



Bank

Chapter 4

Navigating High Debt in Low Visibility – Assessing Resilience of Financial Intermediaries

Highlights

- ASEAN+3 banks are the dominant source of credit in the region, holding a substantial share of financial assets, and their growth has consistently exceeded economic growth over the past decade. Assessing leverage risks is essential, since a widening credit-to-GDP gap relative to its long-term trend can be an indicator of the risk of banking crises.
- ASEAN+3 banks have bolstered resilience by building capital buffers and upholding high credit quality standards, as reflected in their good compliance with Basel III regulations. This prudent regulatory approach has served the region well.
- Improving liquidity buffers can help banks better withstand external shocks, particularly given their vulnerability to market funding risks, with the rise in funding costs associated with global monetary tightening. Meanwhile, some liquidity indicators have worsened, as banks are more vulnerable when interest rates are elevated. However, growing reliance on intraregional financing and regulatory tightening can mitigate the risks. Strengthened deposit insurance schemes and bilateral swap lines can also boost confidence in the banking sector.
- Several risks remain. First, the end of pandemic relief measures left borrowers' leverage at relatively high levels. Second, the concentration of property and construction loans makes banks vulnerable to real estate market cycles, as seen in some economies. Third, rising interest rates may undermine loan portfolio quality due to heightened refinancing and default risks.
- Nonbank Financial Intermediaries (NBFIs) constitute a smaller sector than banking but have grown rapidly and remain systemically important given their key role in financial intermediation in ASEAN+3. Assessing risks posed by NBFIs is complex due to the diverse types of institutions and limited data.
- Systemic risk from NBFIs come primarily through those that provide maturity or currency transformation. NBFIs have expanded rapidly in the region, with their role varying significantly across economies. In Japan, Korea, Hong Kong, and Singapore, growth is concentrated in Financial Market Intermediaries (FMIs), which are key liquidity providers, especially in foreign currency. In China, the main type of NBFIs are Collective Investment Vehicles (CIVs), such as fixed income funds.
- Given the diverse roles of NBFIs, prudential oversight needs to be tailored to the specific risks posed by each type. In light of their growing systemic importance in ASEAN+3, regulation and supervision, data disclosure, and risk management of NBFIs need to be substantially strengthened. Should these lines of defence fail to prevent a systemic crisis, central banks need to be ready to provide temporary liquidity support to solvent NBFIs to ensure the continued functioning of financial markets.

I. Introduction

High debt levels can undermine the resilience of financial intermediaries in multiple ways. For one, high indebtedness makes default more likely, potentially impairing the quality of intermediaries' asset portfolios. Moreover, higher interest rates raise debt-servicing burdens for borrowers and can reduce the quality of assets. The confluence of these factors could shake investor confidence in ASEAN+3 financial intermediaries (Box 4.1), making rapid fund withdrawals more likely and putting liquidity at risk. If excessive debt contributes to asset bubbles that eventually burst, the drop in collateral values could heighten loan-to-value ratios, which would introduce an added layer of financial risk. Furthermore, where multiple intermediaries share a common exposure to certain high-risk borrowers, a single default event could ripple through the financial system.

Against this background, this chapter assesses the resilience of financial intermediaries amid higher debt. Specifically:

- Section II starts with an assessment of ASEAN+3 banks' financial stability through key metrics such as capital adequacy, credit quality, and liquidity coverage. It also analyzes risks to bank balance sheets from cross-border financial exposures. A simulation evaluates banks' resilience to rising interest rates. The section concludes by recommending strategies to enhance regional banking resilience amid market volatility.
- Section III examines Nonbank Financial Intermediaries (NBFIs) in the ASEAN+3 region. It highlights their rapid expansion and growing systemic importance, and considers how data limitations prevent the risks to financial stability from being adequately assessed. The section identifies the key sources of systemic risk posed by various types of NBFIs. It concludes with policy recommendations to strengthen the resilience of NBFIs and ensure they can continue to perform their critical market intermediation role when financial systems come under stress.

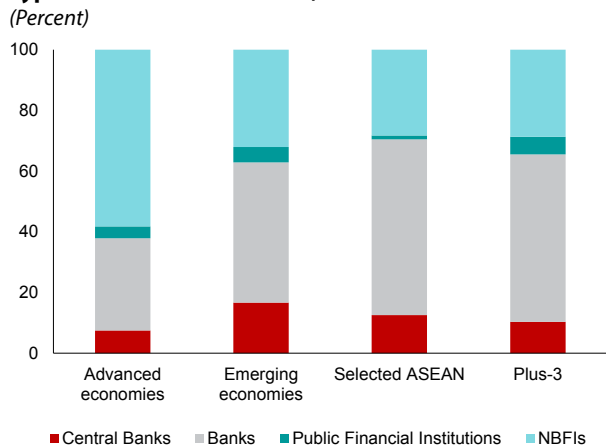
II. Banks

Banks are major providers of credit in the region

ASEAN+3 banks are key players in directing credit to households, businesses, and governments. A significant share of the region's financial assets resides with banks and they have a more dominant role in lending compared to global averages for the financial service industry (Figure 4.1). The region's credit-to-GDP ratios have been rising steadily for decades, mirroring global trends (Figure 4.2). Plus-3 economies (including Hong Kong) have had the highest credit-to-GDP ratios within ASEAN+3 since 2014 (Figure 4.3). These trends may indicate that some borrowers are taking on excessive leverage, which raises financial system vulnerabilities, especially when interest rates are elevated (Drehmann and Tsatsaronis 2014).

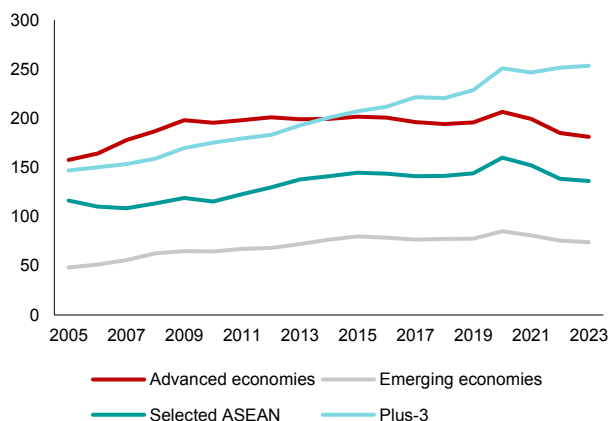
Credit in the region is allocated for various purposes, with notable focus on the property sector. While ASEAN banks extend more loans for financial services, business, and trade, Plus-3 economies granted more to tourism and the services sector (Figures 4.4 and 4.5). Across the region, loans to construction firms and mortgage borrowers comprise a significant share (24 percent to 27 percent). This raises concerns about the vulnerability of banks to fluctuations in the property market, especially when loans are backed by property as collateral.

Figure 4.1. Selected Regions: Share of Financial Assets by Type of Financial Institution, 2021



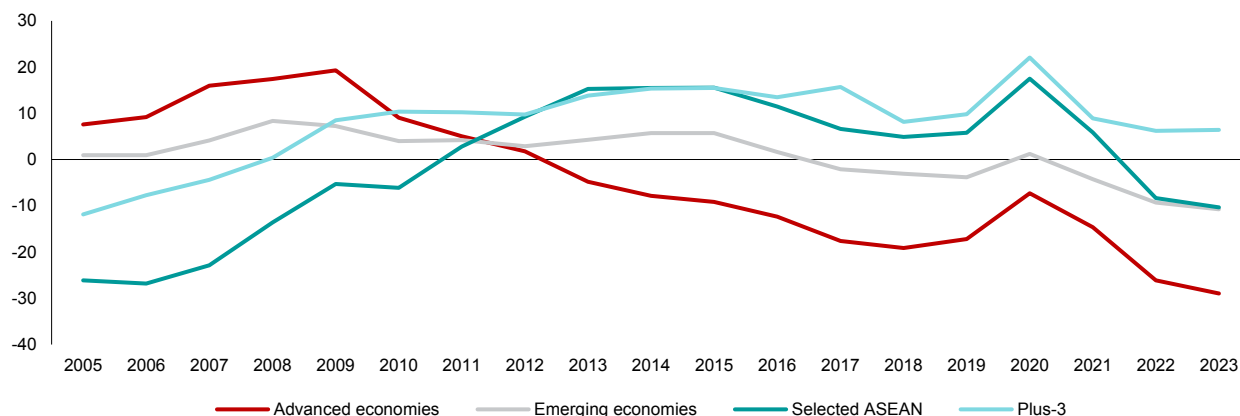
Source: Financial Stability Board via Haver Analytics; AMRO staff calculations.
 Note: Selected ASEAN includes Indonesia and Singapore. Plus-3 economies covered are China, Hong Kong, Japan, and Korea. Due to data availability for public financial institutions, it may be underestimated. Advanced economies refer to selected economies in North America and Western Europe. Emerging economies refer to selected economies in Latin America and Eastern Europe.

Figure 4.2. Selected Regions: Credit-to-GDP Ratio (Percent)



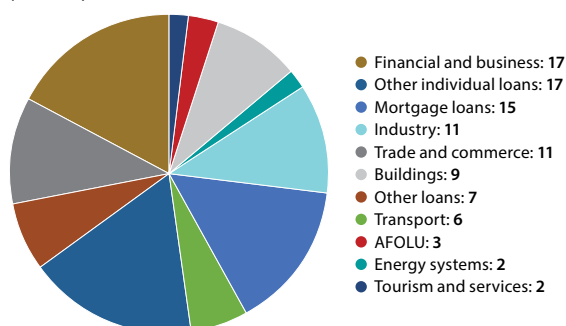
Source: Bank for International Settlements via Haver Analytics; AMRO staff calculations.
 Note: The credit-to-GDP ratios are computed based on simple averages amongst economies in the specific region. The estimates are constrained by data availability. Selected ASEAN includes Indonesia, Malaysia, Singapore, and Thailand. Plus-3 economies covered are China, Hong Kong, Japan, and Korea. Advanced economies refer to selected economies in North America and Western Europe. Emerging economies refer to selected economies in Latin America and Eastern Europe. Data for 2023 as of Q1 2023.

Figure 4.3. Selected Regions: Credit-to-GDP Gap (Percent)



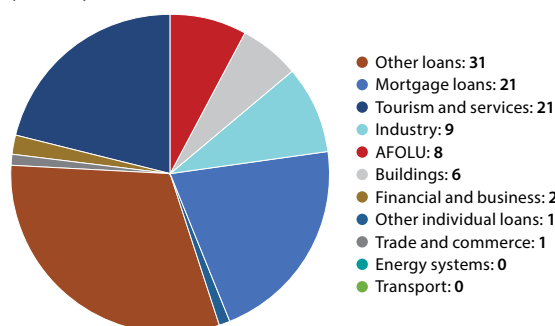
Source: Bank for International Settlements via Haver Analytics; AMRO staff calculations.
 Note: The credit-to-GDP gaps are computed based on simple averages amongst economies in the specific region. The estimates are constrained by data availability. Selected ASEAN includes Indonesia, Malaysia, Singapore, and Thailand. Plus-3 economies covered are China, Hong Kong, Japan, and Korea. Advanced economies refer to selected economies in North America and Western Europe. Emerging economies refer to selected economies in Latin America and Eastern Europe. Data for 2023 as of Q1 2023.

Figure 4.4. ASEAN: Sectoral Credit, 2022



Source: National authorities via Haver Analytics; AMRO staff calculations.
 Note: The shares of sectoral credit are weighted by the size of banking loans. AFOLU=Agriculture, Forestry and Other Land Use.

Figure 4.5. Plus-3: Sectoral Credit, 2022



Source: National authorities via Haver Analytics; AMRO staff calculations.
 Note: The shares of sectoral credit are weighted by the size of banking loans. AFOLU=Agriculture, Forestry and Other Land Use.

Broadly, ASEAN+3 banking sectors are relatively sound

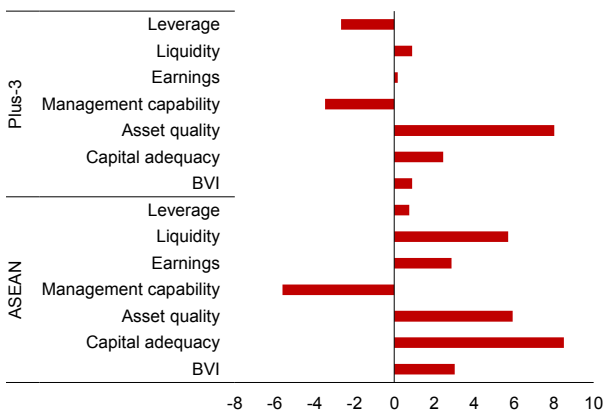
ASEAN+3 banks have remained resilient through the COVID-19 pandemic, bolstered by regulatory improvements since the Asian financial crisis (Khor and Jiang 2023). Utilizing AMRO's Bank Vulnerability Index (BVI),¹ which assesses criteria such as capital adequacy, asset quality, management capability, earnings, liquidity, and leverage, the region's banks have performed more strongly than their peers.

ASEAN+3 banks are well-capitalized, providing a cushion against credit risks. As reflected in the region's higher BVI scores, capital adequacy is better than it was a decade ago (Figure 4.6). Notably, ASEAN banks boast higher total and Tier 1 capital adequacy ratios (CARs) than regional peers (Figures 4.7 and 4.8). While Plus-3 banks have lower CARs, their nonperforming loan (NPL) ratios are among the world's lowest (Figure 4.9). Most economies in the region comply with Basel III regulations and meet elevated capital adequacy standards (Table 4.1). This fortifies capital buffers against credit and liquidity risks while offering continued

credit support to households, businesses, and governments. That said, despite stable bank credit quality, weak corporate solvency ratios are reflected in low interest coverage ratios (Chapter 2), which indicates a possibility of sudden and significant increase in NPLs.

Several factors contribute to the higher CARs of ASEAN+3 banks. First, the region's NPL ratios are low and stable, reflecting generally prudent lending standards that help contain erosion in the capital base and adequate provisioning for losses. Second, regulatory measures such as dividend caps, introduced at the onset of the pandemic (The Nation 2023; Monetary Authority of Singapore 2020; Trang 2022), aided capital retention. Third, even though regional banks' return-on-asset might not be best performing, the decline in profitability during the initial stage of the pandemic was less severe than in other regions (Figure 4.10), and so supported ongoing capital growth. Lastly, ASEAN+3 banks' primary income is from net interest margins (Figure 4.11). These are tied to lending and a more stable source of profit than investments in markets.

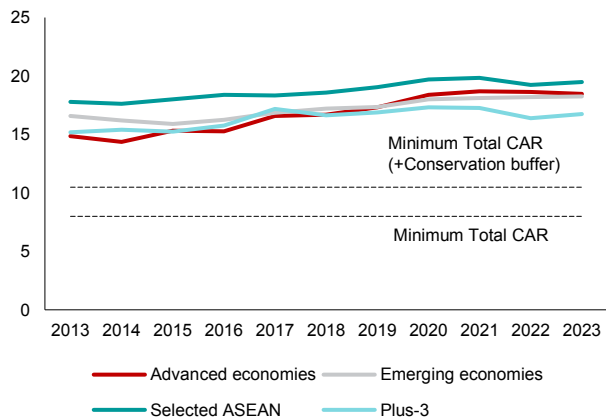
Figure 4.6. ASEAN+3: Improvement in Bank Vulnerability Index (BVI) Factors, 2013–22
(Percent)



Source: AMRO staff calculations. Note: BVI = Bank vulnerability index; BVI comprises of six factors, namely capital adequacy, asset quality, management capability, earnings, liquidity, and leverage. A positive BVI/ BVI factor refers to an improvement in banking sector resilience. The banks are benchmarked against their individual historical domestic banking sector. For more details on the benchmarking group, refer to Wong and Wei (2023).

Pandemic relief measures have been key to sustaining ASEAN+3 banking resilience. Regulators started a variety of initiatives benefitting both banks and borrowers (Table 4.2). For banks, easing regulatory requirements helped maintain credit flows. Borrowers received support through measures such as loan deferrals, restructuring, moratoriums, debt consolidation, credit guarantees, and reduced interest rates to ease cash flow issues. While these supportive policies have ended, NPL ratios have generally remained low. In 2023, Korea, Lao PDR, Thailand, and Vietnam are still phasing out forbearance measures with an emphasis on sound restructuring practices and timely financial disclosure, as the true financial soundness may not yet be fully known.

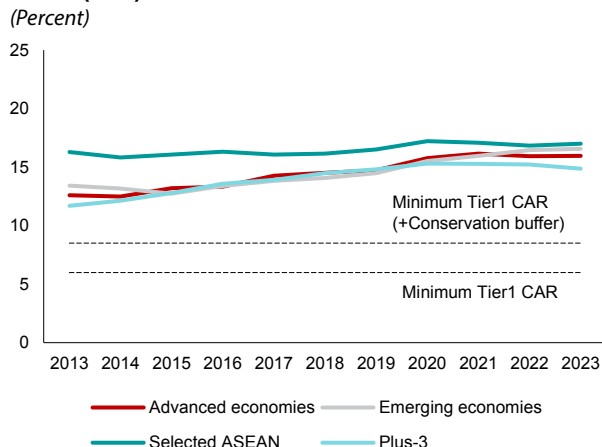
Figure 4.7. Selected Regions: Total Capital Adequacy Ratio (CAR)
(Percent)



Source: National authorities; International Monetary Fund via Haver Analytics; AMRO staff calculations. Note: The CARs are computed based on simple averages amongst economies in the specific region. Due to data availability, ASEAN economies not covered are 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.

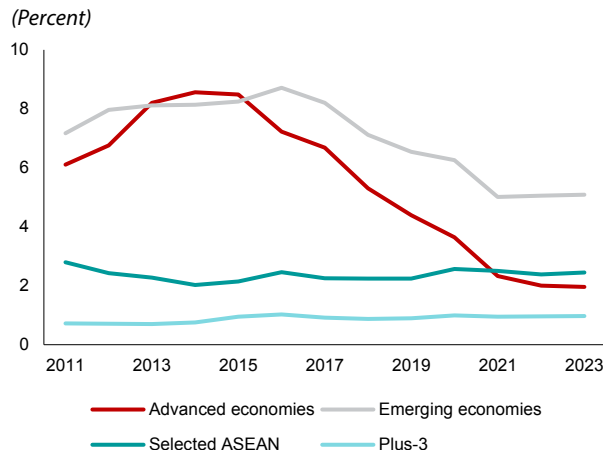
Forbearance policies present long-term risks. First, they can keep borrowers' leverage high, raising the risk of future debt delinquency. This could create insolvent 'zombie firms,' which would be more destabilizing than prompt liquidation (Gee and Lucas 2023). Second, banks, especially with lower capital, may accumulate 'evergreen loans' by deferring payments and prolonging debt restructuring to avoid loan loss recognition (Özlem Dursun-de Neef and Schandlbauer 2021). Proactive surveillance of household and corporate balance sheets can help authorities better assess these long-term vulnerabilities.

¹ The BVI, as described in Wong and Wei (2023), is a modified approach to the widely recognized CAMELS rating system.

Figure 4.8. Selected Regions: Tier 1 Capital Adequacy Ratios (CAR) (Percent)

Source: National authorities; International Monetary Fund via Haver Analytics; AMRO staff calculations.

Note: The Tier 1 CARs are computed based on simple averages amongst economies in the specific region. Due to data availability, ASEAN economies not covered are Indonesia, 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.

Figure 4.9. Selected Regions: Nonperforming Loan (NPL) Ratio (Percent)

Source: National authorities; International Monetary Fund via Haver Analytics; AMRO staff calculations.

Note: The NPL ratios are computed based on simple averages amongst economies in the specific region. Due to data availability, Lao PDR, Myanmar, and Vietnam are excluded from the analysis for ASEAN, while China is excluded from the analysis for Plus-3. Advanced economies refer to selected economies in North America and Western Europe. Emerging economies refer to selected economies in Latin America and Eastern Europe. Data for 2023 as of Q1 2023. Data are extrapolated for the economies that do not have latest data.

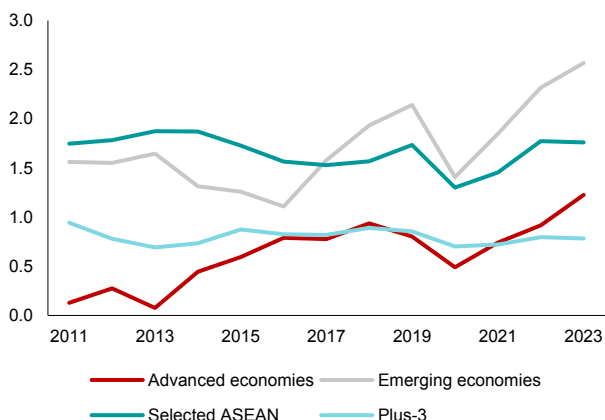
Table 4.1. ASEAN+3: Year of Basel III Implementation

Economy	Capital requirements			Liquidity requirements		Domestic systemically important requirements	Global systemically important requirements	Large exposure framework
	Regulatory capital	Conservation capital	Countercyclical capital buffer	Liquidity coverage ratio	Net stable funding ratio			
Brunei	2019			Brunei has developed guidelines and is in the midst of engaging with industry.	2020			
Cambodia	2016	2019	2019	2020				
China	2013	2016	2016	2017	2018	2016	2016	2018
Hong Kong	2013	2015	2015	2015	2018	2015	2015	2020
Indonesia	2014	2016	2016	2015	2017	2016		2020
Japan	2013	2016	2016	2016	2021	2016	2016	2020
Korea	2013	2016	2016	2015	2018	2016		2019
Lao PDR	2018 (Basel II)	Lao PDR is implementing Basel II.						
Malaysia	2013	2016	2020	2015	2016	2020		2020
Myanmar	2017			2017				2017
Philippines	2014	2014	2018	2018	2019	2014		2024
Singapore	2013	2016	2016	2017	2018	2015	2014	2020
Thailand	2013	2016	2013	2016	2018	2017		
Vietnam	The State Bank of Vietnam is implementing Basel II.							

Sources: Bank for International Settlements; Moody's; national authorities; AMRO staff compilation.

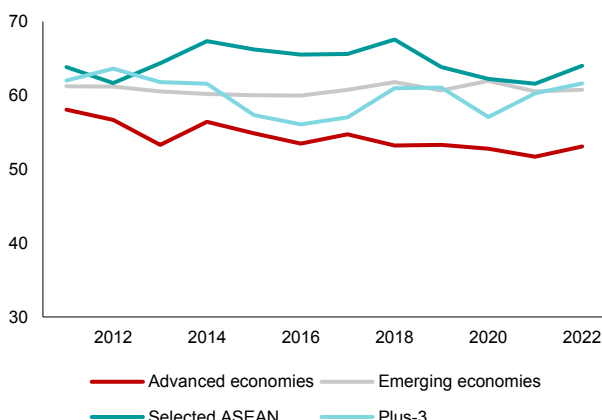
Note: Figures refer to the year of implementation for each measure.

Figure 4.10. Selected Regions: Return on Asset (Percent)



Source: National authorities; International Monetary Fund via Haver Analytics; AMRO staff calculations.
 Note: The ROAs are computed based on simple averages amongst economies in the specific region. Due to data availability, Lao PDR, Myanmar, and Vietnam are excluded from the analysis for ASEAN, while China is excluded from the analysis for Plus-3. Advanced economies refer to selected economies in North America and Western Europe. Emerging economies refer to selected economies in Latin America and Eastern Europe. Data for 2023 as of Q1 2023.

Figure 4.11. Selected Regions: Interest Margin to Gross Income (Percent)



Source: National authorities; International Monetary Fund via Haver Analytics; AMRO staff calculations.
 Note: The net interest margins are computed based on simple averages amongst economies in the specific region. Due to data availability, Lao PDR, Myanmar, and Vietnam are excluded from the analysis for ASEAN, while China is excluded from the analysis for Plus-3. Advanced economies refer to selected economies in North America and Western Europe. Emerging economies refer to selected economies in Latin America and Eastern Europe. Data extrapolated where necessary. Data for 2023 as of Q1 2023. Data are extrapolated for the economies that do not have latest data.

Table 4.2. Selected ASEAN+3: Summary of Regulatory Forbearance Policies

Measure	Economy	Target segments
Relaxing regulatory requirements for banks		
• Reducing capital conservation buffer or liquidity requirements	MY, PH	Broad-based
• Reducing required regulatory reserves	HK, ID, KH, MY, PH	Broad-based
• Relaxation of debt classification and/or provisioning criteria	KH, LA, PH, TH, VN	Broad-based
• Delaying Basel III implementation	ID, JP, HK, KH, SG	Broad-based
• Lowering banks' operation costs	PH	Broad-based
Relief of debt repayment burden for borrowers		
• Moratoriums or deferment of debt repayment	BN, CN, HK, KR, LA, MY, PH, SG, TH	Households, SMEs
• Easing macroprudential regulations	ID, PH, TH	Corporates, property sector
• Debt restructuring and/or consolidation programs	BN, ID, KH, LA, MY, PH, SG, TH, VN	Households, corporates, SMEs
• Interest rate subsidies/ reductions	PH, VN	Corporates, SMEs

Source: National authorities; AMRO staff compilation.
 Note: BN = Brunei; KH = Cambodia; CN = China; HK = Hong Kong; ID = Indonesia; KR = Korea; LA = Lao PDR; MY = Malaysia; PH = Philippines; TH = Thailand; SME = small and medium enterprise; and VN = Vietnam. The policies were introduced to support the banking sectors and borrowers during the pandemic, but might have since been phased out.

Some shifts in financing sources are occurring for ASEAN+3 banks

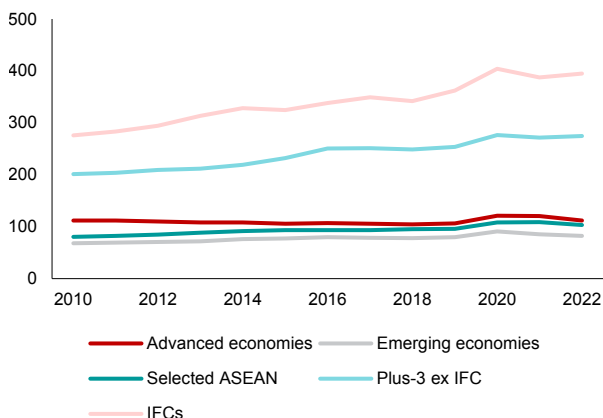
Liabilities have grown, especially from market financing. Reliance on market-based financing has grown more quickly in international financial centers (IFCs) and Plus-3 economies compared with global averages (Figure 4.12). Even as deposits still constitute most banking liabilities, a growing portion comes from more market-based financing sources such as bonds and repurchase operations, especially in economies where the stock of bank liabilities is large (Figure 4.13). This trend exposes banks to greater risks. For example, the March 2023 turmoil in the United States (US) and European banking sectors hurt sentiment in Plus-3 economies, resulting in higher credit default swap (CDS) spreads and lower bank equity prices, which in turn increased the cost of raising funds in the market.

While the US and the rest of the world has traditionally been the main sources of cross-border funding for ASEAN+3 banks, particularly in the Plus-3 region (Figures 4.14, 4.15, 4.16), reliance on intraregional financing, notably from Japan, is growing. This shift, observed since the global financial crisis (Remolona and Shim 2015), could mean economies in the region rely more

on their neighbours and so are less exposed to volatility from outside the region than to volatility from within. Moreover, as this cross-border finance in the region is dominated by the US dollar, it will continue to be affected by unexpected changes in global monetary policies. ASEAN+3 economies should remain vigilant about foreign exchange risks, given that US dollars are significant on the balance sheets of the main intraregional financiers. For instance, the three largest Japanese megabanks, which are key sources of dollar funding for ASEAN, rely on US repurchase operations, cross-currency swaps, and rolling forward FX contracts for funding, although they have increased deposits to stabilize their funding base.

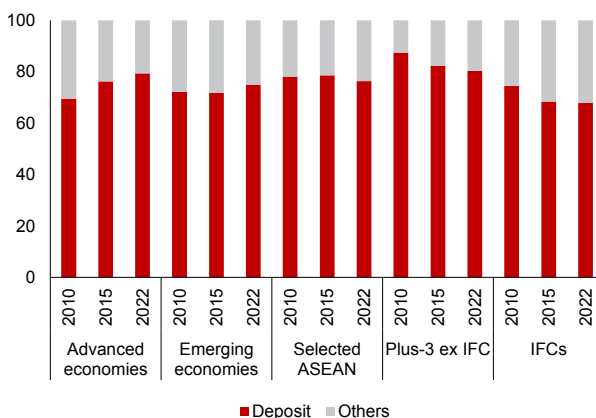
Mitigating cross-border liquidity risk is a priority for ASEAN+3 banks since their regional financial ties are substantial (Figures 4.17 and 4.18), including those with the Hong Kong and Singapore as financial centers. This reliance on cross-border financing can make banks more vulnerable to market volatility (Figure 4.19) given that most claims and liabilities are in US dollars (Figures 4.20 and 4.21), which adds to liquidity risks due to foreign exchange fluctuations.

Figure 4.12. Selected Regions: Bank Liabilities
(Percent of GDP)



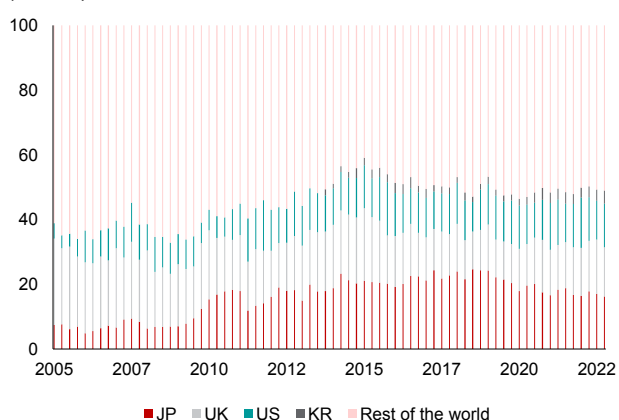
Source: International Monetary Fund via Haver Analytics; AMRO staff calculations.
Note: IFCs = international financial centers; IFCs covers Hong Kong and Singapore. Advanced economies constitute countries in the Western Europe and North American regions. Emerging economies constitutes countries in the Eastern Europe and Latin American regions. Selected ASEAN includes Brunei, Cambodia, Indonesia, Malaysia, Myanmar, the Philippines, Singapore, and Thailand, but excludes Lao PDR due to data availability issue. The figures are computed based on weighted averages amongst economies in the specific region. Data are extrapolated for the economies that do not have latest data. Latest information on Singapore is from 2020.

Figure 4.13. Selected Regions: Share of Bank Liabilities
(Percent)



Sources: International Monetary Fund via Haver Analytics; AMRO staff calculations.
Note: IFCs = international financial centers, covering Hong Kong and Singapore. Advanced economies constitute countries in the Western Europe and North American regions. Emerging economies constitutes countries in the Eastern Europe and Latin American regions. Selected ASEAN includes Brunei, Cambodia, Indonesia, Malaysia, Myanmar, the Philippines, Singapore, and Thailand, but excludes Lao PDR due to data availability issue. The share of liabilities is computed based on simple averages amongst economies in the specific region. Data are extrapolated for the economies that do not have latest data. Latest information on Singapore is from 2020.

Figure 4.14. ASEAN: Share of Foreign Claims on Banks by Counterparty Economy
(Percent)



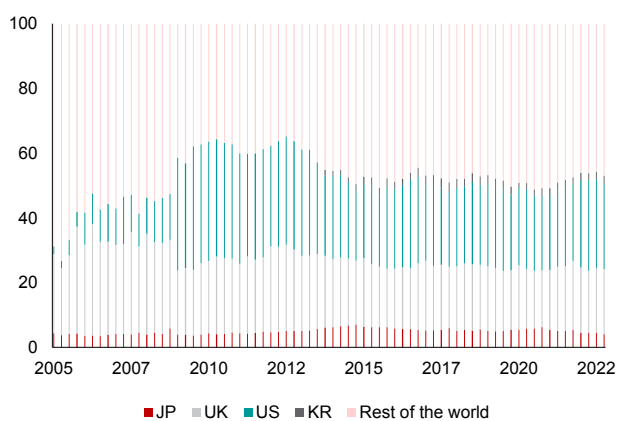
Source: Bank for International Settlements via Haver Analytics; AMRO staff calculations.
Note: JP = Japan; KR = Korea; UK = United Kingdom; US = United States.

Figure 4.15. Hong Kong and Singapore: Share of Foreign Claims on Banks by Counterparty Economy
(Percent)



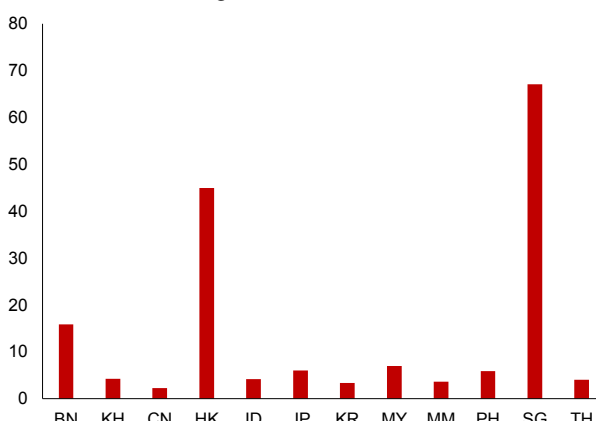
Source: Bank for International Settlements via Haver Analytics; AMRO staff calculations.
Note: JP = Japan; KR = Korea; UK = United Kingdom; US = United States.

Figure 4.16. Plus-3 Excluding IFC: Share of Foreign Claims on Banks by Counterparty Economy
(Percent)



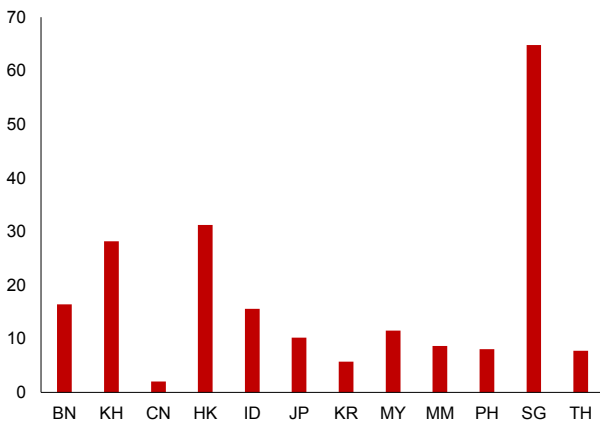
Source: Bank for International Settlements via Haver Analytics; AMRO staff calculations.
Note: Plus-3 excluding IFC covers China, Japan, and Korea. JP = Japan; KR = Korea; UK = United Kingdom; US = United States.

Figure 4.17. Selected ASEAN+3: Cross Border Bank Loans, Q4 2022
(Percent of own banking sector assets)



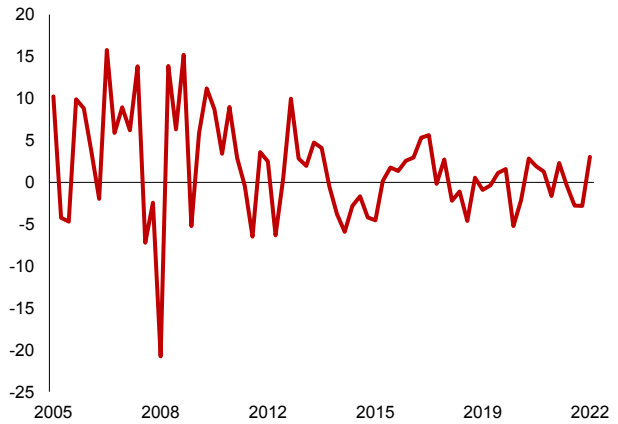
Source: Bank for International Settlements via Haver Analytics; AMRO staff calculations.
Note: Refers to ASEAN+3 banks' lending to external banking counterparts. BN = Brunei; KH = Cambodia; CN = China; HK = Hong Kong; ID = Indonesia; JP = Japan; KR = Korea; LA = Lao PDR; MY = Malaysia; MM = Myanmar; PH = Philippines; SG = Singapore; TH = Thailand; Calculations for Singapore and Myanmar are based on Q4 2019 and Q4 2020 information, and those for China, Japan, and Malaysia on Q3 2022.

Figure 4.18. Selected ASEAN+3: Cross Border Bank Borrowings, Q4 2022
(Percent of own banking sector assets)



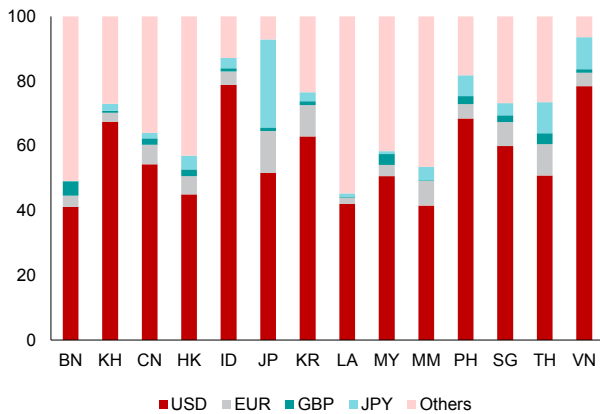
Source: Bank for International Settlements via Haver Analytics; AMRO staff calculations.
Note: Refers to ASEAN+3 banks' lending to external banking counterparts. BN = Brunei; KH = Cambodia; CN = China; HK = Hong Kong; ID = Indonesia; JP = Japan; KR = Korea; LA = Lao PDR; MY = Malaysia; MM = Myanmar; PH = Philippines; SG = Singapore; TH = Thailand; Calculations for Singapore are based on Q4 2019 information and for Myanmar on Q4 2020. Calculations for China, Japan, and Malaysia are based on Q3 2022.

Figure 4.19. ASEAN+3: Quarterly Growth Rate of Cross Border Bank Borrowings
(Percent, quarter-on-quarter)



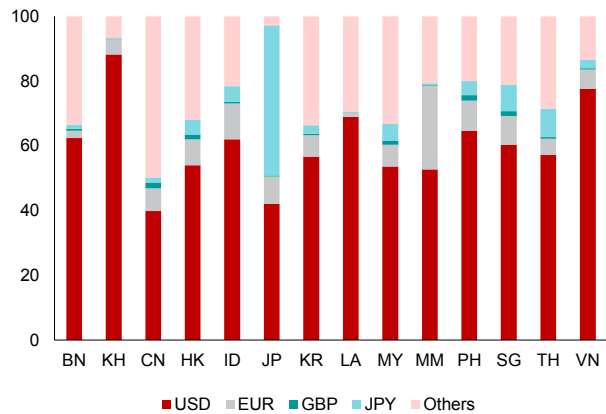
Source: International Monetary Fund via Haver Analytics; AMRO staff calculations.
Note: Refers to the change in ASEAN+3 banks borrowing from external banking counterparts.

Figure 4.20. ASEAN+3: Cross Border Bank Loans by Foreign Currencies, 2022
(Percent)



Source: Bank for International Settlements via Haver Analytics; AMRO staff calculations.
BN = Brunei; KH = Cambodia; CN = China; HK = Hong Kong; ID = Indonesia; JP = Japan; KR = Korea; LA = Lao PDR; MY = Malaysia; MM = Myanmar; PH = Philippines; SG = Singapore; TH = Thailand; VN = Vietnam; USD = US dollar; GBP = Pound sterling; JPY = Japanese yen.

Figure 4.21. ASEAN+3: Cross Border Bank Borrowings by Foreign Currencies, 2022
(Percent)



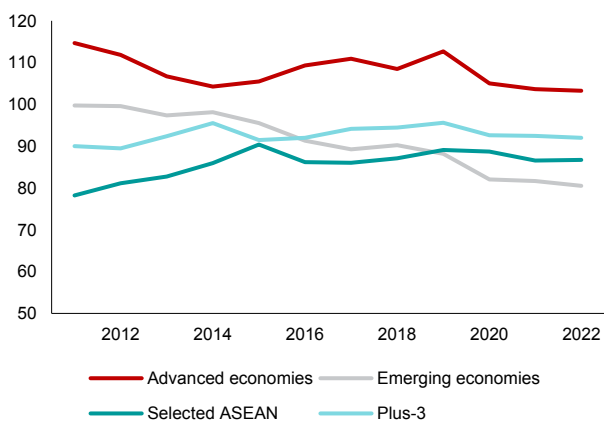
Source: Bank for International Settlements via Haver Analytics; AMRO staff calculations.
BN = Brunei; KH = Cambodia; CN = China; HK = Hong Kong; ID = Indonesia; JP = Japan; KR = Korea; LA = Lao PDR; MY = Malaysia; MM = Myanmar; PH = Philippines; SG = Singapore; TH = Thailand; VN = Vietnam; USD = US dollar; GBP = Pound sterling; JPY = Japanese yen.

Banks should strengthen liquidity buffers to better insulate from external shocks

During the pandemic, ASEAN+3 banks maintained stable liquidity, supported by central bank actions such as government bond purchases and reductions in reserve requirements. The region's loan-to-deposit ratios are better than a decade ago and are in between that of advanced and emerging market economies (Figure 4.22). Liquidity measures, such as the ratio of liquid assets to short-term liabilities, have remained steady, although improved in some other regions (Figure 4.23).

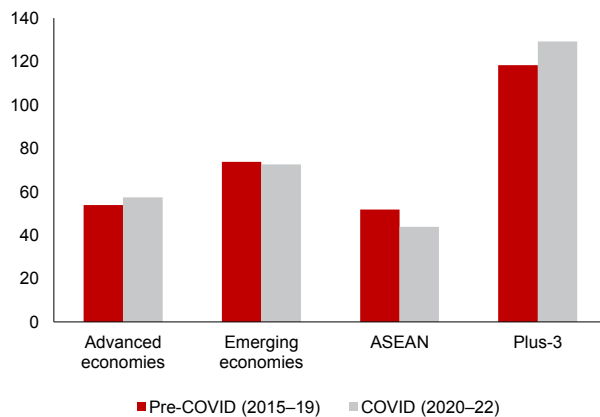
However, potential vulnerabilities do exist. Banks in Plus-3 economies have seen their liquid asset ratios fall, as highlighted in Figure 4.24. Research by Wong and Wei in 2023 indicates that both Domestic Systemically Important Banks (D-SIBs) and large banks in ASEAN+3 emerging markets have experienced some decline in their liquid-asset ratio. Given the increasing reliance on market financing, these banks may need to review their liquid asset ratio and carefully monitor risks from fluctuating interest rates that can influence market funding liquidity, as demonstrated for Malaysia in Box 4.2.

Figure 4.22. Selected Regions: Loan-to-Deposit Ratio (Percent)



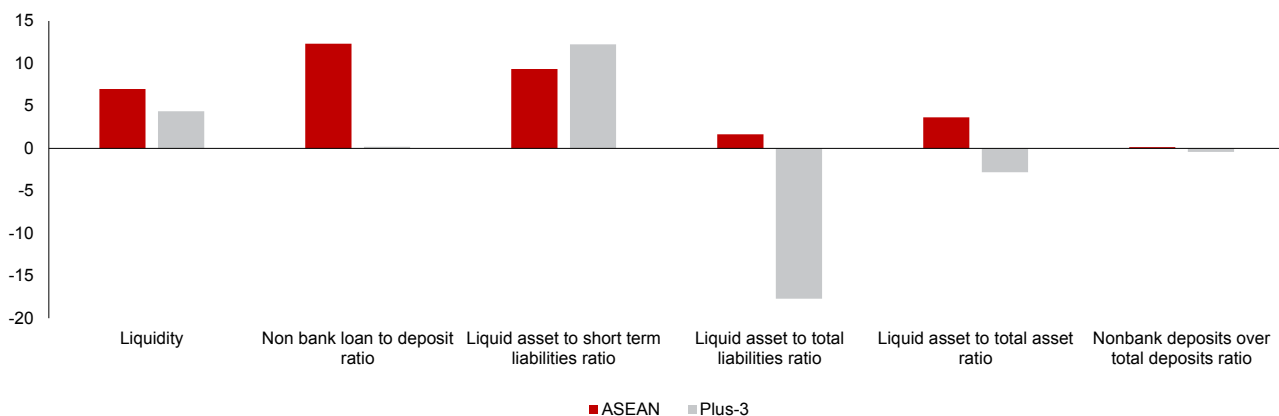
Source: International Monetary Fund via Haver Analytics; AMRO staff calculations.
 Note: The loan-to-deposit ratios are computed based on simple averages amongst economies in the specific region. Due to data availability, Lao PDR and Myanmar were excluded from the analysis of ASEAN while China and Japan for Plus-3. Advanced economies refer to selected economies in North America and Western Europe. Emerging economies refer to selected economies in Latin America and Eastern Europe. Data are extrapolated for the economies that do not have latest data.

Figure 4.23. Selected Regions: Average Liquid Asset-to-Short-Term Liabilities, Pre-COVID and COVID (Percent)



Source: International Monetary Fund via Haver Analytics; AMRO staff calculations.
 Note: Due to data availability, Lao PDR, Myanmar, and Vietnam were excluded from the analysis. The liquid asset-to-short term liability ratios are computed based on simple averages amongst economies in the specific region. Advanced economies refer to selected economies in North America and Western Europe. Emerging economies refer to selected economies in Latin America and Eastern Europe.

Figure 4.24. ASEAN+3: Improvement in Average Bank Vulnerability Index (BVI) Liquidity Factor, Pre-COVID and COVID (Percent)



Source: AMRO staff estimates.
 Note: Higher score represents an improvement in banking resilience. The factor "Liquidity" comprises of five dimensions, including nonbank loan-to- deposit ratio and liquid asset to short term liabilities ratio. The ASEAN+3 banks are benchmarked against banks in the same domestic economy. For more details on the benchmarking group, refer to Wong and Wei (2023).

Box 4.1:

Beta Analysis of Banks and NBFIs

To evaluate how the market perceives risks of financial intermediaries, a study is conducted on the market betas of banks and other financial service providers, which broadly cover Nonbanks Financial Intermediaries (NBFIs). For each economy, two market capitalization-weighted indices are created, one for a consolidated banking sector as well as another one for a consolidated financial services sector. The indices include all listed companies classified as “banks” and “financial services” (which is a proxy for NBFIs) according to Bloomberg Industry Classification Standard (BICS).¹ The market beta is the coefficient of regression of the daily changes of each of these indices to the daily changes in the benchmark index of that economy. The coefficient is calculated on a rolling basis for a period of six months.

The indicator provides a measure of markets perception of risk associated with the respective sectors as compared with the broader economy. A beta greater than 1 is typically associated with a market perception that the sector is riskier than the “market” (more specifically firms included in the benchmark index, typically representative of the dominant sectors and firms in the economy). The risks perceived by the markets could be due to multiple factors such as balance sheet issues (e.g., leverage), business models (e.g., target customers), negative news (operational risks, legal risks, regulatory actions, or adverse corporate governance) and, in some cases, the impact of macroeconomic backdrop on the firms.

The analysis shows that market’s perception of risks associated with the banking sector have been reducing since the pandemic (Figure 4.1.1). The severe slowdown in

economic activity during the pandemic led to concerns of widespread defaults and there was an uptick in the market betas (a measure of market’s perception of risk associated with the sector) in most of the ASEAN+3 economies. However, the governments in the region acted swiftly to provide forbearances and support to the vulnerable sectors of the economies, thus helping ease the risks of a systemic crisis. More recently, banks in most ASEAN+3 economies have reported better net interest margins (NIMs) due to rising interest rates, which has helped boost the market confidence in the sector. A similar trend was seen in the market betas for the NBFIs sector during the pandemic where the beta rose after initially before easing. However, the average beta for ASEAN+3 NBFIs has largely remained stable over the past couple of years (Figure 4.1.2).

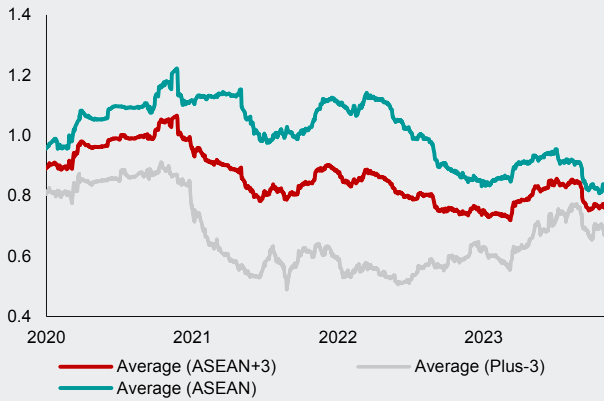
There is a significant difference between the beta magnitudes in Plus-3 and ASEAN markets. Based on the past 6 months of data (Figure 4.1.3), the NBFIs betas have been higher than those of banks in China, Hong Kong, Japan, and Thailand while it is much lower for Indonesia, Malaysia, and Philippines. The relatively higher beta NBFIs in Plus-3 could be an outcome of the more evolved and complex nature of NBFIs which has helped offload the riskier segments of the business from the banks. On the other hand, ASEAN financial system remains dominated by banks and these banks operate across the risk spectrum, which justifies their higher betas. The NBFIs sectors of China and Thailand, and banking sectors of Singapore² are perceived to be riskier than the broader economy (beta > 1) based on the past six months of data.

The author of this box is Prashant Pande.

¹ We use level 2 categorization of the Bloomberg Industry Classification Standard (BICS) for Banks and Financial Services. The BICS definitions of Banks is: “This industry group includes companies that provide banking services. These companies accept deposits and use these deposits as their primary funding source for their lending activities” and the definition of Financial Services is “This industry group includes companies that provide services which focuses on the growth or transaction of money and assets.” The sub-categories included under Banking are Diversified Banks and Banks. The sub-categories for Financial Services are Asset Management, Speciality Finance, and Institutional Finance Services.

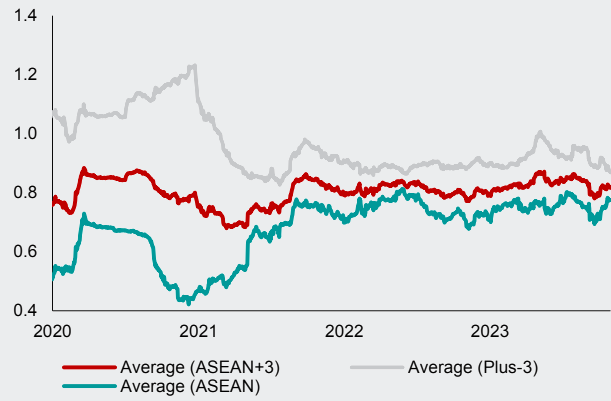
² About 37 percent of the benchmark index for Singapore is made of major banking stocks and over the past six months, have accounted for about 25 percent of the trading volume of the Singapore Stock Exchange. Singapore banks may not be as risky as the market beta suggests but the higher beta could be an outcome of trading behaviour in the stock exchange. With most trading activity concentrated in banking stocks, they would tend to be more volatile than other stocks which are traded less.

Figure 4.1.1. ASEAN+3: Market Betas for Banks
(Index)



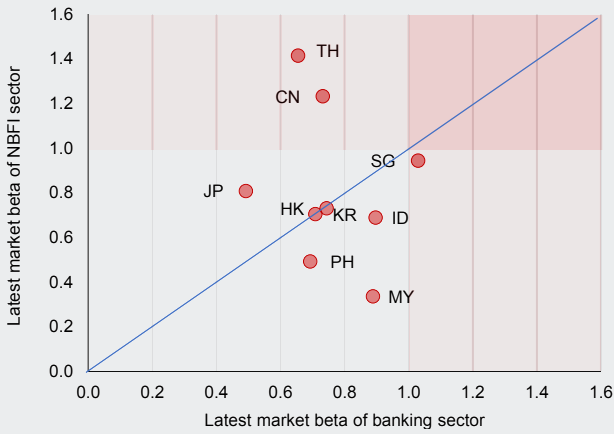
Source: Bloomberg Finance L.P.; AMRO staff calculations.
Note: A simple average across of betas across economies is used.

Figure 4.1.2. ASEAN+3: Market Betas for NBFIs
(Index)



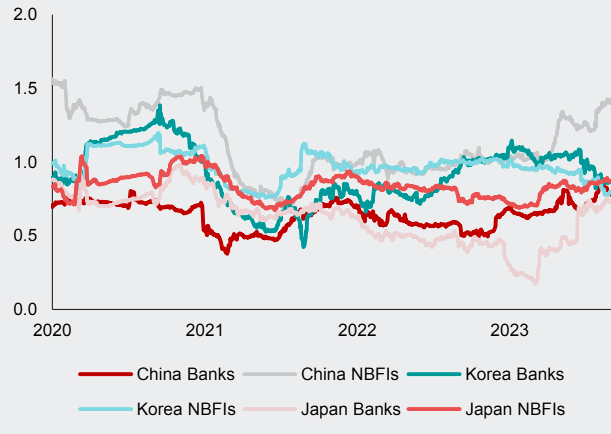
Source: Bloomberg Finance L.P.; AMRO staff calculations.
Note: A simple average across of betas across economies is used.

Figure 4.1.3. Selected ASEAN+3: Market Betas of Banking and NBFIs Sectors
(Index)



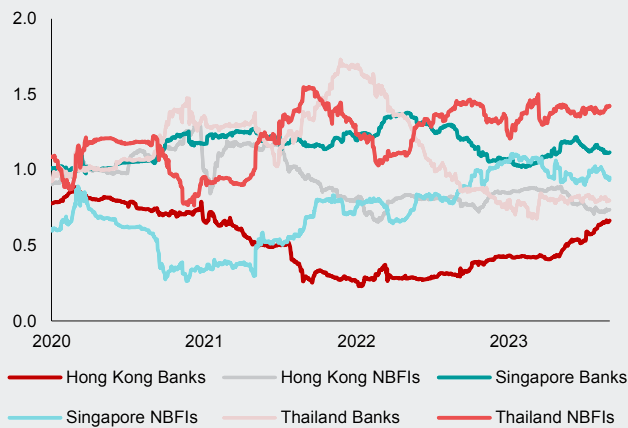
Source: Bloomberg Finance L.P.; AMRO staff calculations.
Note: Data as of 30 October 2023.

Figure 4.1.4. Selected Plus-3: Market Betas for Banks and NBFIs
(Index)



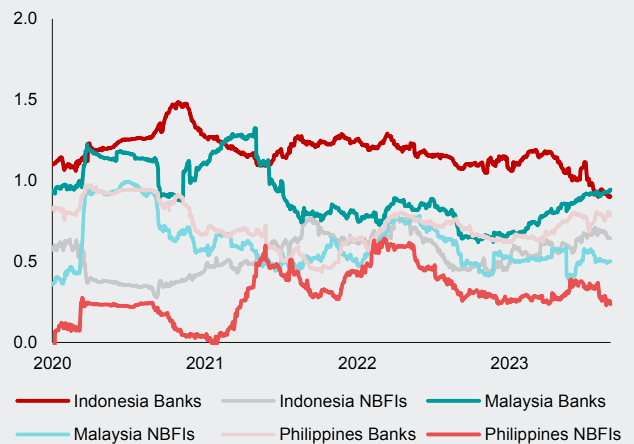
Source: Bloomberg Finance L.P.; AMRO staff calculations.
Note: A simple average across of betas across economies is used. NBFIs = nonbank financial institution

Figure 4.1.5. IFCs and Thailand: Market Betas for Banks and NBFIs
(Index)



Source: Bloomberg Finance L.P.; AMRO staff calculations.
Note: International financial centers (IFCs) include Hong Kong and Singapore. NBFIs = nonbank financial institution.

Figure 4.1.6. Selected ASEAN: Market Betas for Banks and NBFIs
(Index)



Source: Bloomberg Finance L.P.; AMRO staff calculations.
Note: NBFIs = nonbank financial institution.

Box 4.2:

Impact of Rising Interest Rates on Malaysian Banks' Liquidity

The rising interest rate cycle in Malaysia that started in 2022 may have contributed to changes in banks' liquidity position. This box sheds light on this development, based on AMRO's analysis and engagements with market participants in Malaysia.

Symptoms of liquidity tightness

In the second half of 2022, Malaysian banks faced tighter funding conditions due to rising interest rates. Bank Negara Malaysia (BNM) initiated monetary policy normalization in May 2022, raising the Overnight Policy Rate (OPR) from 1.75 percent to 3.0 percent by May 2023. This led to noticeable tightness in the interbank market, especially in the second half of 2022 following the cumulative increase in OPR by 100 bps for the year. During this period, the Kuala Lumpur Interbank Offered Rates (KLIBOR) for three and six months surged by more than 150 bps. The spread between the three-month KLIBOR and OPR widened to 100 bps by year's end, a notable increase from its 45 bps average for 2015–2019 (Figure 4.2.1). This change was attributed both to market expectations of further OPR hikes and shifts in bank balance sheets as economic conditions improved.

Shifts in bank assets and liabilities

Loan growth outpaced deposit growth once economic activities picked up, increasing bank funding needs. After pandemic-related restrictions were relaxed and economic activities expanded in 2022, loan growth—which had fallen short of deposit growth throughout 2021—outpaced deposit growth (Figure 4.2.2). Consequently, the banking system's loans-to-funds ratio rose from under 81 percent in the fourth quarter of 2021 to 82.4 percent at the end of 2022 (Figure 4.2.3). Moreover, bank-level data show that liquid-asset-to-total-asset ratio fell in six of the eight largest Malaysian banks (Figure 4.2.4). The tighter

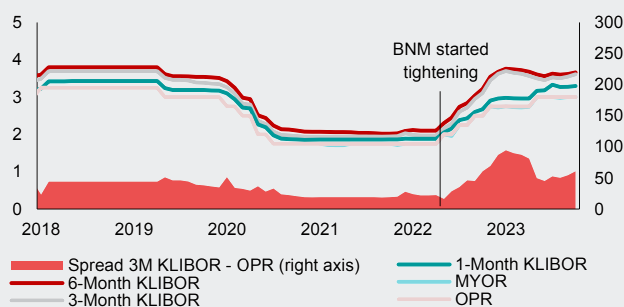
liquidity position, which resulted from faster loan expansion, contributed to higher borrowing costs in the interbank market.

The shift in deposit duration gave rise to lower Liquidity Coverage Ratio (LCR). Anticipating higher interest rates, some interest-sensitive institutional depositors shortened their term deposit placements tenors, especially one to two months (Figure 4.2.5), resulting in a deterioration in LCR for banks.¹ The shift had the biggest effect on banks that relied less on individual deposits and more on rate-sensitive wholesale deposits, such as Islamic banks (Figure 4.2.6). Thus, the average LCR for Islamic banks fell from 144 percent to 127 percent between end-2021 and the third quarter of 2022, the period low. Meanwhile, the average LCR of commercial banks also dropped 12 percent (Figure 4.2.7). Although the ratios remained well above the regulatory threshold of 100 percent, banks pre-emptively restored LCR to avoid market panic by borrowing term liquidity, pushing up money market rates.

Authorities and banks' responses

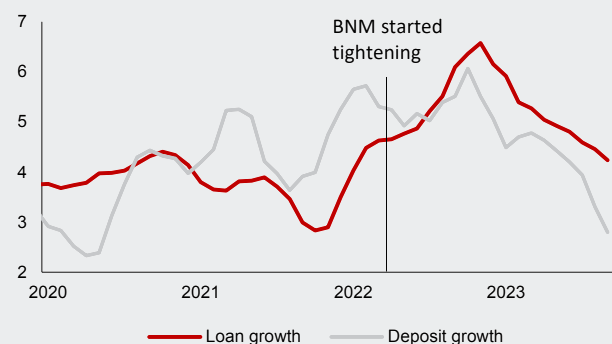
BNM and banks responded promptly to strengthen the liquidity position. BNM addressed the tightened liquidity conditions by easing funding in the interbank market. It injected liquidity into the market through a mix of open market operations, mainly the buy/sell US dollar swaps and term repo. As for banks, besides borrowing term liquidity in the market and from BNM, they attracted term deposits by increasing the rates paid on these deposits. Between April and December 2022, the 3-month and 12-month fixed deposit rates rose close to 100 bps (Figure 4.2.8). Discussions with market participants suggested that competition for term deposits intensified during the second half of 2022. Thanks to such efforts, liquidity conditions improved, as shown by the KLIBOR-OPR spread that narrowed in the first quarter of 2023.

Figure 4.2.1. Overnight Policy Rate (OPR) and Short-Term Market Rates
(Percent)



Source: Bank Negara Malaysia (BNM); CEIC; AMRO staff calculations.
Note: OPR = Overnight Policy Rate; KLIBOR = Kuala Lumpur Interbank Offered Rates; MYOR = Malaysia Overnight Rate.

Figure 4.2.2. Loan and Deposit Growth
(Percent, year-on-year)

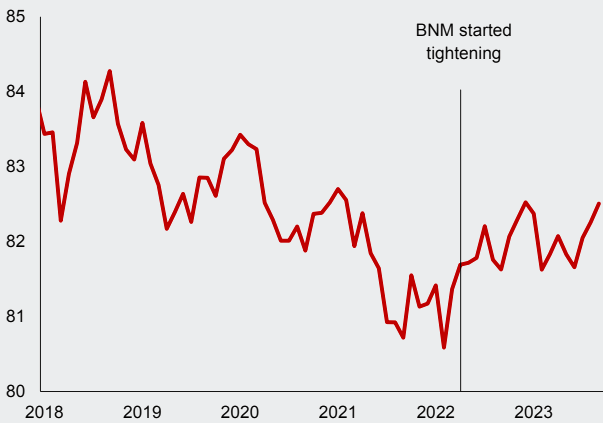


Source: Bank Negara Malaysia; CEIC; AMRO staff calculations.

The author of this box is Pim-orn Wacharapapong.

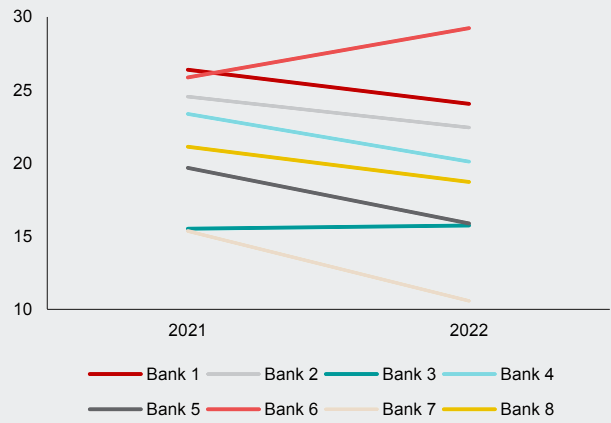
¹ The LCR is calculated by dividing high-quality liquid assets (HQLA) by total net cash outflows over a 30-day stress period. The shortening of funding duration could lead to an increase in the net cash outflows, and hence, lower LCR.

Figure 4.2.3. Loans-to-Fund Ratio of Malaysia’s Banking System (Percent)



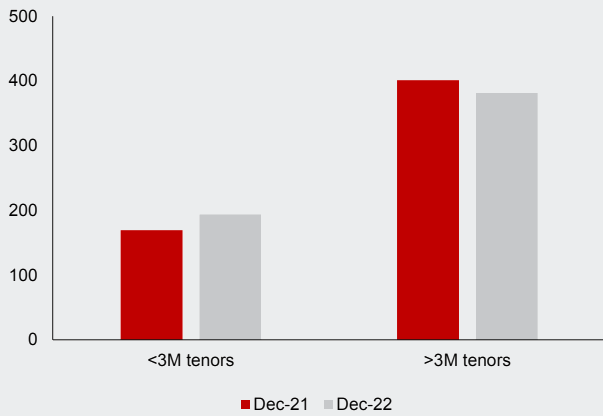
Source: Bank Negara Malaysia.

Figure 4.2.4 Liquid Assets-to-Total Asset Ratios of the Eight Largest Banks in Malaysia (Percent)



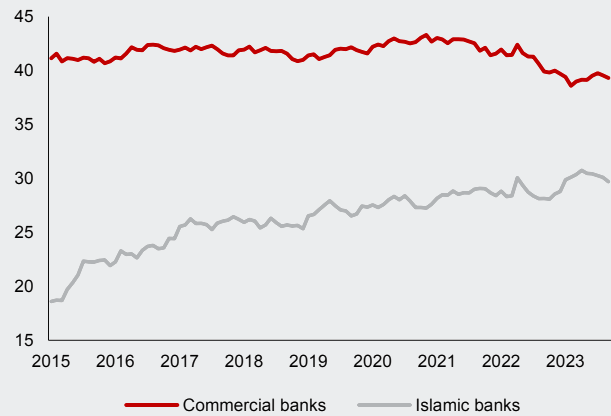
Source: Bank Focus.

Figure 4.2.5. Fixed Deposits by Tenor (Billions of Malaysian ringgit)



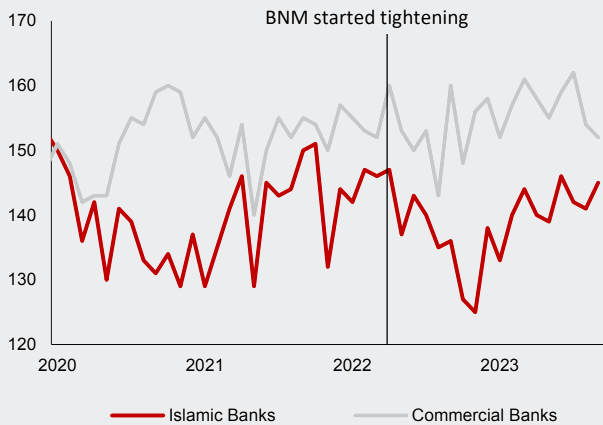
Source: Bank Negara Malaysia; CEIC; AMRO staff calculations.

Figure 4.2.6. Share of Individual Deposits (Percent of total deposits)



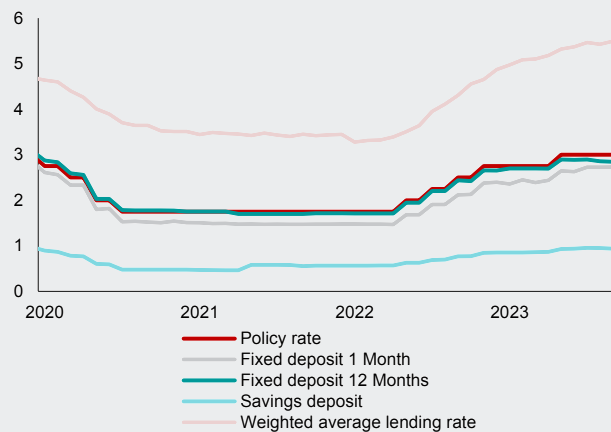
Source: Bank Negara Malaysia; CEIC; AMRO staff calculations.

Figure 4.2.7. Liquidity Coverage Ratio (Percent)



Source: Bank Negara Malaysia; AMRO staff calculations.

Figure 4.2.8. Deposit and Lending Rates (Percent)



Source: Bank Negara Malaysia; CEIC.

Elevated interest rates are a double-edged sword for banks

Rising interest rates could weaken ASEAN+3 bank loan quality. A panel regression model finds that a 100-basis-point interest rate hike could increase NPL ratios by up to 1.5 percentage points on average (Figure 4.25). This reflects the risk that current borrowers, especially when refinancing at higher rates, could face financial stress, which raises the risk of default. The effect on NPL ratios would vary, with banks with poorer initial asset quality likely to see greater deterioration. The rate at which NPL ratios increase also depends on whether loans have fixed or floating interest rates.

Higher interest rates could also boost the profitability of ASEAN+3 banks. Our estimation indicates that a 100-basis-point rate hike in lending rates (as a result of a higher policy rate) will push up net interest income (Figure 4.26). This suggests banks could pass some higher rates on to borrowers, elevating net interest margins while keeping deposit rates relatively stable. This is in line with market perspectives. For example, an investment bank estimates that if Malaysia's overnight policy rate rises by a 25 basis points then the net interest margin increases by 5 to 6 basis points (New Straits Times 2023). Similarly, some Cambodian banks have increased lending rates as funding costs rise (Molika, Thul, and Amarthalingam 2023). These higher profits could help banks to accumulate capital.

That said, while higher interest rates could boost profitability, the outlook remains uncertain. First, the challenging macroeconomic landscape may mean that NIMs have peaked due to rising credit risks (Tan 2023). Second, competitive pressures may hinder banks' ability to pass higher funding rates to borrowers. For instance, Hong Kong banks are using cash rebates to attract mortgage customers (Wee 2023). Moreover, some economies are keeping lending rates low to support businesses and households (Nguyen 2023; Reuters News

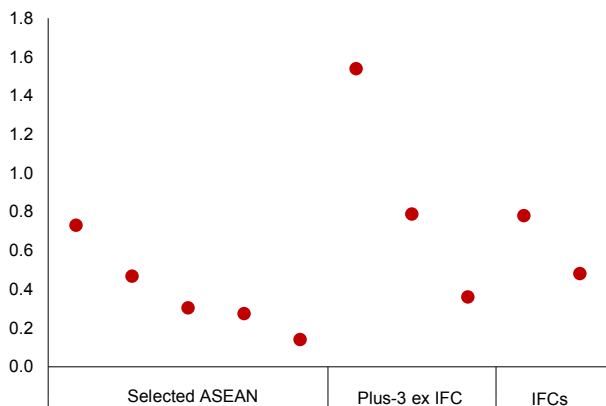
Agency 2023). This helps support the fragile post-pandemic economic recovery, although risks could be underpriced.

Most banks hold adequate capital as a buffer against interest rate shocks. However, a simulation study shows that some may need to bolster their CARs. As sustained and possibly elevated interest rates appear to be on the horizon, this chapter carried out scenario analyses assuming interest rate hikes, ranging from 200 to 400 basis points (Annex 4.1). In such a scenario, banks should increase provisioning or improve their capital reserves to counter the associated risks. The study reveals that individual banks may have limited exposure, yet systemic spillover risks could affect the broader banking sector. These risks could manifest through direct interbank loans, loans extended to a shared pool of nonbank borrowers, and second-order confidence effects.

Bank credit has grown at a faster pace than nominal GDP growth and increased banking system risks. Empirical literature shows that a higher credit-to-GDP gap is an early warning of banking crises (Annex 4.2). An empirical analysis shows that for every 1 percentage point increase in this gap, the likelihood of a crisis occurring in the following year rises by 0.20 percentage point, and over the next five years, jumps to 0.75 percent. The heightened risk can be attributed to higher credit intensity in sectors such as real estate, where overheating could lead to adverse consequences such as an increase in NPLs. Banking crises typically involve large losses (Laeven and Valencia 2018). Accordingly, our estimates indicate that ASEAN+3 banks have strengthened their resilience following the COVID-19 pandemic (Figure 4.27). This is largely due to their low credit-to-GDP ratios. Despite these improvements, financial risks in the region are slightly higher than the global average (Figure 4.28).

Figure 4.25. Selected ASEAN+3: Effect of 100bps Increase in Interest Rate on NPL Ratios

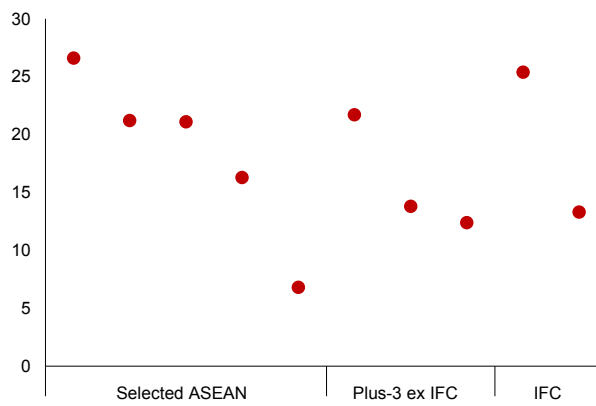
(Percentage points)



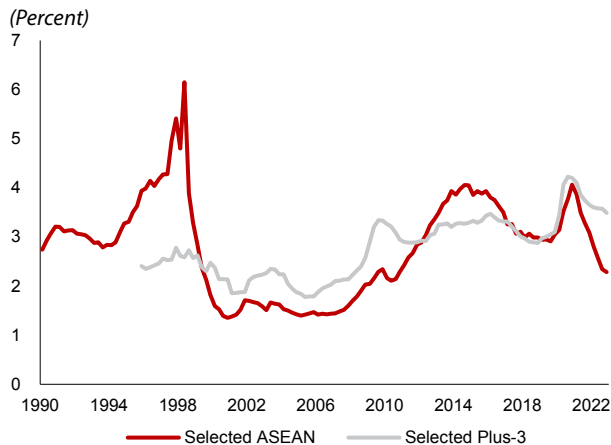
Source: AMRO staff calculations.
 Note: Selected ASEAN includes Indonesia, Malaysia, Philippines, Thailand, and Vietnam.
 IFCs = international financial centers, covering Hong Kong and Singapore.

Figure 4.26. Selected ASEAN+3: Effect of 100bps Increase in Interest Rate on Growth in Net Interest Income

(Percent)

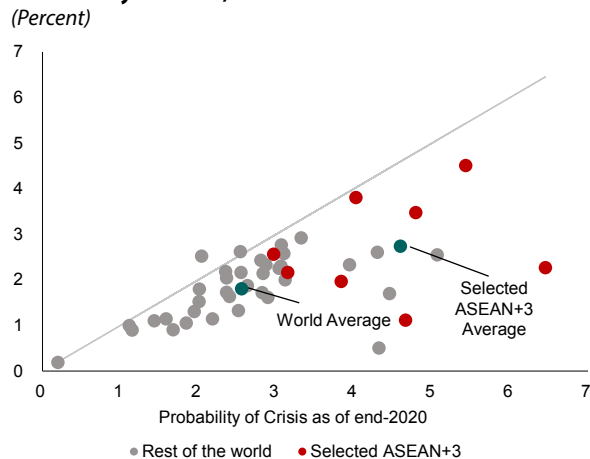


Source: AMRO staff calculations.
 Note: Selected ASEAN includes Indonesia, Malaysia, Philippines, Thailand, and Vietnam.
 IFCs = international financial centers, covering Hong Kong and Singapore.

Figure 4.27. Selected ASEAN+3: Estimated Probability of Crisis

Source: AMRO staff estimates.

Note: Estimated probability of a banking crisis occurring within three years. Refer to Annex 4.2 for more details. Selected Plus-3 includes China, Japan and Korea. Selected ASEAN includes Indonesia, Malaysia, Singapore and Thailand.

Figure 4.28. World and Selected ASEAN+3: Estimated Probability of Crisis, 2020 versus 2022

Source: AMRO staff estimates.

Note: Estimated probability of a banking crisis occurring within three years. Refer to Annex 4.2 for more details. The red dots denote ASEAN+3 economies which include China, Hong Kong, Indonesia, Japan, Korea, Malaysia, Singapore and Thailand. The gray dots refer to the rest of the world. World Average excludes the estimations for ASEAN+3 economies.

Policies can safeguard financial stability in ASEAN+3 banking

ASEAN+3 banks need to manage leverage effectively to minimize vulnerabilities. They should continue to use macroprudential policies as the primary tool to contain risks to financial stability. ASEAN+3 economies were already using macroprudential policies to safeguard financial stability before the pandemic (Figure 4.29). The set of macroprudential policies is listed in Table 4.1. A stocktake shows the effect of macroprudential measures used to address risks, as well as areas for improvement:

- **Capital, provisioning, and liquidity:** These measures strengthen bank capacity to absorb losses and maintain operations. ASEAN+3 banks have generally improved capital buffers and credit risk management, partly to meet Basel requirements. Liquidity needs to be monitored carefully as the region's banks have higher loan-to-deposit ratios than banks in most other regions, while in the Plus-3 economies liquid-asset-to-total-asset ratios have declined. Regular stress tests can strengthen banks' resilience against shocks.
- **Credit measures and reserve requirements:** These tools regulate money supply and include credit growth limits and loan restrictions to maintain prudent leverage. They help manage credit growth and curb excessive lending, especially since nonfinancial sector debt in some of the region's economies is close to levels that could constrain economic growth (Chapter 2).

Improvements to deposit insurance schemes should be considered. Currently, 90 percent of bank accounts in Asia have balances below the deposit insurance limit (Chang 2023), which would provide depositors some confidence in fund recovery, even in adverse scenarios. As the amount of the guarantee

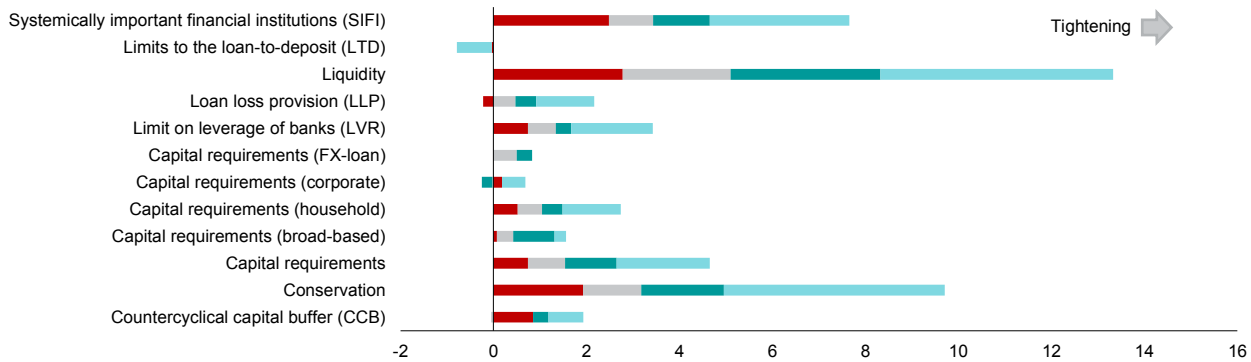
is key in instilling confidence under stress, some ASEAN+3 authorities plan to increase insured deposit amounts after the collapse of Silicon Valley Bank. However, those plans mainly cover domestic currency deposits, though a few economies (e.g., Hong Kong) also extended the coverage to foreign currencies (Table 4.3). Given that regional economies have significant foreign currency or cross-border exposure (e.g., the IFCs), room could exist to extend insurance to foreign currency deposits. However, the scheme's effectiveness hinges on the availability of foreign exchange reserves to underpin a credible deposit insurance system.

Third, mitigating US dollar exchange rate risks on bank balance sheets is crucial. While reducing US dollar dependency is a long-term objective, liquidity facilities like central bank backstops and bilateral swap agreements can help provide emergency foreign currency liquidity in the short-to-medium term. The number of these bilateral agreements in the ASEAN+3 region has already increased fourfold in the past decade (Figure 4.30). Expansion of that network in the region, though mostly meant for meeting balance of payments financing needs, could serve as a second line of defense in times of stress. Direct access to US dollars from the US Federal Reserve (Fed) is always welcomed. In the region, the Bank of Japan can access US dollars through a network of swap lines among six major central banks, including the Fed itself (Federal Reserve 2023). Central banks (e.g., the Bank of Korea and the Monetary Authority of Singapore) have also accessed US dollar liquidity by establishing temporary swap lines with the Fed (Federal Reserve 2020), or tapping into repo facilities that foreign and international monetary authorities established during the pandemic (Federal Reserve 2022).

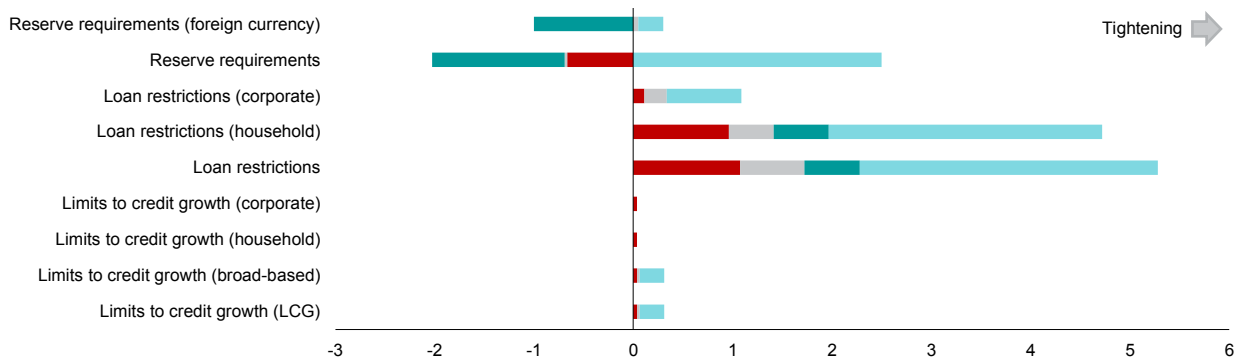
Clear communication and heightened readiness for worst-case scenarios is essential. In reaction to recent US bank failures and Credit Suisse's collapse, several ASEAN+3 central banks, including Japan, Singapore, the Philippines, and Thailand, quickly issued statements clarifying that their local banks had limited exposure to the failed banks and underscoring the resilience of the banking sector as a whole.

Proactive communication is key to easing concerns and ensuring stability. It is also vital that banks have well-defined resolution plans, given the potential for contagion effects (as indicated by earlier simulations). This should be in accordance with Financial Stability Board (FSB) guidance to banks on establishing living wills.

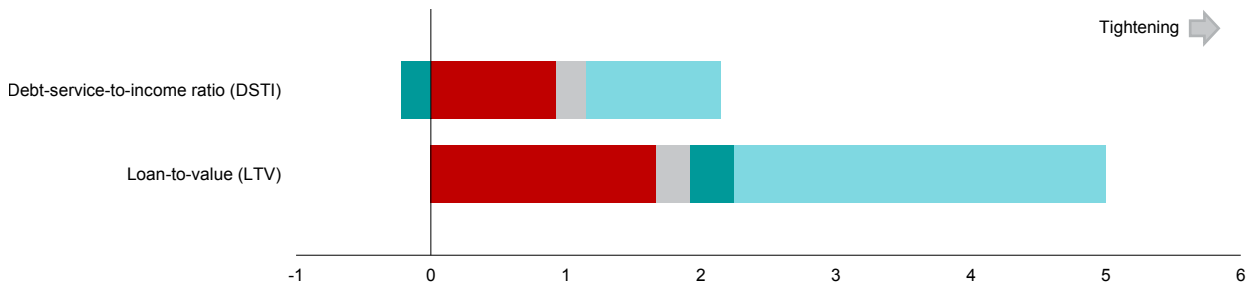
Figure 4.29. World and ASEAN+3: Number of Macroprudential Policy Use, 2010–21
Capital, Provisioning, and Liquidity



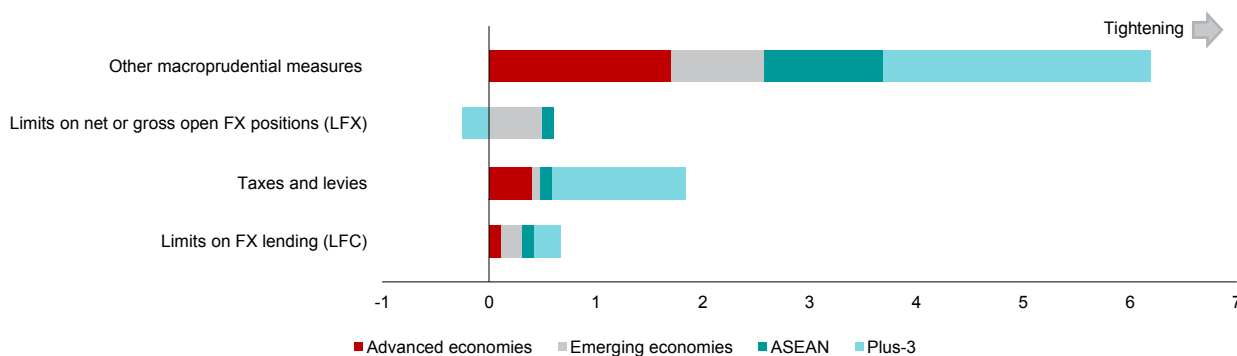
Credit Measures and Reserve Requirements



Housing Related Measures

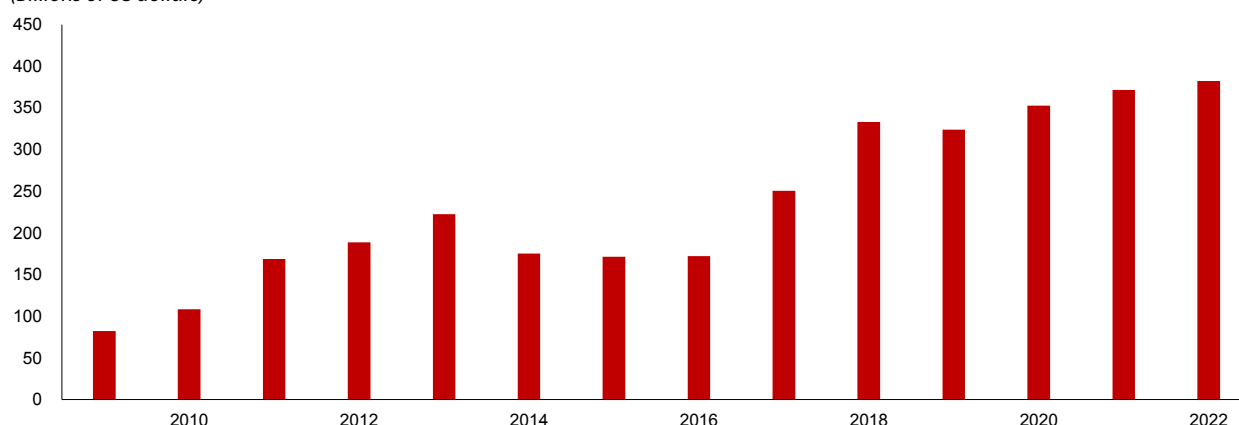


Other Macroprudential and Capital Flow Management Measures



Source: International Monetary Fund; AMRO staff calculations.

Note: CCB = countercyclical capital buffer; LVR = limit on leverage of banks; LLP = loan loss provision; SIFI = measures to mitigate risks from global and domestic systemically important financial institutions; LTV = loan-to-value; DSTI = debt-service-to-income ratio. Advanced economies refer to selected economies in North America and Western Europe. Emerging economies refer to selected economies in Latin America and Eastern Europe.

Figure 4.30. ASEAN+3: Bilateral Currency Swap Agreements*(Billions of US dollars)*

Source: National authorities; AMRO staff calculation.

Table 4.3. ASEAN+3: Summary of Deposit Insurance

Economy	Institution	Current amount guaranteed	Last adjustment date	Amount prior to adjustment	Upcoming plan
Brunei	Brunei Darussalam Deposit Protection Corporation (BDPC)	BND50,000 (USD37,037)	1 st Jan 2011	Never adjusted	-
China	The People's Bank of China (PBC)	RMB500,000 (USD68,871)	1 st May 2015	Never adjusted	-
Hong Kong	Hong Kong Deposit Protection Board	HKD500,000 (USD63,776)	1 st Jan 2011	HKD100,000 (USD12,755)	Public consultation issued
Indonesia	Indonesia Deposit Insurance Corporation (IDIC)	IDR2 billion (USD133,103)	13 th Oct 2008	IDR100 million (USD66,551)	-
Japan	Deposit Insurance Corporation of Japan (DICJ)	JPY10 million (USD69,023)	Jul 1986	JPY3 million (USD20,707)	-
Lao PDR	Deposit Protection Office (DPO)	LAK50 million, and USD5,550	25 th Oct 2017	LAK28,000,000, THB36,000, and USD1,200	-
Malaysia	Perbadanan Insurans Deposit Malaysia (PIDM)	RM250,000 (USD53,419)	31 st Dec 2010	RM60,000 (USD12,821)	-
Philippines	Philippine Deposit Insurance Corporation (PDIC)	PHP500,000 (USD9,032)	1 st Jun 2009	PHP250,000 (USD4,516)	-
Singapore	Singapore Deposit Insurance Corporation (SDIC)	SGD75,000 (USD55,147)	1 st Apr 2019	SGD50,000 (USD36,765)	Public consultation issued
Korea	Korea Deposit Insurance Corporation (KDIC)	KRW50 million (USD38,087)	1 st Jan 2001	KRW20 million per depositor and KRW50 million won for insurance policyholders (USD 15,235 or USD 38,087)	Discussion of plan
Thailand	Deposit Protection Agency (DPA)	THB1 million (USD28,090)	11 th Aug 2021	THB5 million (USD140,449)	-
Vietnam	Deposit Insurance of VietNam (DIV)	VND125 million (USD5,271)	12 th Dec 2021	VND75 million (USD3,163)	-

Source: National authorities; AMRO staff compilation.

III. Nonbank Financial Intermediaries

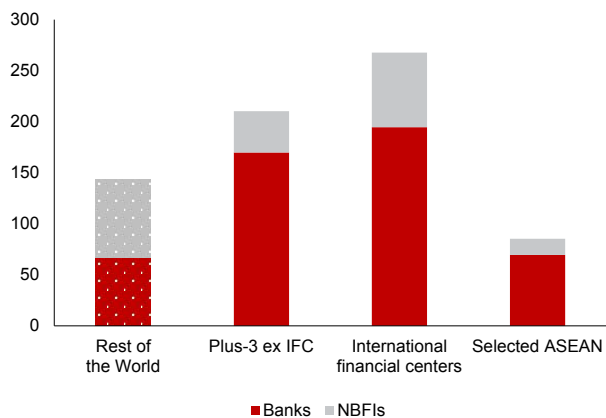
While NBFIs constitute a smaller sector than banks in ASEAN+3, they provide essential financial products and market intermediation functions that if disrupted could threaten financial stability. The sector encompasses a wide range of diverse institutions, including mutual funds, unit trusts, specialized policy banks and specialized financial institutions. The role of NBFIs varies significantly across economies. In Japan, Korea, Singapore, and Hong Kong, China, they are key providers of liquidity, particularly in US dollars needed to support cross-border finance and the international activities of corporates in the region. In China, the main type of NBFIs is the Collective Investment Vehicle. These channel customer funds into investment products.

NBFIs are crucial for cross-border finance, particularly in US dollars. They are vital to dollar funding and the hedging of currency risk, which impacts capital flows and financial market stability in ASEAN+3. Given that the sector is diverse, the focus here is on NBFIs that contribute to systemic risk. These institutions provide substantial maturity and currency

transformation that generates liquidity and credit risk. NBFIs create novel policy challenges for ASEAN+3 authorities. Their regulation, supervision, and risk management is weaker than banks and need to be strengthened by building up the lines of defense against risks. This will help avoid the need for central banks to provide emergency liquidity support to ensure the continued functioning of financial markets. Given that NBFIs act as key suppliers of dollar liquidity, this will also help avoid situations where central banks may need to provide liquidity in dollars.

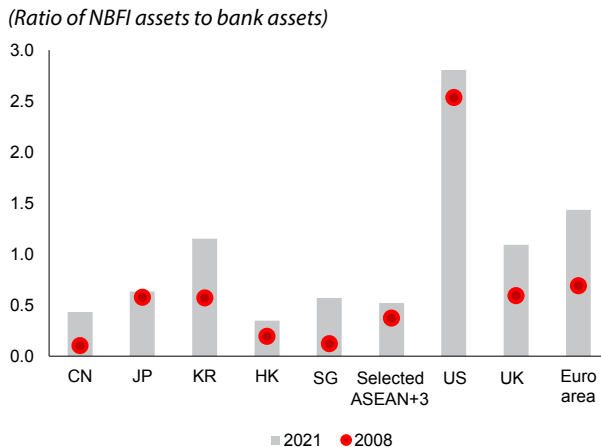
This section outlines the structure of the NBFIs sector in ASEAN+3 for economies with available data. It focuses on NBFIs that pose systemic risk and differentiates this risk from that posed by banks. Also highlighted are risks from the expanding role of NBFIs as providers of dollar liquidity that they raise in global markets and distribute within ASEAN+3. Lastly, it discusses the challenges facing policymakers in strengthening the frameworks for regulation, supervision, and liquidity provision for NBFIs to limit systemic risk, including from dollar liquidity shocks.

Figure 4.31. World and Selected ASEAN+3: Financing of Nonfinancial Private Sector by Banks and NBFIs
(Percent of GNP)



Source: Bank for International Settlements via Haver Analytics; AMRO staff calculations.
Note: International financial centers (IFCs) consist of Hong Kong and Singapore. Selected ASEAN consist of Indonesia, Malaysia and Thailand.

Figure 4.32. Selected Economies: Financial Assets of Banks Relative to NBFIs
(Ratio of NBFIs assets to bank assets)



Source: Financial Stability Board; AMRO staff calculations.
Note: Selected ASEAN+3 includes China, Hong Kong, Indonesia, Japan, Korea and Singapore. CN = China; JP = Japan; KR = Korea; HK = Hong Kong; SG = Singapore; US = United States; UK = United Kingdom.

The development of NBFIs varies across ASEAN+3

In ASEAN+3, banks are the principal financiers of the private sector, while NBFIs function to a greater extent as market intermediaries. Figures 4.31 and 4.32 show that in ASEAN+3 the role of NBFIs in financing the private sector compared with banks is smaller than in the rest of the world. And within the region, the ratio of NBFIs to bank financing is much lower for the selected ASEAN economies of Indonesia, Malaysia, and Thailand, relative to the Plus-3 economies and IFCs (Figure 4.31). This ratio increased in some economies between 2012 to 2020 (Figure 4.32), and the expansion in NBFIs financing was largest in the IFCs, where it rose from 35 percent to 90 percent of GDP (Figure 4.33). This financing remained stable as a percent of GDP in the rest of ASEAN+3 on average, although the role of NBFIs is evolving as illustrated by the example of Thailand (Box 4.3). During the same period, traditional bank financing as a percent of GDP grew moderately in the Plus-3 economies and IFCs and was largely unchanged in the selected ASEAN economies. This expansion in NBFIs' role in IFCs may partly reflect the low global interest rates over the last decade as NBFIs rely more on market sources of financing than banks. However, the rise in global interest rates could reduce the relative funding advantage of NBFIs and raise financing risks.

The FSB provides comprehensive data on NBFIs balance sheets. Data are only available in the Plus-3 and IFCs with no comparable data covering on NBFIs activities in most ASEAN economies (with the exception of Indonesia and Singapore). Accordingly, this section focuses on the Plus-3 economies and IFCs which, as Figure 4.31 shows, account for most NBFIs financing of the private sector in ASEAN+3. This reflects that their financial systems are much larger and more complex with NBFIs playing a greater role.

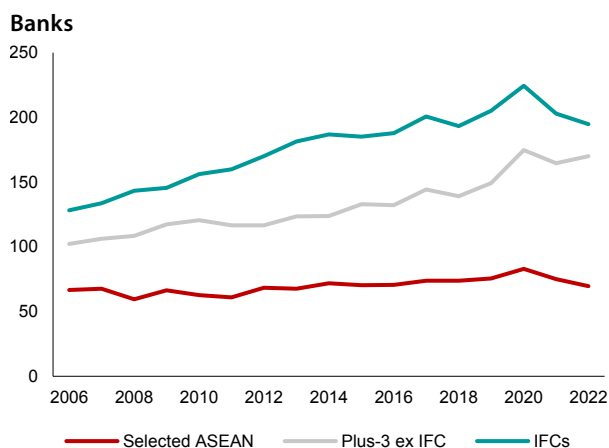
Table 4.4 describes the structure of the NBFIs sector, highlighting significant differences across economies. Broadly speaking, the NBFIs sector is roughly half the size of the banking sectors in reporting economies. In the table, the sector is divided into two groups, those engaging in credit intermediation and other NBFIs, using the classification provided by the FSB. Credit intermediation,

the focus of the following analysis, involves maturity and currency transformation that can give rise to systemic risk. Pension funds and life insurance companies are not the focus of this analysis as they typically match long-term liabilities to long-term assets and do not engage in maturity transformation.

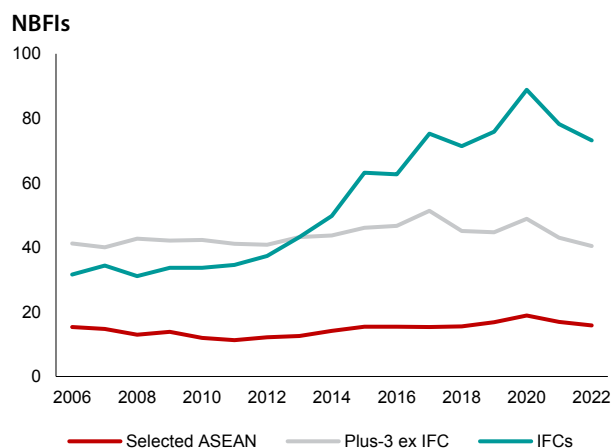
There are significant differences in the size and structure of NBFIs across economies.

- In China, the main type of NBFIs is the **Collective Investment Vehicles (CIVs)**, while in the other Plus-3 economies and IFCs **Financial Market Intermediaries (FMIs)** are relatively important (Figure 4.34). This cross-country variation in the role of NBFIs reflects differences in financial structure and regulation. In China, CIVs are major providers of saving products, while the financial system is less reliant on NBFIs for market making activities. Capital account restrictions may also help explain the smaller size of FMIs in China. This encourages large mainland China firms that operate internationally to rely more on FMIs or major global banks in financial centers such as Hong Kong to obtain the US dollar finance they need to conduct international business.
- The IFCs of Hong Kong and Singapore have the advantage that they host large international corporations and investors with dollar balance sheets. As a result, the major global banks located in IFCs typically have excess dollar deposits and are a source of dollar liquidity for the region.
- In Japan and Korea, domestic corporates and smaller banks typically need to raise dollar funding to operate internationally. They can obtain these from FMIs and global banks in their economies with access to dollar funding in international markets. The structure and function of the NBFIs sector also depend on the regulatory framework. In Japan, NBFIs can be part of a financial conglomerate with banks, while in Korea regulation limits this.

Figure 4.33. Selected ASEAN+3: Banks and NBFIs Financing of Nonfinancial Private Sector (Percent of GDP)



Source: Bank for International Settlements via Haver Analytics; AMRO staff calculations. Note: Selected ASEAN consists of Indonesia, Malaysia, and Thailand. International financial centers (IFCs) consist of Hong Kong and Singapore.



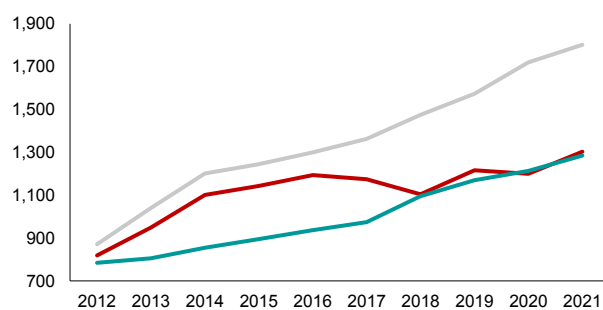
Source: Bank for International Settlements via Haver Analytics; AMRO staff calculations. Note: Selected ASEAN consists of Indonesia, Malaysia, and Thailand. International financial centers (IFCs) consist of Hong Kong and Singapore.

Table 4.4. Plus-3 and IFCs: Total Financial Asset Breakdown of NBFIs

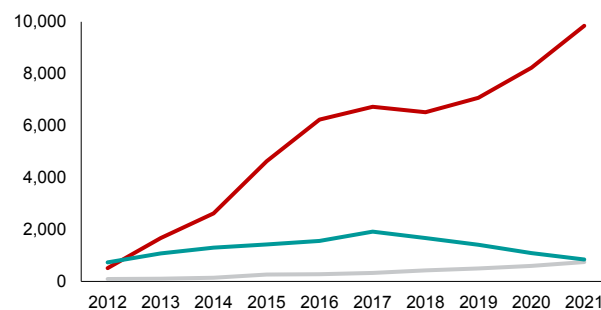
(Percent of GDP, 2021)	China	Japan	Korea	Hong Kong	Singapore	Average of Plus-3 and IFCs
Credit Intermediation:	63	65	63	38	16	63
Collective Investment Vehicle (i.e., fixed income, money market and hedge funds)	55	18	20	16	10	44
Financial market intermediaries (i.e., broker-dealers)	4	29	20	17	4	10
Other: (finance companies, structured finance vehicles, financial guarantors)	5	18	23	6	2	9
Non-Credit Intermediation	49	199	194	283	324	94
NBFI Total	112	264	257	321	340	157
Of Which:						
Pension Funds	1	31	16	54	99	10
Insurance Company	22	98	73	168	73	43
Memo items:						
Banks	258	417	224	921	598	300

Source: Financial Stability Board; AMRO staff calculations.

Note: Credit intermediation refers to activities that could give rise to vulnerabilities because they involve liquidity/maturity transformation or use of leverage, also known as Financial Stability Board's narrow measure of NBFI. Institutional categorization based on credit intermediation was not feasible due to data limitations.

Figure 4.34. Selected ASEAN+3: Credit Intermediation of NBFIs
(Billions of US dollars)**Selected ASEAN+3**

— Collective investment vehicle
— Financial market intermediaries
— Structured finance

China

— Collective investment vehicle
— Financial market intermediaries
— Structured finance

Source: Financial Stability Board; AMRO staff calculations.

Note: Selected ASEAN+3 includes Japan, Korea, Hong Kong, and Singapore.

Box 4.3:

NBFi Financing in Thailand

Thailand has long been characterized as a 'bank-based economy', but recent developments underscore a changing dynamic, with NBFIs emerging as key players in financing both corporates and households. In Thailand, NBFIs encompass insurance companies, pension and provident funds, cooperatives and mutual funds, and also personal loan and credit card companies which provide loans to households.

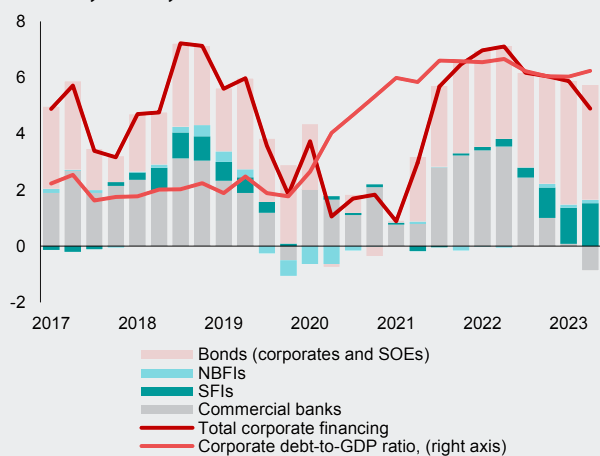
For corporate financing, there is a shift in preference as more corporates opt to raise funding through the bond market, which enables them to lock in lower financing costs amid a rising interest rate environment. Since the latter half of 2022, corporate bond issuances have shown a steady upward trend, while commercial bank lending has experienced more sluggish growth, eventually nearing zero-growth by the second quarter of 2023 (Figure 4.3.1). Notably, although retail investors continue to be the largest holders of corporate bonds; however, the share of NBFi corporate bond holders

has exhibited significant growth over the past decade (Figures 4.3.3 and 4.3.4). For households, growth of lending by NBFIs have also outpaced commercial bank lending (Figure 4.3.2), partly due to more accessible loan application processes, which can attract a broader range of borrowers who may have difficulty meeting the more stringent requirements of traditional banks.

This transition brings regulatory challenges of risk transfer from banks to NBFIs. Commercial banks and Specialized Financial Institutions (SFIs) operate under stringent regulatory oversight, aimed at ensuring financial stability and safeguarding deposits. In contrast, NBFIs often operate with fewer regulatory constraints, rendering them more susceptible to risks arising from leverage, liquidity, and risk management practices. Efforts should be made to harmonize regulations governing NBFIs, especially those on risk management practices, to reduce incentives to risk transfers.

Figure 4.3.1 Financing to Corporates by Type of Financial Institution

(Percent, year-on-year)

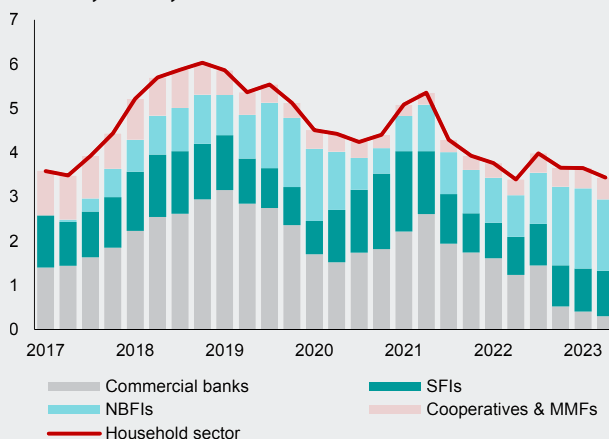


Source: Bank of Thailand; CEIC

Note: NBFi = nonbank financial institution; SFI = specialized financial institution; SOE = state-owned enterprise.

Figure 4.3.2 Lending to Households by Type of Financial Institution

(Percent, year-on-year)

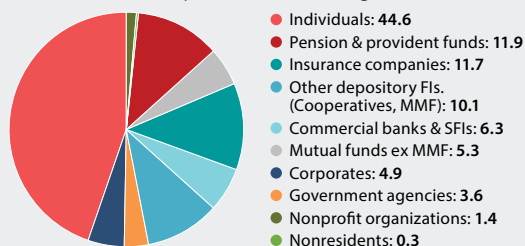


Source: Bank of Thailand; CEIC

Note: NBFi = nonbank financial institution; SFI = specialized financial institution; MMF = money market fund.

Figure 4.3.3 Share of Bond Holdings by Corporate Bondholders, 2013

(Percent of total corporate bond holdings)

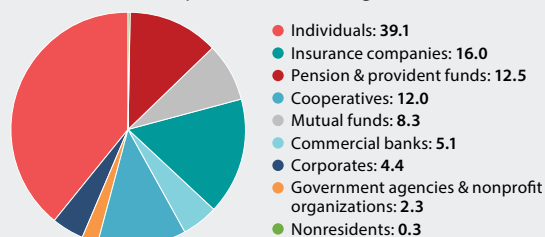


Source: ThaiBMA.

Note: MMF = Money market fund; SFI = specialized financial institution; FI = Financial institution.

Figure 4.3.4 Share of Bond Holdings by Corporate Bondholders, Q2 2023

(Percent of total corporate bond holdings)



Source: ThaiBMA.

Note: SSO = Social Security Office. The categorizations in 2013 and 2023 differ due to changes in groupings implemented by the ThaiBMA since 2020.

NBFIs give rise to risks to financial stability

Table 4.5 identifies three types of NBFIs conducting credit intermediation. These entities often engage in activities requiring significant maturity and currency transformation that can contribute to broader systemic risk. Their diverse roles generate different forms of systemic risk in the financial system.

- **Collective Investment Vehicles (CIVs)** are fixed-income funds, money market funds and hedge funds. They are a source of demand for liquidity in the sense that they receive funds from investors which they channel into assets involving credit, interest rate and currency risks. This role gives rise to a maturity mismatch since liabilities – mostly investor funds – are short term (i.e., redeemable on demand or after a notice period) while assets are longer-term and less liquid (i.e., can only be sold with a delay and/or a price discount). This contributes to the risk of a NBFI “run”, involving the following mechanism:
 - i. Losses on CIV assets are matched by a decline in the value of liabilities, imposing losses on investors.
 - ii. This creates an incentive for investors to withdraw their funds as fast and early as possible to avoid losses.
 - iii. These withdrawals force a fire sale of CIV assets at a discount as they are illiquid and hard to sell. This triggers further price declines and more sales in a negative feedback loop.
 - iv. Systemic risk results from the contagion effect of fire sales, which contribute to a widespread decline in asset prices that prompts investors to withdraw from other, healthy CIVs in a broad “flight to safety.” This represents a key channel of contagion to the banking system and broader economy.
- **Financial Market Intermediaries (FMI)s** are NBFIs such as “Broker-Dealers” that receive funding from counterparties and provide a variety of financial products (e.g., derivatives). They are essential providers of liquidity to the financial system, including through their market-making activities (Box 4.4). This role is critical in Asia where dollar dominance means cross-border finance is largely conducted in dollars. They raise dollar funding from US banks and markets with surplus dollar liquidity and channel it to Asian corporates and financial institutions that need dollar liquidity. For example, derivatives such as cross-currency swaps enable ASEAN+3 banks and corporates to convert local currency assets into dollar financing. These activities involve risks from maturity and currency transformation. And when

the soundness of FMIs is threatened, they may scale back provision of dollar liquidity, which could severely disrupt dollar finance in Asia with potentially large consequences for real economic activity as corporates’ capacity to operate internationally is compromised.

- **Structured Finance Vehicles (SFVs) and investment companies (ICs)** raise market funding to finance investment. SFVs are typically created to fund specific projects or investments. Like investment companies, they engage in maturity transformation as they rely on short-term funding (e.g., commercial paper) to finance long-term investments that involve credit risk and are illiquid (e.g., construction projects). The structure typically involves refinancing risk, and when maturing short term debt funding cannot be rolled over, the financing of the investment project comes to halt. By their nature, SFVs are prone to runs, which creates systemic risk. Specifically, a default affecting one SFV can trigger refinancing difficulties at “healthy” ones as lenders have imperfect information on the credit quality and may view the default as indicative of widespread credit problems.

These features are summarized in Table 4.5, which contrasts the risks faced by each type of NBFIs and how this translates into different systemic risks.

The blurred dividing line between banks and NBFIs, which can provide many of the same financial functions, affects NBFI risks. This dividing line is fluid and can shift over time with an increase in NBFIs risk associated with a risk transfer from banks to NBFIs (e.g., driven by regulatory arbitrage). This can affect risks associated with dollar finance in the region. As both NBFIs and large global banks can access dollar funding, either can assume the primary role as supplier of dollar liquidity. It depends on factors such as (i) global financial market conditions, (ii) banks’ own dollar funding needs related to their global activities, and (iii) the regulation and ongoing structural transformation of finance.

Global financial conditions influence the role of NBFIs as providers of dollar liquidity. NBFIs typically rely on market funding while major banks have a variety of funding sources, including dollar deposits. NBFIs benefited from an extended period of very low global interest rates, which reduced funding costs and made them more competitive as providers of dollar liquidity. The recent rise in global interest rates may have reduced this advantage. Another contribution to NBFIs’ expanding role in dollar finance are innovations in payments and financial markets. An example is the digitalization of secured finance (e.g., in US repo markets) over the last few years.

Table 4.5. Summary of Role and Risks of NBFIs Engaged in Maturity Transformation

Type of NBFIs and Role	CIVs (fixed-income and hedge funds)	Financial market intermediaries (FMIs, e.g., broker-dealers)	Structured finance vehicles (SFVs)/Investment companies (ICs)
Maturity transformation	Short maturity liabilities from investors fund long term and/or illiquid assets	Provides liquidity and financial product (e.g., derivatives) involves maturity/FX mismatches	Funding raised in short-term debt markets used to finance illiquid and/or risky assets
Risks faced by NBFIs	A fall in liabilities forces asset sales and mark-to-market losses, reducing the value of liabilities	Moves in interest/ exchange rates cause loss on mismatched positions. Or loss of liquidity in funding market forces asset liquidation	Refinancing risk as funding instrument (e.g., commercial paper not rolled over), triggering forced sale of asset and mark-to-market losses
Source of systemic risk	A “run” on NBFIs as investors withdraw funding, triggering a fire sale and more losses. Run spreads to more NBFIs and asset prices fall sharply	Provision of financial products cut (derivative canceled) cutting funding or imposing losses for users of product, forcing them reduce economic activity	Contagion as defaults of one SFV leads to failure to rollover funding of other, forcing further asset liquidations and a sharp fall in asset prices. Funding dries up

Source: Financial Stability Board; AMRO staff analysis

Policies to contain the risk to financial stability from NBFIs

NBFIs have rapidly expanded their financial market intermediation role in the region, particularly as suppliers of dollar finance, which represents a novel source of systemic risk. The risks are complex owing to the variety of roles NBFIs play in ASEAN+3 finance. Their growing importance as market intermediaries supplying liquidity to the financial system, particularly of US dollars, means policies governing the role of NBFIs need strengthening. This requires close cooperation among the region’s regulatory and macroprudential authorities, and central banks, owing to the cross-border nature of this finance.

A key prerequisite for strengthening policies is to close data gaps and improve data quality and relevance. This is much more challenging for NBFIs than for banks owing to the diversity of NBFIs and the wide range of functions they perform. Data on the size of different types of NBFIs by function from the FSB and reported by the Plus-3 economies and financial centers should be produced by ASEAN economies (except Indonesia and Singapore, which already publish these data). Data on the liability structure of NBFIs are also essential to assess funding liquidity risk. The lack of these data hampers the ability of market participants to make timely risk assessments needed for market discipline of NBFIs. It also impedes cooperation among ASEAN+3 authorities to address risks from reliance on the US dollar by the region.

The variety of NBFIs means a one-size-fits-all regulatory approach may not work and oversight will need to be tailored to the type of NBFIs. Analysis of the systemic risk posed by different types of NBFIs should guide the prioritization of supervisory resources. The focus needs to be on bolstering regulatory and supervisory frameworks to provide the first line of defense, building on FSB recommendations. This should be complemented by a strengthening of the second line of defense by enhancing incentives for risk management. Given NBFIs’ critical role as market intermediaries, weaknesses in risk management pose a systemic threat to the functioning of financial markets across the region. Finally, should these lines of defense fail, a third line of defense comes from central banks who can provide a temporary liquidity backstop for NBFIs. This may have to be activated in a crisis to ensure the continued operation of core financial markets and to limit contagion to the banking system and broader economy. This liquidity facility should strike a balance between preventing a financial crisis and limiting moral hazard and involve safeguards to avoid providing liquidity support to insolvent NBFIs. With NBFIs’ critical role in intermediating dollar finance in the region, such liquidity support could involve coordination among ASEAN+3 central banks to ensure continued functioning of dollar funding and hedging markets when they come under stress. As this can involve providing liquidity in foreign exchanges, cooperation may be needed to draw on central bank swap lines or rapid financing faculties from international financial institutions.

Box 4.4:

Dollar Finance in ASEAN+3

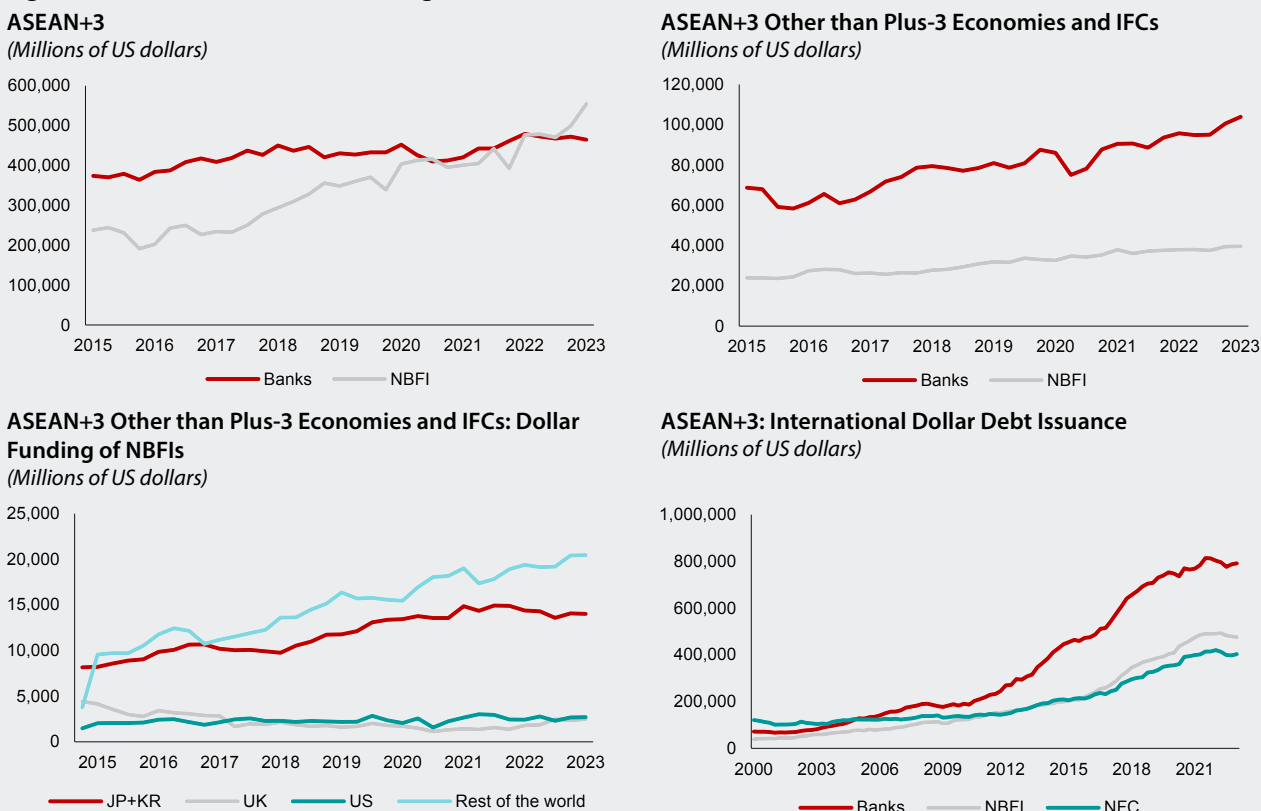
NBFI financial market intermediaries supply FX liquidity, mostly in US dollars, in ASEAN+3 using dollar funding sourced from global banks and dollar financial markets. Dollar funding is provided by large global financial institutions that have surplus dollar liquidity. Some ASEAN+3 NBFIs can also obtain funding by accessing secured financial markets in the US (e.g., repo markets). Within the region, this funding is raised primarily by banks and NBFIs in the two IFCs (i.e., Hong Kong and Singapore), and in Japan and Korea (Figure 4.4.1).

The dollar volume of funding raised by NBFIs has increased rapidly. Financing obtained from international banks has more than doubled since 2015 to above USD500 billion (Figure 4.4.1) and now exceeds the dollar funding raised by ASEAN+3 banks. NBFIs rely more on short-term market funding markets such as repo markets. They make less use of international dollar bond markets than banks, which tap them to raise longer term funding. Nevertheless, NBFI issuance of bonds has also increased substantially to around USD400 billion for ASEAN+3 (Figure 4.4.1). NBFIs’ access to secured funding markets (e.g.,

repo markets) with global bank counterparties enables them to provide financial products that are a key vehicle through which they supply dollar liquidity to the region. This also entails maturity transformation that boosts returns. In sum, the large relative increase in dollar funding raised by ASEAN+3 NBFIs suggests they are playing a rapidly expanding role as suppliers of dollar liquidity in the region.

In contrast, dollar funding going to NBFIs in ASEAN emerging market economies is much smaller and has not increased relative to banks. A feature of the dollar funding received by these NBFIs is that a large share comes from within ASEAN+3. Most of the supply of dollars comes from Japan and Korea and from the rest of the world while the total from the US is very low. The share of intra-ASEAN+3 finance is probably much higher than that reported by the BIS (Figure 4.4.1, lower left panel) as the financial centers of Hong Kong and Singapore are also important providers of intra-ASEAN+3 finance but their contribution is shown in the rest-of-the-world total since they do not report this lending separately (unlike Japan and Korea).

Figure 4.4.1. ASEAN+3: Dollar Financing of Banks and NBFIs



Source: Bank for International Settlements via Haver Analytics; AMRO staff calculation.
 Note: Data for the year 2013 only includes information from the first quarter. JP = Japan; KR = Korea; UK = United Kingdom; US = United States. NBFI = nonbank financial institution; NFC = nonfinancial corporate.

Annex 4.1. Bank Simulation Exercise – Implications of Higher Interest Rate Environment

This is a box to describe the simulation exercise for banks in the region (Figure A4.1.1). A total of 145 ASEAN+3 banks are covered, which cover most of the banking balance sheets.

- Plus-3 excluding IFC: 68 banks, accounting for 82 percent of total assets and 83.2 percent of total loans in the banking sector;
- IFCs (Hong Kong and Singapore): 24 banks, accounting for 77 percent of total assets and 93.7 percent of total loans in the banking sector; and
- ASEAN-4 and Vietnam: 53 banks, accounting for 79.3 percent of total assets and 78.5 percent of total loans in the banking sector.

First, a satellite model is used to estimate the relationship between interest rates and NPL ratios in ASEAN+3 from 2010 to 2022. The specification of the model is as follows:

$$NPL_{it} = \alpha + \beta_1 IR_{it} + \beta_2 GDP_{it-1} + \beta_3 VIX_t + x_i + \epsilon_{it}$$

where NPL_{it} refers to the NPL ratio for economy i in year t , IR_{it} is the interest rate, GDP_{it-1} is the lagged real GDP growth, and VIX_t is the change in VIX index. GDP and VIX are control variables that capture business cycle and international volatility, respectively. Data on NPL ratios, GDP growth, and interest rates are obtained from the International Monetary Fund and/or national authorities. Information on VIX data is sourced from the Chicago Board Options Exchange.

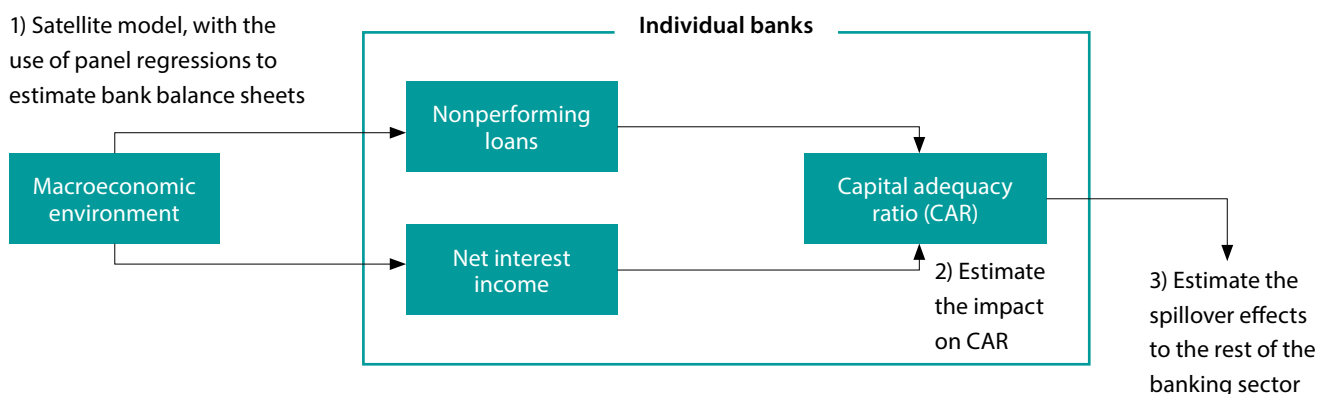
The regression estimations of the correlations between IR, GDP, and VIX and NPL ratio are reported in Figure A4.1.2. The NPL ratio is positively correlated with IR and VIX, but negatively correlated with GDP growth.

Two interest rate shock scenarios are then prescribed in the macroeconomic environment (on IR), which eventually translate into higher NPL ratios. In the mild scenario (termed “*Mild scenario – 200bps*”), an interest rate increase of 200 bps from the end of 2022, equivalent to two standard deviation shocks on average, is assumed. In the stress scenario (termed “*Stress scenario – 400bps*”), interest rate is assumed to increase another 200 bps, for a cumulative 400 bps shock that is equivalent to another Asian financial crisis. The higher interest rates translate into higher NPL ratios, based on the earlier equation. To summarize, Figure A4.1.3 shows that the NPL ratio in some economies could increase 2–3 percentage points when subject to a 400 bps shock.

Second, the higher NPL ratios would lead to a drawdown of banks’ capital buffers from balance sheets. Banks with higher initial NPLs ratios are expected to see larger increase in it. Individual banks’ capital holdings and risk-weighted asset are then estimated, based on initial balance sheet data obtained from Moody’s BankFocus database. The exercise has adopted a more conservative approach, assuming that net interest income remains stable, though net interest income could also increase on the back of higher interest rates. While the average total and Tier 1 CARs of banks in ASEAN+3 in both mild and stress scenarios should remain above Basel prescribed thresholds (Figure A4.1.4 and A4.1.5), some individual banks do come under pressure (Table A4.1.1).

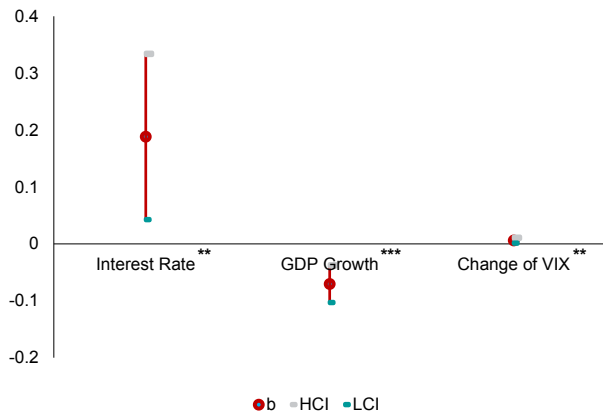
Third, using AMRO’s Systemic Network of World Expected-Losses of Institutions (SuNWEI) model that relies on co-movements of probabilities of default to measure financial interconnectedness (Sun 2020), shocks to any bank identified are estimated to result in direct credit losses of USD 26.8 million to USD 289.8 billion. Contagion credit losses beyond the direct damage to individual banks’ asset quality in the banking sector are about USD 28.2 million for small, less connected banks and USD 119.2 billion for large, connected banks.

Figure A4.1.1. Overview: Steps to Conduct the Simulation Exercise



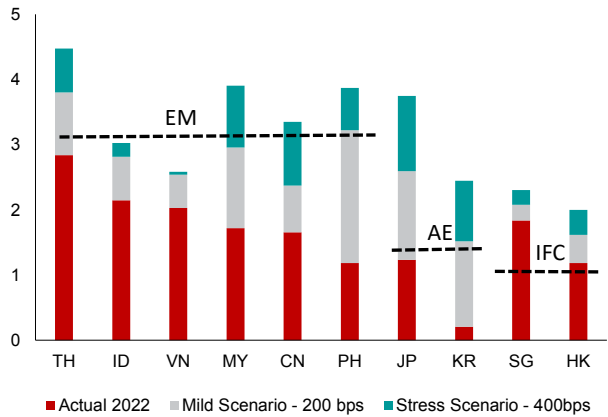
Source: AMRO staff visualization.

Figure A4.1.2. Coefficient Estimates



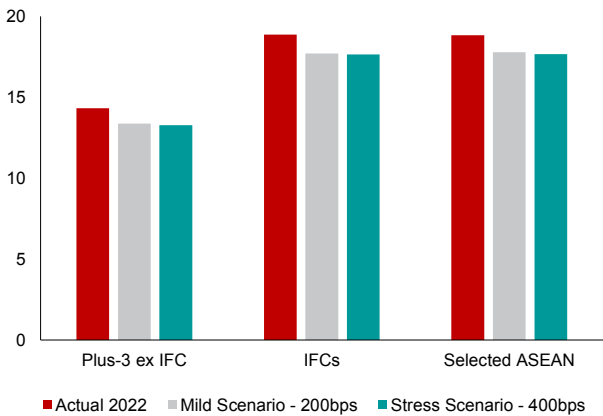
Source: Bank for International Settlements; International Monetary Fund; Moody's Analytics; national authorities; World Bank; AMRO staff estimates.
 Notes: VIX refers to the Chicago Board Options Exchange's Volatility Index. b refers to the coefficient estimate of the specific variable. The red line shows the 95 percent confidence interval. HCI refers to the higher bound of the 95 percent confidence interval and LCI refers to the lower bound. Asterisks (**, ***) denote significance levels at 5 percent and 1 percent levels, respectively.

Figure A4.1.3. Selected ASEAN+3: Nonperforming Loan Ratios (Percent)



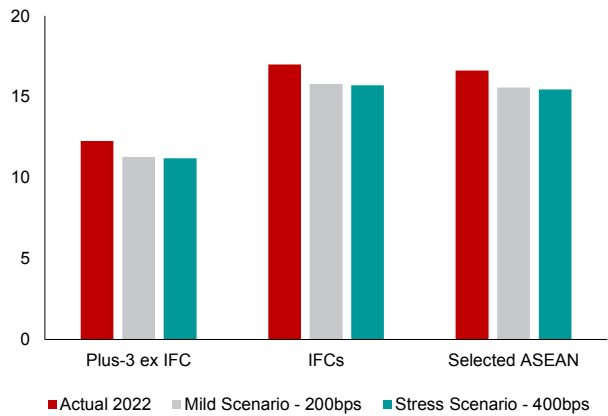
Source: Bank for International Settlements; International Monetary Fund; Moody's Analytics; national authorities; World Bank; AMRO staff estimates.
 Note: The lines represent the average nonperforming loan ratios of emerging market economies (EM), advanced economies (AE) and international financial centers (IFCs) in 2022 respectively.

Figure A4.1.4. Selected ASEAN+3: Total Capital Adequacy Ratios (Percent)



Source: Bank for International Settlements; International Monetary Fund; Moody's Analytics; national authorities; World Bank; AMRO staff estimates.
 Note: Selected ASEAN includes Indonesia, Malaysia, the Philippines, Thailand, and Vietnam. International financial centers (IFCs) include Hong Kong and Singapore. bps = basis points

Figure A4.1.5. Selected ASEAN+3: Tier 1 Capital Adequacy Ratios (Percent)



Source: Bank for International Settlements; International Monetary Fund; Moody's Analytics; national authorities; World Bank; AMRO staff estimates.
 Note: Selected ASEAN includes Indonesia, Malaysia, the Philippines, Thailand, and Vietnam. International financial centers (IFCs) include Hong Kong and Singapore. bps = basis points

Table A4.1.1. Selected ASEAN+3: Bank Solvency Test Results

Scenario	Region	Basel Capital Adequacy Ratio Threshold ¹	Number of Banks ²	Amount of Capital Required	
				Amount (USD Billion)	Percent of Banking Sector Assets
Mild Scenario – 200 bps	Plus-3 ex IFC	Total	9	6.57	0.01
		Tier 1	3	0.59	<0.01
	IFCs	Total	0	0	0
		Tier 1	0	0	0
	Selected ASEAN	Total	6	5.02	0.20
		Tier 1	7	4.19	0.17
Stress Scenario – 400bps	Plus-3 ex IFC	Total	11	7.17	0.01
		Tier 1	5	1.04	<0.01
	IFCs	Total	0	0	0
		Tier 1	0	0	0
	Selected ASEAN	Total	6	5.02	0.20
		Tier 1	7	4.23	0.17

Source: AMRO staff estimates.
 Note: Subscript (1) The Basel CAR Threshold refers to the total and Tier 1 capital requirements that incorporates conservation buffer. Hence, the total and Tier 1 CARs thresholds here are 10.5 percent and 8.5 percent, respectively. (2) Refers to the number of banks with total and Tier 1 CAR falling below Basel requirements, respectively. Selected ASEAN includes Indonesia, Malaysia, the Philippines, Thailand, and Vietnam. International financial centers (IFCs) include Hong Kong and Singapore. bps = basis points.

Annex 4.2. Methodology: Early Identification of Banking Crisis

This box begins by (i) evaluating the predictive power of changes in credit-to-GDP for future banking crises. Subsequently, (ii) it conducts an estimation of the probability of a banking crisis.

For the first part (i), the analysis explores various indicators related to credit-to-GDP. Logit model on an unbalanced panel of 43 economies spanning from 1990 to 2018 for the *s* periods ahead forecast is conducted as follows:

$$\text{Prob}(\text{crisis within } s \text{ years}_{i,t}) = \frac{\exp(\beta_0 + \sum_j \beta_j X_{i,t}^j + \varepsilon_{i,t})}{1 + \exp(\beta_0 + \sum_j \beta_j X_{i,t}^j + \varepsilon_{i,t})}$$

The indicator variable showing banking crisis is obtained from the database compiled by Laeven and Valencia (2020), which includes systemic banking crises, such as sovereign debt, currency, and banking crises. The Bank of International Settlements (BIS) has identified the credit-to-GDP ratio and gap as indicators that offer clear signals for the policy formulation on the countercyclical capital buffer (BIS Quarterly Review 2014). Hence, data on credit-to-GDP ratio/gap is sourced from the BIS and used to assess its effectiveness as a leading indicator of banking crises.

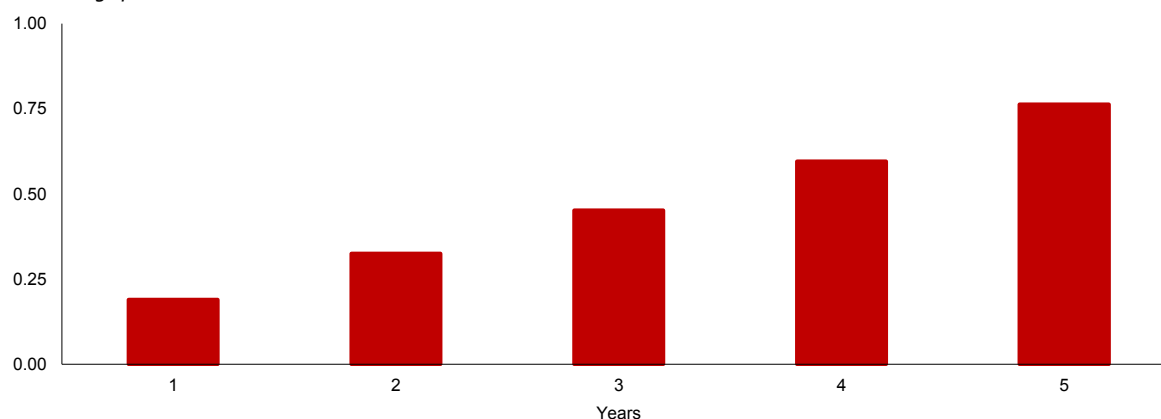
The findings show that the increase in credit-to-GDP gap does indeed predict banking crises (Figure A4.2.1). One percentage point increase in credit-to-GDP gap is associated with 0.45 percentage point increase in the probability of crisis in next 3 years. These results are statistically significant at the 5 percent level even when considering a lag of 5 years.

Finally, for part (ii), the estimates show the probability of banking crisis for selected ASEAN economies indeed peaked during the Asian financial crisis (AFC) and were at elevated levels during the pandemic but were relatively moderate during the Global financial crisis (GFC) (Figure A4.2.2). Such findings were rather intuitive, corresponding to the higher corporate cessations and unemployment rates during the AFC and the numerous unprecedented measures rolled out during the COVID-19. Using the outstanding credit-to-GDP ratio/gap as of July 2023, the current probability of a banking crisis in the region has already declined following COVID-19.

The outstanding credit-to-GDP ratio/gap is just one of several potentially useful indicators for assessing banking sector resilience. While the indicator is known to perform well for a panel of countries, the application to a single economy without considering idiosyncratic factors could lead to misleading interpretations (Drehmann and Tsatsaronis 2014). A more precise and comprehensive assessment must consider structural changes in the economy, which can be challenging to discern using historical credit and crisis data alone. For example, some economies may have shifted to a lower interest rate environment, which could encourage higher leverage while maintaining credit quality. Also, extreme scenarios such as the COVID-19 pandemic could be an one-off event that significantly dampens GDP growth, resulting in widened credit-to-GDP gap temporarily. Additionally, the type of credit institutions offering these loans matters, as state-affiliated institutions can rely on government support during times of stress, potentially preventing a banking crisis altogether.

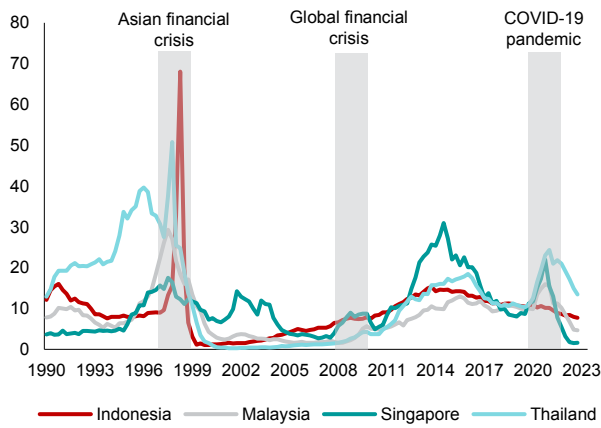
Figure A4.2.1. Probability of Banking Crisis over the Next Five Years under a 1-Percentage Point Increase in Credit-to-GDP Gap Scenario

(Percentage point)



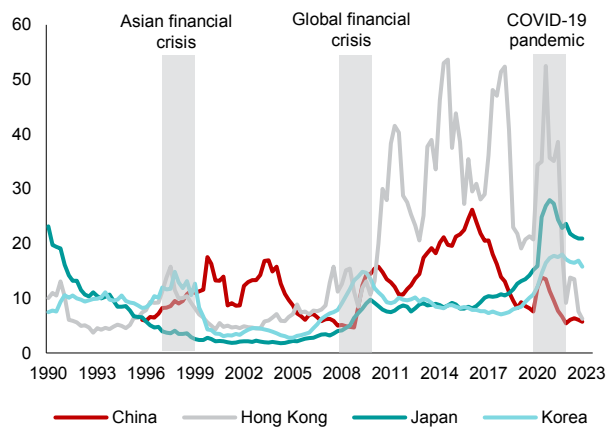
Source: AMRO staff estimates.

Figure A4.2.2. Selected ASEAN: Estimated Probability of Banking Crisis Within Three Years (Percent)



Source: AMRO staff estimates.
 Note: Economies are selected solely based on data availability. The estimation of probability depends only on the credit-to-GDP gap, excluding idiosyncratic economy-specific factors and differentials in safeguards in place.

Figure A4.2.3. Plus-3: Estimated Probability of Banking Crisis Within Three Years (Percent)



Source: AMRO staff estimates.
 Note: Economies are selected solely based on data availability. The estimation of probability depends only on the credit-to-GDP gap, excluding idiosyncratic economy-specific factors and differentials in safeguards in place.

References

- Chang, Wei Liang. 2023. "Asian Banks: Better Insulated From Contagion Risks." Research: Economics and Strategy. Development Bank of Singapore Limited (DBS), Singapore, 24 March. https://www.dbs.com.sg/corporate/aics/templatedata/article/generic/data/en/GR/032023/230324_insights_credit.xml#:~:text=Asia%E2%80%99s%20resilient%20deposit%20base.
- Drehmann, Mathias, and Kostas Tsatsaronis. 2014. "The Credit-to-GDP and Countercyclical Capital Buffers: Questions and Answers." *BIS Quarterly Review*, Bank for International Settlements, Basel, March. https://www.bis.org/publ/qtrpdf/r_qt1403g.pdf
- Federal Reserve. 2020. "Federal Reserve Announces the Establishment of Temporary U.S. Dollar Liquidity Arrangements with Other Central Banks." Press Release. Board of Governors of the Federal Reserve System, Washington, DC, 19 March. <https://www.federalreserve.gov/newsevents/pressreleases/monetary20200319b.htm>
- Federal Reserve. 2022. "Policy Tools: Foreign and International Monetary Authorities (FIMA) Repo Facility." Policy Tools. Board of Governors of the Federal Reserve System, Washington, DC, 24 March. <https://www.federalreserve.gov/monetarypolicy/fima-repo-facility.htm>
- Federal Reserve. 2023. "Credit and Liquidity Programs and the Balance Sheet: Central Bank Liquidity Swaps." Board of Governors of the Federal Reserve System, Washington, DC, 15 March. https://www.federalreserve.gov/monetarypolicy/bst_liquidityswaps.htm
- FIS Global. 2022. "The Global Payments Report." FIS Global. <https://www.fisglobal.com/en/global-payments-report?>
- Gee, Hee Hong, and Deborah Lucas. 2023. "Evaluating the Costs of Government Credit Support Programs during COVID-19: International Evidence." IMF Working Paper WP/23/16, International Monetary Fund, Washington, DC, 27 January. <https://www.imf.org/en/Publications/WP/Issues/2023/01/27/Evaluating-the-Costs-of-Government-Credit-Support-Programs-during-COVID-19-International-528660>
- Khor, Hoe Ee, and Kimi Xu Jiang. 2022. "Rising US Interest Rates Will Not Trigger Another Asian Financial Crisis." Project Syndicate. 4 August. <https://www.project-syndicate.org/commentary/asian-economies-can-withstand-tighter-us-monetary-policy-by-hoe-ee-khor-1-and-kimi-xu-jiang-2022-08?barrier=accesspaylog>
- Laeven, Luc, and Fabian Valencia. 2018. "Systemic Banking Crises Revisited." IMF Working Paper WP/18/206, International Monetary Fund, Washington, DC, 14 September. <https://www.imf.org/en/Publications/WP/Issues/2018/09/14/Systemic-Banking-Crises-Revisited-46232>
- Molika, Meas, Prak Chan Thul, and Sangeetha Amarthalingam. 2023. "US Fed Rate Hikes Pinch Cambodian Pockets." Kiripost, 7 April. <https://kiripost.com/stories/cambodia-economy-business-faces-headwinds-as-us-fed-hikes-rates>
- Monetary Authority of Singapore (MAS). 2020. "MAS Calls on Local Banks to Moderate FY2020 Dividends." Media Release. Singapore, 29 July. <https://www.mas.gov.sg/news/media-releases/2020/mas-calls-on-local-banks-to-moderate-fy2020-dividends>
- Monetary Authority of Singapore (MAS). 2023. "Credit Suisse Continues Operating Without Interruption in Singapore." Media Release. Singapore, 20 March. <https://www.mas.gov.sg/news/media-releases/2023/credit-suisse-continues-operating-without-interruption-in-singapore>
- Monetary Authority of Singapore (MAS). 2023. "Singapore's Banking System Remains Sound and Resilient." Media Release. Singapore, 13 March. <https://www.mas.gov.sg/news/media-releases/2023/singapore-banking-system-remains-sound-and-resilient>
- New Straits Times. 2023. "HLIB: Every 25BPS Hike in OPR Will Lift Banks Earnings Forecast 3-4 pct." Kuala Lumpur, 5 May. <https://www.nst.com.my/news/nation/2023/05/906193/hlib-every-25bps-hike-opr-will-lift-banks-earnings-forecast-3-4-pct>
- Nguyen, Son. 2023. "Banks to Keep Lowering Interest Rates: Deputy Governor." Hanoi Times. 25 April. <https://hanoitimes.vn/banks-to-keep-lowering-interest-rates-deputy-governor-323552.html>
- Ong, Li Lian, Toàn Long Quách, Hoang Nam Nguyen, Alex Liyang Tang, Yin Fai Ho, Prashant Pande, and Edmond Chiang Yong Choo. 2023. "Opportunities and Challenges of Financial Digitalization: A New Perspective on ASEAN+3 Regional Financial Cooperation." AMRO Policy Position Paper. ASEAN+3 Macroeconomic Research Office, Singapore, 2 May. <https://amro-asia.org/opportunities-and-challenges-of-financial-digitalization-a-new-perspective-on-asean3-regional-financial-cooperation/>
- Özlem Dursun-de Neef, H., and Alexander Schandlbauer. 2021. "COVID-19 and Lending Responses of European Banks." *Journal of Banking and Finance* 133. December. <https://www.sciencedirect.com/science/article/pii/S0378426621001953>
- Remolona, Eli M, and Shim, Ilhyock. 2015. "The Rise of Regional Banking in Asia and The Pacific." *BIS Quarterly Review*, Bank for International Settlements, Basel, 13 September. https://www.bis.org/publ/qtrpdf/r_qt1509j.htm

- Reuters. 2023. "China's Big Four State Banks to Lower Deposit Rate Ceilings." 10 May. <https://www.reutersagency.com/en/reutersbest/article/chinas-big-four-state-banks-to-lower-deposit-rate-ceilings/>
- Sun, Wei. 2020. "Covid Credit and Contagion Risks to ASEAN+3 Financial Systems." Analytical note. ASEAN+3 Macroeconomic Research Office, Singapore, 9 June. <https://amro-asia.org/covid-credit-and-contagion-risks-to-asean3-financial-systems/>
- Tan, Nai Lun. 2023. "Singapore Banks Post Robust Q1 Results, But Net Interest Margins Look to Have Peaked." The Business Times. 11 May. <https://www.businesstimes.com.sg/companies-markets/singapore-banks-post-robust-q1-results-nims-look-have-peaked>
- Trang, Quynh. 2022. "Banks Cannot Pay Cash Dividend this Year: Central Bank." VN Express International, 19 January. <https://e.vnexpress.net/news/business/industries/banks-cannot-pay-cash-dividend-this-year-central-bank-4418678.html>
- The Nation. 2023. "BOT Allows Financial Institutions to Make Dividend Payments In Line With Overall Economic Stability, Impact On Stakeholders." The Nation. Thailand, 12 September. <https://www.nationthailand.com/business/30397842>
- Wee, Denise. 2023. "Hong Kong Mortgage Frenzy Sees Banks Go Big On Cash Handouts." Financial Review. 15 May. <https://www.afr.com/property/residential/hong-kong-mortgage-frenzy-sees-banks-go-big-on-cash-handouts-20230515-p5d8ht>
- Wong, Siang Leng, Laura Grace Gabriella, and Aziz Durrani. 2022. "Climate Change: How Far along the Green Path are ASEAN+3 Banks." AMRO Analytical Note. ASEAN+3 Macroeconomic Research Office, Singapore, 19 January. <https://amro-asia.org/climate-change-how-far-along-the-green-path-are-asean3-banks/>
- Wong, Siang Leng, and Min Wei. 2023. "The Bank Vulnerability Index: A Health Check on ASEAN+3 Banks and Banking Sectors." Working Paper (WP/23-02). ASEAN+3 Macroeconomic Research Office, Singapore, 7 June. <https://amro-asia.org/the-bank-vulnerability-index-a-health-check-on-asean3-banks-and-banking-sectors/>