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July 2025

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FINANCIAL SECTOR ASSESSMENT PROGRAM

July 3, 2025

TECHNICAL NOTE

STRESS TESTING THE BANKING SECTOR

Prepared By
Monetary and Capital Markets Department

This Technical Note was prepared in the context of the Financial Sector Assessment Program (FSAP) in the euro area. It contains the technical analysis and detailed information underpinning the FSAP findings and recommendations. Further information on the FSAP program can be found at http://www.imf.org/external/np/fsap/fssa.aspx

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Glossary

€STR	Euro Short-Term Rate
ABS	Asset Backed Security
AC	Amortized Cost
AE	Asset Encumbrance
AM	Asset Management
APP	Asset Purchase Program
AuM	Asset under Management
CAR	Capital Adequacy Ratio
CB	Central Bank
CBC	Counterbalancing Capacity
CBR	Combined Buffer Requirement
CCB	Capital Conservation Buffer
CCF	Credit Conversion Factor
CCoB	Capital Conservation Buffer
CCP	Central Counterparty
CCR	Counterparty Credit Risk
CCyB	Countercyclical Capital Buffer
CET1	Common Equity Tier 1
CF	Cash Flow
CFLST	Cash Flow Based Liquidity Stress Test
CI	Contagion Index
CM	Commodities
CNFG	Cumulated Net-Funding Gap
COREP	Common Reporting
CRR	Capital Requirements Regulation
CQS	Credit Quality Steps
CR	Credit Spread Risk
CRE	Commercial Real Estate
CS	Collateral Swaps
CVA	Credit Valuation Adjustment
EA	Euro Area
EAD	Exposure at Default
EBA	European Banking Authority
ECB	European Central Bank
EDF	Expected Default Frequency
EEPE	Effective Expected Positive Exposure
EQ	Equity
EU	European Union
FINREP	Financial Reporting
FRTB	Fundamental Review of the Trading Book
FSAP	Financial Sector Assessment Program

FVOCI	Fair Value through Other Comprehensive Income
FVPL	Fair Value through Profit and Loss
FX	Foreign Exchange
GC	General Collateral
GDP	Gross Domestic Product
GFC	Global Financial Crisis
G-SIB	Global Systemically Important Banks
HFCS	Household Financial and Consumption Survey
HQLA	High Quality Liquid Assets
IFRS	International Financial Reporting Standards
ITS	Implementing Technical Standards
IM	Initial Margin
IMF	International Monetary Fund
IR	Interest Rate
LaR	Liquidity at Risk
LCR	Liquidity Coverage Ratio
LGD	Loss Given Default
LSI	Less Significant Institutions
MIR	Monetary Financial Institutions Interest Rates
NBFI	Non-Bank Financial Institutions
MRO	Main Refinancing Operations
NFC	Non-Financial Corporates
NFCI	Net Fee and Commission Income
NFG	Net-Funding Gap
NII	Net Interest Income
NIM	Net-Interest Margins
NLO	Net Liquidity Outflows
NPE	Non-Performing Exposures
NPL	Non-Performing Loans
NSFR	Net Stable Funding Ratio
NTI	Net Trading Income
IRB	Internal Ratings-Based
LDI	Liability-Driven Investment
OCI	Other Comprehensive Income
OFI	Other Financial Intermediaries
O-SII	Other Systemically Important Institutions
OTC	Over-The-Counter
P&L	Profit and Loss
P2R	Pillar 2 Requirements
PBT	Profit Before Tax
PD	Probability of Default
PiT	Point-in-Time
PVA	Prudent Valuation Adjustments

QT	Quantitative Tightening
RoE	Return on Equity
RWA	Risk-Weighted Assets
SCI	Scheduled Contractual Inflows
SCO	Scheduled Contractual Outflows
SFT	Securities Financing Transactions
SI	Significant Institutions
STA	Standardized Approach
STE	Short-Term Exercise
SREP	Supervisory Review and Evaluation Process
SSM	Single Supervisory Mechanism
SyRB	Systemic Risk Buffer
TA	Total Assets
TCI	Total Comprehensive Income
TCR	Total Capital Ratio
TM	Transition Matrices
TN	Technical Note
TTC	Through-The-Cycle
VaR	Value at Risk
VI	Vulnerability Index
WEO	World Economic Outlook
WM	Wealth Management

EXECUTIVE SUMMARY

This technical note (TN) focuses on the euro area (EA) banking sector, which has weathered a succession of shocks over the past few years with notable resilience. Strong starting capital positions, ample liquidity and a diversified deposit base allowed banks to absorb the effects of the COVID-19 pandemic as well as the surge in inflation and rapid monetary policy tightening that followed. Capital ratios and liquidity cushions have in fact edged higher, non-performing loans continued to decline and profitability rose to post-global-financial-crisis highs in 2023, buoyed by wider interest margins. Even so, the picture is uneven: large cross-border groups display thinner capital and liquidity buffers, in line with structural differences in business models, and lower returns than their mid-sized domestic peers. Also, profitability retreated in late 2024, as asset-quality indicators began to soften. These recent trends signal both the rewards of prudent balance sheet management in good times and the latent pressures that could resurface should macro-financial conditions deteriorate.

The 2025 EA FSAP team undertook a top-down stress testing analysis using data up to end-2024 under two severe macrofinancial scenarios. The assessment examined how banks would respond to two severe stress scenarios with a three-year horizon—one centered on an escalation of geopolitical tensions and another simulating a deep and widespread recession. The solvency analysis finds that the EA banking system remains broadly resilient, but it would face challenges under adverse macrofinancial conditions.

While both scenarios revealed that adverse macroeconomic shocks can materially erode banks' capital buffers only a few banks would breach regulatory capital requirements. A much larger share would however see their prudential buffers eroded, and a sizable portion of the system would operate with diminished lending capacity during periods of stress. The analysis underscores the critical role of capital buffers and income diversification in maintaining financial stability. It also reinforces the importance of forward-looking risk management and sustained supervisory engagement to ensure that banks remain prepared for severe but plausible economic shocks.

The primary source of capital depletion is the deterioration in credit quality. As economic conditions worsen, a substantial share of loans migrate into higher-risk categories, triggering elevated provisioning needs. Simultaneously, risk-weighted assets expand as exposures become riskier, further pressuring capital ratios. These effects are most pronounced during the second year of the stress period, when the combined impact of credit losses and risk-weight adjustments is most acute. Income generation also suffers under stress. Both net interest income and fee-based revenues decline as banks face weaker loan demand, compressed margins, and reduced financial activity. While some banks begin to recover in the final year of the scenario, earnings are insufficient to fully offset the losses incurred earlier in the period.

The analysis highlights important differences across business models. Globally systemic banks (G-SIBs), which also entered the stress period with thinner capital buffers, experience the most significant capital depletion and some approach minimum regulatory thresholds. Institutions that primarily engage in traditional lending and deposit-taking, while also affected by the shocks, benefit

from stronger initial positions that offer some cushion. Investment banks and asset managers prove the most resilient, supported by higher starting capital and lower exposure to credit-sensitive assets. Finally, universal banks that engage in lending business, and non-lending fee and commission income making, including trading activities, broadly follow the average trend but benefit from diversified income streams that moderate the impact.

Liquidity stress tests reveal that banks can withstand liquidity outflows under severe scenarios, while some banks have material exposure to U.S. dollar (USD) liquidity risk. All banks in the sample comfortably meet liquidity coverage ratio (LCR) and net stable funding ratio (NSFR) requirements, with wide margins. Volatility of monthly USD LCR and USD liquidity buffers is high, albeit the system maintains positive USD liquidity buffers over the 30-day stress horizon. Survival horizons exceed two months for most banks under various stress scenarios. No large bank moves into negative counterbalancing capacity (CBC) in mild outflow scenarios within the first month of stress. Severe outflow scenarios, which include large deposit withdrawals, would lead to a negative CBC in 10 percent of banks within one month. Overall, G-SIBs and universal banks are the most affected by stress scenarios, however these banks still have substantial liquidity buffers. USD cash flow test results reveal that several large banks would face USD liquidity gaps within the first week of stress, but these gaps are small in both nominal terms (equivalent to 0.5 percent of total assets) and compared to the depth of EUR/USD swap markets.

Banks' exposures to contingent liquidity risks have increased materially since the 2018 FSAP and require continued monitoring and analysis. The increase is due to a higher share of secured funding, FX and collateral swaps which may trigger collateral calls. Banks are also exposed to margin calls on derivatives which could amplify liquidity pressures. Accounting for the impact of forced sales by stressed Non-bank financial institutions (NBFIs) on valuation haircuts in an adverse market shock scenario, the system-wide average LCR could decline by almost 50 percentage points. Given the significant buffers, most banks' LCRs would remain above 100 percent.

Joint stress testing of solvency and liquidity risk for G-SIBs reveals important amplification risks from endogenous liquidity flows, business risk, and counterparty credit risk (CCR). The analysis takes a forward-looking, *conditional* view of liquidity risk by projecting endogenous liquidity shocks triggered by solvency concerns. It also accounts for business model sustainability by modeling client attrition and allowing for a credit downgrade based on excessive leverage. Liquidity outflows are linked to LCR run-off rates on contractual and non-maturing items over a two-day and two-week horizon, the borrowing costs of mitigating actions included, and the adverse feedback loops between solvency and liquidity quantified. The analysis indicates that losses from the solvency-liquidity nexus could reach up to two hundred percent of the initial market shock, are highly non-linear on the size of the shock, and increase significantly in the vicinity of a credit downgrade. The findings indicate that CCR losses from vulnerable NBFIs could be substantial if banks liquidate their derivative positions due to missed variation margin calls, given the liquidity shortfalls revealed by the FSAP's system-wide liquidity stress test.

The analysis highlights the importance of granular monitoring of balance sheet items in relation to their sensitivity to solvency and liquidity risk, particularly when *correlations* break under stress. Complementing LCR ratios with a forward-looking *conditional* liquidity measure such

as "liquidity-at-risk" can help identify liquidity risks in a more-timely manner. Also, adequately modeling CCR including from vulnerable NBFIs amid an acute market shock can improve the accuracy of bank resilience assessment.

Reverse stress and sensitivity tests highlight the need to account for banks' business models and balance sheet structures when assessing resilience. G-SIBs in the EA exhibit wide variation in sensitivity to market shocks and CCR losses, as well as in their capacity to absorb losses before breaching leverage ratio requirements. Differences also emerge in CBC composition and reliance on capital-based income and credit-sensitive counterparties. Reverse stress testing sharpens risk assessment by identifying plausible shock combinations that could trigger insolvency when liquidity feedback loops are considered. Sensitivity tests underscore the ECB's broad collateral framework's stabilizing role, while quantifying funding losses from trapped liquidity and franchise erosion.

The interbank network analysis shows that the risk of contagion through interbank exposures within the EA is low. The interbank analysis confirms that banks' robust capital and liquidity positions underpin interbank resilience yet risks stemming from NBFIs, and market volatility, need to be monitored as they can amplify bank stress through capital losses and cascading defaults throughout the network of large exposures.

Table 1. Euro Area: Main Recommendations on Stress Testing		
Recommendation	**Authorities**	**Timing***
Solvency Stress Testing		
Align ad-hoc stress testing regulatory data collections with the on-going European data integration activities for statistical, prudential and resolution data to ensure that such collections adopt the data model of initiatives such as the Banks' Integrated Reporting Dictionary and the Integrated Reporting Framework and share definitions of Financial Reporting (FINREP) and Common Reporting (COREP), thus facilitating the data extractions of banks, and make future stress-testing cycles faster, more consistent, and more transparent for both authorities and institutions (¶60).	EBA	ST
Continue to expand the ECB/SSM stress-testing program to include multiple scenarios to help supervisors map a fuller spectrum of systemic vulnerabilities, taking into account the institutional constraints related to the EU-wide stress test (¶61).	ECB	ST
Liquidity Stress Testing		
Take a forward-looking view to measure contingent liquidity risks stemming from market valuation changes in securities financing transactions (SFTs), derivatives, and other market exposures by recalibrating outflow parameters to stressed market conditions in internal stress test exercises (¶102).	ECB	ST
Provide further guidance on the quantification of outflows from own credit rating downgrades by defining minimum outflow rates by type of outflows (e.g., wholesale flows, early redemptions, margin calls) and conduct peer benchmarking on reported outflows (¶103).	ECB	ST
Harmonize the collection of granular supervisory data (for example, using Short-term exercise) for those banks with a low or volatile FX LCR to better measure concentration and counterparty credit risk (¶104).	ECB	MT
Solvency-Liquidity Interactions		
Continue developing tailored stress tests to account for the *endogenous* interaction between liquidity shocks and capital erosion from market shocks, borrowing costs, and franchise impairment (¶130).	ECB	ST
Continue enhancing the modeling of counterparty credit risk (CCR), building on the trilateral data collection (ECB, Fed, BoE) on banks' NBFI exposures, and on ECB/SSM's ongoing exploratory CCR analysis (¶130).	ECB	ST
Develop a system-wide stress test covering the entire EU financial system building on the ESRB initiative to establish a system-wide stress test (¶130).	ESRB, ECB	ST
Overall Risk Assessment		
Conduct reverse stress testing to different configurations of macrofinancial shocks given the heterogenous sensitivity of banks to risk factors, parameter uncertainty, and model risk (¶131).	ECB	ST
* I (immediate) = within one year; ST (short term) = 1–2 years; MT (medium term) = 3–5 years		

INTRODUCTION[1]

A. Macrofinancial Context

1. The EA economy has remained resilient in the face of multiple shocks. Despite recurring shocks, including heightened geopolitical tensions, Europe's economy continues to remain resilient with record-low unemployment, declining inflation, and a stable financial system. GDP growth is projected at 0.8 percent this year and 1.2 percent in 2026 (April 2025, WEO). Higher tariffs, trade policy uncertainty, and geopolitical tensions are weighing on activity in 2025, more than offsetting an anticipated lift from fiscal policy support and easing monetary policy. Inflation is expected to remain broadly at the 2 percent target from the second half of 2025. Disinflation is supported by lower energy prices, subdued activity moderating nominal wage growth, and firmly anchored inflation expectations.

2. Risks to growth are tilted to the downside, while inflation risks are balanced. Output could be weaker than projected if a rise in trade policy uncertainty, an escalation of tariffs, and continuing weakness in manufacturing, further weigh on consumer confidence and business sentiment. On inflation, trade diversion lowering non-energy goods import prices, weaker-than-expected growth, and euro appreciation could result in lower inflation than expected. These risks are countered by upside factors, such as higher imported inflation due to the escalation of geopolitical and trade tensions as well as the possibility of higher-than-expected wage growth. Fiscal spending (including on defense) might also turn out larger or more inflationary than in the baseline.

3. Credit to the real economy has continued to decline, albeit at a slower pace, while trade-related market volatility and NBFI risks remain significant sources of systemic risk. Credit to nonfinancial corporations and households continued to contract in real terms in 2024Q4, both about-1.5 percent (year-on-year), but the pace has slowed. With the normalization of monetary policy, credit standards have started to ease from their restrictive levels driven by mortgage lending; but borrowing costs remain high (Figure 41) and credit standards tightened for firms during 2024Q4 and 2025Q1. Quantitative tightening is expected to progress in an orderly way but warrants careful monitoring of liquidity conditions in banks, NBFIs, and core funding markets, especially as financial conditions are likely to remain volatile given heightened trade policy uncertainty.

4. Banking sector assets amount to EUR 38 trillion or two and a half times GDP (Table 2). Banks hold about half of total financial sector assets in the EA, 70 percent of which are accounted for by 114 significant institutions (SIs) directly supervised by the ECB, of which 7 are also global systemically important banks (G-SIBs). The remainder comprises 1,865 less significant institutions (LSIs) supervised by the national authorities in close cooperation with the ECB (13 percent), and (non-EU) branches not subject to harmonized EU/European Economic Area regulation and

[1] This TN was prepared by Guillaume Arnould, Mindaugas Leika, Apostolos Panagiotopoulos, Mariano Spector, Laura Valderrama (lead), and Richard Varghese. The analysis has benefited from insightful discussions with ECB/SSM and EBA staff and the Euro Area FSAP team.

supervision (17 percent). NBFIs account for more than twice the EA GDP and are dominated by investment funds.[2] While these funds have diverse investment strategies, about 90 percent of total assets are held in open-ended funds subject to liquidity risk arising from investor redemptions. Ninety percent of fund assets are domiciled in France, Germany, Ireland, Luxembourg, and the Netherlands. Assets of the insurance sector are equivalent to 59 percent of GDP. The consolidated balance sheet of the Eurosystem of central banks remains sizeable at EUR 6.4 trillion, despite having declined since end-2021 from 69 percent to 42 percent of GDP in 2024.

Table 2. Euro Area: Structure of the EA Financial System

	2024			2023		
	In billion euros	In percent of assets	In percent of GDP	In billion euros	In percent of assets	In percent of GDP
Monetary Financial Institutions (MFIs)	46,030	57.0	303.7	45,411	59.1	311.0
Deposit-taking excluding central banks						
o/w: Credit institutions	38,559	47.8	254.4	37,406	48.7	256.2
o/w: Significant Institutions	26,837	33.3	177.1	25,944	33.8	177.7
o/w: Less Significant Institutions	4,948	6.1	32.6	4,952	6.4	33.9
o/w: Third Country Branches	6,774	8.4	44.7	6,510	8.5	44.6
Money Market Funds (MMFs)	1,996	2.5	13.2	1,710	2.2	11.7
Other MFIs	5,475	6.8	36.1	6,295	8.2	43.1
Investment Funds	19,730	24.4	130.2	17,186	22.4	117.7
Financial Vehicle Corporations (FVCs)	2,502	3.1	16.5	2,354	3.1	16.1
Insurance corporations	8,845	11.0	58.4	8,469	11.0	58.0
Pension funds	3,587	4.4	23.7	3,367	4.4	23.1
Total financial system assets	80,694	100.0	532.4	76,787	100.0	526.0
Memo: Eurosystem central banks	6,357	7.9	41.9	6,891	9.0	47.2

Source: ECB; Haver; IMF staff calculations. Note: Other MFIs include central banks in the Eurosystem, electronic money institutions and other financial intermediaries.

5. The banking system has remained resilient through recent shocks. In aggregate, a robust capital and liquidity position, a diversified deposit base, and limited levels of unrealized losses underpinned the resilience of EA SIs (Table 3, Figure 42).[3] Banks' capital position has strengthened gradually while liquidity ratios have remained robust after peaking before the start of the tightening cycle. Benefiting from rapid monetary policy tightening, sticky retail deposit rates, and the lagged effects of the rate-hiking cycle on asset quality, profitability reached post- global financial crisis highs in 2023. While nonperforming loans (NPLs) have marginally declined, recent indicators suggest that the asset quality cycle may be turning.[4] The common equity tier 1 (CET1) ratio has edged up over the last two years, posting 15.9 percent in December 2024 while the LCR remained stable at 158 percent. Profitability peaked in June 2024 at 10.1 percent return on equity

[2] NBFIs include investment funds, insurance companies, pension funds, and other financial intermediaries (OFIs).

[3] SIs held EUR 73 billion of unrealized losses in 2023, against EUR 165 billion of profits. Losses would materialize only in the event that banks had to sell such securities.

[4] NPL ratios declined from 3.5 percent in 2020:Q2 to 2.24 percent in 2023:Q1 but rose to 2.28 percent in 2024:Q4.

(RoE) and declined to 9.5 percent in December 2024. Looking across types of institutions, G-SIBs' 2024 RoE (at 7.9 percent), lagged that of diversified lenders (at 12.2 percent). Larger banks also posted lower capital and liquidity ratios than medium/small sized banks.

Table 3. Euro Area: Financial Soundness Indicators for Significant Institutions

(In percent, unless otherwise indicated)

	2019	2020	2021	2022	2023	2024
Capital adequacy						
Common Equity Tier 1 ratio	14.9	15.7	15.6	15.4	15.9	15.9
Tier 1 ratio	16.1	17	16.9	16.7	17.3	17.3
Total capital ratio	18.6	19.5	19.6	19.4	19.8	20.0
Leverage ratio (fully phased-in definition)	5.6	5.8	5.9	5.5	5.8	5.9
Leverage ratio (transitional definition)	5.7	6	6	5.6	5.8	5.9
Asset quality						
Loans and advances (in billions of euros) 1/	15,698	16,890	18,138	18,477	18,344	18,468
Stage 1 ratio		87.5	88.3	88.2	87.9	87.8
Stage 2 ratio		9.3	9.2	9.6	9.7	9.9
Stage 3 ratio		3.2	2.5	2.2	2.3	2.3
Nonperforming exposures ratio		3.2	2.6	2.3	2.2	2.1
Nonperforming exposures coverage ratio	46.0	45.1	44.6	43.6	42.6	42.1
Earnings and profitability						
Return on equity	5.2	1.5	6.7	7.7	9.3	9.5
Return on assets	0.4	0.1	0.4	0.5	0.6	0.7
Funding and liquidity						
Loan-to-deposit ratio	116	106.8	104.4	103.5	102.7	100.4
Liquidity coverage ratio	145.9	171.3	173.4	161.3	164.3	158.0
Assets						
Total assets (in billions of euros)	22,185	24,176	25,092	25,822	25,944	26,837
Total assets (in percent of GDP)	184.2	209.9	201.1	191.2	165.6	179.2
CB assets (in percent of total assets)				0.08	0.04	0.02
Loans to households and NFCs (in percent)	74.6	75	75.7	75.9	74.4	73.4
Significant institutions by size (number of) 2/						
Total	113	112	113	110	107	109
Banks with total assets						
Less than EUR 30 billion						18
Bw/ EUR 30 billion and EUR 100 billion						44
Bw/ EUR 100 billion and EUR 200 billion						20
More than EUR 200 billion						20
Global systemically important banks						7

Sources: ECB; and IMF staff calculations.

1/ Loans and advances in the asset quality tables are displayed at gross carrying amount, excluding central bank exposures.

2/ The number of SIs for which common reporting (COREP) and financial reporting (FINREP) is available is 109 in 2024.

B. Financial Risks and Vulnerabilities

6. Global risks are on the rise and the outlook has become more uncertain. In the current challenging macroeconomic environment, the materialization of tail risks could impair financial

stability. The financial sector remains vulnerable to adverse dynamics, which could be triggered by negative macrofinancial surprises or the further materialization of geopolitical risks. Growing interlinkages of banks to complex and opaque NBFIs could pose significant challenges and act as amplifiers of systemic risk. Shocks could be amplified by high credit and liquidity risks in NBFIs[5] or a sudden correction in real estate markets, including a further decline in Commercial Real Estate (CRE) (Figure 43). Highly indebted firms and households have been under pressure from higher debt service costs with the lagged economic impact of tighter financial conditions yet to fully materialize because of the lags in the repricing of outstanding loans in some EA countries. Higher funding costs and a softening in real estate markets have elevated credit risk in CRE loans with NPLs reaching 4.6 percent in 2024 relative to 2.3 percent for the aggregate loan portfolio. SMEs and consumer credit have also seen high NPL rates (at 4.7 percent and 5.3 percent, respectively) underperforming mortgage loans posting a 1.5 percent NPL rate. Following recent policy rate cuts financial conditions have started to ease but in the interim the delayed impact of the past tightening, which peaked in September 2023, is still working through the system. For instance, the average loan rate for retail loans is expected to increase by 2.9 percentage points on average for the EA from 2021 (date of the latest Household Financial and Consumption Survey (HFCS) to 2025.

7. While quantitative tightening is expected to progress in an orderly way, it warrants careful monitoring of liquidity conditions in banks and NBFIs, given the growth of the NBFI sector and its interconnectedness with banks (Figure 44). The potential widening of sovereign spreads could raise borrowing rates and heighten credit risk. If fiscal headroom erodes, banks' exposures to highly indebted sovereigns could act as a transmitter of shocks and adversely affect the availability of credit to the real economy. Excessive leverage in NBFIs could amplify stress via counterparty credit risk as illustrated by the 2021 failure of Archegos which resulted in over USD 10 billion of losses across banks.[6] Large credit losses can lead to franchise erosion and a drop in client activity. It can also generate market confidence issues regarding business model sustainability leading to funding pressures fueling adverse feedback loops. Deteriorating asset quality, lower revenues, stress in core financial markets, and contagion from strains in NBFI are risks going forward. The recent spike in financial market volatility following the announcement of US trade tariffs, coupled with European banks' growing reliance on US repo funding could create rollover risks.

C. FSAP Stress Testing Strategy

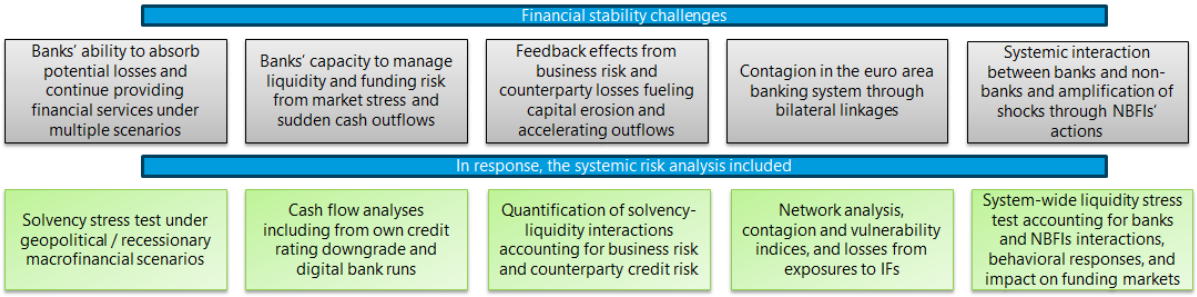
8. The resilience of the euro area banking system was assessed using a range of stress tests. These were (text chart):

[5] The impact of market shocks could be amplified by wrong-way risk in collateralized transactions with NBFIs if the value of the assets posted as margin is correlated with their creditworthiness.

[6] Archegos was highly leveraged through total return swaps and was unable to meet large variation margins when the value of its synthetic positions collapsed, leading to a default on its obligations.

- *A fully-fledged solvency stress test to assess banks' capital adequacy against two severe, adverse macrofinancial scenarios.*
- *A wide range of liquidity stress tests to estimate bank resilience to market-wide and idiosyncratic liquidity risks.*
- *A solvency-liquidity stress test to quantify the amplification of equity losses arising from endogenous liquidity stress, counterparty credit risk, and business risk.*
- *A network analysis to assess amplification losses and cascading defaults through the network of interbank exposures, including under stressed market conditions.*
- *A system-wide stress test to quantify to evaluate the ability of NBFIs to satisfy liquidity demands in a market shock scenario and to assess the knock-on effects on core funding markets and financial institutions (see TN on Systemic Risk Analysis – NBFIs). These findings were used to stress banks' LCR ratios, and to inform the counterparty credit risk (CCR) analysis in the solvency-liquidity risk module.*

9. The resilience of the euro area banking sector was recently examined by the 2023 EU-wide stress test.[7] The 2023 exercise found a capital depletion of 459 basis points under the adverse scenario. At the time of the 2025 FSAP, banks' resilience was being tested under the 2025 EU-wide stress test, with the results expected to be published in August 2025. [8]



[7] ECB Banking Supervision performed two stress test exercises for EA SIs in 2023, 57 included in the EU-wide stress test coordinated by EBA, and a further 41 SIs included in the parallel test coordinated by the ECB.

[8] While the 2023 / 2025 EU-wide stress test aims to assess banks' capital buffers, the FSAP stress testing exercise includes additional modules to test banks' resilience to liquidity risk, to quantify amplification effects through solvency and liquidity interactions, and to measure indirect effects through the network of bank exposures.

SOLVENCY STRESS TEST

A. Key Elements of the Stress Test

10. The IMF stress test was conducted on end-2024 data at the highest level of consolidation in the EA. The exercise was performed over a period of three years from 2025 to 2027. It encompassed 95 (out of 109) SIs in the EA common reporting (COREP) and financial reporting (FINREP) data. Fourteen banks were excluded due to insufficient regulatory data or specialized business models. The stress test was performed using bank-level supervisory data including FINREP and COREP templates, as well as ECB short-term exercise (STE) templates. The stress test excluded LSIs as these are directly supervised by their respective national competent authorities. Contagion dynamics from correlated failures of small entities are out of scope.

11. Bank resilience was assessed against three criteria ("hurdle rates"):

i. The minimum capital ratio or supervisory review and evaluation process (SREP) capital requirement: consisting of Pillar 1 (4.5 percent for CET1) plus Pillar 2 (P2R); and

ii. The minimum capital ratio plus the combined buffer requirement (CBR) consisting of five buffer elements: Capital Conservation Buffer (CCoB), Countercyclical Capital Buffer (CCyB), G-SII buffer, Other Systemically Important Institutions (O-SII) buffer, and Systemic Risk Buffer (SyRB).[9]

iii. The 3 percent Basel III minimum leverage ratio. For the solvency-liquidity risk module, the leverage ratio requirement included P2R and G-SIB add-on.

12. A static balance sheet approach was adopted for the stress tests. The stress tests were conducted under the assumption that exposures and liabilities remain constant at the cut-off date level throughout the stress testing horizon.

13. Stress test results cover all 95 banks and are presented in aggregate. For analytical clarity and to benchmark business model resilience, banks are grouped into four groups based on their primary source of income and operational focus:: G-SIBs (7 globally diversified banks), Lenders (59 banks focused on traditional banking activities such as deposit taking and loan origination), Investment banks (11 banks with income from fees, commissions, and trading; these institutions have a strong presence in capital markets and advisory services and are mainly subsidiaries of large foreign-owned banking groups), and Universal banks (18 banks; their business models integrate traditional lending with insurance, fee-based services, and trading activities, reflecting a diversified revenue structure).[10]

[9] The buffers included in the hurdle are bank-specific whenever applicable.

[10] Developmental, promotional, and custodian banks were excluded due to their specialized business models.

14. The FSAP stress testing analysis does not consider the implementation of the Capital Requirement Regulation (CRR3). This blurs the comparison with the 2025 EU-wide stress test running in parallel and the results are presented on a transitional basis. The analysis does not account for the incorporation of the new EU banking package effective from January 1, 2025, with restated end-2024 balance sheets and output floor impact in banks' adverse scenario. The incorporation of CRR3 affects capital depletion and creates a divergence between transitional and fully loaded capital ratios. In this analysis, all capital-related requirements refer to transitional capital.

B. Scenarios

Macrofinancial Scenarios

15. Bank resilience is assessed against two macrofinancial scenarios to capture economic uncertainty and heterogeneity in banks' business models.[11] First, a "geopolitical scenario" featuring the materialization of a further escalation of geopolitical conflicts, heightening commodity price volatility and disrupting global production chains, with large adverse trade, price, and tariff shocks ("trade wars") slowing growth. For the EA, GDP growth is projected at -3 percent in 2025 (a contraction of 4 percentage points from baseline) relative to the 0.2 percentage-point slowdown forecasted in the April 2025 WEO (due to the April 2 tariffs). Second, a "recessionary scenario" showing a synchronized global slowdown amplified by sovereign debt distress in the EA, the widening of credit spreads, term premium decompression, and confidence losses softening aggregate demand. In the "geopolitical scenario," fiscal policies in countries with fiscal space are used to counteract partly the fall in demand and support consumption. However, the inflationary impact of production chain disruptions leads to monetary policy tightening. Meanwhile, in the "recessionary scenario" accommodative monetary policy mitigates the adverse impact on aggregate demand. Paths for core macrofinancial variables are shown in Appendix III (Tables 1-4).[12]

16. The baseline scenario reflected WEO projections of the global economy and financial conditions. The baseline scenario is in line with the January 2025 WEO publication. The scenarios project the dynamics of GDP growth, unemployment, headline inflation, housing prices (Figure 1), labor costs and oil price, which affect bank profitability and risk-weighted assets (RWA) through various channels. Macroeconomic scenario variables are projected for all 20 members of the EA, as well as 16 major economies (e.g., the United States, and the United Kingdom) and other EU countries e.g., Poland. January 2025 WEO projections are shown in Appendix III (Tables 1-4).

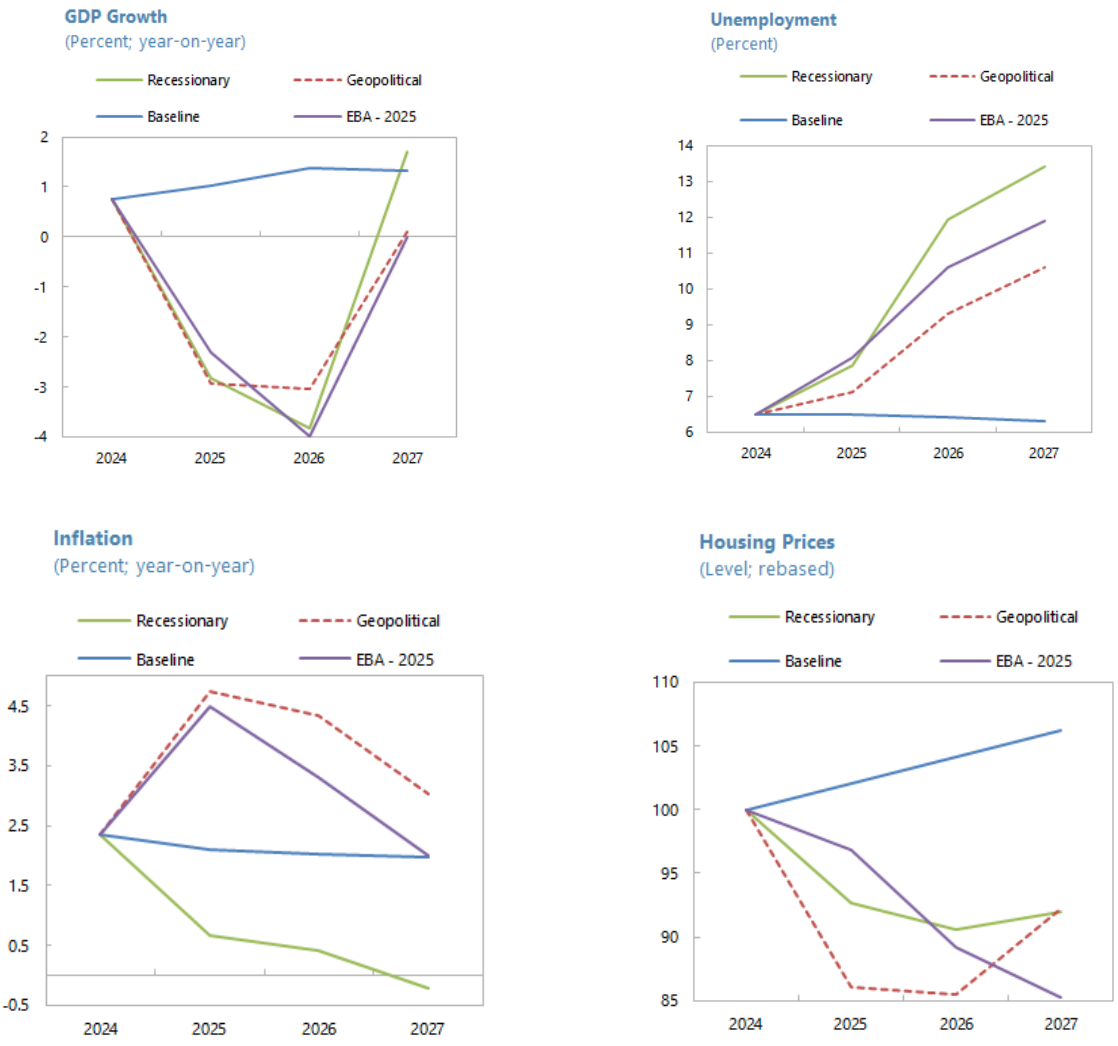
17. The severity of the EBA scenario is comparable to that of the FSAP scenarios for each macroeconomic variable (ESRB, 2025), though differences in the narrative influence the calibration of the specific shocks (Figure 1). The narrative of the EBA scenario is closer to the

[11] Subdued growth due to productivity challenges is reflected in baseline projections as well as in the adverse scenarios.

[12] The adverse scenarios are simulated using a structural macroeconometric model covering forty economies. In the recessionary scenario, documented in Vitek, F. (2015). The slope of the Philips curve is around 0.10, somewhat lower than in Erceg et al (2021).

geopolitical FSAP scenario, though the former tends to be more severe concerning unemployment and GDP shocks. The inflationary pressures are more muted in the EBA scenario, reflecting the stronger contractionary forces in that calibration. The related more muted reappraisal of swap rates aligns with the milder shocks to government bond spreads. Real estate prices in the EBA scenario exhibit a steady decline, with an overall drop that is more severe than in the geopolitical scenario, although less front-loaded.

Figure 1. Projected Core Variables in the Euro Area



Sources: EBA, IMF, and IMF staff calculations. Note: The figure shows the path of key variables for the EA under the FSAP stress test scenarios. Baseline projections for GDP growth, unemployment and inflation are based on January 2025 WEO. EBA – 2025 is the scenario used by the EBA for its 2025 stress test.

18. The FSAP scenarios are severe when compared to historical shocks. The trough of the GDP path in the scenarios at -3 and -4 percent is of lower magnitude compared to the Global Financial Crisis (GFC) and the Covid-19 pandemic, respectively at -4.5 and -6 percent. However, the cumulative 2-year growth is -9 and -8.3 percent relative to baseline, which corresponds to 2.8 and

2.6 standard deviations, in the recessionary and geopolitical scenarios, respectively. The shock to unemployment in the recessionary scenario, reaching 13.5 percent, is more severe than the peak reached after the European sovereign debt crisis at 12 percent. The drop in housing price in both scenarios (-14.5 and -9.5 percent) is more severe than any historical stress event. The inflationary shock in the geopolitical scenario, at 4.5 percent, and the deflationary shock in the recession scenario at -0.2 percent are more severe than any other historical stress events (with the exception of the short period of high inflation during the Covid-19 pandemic, when inflation reached 8.5 percent).

Market Risk Scenarios

19. The market risk analysis was conducted against two short-term market stress scenarios. These were calibrated to capture high-frequency market price and volatility movements, using the market scenario for the NBFI stress test[13] based on the expected shortfall at 0.1 percent of market factors marginal distributions over the holding period of the scenario i.e., 20 or 60 days (Annex III. Table 5).[14] The scenario in the left column is aligned with the geopolitical macro scenario, featuring an increase in interest rates (particularly at the short end of the EUR yield curve), commodity prices and credit spreads, together with a sharp contraction in equity prices. The scenario in the right-column is aligned with the recessionary macro scenario, featuring a drop in commodity and equity prices, a larger increase in the credit spread of mid- and high-risk EA sovereigns, while the short-end of the EUR yield curve remains muted.

C. Household Vulnerability Assessment

20. Household vulnerabilities vary significantly across the EA. Vulnerabilities increase with household leverage, the share of cost-of-living expenses relative to income, and the prevalence of floating-rate mortgages. There is a large heterogeneity in the share of floating-rate mortgages across the EA, with the highest shares in Finland and Estonia, and the lowest in France and Germany. The impact of macrofinancial shocks on household balance sheets was quantified using microdata sourced from the 2021 (latest) Household Finance and Consumption Survey (HFCS). Simulation results suggest that, by end 2026, 15 percent of households in the EA, holding 17 percent of outstanding debt, could become overburdened under baseline conditions, with essential payments (including housing costs, basic expenses and debt payments) exceeding 70 percent of their income. In the geopolitical scenario, this share could increase to over 20 percent of households holding 22 percent of debt, while in the recessionary scenario, the impact would be cut by half due to the offsetting effects of lower interest payments and cost-of-living expenses (Figure 45). The results were used to quantify loan loss provisions from retail loans in the solvency stress test (Box 1).

21. A further tightening of financial conditions combined with an income shock could create additional stress for households. Under a sensitivity test scenario characterized by an increase of 200bps in interest rates, a 10 percent decrease in wage income, and a 5 percentage-

[13] See TN Systemic Risk Analysis – NBFI.

[14] Historical data covered the period January 2008 to October 2024.

point unemployment shock over baseline projections, 20 percent of households could be financially stretched on average, holding 25 percent of bank debt.[15] One out of five consumers could be forced to cut back on consumption of non-essential goods to repay their debt and afford basic expenses leading to a reduction of about 10 percent in aggregate consumption. Lower consumption could trigger second-round effects exacerbating default risk.

D. Credit Risk Models

22. Credit risk is an important component of solvency stress testing. It is associated with potential losses from loans and advances (domestic and cross-border) granted to households, corporates, governments, credit institutions, other financial institutions as well as with default risk in debt securities issued by corporates, governments, credit institutions, and other financial institutions. Under international financial reporting standards (IFRS) debt securities in the banking book (non-trading assets) can be measured at amortized cost (AC), fair value through profit and loss (FVPL), and fair value through other comprehensive income (FVOCI).

23. The credit risk modeling approach is differentiated across AC, FVPL, and FVOCI debt securities holdings.[16] For AC securities, credit impairments are estimated similarly to loans and advances. The credit risk of FVPL securities is embedded in the market risk methodology, where the change in a security's price reflects changes due to risk-free rate movements or widening in credit risk spreads. Finally, the credit risk of debt securities measured at FVOCI are estimated through both the market risk methodology and through banking book credit impairment estimation.

Probability of Default Estimation

24. The impact of macrofinancial scenarios on probability of default (PDs) has been assessed by country segment and exposure class. PDs for household lending have been calibrated at the country level covering the forty material geographies of SIs.[17] All other exposures are treated as domestic exposures. Credit risk models for retail loans use a semi-structural approach incorporating macrofinancial conditions, borrower characteristics and loan terms to estimate default probabilities.[18] For household loans, country level models were calibrated for the twenty-two European countries covered in the 2021 (latest) HFCS; the remaining geographies were mapped to comparable EA countries based on household balance sheet leverage (Box 1). For corporate loans

[15] In the worst-case scenario, 15 percent of median and high-income households (holding larger loans than low-income borrowers) would be overburdened relative to 13 percent under the geopolitical scenario.

[16] Securities booked in AC are held to collect cash-flows and are recognized at carrying amount. Securities booked in FVPL and FVOCI are held to sell the financial assets and/or collect cash flows and are recognized at fair value. Large EA banks tend to hold more securities at fair value than smaller banks. In 2023, SIs held EUR 73 billion of unrealized losses (difference between fair value and carrying value of AC debt securities).

[17] These are the twenty EA countries, Australia, Brazil, China, Czech Republic, Denmark, Hong Kong, Hungary, India, Japan, Mexico, Norway, Poland, Romania, Russia, Singapore, Sweden, Switzerland, Türkiye, UK, and US.

[18] To the extent that public guarantees granted during Covid-19 mitigate credit risk for banks, the stress test may underestimate the default risk from adverse macrofinancial conditions. The effect on LGD due to public guarantee is not considered in the stress test.

and bonds in AC and FVOCI, the respective PDs were derived using firm level data on a country-aggregate basis for the same set of countries (Box 2).[19] PDs for sovereigns and financial institutions (both loans and debt securities subject to provisioning) were estimated using the credit spreads projected in the scenario, defined as the difference between bond yields and the risk-free rate—approximated by Germany's 10-year government bond yield under the macrofinancial scenarios[20]—assuming a fixed loss given default (LGD) of 35 percent.

25. For each bank and each lending segment, a PD path was generated over the course of each scenario. This path represents a weighted average of the aggregate, country-specific PDs, based on the distribution of the bank's lending exposures across countries, as reported in COREP (C09.02). The resulting PD path is adjusted to reflect the bank- and segment-specific starting point-in-time (PiT) PD, calculated as the weighted average of observed transition probabilities from stage 1 to stage 3, and stage 2 to stage 3, weighted by total balances in each stage. This adjustment is performed using the distance-to-default formula (equation 1). The adjusted PD path, together with the initial transition matrix, serves as input to the Beta-linking methodology, which is used to derive IFRS 9-compliant transition matrices for each bank and lending segment.

$$PD_{i,t} = N\left(G\left(PD_{i,0}\right) + G(aPD_t) - G(aPD_0)\right) \qquad \textbf{(1)}$$

where, $PD_{i,t}$ is the bank specific probability of default and aPD_t is the aggregate probability of default at time t, G is inverse of cumulative distribution function of standard normal distribution and N is cumulative distribution function of standard normal distribution.

Loss Given Default Estimation

26. LGD rates for collateralized lending are calibrated through structural modelling (Gross et al., 2020). It uses reported information on the value of collateral in (loan to value, LTV), starting point reported LGDs, and property price paths. The bank-specific property price growth paths used for secured LGD projections are calculated as weighted averages of the aggregate country-level property price paths, with weights based on the distribution of each bank's exposures and are estimated using the same methodology applied for the respective PDs.

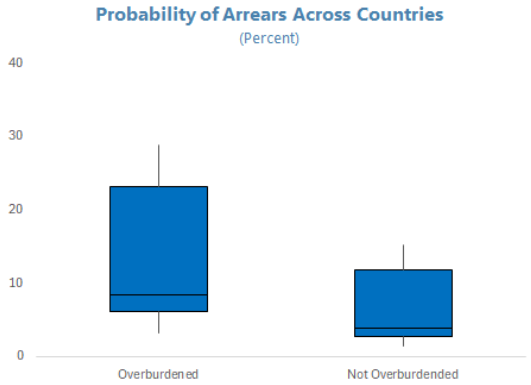
[19] Firm level data from Capital IQ was used for the analysis, covering the twenty EA countries, 5 non-EA European countries (Denmark, Norway, Sweden, Switzerland, and UK), Mexico, and US. The remaining material geographies were mapped against peer countries using data on corporate leverage.

[20] Consequentially, the PD of sovereign lending to Germany, Austria and Netherland is zero.

Box 1. Euro Area: Structural Model for Household Credit Risk

The impact of macrofinancial shocks on household balance sheets is quantified using microdata sourced from the 2021 (latest) HFCS. The survey includes 83,000 households and 200,000 personal files across 22 countries (20 EA countries, Czech Republic, and Hungary). Using a matching procedure we "age forward" households' financials (assets, liabilities, consumption, income, and payments) to project their financial position as of end 2024 (starting point of the stress test). The approach builds on Valderrama et al (2023) and Barbieri et al (forthcoming). The credit risk model includes four steps:

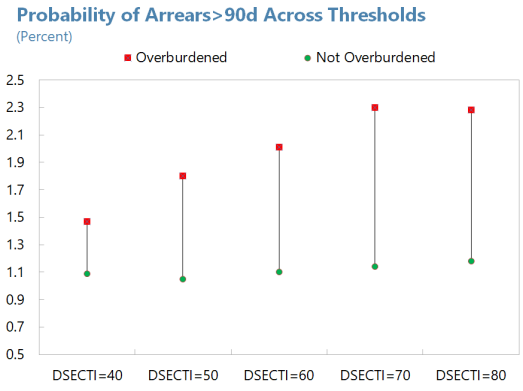
First, we forecast households' balance sheets, payments, income and consumption to project 'vulnerable' households using a simulation approach drawing on the scenarios' macrofinancial projections. We perform Montecarlo simulations of unemployment shocks at the person level within the household (controlling for employment status and type of labor contract) and account for unemployment benefits for unemployed individuals (at around 10 percent of initial income). In this approach, maturing loans are replaced by new loans with the debt to income (DTI) at origination, floating rate mortgages are reset over the life of the loan, and new issuances are repriced at prevailing market rates.



Second, we estimate the link between being financially vulnerable and default risk (PD). Default is proxied by being on arrears over 90 days (stage 3 loans) or less than 90 days (stage 2 loans). For this purpose, we run a battery of logistic regressions[1] at the individual household level to identify the financial indicator of stress and the corresponding threshold which increases significantly the probability of a credit event (in line with IFRS9 accounting standards). The best performing indicator is a cost-of-living *adjusted* debt service to income (DSTI) ratio which includes debt service, essential consumption (food and energy cost) and rents.

Third, we run a horse race across adjusted DSTI thresholds using statistical methods and find that, for most countries, the relative increase in the probability of default is highest when the borrower's adjusted DSTI ratio exceeds 70 percent of disposable income ("overburdened" household).

Finally, we project the share of banks' retail loan portfolio with a credit default (stage 3 loans) or credit event (stage 2 loans) by forecasting the migration of loans held by overburdened households under each scenario.



[1] Logistic regressions are run at the country level controlling for the household income tercile, savings ratio, wealth ratio, and personal / household characteristics including age, gender, education, household size, number of people employed in the household, loan to value ratio of the main residence, credit constraints, source of income, and family / public financial assistance.

Box 2. Euro Area: Structural Model for Corporate Credit Risk

The corporate PD generation is based on the methodology described in Tressel and Ding (2021). The process starts by generating forward-looking financial statements for almost 23,000 listed non-financial corporations in 27 countries. Using 2024 balance-sheet data as a common anchor, country-specific panel regressions are estimated in which key performance ratios—sales growth, return on assets, leverage and the interest-coverage ratio—depending on their own lags and two exogenous drivers: real-GDP growth and a broad financial-conditions index that captures changes in spreads and equity valuations.

The macro inputs are taken directly from the IMF's WEO baseline and the FSAP adverse scenarios, so each firm's projected path is automatically conditioned on the relevant national macro narrative. Accounting identities transform the projected income-statement items into stock variables—debt, equity, cash buffers—over a three-year horizon. The sum of firm forecasts remains consistent with the country-level macro path. Interest expenses evolve with both the firm's own historical funding mix and the scenario-specific shifts in short- and long-term corporate borrowing rates, ensuring that debt-service capacity reacts to the interest-rate environment as well as to changes in leverage and earnings.

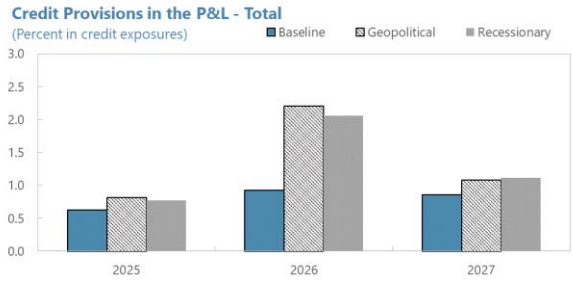
The simulated balance-sheet indicators are mapped into one-year forward PDs. The mapping uses a matrix, originally built by Moody's for U.S. data over 1970-2012, that assigns an empirical default frequency to each cell defined by an interest-coverage ratio band and a debt-to-equity band. Once every firm is placed in a cell for each projected year, the corresponding historical default rate becomes its PD. Aggregating across firms with debt weights yields a scenario-specific corporate default rate for each country.

Because the Moody's matrix is U.S.-centric and reflects an earlier credit cycle, the aggregated PDs are benchmarked to country-specific default measures. Two alternative anchors are employed. For a market-based view of large-listed corporates, the country aggregate for 2024 is rescaled so that it matches Moody's-KMV one-year expected default frequency (EDF); both mean and median EDFs are considered to guard against fat-tail distortions in countries such as the US and Canada. The resulting scaling factor is then applied to the entire forward path of raw PDs under each macro scenario, so differences across scenarios reflect only the impact of the macro shocks and not cross-country calibration quirks.

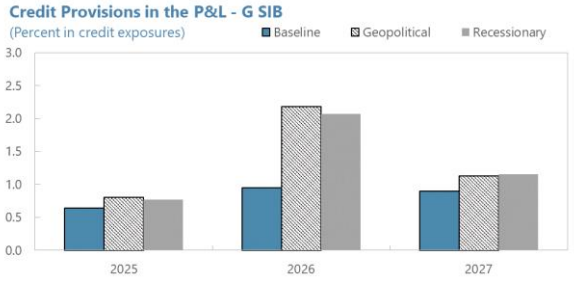
Credit Risk Impact through Profit and Loss (P&L)

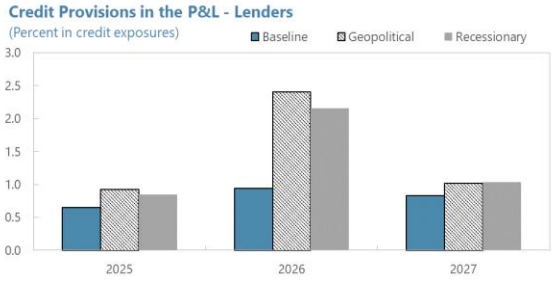
27. Loan loss provisions reported in the balance sheet and credit impairments recognized in the P&L statement are estimated in accordance with IFRS 9. Provisions are calculated on a 12-month basis for stage 1 exposures and on a lifetime basis for stage 2 and stage 3 exposures, with PDs for stage 3 assumed to be 100 percent. Exposure at Default (EAD) includes both on-balance sheet amounts and off-balance sheet items, with the latter weighted according to the characteristics of each segment. A static balance sheet approach is applied whereby matured loans are assumed to be reinitialized in the same stage as at maturity. No write-offs are assumed; hence, stage 3 (defaulted) exposures either remain in default or cure and migrate to stage 1 or stage 2 based on the projected transition matrix. As a result, credit impairments in the P&L correspond directly to the annual change in balance sheet provisions.

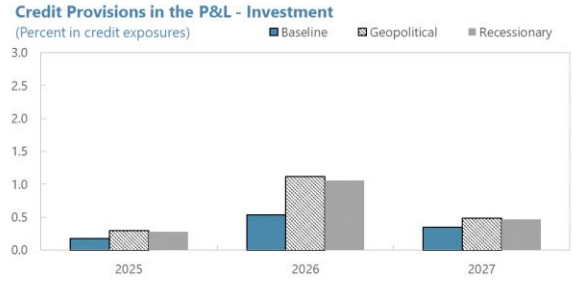
Figure 2. Euro Area: Credit Provisions

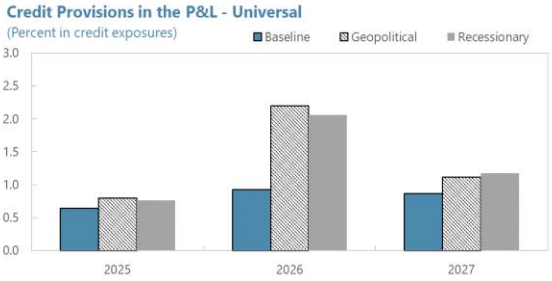


- *Total provisions remain modest in the baseline but jump to ~2 percent in 2026 under both adverse scenarios before easing in 2027.*
- *The geopolitical shock produces the largest peak; the recessionary shock is similar, both far above baseline figures.*
- *Lenders are the most sensitive; G-SIBs and universal banks mirror the aggregate; investment banks are least affected.*
- *Provisions spike in 2026 as exposures migrate into stages 2-3; the partial decline in 2027 following the recovery in property prices.*









Source: IMF staff calculations.

28. Figure 2 shows estimated loan impairment charges across scenarios. For the full sample of 95 banks, provisions amount to 0.63 percent of total loans in 2025 under the baseline, climb modestly to 0.93 percent in 2026 and ease to 0.85 percent in 2027.[21] In the geopolitical scenario, provisions increase to 0.81 percent in 2025, surge to a peak of 2.21 percent in 2026—more than double the baseline—and moderate to 1.08 percent in 2027. The recessionary scenario traces a similar pattern (0.77 percent in 2025, 2.06 percent in 2026, 1.11 percent in 2027). Disaggregation by business model reveals pronounced heterogeneity: G-SIBs and universal banks broadly track the system profile, lenders display the highest sensitivity (2026 provisions jump from 0.94 percent in the baseline to 2.40 percent and 2.16 percent in the geopolitical and recessionary scenarios, respectively), while investment banks are the least affected, with provisions peaking at only 1.12

[21] This figure reflects the EA average, but provisioning rates vary significantly across member states.

percent (geopolitical) and 1.06 percent (recessionary) in 2026. Across all categories, the 2026 spike reflects the point at which deteriorating macroeconomic conditions, including the largest drop in property prices, drive the sharpest migration of exposures into stages 2 and 3, whereas the partial decline in 2027 follows the recovery in property prices.

Capital Requirements for Credit Risk

29. Credit risk charges in RWAs are simulated for internal ratings-based (IRB) and standardized (STA) portfolios separately. For IRB portfolios, the asymptotic single risk factor model for unexpected losses is implemented for different types of exposures (following Basel III). RWAs are subject to PDs and LGDs, provisions for credit losses, and the credit conversion factor of off-balance sheet items. Regulatory through-the-cycle (TTC) PDs are calibrated through the scenario as the weighted average of PiT PDs for each year of the scenarios (weighted by 0.2) and the respective TTC PDs of the previous year (weighted by 0.8, starting with the reported in COREP TTC PDs). Regulatory downturn LGD is considered as the maximum between the reported downturn LGD at end 2024 and the estimated PiT LGD.

30. For the banks that follow the STA, credit risk charges are estimated using the density of credit RWA at the cut-off date (end of 2024). Non-performing exposures (NPEs) are subtracted from the RWA at the cut-off date, assuming a risk weight of 100 percent. Next, the ratio of performing RWA to performing exposures is calculated. The credit risk chart for each year of the scenario is determined by multiplying the performing exposures by this ratio, and adding the total non-performing exposures, multiplied by the non-performing exposure RWA density (assume to be at 100 percent). This calculation is performed separately for each bank, to account for their individual RWA profiles and exposures.

E. Market Risk Approach

31. Market risk was assessed using a partial revaluation approach against two market stress scenarios. Instruments at fair value (i.e., those categorized as FVOCI and FVPL) were revalued using bank-specific sensitivities to risk factors, as reported by banks in the ECB's STE conducted in the context of the SREP.[22] The sensitivities reported by banks in the STE template cover both the trading book and the banking book, and include: first-order sensitivity to the risk factor (delta), sensitivity to curvature risk (gamma), and sensitivity to the volatility of the risk factor (vega). The risk factors covered in the analysis were: commodity risk (CM), credit spread risk (CR), equity risk (EQ), interest rate risk (IR), and foreign exchange (FX) risk. The shocks for each factor are displayed in Annex III. Table 5, except for the FX shock which corresponded to the first-year FX depreciation in the adverse macro scenarios. No market shocks were applied in the baseline scenario.

32. The impact of market risk on bank capital was incorporated into the broader solvency stress test as a one-off overlay in the first year. The estimated model valuation losses are not

[22] The STE template used for the analysis was discontinued by ECB after 2023Q3. The FSAP team considered that it was still reasonable to use these sensitivities to conduct the analysis for market risk with a 2024Q4 cut-off date.

reversed in subsequent years. This approach is designed to capture the impact of short-term market distress episodes that can occur at any time during the stress testing horizon.

33. The formula used to calculate the revaluation of fair value instruments is given by:[23]

$$\Delta V = \sum_{j \in \{CM,CR,EQ,IR,FX\}} \left(Delta_j^{BB} + Delta_j^{TB}\right) \cdot \Delta\varepsilon_j + 0.5 \cdot Gamma_j \cdot \left(\Delta\varepsilon_j\right)^2 + Vega_j \cdot \Delta\sigma_j \quad \textbf{(2)}$$

where j denotes de risk factors, $Delta_j^{BB}, Delta_j^{TB}$ are the delta sensitivities for the banking book and the trading book respectively, and $\Delta\varepsilon_j$ and $\Delta\sigma_j$ are the market stress scenario shocks to the risk factor j and its volatility respectively.

34. A floor was applied to the market risk losses. Depending on the direction of banks' exposures to the various risk factors, they may experience both gains or losses in the market shock scenarios. In order to take a conservative approach, particularly for banks that gain under the stress scenarios, a minimum was applied to total market risk losses. This floor was given by the maximum between:

i. the bank's own fund requirements based on the Fundamental Review of the Trading Book (FRTB) as reported in COREP (C 91.00); and

ii. 8 percent of the bank's RWAs for market risk which are typically computed using a value at risk (VaR) approach to measure tail losses (in line with the approach used by the FSAP to generate the market risk scenario).

35. The calculation used by the FSAP for market losses in the banking book can overestimate actual losses because it includes some instruments classified at AC. In the ECB STE template used for market risk analysis, banks are instructed to report banking book deltas that correspond to all instruments for which the bank regularly calculates a fair value, even if it is for internal risk management purposes. This means that instruments categorized as AC may be included in the banking book deltas if the bank regularly calculates a fair value. The overestimation of market risk may be particularly relevant for smaller banks that have most of their securities portfolio categorized as AC.

36. The FSAP team conducted a sensitivity analysis by adjusting the banking book deltas corresponding to interest rate risk and credit spread risk in the following way:

$$\widetilde{Delta}_j^{BB} = \left(1 - \frac{AC\ Debt\ Securities}{AC\ Debt\ Securities + FVOCI\ Debt\ Securities}\right) \cdot Delta_j^{BB}, \quad \text{for } j = IR, CR \quad \textbf{(3)}$$

while the un-adjusted $Delta_j^{BB}$ can overestimate market risk, the adjusted $\widetilde{Delta}_j^{BB}$ can underestimate it if banks exclude debt instruments reported under AC from the banking book market risk

[23] This approach aggregates the three risk measures—delta, vega, and curvature—without recognizing diversification benefits between risk factors, by contrast to the FRTB approach which applies risk-weighted sensitivities using specified correlation parameters under three different scenarios.

sensitivities. For this reason, the FSAP opted to err on the side of being conservative by using the un-adjusted $Delta_j^{BB}$ for the main results.

37. The total market risk capital impact across all banks in the sample is EUR 113 billion and EUR 130 billion in the geopolitical and recessionary scenarios, respectively. This is of comparable magnitude to the 2023 EU-wide stress test coordinated by the EBA, where total market losses amounted to EUR 136 billion in the EBA adverse scenario.[24]

F. Net Interest Income

38. The scope of the Net Interest Income (NII) module covered all interest-earning assets and interest-bearing liabilities, except for derivatives. This included instrument classified at AC and fair value—both FVOCI and FVPL. The scope only covered on-balance sheet items. Derivatives were excluded due to data limitations. As a conservative assumption, the NII in the adverse scenarios was not allowed to exceed the level at the cut-off date for each respective bank.[25] NPEs were assumed to generate no interest income. Although banks may be able to collect some interest income from NPEs, their income was set to zero in the stress test, both to be more conservative and due to data challenges for calibrating collection rates for NPEs.

Figure 3. Euro Area: NII Portfolio Segmentation

Assets	Liabilities
Debt securities	Debt securities/wholesale funding
Loans and advances: HH mortgages	Deposits: HH sight deposits
Loans and advances: HH non-mortgages	Deposits: HH term deposits
Loans and advances: NFCs	Deposits: NFCs sight deposits
Loans and advances: Fin Institutions	Deposits: NFCs term deposits
Loans and advances: Government	Other deposits
Other interest-earning assets	

Source: IMF staff elaboration.

39. A granular portfolio segmentation was used for the NII analysis. Interest-earning assets and interest-bearing liabilities were segmented along two dimensions: by portfolio type and by country of counterpart.[26]

a) By portfolio instrument and counterparty sector (Figure 3).

b) By country of counterparty: the countries included are (i) all EA countries; (ii) all EU non-EA countries for which a country-specific adverse scenario was available;[27] and (iii) non-EU countries based on materiality of exposures and liabilities, which included Brazil, Japan,

[24] The higher market risk obtained in the EBA 2023 EU-wide stress test, compared to the FSAP stress test, may be attributed to the former's inclusion of additional factors such as counterparty credit risk and shocks to accounting and regulatory valuation reserves (i.e., CVA, funding valuation adjustments, and liquidity reserves).

[25] This is in line with the 2025 EU-wide stress test methodology.

[26] The intersection between the two dimensions of segmentation generates about 400 segments for each bank. However, many of these segments typically have zero assets or liabilities, so the effective (i.e., non-empty) number of segments per bank was much lower.

[27] These were Czech Republic, Denmark, Hungary, Poland and Sweden.

Mexico, Norway, Switzerland, United Kingdom, and United States. All other remaining exposures and liabilities were treated as domestic.

40. The interest income and interest expense for each portfolio segment was projected using a structural approach based on a repricing gap methodology. This approach requires two key data inputs for each portfolio segment: (i) the repricing structure of the portfolio at the cut-off date ("repricing ladder"); and (ii) a time series for interest rates for new originated exposures and liabilities ("interest rates for new business"). The FSAP first projected the interest rate for new business for each portfolio segment using satellite models on ECB Monetary Financial Institutions Interest Rates (MIR) data and then computed the impact on interest income and expense using a repricing gap methodology. A simple structural model was used to project base rates throughout the stress testing horizon.

41. Using a repricing gap methodology and the static balance sheet assumption, the NII for bank b in year t of the stress testing horizon was calculated as (Appendix IV):[28]

$$NII_{b,t} = NII_{b,t=0} + \sum_{j} Interest\ Income\ Delta_{b,t,j} - \sum_{j} Interest\ Expense\ Delta_{b,t,j} \quad \textbf{(4)}$$

where the first term of equation (4), $NII_{b,t=0}$, is the NII during the last year prior to the cut-off date and represents a "base NII" in the absence of interest rate shocks—that is, $NII_{b,t=0}$ is the NII under the assumption that interest rates for new business are equal to the average interest rate at T0 for all segments and all periods; and, the second (third) term of equation (4) sums across all portfolio segments j the $Interest\ Income\ Delta_{b,t,j}$, ($Interest\ Expense\ Delta_{b,t,j}$) which represents the change in interest income (interest expense) relative to the cut-off date from portfolio j due to the repricing of exposures.

42. Figures 4 and 5 display the estimated cumulative passthroughs from $\Delta i_{t,c}^{ST}$ on to $\Delta i_{t,j}^{nb}$, over a horizon of one and two years (Y1 and Y2 respectively). For NFC loans, an increase in the short-term rate by 1 percentage point leads to a median increase of about 0.6 percentage points in new business rates in the first year and a cumulative median increase of about 0.8 percentage points in the second year. As expected, the lowest passthroughs are observed for sight deposits, where the cumulative median passthrough in the second year is below 0.05 percent, both for households and corporates. This suggests that banks with a sizeable deposit franchise stand to benefit from higher interest rates.

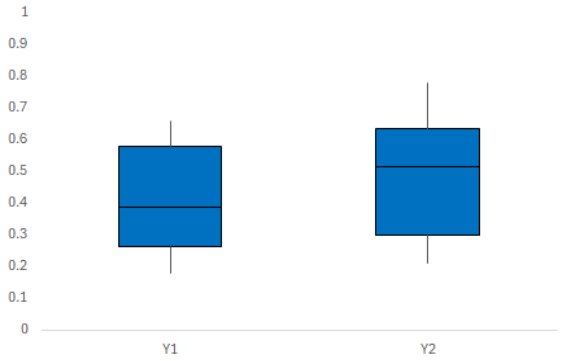
43. The projected new business rates were transformed into "deltas" and applied to initial rates. This was done by taking the difference relative to the average interest rate for the outstanding stock at T0 of the corresponding segment. These latter rates on outstanding stocks

[28] The projected NII is presented here, for simplicity, as if there were no NPEs. The NII calculation is later adjusted for the NPE ratio, assuming that NPEs generate no interest income.

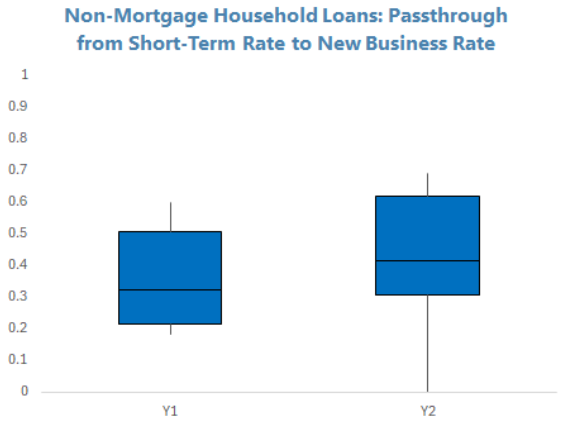
were also obtained from MIR. Since bank-level data was not available in MIR, it was assumed that the same projected "deltas" for new business rates applied equally to all banks.

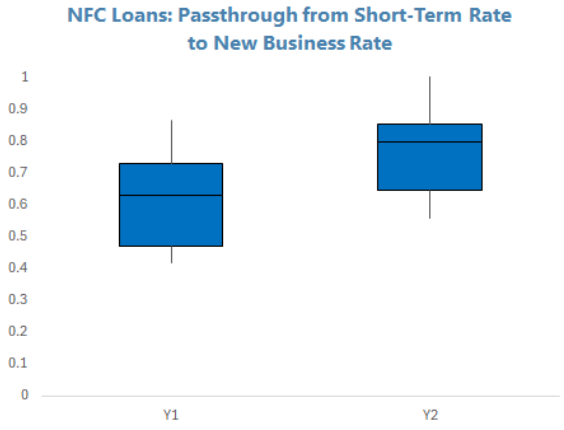
Figure 4. Euro Area: Loans New Business Rate Estimated Passthroughs

The charts display the estimated passthroughs from a change in the short-term rate ($\Delta i_{t,c}^{ST}$) to the change in new business rates ($\Delta i_{t,j}^{nb}$), by type of loan (i.e., mortgages, other household loans, and NFC loans). These passthroughs are estimated at two time horizons: one and two years after the change in the short-term rate (Y1 and Y2, respectively).



- *The Median short-term rate passthrough for mortgage new business rates is 0.39 and 0.51 after one and two years respectively. There is considerable dispersion across the 20 euro area countries*
- *Passthroughs for non-mortgage household credit is slightly lower, with medians of 0.32 and 0.38 after one and two years respectively. Passthrough for NFC loans is considerably higher than for households, at 0.63 and 0.80 for one and two years respectively.*



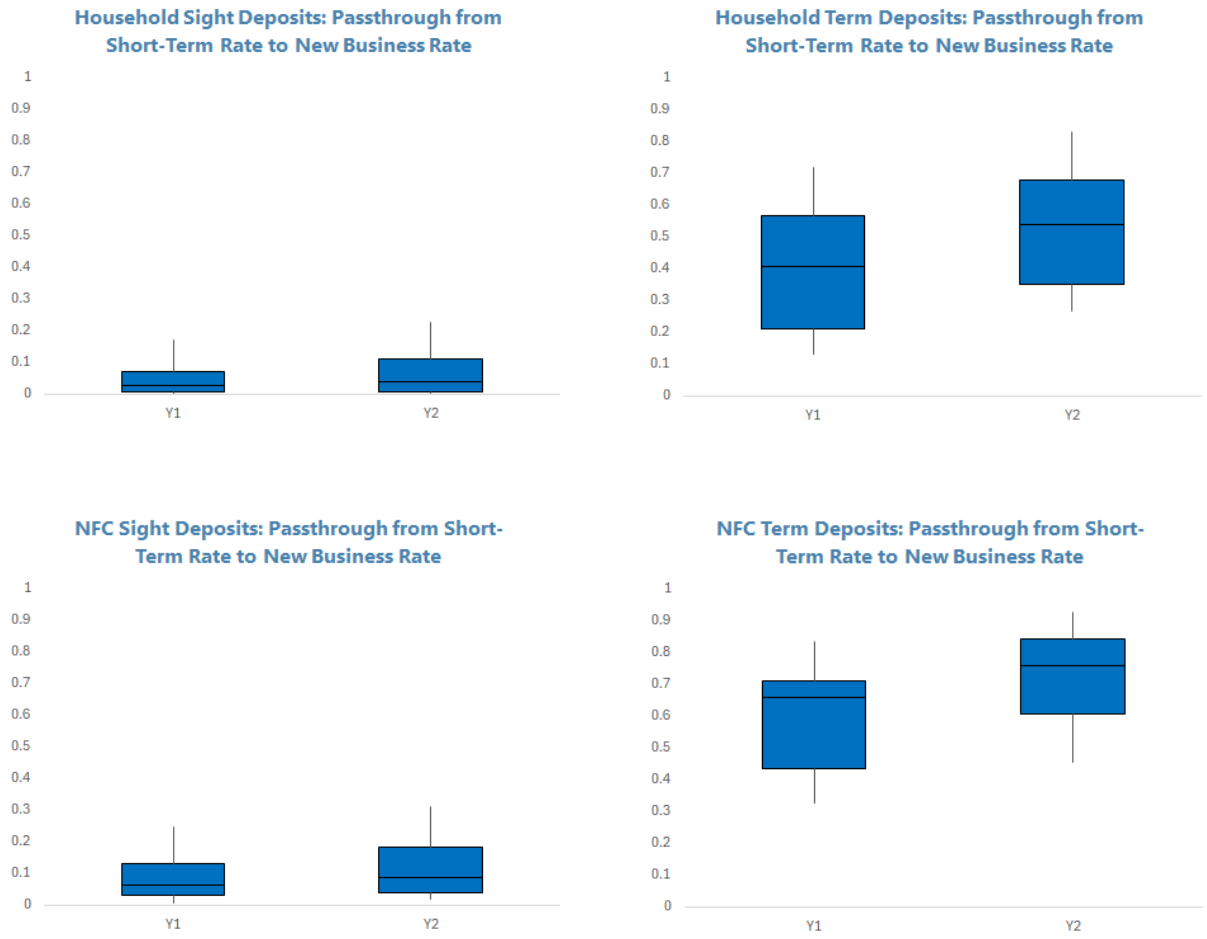


Source: IMF staff calculations.

Note: The box and whiskers represent the 10th, 25th, 50th, 75th and 90th percentiles across the 20 EA countries.

Figure 5. Euro Area: Deposits New Business Rate Estimated Passthroughs

The charts display the estimated passthroughs from a change in the short-term rate ($\Delta i_{t,c}^{ST}$) to the change in new business rates ($\Delta i_{t,j}^{nb}$), by type of deposit (i.e., sight/term household/NFC deposits). These passthroughs are estimated at two time horizons: one and two years after the change in the short-term rate (Y1 and Y2, respectively).



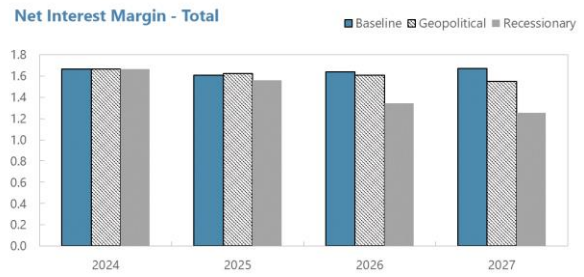
Source: IMF staff calculations.

Note: The box and whiskers represent the 10th, 25th, 50th, 75th and 90th percentiles across the 20 EA countries.

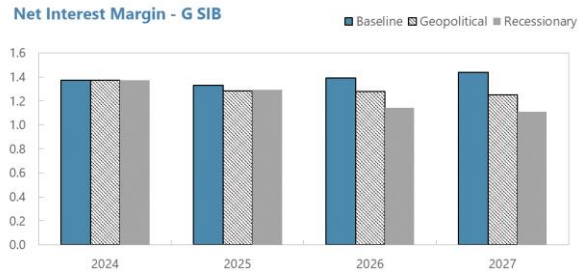
44. Figure 6 compares the projected net-interest margins (NIM) under all three scenarios. At the aggregate level, the NIM is broadly stable in the baseline scenario, staying at 1.67 percent over the course of the three years. In the geopolitical scenario, the NIM falls slightly to 1.55 percent by 2027, while the recessionary scenario leads to a sharper drop, with the system-wide NIM falling to 1.25 percent by 2027, about 40 basis points lower than the baseline—as interest income falls in the context of lower policy rates. Business-model heterogeneity is significant. G-SIBs start with lower-than-average margins at 1.37 percent but see a milder adverse impact, dropping to 1.11 percent in the recessionary case by 2027. Lenders start with the highest margins at 2.09 percent but see a sharper drop to 1.43 in the recessionary scenario by 2027. Investment banks' NIM contracts

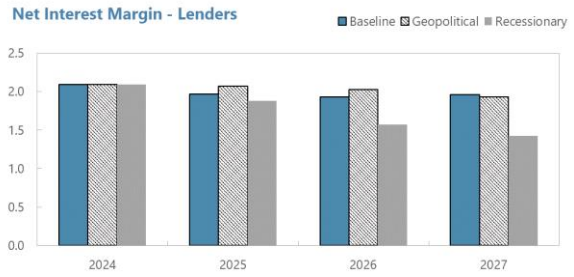
from 0.78 percent in 2024 to 0.11 percent under the recessionary scenario, while universal banks broadly track the system profile, with margins easing from 1.92 percent to 1.50 percent. Overall, the results underline that rising funding costs and weaker asset yields in adverse environments compress banks' core intermediation income, with the magnitude differing according to balance-sheet structure and funding mix.

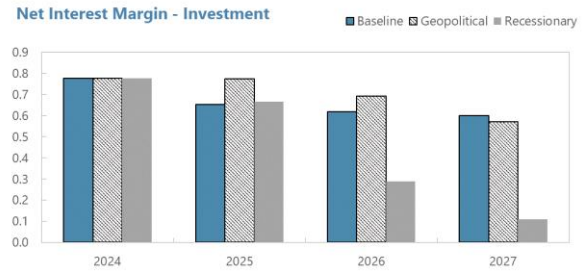
Figure 6. Euro Area: Net Interest Margin

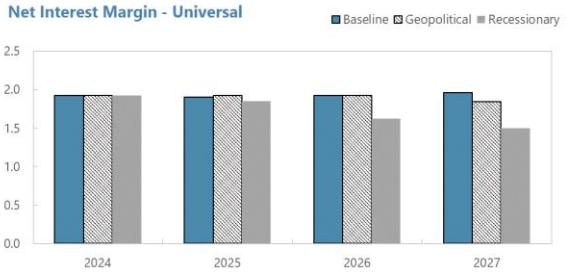


- *The aggregate NIM stays broadly flat in the baseline, while it slightly drops in the geopolitical; the recessionary scenario compresses the aggregate NIM most sharply.*
- *In the geopolitical scenario, all groups of banks display a slight drop in NIMs of between 10 to 20 basis points by 2027. Meanwhile, in the geopolitical, the impact on NIMs is more heterogeneous, with lenders and investment banks experiencing the sharper contraction.*









Source: IMF staff calculations.

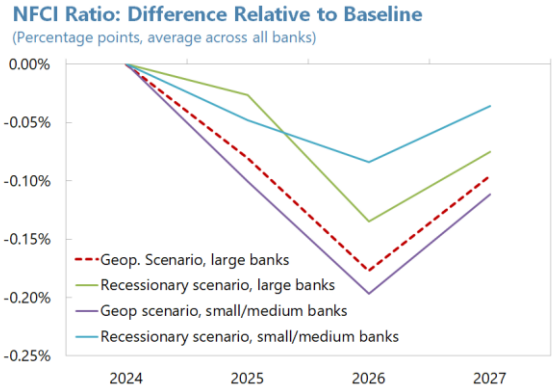
G. Net Fee and Commission Income

45. The ratio of net fee and commission income (NFCI) to total assets was projected using an econometric approach at an annual frequency. The econometric specification was similar to Kok, Mirza and Pancaro (2017). The FSAP team used a panel regression with bank-specific fixed effects, considering the following set of regressors: the first lag of the NFCI ratio, real GDP growth, stock market returns, CPI inflation, residential housing price inflation, the first difference of the 1-month EURIBOR rate, and the first difference of the yield of 10-year sovereign bonds. Additionally,

two global variables were considered: the EUR/USD FX depreciation, and the growth in US stock prices.[29] For all regressors, up to one annual lag was allowed. A LASSO methodology was applied to help select relevant regressors; almost all the regressors were identified as relevant with this methodology.

46. NFCI was projected at the aggregate level. While more granular approaches were explored, a break in the time-series for the individual components in supervisory reporting prevented a robust econometric analysis of the individual components of NFCI. However, to capture the different sources of NFCI by activity across business models (which tend to be correlated with size), the model was estimated separately for large banks and for small and medium sized banks.[30] Appendix IV displays the estimation results for both groups of banks.

47. The text figure displays the projected change in the NFCI ratio (relative to baseline) under the two adverse scenarios for the average bank. In the baseline scenario, the NFCI ratio is assumed to remain constant at the level of the cut-off date. The geopolitical scenario leads to a drop in the NFCI ratio of about 0.2 percentage points at the trough. This impact is not negligible: the aggregate NFCI ratio for our bank sample is 0.68 percent, so a 0.2 percentage point drop represents a contraction of about 30 percent in NFCI. The recessionary scenario has a milder impact, mainly due to lower interest rates.



48. Some client revenues from trading activities are reported as net trading income (NTI) instead of NFCI, so they would not be captured in the analysis discussed above.[31] Given that such revenues can be an important source of income for some banks, the FSAP accounted for this by considering, in the baseline scenario, an annual income from client revenues given by the 5-year average of the ratio of NTI to total assets. In the two adverse scenarios, client revenues were set to 0 in the first year of the stress test, to capture that the bank may have very low profits from client revenues when the market stress episode materializes. Meanwhile, a 20 percent haircut relative to baseline was applied to these revenues in the remaining years of the adverse scenarios. This approach may over or underestimate client revenues because NTI also includes the revaluation of fair value instruments. However, by averaging over a long period of time, the gains and losses from revaluation of instruments in different years may cancel out, thus mitigating the potential bias.

[29] Market volatility captured in the itraxx and VIX were considered in the regressions, but the coefficients were not statistically significant.

[30] Large banks are defined as those that follow the EBA Guidelines on disclosure of indicators of global systemic importance. No country disaggregation was considered in order to have a larger sample size for the estimation.

[31] See EBA (2023).

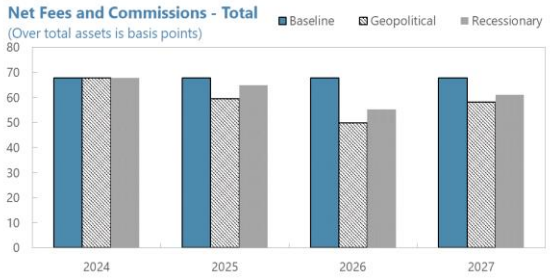
49. Figure 7 illustrates the projected evolution of NFCI. System-wide, the baseline assumes a flat path at 68 basis points (bps). Under the geopolitical shock, the ratio falls to 60 bps in 2025, troughs at 50 bps in 2026, and partially recovers to 58 bps in 2027. The recessionary scenario is slightly milder in the first year (65 bps in 2025) but still compresses fee income to 55 bps in 2026 before a rebound to 61 bps in 2027. Across business models the pattern is similar: G-SIBs slide from 65 bps to 48 bps at the 2026 trough; lenders from 64 bps to 46 bps; investment banks from 74 bps to 55 bps; and universal banks from 73 bps to 55 bps. The modest recovery in 2027 reflects the assumed normalization of transaction volumes and market activity. Fee intensity in both adverse scenarios remains well below the baseline, underscoring the vulnerability of NFCI to macro-financial shocks and shifts in client behavior.

H. Other Profit and Loss Items

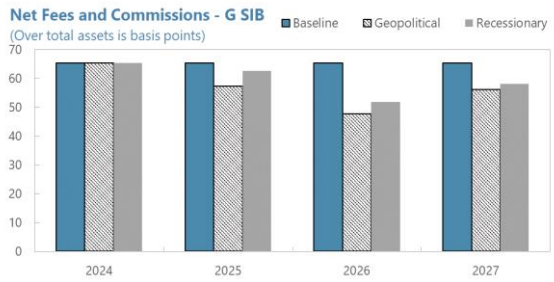
50. All other P&L items were projected by taking a 5-year average relative to total assets. These remaining items consist mostly of non-interest expenses, such as wages and other costs associated with operating branches. These P&L items were kept at the same level in the stress scenarios as in the baseline. Because tax information is available only at the consolidated level and cannot be allocated reliably across the individual jurisdictions in which each bank operates, we apply a historical effective-rate approach. Specifically, we compute each bank's average effective tax rate—defined as income tax expense divided by profit before tax (PBT) over the past five profitable fiscal years, which smooths out short-term volatility in tax payments and one-off items. This five-year average rate is then applied only to periods in which the bank reports a positive PBT. When a bank records a loss each year, no tax expense is recognized for that year. If a loss in one year is followed by a profit in the subsequent year, the current year PBT is first adjusted to offset the accumulated loss carry-forward before calculating income tax.

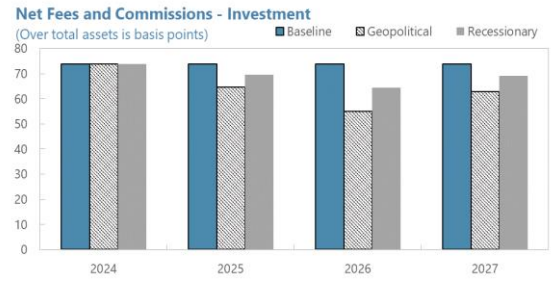
51. Dividends were calibrated based on the bank projected net income and capital buffer. A payout rate is applied to the bank's total comprehensive income equal to 60 percent. If the bank incurs losses, dividends are set to zero. Banks prioritize capital preservation; thus, dividends have been further adjusted based on the bank's capital in relation to the total regulatory capital requirements. Specifically, when banks' capital positions breach the minimum regulatory requirements (both Pillar I and II), dividends have been adjusted to zero.

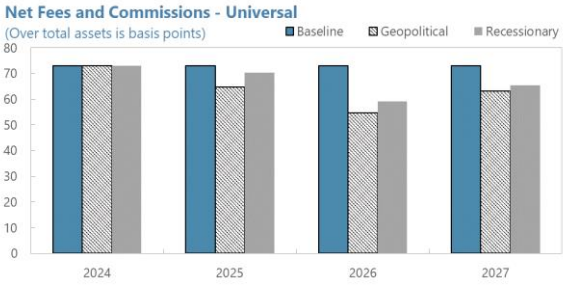
Figure 7. Euro Area: Net Fees and Commissions



- *The system-wide fee-to-asset ratio stays flat at ~68 bps in the baseline but falls to 60 bps in 2025 and bottoms at 50 bps in 2026 under the geopolitical shock; the recessionary path is milder early on (65 bps) yet still troughs at 55 bps before both adverse scenarios recover partially to the high-50s by 2027.*
- *At the 2026 trough, G-SIBs decline from 65 bps to 48 bps, lenders from 64 bps to 46 bps, investment banks from 74 bps to 55 bps, and universal banks from 73 bps to 55 bps.*
- *NFCI is highly sensitive to macro-financial stress; even after a 2027 recovery, fee intensity in adverse scenarios remains well below baseline levels, highlighting the vulnerability of revenue diversification to market-driven shocks.*







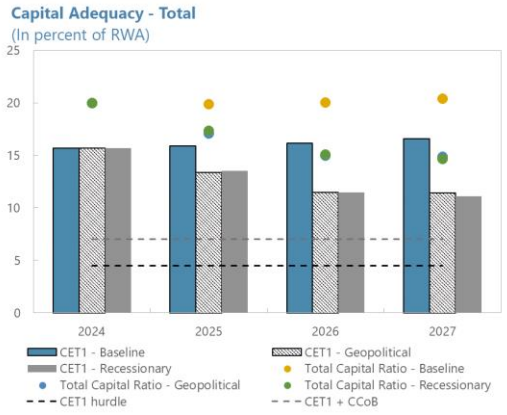
Source: IMF staff calculations.

I. Solvency Stress Test Results

52. Stress test results show that, on aggregate, the EA banking system is resilient to severe macrofinancial conditions, but the depletion in system-level CET1 ratio ranges between 423 and 456 basis points (Figure 8). The baseline path shows a gradual strengthening, with CET1 rising from 15.7 percent in 2024 to 16.6 percent in 2027 and the total capital ratio (TCR) edging up from 20.0 percent to 20.4 percent. Adverse shocks, however, could erode capital buffers significantly: under the geopolitical scenario CET1 falls to 11.4 percent and TCR to 14.9 percent by 2027, while the recessionary scenario produces a similar endpoint (CET1 11.1 percent, TCR 14.7 percent), implying a cumulative decline of roughly 450–500 bp versus the baseline. The 2026 trough in all adverse paths corresponds to the peak in credit-loss recognition and RWA inflation; the modest uptick in 2027 stems from retained earnings and a slight RWA contraction, yet capital ratios in adverse scenarios

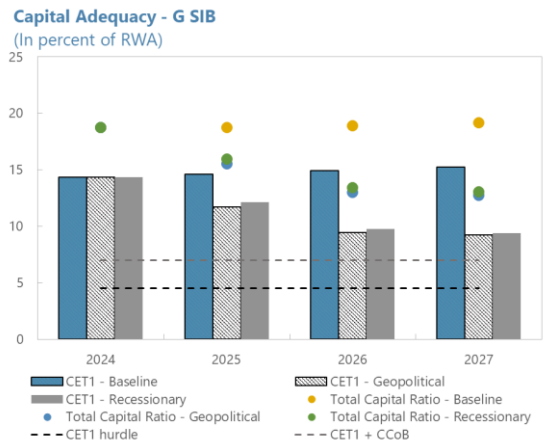
remain materially below baseline levels, underscoring the importance of building capital buffers and earnings generation capacity.

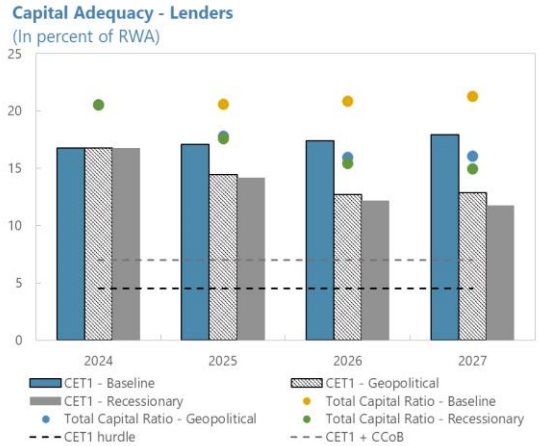
Figure 8. Euro Area: Capital Adequacy Ratio

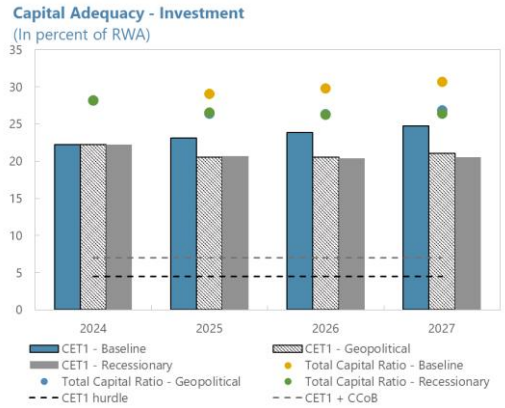


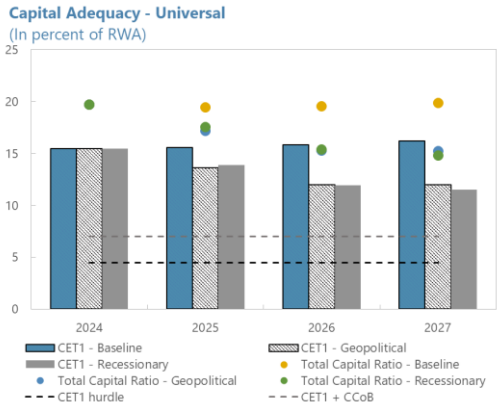
In the baseline, CET1 rises from 15.7 to 16.6 percent.

- *In the two adverse scenarios, CET1 falls to 11.1–11.4 percent—a cumulative hit of roughly 450–500 bps relative to baseline.*
- *Starting with the thinnest buffers, G-SIBs see CET1 slide from 14.3 to 9.2–9.4 percent, leaving them only modestly above regulatory minima.*
- *Lenders lose a similar 500 bps, universal banks broadly mirror the aggregate path, while investment banks remain best-capitalized, retaining well above 20 percent of CET1 after stress.*
- *Capital ratios bottom in 2026 when credit losses and RWA inflation peak; a modest 2027 rebound from retained earnings and easing RWAs still leaves adverse-scenario capital well below baseline.*









Source: IMF staff calculations.

53. Investment banks exhibit the lowest capital depletion due to limited credit risk exposures. Universal banks exhibit low capital depletion too, due to their diversified sources of income. G-SIBs start with the thinnest cushions and experience the steepest depletion, with CET1 sliding from 14.3 percent to 9.2 – 9.4 percent and TCR to about 13 percent in 2027—only a few percentage points above regulatory minima. Lenders experience a significant capital depletion—they shed around 500 bp of CET1 (baseline 17.9 percent versus recessionary 11.7 percent in 2027) but their stronger starting capital position gives them higher resilience. Universal banks broadly track the aggregate profile, ending the severe scenario with CET1 just below 12 percent and TCR near 14.8 percent. Investment banks remain the best-capitalized throughout: even after stress, their CET1 hovers near 20–21 percent and TCR stays above 26 percent, reflecting low credit-risk density and high starting capital. The engagement of universal and investment banks in lending and non-lending activities such as asset management and trading activities cushion the impact from the economic downturn. The results should be interpreted with caution as the stress test does not include CCR losses which could be high for banks with high exposures to the derivative market (e.g., investment banks).[32]

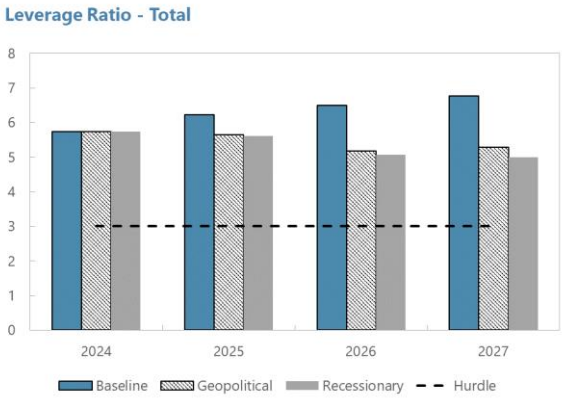
54. The leverage ratio declines significantly, approaching the regulatory minimum for G-SIBs (Figure 9). Under the geopolitical shock, the ratio slips to 5.7 percent in 2025, troughs at 5.2 percent in 2026 (-130 bps versus baseline) as capital is depleted and total exposures expand and recover only marginally to 5.3 percent in 2027. The recessionary scenario exerts a similar but slightly deeper squeeze, ending at 5.0 percent in 2027 (-180 bps versus baseline). G-SIBs—already operating with the lowest starting buffers—see the sharpest erosion. Their leverage ratio drops from 4.8 percent to about 4.0 percent in both adverse paths, close to the regulatory minimum (ranging between 3.60-3.85 percent, including P2R and G-SIB add-on). Lenders remain above the regulatory minimum throughout, falling from 7.5 percent (baseline) to roughly 5.9 percent (geopolitical) and 5.6 percent (recessionary) at the 2026 trough. Investment banks retain the strongest position, with the ratio easing only to 7.3 percent at the stress trough before rebounding, reflecting lighter RWA expansion and higher starting capital. Universal banks track the aggregate pattern, slipping from 7.1 percent (2026 baseline) to 5.9 percent (recessionary) by 2027. Across all categories, the 2026 dip coincides with peak credit-loss charges and leverage-exposure inflation. The muted recovery in 2027 highlights that, even with retained earnings, leverage constraints remain tighter under adverse macro-financial conditions. On the other hand, the aggregate baseline path strengthens steadily—from 5.7 percent in 2024 to 6.8 percent in 2027—on the back of retained earnings and a gradual run-off of low-margin assets.

55. About 8-9 banks (out of 95 SIs) could breach their SREP capital requirements, with a small aggregate capital shortfall (Figure 10). Most banks would meet their SREP capital requirements. The aggregate capital shortfall is only 0.05 percent of RWA in the geopolitical scenario and 0.1 percent in the recessionary scenario. However, between 25-30 percent of the banks would dip into their prudential buffers. Additional capital reaching 1.0 percent of RWA in the

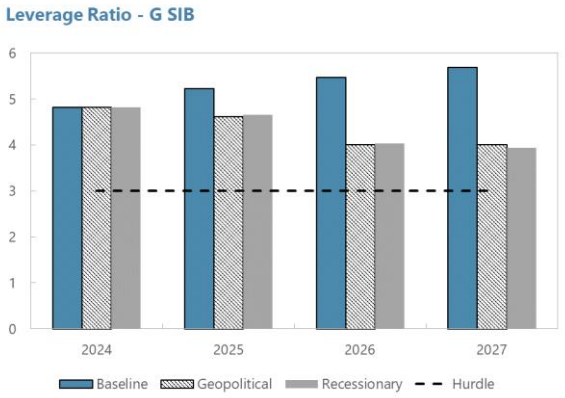
[32] See Barbieri et al (2025)

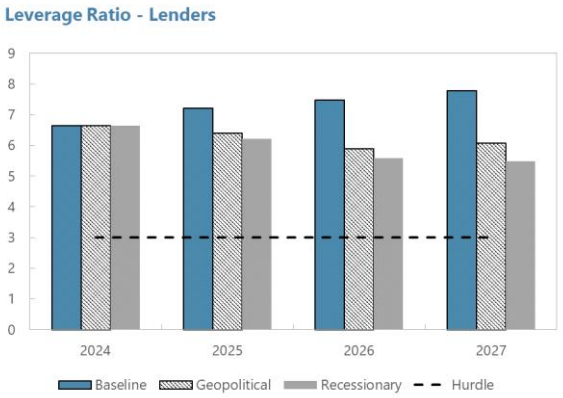
geopolitical scenario and 1.1 percent in the recessionary scenario would be required to restore capital buffers.

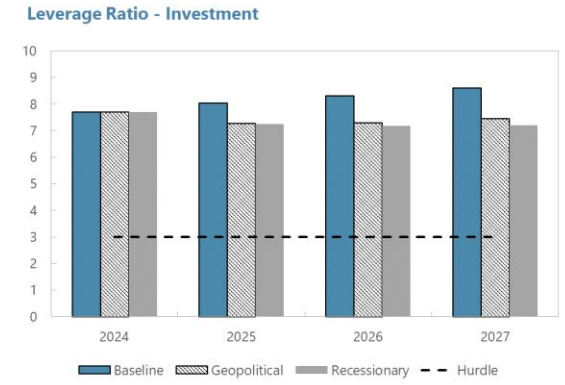
Figure 9. Euro Area: Leverage Ratio

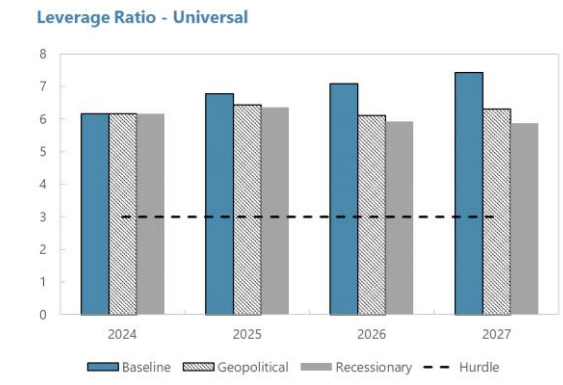


- *The system-wide leverage ratio strengthens in the baseline but drops to a 2026 trough of 5.2 percent in the geopolitical shock and 5.1 percent in the recessionary shock, recovering only slightly by 2027.*
- *G-SIBs start with the thinnest buffer and fall to roughly 4.0 percent under both adverse scenarios.*
- *Lenders maintain the highest ratios in baseline but still slip to 5.6 percent (recessionary) at the trough; Investment banks remain the most robust, bottoming near 7.3 percent before rebounding.*
- *Leverage ratios dip across all business models in 2026 when credit losses and exposure inflation peak; muted 2027 recoveries show that retained earnings only partially offset capital depletion, keeping leverage constraints noticeably tighter under adverse macro-financial conditions.*





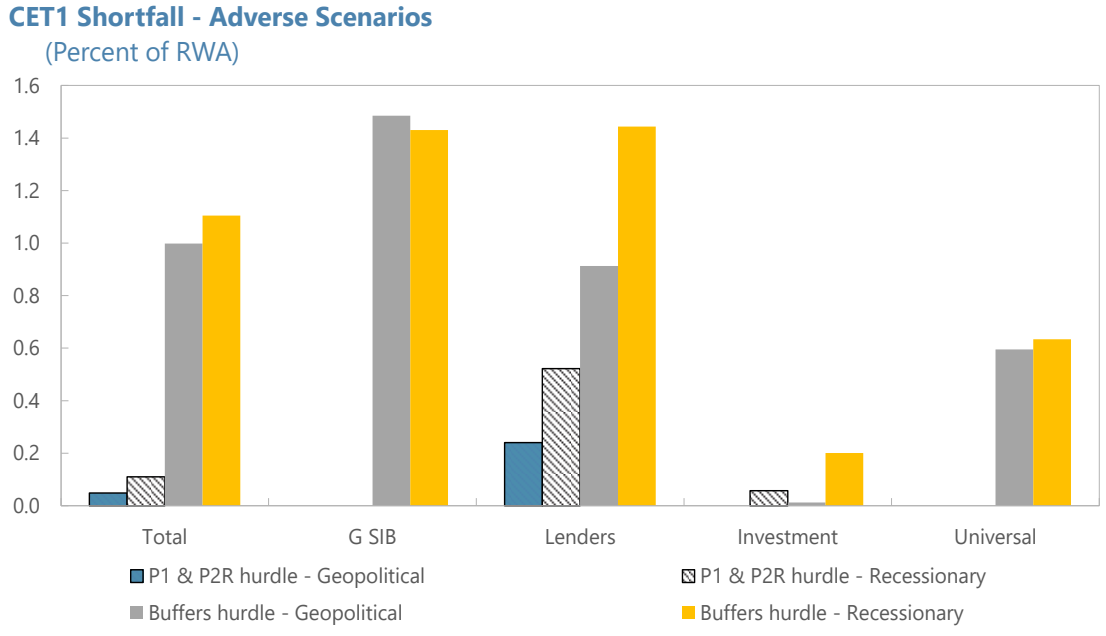




Source: IMF staff calculations.

56. Although G-SIBs meet their SREP capital requirements, they post the largest prudential buffer shortfall. The shortfall is equivalent to 1.49 percent of RWA in the geopolitical and 1.43 percent of RWA in the recessionary scenario, reflecting thinner buffers at the starting point and higher capital depletion. Lenders breach both hurdles: their SREP capital shortfall reaches 0.24 percent (geopolitical) and 0.52 percent (recessionary) of RWA, while their prudential buffer shortfall stands at 0.91 percent (geopolitical) and 1.44 percent (recessionary) of RWA. Thanks to their high starting capital and low credit-risk density, investment banks do not breach their SREP capital in the geopolitical scenario and by only 0.06 percent of RWA in the recessionary scenario, while their prudential buffer deficit is modest (up to 0.20 percent of RWA). Universal banks meet their SREP capital requirements in both scenarios but would need 0.60 percent (geopolitical) to 0.63 percent (recessionary) of RWA to rebuild their combined buffers. Overall, the recessionary shock is consistently more severe on bank buffers than the geopolitical one—increasing buffer shortfalls by roughly 10–60 bp across groups. The findings suggest that while a robust NII offsets somewhat loan losses under a geopolitical scenario, the deterioration in both NII and borrower creditworthiness amplifies the income loss in a severe recession. Appendix V shows detailed results by business model.

Figure 10. Euro Area: CET1 Shortfall



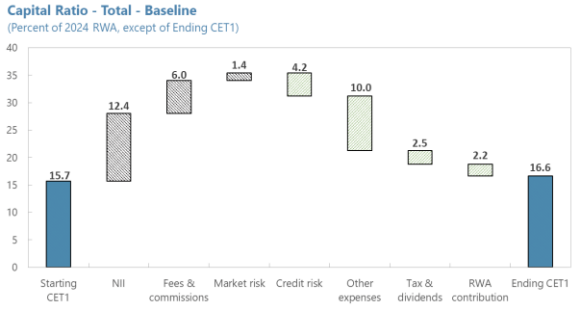
Source: IMF Staff calculations.

Detailed Results: All Banks

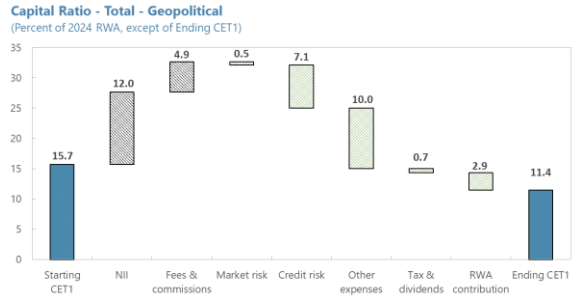
57. In the baseline, healthy NII and NFCI generation lift system-wide capital with moderate market-risk gains adding a further boost (Figure 11).[33] These benefits are partly offset by credit-loss charges, operating costs, taxes, and dividends, while gradual growth in RWA trims the ratio at the end.[34] The overall effect is a mild strengthening of capital buffers over the three-year period.

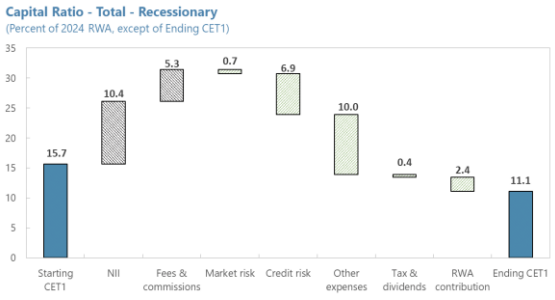
58. Under adverse conditions, capital depletion is driven by credit risk. In the geopolitical shock, revenues soften, and market-risk results deteriorate, but the decisive erosion comes from higher credit-risk provisions and a stress-driven increase in RWAs. The recessionary shock follows the same pattern but with slightly deeper revenue compression, more moderate credit-losses, and a milder surge in RWAs. The final CET 1 ratio ends up marginally below that in the geopolitical scenario, marking the weakest capital position of the three paths.

Figure 11. Euro Area: Contribution to Capital - Depletion



- *In the baseline, core earnings (NII, NFCI) outweigh credit-losses and RWA growth, so the CET 1 ratio edges up over the horizon.*
- *In the geopolitical scenario, softer revenues, larger credit-losses, and stress-driven RWA expansion pull CET 1 several points below the baseline.*
- *In the recessionary scenario, deeper revenue compression and still heavier credit-losses/RWA inflation push the CET 1 ratio to the lowest endpoint, underscoring credit risk and RWA growth as the key capital drains.*





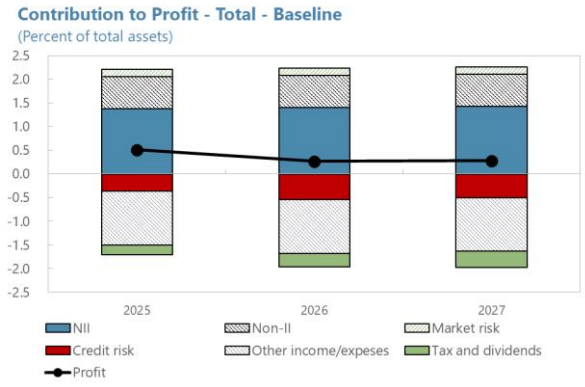
Source: IMF staff calculations.

[33] Figure 11 is a waterfall chart that tracks how successive incomes and expenses items (along with change in RWA) move the system-wide CET 1 ratio from its 2024 starting point to its 2027 end-point under each scenario.

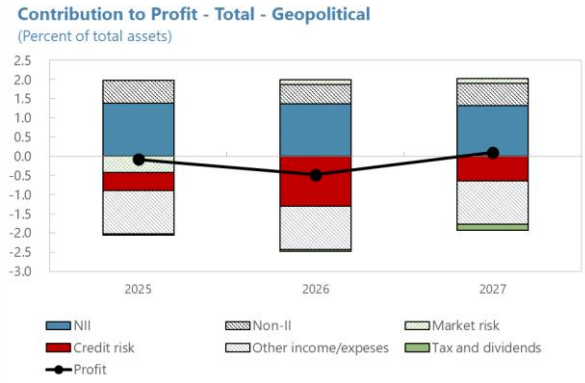
[34] The increase in credit RWAs under the baseline is mainly driven by the treatment of defaulted exposures as not being written off over the horizon. As a result, defaulted exposures accumulate and increase in proportion relative to total exposures. Additionally, the downturn LGD remains stable throughout the baseline scenario while the TTC LGD applied to performing exposures decreases due to favorable conditions. This divergence leads to relatively higher capital charges for defaulted exposures (i.e., difference between downturn and TTC LGD), contributing to a modest increase in risk weight density.

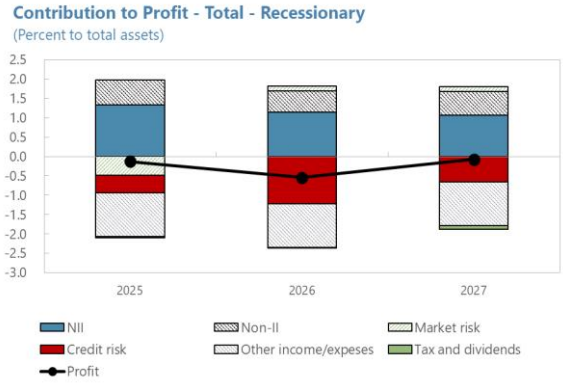
59. Across the three-year horizon, profitability closely mirrors macro-financial conditions (Figure 12). In the baseline, banks remain solidly profitable, posting a peak return on assets of about 0.51 percent of total assets in 2025 before settling at around 0.28 percent by 2027, as credit losses remain contained. The geopolitical shock initially pushes the system into losses: weaker fee income, market-valuation hits, and a rise in credit-risk charges generate losses of roughly 0.08 percent of assets in 2025, which deepen to about 0.48 percent in 2026; as market conditions stabilize, modest revenue recovery and lower provisioning allow profits to turn positive again (about 0.10 percent) in 2027. The recessionary scenario proves harsher: profits swing to a loss of roughly 0.13 percent in 2025 and widen to about 0.55 percent in 2026 amid surging credit impairments and compressed margins; even by 2027, earnings remain marginally negative (around 0.08 percent), underscoring the prolonged drag that a broad-based downturn exerts on bank profitability.

Figure 12. Euro Area: Contribution to Profitability



- *In the baseline, banks stay comfortably profitable throughout, with earnings tapering but still positive by 2027.*
- *In the geopolitical scenario, profits dip into losses in 2025–26, yet a partial revenue rebound turns results modestly positive again in 2027.*
- *In the recessionary scenario, losses are deeper and linger to the end of the horizon, reflecting heavier credit impairments and weak demand.*





Source: IMF staff calculations.

J. Recommendations

60. The European authorities should embed bespoke templates now deployed for each EU-wide stress test into the standing supervisory reporting framework alongside FINREP, COREP, and the STE. Folding ad-hoc data collections—such as for the sensitivities, repricing ladders, and granular market-risk sheets—into the regular schedule would result a single, coherent

taxonomy and set of aggregation rules, sparing banks the costly task of remapping identical data points to different definitions every stress-test cycle. A harmonized regime would also give supervisors a continuously updated, stress-test-ready dataset, allowing scenarios to be run more frequently and at shorter notice, enabling the conduct of desktop-based stress tests, while reducing reconciliation and reporting errors and enhancing the comparability of results across institutions and jurisdictions. Critically, routing this harmonized dataset straight into the capital-impact engine would ensure that shocks to credit, market, and income variables translate immediately into refreshed CET1 trajectories, thereby knitting the reporting upgrade directly to a robust and timely solvency analysis. Integrating the stress testing templates into the core reporting architecture would eliminate duplication, lighten the reporting burden, and make the entire process faster, more consistent, and more transparent for both banks and supervisory authorities.

61. Stress-testing should move beyond one adverse scenario and deploy multiple scenarios, each with its own inflation and interest-rate trajectory. One path could feature a stagflation shock in which commodity-driven price pressures force policy rates sharply higher; another could model a rapid disinflation accompanied by aggressive monetary easing and a flattening yield curve; a third could blend a sovereign-spread shock with a prolonged period of low—but volatile—policy rates. Subjecting banks to contrasting scenarios would produce markedly different projections for NII, funding costs, trading-book valuations, and stage-migration dynamics as revealed in the FSAP stress test analysis.[35] This could expose hidden concentrations—such as heavy reliance on sight deposits, large fixed-rate mortgage books, or structurally short option positions—that a single scenario may miss. By mapping how capital, liquidity, and profitability respond across several severe macro environments, supervisors would gain a richer, more granular view of system-wide vulnerabilities and be better equipped to tailor supervisory priorities and macro-prudential tools to the full spectrum of potential shocks. The authorities could consider conducting reverse stress tests to address scenario uncertainty.

LIQUIDITY STRESS TEST

A. Overview and Key Findings

62. Since the 2018 EA FSAP, supervisory liquidity risk assessment has been enhanced and the ECB started quantitative tightening. The sensitivity analysis of liquidity risk conducted by ECB in 2019, resulted in the introduction of regular liquidity risk stress tests performed by joint supervisory teams. In March 2023, the ECB started quantitative tightening after eight years of balance sheet expansion. Excess reserves declined from a peak in November 2022 (EUR 4.8 trillion) to EUR 2.8 trillion in April 2025 (Hartung et al., 2025).[36] Yet, excess liquidity in the system remained well above the levels observed during the EA FSAP 2018 (Figure 13, left panel).

[35] While the impact of the two FSAP adverse scenarios on the aggregate banking system is not very heterogenous, there is considerable variation at the individual bank level.

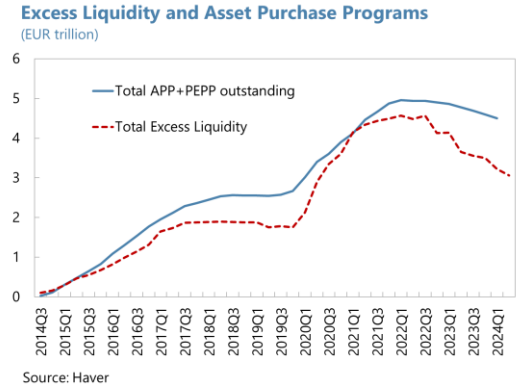
[36] A recent ECB survey (Hartung et al., 2025) reveals that 40 percent of banks are already operating close to their internal LCR and NSFR targets.

63. In March 2024, the ECB announced changes to its operational framework, with standard refinancing operations playing a central role in providing liquidity to banks. Banks can borrow liquidity at a rate of 15 basis points above the deposit rate, with full allotment against a broad set of collateral.[37] This framework is intended to reduce market stigma and allow banks to reduce precautionary liquidity buffers above regulatory minimum (100 percent ratios for both the LCR and the NSFR).

64. At the same time, searching for higher yields could lead to a higher share of less liquid instruments in banks' portfolios. An ECB analysis found that the ECB's asset purchase program reduced the term premia for assets included in the program. For example, 10-year term premia for sovereign securities were reduced by 95 basis points on average (Esser et al. 2019). Figure 13 right panel shows the composition of ECB securities portfolio outstanding and provides insights into which types of marketable securities were affected by ECB purchases.

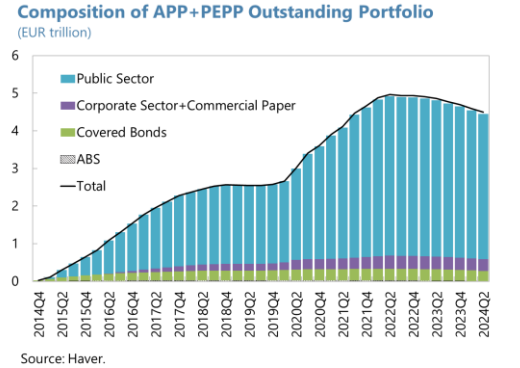
Figure 13. Euro Area: Excess Liquidity and Composition of ECB APP Portfolio

While excess liquidity started to decline in 2022, it remained above the 2018 levels…



Source: Haver

…with ECB purchases of various bonds boosting their liquidity and reducing risk premia.



Source: Haver.

65. Banks' asset encumbrance (AE) remains low, the quality of liquidity buffers is high, but overnight contractual liquidity gaps increased. Aggregate EA banks' overnight contractual liquidity gap increased by 4 percentage points to 31 percent of total assets in 2020-2024. Regulatory reporting shows a decrease in the share of stable deposits and a corresponding increase in SFTs comprising both repos—with secured funding from central counterparties (CCPs) being significant for some banks—and collateral swaps (CS).[38] There was a decline in deposits with the Eurosystem which reflects declining excess liquidity in the banking system and changes in the ECB monetary policy framework. However, the level of AE is relatively low across all business models, with half of the banks having an AE ratio of less than 15 percent of total assets.[39] Banks have encumbered non-tradeable loan portfolios (almost EUR 0.5 trillion) with the ECB, thus most of the remaining

[37] A key change of the operational framework is the spread between the rate on MROs and DFR was reduced to 15 basis points from the previous spread of 50 basis points (as from 18 September 2024). The narrower spread is designed to encourage participation in weekly operations, keeping short-term rates near the deposit facility rate, while limiting volatility and still promoting market-based funding by banks.

[38] A collateral swap involves a securities financing transaction, in which a securities loan is collateralized.

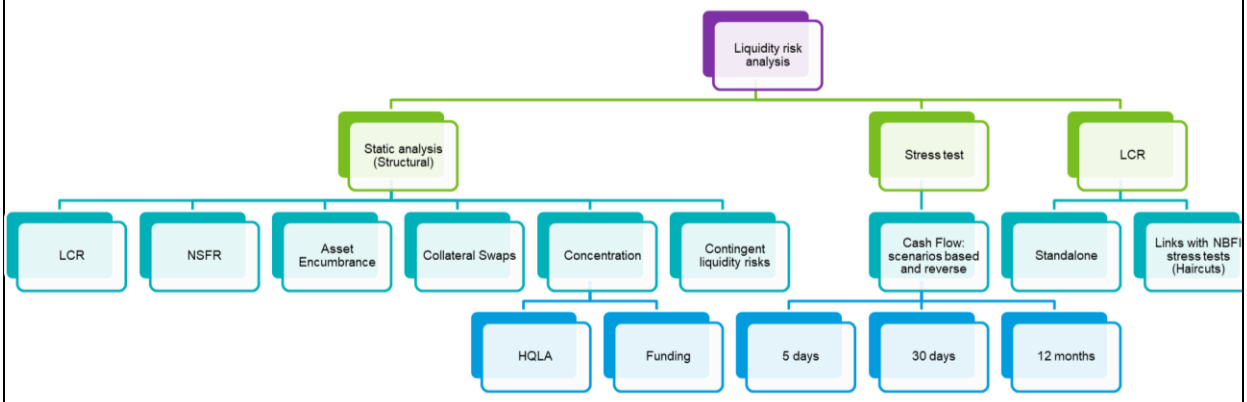
[39] Assets which are not encumbered could be used by banks to generate liquidity (eg, through repo transactions).

unencumbered assets (except for loans) are of high quality. Overall, highly rated sovereign bonds constitute almost half of the liquidity buffers.

66. To assess banks' liquidity risks, a comprehensive analysis of structural liquidity ratios and a variety of liquidity stress tests were performed (Figure 14). Liquidity risk analysis was conducted using data as of end December 2024. The bank sample differed across the types of analysis depending on data availability. For most tests, the minimum size was 80 banks and the maximum was 102. For some tests (e.g., USD LCR, and USD cash flows, collateral swaps) the sample was, however, reduced to 30-40 banks that report this segmentation. The structural analysis covered the LCR (for all currencies and USD), funding concentration, AE, collateral swaps and the NSFR. While the former measures short-term liquidity risks, the latter ratio gauges structural longer-term refinancing and funding risks. The FSAP team did not stress NSFR ratios under alternative scenarios from those prescribed by Basel as it is unlikely that during stress events these will be binding and focused on cash flow-based stress tests and LCR instead.

67. To deal with parameter uncertainty, cash flow tests were conducted over a wide range of scenarios featuring different degrees of severity and central bank support. Cash flow-based liquidity stress tests (CFLST) were conducted using supervisory data on contractual cash flows for different maturity buckets. This approach employs multiple scenarios of increasing severity covering several horizons (ranging between overnight and 1-year) with varying assumptions regarding liquidity buffers and shocks to cash inflows and outflows (Annex VI. Table 1).

Figure 14. Euro Area: Liquidity Risk Analysis Overview



Source: IMF staff elaboration.

68. Multiple FSAP stress tests reveal that EA banks can withstand significant liquidity outflows under severe scenarios. All banks in the sample comfortably meet LCR and NSFR requirements, with an average LCR close to 190 percent and NSFR close to 140 percent (Figure 15). Monthly intra-quarter LCR volatility is low. Volatility of USD LCR and U.S. dollar liquidity buffers is high, albeit the system maintains positive U.S. dollar liquidity buffer over the 30-day horizon. Survival horizons exceed two months for most banks under various stress scenarios, however challenges related to USD outflows remain. No large bank moves into negative CBC in the mild outflow scenarios within the first month of stress. A severe outflow scenario, which includes large

outflows of deposits, would lead to a negative CBC in 10 percent of banks within one month. G-SIBs and universal banks are mostly affected by stress scenarios; however, these banks still have substantial liquidity buffers. U.S. dollar cash flow test results reveal that several large banks would face USD liquidity gap within the first week of stress, but the gap is small, equivalent to 0.5 percent of total assets.

69. Banks' exposure to contingent liquidity risks has increased materially and requires continued monitoring and analysis. The increase occurred via several channels, including a higher share of secured funding and an increased use of collateral swaps which may trigger collateral calls. Banks are also exposed to margin calls on derivatives which could amplify liquidity pressures. These margin calls can be substantial and immediate, further amplifying liquidity pressures, especially if multiple calls occur simultaneously across different counterparties.

70. Compounding these risks is the potential impact of forced asset sales by stressed NBFIs. In a market shock scenario, such sales could depress asset prices, leading to higher valuation haircuts on collateral. This, in turn, would reduce the effective value of banks' liquid assets. If these dynamics were to play out, the system-wide average LCR)—could fall by nearly 50 percentage points. Despite this sharp decline, the average LCR would still remain above the regulatory minimum of 100%, indicating that banks would retain a buffer, albeit a much thinner one. [40]

B. Structural Liquidity Risks

Liquidity Coverage Ratio

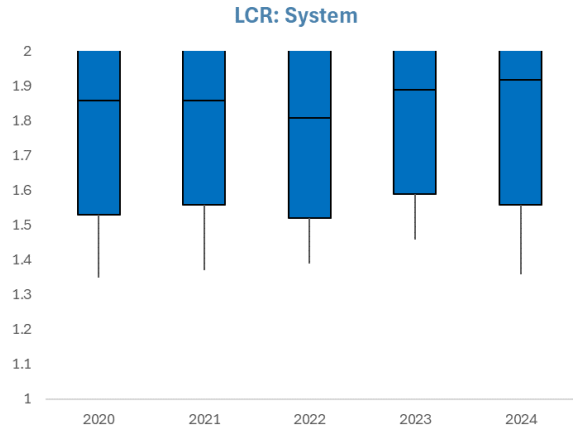
71. Liquidity analysis reveals that all banks comfortably meet the minimum LCR requirement. LCR ratios are significantly above regulatory requirements and have not been affected by the decline in long-term funding from the ECB (Figure 15). The median LCR ratio increased to 192 percent while the lowest was close to 130. LCR ratios do not display high intra-quarter volatility, as might be expected by "window dressing" activities to boost LCR by the end of the quarter.[41] Banks' often target LCRs of 120-130 percent, revealing a preference to signal a strong liquidity position to analysts and rating agencies and to avoid enhanced scrutiny from supervisors. LCR buffers above 100 percent reflect a conservative approach towards market liquidity of high-quality liquid assets (HQLA) and intraday liquidity (as it is not included in the LCR). Market intelligence suggests that intraday liquidity needs could lower regulatory LCR ratios by 2-5 percentage points. Overall, the (unweighted) median share of HQLA assets across business groups is between 20 to 30 percent of total assets. Investment banks, which have the highest volatility of LCR, also maintain the largest HQLA buffers. In addition to their liquidity reserves, banks can obtain liquidity from the ECB in multiple currencies (e.g., EUR, USD, JPN, GBP, SWF). Within the last five years, through several shocks, the ECB provided up to EUR 3.5 billion of short-term liquidity to banks (Figure 16).

[40] See Technical Note "Systemic Risk Analysis-NBFI".

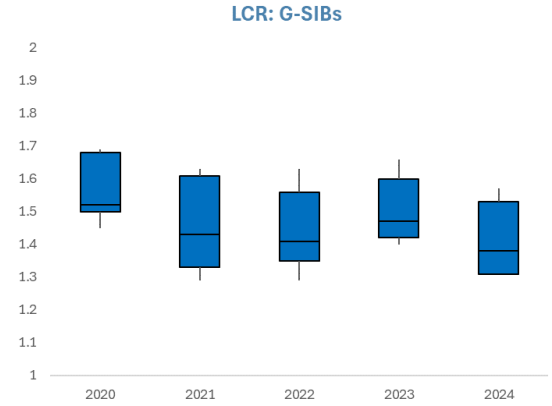
[41] Only quarterly 12-month average LCR numbers are typically reported publicly.

Figure 15. Euro Area: Liquidity Coverage Ratio and Structure of Funding by Maturity[1]

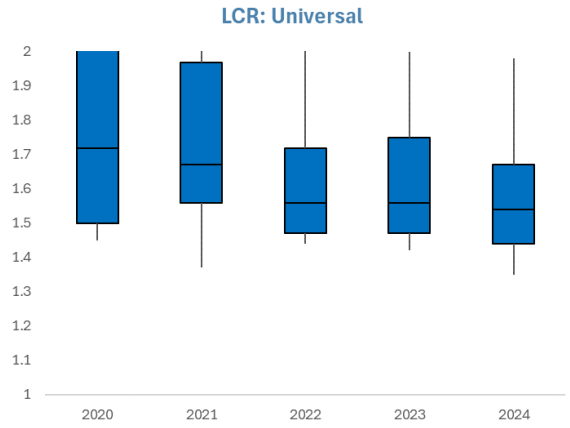
LCR are above 100 percent and reflect large liquidity buffers banks accumulated…



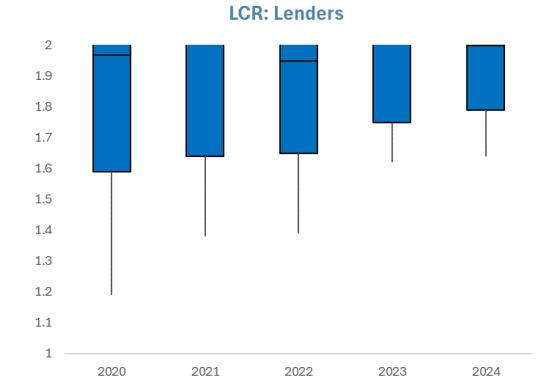
…with G-SIBs total LCR on average showing a declining trend in the past five years.



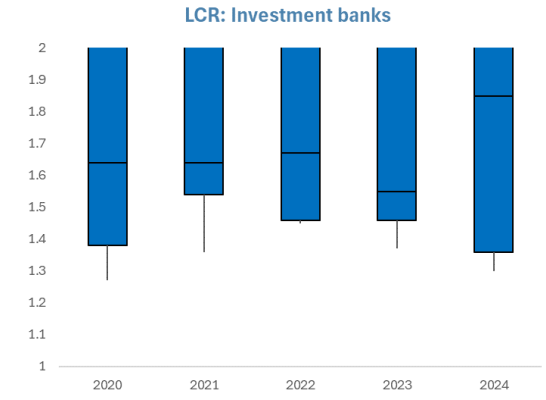
Universal banks opted to reduce liquidity buffers…



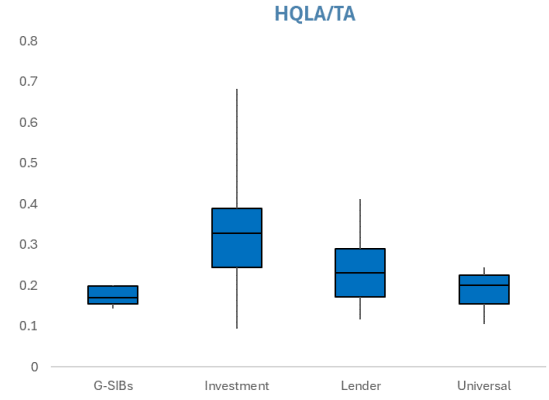
…however domestically oriented smaller banks have highest buffers in the sample.



Investment banks' LCR remains volatile owing to their business model….



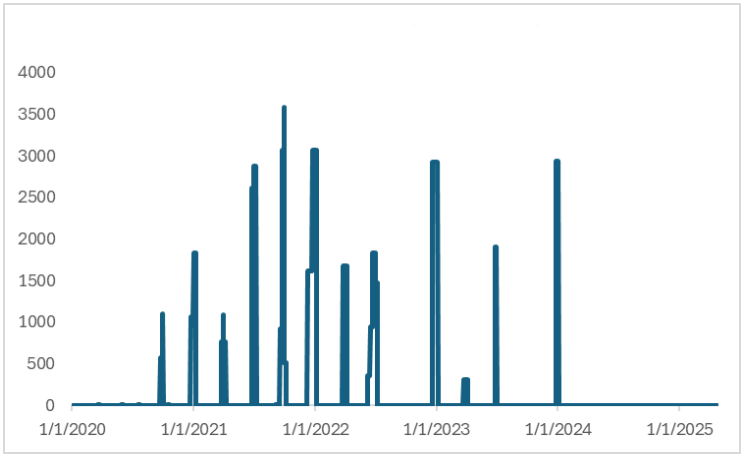
…however their HQLA buffers are highest in the sample.



Sources: ECB, and IMF staff calculations.
1/ Data as of 2024Q4 unless noted in the chart.
Note: The box and whiskers represent the 10th, 25th, 50th, 75th and 90th percentiles.

72. G-SIBs have historically recorded the lowest LCR buffers, owing to their larger share of wholesale funding as well as more optimized liquidity risk management. Lenders, which are typically domestically oriented banks, have higher LCRs, partly due to their lower reliance on short-term wholesale market funding (especially SFTs). Investment banks exhibit greater historic volatility of LCRs than the rest of the groups in the sample, however their business model is very different from other banks as they rely more on SFT and other wholesale funding and have higher funding concentration due to their links with parent banks outside of the EU.

Figure 16. Euro Area: ECB Liquidity Provision (EUR, millions)



Source: ECB.

73. Short term overnight funding can become a source of liquidity risk during times of market turbulence. Overall, overnight funding (including non-maturing items) is close to 32 percent of total funding, but some G-SIBs and some large investment banks have even higher share of short-term unsecured funding from financial corporations, presumably related to parent banks domiciled outside the EA. This increases their vulnerability to sudden market-wide liquidity events.

74. Foreign exchange funding, particularly in USD, remains a source of vulnerability as shown by very low USD LCRs for some banks. The USD is the most important foreign currency that EA banks are exposed to. Investment banks have the lowest USD LCR in the sample, followed by G-SIBs. There is no regulatory (Basel / CRR) requirement to maintain 100 percent LCR by significant currency. LCRs for these currencies are volatile and fall substantially below 100 percent for many of the G-SIB banks (Figure 17). Banks appear to rely on the effective functioning and deep liquidity of the FX swap and spot market, and on the backstop of ECB/Federal Reserve Board swap lines in case of turbulent market conditions.[42] In addition the ECB conducts weekly 7-day USD tenders. Banks can obtain USD from ECB if they provide eligible collateral denominated in EUR. Auctions are with full allotment, i.e. there is no limit on how much USD can be obtained. The ECB applies a 12 percent exchange rate margin which makes the auctions more expensive than market swaps. Hence the amount obtained from ECB by market participants is typically very low (e.g. below USD 100 million).

[42] ECB maintains multiple currency swap facilities with all major CBs and the one with the Federal Reserve Board is unlimited and standing one: https://www.ecb.europa.eu/mopo/international-market-operations/liquidity_lines/html/index.en.html

75. While the FSAP team did not obtain granular supervisory data on USD funding of banks, the ECB's own analysis highlights USD funding concentration, refinancing risks and counterparty risks. Klaus and Mingarelli (2024) finds that banks rely on short-term wholesale USD funding to further channel USD to EA NBFIs. EA banks receive USD funding from their US affiliates and further lend money to NBFIs. In case of USD cash surpluses, these are sold in FX swap markets. Since the majority of trades are provided by a few large banks, the ECB report highlighted the concentration risks, and also the very short-term (one day) maturity of FX swap markets. In the case of NBFIs, USD funding provision via non-centrally cleared repos involves counterparty risk.[43] The FSAP team did not have transaction level data by contrast with the BIS, ECB analysis. However, our analysis showed that USD LCR is very important to about a third of banks (typically large G-SIBs); with unweighted median being 145, yet historically falling to 0 in several G-SIBs, also some investment banks. However, the investment banks with very low USD LCR are subsidiaries of US banks, thus have access to Federal Reserve Board or to parent bank USD funding facilities (assuming that cross-border flows of USD are not affected by any regulatory ringfencing).

76. The FSAP analysis highlighted the concentration of USD funding in some types of banks and the need to monitor risks to NBFI exposures. While funding from parent banks would typically not dry up, geopolitical risks and regulatory ringfencing may not be fully eliminated from funding stress scenarios. Where counterparties are not affiliated ("arms-length"), funding may dry out fast requiring banks to replace lost USD funding from other, potentially more expensive, sources. Counterparties, especially NBFIs, may be unable to repay USD in times of stress. While a bank would be left with other currencies (EUR, JPY) or FX collateral, such as US Treasury bonds, their market liquidity is not ensured in times of excessive market volatility episodes.

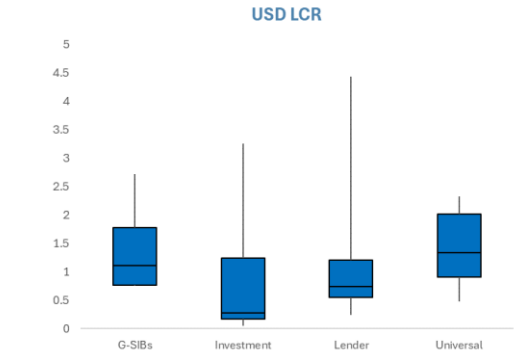
Net Stable Funding Ratio

77. All banks have met the 100 percent NSFR requirement since its inception in 2021 (Figure 17). The ratio has been quite stable, with an unweighted average close to 140 percent through the sample. As in the case with LCR, banks tend to target a higher ratio to account for potential challenges and costs in refinancing longer-term liabilities used to meet NSFR, e.g., they issue more bonds with longer than 12-month maturity than needed to meet minimum NSFR requirements.

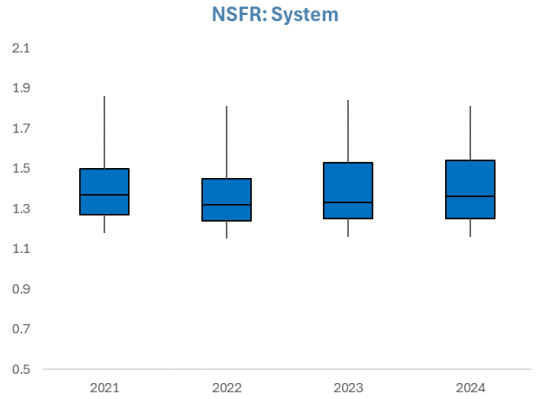
[43] Kloks et al. (2023) and Borio et al. (2022) also noted that due to the off-balance sheet nature as well as limited central clearing of FX repos and swaps data gaps related to FX derivatives are growing and that EA banks are net providers of USD liquidity to Japanese banks. This analysis identified similar challenges as the ECB analysis: market concentration, opacity as well as lending in USD to NBFIs.

Figure 17. Euro Area: USD LCR, NSFR, AE and Funding Ratio

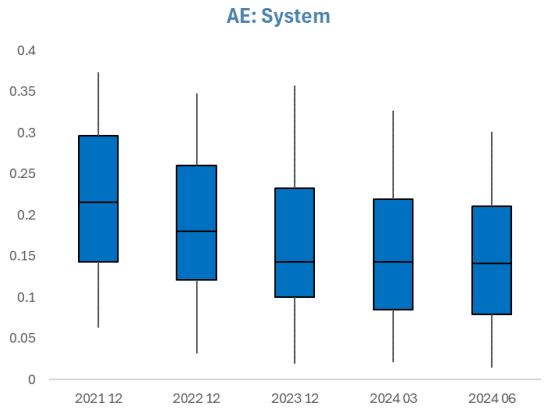
USD LCR is lowest in Investment bank group.



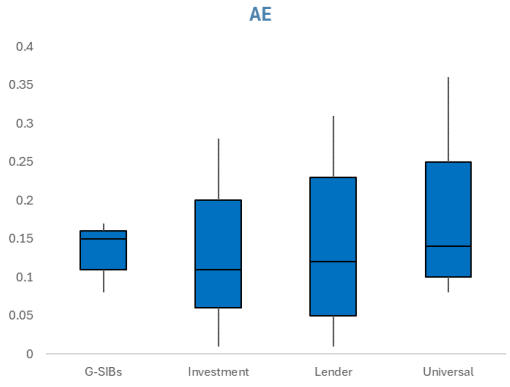
All banks have NSFR above 100 percent, with the ratio quite stable in the past years.



Systemwide AE ratio (unweighted) steadily declined and remained low…

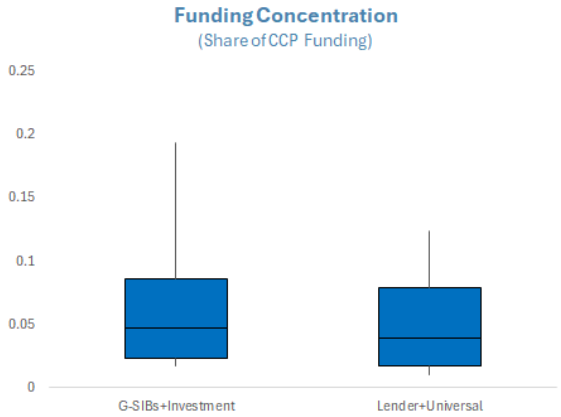


…with some lenders and universal banks relying more on issuance of ABS.

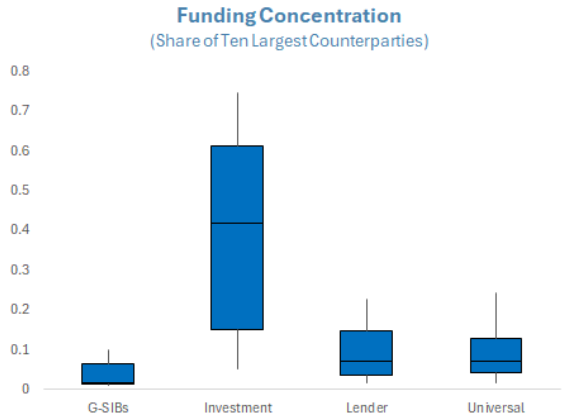


Data for 2024 06

G-Sibs and investments banks have higher dependency on funding from CCPs…



….while same investment banks tend to have more concentrated funding positions.



Sources: ECB, and IMF staff calculations.
Note: The box and whiskers represent the 10th, 25th, 50th, 75th and 90th percentiles.

Asset Encumbrance

78. Overall, AE in the sample declined slightly in the past five years and remains moderate overall. The average AE ratio declined by 6 percentage points since 2021 reaching almost 15 percent of total assets (Figure 17). Some banks within all groups have much higher AE ratios reflecting their dominant business model of issuing asset backed securities (ABS), covered bonds or dependence on ECB lending facilities (based on ECB data, some banks seem to prefer to pledge low quality liquid assets to obtain liquidity from ECB and use HQLA in market transactions).[44] To a lesser amount this highlights funding constraints as well as a shifting of risks to unsecured creditors. Banks with high AE may not only face higher outflows from short-term markets and deposit funding during idiosyncratic and systemic liquidity events but also be unable to obtain additional liquidity in the market or from central banks (as central banks require unencumbered collateral).[45]

79. Except for a few banks, relatively low levels of AE highlights additional liquidity generation ability by banks in times of systemic and/or idiosyncratic stress. Overall, low to moderate (and declining) level of AE improves banks' ability to monetize some of the high-quality loans and other assets in case of an idiosyncratic shock. During systemic stress events, banks may opt to pledge eligible credit claims or eligible own issuances to the ECB to obtain liquidity under open market operations or lending facilities (not emergency liquidity assistance) given the broad ECB collateral framework. Only in a few cases, high AE ratios may hinder banks' ability to tap unsecured funding markets and/or obtain liquidity from the ECB under stress. In the FSAP cash flow stress tests, this additional liquidity generating capacity is not considered although it may be available under certain conditions.

Collateral Swaps

80. Collateral swaps (CSs) can redistribute liquidity within the financial system from banks with excess liquidity to those with a shortfall. If the CS have a maturity longer than 30 days—banks benefit from CSs by increasing their own LCR (if they borrow HQLA assets) and if longer than 6 months—NSFR. At the same time, CSs reflect borrowed liquidity, thus banks which rely on a constant rollover of such CSs could face refinancing issues in times of market stress when certain non-HQLA collateral may not be accepted by counterparts or haircuts may widen. Only 23 banks in the sample are active participants in the CS market. Banks in the sample are typically net liquidity borrowers (collateral upgrade swaps dominate); however, banks' position varies through the sample period. The net amount borrowed increased almost tenfold within the past two years: from 0.02 percent of total assets (end 2022) to 0.2 percent of total assets (end 2024). Most of the CSs are in EUR, and the USD share is very small.

[44] Based on ECB data, most of the available collateral are sovereign securities and most of the collateral pledged to the ECB are credit claims, ABS and covered bonds. https://www.ecb.europa.eu/mopo/coll/charts/html/index.en.html

[45] High level of AE shifts risk to unsecured creditors and thus makes a bank subject to potentially higher wholesale deposit run-off rates. There is a positive feedback loop between level of encumbrance and ability to borrow (cheaply) in unsecured funding markets. High AE makes unsecured debt riskier, and investors demand higher risk premiums or unsecured markets could close for a bank altogether.

81. From an aggregate perspective, the increased use of CSs may reflect liquidity risk transfer to NBFIs, including insurance companies and pension funds. The FSAP team did not have access to counterparty level data; yet it is possible that NBFIs which do not typically face liquidity pressures (unless they engage in leveraged transactions and face margin calls) are CS counterparties for banks. From a bank perspective, these transactions may not provide resilient liquidity in a time of stress and may increase AE ratios when a bank enters collateral upgrade transactions.

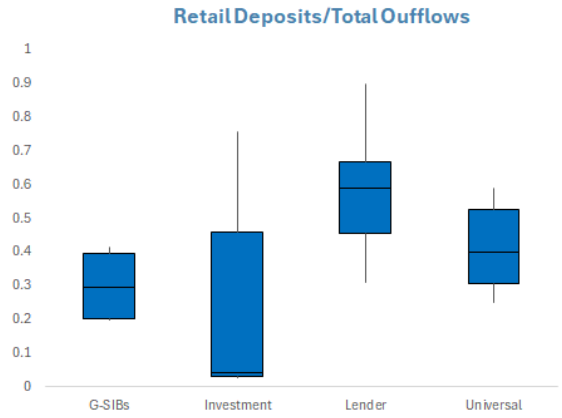
Funding Concentration

82. Funding concentration varies by business model. Investment banks have the most concentrated funding sources (as a share of 10 largest funding providers in total funding), mainly due to being subsidiaries of large foreign-owned (mostly USA, UK and in one case CH) banking groups (Figure 18). G-SIBs have the lowest concentration, owing to the overall size of the banking group. While median values of funding from the 10 largest funding providers are modest (around 10 percent for lenders and universal banks), there are multiple outliers where concentration reaches 15 or 25 percent. Whereas this may be a risk in the event of market turmoil, most of the largest funding providers in the sample are sovereign state-owned. Investment banks as a group represent the business model which is most dependent on wholesale, less stable and concentrated sources of funding (Figure 18). Investment banks in the EA significantly rely on the reputation and liquidity risk management of their parents. Accordingly, they have a higher LCR and share of HQLA in total assets.

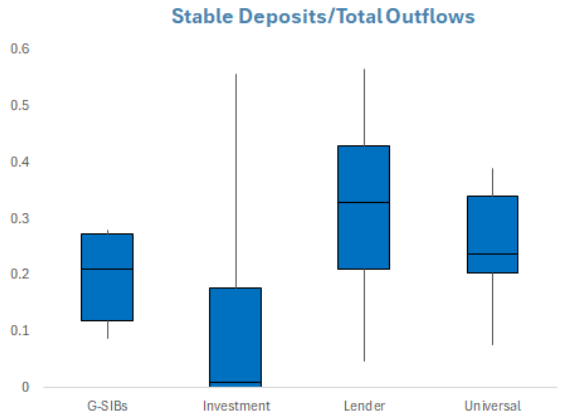
83. Six CCP groups provide almost 3 percent of funding (mostly via repos and deposits) to 29 banks in the sample (Figure 18). The EA market is concentrated, with a few global groups dominating. The majority of exposures are repo transactions (94 percent of total exposure to CCPs) with the remainder being unsecured. While the risk to banks of losing CCP funding is small, (also considering the banks would receive collateral back) there are a few cases when these exposures constitute up to 6 percent of total funding. In the event of unsecured funding there is also counterparty risk to CCPs.

Figure 18. Euro Area: LCR: Funding Concentration

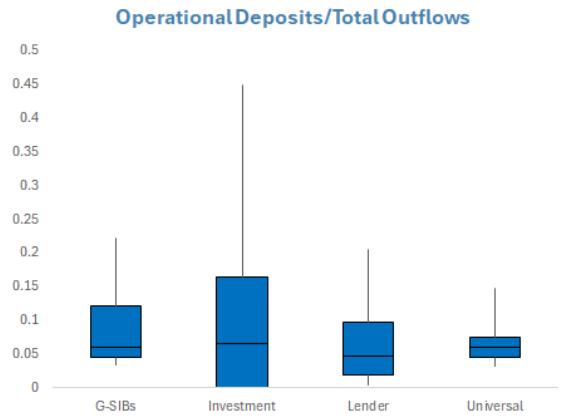
Lender banks are mostly reliant on retail deposits…



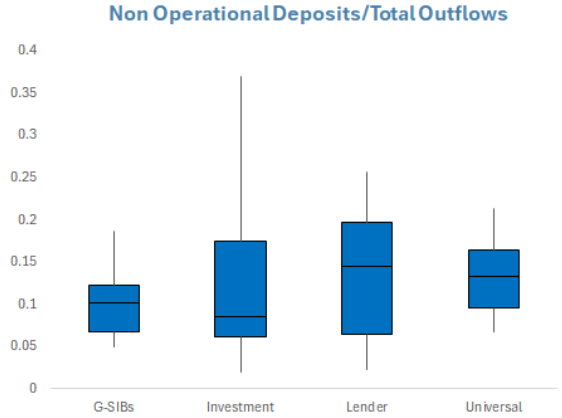
…which are also considered as stable, while investment banks are mostly reliant on wholesale funding.



Share of operational deposits to total outflows is comparable…



…with non-operational ones in most of the banks.



Sources: ECB, and IMF staff calculations.
Note: The box and whiskers represent the 10th, 25th, 50th, 75th and 90th percentiles.

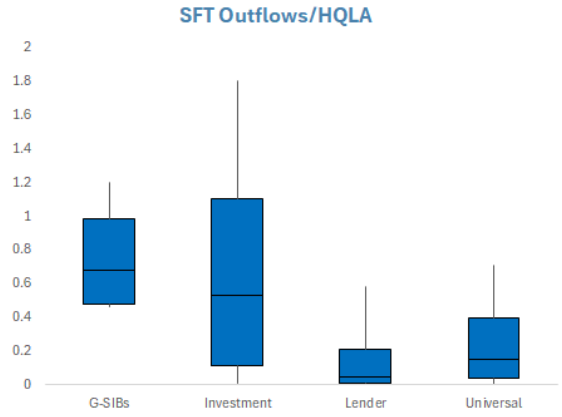
Contingent Liquidity Risks

84. G-SIBs, universal banks and investment banks are much more sensitive to adverse market developments due to their higher contingent liquidity risk exposure arising from their links with other banks and NBFIs. G-SIBs and investment banks rely on a significant share of SFT funding and thus may be subject to significant margin calls (Figure 19). G-SIBs and universal banks provide most of the committed facilities to clients, while also receiving the highest relative share of operational deposits from credit institutions. Investment banks receive a substantial share of their operational deposits from NBFIs as do G-SIBs, yet on a slightly lower basis. Margin calls may also arise due to exposure to derivatives contracts. This type of risk may arise when banks have large positions in particular types of derivatives and are less pronounced when banks' positions are diversified and balanced (i.e., no short or long positions dominate). While the FSAP was not able to

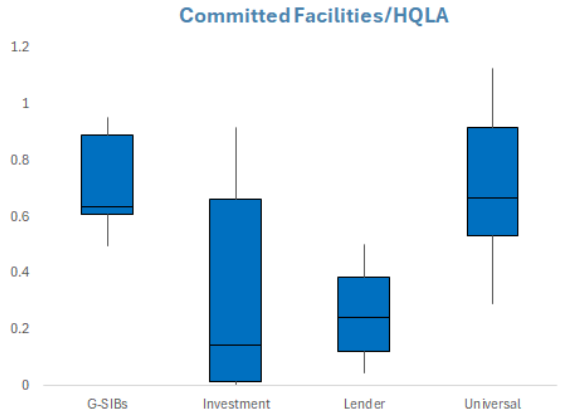
test or calibrate this risk, LCR data submissions suggest that banks estimate that it is relatively low and does not exceed 2-4 percent of HQLA for G-SIBS and investment banks (Figure 20). However, this risk may not be estimated conservatively given the historical look back approach required by the LCR to calibrate these outflows.

Figure 19. Euro Area: LCR: Links with Other Banks and NBFIs

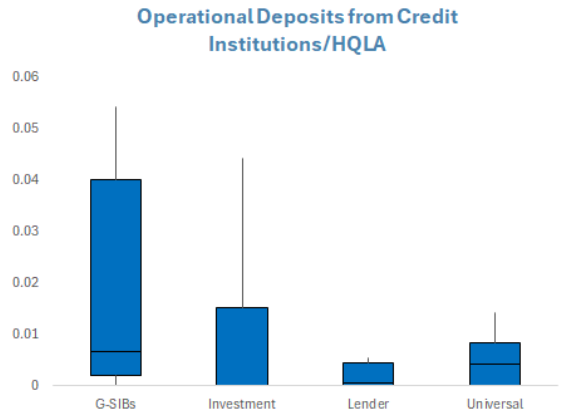
G-SIBs and Investment banks rely on SFTs as a source of funding…



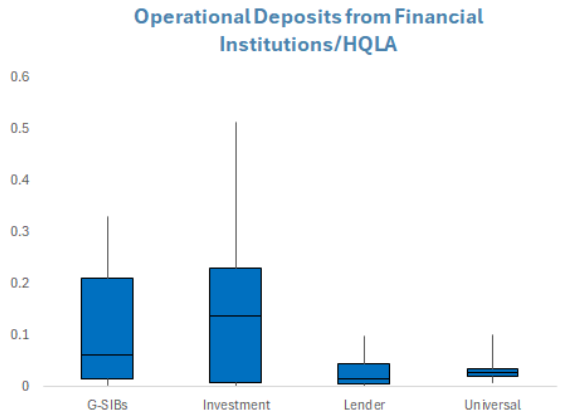
…while G-SIBs and universal banks provide substantial amounts of credit lines to their counterparties.



G-SIBs rely more on operational deposits from other banks, highlighting their central role in market making…

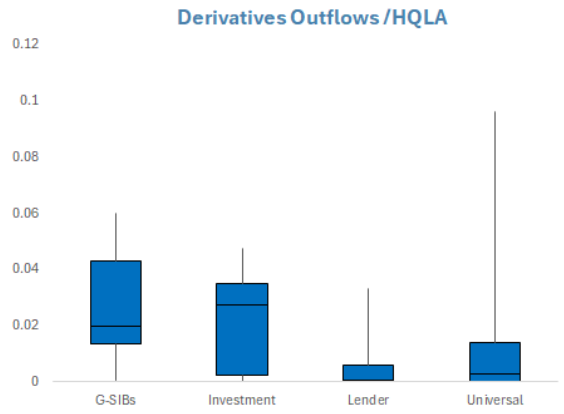


…which also correlates with their role as intermediaries for NBFIs.

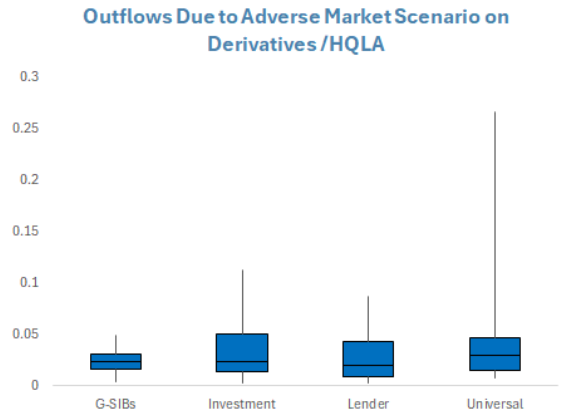


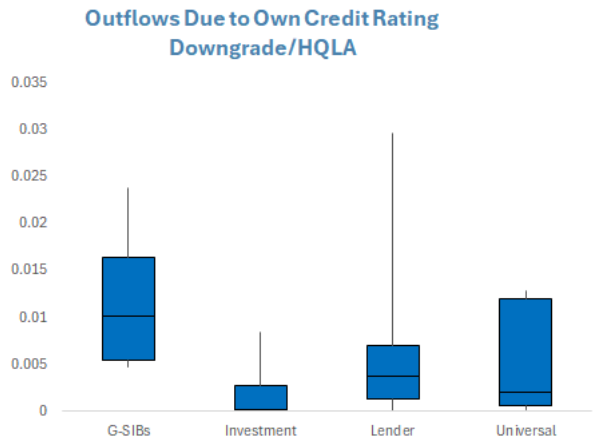
Sources: ECB, and IMF staff calculations.
Note: The box and whiskers represent the 10th, 25th, 50th, 75th and 90th percentiles.

Figure 20. Euro Area: LCR: Contingent Liquidity Risks



- *G-SIBs and Investment banks are mostly exposed to contingent liquidity risks from derivatives.*
- *But banks' own scenario analysis reveals that universal banks are more exposed to outflows in times of stress.*
- *Own credit rating downgrade tests reveal very high heterogeneity of results.*





Sources: ECB, and IMF staff calculations.
Note: The box and whiskers represent the 10th, 25th, 50th, 75th and 90th percentiles.

85. Additional liquidity risks arise when banks' own credit rating is downgraded. Own rating downgrades may trigger severe market funding consequences for a bank: loss of access to unsecured funding, reduction of credit limits from counterparties, including intraday exposures, outflows from deposits provided by other banks and NBFIs. See the Solvency – Liquidity section for an analysis of this risk In 2019, ECB highlighted that own credit rating downgrade risk is somewhat low in the sample of SSM banks (ECB, 2019). The FSAP findings reveal significant heterogeneity: some banks report 0 outflows, some very low in EUR nominal terms, and only a minority have substantial outflows when measured in terms of HQLA (Figure 20). Investment and universal banks in the sample report very low values despite these groups being closely interconnected with other banks and NBFIs, while also being dependent on wholesale funding. Investment banks may assume that their links with parent banks would allow them to operate under business-as-usual conditions, however it is unclear whether they would be able to receive additional funding form foreign domiciled parents under stress.

86. Overall, contingent liquidity risks may be underestimated by banks owing to the increased interconnectedness and dependency on SFT funding, and the higher use of CS, as emphasized by the ECB (ECB, 2019). Continuing to ensure that banks are using a range of hypothetical stress scenarios as part of their internal liquidity stress tests to measure the impact on outflows (including those generated by increased needs related to market valuation changes on derivatives) is therefore critical.

C. Cash Flow Liquidity Stress Tests

Introduction and Objectives

87. The CFLST quantifies the liquidity risk and risk bearing capacity of EA banks under a range of scenarios and time horizons. CFLSTs estimate the magnitude of potential liquidity needs of individual banks and the banking system (comprising the full sample of 95 banks) under a baseline and multiple stress scenarios (Appendix VI). CFLST reveals levels of liquidity risk tolerance, i.e., under which circumstances banks would need additional liquidity support because of contractual liquidity gaps and the absence of sufficient CBC. The CFLST contributes to the assessment of common liquidity risk exposures across banks in the banking system, due to their reliance on unsecured short-term funding, contingent liquidity outflows, less stable deposits and holdings of similar less liquid assets in the CBC. The CFLSTs do not consider a potential redistribution of liquidity within the banking system, i.e. the migration of deposits from banks which experience capital shortfall to the banks which have strong capital buffers. This redistribution of flows was, however, observed during the GFC as well in the March 2023 bank turmoil.

88. Contractual liquidity risk exposure is high (Annex VI. Figure 1). In 2024:Q4, contractual outflows within the first four weeks amount to 50 percent of total funding (weighted average; excluding open maturity and overnight retail deposits (18 percent of total funding) and open maturity and overnight corporate deposits (32 percent of total funding). The contractual inflows amount to about 27 percent of total funding (excluding inflows from central bank deposits (26 percent of total funding). Thus, the cumulated net funding gap over the first 4 weeks reaches about 31 percent of total funding or EUR 7,500 billion. Compared to 2020, banks have become more exposed to liquidity risk from changes in the value of derivatives and SFTs while inflows from central banks have declined.

89. The main drivers of the net outflows are:

(i) Outflows from various types of deposits (26 percent of total funding);
(ii) SFT (mainly repo outflows) 9.3 percent of total funding. SFT outflows net of reverse repos would be zero for the same 30-day time horizon. Yet the difference comes from maturity mismatch between repo and reverse repo transactions. Namely, overnight inflows are by 1 percent less than reverse repos.

Counterbalancing Capacity

90. The CBC in the first month fully covers the aggregate net cash flow gap. Cash and deposits (withdrawable central bank reserves) dominate the composition of the CBC (Table 4). Central bank deposits and 0 percent risk-weight securities account for about two thirds of the CBC. Other non-HQLA items are the third largest position with roughly 30 percent of the CBC. Comparing 2020 and 2024 data, central bank reserves declined substantially, and the share of less liquid securities and other assets increased. This makes the EA banking system relatively more vulnerable to market volatility due to changes in securities prices. CBC amounts to 21 percent of total assets, which is higher than the net funding gap (19 percent of total assets over the first four weeks) in the unstressed reported contractual data (excluding retail and operational deposits). While banks as a group have enough CBC to cover the gap, its distribution is uneven and some banks face shortfalls under stress.

91. However, most of the securities included in CBC have low to very low credit risk (Figure 21). Analysis of unencumbered assets by credit quality steps (CQS) reveals that most of the unencumbered assets (i.e. excluding cash, central bank reserves, credit claims and other non-marketable securities) fall into the lowest credit risk category (CQS1) and Level 1 tradeable assets; thus, can be quickly converted into cash and/or used for collateral management purposes. In terms of U.S. dollar liquidity, banks that are active in FX funding market accumulated large amounts of U.S. sovereign debt securities and U.S. government-sponsored enterprise issued papers, which also fall under the CQS 1 category.

Table 4. Euro Area: Composition of the Counterbalancing Capacity
(Weighted average across all banks, percent of assets)

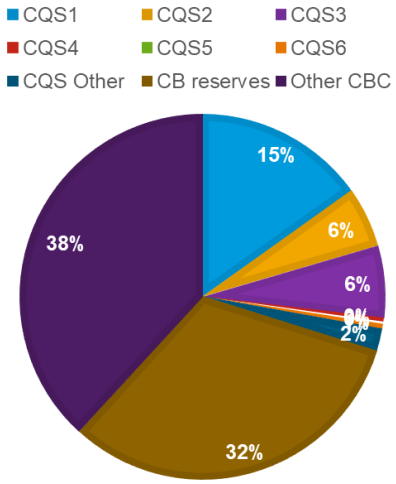
	2020	2024	Change
Coins and bank notes	2	1	-1
Withdrawable central bank reserves	49	35	-14
Level 1 tradable assets	29	32	3
Level 2A tradable assets	2	2	0
Level 2B tradable assets	2	2	0
Other tradable assets	11	10	-1
Non tradable assets eligible for central	3	6	3
Own issuances eligible for central banks	0	11	11
Undrawn committed facilities received	3	1	-1
Total CBC in terms of TA	**21**	**20**	**-1**

Sources: ECB, and IMF staff calculations.

92. EA and U.S. sovereign securities are the most prevalent debt assets included in the CBC. Five countries (Italy, Spain, Germany, United States, and France) cover roughly 65 percent of sovereign exposures in the sample. As most of the banks are exposed to these securities, in the event of a large market shock (such as market turmoil in 2012, 2020, 2023), market liquidity of some of these assets may be severely affected by fire sale effects. At the same time, a risk mitigating factor

is that the average remaining maturity of these sovereign securities is close to two years, hence the impact of changes in interest rates and sovereign risk premiums is lower than the impact on holdings of long-term debt securities. Also, the potential activation of the Transmission Protection Instrument (TPI) could mitigate severe market stress.

Figure 21. Euro Area: Composition of the Counterbalancing Capacity by Credit Quality Step



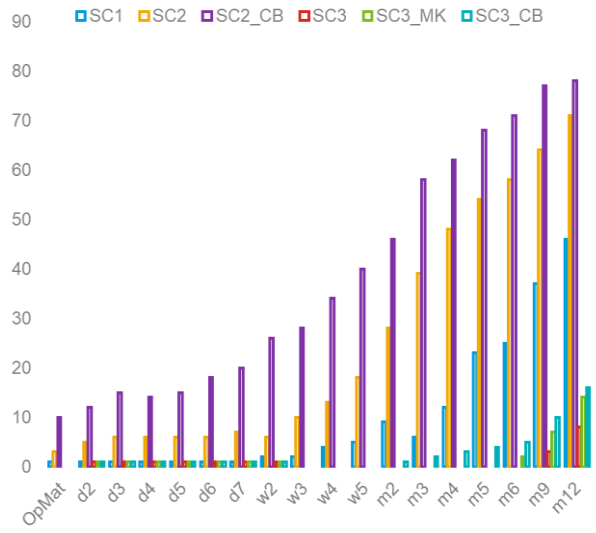
Sources: ECB, and IMF staff calculations.

Results of the Cash Flow-Based Liquidity Stress Tests

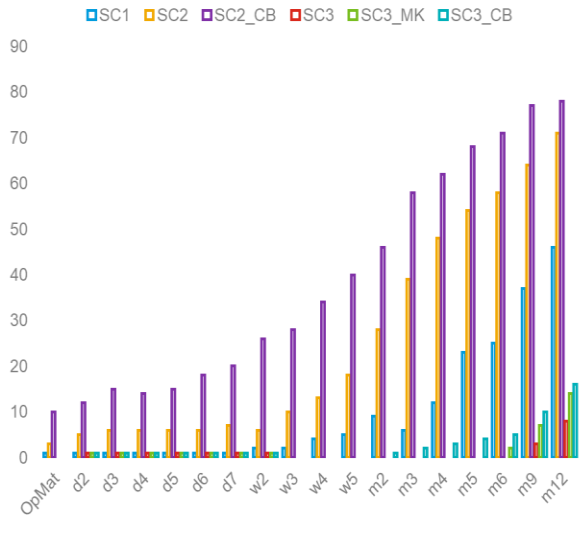
93. Most banks are able to absorb liquidity shocks simulated in the two systemic risk scenarios (Appendix VI. Table 1). No large bank fails the mild scenarios (SC 1 and SC 3) within the first month of the stress (Figure 22). Severe outflows would lead to negative CBC for 10 percent of the banks in the sample within a month. Under the idiosyncratic risk scenario (SC 2), the impact of the shock leads to 10 banks failing within a week, and almost 80 percent of banks failing within 1-year horizon. However, stressed outflows simulated above a 30-day horizon are for illustrative purposes only, as no bank could survive for long with massive deposit outflows. Overall, G-SIBs and universal banks suffer the largest net outflows. At the same time, large banks, including G-SIBs and investment banks have substantial liquidity buffers that help absorb the shocks. Banks which fail have a lower share of CBC as well as a higher share of short-term credit and liquidity facilities extended to clients.

Figure 22. Euro Area: Results of the Cash Flow-Based Liquidity Stress Tests

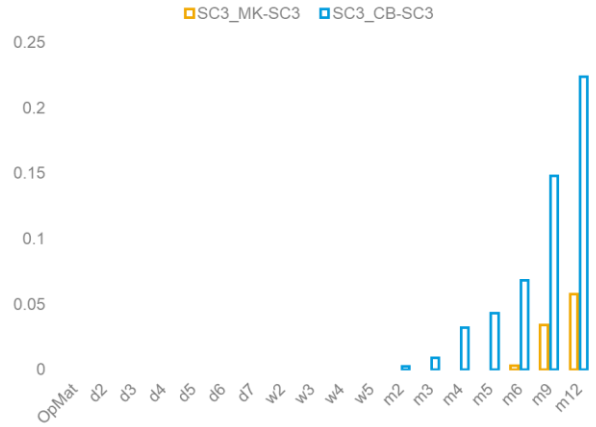
Number of banks with CBC <0 at the end of the period.



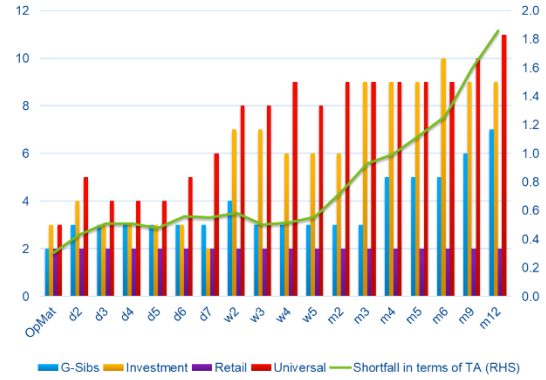
Liquidity gap in percent of total assets of banks with negative CBC.



Effects of the change in composition of collateral available in case of SC 3 (in percent of total assets).



CFLST USD. Number of banks with CBC <0 by business model (LHS) and liquidity gap in percent of total assets (RHS)



Sources: ECB and IMF staff calculations.

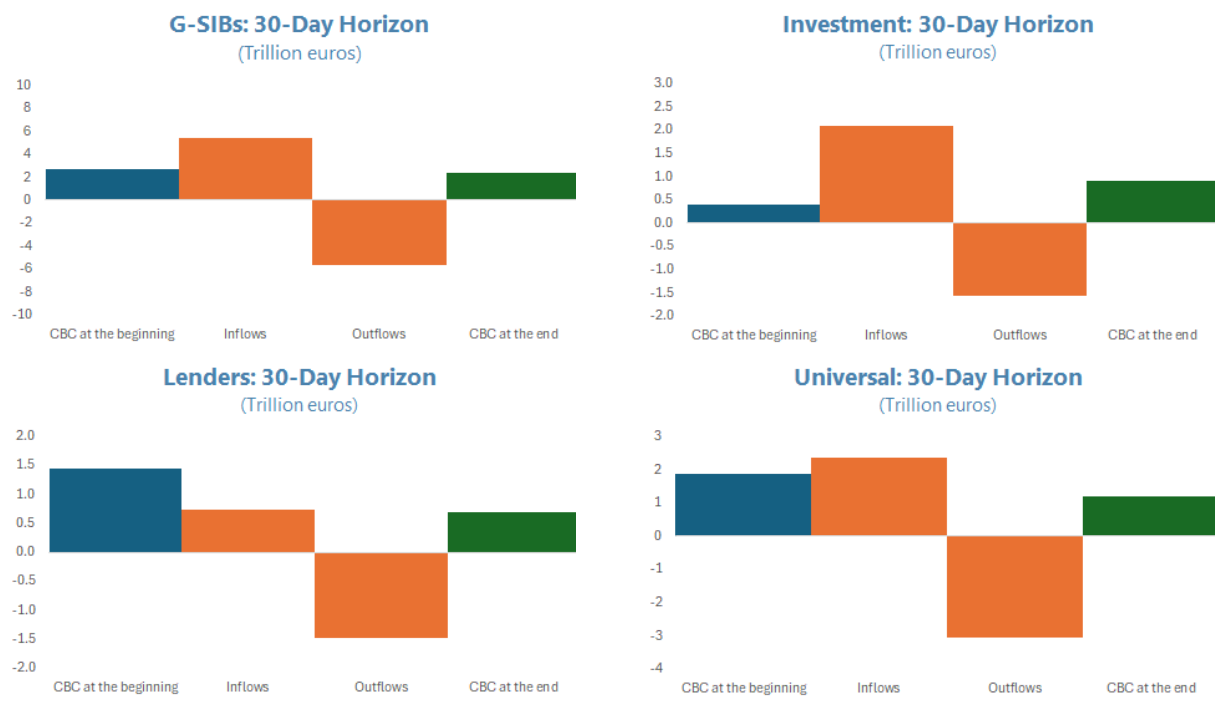
94. In the severe systemic risk scenario (SC 3), the application of higher haircuts to lower quality HQLA assets, reveals little impact on banks within the first 6 months of stress. This is because banks have enough HQLA CBC at the beginning of the stress, even though financial markets are assumed to be not functioning in this scenario. While the impact on the composition of CBC collateral is visible after several months of stress, the maximum increase in the funding gap is 0.2 percent of total assets. However, it may be expected that once CBC composition changes towards a lower share of central bank reserves and very HQLA, more banks may face negative CBC at an earlier stage of liquidity stress.

95. The impact of CFLST in USD is higher than that in total currencies. CFLST results reveal that several large banks would face USD liquidity gaps within the first week of stress, but the gap is

small (0.5 percent of total assets). Most affected banks are the ones with very low USD LCR as well as with substantial committed facilities and loan inflows in USD.

96. In the systemic risk shock scenario (Scenario 1), investment banks are relatively less affected (Figure 23). There is a significant difference between results by business model. Figures 14-15, show that investment banks receive more inflows (including contractual ones) and can scale down their balance sheet if needed during the 30-day stress period. They do not rely on retail deposits and loans (households and corporates) and receive inflows from SFTs, lending to other financial institutions, as well deposits from central banks, other short-term facilities. Thus, their CBC is increasing within the 30-day horizon, while other banks would see declining CBC.

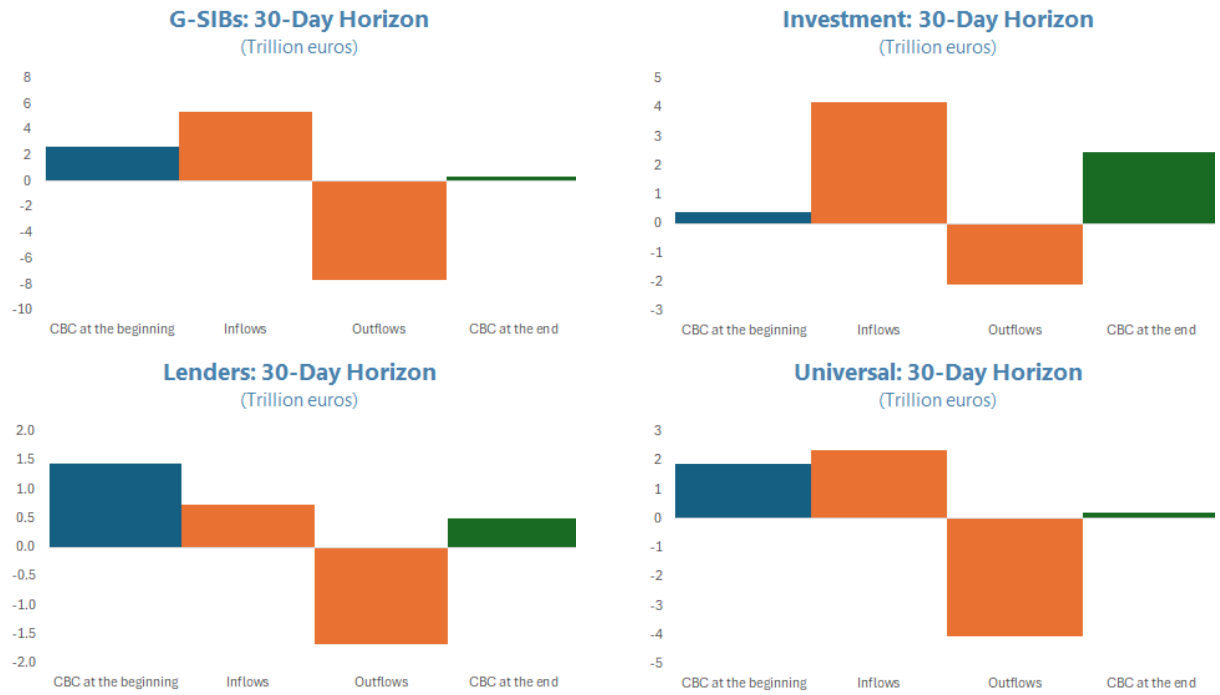
Figure 23. Euro Area: Evolution of the CBC (Scenario 1)



Sources: ECB and IMF staff calculations.

97. In the idiosyncratic risk scenario (Scenario 2), G-SIBs and universal banks are most affected (Figure 24). Results by business models are similar to those obtained by ECB in 2019 (although classification is slightly different, see ECB, 2019). Most of the impact comes from wholesale funding, and the outflow of non-operational deposits. These two types of banks also have shorter funding structures to optimize maturity transformation and return on equity. Lenders, which are mostly retail banks, are less affected.

Figure 24. Euro Area: Evolution of the CBC (Scenario 2)



Sources: ECB and IMF staff calculations.

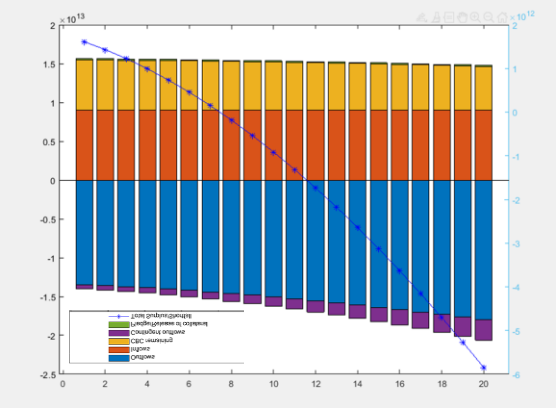
Results of the Reverse Cash Flow-Based Liquidity Stress Tests

98. Results from reverse CFLST reveal that the majority of banks can withstand very severe outflows (Figure 25).[46] The tests use severe idiosyncratic scenario 2 (full CBC) as the starting point and assumes that the maximum severity (terminal points for cash inflows/outflows, haircuts) reaches twice the magnitude of the initial shock (except when the shock is 0 or 100 percent). For the reverse stress tests pass/fail criteria, it was assumed that a threshold point for failing the test is when the size of banks with negative CBC reaches 20 percent of total assets. The number of discrete non-linear convex steps for the increase in stress parameters was set to 20. Banks which are first to breach negative CBC limits are the ones which have large contingent outflows (Figure 25) as well as low CBC to total assets ratio. Overall, banks individually can withstand significant outflows before the 20 percent total assets of banks with negative CBC is reached.

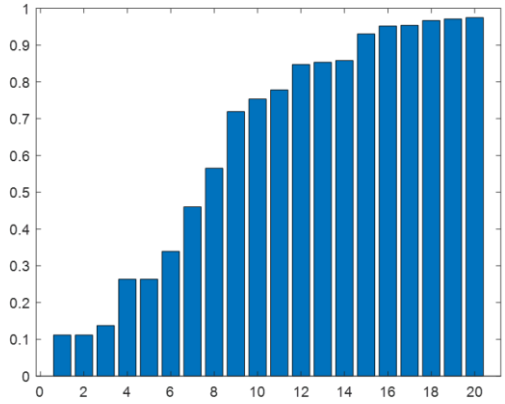
[46] Further methodology of reverse CFLST is described in IMF (2022) Mexico: Financial Sector Assessment Program-Technical Note on Systemic Risk Analysis and Stress Testing.

Figure 25. Euro Area: Results of the Reverse Cash Flow-Based Stress Tests

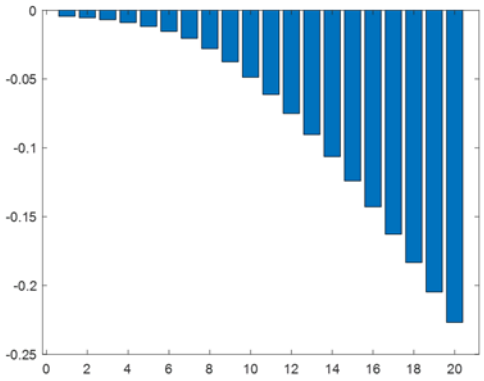
Only after the 13th iteration the systemwide CBC becomes negative.



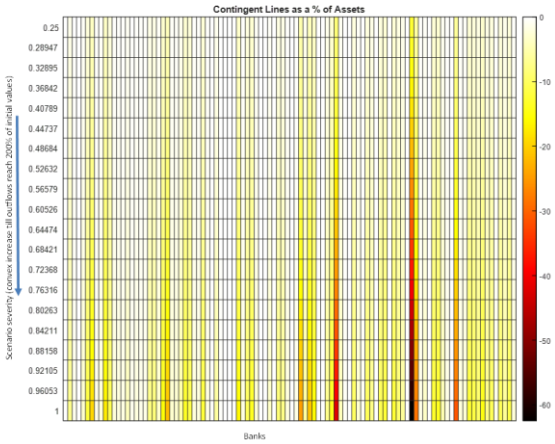
The threshold of 20 percent of failing banks assets in terms of total assets is reached after 4th iteration due to some large banks with negative CBC…



… yet CBC shortfall of liquidity is modest at 1 percent of total assets.



Some of the banks which are mostly affected have significant outflows due to contingent liquidity.



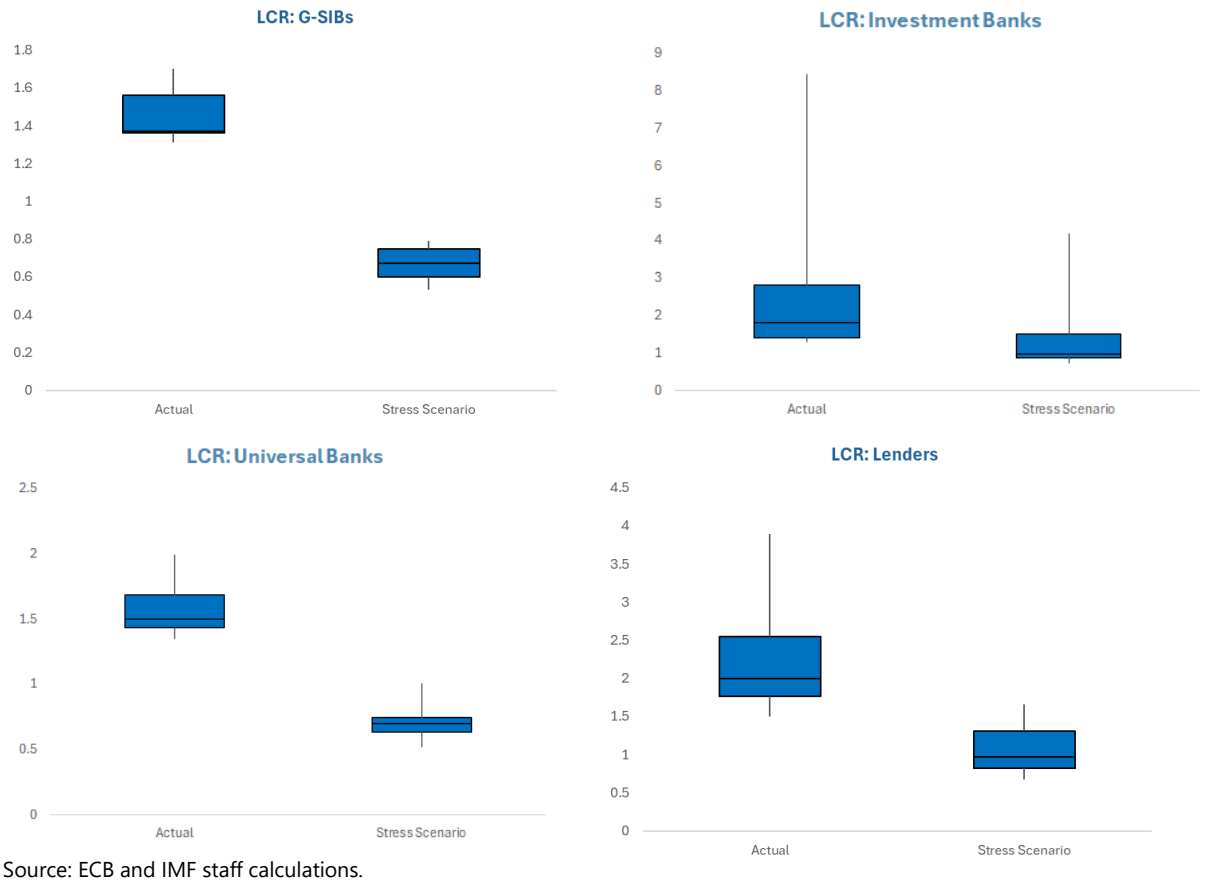
Sources: IMF staff calculations.
Note: In the top two panels, the X axis shows the number of discrete steps for the increase in stress parameters, with a value of 20 denoting twice the magnitude of the initial shock. The Y axis shows the systemwide CBC in EUR (top left panel), and the share of total bank assets with negative CBC (top right panel), The left bottom panel shows the CBC shortfall for banks with negative CBC, as a share of total bank assets. The right bottom panel shows the share of contingent lines relative to assets (right Y-axis) when the scenario severity is increased gradually in 20 stepwise increments with a value of 1 denoting twice the magnitude of the contingent lines reported in the LCR (left Y-axis), and the X axis denotes each individual bank in a random order.

D. LCR Stress Tests

99. LCR stress tests reveal that banks with a significant share of retail funding are most affected by the severe deposit outflow scenario (Figure 26). The FSAP used outflow parameters from the cash flow severe idiosyncratic stress scenario 2 to test if banks would fall below the targeted minimum (120 percent) and minimum (100 percent) ratios. Full HQLA was assumed, with haircuts based on the geopolitical solvency scenario (no additional haircuts). Results reveal that the impact on the aggregate LCR would be significant and the median LCR declines by 80 percentage

points with many banks falling below the minimum ratio as well as some falling close to 0 in line with CFLST results. G-SIBS and universal banks are most affected by the shocks. At the same time, investment banks and lenders maintain a median LCR close to 100.

Figure 26. Euro Area: LCR-Based Stress Test Results[1/]

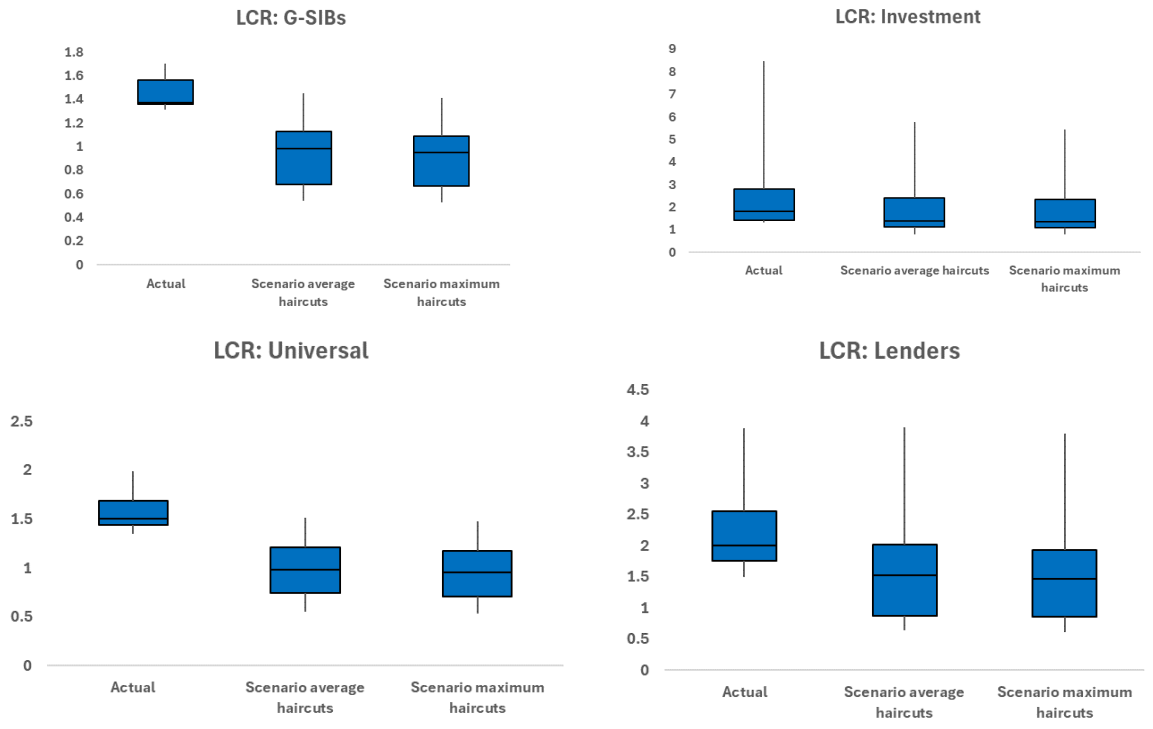


Source: ECB and IMF staff calculations.
Note: The box and whiskers represent the 10th, 25th, 50th, 75th and 90th percentiles.
1/ Banks which have LCR close to 0 are excluded from the charts due to confidentiality preserving data aggregation.

100. Stressed haircuts from the NBFI system-wide stress test were used to shock HQLA in the LCR (Figures 27-29). The NBFI system-wide stress test calculated *endogenous* stressed haircuts by stress testing NBFIs under two horizons: 2 days and two-week shocks.[47] Since direct application of granular haircuts (bank and asset specific) were not possible, LCR sensitivity analysis used aggregated (by HQLA category) haircuts with two different assumptions: i) average per HQLA category; and ii) maximum per HQLA category. The results show that applying LCR based parameters to inflows and outflows and shocking just HQLA leads to a modest decline in LCR with little difference between average and maximum haircuts. The impact differs across different business models, with a larger relative impact on G-SIBs and universal banks.

[47] Technical Note on "Systemic Risk Analysis – NBFI".

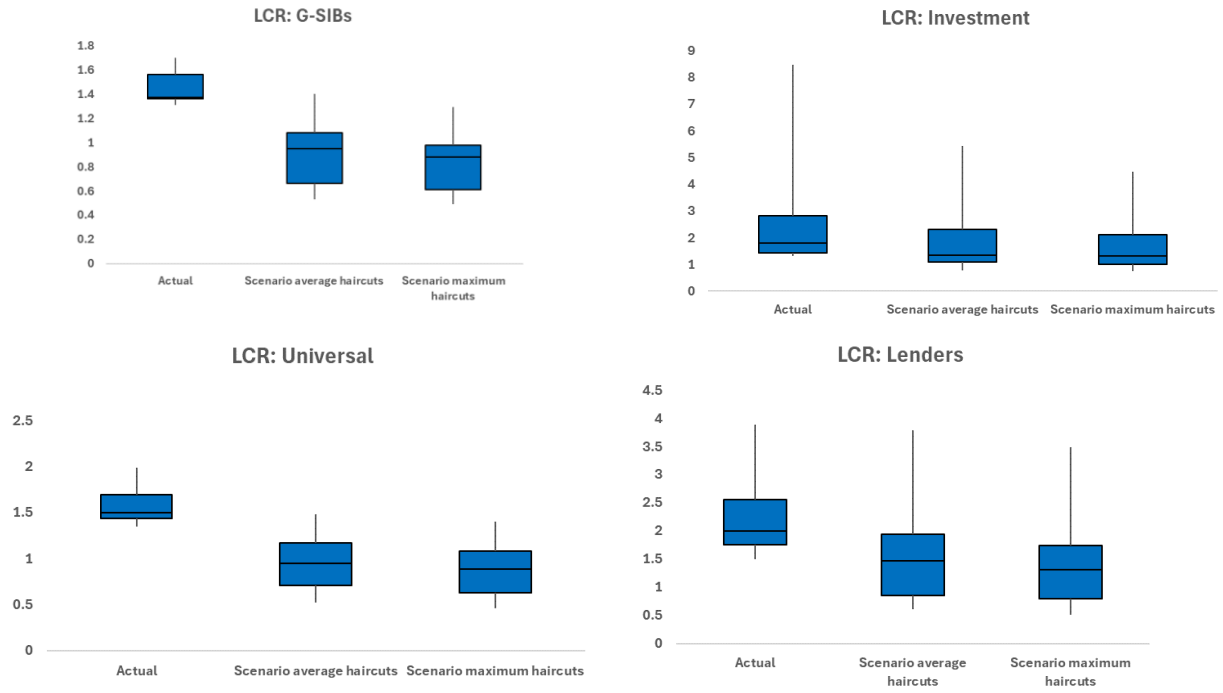
Figure 27. Euro Area: LCR. Impact of Stressed Haircuts from NBFI Liquidity Analysis (2-day Scenario)



Source: ECB and IMF staff calculations.
Note: The box and whiskers represent the 10th, 25th, 50th, 75th and 90th percentiles. Stressed haircuts from forced sales by NBFIs to meet their liquidity demands (TN on Systemic Risk Analysis – NBFI) are applied to the HQLA of the LCR.

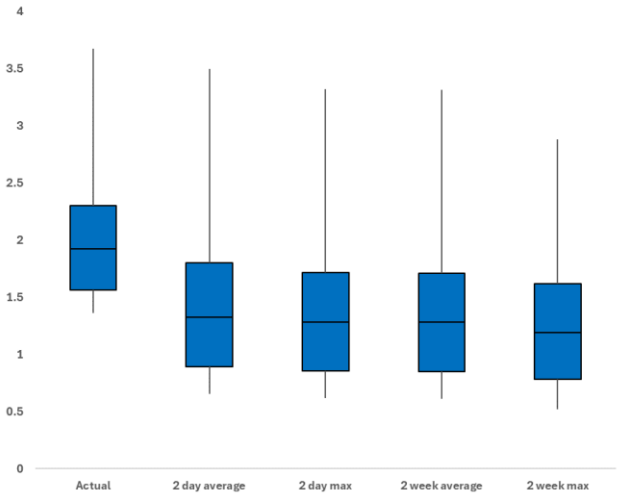
101. Overall results suggest that multiple banks would fall below the 120 percent LCR target, and some banks would fall below the 100 percent LCR requirement (Figure 29). Adding the impact of forced sales by stressed NBFIs on valuation haircuts to the LCR scenario, the aggregate LCR could decline by almost 50 percentage points. There is little difference between results using 2 day and two-week haircuts.

Figure 28. Euro Area: LCR. Impact of Stressed Haircuts from NBFI Liquidity Analysis (2-week Scenario)



Source: ECB and IMF staff calculations.
Note: The box and whiskers represent the 10th, 25th, 50th, 75th and 90th percentiles. Stressed haircuts from forced sales by NBFIs to meet their liquidity demands (TN on Systemic Risk Analysis – NBFI) are applied to the HQLA of the LCR.

Figure 29. Euro Area: Overall Impact of LCR Sensitivity Analysis



Sources: ECB, and IMF staff calculations.
Note: The box and whiskers represent the 10th, 25th, 50th, 75th and 90th percentiles. Stressed haircuts from forced sales by NBFIs to meet their liquidity demands (TN on Systemic Risk Analysis – NBFI) are applied to the HQLA of the LCR.

E. Recommendations

102. ECB and SSM could enhance their liquidity risk analysis by taking a forward-looking view to measure contingent liquidity risks stemming from market valuation changes in SFTs, derivatives, and other market exposures. Key liquidity risks include contingent outflows and unexpected flows from interlinkages between banks and NBFIs. Under stressed market conditions, banks can be subject to outflows higher than those calibrated in the LCR regulation which uses a backward-looking approach. The increasing role of NBFIs, collateral swaps, and digitization of bank operations require a nuanced calibration of potential liquidity shocks as well as parameters of liquidity stress tests. It is recommended that ongoing efforts to quantify CCR and liquidity risks under stressed market conditions be continued. This should involve the use of counterparty-level data and the estimation of amplification effects as they propagate through the network of exposures, as outlined by Barbieri et al. (2025).

103. Internal liquidity risk analysis conducted by SSM using updated stress parameters could provide guidance to banks on the quantification of outflows from own credit rating downgrades by defining types of outflows and minimum outflow rates to address shortcomings observed in the 2019 ECB Sensitivity Analysis of Liquidity Risk. In analyzing banks' liquidity profile, SSM supervisors assess the reduction of secured and unsecured wholesale funding, the correlation between funding markets and diversification across different markets as well as additional contingent off-balance sheet exposures, FX convertibility and access to foreign exchange markets estimates of future balance-sheet growth; due to reputational risks, an implicit requirement for the institution to roll over assets and to extend or maintain other forms of liquidity support. At the same time when assessing liquidity and funding risks as part of the SREP, determining the P2R and when conducting supervisory liquidity stress tests own rating downgrade outflows are typically based on collateral outflows or additional margin calls which may be low in banks with a small trading book or limited covered bond issuance. Yet a rating downgrade may affect their wholesale funding including outflows from operational deposits when counterparties aim at reducing their exposure. Using recent events in the USA and Switzerland, the outflow rates could be recalibrated to harmonize assessment of impact from own credit rating downgrade in SSM SREP and ECB systemwide liquidity risk analysis.

104. FX funding risks could be better measured by harmonizing granular reporting templates by counterparty, collateral and concentration. FX (e.g., USD) funding data are collected in LCR (Corep) templates, with some additional data available in Finrep. Yet the counterparty level data collection is not harmonized beyond LCR FX funding concentration templates. It would be beneficial to harmonize the collection of granular supervisory data by counterparty, rating, type of transaction, and collateral, using a proportional approach. Although incorporating this information in Implementing Technical Standards (ITS) reporting would be time-consuming, integrating it into the STE could be more efficient.

SOLVENCY-LIQUIDITY INTERACTIONS AND BUSINESS RISK

A. Motivation

105. The banking turmoil of March 2023 brought into question the timeliness of regulatory liquidity ratios in detecting early signs of stress. The BIS (2024) noted that liquidity supervision might need to evolve by considering the specific features of banks' business models. Also, it asked whether regulatory monitoring should leverage other sources of information, including high-frequency data. The BIS further questioned whether liquidity stress tests adequately consider banks' ability to monetize their liquid assets and the potential interactions with other risks, including concentration risks and their capital position. The turmoil also made clear the importance of monitoring liquidity risks at a shorter horizon than the 30-day envisaged by the LCR. The speed and scale of deposit outflows for distressed banks in March 2023 suggest that banks may not be able to rely on an extended window of time (30-day) to address liquidity pressures. A shorter horizon, 2-days or 2-weeks may be more appropriate considering potential liquidity pressures from margin and collateral calls amid acute market shocks.

106. The failure of Credit Suisse revealed that concerns over business model sustainability can trigger massive outflows. Business risk[48] played a key role in the failure of the bank. This could be an important channel of stress, particularly for global banks that generate income through prime brokerage business, capital market activity, and wealth/asset management activities.[49] Credit Suisse's downgrade in November 2022 increased its borrowing costs and limited its ability to access short-term funding markets, while at the same time affecting its ability to retain clients. Rating agencies emphasized profitability concerns in their rating downgrade actions (whereas solid capitalization was highlighted as a 'credit strength' factor).[50] However, there are no capital requirements associated to business risk in Pillar 1 capital ratios. While the SSM conducts business model assessments as part of the SREP process to evaluate the viability and sustainability of banks,[51] stress testing practices do not include business risk when assessing bank resilience.[52]

[48] Business risk refers to the risk of reduced revenues, in particular due to a drop in business volume or client activity.

[49] SNB (2023) reports a decrease in the capital market business of investment banking of Credit Suisse of over 70 percent in 2022, while transaction-based income in wealth management dropped by over 20 percent. This contributed significantly to the negative income posted by Credit Suisse in 2023 (CHF 7.2 billion) which raised concerns over the sustainability of the business model.

[50] In its credit opinion on Credit Suisse Group AG following the November 2022 downgrade, Moody's highlighted the large financial losses in 2022, and its projected negative/weak profitability in 2023-25 as drivers of its rating action.

[51] In the SREP process, viability and sustainability of business model is defined as the capacity of the bank to generate satisfactory returns over a 12-month and a 3-year horizon, respectively. Business model assessment contributes to the overall SREP score and hence to calibrating Pillar 2 requirements.

[52] Solvency stress test practices assume a static balance sheet (see Section 2).

107. CCR has been identified as a key vulnerability in the ECB Banking Supervision: SSM supervisory priorities for 2024-2026 (ECB, 2023a). The SSM highlighted that tighter financing conditions and high market volatility amplify risks for highly leveraged NBFIs, especially those with large derivatives positions. This is evidenced by market events in recent years that revealed how leveraged positions and liquidity strains in NBFIs can transmit stress to banks in the form of counterparty credit losses. In March 2021, several global banks incurred large losses due to the collapse of family office Archegos. Credit Suisse suffered the biggest loss, amounting to over USD 5 billion. Other liquidity events, including the March 2020 dash-for-cash, the commodities market turmoil in February 2022, and the September 2022 liability-driven investment crisis in the UK have shown how the inability to satisfy margin and collateral calls could trigger the default of NBFIs and/or prompt them to sell in a downward market amplifying the initial market shock.

B. Modeling Approach

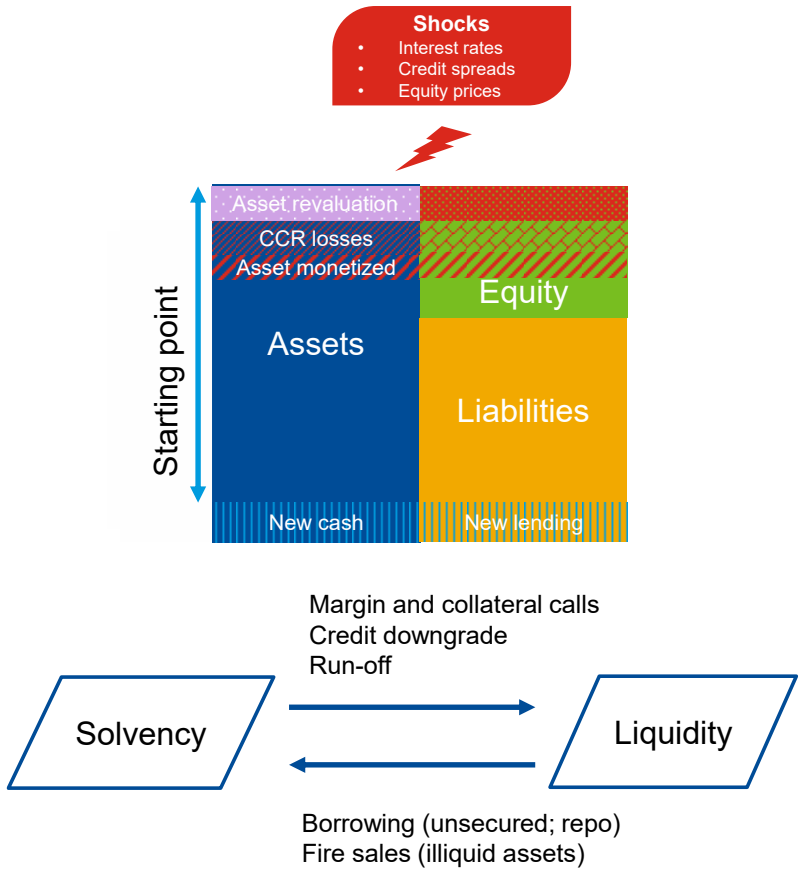
108. To shed light on the significance of these issues in the euro area, the FSAP conducted a joint stress testing framework for solvency and liquidity, taking a forward-looking view of liquidity risk, business risk and CCR. [53] Liquidity and solvency are two strongly interrelated features of the asset/liability structure of banks. Most liquidity shocks arise *endogenously* from balance sheet positions or concerns over business model sustainability. For instance, Credit Suisse suffered sustained client or franchise impairment in 2022 (prior to its failure in March 2023) leading to large deposit outflows. Therefore, rather than modeling solvency and liquidity stress separately, we integrate the mechanisms through which they interact and amplify shocks, using a two-week and a two-day scenario, respectively. The exercise tests bank resilience to a combination of solvency risk and *endogenous* liquidity risk in a market shock scenario, taking into account defaults from vulnerable counterparties in derivatives transactions (see TN on Systemic Risk Analysis – NBFIs). The analysis is on a short-time horizon as liquidity stress tends to be short-lived. We adopt a forward-looking view on business model risks by factoring in potential credit downgrades that could trigger deposit outflows and limit access to unsecured funding. In addition to capturing solvency-liquidity dynamics, the model links market shocks (Section 2) with LCR (Section 3) and NBFI CCR (TN Systemic Risk Analysis – NBFI) to form an overarching and consistent view. The analysis is conducted on the seven EA G-SIBs using supervisory data as of end-2024.

109. Figure 30 illustrates the interplay between solvency and liquidity risk, based on the framework by Cont, Kotlicki, and Valderrama (2020). The stress scenario involves shocks to interest rates, credit spreads, and equity prices across markets. Solvency is hit first through fair value losses (purple dotted area). Defaults by vulnerable derivative counterparties trigger CCR losses (purple lined area), further eroding profitability. Simultaneously, market shocks reduce the value of derivatives and collateral, prompting margin and collateral calls. In a market stress environment,

[53] Sydow, M.et al (2024) quantify solvency and liquidity interactions across sectors (banks, funds, insurers) leveraging on highly granular data on bilateral exposures. Our modeling approach uses information on aggregate portfolios but incorporates CCR losses (including from a NBFI liquidity stress test based on transaction level data) and business risk. Barbieri et al (2025) uses counterparty-level data to estimate the propagation of CCR through the network of bank exposures.

liquidity pressure intensifies as (non-maturing) deposits run off (at the run-off rates prescribed in the LCR) adding to contractual net cash outflows (*systematic* factor). The initial capital loss raises leverage, increasing downgrade risk. A downgrade can cut off unsecured funding, weaken investor confidence and trigger further deposit outflows, amplifying the stress (*idiosyncratic factor*).

Figure 30. Euro Area: Solvency-Liquidity Risk - Transmission Channels



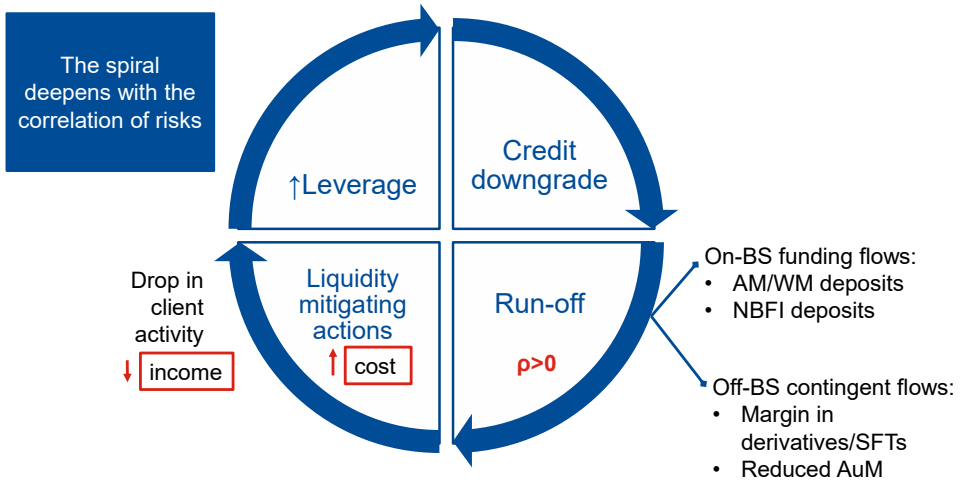
Source: IMF staff elaboration.

110. The speed of the solvency-liquidity spiral increases with the correlation of shocks (Figure 31). G-SIBs stand out given their interconnections with financial markets, including through derivatives and SFTs, and their exposures to institutional, credit-sensitive, counterparties including NBFIs. Also, most of them generate fee and commission income from asset management (AM), wealth management (WM) activities, as well as from trading activities. Crucially, while in normal times, their diversification of income sources may help cushion shocks, in a severe market scenario, it may introduce correlations between balance sheet funding structures (e.g., high value deposits related to AM/WM), and off-balance-sheet items e.g., liquidity needs related to market valuation changes on derivatives and SFTs,[54] or reduced asset under management (AuM) inflows. These

[54] While the LCR regulation assumes outflows related to market valuation changes in collateralized transactions, the calibration is backward-looking and pro-cyclical – measured by the largest net 30-day collateral flow realized during the preceding 24 months – and therefore does not capture margin and collateral flows in a market stress scenario. See Section III for a discussion of contingent liquidity risks in the EA.

linkages introduce *correlation risk* across profits, equity, leverage, and liquidity, potentially feeding a death spiral. Importantly, this correlation risk is not included in Basel capital/liquidity requirements.[55]

Figure 31. Euro Area: Solvency-Liquidity Risk – Correlation of Risks



Source: IMF staff elaboration.

C. Dynamics of Balance Sheets Under Stress

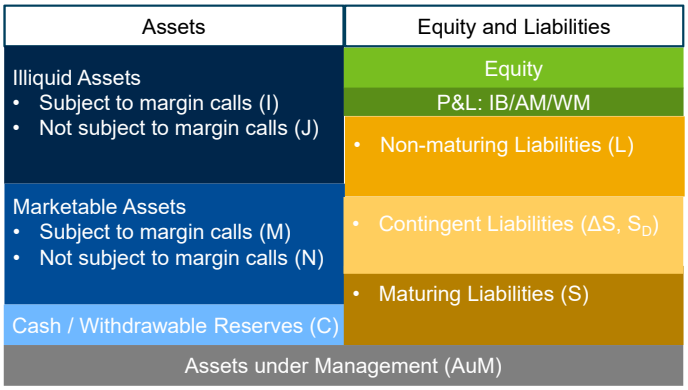
111. The modeling approach requires a granular balance sheet to model solvency-liquidity interactions (Figure 32). Assets need to be broken down in relation to their vulnerability to market shocks and liquidity risk as well as to their capacity to generate liquidity. Off-balance sheet items which generate income and/or liquidity shocks (e.g. AuM) need to be included. The sources of non-lending fees and commission fees need to be segmented by business line, including trading revenues from capital-based activities (securities, corporate finance), asset management fees, wealth management advisory/transaction-based fees, and payment services. Liabilities must be broken down into contractual flows, behavioral flows (e.g., non-maturing deposits), and contingent flows (linked to derivatives and SFTs, or to a credit downgrade).

112. To assess the impact of market shocks on equity, we first measure the change in fair value of the underlying positions. Consider the balance sheet depicted in Figure 32. Market shocks include shifts in risk factors across asset classes including interest rates (benchmark rates in EUR and USD across tenors, and credit spreads on sovereign/corporate bonds in Europe and the US) and equity prices (major indices in Europe, US, Asia, and Latin America). The calibration of the shocks corresponds to the geopolitical scenario generated for the solvency stress test (Appendix III. Table 5). Changes in market valuation are computed using a partial revaluation approach (see paragraph 33).

[55] Correlation risk is expected to be assessed as part of the SREP and may result in Pillar 2 measures. The Basel Framework does not require to determine capital requirements based on supervisory stress tests. Instead, like in peer jurisdictions (UK, US), supervisory stress tests are used to help calibrate (non-binding) capital buffers (P2G in the EA).

113. The quantification of CCR differs across scenarios. In the two-week stress exercise, CCR losses are driven by the default of the three most vulnerable counterparties (i.e., posting higher risk density) among the top 20 derivatives exposures (net of credit risk mitigation techniques), excluding qualifying CCPs, central banks, central governments, and international financial institutions (e.g., EBRD, World Bank, etc.).[56] In the two-day scenario, CCR is linked to the endogenously determined NBFI counterparty defaults projected in the system-wide liquidity analysis. Appendix VII describes the technical aspects of the model.

Figure 32. Euro Area: Stylized Balance Sheet for Solvency-Liquidity Analysis



Source: IMF staff elaboration.
Note: P&L denotes profit and loss; IB denotes investment banking; AM, asset management, and WM, wealth management.

114. Liquidity flows evolve with the stress scenario. In the model, obligations coming due at the end of the horizon include three components:

- *Unconditional flows*. They represent maturing liabilities and contractual outflows, with expected outflows for non-maturing liabilities (which account for most deposits) based on LCR calibration.
- *Contingent flows linked to margin and collateral calls*. For margined derivatives and SFT transactions, flows are linked to negative changes in the fair value of the position.
- *Contingent flows triggered by own credit downgrade*. A rating downgrade generates a run-off of credit sensitive deposits (e.g., high value deposits).

At the same time, liquidity reserves increase with scheduled contractual inflows.

115. Liquidity at risk (*LaR*) measures the net outflows corresponding to the stress scenario considered. *LaR* is a conditional concept, as it quantifies the total draw on liquidity resources of the bank *conditional* on the scenario, including the evolution of liquidity balances and maturing liabilities.

116. A bank facing a liquidity shortfall can raise liquidity through a series of mitigating actions. A liquidity shortfall emerges if liquid assets are not enough to cover net cash outflows. These mitigating actions are a source of liquidity that can be mobilized in a short time horizon, including:

[56] This is a similar approach to that followed in the 2025 EU-wide stress test methodology for market risk.

- *Unsecuritized borrowing in the interbank market.* The bank has access to short-term funding markets at the overnight market rate conditional on not being downgraded.

- *Repo borrowing*. The bank can raise liquidity by entering a repo with the central bank or a market counterparty. This requires the provision of unencumbered eligible assets.

- *Liquidation of assets ("fire sales").* A fraction of illiquid assets can be sold in the short term at a market discount.

117. While a bank's mitigating actions raise liquidity in a short timeframe, they are costly due to borrowing costs or forced sale of assets, further eroding bank capital. The cost of liquidity actions is shown in the pink lined area of Figure 30. The adverse dynamics between solvency and liquidity can push the bank into deep *insolvency*. At the same time, the amount of liquidity that can be generated under stress is limited. First, a bank with a weak capital position may be unable to renew maturing short-term funding and to access short-term funding markets. Second, the shock to the fair value of securities and the haircut applied to unencumbered assets limit the amount of liquidity that a bank can monetize in the short-term. Raising liquidity thus results in an amplification impact of the initial market shock on bank capital.

D. Parameterization of Model Inputs

118. Quantifying solvency and liquidity shocks requires four key inputs. First, *balance sheet data* with sufficient granularity to extract the categories depicted in Figure 32. Second, *risk parameters* include market risk sensitivities, model risk adjustments, and counterparty credit risk exposures. Third, *income data* with a breakdown by source (e.g., capital based, AM, WM). Finally, *liquidity data* information on CBC by instrument, asset encumbrance, and contractual cash inflows and outflows by type and time bucket. Appendix VII describes the mapping of regulatory solvency and liquidity templates to generate the inputs required in our framework.

119. Other model inputs are calibrated to the financial conditions and the regulatory environment prevailing at end-2024. Parameters include the short-term funding rates (unsecured; secured), the valuation haircut on repo transactions, the fraction of illiquid assets available for sale, the fire sales discount, the downgrade threshold, the share of credit sensitive flows, and the insolvency trigger.

- The market interest rate for unsecured borrowing is the Euro short-term rate (€STR) for wholesale euro unsecured overnight borrowing costs.

- The repo rate for market repo transactions (applied to tradable assets) is the overnight general collateral (GC) repo yield – as most tradable assets of banks' CBC is GC.

- The repo rate for central bank borrowing (applied to non-tradable assets eligible for central

bank operations) is the main refinancing operations (MRO) interest rate.

- The haircut applied to eligible collateral depends on the composition of the CBC. The categories in each bank CBC (i.e., level 1, level 2A, level 2B, other tradable assets, non-tradable assets eligible, own issuances eligible) are mapped to the valuation haircut levels by instrument applied in the implementation of the Eurosystem monetary policy framework (ECB, 2022). Table 5 shows that banks differ crucially in the quality of their CBC and therefore on their ability to monetize liquid assets (estimated effective haircut rates range between 5.0 and 9.7 percent across G-SIBs).

Table 5. Euro Area: Solvency-Liquidity Interactions: Model Parameters
(Percent)

Unsecuritized rate (interbank)	2.91
Repo rate (market)	3.00
Rep rate (CB)	3.15
Effective repo haircut (bank specific)	5.0-9.7
Fire sales discount	50.0
Fraction of illiquid assets eligible for sale	5.0
Downgrade threshold (bank specific)	4.10-4.35
Insolvency threshold (bank specific)	3.60-3.85

Sources: ECB and IMF staff calculations.

- The calibration of the fraction of illiquid assets and the fire sale discount follows Cont et al. (2020).
- The downgrade threshold is calibrated as a 50-basis points buffer over the bank-specific minimum regulatory leverage requirements, i.e., "distance to default buffer".
- The share of credit sensitive outflows is calibrated by applying LCR run-off rates to non-maturing deposits and contractual outflows maturing within the scenario horizon. These outflows are triggered when the bank breaches the *distance to default buffer*.
- A bank fails due to *insolvency* when it breaches its regulatory leverage requirements. The minimum regulatory leverage ratio includes Pillar 1, Pillar 2R, and G-SIB add-on.
- A bank fails due to *illiquidity* when maturing liabilities and liquidity demands exceed the bank's capacity to raise liquidity.

E. A Range of Scenarios

120. To address model uncertainty and measure the sensitivity of results around key inputs, we generate multiple scenarios. For the two-week exercise, we include the following scenarios:

- *Reference scenario*. This scenario includes the geopolitical market shock scenario considered in the solvency stress test (Annex III. Table 5) and the parameterization described above.
- *"Credit sensitive" scenario*. Because of a downgrade, the run-off rate of credit sensitive deposits in higher than in the reference scenario. Specifically, for "deposits subject to higher outflows" (e.g., high value deposits), the run-off rate increases to 20 percent (from the 13 and 18 percent

rates prescribed in CRR and assumed in the reference scenario). For operational deposits not covered by a deposit guarantee scheme, the run-off rate increases to 40 percent from 25 percent in CRR. In addition, counterparties in over the counter (OTC) derivatives trigger *initial margin* (IM) calls by 20 percent of the bank IM collateral posted in margined transactions.[57]

- *"Business as usual" scenario.* We assume maturing loans are rolled over during the stress horizon, reflecting realistic behavior beyond contractual maturities. The Credit Suisse crisis showed that stressed banks often continue lending to project strength to regulators and markets.

- *Narrow collateral scenario.* The Eurosystem has a broad collateral framework for credit operations which includes non-tradable instruments. This scenario assumes that eligible credit claims and eligible own issuances become ineligible.

- *"Trapped liquidity" scenario* Another lesson from the Credit Suisse failure is that there may be liquidity in individual entities that is recognized in the consolidated regulatory ratio but is not available in the right location to cover outflows and cannot be easily transferred within the group (Swiss Federal Council, 2024). We proxy these types of obstacles in a scenario assuming that collateral in foreign currency becomes unavailable following a downgrade.

- *Business risk scenario.* This scenario assumes client attrition in investment banking and asset management activities prompted by credit risk concerns (i.e., when leverage exceeds the downgrade trigger) reducing fee income from capital-based and AM by 30 percent.[58]

121. To address uncertainty in CCR measurement, we apply alternative methods in the two-day scenario. CCR risks are more acute in short timeframes, as T+2 settlement limits illiquid counterparties' ability to raise cash by selling assets. To assess CCR losses on bank resilience, we consider the following scenarios::

- **"***No CCR"* scenario. The market shock scenario triggers portfolio valuation losses for fair value portfolios but excludes counterparty credit risk losses.

- **"***CCR measured as outright defaults" scenario.* This scenario assumes that the three most vulnerable counterparties among the 20 largest exposures default (losses are net of credit risk mitigation instruments), excluding qualifying CCPs, central banks, central governments, and international financial institutions.

- **"***CCR estimated from NBFI risks" scenario.* This scenario applies a bank-specific default rate on margined transactions. Using the same market scenario, the analysis estimates the default rates for each non-bank counterparty using transaction level data on derivatives and SFTs. The

[57] The calibration is in line with estimates drawn from market intelligence.

[58] This calibration is in line with the reduced flows on investment banking and wealth management experienced by CS in 2022.

average default rate is then applied to each bank's stressed effective expected positive exposure (EEPE) (see TN on Systemic Risk Analysis – NBFIs).

- **"***CCR estimated from NBFI defaults and Market Volatility" scenario.* This scenario combines CCR from NBFI defaults with a widening of credit spreads from heightened market volatility (i.e., raising borrowing rates by 2 percentage points).

122. To capture uncertainty in modeling market shocks, we conduct reverse stress testing for each scenario. Specifically, we generate a range of adverse scenarios parameterized by the severity of shocks to risk factors and identify critical amplitudes that can potentially lead to insolvency or illiquidity. This reverse stress testing approach requires the valuation of balance sheet components under each scenario. To simplify, we scale the impact of risk factors on balance sheet components linearly. Figures 33-37 show the reverse stress test results for a shock to interest rates and equity prices of up to 7 percent (y axis) and 50 percent (x axis), respectively. [59]

123. The reverse stress tests allow identifying the combination of shocks which can trigger a bank's failure. The orange/grey shaded plots in Figures 33-37 show four regions of bank performance under each scenario: the light grey color means "bank is solvent, liquid, with no borrowing action", the dark grey color means "bank is solvent, liquid, with borrowing action", the light orange color means "bank is liquid, insolvent, due to borrowing costs", and the dark orange color means "bank is liquid, insolvent, due to the size of the shock".

F. Results

124. Balance sheet dynamics under the reference scenario are visualized in the form of solvency-liquidity diagrams (Figure 33). This section reports aggregate results for selected EA G-SIBs with large repo and derivative exposures. The bottom left panel shows banks' equity in the horizontal axis and their liquidity resources on the vertical axis. A solvent and liquid institution corresponds to the upper right quadrant (where the X axis is partitioned around the insolvency trigger). A loss in asset value moves the initial position of the bank to the left. Due to the net cash outflows arising in the scenario, the position is pushed downwards. An adverse stress scenario leads to a "south-west" shift in the diagram with the slope representing the equity impact from market shocks and borrowing costs. The vertical shift shows the amount of net outflows around the downgrade trigger. The top left panel shows the results of the reverse stress test for a combination of interest rate and equity shocks. The results suggest that intermediate shocks (light orange region) may trigger bank insolvency due to the interaction between solvency and liquidity risk rather than through one channel alone. The top right chart shows that amplification effects from the solvency-liquidity nexus are highly non-linear and can exceed 100 percent of the initial market shock with the largest impact around the downgrade trigger. This is because borrowing costs from liquidity

[59] The two-dimensional plots show the reference OIS curve (EUR 1 year) in the y axis and the benchmark equity price index (EQ-Europe) in the x axis but the impact on balance sheet components includes all the risk factors described in Appendix III. Table 5 which are scaled linearly with moves to the plotted factors.

pressures increase significantly with a small increment of the market shock over the trigger threshold.

125. Combining a "credit sensitive" scenario with "business as usual" dynamics can expand failure regions (Figure 34). The top (bottom) left panel shows that the failure region (orange) moves "south-west" under the "credit sensitive" scenario (relative to the reference scenario). This implies that banks are more likely to fail for a broader combination of shocks. The orange region shifts further to the origin of the chart under the combined "credit sensitive" and "business as usual" scenario indicating higher probability of failure. For instance, banks could fail due to liquidity pressures for an interest shock reaching 3.5 percent or an equity shock of 45 percent (rather than 4 percent and + 50 percent, respectively in the reference scenario).

126. The amount of liquidity that banks can generate under stress decreases materially with changes to the Eurosystem collateral framework or with "trapped liquidity" (Figure 35). The distance to the X axis represents the amount of liquidity that can be raised by tapping unsecured markets, pledging unencumbered collateral, or selling illiquid assets at fire sales. The top left chart shows that the maximum volume of liquidity that can be generated reaches EUR 750 billion under a narrow Eurosystem collateral framework, while the top right chart shows a maximum of EUR 425 billion if FX collateral cannot be monetized under stress. This compares against EUR 900 billion of liquidity in the reference scenario.

127. The impact of "business risk" on solvency risk is similar to the effect of the "credit sensitive" scenario (Figure 35). The bottom left chart ("business risk" scenario) displays an orange region similar to that in Figure 34 (top left chart) which shows the insolvency area for "credit sensitive" flows. This implies that liquidity shocks and profitability shocks can have a comparable impact on solvency risk. Therefore, focusing on projecting P&L items in solvency stress tests ignoring liquidity pressures could underestimate banks' resilience.

128. In the two-day scenario, banks' resilience drops significantly when CCR losses are included (Figures 36-37). Results show that resilience varies significantly with the CCR measurement approach. Without CCR losses, even severe market and liquidity shocks are unlikely to cause insolvency (Figure 36, top left panel). However, including defaults from the three largest vulnerable counterparties raises default risk notably (Figure 36, bottom left panel). When CCR is defined as NBFIs failing to meet margin calls amid a sharp market shock (TN "Systemic Risk Analysis – NBFIs"), failure regions expand significantly (Figure 37, top left panel), especially under high interest rates and market volatility (Figure 37, bottom left panel).

G. Recommendations

129. Joint solvency-liquidity stress tests for G-SIBs highlight significant amplification risks from market shocks, confidence loss, and CCR. [60] Under severe but plausible shocks, failure risk rises due to higher borrowing costs from endogenous liquidity stress and franchise-driven business risk. While mitigating actions can ease liquidity pressure, they are costly and may trigger a downward spiral toward insolvency.

130. A forward-looking approach to liquidity risk and robust CCR measurement is key to assessing bank resilience. Enhancing LCR ratios with a conditional, granular "liquidity-at-risk" metric—based on balance sheet composition and behavioral flows—can help detect vulnerabilities before outflows occur. Including CCR losses, especially from vulnerable NBFIs, offers a more realistic view of resilience. Authorities could build on recent CCR stress testing efforts to quantify *endogenously* NBFI-driven CCR losses under a common scenario. [61] This requires taking a system-wide perspective in stress testing to identify intersectoral dependencies in terms of funding and liquidity across entities at entity and transaction level. This aligns with the ESRB's system-wide stress testing initiative and the May 2024 European Commission consultation on the adequacy of macroprudential policies for NBFI.

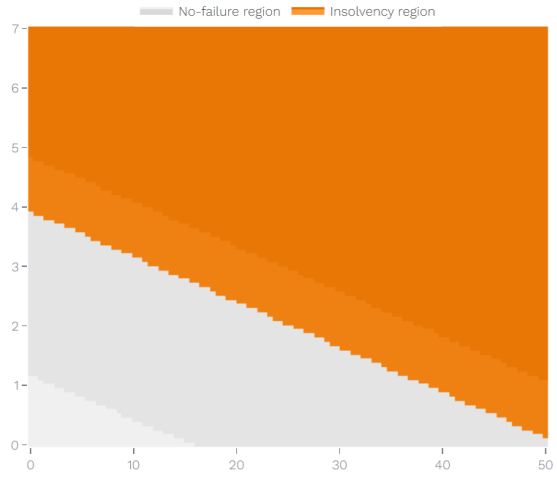
131. Reverse stress testing makes risk and uncertainty more explicit in stress scenarios and helps guide prudential policy. By calibrating shock severity, it identifies critical thresholds that could lead to insolvency. It also incorporates uncertainty around key parameters and behavioral responses to address model risk. Embedding such uncertainties into stress testing enhances policy relevance amid cyclical volatility and structural change.

[60] Under the CRR, banks are allowed to capture the effects of margining in derivative transactions when estimating EEPE subject to supervisory approval. For banks that report EEPE without taking into account any collateral held of posted by way of margin, the initial margin posted by the defaulted counterparty could absorb some of the CCR losses. See Article 285 of Regulation (EU) No 575/2013.

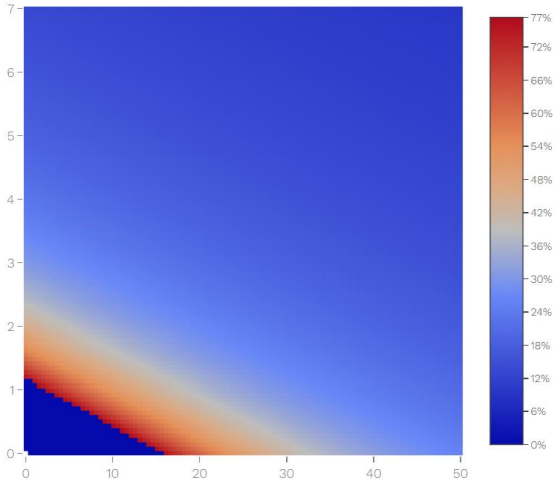
[61] Barbieri, C., Grodzicki, M., Halaj, G., and Pizzeghello, R. (2025), System-wide implications of counterparty credit risk.

Figure 33. Euro Area: Joint Solvency – Liquidity (2 weeks): Reference Scenario

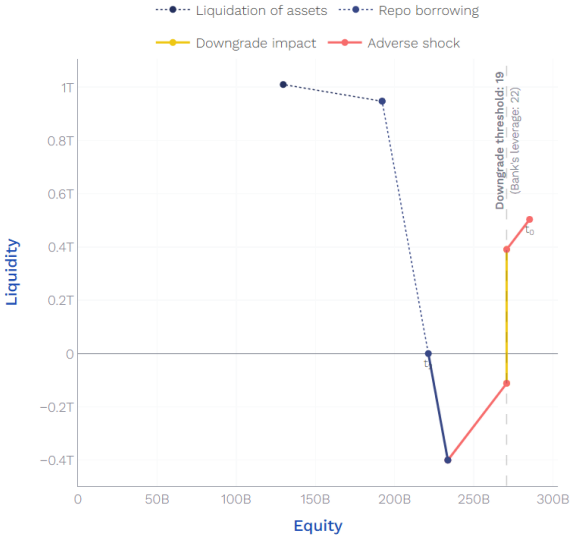
In a stress scenario, banks could be insolvent due to borrowing costs for severe combination of shocks (light orange region)



The loss amplification increases around the downgrade event



Repo borrowing would allow banks to mitigate liquidity pressures…



…but it would erode capital buffers

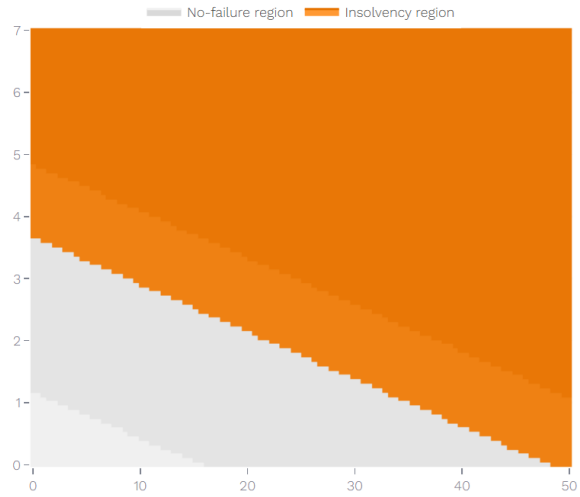
- *Under the market risk scenario, equity drops from EUR 285.3 to 221.3 billion*
- *Liquidity at risk stands at EUR 903.7 billion*
- *The amount of liquidity borrowed reaches EUR 400 billion*

Sources: IMF staff calculations.

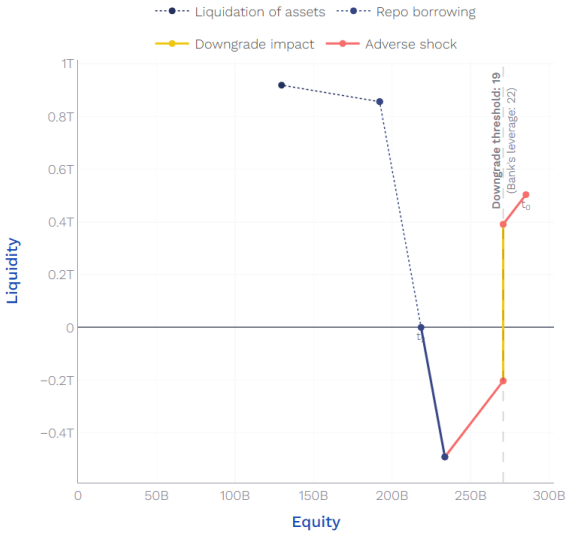
Note: Results are aggregated for selected G-SIBs. The top left panel shows the bank failure regions for shocks to the benchmark market rate ranging between 0 and 7 percent (EUR 1 year OIS; y axis) and between 0 and 50 percent for the reference equity index (EQ-Europe; x axis). The colored areas show four regions of bank performance: the light grey region implies "bank solvent, liquid, with no borrowing action", the dark grey region shows "bank solvent, liquid, with borrowing action", the light orange region depicts "bank liquid, insolvent, due to borrowing costs, and the dark orange region denotes "bank liquid, insolvent, due to the size of the shock". The top right panel shows the amplification effect due to *endogenous* liquidity shocks on bank capital. This effect is quantified by the ratio of the capital depletion due to funding costs to the initial shock to equity multiplied by 100. The bottom left panel illustrates solvency-liquidity diagrams for the market shock described in the reference scenario (Annex III. Table 5) with t (in the x axis) denoting the final point of the simulation. The remaining liquidity that can be monetized is depicted by the two dashed lines: the steeper dashed line represents "Repo borrowing" while the flatter dashed line represents "Liquidation of assets".

Figure 34. Euro Area: Joint Solvency – Liquidity (2 weeks): "Credit Sensitive" flows vs "Business as Usual"

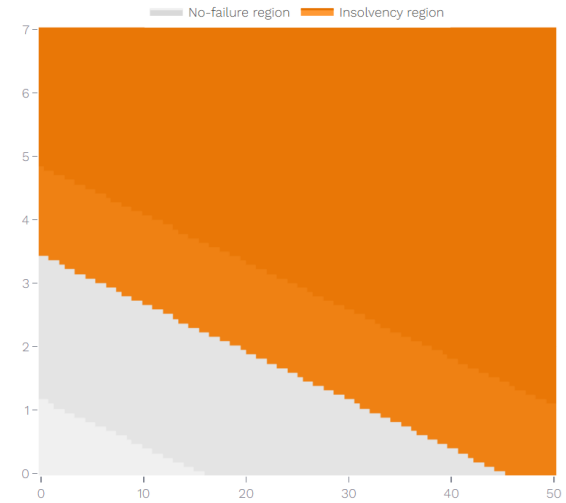
Higher outflows from credit sensitive depositors and higher IM in derivative transactions ("credit sensitive" scenario) expand the region of insolvency…



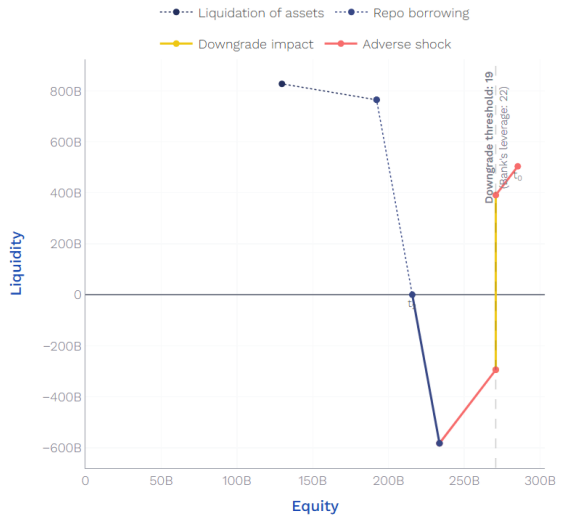
…and reduce the amount of liquidity that can be monetized



Rolling over maturing loans ("business as usual") would increase the likelihood of insolvency…



…and constrain further the amount of cash that can be mobilized

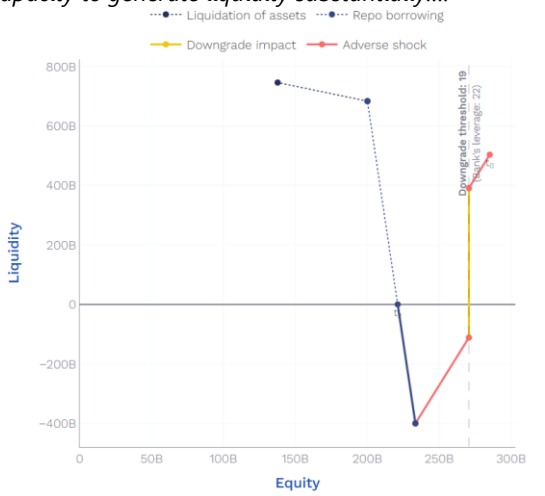


Sources: IMF staff calculations.

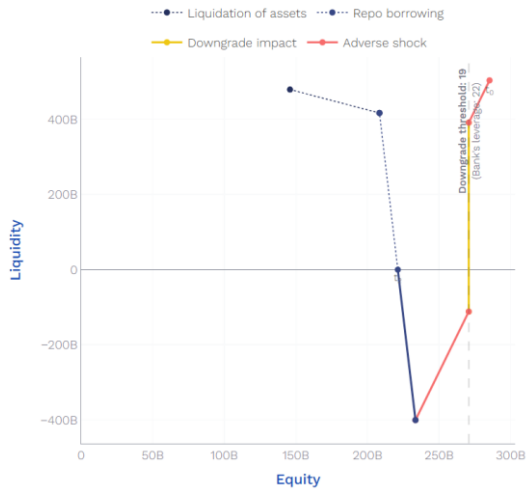
Note: Results are aggregated for selected G-SIBs. In the 'credit sensitive' scenario: (i) the run-off rate of category 1 and 2 deposits increases to 20 percent (from 13, and 18, percent in the regulatory framework, respectively); (ii) operational deposits not covered by DGS are subject to a 40 percent (rather than 25 percent) run-off rate; and (iii) IM on collateral posted in margined transactions increases by 20 percent. In a 'business-as-usual' scenario, maturing loans are rolled over. The left panels show the bank failure regions for the "credit sensitive" and "business as usual" scenarios for shocks to the benchmark market rate ranging between 0 and 7 percent (EUR 1 year OIS; y axis) and between 0 and 50 percent for the reference equity index (EQ-Europe; x axis). The colored areas show four regions of bank performance: the light grey region implies "bank solvent, liquid, with no borrowing action", the dark grey region shows "bank solvent, liquid, with borrowing action", the light orange region depicts "bank liquid, insolvent, due to borrowing costs, and the dark orange region denotes "bank liquid, insolvent, due to the size of the shock". The right panels depict the corresponding solvency-liquidity diagrams with t (in the x axis) denoting the final point of the simulation. The remaining liquidity that can be monetized is depicted by the two dashed lines: the steeper dashed line represents "Repo borrowing" while the flatter dashed line represents "Liquidation of assets".

Figure 35. Euro Area: Joint Solvency – Liquidity (2 weeks): Narrower Collateral Framework, "Trapped Liquidity", and Business Risk

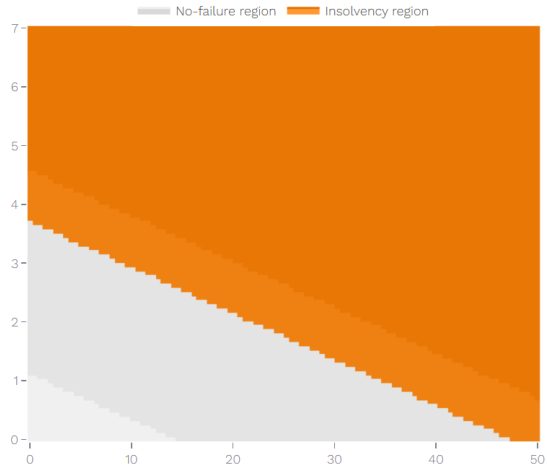
A narrower collateral framework would limit banks' capacity to generate liquidity substantially….



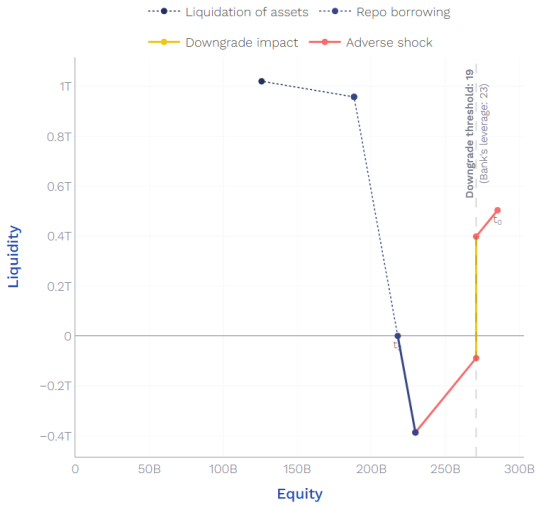
…but "trapped liquidity" in foreign currency would be more material



A reduction of fee and commission income from capital-based and asset management activities would increase the likelihood of insolvency…



…and contribute to banks' capital depletion.

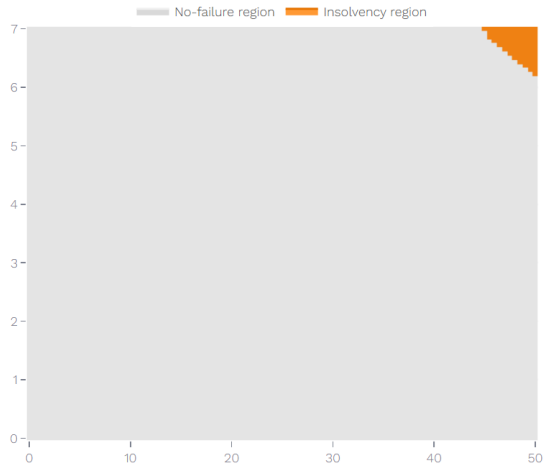


Sources: IMF staff calculations.

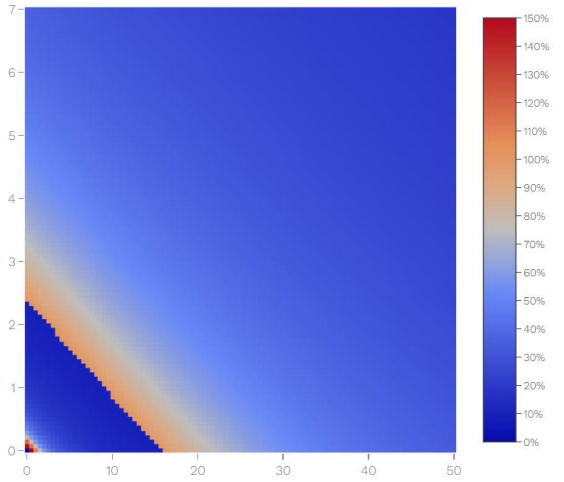
Note: Results are aggregated for selected G-SIBs. In the 'narrow collateral' scenario, credit claims and own issuances eligible for central bank credit operations become ineligible. In the 'trapped liquidity' scenario, collateral in FX becomes unavailable conditional on a credit downgrade. In a 'business risk" scenario, client attrition in investment banking and asset management activities reduce fee and commission income by 30 percent, conditional on a credit downgrade. The top panels show the solvency-liquidity diagrams of the reference scenario (Appendix III. Table 5) under a narrow collateral framework (left panel) and a "trapped liquidity" scenario (right panel) with t (in the x axis) denoting the final point of the simulation. The remaining liquidity that can be monetized is depicted by the two dashed lines: the steeper dashed line represents "Repo borrowing" while the flatter dashed line represents "Liquidation of assets". The bottom left panel shows the bank failure regions for the "business risk" scenario for shocks to the benchmark market rate ranging between 0 and 7 percent (EUR 1 year OIS; y axis) and between 0 and 50 percent for the reference equity index (EQ-Europe; x axis). The colored areas in the bottom left chart show four regions of bank performance: the light grey region implies "bank solvent, liquid, with no borrowing action", the dark grey region shows "bank solvent, liquid, with borrowing action", the light orange region depicts "bank liquid, insolvent, due to borrowing costs, and the dark orange region denotes "bank liquid, insolvent, due to the size of the shock". The bottom right panel depicts the solvency-liquidity diagram for the "business risk" scenario".

Figure 36. Euro Area: Joint Solvency – Liquidity (2-days): The Role of Counterparty Credit Risk

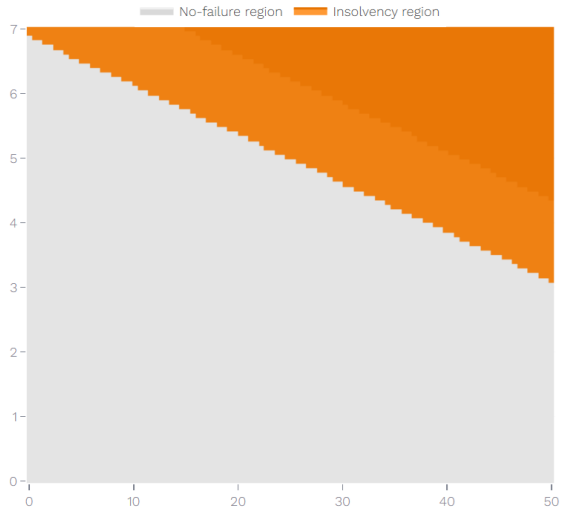
Banks are very resilient in the absence of CCR losses…



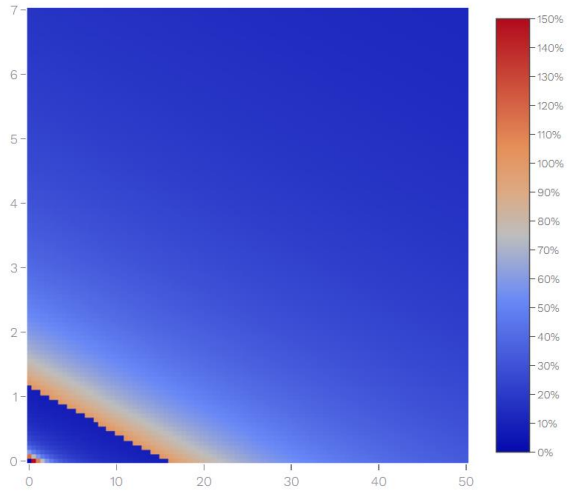
…although liquidity costs could amplify the initial market shock up to 150 percent.



CCR (default of three most vulnerable exposures among the largest twenty counterparties) could increase solvency risk significantly…



…with large amplification effects observed for small market shocks.

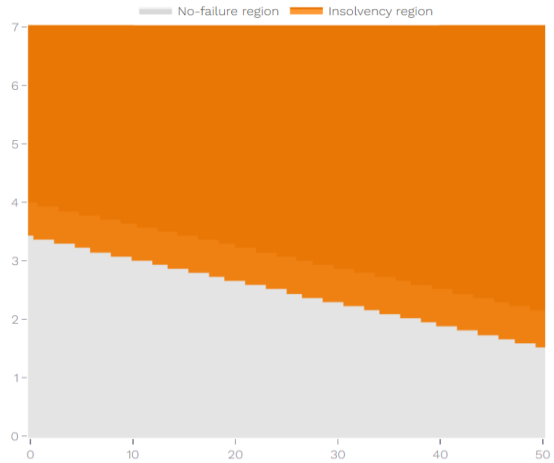


Sources: IMF staff calculations.

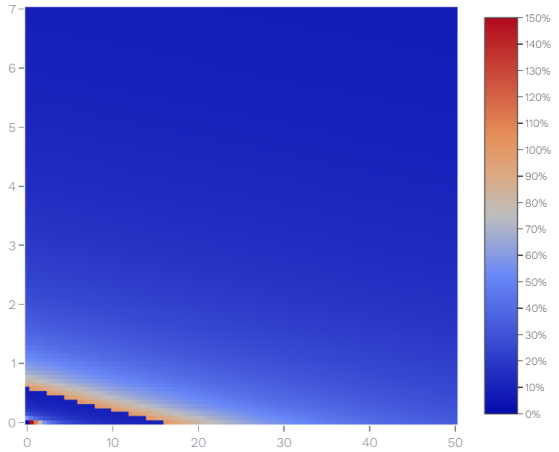
Note: Results are aggregated for selected G-SIBs. In the "No CCR" scenario (top panels), the market shock triggers portfolio valuation losses, but CCR losses are excluded. In the "CCR – outright defaults" scenario (bottom panels), the three most vulnerable counterparties among the 20 largest exposures in derivatives, default (losses are net of credit risk mitigation). The left panels show the bank failure regions for shocks to the benchmark market rate ranging between 0 and 7 percent (EUR 1 year OIS; y axis) and between 0 and 50 percent for the reference equity index (EQ-Europe; x axis). The colored areas in the reverse stress testing panels show three regions of bank performance: the dark grey region shows "bank solvent, liquid, with borrowing action", the light orange region depicts "bank liquid, insolvent, due to borrowing costs, and the dark orange region denotes "bank liquid, insolvent, due to the size of the shock". The amplification effect is quantified by the ratio of the capital depletion due to funding costs to the initial shock to equity multiplied by 100.

Figure 37. Euro Area: Joint Solvency – Liquidity (2-days): The Role of NBFIs and Market Volatility

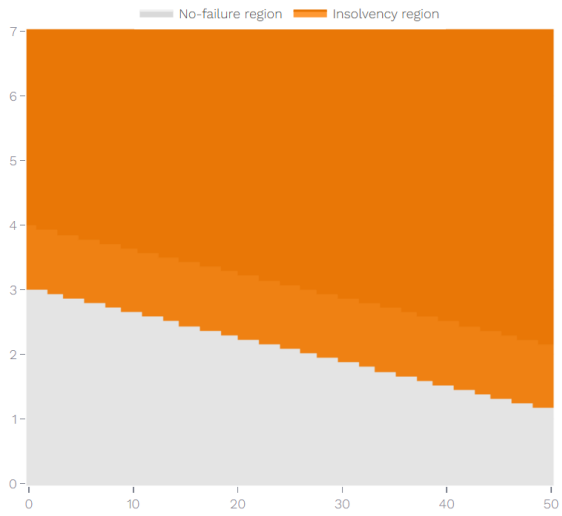
CCR losses from NBFIs (estimated in the system-wide liquidity stress test) could push banks into insolvency for moderate shocks…



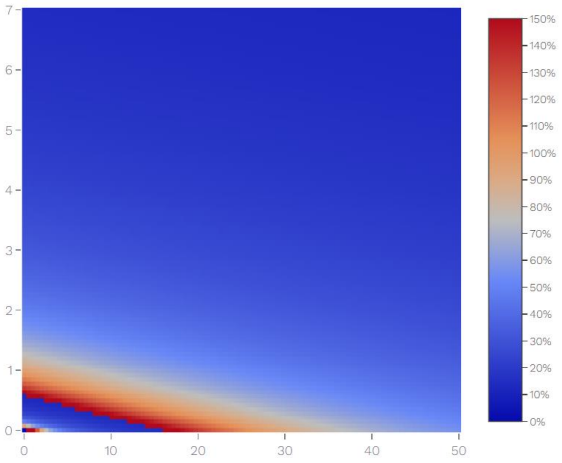
…and create significant amplification effects.



Adding wider credit spreads (two percentage points) from heightened market volatility could significantly increase credit risk…



…and create higher amplification effects for moderate shocks.



Sources: IMF staff calculations.

Note: Results are aggregated for selected G-SIBs. This scenario applies a bank-specific default rate to margined transactions drawing on the NBFI default rate projected in the system-wide stress test ("TN on Systemic Risk Analysis – NBFI"). The top panels show the bank failure regions and heatmap of amplification effects for the two-day scenario, while the bottom panels combine this scenario with higher funding costs from heightened market volatility, adding two percentage points to the funding rates observed in 2024. The left panels show the bank failure regions for shocks to the benchmark market rate ranging between 0 and 7 percent (EUR 1 year OIS; y axis) and between 0 and 50 percent for the reference equity index (EQ-Europe; x axis). The colored areas in the reverse stress testing panels show three regions of bank performance: the dark grey region shows "bank solvent, liquid, with borrowing action", the light orange region depicts "bank liquid, insolvent, due to borrowing costs, and the dark orange region denotes "bank liquid, insolvent, due to the size of the shock". The right panels show amplification effects quantified by the ratio of capital depletion due to funding costs to the initial shock to equity multiplied by 100. CCR losses may be partially offset by the initial margin posted by NBFIs, provided collateral is excluded from EEPE exposure.

NETWORK ANALYSIS

A. Scope

132. Analyzing the interconnectedness of the banking sector is essential for understanding how risks propagate within the network and for developing a comprehensive view on systemic risk. This section seeks to assess whether the banking sector is more likely to absorb or amplify severe shocks originating from within the euro area interbank market. In addition to the reference scenario, which simulates outright bank defaults and quantifies the potential for cascading effects throughout the network, the analysis also examines amplification effects from shocks originating from outside the banking sector. Specifically, it undertakes two additional exercises designed to capture risks stemming from NBFIs through banks' credit exposures and from heightened market volatility.

133. The dataset covers 72 SIs (out of 109), at the highest level of consolidation across 17 countries, representing about 90 percent of EA banking system assets as of June 2024. The ECB's COREP and FINREP supervisory data, including large exposure data reporting, is used to construct the euro area interbank network and quantify the systemic (contagion) risk embedded in the system. This yields 72 banking groups or nodes. The interbank network includes 61 lenders and 50 counterparties with a total of 377 exposures (or edges). While exposures vis-à-vis other credit institutions (i.e., the interbank network of large exposures) is the focus of the analysis in this section, the large exposures data also allows for exposures vis-à-vis NBFIs which would be used to analyze shocks originating from NBFIs.

B. Modeling Framework

134. The CoMap framework proposed by Covi, Gorpe, and Kok (2021) serves as the starting point for the contagion model used in this exercise. The CoMap framework uses a simulation approach to quantify the potential knock-on effects from the hypothetical default of an EA bank throughout the network of its exposures. The technical aspects of the model are described in Appendix VIII. To understand amplification effects due to the interaction of non-linear shocks under different market conditions we conduct scenario analysis. We consider three alternative scenarios.

Reference Scenario ("Baseline")

135. For the baseline analysis, model parameters are calibrated broadly in line with Covi, Gorpe, and Kok (2021). Key parameters include the loss given default, the funding shortfall rate, the net liquidity position, the pool of assets available for fire sales, the discount rate, and the hurdle rate. The relevant calculations and assumptions are shown in Appendix VIII.

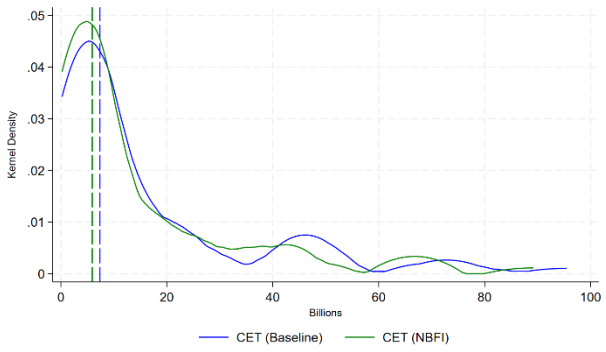
NBFI Risk Scenario

136. Vulnerabilities stemming from the NBFI sector might amplify risk propagation through the interbank network. To consider this concern,[62] flagged by the ECB (2023b; 2024) and IMF (2023; 2024), model parameters are recalibrated to lower the initial level of bank capital in line with banks' credit exposures to NBFIs. Specifically, CET1 capital is depleted to absorb losses from the defaults of the banks' top five NBFI credit exposures. Figure 38 shows the distribution of the CET1 capital across the baseline analysis and the NBFI risk scenario. To ensure that only exposures to leveraged or unregulated (or lightly regulated) NBFIs are reflected in this recalibration, insurance undertakings and pension funding are excluded. Thus, it renders a stylized scenario with lower initial bank capital than baseline as a starting point for the interbank analysis in the NBFI risk scenario.

Market Risk Scenario

137. Risks of extreme market volatility affecting NBFIs and in turn banks remain pertinent in an environment characterized by heightened geopolitical tensions and elevated market valuations. Financial market vulnerabilities, including from stretched valuations, could lead to bouts of market volatility in an uncertain policy environment (ECB, 2024; IMF, 2025), affecting NBFIs, and in turn, banks. NBFIs remain exposed to financial market volatility through their investments in corporate and sovereign securities. To understand how the interaction between market risks and NBFI risks could propagate through the interbank network, a second stylized scenario is calibrated. In addition to lower levels of initial bank capital owing to NBFI exposures as in the NBFI risk scenario, this third exercise includes fair value shocks to HQLA, and partial failures of credit risk mitigation instruments utilized by banks to reduce counterparty credit risk. Specifically, we apply a haircut of 10 percent on HQLA and 50 percent on credit risk mitigation instruments rendering a stylized scenario with lower liquidity surplus (or net liquidity positions) as well as higher net exposures, and consequently, higher loss given default than the baseline exercise. Figure 39 shows the distribution of the net liquidity positions and net exposures across baseline analysis and market risk scenario combined with NBFI risks, respectively.

Figure 38. Euro Area: Distribution of CET1 Capital

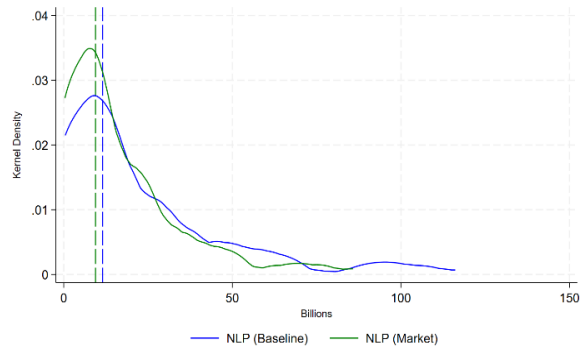


Source: ECB and IMF staff calculations.

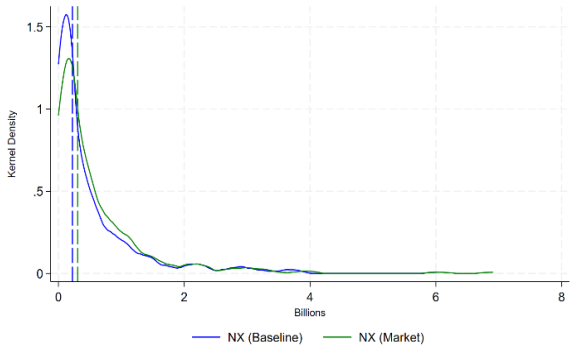
[62] In addition to the rapid increase in the size of the NBFI sector since the global financial crisis, recent events (such as the collapse of Archegos Capital Management which led to significant losses for several major banks) highlight the importance of monitoring risks in the NBFI sector.

Figure 39. Euro Area: Distribution of Net Liquidity Position and Net Exposure

Distribution of Net Liquidity Position
(Billion euros; 2024Q2)



Distribution of Net Exposures
(Billion euros; 2024Q2)



Source: ECB and IMF staff calcuations.

C. Results

138. Bank network analysis facilitates the assessment of each bank's potential to propagate systemic contagion in the event of its failure, as well as its susceptibility to defaults by other banks. The interbank analysis consists of a series of hypothetical defaults where the default of each entity is triggered iteratively. This iterative exercise allows to obtain two main outputs, the number of *defaults* caused by the "trigger event" and the *losses* incurred by each entity in the network in each simulation. Following Covi, Gorpe, and Kok (2021), *losses* in the simulations are used to construct two indices which rank banks according to their systemic risk contribution to financial stability in terms of potential contagion effects and to their degree of vulnerability to the EA banking system.

a. The contagion index (CI) is defined as system-wide losses induced by bank $\boldsymbol{i}$ in percent of total capital in the system (excluding bank $\boldsymbol{i}$) where L_{ji} is the loss experienced by bank $\boldsymbol{j}$ due to the triggered default of bank $\boldsymbol{i}$:

$$CI_i = 100\frac{\sum_{j\neq i} L_{ji}}{\sum_{j\neq i} k_{ji}} \quad \textbf{(5)}$$

b. The vulnerability index (VI) is defined as the average loss experienced by bank $\boldsymbol{i}$ across all simulation in percent of its own capital:

$$VI_i = 100\frac{\sum_{j\neq i} L_{ij}}{\sum_{j\neq i} k_i} \quad \textbf{(6)}$$

139. Combining the contagion and vulnerability indices help identify systemic risks in the EA interbank market. Scatter plots reported in Figure 40 combine information from both contagion

and vulnerability indices to produce systemic risk maps. Each dot on the scatter plot represents an individual bank, with the grey and red dashed lines corresponding to the median and 75th percentile of their distribution. For instance, the horizontal red dashed line identifies the 75th percentile of the distribution of the contagion index while the vertical red dashed line identifies the corresponding value for the vulnerability index. Banks located in the north-east corners, thus, are identified to be both highly systemic and highly vulnerable.

Baseline Analysis

140. The baseline analysis suggests that the risk of contagion through interbank exposures within the EA is currently low. Out of the 72 trigger events in our simulation, Table 6 panel A reports the top 10 hypothetical default events ranked in terms of contagion index, under the baseline parameterization. These top ten events induce, on average, 1.3 percent of capital losses to the euro area banking system with contagion transmitted entirely through credit losses. The results indicate that the risk of contagion through interbank exposures within the euro area is currently low when compared to the analysis undertaken by Covi, Gorpe, and Kok (2021) using 2017Q3 data. The top 10 events induce on average 2.5 percent of capital losses in their study, which is comparable to the most contagious event in our analysis. Moreover, in our baseline simulations, exogenous defaults do not lead to any additional defaults in the network.

141. However, the baseline exercise identifies two banks with the potential to amplify spillovers. Figure 40, panels A and B present the results from the baseline exercise disaggregated by bank business model. It identifies two banks with CI and VI scores above the 75th percentile. It further identifies six banks with high CI scores and three entities with high VI scores. The findings disaggregated by business model (panel A) suggest that G-SIBs have the potential to induce high system wide losses but do not appear vulnerable to shocks from within the euro area banking system. Meanwhile, highly vulnerable banks tend to be classified as universal or lenders. While French banks dominate the group of the most contagious banks, Italian entities form the major share among the group of the most vulnerable banks.

NBFI Risk Scenario

142. Bank-NBFI interlinkages, through banks' credit exposures, could amplify the propagation of stress through the interbank network. Results are based on an exploratory analysis which assumes the outright default of the five largest NBFIs. This contrasts with the estimated default rates using transaction level data described in the TN systemic risk analysis – NBFIs. The stylized scenario is this section helps us build the analysis of uncertainty around the potential vulnerability of market participants into the network analysis. As shown in Table 6 panel B, three events (i.e., events ranked 1, 2, and 6) among the top 10 hypothetical defaults under the NBFI risk parametrization result in one additional default in the network, respectively. The most contagious event leads to one additional default and 3.1 percent of capital losses. More importantly, the results from the simulation underestimate the capital losses, as the initial conditions were calibrated to lower banks' capital surplus resulting in lower total capital in the network. The capital losses to the system from the top ten exogenous default events, on average, remain broadly

comparable to the baseline results at 1.5 percent. As in the baseline, these losses are transmitted in the network entirely through the credit channel. Finally, results disaggregated by bank business model (Figure 40, panel B) and the country of their domicile are broadly comparable to baseline findings.

Market Risk Scenario

143. When NBFI risks are combined with increased market volatility, the risk of contagion through interbank exposures could be material. In a market risk scenario combined with NBFI risks, exogenous defaults of seven banks events (i.e., events ranked 1-8, except 4) in the system could induce eleven additional defaults in total, triggering, on average, 1.9 percent of capital losses to the euro area banking system (Table 3, panel C). The most contagious event under this scenario leads to three additional defaults and 4.4 percent of capital losses to the system. In terms of channels underlying contagion, once again, losses due to credit risk account for the entirety of the losses. The defaults are entirely triggered due to insolvency rather than illiquidity which deviates from Covi, Gorpe, and Kok (2021) and historical observation documented by Aikman et al. (2018). This could reflect the ample excess liquidity resulting from the measures undertaken by the Eurosystem during and after the COVID-19 pandemic.[63] Disaggregated results (Figure 40, panel C) remain robust.

D. Recommendations

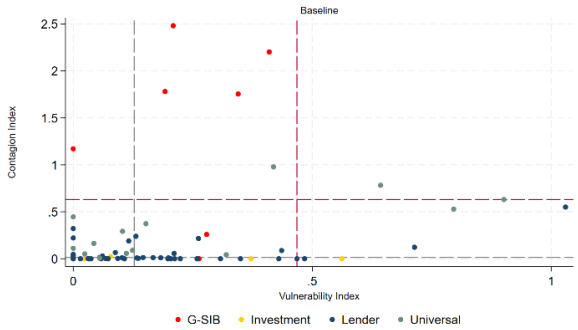
144. The risk of contagion through interbank exposures within the euro area is currently low. The interbank analysis confirms that banks' robust capital and liquidity positions underpin interbank resilience in the EA. In the baseline simulation, a bank's failure will not trigger cascading defaults through the interbank network, and the average size of losses of the top 10 events would amount to 1.3 percent of aggregate capital.

145. Risks from NBFIs and market volatility remain significant amplifiers of bank stress. A failure of the most systemic bank could trigger 4.4 percent capital losses and three cascading defaults. However, this interbank analysis likely understates contagion risk. It excludes banks' exposures to NBFIs, CCR from derivatives and SFTs, liquidity-related borrowing costs, and capital impacts from market volatility. The finding that contagion stems from insolvency—not illiquidity—should be viewed cautiously, as ECB balance sheet unwinding may reduce excess liquidity. Strengthening monitoring of bank–NBFI linkages using granular data and running network simulations, as shown by Barbieri et al. (2025), remains essential.

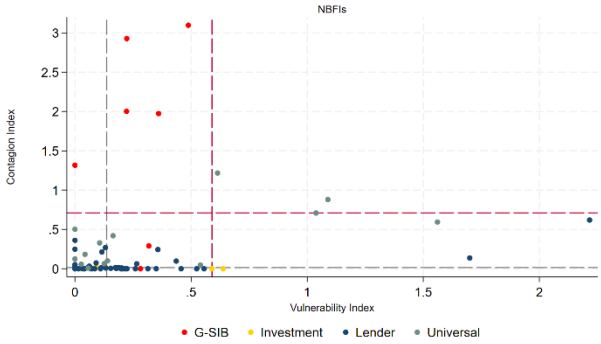
[63] Excess liquidity refers to the amount of central bank reserves held by commercial banks over and above minimum reserve requirements (Hudepohl et al., 2024).

Figure 40. Euro Area: Bank Network Analysis: Systemic Risk Maps

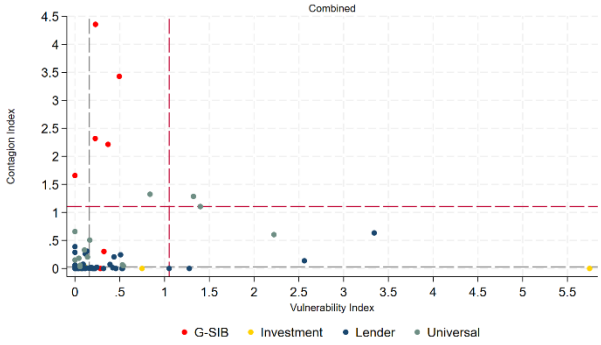
Panel A: Baseline Exercise by Business Model



Panel B: NBFI Risks Scenario by Business Model



Panel C: Market Risks Scenario by Business Model



Sources: ECB and IMF staff calculations.
Note: Contagion and vulnerability indices are not normalized as in Covi, Gorpe, and Kok (2021). Grey and red dashed lines correspond to the median and 75th percentile of their respective distribution.

Table 6. Euro Area: Bank Network Analysis: Contagion and Vulnerability Scores

Rank	Business Model	Contagion Index	Vulnerability Index	Total Defaults
Panel A: Baseline Analysis				
1	G-SIB	2.5	0.2	0
2	G-SIB	2.2	0.4	0
3	G-SIB	1.8	0.2	0
4	G-SIB	1.8	0.3	0
5	G-SIB	1.2	0.0	0
6	Universal	1.0	0.4	0
7	Universal	0.8	0.6	0
8	Universal	0.6	0.9	0
9	Lender	0.6	1.0	0
10	Universal	0.5	0.8	0
Panel B: NBFI Risk Scenario				
1	G-SIB	3.1	0.5	1
2	G-SIB	2.9	0.2	1
3	G-SIB	2.0	0.2	0
4	G-SIB	2.0	0.4	0
5	G-SIB	1.3	0.0	0
6	Universal	1.2	0.6	1
7	Universal	0.9	1.1	0
8	Universal	0.7	1.0	0
9	Lender	0.6	2.2	0
10	Universal	0.6	1.6	0
Panel C: Market Risk Scenario				
1	G-SIB	4.4	0.2	3
2	G-SIB	3.4	0.5	2
3	G-SIB	2.3	0.2	1
4	G-SIB	2.2	0.4	0
5	G-SIB	1.7	0.0	1
6	Universal	1.3	0.8	1
7	Universal	1.3	1.3	1
8	Universal	1.1	1.4	2
9	Universal	0.7	0.0	0
10	Lender	0.6	3.3	0

Sources**:** ECB and IMF staff calculations.

Table 7. Euro Area: Main Economic Indicators, 2021–2030[1/]

(Y/y percent change, unless otherwise specified)

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
				Est.	*Proj.*	*Proj.*	*Proj.*	*Proj.*	*Proj.*	*Proj.*
Demand and Supply										
Real GDP	6.3	3.5	0.4	0.9	0.8	1.2	1.3	1.3	1.2	1.1
Private consumption	4.7	5.0	0.5	1.0	1.0	1.2	1.4	1.3	1.2	1.1
Public consumption	4.4	1.1	1.4	2.8	1.7	1.4	1.0	1.0	1.0	1.1
Gross fixed investment	3.8	2.0	1.7	-1.9	1.4	1.6	1.6	1.8	1.5	1.3
Final domestic demand	4.4	3.4	1.0	0.8	1.2	1.3	1.4	1.3	1.2	1.2
Stockbuilding 2/	0.7	0.5	-0.9	-0.3	0.1	0.0	0.0	0.0	0.0	0.0
Domestic demand	5.1	3.8	0.1	0.5	1.3	1.3	1.4	1.3	1.2	1.2
Foreign balance 2/	1.4	-0.2	0.3	0.4	-0.4	-0.1	0.0	0.0	0.0	0.0
Exports 3/	11.4	7.3	-0.8	1.0	0.0	1.4	2.2	2.6	2.5	2.5
Imports 3/	9.0	8.3	-1.4	0.2	1.0	1.8	2.4	2.8	2.7	2.7
Resource Utilization										
Potential GDP	2.3	1.2	1.0	1.1	1.0	1.1	1.1	1.2	1.1	1.1
Output gap 4/	-1.6	0.6	0.1	-0.2	-0.4	-0.3	-0.1	0.0	0.1	0.1
Employment growth	1.6	2.4	1.4	1.0	0.3	0.2	0.2	0.1	0.1	0.0
Unemployment rate 5/	7.8	6.7	6.6	6.4	6.4	6.3	6.2	6.2	6.2	6.2
Prices										
GDP deflator	2.1	5.1	5.9	2.9	2.2	2.0	2.1	2.1	2.1	2.1
Consumer prices	2.6	8.4	5.4	2.4	2.1	1.9	2.0	2.0	2.0	2.0
Public Finance (percent of GDP)										
Overall fiscal balance	-5.1	-3.5	-3.6	-3.1	-3.2	-3.4	-3.5	-3.5	-3.6	-3.7
Primary balance	-3.8	-1.9	-2.1	-1.5	-1.5	-1.6	-1.5	-1.4	-1.3	-1.3
Structural balance 4/	-4.0	-3.6	-3.6	-3.1	-3.0	-3.3	-3.5	-3.7	-3.8	-3.8
Structural primary balance 4/	-2.7	-2.1	-2.2	-1.5	-1.3	-1.4	-1.5	-1.5	-1.5	-1.4
Gross public debt	93.9	89.5	87.4	87.7	88.7	89.7	90.4	91.1	91.9	92.9
External Sector (percent of GDP) 6/										
Current account balance	2.7	-0.1	1.7	2.8	2.3	2.1	2.1	2.0	2.1	2.1
Interest Rates (percent, end of period) 7/										
Euro short-term rate (€STR)	-0.6	1.9	3.9	2.9	2.2	...	...	...	...	...
10-year government benchmark bond yield	0.3	3.0	2.9	2.8	3.1	...	...	...	...	...
Exchange Rates (end of period) 7/										
U.S. dollar per euro	1.1	1.1	1.1	1.0	1.1	...	...	...	...	...
Nominal effective rate (2005=100)	96.5	96.2	97.7	96.4	99.9	...	...	...	...	...
Real effective rate (2005=100, ULC based)	86.6	84.4	88.5	88.0	85.4	...	...	...	...	...

Sources: IMF staff estimates; and European Central Bank.

1/ Projections for 2025-30 are based on aggregation of the latest projections by IMF country teams, unless otherwise indicated.

2/ Contribution to growth.

3/ Includes intra-euro area trade.

4/ In percent of potential GDP.

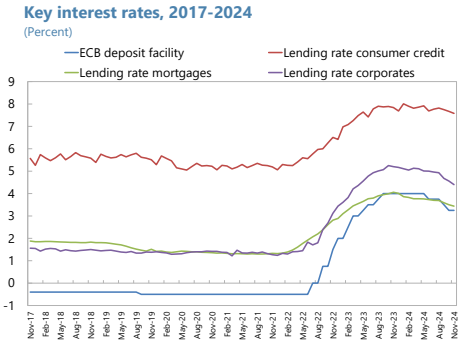
5/ In percent.

6/ Projections are based on member countries' current account aggregations excluding intra-euro flows and corrected for aggregation discrepancy over the projection period.

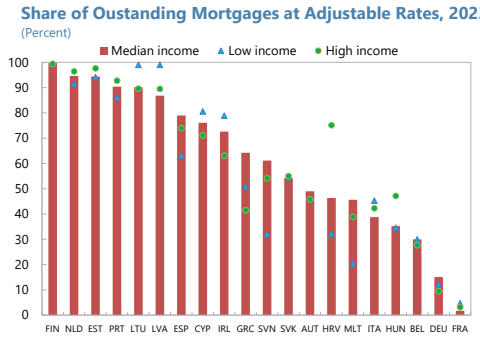
7/ Latest monthly available data for 2025.

Figure 41. Euro Area: Macrofinancial Conditions

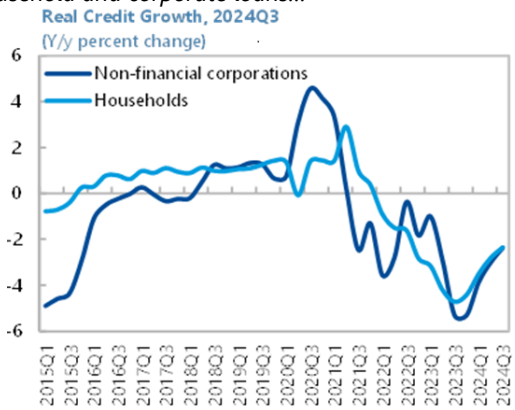
The steep rise in ECB policy rates that started in mid-2022 has sharply tightened financial conditions…



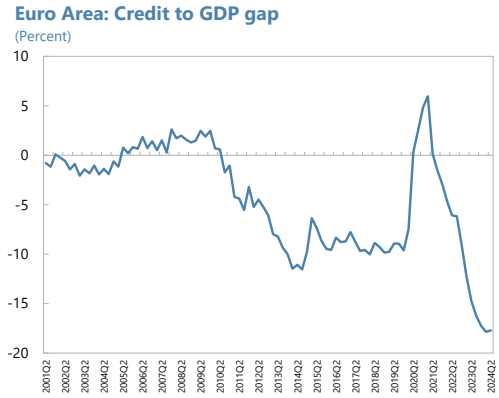
…increasing debt servicing payments for new borrowers and outstanding borrowers with adjustable-rate loans.



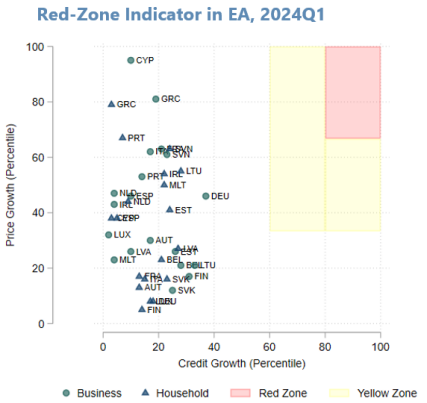
Real credit growth has posted negative rates for both household and corporate loans…



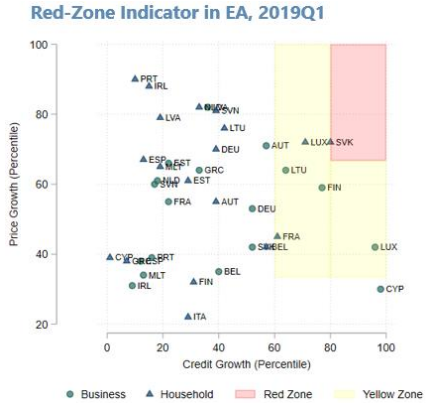
…triggering a significant widening of the negative credit-to-GDP gap…



…signaling a decrease in financial exuberance…



…relative to pre-COVID levels.

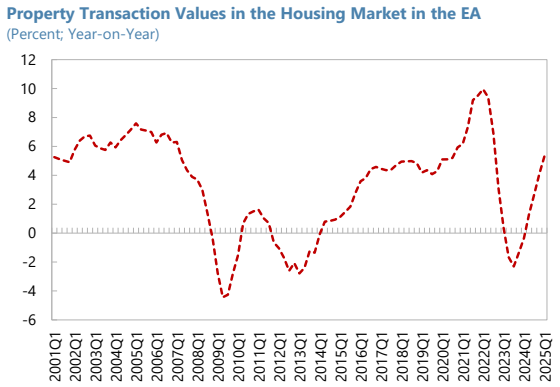


Sources: ECB; Haver; OECD; 2023 Household and Financial Consumption Survey (HFCS); Greenwood et al. 2022, Hennig et al. 2023, and IMF staff calculations.

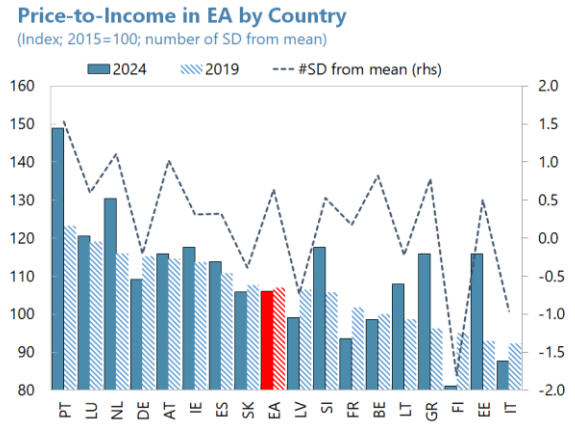
Note: The top right panel shows the share of adjustable mortgages on the household's main residence, i.e., for which the interest rate can vary during the life of the contract. The bottom panels show the credit and asset price growth percentiles for the EA economies (2019:Q1 and 2024:Q1). The x-axis is the three-year change in (business or household) credit-to-GDP ratio and the y-axis is the three-year real (equity or house) price growth in percentiles. A country is defined to be in the "Red-Zone" if the three-year change in the (business or household) credit-to-GDP ratio is above 80th percentile and the three-year change in the log (equity or house) price to is above 66.7th percentile. Percentiles are computed at the income group level (advanced economies) over the sample period 1995–2024.

Figure 42. Euro Area: The Real Estate Market

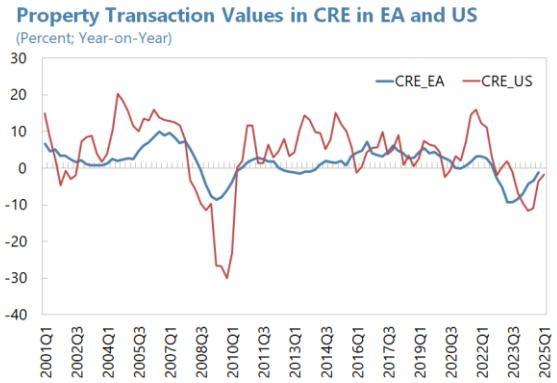
Despite some correction in housing prices…



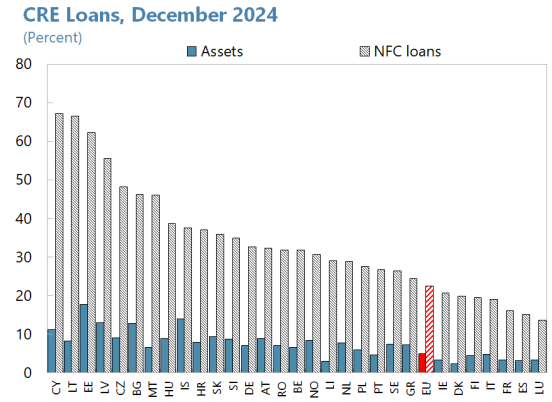
…housing affordability remains a concern in Europe, weighing on households' ability to service their debt.



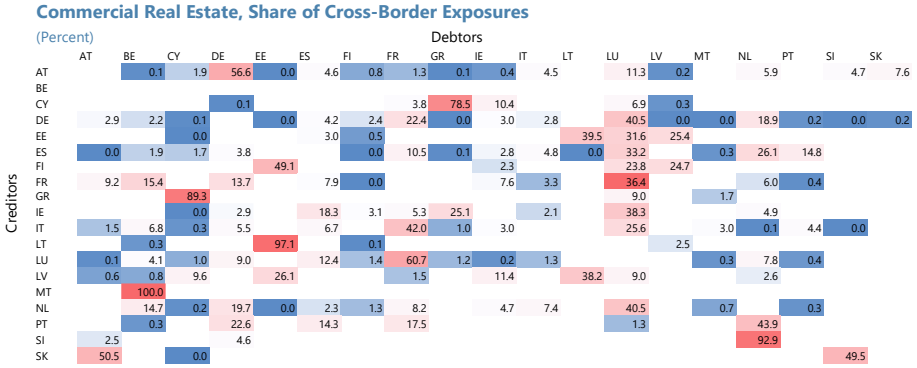
Monetary tightening and structural changes have triggered a turnaround in the CRE in EA and US…



…which accounts for over 20 percent of corporate loans in the EU, doubling that share in eight countries.



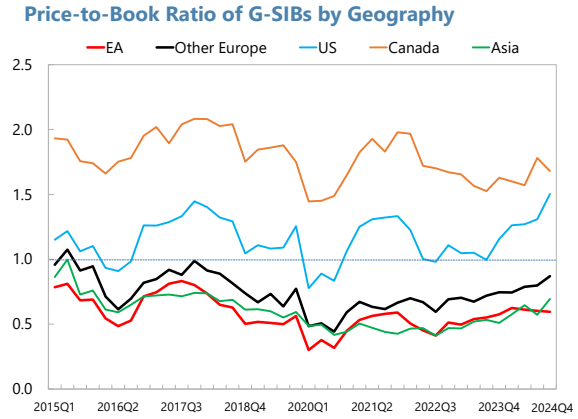
The CRE segment is characterized by significant cross-border linkages, particularly to Cyprus, Finland, France, Germany, Luxembourg, and Netherlands, amplifying potential spillovers from a sharp CRE price correction in debtor countries.



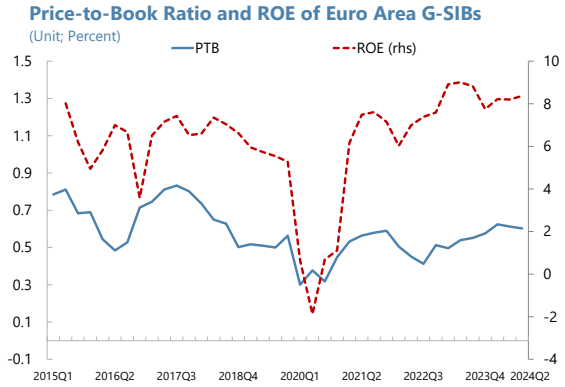
Sources: OECD; ECB; FRB; ESRB based on AnaCredit; EBA; and IMF staff calculations.
Note: The top-right panel shows loans at amortized cost by banks reporting to EBA. The bottom panel shows creditor countries in rows and debtor countries in columns, as of March 2024 (except FR, Sep 2023). The chart shows the breakdown of cross-border exposures to EA destinations. For instance, AT is heavily exposed to DE (accounting for over half of its cross-border exposures). This means that a negative development in DE could affect AT banks. The share of CRE loans in banks' assets varies across countries, ranging between 18 percent in Estonia to 3 percent in Spain, France, Luxembourg and Ireland. On average CRE accounts for 5 percent of bank assets in EU.

Figure 43. Euro Area: Bank Market Values and Performance of SIs vs. LSIs

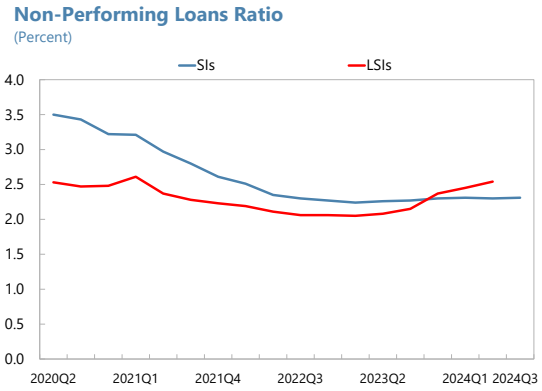
Bank market values for EA G-SIBs remain below book values and lower than those for peer banks…



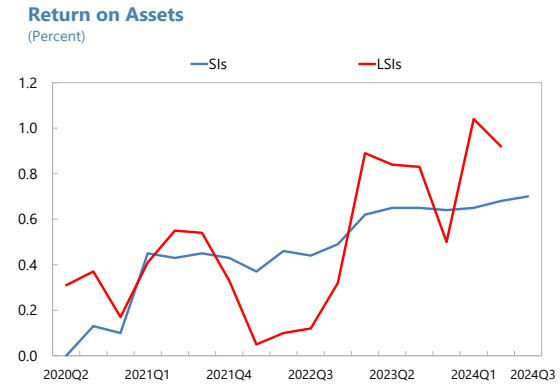
…despite their recent increase, supported by higher profits.



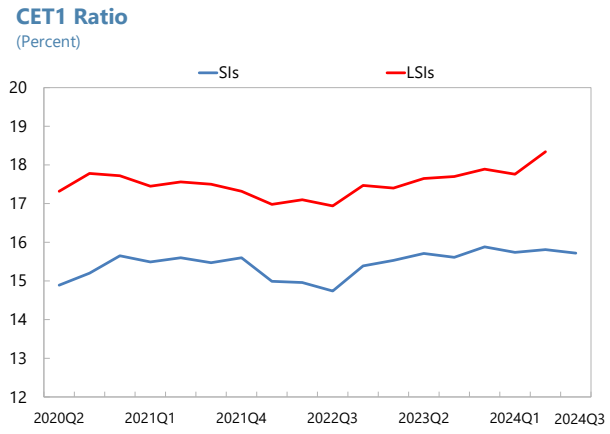
Asset quality remains comparable for SIs and LSIs…



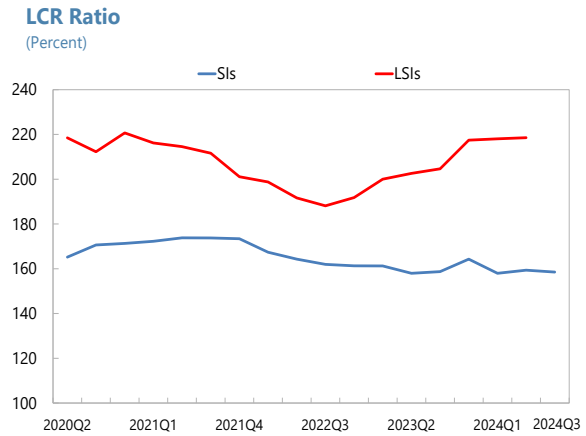
…while profitability is higher for LSIs.



LSIs post higher capital ratios than SIs…



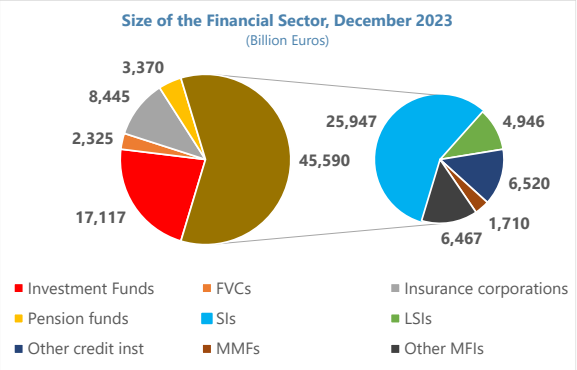
…and higher liquidity buffers.



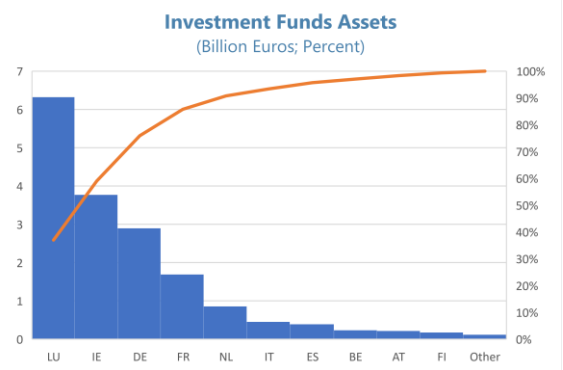
Sources: Bloomberg; ECB; IMF staff calculations.
Note: The top-left chart shows the average price-to-book ratio of the latest 29 G-SIBs (as of November 2024) grouped by geography. NPLs are computed excluding central bank balances. The CET1 ratio is based on the transitional definition of capital.

Figure 44. Euro Area: A Growing and Interconnected Investment Fund Sector

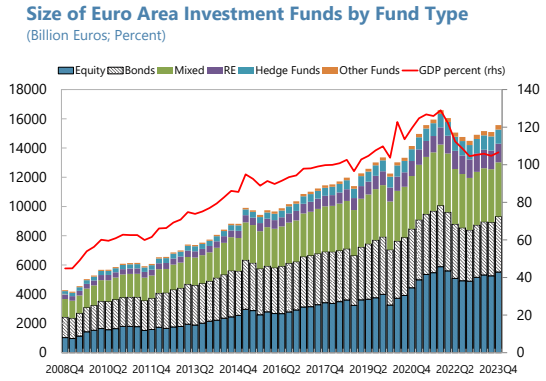
The IF sector accounts for over one-fifth of total financial system assets at 120 percent of EA GDP.



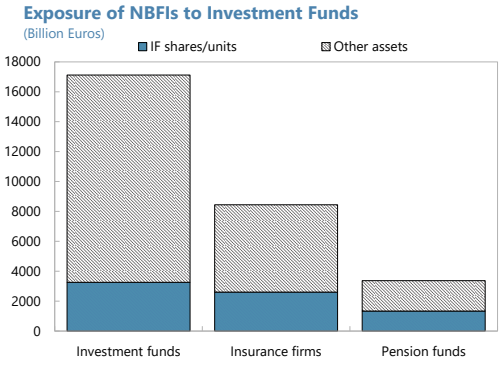
The sector is highly concentrated with LU, IE, DE, FR, and NL, accounting for 90 percent of assets.



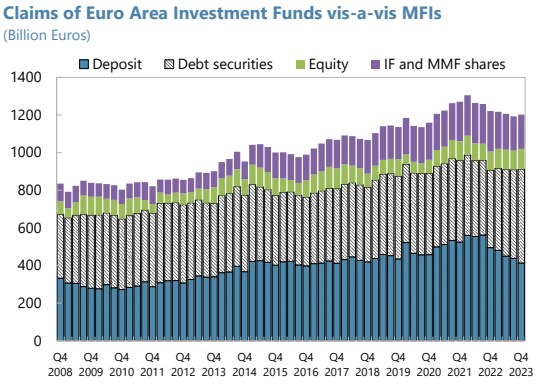
The IF sector tripled since the global financial crisis despite some valuation adjustments over the last two years.



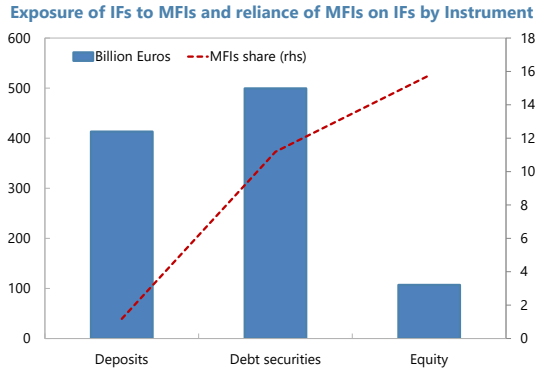
The IF sector exhibits significant intra-sectoral exposures as well as cross-sectoral exposures to insurers and pension funds.



IF exposure to MFIs takes mainly the form of deposits and debt securities…



…but MFIs reliance on IF is highest through the equity channel, exposing banks to market valuation risks.

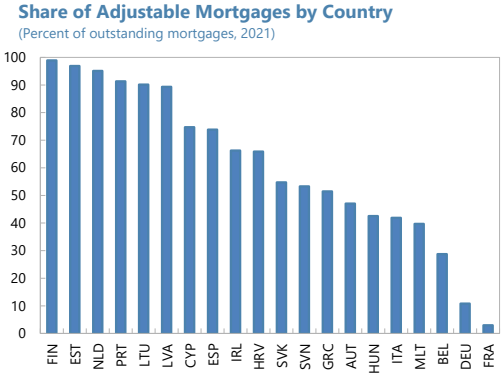


Sources: ECB; IMF staff calculations.

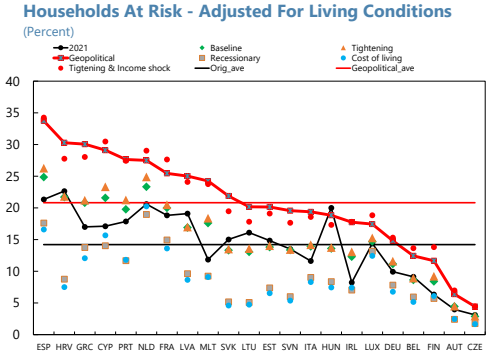
Note: The Investment Fund's figures exclude money market funds. The bottom right chart shows equity holdings held by investment funds in monetary financial institutions (MFIs) as a share of MFI's quoted shares.

Figure 45. Euro Area: Households at Risk in Euro Area Countries Across Scenarios

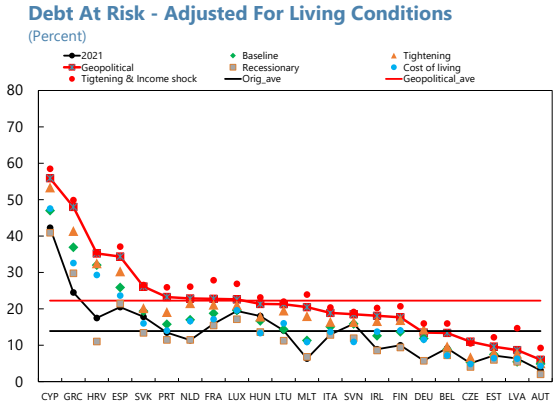
The share of adjustable mortgages is highly heterogenous across countries



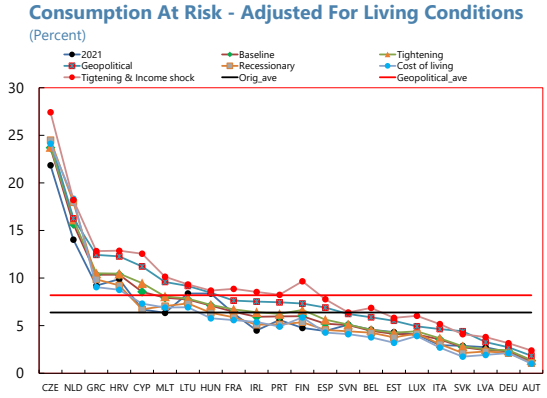
Under the geopolitical scenario, the share of vulnerable households could rise from 14 percent to over 20 percent…



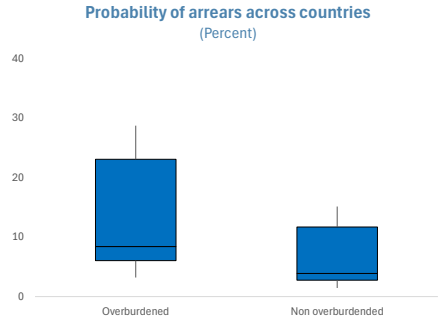
…while the share of debt at risk could exceed 22 percent.



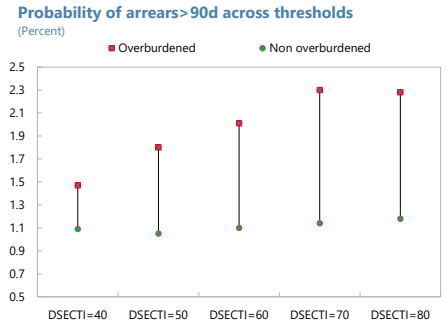
The geopolitical scenario could affect the affordability of goods and services bought by households.



Overburdened households are more likely to miss payments when they become due…



….and to be on arrears on debt payments more than 90 days



Sources: HFCS microdata and IMF staff calculations.

Note: The top right and middle panels show the share of financial distress under the stress test scenarios (baseline, geopolitical, and recessionary) as well as three stylized scenarios: "tightening" (with lending rates raising 200bps over baseline); "cost of living" (combining tightening financial conditions and a 20 percent increase in food and energy costs); and "tightening and income shock" (combining tightening financial conditions, 10 percent reduction of income relative to baseline, and 5pp increase in unemployment relative to baseline). The bottom left chart shows the probability of being on arrears for overburdened households (with debt service and essential consumption payments exceeding 70 percent of their income), and the bottom right chart shows the probability of being on arrears over 90 days for different overburden ratios.

Appendix I. Risk Assessment Matrix (RAM)

Sources of Risk	Likelihood of Risk (High, Medium, Low)	Expected Impact of Risk (High, Medium, Low)	Policy Responses
Global Risks			
Trade policy and investment shocks	**High** Higher trade barriers or sanctions reduce external trade, disrupt FDI and supply chains, and trigger further U.S. dollar appreciation, tighter financial conditions, and higher inflation.	**High** Weaker export growth, combined with higher uncertainty and weaker consumer and business confidence, weighs on the corporate sector and result in lower investment and a slower recovery in private consumption, ultimately undermining productivity and lowering potential output.	• Continue advocating for a stable, rules-based global trading system and pursuing constructive engagement. • Ensure consistency with WTO principles in the use of targeted instruments (e.g., safeguard procedures and anti-dumping, anti-subsidy, and anti-coercion measures). • Diversify global partnerships and advance new free trade agreements. • Deepen single market and avoid industrial policy that creates distortions or provokes retaliation.
Deepening Geoeconomic Fragmentation	**High** Persistent conflicts, inward-oriented policies, protectionism, weaker international cooperation, labor mobility curbs, and fracturing technological and payments systems lead to higher input costs, hinder green transition, and lower trade and potential growth.	**High** Trade barriers and supply disruptions lead to shortages in crucial inputs, higher inflation and production bottlenecks that reduce economic activity and decrease confidence.	• Diversify energy production and secure supply chains to avoid shortages of critical raw materials. • Diversify global partnerships and advance new free trade agreements. • Continue advocating for a stable, rules-based global trading system and pursuing de-escalation and constructive engagement. • Ensure consistency with WTO principles in the use of targeted instruments (e.g., safeguard procedures and anti-dumping, anti-subsidy, and anti-coercion measures).

Sources of Risk	Likelihood of Risk (High, Medium, Low)	Expected Impact of Risk (High, Medium, Low)	Policy Responses
Tighter financial conditions and systemic instability	**Medium** Higher-for-longer interest rates and term premia amid looser financial regulation, rising investments in cryptocurrencies, and higher trade barriers trigger asset repricing, market dislocations, weak bank and NBFI distress, and further U.S. dollar appreciation, which widens global imbalances and worsens debt affordability.	**Medium** Higher funding costs and a shift in risk sentiment lead to bond repricing and financial tightening, reducing credit growth. Insolvencies increase, resulting in deterioration of bank balance sheets and profitability. Rates staying high for longer will also lead to housing market corrections. Sovereign spreads increase, straining fiscal sustainability in high-debt countries.	• Enhance liquidity support to financial institutions and markets to avoid contagion and prevent liquidity shortages morph into insolvencies. • Ensure strong coordination between the ECB and the national authorities on financial stability risks. • Use countercyclical financial policy to support viable financial institutions.
Regional Conflict	**Medium** Intensification of conflicts (e.g., in the Middle East, Ukraine, Sahel, and East Africa) or terrorism disrupt trade in energy and food, tourism, supply chains, remittances, FDI and financial flows, payment systems, and increase refugee flows.	**Medium** Increased uncertainty weakens consumer and business confidence, reducing consumption and investment. Spikes in energy prices and supply disruption reduce competitiveness and the purchasing power of households.	• Accelerate the energy transition. • Provide targeted support to vulnerable households to mitigate the impact if risks materialize.
Commodity Price Volatility	**Medium** Supply and demand volatility (due to conflicts, trade restrictions, OPEC+ decisions, AE energy policies, or green transition) increases commodity price volatility, external and fiscal pressures, social discontent, and economic instability.	**Medium** Higher commodity import prices lead to higher energy prices that fuel inflationary pressures. Export competitiveness of European firms is adversely affected which in turn slows down activity. High energy prices have an adverse impact on households, leading to lower domestic demand.	• Maintain monetary policy flexibility. • Allow automatic stabilizers to operate and provide fiscal support to vulnerable households. • Safeguard energy security by accelerating the green transition and electricity market integration. • Provide targeted support to vulnerable households to mitigate the impact of higher energy prices.

Sources of Risk	Likelihood of Risk (High, Medium, Low)	Expected Impact of Risk (High, Medium, Low)	Policy Responses
Cyberthreats	**Medium** Cyberattacks on physical or digital infrastructure (including digital currency and crypto assets), technical failures, or misuse of AI technologies trigger financial and economic instability.	**Medium** Depending on the country level of digitalization and exposure to digital infrastructure, cyberattacks disrupt the financial system as well as the real economy.	• Advance crisis preparedness to cyberattacks. • Further strengthen coordination at the European/international level. • Strengthen the operational resilience of the financial system.
Climate Change	**Medium** Extreme climate events driven by rising temperatures cause loss of life, damage to infrastructure, supply disruptions, lower growth, and financial instability.	**Medium** Productivity declines or shortages lead to price increases. EU members may receive migrants from economies facing severe climate disruptions.	• Build fiscal space that can be used in response to large climate shocks. • Enhance the EU budget to invest efficiently to mitigate climate risks and flexibly respond to extreme climate events. • Accelerate green transition.
Global growth acceleration	**Low** Easing of conflicts, positive supply-side surprises (e.g., oil production shocks), productivity gains from AI, or structural reforms raise global demand and trade.	**Medium** Higher export growth, combined with stronger consumer and business confidence, supports the corporate sector and results in higher investment, lower unemployment, and a faster recovery in private consumption. Higher growth leads to an improvement in public debt sustainability in some high-debt countries.	• Allow automatic stabilizers to operate and accelerate fiscal consolidation to rebuild buffer. • Promote high quality public investment in infrastructure, and advance structural reforms. • Diversify global partnerships and advance new free trade agreements.
Euro Area Domestic Risks			
Disorderly energy transition	**Medium** A disorderly shift to net-zero emissions (e.g., owing to shortages in critical metals) and climate policy uncertainty cause supply disruptions, stranded assets, market volatility, and subdued investment and growth.	**Medium** Higher energy prices lead to higher inflation and decreased real incomes. Increased climate policy uncertainty lowers investments in green technology.	• Provide temporary, targeted fiscal policy support to households and businesses severely affected by energy transition. • Promote public investment and accelerate structural reforms to improve energy efficiency and facilitate labor reallocation with active labor market policies.

Sources of Risk	Likelihood of Risk (High, Medium, Low)	Expected Impact of Risk (High, Medium, Low)	Policy Responses
Higher defense spending	**Medium** New NATO commitments or a lower-than-expected efficiency of additional defense spending could result in higher than anticipated defense spending.	**Medium** Higher defense spending supports growth but raises concerns about public sector debt sustainability and raises interest rates.	• Limit the use of the national escape of the EU fiscal rules clause to the initial phase of scaling up defense investment expenditures. • Assess the consequence of increased defense spending on debt sustainability. • Closely monitor efficiency of additional defense spending.
Populism and Polarization	**Medium** Real income loss, spillovers from conflicts, dissatisfaction with migration, and worsening inequality ignite populism, polarization, and resistance to reforms.	**Medium** Delayed and suboptimal policies weaken confidence and raise uncertainty, lowering growth and leading to market repricing. Delayed fiscal adjustment weakens fiscal sustainability and increases sovereign risks.	• Increase growth and productivity, and ensure benefits are shared widely. • Ensure that increased defense spending and fiscal consolidation do not undermine targeted social spending or exacerbate inequality. • Provide temporary support to vulnerable households if needed.
Realization of Financial Sector Vulnerabilities	**Low** A shift in market perception undermines the ability to roll over and service debt, re-igniting financial fragmentation and adversely affecting the banking system. NBFIs could amplify risk propagation in the banking sector and system-wide spillovers from investment fund distress	**High** Higher funding costs and a shift in risk sentiment lead to bond repricing and financial tightening, reducing credit growth. Insolvencies increase, resulting in deterioration of bank balance sheets and profitability.	• Enhance liquidity support to financial institutions and markets to avoid contagion and prevent liquidity shortages morph into insolvencies. • Ensure strong coordination between the ECB and the national authorities on financial stability risks. • Use countercyclical financial policy to support viable financial institutions. • Rely on bank resolution systems to address unsound banks. • Enhance system-wide monitoring and improving data sharing.

Sources of Risk	Likelihood of Risk (High, Medium, Low)	Expected Impact of Risk (High, Medium, Low)	Policy Responses
Shifting sentiment on countries with high public debt	**Low** Policy slippages with weak growth outturns in some high-debt euro area countries, along with weak trust in the Governance Framework, could raise concerns over debt sustainability in high debt countries.	**High** Sharp increases in funding costs strain high-debt countries' ability to service their debt resulting in adverse real-financial feedback loops and financial fragmentation that weighs on economic activity and impairs monetary policy transmission.	• Activate EU support lines for high-debt countries under stress. • Make use of the transmission protection instrument (TPI) if higher spreads are not based on fundamentals. • Enhance liquidity support to financial institutions and markets with strong coordination between the ECB and the national authorities on financial stability risks.

A. Banking Sector: Solvency Stress Test		
Top-down by IMF		
1. Institutional Perimeter	Institutions included	• 95 SIs (out of 109 SIs), of which 7 are G-SIBs.
	Market share	• About 99 percent of the banking sector assets.
	Data and baseline date	• Data vintage: 2024:Q4. • Supervisory data: Bank balance sheet and supervisory statistics (including FINREP and COREP), information on IRRBB, short-term exercise (STE), provided by the ECB. Expected Default Frequency sourced from Moody's. • Household analysis relies on household survey microdata from the 2021 (latest) HFCS survey, covering 83,000 households across 22 countries (EA, CZ, and HU) and 200,000 personal files. Montecarlo simulations of unemployment shocks at the person level. Projections of households' balance sheets, consumption, and debt repayments, allowing for new issuances of maturing loans. • Market and publicly available data, such as information from ECB statistical data warehouse on funding and lending rates for new business by type of asset and funding portfolios, complemented with commercial databases such as Capital IQ. Corporate sector analysis uses data from Orbis. • Scope of consolidation: banking activities of the consolidated banking group for banks having their headquarters in the euro area. • Coverage of sovereign and non-sovereign securities exposures: debt securities measured through fair value (FVPL and FVOCI) and amortized cost (AC) account.

A. Banking Sector: Solvency Stress Test		
Top-down by IMF		
2. Channels of Risk Propagation	Methodology	• FSAP team satellite models and methodologies. • For internally modelled exposures (IRB), projection of PiT and TTC PDs, PiT and DT LGDs, EAD, and RWA. For SA exposures, Projection of new flows of defaulted exposures and RWA based on risk weights for performing and nonperforming loans separately. Provisioning for IRB and SA modeled using IFRS 9 transition matrix approach. • Static balance-sheet approach, allowing the re-issuance of maturing loans at current market rates. • Provisioning for IRB and SA are modeled using IFRS9 transition matrix approach. • Traded risk impact from the revaluation of instruments at fair value (FVPL and FVOCI, including hedging instruments) will be assessed using bank-specific sensitivities reported in COREP/Short-Term Exercise to market risk factors. The analysis will use one-off market stress scenarios that have a similar narrative to the macro scenarios but correspond to a shorter time horizon (e.g., in the geopolitical scenario, the one-off market stress event features higher interest rates and commodity prices, while the opposite occurs in the recessionary scenario). Risk factors include interest rate, commodity, equity, FX, and credit spread.
	Satellite models for macrofinancial linkages	• Models for credit losses, funding costs, lending rates • Within EA, for household and corporate, analysis of PD using micro-data at individual household (based on household survey, HFCS) and corporate (based on corporate databases Datastream and Capita IQ). Outside of EA, expected default frequency will be used as proxies for corporate PDs, while a panel model will be used for household PDs. LGD shocks for collateralized exposures will be linked to paths for real estate prices in the scenario using a smoothing factor to account for the TTC regulatory approach. • Interest income to be projected at geography-portfolio segment level using a structural approach applying interest rate shocks on new business and repricing of floating rate instruments. Funding costs to be projected at portfolio level using funding structure by product (retail and wholesale deposits, secured and unsecured debt securities, repo, etc.) and maturity bucket (overnight vs. term).

A. Banking Sector: Solvency Stress Test		
Top-down by IMF		
3. Tail Shocks	Stress test horizon	• 2025 – 2027 (three years)
	Scenario	Three scenarios: • A baseline scenario drawn from the January 2025 WEO macroeconomic projections. • Adverse scenario 1: A geopolitical scenario featuring an escalation of geopolitical conflicts. • Adverse scenario 2: A recessionary scenario showing a synchronized global slowdown amplified by sovereign debt distress in EA. • The two adverse scenarios rely on GFM, a structural macro econometric model of the world economy, disaggregated into 40 national economies, documented in Vitek (2015).
	Second-round effects and Sensitivity analysis	• Household 'consumption at risk,' defined as the consumption of "economically vulnerable households" (for which the sum of debt service and consumption exceeds gross income) as a share of aggregate consumption. The elasticity of unemployment to changes in consumption will be used to test second-round effects on default risk. • Solvency and liquidity risk interactions testing business risk will be assessed in April 2025 for the G-SIBs.
4. Risks and Buffers	Risk covered	• Risks covered include credit (on loans and debt securities), market (valuation impact of financial instruments with respect to market risk factors such as interest rates, foreign exchange, credit spread, equity prices) and interest rate risk.

A. Banking Sector: Solvency Stress Test		
Top-down by IMF		
	Behavioral Adjustment	• Static balance sheet approach: size of portfolios (gross of NPLs) remains constant throughout the stress testing horizon (with no write-offs allowed). • In projecting RWAs, standardized and IRB portfolios are differentiated. For the standardized portfolios, RWAs change due to the shift in the composition of performing and non-performing exposures, and a deterioration in creditworthiness is modeled as a credit rating downgrade linked to the initial rating of the exposure and the projected rise in loan losses. For the IRB portfolios, through-the-cycle-PDs, downturn LGDs and EAD for each asset class/industry are used to project risk weights. • Interest income from nonperforming loasn is not accrued. • Dividends are paid out by banks that remain profitable and adequately capitalized. The tax rate and the dividend rate are both set at 30 percent.
5. Regulatory and Market-Based Standards and Parameters		• Consider two hurdle rates: (i) "Minimum capital hurdle" consists of regulatory minimum Pillar 1 capital requirements (4.5 percent for CET1 ratio) plus Pillar 2 requirements (P2R); (ii) "Breaching buffers hurdle" includes the SREP capital requirements and capital buffers (CCoB, max (G-SII, O-SII), and SyRB). The CCyB is assumed to be zero in the scenarios. Leverage ratio during the stress test horizon assessed against the 3 percent Basel III minimum requirement.
6. Reporting Form for Results	Output presentation	• Aggregate capital path for each scenario by groups of banks, categorized by business model. • Aggregate capital shortfall relative to RWAs. • Number of banks and percent of banking assets in the system which fall below the hurdle rates. • Outputs also include information on the impact of different result drivers, including profit components.

B. Banking Sector: Liquidity Stress Test		
Domain		**Framework**
		Top-Down by FSAP Team
1. Institutional perimeter	Institutions included	95 SIs (out of 109 SIs), of which 7 are G-SIBs.
	Market share	About 99 percent of the banking sector assets.
	Data and horizon	Data vintage: 2024: Q2 updated to 2024: Q4 in April/May 2025 Data: Supervisory data from ITS files (FINREP, COREP). Scope of consolidation: Consolidated group basis. Perimeter of the banking group (CRD V). Insurance activities are excluded; banking associates are included.
2. Channels and Risk Propagation	Methodology	Structural analysis: evolution of LCR, NSFR, Asset Encumbrance, Funding concentration and Collateral Swaps. Dynamic analysis: (i) LCR- stress tests, using more severe scenarios than regulatory ones. Breakdown by significant currency, where available. (ii) Cashflow-based stress test. Breakdown by significant currency, where available. (iii) Reverse stress test to imply under which outflows banks would not meet regulatory requirements (LCR) or become illiquid (negative CBC).
	Stress test horizon	30 days for LCR-based tests, and 1-day through 1-year for cashflow analysis.
3. Type of analyses	Scenario analysis	For cash flow liquidity stress tests. Various stress scenarios are considered, with varying intensity of adverse liquidity conditions. Main risks analyzed are: (i) idiosyncratic risk due to reputational risks/decline in CET1 capital; (ii) market upheaval and tightening of market liquidity conditions (linked to solvency adverse scenario, where possible), deposit run-offs, outflows from top funding sources.
4. Buffers	Behavioral adjustments	Different amounts of CBC using assumptions about ECB monetary policy (collateral) normalization. Liquidity from the central bank (except for the lender of the last resort measures) is considered under different assumptions about what type of collateral is included into CB eligible CBC
	Buffers	Capacity of banks to generate liquidity from inflows and from assets under stress (i.e., counter-balancing capacity).

B. Banking Sector: Liquidity Stress Test		
Domain		**Framework**
		Top-Down by FSAP Team
5. Regulatory standards	Regulatory/accounting and market-based standards	For the LCR, the hurdle rate is set at 100 percent at the aggregate currency level (per Basel III and domestic regulation). For cashflow analysis, the outcomes of interest are the Net Liquidity Position and the survival period.
6. Reporting format for results	Output presentation	Outputs include (1) Average LCR, Net Liquidity Position and survival period, (2) Number of institutions with LCR below regulatory limits, (3) Reverse stress tests.

C. Banking Sector: Solvency-Liquidity Interactions		
Top-down by FSAP Team		
1. Institutional Perimeter	Institutions included	7 (all) G-SIBs.
	Market share	44 percent of the banking sector assets.
	Data and horizon	Data vintage: 2024: Q4 Data: Supervisory data from ITS files (FINREP, COREP). Scope of consolidation: Consolidated group basis. Perimeter of the banking group (CRD V). Insurance activities are excluded; banking associates are included.
2. Key Elements	Methodology	Based on Cont, R., Kotlicki, A., and Valderrama, L., (2020), "Liquidity at Risk: Joint stress testing of solvency and liquidity" Dynamic analysis: includes mitigating actions to fend off liquidity pressures. Sensitivity tests Reverse stress test to imply under which outflows banks would not meet regulatory requirements (LCR) or become illiquid (negative CBC).
	Stress test horizon	2-week and 2-days horizon.
3. Approach	Scenario analysis	"Reference scenario" (market shock calibrated for the solvency stress test); "credit sensitive scenario" due to own credit downgrade; "business as usual scenario" for signaling effects; "narrow collateral scenario" whereby eligible credit claims and own issuances become ineligible for CB liquidity; "trapped liquidity scenario" whereby FX collateral becomes ineligible; and "business risk scenario" showing credit attrition prompted by credit risk concerns.
4. Buffers	Behavioral adjustments	To mitigate liquidity shortfalls, a bank can take a series of actions: (i) unsecuritized borrowing; (ii) repo borrowing; and (iii) liquidation of assets.
	Buffers	CET1 over bank specific regulatory leverage ratio (solvency), and counterbalancing capacity (liquidity).
5. Regulatory Standards	Regulatory/ standards	Bank specific regulatory leverage ratio (Pillar 1+Pillar 2R+G-SIB add-on).
6. Reporting of results	Output presentation	Aggregate results include (1) Regions of failure due to illiquidity/insolvency; and (ii) Solvency-liquidity diagrams for selected G-SIBs.

D. Network Analysis		
Top-down by FSAP Team		
1. Institutional perimeter	Institutions included	72 SIs (out of 109 SIs), of which 7 are G-SIBs.
	Market share	Around 90 percent of the banking sector assets.
	Data and horizon	Data vintage: 2024: Q4 Data: Supervisory data from ITS files (FINREP, COREP). Scope of consolidation: Consolidated group basis. Perimeter of the banking group (CRD V). Insurance activities are excluded; banking associates are included.
2. Methodology	Methodology	Based on Covi, G., Gorpe, M. Z., & Kok, C. (2021). "CoMap: Mapping Contagion in the Euro Area Banking Sector".
	Stress test horizon	1-month horizon.
3. Type of analyses	Scenario analysis	"Baseline scenario" (parameters calibrated as in Covi et al, 2021). "NBFI risk scenario" including the default of the to five NBFI credit exposures (excluding insurance firms). "Market risk scenario" including a 10 percent haircut in HQLA and 50 percent efficiency of hedges. "Combined scenario" including the NBFI and Market risk scenarios.
4. Buffers	Behavioral adjustments	The approach simulates cascading defaults and counterparty credit losses. No mitigating actions are assumed.
	Buffers	CET1 over bank specific regulatory leverage ratio (solvency), and counterbalancing capacity (liquidity).
5. Regulatory standards	Regulatory/ standards	Bank specific minimum CET1 ratio (Pillar 1+Pillar 2R) (solvency), and liquidity reserves (HQLA) minimum net outflows (liquidity).
6. Reporting format for results	Output presentation	Outputs include (1) Number of triggered defaults; (2) Capital depleted due to triggered defaults; (3) Contagion Index; and (4) Vulnerability Index. Results are presented by banks' business models.

Appendix III. Variable Paths Across Macrofinancial Scenarios

Annex III. Table 1. Euro Area: GDP Growth Paths

(Percent)

	Baseline				Geopolitical				Recessionary			
	2024	2025	2026	2027	2024	2025	2026	2027	2024	2025	2026	2027
Australia	1.16	2.06	2.20	2.27	1.16	-2.80	-0.79	2.57	1.16	-6.60	2.41	4.82
Austria	-1.00	0.26	1.22	1.52	-1.00	-2.74	-3.24	-0.54	-1.00	-2.03	-4.36	0.16
Belgium	1.14	1.08	1.16	1.27	1.14	-3.59	-4.81	-1.08	1.14	-3.09	-4.79	0.84
Brazil	3.65	2.15	2.22	2.34	3.65	-2.01	-1.08	0.33	3.65	-1.43	-3.23	1.02
China	4.82	4.64	4.50	4.23	4.82	-2.96	-0.57	5.67	4.82	-2.12	1.27	5.93
Croatia	3.50	3.10	2.74	2.64	3.50	-1.56	-3.24	0.29	3.50	-1.06	-3.21	2.21
Cyprus	3.69	2.73	2.81	3.02	3.69	-2.85	-1.95	2.92	3.69	-3.96	-2.50	6.04
Czech Republic	1.07	2.30	2.22	2.10	1.07	0.27	-2.04	2.49	1.07	-1.99	-0.04	4.45
Denmark	1.94	1.65	1.44	1.44	1.94	0.05	-3.30	1.23	1.94	-3.51	-0.56	4.68
Estonia	-0.73	1.01	2.30	2.17	-0.73	-1.15	-1.64	-0.48	-0.73	-0.23	-2.48	0.60
Euro area	**0.75**	**1.03**	**1.37**	**1.32**	**0.75**	**-2.95**	**-3.05**	**0.09**	**0.75**	**-2.83**	**-3.83**	**1.71**
Finland	-0.33	1.47	1.53	1.37	-0.33	-0.69	-2.41	-1.27	-0.33	0.23	-3.25	-0.19
France	1.07	0.83	1.15	1.35	1.07	-2.90	-2.72	0.48	1.07	-2.73	-3.87	1.65
Germany	-0.18	0.27	1.12	1.08	-0.18	-2.69	-3.26	-0.88	-0.18	-1.96	-4.25	0.00
Greece	2.26	2.06	1.69	1.41	2.26	-3.53	-3.07	1.32	2.26	-4.63	-3.63	4.43
Hungary	1.48	2.86	3.00	3.00	1.48	-2.73	-1.76	2.90	1.48	-3.83	-2.32	6.02
Ireland	-0.47	2.47	2.72	2.57	-0.47	-2.82	-3.54	-0.02	-0.47	-4.05	-1.41	3.69
Italy	0.55	0.71	0.94	0.57	0.55	-4.47	-3.18	0.68	0.55	-5.26	-4.08	3.03
Japan	-0.17	1.06	0.76	0.62	-0.17	-2.81	-0.76	1.43	-0.17	-6.95	-2.58	1.22
Latvia	-0.08	2.03	2.54	2.55	-0.08	-2.63	-3.43	0.20	-0.08	-2.13	-3.40	2.12
Lithuania	2.41	3.00	2.55	2.53	2.41	-1.66	-3.42	0.18	2.41	-1.16	-3.39	2.11
Luxembourg	0.54	2.00	2.44	2.51	0.54	-1.83	-3.25	-0.33	0.54	-0.98	-3.48	1.30
Malta	5.00	4.10	4.04	4.00	5.00	-0.56	-1.93	1.65	5.00	-0.06	-1.91	3.58
Mexico	1.78	1.42	1.99	2.15	1.78	-2.79	-1.30	0.08	1.78	-2.14	-3.54	0.92
Netherlands	0.90	1.60	1.77	1.79	0.90	-2.23	-3.91	-1.05	0.90	-1.37	-4.14	0.58
Norway	1.55	1.83	1.69	1.60	1.55	-0.25	-2.59	2.57	1.55	-3.65	-0.73	5.10
Poland	2.80	3.54	3.29	3.09	2.80	-0.23	-0.40	4.34	2.80	-2.65	1.49	7.17
Portugal	1.67	2.11	2.00	1.75	1.67	-2.07	-2.50	0.78	1.67	-2.69	-3.62	3.00
Slovak Republic	2.10	1.75	2.19	2.59	2.10	-2.92	-3.78	0.24	2.10	-2.42	-3.75	2.17
Slovenia	1.30	2.60	2.50	2.40	1.30	-2.06	-3.47	0.05	1.30	-1.56	-3.45	1.98
Spain	3.08	2.31	1.83	1.64	3.08	-3.07	-2.41	1.78	3.08	-3.74	-2.94	4.63
Sweden	0.59	1.66	2.24	1.77	0.59	-0.14	-1.93	2.49	0.59	-3.47	0.26	5.08
Switzerland	1.28	1.18	1.74	1.20	1.28	-1.44	-1.10	0.96	1.28	-5.37	2.56	3.55
Türkiye	2.84	2.61	3.24	3.37	2.84	-2.82	-0.73	5.68	2.84	-5.65	1.60	9.04
United Kingdom	0.89	1.59	1.50	1.46	0.89	-3.42	-1.06	0.45	0.89	-2.11	-3.90	3.19
United States	2.84	2.71	2.14	2.12	2.84	-0.48	-1.73	0.04	2.84	-1.01	-0.88	4.07

Source: IMF staff calculations.

Annex III. Table 2. Euro Area: Unemployment Paths

(Percent)

	Baseline				Geopolitical				Recessionary			
	2024	2025	2026	2027	2024	2025	2026	2027	2024	2025	2026	2027
Australia	4.10	4.30	4.48	4.54	4.10	5.27	7.52	8.33	4.10	7.18	9.96	9.16
Austria	5.44	5.56	5.47	5.30	5.44	5.80	7.72	9.27	5.44	6.25	9.87	12.01
Belgium	5.70	5.70	5.60	5.50	5.70	6.46	9.32	11.38	5.70	7.10	11.51	13.47
Brazil	6.94	7.10	7.22	7.31	6.94	8.05	10.27	11.93	6.94	8.00	11.93	13.99
China	5.10	5.10	5.10	5.10	5.10	7.35	11.29	11.71	5.10	7.51	11.27	11.01
Croatia	5.46	5.28	5.28	5.28	5.46	6.04	9.00	11.16	5.46	6.68	11.19	13.25
Cyprus	4.89	4.70	4.89	4.98	4.89	5.83	8.93	9.97	4.89	7.00	12.32	12.83
Czech Republic	2.80	2.50	2.40	2.40	2.80	2.67	4.57	5.47	2.80	3.97	6.63	6.33
Denmark	2.90	2.97	2.97	2.97	2.90	2.93	4.79	6.00	2.90	4.72	7.42	6.81
Estonia	7.50	7.02	6.59	6.43	7.50	6.95	7.95	9.46	7.50	7.36	9.98	11.98
Euro area	**6.48**	**6.51**	**6.41**	**6.31**	**6.48**	**7.11**	**9.32**	**10.60**	**6.48**	**7.85**	**11.95**	**13.42**
Finland	8.34	8.13	7.60	7.58	8.34	8.05	8.96	10.62	8.34	8.46	10.99	13.14
France	7.39	7.60	7.30	7.11	7.39	8.13	9.92	10.85	7.39	8.77	12.40	13.70
Germany	3.43	3.36	3.26	3.07	3.43	3.57	5.43	6.85	3.43	4.04	7.59	9.55
Greece	10.38	10.06	9.07	8.42	10.38	11.19	13.12	13.41	10.38	12.36	16.50	16.27
Hungary	4.40	4.23	4.10	3.96	4.40	5.36	8.14	8.96	4.40	6.54	11.53	11.82
Ireland	4.31	4.41	4.41	4.41	4.31	5.70	8.98	11.66	4.31	6.63	11.11	12.32
Italy	6.90	7.07	7.22	7.35	6.90	8.12	10.94	11.88	6.90	9.12	14.04	14.77
Japan	2.50	2.50	2.50	2.50	2.50	3.20	4.33	4.27	2.50	5.12	8.96	9.96
Latvia	6.82	6.59	6.50	6.46	6.82	7.35	10.22	12.34	6.82	7.99	12.41	14.43
Lithuania	7.30	7.10	6.50	6.40	7.30	7.86	10.22	12.28	7.30	8.50	12.41	14.37
Luxembourg	5.89	6.09	5.87	5.66	5.89	6.52	8.87	10.88	5.89	7.06	10.98	13.14
Malta	3.00	3.00	3.00	3.00	3.00	3.76	6.72	8.88	3.00	4.40	8.91	10.97
Mexico	2.75	3.12	3.31	3.43	2.75	4.07	6.22	7.86	2.75	4.03	8.03	10.01
Netherlands	3.80	4.20	4.50	4.70	3.80	4.64	7.50	9.93	3.80	5.18	9.61	12.18
Norway	4.28	3.81	3.80	3.80	4.28	3.99	5.95	6.66	4.28	5.66	8.75	8.14
Poland	2.92	3.06	3.21	3.21	2.92	3.78	5.94	6.19	2.92	5.16	8.31	7.17
Portugal	6.77	6.72	6.63	6.54	6.77	7.38	9.71	10.94	6.77	8.33	12.84	14.03
Slovak Republic	5.41	5.53	5.66	5.53	5.41	6.29	9.38	11.41	5.41	6.94	11.57	13.50
Slovenia	3.82	4.15	4.17	4.19	3.82	4.90	7.89	10.07	3.82	5.55	10.08	12.16
Spain	11.47	11.22	11.10	11.00	11.47	12.34	14.98	15.70	11.47	13.83	19.17	19.92
Sweden	8.34	8.23	8.23	8.03	8.34	8.32	10.22	10.78	8.34	10.00	12.86	12.03
Switzerland	2.44	2.60	2.60	2.60	2.44	2.71	4.15	4.82	2.44	4.70	6.58	5.42
Türkiye	9.26	9.88	9.61	9.34	9.26	11.29	13.94	13.85	9.26	12.79	16.32	14.42
United Kingdom	4.28	4.10	4.00	4.00	4.28	5.29	6.57	7.92	4.28	4.87	8.32	9.05
United States	4.01	4.01	3.94	3.91	4.01	4.33	5.82	7.47	4.01	5.18	8.16	7.88

Source: IMF staff calculations

Annex III. Table 3. Euro Area: Headline Inflation Paths

(Percent)

	Baseline				Geopolitical				Recessionary			
	2024	2025	2026	2027	2024	2025	2026	2027	2024	2025	2026	2027
Australia	3.34	3.27	2.95	2.54	3.34	5.96	4.32	2.83	3.34	3.94	0.83	0.40
Austria	2.88	2.32	2.25	2.08	2.88	5.04	4.77	3.07	2.88	1.06	1.12	-0.09
Belgium	4.44	2.27	2.13	1.94	4.44	5.18	4.95	3.26	4.44	0.85	0.59	-0.32
Brazil	4.36	4.18	3.65	3.10	4.36	5.49	5.10	3.95	4.36	3.56	1.02	0.41
China	0.29	0.79	1.35	1.65	0.29	1.51	2.18	2.83	0.29	-0.87	-2.56	-0.30
Croatia	3.95	2.84	2.23	2.21	3.95	5.75	5.06	3.53	3.95	1.42	0.69	-0.06
Cyprus	2.25	2.12	2.00	2.00	2.25	4.72	3.98	3.03	2.25	0.32	-0.45	-0.24
Czech Republic	2.47	2.38	2.00	2.00	2.47	3.52	2.69	2.44	2.47	1.19	-1.38	-0.55
Denmark	1.80	2.20	2.00	2.00	1.80	3.78	3.81	2.98	1.80	1.08	-0.88	-0.28
Estonia	3.73	3.43	2.53	2.38	3.73	6.20	5.29	3.71	3.73	2.13	1.32	0.25
Euro area	**2.34**	**2.11**	**2.02**	**1.97**	**2.34**	**4.73**	**4.34**	**3.03**	**2.34**	**0.67**	**0.41**	**-0.22**
Finland	1.03	1.96	2.00	2.00	1.03	4.73	4.76	3.34	1.03	0.66	0.79	-0.13
France	2.33	1.67	1.91	1.85	2.33	4.24	4.14	2.85	2.33	0.29	0.50	-0.25
Germany	2.42	2.21	2.00	1.97	2.42	4.89	4.47	3.06	2.42	0.89	0.69	-0.25
Greece	3.00	2.33	2.02	2.01	3.00	4.93	4.00	3.04	3.00	0.53	-0.44	-0.23
Hungary	3.81	3.48	3.09	3.00	3.81	6.07	5.07	4.03	3.81	1.68	0.64	0.76
Ireland	1.34	1.62	1.65	1.87	1.34	3.59	4.43	3.07	1.34	0.91	-0.52	-0.42
Italy	1.10	2.03	1.98	2.00	1.10	4.53	3.95	3.00	1.10	0.41	0.01	-0.09
Japan	2.53	1.96	2.04	2.04	2.53	4.39	3.92	2.92	2.53	2.09	-0.62	-1.01
Latvia	1.29	2.15	2.20	2.22	1.29	5.06	5.02	3.53	1.29	0.73	0.66	-0.05
Lithuania	0.84	2.40	2.39	2.45	0.84	5.31	5.21	3.77	0.84	0.98	0.85	0.18
Luxembourg	2.18	2.45	2.23	1.77	2.18	5.39	4.97	3.02	2.18	1.00	0.64	-0.51
Malta	2.47	2.18	2.05	2.02	2.47	5.09	4.87	3.34	2.47	0.76	0.51	-0.25
Mexico	4.72	3.67	2.99	3.00	4.72	5.23	5.15	4.64	4.72	3.04	0.56	0.83
Netherlands	3.20	2.83	2.43	2.00	3.20	5.78	5.17	3.25	3.20	1.38	0.84	-0.28
Norway	3.26	2.40	2.00	2.00	3.26	3.42	2.63	2.27	3.26	1.46	-1.04	-0.49
Poland	3.84	4.58	3.50	2.92	3.84	6.31	6.00	4.88	3.84	3.85	0.95	0.70
Portugal	2.58	2.25	1.99	2.00	2.58	4.89	4.14	2.88	2.58	0.68	0.08	-0.26
Slovak Republic	3.12	5.55	2.42	2.03	3.12	8.46	5.24	3.35	3.12	4.13	0.87	-0.23
Slovenia	1.96	2.64	2.08	2.10	1.96	5.55	4.90	3.41	1.96	1.22	0.54	-0.17
Spain	2.81	1.89	2.02	2.00	2.81	4.39	3.98	2.99	2.81	0.12	-0.30	-0.34
Sweden	1.88	1.80	2.00	2.00	1.88	2.93	2.81	2.49	1.88	0.77	-1.20	-0.56
Switzerland	1.07	0.81	0.81	0.79	1.07	3.28	1.77	1.02	1.07	1.13	-2.02	-1.66
Türkiye	58.73	36.15	21.12	16.24	58.73	37.56	22.81	17.55	58.73	35.30	18.17	13.80
United Kingdom	2.54	2.42	2.00	2.00	2.54	4.61	4.38	1.97	2.54	2.50	0.61	-0.69
United States	2.87	1.96	2.08	2.12	2.87	4.21	4.88	3.37	2.87	0.52	-2.67	-1.13

Source: IMF staff calculations.

Annex III. Table 4. Euro Area: House Price Index Paths

(Rebased to 100 in 2024)

	Baseline				Geopolitical				Recessionary			
	2024	2025	2026	2027	2024	2025	2026	2027	2024	2025	2026	2027
Australia	100	103.3	106.3	109.0	100	83.4	82.2	89.1	100	90.6	89.6	91.0
Austria	100	102.3	104.6	106.8	100	86.7	86.3	92.8	100	93.6	91.3	92.4
Belgium	100	102.3	104.4	106.5	100	86.7	86.0	92.5	100	92.8	91.0	92.1
Brazil	100	104.2	108.0	111.3	100	83.5	83.5	91.8	100	89.5	87.8	91.3
China	100	100.8	102.2	103.8	100	57.2	50.1	61.9	100	71.1	62.5	67.5
Croatia	100	102.8	105.1	107.5	100	87.2	86.6	93.4	100	93.4	91.6	92.9
Cyprus	100	102.1	104.2	106.3	100	85.3	84.6	91.5	100	91.3	89.5	91.5
Czech Republic	100	102.4	104.4	106.5	100	81.4	78.9	86.3	100	88.0	85.5	87.7
Denmark	100	102.2	104.2	106.3	100	81.1	78.5	86.9	100	86.5	83.8	87.2
Estonia	100	103.4	106.0	108.6	100	87.8	87.5	94.1	100	94.9	92.7	93.8
Euro area	**100**	**102.1**	**104.2**	**106.2**	**100**	**86.1**	**85.5**	**92.2**	**100**	**92.7**	**90.6**	**92.0**
Finland	100	102.0	104.0	106.1	100	86.6	85.8	91.9	100	93.6	90.9	91.7
France	100	101.7	103.6	105.5	100	85.7	85.3	91.9	100	92.4	90.3	91.7
Germany	100	102.2	104.3	106.3	100	86.6	85.8	92.1	100	93.5	90.9	91.8
Greece	100	102.3	104.4	106.5	100	85.5	84.8	91.7	100	91.5	89.7	91.7
Hungary	100	103.5	106.7	109.9	100	86.4	86.6	94.6	100	92.5	91.6	94.7
Ireland	100	101.6	103.3	105.2	100	84.9	83.2	90.4	100	91.0	88.8	90.9
Italy	100	102.0	104.0	106.1	100	85.5	85.1	92.2	100	91.7	90.0	92.1
Japan	100	102.0	104.0	106.2	100	81.9	80.6	87.0	100	87.7	83.8	84.0
Latvia	100	102.2	104.4	106.7	100	86.6	86.0	92.8	100	92.7	91.0	92.3
Lithuania	100	102.4	104.8	107.4	100	86.8	86.3	93.4	100	93.0	91.4	92.9
Luxembourg	100	102.5	104.7	106.6	100	86.9	86.2	92.2	100	93.4	91.1	91.6
Malta	100	102.2	104.3	106.4	100	86.7	85.8	92.5	100	92.8	90.9	92.0
Mexico	100	103.7	106.8	110.0	100	82.5	82.7	92.6	100	88.8	86.5	89.7
Netherlands	100	102.8	105.3	107.4	100	87.3	86.7	92.9	100	93.8	91.6	92.3
Norway	100	102.4	104.5	106.5	100	81.1	79.0	86.5	100	88.1	86.3	88.5
Poland	100	104.6	108.3	111.4	100	83.2	84.2	94.2	100	89.1	88.4	91.7
Portugal	100	102.3	104.3	106.4	100	86.0	85.4	92.2	100	91.5	89.7	92.1
Slovak Republic	100	105.6	108.1	110.3	100	89.5	89.0	95.9	100	95.8	94.2	95.4
Slovenia	100	102.6	104.8	107.0	100	87.0	86.3	93.0	100	93.2	91.3	92.5
Spain	100	101.9	104.0	106.0	100	85.4	85.2	92.3	100	91.5	90.1	92.2
Sweden	100	101.8	103.8	105.9	100	80.8	78.7	86.2	100	87.8	85.7	87.7
Switzerland	100	100.8	101.6	102.4	100	80.1	77.8	83.6	100	86.8	85.2	85.5
Türkiye	100	136.2	164.9	191.7	100	109.4	129.5	161.9	100	117.2	136.4	158.6
United Kingdom	100	102.4	104.5	106.6	100	80.3	80.4	87.4	100	88.2	87.3	89.1
United States	100	102.0	104.1	106.3	100	80.7	81.7	89.6	100	86.7	81.6	83.0

Source: IMF staff calculations.

Annex III. Table 5. Euro Area: Market Risk Scenarios

(Basis Points)

			Geopolitical - market scenario		Recessionary - market scenario	
risk	factor	unit	delta shock	volatility shock	delta shock	volatility shock
CM	energy	relative change, percent	56.3		-58.8	
	industrial metals		24.8		-28.1	
	precious metals		17.4		-18.3	
CR	CR-low-5Y	absolute change, bps	85.5		0	
	CR-low-10Y		0		0	
	CR-mid-5Y		117.8		168.8	
	CR-mid-10Y		0		0	
	CR-high-5Y		206.8		319.3	
	CR-high-10Y		206.8		319.3	
	CR-europe		82.9		82.9	
	CR-US		98.3		98.3	
EQ	EQ-Asia	relative change, percent. PP change	-42.6	40.0	-42.6	40.0
	EQ-JP		-40.8	40.8	-40.8	40.8
	EQ-Latam		-46.8	40.0	-46.8	40.0
	EQ-US		-38.2	56.0	-38.2	56.0
	EQ-europe		-32	57.1	-32	57.1
IR	EUR-1M	absolute change, bps. PP change for vol	148.7	14.8	0	14.8
	EUR-6M		160.4	10.8	0	10.8
	EUR-1Y		178.7	13.5	0	13.5
	EUR-5Y		0	5.3	0	5.3
	EUR-10Y		0	4.8	0	4.8
	EUR-20Y		0	6.8	0	6.8
	EUR-30Y		0	6.8	0	6.8
	USD-1M		155.8	19.1	155.8	19.1
	USD-6M		158.8	21	158.8	21
	USD-1Y		171.4	23.6	171.4	23.6
	USD-5Y		164.2	7.6	164.2	7.6
	USD-10Y		151	71.8	151	71.8
	USD-20Y		127.2	8.2	127.2	8.2
	USD-30Y		112.4	8.3	112.4	8.3

Source: Bloomberg and IMF staff calculations.
Note: CM: commodities; CR: credit spreads; EQ: equity; IR: interest rates.

Appendix IV. Solvency Stress Test—Technical Aspects

This appendix explains additional technical details of the methodological approach used to project credit risk, NII, and NFCI.

Credit Risk

1. All financial institutions in the solvency stress test have adopted IFRS9 standards and credit impairments are calibrated in accordance with this accounting framework. Due to the lack of a long historical time-series of credit risk transition matrices, scenario-based transition matrices are estimated using Beta-linking (Gross et al., 2020), where an aggregate PD is projected and adapted to stage 1 and stage 2 exposures according to the most recently observed transition matrices. Starting transition matrices that are required for the Beta-linking for every bank and lending segment are constructed with data from FINREP (F04.04.1 for balance stocks and F12.02 for flows between stages).

2. LGD for unsecured lending is calibrated using the Frye and Jacobs (2012) method. Starting loan to values for collateralized lending and starting LGDs for all lending segments are reported in the STE templates for credit risk. Both secured and unsecured LGDs have been calibrated at the bank-specific portfolio level. Notably, under both adverse scenarios, the substantial decline in property values materially affects the LGD of secured lending. This, in turn, has a consequential impact on the credit risk charges associated with mortgage lending.

Net Interest Income

3. The data sources used to obtain the inputs for the equation below were the following:

i. The NII in the year before the cut-off date, $NII_{b,t=0}$, was obtained from FINREP (F16.01).

ii. Exposures and liabilities for each segment—that is, by portfolio type and by country of counterparty—were obtained from FINREP (F20.04 and F20.06, respectively).

iii. The repricing ladder for each segment was obtained by combining several sources: STE templates for interest rate risk in the banking book (IRRBB) and template J05.00 from the supervisory IRRBB module were the preferred sources but were complemented with COREP C66.01 whenever the other sources were not available.[1]

iv. Projections for the new business rate deltas, $dr_{t,j}^{nb}$, were obtained from satellite models estimated using the ECB's data set "MFI Interest Rates Statistics" (MIR).

4. New business rates were projected by estimating a range of passthrough regressions by segment. The publicly available MIR dataset reports new business rates by portfolio and by country of counterparty. This covers the following portfolios: mortgages, non-mortgage household

[1] Template C 66.01 was not the preferred source because it provides a *maturity*, rather than a *repricing*, ladder. Maturity and repricing do not coincide in the case of floating rate instruments.

credit, and NFC loans on the asset side, and household sight, household term, NFC sight, and NFC term deposits on the liability side. For the remaining portfolios, the FSAP assumed a unit passthrough from market rates (where market rates were either the 1-month EURIBOR or the sovereign yield). MIR covers all EU countries of counterparty; for non-EU countries, alternative data sources were used (e.g., country Central Bank statistics, Haver, etc.). Passthrough regressions were estimated independently for each segment j, using the following specification at quarterly frequency:

$$\Delta i_{t,j}^{nb} = \alpha_j + \beta_{0,j}^{ST}\Delta i_{t,c}^{ST} + \beta_{1,j}^{ST}\Delta i_{t-1,c}^{ST} + \beta_{1,j}^{LT}\Delta i_{t,c}^{LT} + \beta_1^{LT}\Delta i_{t-1,c}^{LT} + \gamma_j GDPgrowth_{t,c}$$

where Δ denotes quarterly changes, $i_{t,j}^{nb}$ is the new business rate for segment j, $i_{t,c}^{ST}$ is a short-term rate for country c (EURIBOR in the case of EA countries, and the short-term sovereign yield for non-EA countries), $i_{t,c}^{LT}$ is the long-term sovereign yield, and $GDPgrowth_t$ is the quarter-on-quarter real GDP growth.

5. All formulas apply at the bank-segment level; the notation omits these subindices for simplicity. The model requires two key inputs:

- A repricing ladder at T0, given by the value of exposures in each repricing bucket $[k, k+1]$ (i.e., exposures with time-to-repricing between k and $k+1$ years), denoted as $E_0^{[k,k+1]}$. The corresponding fraction of total exposures in that bucket is denoted as $\theta_0^{[k,k+1]}$. This is summarized in the following table:

Repricing Buckets	Value of Exposures	Share of Exposures
[0;1] yrs	$E_0^{[0,1]}$	$\theta_0^{[0,1]} = E_0^{[0,1]}/E_0$
[1;2] yrs	$E_0^{[1,2]}$	$\theta_0^{[1,2]} = E_0^{[1,2]}/E_0$
[2;3] yrs	$E_0^{[2,3]}$	$\theta_0^{[2,3]} = E_0^{[2,3]}/E_0$
[3;4] yrs	$E_0^{[3,4]}$	$\theta_0^{[3,4]} = E_0^{[3,4]}/E_0$

- Any exposure with time-to-repricing larger than three years can be allocated to the [3;4] year bucket. This is without loss of generality because those exposures will not reprice within the three-year stress-testing window.
- Scenario-specific projections for the interest rate on new business, denoted as r_t^{nb}.

6. The model calculations are conducted in four steps:

Step 1: Simulate the exposures originated/repriced in each bucket and period.

The model simulates the "law of motion" of exposures across buckets. Consider the value of exposures in bucket $[k-1, k]$ at the end of year-1. The exposures in that bucket will correspond either to exposures that at end of year-0 were in bucket $[k, k+1]$ (so one year later they have moved to the bucket with 1-year lower time-to-repricing), or to exposures that have been newly issued/repriced during year-1. The corresponding equation for this is:

(1) $E_t^{[k-1,k]} = E_{t-1}^{[k,k+1]} + I_t^{[k-1,k]}$

- where $I_t^{[k-1,k]}$ are the newly issued/repriced loans in bucket $[k-1,k]$ during year-t. In order to pin down the value of $I_t^{[k-1,k]}$, the key assumption is that the shares of exposures across buckets are constant over time. That is,

  (2) $\theta_t^{[k,k+1]} = \theta_0^{[k,k+1]}$ for all t,k

- This assumption is consistent with the static balance sheet used throughout the stress test.

Step 2: Simulate the average interest rate for each bucket and period.

- Denote as $r_{t-1}^{[k,k+1]}$ the average interest rate of the exposures that at end of year $(t-1)$ were in bucket $[k,k+1]$. This interest rate can be calculated recursively. From equation (1), $E_t^{[k-1,k]}$ is the sum of the exposures that were in bucket $[k,k+1]$ at end of year $(t-1)$ and the newly issued/repriced exposures $I_t^{[k-1,k]}$. Then, it must be that the average interest rate of $E_t^{[k-1,k]}$ is an exposure-weighted average of the respective interest rates of these two terms. That is:

  (3) $i_t^{[k-1,k]} = \rho_t r_{t-1}^{[k,k+1]} + (1-\rho_t) r_t^{nb}$ where $\rho_t = \frac{E_{t-1}^{[k,k+1]}}{E_t^{[k-1,k]}}$

- The recursive definition in equation (3) requires an initial condition, $r_0^{[k-1,k]}$. The assumption will be that the initial interest rate in all buckets is equal to the average interest income rate of the portfolio at T0, denoted as IIR_0.

Step 3: Calculate the interest income.

- Consider first the case without NPEs; the interest income (II) is:

  (4) $II_t = \sum_{k=0}^{3} r_{t-1}^{[k,k+1]} E_0^{[k,k+1]} + (1-\omega)\left(r_t^{nb} - r_{t-1}^{[0,1]}\right) E_0^{[0,1]}$ where $\omega = \frac{avg\ days\ to\ repricing}{365}$

- The first term is the base rate, which is determined in year $(t-1)$ and is therefore unaffected by the year t interest rate shock; the second term captures the effect of the year t interest rate shock on the interest income from interest-sensitive assets (i.e., exposures that reprice during year- t). The interest-sensitive assets will, on average, continue to earn the old interest rate $r_{t-1}^{[0,1]}$ during the fraction ω of the year, and during the remaining fraction $(1-\omega)$ their rate will change by a magnitude $r_t^{nb} - r_{t-1}^{[0,1]}$. The exposures have a T0 subindex because of the static balance sheet assumption.

- In order to incorporate NPLs into the model, the simplifying assumption is that the NPE ratio is the same across buckets. The interest income is therefore:

  (5) $\widetilde{II}_t = (1 - NPEr_t) \cdot II_t$

That is, the interest income $\widetilde{II}_t$ from equation (4) is multiplied by the exposure-weighted average share of performing exposures for the portfolio segment.

Step 4: Rewrite the model in terms of interest rate, i.e., "deltas"

It is useful to rewrite equation (5) in terms of changes, or "deltas", relative to the initial interest income rate IIR_0. In the hypothetical situation in which there are no interest rate shocks —i.e., $r_t^{nb} = IIR_0$ for all t—, the interest income from equation (5) would simply be $\overline{II}_t = IIR_0 \cdot E_0$, where $\overline{II}_t$ is used to denote this particular case of constant rates. Equation (5) can then be rewritten as a difference from $\overline{II}_t$ as

(6) $II_t - \overline{II}_t = \sum_{k=0}^{3} dr_{t-1}^{[k,k+1]} E_0^{[k,k+1]} + (1-\omega)\left(dr_t^{nb} - dr_{t-1}^{[0,1]}\right) E_0^{[0,1]}$

where dr denotes the interest rate "delta" relative to IIR_0 (e.g., $dr_t^{nb} = r_t^{nb} - IIR_0$).

The $Interest\ Expense\ Delta_{b,t,j}$ is defined analogously to the income Delta, simply replacing exposures for liabilities.

Net Fee and Commission Income

7. Econometric results suggest that GDP growth and the change in EURIBOR are significant across specifications, with a positive and negative coefficient respectively, while the stock price growth only comes up as significant for large banks, with a positive coefficient. These signs appear reasonable: higher real GDP and stock price growth indicate a better performing real economy and growing financial markets, which would both imply an expansion of the financial services that generate fee and commission income; it is also to be expected that stock prices are more significant for larger banks, as their business model tends to generate a larger share of NFCI from securities, corporate finance, and asset management activities (linked to financial market activity). The negative coefficient on the EURIBOR rate might be related to the fact that higher rates are associated with lower bank business volumes, thus reducing fee and commission income from payment services (linked to current accounts and credit cards).

	Large banks			Small/Medium-sized banks		
	All regressors	Lasso-selected regresors	Arellano-Bond estimator	All regressors	Lasso-selected regresors	Arellano-Bond estimator
	(1)	(2)	(3)	(1)	(2)	(3)
NFCIR (t-1)	0.707***	0.707***	0.623***	0.717***	0.714***	0.463***
RGDP growth	0.00891***	0.00862***	0.00880***	0.00700***	0.00612**	0.00584***
RGDP growth (t-1)	0.00186	0.00174	0.00277*	0.000274	0.000286	0.00188
Stocks growth	0.00189**	0.00190**	0.00222***	0.000349	0.000204	0.000523
Stocks growth (t-1)	0.0000981	0.0000929	0.000262	0.000439	0.000703	0.000685
D.EURIBOR	-0.0270***	-0.0270***	-0.0295***	-0.0162**	-0.0177***	-0.0184**
D.EURIBOR (t-1)	-0.00566	-0.00464	-0.00991	-0.0398**	-0.0360**	-0.0373***
10y sov yield	0.0140	0.0137	0.0112	0.00125		
10y sov yield (t-1)	-0.0158	-0.0158	-0.00758	0.00638	0.00672	0.00525
CPI inflation	-0.000760			-0.00434	-0.00259	-0.00337
CPI inflation (t-1)	0.00739*	0.00764*	0.00501	0.00626*	0.00652**	0.00577**
HPI inflation	-0.000626			-0.00173*		
HPI inflation (t-1)	0.00237	0.00184*	0.00225**	0.00287***	0.00170	0.00217
US stocks growth	-0.00162	-0.00161	-0.00226*	0.000506	0.000854	0.000379
US stocks growth (t-1)	0.000516	0.000480	0.000327	0.000687		
EUR/USD FX change	-0.000281	-0.000248	-0.000919	0.000684		
EUR/USD FX change (t-1)	0.00156	0.00158	0.00163	0.000540	0.000520	0.000889
r2	0.609	0.609		0.608	0.605	
N	595	595	568	942	942	867
="* p<0.10	** p<0.05	*** p<0.01"				
All variables are expressed in percentages.						

Appendix V. Solvency Stress Test—Detailed Results by Business Model

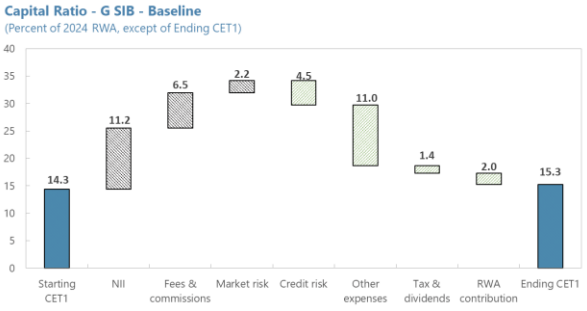
This appendix describes the drivers of capital depletion and profitability by business model.

Detailed Results: G-SIB

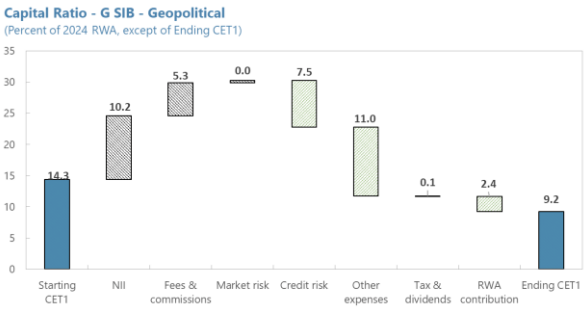
1. Under the baseline, strong fee generation and favorable market-risk income boost capital early on, more than offsetting credit-loss charges, operating expenses, and shareholder distributions (Annex V. Figure 1). The modest expansion of RWAs at the end trims some of these gains, but the ratio still finishes slightly higher than where it began, signaling that, in normal conditions, earnings capacity is enough to build capital.

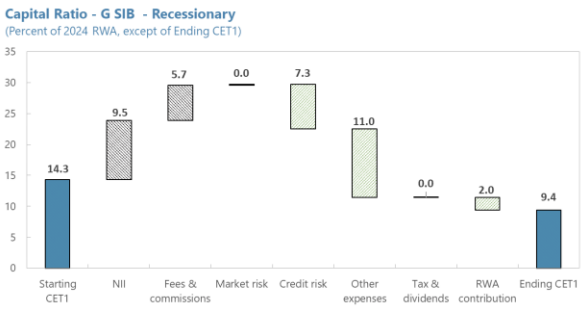
2. Under both the geopolitical and recessionary shocks, revenue lines weaken, and market-risk results turn less supportive, yet the dominant drag comes from sharply higher credit-risk charges. Those losses, combined with stress-related RWA inflation, erase all earlier gains and push the CET 1 ratio down into the 9 percent range. Overall, the critical vulnerabilities are elevated credit losses and RWA growth under stress; revenue shortfalls play a secondary role. The analysis underscores that these banks' thinner starting buffers leave limited headroom once severe credit deterioration sets in.

Annex V. Figure 1. Contribution to Capital – G SIB



- *G-SIBs convert healthy fee income and market gains into a modest capital build-up, nudging the CET 1 ratio from the mid-14 percent starting point to just above 15 percent despite normal credit losses, costs, and RWA growth.*
- *In both geopolitical and recessionary shocks, sharply higher credit-risk charges coupled with stress-induced RWA inflation drive the CET 1 ratio down to roughly 9 percent—well below the baseline outcome and close to binding regulatory buffers.*
- *Elevated credit losses and RWA expansion, rather than revenue shortfalls, are the primary forces depleting G-SIB capital, highlighting limited headroom in severe downturns.*



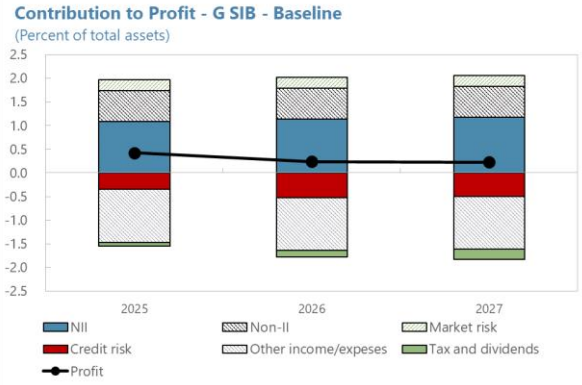


Source: IMF staff calculations.

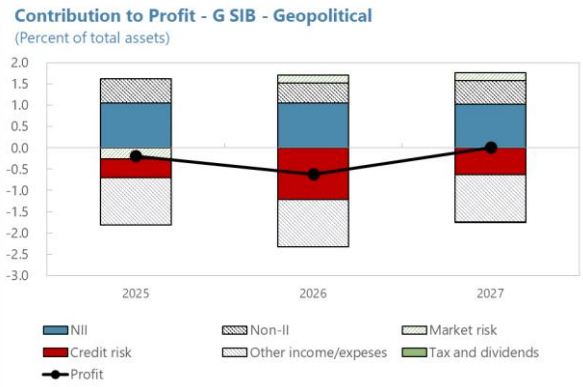
3. Profitability tracks the severity and persistence of the two stress scenarios (Annex V. Figure 2). Under the baseline, these globally systemic banks remain comfortably profitable. Strong fee and trading income lift returns to about 0.42 percent of assets in 2025, before higher funding

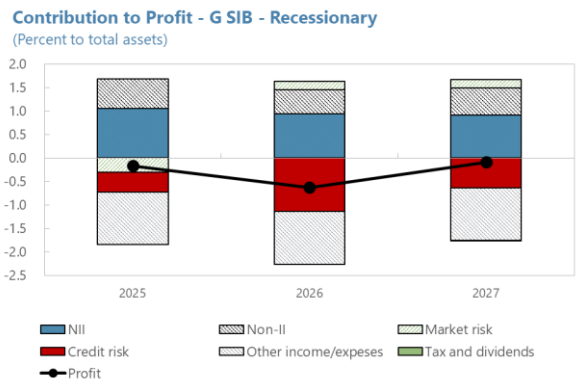
costs and a gradual rise in credit-loss provisioning trim profits to roughly 0.24 percent in 2026 and 0.23 percent in 2027. The geopolitical shock initially generates losses of about 0.20 percent in 2025 which deepen to roughly 0.62 percent in 2026 as market-valuation hits and credit-risk charges spike, yet a recovery in client activity and lower provisioning allows a marginal return to break-even in 2027. The recessionary scenario proves harsher. Losses of roughly 0.17 percent in 2025 widen to about 0.63 percent in 2026 amid surging impairments and compressed margins, and although the drag eases in 2027, results remain slightly negative at around 0.09 percent, underscoring how a broad-based downturn can keep large, globally active banks in the red for an extended period.

Annex V. Figure 2. Profitability – G SIB



- *In baseline, G-SIBs stay in the black throughout, with returns tapering from roughly 0.42 percent in 2025 to about 0.23 percent by 2027.*
- *In geopolitical, earnings swing to losses in 2025–26 but recover to near break-even in 2027 as market conditions stabilize.*
- *In recessionary, losses are deeper and persist through 2027, highlighting the cohort's vulnerability to a broad macro downturn.*





Source: IMF staff calculations.

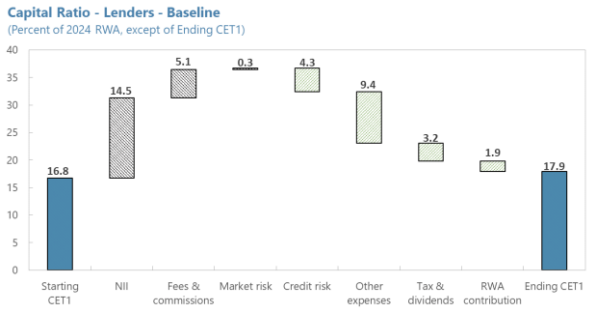
Detailed Results: Lenders

4. For Lenders, in the baseline, starting in the mid-16 percent CET1 range, strong core revenues push the ratio sharply higher early in the horizon, and modest market-risk gains provide an additional lift (Annex V, Figure 3). Subsequent credit-risk charges, operating costs, taxes, and dividends pare back part of that gain, while a measured expansion of RWAs shaves off the remainder. Even so, the ratio finishes the period slightly above its starting point, indicating that traditional, deposit-funded lenders can still build capital under benign conditions.

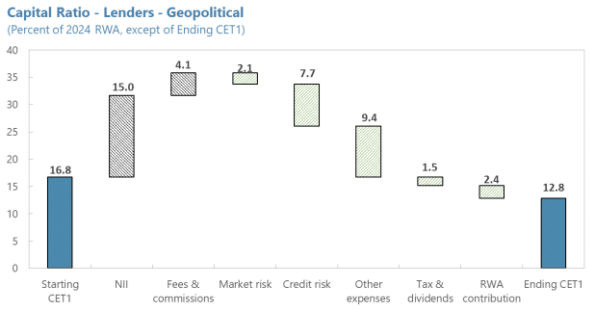
5. In the geopolitical scenario, revenue lines hold up reasonably well, but larger credit-losses and higher operating costs erode most of the early gains. The stress-related increase in RWAs then drags the CET 1 ratio down into the 12–13 percent range by the end of the

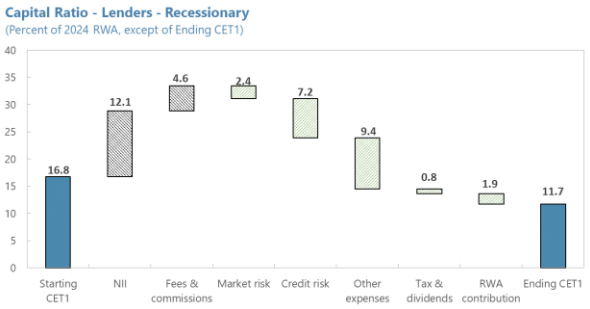
horizon—about four percentage points below the baseline outcome. In the recessionary scenario, a deeper revenue hit combined with still higher credit-risk charges and stronger RWA inflation, pulls the scenario-end CET 1 ratio down to roughly 11.5 percent, the lowest of the three scenarios. The result underscores lenders' sensitivity to macro-driven credit deterioration and RWA expansion, despite their relatively strong starting capital.

Annex V. Figure 3. Contribution to Capital – Lenders



- *In baseline, strong deposit-funded revenues and modest market gains allow Lenders to nudge their CET 1 ratio slightly above the mid-16 percent starting point by 2027, despite normal credit costs and gradual RWA growth.*
- *In geopolitical, higher credit-losses and stress-driven RWA expansion wipe out most earnings, pulling the ratio into the low-12 percent range—around four points below the baseline finish.*
- *In recessionary, deeper revenue compression, heavier credit-losses, and stronger RWA inflation push the ratio down to the low-11 percent range, marking the weakest capital position and highlighting lenders' sensitivity to macro downturns.*

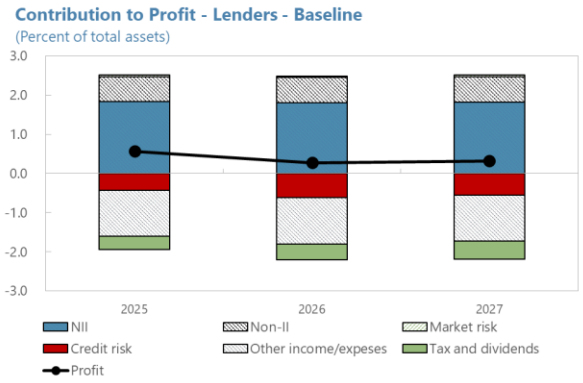




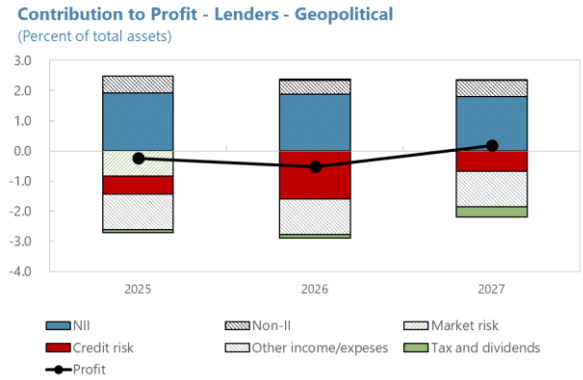
Source: IMF staff calculations.

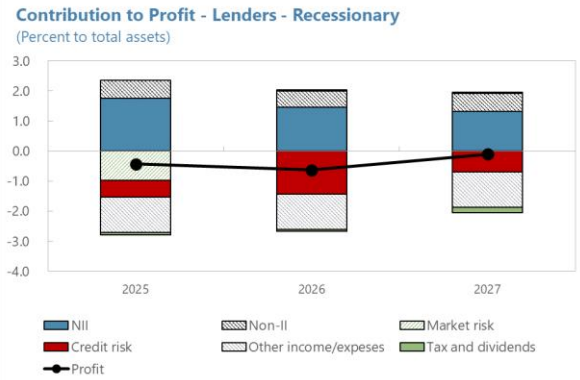
6. Among Lenders, profitability follows a clear hierarchy across scenarios (Annex V, Figure 4). Under the baseline, their deposit-funded business model generates healthy earnings. In the geopolitical scenario, we observe a loss of about 0.24 percent in 2025 that deepens to roughly 0.52 percent in 2026, reflecting lower fee income, market-valuation hits, and a spike in credit-risk charges; however, a moderation of impairments allows profits to turn positive again (around 0.18 percent) in 2027. The recessionary scenario is harsher. Losses swell to roughly 0.43 percent in 2025 and about 0.63 percent in 2026 as credit impairments surge and margins compress; although the drag eases in 2027, earnings remain slightly negative (0.10 percent), underscoring lenders' sensitivity to broad-based economic downturns despite their strong starting profitability.

Annex V. Figure 4. Profitability – Lenders



- *In baseline, lenders stay comfortably profitable, with returns drifting from roughly 0.56 percent in 2025 to about 0.32 percent in 2027.*
- *In geopolitical, earnings swing to losses in 2025–26 but recover to a modest profit in 2027 as impairments ease.*
- *In recessionary, losses deepen in 2025–26 and remain slightly negative in 2027, highlighting heightened sensitivity to a broad downturn.*





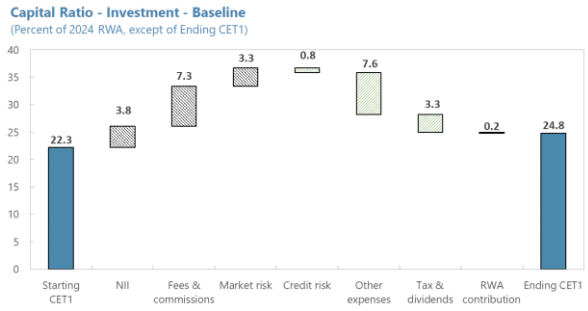
Source: IMF staff calculations.

Detailed Results: Investment

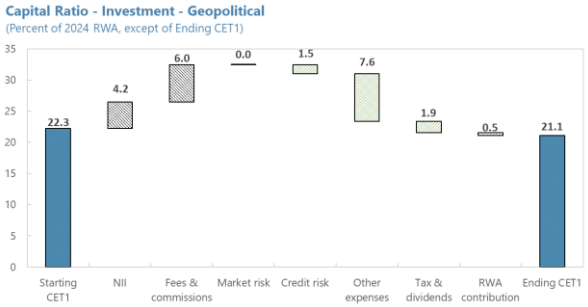
7. In the baseline, investment banks begin with a healthy CET 1 buffer and benefit from strong fee income and trading revenues, which bring material front-loaded capital gains (Annex V. Figure 5). Normal levels of credit-risk charges and operating costs then chip away at this gain, and the modest expansion of RWAs trims it further. Even so, the cohort ends the horizon with a CET 1 ratio comfortably above the starting point, reflecting robust earnings capacity and relatively low credit-risk.

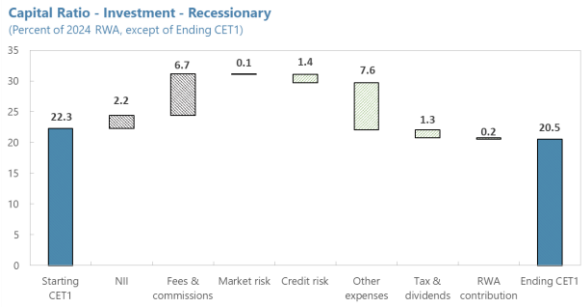
8. In the geopolitical scenario, core revenues remain resilient, but market-risk income and fee generation soften, while credit-risk charges rise. Although these factors reduce capital, the cohort still retains a sizeable buffer until stress-related RWA inflation pulls the CET 1 ratio down into the mid-12 percent range by the end of the horizon, several points below the baseline finish yet well above capital minimum requirements. In the recessionary scenario, deeper revenue compression, heavier credit-risk losses, and a stronger surge in RWAs generate the largest downward pull, bringing the year-end CET 1 ratio to the low-21.1 percent range. Despite this decline, investment banks remain better capitalized than other cohorts, underscoring their lighter balance-sheet risk profile.

Annex V. Figure 5. Contribution to Capital – Investment



- *In baseline, strong fee and trading revenues let investment banks lift their CET 1 ratio above the starting level, even after normal credit costs, expenses, and modest RWA growth.*
- *In geopolitical, softer market income, higher credit-losses, and stress-driven RWA expansion pull CET 1 down to the mid-21.1 percent range—below baseline but still comfortably above regulatory minima.*
- *In recessionary, deeper revenue compression, heavier credit losses, and a larger RWA surge push the ratio to the low-20.5 percent range, yet investment banks remain the best-capitalized cohort thanks to their lower credit-risk density.*

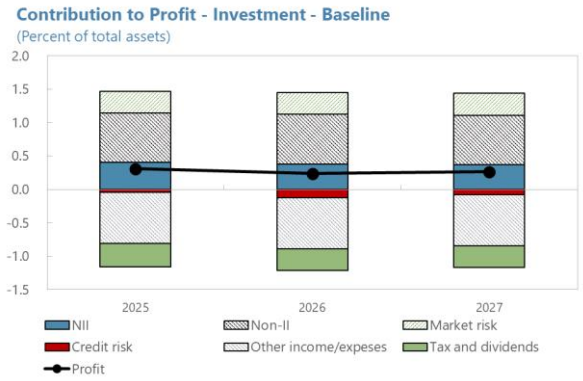




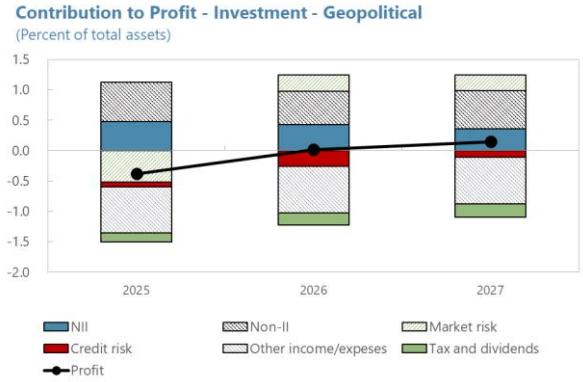
Source: IMF staff calculations.

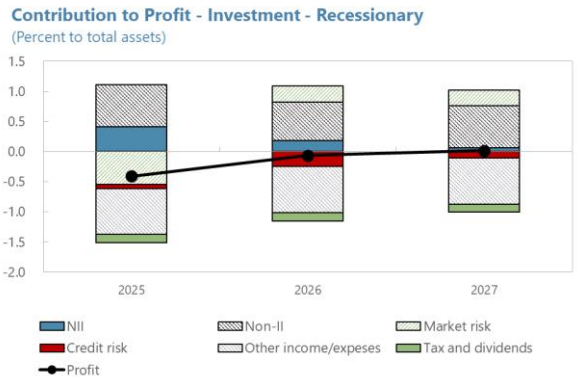
9. Investment banks' profitability follows a distinct three-phase pattern across the three scenarios (Annex V. Figure 6). Under the baseline, healthy trading and advisory revenues keep earnings firmly positive, with returns of roughly 0.31 percent of assets in 2025 tapering to about 0.27 percent by 2027 as market conditions normalize. The geopolitical shock triggers a sharp setback to 0.38 percent in 2025; however, stabilizing asset prices allow the cohort to edge back to break-even in 2026 and post a modest profit of roughly 0.14 percent in 2027. The recessionary scenario is harsher and more drawn-out: losses deepen to about 0.41 percent in 2025 and linger in 2026, but a gradual recovery in trading volumes and a moderation in credit-risk charges bring the result just above zero by 2027. Overall, investment banks prove more volatile than other business models yet still manage to restore profitability by the end of both adverse paths, reflecting their lower credit-risk density and strong fee-generating franchises.

Annex V. Figure 6. Profitability – Investment



- *In baseline, investment banks remain profitable throughout.*
- *In geopolitical, a sharp loss in 2025 gives way to break-even in 2026 and a modest profit in 2027 as market conditions improve.*
- *In recessionary, losses persist in 2025–26, turning only marginally positive in 2027, underscoring sensitivity to prolonged macro stress despite eventual recovery.*





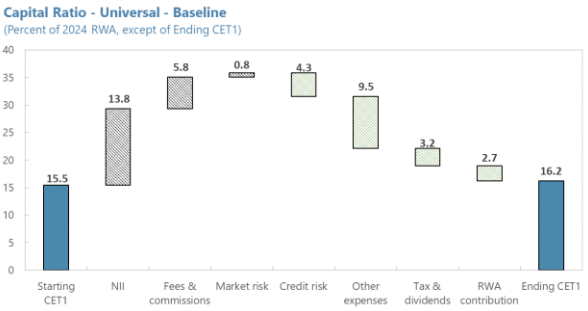
Source: IMF staff calculations.

Detailed Results: Universal

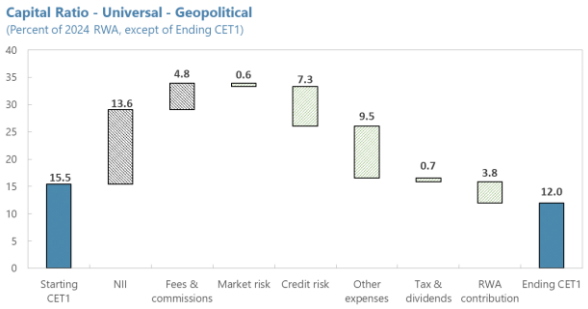
10. In the baseline, Universal banks benefit from solid fee income and trading gains, which lift capital materially in the first years of the scenario (Annex V. Figure 7). Normal credit-loss charges, operating costs, and shareholder distributions then erode part of that gain, and a measured increase in RWAs trims it further. Even so, the cohort finishes the period a little above its starting level, signaling that the franchise generates enough earnings in benign conditions to build capital modestly.

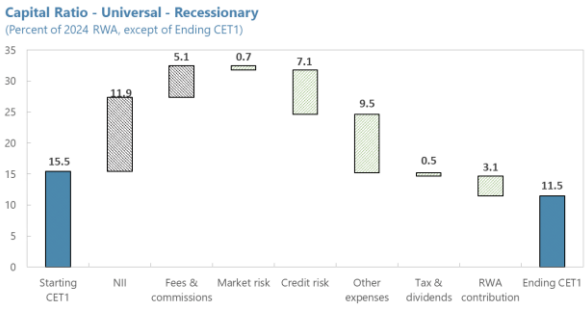
11. In the geopolitical scenario, while NII proves resilient, fees and trading revenues soften, and credit-risk charges rise markedly. These effects, combined with higher expenses, reduce capital, but the decisive hit comes from stress-related RWA inflation, which drags the year-end CET 1 ratio down to just under 12 percent, about 4 percentage points below the baseline finish. In the recessionary scenario, a deeper fall-off in revenues, heavier credit-losses, and an even larger surge in RWAs generate the most severe erosion, leaving the cohort with a CET 1 ratio in the high-11 percent range at the horizon. Although still above minimum requirements, this outcome underscores Universal banks' sensitivity to broad-based macro downturns despite offsets from their diversified business mix.

Annex V. Figure 7. Contribution to Capital – Universal



- *In baseline, robust fee and trading income lift Universal banks' CET 1 slightly above the mid-15 percent starting level by 2027, even after normal credit costs, expenses, and modest RWA growth.*
- *In geopolitical, softer revenues, higher credit-losses, and stress-driven RWA inflation pull the ratio to just under 12 percent—around four points below the baseline finish.*
- *In recessionary, deeper revenue hits, heavier credit-losses, and a larger RWA surge lower the ratio to the high-11 percent range, keeping it above minima but highlighting sensitivity to broad downturns.*

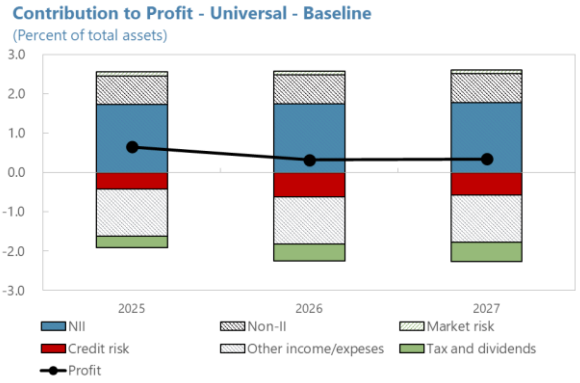




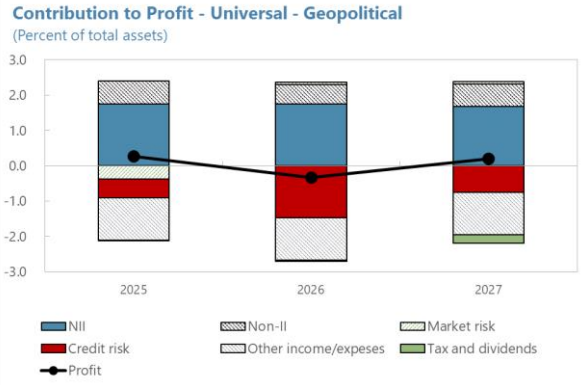
Source: IMF staff calculations.

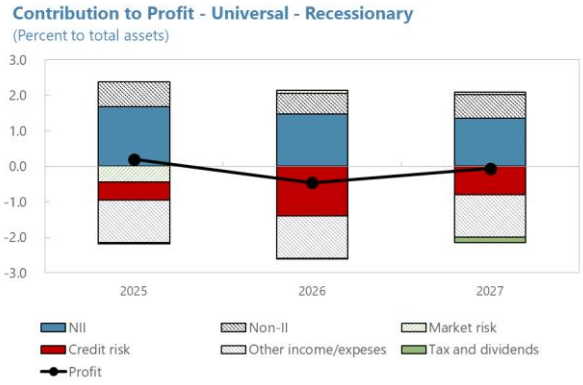
12. Profitability demonstrates a pronounced cyclical pattern across the three scenarios (Annex V. Figure 8). Under the baseline, a diversified revenue mix, combining steady NII with solid fee and trading performance, keeps earnings strong. Profits peak at about 0.65 percent of assets in 2025, dip to roughly 0.32 percent in 2026, and rebound to around 0.35 percent in 2027. The geopolitical shock softens revenues but does not eliminate profitability. Returns fall to roughly 0.27 percent in 2025, swing to a moderate loss of about 0.33 percent in 2026 amid valuation hits and higher credit-risk charges, then recover to a modest profit of roughly 0.20 percent in 2027. The recessionary scenario is the most punitive. Profits compress to about 0.20 percent in 2025 and turn sharply negative (-0.46 percent) in 2026 as credit impairments surge and margins compress; earnings remain slightly negative in 2027 (-0.06 percent), showing that Universal banks' profitability can be impaired due to severe macrofinancial conditions.

Annex V. Figure 8. Profitability – Universal



- *In baseline, diversified revenues keep Universal banks solidly profitable.*
- *In geopolitical, profits shrink in 2025, dip into a modest loss in 2026, and rebound to a small gain by 2027.*
- *In recessionary, earnings compress sharply, swinging to a deeper loss in 2026 and remaining slightly negative in 2027, highlighting vulnerability to a broad downturn.*





Source: IMF staff calculations.

Appendix VI. Liquidity Stress Test—Technical Aspects

This appendix explains additional technical details of the methodological approach used to project liquidity risk, including a description of the scenarios and calibration used for cash flow and LCR stress tests.

Cash Flow Liquidity Stress Tests

1. Cash-flow based liquidity stress tests transform reported cash-flow data into stressed cash-flows and security flow data based on a matrix of scenario dependent stress factors.[1]They focus on two key indicators, namely, liquidity risk exposure and liquidity risk bearing capacity of banks. The first indicator is defined as the difference between cash-inflows and cash-outflows in each time bucket (the net-funding gap, NFG) and the sum of these differences across buckets (i.e. the cumulated net-funding gap, CNFG). The second indicator is the CBC, defined as the sum of cash inflows banks can generate under stress at reasonable prices in the respective bucket after considering securities flows. The cumulative CBC is the sum of the counterbalancing capacities across time buckets and the current one. The analysis builds on data collected within the COREP C66 template with data cut-off point of December 2024.

2. Comparing cash flow matrices in 2020 and 2024, some major differences in the shortest overnight time bucket are noticeable:

i) Overnight CB inflows constituted the largest part (7.8 percent) of total funding in 2020, decreased to 0.5 percent in 2024.
ii) SFT funding was negligible in 2020 yet it went up to 5 percent of overnight flows in 2024.
iii) Share of stable retail overnight deposits declined by 2 percentage points to 10 percent in 2024.
iv) Share of FX swaps increased to 2 percent from 0.3 percent in 2020.

3. Comparing liquidity risks in 2020 and 2024, banks in the sample became more susceptible to contingent liquidity risks stemming from changes in net value of repos and derivatives positions. The share of funding from stable retail deposits also declined. The net overnight contractual gap widened from 27 percent in 2020 to 31 percent in 2024. Due to the lack of data, the adverse scenario impact on the value of collateral posted for derivative transactions could not be estimated, although the value of additional collateral posted/received due to repo and reverse repo transactions (up to three months) was considered in the cash flow liquidity stress tests. The value of collateral was reduced by the haircut obtained from the market risk scenario.

Scenarios

4. Parameter uncertainty is an integral component of any liquidity stress test. Regardless of the sophistication of parametrization, liquidity stress situations can be unexpected and last for various time periods (from a few days to the slow drain of liquidity over many months). To address

[1]For details see Schmieder, et al. (2012), Schmitz (2015) and IMF (2018).

the inherent parameter uncertainty, FSAP team: i) designed several scenarios of increasing severity and linked those with macro scenarios; ii) designed a set of reverse stress tests which run across multiple time horizons with increasing outflow rates (yet the outflow rates were still capped at double the original rates) with the condition that 20 percent of the banks (by assets) need to fail.

Annex VI. Table 1. Euro Area: Key CFLST Scenario Parameters
(Percent)

		SC1 Mild	SC2 Idiosyncratic	SC3 Severe
Outflows	Stable retail deposits	5	8	5
	Other retail deposits	10	40	10
	Operational deposits	25	49	15
	Non-operational deposits from credit institutions	100	100	50
	Non-operational deposits from other financial customers	75	100	50
	Non-operational deposits from central banks	0	0	0
	Non-operational deposits from non-financial corporates	25	76	25
	Non-operational deposits from other counterparties	25	76	25
	FX-swaps maturing	50	100	50
	Derivatives amount payables other than those reported in 1.4	50	100	50
	Other outflows	50	100	50
CBC haircuts	Level 1 central bank	100	100	100
	Level 1 (CQS 1)	98	98	90
	Level 1 (CQS2, CQS3)	95	95	85
	Level 1 (CQS4+)	75	75	60
	Level 1 covered bonds (CQS1)	97	97	90
	Level 2A corporate bonds (CQS1)	85	80	80
	Level 2A covered bonds (CQS 1, CQS2)	85	80	80
	Level 2A public sector (CQS1, CQS2)	85	80	80
	Level 2B ABS (CQS1)	75	75	60
	Level 2B covered bonds (CQS1-6)	75	75	60
	Level 2B corporate bonds (CQ1-3)	75	75	60
	Level 2B shares	75	75	60
	Level 2B public sector (CQS 3-5)	75	75	60
	Other tradable assets	75	75	60
	Non tradable assets eligible for central banks	62	62	50
	Own issuances eligible for central banks	62	62	50

5. The CFLST analysis employs a set of three scenarios ranging between one-day day to 1-year horizon. Scenarios assume the same cash flow rates through all-time buckets.

(i) *Mild*. Macro shock due to general risk aversion (affects CBC); some drawdown of liquidity facilities.

(ii) *Moderate*. Macro shock due to sovereign distress (affects CBC and outflows from individual banks); severe drawdown form liquidity facilities.

(iii) *Severe*. Idiosyncratic risk leads to severe outflows (bank specific).

6. In terms of inflows, CFLST made conservative assumptions. Key inflows, such as inflows from loans to non-financial corporates, retail loans etc. were set at 0 percent in all scenarios. Banks try to preserve their franchise value, thus tend to grant loans and allow committed facilities to be drawn even in times of stress. Other inflows from secured transactions (SFTs) were set to 100 percent.

7. Contingent liquidity outflows. Due to renewals of repo/reverse repo contracts, it was assumed that collateral monetization rate is lower due to decline in market prices of CBC securities (which is equivalent to higher margin requirements and/or margin calls). Outflows from derivatives and other contingent items were left the same as banks calibrated in their submissions (FSAP team was not able to recalibrate those items).

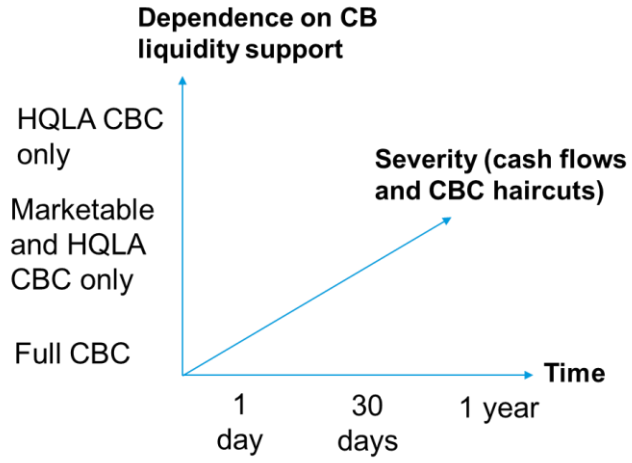
8. Some of the stress scenarios are combined with three different approaches to the counterbalancing capacity (Annex VI. Figure 1):

(i) Unrestricted. Full CBC without additional haircuts as long as banks have unencumbered eligible collateral.

(ii) Restricted to liquid and marketable CBC: non-marketable components of the counterbalancing capacity (i.e. credit claims and committed lines provided to the banks; 18 percent of CBC in the sample) are disregarded.

(iii) Most restricted. Liquid HQLA CBC: haircuts and specific market price effects derived from the solvency stress test for assets that are liquid in private markets. 28 percent of CBC in the sample is disregarded.

Annex VI. Figure 1. CFLST Scenarios



Coins and bank notes	40,992	1%	Liquid CBC
Withdrawable central bank reserves	1,887,385	35%	
Level 1 tradable assets	1,718,135	32%	
Level 2A tradable assets	126,781	2%	
Level 2B tradable assets	130,950	2%	
Other tradable assets	517,833	10%	Marketable CBC
Non tradable assets eligible for central banks	321,655	6%	Non-Marketable CBC
Own issuances eligible for central banks	568,512	11%	
Undrawn committed facilities received	77,643	1%	

Sources: IMF staff elaboration.

Data in EUR millions.

9. The stress scenarios were linked to macro scenarios developed for solvency stress testing using a similar narrative and customizing cash flow rates and haircuts. To ensure consistency with solvency stress tests, the calibration of haircuts under the liquid CBC approach

draws on the asset prices (sovereign and corporate bonds) under the adverse geopolitical scenario of the solvency stress tests.

10. Parameters were calibrated using multiple approaches, including the March 2023 banking turmoil, the ECB/SSM 2019 liquidity stress test, and the EA 2018 FSAP. Key cash flow parameters used for calibration purposes are highlighted below.

Annex VI. Table 2. Euro Area: Deposit Outflow Rates in Liquidity Crisis Episodes
(Percent)

Bank	Observed deposit outflow rate	Period	Daily
Silicon Valley Bank (2023)	85	2 days	43
Northern Rock (2007)	20	4 days	5
Wamu (2008)	10	10 days	1
First Republic Bank (2023)	57	90 days	0.6
IndyMac (2008)	8	14 days	0.6
Icesave (2008)	20	75 days	0.3
Credit Suisse (2023)	21	90 days	0.2
LCR assumption			
Retail stable	5	30 days	0.2
Retail less stable	10	30 days	0.3
Operational	25	30 days	0.8
Non-Financial Corporate	40	30 days	1.3
Average (net) outflows for the euro area SIs	4.2	30 days	0.1
IMF ST daily (ex SVB and CS)			1.5

Sources: BCBS report on the 2023 banking turmoil; IMF, ECB calculations

Appendix VII. Solvency-Liquidity Interactions—Technical Aspects

This appendix explains the methodological approach used for the joint solvency and liquidity stress test, including the procedure to map regulatory solvency and liquidity templates to model inputs. The approach builds on Cont, Kotlicki and Valderrama (2020).

Methodology

1. Changes in market valuation are computed using a partial revaluation approach. Model valuation uses the sensitivities (delta, gamma, vega) reported in the STE for market risk in both trading book and banking book (measured a fair value). Denoting $\delta_k M$ the sensitivity of asset M to risk factor X_k, the change in the value of M is given by

$$(1)\ \Delta M = \sum_{k=1}^{d} \delta_k M \cdot \Delta X_k = \delta M \cdot \Delta X$$

similarly, we compute $\Delta I = \delta I \cdot \Delta X$, and $\Delta N = \delta N \cdot \Delta X$.

2. In the two-day scenario, CCR losses are linked to NBFI counterparty default rates estimated in the system-wide liquidity analysis. [1] The share of NBFI counterparty defaults projected in the system-wide stress test using the same market scenario is applied to each bank-specific EEPE[2] on margined transactions. In the two-week stress exercise, CCR losses are driven by the default of the three most vulnerable counterparties (i.e., posting higher risk density) among the top 20 derivatives exposures (net of credit risk mitigation techniques), excluding qualifying CCPs, central banks, central governments, and international institutions.[3] In the model, CCR is applied to asset J (illiquid assets, not subject to margin calls) $\Delta J = CCR_{losses}$.

3. Liquidity flows evolve with the stress scenario. In the model, obligations coming due at t=2 include three components:

- *Unconditional flows* They represent maturing liabilities (S_0) and scheduled contractual outflows (SCO) expected during the stress test horizon.
- *Contingent flows linked to margin and collateral calls*. For derivatives and SFT positions subject to margin requirements, negative changes in fair value trigger margin calls denoted by: $\Delta S = (\Delta I)^- + (\Delta M)^-$.
- *Contingent flows triggered by own credit downgrade.* A credit rating downgrade following the initial capital depletion leads to a run-off of deposit outflows: $S_D 1_{downgrade}$

[1] See TN "Systemic Risk Analysis – NBFIs".

[2] The EEPE is defined in CRR and used to calculate capital requirements for counterparty credit risk using internal models.

[3] This is a similar approach to that followed in the 2025 EU-wide stress test methodology for market risk.

Therefore, conditional on the market scenario, cash outflows increase to:

(2) $S_2 = S_0 + SCO + \Delta S + S_D 1_{downgrade}$,

while liquidity reserves increase with scheduled contractual inflows (SCI) to

(3) $C_1 = C_0 + SCI$

4. Liquidity at risk (*LaR*) measures the net outflows corresponding to the stress scenario considered. *LaR* is a conditional concept, as it quantifies the expected total draw on liquidity resources of the bank *conditional* on the scenario, including the evolution of liquidity balances and maturing liabilities:

(4) $LaR = S_2 - \left(C_1 - C_0\right)$

5. A bank facing a liquidity shortfall can raise liquidity through a series of mitigating actions. A liquidity shortfall λ emerges if liquid assets are not enough to cover cash outflows, i.e., $\lambda = \left(S_2 - C_1\right)^+$. These mitigating actions, subject to a pecking order based on cost considerations, are a source of liquidity that can be implemented in a short time horizon, including:

- *Unsecuritized borrowing in the interbank market.* The bank has access to short-term funding markets at a market rate r_u conditional on not being downgraded. The distance to a downgrade (second term in the equation below) represents the maximum volume available of unsecuritized borrowing, where a downgrade occurs if the leverage ratio exceeds δ:

  (5) $B_u = \min\left\{\lambda, \frac{\left(E_1\delta - \{I_1 + J_1 + M_1 + N_1\}\right)^+}{1 + r_u\delta}\right\}$

- *Repo borrowing*. The bank can raise liquidity by entering a repo with the central bank or a market counterparty. This requires the provision of unencumbered tradable assets given by $M_1 + N_1$ with a haircut h yielding the following volume of repo borrowing:

  (6) $B_r = \min\left\{\lambda - B_u, \left(1-h\right)\left(M_1 + N_1\right)\right\}$

- *Liquidation of assets ("fire sales").* A fraction θ_J of illiquid assets J can be sold in the short-term at a discount ψ. The endogenous share of assets liquidated at fire sales is denoted by:

  (7) $w = \min\left\{\frac{\left(S_2 - \{C_1 + B_u + B_r\}\right)^+}{\left(1-\psi\right)\theta_J J_1}, 1\right\}$

6. While liquidity mitigating actions serve to absorb liquidity pressures, they are costly in terms of equity. Cash increases to

(8) $C_2 = C_1 + B_u + B_r + \omega\left(1-\psi\right)\theta_J J_1$

but the value of equity is reduced to:

(9) $E_2 = E_1 - r_u B_u - r_r B_r - \omega\psi\theta_J J_1$.

Raising liquidity thus results in an amplification of the initial market shock on bank capital measured by

$$Loss\ amplification = \frac{E_2 - E_1}{E_1 - E_0} x100$$

Mapping of Regulatory Solvency and Liquidity Templates

7. Marketable assets are those available for short-term funding in stress scenarios. Assets subject to margin requirements (Asset M, Figure 32) include the fair value of derivatives—trading, economic hedges, and hedge accounting—sourced from FINREP (F10.00, F11.01). Assets not subject to margin requirements (Asset N, Figure 32) comprise counterbalancing capacity (excluding cash and central bank reserves), including HQLA, other tradable assets, non-tradable but repo-eligible assets (e.g., credit claims), and own issuances like covered bonds. These are identified in the COREP maturity ladder (C66.01.b).

8. Illiquid assets include both encumbered and non-marketable assets. Encumbered assets are pledged in derivatives or SFTs and include debt securities, equities, and loans. Non-marketable assets cover loans ineligible for central bank repos, hard-to-value securities (e.g., Level 3), investments in subsidiaries, tangible and intangible assets, and tax assets. These are reported in the asset encumbrance template (F32.01).

9. Initial equity losses stem from fair value shocks, prudent valuation adjustments (PVA), and CCR losses. Market valuation impacts are estimated using sensitivities from the STE – market risk module, following the solvency stress test methodology (see Section 2). In addition, we consider PVA losses which reflect market price uncertainty, model risk, and close-out costs (C32.02.a). CCR losses are based on the top 20 derivative exposures (C34.06) and stressed EEPE for margined trades (C34.05).

10. FINREP (F22.01) provides the breakdown of fee and commission income (FCI) by activity. Concerns over business model sustainability drive declines in FCI from capital markets and asset management. The shock is calibrated to Credit Suisse's 2022 FCI loss, triggered by viability concerns (idiosyncratic risk) and rising interest rates (systemic risk), consistent with our geopolitical market scenario. Client franchise erosion created a self-fulfilling dynamic, weakening future profit potential.

11. Contractual cash flows are sourced from the maturity ladder, with overnight to two-week flows reported in COREP (C66.01.a). Outflows are mapped to LCR categories (C73.00.a), and run-off rates for various deposit types—such as intragroup, retail, and operational—are disaggregated by characteristics (e.g., deposit guarantee coverage, high-value, excess operational) per LCR templates. This enables an LCR-based liquidity test over 2-week and 2-day horizons within the solvency stress test.

Appendix VIII. Network Analysis - Technical Aspects

This appendix explains the methodological approach used for the network analysis.

Contagion Mapping Model (CoMap)

1. The CoMap framework proposed by Covi, Gorpe, and Kok (2021) serves as the starting point for the contagion model used in this exercise. The CoMap framework uses a simulation approach to quantify the potential knock-on effects from the hypothetical default of an EA bank throughout the network of its exposures. This captures the potential impact of a bank's default on the broader banking system. Losses from the hypothetical default can be propagated through the credit channel (credit risk) or the funding channel (loss of funding). By modelling hypothetical defaults of each bank in the interbank network, the simulation helps form a view on the channels of contagion in the interbank market and examines the resilience of the system.

Credit Channel

2. The credit channel captures the impact of hypothetical default of a bank on its obligations to its counterparts, namely other banks in the network. When a bank in the network defaults, other banks in the network with direct exposures to the defaulting entity face potential losses. In response to a subset ($\mathcal{Y}$) of banks defaulting on their obligations x_{ij}^k, bank $\boldsymbol{i}$'s losses ($LOSS_i^{credit}$) are summed across all banks $j \in \mathcal{Y}$ and claim types k using exposure-specific loss-given default rates, λ_{ij}^k, corresponding to its claim of type k on bank j multiplied by the default ratio:

$$(1)\quad LOSS_i^{credit} = \Sigma_{j\in\mathcal{Y}}\Sigma_k \lambda_{ij}^k x_{ij}^k$$

Funding Channel

3. The funding channel captures how the hypothetical default of a bank leads to withdrawal of funding from other banks in the network and their consequent actions. In response to a subset ($\mathcal{Y}$) of banks defaulting, and consequently withdrawing funding from other banks in the network, bank $\boldsymbol{i}$ faces funding shortfall (TFS_i) summed across all defaulting banks $j \in \mathcal{Y}$ using a bank-specific funding shortfall rate, ρ_i^k on the funding x_{ji}^k received from bank j:

$$(2)\quad TFS_i = \Sigma_{j\in\mathcal{Y}}\Sigma_k \rho_i^k x_{ji}^k$$

4. To absorb this shortfall, at least partially, bank $\boldsymbol{i}$ can pledge $\boldsymbol{HQLA}$ in excess of net liquidity outflows (NLO), γ_i, to the central bank for immediate liquidity support. Thus, the remaining liquidity shortage is computed as:

$$(3)\quad max\{0, \Sigma_{j\in\mathcal{Y}}\Sigma_k \rho_i^k x_{ij}^k - \gamma_i\}$$

5. If the remaining liquidity shortage is strictly positive, bank $\boldsymbol{i}$ can still meet the liquidity requirement through the sale of unencumbered marketable non-central bank eligible assets at a discount rate. Thus, bank $\boldsymbol{i}$ may be pushed to deleverage through fire sales to replace the lost

funding. Considering that bank $\boldsymbol{i}$ has a limited pool of such assets, θ_i, and assuming a fire sale discount rate, δ_i, its potential losses from fire sales is equivalent to:

$$(4)\ LOSS_i^{funding} = \delta_i min\left\{\frac{1}{1-\delta} max\{0, \Sigma_{j\in y}\Sigma_k \rho_i^k x_{ij}^k - \gamma_i\}, \theta_i\right\}$$

Default Condition

6. Total losses, from both the credit and funding channels, are compared to a bank's regulatory capital to determine if the bank becomes insolvent. The bank is considered to be in default due to *insolvency* if its buffer relative to capital requirements is lower than its total losses, as given below:

$$(5)\ (c_{i,t} - c_{i,min} < LOSS_i^{credit} + LOSS_i^{funding}$$

where $c_{i,t}$ and $c_{i,min}$ are bank's capital position at time t and minimum capital requirements, respectively.

7. Funding shortfalls are compared to a bank's liquidity reserves to gauge if the bank may fail due to illiquidity. If the bank HQLA assets and pool of unencumbered assets available for fire sale is insufficient to cover its liquidity needs, the bank is considered to be in default due to *illiquidity*:

$$(6)\ \theta_i < \frac{1}{1-\delta} max\{0, \Sigma_{j\in y}\Sigma_k \rho_i^k x_{ji}^k - \gamma_i\}$$

Model Parameters for the Reference Scenario ("Baseline")

8. For the baseline analysis, model parameters are calibrated in line with Covi, Gorpe, and Kok (2021), except for the funding shortfall rate and the fire sale discount rate.

a. Loss given default (λ_{ij}^k) is calibrated as a ratio of net exposure to gross exposure. Net exposure is defined as the exposure value after exemptions and credit risk mitigation instruments, whereas gross exposure is defined as the exposure value after exemptions but before application of credit risk mitigation instruments (C.27-C.28).

b. Funding shortfall rate or short-term funding share (ρ_i^k) is assumed to be 100 percent. This implies that interbank funding matures by the end of the horizon (30-day scenario). This is a plausible assumption given that interbank funding is typically short-term.

c. Liquidity surplus or net liquidity position (λ_i) is defined as HQLA assets (C.72.00.a.10), $HQLA$, in excess of net liquidity outflows (C.76.00.a. 20)

d. Pool of assets available for fire sale (θ_i) is defined as the total unencumbered non-central bank eligible assets (F.32.01).

e. Fire sale discount rate (δ_i) is assumed to be 50 percent, which corresponds to the highest haircut on central bank eligible assets.[1]

f. Bank's capital surplus or default threshold is defined as excess capital over minimum capital requirements. Bank's capital is defined as CET1 capital. Minimum capital requirement (or hurdle rate) is defined as 4.5 percent of RWAs and the bank-specific P2R set in the SREP process.

9. Annex VIII. Table 3 presents the summary statistics for the core variables discussed above.

Annex VIII. Table 3. Euro Area: Summary Statistics of Interbank Network
(Billion euros; 2024Q2)

	Mean	SD	p25	p50	p75
Baseline Analysis:					
Gross Exposure	0.7	0.9	0.1	0.3	0.9
Credit Risk Mitigation	0.1	0.4	0.0	0.0	0.1
Net Exposures	0.5	0.8	0.1	0.2	0.6
Loss Given Default	0.8	0.3	0.8	1.0	1.0
CET1	16.2	20.6	3.2	7.4	19.0
CET1 Minimum	6.1	8.3	1.1	2.6	7.0
HQLA	61.6	81.0	10.4	26.3	91.8
Net Liquidity Outflows	38.9	56.8	4.5	11.6	56.6
Unencumbered non-HQLA assets	215	346	39	66	204
Total Assets	329	492	57	110	351
Risk-Weighted Assets	110	151	21	45	127

Sources: ECB and IMF staff calculations. SD denotes the standard deviation, p25, p50, and p75, are the respective percentiles.

[1] This applies to the valuation haircut levels applied to central bank eligible credit claims, credit quality step 3, fixed interest payment, duration higher than 15 years.

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