022 Fed hikes	04-Jan-22 to 05-Jul-22	-0.82	0.59	0.75	-0.37	-0.09	-0.15	0.61	-0.03	0.71	-0.73	-0.14	0.06
Tariff announcements	19-Feb-25 to 08-Apr-25	0.40	-0.76	0.39	0.90	-0.06	-0.87	-0.78	0.84	0.53	0.87	-0.28	0.20

Source: Bloomberg Finance L.P.; AMRO staff calculations.
Note: The data represents the correlation coefficients of each NEER and gold with US Financial Conditions Index (FCI). The index, NEERs, and prices are in level terms. The redder the color the stronger the negative correlation with US FCI, where a higher index means easier financial condition and vice versa. A greener color denotes a stronger positive correlation. The periods are selected based on the changes in US FCI. The periods capture the steepest phase of financial conditions climbing to the tightest levels seen during the episodes, with a minimum time frame of 10 days.

The ebbs and flows of market stress in ASEAN+3 markets

US trade policy shocks caused the market stress in ASEAN+3 to rise sharply, but the stress normalized as markets stabilized after the events. The magnitude of stress varied across the economies as ASEAN markets saw a relatively larger rise during the 2 April Liberation Day market stress (Figures 1.19 and 1.20).

The average market stress in 2025 (as of 8 September 2025) in ASEAN+3 markets is broadly stable but there has been divergence between the economies and the components (Figure 1.21). Market stress in China (driven by lower stock market and FX volatility) eased while Malaysia (lower real housing prices) saw market stress rise compared to the end of 2024. Notably, market stress rose in most ASEAN+3 economies around Liberation Day (Figure 1.22) amid higher volatility in stocks, FX, and bond yields. However, once the tariff pause was announced, the market stress declined gradually.[1]

Figure 1.19. Plus-3: Market Stress Indicators
(Index)

Plus-3 witnessed a notable rise in market stress in August 2024 driven by heightened market volatility.

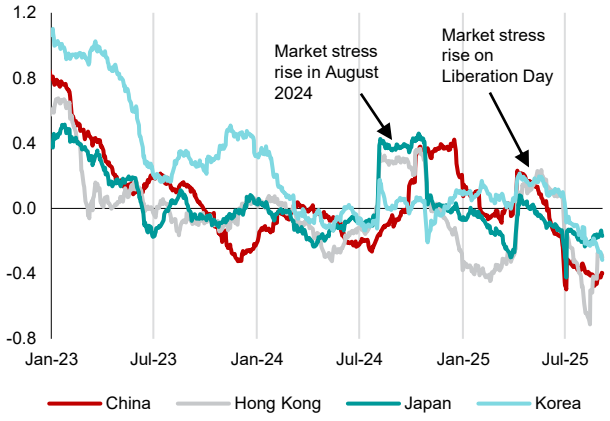
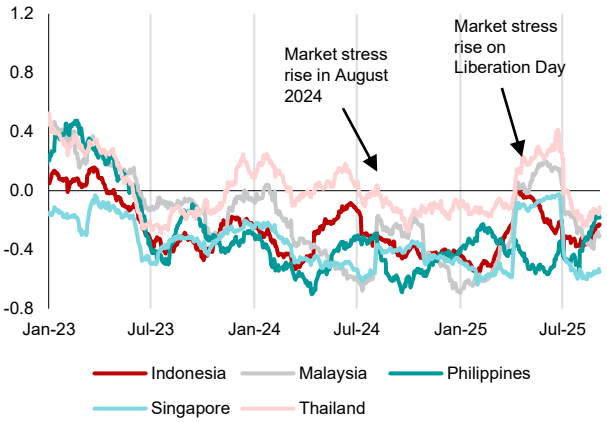


Figure 1.20. ASEAN: Market Stress Indicators
(Index)

ASEAN saw a larger rise in market stress on Liberation Day.



Source: Bloomberg Finance L.P.; Haver Analytics; AMRO staff calculations.
Note: The Market Stress Index is based on the Mispricing Risk (Refined) proposed in Hennig, Iossifov, and Varghese (2023) which attempts to capture the slack in financial conditions. The Mispricing Risk (Refined) is constructed using a simple average of indicators of price growth and volatility transformed into within-economy percentiles. The measure of risk uses real equity market returns, equity market volatility, domestic sovereign bond yield volatility, sovereign foreign exchange risk spreads, foreign exchange market volatility, and real house price growth. We introduce two additional parameters—real domestic government bond yield and growth of real effective exchange rate (REER)—which are included in the construction of Mispricing Risk (Unrefined) as high frequency data are available. We also flip the sign of the resultant index so that higher values of the index indicate less slack in financial conditions, to create the Market Stress Index. Data as of 8 September 2025.

Figure 1.21. Selected ASEAN+3: Contributors to Change in Market Stress from January 2025 to September 2025
(Index)

Market stress levels differed across economies.

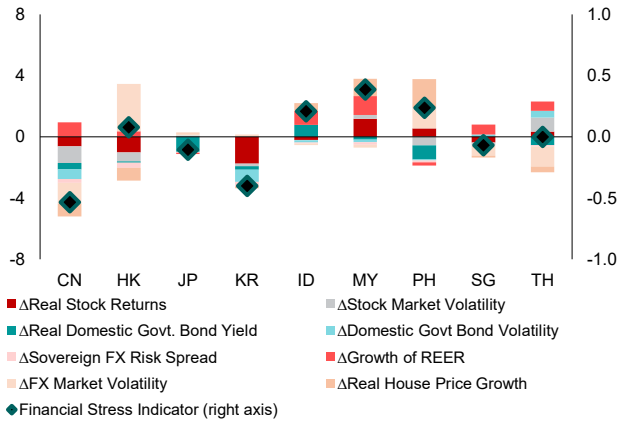
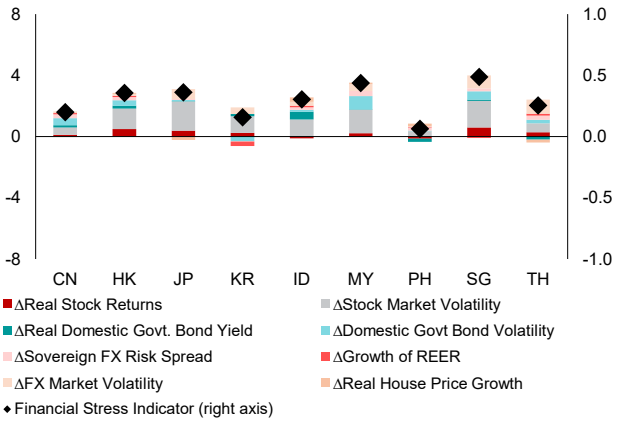


Figure 1.22. Selected ASEAN+3: Contributors to Change in Market Stress from 25 March 2025 to 14 April 2025
(Index)

Market stress rose around Liberation Day in most regional economies because of higher market volatility.



Source: Bloomberg Finance L.P.; Haver Analytics; AMRO staff calculations.
Note: A rise in stock market volatility, real domestic government yields, domestic government bond yield volatility, sovereign foreign exchange risk spread, and foreign exchange market volatility; and a fall in real stock market returns, growth of REER and real house prices contribute to higher market stress. FX = foreign exchange; govt. = government; REER = real effective exchange rate; Δ = change in; CN = China; HK = Hong Kong; ID = Indonesia; JP = Japan; KR = Korea; MY = Malaysia; PH = Philippines; SG = Singapore; TH = Thailand; 25 March 2025 is the trough of market stress closer to the Liberation Day, while 14 Apr 2025 is the peak post Liberation Day. Data as of 8 September 2025.

[1] The market stress is calculated based on a three-month rolling window. Therefore, the stress indicator declined notably after three months from the Liberation Day.

Tariffs, politics, and fiscal policy create differentiation among ASEAN+3 assets

ASEAN+3 markets showed divergence in 2025 (Figures 1.23 to 1.26). While some domestic developments were responsible, the divergence also reflected the variety of structures of the economy and markets, which led markets to react differently to the global developments. Notably, the impact of Liberation Day tariff announcements on regional financial assets was a function of the tariff rates and the trade exposure of an economy (AMRO 2025). Higher tariffs and higher exposure to global trade led to weaker stock markets and exchange rates.

Overall, in 2025 (year to date), there was a distinction between the stock markets of Plus-3 and ASEAN economies. Plus-3 stock markets strengthened (except Japan) while those in ASEAN weakened (except Singapore). Government bond yields remained less sensitive to changes in US yields and fell in most of the regional markets. Expectations of monetary easing in response to the negative growth implications of the tariffs were among the driving factors. US dollar weakness was evident against most regional currencies as the bilateral exchange rate became insensitive to yield differentials. That said, some divergence was seen between nominal effective exchange rates, largely reflecting relative spillovers from the tariffs and idiosyncratic factors such as political developments and tariffs. Some of the important idiosyncratic factors relevant for ASEAN+3 asset price movements are:

- After a subdued start to the year, Korean stocks strengthened as the elections in early June provided political stability, fueling market hopes of swift economic stimulus and market reforms. The new government also passed the Commercial Reform Act with the aim to improve valuations of Korean companies (Lee and Lee 2025).[2]

- Expectations of monetary easing pushed bond yields lower in most of the economies except Japan, where rate hikes were expected, and Vietnam, because of expectations for heavier bond supplies (Vu and Guarascio 2025).

- The Indonesian rupiah depreciated on a nominal effective exchange rate basis. The Indonesian rupiah came under pressure as markets evaluated the policy signals and priorities of the new administration inaugurated in October 2024. It also led to a rise in bond yields early in the year; subsequently yields eased as foreign investor demand returned in the second quarter but persistent sale of equities by foreigners limited any positive spillovers to the rupiah.

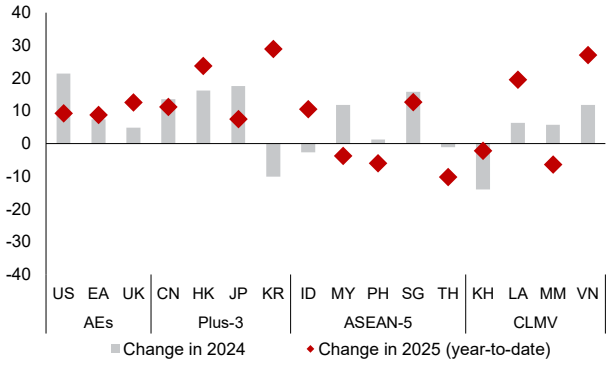
- Thai stock markets also weakened as political uncertainty remained high in 2025 amid a weaker growth outlook (NESDC 2025).

Most regional bond yields have eased more than those of US Treasuries in 2025, which makes their valuations less attractive at the margin as compared to those in 2024 (Figure 1.27). The bond valuations reflect the higher premium demanded by investors from US Treasuries amid fiscal concerns and the expectations of monetary easing by most ASEAN+3 central banks, which pushes domestic bond yields lower. Rising price-to-earnings ratios for most regional equities has also reduced attractiveness from a valuation standpoint. Whereas many regional equity markets have risen in 2025, the earnings outlook has weakened (Figure 1.28). Overall, as compared to 2024, global uncertainties have led to less attractive valuations of regional assets.

[2] The Commercial Act reform aims at modernizing corporate governance, strengthening minority shareholders and tackling the so-called "Korea discount". The discount refers to the lower valuations of Korean companies have been attributed to inferior governance practices as compared to major advanced economies and dominance of conglomerates.

Figure 1.23. Selected ASEAN+3: Changes in Equity Markets
(Percent, log changes)

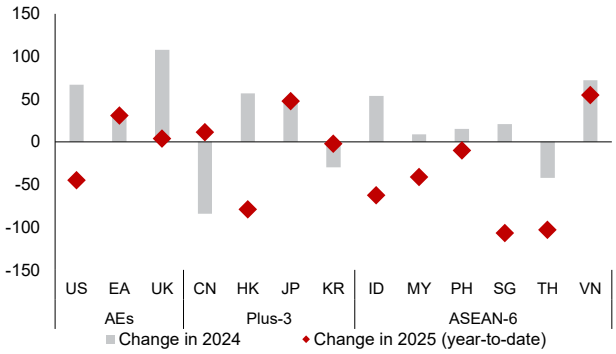
Plus-3 equity markets strengthened while most ASEAN markets weakened.



Source: National authorities via Bloomberg Finance L.P.; Bank for International Settlements; Haver Analytics; AMRO staff calculations.
Note: The DXY Index is used to determine the change in the US dollar. AEs = advanced economies; CN = China; EA = euro area; HK = Hong Kong; ID = Indonesia; JP = Japan; KH = Cambodia; KR = Korea; LA = Lao PDR; MM = Myanmar; MY = Malaysia; PH = Philippines; SG = Singapore; TH = Thailand; UK = United Kingdom; US = United States. VN = Vietnam. Data for 2025 (year to date) as of 8 September 2025.

Figure 1.24. Selected ASEAN+3: Changes in 10-Year Government Bond Yields
(Basis points)

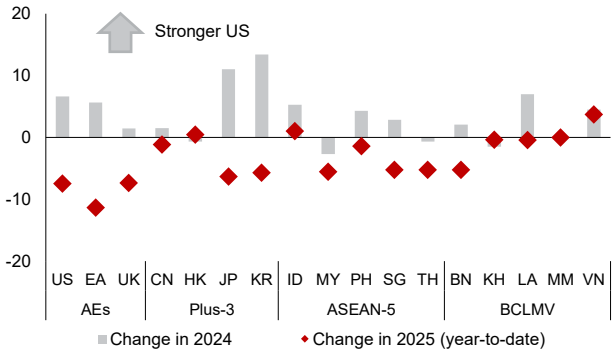
Government bond yields fell in most regional markets.



Source: National authorities via Bloomberg Finance L.P.; Bank for International Settlements; Haver Analytics; AMRO staff calculations.
Note: The DXY Index is used to determine the change in the US dollar. AEs = advanced economies; CN = China; EA = euro area; HK = Hong Kong; ID = Indonesia; JP = Japan; KR = Korea; MY = Malaysia; PH = Philippines; SG = Singapore; TH = Thailand; UK = United Kingdom; US = United States. VN = Vietnam. Data for 2025 (year to date) as of 8 September 2025.

Figure 1.25. Selected ASEAN+3: Exchange Rates Against the US Dollar
(Percent, log changes)

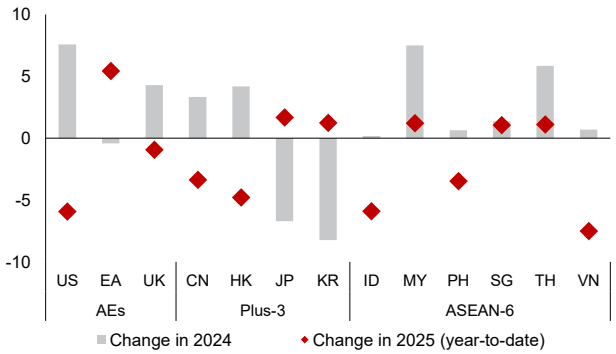
Most ASEAN+3 currencies strengthened against the US dollar.



Source: National authorities via Bloomberg Finance L.P.; Bank for International Settlements; Haver Analytics; AMRO staff calculations.
Note: The DXY Index is used to determine the change in the US dollar. AEs = advanced economies; BN = Brunei; CN = China; EA = euro area; HK = Hong Kong; ID = Indonesia; JP = Japan; KH = Cambodia; KR = Korea; LA = Lao PDR; MM = Myanmar; MY = Malaysia; H = Philippines; SG = Singapore; TH = Thailand; UK = United Kingdom; US = United States. VN = Vietnam. Data for 2025 (year to date) as of 8 September 2025.

Figure 1.26. Selected ASEAN+3: Nominal Effective Exchange Rates
(Percent, log changes)

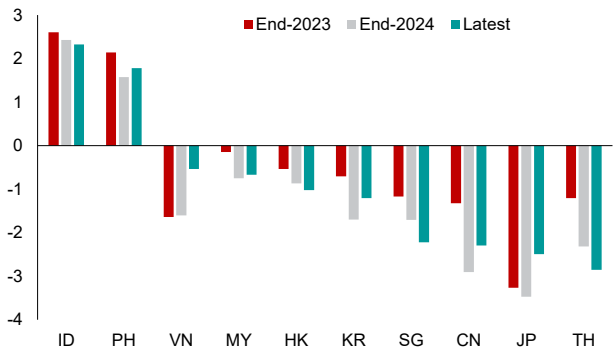
The performance of NEERs in the region diverged.



Source: National authorities via Bloomberg Finance L.P.; Bank for International Settlements; Haver Analytics; AMRO staff calculations.
Note: The DXY Index is used to determine the change in the US dollar. AEs = advanced economies; CN = China; EA = euro area; HK = Hong Kong; ID = Indonesia; JP = Japan; KR = Korea; MY = Malaysia; PH = Philippines; SG = Singapore; TH = Thailand; UK = United Kingdom; US = United States. VN = Vietnam. Data for 2025 (year to date) as of 8 September 2025.

Figure 1.27. Selected ASEAN+3: 10-Year Yield Spread versus US Treasury Yields
(Percentage points)

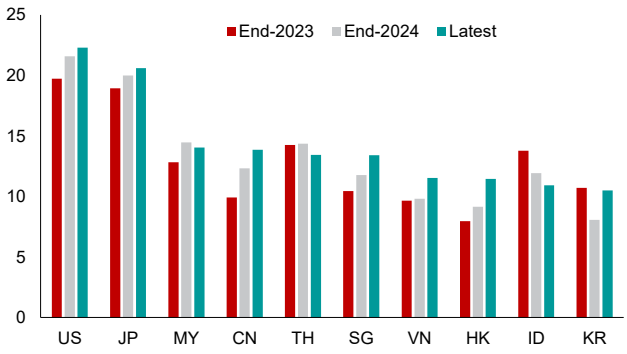
The yield spread over US Treasury for most ASEAN+3 bonds has narrowed.



Source: Bloomberg Finance L.P.; Haver Analytics; 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. Data as of 8 September 2025.

Figure 1.28. US and Selected ASEAN+3: 12-Month Forward Price-to-Earnings Ratio
(Index)

Change in price-to-earnings ratios for most ASEAN+3 stock markets reflect a weaker earnings outlook because of tariffs.



Source: Bloomberg Finance L.P.; Haver Analytics; AMRO staff calculations.
Note: CN = China; HK = Hong Kong; ID = Indonesia; JP = Japan; KR = Korea; MY = Malaysia; SG = Singapore; TH = Thailand; US = United States; VN = Vietnam. Data as of 8 September 2025.

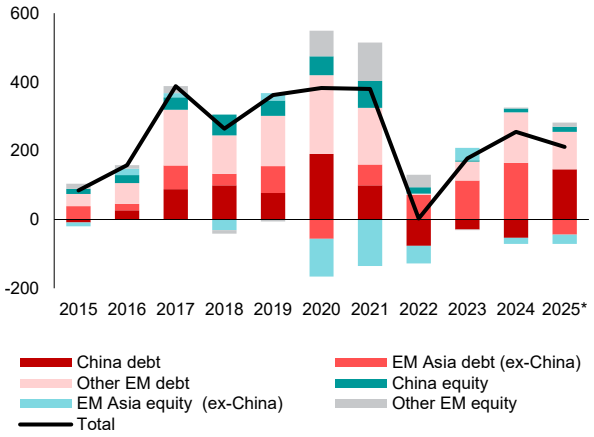
Foreign portfolio investors prefer debt investments over equity

Emerging market portfolio inflows continue to be dominated by debt flows in 2025 (Figures 1.29 to 1.32). Emerging markets outside Asia continued to receive robust inflows but within Asian emerging markets, the inflows were dominated by China. The inflows into China's debt markets resumed in the first half of 2025. The relative stability and lower volatility of Chinese bonds may have been important factors (Yue 2025), attracting foreign investors as fiscal concerns rose in other major economies. China also received modest inflows into its equity markets amid a stock market recovery in 2025.

Equity markets in emerging-market Asia (excluding China) saw outflows in 2025 (year to date). Outflows from equity markets were consistent throughout the first half across countries with growth prospects broadly worsening amid the tariff uncertainty. Korean equity markets were able to garner foreign interest after the June elections as political stability and market reforms provided confidence to international investors. On the other hand, debt markets received inflows across markets during the first half. The debt instruments in most of Asian emerging markets appeared attractive in the context of slowing growth and subdued inflation which can lead to monetary easing and lower rates. Some of these markets acted as an ideal destination for investors to move away from major bond markets on fiscal concerns.

Figure 1.29. Emerging Markets: Annual Portfolio Flows
(Billions of US dollars)

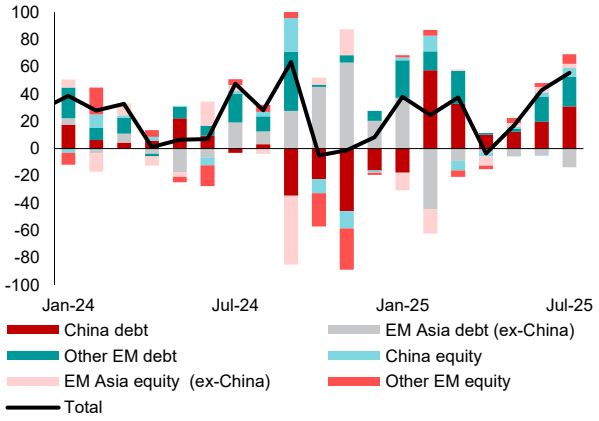
EM portfolio inflows dominated by debt flows in 2025.



Source: The Institute of International Finance via Haver Analytics; AMRO staff calculations.
Note: EM = emerging market. Data as of July 2025.

Figure 1.30. Emerging Markets: Monthly Portfolio Flows
(Billions of US dollars)

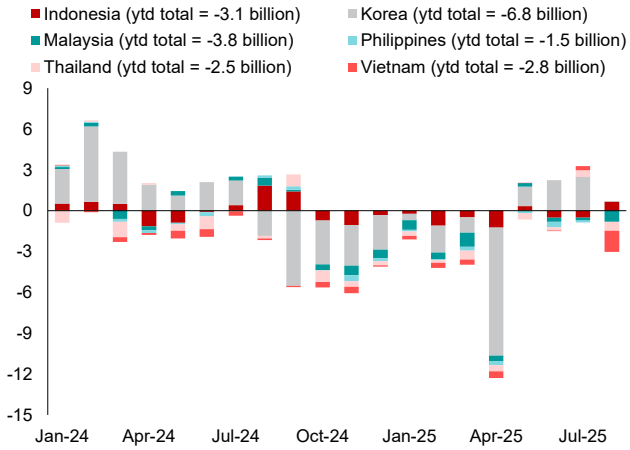
EM outside Asia and China attracted portfolio inflows while EM Asia (ex-China) saw outflow.



Source: The Institute of International Finance via Haver Analytics; AMRO staff calculations.
Note: EM = emerging market. Data as of July 2025.

Figure 1.31. Selected ASEAN+3: Monthly Equity Flows
(Billions of US dollars)

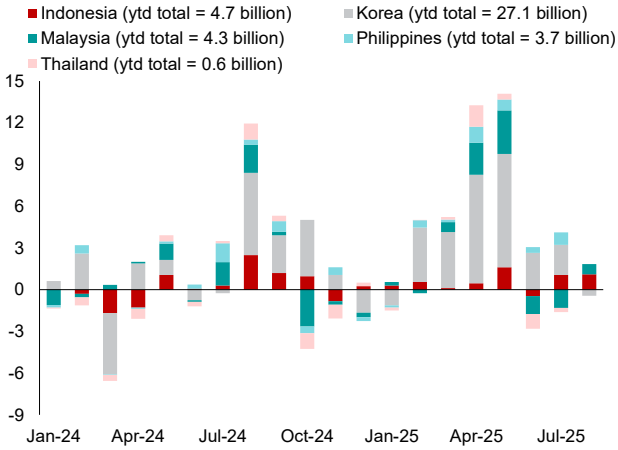
Regional equity markets saw outflows in the first half of 2025 amid worsening growth prospects.



Source: National authorities; Bloomberg Finance L.P; Haver Analytics; AMRO staff calculations
Note: ytd = year-to-date. Data as of August 2025.

Figure 1.32. Selected ASEAN+3: Monthly Debt Flows
(Billions of US dollars)

Regional debt markets received inflows in the first half of 2025 buoyed by monetary easing expectation.



Source: National authorities; Bloomberg Finance L.P; Haver Analytics; AMRO staff calculations.
Note: The debt flows data includes foreign investments in local currency debt only. The data consists only of government bonds for Indonesia and the Philippines, and government and corporate bonds for other markets. ytd = year-to-date. Data as of July 2025 for Philippines and Vietnam, and August 2025 otherwise.

Monetary policy in ASEAN+3 stays on track for gradual interest rate reductions

Many regional central banks are on a path of easing monetary policy to support growth, facing heightened uncertainties from the tariff and geopolitical events while inflationary pressure remains low.

The overarching themes for ASEAN+3 central banks over the past three quarters have been subdued or moderate inflationary pressures and downside risks to growth from US tariffs and potentially weaker global growth and demand (Figure 1.34). This has paved the way for the regional central banks to reduce their policy rates (Figure 1.35). However, the pace has been gradual as central banks exercise caution because of global trade and geopolitical uncertainties. The gradual pace of lowering rates helps the central banks to preserve policy space, ensure currency stability, and limit imported inflation (amid episodes of geopolitical stress leading to rise in commodity prices), while allowing them to monitor the economic effects of the previous rate cuts and providing due consideration to other financial stability risks such as household debt.

However, some central banks are at a different stage of monetary policy.

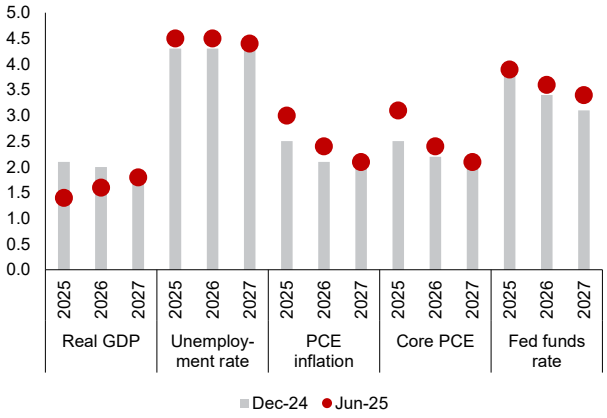
- **Japan:** The Bank of Japan (BOJ) stays on the path of gradual rate hikes. It started raising interest rates in 2024 as it found evidence of a recovery of inflation and strong wage growth, which can help reinforce expectations of self-sustaining inflation. However, global and domestic uncertainties and economic conditions, and the need to avoid premature tightening has led to the BOJ leaving its policy rates unchanged since January 2025.

- **China:** The People's Bank of China (PBC) had embarked on monetary easing in 2023, much earlier than most other regional central banks to provide financial support to the economy and maintained the support through 2024. It delivered another round of monetary easing in May 2025 to maintain a moderately loose monetary policy and strengthen support for the real economy.

- **Vietnam:** The State Bank of Vietnam also eased monetary policy in 2023 but has stayed on hold in 2024 and 2025. However, it maintains an accommodative monetary policy to support growth while restricting inflation below the government's ceiling of 4.5 percent to 5 percent and aims to achieve a credit growth of 16 percent in 2025 (Vu and Hue 2025).

Figure 1.33. Federal Reserve: Change in Summary of Economic Projections from December 2024 to Latest
(Percent)

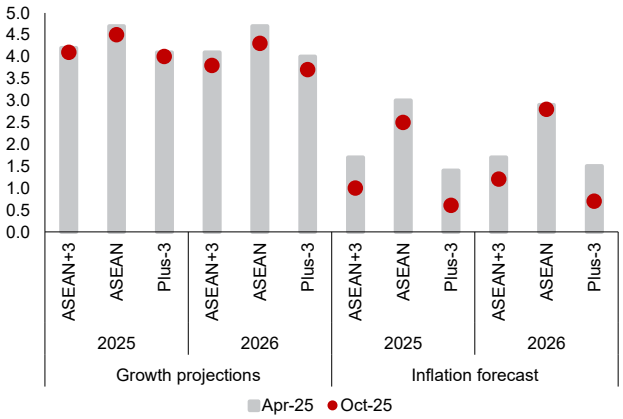
Fed expects lower growth, higher unemployment, and higher inflation.



Source: Federal Open Market Committee projection materials; AMRO staff calculations
Note: PCE = Personal Consumption Expenditures Price. Data as of 8 September 2025.

Figure 1.34. ASEAN+3: Change in AMRO's Growth and Inflation Forecast from April 2025 to October 2025
(Percent)

AMRO lowered growth and inflation forecast for the region.

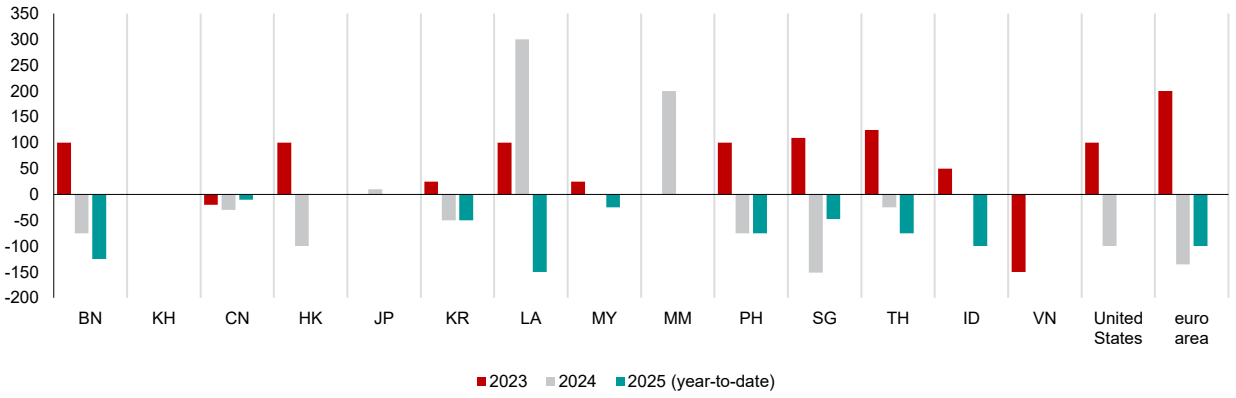


Source: April 2025, October 2025 *ASEAN+3 Regional Economic Outlook (AREO)*; AMRO staff calculations.
Note: Data as of 15 September 2025.

The broad weakness in the US dollar exchange rates has allowed ASEAN+3 central banks to scale back their FX interventions. That said, central banks intervened when exchange rate volatility was high in February and April. The ASEAN+3 currencies have been stable otherwise and ample foreign exchange reserves (Figure 1.36) have further underpinned the currency markets. Most central banks have accumulated FX reserves during the year (Figure 1.37), though some of the rise could be attributed to the valuation effects of a weaker US dollar (which inflates the value of non-dollar assets) and a strong rally in gold prices. Holdings of gold have increased in terms of value but after adjusting for the price, the ASEAN+3 central banks have held their gold holdings stable (Figure 1.38).

Figure 1.35. US, euro area, and ASEAN+3: Change in Monetary Policy Rates
(Percent)

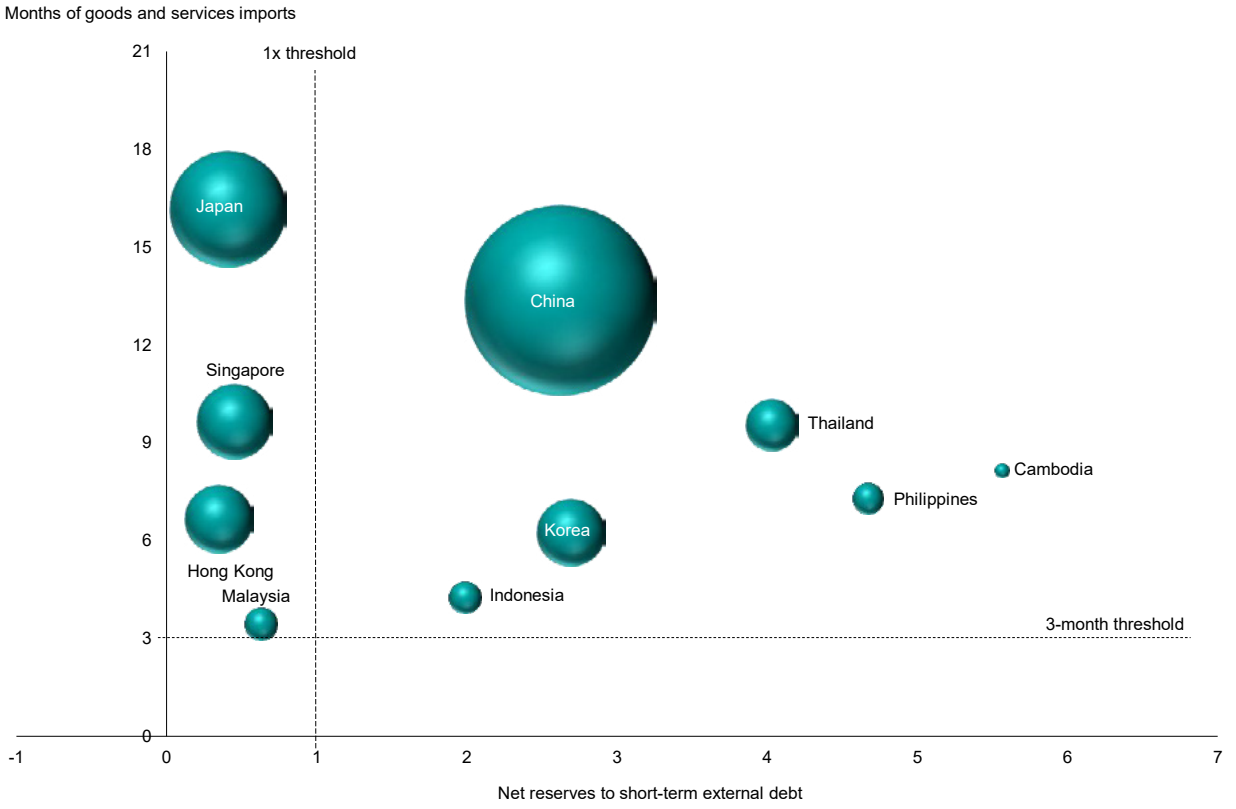
Most central banks in the region cut rates in 2025.



Source: National authorities via Haver Analytics; AMRO staff calculations.
Note: H1 = first half of the year; H2 = second half of the year; BN = Brunei, KH = Cambodia; CN = China; HK = Hong Kong; JP = Japan; KR = Korea; MY = Malaysia; MM = Myanmar; PH = Philippines; SG = Singapore; TH = Thailand; ID = Indonesia; VN = Vietnam; For Brunei, we use the standing facility lending rate. For China, we use the People's Bank of China 7-day reverse repurchase yield. For Hong Kong, we use the Base Rate. Data for 2025 as of 8 September 2025.

Figure 1.36. ASEAN+3: Reserve Adequacy

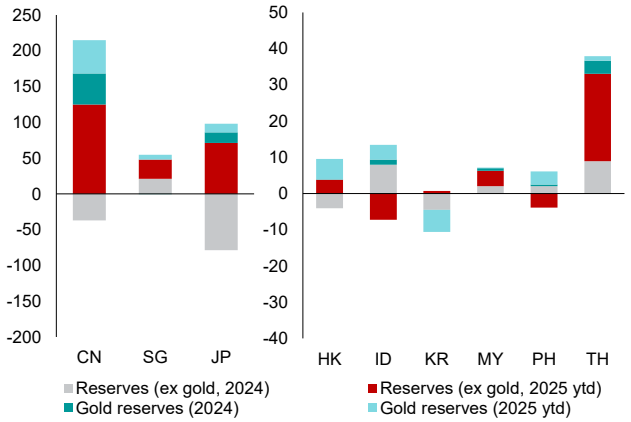
ASEAN+3 maintains solid foreign exchange reserves.



Source: National authorities; International Monetary Fund; World Bank; AMRO staff calculations.
Note: Data for reserves are sourced from either national authorities or IMF IFS database and are as of April 2025, except Cambodia (March 2025). Data for short-term external debt are sourced from IMF Quarterly External Debt Statistics database and are as of the fourth quarter of 2024, except Lao PDR, Myanmar (end of 2021) and Vietnam (end of 2023). Data for goods and services imports are sourced from either national authorities or IMF IFS database and are as of Q4 2024. The size of the bubble denotes the relative amount of each economy's net international reserves in US dollars. Lao PDR and Myanmar are excluded due to lack of short-term external debt data..

Figure 1.37. Selected ASEAN+3: Changes in Foreign Reserves, 2024 and 2025
(Billions of US dollars)

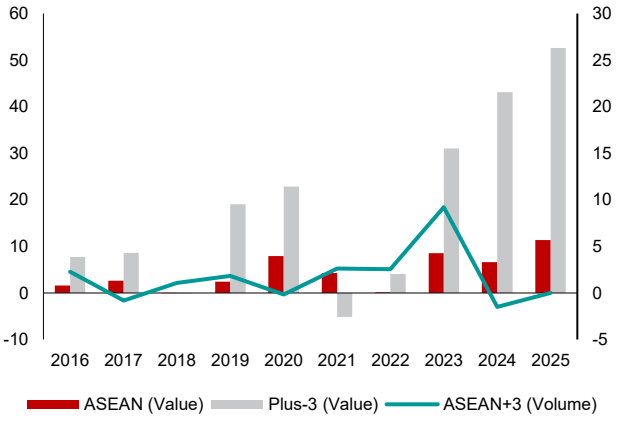
Most central banks in the region have accumulated FX reserves during 2025.



Source: National authorities via Haver Analytics; AMRO staff calculations.
Note: ytd = year-to-date. Data as of August 2025.

Figure 1.38. Selected ASEAN+3: Annual Net Purchases of Gold for Reserves
(Percent, both scales)

The dollar value of ASEAN+3 central bank's gold holdings rose in 2025 as a result of valuation effects.



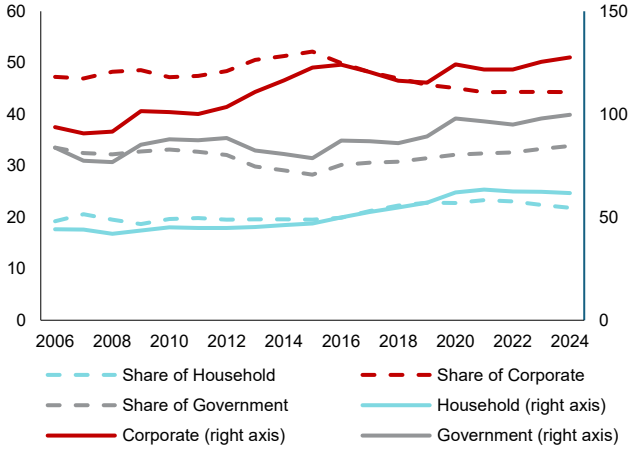
Source: Bloomberg Finance L.P.; National authorities via Haver Analytics; AMRO staff calculations.
Note: Data as of June 2025.

The debt overhang in ASEAN+3 economies persist

The weighted average debt-to-GDP ratio across ASEAN+3 economies rose slightly in 2024 as an uptick in corporate and government debt was partially offset by a reduction in household debt (Figure 1.39). Rising interest rates amid still robust growth outlook may have helped stabilize the debt at elevated levels. Monetary easing in many economies will reduce the debt burden in coming years if debt build-up is restrained. That said, the debt overhang may amplify spillovers from global developments.

Figure 1.39. Selected ASEAN+3: Corporate, Government, and Household Debt
(Percent; Percent of GDP)

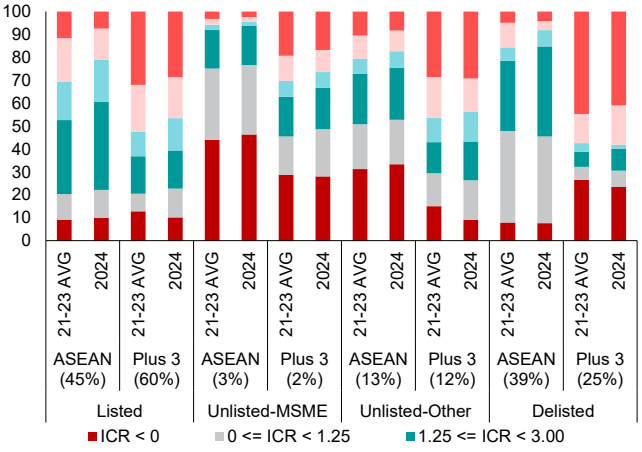
ASEAN+3's total debt-to-GDP ratio rose by 4 percentage points in 2024, driven by corporate and government debt.



Source: Bank for International Settlements (BIS); AMRO staff calculations.
Note: Data covers all economies reporting nonfinancial debt data to the BIS. Selected ASEAN+3 includes China, Hong Kong, Indonesia, Japan, Korea, Malaysia, Singapore, and Thailand. Government debt data for these economies in nominal value, except for Korea, which reports market value.

Figure 1.40. ASEAN+3: Share of Corporate Debt by Interest Coverage Ratio (ICR) Range
(Percent of total debt)

Many unlisted MSMEs may face difficulties in meeting their debt obligations.



Source: Orbis and ARTEMIS[3]; AMRO staff calculations.
Note: Unlisted-Others refers to other subgroups than MSMEs in the "unlisted" category. The number in parenthesis denotes the share of debt by each firm category in ASEAN or Plus 3 in 2024. 21-23 AVG refers to the average level of 2021 to 2023. MSME = micro, small, and medium-sized enterprise.

[3] AMRO members can access corporate debt information compiled by AMRO at https://amro-asia-org.domo.com/page/130520604.

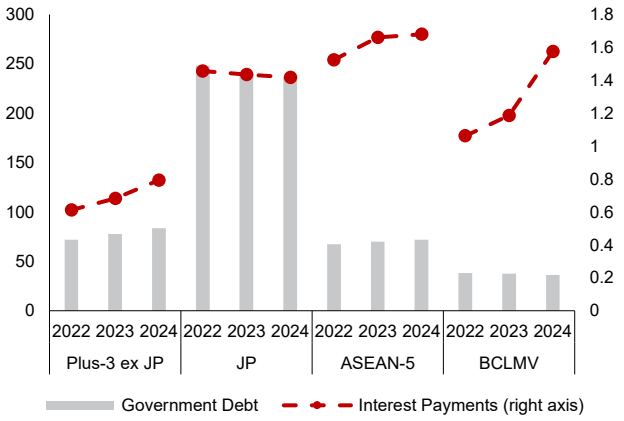
Vulnerabilities in corporate debt remained concentrated among unlisted firms, especially micro, small, and medium-sized enterprises (MSMEs) (Figure 1.40). As of end 2024, roughly half of MSME debt in Plus-3 and about 77 percent of MSME debt in ASEAN carried an ICR below 1.25 at the end of 2024, both marginally higher than in 2023. Among the sectors, property and construction remain the most vulnerable with Debt-at-Risk (DAR)[4] around 3.4 percent of GDP, followed by raw materials at 2 percent and manufacturing at 1.9 percent. A slowdown in global demand, either because of tariffs or other growth shocks, can cause further stress in export-oriented sectors such as manufacturing and raw materials.

The ASEAN+3 government debt to GDP ratio inched higher in 2024 with a more noticeable rise in the Plus-3 economies (excluding Japan) than ASEAN economies. The interest burden remained stable for Japan but rose for other Plus-3 and ASEAN-5 economies due to the elevated debt and higher interest rates. The BCLMV economies saw a steeper rise in debt service burden mainly driven by substantial external public debt interest payments due from Lao PDR in 2024, which were nearly double the amount in 2023 (Figure 1.41). The composition of debt, which generally has a well spread-out maturity profile, and most bonds, being fixed-rate and denominated in local currencies, should limit any near-term rollover and interest rate risks.

Investor composition also matters. Multiple studies[5] have shown that foreign investors—particularly foreign nonbank investors—tend to have higher demand elasticity than other investor groups, making them more prone to sudden and large-scale withdrawals during periods of stress. However, the share of foreign holdings in ASEAN+3 government debt is generally lower than the global average (Figure 1.42). In an environment where global investors are becoming increasingly sensitive to the fiscal situation of major economies, fiscally prudent emerging markets with lower foreign positioning could attract more foreign demand.

Figure 1.41. Selected Economies: Government Debt and Interest Payments
(Percent of GDP)

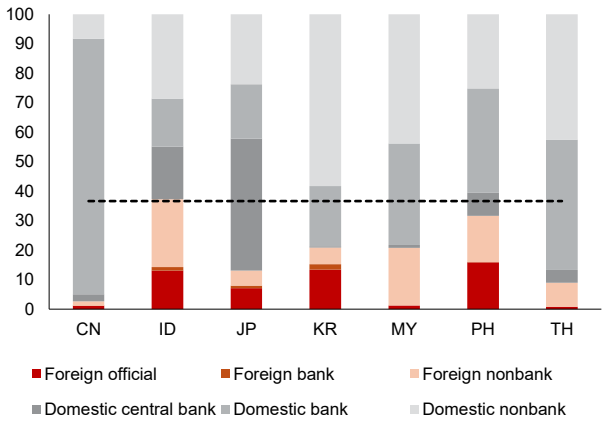
Rising government debt and higher interest rates drove up interest payments.



Source: National authorities via CEIC and Haver Analytics, IMF WEO April 2024 and AMRO staff calculations.
Note: Government debt-to-GDP is GDP-weighted, and interest payments-to-GDP is the simple average, both based on fiscal-year data for economies in each group. Plus-3 ex-JP = China, Hong Kong, and Korea; JP = Japan; ASEAN-5 = Indonesia, Malaysia, Philippines, Singapore, and Thailand; BCLMV = Brunei, Cambodia, Lao PDR, Myanmar, and Vietnam.

Figure 1.42. Selected ASEAN+3: Investor Composition of Government Debt
(Percent)

Most ASEAN+3 markets' foreign positioning were lower than the global average.



Source: International Monetary Fund; AMRO staff calculations.
Note: The dotted line represents a global average of the foreign investor holding ratio. CN = China; ID = Indonesia; JP = Japan; KR = Korea; MY = Malaysia; PH = Philippines; TH = Thailand. Data are as of the second quarter of 2024.

ASEAN+3 financial institutions remain sound

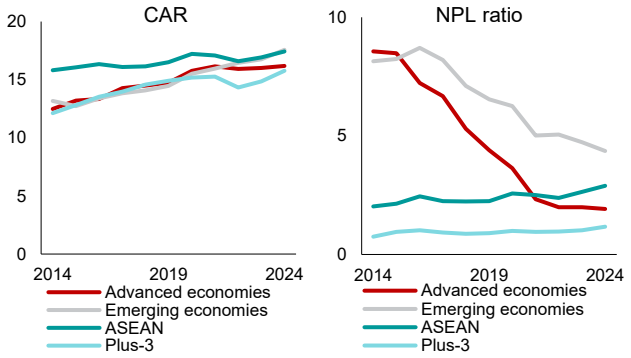
Adequate capital levels and stable asset quality have continued to underpin the resilience of the ASEAN+3 banking system (Figure 1.43). In 2024, banks in the region further strengthened their capital buffers and stayed well above regulatory thresholds. While nonperforming loan (NPL) ratios rose slightly in some economies, Plus-3 banks still recorded some of the lowest levels globally, and ASEAN banks' NPL ratios remained broadly in line with the global average.[6]

Profitability improved in recent years, supported by policy rate increases that widened lending spreads and increased net interest margins, especially in ASEAN, where banks remain more reliant on interest income. Both net interest margins and returns on assets have risen steadily in ASEAN over the past few years, whereas gains have been more modest in Plus-3 economies (Figure 1.44), where margin compression continues to weigh on profitability.

[4] DAR is defined as ICR below 1.25.
[5] Saito and Hogen (2014), Park, Taniguchi, and Tian (2018), Fang, Hardy, and Lewis (2023), Eren, Schrimpf, and Xia (2023), IMF (2023).
[6] That said, in some economies, the COVID-related regulatory forbearance measures may not have been fully normalized, which could mask the true underlying conditions or financial soundness of the banking system.

Figure 1.43. Selected Regions: Total Capital Adequacy Ratio (CAR) and Nonperforming Loan (NPL) Ratio
(Percent)

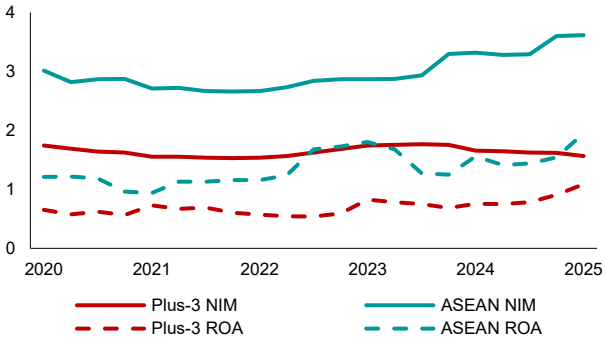
ASEAN+3 banks maintained high asset quality and showed resilience with robust capital buffers, mitigating credit risks.



Source: National authorities; International Monetary Fund via Haver Analytics; AMRO staff calculations.
Note: Simple averages of economies in each group. Due to data availability, 'ASEAN' does not cover Lao PDR, Myanmar, and Vietnam. 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, the latest available quarter data was used.

Figure 1.44. ASEAN+3: Return on Assets (ROA) and Net Interest Margin (NIM)
(Percent)

ROA and NIM trended upward for ASEAN, supported by increased interest rates.



Source: CEIC, AMRO staff calculations.
Note: Simple average of economies in each group. Data as of the first quarter of 2025.

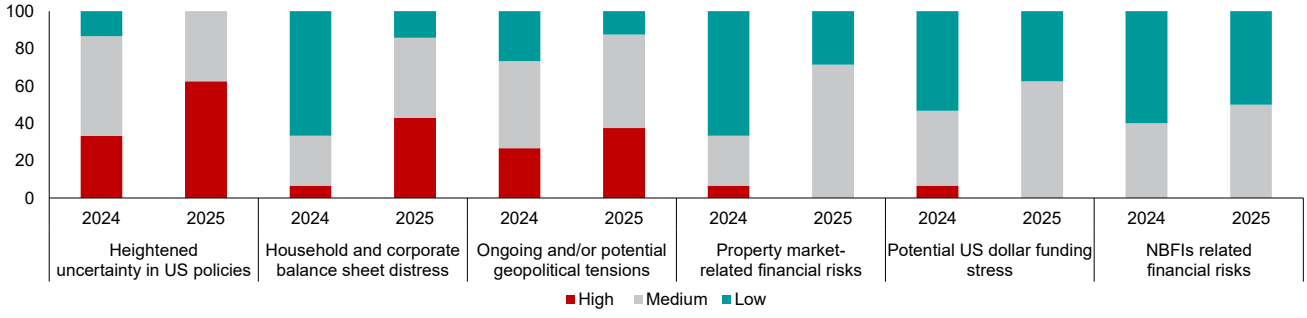
Despite pockets of vulnerability—such as deteriorating asset quality in property-related exposures and an increasing reliance on non-deposit market-based funding highlighted in Chapter 2 of the 2024 *ASEAN+3 Financial Stability Report*—banks have generally managed well in absorbing monetary policy shocks and promoting financial digitalization. First, as discussed in Chapter 2 of this report, the banking sector has demonstrated resilience to monetary tightening: a 1 percentage point increase in global policy rates would, on average, raise NPL ratios in the region by just 0.1 percentage point and have minimal impact on CARs. Second, as noted in Chapter 3, banks have played a crucial role in advancing digitalization while balancing innovation with financial stability through the modernization of banking services driven by technological advancements, evolving structures, and proactive risk management.

II. Risks

The primary risks to financial stability in ASEAN+3 emerge from external developments, but some idiosyncratic issues could be a source of fragility. The external risks are concentrated around the US policy uncertainty, especially corporate credit risks associated with US trade policies, and potential market risks associated with continued worries about the safe haven status of the US dollar and assets. At the same time, geopolitical risks persist, and their escalation could have significant impact on financial systems in ASEAN+3. AMRO survey of member authorities indicates increased concerns around spillovers from US policy uncertainty and household and corporate balance sheet stress compared to last year. At the same time, the perceived likelihood of property market related financial risks and US dollar funding stress have reduced (Figure 1.45).

Figure 1.45. AMRO Member Survey: Perceived Likelihood of Key Risks in 2025
(Share of respondents)

The survey results show increased concerns about US policy spillovers, and household and corporate balance sheet stress.



Source: AMRO's survey of member authorities.
Note: For "Heightened uncertainty in US policies", the 2024 survey referred specifically to monetary policy spillovers, while the 2025 survey referred to trade policy. Note: Simple average of economies in each group. Data as of the first quarter of 2025.

Spillovers from US policy uncertainty

The growth impact of US tariffs can have a material spillover on the health of the export-oriented companies in some of the ASEAN+3 economies. The impact of tariffs will largely depend on the pricing power of these companies in the US. Anecdotal evidence exists on either side of the spectrum. Whereas some exporters may not raise their prices for the US consumer and will absorb the tariff impact (Reuters 2025), others are passing the tariff costs to the consumers (Tewari 2025). However, in either case, it is likely that the profitability of these firms is impacted.

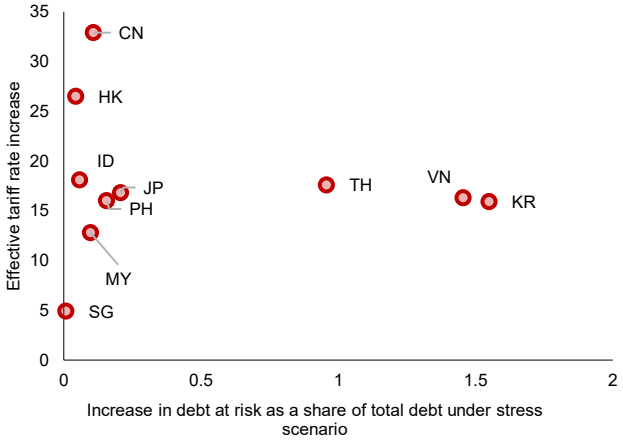
The impact could be particularly severe for smaller companies which may have concentrated exposure to US demand, either directly or through global supply chains. Indeed, companies directly exposed to US markets would be more vulnerable to the shocks and though the data about US share in corporate revenues in ASEAN+3 is not available, we look at the sensitivity of debt-at-risk to a 10 percent shock in revenues. We find that most countries in the region, on aggregate, are resilient to a blanket revenue shock but the concentration of risks in certain sectors and types of firms could be exposed in adverse scenarios. Companies in countries facing higher tariffs (Figure 1.46) could be more vulnerable to spillovers from US tariffs.

Unlisted MSMEs in raw materials and manufacturing have relatively higher levels of debt-at-risk and these firms exporting to the US may need closer monitoring. The health of MSMEs is especially important because they employ almost 60 percent of the working population in developing Asia (ADB 2024). Though export-oriented MSMEs are still fewer in number, any stress in the sector could have widespread consequences for the economy.

The growing uncertainties could also prompt banks in many ASEAN+3 economies to shift further toward lower-risk assets. Banks in most of the region's economies have reduced their risk-weighted asset intensity[7] since 2020, indicating a broad move toward safer exposure (Figure 1.47). The growth impact of US trade policies could cause central banks to lower policy rates to support domestic industries and could reverse some recent gains in bank profitability. Lower interest rates could compress net interest margins, particularly for banks in economies that remain heavily reliant on lending income. Notably, Vietnam and Cambodia have reduced risk-weighted asset intensity since 2020 but still maintain relatively high exposure to riskier segments, while Lao PDR has recorded a notable increase in intensity, suggesting a shift toward higher-risk assets, partly from increased lending to households and infrastructure projects, as well as regulatory tightening. However, this shift has been accompanied by sufficient capital levels, with CARs above regulatory requirements, indicating that banks in these economies continue to maintain adequate buffers to absorb potential losses.

Figure 1.46. US Effective Tariff Increase and Corporate Debt at Risk Sensitivity
(Percent)

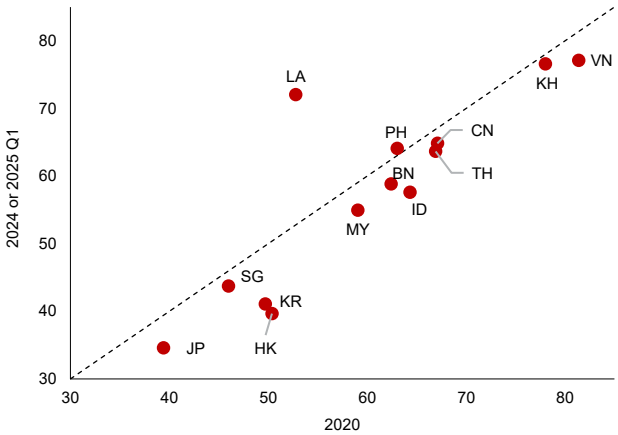
Revenue shock has a marginal impact on overall debt-at-risk, but some sectors and firms may face greater stress.



Source: Orbis and AMRO staff calculations.
Note: Effective tariff rate increase is calculated as the August 7 effective tariff rate (as described in AMRO 2025b) less the end-2024 effective tariff rate (calculated as actual US customs tax collected as percentage of import from the trading partner). Increase in Debt at Risk (DAR) as Share of Total Debt under Stress Scenario denotes the rise in DAR following a 10 percent revenue shock, after accounting for firms' cash buffers. CN = China, ID = Indonesia, JP = Japan, KR = Korea, MY = Malaysia, SG = Singapore, TH = Thailand, VN = Vietnam.

Figure 1.47. ASEAN+3: Five-Year Change in Risk-Weighted Asset Intensity
(Percent)

Most economies show declining risk-weighted asset intensity, indicating a move toward safer asset profiles.



Source: Moody's BankFocus, AMRO staff calculations.
Note: BN = Brunei; CN = China; HK = Hong Kong, ID = Indonesia; JP = Japan; KH = Cambodia; KR = Korea; LA = Lao PDR; MY = Malaysia; PH = Philippines; SG = Singapore; TH = Thailand; VN = Vietnam

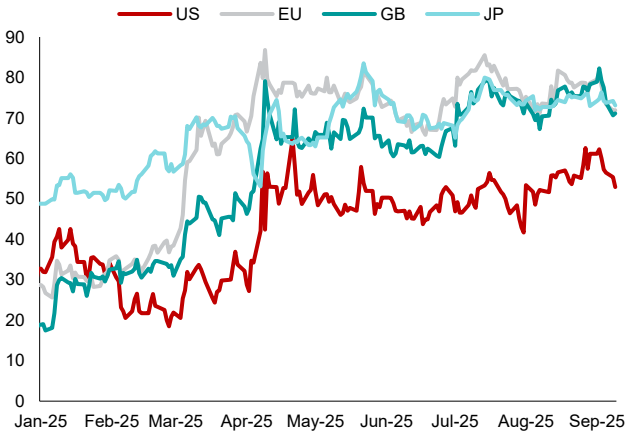
[7] Risk-weighted asset intensity is defined as the ratio of risk-weighted assets to total assets, reflecting the average riskiness of a bank's asset portfolio.

Markets have become more sensitive to fiscal risks

Finally, the fiscal policy uncertainty that emerged from the US has quickly spread to other major advanced and emerging markets. Markets may have become less tolerant of fiscal indiscipline. Bond yields have reacted significantly to inflationary fiscal policies in the US and other developed markets as reflected in the rise of the 10-year versus 2-year yield spreads— i.e., yield curves have steepened (Figure 1.48). The steepening pressures on most ASEAN+3 markets have been limited so far. Even as about half of the emerging market ASEAN+3 yield curves have steepened in 2025 (Figure 1.49), the steepness can partly be attributed to spillovers from global developments as term premiums have risen in global bond markets. However, the emergence of fiscal concerns in any of the ASEAN+3 economies could force investors to demand higher term premiums and reduce demand of domestic bonds.

Figure 1.48. Selected Advanced Economies: 10-Year versus 2-Year Yield Spread
(Basis points)

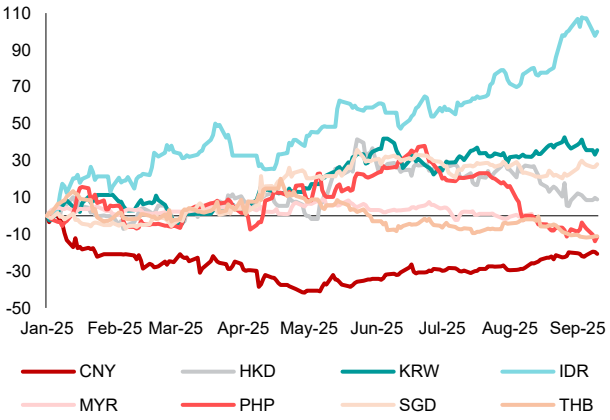
Major advanced economy yield curves steepened in 2025.



Source: Bloomberg Finance L.P.; AMRO staff calculations.
Note: GB = Great Britain. Data as of 9 September 2025.

Figure 1.49. Selected ASEAN+3: 10-Year versus 2-Year Yield Spread
(Basis points, indexed on 1 January 2025)

The steepening in most ASEAN markets has been limited.



Source: Haver Analytics; AMRO staff compilation.
Note: Data as of 9 September 2025.

Revaluation of US dollar's safe status

Market scrutiny of the US dollar's safe haven status can have positive implications for the region but could also create other vulnerabilities for the financial system. Concerns around the status could reduce the attractiveness of the dollar in financial and real transactions, which will—at the margin—reduce the reliance of ASEAN+3 financial institutions on dollar funding and so reduce one of the important risks to financial stability in the region (Chapter 3 of the 2024 *ASEAN+3 Financial Stability Report*). Diversification away from the dollar (and probably dollar assets) could stimulate capital inflows into regional economies. The absence of a single comparable alternative to the dollar could act as a catalyst for the use of regional currencies for cross-border transactions in ASEAN+3, further strengthening the momentum of regional integration.

That said, the diminishing safe haven status of the US dollar could create some risks:

- Absence of a comparable alternative to the US dollar risks creating a fragmented international financial system. The reliance of regional financial institutions on external financing may not be reduced but may shift from the dollar to a basket of other currencies, thus making it more expensive and inefficient to procure liquidity from international markets and manage their FX exposures. Such fragmented markets would be susceptive to more information asymmetries which will further complicate liquidity management.

- Assets denominated in US dollars account for about half of global equity markets and about 40 percent of global bond markets. If the dollar loses its safe haven status, that could create valuation pressures or even bubbles in other assets perceived to be safer. In such a scenario, the volatility of these assets could rise.

- US Treasury yields have long served the international financial system as a risk-free anchor. However, as the safe haven status erodes, US Treasuries would no longer be risk-free assets and the markets would be dependent on private signals and relative valuations, which could increase volatility and a structurally higher risk premium (Landau 2025).

Geopolitical risks continue to linger

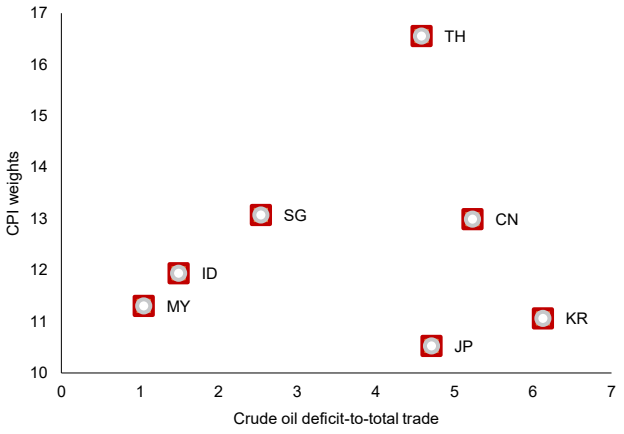
Geopolitical tensions and escalations were highlighted as a financial stability risk in Chapter 1 of the *ASEAN+3 Financial Stability Report 2024*, and the risks continue to linger in the background. The tensions in the Middle East and Russia-Ukraine war have failed to subside while geopolitical tensions have increased in other parts of the world. That said, conflicts in the Middle East pose a greater risk to ASEAN+3 economies. These could cause oil prices and shipping costs to rise, thus adding to supply-side inflationary pressure and market volatility. Notably, since many ASEAN+3 economies are net oil importers, rising oil prices lead to currency depreciation as terms of trade worsen. In addition, inflationary pressures could be higher in economies with a higher weight of energy-dependent transport sector in CPI basket (Figure 1.50). Our analysis shows that regional currencies face depreciation pressures when supply-side factors lead to higher oil prices (Figure 1.51). An escalation of geopolitical tensions also hurts market sentiment. As seen in the Israel-Iran conflict in June, these events can cause risk aversion and, in an extreme scenario, trigger capital outflows from the region.

Property market weakness has eased but still warrants monitoring

The property market in some ASEAN+3 economies saw a significant downturn after the pandemic (Figure 1.52). There were concerns that the decline, in an environment of high interest rates and financially vulnerable developers, could pose a risk to financial stability (Chapter 2 of the *ASEAN+3 Financial Stability Report 2024*). However, authorities have managed to ringfence the stress emerging from the property sector. For instance, China's government has implemented real estate stimulus policies over the past two years to stabilize market expectations and support reasonable housing demand. However, the situation may still require continued monitoring, policy support, and structural reforms to ensure the long-term stability and health of the property market (Box 1.4). On the other hand, in a few regional property markets prices have risen sharply in the past couple of years and, in some cases, authorities have intervened. For example, price growth in Singapore moderated after the implementation of measures such as higher stamp duty for buyers, tighter loan-to-value ratios, and stimulating supply by increasing government land sales.

Figure 1.50. Selected ASEAN+3: Transportation Weights in the CPI Basket and Crude Oil Deficit
(Percent; Percent)

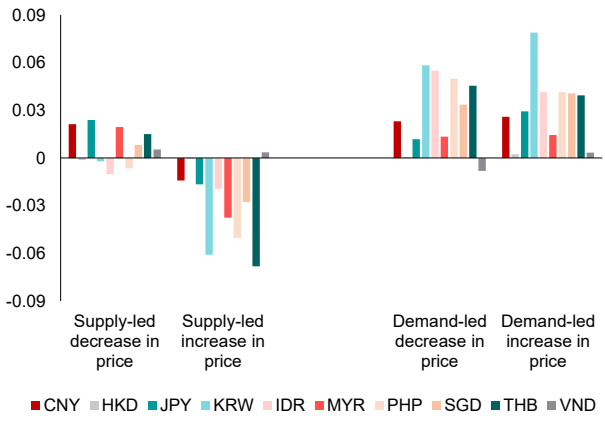
Larger crude oil deficits and energy-intensive CPI baskets could raise inflationary pressures.



Sources: Haver Analytics; AMRO staff calculations.
Note: CPI = Consumer Price Index. The y-axis contains the weightage of transportation in the CPI basket in 2024 for all economies other than China. For China, the weightage of transportation and communication in the CPI basket in 2024 is displayed. The x-axis lists the crude oil deficits (total crude oil imports – exports) scaled by total trade (goods exports + goods imports) for 2024. CN = China; JP = Japan; KR = Korea; ID = Indonesia; MY = Malaysia; SG = Singapore; TH = Thailand.

Figure 1.51. Beta of Supply and Demand-side Oil Price Changes to ASEAN+3 Currency Changes
(Coefficient)

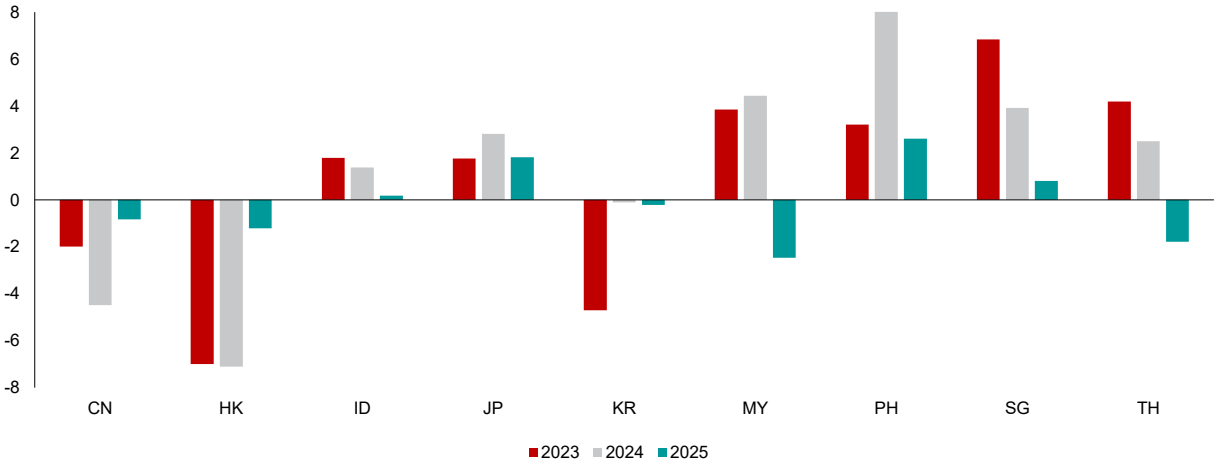
Supply-led increases in oil prices can lead to currency depreciation pressures.



Sources: Bloomberg Finance L.P.; AMRO staff calculations.
Note: Daily supply- and demand-side oil price changes are first sorted into price decreases and increases. Betas between daily individual currency changes and the corresponding price changes for decreases and increases are then calculated. CNY = Chinese yuan; HKD = Hong Kong dollar; JPY = Japanese yen; KRW = Korean won; IDR = Indonesian rupiah; MYR = Malaysian ringgit; PHP = Philippine peso; SGD = Singapore dollar; THB = Thai baht; VND = Vietnamese dong. Data are from 1 April 2021 to 15 August 2025.

Figure 1. 52. Selected ASEAN+3: Residential Property Price Indices
(Percent, year-on-year)

The property market downturn is easing in China, Hong Kong, and Korea; meanwhile, property prices are rising in some ASEAN economies.



Source: Bank for international Settlements (BIS) residential property price database.
Note: CN = China; HK = Hong Kong; ID = Indonesia; JP = Japan; KR = Korea; MY = Malaysia; PH = The Philippines; SG = Singapore; TH = Thailand. For CN, HK, KR, and TH, monthly data as of April 2025 (except China, where May 2025 data is available) are used, whereas for ID, JP, MY, PH, and SG, quarterly data as of Q1 2025 are employed.

Box 1.4:

Implications of Stress in China's Property Sector for Financial Stability

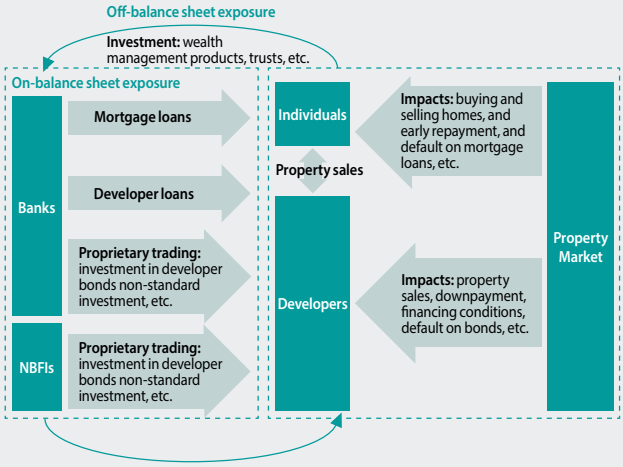
The adjustment of the Chinese real estate market has evolved into a long-term challenge for financial stability. The market has been in a prolonged downturn since May 2022, worsened by the COVID-19 pandemic. Residential property prices have dropped (Figure 1.4.1), leading to a devaluation of collateral and potential asset quality deterioration for banks, which could increase nonperforming loans (NPLs). The reduced sales constrained developers' cash flows, heightening the risk of defaults. More than 50 Chinese developers have defaulted on more than USD 60 billion of dollar-denominated bonds, causing market volatility and downgrades in credit ratings.

Figure 1.4.1. Residential Property Prices and Sales Volumes

(Millions of square meters; Index, 2020 = 100)

Source: National Bureau of Statistics.

Figure 1.4.2. Interconnectedness of the Financial system and Real Estate Sector



Source: AMRO staff compilation.

The Chinese financial system's exposure to real estate is concentrated in bank loans. Developers, individuals, banks, and nonbank financial institutions (NBFIs) collectively form a comprehensive investment and financing system in the real estate market (Figure 1.4.2). The sector's link to financial institutions, especially commercial banks, is significant, as their on-balance sheet exposure includes mortgage loans, developer loans, and property-related investments. NBFIs have limited exposure, primarily through proprietary investments. In addition, off-balance-sheet risks exist through wealth management products and trust investments, presenting further credit risks despite indirect exposure.

The proportion of real estate exposure of financial institutions has been continuously decreasing in recent years. On-balance-sheet exposures peaked in 2022 but has stabilized since then with the proportion of total assets declining steadily from 2021 to 2024 (Figure 1.4.3). This decrease is due to stricter regulations, such as lending caps and increased risk management, along with financial institutions reducing exposure to mitigate risks amid the market downturn. NBFI exposure is much smaller, and off-balance-sheet exposure, particularly in real estate trusts, is now half of its peak (Figure 1.4.4).

The real estate-related risks faced by financial institutions can be channeled through asset quality and profitability. Due to the real estate downturn and stagnant income growth, the nonperforming loan ratio of mortgages rose to 0.7 percent in 2024, twice the rate in 2015. Developer loans have seen a significant decline in asset quality, with the nonperforming loan ratio rising materially from 2021 to 2023 before a slight decrease in 2024 (Figure 1.4.5). Banks face growing profitability pressures as accommodative monetary policy has driven down the weighted average mortgage lending rate from 5.63 percent in 2023 to 3.1 percent in 2024. This, along with negative growth in mortgage loan balances, has shrank banks' net interest margins.[1]

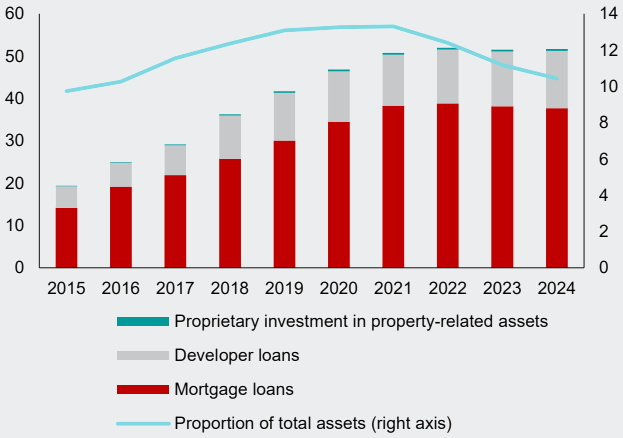
The author of this box is Yang Jiao.

[1] The NIM of China's banking sector has narrowed from 2.18 percent in 2018 to 1.52 percent in 2024.

The reduction in mortgage loan outstandings and interest income accounts for about 11 percent of the banking sector's overall profitability.[2] Despite Proprietary investments and WMPs' smaller scale, these are still highly exposed to risks. In 2024, 27 defaults occurred in RMB 34.2 billion of real estate bonds, representing 27 percent of all defaults in the bond market. Real estate bond markets have also been volatile (Figure 1.4.6).

China needs to further enhance the supervision and disposal mechanisms for the financial sector's real estate-related businesses. Banks could diversify their asset allocation in low-risk, high-liquidity instruments and reduce their exposure to real estate assets. For nonperforming assets tied to real estate, asset securitization and the transfer of asset income rights are viable solutions. Since August 2023, the Chinese government has implemented a series of real estate stimulus policies, including reducing the downpayment ratio and mortgage interest rates, relaxing purchase restrictions, supporting developer financing, and promoting the "guaranteeing the delivery of buildings" policy. These measures have stabilized market expectations and support reasonable housing demand, but their long-term effectiveness will depend on a sustained recovery in consumer confidence and the broader economy. Continued policy support, coupled with structural reforms to address systemic risks, will be essential to ensure the stability and healthy development of the real estate market.

Figure 1.4.3. Financial system on-balance sheet exposure to real estate sector
(Trillions of Chinese renminbi; Percent)

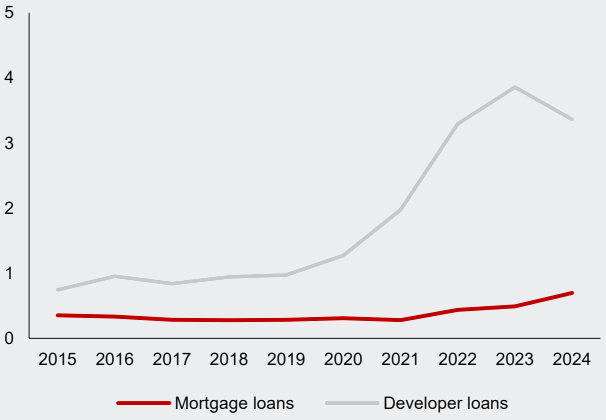


Source: People's Bank of China; China Central Depository and Clearing Company; Shanghai Clearing House; Shanghai Stock Exchange.

Figure 1.4.4. Real estate trust
(Billions of Chinese renminbi)

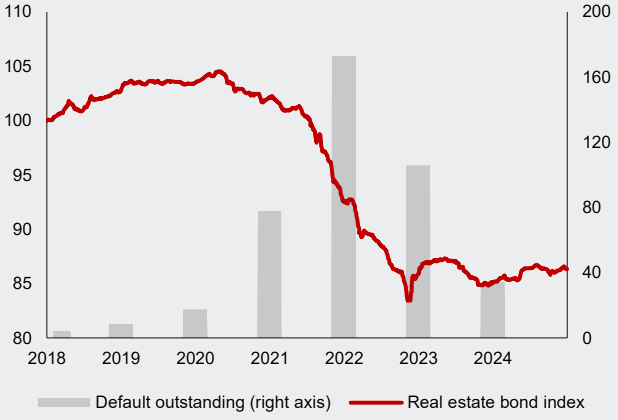
Source: China Trustee Association.

Figure 1.4.5. NPL ratios
(Percent)



Source: Wind.
Note: The weighted average NPL ratios for mortgage and developer loans are calculated from annual financial reports of 42 listed banks.

Figure 1.4.6. Real estate bonds index and defaults
(Index, 2018 = 100; Billions of Chinese renminbi)



Source: Wind.

[2] Assuming the mortgage loan balance continues to grow at the average rate of the past five years, the expected mortgage loan balance in 2024 would be RMB 42.86 trillion. However, the actual mortgage loan balance in 2024 was RMB 37.56 trillion. Whereas the NIM was expected to be 2.09 percent in 2024, assuming its grew at the average rate over the past five years, the actual NIM in 2024 was 1.53 percent. The decrease in this loan balance, combined with the impact of declining interest rates on NIM, is factored in to assess the effect on the banking sector's profitability, which is reduced by RMB 320 billion. This accounts for about 11 percent of banking sector profits in 2024, which totaled RMB 2.89 trillion.

III. Policy Discussion

Heightened US policy uncertainty and geopolitical tensions are major risks to growth and financial stability in the ASEAN+3 region. While the tariff announcements and geopolitical issues created market volatility, the appreciation of regional currencies against the US dollar helped to cushion spillovers to regional financial markets and reduced the risks of supply-side inflationary pressures. Risks to the outlook remain, with pockets of vulnerability especially evident in export-oriented MSME sectors. Continued monitoring and identification of vulnerabilities is essential to help devise preemptive policy actions. Such monitoring should span across all types of firms and industries to the extent possible in order to safeguard against potential financial stability risks arising from sectors that could be beyond regulatory reach.[8]

The ASEAN+3 policy mix, therefore, needs to focus on mitigating risks to financial stability from external uncertainty while supporting domestic growth and keeping inflationary pressure in check. As discussed in Chapter 2, ASEAN+3 authorities will need to strengthen their domestic policy frameworks and bolster regional resilience to mitigate spillover risks from monetary policies and market volatility in advanced economies.

Compared to the US, regional economies face a less complicated challenge in the absence of significant upside risks to inflation. This will allow ASEAN+3 monetary and fiscal policies to focus on supporting growth, while remaining aware of the uncertain outlook. Monetary and fiscal policies could have different roles, based on domestic economic and market conditions and the available policy space. Monetary policy can support the economy in a broad-based slowdown, while fiscal policy can be more targeted to vulnerable sections. If needed, macroprudential measures can also be activated to complement monetary and fiscal policies, should financial stability issues, such as a build-up in debt, arise.

That said, policy support should be provided prudently. With heightened external uncertainty, careful calibration of fiscal and monetary policies to strike a balance between timely policy actions and preserving policy space for future shocks would be essential. Preserving monetary policy space can help limit further spillovers from global market stress. Many regional central banks have moderated the pace of rate cuts to promote exchange rate stability and discourage volatile capital outflows. Moderating monetary easing can also help manage the risk of imported inflation, especially since geopolitical tensions persist. In fact, in an extreme scenario, volatility in commodity prices and supply chain disruptions could create upside risks to inflations, which may require a shift towards monetary tightening. However, elevated policy rates alone may not ensure exchange rate stability during heightened global market stress and may require authorities to intervene in the markets to curb volatility. Finally, while monetary policy can play an important role in managing the external shock, it also needs to account for domestic vulnerabilities.

Fiscal policy can also be used effectively to build resilience to external shocks. The uncertain outlook makes it important for fiscal policy to remain agile and flexible to respond swiftly and, if needed, preemptively to emerging shocks. ASEAN+3 economies have used fiscal policy in close coordination with monetary policy to mitigate supply-side inflation risks and support growth. However, weakened fiscal position and narrowed fiscal buffers may limit the effectiveness of fiscal support (AMRO 2024b). Fiscal discipline can also prevent bond market volatility. As seen in the first half of 2025, deepening fiscal concerns led government bond yields and volatility to rise in many advanced economies, indicating increased sensitivity of bond investors to fiscal risks. The risk of severe bond market reactions can be mitigated with well-targeted fiscal policies while staying committed to medium-term fiscal consolidation.

The risks around the US fiscal situation and growth outlook amid concerns about the consequences of the US dollar losing its safe haven status could also repel investors from US bonds and equities. These flows could be partially reallocated to ASEAN+3 assets. Even as such foreign portfolio inflows could be supportive of domestic financial stability in the near term, authorities need to stay vigilant on potential asset price misalignments and excessive credit growth.

[8] This includes large conglomerates. Structurally, some economies suffer from the opaque relationships between banks and conglomerates. These linkages could cause systemic risks to arise not only from direct linkages but also from market sentiment, which tends to deteriorate in the event of global shocks. The primary issue is the difficulty in quantifying these linkages and the spillovers due to lack of data, differences in institutional frameworks, and the high-level of interagency coordination required to address these issues.

The diminishing attractiveness of the US dollar as a safe asset could help reduce vulnerabilities to dollar financing risks. The ASEAN+3 region has been vulnerable to dollar funding shortages during adverse market conditions but when the US dollar is weak, these risks are typically lower (Chapter 3 of the *ASEAN+3 Financial Stability Report 2024*). The current environment provides an opportune time for ASEAN+3 authorities to encourage a diversification in the use of currencies, which can improve funding resiliency (AMRO 2024a). That said, it may be too early to conclude that the US dollar's safe haven status has diminished, and a scenario of a US dollar resurgence should not be ignored. Though the region remained resilient during the previous episode of US dollar strength driven by the Fed's tightening cycle, the situation could be more challenging if the dollar rises while growth prospects dwindle due to US tariffs. The current backdrop of weak US dollar provides a window of opportunity to accumulate and diversify reserves, which could be deployed to manage FX volatility, should the need arise.

In addition, authorities may need to closely monitor the US dollar alternatives used by their financial systems and establish appropriate safety nets through swap lines and reserves denominated in the alternative currencies. Existing safety nets, such as the Chiang Mai Initiative Multilateralization, have also evolved to facilitate local currency usage. Finally, authorities may need to deepen domestic bond markets so that in absence of a global risk-free benchmark, there is a reliable domestic benchmark yield curve which can be used to price domestic assets while reducing the dependence on global benchmarks for pricing.

Over the medium term, further regional financial integration can help strengthen resilience to global shocks. In this regard, the efforts put in by the smaller ASEAN economies—Brunei, Cambodia, Lao PDR, and Myanmar will be crucial in narrowing the gap between the ASEAN+3 financial systems. These developments include active effort in deepening the financial markets (with a focus on interbank market development), using technology to consolidate exchange rate markets, and strengthening regulations for nonbank financial institutions (Box 1.5).

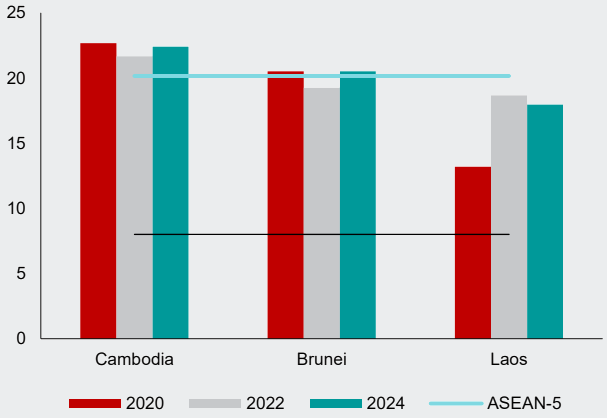
Box 1.5:

Recent Developments in BCLM Financial Sector

Banking systems remain the primary financial intermediaries across Brunei, Cambodia, Lao PDR, and Myanmar (known collectively as the BCLM countries), though performance has diverged significantly. Brunei's banks remain well capitalized, and asset quality has improved, with the nonperforming loan (NPL) ratio falling below 2 percent (Figures 1.5.1 and 1.5.2). However, the other countries face more pressing challenges. Cambodia's banking sector has experienced a notable rise in nonperforming loans from below 2 percent in 2020 to over 7 percent by 2024. This increase partially reflects weakening real estate conditions and a slower-than-expected recovery in tourism. Lao PDR's capital adequacy ratio has stayed below regional peers, and the capital buffer of the largest state-owned bank fell well below the minimum ratio, leaving the system more exposed to shocks despite a modest decline in reported NPLs.[1]

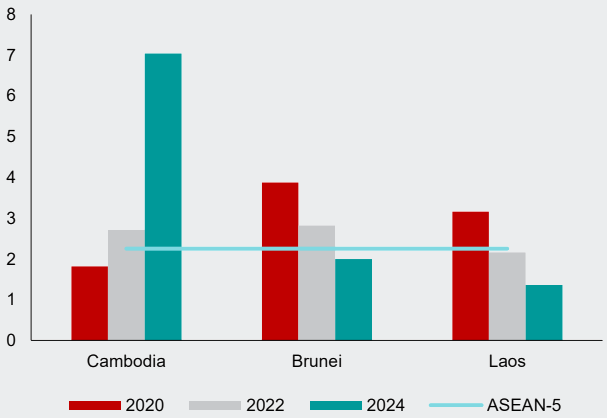
Real credit growth (Figure 1.5.3) has moderated, though for different reasons. In Cambodia, weaker loan demand and tighter underwriting standards have slowed annual credit expansion to low single digits. Lao PDR has seen credit expansion slow as banks respond to monetary policy tightening and the stabilization of currency depreciation.

Figure 1.5.1. Capital Adequacy Ratio
(Percent)



Sources: Haver Analytics; IMF; Bank of the Lao People's Democratic Republic.
Note: Regulatory capital to Risk weighted asset. ASEAN-5 is a simple average of ASEAN-5 countries as of end 2024. Black horizontal line is 8 percent, Basel III regulatory minimum without considering countercyclical buffer of 0-2.5 percent.

Figure 1.5.2. Nonperforming Loan to Gross Loan
(Percent)



Sources: Haver Analytics; IMF; Bank of the Lao People's Democratic Republic.
Note: End of year. ASEAN-5 is a simple average of ASEAN-5 countries as of end 2024.

BCLM countries are working to deepen their domestic financial markets, with particular focus on interbank market development. Brunei has made significant progress by completing four high-priority reforms in 2024 aimed at improving interbank market depth and functionality.[2] These reforms encompass improvements to market infrastructure, trading mechanisms, and liquidity management frameworks. The authorities are currently implementing additional measures, including enhanced legal frameworks for interbank transactions and increased central bank bill issuance to provide more liquid benchmark instruments.

Lao PDR has also made strides in this area by establishing the Interbank 2018 platform.[3] This initiative is designed to facilitate interbank lending activities and improve the efficiency of monetary policy operations by providing a centralized and regulated platform for financial institutions to manage their short-term liquidity.

Cambodia has been developing its sovereign bond market to facilitate the construction of a domestic yield curve.[4] Following the successful issuance of its first sovereign bond in 2022 with a 1-year maturity, the authorities expanded the maturity profile in 2023 to include 2, 3, and 5-year tenors. This progressive lengthening of maturities is crucial for establishing benchmark rates across different horizons, thereby aiding price discovery and the development of other fixed-income instruments.

The author of this box is Yoki Okawa.

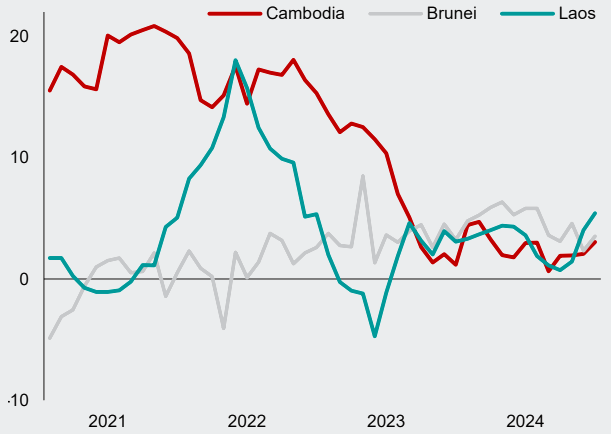
1 AMRO Annual Consultation Report Lao PDR, 2024.
2 IMF Brunei Darussalam 2024 Staff report for Article IV Consultation.
3 AMRO Annual Consultation Report Lao PDR, 2024.
4 ADB Completion Report Cambodia: Inclusive Financial Sector Development Program, 2023.

Exchange rate developments have varied considerably across the region (Figure 1.5.4). Cambodia and Brunei have maintained relative currency stability through their monetary arrangements. Cambodia continues to operate an effective crawling peg against the US dollar, which has provided exchange rate predictability while allowing for gradual adjustments. Brunei's currency board arrangement with the Singapore dollar has similarly ensured exchange rate stability.

In contrast, Myanmar and Lao PDR experienced significant currency pressures, with sharp depreciations from 2023 through mid-2024. Both currencies have since stabilized. Lao PDR's exchange rate stabilization could be attributed to the tighter regulation and the launch of the Lao Forex Exchange platform.[5]

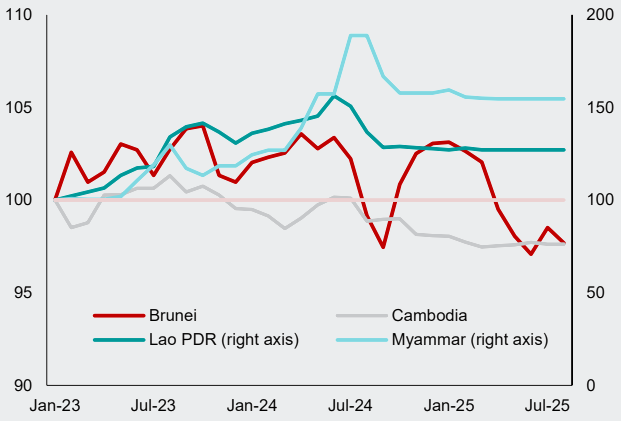
While the banking sector retains a dominant role, the nonbank financial sector in BCLM countries is gradually increasing in importance.[6] Countries are enhancing regulatory frameworks to ensure stability and foster growth in this segment. In Cambodia, for example, the Non-Bank Financial Services Authority (NBFSA) was established to strengthen regulatory oversight and enhance supervisory capacity across all nonbank subsectors. A key initiative involves collaborative efforts between the Credit Bureau of Cambodia and the NBFSA. They are jointly assessing the quality of real estate sector loans with a focus on obtaining more granular insights into the financial health of developers.

Figure 1.5.3. Real Credit Growth
(Percent)



Sources: Haver Analytics; IMF.
Note: Annual growth of total credit to private sector divided by consumer price index. Negative numbers suggest credit growth is outpaced by growth in consumer prices.

Figure 1.5.4. Foreign Exchange Rates
(Index)



Source: Haver Analytics; IMF; Bank of the Lao People's Democratic Republic; AMRO staff calculations.
Note: Exchange rate of LCU/USD, normalized with 100 in 1 January 2023. Higher number denotes depreciation against the US dollar. Lao PDR exchange rates are parallel rates from the Bank of the Lao People's Democratic Republic. Myanmar exchange rate is AMRO staff estimates of effective exchange rate.

[5] Ng, Poh Lynn, and Thai Yangsingkham. 2025. "Lao PDR's Bold Foreign Exchange Measures: A Step Toward Macroeconomic Stability." AMRO, *Blog*, 13 March.
[6] AMRO Annual Consultation Report Cambodia, 2024.

References

Agnolucci, Paolo, and Nikita Makarenko. 2025. "Crude Realities: Shaky Balance in Oil's Supply and Demand Shifts." *World Bank Blogs*, 13 May. *https://blogs.worldbank.org/en/opendata/crude-realities--shaky-balance-in-oil-s-supply-and-demand-shifts*

Atkins, Alice, Michael Mackenzie. 2025. "Treasury Yields Slide to 2025 Low as Economic Red Flags Pile Up." *Bloomberg News*, 25 February. *https://www.bloomberg.com/news/articles/2025-02-25/treasuries-rally-as-traders-boost-bets-on-fed-interest-rate-cuts*

ASEAN+3 Macroeconomic Research Office (AMRO). 2024a. "Strengthening Resilience to Challenges Ahead." A*SEAN+3 Financial Stability Report*, Singapore, April. *https://amro-asia.org/asean3-financial-stability-report-2024/*

ASEAN+3 Macroeconomic Research Office (AMRO). 2024b. "Transitioning to Fiscal Normality." *ASEAN+3 Fiscal Policy Report*, Singapore, April. *https://amro-asia.org/wp-content/uploads/2024/05/AFPR-2024_for-republication_final-1.pdf*

ASEAN+3 Macroeconomic Research Office (AMRO). 2025. "Post-Liberation Day: Tariff Tantrum and Potential Risk beyond the Market Turbulence." *AMRO Analytical Note*, Singapore, 22 April. *https://amro-asia.org/wp-content/uploads/2025/04/Analytical-Note_Liberation-day-and-financial-markets_final.pdf*

Asian Development Bank (ADB). 2024. "Asia Small and Medium-Sized Enterprise Monitor 2024." November. *https://www.adb.org/sites/default/files/publication/1011576/asia-sme-monitor-2024.pdf*

Business Times. 2025. "ECB's Lagarde Pitches Euro Alternative to Dollar in 'Fracturing' World." *Business Times*, May 26. *https://www.businesstimes.com.sg/international/global/ecbs-lagarde-pitches-euro-alternative-dollar-fracturing-world*

Eren, Egemen, Andreas Schrimpf, and Fan Dora Xia. 2023. "The Demand for Government Debt." Bank for International Settlement Working Paper 1105, June. *https://www.bis.org/publ/work1105.pdf*

Fang, Xiang, Bryan Hardy, and Karen K. Lewis. 2023. "Who Holds Sovereign Debt and Why It Matters." BIS Working Paper 1099, Bank for International Settlements, 24 April. *https://www.bis.org/publ/work1099.pdf*

Financial Times. 2025. "Trump Tracker: US Tariffs." *Financial Times*. *https://www.ft.com/content/2c473393-35fb-479d-8bba-236a1a98087c*

Gardner, Akayla, Jennifer A. Dlouhy, and Kate Sullivan. 2025. "Trump Pressures Iran to Make Peace, Threatening More US Strikes." *Bloomberg News*, June 22. *https://www.bloomberg.com/news/articles/2025-06-22/trump-says-us-destroyed-iran-nuclear-sites-threatens-more-hits?sref=BPMQ98P3*

Habib, Maurizio Michael, Livio Stracca, and Fabrizio Venditti. 2020. "The Fundamentals of Safe Assets." European Central Bank Working Paper 2355, January. *https://www.ecb.europa.eu/pub/pdf/scpwps/ecb.wp2355~3a921c5633.en.pdf*

Hennig, Tristan, Plamen K Iossifov, and Richard Varghese. 2023. "Predicting Financial Crises: The Role of Asset Prices." IMF Working Paper 2023/157, International Monetary Fund. Washington, DC, 4 August. *https://www.imf.org/en/Publications/WP/Issues/2023/08/03/Predicting-Financial-Crises-The-Role-of-Asset-Prices-536491*

International Monetary Fund (IMF). 2023. "Safeguarding Financial Stability amid High Inflation and Geopolitical Risks." *Global Financial Stability Report*, Washington, DC, April. *https://www.imf.org/en/Publications/GFSR/Issues/2023/04/11/global-financial-stability-report-april-2023*

Landau, Jean-Pierre. 2025. "A world with no safe assets." C*entre for Economic Policy Research*, June 6. *https://cepr.org/voxeu/columns/world-no-safe-assets*

Lee, Jihoon, and Joyce Lee. 2025. "South Korea Passes Commercial Bill Revision to Tackle 'Korea Discount'." *Reuters*, 3 July. *https://www.reuters.com/sustainability/boards-policy-regulation/south-korea-assembly-passes-commerce-bill-expanding-duty-boards-shareholders-2025-07-03/*

Lee, Julian. 2025. "What If Iran Tries to Close the Strait of Hormuz?" *Bloomberg News*, 22 June. *https://www.bloomberg.com/news/articles/2025-06-22/what-if-iran-tries-to-close-the-strait-of-hormuz-quicktake?sref=BPMQ98P3*

Liptak, Kevin, Kylie Atwood, and Jennifer Hansler. 2025. "Trump's New Two-Week Negotiating Window Sets Off Scramble to Restart Stalled Iran Talks." *CNN*, June 20. *https://edition.cnn.com/2025/06/19/politics/trump-iran-negotiations-pessimism*

National Economic and Social Development Council (NESDC). 2025. "Thai Economic Performance in Q2 of 2025 and the Outlook for 2025." Office of the NESDC. *https://www.nesdc.go.th/wordpress/wp-content/uploads/2025/08/03-PRESSENG-Q2-2025-1.pdf*

Ohnsorge, Franziska, Marcin Wolski, and Yuanyan Sophia Zhang. 2014. "Safe Havens, Feedback Loops, and Shock Propagation in Global Asset Prices." IMF Working Paper, International Monetary Fund. Washington, DC, May 9. *https://www.imf.org/external/pubs/cat/longres_gsause.aspx?sk=41547&gsa=true*

Park, Donghyun, Kiyoshi Taniguchi, and Shu Tian. 2018. "Foreign and Domestic Investment in Global Bond Markets." ADB Working Paper 535, Asian Development Bank, January. *https://www.adb.org/sites/default/files/publication/396581/ewp-535-foreign-domestic-investment-bond-markets.pdf*

Parry, Jacob. 2025. "Iran Reportedly Moves to Shut Strait of Hormuz After US Attacks." *Politico*, 22 June. *https://www.politico.eu/article/iran-reportedly-moves-shut-strait-hormuz-us-attacks/*

Reuters. 2025. "Toyota Says It Will Maintain Operations Despite US tariffs." *Reuters*, 31 March. *https://www.reuters.com/business/autos-transportation/toyota-says-it-will-maintain-operations-despite-us-tariffs-2025-03-31/*

Saito, Masashi, and Yoshihiko Hogen. 2014. "Portfolio Rebalancing Following the Bank of Japan's Government Bond Purchases: Empirical Analysis Using Data on Bank Loans and Investment Flows." Bank of Japan Monetary Affairs Department, June. *https://www.boj.or.jp/en/research/brp/ron_2014/data/ron140619a.pdf*

Shin, Hyun Song, Philip Wooldridge, and Dora Xia. 2025. "US Dollar's Slide in April 2025: The Role of FX Hedging." *BIS Bulletin* 105, 20 June. *https://www.bis.org/publ/bisbull105.htm*

Tewari, Suranjana. 2025. "How Trump's Tariff Chaos Could Reshape Asia's businesses." *BBC*, Singapore, 7 July. *https://www.bbc.com/news/articles/czeyrrnjjnpo*

Vu, Dinh, and Minh Hue. 2025. "Monetary, Exchange Rate Policies Under Mounting Pressure: Vietnam Central Bank." *The Investor*, Vietnam, 21 February. *https://theinvestor.vn/monetary-exchange-rate-policies-under-mounting-pressure-vietnam-central-bank-d14612.html*

Vu, Khanh, and Francesco Guarascio. 2025. "Vietnam Ramps up Bond Sales, Spending as Export-Led Growth Faces Tariff Risks." *Reuters*, 25 April. *https://www.reuters.com/world/asia-pacific/vietnam-ramps-up-bond-sales-spending-export-led-growth-faces-tariff-risks-2025-04-25/*

Watson, Tara, and Jonathon Zars. 2025. "100 Days of Immigration under the Second Trump Administration." *Brookings Commentary*, 29 April. *https://www.brookings.edu/articles/100-days-of-immigration-under-the-second-trump-administration/*

Xinhua News. 2025. "China's Central Bank to Promote Cross-Border RMB Use." *Xinhua News*, Beijing, 20 February. *https://english.news.cn/20250220/f1780a9a3dc84c2899a650819f3ca601/c.html*

Yue, Eddie. 2025. "Unlocking Value Through China's Resilience." Central bank speech, Bank for International Settlements. Hong Kong, 8 July. *https://www.bis.org/review/r250708d.htm*

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.

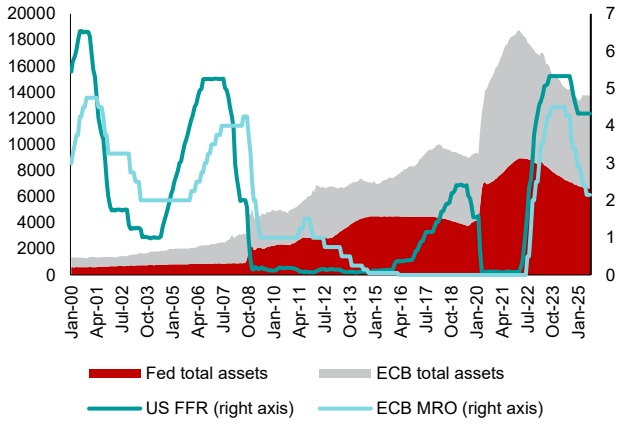
II. Assessing the Impact of Global Monetary Policy Shock on ASEAN+3—This Time Is Different

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.

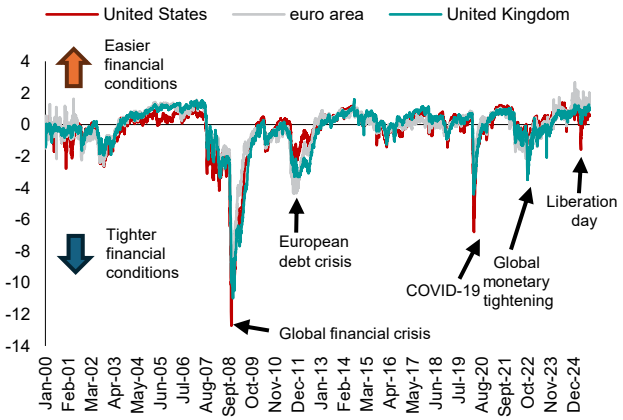


Source: Federal Reserve Bank of New York, Federal Reserve Board, European Central Bank via Haver Analytics.
Note: FRB refers to the Federal Reserve Board, ECB stands for the European Central Bank, FFR is the effective federal funds rate, and MRO denotes the Main Refinancing Operations rate.

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.

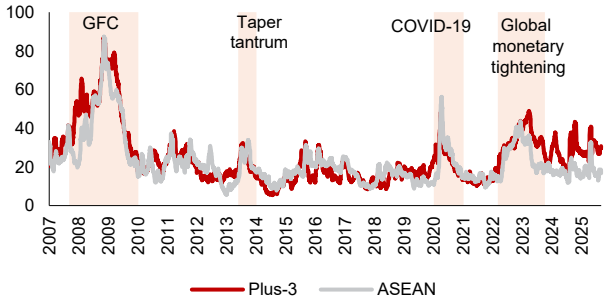
- **Stock index:** During the GFC, stock indexes plunged sharply across all markets. The taper tantrum caused only a brief, shallow dip, with markets stabilizing quickly. The COVID-19 shock triggered sharp volatility, but unprecedented policy support spurred a swift and broad based rebound. By contrast, 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)

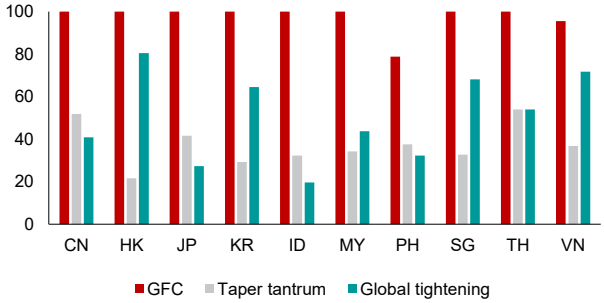
The FSI spiked during the GFC, rose briefly in the taper tantrum and COVID-19, and climbed again in monetary tightening.



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)

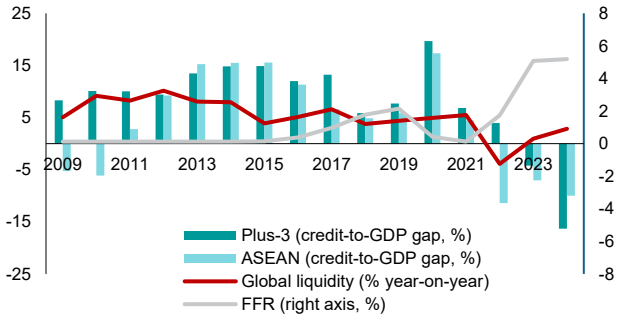
FSI peaks were highest in the GFC, with taper tantrum and global tightening impacts varying by country.



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)

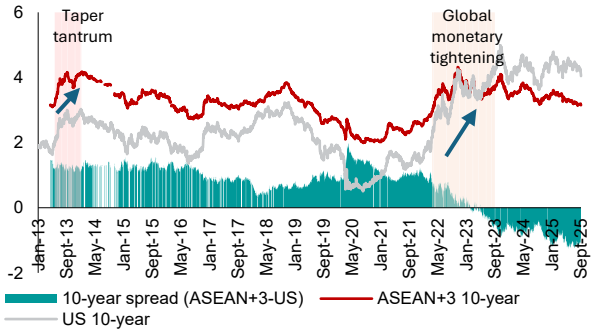
Global liquidity and the ASEAN+3 credit-to-GDP gap turned negative amid global monetary tightening.



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)

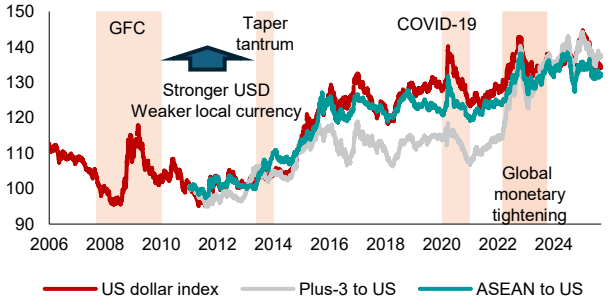
Bond yields spiked in the taper tantrum and global tightening, with the ASEAN+3-US spread turning negative in the latter.



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)

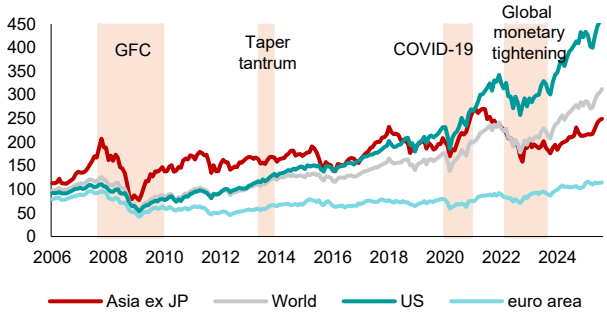
ASEAN currencies fell more during the taper tantrum, while depreciation was broader in global tightening.



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)

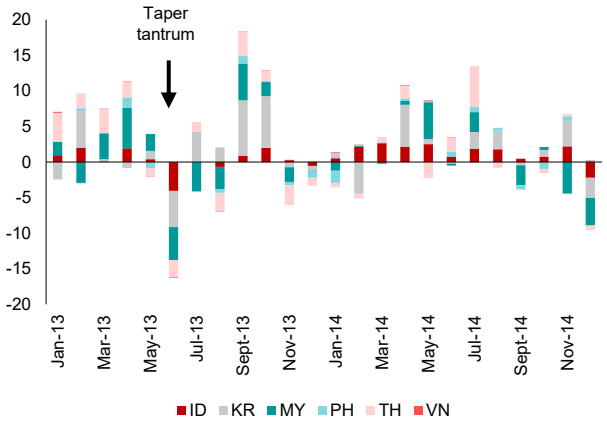
Global stocks fell in 2022; while US and world indexes rebounded quickly, ASEAN+3 saw a modest recovery



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)

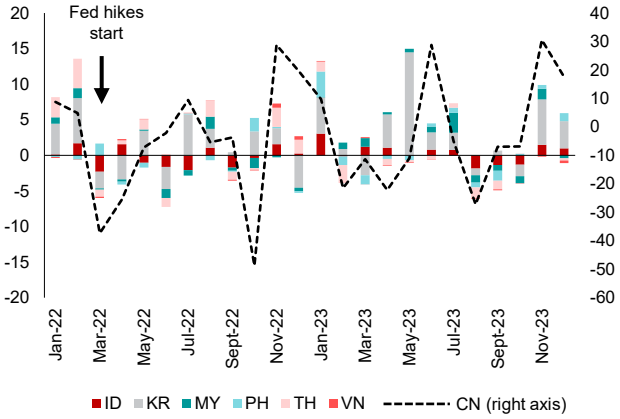
Portfolio flows sharply reversed in several ASEAN+3 economies before quickly recovering.



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

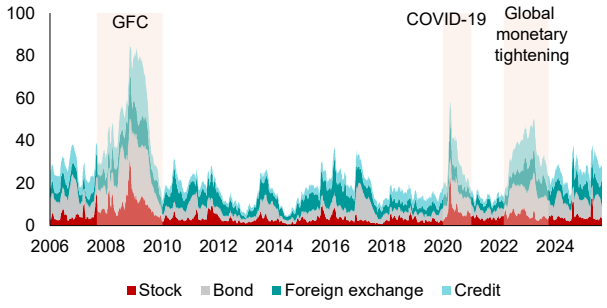
How have global monetary policy shifts/shocks created cross-border financial spillovers in ASEAN+3?

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)

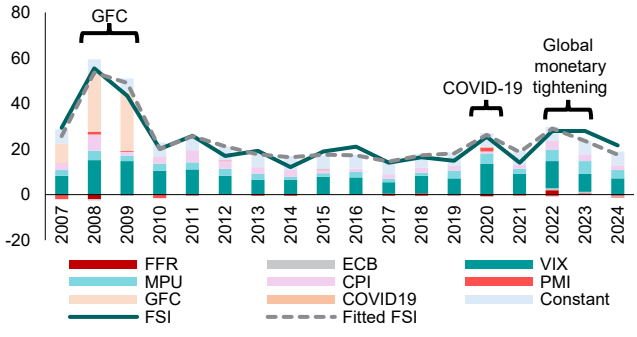
The spike in financial stress during tightening was mainly driven by bond and credit market volatility.



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.

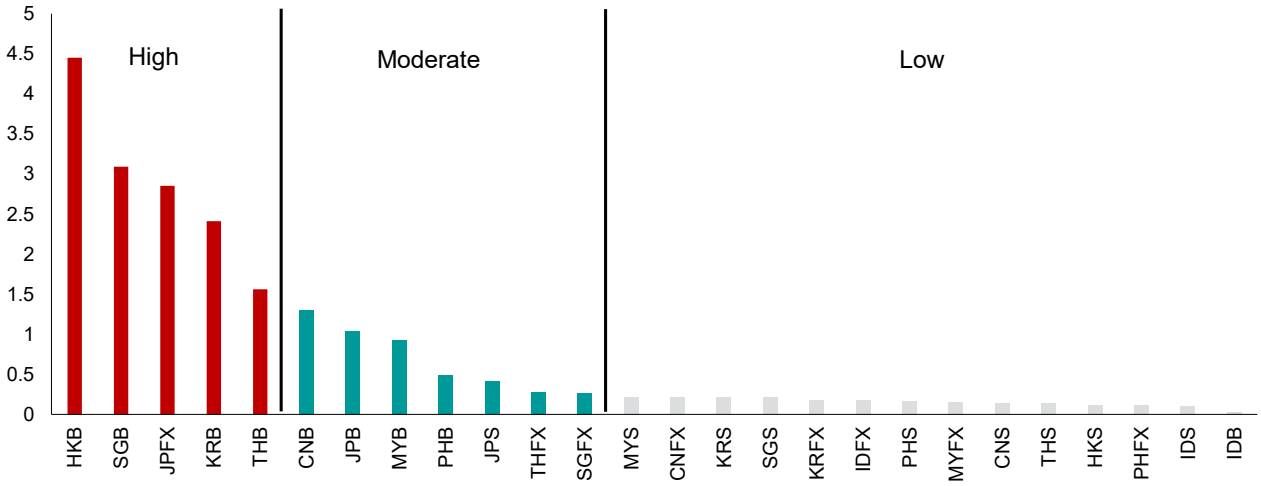


Source: AMRO staff calculations.
Note: The contributions are computed by multiplying each regression coefficient by the corresponding variable, then averaging across countries by month and year. FFR = US federal funds rate; ECB = European Central Bank main refinancing operations (MRO) rate; VIX = Chicago 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).

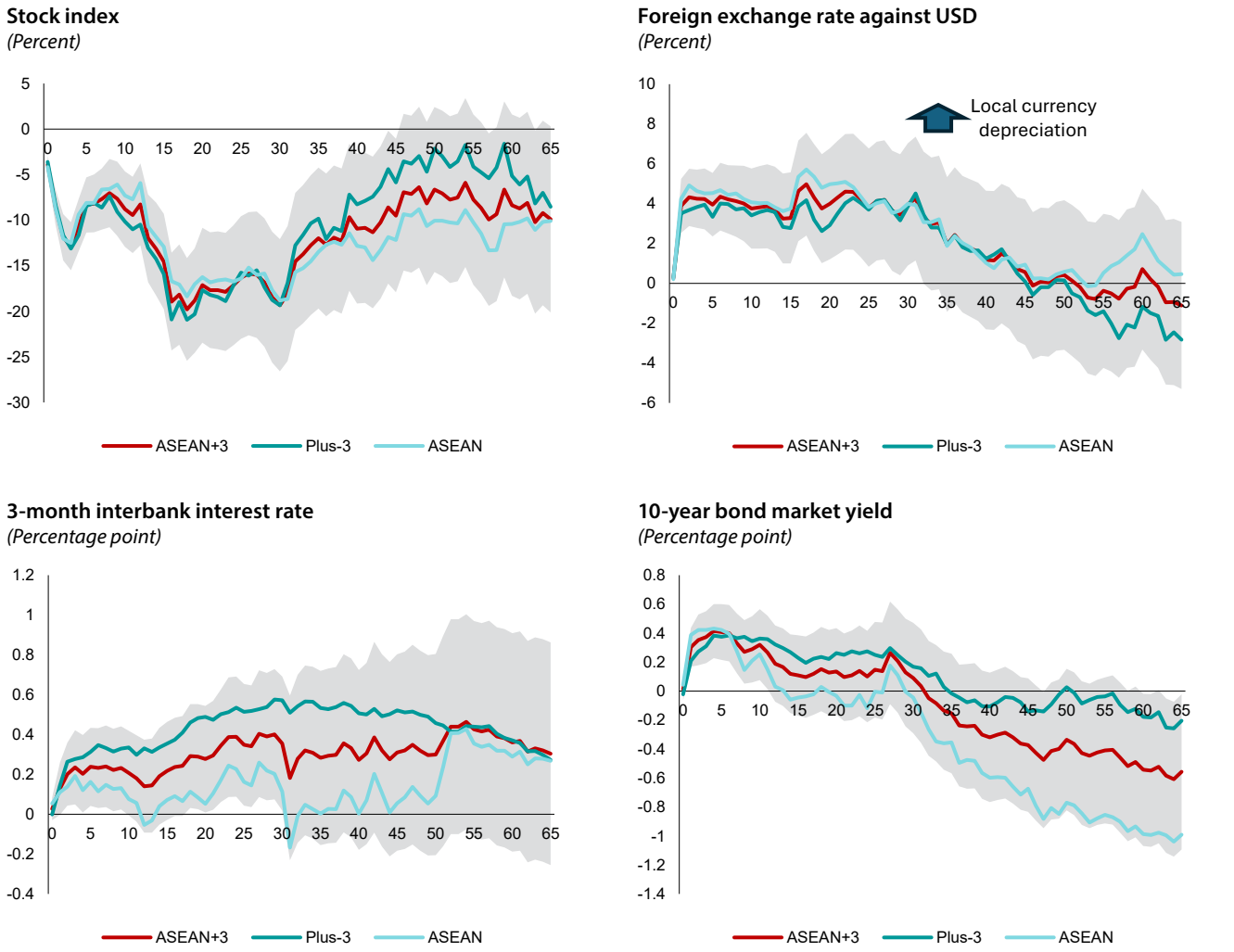
Simulated results show significant effects of pure monetary policy shocks on ASEAN+3 markets (Figure 2.14): stock prices fall, currencies depreciate, and interest rates rise following an unexpected Fed hike. These responses, strongest in the first 20–30 trading days, reflect tighter financial conditions 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]

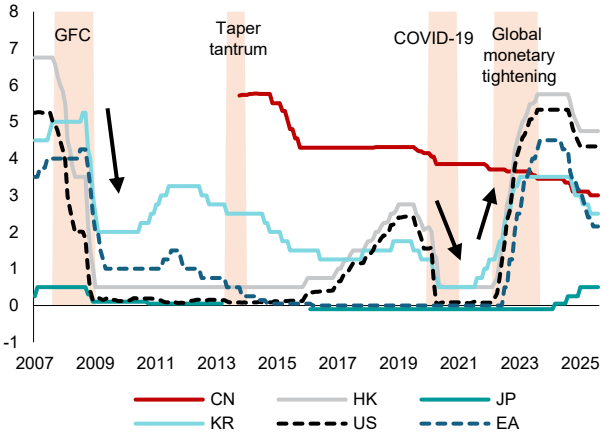
During the taper tantrum in 2013, several ASEAN economies faced sharp capital outflows and currency sell offs. Indonesia, for example, was forced to raise rates steeply to stem depreciation and restore investor confidence—an emergency measure rather than a deliberate policy choice—despite the drag on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

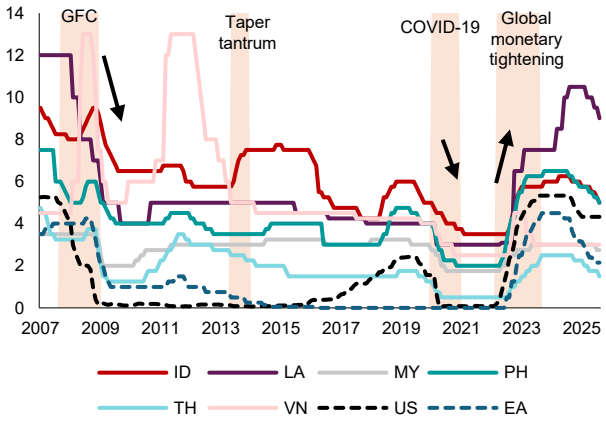
Hong Kong tracks the US, Korea broadly aligns with the global cycle, while China and Japan remain independent.



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.



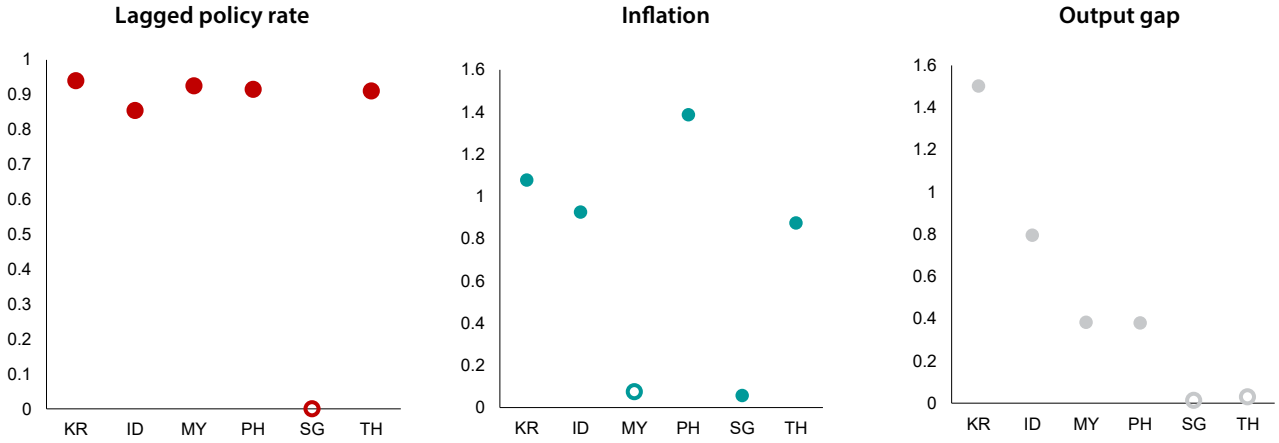
Source: National authorities via Haver Analytics.
Note: Singapore, Brunei, Cambodia, and Myanmar are excluded from the policy rate analysis. Singapore conducts monetary policy through exchange rate management without direct control on the interest rate. Brunei adopts a currency board arrangement with 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).

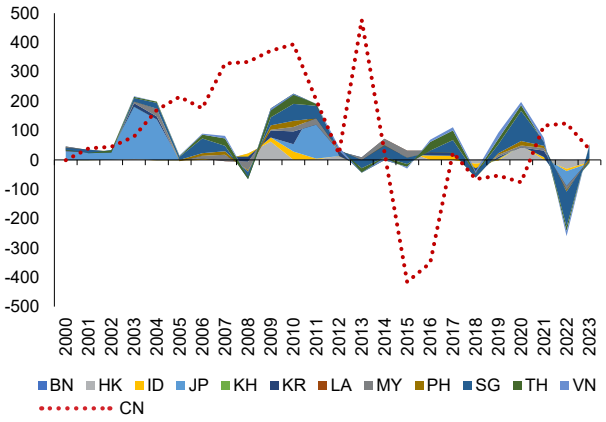
Even with flexible exchange rates, foreign exchange intervention remains a part of the toolkit to mitigate external shocks and curb excessive exchange rate volatility. Interventions are typically asymmetric and state-contingent—used more actively during episodes of capital outflows or excessive exchange 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)

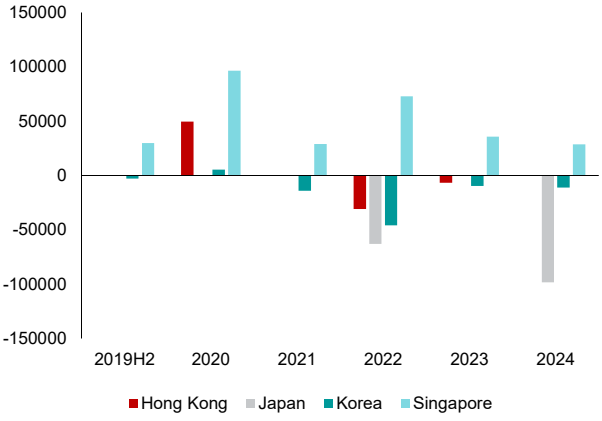
Many economies accumulate reserves during periods of ample liquidity and draw them down during global stress.



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

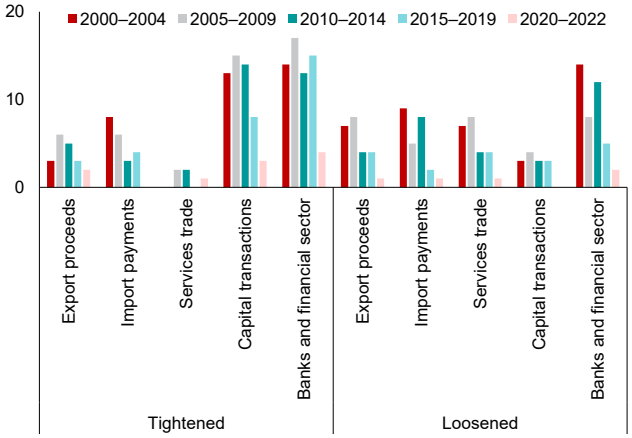
While the traditional policy consensus—rooted in the Impossible Trinity—held that flexible exchange rates could safeguard monetary autonomy without capital flow measures (CFMs), excessive volatility can make the exchange rate a shock amplifier rather than a shock absorber (Georgiadis and Zhu 2021). Episodes 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)

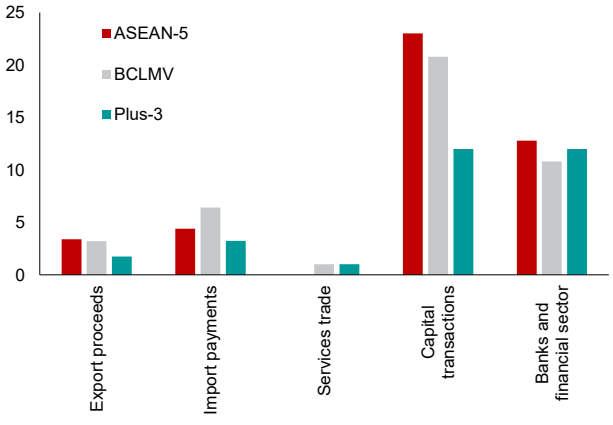
ASEAN+3 has adjusted cross-border regulations over time, especially on capital and financial sector measures.



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

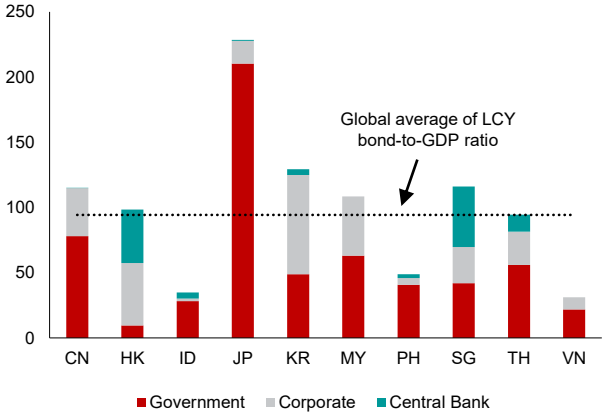
The depth and structure of regional financial markets is critical in determining how ASEAN+3 economies absorb and respond to external shocks. In particular, well-developed local currency (LCY) bond markets strengthen resilience by facilitating domestic financing, reducing reliance on foreign-currency 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)

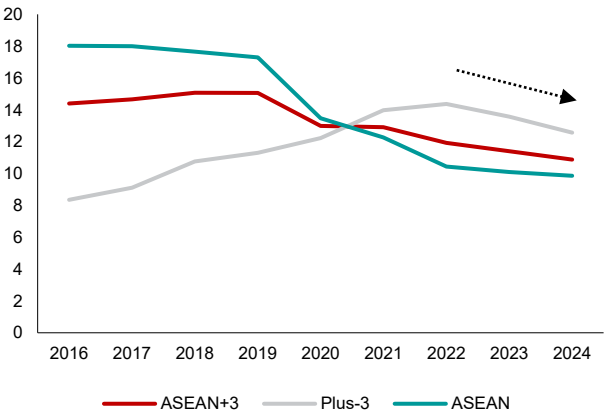
Several economies in the region have sizable LCY bond markets exceeding the global average.



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.

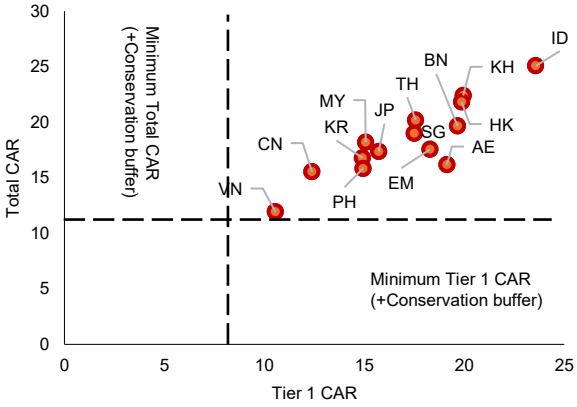
To further assess the robustness of the banking system, AMRO conducted a reverse stress test to evaluate how much deterioration in asset quality banks could withstand before their CARs fall to the Basel III minimum of 10.5 percent (Annex 2.6). The stress scenario simulates the impact of a monetary policy 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)

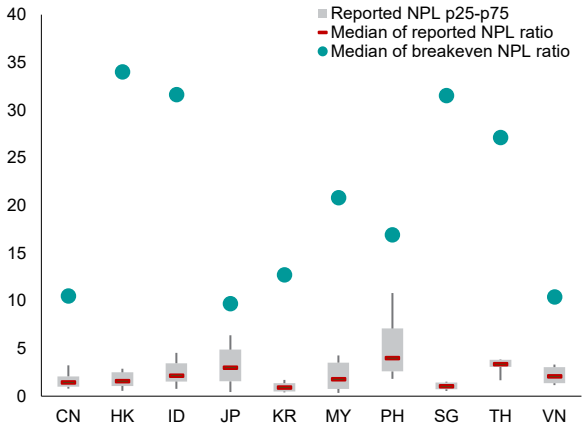
ASEAN+3 bank CARs generally exceed Basel requirements, offering a buffer against external shocks.



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.

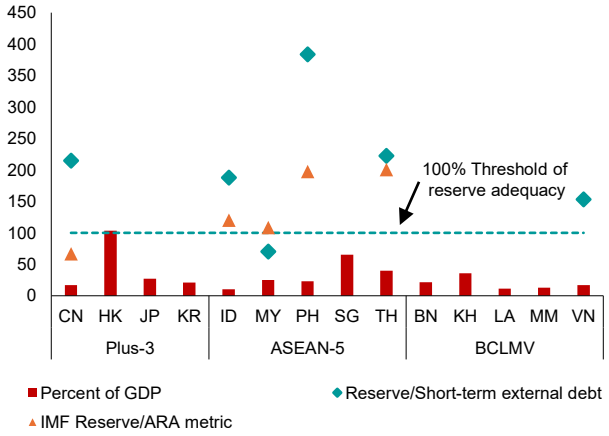
Most ASEAN+3 economies appear to maintain sufficient foreign reserves. According to the Guidotti-Greenspan rule, which sets a 100 percent threshold for the ratio of reserves to short-term external debt, most economies with available data exceed this benchmark, indicating strong liquidity positions. Notably, 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)

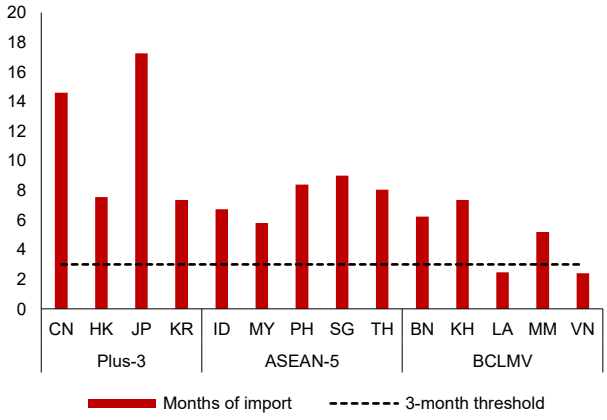
Most ASEAN+3 economies have sufficient reserves relative to short-term external debt.



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).

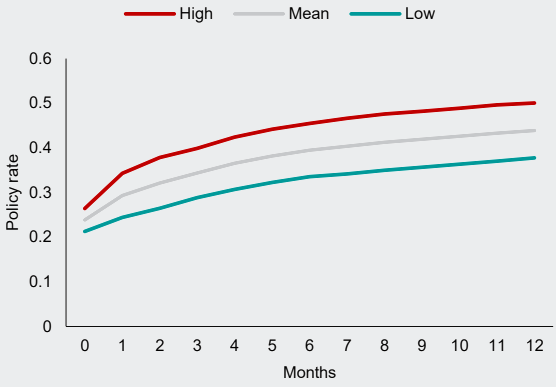
Domestic policy responses to changes in the federal funds rate tend to be both immediate and persistent, highlighting the broad reach of international monetary spillovers. However, the intensity of these responses varies significantly across countries, depending on their financial exposure to the US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

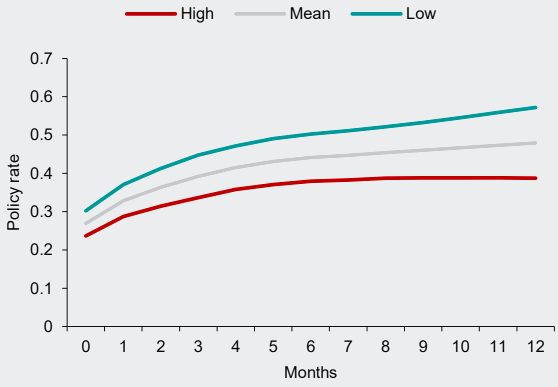
Higher US borrowing exposure leads to stronger policy rate responses.



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).

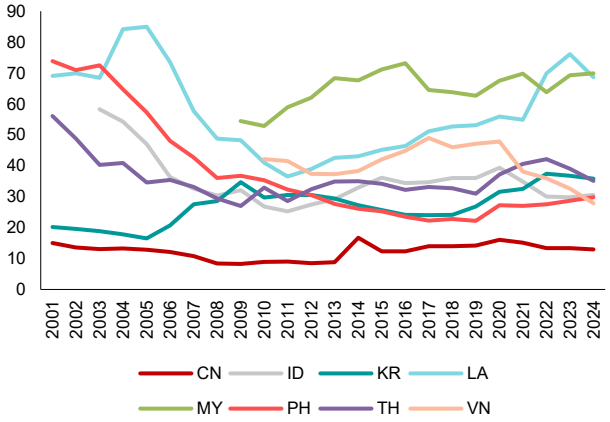
ASEAN+3 corporate bonds grew from USD 9 trillion in 2019 to over USD 12 trillion in 2024. While local currency (LCY) bonds dominate, FCY still makes up about one-fifth, exposing companies to refinancing and currency risks (Figure 2.30). China and Korea rely mainly on LCY because their domestic capital 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)

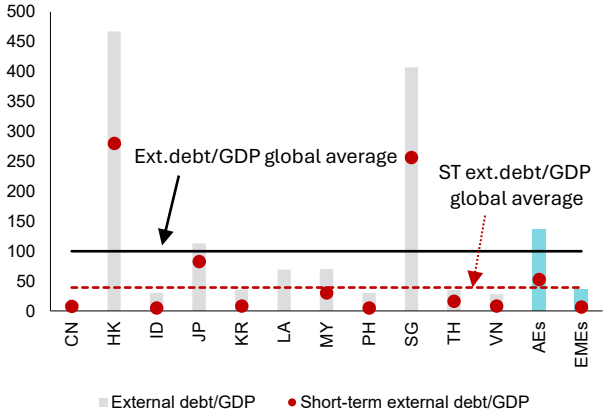
External debt ratios have stabilized overall but remain high or increasing in some economies.



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)

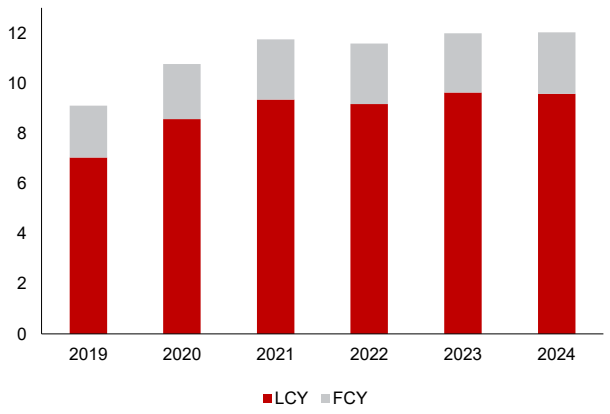
Excluding financial centers, external debt-to-GDP ratios in ASEAN+3 are generally modest.



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)

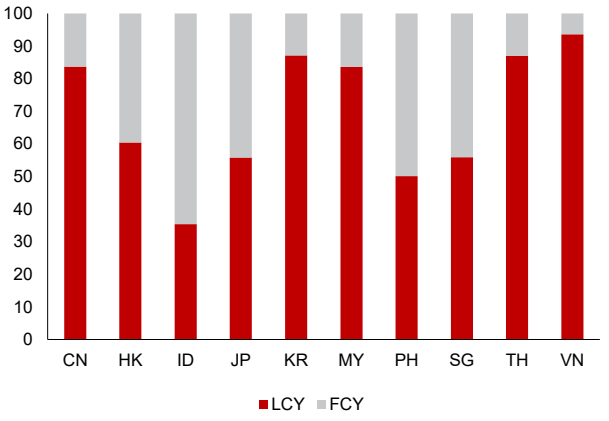
ASEAN+3 corporate bonds rose steadily, with LCY bonds dominating but FCY bonds remaining sizable.



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

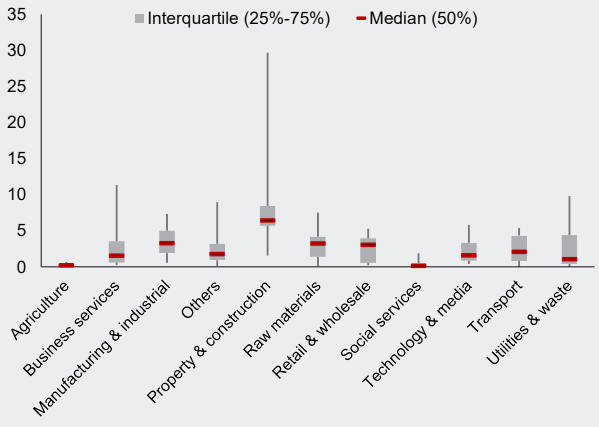
To assess the potential impact of external monetary shocks on corporate resilience, the analysis focuses on their effects on companies' interest coverage ratios (ICRs) through two main channels. First, global monetary tightening can spill over into domestic financial conditions, raising local interest 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)

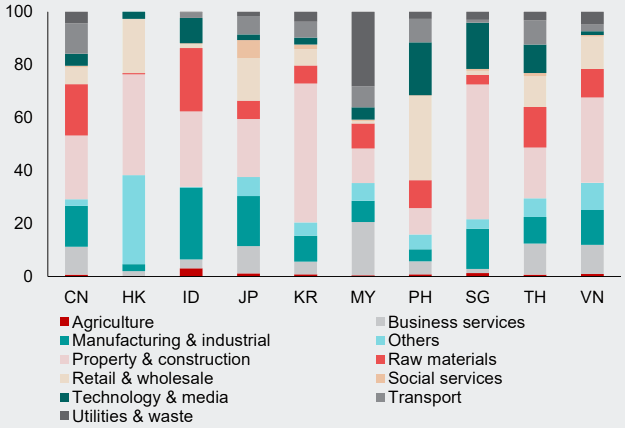
Corporate DAR is high in sectors such as property and construction, manufacturing, and raw materials.



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.

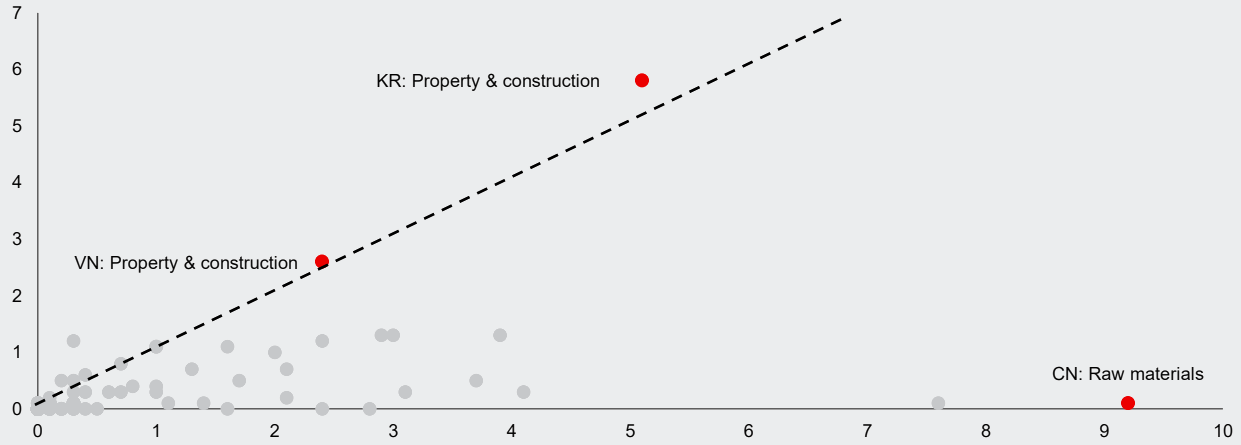
To assess the sensitivity of corporate vulnerabilities to external monetary tightening, a stress test is conducted simulating a 100 basis point global interest rate shock. The impact is transmitted through two channels: directly through higher refinancing costs for FCY liabilities, and indirectly through 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).

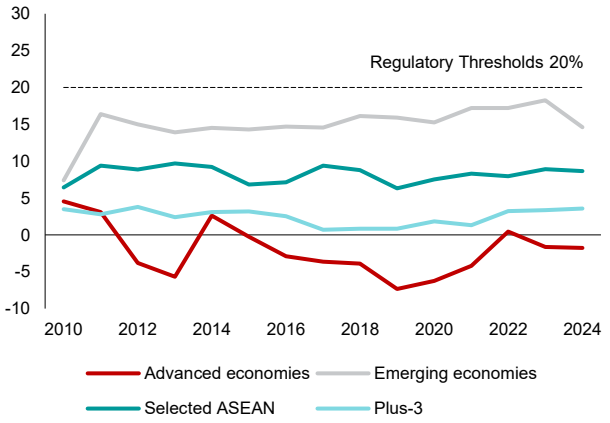
Interest rate risk is particularly important for banks' bond holdings, with the main risk stemming from the negative effect of interest rate fluctuations on bond prices. Therefore, banks with a greater share of trading debt securities in their financial assets may be more exposed to this risk. When interest 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)

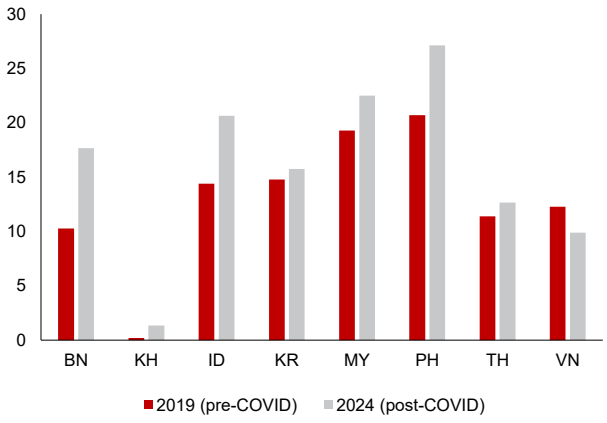
ASEAN+3 banks maintain stable net open positions, well below the regulatory threshold.



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.

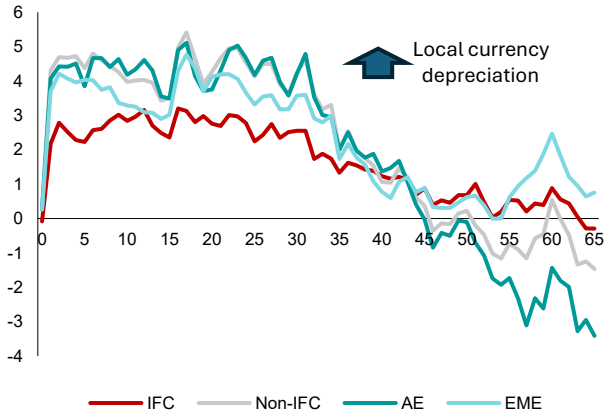
Across all economy groups, the US monetary policy shock typically results in falling stock prices, depreciation of regional currencies against the US dollar, and a rise in both short- and long-term interest rates, particularly in the initial period.

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.

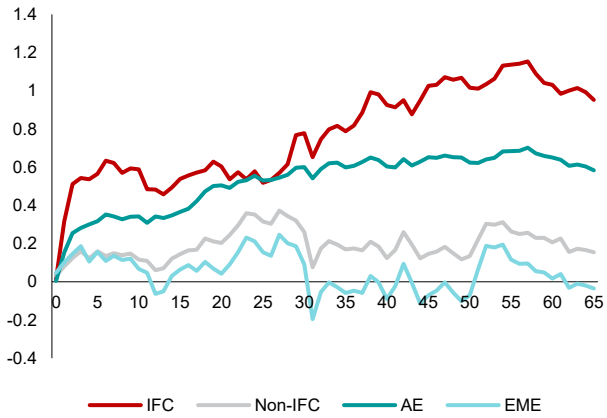
Figure A2.4.1. Selected ASEAN+3 Economies: Simulated Dynamic Effects of a 100bp Unexpected Monetary Policy Shock on Financial Indicators

Stock index
(Percent)

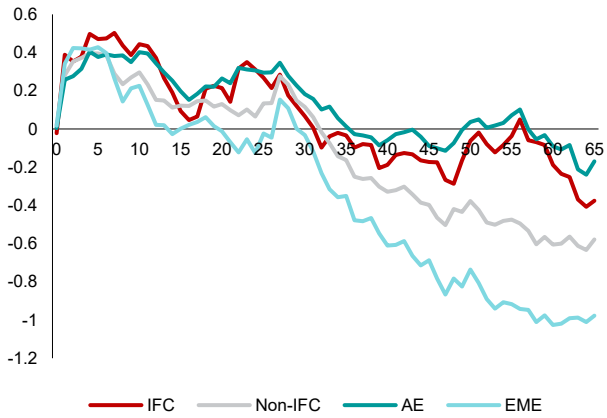
Foreign exchange rate against USD
(Percent)



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.

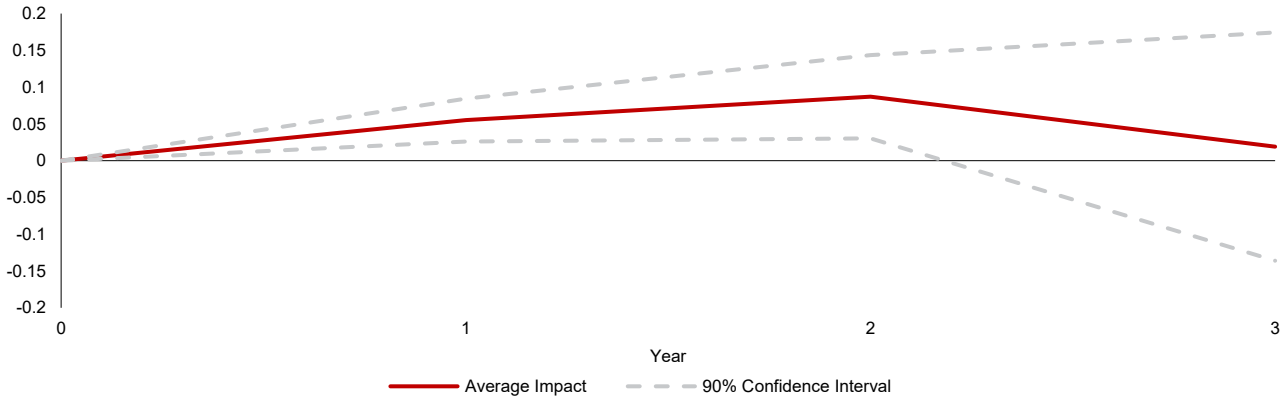
This specification captures how a change in global interest rates at time t, conditional on the domestic macrofinancial environment, affects the evolution of banking sector over a multiyear horizon. Several steps are taken to address potential endogeneity concern. First, the global monetary policy shock 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*.

Chapter 3

Banking Sector in the Digital Age: Balancing Innovation and Stability

Highlights

- The digitalization of banking services has picked up significantly in ASEAN+3 over the past decade amid strong policy support across the region. While customer demand for convenience and efficiency is probably the most important driver, technological developments and their innovative applications by new financial industry entrants have also contributed immensely to digitalization efforts. Furthermore, policymakers in ASEAN economies with low financial and high mobile-phone penetration have made an additional push for digitalization to promote financial inclusion.

- In the private sector, the digitalization efforts have been driven by fintechs, bigtechs, traditional banks, and digital banks. While fintechs have thrived in the payments, alternative lending, wealthtech, and insurtech domains, bigtechs have leveraged their ecosystems to provide financial services. Traditional banks have invested heavily in overhauling technology as they seek higher efficiency and strong customer retention.

- Digital banks are an emerging sector in ASEAN+3 economies. While the emphasis on digital channels reduces operational overheads, digital banks face pressures from heavy technological investments and customer acquisition costs in the first few years of doing business. Many digital banks in the region are either owned by or have partnerships with technology, e-commerce, and telecom companies to leverage their customer bases and reduce customer acquisition costs. Digital banks are still much smaller than incumbent banks but have expanded rapidly in recent years.

- Digitalization may affect market structure and could change the nature and distribution of financial stability risks. Operational risks, which include cybersecurity and fraud, are probably the most pronounced risks emanating from digitalization, followed by systemic risks, which can emerge from nonfinancial companies. The financial inclusion objectives and still developing financial systems in ASEAN economies could expose the new players to higher credit and business risks.

- A holistic approach to sound and prudent regulatory frameworks is key to facilitating further innovation while safeguarding financial stability. As there is no one-size-fits-all solution, authorities must use a mix of policy approaches to manage digitalization, depending on the nature of risks and maturity of industry segments. Policy should focus not only on preventing risk incidents but also on ensuring the quick recovery and resilience of the system, with frameworks for appropriating responsibilities (risk-sharing) across the banking value chain. Financial safety nets and effective communication can also play an important role during stress periods to help contain contagion and restore confidence.

This chapter is authored by Prashant Pande under the guidance of Runchana Pongsaparn, with contributions from Benyaporn Chantana, Chiang Yong (Edmond) Choo, Wen Yan Ivan Lim, and Leilei Lu.

I. Overview

The past decade has brought an unprecedented rise in financial digitalization,[1] with technological progress and innovations transforming the financial industry. While there was always a demand for fast and efficient financial infrastructure and services, a combination of changing user preferences, progress in technology, and an appropriate policy push created the perfect environment for the changes to materialize. Indeed, while the COVID-19 pandemic acted as a catalyst, the change was well under way before the pandemic (Ong and others 2023). Digitalization has affected almost every sector of financial services—i.e., banking and payments, insurance and occupational pensions, and securities and markets.[2]

The changes have offered a wide range of benefits to consumers and the financial institutions but also pose some financial stability challenges. Technological progress has helped improve customer experience, achieve speed and cost efficiencies, increase financial inclusion, and strengthen risk management and compliance (World Bank 2022; BCBS 2024). However, these advances also have implications for financial stability. Financial digitalization could affect market structure (He and others 2017) and change the nature and distribution of financial stability risks. Risk monitoring systems and regulations need to adapt proactively to financial stability risks, while embracing technological advancement.

The spectrum of financial services undergoing tech-enabled transformation is wide. This chapter therefore focuses specifically on the transformation of banking and payment services and analyses potential financial stability risks.[3] It also provides a policy discussion about tackling the issues pre-emptively, without stifling innovation. Section II highlights drivers of the digitalization of banking services which include supply and demand-side factors as well as policy initiatives identified through a survey of ASEAN+3 authorities. Section III discusses the changing financial landscape resulting from digitalization and Section IV dives deeper into the emerging segment of digital banks in the region.[4] Section V analyzes the potential risk to financial stability from digitalization. Section VI assesses policies for containing and managing the risks emerging from digitalization of banking services while reaping their benefits.

[1] The use of new technologies and innovations to transform the delivery of traditional banking and financial services, covering a variety of applications, products, processes, and business models (Ong and others 2023).

[2] Financial services are classified as described in EBA, EIOPA, and ESMA (2024).

[3] The study is handicapped by extensive data not being available. Therefore, it relies on interviews and surveys with private sector enterprises and policymakers, while leveraging existing research.

[4] Digital banks include banks classified as virtual banks, internet banks, and banks which may have some branches but predominantly conduct business through mobile or internet channels.

II. Drivers of Digitalization in Banking Services

Financial digitalization has been picking up significantly across the world. Progress has been driven by a wide variety of factors—from both the demand and supply sides. On the demand side for financial services, customers have become more tech-savvy and increasingly prefer financial services delivered digitally and instantly. Supply side changes have been enabled by technology that allows fintechs and banks to provide banking services to customers through mobile phone applications and process transactions instantly without compromising on compliance and security. Innovations led by fintech and bigtech companies have pushed banks to upgrade their service delivery. Regulators have also had a significant role, and they view digitalization as an effective medium to achieve policy objectives such as financial inclusion and monitoring transactions.

AMRO staff conducted a survey of ASEAN+3 authorities to understand their perspectives on the digitalization of banking services.[5] According to the results, on average, Plus-3 financial systems are more digitalized than in the ASEAN economies (Figure 3.1), which also explains the different drivers of digitalization across these economic groups. Digitalization is mostly demand-driven across the ASEAN+3 region: in ASEAN economies demand for improved services was a stronger factor, whereas in Plus-3 consumers wanted higher efficiency (Figure 3.2). Technological developments that enabled fintechs and bigtechs to innovate and compete with traditional banks were more relevant in Plus-3 economies, whereas the need for financial inclusion drove policy in ASEAN. The results also show how the private sector (through fintechs, bigtechs, and traditional banks) has led the digitalization efforts, with authorities providing a conducive environment and incentives across most of the economies. Demographic and financial penetration data for ASEAN provides credence to the survey findings (Table 3.1):

- A young, mobile-native population and high rates of internet and smartphone penetration have created a large base of tech-savvy consumers who are drawn to seamless, digital-first financial services.

- A significant unbanked and underbanked population has made financial inclusion a priority, prompting targeted initiatives from governments and regulators. Lack of financial penetration itself is a complex issue and could reflect multiple problems including lack of financial literacy and infrastructure, and geographical inaccessibility (mountainous terrains, archipelagoes, and so on).

The example of Cambodia's Bakong system demonstrates the effectiveness of technology to expand financial inclusion in places where financial penetration is poor but mobile penetration is high (Box 3.1).

[5] Eleven of the fourteen authorities provided, at least partially, both qualitative and quantitative inputs to the survey questions.

Box 3.1:

Cambodia's Bakong and Financial Inclusion: Advancing the Benefits of Digitalization

Cambodia has made progress in financial digitalization during the pandemic, as an element of its national strategy, with financial inclusion being a significant objective. Key strategies and policy frameworks[1] emphasize financial digitalization as a tool to increase access to financial services, maintain financial stability, accelerate economic development, and improve social welfare. Though the share of individuals (aged 15 or above) using digital financial services[2] has increased, Cambodia lags its peer countries (Table 3.1.1). The proportion of adults with bank accounts has improved but progress is slow in rural areas (Figure 3.1.1).

Financial digitalization expands access to financial services beyond traditional channels (BCBS 2024). Secure and accessible retail payment systems are vital for inclusion, with transaction accounts acting as gateways to credit, insurance, and savings (BIS and World Bank 2016). Digital payment histories help individuals and small businesses to access credit despite having limited financial records.

To advance this agenda, Cambodia's NBC has upgraded its national payment system (Figure 3.1.2),[3] notably through the 2020 launch of the Bakong blockchain-based platform (NBC 2020). Bakong integrates bank and mobile money accounts,[4] enabling real-time, low-cost, peer-to-peer transactions. It supports both KHR and USD, is interoperable across banks and payment service institutions through KHQR, and features a simplified know-your-customer process to expand access—especially in rural areas, among small businesses, and in agriculture.

Table 3.1.1. Financial Digitalization and Access to Formal Financial Services

	2017	2021	2024				
	KH	KH	KH	VN	TH	PH	SG
1. Has a bank or similar financial institution account (% of 15+)	22	33	39	71	92	50	98
2. Owns a debit card (% of 15+)	7	15	12	65	57	20	95
3. Made or received a digital payment (% of 15+)	16	26	32	62	83	40	95
4. Sent/received domestic remittances through accounts (% of 15+ remittance senders/recipients)	12	10	46	53	80	52	82
5. Received wages in cash only (% of 15+ wage recipients)	88	72	58	21	31	63	2

Source: World Bank's Global Findex Database 2021, 2025.
Note: (1)-(3): Percent of people aged 15 or above (15+); (4): Percent among remittance senders/recipients aged 15+; (6): Percent among wage recipients aged 15+. KH = Cambodia, PH = Philippines, SG = Singapore, TH = Thailand, VN = Vietnam. Underlined numbers are from 2021.

The authors of this box are Kuchsa Dy and Andrew Tsang.

[1] Key strategic frameworks include the Financial Sector Development Strategy 2016–2025, National Financial Inclusion Strategy 2019–2025, Cambodia Digital Economy and Society Policy Framework 2021–2035, and Cambodia Financial Technology Development Policy 2023–2028.

[2] In this context, digital financial services refers to digital services including debit and credit cards, digital payments, money transfer services for remittances, and digital wage receipts.

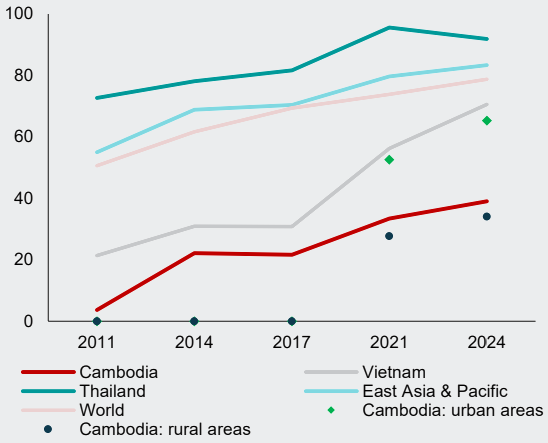
[3] The NBC has developed several payment systems: (1) National Clearing System (NCS), a deferred net settlement platform primarily facilitating banks' net settlements and fund transfers, (2) Online Banking System (OBS), providing online banking services for banking and financial institutions (BFIs) as well as government agencies, (3) FAST Payment System, enabling instant retail payments, with settlement occurring at the end of the day (KHR only), (4) Retail Pay System, supporting real-time fund transfers for both KHR and USD, with a QR payment component under development, (5) Cambodian Shared Switch (CSS), operating as a payment card scheme which allows ATM cards issued by one bank to be used at the ATMs of other banks, (6) Bakong Tourist App, streamlining transactions for travelers by linking their Bakong accounts to MasterCard or Visa cards, or by allowing funds to be added at participating banks.

[4] Popular payment service institutions such as Wing and TrueMoney have traditionally catered to unbanked and underbanked populations, particularly in rural and remote areas where formal banking infrastructure remains limited. These rely on low-cost and extensive physical agency networks and provide mobile accounts or e-wallets that are readily accessible because of KYC requirements have been simplified.

High mobile penetration has boosted the uptake of digital payments, while Bakong's cross-border functions[5] support remittances, trade, and tourism—further promoting account ownership and financial inclusion. By the end of 2024, Bakong reached 30 million users, and the number of KHQR-registered merchants grew to 4.5 million. Between 2022 and 2024, digital transaction value rose 67.7 percent to KHR 2,728.9 trillion (14.7 times GDP, up from 9.9 times GDP), with Bakong's share increasing from 7.0 percent to 22.2 percent (KHR 605.6 trillion), second only to mobile banking (31.8 percent) and ahead of e-wallets (17.2 percent of total digital transaction value) (Figure 3.1.3). Financial inclusion also improved: e-wallet accounts rose from 13.6 million to 20.7 million in number, and bank accounts from 12.7 million to 23.3 million (Figure 3.1.4).

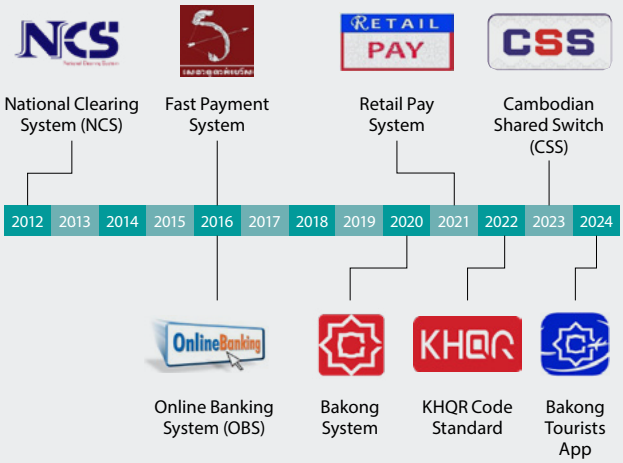
However, cash remains dominant, especially for paying wages (Table 3.1.1), resulting from the large informal sector. Expanding digital wage initiatives, such as IFC pilots in garments,[6] to sectors like hospitality could boost formal financial access. Persistent cash savings also point to trust and literacy gaps. Addressing these through financial education, consumer protection (e.g., deposit insurance), and stronger digital and cybersecurity frameworks will be key for sustainable, inclusive digital finance.

Figure 3.1.1. Percentage of Adults (15+) with Bank or Financial Institution Accounts
(Percent)



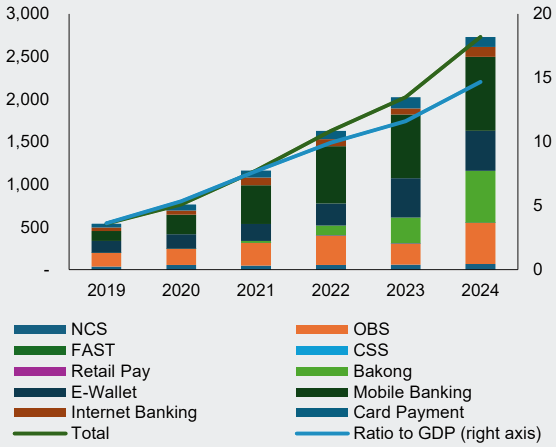
Source: World Bank's Global Findex Database 2021, 2025.

Figure 3.1.2. NBC's Payment System Infrastructure



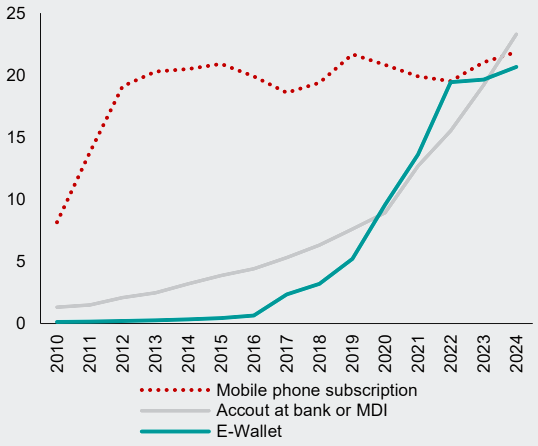
Source: National Bank of Cambodia; AMRO staff compilation.

Figure 3.1.3. Value of Digital Payment Transactions by Payment Systems
(Trillions of Cambodian riel; percentage of GDP)



Source: National Bank of Cambodia; AMRO staff calculation.
Note: Mobile banking transactions refer to digital transactions in mobile bank accounts through bank payment systems. E-Wallet transactions refer to digital transactions in e-wallet accounts through bank and financial institutions (BFIs) and the systems of payment service institutions. Refer to Figure 3.1.2 for payment systems abbreviations.

Figure 3.1.4. Number of Bank Accounts, E-Wallet Accounts, and Registered Mobile Subscriptions
(Number of accounts/subscriptions in millions)



Source: National Bank of Cambodia; CEIC.
Note: MDI = microfinance deposit-taking institution

[5] This includes interoperability with Union Pay, Alipay, and payment systems in Thailand, Lao PDR, Vietnam, Malaysia, and Korea, and the launch of the Bakong Tourist App.

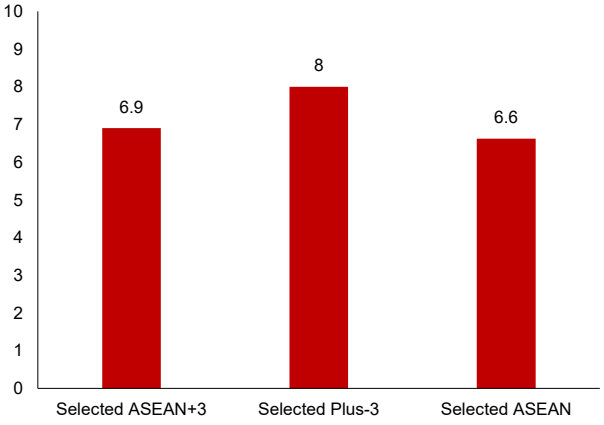
[6] Research by the International Finance Corporation and BSR's HERproject™(2022), "The Potential Gains of Digitizing Garment Sector Wages in Cambodia" found that digitizing wage payments in the garment sector could enhance supply chain efficiency while bringing large numbers of unbanked workers—especially women—into the formal financial system.

The COVID-19 pandemic accelerated digital adoption (Ong and others 2023), pushing both consumers and institutions to embrace online channels. Supportive regulatory frameworks, public investment in digital infrastructure, and rising financial and digital literacy have built trust and enabled rapid digital transformation across ASEAN+3.

Demand and supply factors, along with the policy objectives, are crucial for driving the digitalization efforts, yet progress is highly dependent on the enabling technologies. Table 3.2 provides a list of important technological innovations and their role in improving banking services. Our survey of ASEAN+3 authorities shows that most technologies listed in the table are used across the region, but authorities are especially intrigued by the immense potential of artificial intelligence and machine learning (AI/ML) and data analytics. They also highlight the increasing adoption of cloud-based solutions by financial institutions.

Figure 3.1. Selected ASEAN+3: Extent of Digitalization of Banking Services
(Scale of 1 to 10)

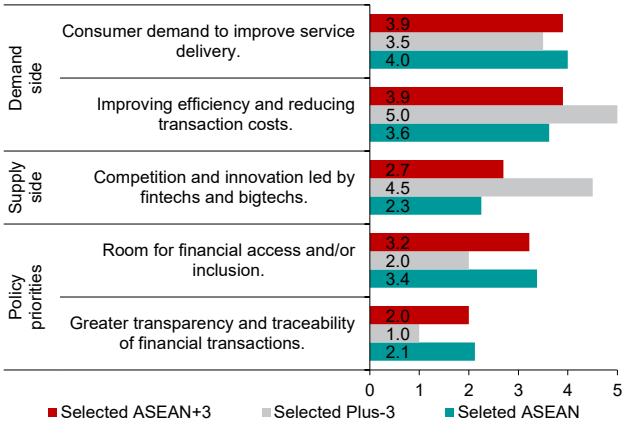
On average, the Plus-3 are more digitized than ASEAN economies.



Source: Authority Survey; AMRO staff compilation.
Note: Survey results for the question "On a scale of 1 (least) to 10 (most), how would you rate the extent of digitalization of banking services in your economy? Why?" *[Enter 10 if all the banking services listed in the context have been digitalized and 1 if none are digitalized].* Figures shown are the averages for the selected economy groups.

Figure 3.2. Selected ASEAN+3: Key Drivers of Financial Digitalization
(Ranked from 1 to 5 in significance)

Demand-side factors drive digitization across the region.



Source: Authority Survey; AMRO staff compilation.
Note: Survey results for the question "What are the drivers of digitalization of banking services in your economy?" *[Rank from 5 for most significant and 1 for least; enter NA for drivers that are not applicable].* Demand, supply and policy drivers are included in the survey, with respondents also able to input any other driver with its corresponding significance. The Figures shown are averages for the selected economy groups.

Table 3.1. ASEAN+3: Demographics and Penetration of Banking, Internet, and Mobile Services

Large tech-savvy consumers and unbanked populations drive financial digitalization in the region.

Economy	Unbanked Population (Percent)	Cash Transactions (Percent)	Card Transactions (Percent)	Number of ATMs per 100,000 adults	Internet Penetration (Percent)	Mobile Penetration	Median Age
Brunei	-	-	-	73.1	99	127	31.8
Cambodia	60.97	-	-	52.2	61	121	25.8
China	10.62	4.2	17.7	82.2	78	128	39.1
Hong Kong	2.69	7.6	52.4	46.7	96	319	46.2
Indonesia	43.67	36.4	20.5	50.5	69	125	29.8
Japan	1.48	36.3	38.9	109.6	87	178	49
Korea	3.11	6	66.3	245.2	97	162	44.5
Lao PDR	62.35	-	-	28.7	64	65	24.3
Malaysia	11.31	22	33.5	57.9	98	143	30.1
Myanmar	52.21	-	-	6.9	59	121	29.5
Philippines	49.82	39	24.3	30.1	84	117	25.3
Singapore	2.03	11.4	50.7	55.6	94	173	35.1
Thailand	8.18	28.4	14.3	113.5	90	169	39.7
Vietnam	29.45	32.8	18.1	30.9	78	131	32.4

Source: World Bank, Worldpay's Global Payments Report 2025; IMF Financial Access Survey (FAS); United Nations (UN); AMRO staff compilations.
Note:
1. Statistics on unbanked population are drawn from the World Bank's Global Findex Database 2025, which compiles surveys in countries and economies worldwide. The measure is based on the proxy "Account (%, 15+)", which measures the percentage of respondents who report having an account (by themselves or together with someone else) at a bank or similar financial institution or report personally using a mobile money service in the past year. All data refer to 2024, except for Myanmar, which is as of 2021.
2. Statistics on cash and card transactions are drawn from the Worldpay's Global Payments Report 2025. All data refer to 2024.
3. Statistics on the number of ATMs per 100,000 adults are drawn from the IMF's FAS. All data refer to 2024, except for Brunei (2021), Hong Kong (2023), Korea (2023), Lao PDR (2023), Japan (2023) and Myanmar (2019).
4. Statistics on internet penetration are drawn from the World Bank and refer to individuals using the Internet in 2023.
5. Statistics on mobile penetration are drawn from the World Bank and refer to mobile cellular subscription per 100 people in 2023.
6. Statistics on median age are drawn from the UN. All data are as of 1 July 2023.
7. Cells with "–" denote no data. The darker red shades indicate a stronger case for the use of financial digitalization.

Table 3.2. Technologies that Enable the Modernization of Banking Services

Technology	Description	Selected Examples of Use Cases
Cloud Computing	Cloud computing facilitates the on-demand delivery of IT services and resources through the internet through various deployment models, such as public, private or hybrid clouds. It helps banks with cost efficiency, operational flexibility, and scalability, and it offers robust security tools. Cloud adoption also reduces reliance on capital-intensive infrastructure, allowing banks to innovate and scale more rapidly.	• Migration and hosting of core banking system and IT infrastructure (Infrastructure-as-a-Service (IaaS) and Platform-as-a-Service (PaaS)). • Data analytics and applications (e.g., fraud detection, personalized customer insights, real time collaboration, GenAI tools), either through Software-as-a-Service (SaaS) or bank-developed models deployed through PaaS.
Application Programming Interfaces (API)	APIs are sets of rules and protocols that enable different software applications to communicate and interact. APIs generally provide stronger security than other data-sharing methods by shielding the internal architecture of systems and disclosing only selected information. APIs support the integration and interoperability of independent software applications, enabling digital resources to be unlocked from silos and made reusable across a range of contexts, while offering institutions greater control over the accessibility of data.	• Enables open banking third-party integration with fintechs (such as e-wallets and ride-hailing apps) to support account information sharing, payment initiation, and other embedded financial services. • Digital onboarding and Electronic Know Your Customer (e-KYC) by connecting to external databases such as national identification registries. • Bank integration with national payment systems for real-time transfers (e.g., PromptPay Thailand).
Mobile Technology	Mobile technology refers to the set of electronic devices, software, and wireless communication systems that enable users to access information, communicate, and perform services in real-time regardless of physical location.	• Smartphones and mobile networks allow on-the-go access to digital banking applications. • Built-in mobile cameras and biometrics technology (e.g., facial, fingerprint) support e-KYC functions.
Artificial Intelligence (AI)	AI refers to technologies that can perform tasks traditionally requiring human cognition such as prediction, classification, and decision-making. It is a broad umbrella encompassing machine learning, large language models (LLMs) and Generative AI (GenAI). AI enables banks to enhance efficiency, improve risk management, and deliver more personalized customer experiences at scale.	• Support administrative and operational processes (e.g., summarize reports, knowledge management). • Customer engagement and servicing (e.g., chatbots, personalized content, AI bank teller). • Compliance (e.g., transaction and fraud monitoring). • Core business activities (e.g., analyze factors for loan approval, portfolio construction and selection).
Digital Ledger Technology (DLT)	DLT refers to infrastructure and protocols that allow multiple participants across locations to propose, validate, and record transactions in a synchronized manner without relying on a central authority. Depending on their design, DLTs can offer strong security, high data integrity, with varying degrees of transparency. They often support programmability through smart contracts, which execute automatically when predefined conditions are met.	• Real-time cross-border payments and foreign exchange transactions (e.g., Project mBridge). • Cross-border clearing and settlement of local currency bonds (e.g., Project Tridecagon). • Trade finance and supply chain tracking.

Source: AMRO staff compilation from articles, reports and websites.

Benefits of digitalization in safeguarding financial stability

Digitalization not only addresses consumer demand and direct policy objectives, but it can also significantly improve financial sector resilience and help safeguard financial stability. Technology, with appropriate policy frameworks, strengthens compliance and risk management, makes reporting efficient, and helps identify real-time vulnerabilities.

Compliance and risk identification: Technology has helped automate and streamline compliance procedures such as Know Your Customer (KYC) and Anti-Money Laundering/Combating the Financing of Terrorism (AML/CFT), making them faster and more efficient. Biometric and advanced document verifications help establish customer identity, which may be verified using Application Programming Interfaces (APIs) to centralized databases, while Robotic Process Automation (RPA) collects customer information from various sources to automate compliance. Financial institutions are also leveraging technologies such as real-time analytics and automated monitoring systems that scan transactions for suspicious patterns using AI and machine learning algorithms. These algorithms can process large volumes of data, learn from historical trends, adapt to evolving threats, and improve their detection of suspicious activities, to improve both the accuracy and speed of risk identification (FATF 2021).

Cyber protection and business continuity: Robust cybersecurity practices protect financial institutions and their customers while enhancing the overall stability and resilience of the system. This reduces the risk of disruption from cyberattacks and maintains trust in digital financial services. Implementing multilayered detection controls—spanning people, processes, and technology—ensures that each layer is a safeguard for the others (BIS 2016). Technology also enables rapid response to potential breaches, minimizing the effect of cyber incidents. In addition, a well-designed business continuity plan can further reinforce the financial resilience of individual firms and the broader system.

Faster response and recovery: Beyond real-time monitoring and automation, advanced technologies can facilitate faster responses and recovery following a crisis. Cloud services, in particular, offer strong disaster recovery and business continuity capabilities for financial institutions. Features like redundancy, automatic backups, and data distribution help institutions recover from service disruptions and cyberattacks more effectively and efficiently (Uppaluri 2025). Technology-enabled innovations—regtech, when adopted by financial institutions for regulatory reporting and compliance purposes; suptech, when used by supervisory authorities to support supervision—can help financial regulators monitor the increasingly digitalized financial system and respond to incidents in real time. These technologies support early detection of regulatory breaches, enable the integration of broader data into stress testing, and enhance responsiveness to emerging risks such as liquidity imbalances—allowing authorities to act swiftly and decisively.

Functional resilience: One of the key policy objectives behind financial digitalization, especially in the emerging and developing economies, is to increase financial inclusion.[6] Beyond strengthening the financial resilience of consumers, financial inclusion also contributes to the overall resilience of the financial system. Integrating the unbanked and underserved into the formal financial system diversifies customer bases and reduces the concentration risks faced by financial institutions. For example, deposit inclusion can strengthen banks' resilience by attracting more stable retail deposits from individuals and small businesses (Ahamed and Mallick 2019). Similarly, credit inclusion supports loan diversification by spreading credit exposure across a larger number of small borrowers, thereby lowering banking risks, particularly in emerging markets (Naceur and others 2024). Furthermore, expanding access to financial services requires stronger safeguards—such as effective consumer protection and robust regulatory frameworks—which help build trust and promote greater financial system stability (Lin and Ashwin 2024).

III. The Evolving Ecosystem of Banking Services in ASEAN+3

Banking is undergoing a structural transformation as technology is reshaping the delivery of products and services and altering the market structure. Technology has disaggregated and reconfigured the traditional banking value chain, enabling new entrants, including nonbanks, to participate in the provisioning of banking services. The financial landscape in ASEAN+3 has four major types of private firms, which are key participants in the digitalization of banking services.

1. **Fintech firms (fintechs)** provide innovative financial products and services with their differentiated and customer-centric value propositions, collaborative business models, and cross-skilled and agile teams (McKinsey & Company 2023).

2. **Bigtechs**, or large technology companies, use their competitive advantage of tech expertise, access to large amounts of user data, and network effects within their ecosystem to provide an array of innovative financial services.

3. **Traditional banks** embrace digital transformation to adapt to changing customer preferences and competition, while staying up to speed with technological developments.

4. **Digital banks** have emerged in ASEAN+3 due to either a regulatory push or attempts by nonfinancial firms to diversify into banking services. They aim to bring together the advantages offered by fintechs and traditional banks.

While the private sector has innovated and invested significantly in digitalization, the public sector has also encouraged these efforts to foster innovation and achieve varied policy goals.

[6] Financial digitalization improves digital financial inclusion and can also increase the digital divide between countries that is due to demographics, digital and financial literacy, and access to technology. Within a country, the divide may exist between urban and rural populations, larger and small institutions, and so on.

Fintechs: Specialized Technology Solutions

Fintechs typically use an asset-light, technology-driven, and targeted strategy that allows them to address specific market inefficiencies in the banking value chain and deliver more accessible, efficient, and cost-effective solutions (BIS 2021; BCBS 2024). ASEAN+3 is at the forefront of financial digitalization and has made great progress in the past decade (ADB 2023; Ong and others 2023). The region has a thriving fintech landscape with ASEAN+3 cities steadily appearing among the top global startup ecosystems (Startup Genome 2025). Fintech investments in ASEAN-6[7] have been resilient (UOB, PWC, and SFA 2024) and the revenue projections for Asia are also stronger than the rest of the world, expected to grow 36 percent annually from 2024 to 2030 (Figure 3.3).

Payment solutions constitute the largest share of fintechs in ASEAN+3 operating in the banking and payments domain.[8] Besides payments, ASEAN fintechs (ex-Singapore) are focused on alternative lending, whereas Plus-3 and Singapore have more firms in wealthtech and insurtech solutions (Mittal and others 2016; Choi 2024; UOB, PWC, and SFA 2024; HKUST and others 2025; Singlife 2025). Alternative lending platforms cater to financially underserved segments, which aligns with the greater need for financial inclusion in ASEAN (ex-Singapore). In contrast, fintechs in most Plus-3 economies and Singapore focus on providing more sophisticated financial services.

The dominance of payment fintechs in ASEAN+3 is a result of high transaction volumes, relatively lighter regulatory requirements, and, in some cases, a strong push by the authorities (Pande and others 2025). Payment regulations focus largely on consumer protection and anti-money laundering and have lower guardrails (compared to banking) on prudential and capital requirements, thus reducing entry barriers. ASEAN+3 authorities undertook initiatives such as QR code standardization (e.g., SGQR, QRIS, KHQR) and developing digital payment infrastructures (e.g., PromptPay, PayNow, DuitNow), while providing targeted policy and regulatory support and engaging in public education to encourage cashless payments. These efforts have led to a significant rise in the share of cashless payments (Figure 3.4).

Fintech lenders in ASEAN play an important role in improving financial inclusion by broadening access to credit for underserved individuals and small businesses. Peer-to-peer (P2P) lending platforms connect borrowers with investors and use alternative credit evaluations for borrowers lacking credit or financial history.[9] Providers of Buy Now, Pay Later (BNPL) services offer short-term consumer credit at point of sale, often without requiring conventional credit checks. Some fintechs have also embedded their financial products and services within specialized nonfinancial services.[10] Separately, wealthtech and insurtech aim to reduce friction in the provision of wealth management and insurance products to an expanding number of consumers.

Most fintechs in banking and payments either directly compete with banks or provide services to banks,[11] but many can operate as "adjacent competitors"—i.e., providing services that banks have chosen not to offer. These fintechs add value to traditional bank products by helping improve customer engagement and tap new customer segments quickly (BCG and QED Investors 2022). For example, banks in Indonesia invest in P2P platforms to lend to customers who may have limited access to financial services. The P2P platform helps with customer onboarding, due diligence, credit evaluation, and loan disbursements and recovery, which allows the bank to expand its borrower base without taking up much operational overhead.

Bigtechs: Platform Integration

Large technology companies (or bigtechs) that specialize in nonfinancial products or services may use their ecosystems to seamlessly integrate financial services. They often leverage a large customer base, brand recognition, a strong financial position, access to a rich user data network effect (data-network-activities loop),[12] and ecosystem integration to generate synergies between the core product and the financial services to improve customer experience (Box 3.2). They deliver personalized services, reduce marginal costs, and reinforce user engagement to acquire, service, and retain customers and reduce frictions by offering a wide range of interlinked services in "super apps." The ecosystem integration also helps them serve underbanked segments, such as gig workers and small businesses.

---

7 Includes Indonesia, Malaysia, Philippines, Singapore, Thailand, and Vietnam.

8 These include fintechs that provide services directly competing with those provided by traditional banks—i.e., those providing services similar to banks to customers who are current or prospective banking sector clients. Therefore, it excludes banking tech, blockchain, digital asset and cryptocurrency platforms, and cybersecurity firms.

9 These can include a wide range of information, which can facilitate credit profiling. These may include demographics (age, gender, employment), geographical location (place of residence, place of work), transaction data (bill payment history, type, volume, and nature of financial transactions), and social media profiling (user preferences, potential income through social media, and so on).

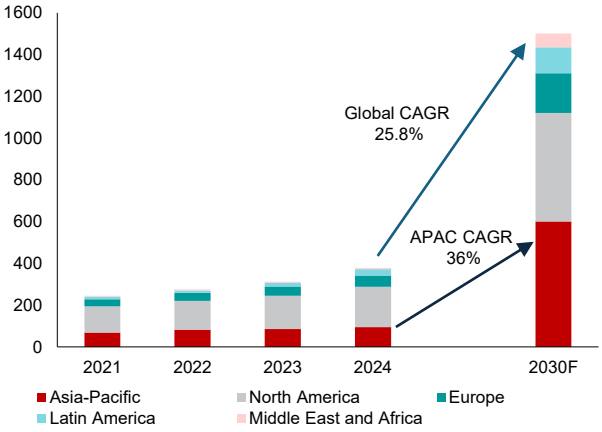
10 For example, a supply chain management solution may also provide working capital and purchase order financing.

11 These include, but are not limited to, marketing support, data and analytics, risk management, and other technological solutions.

12 Data analytics enhances user experience and attracts more users to participate in the platform of a big tech. The expanding user base amplifies cross-side network externalities, further enhancing the platform's value. When the number of users reaches a critical mass, the bigtech can roll out more service activities on the platform. This will generate more data and fuel the next round of the data-network-activities loop.

Figure 3.3. Selected Regions: Fintech Revenues
(Billions of US dollars)

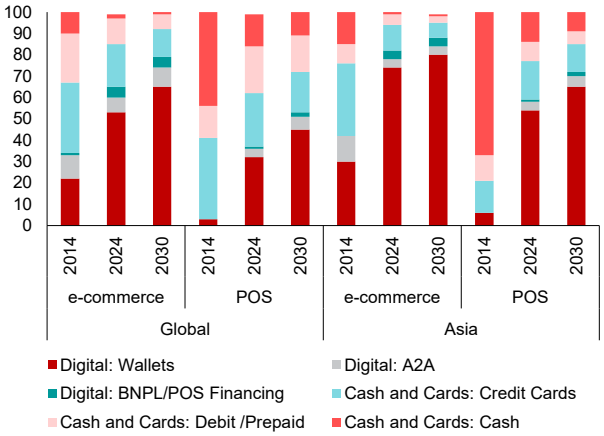
Asia fintech revenue projections remain stronger than the rest of the world and are expected to grow rapidly.



Source: Boston Consulting Group (BCG); AMRO staff calculations.
Note: 2021 values were back calculated from the 2030 forecast using the Compounded Annual Growth Rate (CAGR); 2023 values were obtained by linear interpolation.

Figure 3.4. Global and Selected Asia: Share of Payment Modes in E-commerce and Point of Sale Transactions
(Percent of total)

There has been a significant rise in the share of cashless payments, both globally and in Asia.



Source: WorldPay's Global Payment Report 2025; AMRO staff calculations.
Note: The data for 2030 are forecasts. Selected Asia includes Australia, China, Hong Kong, India, Indonesia, Japan, Malaysia, New Zealand, Philippines, Singapore, Korea, Taiwan Province of China, Thailand, and Vietnam. BNPL =Buy Now, Pay Later, POS = point of sale, A2A = Account to Account transfer.

Box 3.2:

Mobile Payment Solutions by Bigtechs in China

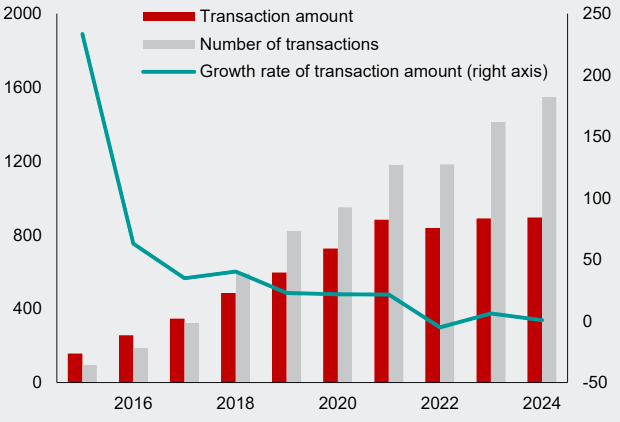
China has become a global leader in mobile payment adoption as digital transactions are now deeply embedded in everyday life. As of 2024, mobile payment transactions reached RMB 895 trillion—equivalent to 6.6 times the country's GDP—with a total of 1.55 trillion transactions recorded.[1]

Mobile payments started before 2010 but relied primarily on SMS and WAP protocols. In 2010, regulatory frameworks—most notably introduction of the "Nonfinancial Institution Payment Services Regulation" by the People's Bank of China—formally legitimized nonbank payment service providers (PSPs). This regulatory shift and increased smartphone penetration, drove exponential growth in the sector over the following decade (Figure 3.2.1). PSPs now account for about 80 percent of total digital payment transaction volumes in recent years (Figure 3.2.2).

Infrastructural inadequacies and device compatibility constraints made it a struggle for early bank-led initiatives to scale up.[2] In contrast, third-party platforms achieved rapid and widespread adoption by strategically integrating payment functionalities into existing digital ecosystems. Alipay leveraged the e-commerce infrastructure of Taobao, while WeChat Pay capitalized on Tencent's extensive social media network—making them the dominant players in the mobile payment landscape.[3] Mobile payments have since integrated into the financial ecosystems and transformed the operations of nonbank financial institutions in China. Alipay and WeChat Pay have evolved into multifunctional financial service platforms, offering a diverse portfolio of services including micro-lending, wealth management, and insurance products. Huabei, Alibaba's consumer credit product, caters to about 20 percent of China's consumer credit market. Its user base is largely young and has expanded credit access across urban and rural demographics.[4] Alipay and WeChat Pay's micro-lending products are linked to the People's Bank of China's credit registry, helping build formal credit histories.

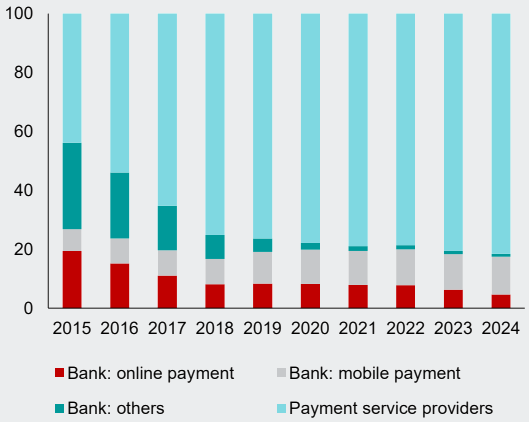
Yu'e Bao, launched by Alipay and Tianhong, saw its user base grow tenfold in five years, with AUM peaking at RMB 1.58 trillion in 2017. Regulatory tightening later reduced its market share from 67 percent to 38.2 percent, but it played a key role in improving financial literacy and lowering entry barriers to financial participation.[5] Alipay and WeChat Pay have also expanded into cross-border payments, supporting Chinese users abroad and foreign visitors to China. WeChat Pay now supports 31 currencies across 74 economies, and Alipay operates in over 70 economies through 36 PSP partners—enhancing accessibility for retail and small business transactions.

Figure 3.2.1. Mobile Payment Development
(Trillions of RMB/ number in 100 million; Percent)



Source: People's Bank of China; AMRO staff calculations.

Figure 3.2.2. Share of Digital Payment by Institution Types (by number of transactions)
(Percent)



Source: People's Bank of China; AMRO staff calculations.
Note: Other forms of banks' digital payment include telephone payments, ATM, and POS-based payments.

The authors of this box are Yang Jiao and Chenxu Fu.

[1] Digital payments, the broadest category under People's Bank of China definitions, include both bank and nonbank payment service providers (PSPs). For banks, this covers online, mobile, telephone, ATM, and point of sale payments; for nonbank PSPs, payments are predominantly mobile based. Mobile payment here refers to the sum of bank transactions conducted through mobile and total payments facilitated by nonbank PSPs.

[2] In 1999, China Mobile, the Industrial and Commercial Bank of China, and China Merchants Bank piloted SMS-based services in Guangdong.

[3] In 2024, Alipay and WeChat Pay accounted for 55 percent and 39 percent of total mobile payments.

[4] Notably, 60 percent of these users are geographically distributed across third-tier and lower-tier cities.

[5] The proportion of urban residents utilizing internet financial services increased from 8.5 percent in 2013 to 72.3 percent in 2024 (People's Bank of China 2025).

Shaping Consumer and Business Behavior

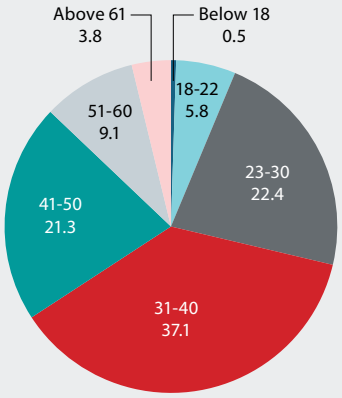
Mobile payments in China have been widely adopted, led by users aged 18–40 but with uptake rising among people aged over 40 (Figure 3.2.3). Use spans various contexts, with high penetration rates in food services, transportation, and public services (Figure 3.2.4). In urban areas, mobile payments, integrated with platforms, have accelerated the shift toward a cashless economy. In rural areas, they have boosted financial inclusion, with 77.5 percent of rural internet users adopting the technology (Payment and Clearing Association of China 2023). Mobile payments support rural revitalization. For micro, small and medium-sized entrepreneurs, PSPs have reduced operational barriers and improved market and credit access.[6]

Regulation for Emerging Risks

Mobile payment platforms in China advanced financial inclusion and grew into multifunctional ecosystems. In recent years, China has tightened regulation on mobile payment giants to manage the systemic and consumer risks associated with their rapid expansion. In response to growing financial risks, regulators designated large fintech firms as financial holding companies, subjecting them to capital and governance requirements comparable to those for banks. To address credit opacity and data monopolies, authorities also mandated that platform-generated consumer credit data be submitted to the central credit registry.

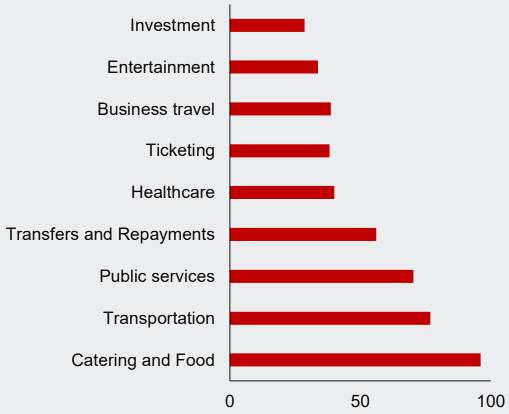
Regulations also address anti-competitive practices by prohibiting exclusive partnerships and mandating QR code interoperability, promoting a level playing field among PSPs. Oversight of money market funds has been tightened to mitigate liquidity and shadow banking risks. Cross-border payment services are now subject to enhanced know-your-customer and compliance standards. Key regulatory priorities include credit data integration, interoperability, and oversight of embedded financial products.

Figure 3.2.3. Distribution of Mobile Payment Usage by Age, 2023
(Percent)



Source: China Payment and Clearing Association.

Figure 3.2.4. Distribution of Mobile Payment Usage by Scenario, 2023
(Number of accounts/subscriptions in millions)



Source: China Payment and Clearing Association.

[6] Research indicates that more than 80 percent of small-scale merchants have adopted digital payment and credit instruments, with many leveraging platform-generated analytics to improve operational efficiency and strategic decision-making (Webank and Postal Savings Bank 2022).

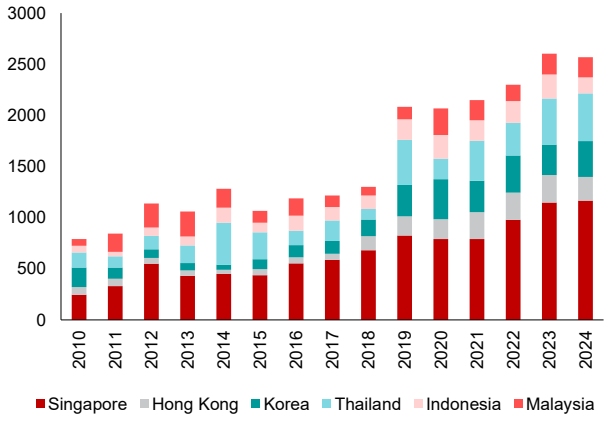
Traditional banks: Digital Metamorphosis

Traditional banks in ASEAN+3 have also increased their investment (Figure 3.5) in technology upgrades as they seek higher efficiencies, improved customer acquisition and retention, faster time to market, and higher balances in current and savings accounts (McKinsey & Company 2023).[13] They are adding more digital channels for customer engagement and are actively upgrading their core banking functions to fit their transformation goals. The use of omnichannel banking has led to a reduced number of ATMs and branches needed to serve their customers (Figure 3.6). Meanwhile, many ASEAN+3 authorities are encouraging digital-only and digital banks.

Some of the important changes being made to legacy IT systems include using cloud technologies to improve cost efficiency and roll out of new offerings faster, RPA to automate tasks and streamline processes, biometric technologies to improve security, and APIs for sharing data. Banks are also exploring the potential of AI/ML for use cases such as chatbots for 24/7 customer support, robo-advisors for investment advice, transaction screening for fraud detection, credit scoring, and offering personalized services to their customers. A few banks are looking into the use of distributed ledger technology (DLT) for tokenization of assets and deposits and other purposes such as payment, though DLT activities remain a small fraction of the market (BCBS 2024). Traditional banks also seamlessly partner with external firms using open banking to securely share data and services. These partnerships allow each party to leverage unique strengths and help banks reduce costs, accelerate innovation, and better meet evolving customer expectations.

Figure 3.5. Selected ASEAN+3: Investments by Banks in Technology
(Billions of US dollars)

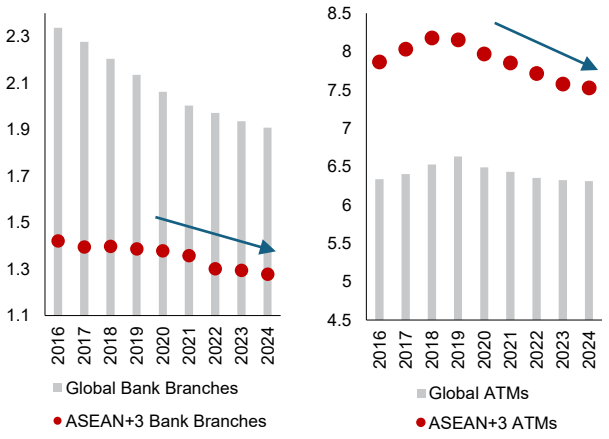
Banks in most economies have increased their technology expenses.



Source: Company balance sheets; AMRO staff calculations.
Note: Includes software additions (or the closest approximation) under intangible assets available in the three largest banks (by assets) of each of the markets.

Figure 3.6. Global and Selected ASEAN+3: Bank Branches and ATM Penetration
(Number per million adults)

Banks have reduced the number of branches and ATMs in recent years.



Source: IMF Financial Access Survey (FAS); AMRO staff compilation.
Note: The number of bank branches in ASEAN+3 excludes Brunei, Lao PDR, and Myanmar due to data unavailability. For Hong Kong, Japan and Korea, 2023 figures are used as proxies as 2024 data are not yet available. The number of ATMs in ASEAN+3 excludes Brunei and Myanmar due to data unavailability. For Hong Kong, Japan, Korea, and Laos, 2023 figures are used as proxies as 2024 data are not yet available.

Public Sector: Promoting Innovation to Pursue Policy Objectives

The public sector, including ASEAN+3 authorities and international organizations, have also led various initiatives to enable financial digitalization and promote innovation.

- The major contribution of the authorities has been in providing a conducive environment for financial digitalization. Steps have included modernization of compliance and regulatory processes (e-KYC, online AML/CFT), providing centralized, shared infrastructure (such as credit databases, identity verification, payment systems), providing safe testing grounds for new products and services (sandboxes, pilots), and encouraging the establishment of digital banks.

[13] Balances held in current and savings accounts are the least expensive for banks as they pay interest rates much lower than term deposits. Banks enjoy higher balances in current and savings accounts if they can embed various daily transaction services in their application. Depositors will maintain higher balances to seamlessly conduct daily transactions without worrying about the availability of funds.

- Many jurisdictions are establishing open banking and API infrastructures to give customers greater control over their own data while encouraging digital and data-driven innovation. In Malaysia, the development of a proposed regulatory framework and infrastructure to enable Open Finance is underway. However, this shift toward increased data sharing among financial institutions, services providers, and customers requires new regulatory considerations around data privacy, consent management, and cybersecurity (Kijang 2025). In Thailand, Project "Your Data" aims to let consumers share their financial and nonfinancial data with third-party service providers, based on consent.[14]

- Many ASEAN+3 economies have developed domestic FAST payment systems and cross-border links. ASEAN launched the Regional Payment Connectivity initiative to enable cooperation in cross-border payments. Various regional authorities, with support from the Bank for International Settlements (BIS), set up Nexus Global Payments, a system to provide multilateral payment connectivity to member economies (Pande and others 2025).

- Central banks have continued exploring the use of central bank digital currencies (CBDCs), along with their implications for financial stability and cross-border payments, and uses for wholesale and retail applications. Notably, the Philippines launched a wholesale CBDC pilot (BSP 2023) and China expanded its e-CNY pilot to test cross-border interoperability (HKMA 2024). Thailand concluded its retail CBDC pilot program (BOT 2024). Multiple ASEAN+3 central banks have also participated in many cross-border CBDC (or DLT) projects such as Dunbar (MAS 2022), mBridge (BISIH 2022), Stella (BOJ 2020), and Ubin (MAS 2020).

- Regulators acknowledge the potential of AI, including Generative AI (GenAI) and large language models (LLMs) in financial services but remain cautious about the risks. They have permitted low-risk AI use cases to improve customer experience, risk management, and operational efficiency. These applications include chatbots, real-time fraud and abnormal transaction detection, remote account opening, and automating administrative tasks such as proofreading and internal analysis (FSC 2024; HKIMR 2025).

IV. The Emergence of Digital Banks in ASEAN+3

Digital banks have emerged globally in response to technological innovation, regulatory reform, and consumer interest in more accessible and user-friendly banking services. Unlike traditional bricks-and-mortar banks, fully digital banks operate without physical branches[15] and deliver services entirely through digital channels such as mobile apps and internet platforms. This results in lower operating costs than traditional banks, which allows digital banks to charge lower fees and usually offer higher deposit rates.

Digital banks in ASEAN+3 generally serve dual objectives—financial inclusion and fintech innovation. The push for digital banking is linked closely to improving access for the unbanked and underserved small businesses and individuals, as well as increasing competition by modernizing banking services and fostering fintech innovation. While these are the overarching objectives for all ASEAN+3 authorities, China, Hong Kong, Indonesia, Malaysia, the Philippines, Thailand, and Vietnam have emphasized more on financial inclusion while Japan, Korea, and Singapore are relatively more focused on increasing competition by modernizing banking services and fostering fintech innovation.

ASEAN+3 regulators have adopted pragmatic and adaptive licensing frameworks for digital banks. Korea, and the Philippines treat digital banks and traditional banks differently and issue dedicated digital bank licenses, while Hong Kong issues the same license as traditional bank with some tailored supervisory requirements and conditions. These digital banks can start offering the full suite of banking services as soon as they obtain the license. Malaysia, Singapore, and Thailand implement structured licensing frameworks, beginning with restricted operational phases with simplified regulatory framework to ensure stability and regulatory compliance, and for the banks to test-and-learn as they scale up their businesses, before allowing full-scale operations. Indonesia, Japan, and Vietnam do not issue digital banking licenses. While digital banks in Indonesia operate under the existing tiered banking licensing framework, they provide more digitalized services than the traditional banks. In Vietnam, incumbent digital banks do not have separate licenses and need to partner with traditional banks to offer financial products and services. Table 3.3 compares the licensing frameworks across ASEAN+3 digital banks.

[14] "Your Data" Project aims to develop mechanisms that enable individuals and businesses to exercise their rights to digitally transfer their data, both in the financial and non-financial sector, to financial service providers in order to receive better, more personalized services, thereby becoming a key infrastructure for the digital financial system and enhancing financial services. (BOT 2025)

[15] In some jurisdictions, such as Hong Kong, digital banks are permitted to have physical branches to serve customers where in-person interactions are still preferred or required. In contrast, Indonesia does not differentiate between traditional and digitalized banks, due to which many of them have physical branches for legacy or business reasons. Japan does not prohibit digital banks from establishing branches, but these banks have chosen not to maintain any physical branches.

Table 3.3. Digital Banks in ASEAN+3

Country	Licensing Framework	Key Players	Primary Objective
China	Full bank licenses for digital banks	WeBank (Tencent), MYbank (Ant), XWBank	Serve SMEs and underbanked using tech-driven models
Hong Kong, China	Full bank licenses for digital banks	ZA Bank, Mox, WeLab, Fusion, Livi Bank, PAO Bank, Ant Bank (Hong Kong), Airstar.	Promote fintech and innovation, offer new customer experience and promote financial inclusion
Japan	No separate digital bank licenses; digital banks operate under traditional model	Rakuten Bank, Minna Bank, au Jibun Bank, Sony Bank, Paypay Bank	Modernize retail banking, enhance user experience
Korea	Internet-only bank licenses issued (2017)	KakaoBank, K Bank, Toss Bank	Promote competition and innovation
Indonesia	No separate digital bank licenses	Bank Jago, Blu by BCA Digital, SeaBank, Bank Neo Commerce	Serve unbanked/ underbanked, MSMEs' financing
Malaysia	Digital bank licenses (2022)	GXBank, AEON Bank, Boost Bank, KAF Digital Bank, Ryt Bank	Expand financial inclusion, especially underserved groups
Philippines	Digital bank licenses (2020)	Maya Bank, OFBank, Tonik Digital Bank, GoTyme Bank, UNObank, UnionDigital Bank	Improve financial inclusion, digitalize payments
Singapore	Full bank or wholesale bank licenses for digital banks (2020)	Trust Bank, GXS Bank, MariBank, GLDB, ANEXT Bank	Promote competition and innovation
Thailand	Virtual bank licenses (2025)	Three major consortiums led by Krungthai Bank, SCB X, and Ascend Money to launch virtual banks in 2026	Enhance financial inclusion, competition and innovation
Vietnam	No separate digital bank license, digital-only banks operate under the license of their sponsoring commercial banks	Timo, TNEX, Cake	Drive digital financial inclusion

Source: Bank's websites; central bank websites; news articles; reports; AMRO staff compilation.
Note: MSME = micro, small, and medium-sized enterprises; SME = small and medium-sized enterprises.

In ASEAN+3, digital banks are primarily established (Figure 3.7) by:

- **Bigtechs:** Ownership of digital banks enables seamless integration of payments and credit services within their apps, making transactions highly convenient and driving efficient customer acquisition.

- **Fintechs:** Acquiring digital bank licenses allows fintechs to expand beyond niche services like payments or lending, using their initial customer base to offer a broader range of financial products and capture more value along the financial services chain.

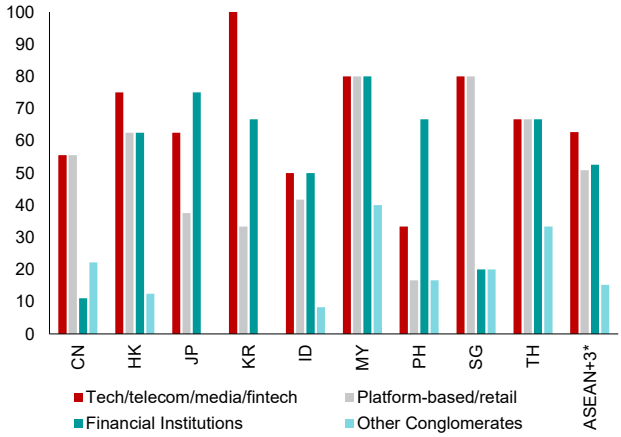
- **Incumbent banks:** A digital subsidiary allows incumbent banks to focus on high-value clients through physical channels, while serving the mass market more cost-effectively through technology. It helps onboard underserved segments and acts as a low-risk pilot for broader digital transformation.

ASEAN+3 is at the frontier of technology and financial services convergence, which is enabling ecosystem-based digital banking. This is where digital banks are embedded within a broader digital environment—typically built by bigtechs, platform companies, or super apps—that integrates financial services with nonfinancial offerings such as e-commerce, ride-hailing, food delivery, social media, and lifestyle service and uses the collection of high frequency transaction data to provide personalized services to customers. Examples of ecosystem-based digital banking include WeBank (the Tencent ecosystem) and MYbank (Ant/Alibaba) in China, KakaoBank (Kakao ecosystem) and K Bank (KT telecom ecosystem) in Korea, GXS (Grab-Singtel) in Singapore, SeaBank (Shopee) in Indonesia, and Maya in the Philippines.

Digital banks remain a small but growing segment of the ASEAN+3 banking system. With the exception of Korea, the market share of digital banks remains below 1 percent of total assets, loans, and deposits across the region (Figure 3.8), reflecting the position of incumbent banks, later market entry, and caution by regulatory authorities. That Korean digital banks are early movers can be attributed to the country's earlier start in licensing internet-only banks and platform integrations. Rapid growth is evident in continued expansion of digital banks' deposits and loans across the region, especially in the earlier years of operation (Figures 3.9 and 3.10). For markets where digital banks are more mature, such as China and Korea, growth has become less aggressive but still remains firm.

Figure 3.7. Ownership Patterns of ASEAN+3 Digital Banks
(Percent)

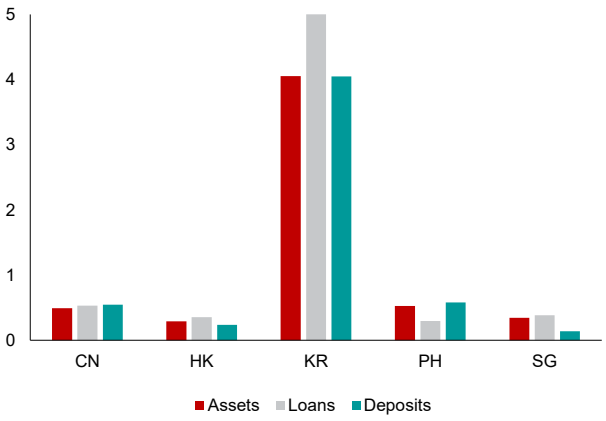
Digital banks in the region are primarily established by bigtechs, fintechs, and traditional banks.



Source: Digital bank websites; AMRO staff compilation.
Note: Bars show the percentage of digital banks in each economy/region that have at least one shareholder in each of four categories: 1. Tech/Telecom/Media/Fintech firms; 2. Platform-based or retail groups; 3.Financial institutions (banks, insurers, investment firms); 4. Other conglomerates, which are diversified groups excluding those whose primary businesses are in tech, telecom, media, fintech, retail, or financial services. Because many digital banks have multiple shareholders spanning more than one category, the category shares for an economy/region can sum to more than 100 percent. CN = China; HK = Hong Kong; JP = Japan; KR = Korea; ID = Indonesia; PH = Philippines; SG = Singapore; TH = Thailand. ASEAN+3* include China, Hong Kong, Japan, Korea, Indonesia, Philippines, Singapore and Thailand.

Figure 3.8. Market Share of Digital Banks
(Percent of banking system)

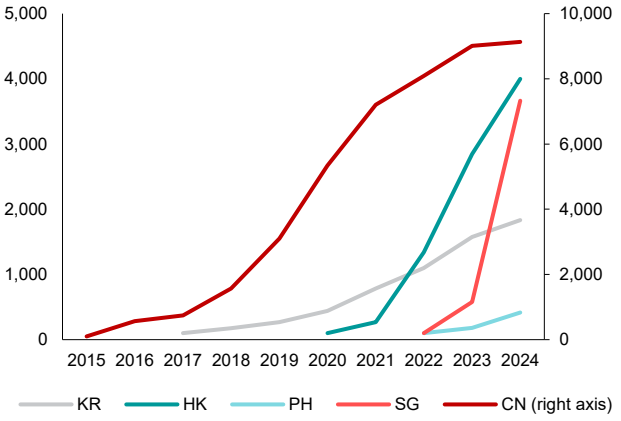
The size of digital banks' assets, loans, and deposits remain small compared to traditional banks.



Source: National authorities, Moody's BankFocus; CEIC.
Note: For cross-country comparability, total banking system size refers to the total assets, loans, and deposits of commercial banks only. Specialized government credit institutions, savings banks, cooperative banks, microfinancing institutions, and foreign branches are excluded. For PH, banking system refers to universal and commercial banking groups. CN = China; HK = Hong Kong; KR = Korea; PH = Philippines; SG = Singapore.

Figure 3.9. Selected ASEAN+3: Growth of Digital Bank Customer Deposits
(Index, first operating year = 100)

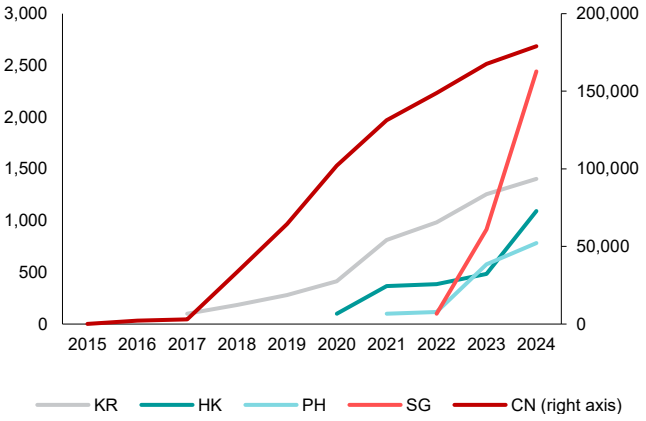
Digital banks have rapidly scaled customer deposits…



Source: Moody's BankFocus, AMRO staff calculations.
Note: Outliers from first year full-year growth are omitted. CN = China; HK = Hong Kong; KR = Korea; PH = Philippines; SG = Singapore.

Figure 3.10. Selected ASEAN+3: Growth of Digital Bank Loans
(Index, first operating year = 100)

…accompanied by a corresponding growth in loans.

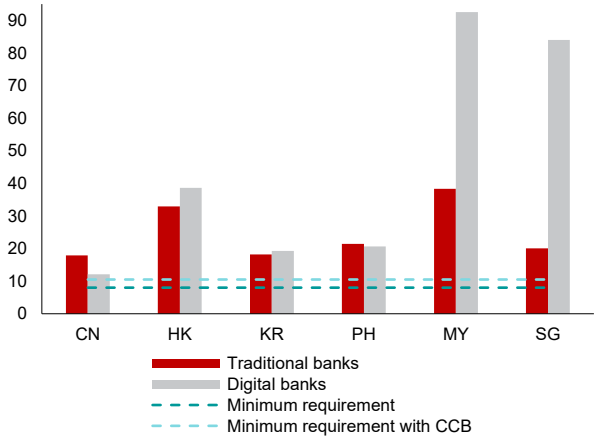


Source: Moody's BankFocus, AMRO staff calculations.
Note: Outliers from first year full-year growth are omitted. CN = China; HK = Hong Kong; KR = Korea; PH = Philippines; SG = Singapore.

Digital bank capital and liquidity buffers generally remain strong. Digital banks report significantly higher capital adequacy ratios (CARs), exceeding 80 percent in Malaysia and Singapore, where digital banks are more recently established (Figure 3.11). High CARs reflect early-stage development with limited lending activity and large initial capital injections. Strong capital positions provide an important safeguard as digital banks scale up and take on more credit and operational risks. Similarly, newer digital banks, particularly in Malaysia and Singapore, maintain high liquidity ratios (Figure 3.12), which provide a buffer against sudden deposit outflows. However, high capital and liquidity buffers will likely gradually normalize as digital bank balance sheets grow, and lending activities continue to expand. As these banks move into riskier lending segments and scale up operations, their capital positions may come under pressure, particularly given their currently weak profitability and reliance on subsidized offerings to gain market share.

Figure 3.11. Selected ASEAN+3: Capital Adequacy Ratio (CAR) by Bank Type
(Percent of risk-weighted assets)

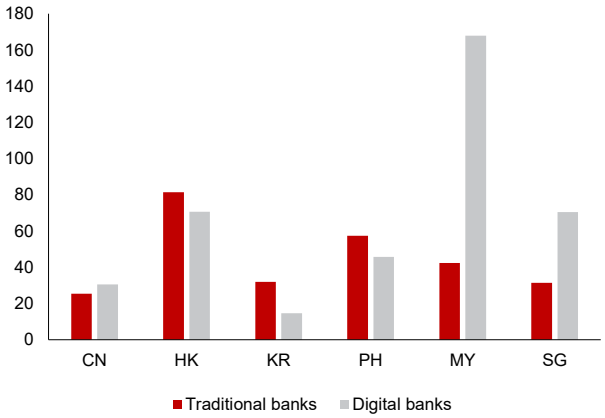
Digital banks' strong capital buffers enable them to scale up operations and absorb early-stage risks.



Source: Moody's BankFocus; AMRO staff calculations.
Note: As of the end of 2024. CN = China; HK = Hong Kong; KR = Korea; PH = Philippines; MY = Malaysia; SG = Singapore; CCB = capital conservation buffer

Figure 3.12. Selected ASEAN+3: Liquid Assets by Bank Type
(Percent of total deposits)

Newer banks maintain higher liquidity buffers to guard against rapid deposit outflows.



Source: Moody's BankFocus; AMRO staff calculations.
Note: As of the end of 2024. Recently established digital banks omitted from compilation. CN = China; HK = Hong Kong; KR = Korea; PH = Philippines; MY = Malaysia; SG = Singapore.

V. Key Risks to Financial Stability from Digitalization of Banking Services

Digitalization could increase some financial stability risks or change their nature and distribution. Our survey of country authorities showed that operational risks, such as cybersecurity and fraud, are the most pronounced, followed by systemic risks. Plus-3 policymakers are more concerned about liquidity risks whereas ASEAN policymakers focus more on credit and business risks (Figure 3.13). Most respondents ranked procyclicality risks as lowest.

Operational risks

Operational risk is the risk of loss resulting from inadequate or failed internal processes, people and systems, or from external events (including legal risk but excluding strategic and reputational risks). Technology improves the efficiency and speed of operations and reduces the overall operational risks. However, it also introduces or increases other operational risks such as higher incidence of cyber risks, elevated risks of digital fraud, and model risk, and may function as a channel to amplify other nonoperational risks.

Cyber risk

Digitalization improves cybersecurity but also increases the number of digital touchpoints, potentially increasing cyber risks.[16] Cyber incidents with a malicious intent (i.e., cyberattacks) to steal, cause damage, or to disrupt have increased in the past decade across the world (Figure 3.14). Reported cyberattacks in ASEAN+3 have also been on an upward trend since 2014, with the financial industry increasingly targeted (Figure 3.15).

[16] Cyber incidents are defined as a cyber event that adversely affects the cybersecurity of an information system or information the system processes, stores, or transmits whether resulting from malicious activity or not. Cyber risk is the combination of the probability of cyber incidents occurring and their impact (FSB 2023).

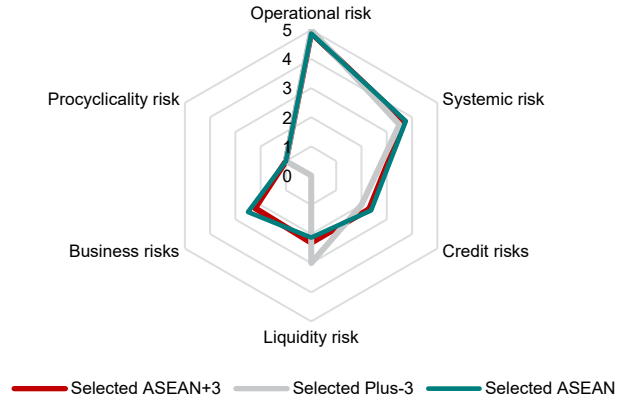
Cyberattacks against the financial sector are predominately exploitative; that is, to access and steal sensitive information such as personal identification information or financial assets. However, mixed motives, where cyberattacks have sought both to steal and disrupt financial firms' operations, appear increasingly frequent since 2020 (Figure 3.16).

Cyber incidents causing data breaches or disruption of services can cause direct operational losses from legal costs and additional investments in IT. Financial institution can also suffer reputational loss which leads to decreased franchise values (Kamiya and others 2021). A fall in franchise value because of a cyberattack can be nontrivial (Figures 3.17 and 3.18).[17] ASEAN+3 bank's average stock market losses, estimated using a market model, ranged from approximately -0.4 percent to -1.2 percent (depending on the estimation window) following cyberattacks during 2014–2023. Unadjusted market losses are larger and range from approximately -0.7 percent to -2.4 percent. Cyber incidents unrelated to cyberattacks, such as human coding errors during maintenance or software bugs, can also result in reputational, market, and regulatory risk (Box 3.3). Cyber incidents may also increase liquidity risks as they can lead to deposit outflows from a loss of confidence in the safety of deposits (Gogolin and others 2025).

While ASEAN+3 has yet to face systemic risks from cyber incidents, it is important to understand the channels through which cyber risks can also amplify systemic risk. These are erosion of confidence, lack of substitutes, and interconnectedness (Adelmann and others 2020). Cyber incidents can erode confidence in the banking sector's ability to safeguard against cyber threats, leading to systemwide "cyber runs" (Duffie and Younger 2019). Second, cyber incidences at institutions or services that are not easily substitutable can amplify systemic risks. For instance, the failure of key cloud services or payment systems can have cascading effects and increase liquidity risks in the system (Kotidis and Schreft 2024).[18] Lastly, interconnectedness of the banking systems through technological or financial linkages could also lead to systemic failures in the event of severe cyberattacks.

Figure 3.13. Selected ASEAN+3: Risks Posed by Digitalization
(Risk ranking)

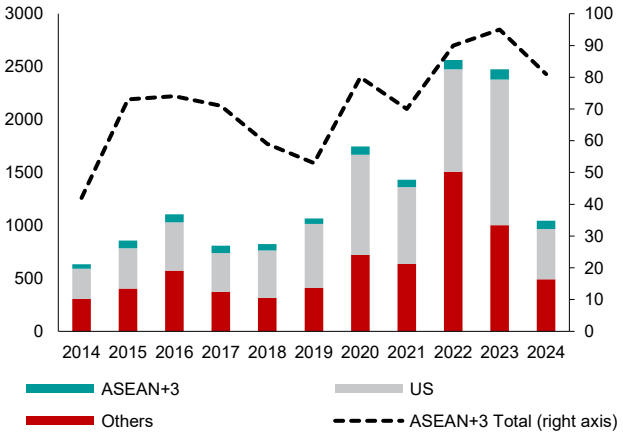
Operational risk is seen as the most significant risk.



Source: Authority Survey; AMRO staff compilation.
Note: Survey results for the question "Based on your qualitative assessment, please rank the following risks posed by the digitalization of banking services." The spiderweb shows the average risk rankings for the various economy groups for each specific risk, with 5 carrying the most risk and 1 the least.

Figure 3.14. Worldwide: Total Number of Cyberattacks
(Worldwide; in ASEAN+3)

Cyberattacks have increased significantly in the past decade.



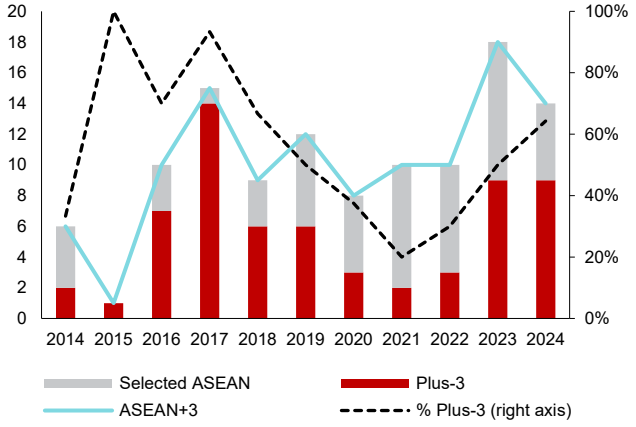
Source: Center for International and Securities Studies at Maryland (CISSM) Cyber events database; AMRO staff calculations.
Note: The data collected by CISSM relies on scraping publicly available data, the data could be biased toward large, developed economies. In addition, count data might also be underreported for recent years (e.g., 2024) as cyberattacks that occurred might only be revealed or reported in future. ASEAN+3 = Cambodia, China, Hong Kong, Indonesia, Japan, Korea, Lao PDR, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Vietnam.
Others = all economies less ASEAN+3 and US.

[17] Figure 3.17 contains eight cyberattacks in selected ASEAN+3 economies (Malaysia, Thailand, and Indonesia) from 2014–2023. Bank abnormal returns are calculated using the market model. The model's parameters are estimated using 220 trading days of return data beginning 280 days before and ending 61 days before the cyberattack, with the market index being the stock market index of the economy in which the cyberattack occurred. Daily abnormal returns are then cumulated to obtain cumulative abnormal returns for various windows (0, -2), (0, -3), (0, -4), (0, -5). Normal returns are cumulative unadjusted stock market returns. Solid bars represent significance at the 10 percent level. Figure 3.18 presents the data again, excluding an outlier.

[18] Kotidis and Schreft (2022) study the effects of a multiday cyberattack on a technology service provider that led to banks being unable to send payments over Fedwire. This caused counterparty banks to receive fewer payments, increasing their liquidity risk. Unaffected banks thus had to increase their borrowing from either the discount window or the federal funds market. Eisenbach and others (2022) also show that if one of the top five banks in the US were hacked and unable to make payments, 38 percent of network would be impaired, leading to liquidity shortages at counterparties. In turn, these counterparties hoard liquidity, further amplifying liquidity shortages in the financial system.

Figure 3.15. ASEAN+3: Cyberattacks in Finance and Insurance Industry
(Number; Percent of Plus-3 as a share of ASEAN+3)

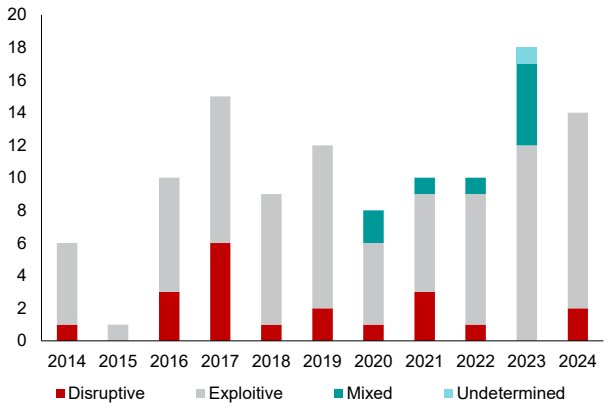
Cyber risks in the financial sector have increased over time for the region.



Source: Center for International and Securities Studies at Maryland (CISSM) Cyber events database; AMRO staff calculations.
Note: Plus-3 = China, Hong Kong, Japan, Korea. Selected ASEAN = Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Singapore, Thailand, Vietnam.

Figure 3.16. ASEAN+3: Cyberattacks in Finance and Insurance Industry by Type
(Number)

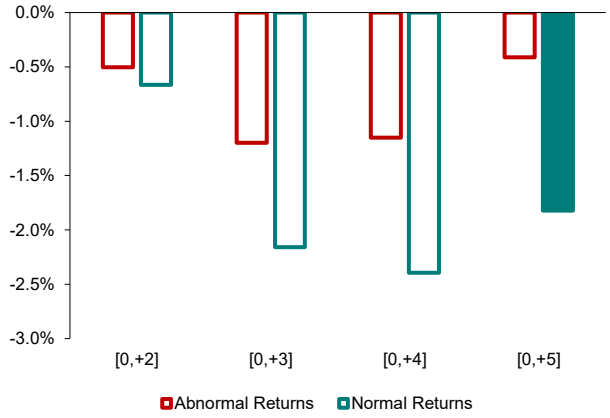
Cyberattacks targeting the financial sector are predominantly exploitative in nature.



Source: Center for International and Securities Studies at Maryland (CISSM) Cyber events database; AMRO staff calculations.
Note: Sample includes ASEAN+3 economies; Cambodia, China, Hong Kong, Indonesia, Japan, Korea, Lao PDR, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Vietnam. Disruptive cyberattacks impede the firm's normal operations. Exploitative cyberattacks illicitly access or exfiltrate sensitive information such as personal identifiable information, classified information, or financial data. Mixed cyberattacks incorporate both disruptive and exploitative elements, such as ransomware attacks.

Figure 3.17. ASEAN+3: Stock Market Losses from Cyberattacks on Banks (Full Sample)
(Percent)

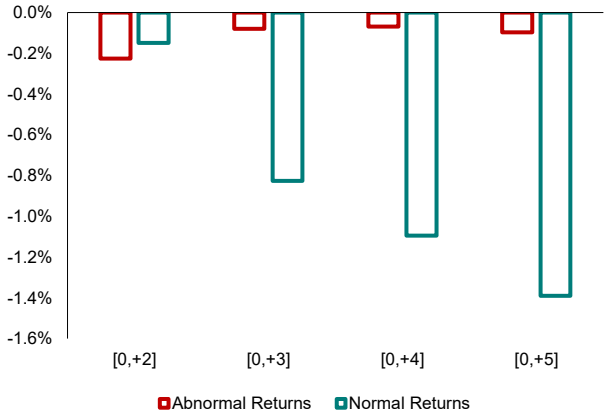
Market losses from cyberattacks range from -0.4 to -2.4 percent.



Source: Bloomberg Finance L.P.; AMRO staff calculations.
Note: Figure contains eight cyberattacks in selected ASEAN+3 (Malaysia, Thailand and Indonesia) economies from 2014–2023. Bank abnormal returns are calculated using the market model. The market model parameters are estimated using 220 trading days of return data beginning 280 days before and ending 61 days before the cyberattack, with the market index being the stock market index of the economy in which the cyberattack occurred. Daily abnormal returns are then cumulated to obtain the cumulative abnormal returns (CAR) for various windows (0, -2), (0, -3), (0, -4), (0, -5). Normal returns are unadjusted cumulative daily stock market returns. Solid bars represent significance at the 10 percent level.

Figure 3.18. ASEAN+3: Stock Market Losses from Cyberattacks on Banks (Excluding Outliers)
(Percent)

Market losses from cyberattacks range from -0.1 to -1.4 percent.



Source: Bloomberg Finance L.P.; AMRO staff calculations.
Note: Figure contains seven cyberattacks (excluding an outlier) in selected ASEAN+3 (Malaysia and Thailand) economies from 2014–2023. Bank abnormal returns are calculated using the market model. The market model parameters are estimated using 220 trading days of return data beginning 280 days before and ending 61 days before the cyberattack, with the market index being the stock market index of the economy in which the cyberattack occurred. Daily abnormal returns are then cumulated to obtain the cumulative abnormal returns (CAR) for various windows (0, -2), (0, -3), (0, -4), (0, -5). Normal returns are unadjusted cumulative daily stock market returns. Solid bars represent significance at the 10 percent level.

Box 3.3:

Operational Disruptions at Singapore's DBS Bank in 2023

DBS Bank Ltd, a leader in digital banking services, endured multiple major disruptions to its digital banking services in 2023, with key incidents occurring on 29 March, 5 May, 26 September, and 14 and 20 October. During these disruptions, customers were unable to access online and mobile banking platforms as well as PayLah! Mobile Wallets (Table 3.3.1). In some outages, ATMs, mobile contactless payments on DBS cards, and mobile trading apps were also affected, with severe disruptions lasting up to a full day. As a result, customers were unable to complete payment transactions or access their accounts, balances, and other essential banking functions.[1]

The technical causes varied, with four of the bank's five major disruptions related to bugs or software incidents. For instance, the disruption on 5 May 2023 was due to human error in coding the program used for system maintenance.[2] That led to a significant reduction in system capacity, which in turn affected the system's ability to process transactions. The incident on 14 October 2023 involved a cooling failure at a third-party data center hosting the DBS IT system that supported delivery of its retail and corporate banking services. The data center's temperature exceeded the optimal operating range, leading to a shutdown of the bank's IT systems. Efforts to recover affected systems at back-up data centers also failed because of network misconfigurations. In addition, the 14 October incident also affected Citibank, which relied on the same third-party data center.

The outages created significant problems for DBS customers and negatively impacted its stock price. For instance, the widespread disruption on the 14 October 2023 incident prevented completion of about 2.5 million payment and ATM transactions.[3] As a result, DBS reopened its branches from 5.30 pm to 9.30 pm on 14 October (a Saturday) to assist affected customers. In another serious day-long outage on 29 March of the same year, branch opening hours were extended by two hours to help customers complete transactions. Market reactions to the operational outages were negative. DBS's average five-day cumulative normal returns following severe operational outages were -2.63 percent, more than double that of UOB and OCBC (Figure 3.3.1). Cumulative five-day abnormal returns using a market model on severe outages were also negative at -0.9 percent (Figure 3.3.2).

Table 3.3.1. Description of Major Digital Outages in 2023

Date	Disruption	Cause	Details
29 Mar, (Wed)	Day long outage of internet and mobile banking platform, mobile wallet, and mobile trading app	Software bug	Independent review reported weak system resilience, incident management, change management, technology risk governance and oversight
5 May, (Fri)	Intermittent disruptions to internet and mobile banking, mobile wallet, mobile trading, ATM, and contactless payment on DBS cards	Human error in coding used for system maintenance	Error led to a significant reduction in system capacity, affecting system's ability to process transactions
26 Sep, (Tue)	Delays in FAST and instant interbank transfers (PayNow) payment services in the afternoon	Unspecified system issue	Services were restored in a day; reconciliation and remediation of affected transactions/customers were completed only three days later
14 Oct, (Sat)	Severe nationwide disruption of DBS's suite of digital banking services, mobile wallets and ATM banking from afternoon till morning	Cooling failure at third-party Equinix data center	Temperature in the data center hosting banking services rose above the optimal operating range during a planned system upgrade. Network misconfiguration errors prevented recovery of affected systems at back-up data centers
20 Oct, (Fri)	Intermittent access issues affecting Mobile Wallet Payment service	Unspecified system issue	Other payment services such as DBS's digital banking Scan & Pay remained operational

Source: AMRO staff compilation from articles, reports and websites.

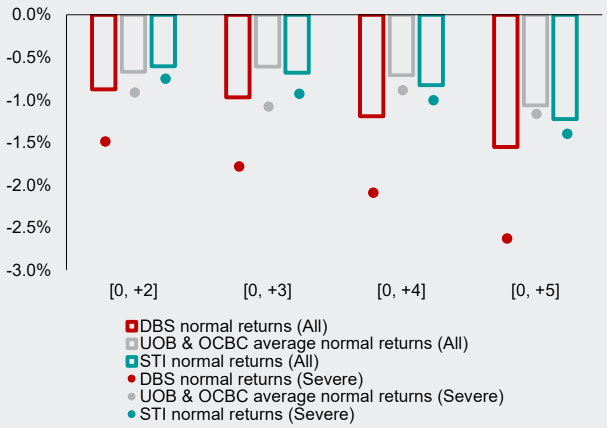
The author of this box is Wen Yan Ivan Lim.

1 Oi, Rebecca. 2023. "How Will DBS Bank Reclaim Trust After Service Interruptions?" *Fintechnews*, 3 November.

2 MAS. 2023. "Written reply to Parliamentary Question on the disruption of DBS' digital banking services".

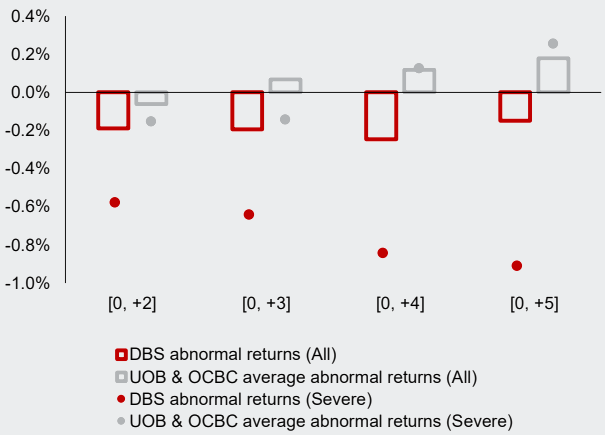
3 MAS. 2023. "Oral reply to Parliamentary Questions on banking services disruption of DBS and Citibank on 14 October 2023." MAS, 6 November.

Figure 3.3.1. Stock Reaction: Normal Returns following DBS Operational Disruptions
(Percent)



Source: Bloomberg Finance L.P.; AMRO staff calculations.
Note: The bars show cumulative daily normal unadjusted returns for DBS Bank, the average cumulative daily normal unadjusted returns for UOB and OCBC Bank, as well as the cumulative daily normal unadjusted returns for Singapore STI Index following the five DBS operational disruptions (29 Mar, 5 May, 26 Sep, 14 Oct, 20 Oct). The dots display cumulative daily normal unadjusted returns for only the three severe DBS operational disruptions (29 Mar, 5 May, and 14 Oct).

Figure 3.3.2. Stock Reaction: Abnormal Returns following DBS Operational Disruptions
(Percent)



Source: Bloomberg Finance L.P.; AMRO staff calculations.
Note: The bars show cumulative abnormal returns for DBS Bank and the average cumulative abnormal returns for UOB and OCBC Bank following the five DBS operational disruptions (on 29 Mar, 5 May, 26 Sep, 14 Oct, 20 Oct). Abnormal returns are calculated using the market model. The market model parameters are estimated using 120 trading days of return data beginning 125 days before the and ending six days before DBS's operational disruption occurred. The dots display cumulative abnormal returns for only the three severe DBS operational disruptions (on 29 Mar, 5 May, and 14 Oct).

The Monetary Authority of Singapore (MAS) viewed the repeated outages as unacceptable and took strong supervisory actions. An independent review mandated by MAS after the March incident uncovered structural deficiencies in DBS's IT governance and processes, including weaknesses in system resilience, incident and change management, and technology risk oversight.[4] Following the May disruption, MAS imposed additional capital requirements on DBS and raised the multiplier for the bank's risk-weighted assets for operational risk to 1.8 times, reducing the bank's Common Equity Tier-1 capital ratio by 0.3 percentage point, from 14.4 percent to 14.1 percent.[5,6] The October 2023 disruptions drew further enforcement against DBS: MAS imposed a six-month moratorium on all non-essential IT changes, barred the bank from acquiring new business, and prohibited any reduction in its branch and ATM networks. This was to ensure resources were focused on addressing weaknesses in IT systems as well as providing alternate offline avenues for customers in the event of digital outages.

The DBS board and management acknowledged the severity of these failures. In response to the disruptions, the bank imposed a 30 percent reduction (SGD 4.14 million) in CEO Piyush Gupta's 2023 variable compensation, and a collective 21 percent pay cut for its management committee, holding them accountable for the repeated operational outages.[7] Following the independent review, DBS committed a SGD 80 million special budget to strengthen system resilience as part of a phased, 24-month technology road map designed to address structural shortcomings and improve the robustness of its digital banking infrastructure.

The 2023 DBS operational disruptions are a cautionary case study for the banking industry's digital journey. These incidents demonstrate how accelerated digitization can rapidly escalate into operational crises through IT outages, potentially undermining public confidence and trust. The disruptions also highlight the risks associated with third-party service providers, which banks increasingly rely on to support critical IT operations. Such providers often fall outside direct regulatory purview and can become single points of failure if not properly managed. In turn, this could pose a systemic risk if multiple institutions are affected simultaneously. Thus, strong oversight, resilient system design, and rigorous contingency planning are crucial to ensure that the pursuit of digital efficiency does not compromise financial stability.

4 MAS. 2023. "MAS Imposes Six-Month Pause on DBS Bank's Non-Essential Activities as Bank Restores System Resilience." 1 November.
5 DBS Bank. 2023. "DBS' response to MAS' actions on digital disruption." DBS, 5 May.
6 This is up from the 1.5 times multiplier and SGD 980 million in additional regulatory capital imposed by MAS in 2022, following a major disruption that lasted two days.
7 Tan, Angela. 2024 "DBS CEO Piyush Gupta gets 30 percent cut in 2023 variable pay over bank's digital disruptions." The Straits Times, 7 February.

Fraud

Digital fraud is the act of stealing customers or financial institution's assets through digital mediums by external perpetuators through fraudulent or illicit means. The issue is especially relevant for ASEAN+3 economies as the region may have suffered financial losses between USD 18 billion to USD 37 billion from scams in 2023, and the losses may have risen in subsequent years. The scams are committed by organized crime groups in Southeast Asia who use technologies such as malware, generative AI, and deepfakes (UNODC 2024). Though law enforcement agencies and regulators have stepped up their efforts to curb the crimes (Nikkei Asia 2025), incidents continue to rise at an alarming pace. Apart from the fraudsters becoming more sophisticated, the sharp rise in fraud is due to the widespread adoption of mobile banking applications and instant payment systems, increased e-commerce-based transactions, and the ease of accessing personal information through social media (Raman and others 2024). Some common means of digital fraud perpetuation are through unauthorized payment transactions from theft of customer payment details, the manipulation of customers into making payments, and exploiting weaknesses in cybersecurity and compliance systems.[19]

Digital fraud can also pose risks to financial institutions and the broader financial system. It can inflict direct (liability sharing) or indirect costs (compliance costs and fines) and reputational loss to financial institutions (IMF 2023). More broadly, a widespread erosion of confidence in the digital financial ecosystem could dampen payment activity and digital consumer spending, amplifying liquidity and systemic risks.

Model risk

Model risk refers to the potential for financial losses arising from the flawed or inappropriate use of models. Broad adoption of AI/ML into various facets of bank's core business significantly amplifies model risks as they exhibit limited explainability, the use of unstructured data, and the approach of overfitting historical data in the model. In the Philippines, about 60 percent of surveyed financial institutions assessed their AI model to be explainable, and about half considered them to be auditable (BSP 2024a). In Hong Kong, nearly all financial institutions (95 percent) have identified model performance and accuracy as the foremost risk-management consideration when adopting GenAI, while 65 percent also cite model transparency and explainability (HKIMR 2025).

The models may have poor predictive accuracy, particularly during black swan events or when structural changes have altered market conditions. The quality of training data can influence model outcomes and lead to biases or structural shortcomings. For instance, AI/ML models may perpetuate bias in credit underwriting decisions and discriminate against certain groups of borrowers, exposing the financial institution to litigation and reputational risks (MindForge 2024). The prevalence of AI/ML models in credit scoring by fintechs and digital banks in ASEAN could be an avenue where model risks manifest. Model risks can amplify credit risks if the credit-scoring models incorrectly assess credit worthiness.

Systemic risk

Systemic risks have evolved from being an outcome of interconnectedness between financial institutions alone to now being dependent on nonfinancial entities such as technology service provides. In this way, digitalization has transformed the nature of systemic risks as the source of risk can extend beyond the financial sector.

Many banks are increasingly reliant on fintechs and technology companies for functions such as collection and storage of data, advanced analytics, and servicing customers. But these collaborations have also produced vulnerabilities in data and transaction security, privacy concerns, and inconsistent cybersecurity standards (Liu and others 2025). Such added layers of complexity and opacity make it more challenging for regulators to identify, assess, and respond to emerging risks.

The dominance of a limited number of technology providers, such as Cloud Service Providers (CSPs) or AI ecosystems, also increases concentration and systemic risks (IDC 2024). The business continuity of many financial firms may be affected by cyberattacks, outages, or other operational issues at any of these technology providers (Koh and Prenio 2023; BCBS 2024). Inadequate oversight of third-party service providers could lead to cybersecurity breaches or system failures, disrupting banks' operations. For example, an October 2022 fire at a data center shared by Kakao Corp. and Naver Corp. resulted in temporary operational disruptions for both tech companies (Judge 2022).[20]

[19] Social engineering is a general term for trying to deceive people into revealing information or performing certain actions (FSB 2023). See BCBS (2023) for a classification of these fraud types.

[20] KakaoTalk suffered a record-breaking outage that lasted over 11 hours, with service disruptions extending for several days. By contrast, Naver experienced a much shorter interruption, as it was able to restore services more quickly thanks to established backup systems, including servers at a separate site. In the aftermath, former President Yoon ordered an investigation into the causes and measures to prevent a recurrence. Subsequently, in December 2022, the Ministry of Science and ICT announced plans to diversify the core functions of major Korean online platforms across multiple data centers, given their critical importance.

Credit risk

Financial digitalization in lending activities has been characterized by three important and interrelated changes: (1) catering to the unserved or underserved population, (2) alternative credit-scoring mechanisms, and (3) innovative lending structures such as BNPL, platform lending and P2P lending. The resultant risks are largely concentrated with fintechs and digital banks because incumbent banks continue to lend to "financially included" customers with strong credit history and use traditional credit-scoring measures and lending structures, while only tweaking their procedures to suit a digital delivery.

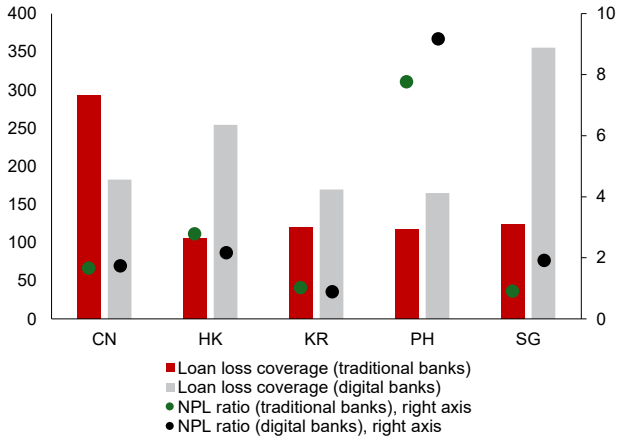
Using alternative credit assessment methods allows fintechs and digital banks in ASEAN to target unbanked or underbanked populations and avoid direct competition from incumbent banks. However, it also increases the risk of adverse selection and loan defaults. As already noted, alternative credit-scoring strategies are susceptible to model risks and may prompt firms to extend loans to unworthy customers, potentially raising nonperforming loan (NPL) ratios as the models adapt to incoming data. The new age financial institutions also lack physical infrastructure and work with limited staffing, which can also pose challenges in loan collection. Credit risk is not yet a major concern for most digital banks across the region, but close monitoring is warranted where the loss buffers are thin.

Digital banks' NPL ratios, on average, are generally comparable to those of traditional banks with ample provisioning among those who have started to report such data (Figure 3.19). Average NPLs for digital banks in Korea and Hong Kong are even lower than those of their traditional counterparts. However, credit risk warrants continued monitoring, as seen in the Philippines, where the initial higher NPLs reported by digital banks were due to nascent underwriting standards and the challenges of lending to underserved borrowers. While the NPLs level have since declined, these banks will likely require more time to mature and strengthen their internal credit risk management frameworks (Box 3.4).

The focus on less-served borrower segments leads to higher interest margins among digital banks. Reported net interest margins (NIM) are higher for digital banks than for traditional banks across most ASEAN+3 economies (Figure 3.20). This reflects their focus on higher-yielding segments such as unsecured consumer credit and loans to micro, medium and small-sized enterprises (MSMEs), which are often priced with wider spreads to compensate for higher perceived risk.

Figure 3.19. Selected ASEAN+3: NPL and Loan Loss Coverage Ratio by Bank Type
(Percent)

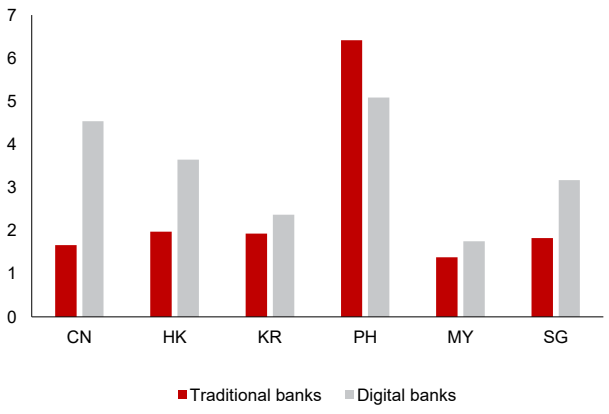
On average, NPL levels remain manageable and well covered by loan loss reserves.



Source: Moody's BankFocus; AMRO staff calculations.
Note: Latest available quarterly data for each bank. NPL ratio = nonperforming loans/total loans. Loan Loss Coverage Ratio = loan loss reserves/nonperforming loans. Digital bank figures refer those of digital banks that reported NPL data out of the total with available data as of end 2024: CN (8/8), HK (7/8) Korea (3/3), PH (5/6), Singapore (1/5). For banks with no reported NPL ratios, stage 3 loans under IFRS 9 is used for calculation. CN = China; HK = Hong Kong; KR = Korea; PH = Philippines; SG = Singapore.

Figure 3.20. Selected ASEAN+3: Net Interest Margin Ratio by Bank Type
(Percent)

Digital banks generally show higher NIM, reflecting their focus on higher-yielding segments.



Source: Moody's BankFocus; AMRO staff calculations.
Note: NIM (net interest margin) = (interest income – interest expense)/average interest-earning assets. CN = China; HK = Hong Kong; KR = Korea; PH = Philippines; MY = Malaysia; SG = Singapore.

Box 3.4:

Evolving Digital Banks in the Philippines: Unlocking Financial Inclusion While Managing Credit Risks in the Startup Phase

Since formulating its first National Strategy for Financial Inclusion in 2015, the government has promoted financial inclusion as a national agenda.[1] Inclusive digital finance, as a priority initiative, has emerged as a key contributor to advancing financial inclusion, particularly by serving unbanked individuals and micro, small, and medium-sized enterprises (MSMEs). In this context, this box examines the evolving role of digital banks as startups in financial inclusion and credit risk management.

Digital banks in the Philippines show strong potential for advancing financial inclusion, especially among the estimated 34.3 million unbanked as of 2021 (BSP 2021).[2] The country's archipelagic geography makes digital delivery particularly effective, aligning with broader goals of Bangko Sentral ng Pilipinas, the central bank, to expand financial access. Since May 2024, digital bank deposits have grown rapidly—averaging 34 percent year-on-year and far outpacing the less than 10 percent growth in traditional banks (Figure 3.4.1). However, they still represent just PHP 114 billion, or 0.56 percent of the PHP 20 trillion in total system deposits as of July 2025. Similarly, digital bank loans surged 89 percent year-on-year in the first seven months of 2025, driven by credit card, personal, and MSME lending (Figure 3.4.2), yet their PHP 58 billion loan book accounts for just 0.37 percent of the PHP 16 trillion in total loans. Notably, account ownership rose from 3 percent in March 2023 to 18 percent by June 2025, reflecting growing demand[3] and supporting financial inclusion through digital channels.

Amid the rapid expansion of lending, the nonperforming loans (NPL) of the six digital banks were volatile over a short period. The NPL ratio peaked at 25.3 percent in March 2024 and declined to 7.0 percent by July 2025 (Figure 3.4.3). Consistent with these trends, the digital banks recorded losses, partly because credit costs increased, including those for provisioning in response to rising credit risks and write-offs on nonperforming loans (Figure 3.4.4).[4, 5]

Volatility in NPL ratios and related losses suggests that digital banks in the Philippines are still building credit risk management capabilities, especially as they target underserved borrowers with limited credit histories. High NPLs may reflect early-stage trial-and-error, structural challenges like limited debt collection infrastructure, and nascent underwriting standards. The recent improvement in NPL ratios suggests digital banks are refining strategies and credit risk controls by enhancing expertise, reassessing customer segments, and strengthening data-driven underwriting.

To sustain progress and achieve long-term profitability, digital banks must continue refining credit risk practices. Their resilience will be tested across credit cycles, especially during downturns, requiring robust, risk-based underwriting and adaptive risk management frameworks.

The authors of this box are Shunsuke Endo and Chiang Yong (Edmond) Choo.

1 The Financial Inclusion Steering Committee (FISC) in 2022 launched the National Strategy for Financial Inclusion 2022–2028, focusing on reducing inequalities in financial access and improving financial health and resilience by empowering consumers.

2 The share of Filippino adults with bank accounts rose from 29 percent in 2019 to 56 percent in 2021, according to the Bangko Sentral ng Pilipinas 2021 Consumer Finance Survey. The central bank aims to further increase this figure to 70 percent.

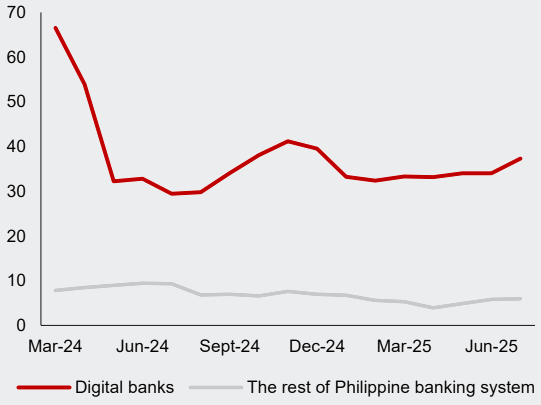
3 On the supply side, the expansion of digital banking services can also be attributed to their appeal. Most digital banks offer accounts with no minimum balance requirements, which attracts individuals with limited funds. Seamless remote onboarding—often completed within minutes—eliminates the need to visit physical branches, benefiting those in hard-to-reach areas. Furthermore, each digital bank offers a unique value proposition to help integrate more Filipinos into the formal financial system. Some focus on secure remittance and financial services for overseas Filipino workers, while others partner with e-commerce platforms to reward consumers, offer easy access to credit lines, or expand investment opportunities.

4 These losses were also influenced by elevated noninterest expenses. Such costs were likely driven by initial investments in IT infrastructure, risk management model development, regulatory compliance, and marketing expenditures aimed at improving business visibility. While in aggregate the six digital banks remained in deficit, a few banks recently recorded profits.

5 Startups may take several years to achieve a net gain, as they require time not only to establish their organizational structures but also to comply with regulatory requirements, conduct business-related R&D, and build customer trust.

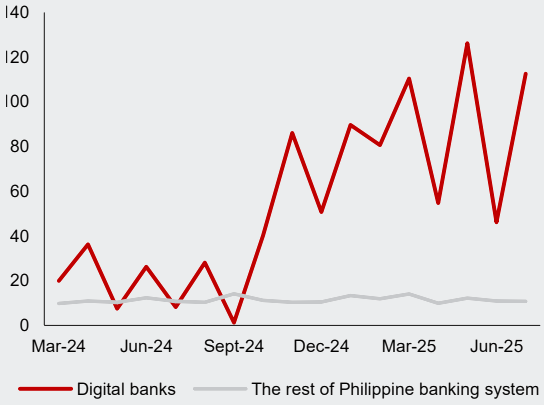
Bangko Sentral ng Pilipinas adopted a phased licensing framework to assess the impact of digital banks before expanding the sector. After licensing six digital banks from 2020,[7,8] a moratorium was imposed in August 2021 to evaluate their contributions to financial inclusion and digital transformation. It was lifted in January 2025 following a positive assessment, allowing up to 10 digital banks to operate, with emphasis on innovation and targeting underserved segments (BSP 2024b). This test-and-learn approach balances inclusion and risk management. Digital banks are monitored for both financial inclusion and stability, and are subject to the same prudential standards as traditional banks, including credit risk regulation (BSP 2020, BSP 2022). As the central bank gains further experience, it may refine regulations in consultation with the industry[9]—offering valuable lessons for other jurisdictions.

Figure 3.4.1. Growth in Deposits
(Percent, year-on-year)



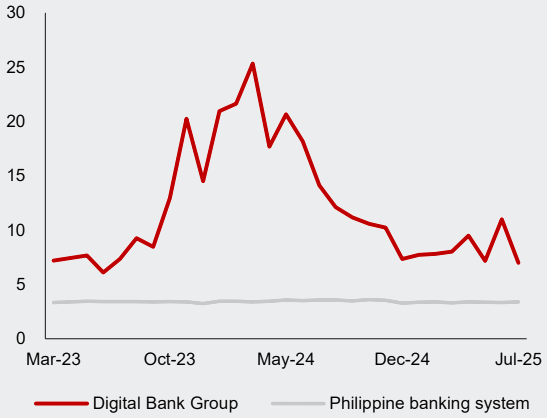
Source: Digital banks' balance sheets; Bangko Sentral ng Pilipinas; AMRO staff calculations.

Figure 3.4.2. Growth in Loans
(Percent, year-on-year)



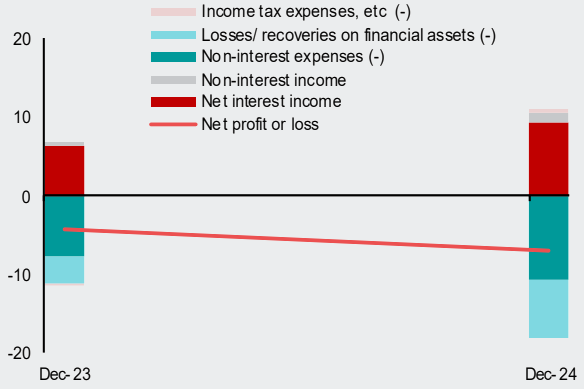
Source: Digital banks' balance sheets: Bangko Sentral ng Pilipinas; AMRO staff calculations.

Figure 3.4.3. Digital Bank Gross NPL Ratios
(Percent)



Source: Bangko Sentral ng Pilipinas.
NPL = nonperforming loan.

Figure 3.4.4. Digital Bank Earnings Breakdown[6]
(Billions of Philippine pesos)



Source: Bangko Sentral ng Pilipinas; AMRO staff calculations.

[6] Net Profit or Loss = "Net Interest Income" + "Non-Interest Income" - "Non-Interest Expenses" – "Losses/Recoveries on Financial Assets" - "Income Tax Expense etc". "Losses/Recoveries on Financial Assets" comprise "provision for credit losses on loans and other financial assets", "bad debts written off", and "recovery on charged-off assets", encompassing not only expenses related to loans but also those associated with other financial assets. Those related to NPLs refer to simply as credit costs in the main text.

[7] In December 2020, Bangko Sentral ng Pilipinas issued Circular No. 1105 (Guidelines on the Establishment of Digital Banks), which established the formal guidelines for digital banks as a distinct classification within the banking system. The guidelines define digital banks as institutions that offer financial products and services exclusively through digital platforms, without physical branches, and are required to maintain a principal office in the country.

[8] Under this framework, Bangko Sentral ng Pilipinas granted licenses to six digital banks: GoTyme Bank, Overseas Filipino Bank, Maya Bank, Tonik Digital Bank, UnionDigital Bank, and UNObank. They primarily served overseas Filipino workers, the underserved, unbanked, mass market consumers, and MSMEs.

[9] Provided that risks to financial stability remain limited and further acceleration of financial inclusion is needed, there could be room to fine-tune regulation based on the proportionality principle as necessary, for example, in a manner suited to the Philippines. The proportionality approach is taking regulatory and supervisory requirements that are tailored to the size, complexity of activities, risk profile and systemic importance of a financial institution. That said, implementing a sound proportionality regime is not an easy task, and appropriate international guidance can help authorities avoid being perceived as having a less rigorous regulatory framework (Restoy 2022).

Liquidity risk

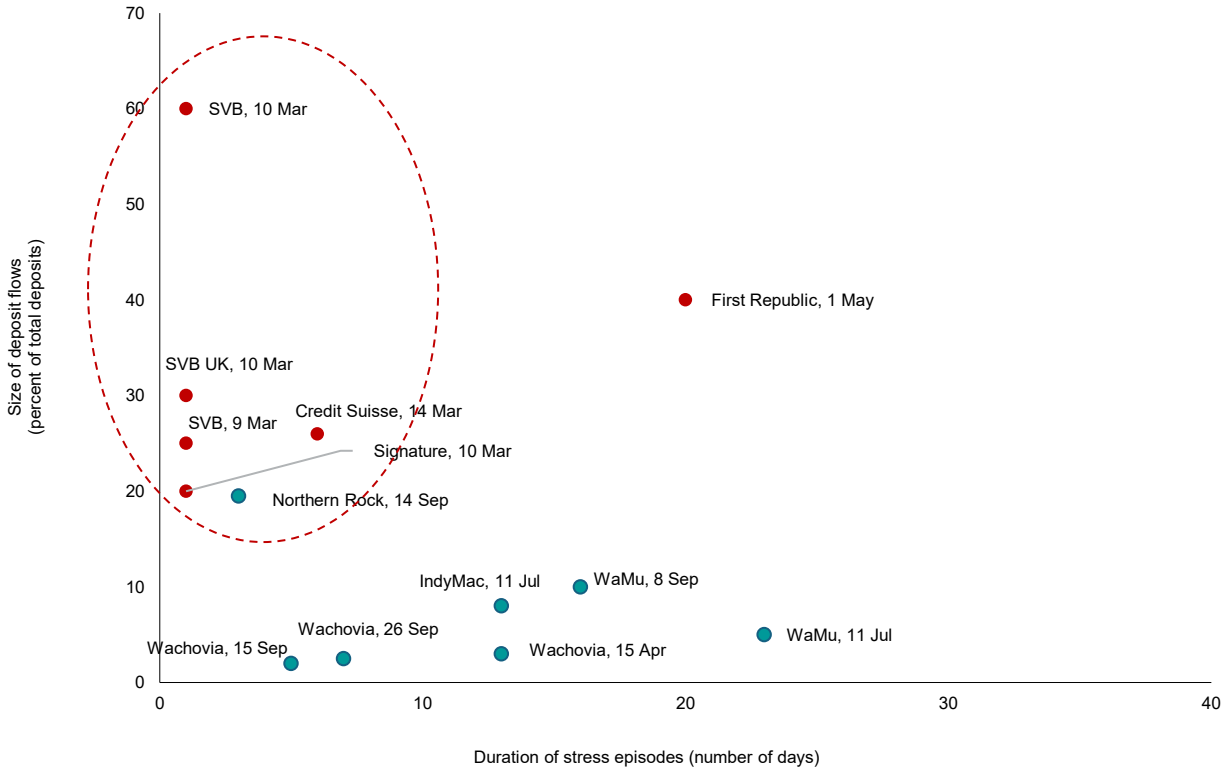
Financial digitalization can heighten liquidity risks in the banking system through several channels. First, while e-wallets and alternative lending platforms—often linked to nonbank ecosystems and offering attractive returns—are not yet able to compete with traditional banks, their rise could draw deposits away once they reach strategic scale. In an extreme scenario, this shift could weaken banks' core deposit bases, compelling them to rely more heavily on volatile wholesale funding, which is both more expensive and less stable during times of financial stress. The ASEAN+3 traditional banks are aware of these risks and are transforming their mobile apps into super-apps which provide financial services and seamless integrations with other nonfinancial products and services. More usage of bank wallets for daily transactions helps banks attract low-cost current and savings account deposits, which reduces liquidity risks. That said, and as discussed in relation to business risks, the technological investments for the super apps and integrations are very high and not all banks can afford to invest. The small and mid-sized banks will likely remain more vulnerable to liquidity risks.

Second, the always-on nature of digital banking allows customers to move funds instantaneously, heightening the risk of sudden liquidity outflows and amplifying market volatility during times of stress (Ong and others 2023). On 9 March 2023, Silicon Valley Bank (SVB) experienced a classic bank run, as depositors rapidly withdrew funds following rumors and concerns about the bank's financial health. While the concerns were well founded, the speed at which they spread across social media platforms, and the pace of deposit withdrawals was unprecedented. The collapse of SVB and of Signature Bank, which shut down just days later, demonstrate that liquidity outflows enabled by technology were too fast for the banks or the authorities to take corrective actions (Figure 3.21).

Finally, the expansion of cross-border banking activities may present a greater challenge for supervision and crisis management. It may limit central banks' ability to act as lenders of last resort—providers of liquidity to financial systems or banks that are temporarily illiquid. Poor liquidity management could trigger the failure of a banking group across the region. Although a home supervisor can provide liquidity support for settlement of its own currency, it may not be able to prevent a chain reaction of failures in other markets (ADB 2023). Stronger economic and financial integration among regional economies has increased the use of local currencies in cross-border transactions, necessitating closer cooperation among regulators to effectively manage emerging risks.

Figure 3.21. US and Europe: Magnitude and Speed of Bank Deposit Runs

Recent bank runs have been larger and faster compared to past episodes.



Source: Adrian and others (2024); AMRO stylization.
Note: Red dots denote incidents in 2023. Teal dots denote incidents in 2008, except for Northern Rock which occurred in 2007. SVB = Silicon Valley Bank; WaMu = Washington Mutual Inc.

Business or strategic risk

The digitalization of banking services needs large investments. Global fintech investments rose consistently leading into and during the pandemic as demand for digital services rose. Investment has eased since then (Figure 3.22) because of higher interest rates, rising geopolitical uncertainties, valuations concerns, and an environment with limited exit opportunities for venture capitals (Jawhar and Troiano 2022; KPMG 2024, 2025). Investment in ASEAN+3 fintechs was notably weaker as they did not pick up during the pandemic and have continued to weaken. The decline in funding, despite the growth in fintech revenues and a positive outlook, shows that potential investors in fintech were probably seeking higher premiums.

ASEAN+3's digital banks also face business sustainability concerns as many are yet to turn profitable. Digital banks have very limited fee-based income and profitability indicators point to strategic vulnerabilities in some economies (Figure 3.23). In economies such as Hong Kong and Singapore, digital banks report much higher costs driven by elevated operating costs and still-nascent revenue streams. Cost pressures for digital banks come from the need for significant initial investments in technology and high (and often unsustainable) customer acquisition costs through marketing campaigns and attractive service terms. Digital banks also face business concentration risks in the absence of meaningful fee-based income and diversified funding sources, and by catering to specific customer segments. Fintechs and digital banks also face talent retention challenges as they often compete with large tech firms and traditional banks for a limited pool of skilled tech and data talent.

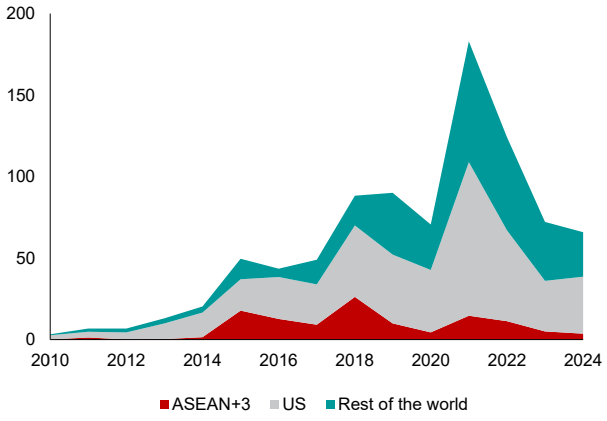
On the other hand, large traditional banks face minimal sustainability risks. They have invested heavily in upgrading (and even overhauling) their technology and systems to improve customer experience and engagement and to keep up with competition from fintechs and digital banks, rather than return-on-investment considerations. That said, they run the risk of investing in technologies with much lower marginal returns and at the same time dealing with the dilemma of either partnering with external vendors or building technological solutions in-house. Partnering with external service and product providers is generally cheaper, but in-house development provides more flexibility and control over product development. Many large banks in ASEAN+3 have typically resorted to in-house development teams for core functions while small and mid-sized banks have relied more on service providers.

Sustainability pressures are greater for mid-sized firms as they compete with both large institutions and nimble niche providers. Financial digitalization may lead to a "barbell" market structure where few very large, multiproduct institutions can dominate on one end thanks to economies of scale, scope, and access to extensive data, while at the other end, many focused niche providers thrive by using technology to reach targeted customer bases (BIS 2021). This dynamic leaves little room in the middle for mid-sized firms, who are caught in a double bind.

We find early signs in some ASEAN+3 advanced economies that the "barbell" structure could be further disrupted. This is largely because many traditional banks have upgraded their service offerings enough to nullify any competitive advantage that niche fintechs may have. This is pushing fintechs and mid-sized banks to either of two paths for survival: (1) form a consortium of similar financial institutions to upgrade technology and compete with the large banks, or (2) integrate into defensive ecosystems where financial and nonfinancial services can be seamlessly integrated. The recent trend of Japanese telecom providers acquiring digital banks is a step in this direction as it eases customer acquisition and servicing costs for both the telecom provider and bank (Business Times 2025).

Figure 3.22. World and ASEAN+3: Funding to Fintech Companies
(Billions of US dollars)

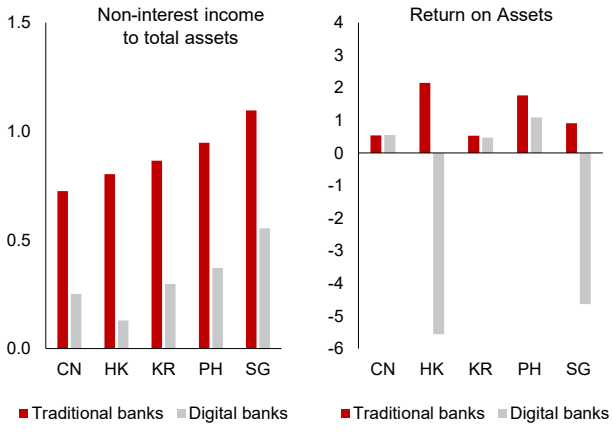
Global funding to fintech companies has slowed after more than a decade of rapid growth.



Source: Tracxn; AMRO staff calculation.

Figure 3.23. Selected ASEAN+3: Non-Interest Income to Total Assets, and ROA (2024)
(Percent)

Digital banks have lower non-interest incomes and return on assets.



Source: Moody's BankFocus; national authorities; AMRO staff calculations.
Note: Data as of end 2024. ROA = return on assets. CN = China; HK = Hong Kong; KR = Korea; PH = Philippines; SG = Singapore.

Procyclicality risks

Digitization of banking services can heighten procyclicality by amplifying credit cycles. Digital banks, fintechs, and bigtechs often concentrate lending in underserved retail and MSME segments with weaker credit profiles. When conditions deteriorate, asset quality can deteriorate quickly, prompting tighter lending to conserve capital. For instance, during COVID-19, fintech companies in Indonesia scaled down on P2P lending (IMF 2021). This can exacerbate procyclicality by restricting access to credit to already distressed customers. Furthermore, the growing adoption of AI models in banking could increase market correlations adding to procyclicality risks as financial institutions increasingly rely on similar pretrained models or models that are trained using similar data sources (MAS 2024).

VI. Policy Discussion

Key regulatory approaches and developments in ASEAN+3

Regulatory developments across the region vary depending on the maturity of the financial ecosystem, national objectives for digitalizing in finance, and specific idiosyncratic risks. Authorities have adopted diverse approaches to address these differentiated risks. The approaches, however, are not mutually exclusive; regulators often blend elements from multiple frameworks to design customized regulatory systems.

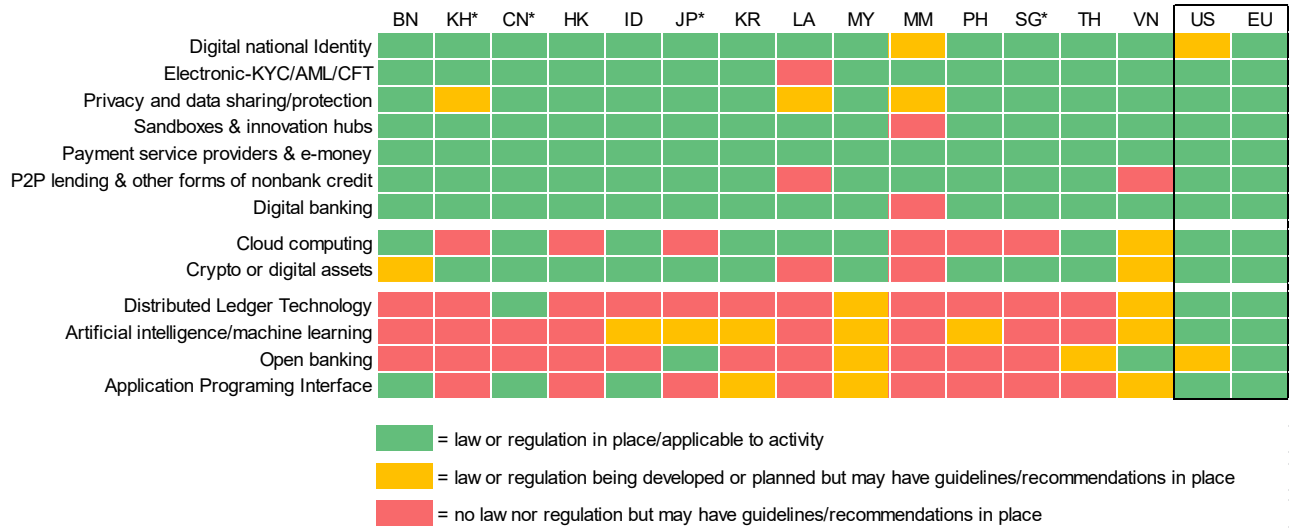
Cross-jurisdiction comparison of regulatory frameworks

Over the years, ASEAN+3 regulators have strengthened rules and laws, some guided by global best practices and some dictated by idiosyncratic factors, to address different aspects of emerging financial digitalization and its effect on the banking sector. We identify 13 areas for regulatory oversight of financial digitalization relevant for banking and compare the stringency of these laws in different economies (Figure 3.24).

While most jurisdictions have established frameworks to manage fundamental issues such as national digital identification, data privacy and protection, and AML/CFT compliance, some are still considering clear guidance or regulations for newer technologies like AI and DLT.

Figure 3.24. ASEAN+3, US, and EU: Fintech Regulations in Place, September 2025

The region has diverse regulatory treatments across technological areas.



Source: National authorities; AMRO staff compilation.
Note: Asterisk (*) denotes regulations of a particular economy have not been cross validated with authorities' survey inputs. In the heatmap, green means there is at least one legally binding law or regulation in place for the specific activity. Yellow means related policies are still in development or the planning phase, while red indicates that no regulations have been imposed on the activity. Laws include acts, decrees, ordinances, prakas, and regulations. Associated guidelines and recommendations are not considered as legally binding. Guidelines and recommendations include standards, principles, guidance frameworks, and sandboxes. AML/CFT = anti-money laundering and combating of the financing of terrorism; BN = Brunei; KH = Cambodia; CN = China; EU = euro area; HK = Hong Kong; ID = Indonesia; JP =Japan; KYC = know your customer; KR = Korea; LA =Lao PDR; MY = Malaysia; MM = Myanmar; P2P = peer-to-peer; PH = Philippines; SG = Singapore; TH = Thailand; VN = Vietnam; US = United States.

We can broadly divide these areas of regulations based on the extent of implementation across economies. The classification is subjective and based on information available as of September 2025. It is likely that some of the less-regulated areas will become more regulated as more countries furnish their regulatory frameworks.

1. **Widely regulated:** These areas can be classified as either enablers of digitalization or those where digitalization has progressed significantly. Regulations related to digital national identification, electronic KYC/AML/CFT, and data privacy and protection are central to the establishment of systems to enable digital onboarding of customers and adherence to compliance standards. Therefore they have well established laws and enforcement guidelines. Since authorities appreciate the importance of testing fintech products, services, or business models in a controlled environment, regulatory sandboxes[21] have emerged as a key component in building an inclusive digital financial ecosystem—enabling innovation to thrive while managing risks (APEC Secretariat 2021). The immense adoption in payment systems and alternative lending (such as P2P) and the strong push from various authorities on digital (or virtual) banking initiatives have played an important role in strengthening the relevant regulatory frameworks.

2. **Regulated in most economies:** This category includes regulations around cloud computing, which is a cost-effective solution to infrastructure needs, and crypto (or digital or virtual) assets, which have acted as an alternative investment asset, mostly outside the banking system. Cloud computing regulations may include outsourcing/vendor requirements and data-sharing agreements. Regulations around crypto assets have seen wide dispersion in the region. While some authorities have adopted a wait-and-see approach, others have been proactive in minimizing risks posed by crypto assets. Some countries have also banned specific activities related to crypto assets. Many authorities in the region have allowed banks to engage with crypto assets but under very stringent risk management, enhanced compliance requirements, and controls for financial stability and user protection.

3. **Emerging areas with limited regulations:** These predominantly include technologies still in exploratory stages and generally being considered to improve operational efficiencies. Technologies such as DLT and AI/ML are being extensively explored but have seen limited adoption in the wider financial system. Thus, there are generally fewer regulations around these technologies in most ASEAN+3 economies. Similarly, though the concept of open banking and API standardization is gaining traction and has found use in integrating various parts of the financial system, it remains one of the less-regulated aspects.

Policy recommendations

Regulating the evolving environment of banking services

There is immense diversity in the progress of banking service digitalization within the region. This extends across types of firms, the stages of financial development and digitalization of economies, and the approach toward regulations.

Assessing the different types of firms, diversity is highest among fintechs and least among incumbent banks. Digital banks are still evolving and though the diversity is much lower than for fintechs, the business models and services portfolio varies among them. Also, fintechs, bigtechs, and digital banks are still much smaller than incumbent banks in ASEAN+3, giving the authorities some flexibility to assess the developments and gradually impose or adjust related regulations. In case of incumbent banks, while digitalization helps reduce risks in many dimensions, it can amplify or redistribute other types of risks. To appropriately regulate such an environment, authorities may adopt approaches that are most suited for their specific country and industry circumstances (Table 3.4).

The approaches are not mutually exclusive; regulators often blend elements from multiple frameworks to design customized regulatory systems. For example, Singapore requires digital banks to comply with the same regulatory standards as traditional banks under the Banking Act (i.e., an entity-based regulatory requirement). However, the digital banks must meet a separate set of requirements (Eligibility Criteria and Requirements for Digital Banks) specific to their operations (MAS 2019) and which has elements of an activity-based system, such as value proposition and track record of the applicant groups. Thus, both approaches are amalgamated to regulate digital banks prudently.

[21] Regulatory sandboxes are frameworks that allow firms to test innovative financial products, services, or business models under a specific testing plan, which is agreed upon and supervised by a designated unit within the competent authority. In contrast, innovation hubs serve as dedicated contact points where firms can submit inquiries related to fintech and receive nonbinding guidance on regulatory and supervisory expectations, including licensing requirements (ESMA 2018). According to the Cambridge Centre for Alternative Finance, the region currently hosts 17 active financial services sandboxes and 16 innovation offices.

While there are multiple approaches to regulations, authorities need to be flexible in gradually shifting their regulatory frameworks with changes in the landscape. An emerging financial service or business model could be managed by a risk-based approach in its nascent stages but as its adoption and acceptance grows, authorities may move toward formalizing its regulations. The regulations can be based on principles and activities to provide some flexibility for innovations. As the service or model matures, regulators can switch to use an entity-based and rule-based approach that provides more regulatory certainty.

Moreover, it is beneficial for regulators to engage with regional peers, exchanging experiences, insights, and practices. Cross-jurisdictional cooperation can help accelerate the learning curve and maximize the benefits of sandbox initiatives, especially in supporting cross-border innovation and regulatory harmonization.

Table 3.4 Summary of Regulatory Frameworks and Initiatives to Manage Risks

Framework and Approach	Circumstances	Use Case
Entity-based framework	Less diversity across firms; risks emerging from a combination of activities; a need to mitigate systemic risks	Traditional banks in all ASEAN+3 economies
Activity-based framework	High diversity across firms; firms providing a systemically important activity or service; "*same activity, same risk, same regulation*"	Payment solutions by fintechs, bigtechs and banks
Risk-based framework	Evolving services, businesses and technologies that are difficult to classify under existing activities; room to adjust regulatory intensity based on the likelihood and potential impact of identified risk; "*higher the risk, greater the controls*"	Emerging fields like digital finance, cybersecurity and AI deployment
Principle-based framework	A need to provide flexibility for rapidly evolving sectors; scope to define high-level standards; room to allow greater discretion to firms for compliance	
Rule-based framework	Strong requirement of detailed, prescriptive, clear, and consistent regulations across the industry	A new licensing regime and requirements for digital banks
Big-bang approach	A need for direct regulatory overhaul and dismantling outdated frameworks; higher tolerance for potential disruptions, steep learning curves and high implementation costs	
Adaptive approach	Existing regulatory frameworks can accommodate new products and services, business models and entities	Payments and e-KYC
Sandbox approach	Need to test innovative products, services or business models in a controlled environment; allows direct oversight from regulators	Emerging fintechs

Source: AMRO staff compilation.

Mitigating risks from digitalization of banking services

While the regulations, frameworks, and testing make sure that the risks to financial stability are mitigated, it could be useful to evaluate policy measures to contain different types of risks.

Operational risks: Cybersecurity, business continuity, and fraud risks are arguably the most significant risks from financial digitalization. While cybersecurity and business continuity risks can be viewed from the technological infrastructure perspective, fraud risks typically emerge from social engineering. Their management requires a multipronged approach:

- In order to ensure cybersecurity and operational resilience, governments can issue standards and guidelines for IT infrastructure. These include integrating cyber risk assessment frameworks in risk management, regular risk assessments, data protection policies, and cyber threats, and managing third-party or vendor risk. The companies should also have robust internal procedures to make sure that software upgrades are tested thoroughly before implementation.

- Financial institutions should also be required to have appropriate incident resolution and reporting protocols. The recovery should be governed by service level agreements (such has maximum downtime, response time, resolution time) while reporting protocols should be designed to learn from incidents and put preventive measures in place. The authorities may decide to penalize firms through fines or increased capital requirements if they fail to meet the standards for cybersecurity and operational resilience.

- The authorities should also encourage training and knowledge sharing between firms so that companies learn from each other's experience. This is an essential part of fraud risk management because most fraud is executed using social engineering. The customer becomes the weakest link in the banking value chain. Therefore, increased customer engagement and education is vital to prevent exploitation by fraudsters and many other operational risks for financial institutions.

- Increasing financial and digital literacy amongst end users of digital services is also equally important because, as seen in socially engineered frauds, the end user becomes the weakest link in the banking chain, which is exploited by the fraudsters. These efforts can be encouraged by authorities and provided by financial institutions as part of their regular customer engagement.

- Finally, the introduction of loss-sharing programs for cyber incidents and fraudulent transactions can help allocate liabilities, strengthen trust, and improve incentives for prevention. Many countries have been developing loss-sharing agreements for fraudulent transactions withing the banking value chain (Box 3.5). A lot of fraud includes activities conducted across borders—and hence call for increased cooperation between authorities.

Box 3.5:

Loss–Sharing Schemes in ASEAN+3

The rise of digital financial services has driven a surge in scams and fraud. Sophisticated phishing, social engineering, and fake apps have led consumers to authorize transfers to fraudsters. Where data are available, reported losses are large and increasing. Singapore recorded over SGD 1.1 billion (USD 860 million) in scam losses in 2024 (a 71 percent year-on-year increase),[1] while Hong Kong reported HKD 9.2 billion (USD 1.2 billion) lost in 2024.[2] Thailand's online scams totalled THB 96 billion (USD 3 billion) between March 2022 and July 2025,[3] and Vietnam recorded losses of VND 18.9 trillion (USD 723 million) in 2024.[4] Given this rapid growth of scam losses, protecting victims is crucial to maintaining confidence in digital financial services and the overall integrity of the financial system.

Traditionally, victims were left to bear the full financial loss. Banks often deny liability unless a transaction was clearly unauthorized in a technical sense (e.g., hacking without the customer's involvement). However, with scams now operating at industrial scale, this model is increasingly viewed as unfair to consumers who may have been tricked despite taking precautions. In response, authorities across ASEAN+3 are developing loss-sharing programs that distribute scam losses more fairly among customers, banks, payment providers, and telecommunication firms. These frameworks aim to protect victims while pushing all players to strengthen fraud prevention.

Loss-sharing models typically aim to create a fairer system. Rather than placing the entire burden on victims of the scam, these frameworks set clear obligations for all parties affected. Banks, payment providers, and telecom companies (telcos) are expected to implement robust security measures such as multifactor authentication, real-time alerts, transaction monitoring, and SMS filtering. To minimize moral hazard risks, consumers also have responsibilities to exercise caution and follow security best practices. Liability is then allocated based on whether each party has met these obligations. If a bank or telecom provider fails to meet the standards required, it is responsible for reimbursing the victim. If all parties have fulfilled their duties and the customer has been negligent, the loss may remain with the customer, balancing customer protection with personal responsibility.

ASEAN+3 jurisdictions are at varying stages in adopting such loss-sharing frameworks. Singapore launched its Shared Responsibility Framework in late 2024, mandating clear duties for banks, payment providers, and telcos, with liability determined by compliance with these duties. Korea has long had a legal basis for freezing and refunding scam proceeds under the Special Act on Telecommunications-Based Financial Fraud, with new reforms to expand and speed up compensation. Malaysia adopts a joint responsibility approach where both banks and consumers bear shared losses from unauthorized online fraud, while consumers can seek redress through the ombudsman. In contrast, China and Japan place greater focus on prevention and asset recovery. Their regulations prioritize identifying and freezing fraudulent accounts to return seized funds to victims but do not formally mandate banks to cover unrecovered losses, which may leave victims exposed if the funds cannot be fully recovered (Table 3.5.1).

Beyond loss-sharing programs, protecting consumers will require a comprehensive approach. Staying ahead of evolving scams will require advanced detection systems, strong regulation enforcement, and targeted consumer education to ensure safety and sustain the growth of digital financial services.

The author of this box is Benyaporn Chantana.

1 Singapore Police Force Annual Scams and Cybercrime Brief (2024).
2 Hong Kong Police Force, Law and order situation in Hong Kong in 2024.
3 Cyber Crime Investigation Bureau.
4 Vietnam News. 2024. "Online frauds caused $774 million in damages in 2024." Vietnam News, 16 December.

Table 3.5.1. Loss-Sharing Programs in ASEAN+3

Economy	Law or framework	Key Features
Schemes already in effect		
China	Anti-Telecom and Online Fraud Law (2022)	• Telecom providers, financial institutions, and internet service providers (ISPs) are required to have monitoring and risk management measures to reduce suspicious behaviours • No mandatory reimbursement for unrecovered losses
Japan	Criminal Accounts Damage Recovery Act (2007)	• Enables banks to swiftly scammer bank accounts and channel seized funds to victims • No general bank liability for unrecovered losses
Korea	Special Act on Prevention of Loss Caused by Telecommunications-Based Financial Fraud (2011, reform in 2025)	• Enables rapid freezing of suspicious transfers and returning funds to victims • Reforms will likely shorten payout times and broaden eligible fraud scenarios to improve consumer protection
Malaysia	Policy Document on Ensuring Fair Treatment for Victims of Unauthorised e-Banking Transactions	• Banks must promptly investigate fraud and communication outcomes • For unauthorised online fraud- - banks bear full responsibility if the fraud is due to security measure failures - banks and customers jointly share the liability for cases with element of joint culpability • If victims disagree with the decision or compensation offered, they have the right to submit a dispute to the ombudsman
Singapore	Shared Responsibility Framework (2024)	• Mandatory regulatory framework which sets clear duties for banks, payment providers, and telcos (e.g., transaction blocking, real-time alerts, SMS filtering) • Establishes a 'liability waterfall' where if a bank or telco fails to meet required duties, it must reimburse the victim • If all providers meet standards and the customer is negligent, the customer bears the loss • Introduces new tools such as account kill switches to let customers immediately freeze their account
Thailand	Royal Decree on Measures to Prevent and Suppress Technology Crimes No. 2 (2025)	• Sets a shared-responsibility framework across banks, payment providers, telcos, social media platforms, and digital asset firms and holds them liable for losses if they fail to meet regulatory standards • Liability is assigned proportionally based on court assessments of negligence and failure to meet standards • Regulatory standards are being issued across agencies. BOT and SEC focus on KYC and mule account suspension; ETDA assigns social platforms to curb scam-related and false information; NBTC requires telecom operators to verify customer identity, monitor SIM use, regulate automated messaging, and suspend suspicious activities
Schemes under development		
Hong Kong	HKMA-proposed approach for handling customer claims for losses arising from authorized payment scams (under consultation)	• HKMA is consulting on the adoption of a more aligned approach for banks to assess customer claims for losses arising from authorized payment scams

Source: AMRO staff compilation.

Systemic risks: The high dependency of financial institutions on a few service-providers is one of the more recent risks that digitalization has introduced to the financial system. To minimize these, governments should encourage key financial institutions to seek services from different vendors. Over the longer horizon, the development of high-tech technology service providers within the economy could help reduce the external dependency of the financial system.

Traditional systemic risks could also be amplified as financial institutions (banks, fintechs, and virtual banks) become increasingly interconnected. Connections between traditional financial institutions pose a systemic risk in the event of stress in the financial system or the real economy. Digitalization has put fintechs and bigtechs into this mesh. In many economies, fintechs and bigtechs are not large enough to pose systemic risks, but their growth has been strong. This calls for robust monitoring of their linkages with the financial systems, encouraging diversification of financial partners, and considering appropriate macroprudential frameworks to limit spillovers from individual firms or sectors to the broader financial system.

Credit risks: The credit risk profile for incumbent banks has not changed much through digitalization, with elevated risks concentrated more in those fintechs, bigtechs, and digital banks using alternative credit-scoring models. Partly, this is due to lack of centralized credit data. With rising interconnectedness, spillovers can occur from fintechs, bigtechs, and digital banks to traditional banks.

- Many of these entities try to mitigate the risks themselves. Where lending is enabled by a digitalized ecosystem, many firms typically wait for some transaction history to accumulate before offering loans to their customers. The size and tenor of the loans are also adjusted based on the data available. Typically, customers with limited data will be offered smaller loans for short durations and vice versa. This allows the firms to risk-adjust their exposures. Such prudence should be encouraged where possible.

- The use of the alternative credit-scoring models can initially expose entities to the risks of higher nonperforming loans as the model learns from the data, but this phase is also critical for calibrating the models. Calibration can be expedited if appropriate data-sharing policies exist within the financial system, between both private and public institutions. It will also allow parallel development of various models, allowing diversity in their evolution.

- The need to develop alternative credit-scoring models in some jurisdictions arises from the lack of credit data. In these cases, establishment of a comprehensive and centralized credit data registry may help alleviate such information asymmetry. Maintaining a central credit registry and sharing it with financial institutions (including fintechs) can also help as firms can monitor credit history and debt recovery status across the industry, before offering new loans. Adding alternative credit scores for unbanked customers in the credit registry could also help improve the credit screening process across the industry. Companies may augment these scores to their own credit-scoring models to have a robust credit risk evaluation.

- The authorities should monitor the lending using the alternative credit scoring system and introduce regulations, such as the size of the lending, and hence limit its potential spillover to the financial system, rises. They can also consider licensing frameworks for new lending models, such as P2P lending and BNPL, which are gaining traction as business models mature.

Liquidity risks: Technology, by reducing frictions, can increase the speed, scale, and scope of a digital bank run. While such an event may have roots in broader risks, technology may not give banks or the authorities enough time to react and put corrective measures in place. Financial safety nets will thus play a critical role in preventing bank runs:

- Regulators may require financial entities under their supervision to demonstrate intraday liquidity management as part of business continuity and recovery planning using real-time dashboards to ensure the entities have viable contingency plans.

- Deposit insurance programs could also be effective in reducing the severity of strong deposit outflows (AMRO 2023). In addition, authorities may design safety nets such as the emergency lending assistance to solvent financial institutions (including those fintechs and virtual banks that are well regulated and have growth to be systemically significant) facing temporary liquidity problems. That said, these facilities can generally be used only by entities regulated by the central bank.

- During the stress period, effective communication is crucial. One factor that can accelerate a digital bank run is the spread of information (or misinformation) through social media channels. This has prompted many banks to employ dedicated teams to monitor social media and intervene if the bank is targeted. Similarly, authorities can be active on social media platforms to monitor trending news and stop the spread of misinformation about the financial system.

Business or strategic risks: These are significant for fintechs, which are susceptible to failure in the first few years of operation. Similarly, many digital banks have moderately high exit risks. Among incumbent banks, the risks for larger banks may be low as they still derive revenue from traditional business streams and can use heavy technological investments to consolidate their position. However, small and mid-sized banks that could be squeezed by increasing competition from fintechs may not be able to invest enough in fortifying their technological defenses. Accordingly:

- The risk-based approach suggests that the life cycle of fintechs could be left untouched unless some become systemically important. Similarly, authorities should mandate digital banks to formulate an exit plan before they start business with an aim to allow a smooth closure of operations with minimal contagion risks.

- Risk monitoring on large incumbent banks, however, need to be more stringent. Most traditional banks do not have return-on-investments considerations when investing in cutting-edge technologies as they seek to stay ahead of competition. That said, mistakes in these big-ticket investments can lead to suboptimal performance and cause severe concerns among customers and shareholders. This calls for the implementation of a strong governance framework, thorough an investment review process, and clear articulation of underlying strategic objectives. The governance framework must include close monitoring of progress in fintech and financial digitalization projects with a well-defined exit strategy if the projects fail to provide the expected benefits.

- The largest challenge remains for mid-sized banks. The mid-sized banks will likely face the most challenging environment. These institutions may need government support to move to different ends of the barbell—either by becoming niche players or pooling resources through partnerships with other institutions to have enough resources to compete with larger banks. As seen in some advanced economies, to fend off competition small and mid-sized banks may need to either form alliances, consolidate through mergers, or integrate themselves into defensive ecosystems. In doing so, the authorities can ease and accelerate regulatory approval processes for mergers and acquisitions—especially between nonfinancial and financial entities and consider easing some regulatory burdens and capital requirements during the transitory stages.

Procyclicality risks: These risks appear to be peripheral for now, but could increase in scale if alternative lending grows significantly with higher interconnectedness to the broader financial sector. In such a scenario, authorities must upgrade their risk assessment frameworks to include the alternative lenders, and appropriately capture the exposure of vulnerable sectors (households, MSMEs, and so on) and the interconnectedness of the larger financial institutions with these lenders. The authorities may also need to closely track the credit-scoring models and lending standards used by these lenders to act as needed when vulnerability rises. Applicable macroprudential measures can also be applied to nonbank lenders based on proportionality i.e., their systemic importance and risk exposures.

The Way Forward

Digitalization is fundamentally changing the structure of the financial system. In economies where financial inclusion is low, digitalization has an important role in increasing the catchment area for customers of banking services. Engaging underserved and unserved segments of society will provide sufficient opportunities for new entrants into financial services to expand and gain sizable market share if they have robust business models and can adapt to customer needs.

On the other hand, for economies with high financial inclusion, new entrants will have to compete with strong incumbents who are investing heavily in upgrading service delivery through technology. Even as it seems many financial systems will gradually move toward a "barbell" structure, evidence from advanced economies suggests that niche players will find it difficult to survive as larger companies catch up. This dynamic will push the industry toward consolidation, alliances with financial and nonfinancial partners, and the development of defensive ecosystems. The trend in advanced economies is a good template for ASEAN economies with financial services that are still growing rapidly as inclusion picks up pace. That noted, issues for small and mid-sized firms will arise once financial inclusion reaches new heights, while further digitalization will have diminishing effect in expanding the financial industry's size. As these economies progress toward this stage, the authorities may need to be mindful of the risks posed by failures of niche players as well as the process of industry consolidation.

The profile of customers catered by newly digitalized financial services has been largely consistent across most economies. Retail customers, especially the young and financially excluded, have seen the most benefit from improvement in banking service delivery. However, digitalization in corporate banking has still been limited. Technological readiness is not likely an issue as many corporate banking services can be digitalized with the same building blocks used by retail businesses. But there needs to be a greater push for policymakers to facilitate these developments. Most economies still do not have the facility for firms to automate compliance procedures such as KYC and AML/CFT. Compared to national identification for individuals, corporate identification programs are lagging in most of the economies. Many processes, such as credit evaluation, are still using procedures which require physical submission of paper-based forms and documentary proofs (such as financial statements, contracts).

With retail services across many of the economies making substantial progress in digitalization, it is likely that authorities will shift focus to enabling the digitalization of corporate banking. Paperless processes will be a key stepping stone but will need to be followed up with multiple other changes as digitalization progresses. This would require a broader scale of digitalization beyond financial services. Nonetheless, several ASEAN+3 economies have already made progress with corporate banking digitalization. Examples include digital supply chain finance platforms in Thailand, digital trade finance in Malaysia, and APIs for enterprise resource planning (ERP) connectivity in Singapore.

An important aspect of corporate banking digitalization would be to ensure the 24/7 availability of financial services—including those which are market based. These services are provided to retail customers for small payments as financial intermediaries can manage market risks until markets open, given the transaction sizes. However, for corporate solutions, the significantly larger size of transactions would mean that intermediaries may not be able to manage risks when markets are closed. If markets need to operate 24/7, so would monitoring and supervision by authorities. Multiple initiatives by private and public sectors aim to automate many of these procedures so they can be operated beyond current market hours, but market development still remains a significant hurdle as liquidity dries up. Overall, while digitalization of corporate financial services is the logical next step, the impetus to facilitate it could be much higher than would be needed for retail services.

Finally, while there is no one-size-fits-all approach, authorities should take a holistic view and continue closing gaps in regulatory frameworks. Regulations across many parts of the digital economy are well developed in the region but some, such as for the use of AI and DLT, are still lagging. In light of this, cross-country collaboration and experience sharing could also facilitate the design of regulatory framework that encompasses a fast and nimble approach to innovation. At the same time, authorities must continue to monitor and assess risks that may develop as financial services, business models, and related entities evolve. A sound and prudent regulatory framework will be important to ensure that innovation in financial services continues to evolve while safeguarding financial stability.

References

Adelmann, Frank, and others. 2020. "Cyber risk and financial stability: It's a small world after all." Staff Discussion Note, International Monetary Fund, Washington, DC. *https://www.imf.org/en/Publications/Staff-Discussion-Notes/Issues/2020/12/04/Cyber-Risk-and-Financial-Stability-Its-a-Small-World-After-All-48622*.

Adrian, Tobias, Nassira Abbas, Silvia Ramirez, Gonzalo Fernandez Dionis. 2024. "The US Banking Sector since the March 2023 Turmoil: Navigating the Aftermath." IMF Global Financial Stability Notes No. 2024/001. International Monetary Fund, Washington DC. 5 March. *https://www.imf.org/en/Publications/global-financial-stability-notes/Issues/2024/03/04/The-US-Banking-Sector-since-the-March-2023-Turmoil-Navigating-the-Aftermath-544809*

Ahamed, M. Mostak, and Sushanta K. Mallick. 2019. "Is Financial Inclusion Good for Bank Stability? International Evidence." *Journal of Economic Behavior & Organization* 157: 403–27. *https://www.sciencedirect.com/science/article/abs/pii/S0167268117302056*.

Ali, Suhaimi. 2024. "Opening remarks - Open Finance Conference and Workshop." Opening Remarks at Open Finance Conference and Workshop, Kuala Lumpur. Bank for International Settlements. *https://www.bis.org/review/r241104a.htm*.

Aljazeera. 2024. "CrowdStrike IT outage causes chaos, disrupting airlines, banks, media." *Aljazeera*. July 19. *https://www.aljazeera.com/economy/2024/7/19/australia-struck-by-major-it-outage-hitting-banks-media-telecoms*.

ASEAN+3 Macroeconomic Research Office (AMRO). 2023. "Navigating High Debt in Low Visibility in ASEAN+3." *ASEAN+3 Financial Stability Report*, Singapore, December. *https://amro-asia.org/asean3-financial-stability-report-2023*.

Asian Development Bank (ADB). 2023. "Financial Digitalization and Its Implications for ASEAN+3 Regional Financial Stability." P857596, ADB. *https://www.adb.org/sites/default/files/publication/857596/financial-digitalization-asean3-financial-stability.pdf*.

Asia-Pacific Economic Cooperation (APEC) Secretariat. 2021. "FinTech Regulatory Sandboxes Capacity Building Summary Report" March. *https://www.apec.org/publications/2021/03/fintech-regulatory-sandboxes-capacity-building-summary-report*.

Bangko Sentral ng Pilipinas (BSP). 2020. "Guidelines on the Establishment of Digital Banks." BSP Circular No. 1105, Series of 2020. BSP, Manila, 26 November. *https://www.bsp.gov.ph/Regulations/Issuances/2020/c1105.pdf*.

Bangko Sentral ng Pilipinas (BSP). 2021. "2021 Financial Inclusion Survey." BSP Financial Inclusion Reports and Publications. BSP, Manila. *https://www.bsp.gov.ph/Inclusive%20Finance/Financial%20Inclusion%20Reports%20and%20Publications/2021/2021FISToplineReport.pdf*.

Bangko Sentral ng Pilipinas (BSP). 2022. "Prudential Requirements Applicable to Digital Banks, and Amendments to Relevant Provisions of the Manual of Regulations for Banks and Non-Bank Financial Institutions and Manual of Regulations on Foreign Exchange Transactions." BSP Circular no.1154, series of 2022. BSP, Manila. 8 September. *https://www.bsp.gov.ph/Regulations/Issuances/2022/1154.pdf*.

Bangko Sentral ng Pilipinas (BSP). 2023. "BSP Selects Technology for Pilot CBDC Project." BSP media and research. BSP, Manila, 7 September. *https://www.bsp.gov.ph/SitePages/MediaAndResearch/MediaDisp.aspx?ItemId=6841*.

Bangko Sentral ng Pilipinas (BSP). 2024a. "Project SAPIENS: Thematic review on the use of artificial intelligence and machine learning in the Philippine financial services". Media and Research, BSP, Manila. *https://www.bsp.gov.ph/Media_And_Research/Special%20Publications/BSP_Thematic_Review_on_the_Use_of_AI_and_ML_in_Financial_Services.pdf*

Bangko Sentral ng Pilipinas (BSP). 2024b. "BSP Lifts Moratorium on Establishment on Digital Banks." Media and Research, Press Release. BSP, Manila, 8 August. *https://www.bsp.gov.ph/SitePages/MediaAndResearch/MediaDisp.aspx?ItemId=7205*.

Bank for International Settlements (BIS). 2016. "Guidance on Cyber Resilience for Financial Market Infrastructures." CPMI Paper No. 146. BIS Committee on Payments and Market Infrastructure, Board of the International Organization of Securities Commissions (CPMI-IOSCO), Basel, 29 June. *https://www.bis.org/cpmi/publ/d146.htm*.

Bank for International Settlements (BIS) and World Bank. 2016. "Payment Aspects of Financial Inclusion." CPMI Paper No. 144. BIS Committee on Payments and Market Infrastructures, Basel. World Bank, Washington, DC. *https://www.bis.org/cpmi/publ/d144.htm*.

Bank for International Settlements (BIS), Central Bank of the UAE, People's Bank of China Digital Currency Institute Hong Kong Monetary Authority, Bank of Thailand. 2022. "Project mBridge: Connecting Economies Through CBDC." BIS Innovation Hub (BISIH). h*ttps://www.bis.org/publ/othp59.pdf*.

Bank of Thailand (BOT). 2025. "Draft Regulation on Oversight of Mechanisms Enabling Customers to Exercise Their Right to Share Their Data Held by Financial Service Providers." BOT Consultation Paper. 18 February. *https://www.bot.or.th/content/dam/bot/documents/en/laws-and-rules/hearing/public-hearing-20250218-yourdata-eng.pdf*.

Basel Committee on Banking Supervision (BCBS). "Digitalisation of Finance." 2024. BCBS Publication, Bank for International Settlements. *https://www.bis.org/bcbs/publ/d575.htm*.

Boston Consulting Group (BCG) and QED Investors. 2022. "Matchmaker, Make Me a Match: Best practices in bank-fintech partnerships." Report. *https://cdn.prod.website-files.com/605db59b78445cf5ae548e49/62fd86b8d9ba1f6bcb413ed7_20220418_QED_BCG_fintech_partnership_Whitepaper-FINAL.pdf*.

Business Times. 2025. "NTT Docomo to buy SBI's online bank for 420 billion yen in cut-throat market." *Business Times*. 29 May. *https://www.businesstimes.com.sg/companies-markets/banking-finance/ntt-docomo-buy-sbis-online-bank-420-billion-yen-cut-throat-market*.

The Canadian Broadcasting Corporation (CBC) News. 2024. "Global IT problems plague eastern Ontario." *CBC News*. July 19. *https://www.cbc.ca/news/canada/ottawa/ottawa-crowdstrike-outages-1.7268896*.

Choi, Julie. 2024. "Fintech in South Korea: An intro to the country's fintech scene." *Tenity blog*, 17 June. *https://www.tenity.com/blog/fintech-korea*.

Crisanto, Juan Carlos, Johannes Ehrentraud, and Marcos Fabian. 2021. "Big Tech in Finance: Regulatory Approaches and Policy Options." FSI Briefs No. 12. Bank for International Settlements, Financial Stability Institute, Basel. 16 March. *https://www.bis.org/fsi/fsibriefs12.htm*.

Crisanto, Juan Carlos, and others. 2024. "Regulating AI in the financial sector: recent developments and main challenges." FSI Insights on policy implementation 63. *https://www.bis.org/fsi/publ/insights63.pdf*.

Duffie, Darrel, and Joshua Younger. 2019. "Cyber Runs" Hutchins Centre Working Paper 51. *https://www.brookings.edu/wp-content/uploads/2019/06/WP51-Duffie-Younger-2.pdf*.

European Banking Authority (EBA), European Insurance and Occupational Pensions Authority (EIOPA), European Securities and Markets Authority (ESMA). 2024. "EFIF taxonomy of Financial Innovation." *https://www.esma.europa.eu/sites/default/files/2024-01/Taxonomy_of_Financial_Innovation_-_Matrix_and_Glossary.pdf*.

European Central Bank (ECB), and Bank of Japan. 2020. "Project Stella: the ECB and the Bank of Japan release joint report on distributed ledger technology (Phase 4)." STELLA. *https://www.boj.or.jp/en/paym/fintech/rel200212a.htm*.

Eisenbach, Thomas M., Anna Kovner, and Michael Junho Lee. 2022. "Cyber risk and the US financial system: A pre-mortem analysis." *Journal Journal of Financial Economics* 145(3): 802–26. *https://www.sciencedirect.com/science/article/abs/pii/S0304405X21004578*.

Feyen, Eric, and others. 2021. "Fintech and the digital transformation of financial services: implications for market structure and public policy" BIS Papers No 117, Bank for International Settlements, Basel. *https://www.bis.org/publ/bppdf/bispap117.htm*.

Financial Action Task Force (FATF). 2021. "Opportunities and Challenges of New Technologies for AML/CFT" FATF Report, Paris. *https://www.fatf-gafi.org/en/publications/Digitaltransformation/Opportunities-challenges-new-technologies-for-aml-cft.html*.

Financial Inclusion Steering Committee (FISC). 2022. "National Strategy for Financial Inclusion." Bangko Sentral ng Pilipinas (BSP) Inclusive Finance Reports and Publications. BSP, Manila. *https://www.bsp.gov.ph/Pages/InclusiveFinance/NSFI-2022-2028.pdf*.

Financial Services Commission (FSC). 2024. "FSC Introduces Roadmap to Make Improvements to Network Separation in Financial Industry." FSC Press Release, August 13. *https://www.fsc.go.kr/eng/pr010101/82884*.

Financial Stability Board (FSB). 2023. "Cyber Lexicon" Financial Stability Board, 13 April. *https://www.fsb.org/uploads/P130423-3.pdf*.

Financial Stability Board. (FSB). 2024. "Financial stability implications of artificial intelligence." Financial Stability Board, 14 November. h*ttps://www.fsb.org/2024/11/the-financial-stability-implications-of-artificial-intelligence/*.

Fintech Global. 2023. "Japanese FinTech deal activity on track to decline for fifth year straight." Industry Research, Financial Stability Board, 15 November. *https://fintech.global/2023/11/15/japanese-fintech-deal-activity-on-track-to-decline-for-fifth-year-straight/*.

Gogolin, Fabian, Ivan Lim, & Francesco Vallascas. 2025. "Cyberattacks on small banks and the impact on local banking markets." Working Paper. *https://www.garp.org/hubfs/Whitepapers/a2r1W000000x4MBQAY_WP.RiskIntell.CyberAttacks.SmallBanks-1.pdf*.

He, Dong, Ross Leckow, Vikram Haksar, Tommaso Mancini-Griffoli, Nigel Jenkinson, Mikari Kashima, Tanai Khiaonarong, Céline Rochon, and Hervé Tourpe. 2017. "Fintech and Financial Services: Initial Considerations" IMF Staff Discussion Note 17/05/ *https://www.imf.org/en/Publications/Staff-Discussion-Notes/Issues/2017/06/16/Fintech-and-Financial-Services-Initial-Considerations-44985*.

Hong Kong Monetary Authority (HKMA). 2024. "Expanding the cross-boundary e-CNY pilot in Hong Kong." Press Releases, May 19. *https://www.hkma.gov.hk/eng/news-and-media/press-releases/2024/05/20240517-3/*.

Hong Kong Monetary Authority (HKMA), and Hong Kong Institute for Monetary and Financial Research (HKIMR). 2025. "Financial Services in the Era of Generative AI: Facilitating Responsible Adoption." HKIMR Applied Research Report No.1, April 9. *https://www.hkma.gov.hk/eng/news-and-media/press-releases/2025/04/20250409-3/*.

Hong Kong University of Science and Technology (HKUST), and others. 2025. *The Hong Kong Fintech Ecosystem Report*. March. *https://www.investhk.gov.hk/media/lyye3jqu/hong-kong-fintech-ecosystem-report_20250314.pdf*.

International Data Corporation (IDC). 2024. "Public Cloud Services Market in Asia/Pacific Grew 24.2% to US$41.5 billion in 2023." Article. IDC Worldwide Semiannual Public Cloud Services Tracker, 2H23, Massachusetts, 21 August. *https://my.idc.com/getdoc.jsp?containerId=prAP52538224*

International Finance Corporation and BSR's Health Enables Returns Project (HERproject). 2022. "The Potential Gains of Digitizing Garment Sector Wages in Cambodia." Insights & Reports, World Bank, Washington, DC, 29 September. *https://www.ifc.org/en/insights-reports/2022/potential-gains-of-digitizing-garment-sector-wages-in-cambodia*.

International Monetary Fund (IMF). 2023. "2023 Review of The Fund's Anti-Money Laundering and Combating the Financing of Terrorism Strategy." IMF Policy Paper No. 2023/052. *https://doi.org/10.5089/9798400258763.007*.

Jawhar, Tracy, and Beatriz Troiano. 2022. "Fintech Valuations Run into a Macroeconomic Buzzsaw." Bain & Company, November. *https://www.bain.com/insights/fintech-valuations-run-into-a-macroeconomic-buzzsaw/*.

Judge, Peter. 2022. "South Korea's Government to Grill Kakao After Data Center Fire Cripples Key Services." Data Center Dynamics News Article, London, October 17. *https://www.datacenterdynamics.com/en/news/south-koreas-government-to-grill-kakao-after-data-center-fire-cripples-key-services/*.

Kamiya, Shinichi, and others. 2021. "Risk management, firm reputation, and the impact of successful cyberattacks on target firms." *Journal Journal of Financial Economics* 139(3): 719–749. *https://www.sciencedirect.com/science/article/abs/pii/S0304405X20300143*.

Kijang, Sasana. 2025. "Opening Remarks by Governor Abdul Rasheed Ghaffour at MyFintech Week 2025." Bank Negara Malaysia, August 5. *https://www.bnm.gov.my/-/myfintech25-g-spch*

Koh, Ting Yang, and Jermy Prenio. 2023. "Managing cloud risk – Some considerations for the oversight of critical cloud service providers in the financial sector", Financial Stability Institute Insights No. 53, Bank for International Settlements. *https://www.bis.org/fsi/publ/insights53.pdf*.

Kotidis, Antonis, and Schreft Stacey L. 2024. "The propagation of cyberattacks through the financial system: Evidence from an actual event." Social Social Science Research Network. *https://papers.ssrn.com/sol3/papers.cfm?abstract_id=5087787*.

KPMG. 2024. "Pulse of Fintech H2'23." Report. *https://assets.kpmg.com/content/dam/kpmg/sg/pdf/2024/02/pulse-of-fintech-h2-2023.pdf*.

KPMG. 2025. "Global analysis of fintech funding" Pulse of Fintech H2'24 report. *https://assets.kpmg.com/content/dam/kpmgsites/xx/pdf/2025/02/pulse-of-fintech-h2-2024.pdf.coredownload.inline.pdf*.

Lin, Zhuo, Kwatra Ashwin. 2024. "Beyond Inclusion: Building People's Financial Resilience." ESCAP MPFD Polic Brief No. 128. Economic and Social Commission for Asia and the Pacific (ESCAP), Bangkok. July 2.*https://repository.unescap.org/items/3f4ef097-4c0e-43a4-81a8-8ac5f4d21060https://repository.unescap.org/items/3f4ef097-4c0e-43a4-81a8-8ac5f4d21060*.

Liu, Yang, and others. 2025. "Navigating Fintech and Banking Risks: Insights from A Systematic Literature Review." *Nature Journal, Humanities and Social Science Communications* 12(717), May 26. *https://www.nature.com/articles/s41599-025-05055-9*.

Mangaluz, Jean. 2024. "Philippine banks hit by global IT outage." *Philstar*. Manila, July 19. *https://www.philstar.com/business/2024/07/19/2371419/philippine-banks-hit-global-it-outage*.

McKinsey & Company. 2023a. "Fintechs: A New Paradigm of Growth." Report. h*ttps://www.mckinsey.com/~/media/mckinsey/industries/financial%20services/our%20insights/fintechs%20a%20new%20paradigm%20%20of%20growth/fintechs-a-new-paradigm-of-growth.pdf?shouldIndex=false.*

McKinsey & Company. 2023b. "Why most digital banking transformations fail—and how to flip the odds." Report. *https://www.mckinsey.com/capabilities/mckinsey-digital/our-insights/tech-forward/why-most-digital-banking-transformations-fail-and-how-to-flip-the-odds.*

MindForge. 2024. "Emerging risks and opportunities of generative AI for banks: A Singapore perspective." Monetary Authority of Singapore. 26 May. *https://www.mas.gov.sg/-/media/mas-media-library/schemes-and-initiatives/ftig/project-mindforge/emerging-risks-and-opportunities-of-generative-ai-for-banks.pdf*

Mittal, Sachin, and others. 2016. "The Rise of FinTech in China: Redefining Financial Services." *A collaborative report by DBS and EY*. November. *https://www.dbs.com/insights/uploads/20161202-03-Report-031-CHINA-FINTECH-LOWRES.pdf.*

Monetary Authority of Singapore (MAS). 2019. "Eligibility Criteria and Requirements for Digital Banks." MAS Digital Bank License Reference Material, MAS, Singapore. August. *https://www.mas.gov.sg/regulation/banking/digital-bank-licence.*

Monetary Authority of Singapore (MAS). 2020. "Project Ubin: Central Bank Digital Money using Distributed Ledger Technology." MAS Schemes and Initiatives, MAS, Singapore *https://www.mas.gov.sg/schemes-and-initiatives/project-ubin.*

Monetary Authority of Singapore (MAS). 2022. "Project Dunbar." MAS Monographs or Information Paper, MAS, Singapore. 24 March. *https://www.mas.gov.sg/publications/monographs-or-information-paper/2022/project-dunbar.*

Monetary Authority of Singapore (MAS). 2024. "Artificial Intelligence Model Risk Management. Observations from a Thematic Review" MAS Monographs or Information Paper, MAS, Singapore. Dec 24. *https://www.mas.gov.sg/-/media/mas-media-library/publications/monographs-or-information-paper/imd/2024/information-paper-on-ai-risk-management-final.pdf*

Naceur, Sami Ben, Bertrand Candelon, and Farah Mugrabi. 2024. "Systemic Implications of Financial Inclusion." *IMF Working Paper* 2024(203). International Monetary Fund, Washington, DC,. September 20 September. *https://www.elibrary.imf.org/view/journals/001/2024/203/article-A001-en.xml.*

National Bank of Cambodia (NBC). 2020. "Project Bakong: Next Generation Payment System" Bakong White Paper, June. *https://bakong.nbc.gov.kh/download/NBC_BAKONG_White_Paper.pdf.*

Nikkei Asia. 2025. "Over 1,800 people arrested in Asia crackdown on scam operations." *Nikkei Asia*, 3. June. h*ttps://asia.nikkei.com/Spotlight/Society/Crime/Over-1-800-people-arrested-in-Asia-crackdown-on-scam-operations.*

Oliver Wyman. 2022. "The State of the Financial Services Industry 2022 – The Tectonic Shift Between Risk, Data, and Technology." Report. *https://www.oliverwyman.com/our-expertise/journals/state-of-financial-services.html.*

Ong, Li Lian, Alex Liyang Tang, Edmond Chiang Yong Choo, Hoang Nam Nguyen, Prashant Pande, Toàn Long Quách, and Yin Fai Ho. 2023a. "Opportunities and Challenges of Financial Digitalization: A New Perspective on ASEAN+3 Regional Financial Cooperation." AMRO Policy Position Paper PPP23-01, ASEAN+3 Macroeconomic Research Office, Singapore, May 2. *https://amro-asia.org/wp-content/uploads/2024/06/AMRO-Policy-Position-Paper_Opportunities-and-Challenges-of-FinDig_May-2-2023_Published.pdf.*

Ong, Li Lian, and others.Alex Liyang Tang, Hoang Nam Nguyen, Prashant Pande, and Toàn Long Quách. 2023b. "The Failure of SVB and the Bank-Tech Nexus: What Does it Foreshadow for the ASEAN+3?" AMRO Analytical Note, ASEAN+3 Macroeconomic Research Office, Singapore, March 22 March. *https://amro-asia.org/the-failure-of-svb-and-the-bank-tech-nexus-what-does-it-foreshadow-for-the-asean3/.*

Pande, Prashant, Toàn Long Quách, and Edmond Chiang Yong Choo. 2025. "Powering Payments: The Role of Technology in ASEAN's Regional Payment Connectivity Initiative." AMRO Policy Perspectives PP/25-02, ASEAN+3 Macroeconomic Research Office, Singapore, July 3. *https://amro-asia.org/wp-content/uploads/2025/07/AMRO-Policy-Perspectives-Powering-Payments-The-Role-of-Technology-in-ASEANs-Regional-Payment-Connectivity-Initiative-for-publishing.pdf.*

Raman, Jayant, and others. 2024. "Cracking the $5 billion scam challenge in Southeast Asia." Oliver Wyman. *https://www.oliverwyman.com/content/dam/oliver-wyman/v2/publications/2024/mar/cracking-$5-billion-scam-challenge-in-southeast-asia-oliver-wyman.pdf.*

Restoy, Fernando. 2022. "Proportionality and Financial Inclusion: Implications for Regulation and Supervision". BIS Welcome Remarks. Bank for International Settlements, Basel. 7 November. *https://www.bis.org/speeches/sp221107.pdf.*

Roush, Ty, and Brian Bushard. 2024. "CrowdStrike's Massive Global Tech Outage: Airlines, Hospitals, Bank, 911, Government Impacted." Forbes. July 19. *https://www.forbes.com/sites/tylerroush/2024/07/19/crowdstrikes-massive-global-tech-outage-airlines-banks-911-state-services-impacted/.*

Singlife. 2025. "Fintech in Singapore" grow with Singlife. 19 February. *https://grow.singlife.com/content/dam/singlife-elevate/insights/thematic-report/edition-02/thematic_report_edition_02_20250219.pdf.*

Startup Genome. 2025. "The Global Startup Ecosystem Report 2024." Report. *https://startupgenome.com/report/gser2024/introduction.*

United Nations Office on Drugs and Crime (UNODC). 2024. "Transnational Organized Crime and the Convergence of Cyber-Enabled Fraud, Underground Banking and Technological Innovation in Southeast Asia: A Shifting Threat Landscape." UNODC. Southeast Asia and the Pacific, October. *https://www.unodc.org/mwg-internal/de5fs23hm64ds/progress?id=jadM4Fx4x6oQU_sOk8Jh212pi5-gyes2AbM--TAkVK4.*

United Overseas Bank (UOB), PWC and Singapore Fintech Association (SFA). 2024. "FinTech in ASEAN 2024: A Decade of Innovation." Report. *https://www.uobgroup.com/assets/web-resources/techecosystem/fintech/pdf/fintech-in-asean-2024.pdf.*

Uppaluri, Ruthvik. 2025. "Cloud-Driven Modernization of Financial Systems." *World Journal of Advanced Research and Reviews* 26(01): 147–157, 2 April. *https://journalwjarr.com/sites/default/files/fulltext_pdf/WJARR-2025-1030.pdf.*

World Bank Group. 2022. "Policy Brief: Fintech and the Future of Finance." Report. *https://thedocs.worldbank.org/en/doc/11ea23266a1f65d9a08cbe0e9b072c89-0430012022/related/FFoF-2-page-Brief-Summary-for-Policy-Makers.pdf.*

WorldPay. 2025. "Global Payment Report 2025." Report. *https://www.worldpay.com/en-GB/global-payments-report?utm_source=google&utm_medium=paid_search&utm_campaign=2025_ENT_PM_GPR-ENGLISH_29508&utm_content=en-gb_gpr_google&gad_source=1&gad_campaignid=22443344530&gbraid=0AAAAAqItqDPFR_UiL_*

This page is intentionally left blank.

This page is intentionally left blank.

ASEAN+3 Macroeconomic Research Office

10 Shenton Way, #15-08,
MAS Building, Singapore 079117
Tel: +65 6323 9844
Email: enquiry@amro-asia.org

Follow us

LinkedIn

Twitter

Facebook

www.amro-asia.org