



EUROPEAN CENTRAL BANK

EUROSYSTEM

Financial Stability Review

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Contents

Foreword	3
Overview	4
1 Macro-financial and credit environment	14
1.1 While risks of a deep recession have declined, geopolitical risks are on the rise	14
1.2 Lax fiscal policies may reinforce public debt sustainability concerns	17
1.3 Euro area firms are coping with rising debt service costs	19
Box 1 Corporate debt service and rollover risks in an environment of higher interest rates	22
1.4 Strong labour markets support household resilience	25
1.5 Correction under way in property markets, notably the commercial segment	27
2 Financial markets	31
2.1 Markets adjust to expected shift in monetary policy	31
2.2 Benign pricing of risk keeps asset prices vulnerable to shocks	35
Box 2 Low implied equity market volatility could underestimate financial stability vulnerabilities	39
2.3 Exogenous risks could add to volatility in euro area markets	43
Box 3 Financial stability risks from basis trades in the US Treasury and euro area government bond markets	45
3 Euro area banking sector	49
3.1 Profitability peaked at multi-year highs as headwinds to income strengthen	49
3.2 Bank funding costs have continued to increase	53
3.3 Asset quality is slowly deteriorating, with commercial real estate and low provisioning levels most concerning	56
3.4 Resilient banks amid subdued market valuations	60
Box 4 Non-bank financial intermediaries as providers of funding to euro area banks	63

4	Non-bank financial sector	66
4.1	Fragile macro-outlook may still test non-banks' resilience	66
4.2	Funds face risks from concentrated portfolios, real estate and low liquidity	69
	Box 5 Assessing the liquidity preparedness of investment funds to meet margin calls in derivatives markets	72
4.3	Strong solvency but uncertain profitability outlook for insurers	75
5	Macroprudential policy issues	79
5.1	Preserve banking sector resilience and enhance the macroprudential framework for banks	79
5.2	Progress towards a capital markets union requires a solid institutional and policy framework for non-banks	82
5.3	Other ongoing policy initiatives that support euro area financial stability	88
	Box 6 Containing risks from leverage in the NBFIs sector – insights from recent policy initiatives	89
	Special Features	92
A	Turbulent times: geopolitical risk and its impact on euro area financial stability	92
B	The rise of artificial intelligence: benefits and risks for financial stability	104
C	Private markets, public risk? Financial stability implications of alternative funding sources	120

Foreword



Financial stability conditions have improved since the last edition of the Financial Stability Review was published. The near-term risk of a deep recession accompanied by rising unemployment – a major source of concern six months ago – is much lower from today’s perspective, and disinflation has proceeded in parallel.

At the same time, geopolitical tensions are a significant source of risk for not only euro area financial stability but also global financial stability. Policy uncertainty remains high around the world in a year featuring so many major elections. In such an environment, the scope for adverse economic and financial surprises is elevated, and the risk outlook for euro area financial stability remains fragile accordingly.

Financial markets have been looking through these risks, with risk premia and volatility remaining unusually compressed by historical standards. Yet sentiment can change rapidly, not least given the geopolitical environment and pricing-for-perfection which creates the potential for large market reactions to disappointing news.

While there are risks ahead, financial stability also depends on shock-absorbing capacity. So far, household and corporate balance sheets have proven resilient through this interest rate cycle, while euro area banks have withstood shocks well. This should not provide grounds for complacency, as pockets of vulnerability remain. Debt servicing capacities differ across corporates, with large real estate firms displaying greater vulnerability to rising interest rates. Lower-income households are finding it harder to service their debts, despite buoyant labour markets. At the same time, fiscal fundamentals remain vulnerable to negative growth surprises and fiscal slippage, as maturing debt is refinanced at higher interest rates. Parts of the non-bank financial intermediation sector, notably a cohort of open-ended investment funds, exhibit significant liquidity mismatches. At the same time, some non-bank entities may face risks related to relatively high leverage and portfolio concentration.

This issue of the Financial Stability Review (FSR) includes three special features. The first examines the implications of geopolitical risk for euro area financial stability. The second analyses the risks and benefits associated with the rise of artificial intelligence, while the third focuses on the growing footprint of private markets.

The FSR has been prepared with the involvement of the ESCB Financial Stability Committee, which assists the decision-making bodies of the ECB in the fulfilment of their tasks. The FSR promotes awareness of systemic risks among policymakers, the financial industry and the public at large, with the ultimate goal of promoting financial stability.

Luis de Guindos
Vice-President of the European Central Bank

Overview

Euro area financial stability vulnerabilities have eased, yet the outlook remains fragile

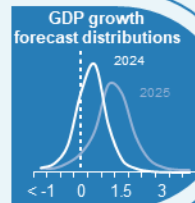
Pricing-for-perfection in financial markets and non-bank liquidity fragilities are creating the potential for outsized market reactions to adverse shocks.

A cohort of vulnerable households, corporates and sovereigns is being tested by rising debt service costs, while a property market downturn is challenging real estate firms.

Euro area banks have been a source of resilience, but low market valuations suggest that challenges remain, notably related to asset quality, funding and revenues.

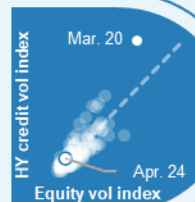
Risks to the economic outlook may threaten private sector debt service

- Economic and geopolitical uncertainty ahead
- Financing conditions remain tight for firms
- Rising share of vulnerable households
- Outlook for commercial real estate remains fragile



Low risk pricing can mask vulnerabilities and lead to excessive risk taking

- Lower volatility supports tighter spreads
- Total bond funding costs might rise further
- "AI rally" raises concentration risk
- Markets price in higher geopolitical risk



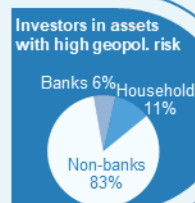
Euro area banks face headwinds from weaker asset quality, lower revenues and cost of funding

- Market valuations of banks remain subdued
- Deteriorating commercial real estate asset quality
- Rollover of bank funding at higher interest rates
- Lower income from variable-rate loans expected



Non-banks remain vulnerable to shocks amid low liquidity buffers

- Rising concentration risk in equity portfolios
- Persistent liquidity mismatches in funds
- Risk of losses on real estate exposures
- Uncertain profitability outlook for insurers



The euro area banking system is resilient and well-placed to face higher risks thanks to active prudential policy in recent years.

Enhanced macroprudential policy space, regulatory reform and faithful implementation of the final parts of Basel III can help to ensure durable resilience.

Structural vulnerabilities in non-banks continue to require a comprehensive policy response.

Euro area financial stability vulnerabilities have eased, yet the outlook remains fragile

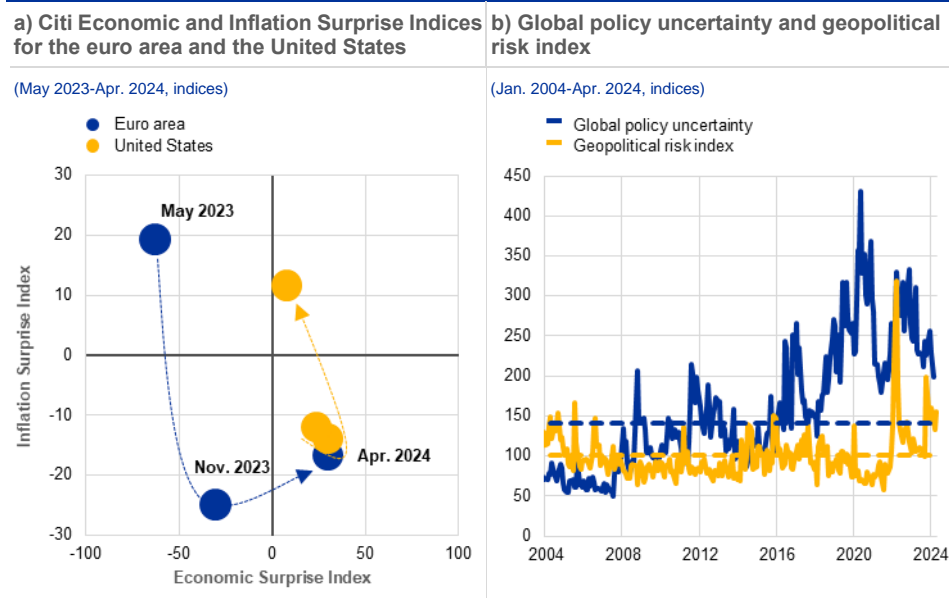
Financial stability in the euro area has benefited from an improving economic outlook, but rising geopolitical risks could pose considerable downside risks.

Favourable economic surprises in recent months have fostered investors' baseline expectations that euro area inflation will reach the ECB's target without a deep economic contraction, achieving a "soft-landing" scenario (**Chart 1**, panel a). Associated analyst expectations of interest rate cuts sparked a rally in financial markets, with growing signs of pricing-for-perfection creating the potential for outsized market reactions to disappointments. A key feature of post-pandemic balance sheet adjustment has been a fall in the debt ratios of euro area households, firms and sovereigns, which should bolster resilience in the medium to long term; however, some households, firms and sovereigns still have balance sheet vulnerabilities and could be challenged by rising debt service costs going forward. Euro area banks recorded strong profits in 2023 which, through the retention of earnings, helped to maintain resilience, but there are indications that the peak may have been reached. At the same time, the ongoing downturn in property markets, especially in commercial real estate, could have knock-on effects on the asset quality of some banks. Overall, despite reduced near-term recession risks and baseline expectations for an imminent return of moderate growth, risks to financial stability remain high. The likelihood of tail events materialising appears elevated as geopolitical risk has been on the rise (**Chart 1**, panel b). Should tensions ratchet up further, this could affect the supply of energy commodities, undermine confidence in the real economy, fuel inflation and spark risk aversion in financial markets (**Special Feature A**). Similarly, global economic policy uncertainty remains high, as countries with more than half of the world's population are sending their citizens to the polls in 2024.

Against this backdrop, three key themes are shaping the outlook for euro area financial stability. First, benign risk pricing in financial markets and structural liquidity vulnerabilities in non-banks harbour the potential for sudden shifts in market sentiment in response to adverse shocks, triggered, for example, by negative macro-financial surprises or heightened geopolitical tensions. Second, rising debt service costs are challenging euro area households, firms and sovereigns with weak balance sheets, and the downturn in property markets is, in some cases, compounding household and corporate vulnerabilities. Third, euro area banks have remained resilient, supported by strong profitability. Bank earnings appear set to moderate somewhat from recent highs in the next two years. At the same time, bank market values, while having risen somewhat, remain stubbornly below book values – indicating deeper seeded investor concerns about the durability of bank profitability.

Chart 1

Positive macro surprises point to a soft landing, but tail risks remain elevated in the light of high macro-financial and geopolitical uncertainty



Sources: Bloomberg Finance L.P., Caldara and Iacoviello*, Baker, Bloom and Davis** and ECB calculations.

Notes: Panel b: the dashed lines represent the long-term averages over the period from January 1997 to April 2024. The global policy uncertainty index is shown until February 2024.

*) Caldara, D. and Iacoviello, M., "Measuring Geopolitical Risk", *American Economic Review*, Vol. 112, No 4, April 2022, pp. 1194-1225.

**) Baker, S., Bloom, N. and Davis, S., "Measuring Economic Policy Uncertainty", *The Quarterly Journal of Economics*, Vol. 131, No 4, November 2016, pp. 1593-1636.

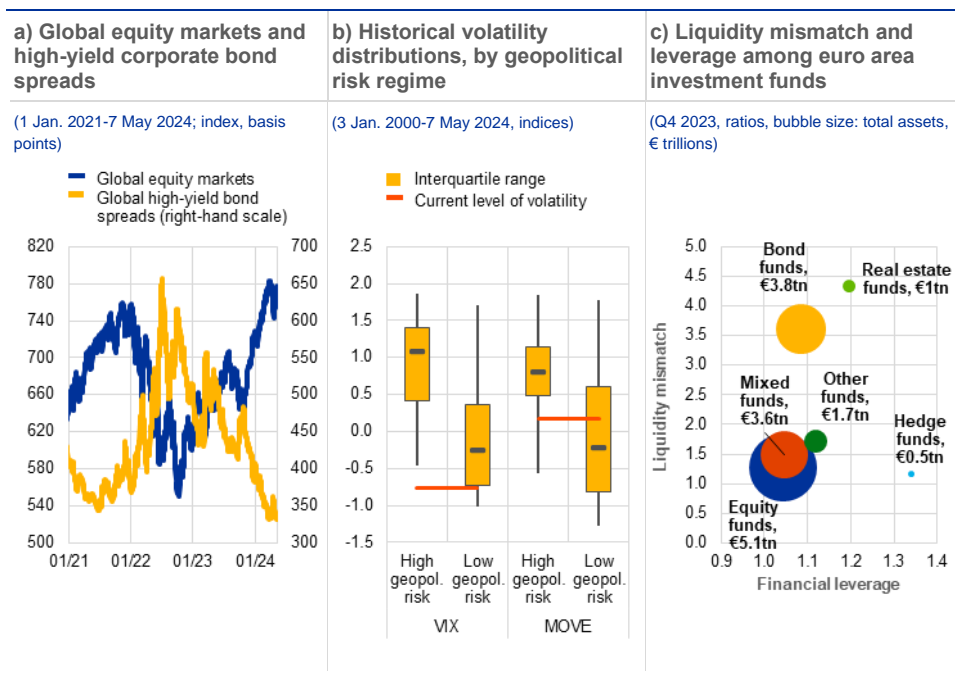
Asset prices remain vulnerable to adverse dynamics that may be amplified by liquidity risks in non-banks

Expectations of monetary policy easing have boosted investor demand for risky assets, but risk sentiment in markets has been fickle. Expectations that monetary policy will ease around the world have been fuelling investors' appetite for risky assets since October 2023, as markets have been pricing-in a soft landing for the global and euro area economies. Reflecting this, stock prices have increased and credit spreads have narrowed, with a short-lived reversal more recently (Chart 2, panel a). At the same time, equity market volatility has remained relatively subdued, despite the recent uptick and continued substantial uncertainty in both the macro-financial and geopolitical environments, and has diverged from volatility in interest rate markets, which has been elevated (Box 2). In this environment of substantial risks to growth and structurally higher funding costs, markets might underestimate and under-price the likelihood and the impact of adverse scenarios, which could cause vulnerabilities to build up. Moreover, there is a greater likelihood of negative surprises resulting in abrupt shifts in sentiment. Volatility in financial markets could increase significantly, should inflation deviate substantially from consensus expectations, if economic growth weakens or if geopolitical conflicts escalate further (Chart 2, panel b). Heightened concentration and high valuations in equity markets, notably in the United States, indicate scope for greater volatility and potential for a

market correction. Given deeply integrated global equity markets, financial stability risks for the euro area might stem from adverse spillovers from the United States.

Chart 2

Geopolitical tensions may spark volatility and trigger adjustments in financial markets, which could be amplified by non-banks with low liquidity and high leverage



Sources: Bloomberg Finance L.P., Caldara and Iacoviello, ECB (IVF) and ECB calculations.

Notes: Panel a: the MSCI All Country World Index is used for global equity markets; the ICE BofA Global High Yield Index is used for global high-yield bond spreads. Panel b: VIX – index for implied volatility in the US equity market, MOVE – index for implied volatility in the US Treasury bond market. Geopolitical risk is measured by the geopolitical risk index (GPRI) created by Caldara and Iacoviello, op. cit. High geopolitical risk denotes episodes when the GPRI was at least 2 standard deviations above its average since 2000. Boxplots show the distributions of standardised volatility measures since 2000, where whiskers denote the 5th and 95th percentiles. Panel c: includes open-ended investment funds only. Liquidity mismatch is defined as the ratio of investment fund shares issued to liquid assets (deposits and debt securities with a maturity of less than one year, euro area sovereign bonds, investment and money market fund shares, and advanced economy listed shares). Financial leverage is defined as total assets divided by shares issued.

The non-bank financial intermediation sector could still amplify any market correction, given liquidity vulnerabilities, leveraged exposures and rising concentration risks. Non-banks have benefited from improving market conditions in recent months, supporting their portfolio valuations, while higher interest rates have also boosted investment income from debt securities. However, asset quality in non-bank portfolios may still be impaired by worsening corporate sector fundamentals and real estate market conditions together with rising geopolitical risk (**Special Feature A**). In this context, any shocks to market valuations could trigger a rise in investment fund outflows or margin calls on derivative exposures. Given low liquid asset holdings and significant liquidity mismatches in some types of open-ended investment funds, this could result in forced asset sales that may negatively affect wider financial stability (**Chart 2**, panel c). Although generally limited, pockets of elevated financial and synthetic leverage in some entities may add to spillover risks. In addition, concentration in equity portfolios – notably in investment funds due to exposures to US-based technology firms – has increased markedly in recent years (**Chapter 4**), making investment portfolios more vulnerable to idiosyncratic shocks or adverse developments in the US economy. For the insurance sector, uncertainties around a weak macro-financial outlook highlight possible profitability headwinds.

These include both underwriting profitability challenges for life insurers and consistently low returns on debt securities portfolios.

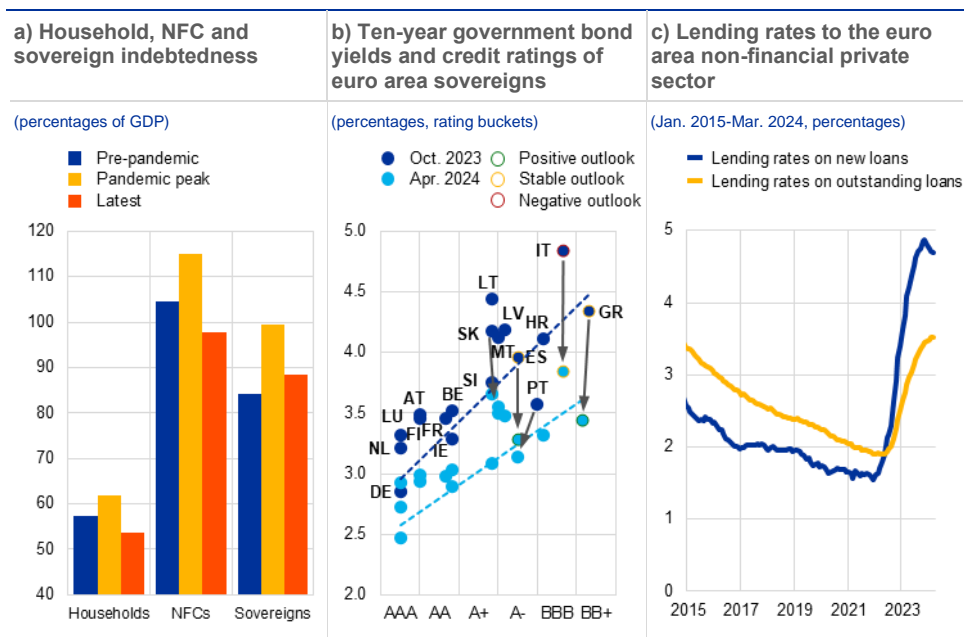
Tight financial conditions are testing the resilience of vulnerable households, firms and sovereigns

Euro area households, firms and sovereigns have so far remained resilient on aggregate, albeit with some pockets of vulnerability. The indebtedness of euro area households, firms and sovereigns has declined from post-pandemic highs (**Chart 3**, panel a), alleviating debt sustainability concerns. However, associated vulnerabilities remain elevated, especially among sovereigns. Here indebtedness remains above pre-pandemic levels, owing partly to a transfer of risk from the private sector to sovereign balance sheets during the pandemic as well as during the recent energy crisis and period of high inflation. The debt service costs of non-financial sectors are likely to remain at current high levels or even creep up further as the debt originally contracted at historically low interest rates and at long maturities continues to reprice at prevailing, significantly higher, interest rates. This means that a vulnerable cohort of highly indebted households, firms and sovereigns may still see their debt servicing capabilities challenged going forward.

Sovereign financing conditions have improved, but fiscal fundamentals remain vulnerable to negative growth surprises and fiscal slippage. Sovereign borrowing costs have benefited from easier financing conditions of late and positive rating actions in some countries (**Chart 3**, panel b). Interest costs are set to rise further, however, especially for sovereigns with high short-term refinancing needs, as maturing public debt is rolled over at higher interest rates. Despite falling debt-to-GDP ratios in recent years, fiscal fundamentals remain fragile in a number of countries, as indicated by missed deficit targets in some cases in 2023. Given structural headwinds to potential growth from factors such as weak productivity, persistently elevated debt levels and budget deficits would be more likely to reignite debt sustainability concerns and push sovereign credit risk premia higher in the event of adverse macro-financial surprises. Risks of fiscal slippage in the light of a busy electoral agenda in 2024-25 (at both national and EU levels) or uncertainties around the exact implementation of the new EU fiscal framework could lead market participants to reprice sovereign risk. On the other hand, greater fiscal reform to ensure that public finances have a more growth-friendly composition could enhance the medium-term economic growth potential of the euro area, thereby mitigating debt sustainability risks.

Chart 3

Debt levels in the non-financial sectors have fallen from pandemic highs, but debt service costs may still rise further



Sources: Bloomberg Finance L.P., LSEG, S&P Global Market Intelligence, Moody's Analytics, Fitch Ratings, Eurostat and ECB (QSA), ECB (MIR) and ECB calculations.
Notes: Panel a: NFCs stands for non-financial corporations. NFC debt is illustrated in unconsolidated terms, i.e. including intra-sectoral loans. "Pre-pandemic" indicates figures as at Q4 2019, "Pandemic peak" refers to Q1 2021, and the latest observation captures Q4 2023. Panel b: ratings and rating outlooks are aggregated from S&P, Moody's and Fitch and are shown as at 31 October 2023 and 30 April 2024. Rating outlooks are only indicated for those sovereigns for which the aggregated outlook has changed since October 2023. Aggregated outlooks can be determined by the outlook from a single agency; for instance, two stable outlooks and one negative outlook, which was the case for Italy in October 2023, are aggregated to form an overall negative outlook.

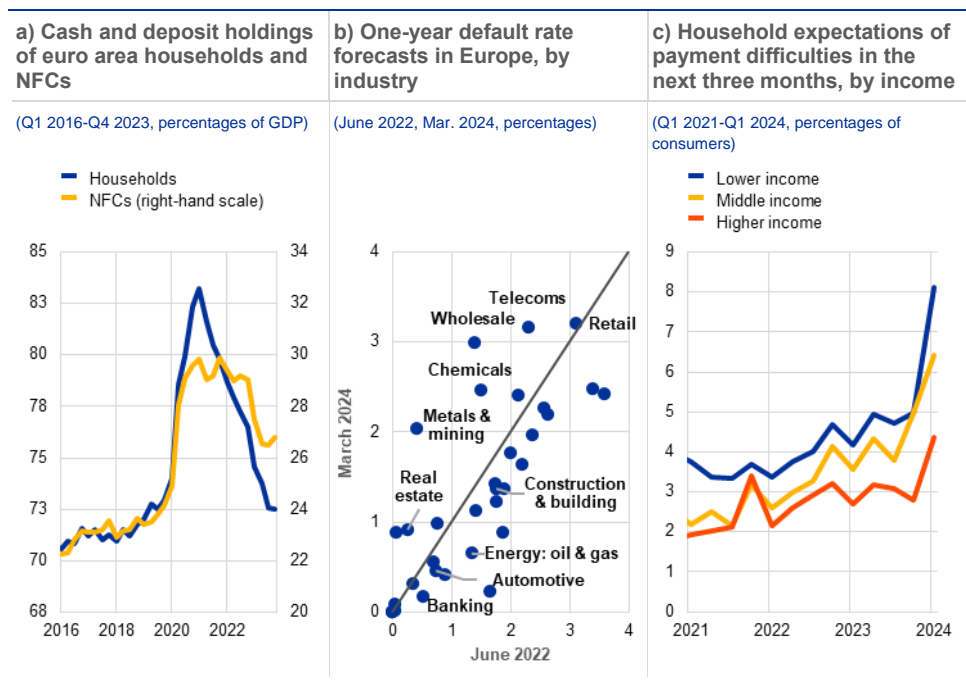
Euro area household and corporate balance sheets have been bolstered by a resilient labour market and strong post-pandemic profits. Corporate profitability has continued to hold up relatively well, supporting firms' debt servicing capacity (Section 1.3). Declining energy and other input costs have boosted corporate earnings despite weak consumer demand, although the impact of anaemic growth and higher labour costs on profit margins might not have fully materialised yet. While corporate insolvencies have continued rising to above pre-pandemic levels in a number of euro area countries, defaults and non-performing loan rates have remained relatively low. At the same time, euro area household vulnerabilities have been mitigated by the resilience of labour markets, coupled with government support measures and excess savings accumulated during the pandemic. While household and corporate debt-to-GDP levels have dropped below pre-pandemic readings, the pass-through of higher interest rates to debt service costs is incomplete. Continued loan repricing at higher market rates than on outstanding loans (Chart 3, panel c), together with weaker than expected growth and deteriorating labour market conditions, could erode household and corporate debt servicing capacity. At the same time, evaporating liquidity buffers (Chart 4, panel a) may render households and firms vulnerable to unexpected adverse shocks.

Pockets of vulnerability remain, as high interest rates weigh on the debt servicing capacity of vulnerable households and firms. High debt service costs could prove especially challenging for firms with lower credit ratings, as reflected by

the rise in expected default frequencies in the high-yield segment. Expected default rates are also highly uneven across economic sectors, with firms operating in wholesale trade or in real estate seeing some of the largest increases in expected default rates (**Chart 4**, panel b). Defaults could rise if yields remain high, energy prices soar again or global supply chain disruptions intensify. Euro area households, especially those with lower incomes and in countries with mainly floating-rate mortgage lending, are being relatively more challenged by higher interest rates (**Chart 4**, panel c). However, middle-income households may be affected too, especially if labour market conditions were to weaken considerably. In such a scenario the implications for banks mortgage portfolios could become notable.

Chart 4

Declining liquidity buffers of euro area households and firms in recent years may weigh on the debt servicing capabilities of vulnerable cohorts



Sources: Eurostat and ECB (QSA), ECB (CES), Moody's Analytics and ECB calculations.
 Notes: Panel b: June 2022 is the month before the start of the recent monetary policy hiking cycle. Panel c: the share of consumers is calculated using survey weights, and the total number of surveyed households includes those who report not having a loan or answering "don't know". The sample of countries comprises Belgium, Germany, Spain, France, Italy and the Netherlands, and from April 2022 also includes Ireland, Greece, Austria, Portugal and Finland. The share of lower-income households is calculated as the average of the first and second income quintiles, middle-income households correspond to the third income quintile, and higher-income households comprise the average of the fourth and fifth income quintiles. The total shares are equal-weighted averages of the shares for mortgages and other loans.

Tight financial conditions have underscored vulnerabilities in real estate markets, compounding the challenges faced by some households and firms.

The sharp downturn in the commercial real estate (CRE) sector has continued (**Chart 5**, panel a), with subdued market activity continuing to hamper price discovery. Prices could decline further, given structurally lower demand for some CRE assets post-pandemic, notably in the office segment (**Section 1.5**). Sharp drops in rental income and profit margins since early 2022 have made real estate firms particularly vulnerable to losses, compounding the challenges posed by refinancing debt at higher rates (**Box 1**). The ongoing adjustment in residential real estate (RRE) markets has remained orderly, as households' financial positions have been underpinned by the

strength of the labour market. There have also been signs of incipient stabilisation of euro area house prices at the aggregate level, but risks remain tilted to the downside, especially in countries with elevated debt levels and overvalued property markets. That said, the expected decline in borrowing costs might alleviate affordability challenges and boost loan demand going forward. Overall, the downturn in the RRE market should remain orderly, unless labour market conditions deteriorate significantly.

Banks remained resilient, but face headwinds from weaker asset quality, lower revenues and cost of funding

There are signs of deterioration in the asset quality of euro area banks, notably in CRE portfolios. While banks' non-performing loan ratios remained at historically low levels just above 2% in 2023, there have been nascent signs of rising losses on a subset of loan portfolios that are more sensitive to cyclical downturns. In fact, CRE loan books have been the main driver of asset quality deterioration, reflecting both the downturn in euro area CRE markets and spillovers from the ongoing correction in US CRE markets to euro area banks with material exposures. That said, these portfolios are generally modest in size and should not have a systemic impact on the banking sector. For some banks with above-average CRE exposure, though, a marked deterioration in CRE asset quality could pose challenges. At the same time, the credit risk outlook for household and corporate portfolios remains tilted to the downside, as macro-financial conditions are weak and borrowers are increasingly feeling the impact of higher interest rates. As a result, banks may face the risk of higher provisioning costs if risks in the non-financial sectors materialise, not least because collateral values may not to be fully reflected in banks' balance sheets.

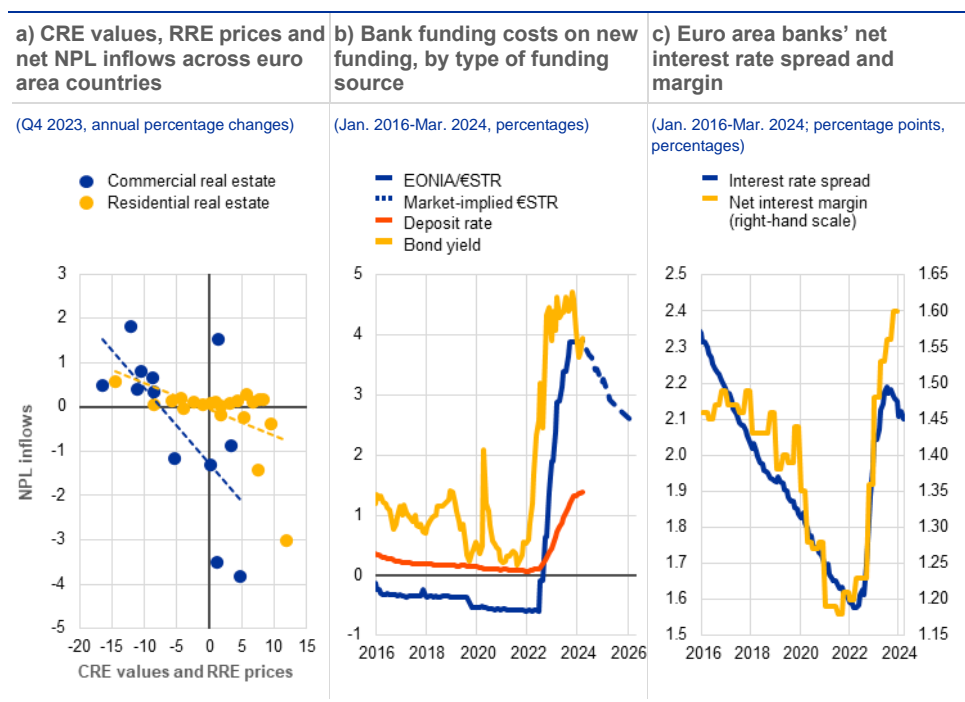
Euro area banks continue to face funding cost headwinds. Since the previous issue of the Financial Stability Review was published, bank bond yields have declined and new business deposit rates have lost upward momentum in line with market expectations of looming policy rate cuts (**Chart 5**, panel b). However, the average cost of outstanding bank funding has risen further, reflecting a shift in composition towards more expensive sources of funding. In particular, depositors seeking higher remuneration have been shifting from overnight deposits to higher-yielding term deposits. At the same time, bond funding has also been growing as it replaces other sources such as the ECB's targeted longer-term refinancing operations (TLTROs). Looking ahead, bank funding costs seem set to remain high as maturing liabilities reprice at higher levels and the composition of funding continues moving back towards long-run averages featuring a higher share of term deposits and bonds. Overall funding costs might therefore still increase further, even if policy rates start to decline.

Low bank valuations indicate market concerns regarding the longer-term sustainability of bank profits. In recent years, strong euro area bank profitability has primarily been driven by rising net interest margins. This is because bank funding costs adjusted more slowly than lending rates due to the automatic repricing of floating-rate loans. As such, floating-rate assets could now turn into a headwind for banks' interest income as policy rates are expected to fall, while overall funding costs

may increase still further. Indeed, the recent decrease in interest rate spreads suggests that euro area banks are likely to see their net interest margins decline (Chart 5, panel c). Margin compression, together with continued muted lending volumes, could serve to reduce banks' operating income and compound the challenges stemming from deteriorating asset quality, ultimately weighing on bank profitability. These profitability uncertainties are also visible in euro area bank price-to-book valuations, which have continued to hover around 0.7 (Chapter 3), well below those of some major international peers.

Chart 5

Euro area bank profitability has likely peaked, with signs of worsening asset quality and higher funding costs posing headwinds to euro area banks going forward



Sources: Bloomberg Finance L.P., Dealogic, Eurostat and ECB (RESR), ECB (MIR, RESC, supervisory data) and ECB calculations. Notes: Panel a: NPL stands for non-performing loan. Panel b: market implied €STR is shown for April 2024 until March 2026. Panel c: net interest margin is shown until the fourth quarter of 2023.

From a structural perspective, a greater need to respond to cyber and climate risks, and strong interlinkages with the non-bank financial intermediation (NBFi) sector, may also challenge euro area banks. Next to the headwinds associated with challenging macro-financial conditions that lie ahead, euro area banks need to press ahead with digital transformation, not least so that they can respond to the growing threat of cyber risks as well as address the opportunities and challenges associated with the rise of artificial intelligence (Special Feature B). Euro area banks also need to carefully manage the implications of the transition to a greener economy. In addition, elevated vulnerabilities in the NBFi sector may produce spillover risks for euro area banks, given strong interconnections between these sub-sectors of the financial system, not least via the funding channel (Box 4).

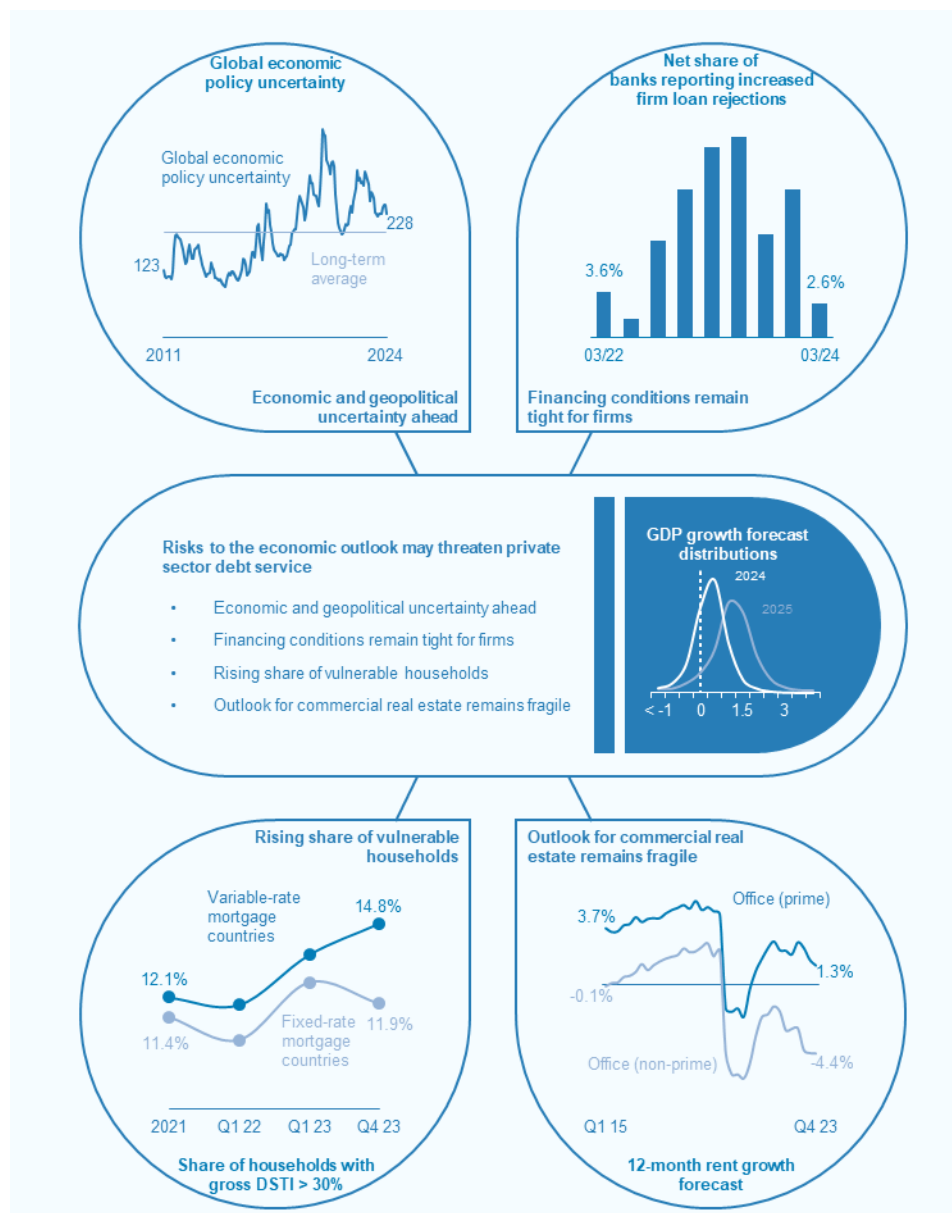
Macroprudential policies can help safeguard and strengthen resilience across the financial system

All in all, financial stability vulnerabilities have eased, but the outlook remains fragile. Financial stability conditions have improved somewhat since the previous issue of the Financial Stability Review was published. This includes some positive economic surprises and faster than expected disinflation, underpinning expectations in financial markets of a soft landing. That said, despite improved baseline expectations, the likelihood of tail events appears elevated. In particular, the materialisation of downside risks to economic growth, more persistent inflation outturns or acute geopolitical stress could expose existing vulnerabilities. This would notably concern risks associated with the potential for disorderly adjustments in financial markets, coupled with debt servicing challenges for highly indebted households, firms and sovereigns and their adverse knock-on effects on the asset quality of euro area banks.

Preserving the resilience of the banking sector and, where conditions are favourable, further increasing macroprudential space remain crucial in an uncertain macro-financial environment. The resilience of the euro area banking sector is, on aggregate, underpinned by strong capital and liquidity positions. Standard regulatory metrics point towards strong liquidity resilience overall, despite more than 90% of borrowed TLTRO funds being repaid over recent quarters. On aggregate, solvency ratios remain robust, supported by organic growth from high bank profitability. In recent years, euro area macroprudential authorities have also implemented a comprehensive set of measures that have bolstered banks' resilience and enhanced the availability of releasable capital buffers. As such, it is prudent to maintain macroprudential capital buffers to ensure that they remain available in case of headwinds. Prevailing borrower-based measures can continue to act as structural backstops to ensure sound lending standards in a framework where capital-based and borrower-based measures complement each other. The recent strength of profitability of the banking sector can be used to further increase macroprudential space through releasable capital buffers, to further strengthen the resilience of bank lending to the economy in the event of marked economic downturns.

Structural vulnerabilities in the NBFi sector require a comprehensive policy response to enhance its resilience from a macroprudential perspective. A large market footprint and the interconnectedness of non-bank financial institutions call for a comprehensive set of policy measures to increase the sector's resilience. This includes policies aimed at enhancing the liquidity preparedness of non-bank market participants to meet margin and collateral calls (**Box 5**), tackling risks from non-bank leverage (**Box 6**), mitigating liquidity mismatch in open-ended funds and enhancing the resilience of money market funds to liquidity shocks (**Section 5.2**). A more integrated EU-wide system of supervision for non-banks would also build a level playing field and reduce the potential for regulatory arbitrage. A resilient NBFi sector would also help to foster more integrated capital markets, which could enhance financial stability and complement the objectives of the capital markets union.

1 Macro-financial and credit environment



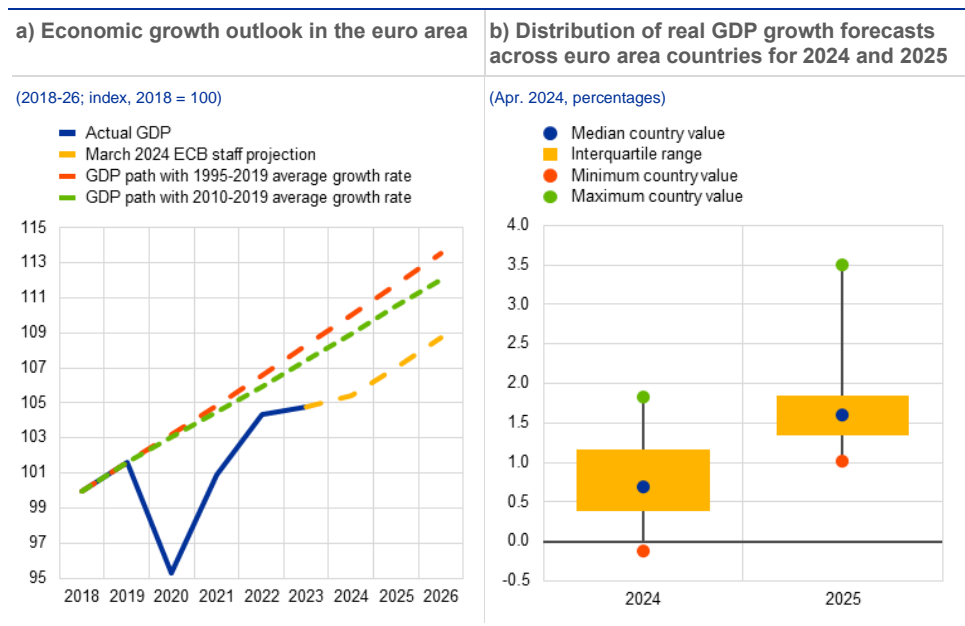
1.1 While risks of a deep recession have declined, geopolitical risks are on the rise

Investor sentiment has been recovering alongside an improving macro-financial outlook, although prospects for growth vary across euro area countries. Headline inflation in the euro area is now projected to fall to 2.3% in 2024, compared with 2.7% expected just six months ago. In parallel, although economic growth in 2024 is likely to be weaker than previously hoped, there is less likelihood of the euro area experiencing a severe downturn. Taken together, this has improved

near-term investor sentiment. Looking ahead, the financial stability outlook will increasingly depend on mixed medium-term growth prospects. On the one hand, economic activity is expected to pick up more strongly over the period 2025-26 (**Chart 1.1**, panel a), supported by resilient labour markets and a recovery in households' real incomes. On the other hand, structural challenges (related to, for example, slow digitalisation, weak innovation and an ageing population) remain a drag on productivity and income growth. Finally, current growth expectations vary considerably across the euro area (**Chart 1.1**, panel b), making some countries more vulnerable to future adverse shocks than others.

Chart 1.1

The near-term economic outlook is improving unevenly across countries, while medium-term growth challenges remain



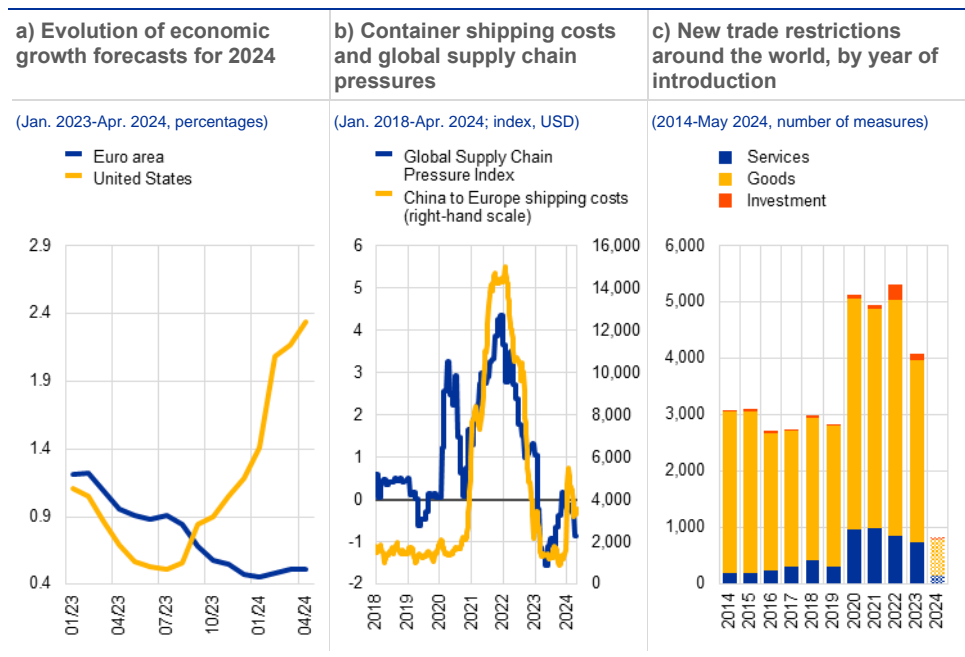
Sources: ECB staff macroeconomic projections for the euro area, March 2024, Consensus Economics Inc. and ECB calculations. Notes: Panel a: alternative post-2019 GDP paths use different assumptions about annual GDP growth rates. Panel b: the cross-country distributions of GDP growth forecasts are based on average country forecasts made by professional forecasters in April 2024 for Belgium, Germany, Ireland, Greece, Spain, France, Italy, the Netherlands, Austria, Portugal and Finland.

Risks to the macro-financial outlook remain elevated. Several such risks are related to external factors. Global demand could surprise to the downside if tight financing conditions continue to squeeze incomes and expenditure more strongly than expected, or if higher than expected inflation in the United States leads to a delayed easing of US monetary policy spilling over to tighter financing conditions globally. Divergent policy paths between the United States and the euro area would in turn increase the risk of adverse spillovers to European financial markets (**Chart 1.2**, panel a). Demand for euro area exports could be further weakened if the ongoing adjustment in property markets in China has a more pronounced, negative impact on its broader economy. As some euro area economies with relatively weaker near-term growth prospects depend heavily on exports to China, this would further amplify divergence between growth outcomes in the euro area. While progress has been made in bringing euro area inflation down, domestic price pressures are still high, owing in part to strong wage growth which could still surprise to the upside given how

tight labour markets are. Globally diverging monetary policy paths could also lead to higher inflation via their impact on the euro exchange rate and import prices.¹ Finally, geopolitical tensions could, as a result of their impact on commodity prices and global supply chains, lead to renewed inflationary pressures in the euro area as well.

Chart 1.2

Elevated external risks cloud the macroeconomic outlook for the euro area



Sources: Consensus Economics Inc., Bloomberg Finance L.P., Federal Reserve Bank of New York (AMEC), Global Trade Alert and ECB calculations.

Notes: Panel a: average GDP growth forecasts among professional forecasters. Panel b: higher values for the Global Supply Chain Pressure Index represent greater pressures on supply chains. Panel c: all measures introduced globally that restrict cross-border flows of goods, services and foreign direct investment. Data for 2024 are as of 7 May 2024.

Geopolitical tensions have risen, posing risks to the global growth outlook and the euro area disinflation process.

Russia's war against Ukraine and the conflict in the Middle East are key sources of tail risk. The recent attacks on cargo ships on the Red Sea trade route triggered an abrupt rise in shipping costs between Asia and Europe in December 2023 (Chart 1.2, panel b) and global supply chain pressures have been on the rise since last autumn. The immediate risks to inflation and growth in the euro area from the Red Sea attacks seem limited owing to their minimal impact on oil production costs, current spare capacity in global shipping and subdued global demand. However, the impact on euro area growth and inflation could be substantial if the disruptions were to escalate to the broader region and last longer. The recent intensification of the Iran-Israel conflict has increased the probability of such a tail-risk scenario materialising. The expected reduction in oil production by its main exporters, as well as supply disruptions to oil and gas facilities in Russia and Ukraine, pose further upside risks to oil and gas prices. The rise in geopolitical tensions between major economies in recent years is also leading to weakening global trade links. For example, the share of imports to the United States from China declined from 25% in

¹ A material strengthening of the US dollar could also pose a challenge for emerging markets, with potential adverse spillovers to economic activity in the euro area.

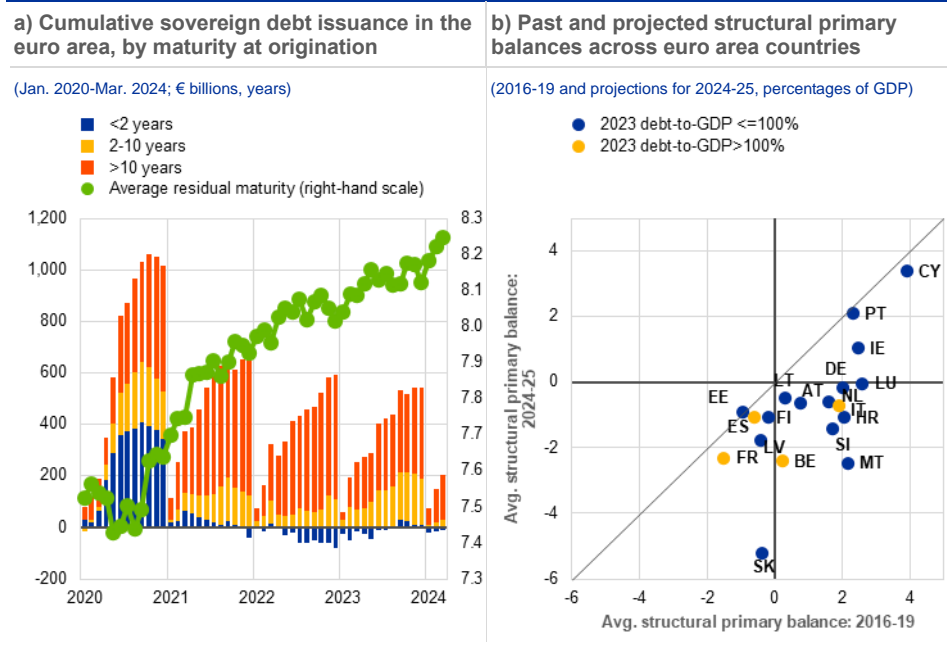
2017 to 15% in 2023, and the number of protectionist measures targeting cross-border trade is increasing globally ([Chart 1.2](#), panel c). Continued geopolitical tensions pose the risk of economic and financial fragmentation in the world economy, with potential adverse effects on financial stability in the euro area and globally. These potential effects could include slower productivity growth and higher production costs resulting from less efficient resource allocation, greater macro-financial volatility due to reduced international risk-sharing opportunities, and lower profitability and a higher cost of funding for financial institutions on the back of reduced cross-border capital flows. In this context, the record number of elections due to take place across the world in 2024 are likely to keep the uncertainty around global economic policies elevated.

1.2 Lax fiscal policies may reinforce public debt sustainability concerns

While sovereign financing conditions have improved, borrowing needs are high and could be tested by rising geopolitical tensions and other risks. Euro area sovereigns have benefited from easier global financing conditions in recent months, and demand for sovereign debt has been strong as investors try to lock in higher yields before the expected cuts in central bank interest rates materialise ([Chart 1.3](#), panel a). Spreads between lower- and higher-rated sovereigns have also declined ([Chart 3](#), panel b in the [Overview](#)), reflecting favourable risk sentiment, as well as better prospects for growth in lower-rated countries and declining debt-to-GDP ratios. Nevertheless, since yields on new sovereign issuances are still above average yields on outstanding debt, sovereign interest burdens are continuing to rise. This could lead to greater challenges ahead, particularly for countries with greater short-term financing needs. Any reassessment of sovereign risk by market participants due to high debt levels and lenient fiscal policies could raise borrowing costs further and have negative financial stability effects, including via spillovers to private borrowers and to sovereign bond holders. Finally, rising geopolitical tensions and upcoming elections in many countries are increasing uncertainty around future borrowing needs.

Chart 1.3

Sovereign debt issuance is currently benefiting from strong investor demand, but projected large financing needs leave sovereigns vulnerable to adverse shocks



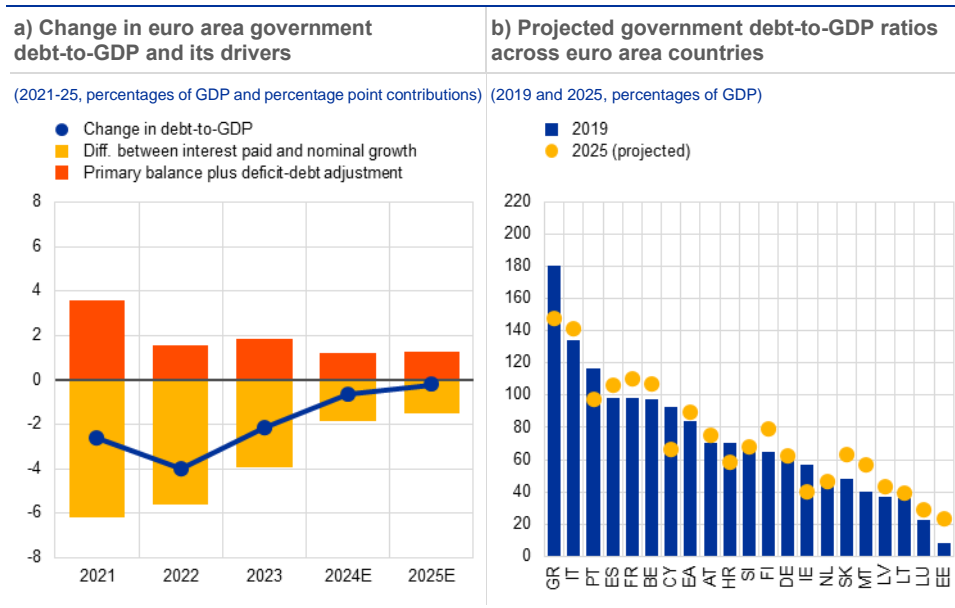
Sources: Eurostat and ECB (GFS), European Commission (AMECO) and ECB calculations.
 Notes: Panel a: the bars in the chart show cumulative debt issuance since the start of the calendar year. Panel b: for Greece (not shown), the average structural primary balance was 8.7% of GDP in the period 2016-19 and is expected to average 1.9% of GDP in the period 2024-25.

National budget deficits are expected to stay larger than they were before the pandemic as many of the support measures taken have remained in place.

While most of the energy and inflation support measures introduced after the Russian invasion of Ukraine are being phased out, many of the measures taken during the pandemic have not been fully rolled back. Moreover, structural primary balances (i.e. budget balances adjusted for the impact of changes in economic growth due to business cycle fluctuations and excluding interest payments on outstanding debt) are expected to remain well below pre-pandemic levels over 2024-25. This is the case for almost all euro area countries, irrespective of their starting level of sovereign debt (Chart 1.3, panel b). Potential fiscal slippages are an additional concern, as weakening economic activity has already contributed to some countries missing deficit targets in 2023, and the upcoming cycle of elections is increasing the risk of fiscal targets being missed as well. The lack of envisaged fiscal consolidation, combined with high debt levels, makes national budgets vulnerable to intensifying geopolitical tensions should these require increases in spending on defence, for example. It would also be more difficult to accommodate additional investment in areas such as climate change and digital technology, which would have a negative effect on euro area growth potential.

Chart 1.4

Despite falling somewhat in recent years, projected sovereign debt levels remain high



Sources: European Commission (AMECO), Eurostat and ECB (GFS) and ECB calculations.
 Note: Panel a: values for 2024 and 2025 are projections.

High levels of debt make euro area sovereigns vulnerable to adverse shocks, especially given the structural weakness in productivity and potential growth.

While the government debt-to-GDP ratio in the euro area has fallen gradually from its pandemic-era peaks, the drop has been primarily driven by the post-pandemic recovery in nominal GDP, which has more than offset the impact of higher debt service costs on debt levels (Chart 1.4, panel a). With weaker nominal growth prospects ahead and little change expected in the structural primary balances, the debt-to-GDP ratio is falling at a slower pace. As a result, public debt levels in most euro area countries are expected to remain above pre-pandemic levels in the short to medium term (Chart 1.4, panel b). More importantly, structural headwinds to potential growth, from weak productivity for instance, are raising concerns about longer-term debt sustainability, making sovereign finances more vulnerable to adverse shocks and elevating risks to the financial stability outlook.

1.3 Euro area firms are coping with rising debt service costs

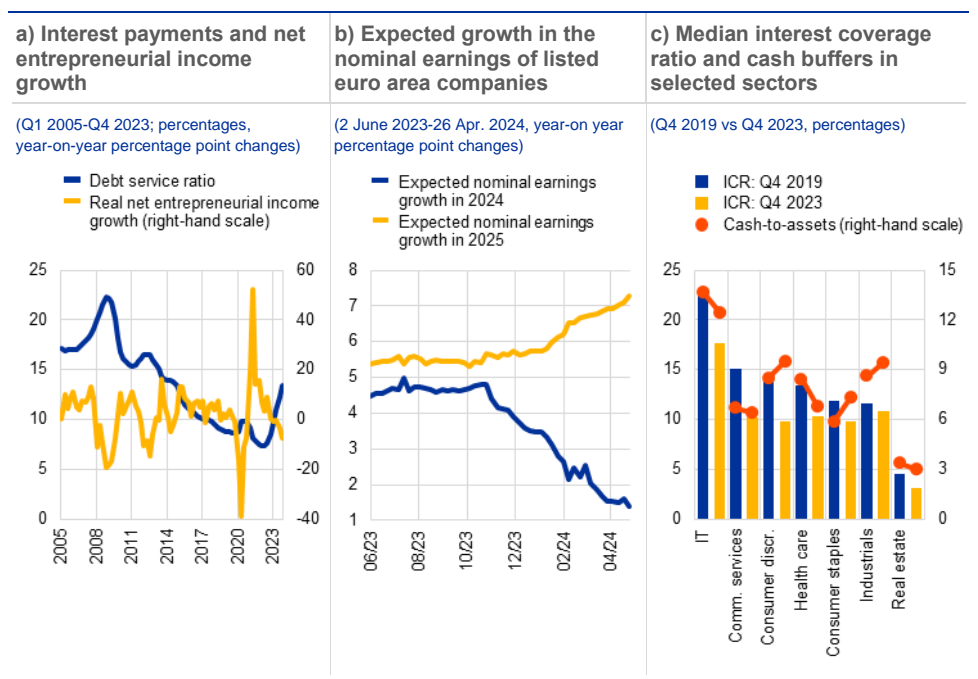
Resilient post-pandemic profitability has helped firms to service the rising cost of debt, but weak growth and high labour costs are creating challenges.

The interest payments faced by non-financial corporations (NFCs) have risen further in recent quarters (Chart 1.5, panel a) and are expected to remain close to their current levels or even increase for some corporates in the near future, even if the cost of new borrowing continues to decline. This is because a large share of firms still need to refinance loans and bonds that were originated at low interest rates, before the recent surge in borrowing costs. For example, at the end of 2021, around 25% of firms' bank loans had interest rates fixed for between two and five years. Firms' debt repayment

capacity has held up relatively well so far, supported by the strong revenue growth seen in recent years (Box 1). At the same time, however, firms' profitability is weakening and is expected to decline further in 2024, owing to the poor outlook for growth for 2024 (Chart 1.5, panel b) and the fact that labour costs are still growing strongly. Since access to external funding could remain constrained by tight bank lending standards for a longer period of time (Chapter 3), a significant and protracted slowdown in earnings growth would make debt repayments much more difficult to meet, especially for firms that have already drawn on their cash buffers.

Chart 1.5

If profitability weakens, firms' ability to accommodate rising debt service costs could be challenged, especially in sectors most sensitive to changes in interest rates



Sources: Eurostat and ECB (MNA, QSA), LSEG, S&P Global Market Intelligence and ECB calculations.

Notes: Panel a: the debt service ratio is the sum of the interest paid in the current and the past three quarters divided by the sum of net operating surplus and property income in the current and the past three quarters for the NFC sector. Net entrepreneurial income is the sum of gross operating surplus and property income net of depreciation. Panel b: analysts' forecasts for nominal earnings growth for 2024 and 2025 are calculated for the companies included in the MSCI EMU index. Panel c: the cash-to-assets ratio is defined as cash plus cash equivalents over total assets. ICR stands for interest coverage ratio and is defined as the ratio of earnings before interest, taxes, depreciation and amortisation (EBITDA) to interest expense. Firm-level ICR and the cash-to-assets ratio are computed as four-quarter moving averages. "Comm. services" stands for communication services; "Consumer discr." stands for consumer discretionary goods.

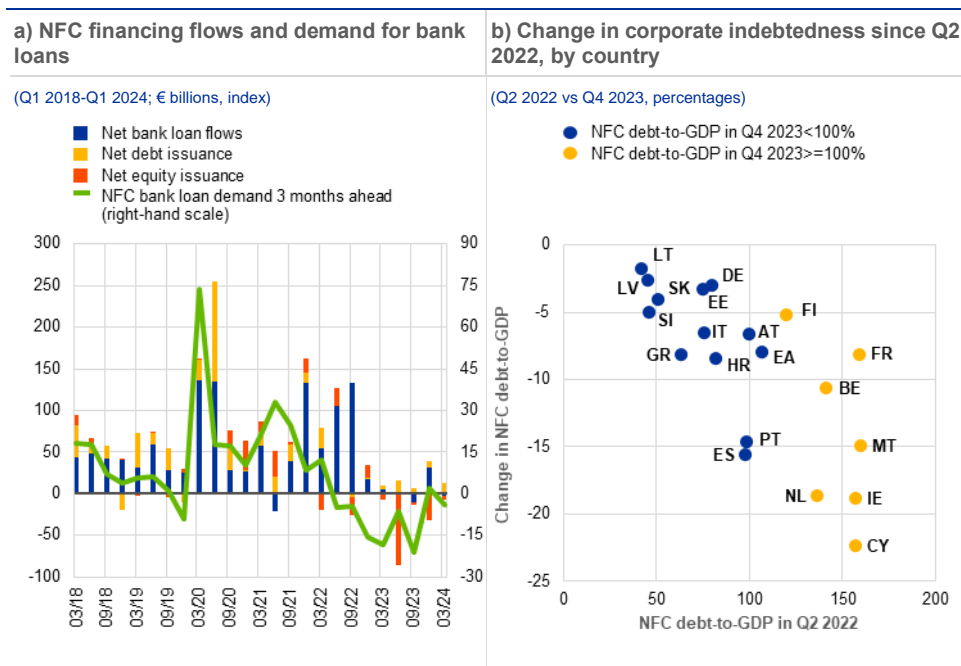
Vulnerabilities are elevated, particularly in those sectors and countries most exposed to the impact of higher interest rates.

While the overall debt servicing capacity of euro area firms has been resilient, tight financing conditions have had a bigger impact on some countries and sectors than on others. Among large firms, the ability to meet interest payments from earnings has declined substantially since the end of 2019 in those sectors, such as real estate and discretionary consumer goods, affected by weaker demand on the back of higher interest rates on consumer and mortgage loans (Chart 1.5, panel c). Firms in the real estate sector have seen particularly large declines in their profitability since mid-2022, making them highly vulnerable to continuing tight financing conditions and to downside risks to the growth outlook (Section 1.5). Default rates on bank loans to commercial real estate firms are rising (albeit from low levels), reflecting eroding financial health. The same also

applies to loans to small and medium-sized enterprises, since they have smaller liquidity buffers and lower profit margins than bigger firms (**Chapter 3**). Finally, corporate interest burdens have also increased more strongly in euro area countries where floating-rate lending is prevalent than in countries with a larger share of fixed-rate loans (**Box 1**). At the same time, if downside risks do not materialise, NFCs with floating-rate loans will also benefit more quickly from the expected declines in market rates than borrowers with fixed-rate loans.

Chart 1.6

Subdued borrowing is contributing to declining indebtedness of euro area corporates



Sources: ECB (BLS, BSI, CSEC), Eurostat and ECB (QSA) and ECB calculations.
 Notes: Panel a: the "bank loan demand" indicator reflects changes anticipated by banks. It is equal to the difference between the sum of the shares of banks responding that demand for corporate loans is expected to "increase considerably" and "increase somewhat" and the sum of the shares of banks responding that demand for corporate loans is expected to "decrease somewhat" and "decrease considerably". Panel b: the chart shows the ratio of the gross non-consolidated debt (i.e. including intra-sectoral loans) of NFCs to GDP. Changes in the gross NFC debt-to-GDP ratio are calculated for the period Q2 2022-Q4 2023. The chart does not show Luxembourg, where the gross NFC debt-to-GDP ratio increased from 315.5% in Q2 2022 to 316.8% in Q4 2023. The non-consolidated NFC debt levels for Cyprus include the debt held by special-purpose entities.

Lending standards are expected to remain tight for some time, which could create additional headwinds for firms with high near-term refinancing needs.

New borrowing by firms has remained subdued across all borrowing instruments in recent months (**Chart 1.6**, panel a), particularly for small and newly established firms. To a certain extent, this weakness reflects low demand for external financing because of high borrowing costs and an uncertain business outlook, as well as tight credit standards imposed by lenders. While the cost of new credit has been falling recently as lenders start to price-in the expected decline in central bank interest rates, it remains historically high, with the average interest rate on new bank loans to corporates at above 5% since September 2023. With the outlook for near-term growth subdued and lending standards expected to remain tight going forward, the near-term outlook for corporate borrowing is weak. This could pose a risk to firms' debt rollover capacity, especially if growth continues to surprise to the downside and if the

downward pressure on corporate profitability reduces firms' capacity to substitute external with internal funding.

The ongoing corporate deleveraging should support firms' access to external financing once the economy picks up and financing conditions ease. Weak new borrowing since late 2022 and the negative effect of past high inflation on corporate debt ratios have contributed to considerable deleveraging among firms, with the aggregate NFC gross-debt-to-GDP ratio in the euro area declining from 106.4% in the second quarter of 2022 to 98.4% in the fourth quarter of 2023. Although the countries with the highest levels of NFC debt have seen the largest declines in indebtedness (**Chart 1.6**, panel b), corporate debt levels are still elevated in some jurisdictions. At the same time, the decline in overall indebtedness, as long as it remains orderly, will likely put firms in a better position to access external funding in the medium term, once interest rates start declining and economic activity gains strength.

Box 1

Corporate debt service and rollover risks in an environment of higher interest rates

Prepared by Lucyna Górnicka, Maciej Grodzicki, Thore Kockerols and Chloe Larkou

The rapid increase in interest rates could weaken the ability of firms to service and roll over their debt and, consequently, worsen the outlook for bank asset quality. Since the pandemic, several factors have helped to keep euro area corporate sector profitability remarkably resilient to shocks. First, firms managed on aggregate to improve their revenues as economic activity rebounded after the pandemic. Second, pent-up demand made it easier for them to pass rising energy and input costs (affected by supply bottlenecks and Russia's war against Ukraine) through to consumers. After the ECB started raising its policy rates in the middle of 2022, however, firms started facing higher costs to service their debts, initially on floating-rate debt and later also on their fixed-rate debt. This box combines firm-level balance sheet data with loan-level data to assess the joint impact of resilient post-pandemic profitability and higher financing costs on the debt servicing capacity of euro area firms. As a measure of debt servicing capacity, the box uses an adjusted interest coverage ratio (ICR).² As the financial data of non-listed euro area firms are typically released with a long lag, firms' earnings in 2023 are estimated using sector and country aggregate earnings growth rates. Interest payments are estimated based on actual lending rates available at the individual loan level.

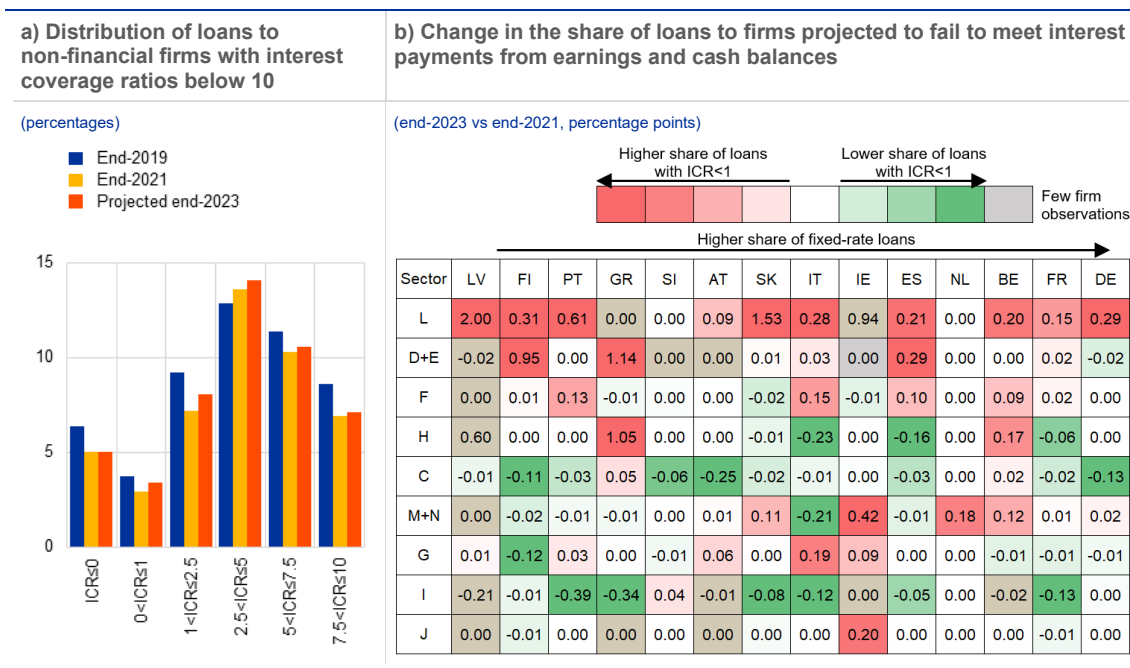
The estimated interest burdens of euro area firms may be signalling a mild increase in either loan defaults or restructurings, or both. Most firms are expected to continue servicing their debts without difficulty, despite higher interest rates. This can be attributed to low starting levels of interest payable, high cash buffers that were bolstered during the pandemic or a sizeable increase in earnings since 2021. The share of loans to firms assessed to be unable to meet their interest payments with earnings and accumulated cash – meaning they have an ICR below 1 – is estimated to have risen

² We define the interest coverage ratio as earnings before interest, depreciation and amortisation (EBITDA) plus cash and cash equivalents, divided by annual interest payments. This indicator measures the ability of firms to meet interest payments in the next 12 months and does not capture firms' vulnerability over a longer horizon. The ICR decreases when a firm's capacity to service its debt weakens. The ICR is correlated with other measures of a firm's financial distress; see the box entitled "[Corporate vulnerabilities and the risks of lower growth and higher rates](#)", *Financial Stability Review*, ECB, November 2023. Firms that cannot service their debt may adjust by reducing investment outlays or personnel costs, or selling assets, meaning that an ICR below 1 does not necessarily lead to them defaulting on their debt.

from about 7.9% to 8.4% since 2021 (**Chart A**, panel a).³ A further 8.1% of loans have been granted to firms which could face challenges in making principal repayments, as they have small earnings buffers above their contractual interest payments (ICRs of between 1 and 2.5). Since this renders firms vulnerable to revenue or input cost shocks, some of them may need their debt to be reprofiled to remain solvent.

Chart A

Corporate interest burdens have increased more in sectors and countries most exposed to the effects of higher interest rates



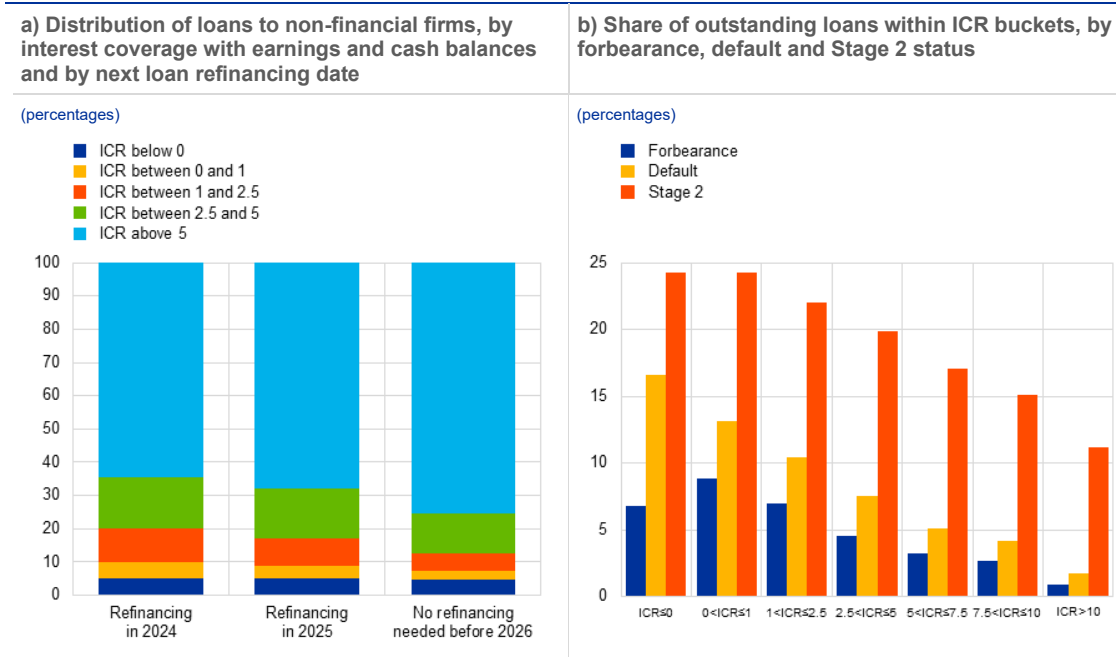
Sources: ECB (AnaCredit), Bloomberg Finance L.P., Eurostat, BvD Electronic Publishing GmbH – a Moody’s Analytics company and ECB calculations.
 Notes: The interest coverage ratio (ICR) is defined as earnings before interest, tax, depreciation and amortisation plus cash and equivalents, divided by annual interest payments. The latest available data on earnings refer to 2021; projections for 2023 are obtained by indexing earnings at the NACE-2 sector level in line with sectoral turnover aggregates reported by Eurostat. Annual interest payments are estimated from loan-level data, taking into account the increase in interest rates due to indexation to a floating-rate index. Where a figure for depreciation and amortisation is not available, it is assumed to be zero. Data cover about 461,000 firms active in 2019 and 2021 which had loans outstanding at the end of 2023. Panel a: the distribution of the ICR has been censored at 10. Panel b: the heatmap shows changes in the share of total outstanding firm loans with an ICR<1, broken down by economic sector and country. Economic activity classification in accordance with NACE Rev.1. Sector L refers to real estate activities, sectors D+E refer to Electricity, Gas, Water, sector F refers to Construction, sector H refers to Transporting and Storage, sector C refers to Manufacturing, sectors M+N refer to Professional activities, sector G refers to Wholesale and Retail Trade, sector I refers to Accommodation and Food, sector J refers to Information and Communication. Countries sorted by increasing share of fixed-rate loans. Grey areas indicate country-economic activity pairs for which data on fewer than 70 firms are available. Some euro area countries are not presented due to limited availability of corporate financial data.

The impact of higher debt service costs has been disproportionately strong in the real estate sector and in countries where loans are mostly contracted with floating interest rates. The larger increase in the interest payable of real estate firms compared with other sectors reflects the larger negative impact of weaker demand (amid higher mortgage interest rates) on their net revenues (Chart A**, panel b). Interest burdens have also increased more strongly in several smaller euro area countries where floating-rate lending is prevalent, contrasting with milder increases in fixed-rate countries such as Germany and France.**

³ The high number of firms with an ICR below 0 already pre-pandemic is consistent with other studies that find a comparable share of illiquid firms (i.e. those not able to cover financial expenses with cash flows and cash) based on the Orbis database. See, for example, Kalemli-Ozcan, S., Gourinchas, P.-E., Penciakova, V. and Sander, N., “COVID-19 and SME Failures”, *IMF Working Papers*, International Monetary Fund, 2020. Illiquid firms might still continue operating thanks to access to credit and debt restructuring, for instance.

Chart B

Pressure on refinancing corporate loans is expected to ease in the coming years, but banks have been slow to recognise the impact of higher debt service costs on loan quality



Sources: ECB (AnaCredit), Bloomberg Finance L.P., Eurostat, BvD Electronic Publishing GmbH – a Moody's Analytics company and ECB calculations.
 Notes: See Notes to Chart A. Panel b: "Forbearance" refers to refinanced loans or loans with modified terms and conditions. "Default" refers to loans that are deemed unlikely to pay or that are more than 90/180 days past due. "Stage 2" refers to loans for which credit risk has increased significantly since initial recognition, but which are not impaired. The status categories are not mutually exclusive, meaning that shares of outstanding loans by status are not additive.

Some vulnerable firms may benefit from refinancing in a more favourable environment, if market rates fall as expected. Even if vulnerable firms manage to continue servicing their loans, a low interest coverage ratio raises refinancing risk because banks need to re-assess the creditworthiness of the borrower before agreeing to the terms of the new loan. The cohorts of firms which are due to refinance their loans after 2024 are less vulnerable than those which have secured financing for shorter terms (**Chart B**, panel a), as they are expected to benefit from gradually falling interest rates.

Banks should recognise credit distress promptly and offer viable solutions to firms which struggle to service their debt. Lower interest coverage ratios are usually associated with higher shares of defaulted and underperforming (Stage 2) loans. However, even among firms with low interest coverage ratios, more than half of the bank loans have not been restructured and remain performing (**Chart B**, panel b). Weak interest coverage is likely to lead to trade-offs for banks between offering forbearance solutions and enforcing the loans, where the latter would likely lead to more abrupt credit loss. It is important that such forbearance solutions are viable for the customer and that their financial implications are accurately recognised in bank financial statements. Otherwise, unsustainable forbearance may lead to higher credit losses in the long run.

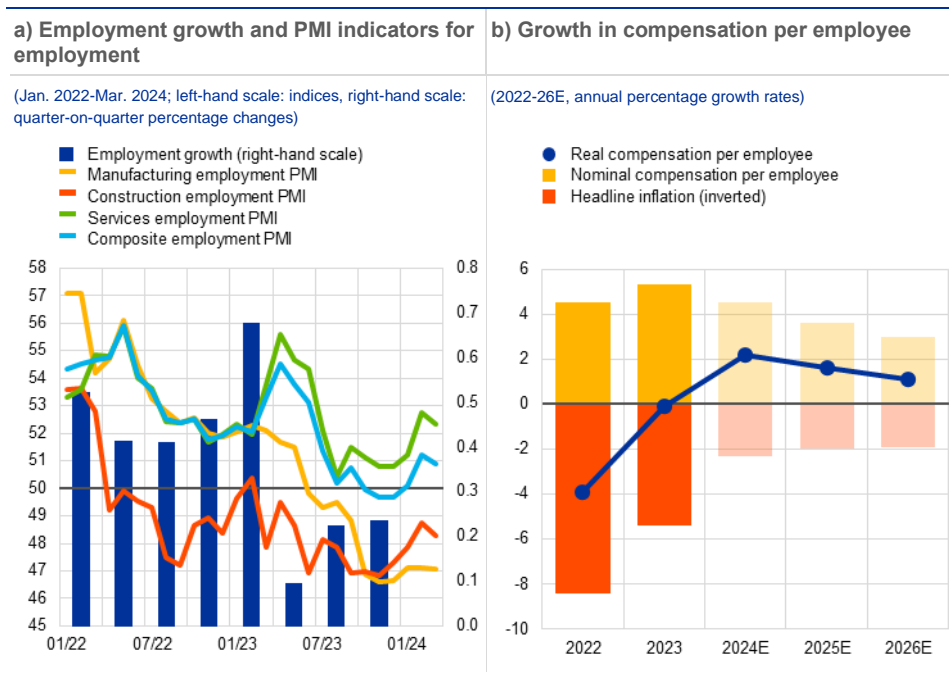
1.4 Strong labour markets support household resilience

Euro area households continue to benefit from record employment levels and rising real wages and incomes, with further real wage growth expected ahead.

Employment growth remained positive in late 2023, despite some signs of an impending turn in labour markets several months previously (Chart 1.7, panel a). Purchasing Managers' Indices (PMIs) for employment, which are early indicators of future labour market conditions, have been climbing out of negative territory (values below 50) over the past few months. The continued strength of labour markets can be observed across the board, with only a few countries seeing unemployment rates rise. At the same time, real wage growth picked up enough to turn positive in the third quarter of 2023, pushing up household income. After several difficult years, growth in compensation per employee is expected to outpace inflation in 2024 and beyond amid rapid disinflation (Chart 1.7, panel b), which will considerably bolster the financial situation of households.

Chart 1.7

Labour markets remain robust, while positive real wage and income growth bolsters households' financial situations



Sources: Eurostat and ECB (MNA), S&P Global Market Intelligence, ECB staff macroeconomic projections for the euro area, March 2024 and ECB calculations.

Notes: Panel a: the latest observation for employment growth is for Q4 2023. Panel b: shaded bars are forecasted values from the March 2024 ECB staff macroeconomic projections.

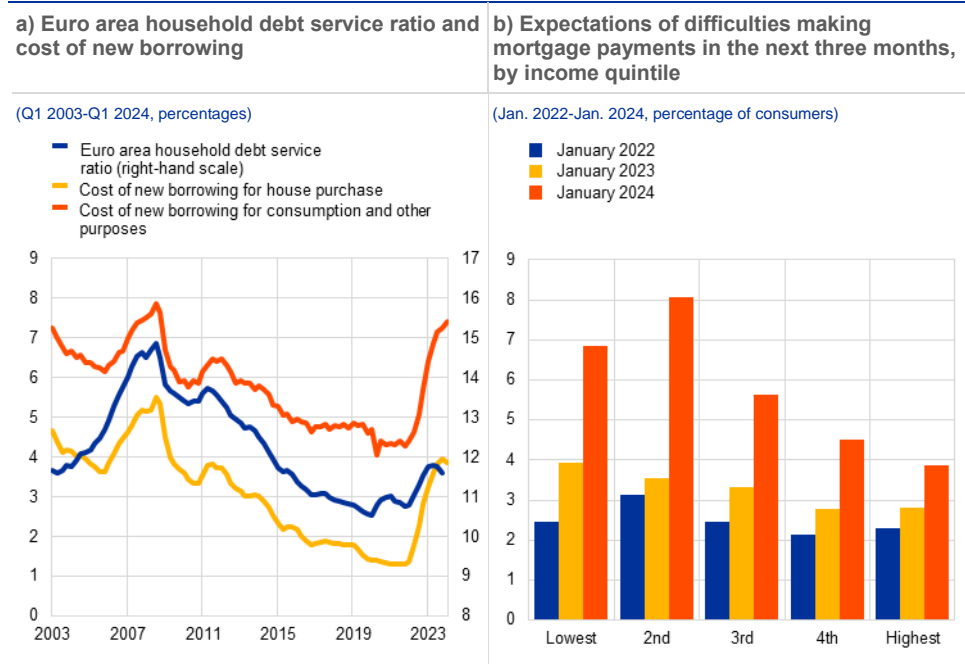
The cost of new borrowing and outstanding debt service have plateaued, while real income growth is supporting households' debt servicing capabilities.

Interest rates on new and renegotiated mortgages as well as on new consumer loans peaked in the fourth quarter of 2023, likely in anticipation of policy rate cuts later in 2024 (Chart 1.8, panel a). Countries with predominantly variable-rate mortgages have seen their debt service costs increase considerably. At the same time, households' debt servicing capabilities in countries with mainly fixed-rate mortgages will depend on

future interest rates when mortgage fixation periods end. The less rapid rise in interest rates together with the recent pick-up in wages across the euro area led to the aggregate debt service-to-income ratio plateauing as of the fourth quarter of 2023. Additionally, households have likely used excess savings accrued during the COVID-19 pandemic to reduce debt burdens in recent years ([Overview](#), [Chart 4](#), panel a), limiting the overall deterioration in their ability to service their debts compared with the previous hiking cycle between 2006 and 2008.

Chart 1.8

Households' cost of new borrowing has plateaued, and aggregate debt service seems to be at a turning point, as expectations of future debt servicing capabilities worsen



Sources: Eurostat and ECB (QSA), ECB (MIR, CES) and ECB calculations.
Notes: Panel a: the latest observation for the household debt service ratio is for Q4 2023. The debt service ratio is defined as the ratio of fixed debt service costs (i.e. interest payments plus amortisations) to disposable income. Fixed debt service costs assume identical repayment of principal over the average maturity of the debt and an average interest rate. Disposable income is expressed as a function of income, the average interest rate and the average remaining maturity of the debt stock. Panel b: the percentage of consumers is calculated using survey weights. The total number of households surveyed includes those who report not having a loan or not knowing how to answer. The sample of countries comprises Belgium, Germany, Spain, France, Italy and the Netherlands, and from April 2022 also includes Ireland, Greece, Austria, Portugal and Finland.

Risks to household financial stability appear manageable at present, yet the share of vulnerable households is rising, especially in lower-income brackets.

The combination of persistently strong labour markets, expected high wage growth, healthy savings cushions at pre-pandemic levels and the high share of fixed-rate mortgages in the euro area is ensuring that severe risks to the household sector's financial situation remain contained.⁴ However, the share of households expecting to face difficulties in making mortgage payments in the next three months jumped in January 2024 compared with 2023 ([Chart 1.8](#), panel b). This increase is especially pronounced for both lower- and, unusually, middle-income households. Additionally, microsimulations of household survey data suggest that the share of households with

⁴ The impact of elevated debt burdens may also be cushioned by government support programmes which are currently under discussion in some euro area countries.

a dangerously high debt service-to-income ratio in countries with mainly variable-rate mortgages increased to around 15% as of the fourth quarter of 2023 from a stable level of around 12% in 2021 and early 2022.⁵ While debt held by lower-income households makes up only around 11.4% of total household debt in the euro area, the sharp increase in expected difficulties reported by households in the middle income quintile, which accounts for 14.7% of total household debt, could be indicative of a larger financial stability issue in the future, especially if interest rates do not fall as expected in 2024, real wage growth turns out to be much lower than expected and the labour market weakens notably.

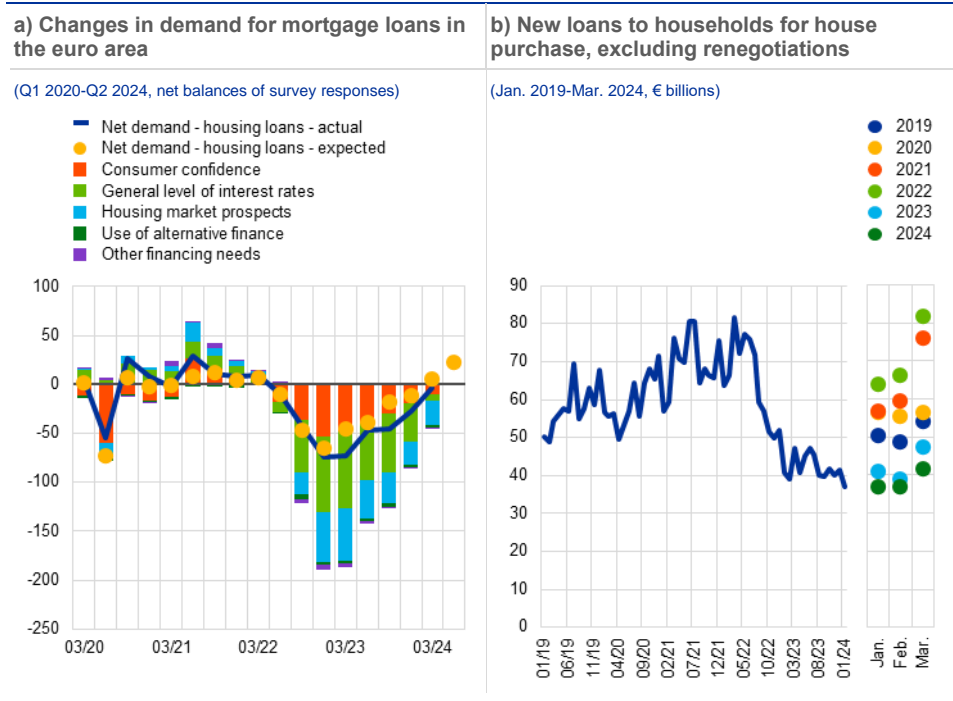
1.5 Correction under way in property markets, notably the commercial segment

Mortgage demand is expected to pick up in the second quarter of 2024, but new lending remains subdued. The steep increase in borrowing costs since the start of the present rate-hiking cycle has, together with subdued consumer confidence and housing market prospects, been the main driver behind the falling demand for mortgages. The decline in demand for new housing loans eased in 2023 and is expected to reverse entirely in the second quarter of this year (**Chart 1.9**, panel a). If this reversal materialises, it would be the first time in two years that banks have reported net positive demand for mortgages. Expectations that a lower cost of mortgage debt would boost the affordability and attractiveness of housing appear to be the key factor behind this change in outlook. Borrowing costs already declined slightly for four consecutive months between November 2023 and March 2024, bringing the average interest rate from 4.01% to 3.77%. However, the volume of new loans for house purchase remains subdued in 2024 and stands below the lows of 2023 (**Chart 1.9**, panel b).

⁵ The threshold for a dangerously high debt service level is defined here as a total debt service-to-gross-income ratio of above 30%. This is a conservative measure far above the common ratio of 30% debt service in relation to net income and is associated with a significantly increased risk of default.

Chart 1.9

Banks expect demand for housing loans to increase on the back of lower borrowing costs, but new loan origination remains subdued for the moment

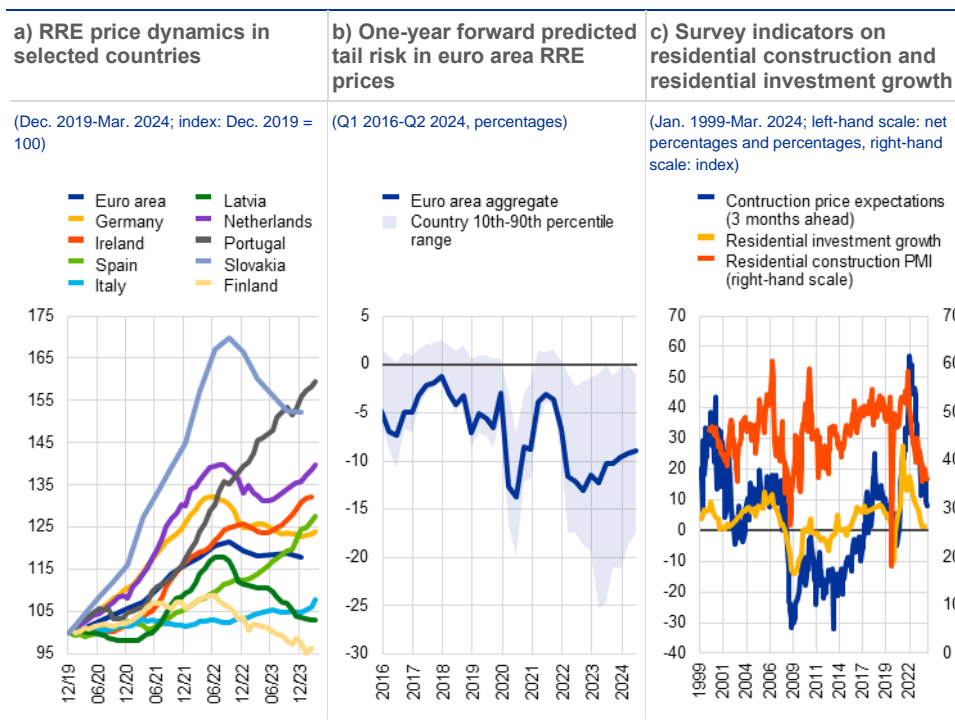


Sources: ECB (BLS, MIR) and ECB calculations.

There are some signs of stabilisation in residential real estate (RRE) prices, but downside risks remain. Euro area RRE prices declined 1.1% year on year in the fourth quarter of 2023. This fall in aggregate euro area RRE prices masks significant differences across countries, with around two-thirds of euro area countries still exhibiting positive price dynamics in the same period. In addition, high-frequency data on RRE prices available for a selected number of countries indicate that the drop in RRE prices in some countries might have slowed or even come to a halt in the second half of last year ([Chart 1.10](#), panel a). The orderly contraction in RRE prices has led to a reduction in overvaluation measures, which is reflected in slightly lower tail risk for euro area RRE prices compared with the third quarter of 2022 ([Chart 1.10](#), panel b). Nonetheless, downside risks remain elevated in some euro area countries, as housing affordability is at low levels owing to high interest rates and high prices, with some markets still showing signs of overvaluation. The tightening in financial conditions has been followed by a stark deceleration in RRE investment, which will likely have a negative impact on supply going forward ([Chart 1.10](#), panel c). The reduction in housing supply and expectations of rising construction prices, albeit much slower than in the recent past, might to some extent mitigate the risk of prices falling substantially going forward.

Chart 1.10

The orderly contraction in RRE prices has reduced tail risks to RRE prices, but significant downside risks are likely to persist in some countries



Sources: ECB, Europace, Immobiliare.it (Italy), Confidencial Imobiliário (Portugal, sourced from BIS), Arco Real Estate (Latvia), Národná banka Slovenska, Statistics Finland, Indominio.es (Spain), Central Statistics Office (Ireland), Statistics Netherlands, S&P Global Market Intelligence and ECB calculations.

Notes: Panel a: the chart includes monthly data up to December 2023, February 2024 or March 2024 for the following countries: Germany, Ireland, Spain, Italy, Latvia, the Netherlands, Portugal and Finland. The data for Slovakia are quarterly and up to December 2023. An average listing price index is used for Italy, while a hedonic price index based on transaction prices is used for all the other countries. Data for Latvia reflect prices of apartments in Riga and thus only a portion of the country's real estate market. The data for Portugal capture around 40% of the real estate market, as transactions that do not go through estate agents are excluded. As a result, official country statistics might differ from the data provided here, as they capture the entire market at the cost of lower frequency. Panel b: the chart shows the results from an RRE price-at-risk model based on a panel quantile regression on a sample of 19 euro area countries. The chart shows the 5th percentile of the predicted RRE price growth for the euro area aggregate and the 10th-90th percentile range of this estimate across individual euro area countries. Further details on the methodology can be found in the article entitled "The analytical toolkit for the assessment of residential real estate vulnerabilities", *Macprudential Bulletin*, Issue 19, ECB, October 2022.

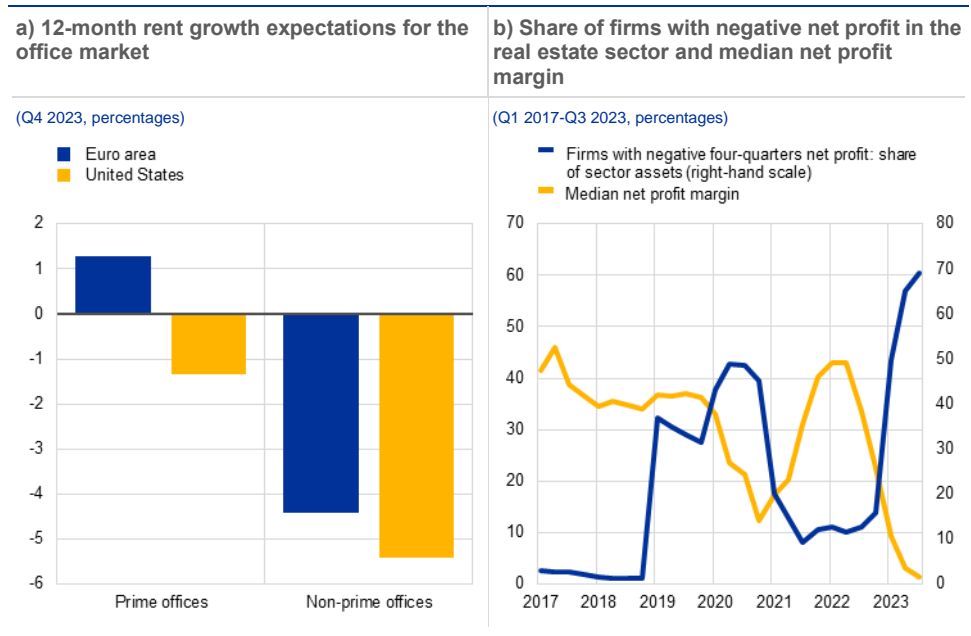
The outlook for offices and lower-quality commercial real estate (CRE) continues to deteriorate, which is having a negative effect on the resilience of real estate firms.

Transaction activity in CRE markets remains subdued, with almost half as many transactions completing in the last two quarters of 2023 as in the equivalent period in 2022. Furthermore, market intelligence indicates little to no pick-up in activity over the start of 2024. While this low level of market activity is inhibiting price discovery, there is already evidence of a significant price correction occurring in markets, with prices down 8.7% annually as of the fourth quarter of 2023 (**Overview**). The outlook for the office market is particularly bleak. Increased use of work-from-home options has created a structural drop in demand for this asset, which is reflected in a significant decline in rent growth expectations compared with pre-pandemic dynamics. Lower-quality assets are the most affected, and expectations in this segment continue to deteriorate due to additional concerns about energy efficiency requirements and capital expenditure costs. However, conditions in euro area markets do appear more benign than in the United States, attributable to more extensive working from home in the United States combined with an excess of supply going into the downturn (**Chart 1.11**, panel a). Falling rental income, rising capital

expenditures and higher financing costs pose a triple threat to real estate firms. The largest real estate firms in the euro area have seen their profit margins contract sharply since the start of 2022, which has left around half of them in loss-making territory (**Chart 1.11**, panel b).

Chart 1.11

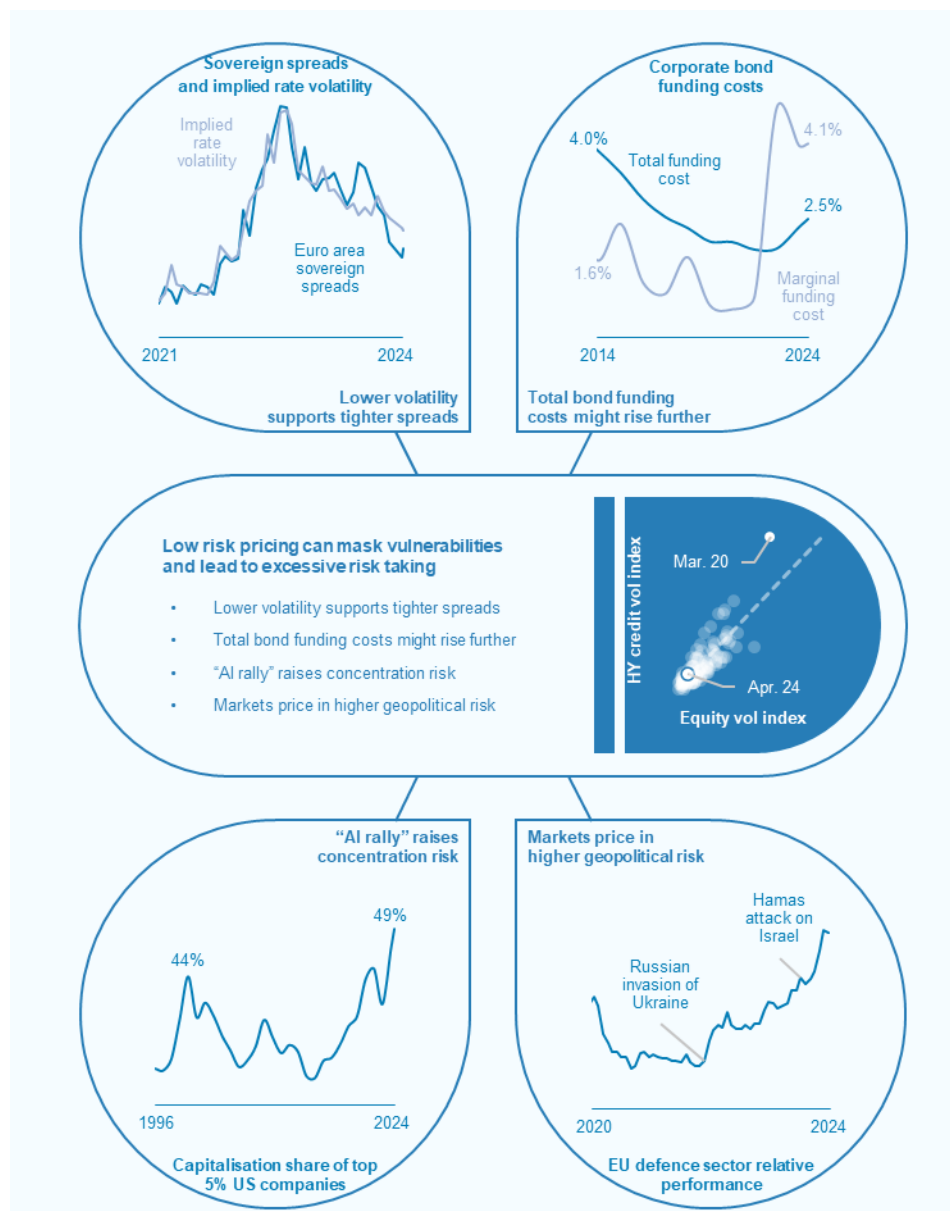
The outlook for CRE markets continues to deteriorate, with real estate firms facing increasing profitability pressure



Sources: RICS, S&P Global Market Intelligence and ECB calculations.

The downturn in RRE markets has remained orderly thus far, while some signs of materialising risk can be observed in CRE markets. The downward adjustment in RRE prices remains orderly, with signs of stabilisation in some countries. Generally, the contraction in RRE prices has been larger in countries where properties showed signs of greater overvaluation at the start of the rate hike cycle. Risks remain tilted to the downside, however, especially in those countries where debt levels are elevated and properties might still be overvalued. The commercial segment has seen a steeper downturn, and rising financing costs pose challenges to the debt servicing capacity of real estate firms, especially where rental income is also under pressure. This development is reflected in positive and rising non-performing loan inflows in banks' CRE portfolios, although these remain contained for now. Banks' aggregate exposures are substantially smaller to CRE than to RRE and are unlikely to be large enough at the euro area level to threaten the solvency of the banking system as a whole. However, these exposures are not evenly spread across the banking system, and stress could arise among the euro area's most exposed banks (**Chapter 3**). Additionally, an adverse outcome of such a scenario could be amplified by procyclical selling among non-banks, particularly real estate investment funds (**Chapter 4**).

2 Financial markets



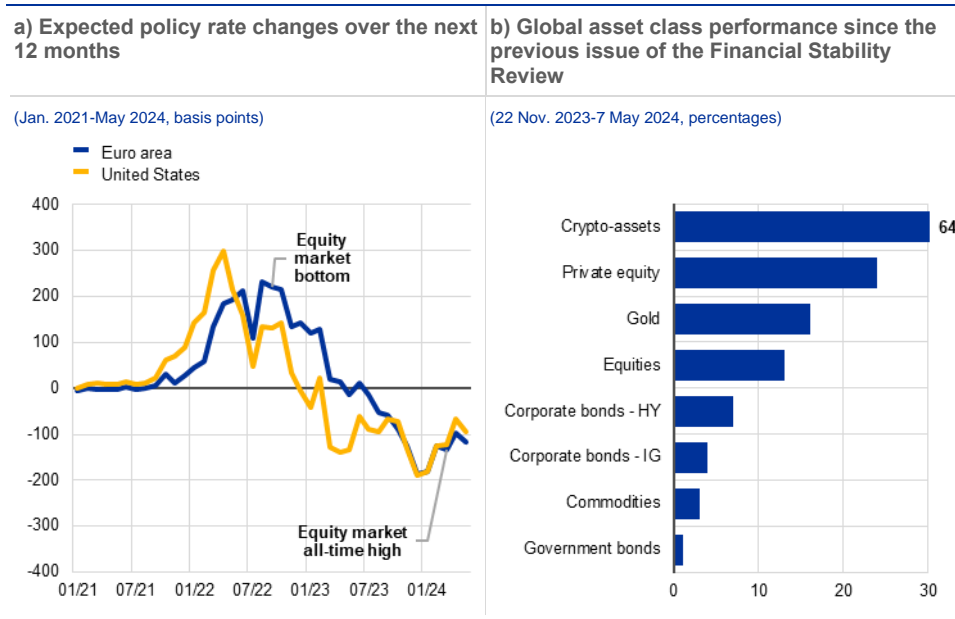
2.1 Markets adjust to expected shift in monetary policy

Expectations of global monetary policy easing have been boosting investor demand for risky assets. The disinflation trend, partly supported by moderating energy prices, has led to investor expectations that major central banks will start to ease monetary policy in 2024. Market participants are currently pricing-in around 115 basis points of policy rate cuts over the next 12 months in the euro area and 95 basis points in the United States (**Chart 2.1**, panel a). While longer-dated risk-free rates rebounded from the strong decline observed close to the end of 2023, the expected

shift in monetary policy still supported risky asset valuations. Increased risk appetite contributed to the strong outperformance of the riskiest asset classes (**Chart 2.1**, panel b). While some positive economic surprises in the first months of 2024 have led investors to postpone their expectations surrounding the timing of a first policy rate cut, investors remain confident that inflation in advanced economies might reach its 2% target without a deep economic contraction (a “soft landing”).

Chart 2.1

Shift in monetary policy prospects has boosted investor confidence and risk appetite



Sources: Bloomberg Finance L.P. and ECB calculations.
Notes: Panel a: the latest observations are for 7 May 2024. The chart shows the difference between 1Y1M forward overnight index swap (OIS) rates and current overnight rates (euro area – €STR, United States – SOFR). The equity market bottom and all-time high indicated are based on the daily-close values for the EURO STOXX Index. Panel b: HY stands for high yield; IG stands for investment grade. Performance is based on the following indices: crypto-assets – Bloomberg Galaxy Crypto Index; private equity – FTSE Private Equity Buyout Index (for United States); equities – MSCI ACWI Index; bonds – ICE BofA indices; commodities – Bloomberg Commodity Index Total Return.

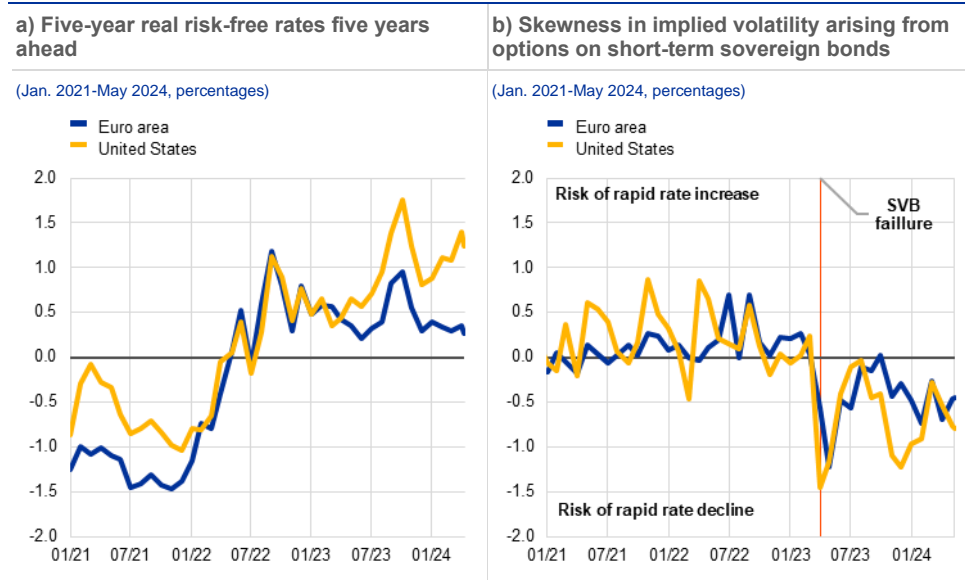
Positive real risk-free rates might mitigate some financial stability concerns but might also challenge the most vulnerable corporates. Investor expectations suggest that while policy rates will go down, they will remain well above the zero lower bound. Consequently, long-term real risk-free rates are expected to remain in positive territory – at around 0.25% for the euro area – also in steady state (**Chart 2.2**, panel a). While the era of negative interest rates in the decade before the inflation outbreak was associated with the rise of a number of financial stability risks, the new regime may bring long-term benefits for the stability of the financial system.⁶ Nevertheless, the ongoing period of transition could still expose some vulnerabilities and increase market volatility. For example, the stress seen in the banking sector in March 2023 showed that some individual financial entities are particularly vulnerable to interest rate risk. Since then, market participants have priced in tail risks as skewed

⁶ See, for example, “Macprudential policy issues arising from low interest rates and structural changes in the EU financial system”, ESRB, November 2016, and Hermans, L., Kostka, T. and Vassallo, D., “Asset allocation and risk taking under different interest rate regimes”, *Working Paper Series*, No 2803, ECB, March 2023.

to the downside, as reflected in the prices of options on short-term sovereign bonds (Chart 2.2, panel b).

Chart 2.2

Market participants expect long-term real rates to stay higher for longer, but risks for short-term rates are perceived as skewed to the downside



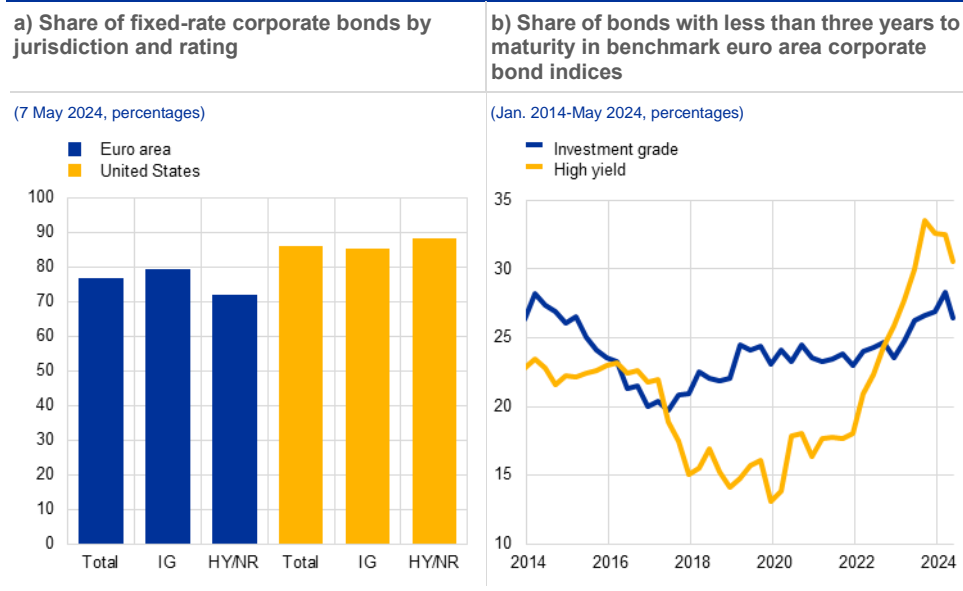
Sources: Bloomberg Finance L.P. and ECB calculations.
 Notes: The latest observations are for 7 May 2024. Panel a: difference between 5Y5Y forward OIS rates (euro area – €STR, United States – SOFR) and 5Y5Y inflation swap forward rates (euro area – HICP ex tobacco, United States – CPI). Panel b: difference between implied volatility in 5% delta put and 5% delta call one-month options on 2Y sovereign bond futures (euro area – Euro Schatz listed on Eurex, United States – US Treasury Note listed on CBOT).

The structure of the corporate bond market has delayed the full impact of higher interest rates on businesses. One way corporates can hedge against the impact of unexpected interest rate changes on their funding costs is to issue fixed-rate bonds instead of floating-rate bonds. In this case funding costs mostly increase when the debt has to be rolled over in a higher-rate environment. Given that fixed-rate bonds are dominant in corporate bond structures in both the euro area and the United States (Chart 2.3, panel a), the aggregated impact of past policy tightening has been smoothed over time.⁷ In addition, in the euro area lower-rated corporate borrowers issued a record amount of debt shortly before the onset of the recent tightening cycle, which has also kept the share of bonds maturing in the near term at low levels (Chart 2.3, panel b). This enabled lower-rated borrowers to reduce issuance in 2022 and 2023, which shielded them from the immediate effects of higher risk-free rates and wider spreads on their funding costs. However, increased rollover needs going forward might accelerate the impact of higher rates. Furthermore, the recently observed shift towards shorter debt maturities is leaving lower-rated firms more exposed to future market conditions.

⁷ Moreover, non-financial corporations in the euro area are net fixed-rate payers in interest rate derivatives, which suggests that part of the floating rate debt outstanding might also be hedged.

Chart 2.3

High share of fixed-rate corporate bonds and a supportive maturity structure has so far slowed the impact of policy tightening on the most vulnerable issuers



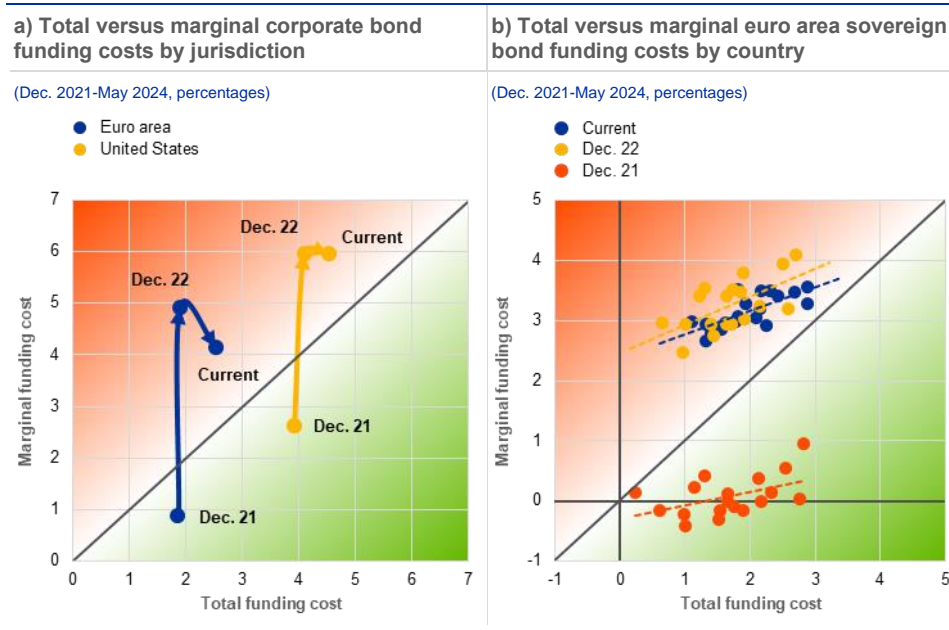
Sources: Bloomberg Finance L.P. and ECB calculations.

Notes: Panel a: IG stands for investment grade; HY stands for high yield, NR stands for not rated. Calculated for bonds issued in local currency. Investment grade means at least one investment grade rating from Fitch, Moody's or S&P. Panel b: the latest observations are for 7 May 2024. "Investment grade" refers to bonds included in the ICE BofA Euro Corporate Index, while "high yield" refers to bonds included in the ICE BofA Euro High Yield Index.

Total bond funding costs are still expected to increase further. At the end of 2021, marginal bond funding costs were substantially lower than total bond funding costs in both the euro area and the United States (Chart 2.4, panel a), indicating that pandemic-related policy easing had not yet been fully transmitted. The rapid increase in bond yields over 2022 has reversed these dynamics but, until recently, the overall increase in total bond funding costs had been relatively limited. While current bond yields reflect the policy rate cuts anticipated by investors, the limited scale of the expected easing cycle leaves scope for further total funding cost increases (proxied by the distance to the 45-degree line in the chart). This might put pressure on more indebted corporates, especially if the subdued economic growth currently observed in the euro area continues. In the sovereign bond space, while total funding costs are also expected to increase further, the scale of expected increase varies substantially across individual countries (Chart 2.4, panel b). In contrast to the situation for corporates, it appears that more of the past tightening has already been transmitted to more indebted sovereign issuers than to less indebted ones (the higher the marginal cost of bond funding, the closer it is to the total cost of bond funding). This is because of the significant amount of lower-rated sovereign debt which has already been rolled over at higher rates. In addition, the recent substantial compression of spreads has further mitigated the expected additional increase in average sovereign funding costs.

Chart 2.4

Bond funding costs will increase further as issuers refinance their debt



Sources: Bloomberg Finance L.P. and ECB calculations.

Notes: The latest observations are for 7 May 2024. Total funding cost is proxied by the average yield at issue on outstanding fixed-rate bonds weighted by the amount outstanding. When data on yield at issue were not available the coupon rate was used instead. The marginal funding costs are proxied by the average yield-to-worst on outstanding fixed-rate bonds weighted by the amount outstanding. Panel a: calculated for bonds included in ICE BofA indices: Euro Corporate Index, Euro High Yield Index, US Corporate Index, US High Yield Index. Panel b: calculated for bonds included in the ICE BofA All Maturity All Euro Government Index.

2.2 Benign pricing of risk keeps asset prices vulnerable to shocks

Low risk perceptions might mask underlying vulnerabilities and lead to excessive risk-taking.

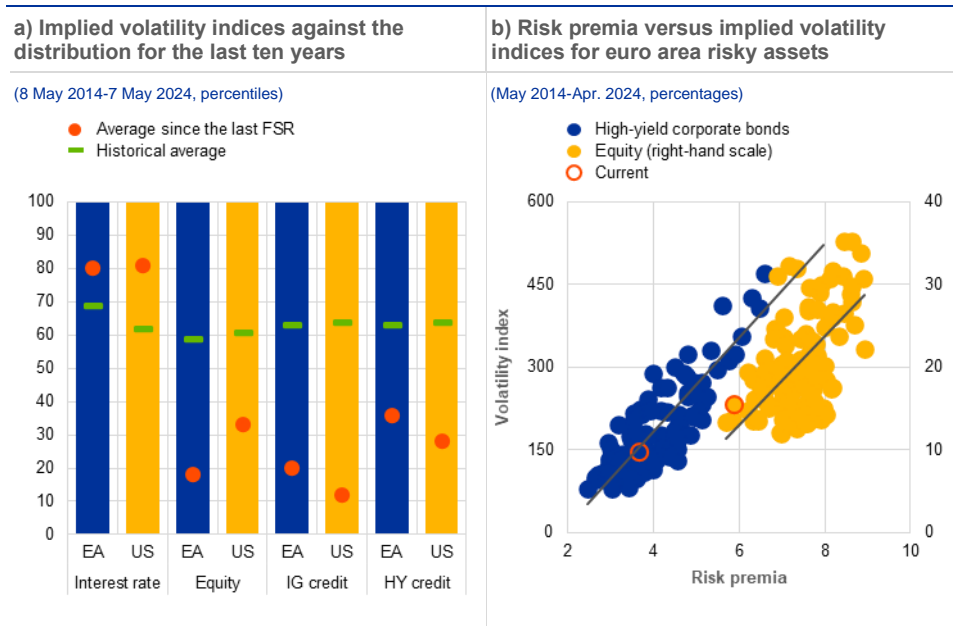
Since the publication of the previous edition of the Financial Stability Review in November 2023, implied volatility indices for risky asset classes have remained subdued both in historical terms and in comparison with the implied volatility in the interest rate markets (Chart 2.5, panel a). Given the role played by diversified equity indices in reflecting broad macroeconomic conditions, volatility indicators based on them (such as VIX and VSTOXX) are perceived as benchmark market-based risk indicators. While low implied volatility in financial markets can support financial stability to the extent that it properly reflects sound fundamentals and a stable risk outlook, it might also reflect some underestimation of financial stability vulnerabilities by market participants (Box 2). In addition, because financial institutions commonly use implied volatility indices in their risk management, prolonged periods of subdued volatility might incentivise excessive risk-taking.⁸ This

⁸ See, for example, Brunnermeier, M. and Sannikov, Y., "A Macroeconomic Model with a Financial Sector", *The American Economic Review*, Vol. 104, No 2, February 2014, pp. 379-421.

could, in turn, lead to a substantial compression of risk premia (**Chart 2.5**, panel b) and add to non-linear dynamics during shocks.⁹

Chart 2.5

Most implied volatility indices remain subdued and might incentivise risk-taking



Sources: Bloomberg Finance L.P. and ECB calculations.

Notes: Panel a: IG stands for investment grade; HY stands for high yield. Based on the following indices for the euro area and the United States respectively: interest rate – SMOVE, MOVE; equity – VSTOXX, VIX; IG credit – Itraxx/Cboe Europe Main 1M Volatility Index, CDX/Cboe IG 1M Volatility Index; HY credit: Itraxx/Cboe Europe Crossover 1M Volatility Index, CDX/Cboe HY 1M Volatility Index. Panel b: for high-yield corporate bonds “risk premia” is proxied by option-adjusted spreads for the ICE BofA Euro High Yield Index while for equities it is proxied by the 5Y CAPE yield over the 5Y real risk-free rate for EURO STOXX.

The rally in equity markets has pushed both valuations and concentration levels higher.

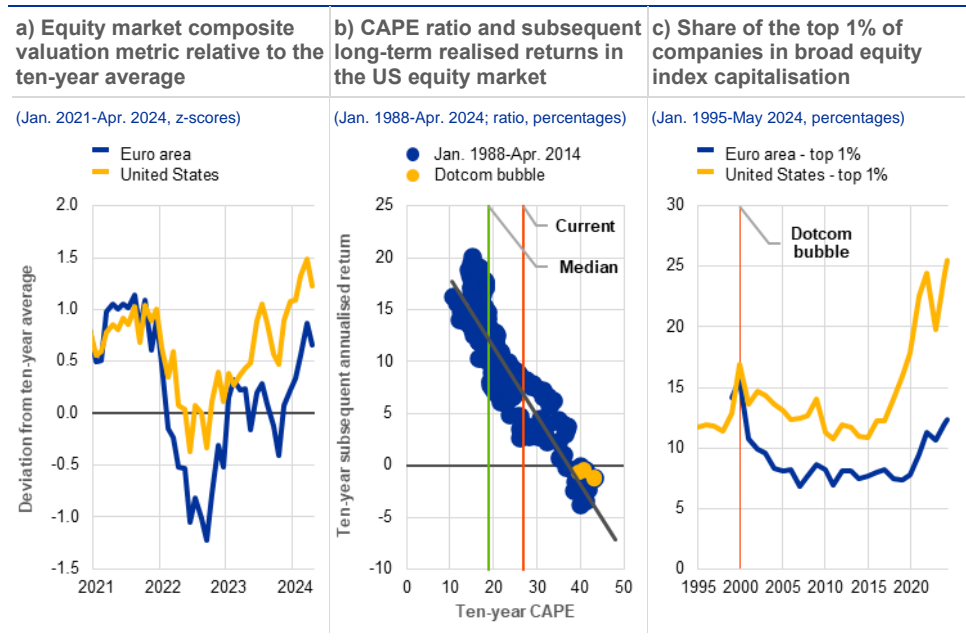
Robust earnings, investor optimism and the related compression of risk premia have resulted in a strong equity performance in recent months, taking major indices to all-time highs. In the United States, some equity valuation metrics have reached decade-high values (**Chart 2.6**, panel a), fuelling concerns of overvaluation or, even, an AI-related asset price bubble. Although cyclically adjusted metrics are still below dotcom bubble levels, they are also substantially above the historical median, suggesting that there is scope for a market correction and lower long-term returns going forward (**Chart 2.6**, panel b). In addition, there have been increasing concerns over heightened market concentration, as the largest companies in the United States now account for a historically high share of broad index capitalisation (**Chart 2.6**, panel c). This could lead to the prevalence of idiosyncratic risks related to the key themes driving earnings expectations higher – as was the case for internet development in the 1990s and is the case for AI currently. Elevated uncertainty surrounding the ultimate impact of AI on the real economy could therefore contribute to high volatility in the overall equity market, irrespective of whether the “AI rally” is displaying asset price bubble dynamics or not. In the euro area, while market concentration has also risen, equity valuation indicators have not increased to the

⁹ See, for example, the box entitled “Volatility-targeting strategies and the market sell-off”, *Financial Stability Review*, ECB, May 2020.

levels seen in the United States. As the respective equity markets are deeply integrated, financial stability risks for the euro area might relate mostly to spillovers from the United States or to potential negative earnings surprises, particularly if subdued economic growth continues.

Chart 2.6

Heightened US equity valuations indicate scope for a larger market correction, while extreme market concentration might indicate elevated idiosyncratic risks



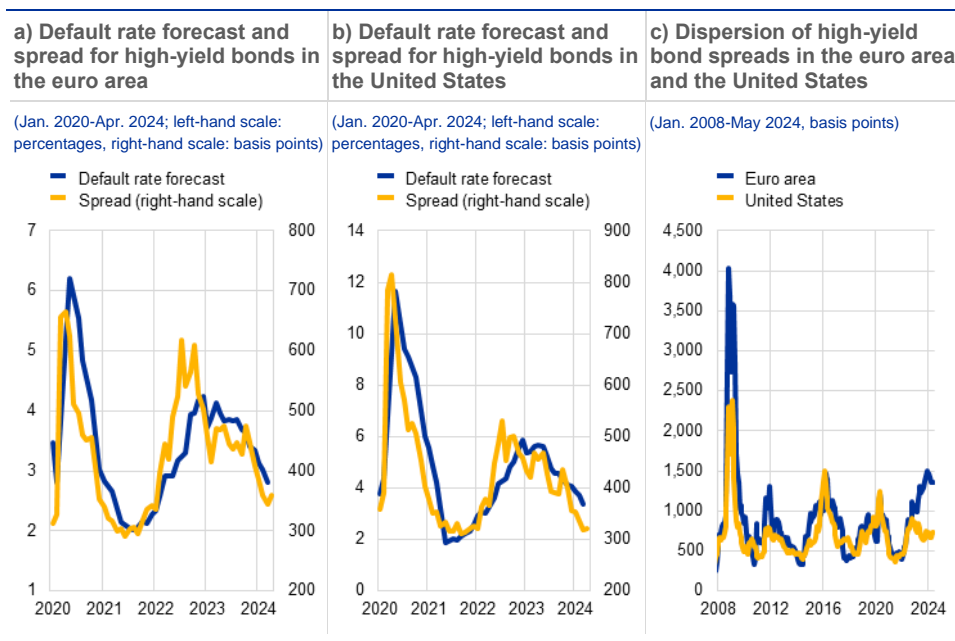
Sources: Bloomberg Finance L.P. and ECB calculations.
Notes: Panel a: average z-scores of the following valuation metrics for EURO STOXX (euro area) and the S&P 500 (United States): price-to-book ratio, price-to-forward (12-month) earnings ratio, price-to-long-term (ten-year) inflation-adjusted earnings ratio, price/earnings-to-growth ratio (growth rate calculated as the average of annualised five-year historical earnings growth and annualised two-year blended-forward earnings growth) and inverse risk premia proxied by five-year CAPE yield less five-year real (inflation-swap-adjusted) government bond yield (German for the euro area). Panel b: CAPE stands for cyclically adjusted price-to-earnings, where earnings for the last ten years are adjusted by inflation and averaged. Calculations are for the S&P 500. "Dotcom bubble" refers to the period between December 1999 and March 2000. Panel c: the latest observations are for 7 May 2024, calculated for the EURO STOXX (euro area) and the S&P 500 (United States).

While the corporate sector is perceived as resilient on aggregate, pockets of vulnerabilities have become more apparent. Buoyant investor sentiment has also been observed in the corporate bond market. Progress seen in the convergence of inflation towards central bank targets has strengthened baseline expectations among investors that the global economy will experience a soft landing. In such a scenario, default rates – even those for more indebted borrowers – are expected to remain contained, which has supported the continued compression of high-yield bond spreads in both the euro area (Chart 2.7, panel a) and the United States (Chart 2.7, panel b). While this would be a desirable outcome from a financial stability perspective, there are still some concerns over the heterogeneous situation of individual sectors. In the euro area, this has been reflected in the substantial increase in spread dispersion to levels last seen during the global financial crisis (Chart 2.7, panel c). The sectoral split indicates that distressed borrowers are concentrated in the real estate sector, which has recently become more vulnerable because of the downturn in the commercial segment (Chapter 1). While the small share of such troubled borrowers points to limited potential spillovers to the broader corporate bond market, it might reflect the deteriorating asset quality of some bank loan portfolios

(Chapter 3). By contrast, in the United States spreads have compressed substantially even for the lowest-rated borrowers, which might reflect a better economic outlook.

Chart 2.7

Corporate spread compression reflects optimism about borrowers' resilience, but sectoral-specific risks seem to be on the rise

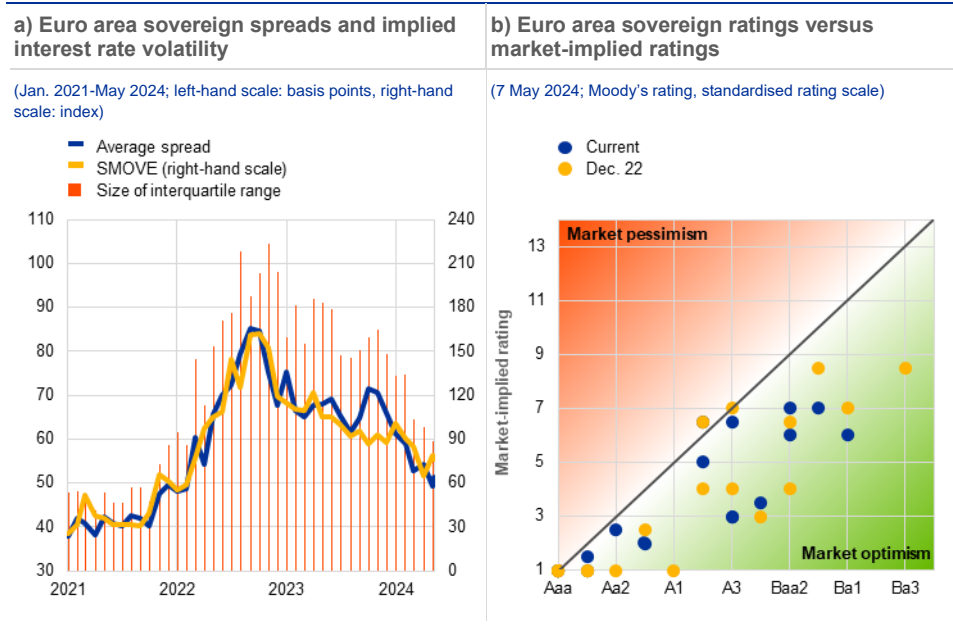


Sources: Bloomberg Finance L.P., Moody's Analytics and ECB calculations.
 Notes: Panel a: option-adjusted spreads for the ICE BofA Euro High Yield Index and the 12-months-ahead baseline default rate forecast for European high-yield bonds by Moody's. Panel b: option-adjusted spreads for the ICE BofA US High Yield Index and the 12-months-ahead baseline default rate forecast for US high yield-bonds by Moody's. Panel c: the latest observations are for 7 May 2024. The difference between the option-adjusted spreads for BB and CCC (or lower) bonds included in ICE BofA Bond Indices.

Investor concerns about euro area sovereign debt sustainability have decreased greatly, despite medium-term vulnerabilities. Declining uncertainty in the interest rate market has continued to be one of the key drivers of sovereign spread compression in the recent period (Chart 2.8, panel a). In addition, substantial debt issuance by more vulnerable countries has been well absorbed by market participants, in part due to the growing demand for duration exposure. Investors have become more confident that risks in the sovereign bond market will remain contained. Consequently, the market pricing of sovereign credit risk still appears benign in comparison with the views of credit rating agencies (Chart 2.8, panel b). Because of the rise in interest expenses and still-elevated debt levels, some euro area countries may experience significant spread widening if they are unable to consolidate their fiscal positions. This may prove challenging, given the subdued economic growth outlook (Chapter 1).

Chart 2.8

While sovereign spread compression is supported by the declining implied volatility of interest rates, investors might be overly optimistic in their assessment of risk



Sources: Bloomberg Finance L.P., Moody's Analytics and ECB calculations.
Notes: Panel a: the latest observations are for 7 May 2024. Spreads are against German bonds for bonds included in the ICE BofA All Maturity All Euro Government Index (excluding German bonds). Average is weighted by the amount outstanding. The size of the interquartile range shows the difference between the first and third quartiles of the distribution of spreads across bonds. Panel b: each data point shows an average of market-implied ratings from bond and credit default swap (CDS) pricing, based on Moody's MIR methodology.*
*) See Dwyer, D.W., Moore, D. and Wang, Y., "Moody's Market Implied Ratings: Description and Methodology", Moody's Analytics.

Box 2

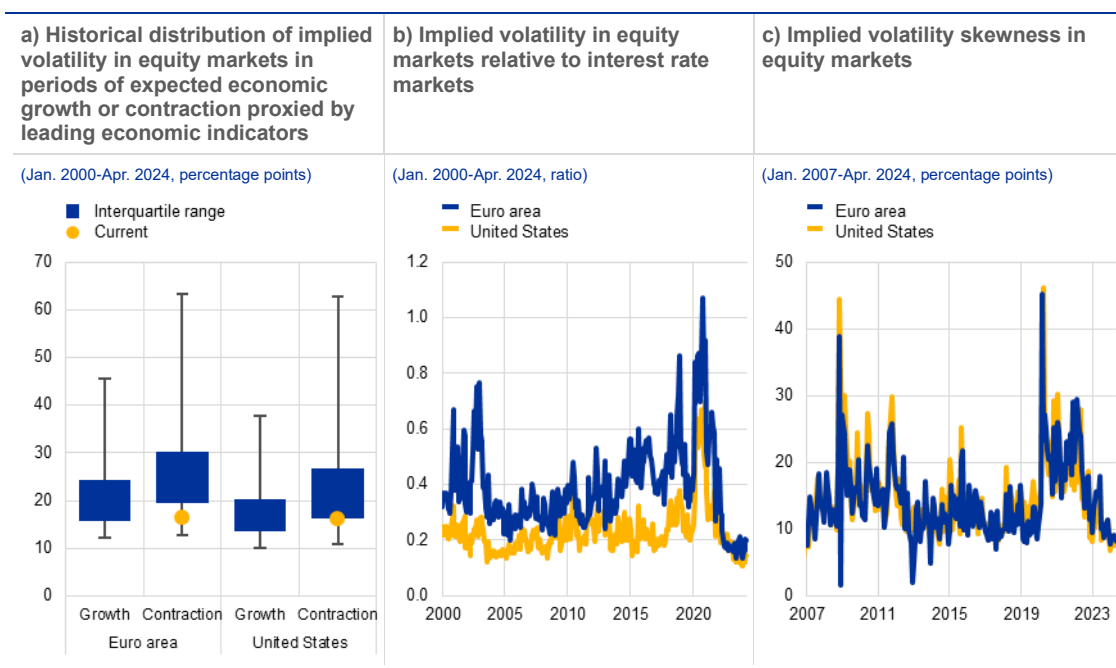
Low implied equity market volatility could underestimate financial stability vulnerabilities

Prepared by Kasper Goosen, Magdalena Grothe, Peter McQuade, Andrzej Sowiński and Stefan Wredenberg

Implied equity market volatility has been low in recent years, in both absolute and relative terms. Abstracting from short-lived spikes, implied equity market volatility has broadly declined since March 2020, despite tighter monetary policy, rising geopolitical tensions and a balance of risks to economic growth tilted to the downside. At the current juncture, low implied volatility in equity markets contrasts with signals from some leading economic indicators (**Chart A**, panel a) and still-elevated implied volatility in interest rate markets; the ratio of the two is at the lowest level in decades for both the United States and the euro area (**Chart A**, panel b). In addition, the subdued volatility skewness in the equity markets points to benign pricing of the downside risks (**Chart A**, panel c). This box discusses factors behind low levels of implied equity market volatility, its divergence from the implied volatility in interest rate markets and possible implications for financial stability, including underestimation of risks and related to this excessive risk-taking.

Chart A

Implied equity market volatility seems subdued but, as in the past, it might rise quickly



Sources: Bloomberg Finance L.P. and ECB calculations.

Notes: Panel a: based on the Conference Board Leading Economic Indicators, with positive year-on-year change indicating growth. The whiskers correspond to the minimum and maximum of monthly average values of equity market implied volatility (euro area – VSTOXX, United States – VIX). Panel b: ratio of equity market implied volatility (VSTOXX – euro area, VIX – United States) to interest rate market implied volatility (euro area – SMOVE, United States – MOVE). Panel c: difference between implied volatility in 5% delta put and 5% delta call one-month options on the EURO STOXX 50 (euro area) and the S&P 500 (United States).

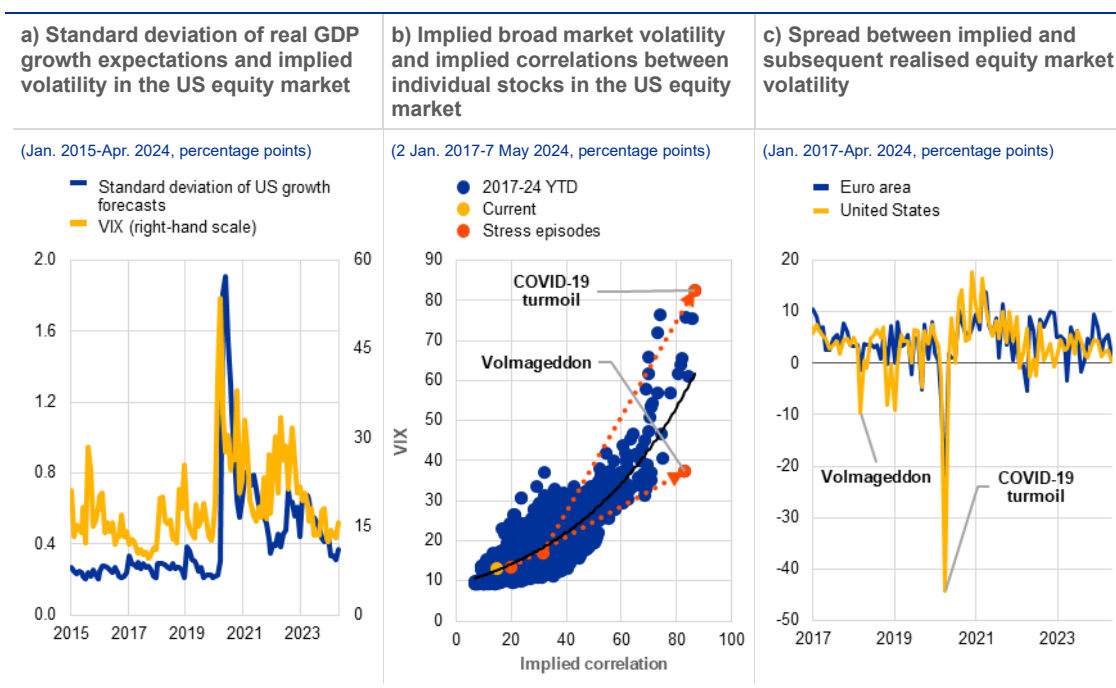
Several factors may have contributed to the low levels of implied equity market volatility.

During the period of relatively high inflation since 2021, diversified equity portfolios might have been seen as offering better inflation protection than fixed-coupon bonds, as nominal corporate earnings, from which equities pay a dividend, tend to grow with the price level. More recently, progress in bringing down inflation without a deep economic contraction has fostered investor optimism. This has been reflected in a sustained period of rising equity prices and declining realised volatility, which comoves strongly with implied volatility. While broader risks to the economic outlook prevail, lower implied equity market volatility may have also been supported by declining uncertainty regarding the growth outlook, visible, for example, in analyst expectations (**Chart B**, panel a). In addition, investors might expect that low correlations across stock returns could prevail and further contribute to low volatility at index level (**Chart B**, panel b).¹⁰ Subdued demand for tail-risk protection could be another potential explanatory factor. Investors might assume that major central banks now have more scope to ease monetary policy in response to financial stability risks than they did at the onset of the inflation surge. This may have led to expectations – which might not necessarily hold – that despite elevated tail risks, their materialisation would only lead to a transitory period of higher equity price volatility.

¹⁰ When correlations across individual share prices are low, more diverse changes within the stock price index tend to cancel out and the overall index performance is more stable.

Chart B

Progress towards a soft landing and low correlations across individual stocks supported VIX decline



Sources: Bloomberg Finance L.P., Consensus Economics Inc. and ECB calculations.

Notes: "COVID-19 turmoil" refers to the pandemic-related market crash that occurred between 21 February and 16 March 2020; "Volmageddon" refers to the period from 1 to 5 February 2018, when stress in the US equity market was induced by forced unwinding of oversized short volatility positions.* Panel a: standard deviation of analysts' one-year-ahead real GDP growth expectations. Panel b: "Implied correlation", as measured by the Cboe Implied Correlation Index, captures the average expected correlation between the top 50 stocks in the S&P 500 index. Solid black fitted line is an exponential function. Panel c: spread between 30-day implied volatility (euro area – VSTOXX, United States – VIX) and subsequently realised 30-day volatility of underlying indices (euro area – EURO STOXX 50, United States – S&P 500).

*) See Augustin, P., Cheng, I. and Van den Bergen, L., "Volmageddon and the Failure of Short Volatility Products", *Financial Analyst Journal*, Vol. 77, No 3, 2021.

Increasingly common short volatility strategies may also have suppressed implied equity market volatility and increased the risk of sudden repricing. These strategies aim to profit from declining or low equity volatility by selling equity options or taking short positions on VIX-based derivatives. Most of the time, they provide positive returns thanks to positive volatility risk premia – the difference between implied and subsequently realised volatility (**Chart B**, panel c) – but suffer large losses when there are spikes in volatility. Substantial profits from such strategies in recent years have increased interest in deploying them, thus potentially contributing to the downward trend in the VIX.¹¹ In addition, there has been growing interest in trading options on the day of their expiry ("0 days to expiry" or "0DTE"), potentially also among "short volatility" traders.¹² In view of the increasingly crowded positions in such trades, their abrupt unwinding – triggered for example by a tail event – could lead to a disorderly correction and volatility feedback loops, as was the case during the "Volmageddon" volatility spike of February 2018 which led to large losses on short volatility strategies. The historically high end-of-day exposures to broad US equity market volatility instruments (**Chart C**,

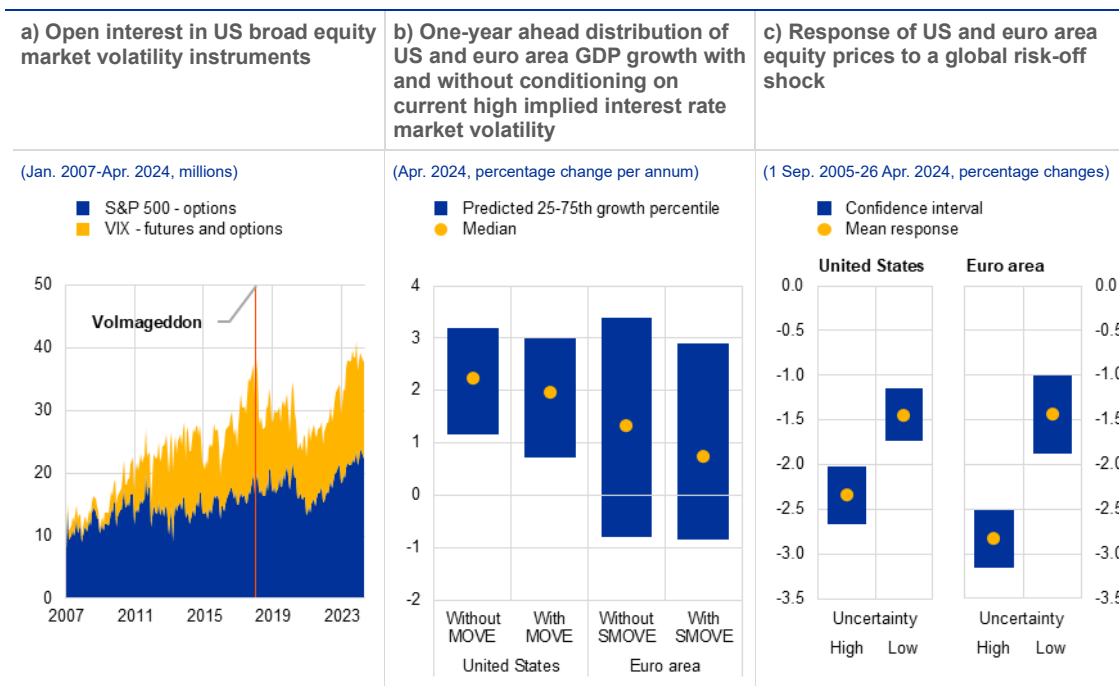
¹¹ Investment funds that add a "short volatility" component to their broad market exposure, when pursuing a "covered call" strategy for instance, have experienced substantial inflows over the last two years. Their selling activity might put downward pressure on the prices of options used to calculate the VIX. See also Todorov, K. and Volkov, G., "What could explain the recent drop in VIX?", *BIS Quarterly Review*, Bank for International Settlements, March 2024, pp. 6-7.

¹² While oversized supply of 0DTE options does not affect the VIX directly, it might have some dampening impact on its level if, for instance, market-makers decide to proxy-hedge their positions with longer-dated options or due to the deployment of specific term spread strategies.

panel a), as well as an intraday build-up of positions in 0DTE options, could make such market adjustments less orderly.¹³

Chart C

While positions in equity volatility instruments accumulate, high implied volatility in interest rate markets points to downside risks to GDP and equity prices



Sources: Bloomberg Finance L.P., ECB, LSEG and ECB calculations.

Notes: Panel a: open interest in S&P 500 options also includes options on the S&P 500 mini, S&P 500 nano and SPDR S&P 500 ETF, all adjusted to reflect the same notional. Open interest in VIX futures and options also includes mini VIX futures, adjusted to reflect the same notional. Panel b: predicted quantiles of year-on-year GDP growth distribution one year ahead as of April 2024, estimated with quantile regressions using a set of explanatory variables from January 1989 (January 1999 for the euro area) to April 2024, with and without implied interest rate market volatility (United States – MOVE, euro area – SMOVE). For both the euro area and the US, the lower 10th percentile (not shown in the chart) is estimated to be lower when the MOVE/SMOVE is included. Panel c: the dots represent the mean estimate of the response of US and euro area equity prices to a global risk-off shock. The shock is identified in a daily Bayesian vector autoregression (BVAR) model by Brandt et al.* and calibrated to a flight-to-safety impact of around -10 basis points on the ten-year US Treasury yield. Impulse responses are shown after one week and are estimated by local projections allowing for state dependence, similar to the approach in Ramey and Zubairy**, with the gamma parameter assumed to be 2. The estimation controls for economic activity, interest rates, funding conditions and stock market uncertainty in the United States and the euro area respectively (measured by the Citigroup Economic Surprise Index, the spread between the ten-year and the two-year bond yield, financial conditions index and the stock market implied volatility) and includes a crisis dummy for the weeks of the peak of the global financial crisis and COVID-19 turmoil. The states are defined based on the US and euro area interest rate market uncertainty, as measured by the MOVE and SMOVE respectively. *) Brandt, L., Saint Guilhem, A., Schröder, M. and Van Robays, I., "What drives euro area financial market developments? The role of US spillovers and global risk", *Working Paper Series*, No 2560, ECB, 2021. **) Ramey, V.A. and Zubairy, S., "Government Spending Multipliers in Good Times and in Bad: Evidence from US Historical Data", *Journal of Political Economy*, Vol. 126, No 2, 2018, pp. 850-901.

Elevated implied interest rate market volatility could point to downside macro-financial risks that equity investors do not seem to have fully priced in. Risks surrounding the economic outlook and the related monetary policy response remain elevated, against the background of rising geopolitical risks. These factors explain why implied interest rate market volatility is elevated and, in contrast to low option-implied equity market volatility, might signal prevailing financial stability risks. Historically, elevated implied interest rate volatility has been associated with larger downside risks to economic growth around one year ahead in particular (**Chart C**, panel b).¹⁴ Empirical evidence also suggests that equity prices tend to respond more strongly to global risk-off shocks when implied

¹³ For a more detailed discussion on risks from 0DTE options, see, for example, the box entitled "The risks from hidden leverage in short-term equity options", *Financial Stability Review*, ECB, November 2023.

¹⁴ A similar argument is made by Sarisoy, C., "Elevated Option-Implied Interest Rate Volatility and Downside Risks to Economic Activity", *FEDS Notes*, Board of Governors of the Federal Reserve System, 22 December 2023.

interest rate volatility is elevated (**Chart C**, panel c). This implies that equity prices could be particularly vulnerable to shifts in risk appetite or other adverse shocks in the current environment of elevated implied interest rate volatility.

Low implied equity market volatility could mask financial stability vulnerabilities. Low realised and implied volatility in financial markets can support financial stability to the extent that it properly reflects sound fundamentals and a stable risk outlook. However, subdued implied equity market volatility – despite broader uncertainties related to the macroeconomic outlook and heightened geopolitical risks, as reflected in elevated implied interest rate volatility – might suggest an underestimation of risks in equity markets and excessive risk-taking.¹⁵ Consequently, adverse economic surprises or geopolitical shocks could lead to significant market corrections. Large exposures in volatility instruments could, in turn, increase the likelihood of a disorderly correction.

2.3 Exogenous risks could add to volatility in euro area markets

Risks from the US Treasury market might spill over to euro area markets. Since the onset of higher inflation in 2021, implied volatility in interest rate markets has increased substantially, undermining the liquidity of the US sovereign bond market (**Chart 2.9**, panel a). In addition, the regulatory reforms implemented in response to the global financial crisis have constrained banks' market making capacity, while the supply of government bonds has continued to grow.¹⁶ This combination of cyclical and structural factors adversely affecting market liquidity has increased the likelihood and magnitude of price dislocations, attracting some non-bank financial institutions which saw this as an arbitrage opportunity (**Box 3**). Although such activity is, in principle, beneficial for market efficiency, a forced unwinding of leveraged exposures at a time of severe market stress might add to volatility, as is believed to have been the case in March 2020. That said, conditions in the US Treasury market remain fragile and, given the role of these securities as global risk-free assets, the risk of spillovers to euro area markets remains high.¹⁷

Growing US debt sustainability concerns might increase financial market volatility. The rapid tightening of monetary policy substantially increased the US government's net interest payments not only nominally, but also in relation to budget revenues (**Chart 2.9**, panel b). The expected further growth of these expenses has increased concerns about US debt sustainability, as reflected in a number of negative rating actions and in market-based measures of US credit risk, such as CDS spreads. On the basis of its long-term projections, the US Congressional Budget Office has

¹⁵ See also, for example, "[The Volatility Paradox: Tranquil Markets May Harbor Hidden Risks](#)", *Markets Monitor*, Second Quarter 2017, Office of Financial Research, 2017.

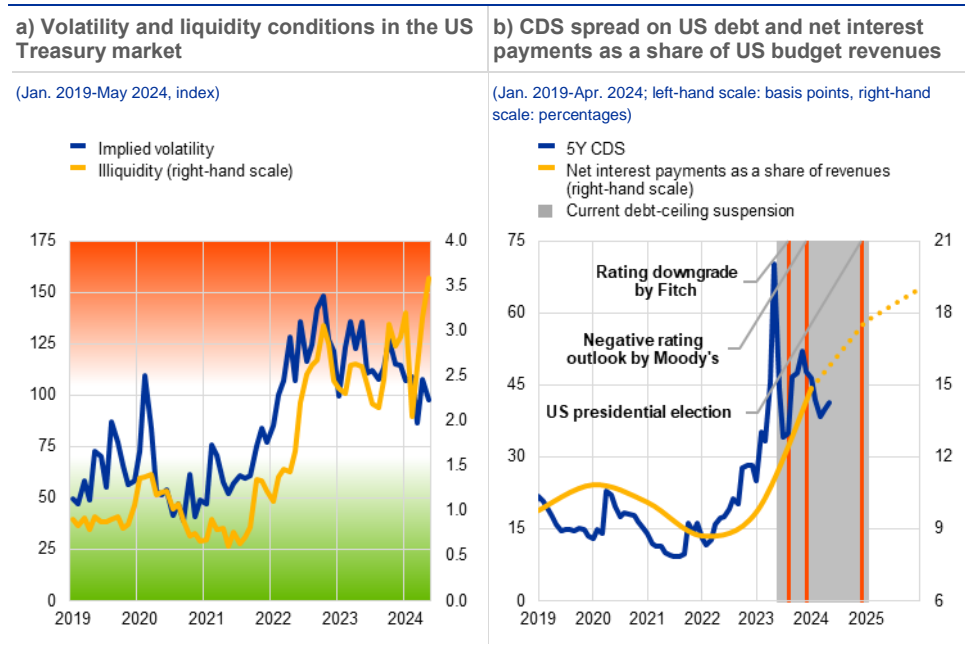
¹⁶ See, for example, Duffie, D., Fleming M., Keane, F., Nelson, C., Shachar, O. and Van Tassel, P., "[Dealer Capacity and U.S. Treasury Market Functionality](#)", *Staff Reports*, No 1070, Federal Reserve Bank of New York, August 2023, and Bruno, S. and Hill, A., "[Liquidity and resilience in the core European sovereign bond markets](#)", ICMA, March 2024.

¹⁷ See, for example, the box entitled "[US Treasury market conditions and global market reactions to US monetary policy](#)", *Economic Bulletin*, Issue 8, ECB, 2023.

indicated that unabated future increases in debt could slow economic growth, push up interest payments to foreign holders of US debt and pose significant risks to the fiscal and economic outlook.¹⁸ Although a technical default on outstanding debt would be an extreme tail risk, a significant rise in US Treasury bond yields or an induced economic shock could weigh on other assets globally.

Chart 2.9

Conditions in the US Treasury market remain challenging, while US debt sustainability concerns may add to volatility



Sources: Bloomberg Finance L.P., US Congressional Budget Office and ECB calculations.
Notes: Panel a: the latest observations are for 7 May 2024. Implied volatility shows the MOVE index, while illiquidity is proxied by the Bloomberg Liquidity Index for US Treasuries. Panel b: the dotted line shows the US Congressional Budget Office's February projection.

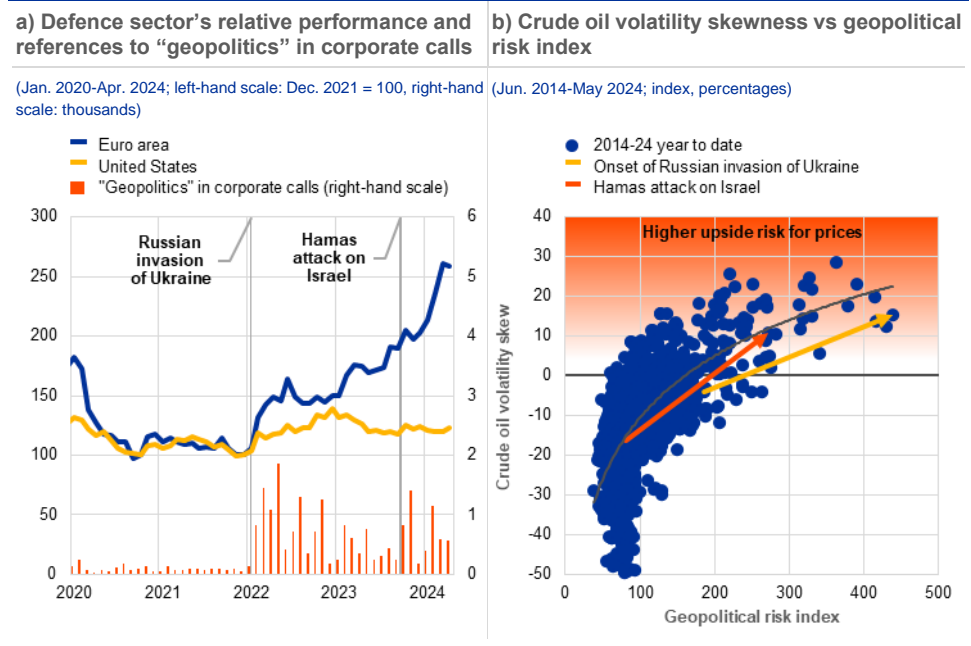
Although sentiment is buoyant, market participants are trying to weigh up geopolitical risks. Since the beginning of the unjustified Russian invasion of Ukraine, investors have increased their attention to geopolitical risks, as reflected by the frequency at which the topic is mentioned in corporate calls with market participants and analysts (Chart 2.10, panel a). The risk of the conflict escalating has also been reflected in the outperformance of defence sector companies, especially in the euro area, where military spending has already risen significantly and is expected to rise still further. In addition, gold prices have recently reached all-time highs, likely driven by the demand for geopolitical risk hedges. While the immediate market reaction to Hamas' attack on Israel has been quite muted, increased tail risks have also been priced in by the energy market, which is often an important channel of geopolitical risk contagion (Special Feature A). Risks to crude oil prices are typically skewed to the downside, but when geopolitical risks grow this pattern inverts, as reflected by the option-implied volatility skewness (Chart 2.10, panel b). That said, the potential escalation of international conflicts, especially when they involve or are close to

¹⁸ See "The Budget and Economic Outlook: 2024 to 2034", US Congressional Budget Office, February 2024.

important commodity exporters, might increase the risk of negative supply shocks substantially. Such a scenario could undermine disinflation efforts and put significant pressure on asset valuations.

Chart 2.10

Investors are mindful of geopolitical risks which might, for example, increase the likelihood of negative supply shocks



Sources: Bloomberg Finance L.P. and ECB calculations.

Notes: Panel a: ratio of defence sector sub-indices (euro area – UBS EU Defense Spending Index, United States – UBS Defense Spending Index) over broad market indices (euro area – EURO STOXX, United States – S&P 500). The total number of references includes the word "geopolitics" and Bloomberg-suggested synonyms. Panel b: the latest observations are for 7 May 2024. Volatility skew reflects the difference between implied volatility in 1M 5DC and 5DP options on crude oil. "Onset of Russian invasion of Ukraine" refers to the change between 17 February and 3 March 2022, while "Hamas' attack on Israel" refers to the period 6 October to 23 October 2023. For the geopolitical risk index, a seven-day moving average version is used.*

*) See Caldara, D. and Iacoviello, M., "Measuring Geopolitical Risk", *American Economic Review*, Vol. 112, No 4, April 2022, pp. 1194-1225.

Box 3

Financial stability risks from basis trades in the US Treasury and euro area government bond markets

Prepared by Claudio Bassi, Felix Hermes, Simon Kördel, Francesca Lenoci, Riccardo Pizzeghello and Andrzej Sowiński

Basis trades are arbitrage strategies which improve market functioning but are subject to specific risks, especially when excessively leveraged. Basis trades typically aim to exploit any mispricing between the spot price of a security (adjusted for the funding cost until the expiry of a futures contract) and its futures price – the difference being called the net basis. In order to do this, an arbitrageur needs to simultaneously conclude two opposing trades – one in the futures market and the other in the spot market. As the futures contract approaches its maturity, the futures price and the spot price converge, arguably making the basis trade return risk-free if held until the futures contract expires. In principle, therefore, basis trades are not speculative in nature and should have a beneficial impact on market efficiency and liquidity. Given that price dislocations are typically small compared with the market value of the relevant security, arbitrageurs often employ high leverage to enhance their returns. In the spot market, leverage is employed using repo funding (securities are pledged as

collateral and the cash received is used to purchase more securities), while in the futures market, leverage is synthetic and stems from the obligation to post only a fraction of the nominal exposure as margin. This exposes basis trades to funding risks – the inability to roll over repo borrowing at an acceptable price – and liquidity risks – the inability to meet margin calls related to futures positions. Rapid unwinding of basis trades in response to forced deleveraging, for instance, could add to price dislocations. However, such a scenario is less likely for arbitrage strategies and would have less impact on prices than would be the case for leveraged directional positions.¹⁹

The build-up of hedge funds' leveraged exposures in the US Treasury market has given rise to financial stability concerns.²⁰ Some evidence from the US Treasury repo market suggests that basis trades are behind the growing net short positions of these funds in US Treasury futures (**Chart A**, panel a).²¹ Over the last two years, the deterioration of US Treasury market liquidity and increased volatility (**Chart A**, panel b) have made price dislocations more frequent and basis trades more attractive. In addition, fixed income funds have seen significant inflows and asset managers have preferred the futures market over the spot market to build their duration exposure more flexibly. This has put downward pressure on the net basis. Hedge funds have stepped in as a “counterparty” for those asset managers in the futures market (**Chart A**, panel a), at the same time buying US Treasuries in the spot market and using them as collateral in the repo market to increase leverage.

Disruptions in the repo market could still force some entities to unwind their basis trades, fuelling dislocations in the US Treasury market. The liquidity preparedness of basis traders to maintain their futures positions seems better now compared with previous stress events, as traders are expected to meet margin requirements that are close to historical highs (**Chart A**, panel c). This limits the maximum leverage deployed in the strategy. Still, disruptions in the repo market could lead to the forced unwinding of basis trades. Given the role of US Treasury bonds as global risk-free assets, a volatility jump in response to such unwinding may potentially be observed across asset classes and jurisdictions, as has been witnessed during some historical stress events.²² The effect could be amplified by the high correlation between US Treasuries and euro area government bonds, and when the same counterparties are active in both markets. Sufficient liquidity in the spot, futures and repo markets in the United States is therefore crucial to contain vulnerabilities globally.

¹⁹ While the funding risk and the risk of a sudden increase in margin requirements are present for both leveraged directional trades and arbitrage strategies, another reason for the forced closure of trades are the mark-to-market losses on the strategy. Arbitrage strategies incur such losses in the event of deeper price divergences between the spot and the futures markets, which might happen if, for instance, other arbitrageurs limit their activity. For directional trades, the likelihood of mark-to-market losses is larger, as it only takes prices to move into the opposite direction than assumed. In addition, while unwinding of arbitrage trades feeds into price divergences, it should not have directional impact, as unwinding also means trading into the opposite directions (in the futures and the spot markets). Unwinding of directional bets, however, has strong directional impact on the underlying prices and fuels an already ongoing trend, making disorderly price movements and volatility spirals much more likely.

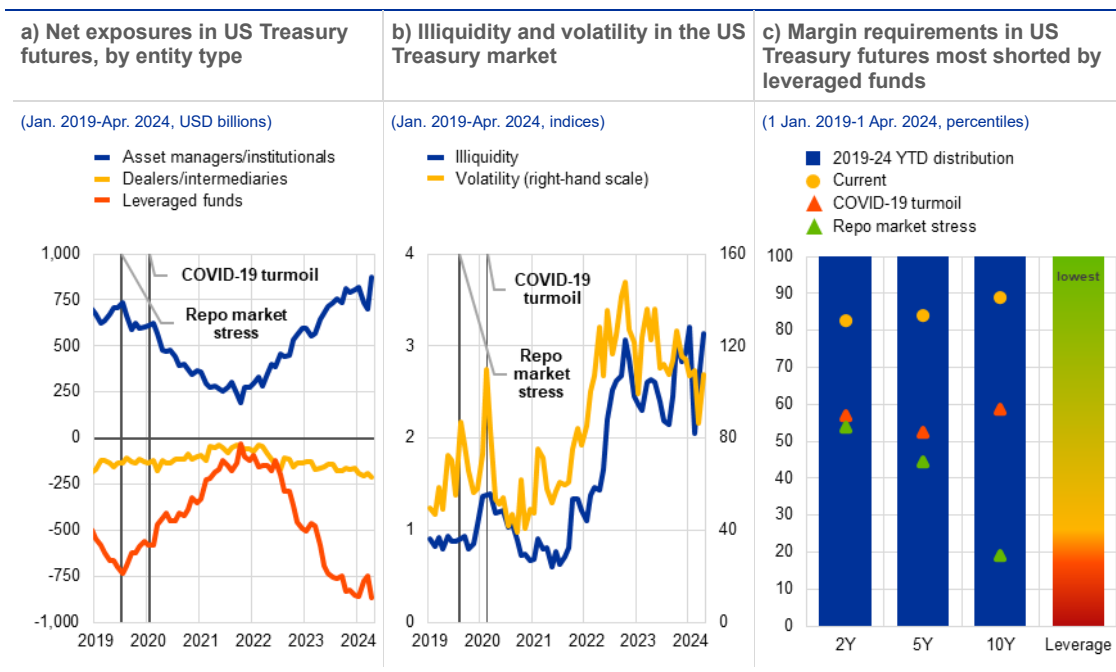
²⁰ See, for example, Avalos, F. and Sushko, V., “[Margin leverage and vulnerabilities in US Treasury futures](#)”, *BIS Quarterly Review*, Bank for International Settlements, September 2023.

²¹ See, for example, Barth, D., Kahn, R. and Mann, R., “[Recent Developments in Hedge Funds' Treasury Futures and Repo Positions: is the Basis Trade 'Back'?](#)”, *FEDS Notes*, Board of Governors of the Federal Reserve System, August 2023, or Glicoes, J., Iorio, B., Monin, P. and Petrasek, L., “[Quantifying Treasury Cash-Futures Basis Trades](#)”, *FEDS Notes*, Board of Governors of the Federal Reserve System, March 2024.

²² Some studies, however, question the impact of forced unwinding of basis trades on price dislocations in the US Treasury market in March 2020. See, for example, Barth, D. and Kahn, J., “[Basis Trades and Treasury Market Illiquidity](#)”, *OFR Brief Series*, Office of Financial Research, July 2000.

Chart A

Growing basis trade activity in the United States might be a symptom of deteriorating liquidity conditions, but vulnerabilities are partly mitigated by high margin requirements



Sources: Bloomberg Finance L.P., CME Group, and ECB calculations.

Notes: Panel a: entity types as reported in CFTC's weekly Commitments of Traders (COT) Reports, where "Leveraged Funds" are typically hedge funds.* Panel b: "Illiquidity" proxied by the Bloomberg US Govt Securities Liquidity Index and "Volatility" by the MOVE Index. Panel c: distribution of margin requirements for front-month contracts relative to their market value. For "COVID-19 turmoil" and "Repo market stress", highest observed margin requirements are shown. 2Y, 5Y and 10Y refer to two-year, five-year and ten-year T-Note futures contracts listed on the CBOT exchange.

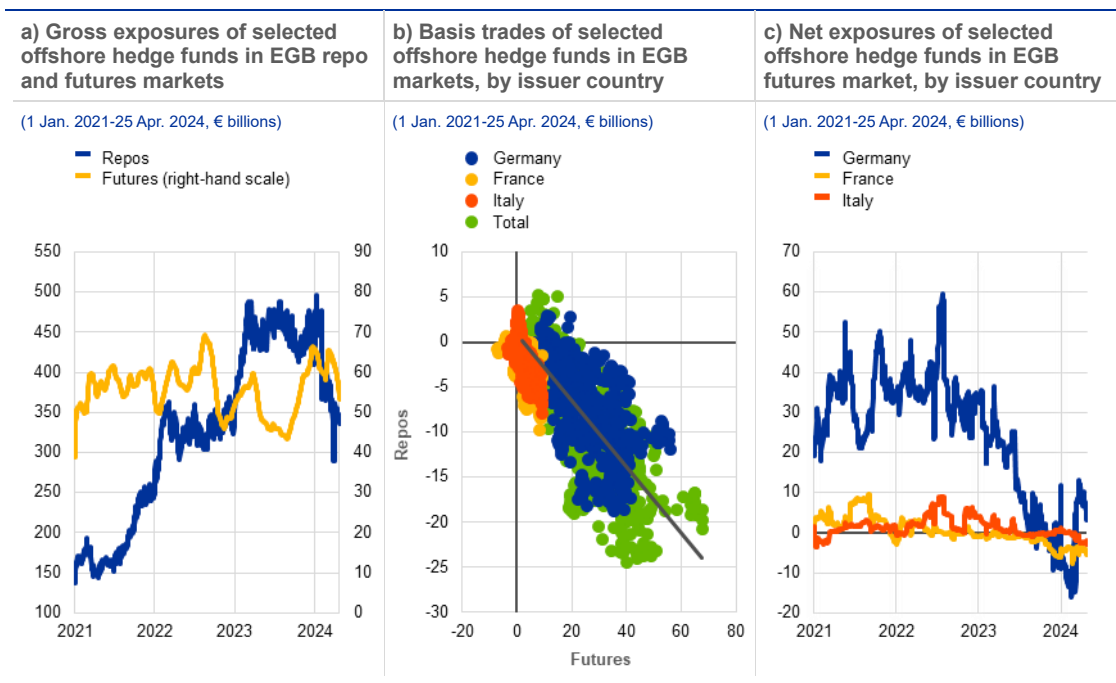
*) See "Traders in Financial Futures - Explanatory Notes", Commodity Futures Trading Commission (CFTC).

A build-up of hedge fund exposure has also been observed in the euro area government bond market, but the size of basis trade activity seems contained. Offshore hedge funds, believed to also be involved in basis trades in the United States, have become increasingly present in the euro area government bond repo market, with their positions growing up to threefold since the beginning of 2021 (**Chart B**, panel a).²³ At the same time, these funds have also been active in the euro area government bond futures market, albeit to a lesser extent. A strong negative correlation observed when matching these positions suggests some short basis trade activity (**Chart B**, panel b). In other words, these funds have mostly taken long futures positions at the same time as borrowing underlying bonds in the repo market and presumably short selling them. While the direction of these basis trades is the opposite to what has been observed in the US Treasury market, in principle it is subject to similar risks. That said, what limits the financial stability implications is the small scale of these trades and more balanced net futures positions (**Chart B**, panel c). This might be reflective of smaller market distortions in the euro area government bond market than in the US Treasury market or higher costs of arbitraging. Nevertheless, it appears that the growing presence of offshore hedge funds in the euro area government bond market is also related to other investment strategies, potentially including leveraged directional trades, associated with higher financial stability risks than basis trades. Spillovers to the euro area government bond market could be amplified, should these entities face liquidity strains in the US Treasury market.

²³ These funds are mostly domiciled in the Cayman Islands. They account for more than half of investment funds' positions on euro area government bond futures and for almost the entire euro area government bond repo activity of non-EU investment funds.

Chart B

The increased presence of non-euro area hedge funds in EGB repo and futures markets can be partly linked to basis trade strategies



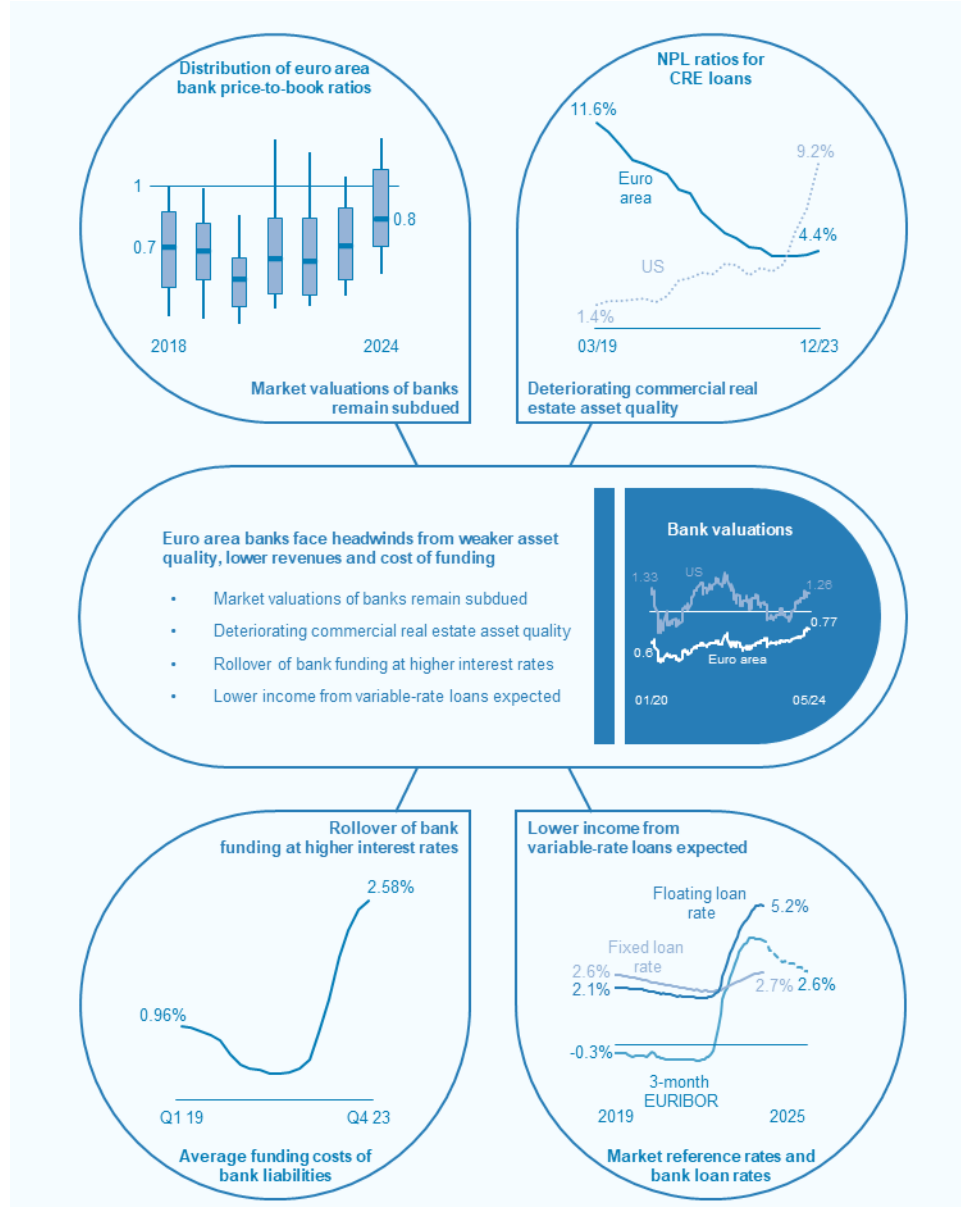
Sources: ECB (EMIR, SFTDS), sector enrichment based on Lenoci and Letizia* and ECB calculations.

Notes: "Selected offshore hedge funds" refers to investment funds domiciled in the Cayman Islands. EGB stands for euro area government bond. Panel a: "Repos" refers to the sum of repo and reverse repo exposures. Repo and reverse repo positions are at the counterparty and collateral level. "Futures" refers to the sum of absolute net long and net short positions at counterparty and contract level. Panel b: negative exposures in the repo market indicate borrowing of the collateral that is eligible for delivery for the corresponding position in the futures contract. Smaller absolute values on average for repo exposures in comparison with the corresponding futures positions might stem from the lack of data on securities financing transactions concluded between selected offshore hedge funds and non-EU entities, which might also be the lenders of the relevant bonds. Total reflects aggregated exposures in bonds issued by all three countries listed.

Panel c: the sample of EGB futures includes futures on German, French and Italian government bonds traded at Eurex, which is the most traded and liquid EGB futures market. Futures positions are netted at counterparty and contract level.

*) See Lenoci, F.D. and Letizia, E., "Classifying Counterparty Sector in EMIR Data", in Consoli, S., Reforgiato Recupero, D. and Saisana, M. (eds.), *Data Science for Economics and Finance*, Springer, Cham, 2021.

3 Euro area banking sector



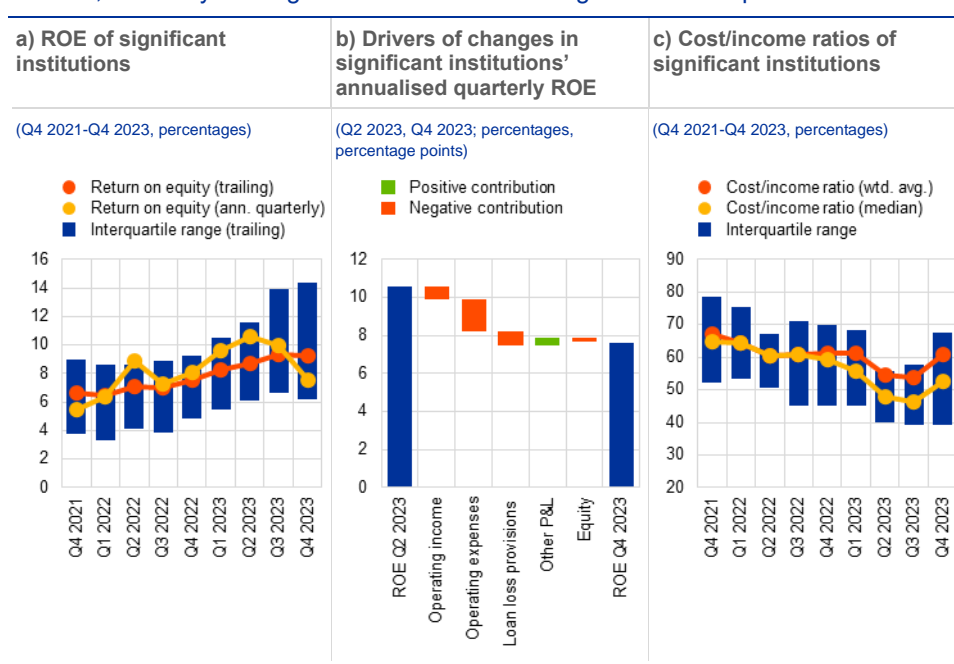
3.1 Profitability peaked at multi-year highs as headwinds to income strengthen

Euro area bank profitability peaked in the second half of 2023, as cost pressures intensified and operating profits weakened. Annual bank profitability reached a high of 9.3% in 2023, a level last seen before the global financial crisis. However, significant institutions already saw their four-quarter trailing return on equity (ROE) decline slightly in the final quarter of the year compared with the previous quarter. The turn in profitability is made all the clearer by quarterly data, as the

annualised quarterly ROE fell to 7.6% in the fourth quarter of 2023 from a peak of 10.6% in the second quarter (Chart 3.1, panel a)²⁴. This decline was broad-based, driven by rising operating expenses, lower operating income and higher loan-loss provisions (Chart 3.1, panel b). As a further indicator of increasing challenges to cost control, the weighted average quarterly cost/income ratio of euro area banks increased significantly in the fourth quarter of 2023, to 61%, returning to levels observed one year ago (Chart 3.1, panel c). This reflects a quarterly increase of 13% in operating expenses, including an increase of 14% in staff costs. This sharp quarterly increase might, however, reflect some seasonality, as costs increased more moderately compared with the fourth quarter of 2022, with quarterly operating and staff costs rising by 4.2% and 6.2% respectively year on year. This compares with euro area inflation and wage growth of 2.9% and 4.5% respectively in 2023 (Chapter 1).

Chart 3.1

Bank profitability has declined somewhat from multi-year highs over the last six months, driven by a rising cost/income ratio and higher loan-loss provisions



Sources: ECB (supervisory data) and ECB calculations.

Notes: Panels a and c: based on a balanced sample of 80 euro area significant institutions. Panel b: based on annualised quarterly figures.

Significant institutions' net interest income stagnated in the fourth quarter of 2023, amid early indications that interest margins might be narrowing.

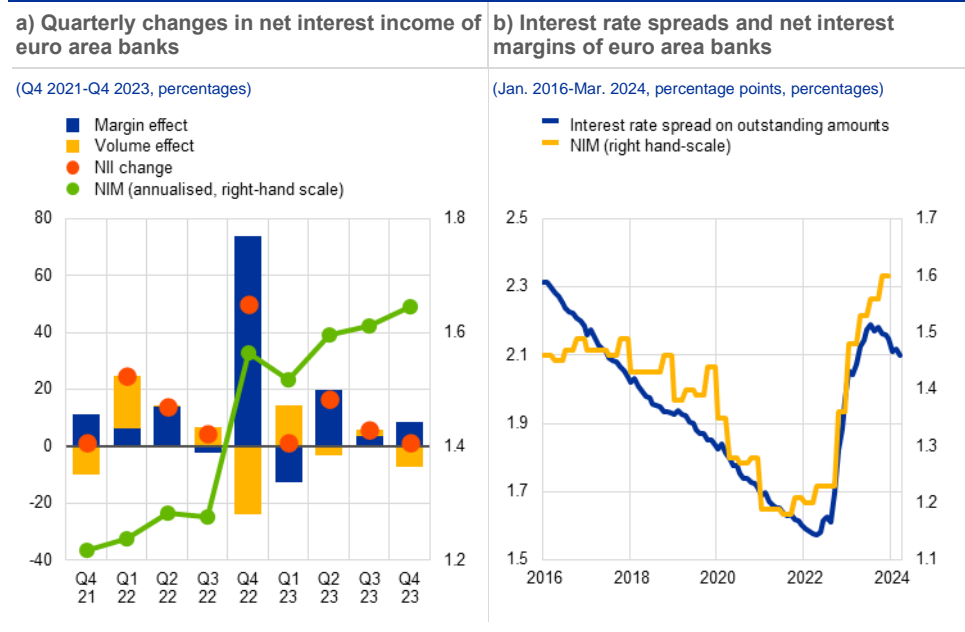
After increasing steadily in the eight preceding quarters, euro area banks' net interest income ceased to grow during the fourth quarter. Lower loan volumes have fully offset the positive contribution of expanding net interest margins (NIMs) (Chart 3.2, panel a). However, NIMs typically trail developments in loan-deposit spreads charged by banks.

²⁴ The Financial Stability Review uses the four-quarter average of stock variables, while flow variables are annualised using trailing four-quarter sums. In addition, a balanced sample of currently 80 banks is used to avoid composition effects, which might result in figures that differ from those published in the Supervisory Banking Statistics.

These spreads started to decline during the fourth quarter, indicating that NIMs may follow suit in the near future ([Chart 3.2](#), panel b).

Chart 3.2

Net interest income growth stagnated as loan volumes declined while interest rate spreads started to tighten



Sources: ECB (supervisory data, MIR) and ECB calculations.

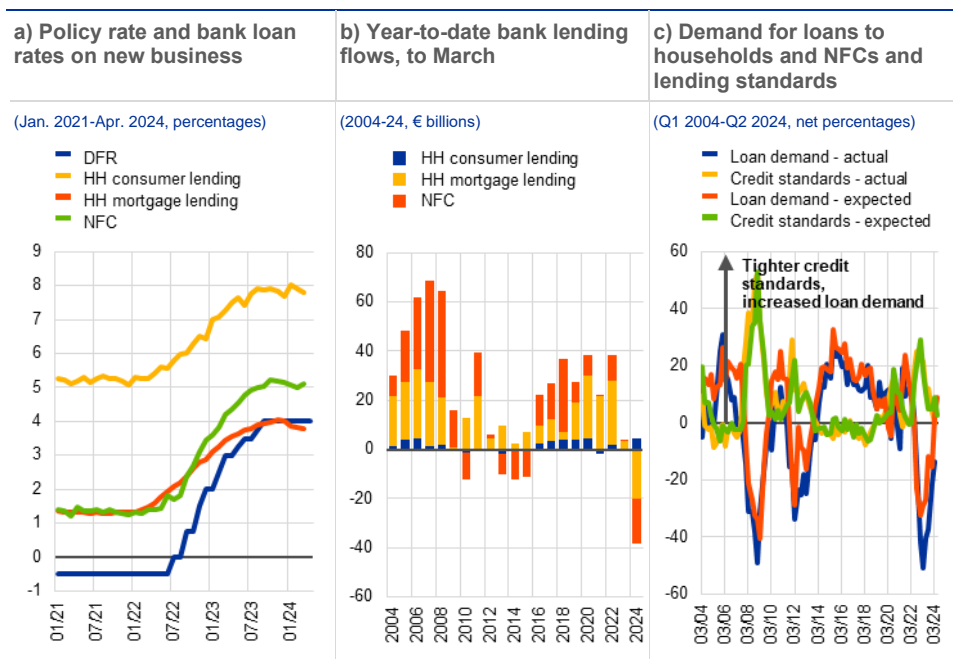
Notes: Panel a: NII stands for net interest income; NIM stands for net interest margin, calculated as net interest income divided by total assets. The chart shows quarter-on-quarter changes in NII. Based on a balanced sample of 80 euro area significant institutions. Panel b: based on all euro area banks.

Weak loan demand and tight credit standards suggest that loan growth will remain subdued.

Rates charged by banks on new loans to households and non-financial firms have already lost momentum over recent months and appear to have reached their peak ([Chart 3.3](#), panel a). Year-to-date bank lending flows to the non-financial private sector were at record lows at the end of March, driven by large reductions in mortgage lending and loans to non-financial corporations (NFCs) ([Chart 3.3](#), panel b). Banks have tightened their credit standards further since the previous issue of the Financial Stability Review was published and expect those standards to tighten again over the second quarter of 2024, which should further dampen loan growth over the medium term. At the same time, the demand for loans from households and NFCs has weakened further but is expected to recover slightly during the second quarter of 2024 ([Chart 3.3](#), panel c).

Chart 3.3

Bank loan rates have peaked amid weak lending dynamics and tightening credit standards



Sources: ECB (MIR, BSI, BLS) and ECB calculations.

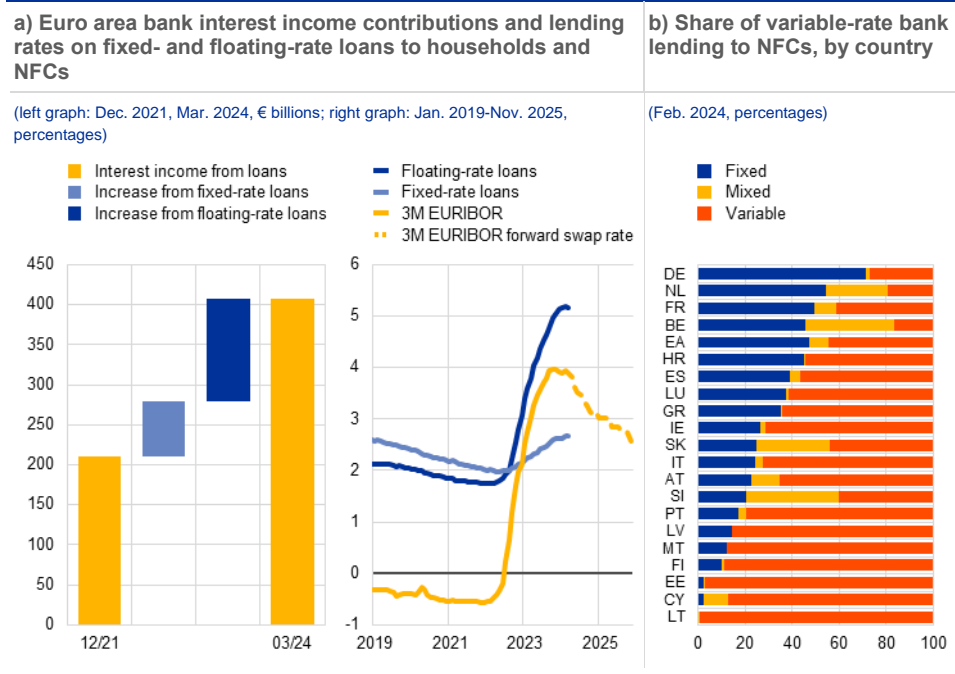
Notes: Panel a: DFR refers to the ECB's deposit facility rate. HH stands for households. Panel b: lending flows correspond to flows for January-March for each year. Panel c: "Actual" values are changes that have occurred, while "expected" values are changes anticipated by banks. For credit standards, net percentages are defined as the difference between the sum of the shares of banks responding "tightened considerably" and "tightened somewhat" and the sum of the shares of banks responding "eased somewhat" and "eased considerably" in the ECB's bank lending survey (BLS). Net percentages for the questions on demand for loans are defined as the difference between the sum of the shares of banks responding "increased considerably" and "increased somewhat" and the sum of the shares of banks responding "decreased somewhat" and "decreased considerably". Net percentages have been aggregated by taking the weighted average across the three loan categories.

Floating-rate assets could weigh on banks' interest income, as market reference rates are expected to fall.

Three-quarters of the increase in banks' interest income from loans can be linked to loans remunerated at variable rates. This is because these loans repriced alongside rising market reference rates while rate dynamics for fixed-rate loans have remained comparably muted (Chart 3.4, panel a). However, floating-rate loans become a headwind for bank profitability under assumptions of an imminent turn in market reference rates, as implied by current market expectations. Similarly, banks' liquid assets, such as central bank reserves, reverse repos and short-term debt securities, have been a major source of increased profits, but their yields would shrink quickly once market interest rates fell. Banking systems with large shares of floating-rate loans and liquid assets are the most exposed to declining market reference rates, including several countries where almost the entire loan book to NFCs has been granted at variable rates (Chart 3.4, panel b).

Chart 3.4

Variable-rate loans have been the main driver of increases in banks' loan interest income but would become a headwind to profits if market interest rates fall



Sources: Bloomberg Finance L.P., ECB (MIR, BSI, AnaCredit) and ECB calculations.
 Notes: Panel a: based on all euro area banks. Interest income is computed as the product of outstanding loan amounts and corresponding interest rates and refers to loans to households and NFCs. Average outstanding rates are shown for floating- and fixed-rate loans. Panel b: lending shares refer to outstanding amounts for NFC loans. "Fixed" indicates a rate known with certainty to both sides of the loan contract at inception. "Variable" indicates a rate linked to an exogenous parameter (e.g. EURIBOR). "Mixed" indicates a combination of fixed and variable rates.

3.2 Bank funding costs have continued to increase

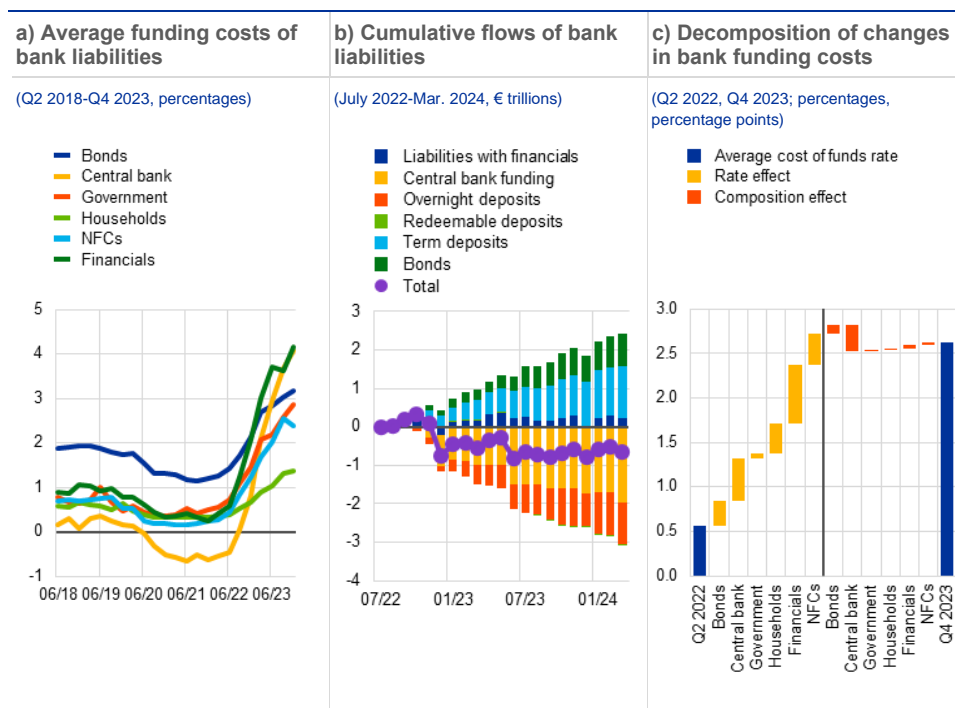
Since the monetary policy tightening cycle started, bank liabilities have repriced at higher rates, with the degree of pass-through varying across different funding sources. Banks' average cost of funds reached 2.6% in the fourth quarter of 2023, an increase of 2 percentage points since the start of the hiking cycle. Interest rates have risen for all types of funding, but especially for liabilities with other financial institutions, central bank funding and bonds. Even the rate on household deposits has increased substantially, by about 1 percentage point, despite exhibiting the lowest interest rate sensitivity (Chart 3.5, panel a).

At the same time, the composition of bank funding has shifted towards more expensive instruments. Euro area banks' liabilities decreased by €508 billion between June 2022 and January 2024. The mild aggregate reduction masks a major change in composition. Banks repaid €1.7 trillion in central bank funding, and their overnight NFC deposits declined by €1.1 trillion. By contrast, term deposits and bonds gained importance in the composition of banks' funding, increasing by a total of €2.4 trillion, in an overall shift towards more expensive sources of funding (Chart 3.5, panel b). Euro area banks have also been transferring government bonds freed up from the collateral pool at the ECB to secure repo borrowing. The resulting rise in overall funding costs was mainly driven by rising interest rates, while the shift towards

more expensive funding sources only contributed to a small extent²⁵ (Chart 3.5, panel c).

Chart 3.5

Funding repricing and composition shift have driven bank funding costs higher



Sources: ECB (BSI, supervisory data) and ECB calculations.

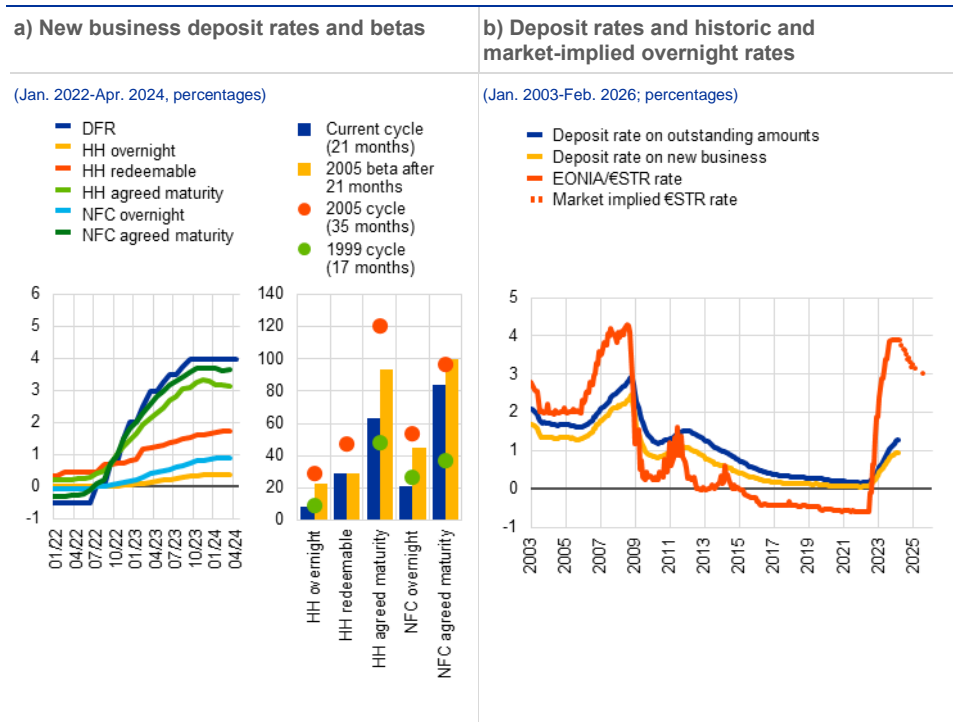
Notes: Panel a: funding costs refer to average rates computed as interest expense/average stock of liability for the quarter. Panels a and c: based on a balanced sample of 80 euro area significant institutions. Panel b: based on all euro area banks.

The outlook for deposit rates remains uncertain, as new business deposit rates lose momentum while rates on the outstanding stock continue to rise. With policy rates expected to fall and the pass-through of changes in policy rates at similar levels to previous hiking cycles, term deposit rates are likely to decline going forward. The cost of new term deposits from NFCs has already reached a plateau, and rates offered on new term deposits from households already started falling in November 2023. This contrasts with the evolution of overnight deposit rates, for which the pass-through of policy rate increases remains compressed and which continue to rise slowly (Chart 3.6, panel a). Moreover, the share of overnight deposits remains high by historical standards and depositors continue to move funds into better remunerated term deposits. The implications for aggregate deposit rates are uncertain but if historic regularities from previous hiking cycles were to be repeated, deposit costs on the stock of outstanding deposits could, on average, increase further and lag the turn in the short-term interest rate cycle (Chart 3.6, panel b). This implies that deposit costs could become a headwind for bank profitability going forward, especially for those banks most dependent on deposit funding, such as those with small reserve ratios which have already seen larger changes in deposit rates over recent months.

²⁵ It should be noted that this does not separate the rate effect from the composition effect for shifts from overnight deposits to term deposits. Calculations based on ECB (MIR, BSI) data suggest that for NFC deposits, this effect accounts for about 15% of the increase in funding costs.

Chart 3.6

The outlook for bank deposit rates is uncertain as market rates have likely peaked



Sources: Bloomberg Finance L.P., ECB (MIR, BSI) and ECB calculations.

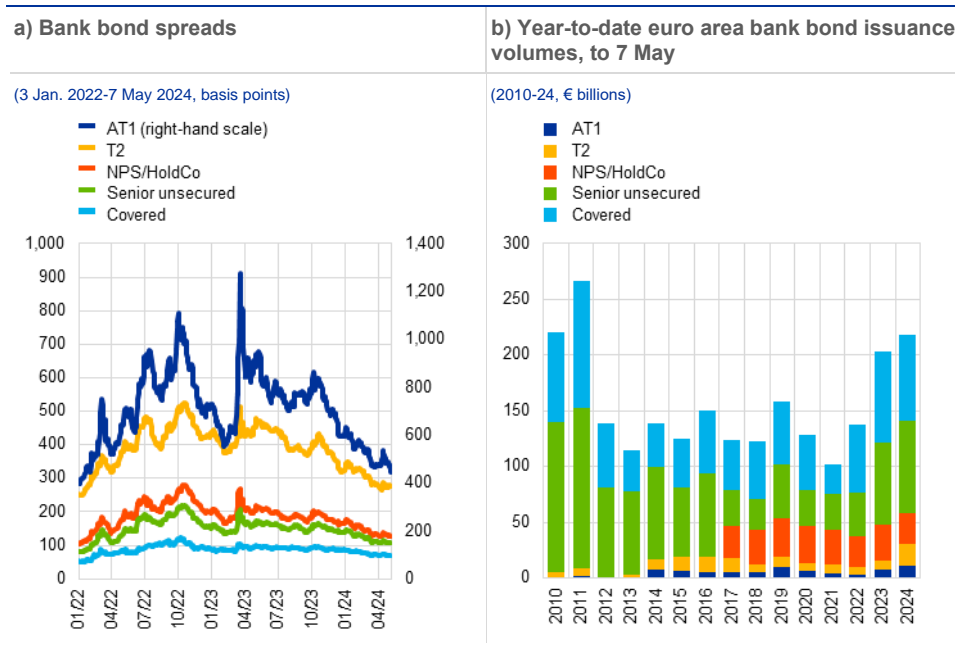
Notes: Panel a: deposit betas capture the percentage pass-through of the increase in the ECB's deposit facility rate (DFR) to new business deposit rates since the start of the respective hiking cycles. All three deposit types – overnight, redeemable and term deposits – are considered in the right graph. Panel b: EONIA/€STR refers to EONIA minus 8 basis points until end-2021 and €STR afterwards.

Market-based funding costs have decreased since the previous issue of the Financial Stability Review was published, with credit spreads tightening considerably for the riskiest instruments.

The cost of issuing new debt has risen significantly since the start of the monetary policy hiking cycle. Bond yields have, however, declined since the previous issue of the Financial Stability Review was published, benefiting from expectations of monetary policy rate cuts, which affect the yield curve, and strong bank fundamentals which supported a reduction in credit spreads (Chart 3.7, panel a). Despite some volatility in the market for covered bonds secured on commercial property loans in early 2024, there have been no spillovers to broader bank funding markets. Tighter credit spreads created a window of opportunity for some issuers to front-load issuance in early 2024. As a result, year-to-date cumulative issuance volumes are close to record levels (Chart 3.7, panel b). Market analysts expect the strong issuance activity to continue in 2024 – especially across covered and senior segments, which offer tighter pricing relative to other debt instruments – due to continued TLTRO repayments. In addition, with sizeable redemptions looming, issuance of AT1 instruments is also expected to increase considerably over previous years. By contrast, the issuance of senior non-preferred bonds is expected to slow, as banks have already built out MREL buffers to required levels.

Chart 3.7

Bank bond spreads have narrowed and issuance activity is close to record levels



Sources: S&P Dow Jones Indices LLC and/or its affiliates, Dealogic and ECB calculations.
Notes: Based on a sample of euro area banks that issue euro-denominated bonds. AT1 stands for Additional Tier 1 securities; T2 stands for Tier 2 securities; NPS/HoldCo stands for senior non-preferred securities. Panel a: secondary market z-spreads. Panel b: year-to-date issuance volumes until 2 April across years and including issuance in all currencies.

Bank funding costs are expected to increase further, despite favourable developments in market funding conditions.

With interest rates expected to decline, market-based short-term liabilities, such as those with financial institutions, should reprice downwards swiftly, reversing rate effects. By contrast, longer-term market-based liabilities, such as bonds, should continue to reprice at higher rates, given that outstanding bond rates are still below current market yields. In conjunction with the low and lagged pass-through of policy rates to deposit rates, overall funding costs might increase further, despite the easing of funding pressures.

3.3 Asset quality is slowly deteriorating, with commercial real estate and low provisioning levels most concerning

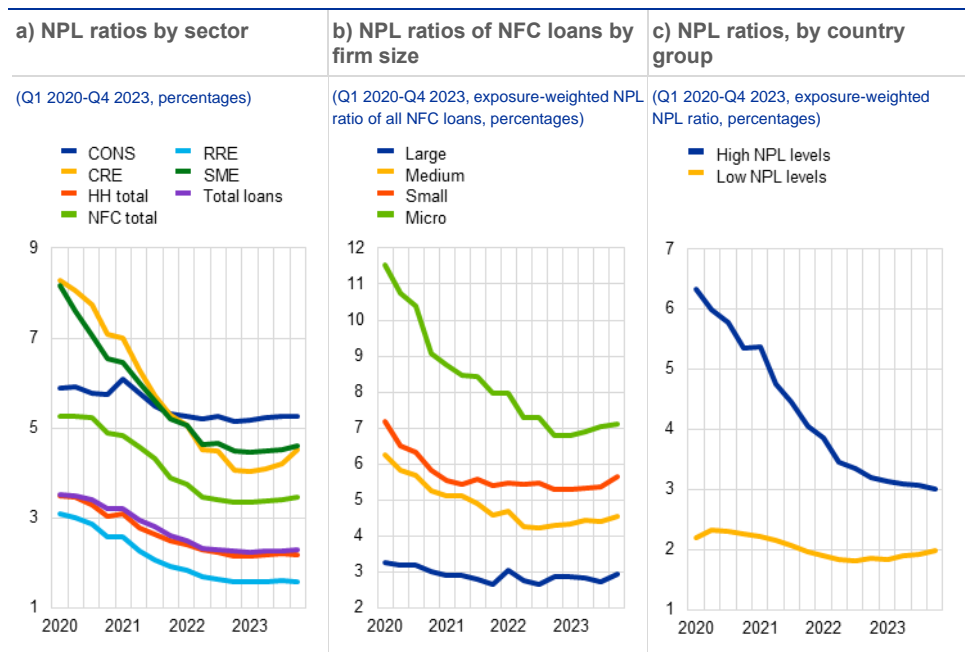
Non-performing loan (NPL) ratios remain close to historical lows in aggregate, but loans to micro firms and the commercial real estate (CRE) sector, and loans in countries with historically low NPL ratio levels, are starting to show mild signs of deterioration.

NPL ratios remain broadly unchanged, apart from a recent slight increase for CRE portfolios (Chart 3.8, panel a). This development reflects the recent downturn in several CRE markets, in both the euro area and other advanced economies. NPL ratios also increased throughout 2023 for lending to micro firms, while declining slightly for lending to larger enterprises (Chart 3.8, panel b). This divergence in asset quality can be attributed to the effect of a cooling economy over the previous quarters, which disproportionately affects smaller firms. Banks in countries where NPL ratios have been lower historically are now showing an uptick in

their NPL ratios, while banks established in countries with historically high NPL ratios continued to reduce their stock of legacy NPLs and maintained stable NPL ratios (Chart 3.8, panel c).²⁶

Chart 3.8

NPL ratios started to increase slightly for loans backed by CRE, loans to micro firms and in countries with historically low NPL levels



Source: ECB (AnaCredit, supervisory data).
Notes: Panel a: based on the full sample of significant institutions. Excludes loans held for sale, cash and cash balances at central banks and other demand deposits. CONS stands for consumer loans; CRE stands for commercial real estate; RRE stands for residential real estate. Panel b: AnaCredit follows the EU Commission standard classification for micro, small, medium and large firms. Panel c: based on the full sample of significant institutions. Excludes loans held for sale, cash and cash balances at central banks and other demand deposits. For country groupings, see footnote 26. Slovakia has only branches or subsidiaries with a parent in the euro area, which are not considered here.

Default rates have started to rise across various sectors from very low levels, while early arrears have increased, particularly for CRE and consumer loans.

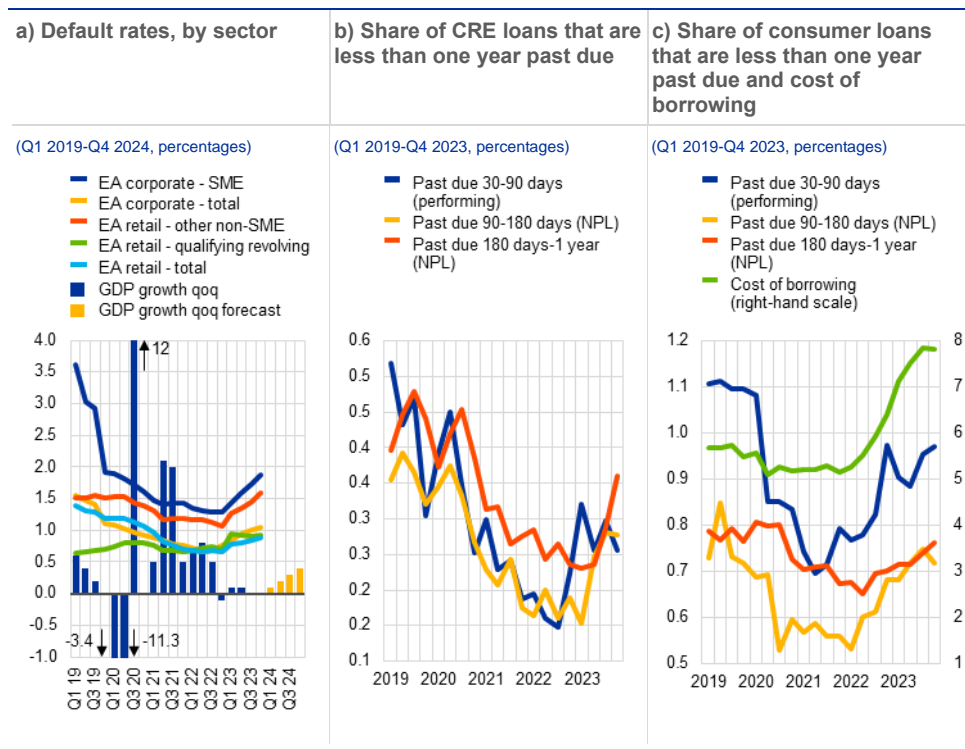
Default rates on corporate and retail exposures have been rising since the beginning of 2023, suggesting heightened risk in these sectors (Chart 3.9, panel a). Despite credit standards tightening and the cost of borrowing rising over the same period (Chapter 1 and Box 1), default rates remain at very low levels overall. There is a lagged relationship between economic growth and asset quality, and GDP growth is expected to strengthen in the second half of 2024, albeit at very different rates across countries (Chapter 1), in the light of which default rates are likely to deteriorate in countries with weak expected growth. Yet, the recent downturn in the CRE market is already affecting the performance of banks' CRE loan portfolios. Loans less than one year in arrears continued to increase in 2023, albeit remaining below pre-pandemic levels (Chart 3.9, panel b). On the household side, the higher cost of living and

²⁶ Countries are grouped based on whether their historical NPL ratio levels are above or below the median across countries in the first quarter of 2019. The countries with low historical NPL ratios are Belgium, Germany, Estonia, Latvia, Lithuania, Luxembourg, the Netherlands, Austria and Finland. The countries with high historical NPL ratios are Ireland, Greece, Spain, France, Italy, Cyprus, Malta, Portugal and Slovenia.

borrowing is beginning to weigh on consumers, as seen in the growing share of consumer loans overdue by less than a year. Loans past due are nearing pre-pandemic levels, suggesting an uptick in financial stress (Chart 3.9, panel c). Looking forward, more defaults are to be expected in countries where weak economic growth forecasts materialise and in sectors, notably CRE, where the downturn intensifies.

Chart 3.9

Bank asset quality is gradually weakening, which is visible in rising default rates and arrears on consumer and CRE loans



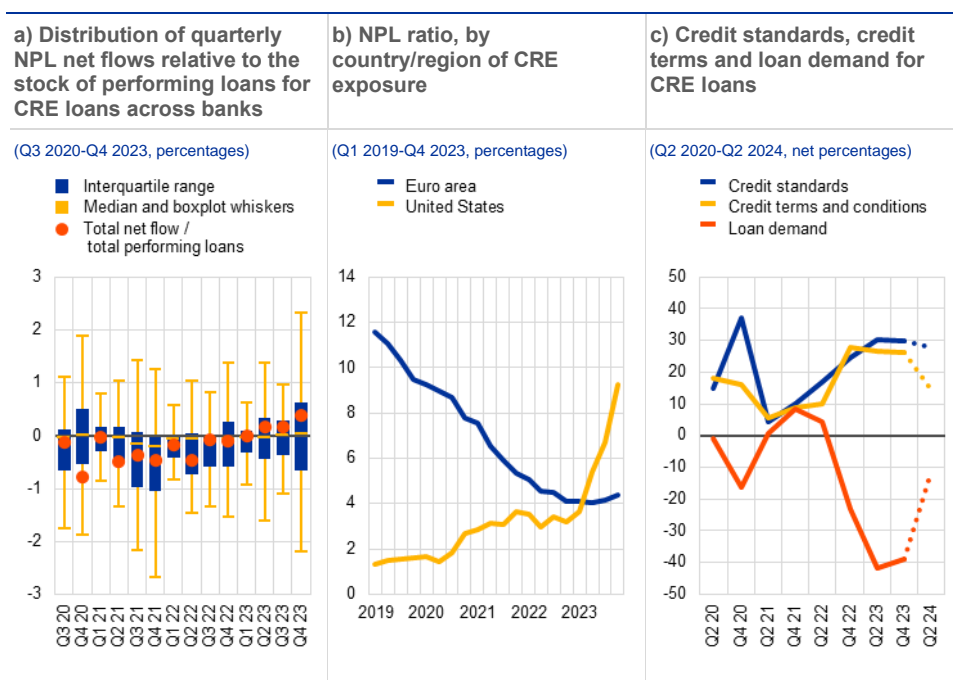
Sources: ECB (ECB staff macroeconomic projections for the euro area, March 2024, MIR, supervisory data). Notes: Panel a: based on IRB-reporting significant institutions. Four-quarter trailing figures. Euro area exposures only. Panel b: based on the full sample of significant institutions; Panel c: based on the full sample of significant institutions. The cost of borrowing is measured as the lending rate on new consumer loans to households.

CRE lending has been at the centre of asset quality deterioration, although it remains a small part of banks’ overall lending portfolios. A handful of banks have recently experienced a significant deterioration in their CRE portfolios, evidenced by large net inflows to NPLs relative to the stock of performing CRE loans (Chart 3.10, panel a). While the situation varies considerably across banks, in aggregate CRE portfolios have experienced net inflows to NPLs over the last four quarters. The deterioration is particularly severe in the United States, whereas the performance of euro area CRE loans worsened only slightly (Chart 3.10, panel b). It is important to note that US CRE exposures are concentrated among a few banks, but euro area banks in aggregate have only limited exposures to US CRE (ten times smaller than euro area CRE exposures). Looking ahead, banks expect CRE loan demand to decline in the first two quarters of 2024, albeit much less so than in previous quarters, possibly indicating a gradual easing of the downturn in the CRE market (Chart 3.10, panel c). CRE loans remain a relatively small part of banks’ loan books, accounting for

only around 8% of the total loans granted by significant institutions in the fourth quarter of 2023.

Chart 3.10

A few banks had large net inflows to NPLs on their CRE portfolios recently, while NPL ratios deteriorated on US exposures; banks expect CRE loan demand to decline further



Source: ECB (supervisory data, BLS).

Notes: Based on the full sample of significant institutions. Panel a: excludes loans held for sale. Boxplot whiskers extend to the most extreme data point, which is no more than 1.5 times the length of the box away from the box. Panel b: loans and advances to NFCs collateralised by commercial immovable property. Panel c: each data point corresponds to the previous six-month period. The full lines represent the six-month backward-looking values, while the dotted lines show the six-month forward-looking value for Q2 2024. The net percentage of banks reporting a tightening of credit standards/terms and conditions is the share of banks reporting a tightening minus the share of banks reporting an easing, while the net percentage of banks reporting an increase in loan demand is the share of banks reporting an increase minus the share of banks reporting a decrease.

Banks' muted provisioning flows could pose a risk if the deterioration in asset quality and credit risk continues.

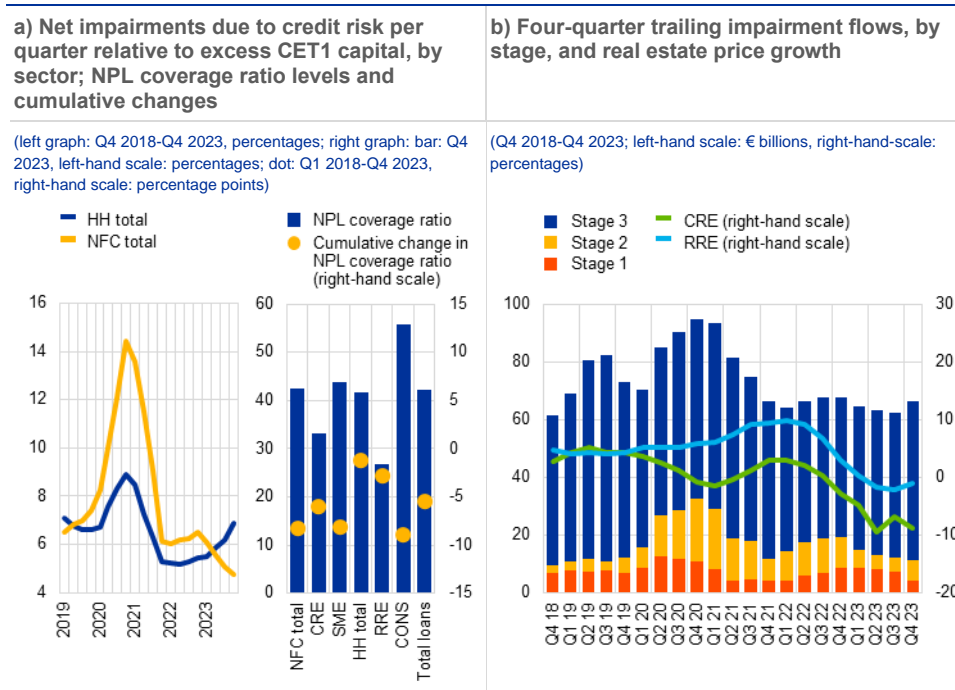
At the start of the pandemic, impairments due to credit risk eroded large parts of excess CET1 capital in the banking sector (Chart 3.11, panel a, left graph). If economic conditions, and collateral values in particular, trigger further impairments, this could substantially reduce excess CET1 capital. Furthermore, NPL coverage has been declining for all loan portfolios since 2018 (Chart 3.11, panel a, right graph) as banks have disposed of legacy NPLs with relatively high coverage ratios. Late and low provisioning could pose a risk if the economic environment deteriorates further. As NPL valuations reflect banks' expected recoveries, which largely come out of collateral, the ongoing decline in loan impairment flows (Chart 3.11, panel b) seems inconsistent with falling property prices. The frequency at which banks revalue collateral varies substantially across the euro area²⁷ and the falling valuations suggest that provisioning can be expected to catch

²⁷ See Horan, A., Jarmulka, B. and Ryan, E., "Asset prices, collateral and bank lending: the case of Covid-19 and real estate", Working Paper Series, No 2823, ECB, 2023.

up – translating into a higher cost of risk – and may, in some cases, lead to erosion of capital.

Chart 3.11

Credit risk impairments could reduce CET1 capital, while NPL coverage ratios and banks provision flows declined recently, despite a drop in real estate prices



Sources: Eurostat and ECB (RESR) and ECB (supervisory data, RESC).
 Notes: Based on the full sample of significant institutions. Panel a, left graph: impairments include changes due to change in credit risk (net), changes due to modifications without derecognition (net) and changes due to an update in the institution's methodology for estimation (net). CET1 surplus/deficit refers to the difference between actual CET1 capital and regulatory requirements. Right graph: the NPL coverage ratio is computed as the stock of loan-loss provisions divided by the amount of NPLs. The bars show the level of NPL coverage ratio in Q4 2023, while the dots show the cumulative decline between Q1 2018 and Q4 2023. CONS stands for consumer loans; CRE stands for commercial real estate; RRE stands for residential real estate, SME stands for small and medium-sized enterprise. Panel b: excludes outflows for disposals and write-offs. The lines represent annual percentage changes in CRE and RRE prices.

3.4 Resilient banks amid subdued market valuations

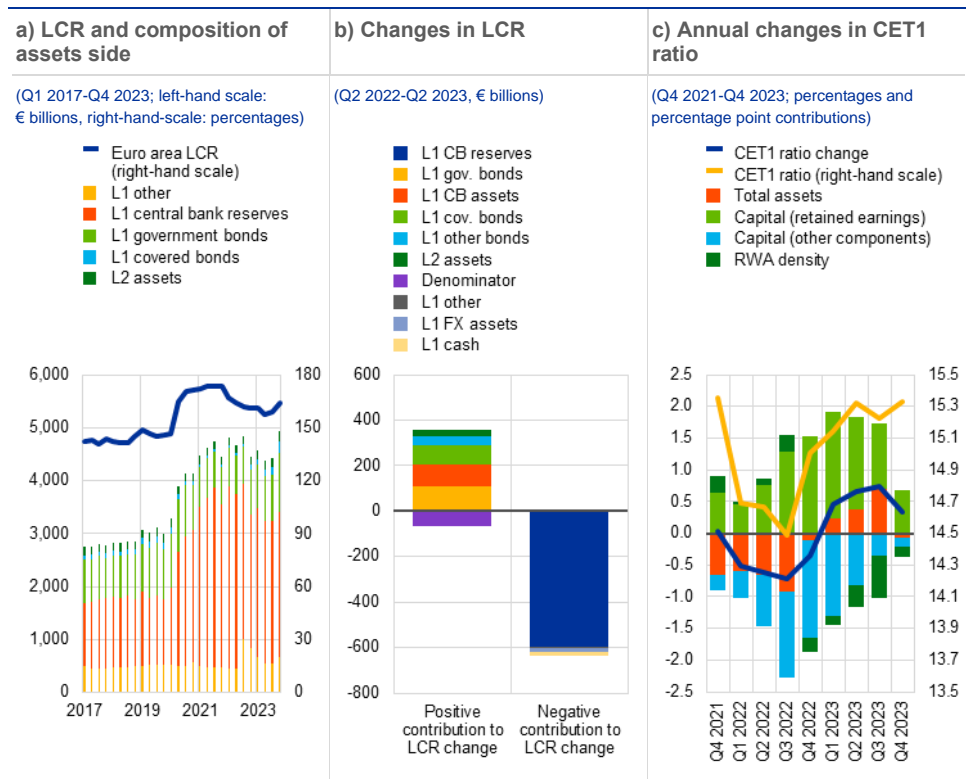
Euro area banks continue to display resilience as liquidity positions and solvency ratios, supported by organic growth from high bank profitability, remain robust overall. The aggregate liquidity coverage ratio (LCR) of significant institutions in the euro area rose above 160% in the fourth quarter of 2023, despite the repayment of more than 80% of borrowed targeted longer-term refinancing operation (TLTRO) funds over recent quarters (Chart 3.12, panel a). The limited impact on the LCR from TLTRO repayments is partly because banks did not rely solely on excess reserves to meet TLTRO outflows but also reduced loans on demand²⁸, which do not qualify as high-quality liquid assets (HQLA) and thus have no impact on the LCR. Furthermore, TLTRO repayments released HQLA back into the banking system, which helped to support the LCR. Moreover, LCRs have also benefited from a small

²⁸ Loans on demand are loans that a lender can require to be repaid in full at any time.

reduction in the expected net outflows thanks to the migration of deposits from sight to term accounts²⁹ (Chart 3.12, panel b). At 15.33% in the fourth quarter of 2023, the aggregate CET1 ratio of euro area banks was 33 basis points higher than one year ago, driven by an increase in retained earnings underpinned by strong bank profitability (Chart 3.12, panel c).³⁰

Chart 3.12

Liquidity and capital positions remain robust despite large TLTRO repayments and record shareholder payouts



Sources: ECB (supervisory data) and ECB calculations.

Notes: Based on a balanced sample of 80 euro area significant institutions. Panels a and b: L1 and L2 stand for level 1 and level 2 respectively. L1 assets are of the highest quality and liquidity. L2 assets are of lower quality and less liquid than L1 assets, and they are subject to limits on the extent to which a bank can hold them to meet the LCR requirement. Panel b: CB stands for central bank. Change between Q2 2022 and Q2 2023.

Looking ahead, analysts expect bank profitability to decline slightly over the next two years, albeit to still comfortable levels above historic averages.

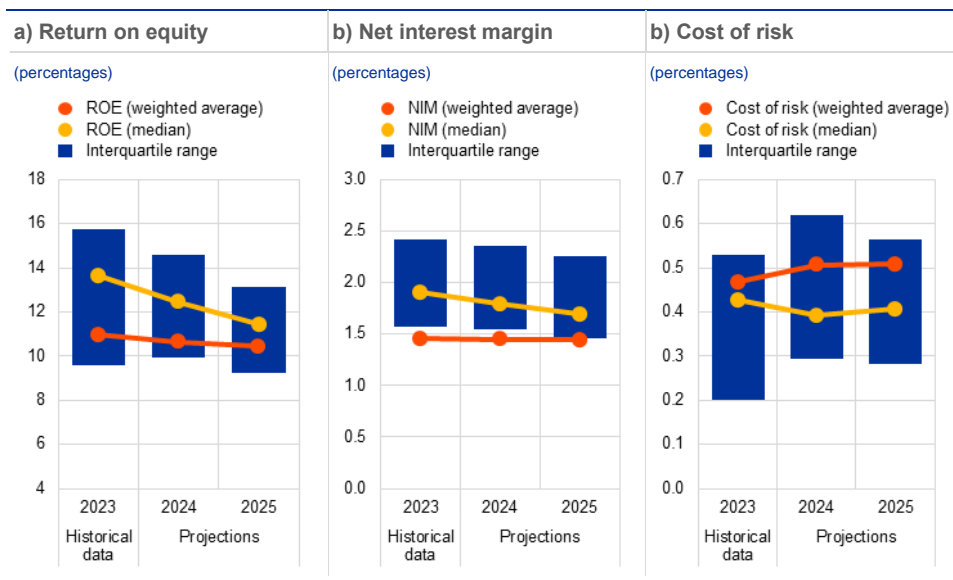
Analysts expect the ROE of listed banks to fall from the present level of 11% to 10.7% and 10.4% in 2024 and 2025 respectively (Chart 3.13, panel a). This decline in bank profitability is expected to be driven by a mild reduction in net interest margins together with a slight rise in the cost of risk (Chart 3.13, panels b and c).

²⁹ The LCR is calculated by dividing a bank's HQLAs by its total net cash flows, over a 30-day stress period. Total expected cash outflows are calculated by multiplying the outstanding balances of various categories or types of liabilities and off-balance-sheet commitments by the rates at which they are expected to run off or be drawn down. Term deposits with maturity beyond 30 days have a 0% run-off rate, while the run-off rate for overnight deposits is between 3% and 10%. This means that a shift from overnight to term deposits has effectively reduced the expected outflows (LCR denominator).

³⁰ In addition, Pillar 2 requirements increased by an average of 10 basis points in the latest Supervisory Review and Evaluation Process, due among other things to heightened liquidity and interest rate risk in the banking book.

Chart 3.13

Analysts expect that bank profitability will decline mildly in 2024 and 2025 to still comfortable levels, as net interest margins narrow and cost of risk increases



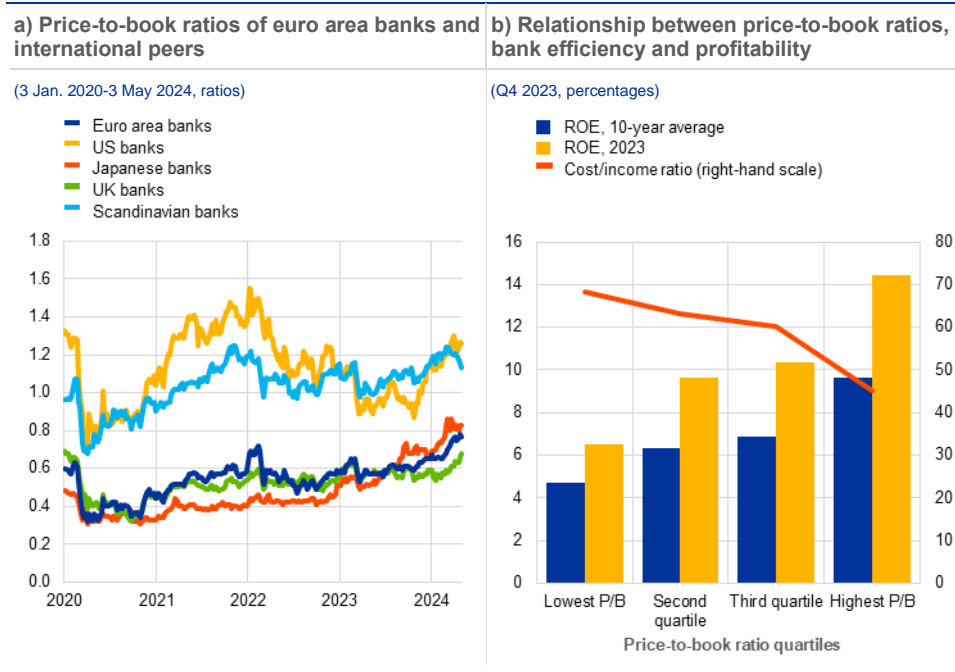
Sources: LSEG and ECB calculations.

Notes: Based on 37 listed banks with available analyst projections. All items refer to annual data. NIM stands for net interest margin and is computed as net interest income divided by total assets; cost of risk is computed as loan-loss provisions divided by total loans.

Euro area bank valuations lag those of some global peers, reflecting investor concerns about the durability of bank profits. The aggregate price-to-book ratio of euro area banks has improved in recent months and currently stands at 0.77 (Chart 3.14, panel a). Notwithstanding the recent improvement, the ratio remains notably below 1 and below that of some international peers, reflecting investor concerns about the ability of euro area banks to sustain current profitability levels durably given headwinds from weaker asset quality, lower revenues and cost of funding. In addition, one-off factors such as the introduction of bank levies and lingering structural problems across the industry may play a role. However, a track record of strong profitability and a low cost/income ratio are important determinants of increased price-to-book ratios at the individual bank level, suggesting that sustained bank profitability and efficiency provide a path to improved bank valuations (Chart 3.14, panel b).

Chart 3.14

Euro area bank price-to-book ratios continue to lag international peers but the relationship with bank profitability suggests a path to improving valuations



Sources: LSEG, Bloomberg Finance L.P., ECB (supervisory data) and ECB calculations.
Notes: Panel a: price-to-book ratios for Datastream banking sector indices. Panel b: calculations based on sample of 29 listed euro area banks. The cost/income and price-to-book ratios are as of Q4 2023.

Box 4

Non-bank financial intermediaries as providers of funding to euro area banks

Prepared by Emanuele Franceschi, Christoph Kaufmann and Francesca Lenoci

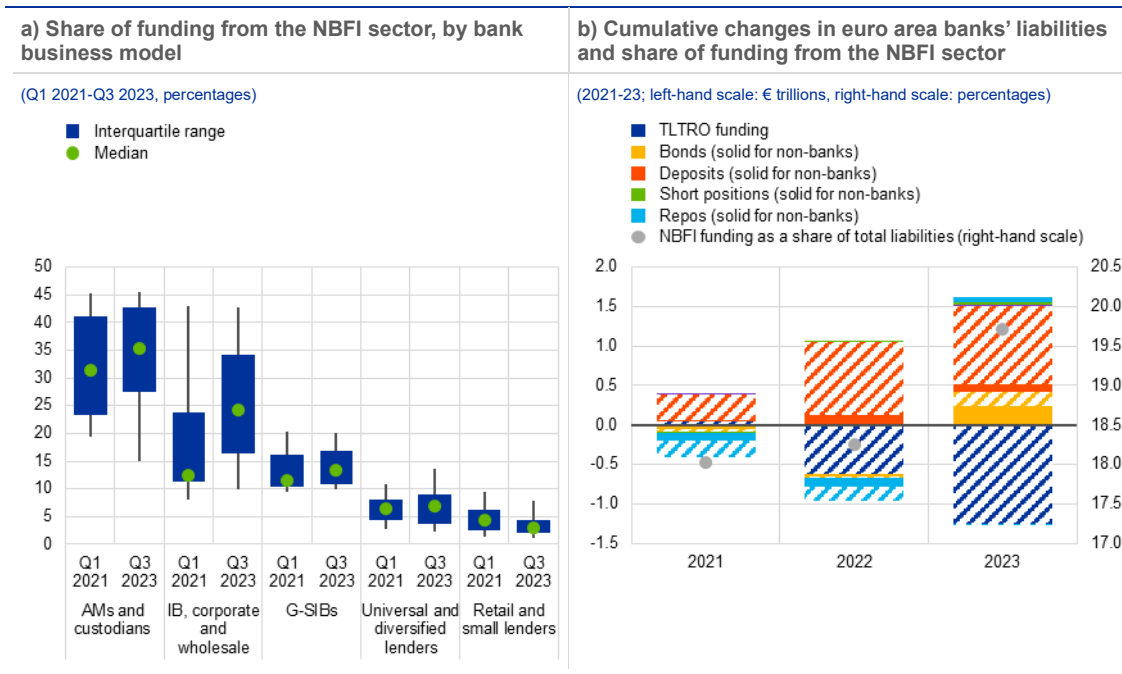
Around 20% of euro area banks' funding is provided by the non-bank financial intermediation (NBFI) sector. Compared with usually more stable retail sources, NBFI funding mainly consists of market-based instruments, such as bonds and repurchase agreements, with the latter being particularly sensitive to stress events.³¹ Leveraging on previous analysis,³² this box investigates the role of the NBFI sector in providing funding to banks. In this context, the analysis assesses risks to banks in the event of sudden outflows from the NBFI sector with potential knock-on effect on their ability to finance banks. Specifically, we evaluate whether banks can replace their NBFI funding by tapping different instruments or sectors.

³¹ The run on repo during the global financial crisis was driven predominantly by outflows from foreign banks, hedge funds and the NBFI sector; see Gorton, G.B., Metrick, A. and Ross, C.P., "Who Ran on Repo?" *AEA Papers and Proceedings*, Vol. 110, May 2020. Also, banks and corporates with more funding from non-banks were less resilient during the period of acute financial stress in 2020; see Forbes, K., Friedrich, C. and Reinhardt, D., "Stress relief? Funding structures and resilience to the covid shock", *Journal of Monetary Economics*, Vol. 137, July 2023, pp. 47-81.

³² See the special feature entitled "Key linkages between banks and the non-bank financial sector", *Financial Stability Review*, ECB, May 2023.

Chart A

The share of NBFi funding has increased since 2021, driven by more bond issuance and repo financing



Sources: ECB (CSDB, supervisory data, SHS) and ECB calculations.

Notes: Panel a: box-whisker plots based on a sample of 97 euro area banks, where the boxes indicate the interquartile ranges, the dots indicate the median, and the whiskers indicate the 10th and 90th percentiles. AMs stands for asset managers; IB stands for investment banks; G-SIBs stands for global systemically important banks.

The importance of NBFi funding varies with banks' business models. Investment banks and banks specialised in corporate and wholesale lending often receive about one-third of their funding from NBFi entities (Chart A, panel a). Universal and diversified banks – which dominate the euro area banking sector – and smaller retail banks receive between 5% and 10% of their funding from the NBFi sector. Banks which depended significantly on NBFi funding in 2021 have tapped this source even more over the last two years, while smaller banks further reduced their initially low exposure. In aggregate, the importance of non-bank funding has increased over recent years, with a reduction in central bank funding being partially offset by issuing bonds and borrowing from NBFi entities on secured money markets (Chart A, panel b).

NBFi sectors feature preferred habitats for different asset classes and maturities, leading to a limited degree of substitutability across sectors and funding instruments. Insurance corporations and investment funds hold sizeable amounts of long-term debt securities issued by euro area banks (Chart B, panel a).³³ Other financial institutions and investment funds provide short-term secured funding on repo markets, while money market funds hold large amounts of banks' commercial paper and certificates of deposit. The concentration by funding source reflects different business models, investment mandates and maturity profiles in NBFi sectors.

Short-term repo funding could be particularly volatile during periods of financial stress.

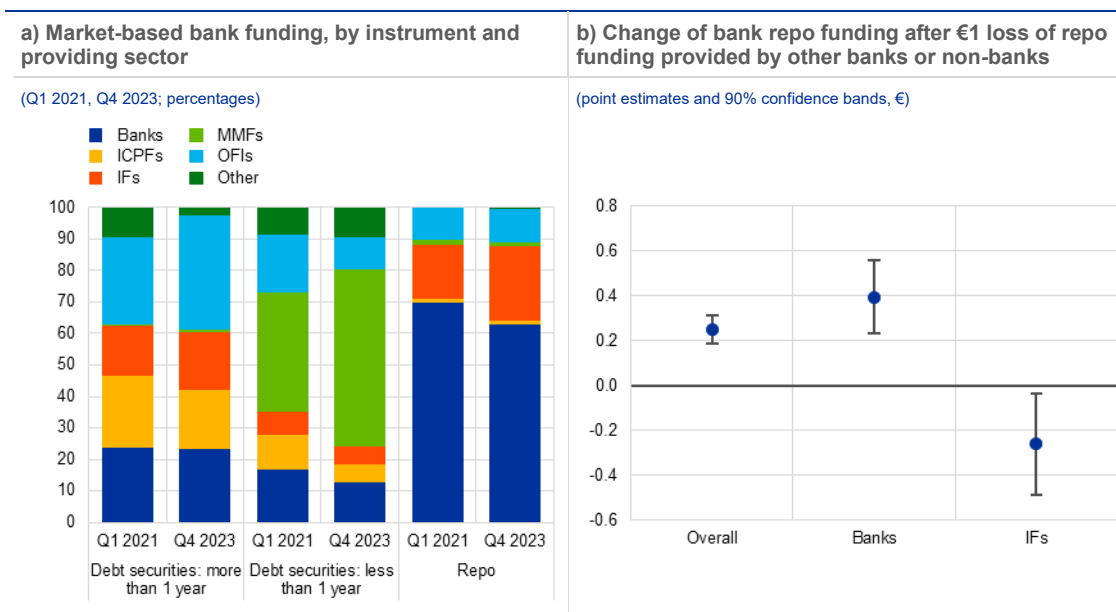
Econometric analysis finds that about 25% of a reduction in repo funding to a given bank by one of its counterparties is replaced by other institutions on the same trading day (Chart B, panel b). However,

³³ Investment funds also hold the largest amounts of banks' AT1 bonds, compared with other NBFi sectors.

reductions in repo funding from the NBFi sector could be challenging for banks to replace, potentially forcing them to shrink their balance sheets. For example, a reduction of €1 in repo funding from investment funds correlates with a further reduction of €0.26 in repo funding from other, similar institutions, after controlling for overall changes in banks' demand for funding.

Chart B

Different NBFi sectors provide different types of bank funding, leading to limited substitutability in the event of lower funding supply



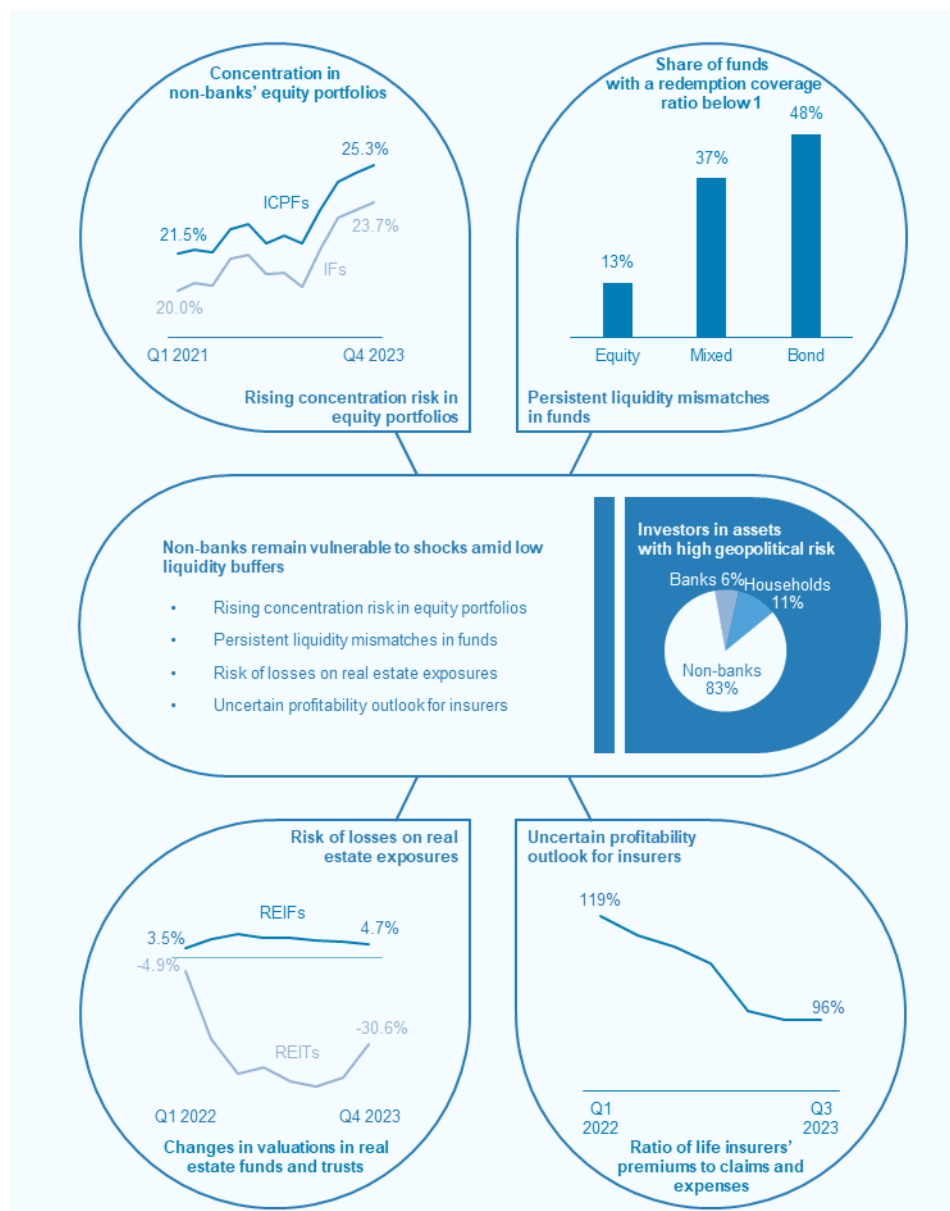
Sources: ECB (CSDB, SFTDS, SHS, supervisory data) and ECB calculations.

Notes: Panel a: ICPFs stands for insurance corporations and pension funds; IFs stands for investment funds; MMFs stands for money market funds; OFIs stands for other financial institutions. Panel b: regressions are based on up to 2,900,000 transaction-level observations for repos between 248 euro area banks and all counterparty entities using daily observations between January 2021 and December 2023. The dependent variable is the one-day change in total repos provided to bank *i* by all counterparty entities except for entity *j*. The control variables include the one-day change in repos provided by counterparty *j* to the bank *i* as well as dummy interactions for different repo providing sectors. The regressions also include bank time fixed effects to control for bank demand for funding as well as all other bank and time-specific developments. The coefficients show the joint effect of a change in repo funding provided by other banks, non-banks, and investment funds on the total repo funding of bank *i*.

Some recent episodes of liquidity turmoil in the NBFi sector led to financial stability issues for banks,³⁴ suggesting that more widespread shocks could affect banks' ability to secure funding. NBFi entities play a pivotal role as key sources of funding for banks. All in all, this funding has not experienced major systemic stress events over the last few years, despite market shocks and banking sector tensions. Nevertheless, a high concentration of NBFi funding in some banks, together with NBFi sectoral preferences for specific funding instruments, could make swift substitution difficult should funding outflows materialise. In a crisis, uninsured depositors, high-net-worth individuals and professional investors are most likely to run. This creates a vulnerability for banks, in particular as regards short-term repo funding, although the ability to reuse collateral with other counterparties could mitigate these vulnerabilities. Indeed, the turmoil in March 2023 showed that banks facing liquidity difficulties can be at risk of failure, even if they comply with regulatory ratios.

³⁴ In March 2020, for example, high, rapid outflows constrained the funding that money markets could provide to banks. In September 2022 the UK mini-budget triggered a sharp fall in gilt prices that affected pension funds. In March 2023 the AT1 market froze following the collapse of Credit Suisse.

4 Non-bank financial sector



4.1 Fragile macro-outlook may still test non-banks' resilience

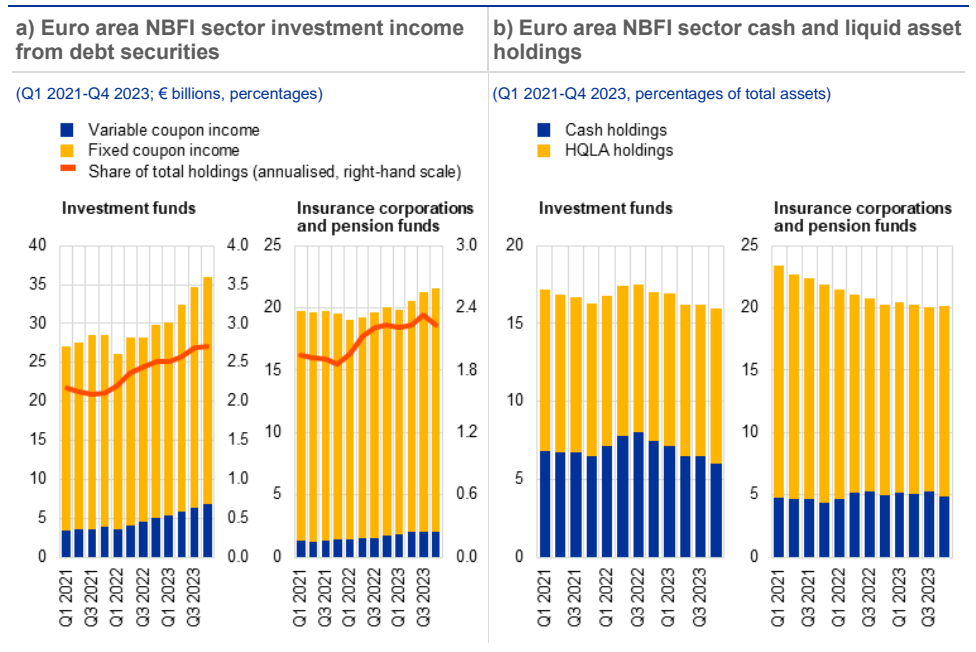
The non-bank financial intermediation (NBFI) sector in the euro area has remained resilient overall and benefited from rising investment income in 2023.

Euro area non-banks have continued to prove resilient in a challenging macro-financial environment (**Chapter 1**), further adjusting their portfolios towards fixed income securities in the context of a higher interest rate environment. Higher interest rates have also resulted in rising investment income from debt securities. This has allowed non-banks to generate increasing returns while simultaneously reducing

their exposures to comparatively riskier asset classes. Although aggregate income from both fixed- and variable-rate debt securities has improved for the NBFi sector (**Chart 4.1**, panel a), some sub-sectors, such as insurance corporations, have only benefited marginally to date (**Section 4.3**).

Chart 4.1

Higher interest rates have pushed up non-banks' investment income from debt securities, but have so far not translated into higher liquidity buffers



Sources: ECB (ICB, IVF, PFBR, SHS, CSDB) and ECB calculations.

Notes: Panel a: annualised income as a share of nominal holdings. Fixed-coupon debt securities include zero coupon bonds. Panel b: HQLA (high-quality liquid assets) are defined as HQLA Level 1 securities.

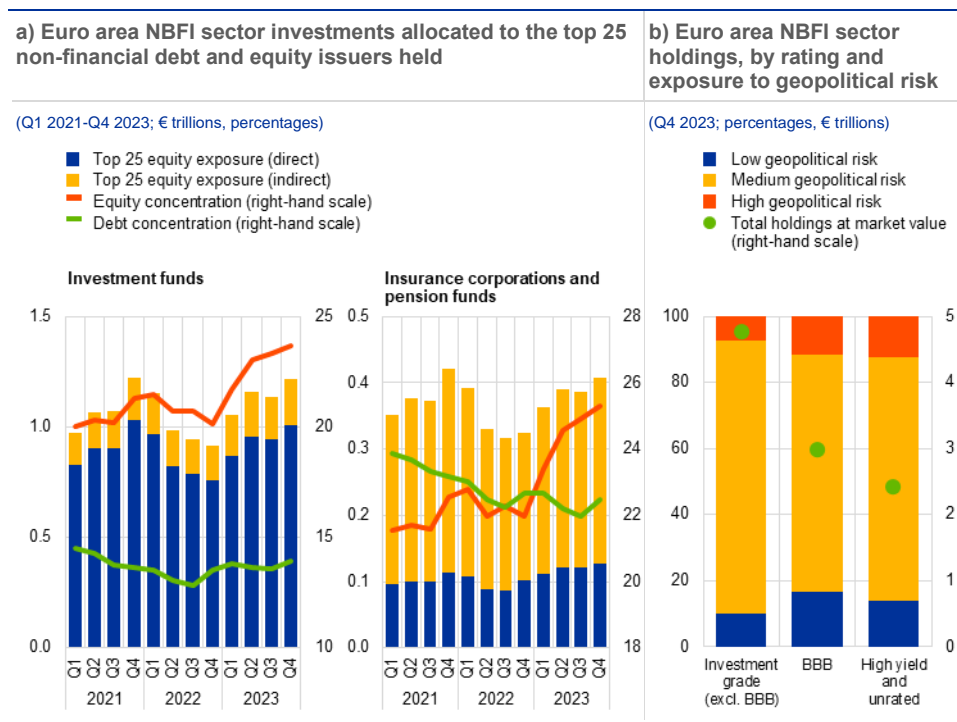
Liquidity buffers have declined further, despite higher returns on more liquid asset classes, limiting the capacity of the NBFi sector to absorb shocks. The cash and liquid asset holdings of euro area non-banks remain low in aggregate, exposing the NBFi sector to liquidity risks (**Chart 4.1**, panel b). This represents a structural vulnerability in open-ended investment funds as it increases the risk of forced asset sales in the event of an unexpected rise in shareholder redemptions (**Section 4.2**). Sudden liquidity needs may also arise from margin calls on derivative exposures (**Box 5**), especially for interest rate derivatives amid elevated interest rate volatility (**Chapter 2**). Ensuring adequate preparedness against spikes in demand for liquidity therefore remains a key element in preserving financial stability in the NBFi sector (**Chapter 5**).

NBFi portfolio valuations have been supported by improved market sentiment, while equity exposures have become more concentrated. Improved financial market sentiment in late 2023 and early 2024, especially in US equity markets (**Chapter 2**), has helped to push up asset valuations in the NBFi sector. Over the course of 2023, euro area non-banks' holdings of listed shares issued by non-financial corporations became more concentrated, reflecting both a reduction in overall equity portfolio size and an increasing market footprint of a few large issuers. The share of the 25 largest issuers held among non-financial equities has risen to 24% for

investment funds and 25% for insurance corporations and pension funds (ICPFs) (Chart 4.2, panel a). By contrast, portfolio concentration is relatively stable or declining for non-financial debt holdings. Equity portfolios may therefore be increasingly vulnerable to idiosyncratic risk, especially in investment funds, where holdings are additionally concentrated in US-based technology firms (Section 4.2). As such, sudden drops in the share price of one or a few individual companies could trigger significant portfolio losses and result in fund outflows, with the potential for spillovers to the wider financial system.

Chart 4.2

Non-banks' equity portfolios have become more concentrated while the sector also remains exposed to geopolitical risk



Sources: ECB (SHS, CSDB) and ECB calculations.

Notes: Panel a: equities are defined as listed shares issued by non-financial corporations. Indirect exposures relate to assets held through investment fund shares. Panel b: levels of geopolitical risk exposure are defined at the sector level using the methodology outlined in Special Feature A in this issue of the Financial Stability Review. The worst available rating is used to allocate holdings to credit risk segments.

Downside risks to asset valuations remain, especially for NBF portfolios with high credit risk, a focus on real estate or exposures sensitive to geopolitical risk.

While the overall outlook has improved over the past six months, the macroeconomic environment remains characterised by elevated uncertainty (Chapter 1). Pockets of vulnerability therefore remain in different parts of the euro area NBF sector, which may still face valuation losses. While a risk of rising corporate defaults may impair asset quality for a wide range of NBF entities, a further downturn in real estate markets may particularly affect valuations of real estate investment funds or ICPFs with sizeable real estate holdings (Sections 4.2 and 4.3). Investment portfolios held by the euro area NBF sector are also sensitive to increases in geopolitical risk, and tensions related to ongoing conflicts and upcoming elections may also indirectly spill over to the sector (Special Feature A). The risk of potential

valuation losses in this context could thereby be amplified by elevated credit risk in a significant share of asset holdings with medium or high levels of sensitivity to geopolitical risk (**Chart 4.2**, panel b).

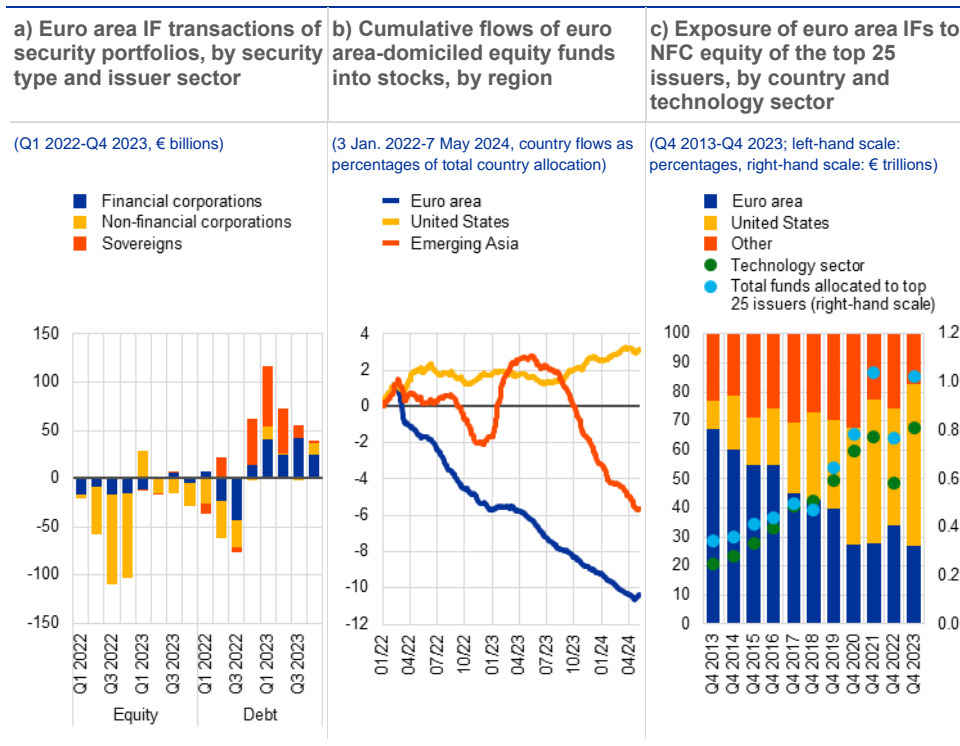
4.2 Funds face risks from concentrated portfolios, real estate and low liquidity

Euro area investment funds' portfolios have shifted towards safer assets, but concerns remain over funds' support to the euro area real economy. Over the last two years, euro area investment funds have rebalanced their portfolios' holdings away from equities towards debt securities, in particular sovereign and financial bonds (**Chart 4.3**, panel a). This shift in funds' securities holdings highlights a de-risking trend. At the same time, concerns remain about the support given to the euro area economy by investment funds through the equity markets, which may point to a tightening in financing conditions for euro area corporates. Indeed, cumulative flows of euro area-domiciled equity funds into euro area stocks have been negative for the last two years (**Chart 4.3**, panel b). At the same time, flows into US stocks have been steadily rising. These observed flow dynamics reflect the diverging growth expectations between the two economies (**Chapter 1**, **Chart 1.2**, panel a), while the declining flows towards emerging Asian markets (since the second half of 2023) might be echoing the rising geopolitical tensions.

Concentration in the non-financial equity portfolio of euro area investment funds remains high and tilted towards US issuers. The share of holdings in the top 25 issuers rose from 20% in the fourth quarter of 2022 to 24% in the fourth quarter of 2023, following a trend common to the rest of the non-bank sector (**Section 4.1**, **Chart 4.2**, panel a). Within this share, portfolio concentration has shifted significantly from euro area issuers towards US issuers over the last decade (**Chart 4.3**, panel c). In terms of sector, technology companies account for more than 60% of the top 25 issuers as of the fourth quarter of 2023. These factors expose the euro area investment fund sector to adverse developments in the US economy and to potential bubbles in the technology sector (**Chapter 2**, **Chart 2.6**).

Chart 4.3

Euro area investment funds are reducing their equity exposures towards the euro area economy and increasing their portfolios' concentration towards US and tech sectors



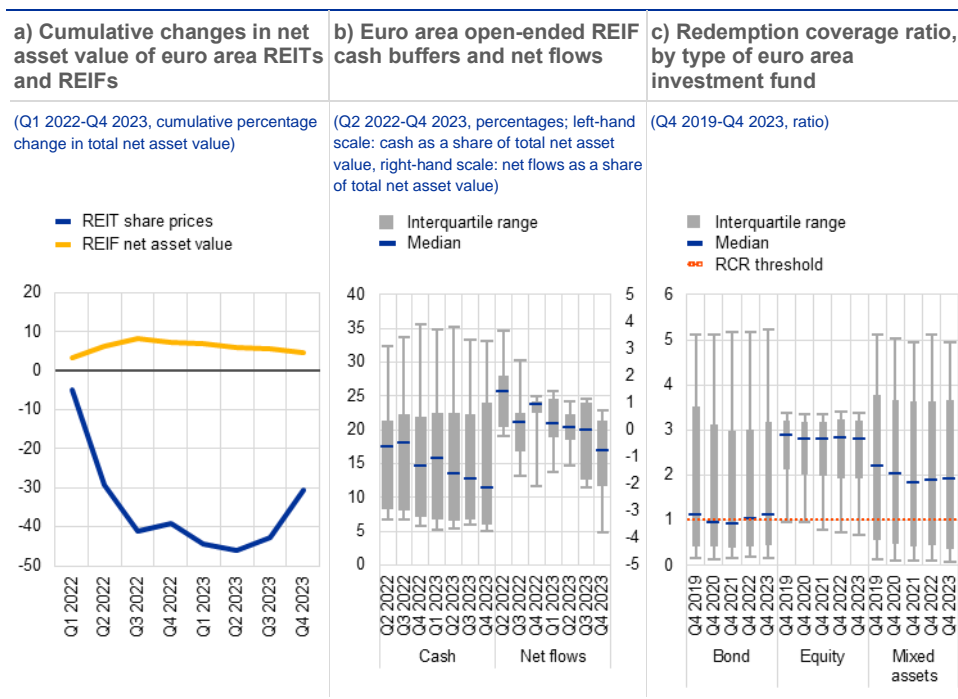
Sources: ECB (CSDB, SHS), EPFR Global and ECB calculations.
Notes: IFs stands for investment funds. Panel b: country flows combine fund flows and country allocations to show total flows into a specific country. Country allocation is the average fund's exposure to a country, while total country allocation is the total flows into a specific country.

Corrections in real estate markets might challenge the liquidity preparedness of real estate investment funds (REIFs). Euro area REIFs might face losses from real estate market corrections, as hinted at by the declining market capitalisation of real estate investment trusts (REITs)³⁵. The net asset value of euro area REIFs has remained stable, despite a significant correction in the underlying commercial real estate market, which suggests that valuation losses have not yet been fully priced in (Chart 4.4, panel a). Such losses might trigger redemption requests for REIFs, putting stress on their cash buffers. Indeed, cumulative quarterly flows into euro area open-ended REIFs have been declining since the start of the monetary policy tightening cycle and turned negative as of the third quarter of 2023. Moreover, the median cash buffer has also gone down (Chart 4.4, panel b). Insufficient cash buffers could lead to forced asset sales, particularly if the downturn in the real estate market were to persist or intensify.

³⁵ REITs are structured as companies or trusts which own (sometimes operate) income-producing real estate. They are traded like stocks and pay dividends to investors. REIFs, by contrast, invest in public real estate companies (which can include REITs) and aim to generate value from the appreciation of the securities they own.

Chart 4.4

Corrections in real estate markets and low liquidity buffers could be a test for the resilience of euro area investment funds



Sources: ECB (IVF), Bloomberg Finance L.P., LSEG Lipper and ECB calculations.
Notes: REITs stands for real estate investment trusts; REIFs stands for real estate investment funds. Panel b: the distributions are from country aggregate statistics of open-ended REIFs. The countries included in the sample are Germany, Ireland, France, Luxembourg, the Netherlands, Austria, Portugal and Slovakia. The whiskers refer to the 10th and 90th percentiles. Panel c: the redemption coverage ratio (RCR) measures investment funds' resilience to redemption shocks, following the methodology set out in the box entitled "Assessing liquidity vulnerabilities in open-ended bond funds: a fund-level redemption coverage ratio approach", *Financial Stability Review*, ECB, November 2023. The RCR is obtained by dividing the value of fund-level HQLA stock by net outflows experienced in a severe but plausible scenario lasting 30 days. The box plots display the distribution per fund group of the resulting fund-level RCRs. The whiskers refer to the 10th and 90th percentiles.

Liquidity risks and leverage continue to be a challenge for the euro area investment fund sector.

The redemption coverage ratio (RCR) shows that overall the sector is in a position to meet liquidity needs from outflows. However, the ratio has deteriorated since the fourth quarter of 2019, and pockets of vulnerabilities lie in the lower tails of the RCR distributions, especially for certain types of funds with comparatively high liquidity mismatches (Chart 4.4, panel c). Liquidity shocks might come from the derivatives market, where the ability of some funds to meet margin calls has deteriorated over the last two years (Box 5). Furthermore, excessive leverage remains an issue for the investment fund sector, especially when combined with low liquidity buffers and high credit risk. These considerations highlight the need to strengthen the resilience of investment funds from a macroprudential perspective (Chapter 5 and Box 6).

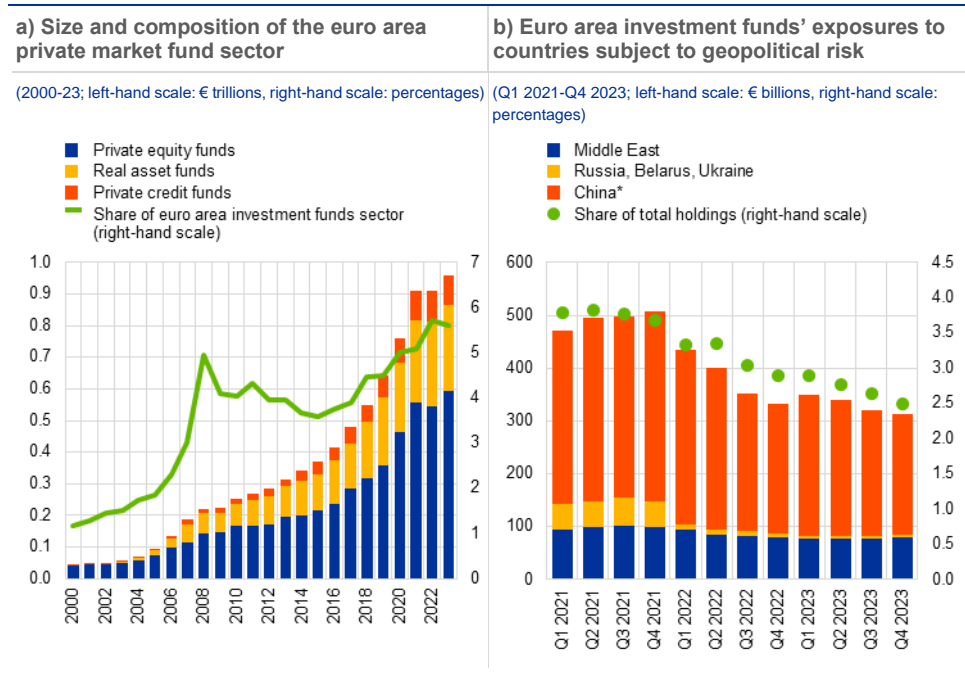
Emerging risks from private market funds and geopolitical tensions might pose new challenges to the euro area's financial stability.

Although still limited in size, the euro area private market fund sector has been growing significantly over the last two decades (Chart 4.5, panel a). Despite demonstrating a relatively low risk profile overall, private markets have concentrated exposures, opaqueness and uncertain resilience in a higher interest rate environment that are a source of concern for financial stability (Special Feature C). Further worries stem from geopolitical

tensions. On the one hand, direct exposures of euro area investment funds to countries badly affected by geopolitical risk are limited and decreasing (**Chart 4.5**, panel b). On the other hand, the threat of adverse geopolitical developments may still spread to the sector indirectly, increasing uncertainty and undermining investor confidence (**Special Feature A**).

Chart 4.5

An expanding private market fund sector and exposures to geopolitical risk might yield new challenges for euro area financial stability



Sources: ECB (IVF, SHS, CSDB), PitchBook Data, Inc. and ECB calculations
Notes: Panel a: data for 2023 refer to Q3. Private equity funds include venture capital funds; real asset funds include real estate, infrastructure and natural resources. Panel b: *data for China include Hong Kong SAR and Taiwan.

Box 5

Assessing the liquidity preparedness of investment funds to meet margin calls in derivatives markets

Prepared by Margherita Giuzio, Annalaura Ianiro, Fabrizio Lillo³⁶, Valentina Macchiati, Andrzej Sowiński and Elisa Telesca

Recent episodes of liquidity stress in financial markets have highlighted the need to monitor the liquidity preparedness of funds to meet margin calls in the derivatives market.³⁷ Spikes in margin calls can lead to liquidity strains in the investment fund sector and to procyclical asset sales during times of market stress. This scramble for liquidity can spread to other parts of the financial

³⁶ University of Bologna, Bologna, Italy.

³⁷ See “Non-banks’ liquidity preparedness and leverage: insights and policy implications from recent stress events”, *Financial Stability Review*, ECB, May 2023; “Lessons learned from initial margin calls during the March 2020 market turmoil”, *Financial Stability Review*, ECB, November 2021; Jukonis, A., Letizia, E. and Rousová, L., “The impact of derivatives collateralisation on liquidity risk: evidence from the investment fund sector”, *Working Paper Series*, No 2756, ECB, December 2022; and Ghio, M., Rousová, L., Salakhova, D. and Villegas Bauer, G., “Derivative margin calls: a new driver of MMF flows”, *Working Paper Series*, No 2800, ECB, March 2023.

system and the real economy, potentially transforming liquidity stress at the individual entity level into a system-wide issue, as happened during the market turmoil in March 2020 and the UK gilt crisis in September 2022.³⁸ This box proposes four novel indicators of fund-level liquidity preparedness to meet margin calls, aimed at identifying potential pockets of vulnerabilities that may require higher cash buffers and/or more diversified high-quality liquid assets (HQLA).³⁹

Over 15% of euro area open-ended investment funds and exchange-traded funds (ETFs) seem to be inadequately prepared to cope with plausible spikes in margin calls. The first indicator is the ratio of the stock of initial margin posted by these investment funds to their cash holdings. This measures the share of these holdings that could be depleted to meet plausible variation margin calls,⁴⁰ making it an ex ante metric aimed at gauging liquidity preparedness against reasonably anticipated liquidity needs.⁴¹ A ratio above 100% suggests that the cash holdings might not be sufficient and that other assets may well need to be sold. The median ratio between the first quarter of 2022 and the end of 2023 comes in at around only 20%, although it did increase towards the end of that period. As of December 2023, around 20% of bond and mixed-asset funds and 10% of equity funds had a stock of initial margins amounting to over 80% of their cash holdings (**Chart A**, panel a). This high share can raise some liquidity concerns, as it is similar to that observed in March 2020 when a spike in market volatility coupled with large outflows led to significant procyclical asset sales by funds.

In addition, for more than 20% of funds, the actual maximum weekly flow of margins posted in a given quarter amounts to over 80% of their cash holdings. The second indicator is the ratio of the flow of initial and variation margins posted to cash holdings. It measures how much of the realised changes in margin calls could have been covered by cash. As such, it is an ex post metric aimed at comparing liquidity preparedness against actual liquidity needs. The realised median margin flows amounted to 20% of funds' cash holdings between 2022 and 2023, but this share started increasing towards the end of that period. In the fourth quarter of 2023, around 25% of bond and mixed-asset funds posted margins larger than 80% of their cash holdings, mainly due to the increased volatility in the bond market following monetary policy tightening (**Chart A**, panel b).

³⁸ Stress in the UK gilt market also stemmed from collateral calls in the repo market. See, for example, Dunne, P., Ghiselli, A., Ledoux, F. and McCarthy, B., "Irish-Resident LDI Funds and the 2022 Gilt Market Crisis", *Financial Stability Notes*, Vol. 2023, No 7, Central Bank of Ireland, September 2023.

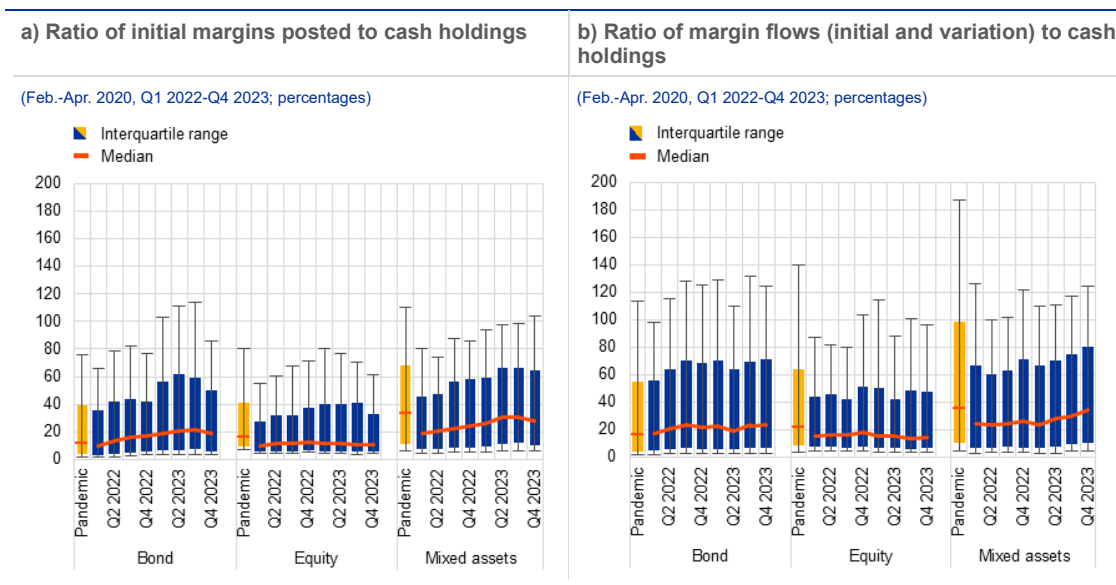
³⁹ The post-global financial crisis reforms have greatly increased collateralisation of trading in the derivatives market. While this has reduced the counterparty credit risk, it also increased the liquidity needs of market participants, especially in times of market stress.

⁴⁰ While variation margins are paid in cash, initial margins can also be met with non-cash collateral.

⁴¹ Initial margin requirements aim to cover potential changes in contract valuation in the interval between the last margin collection and the liquidation of positions, in case a counterparty defaults. Since they are calculated mostly based on the expected volatility of the underlying asset, they are also an objective proxy of plausible variation margin calls over the margin period of risk.

Chart A

Euro area investment funds' cash holdings seem adequate overall to cover variation margin needs, but pockets of risk remain in the upper tails



Sources: ECB (EMIR), EMIR sector enrichment based on Lenoci and Letizia*, LSEG Lipper and ECB calculations.

Notes: The sample includes euro area-domiciled mutual funds and ETFs reporting in both EMIR and Lipper. The samples considered for 2020 and 2022-23 do not overlap completely. "Pandemic" refers to the period between February and April 2020. The whiskers refer to the 15th and 85th percentiles. For confidentiality reasons, the percentiles of the distribution are calculated by averaging values across four entities. Panel a: the chart shows the distribution of the maximum over the quarter of the ratio of the stock of initial margin posted to cash holdings as at the end of the month, at fund level. Panel b: margins flows are calculated as the weekly (Wednesday-Wednesday) difference between the stock of margins defined as the sum of initial and variation margins posted minus variation margins received (meaning that outflows have a positive sign). Therefore, margin flows might, by design, suffer from distortions around the contract closure, when the stock of related variation margin posted is reset to zero, without a corresponding exchange of cash. The ratio is calculated by first dividing the maximum weekly flows over the month by the cash holdings as of the previous month, at fund level, and then taking its maximum over the quarter. Cash posted to meet margin requirements is reflected in both the numerator and the denominator of the ratios.

* See Lenoci, F.D. and Letizia, E., "Classifying Counterparty Sector in EMIR Data", in Consoli, S., Reforgiato Recupero, D. and Saisana, M. (eds.), *Data Science for Economics and Finance*, Springer, Cham, 2021.

As they might not have sufficient cash to cover margin calls, it is important that funds rely on diverse and reliable sources of liquidity and collateral.⁴² The third indicator is the ratio of the stock of initial margin posted by funds to their HQLA holdings.⁴³ This gauges the share of HQLA holdings that might be needed to meet plausible variation margin calls, and to what extent a buffer for any potential increase in the initial margin requirements is already used.⁴⁴ The median ratio is low, with initial margins posted amounting to less than 5% of funds' HQLA stock (**Chart B**, panel a). Similarly, the final indicator, which sets initial and variation margin flows against HQLA holdings, suggests that the realised changes in margin calls could, on average, comfortably be covered by HQLA (**Chart B**, panel b). However, this might not hold true for those funds at the upper tails of the distribution, especially bond and mixed-asset funds. In addition, some of the securities included in the HQLA holdings may become illiquid in periods of stress, as happened in March 2020. Their resulting forced sale to cover margin calls would impact prices quite significantly, which could potentially further feed market stress.

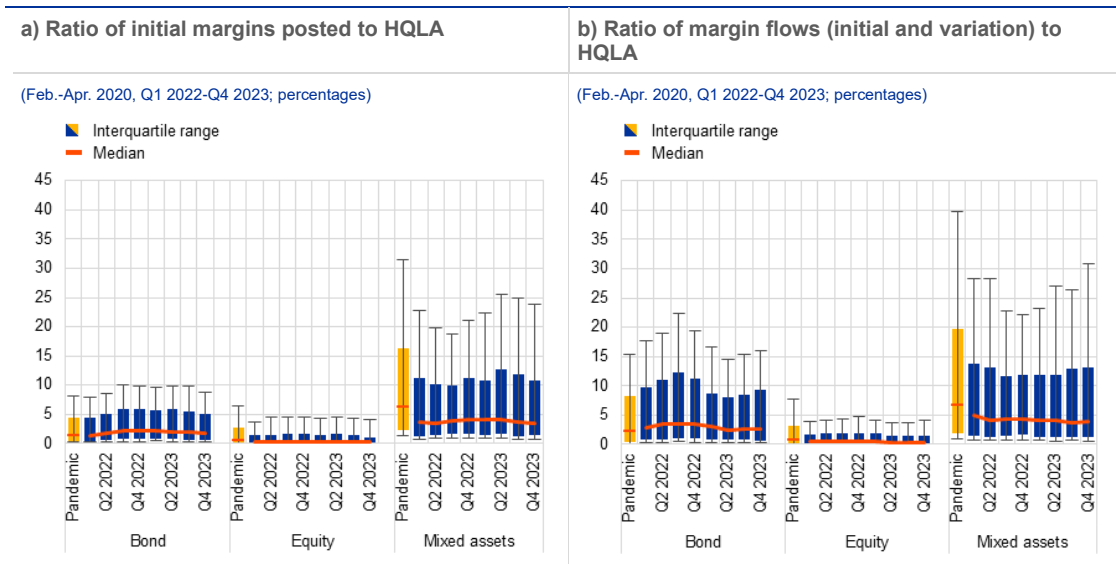
⁴² See "Liquidity preparedness for margin and collateral calls: Consultation report", Financial Stability Board, April 2024.

⁴³ The funds in the sample have a quite diverse composition of HQLA stock. For example, in the fourth quarter of 2023, the stock was composed in aggregate of 6% cash, 27% Level 1 assets, 13% Level 2A assets, and 54% Level 2B assets.

⁴⁴ HQLA excluding cash may be (i) used to meet the part of a margin call pertaining to higher initial margin requirements, (ii) pledged as collateral in the repo market to source additional cash, or (iii) sold.

Chart B

Euro area investment funds can rely on high levels of HQLA holdings to meet margin calls, but these assets may become illiquid in periods of stress



Sources: ECB (EMIR, CSDB), EMIR sector enrichment based on Lenoci and Letizia*, LSEG Lipper and ECB calculations.

Notes: The HQLA stock at fund level is calculated in line with the methodology set out in a previous issue of the Financial Stability Review**; it comprises cash, Level 1, Level 2A and Level 2B holdings. "Pandemic" refers to the period between February and April 2020. The whiskers refer to the 15th and 85th percentiles. For confidentiality reasons, the percentiles of the distribution are calculated by averaging values across four entities. Panel a: the chart shows the distribution of the maximum over the quarter of the ratio of the stock of initial margin posted divided by the HQLA stock as of end of the month, at fund level. Panel b: margins flows are calculated as the weekly (from Wednesday to Wednesday) difference between the stock of margins defined as the sum of initial and variation margins posted minus variation margins received (therefore outflows have a positive sign). Therefore, margin flows might, by design, suffer from distortions around the contract closure, when the stock of related variation margin posted is reset to zero, without a corresponding exchange of cash. The ratio is calculated by first dividing the maximum weekly flows over the month by the HQLA stock as of the previous month, at fund level, and then taking its maximum over the quarter. HQLA holdings posted to meet margin requirements are reflected in both the numerator and the denominator of the ratios.

*) See Lenoci, F.D. and Letizia, E., op. cit.

**) See the box entitled "Assessing liquidity vulnerabilities in open-ended bond funds: a fund-level redemption coverage ratio approach", *Financial Stability Review*, ECB, November 2023.

The new indicators of funds' liquidity preparedness for margin calls reveal some

vulnerabilities in the fund sector that could lead to procyclical behaviours and amplify

market-wide stress. A "dash for cash" driven by large margin calls could lead to asset fire sales or a rapid unwinding of derivative exposures, which might further fuel already high price volatility and lead to disorderly market functioning. In the event of extraordinarily large market moves, the failure of funds to meet margin calls could spread to other market participants, such as banks acting as clearing members of central counterparties or dealers in the bilaterally cleared OTC space. This suggests that it is important to ensure that adequate cash buffers and diverse and reliable sources of liquidity and collateral are in place. The indicators proposed in this box are valuable monitoring tools for strengthening the governance and liquidity risk management of investment funds, enhancing contingency planning and governance, and performing liquidity stress tests.

4.3 Strong solvency but uncertain profitability outlook for insurers

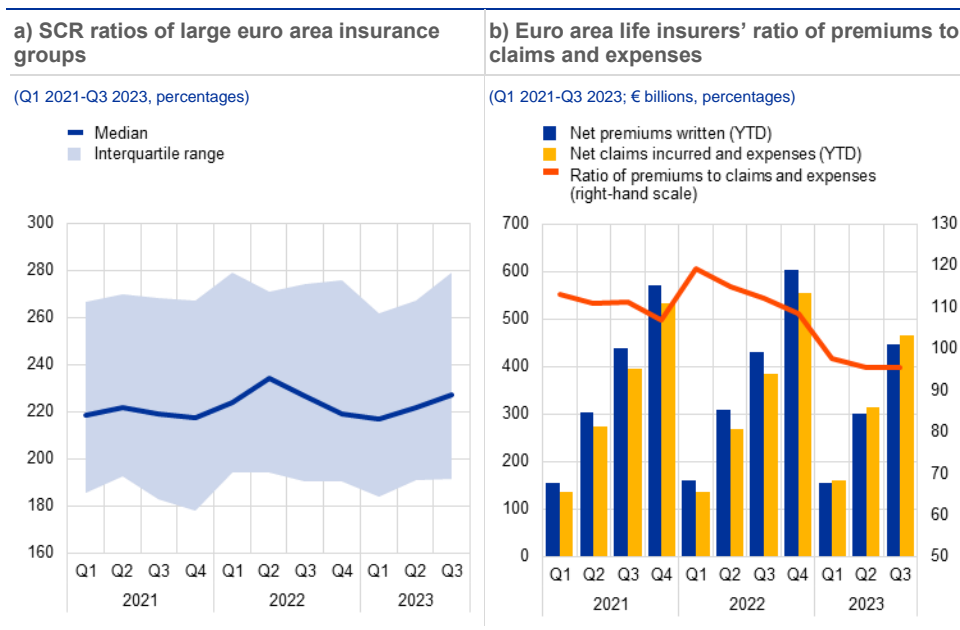
Euro area insurance corporations remain resilient overall, although profitability challenges remain, especially for life insurers. Insurers' Solvency Capital

Requirement (SCR) coverage ratios remained well above the regulatory minimum of

100% and increased marginally in 2023 (Chart 4.6, panel a).⁴⁵ However, the profitability outlook remains less certain. Life insurers saw the ratio of premiums written to claims incurred and acquisition expenses decline slightly in 2023, as claims increased relative to previous years (Chart 4.6, panel b). Limited growth in demand for new policies is most likely attributable to worsening real household incomes and the availability of higher returns from other asset classes.⁴⁶ However, positive macroeconomic outcomes and increasing returns on life insurance products could support growth in underwriting going forward.

Chart 4.6

Insurers' solvency remains strong, but life insurers' underwriting profitability has fallen



Sources: ECB (LIG) and ECB calculations.
Notes: Panel a: the SCR coverage ratio is defined as eligible own funds divided by SCR. Panel b: the ratio is cumulative over the period Q1 to Q4 of each year for large euro area insurance groups' life business.

The period of ultra-low interest rates coming to an end may help ICPFs become more resilient in the medium term, although it is still important for them to strengthen their liquidity preparedness. Insurance corporations and pension funds (ICPFs) generally benefit from higher interest rates, given their negative duration gaps.⁴⁷ Additionally, rising rates may also increase their demand for higher-quality bonds, which may help to lower credit risk. At the same time, any sharp increase in financial market volatility or interest rates could expose those ICPFs that use interest rate derivatives to large margin calls. Recent stress events, such as the March 2020 market turmoil and the UK gilt market episode, demonstrate how liquidity pressures

⁴⁵ Note that where insurers employ transitional measures, the reported SCR ratio does not account for potential unrealised losses in their asset portfolios. For further discussion, see the “[Report on Long-Term Guarantee Measures and Equity Risk 2020](#)”, EIOPA, December 2020.

⁴⁶ See “[Financial Stability Report – December 2023](#)”, EIOPA, 11 December 2023.

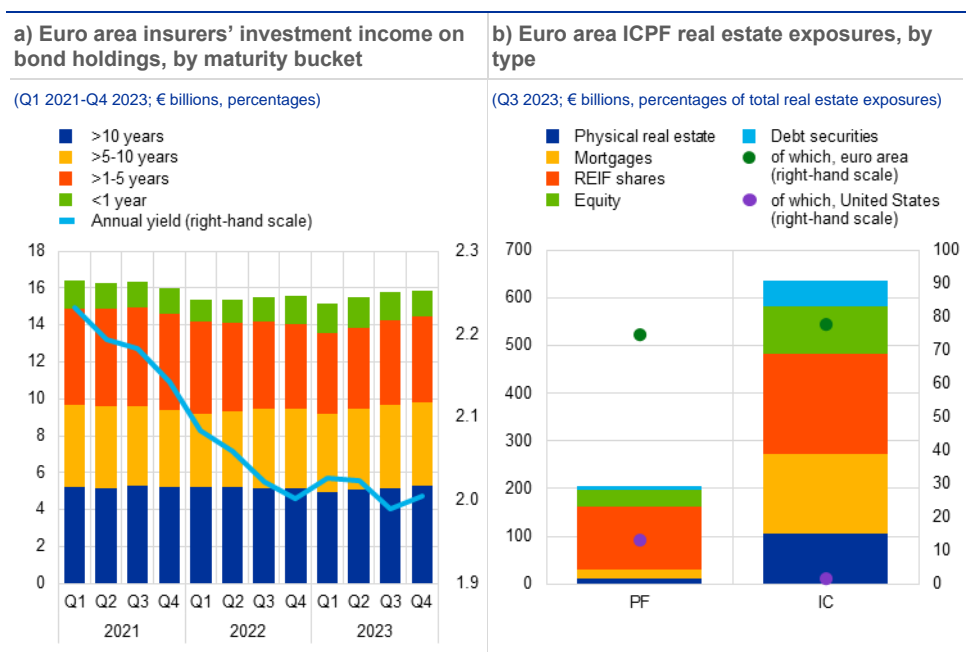
⁴⁷ The duration gap refers to the difference between the duration (average maturity) of assets and liabilities. When the duration of assets is larger (smaller) than that of liabilities, the insurer has a positive (negative) duration gap. Insurers and pension funds typically have a negative duration gap, implying that they benefit from rising interest rates, whereas banks have a positive duration gap.

faced by ICPFs can propagate stress across the wider financial system. This underscores how important it is for ICPFs to strengthen their liquidity preparedness to meet margin calls (**Chapter 5**).

Additionally, insurers have seen their investment income remain relatively unchanged despite higher interest rates. Income from bond investments increased marginally in 2023, whereas the annual yield on insurers’ bond portfolios remained at around 2% (**Chart 4.7**, panel a). This reflects the insurers’ large share of long-dated bond holdings acquired during a period of ultra-low interest rates and the prevalence of fixed-rate coupons (**Section 4.1**). In the short term, any fall in interest rates could further depress investment income. In the longer term, however, insurers are still likely to benefit from improved returns as they gradually roll over their portfolios at higher yields than in the past. Additionally, ICPFs have increased their allocation to alternative, typically higher-yielding assets, such as private equity, private credit and real estate. These may improve investment returns while also posing risks (**Special Feature C**).

Chart 4.7

Euro area insurers are exposed to falling investment income and corrections in commercial real estate markets



Sources: ECB (SHS), EIOPA and ECB calculations.
Notes: Panel a: the chart shows the investment income for bond holdings only, broken down by maturity bucket. Panel b: REIF stands for real estate investment fund.

Insurers may face revaluation losses on real estate investments, which could weigh on profitability. During the period of ultra-low interest rates that prevailed until 2022, ICPFs significantly increased their holdings of less liquid assets, especially real estate.⁴⁸ This mainly reflects indirect investment in euro area real estate through REIF shares, other equities and debt securities (**Chart 4.7**, panel b). The ongoing correction

⁴⁸ See chapter 4.3 in the “Financial Stability Review – May 2023”, ECB, May 2023.

in commercial real estate markets (**Chapter 1**) could result in losses on these exposures, which would weigh on insurers' profitability. Further corrections could increase redemption pressures and the potential for forced sales by open-ended REIFs (**Section 4.2**), with potential losses for their investors, including ICPFs. Consequently, interconnectedness in commercial real estate exposures across the financial system warrants continued monitoring.

5 Macprudential policy issues



5.1 Preserve banking sector resilience and enhance the macroprudential framework for banks

In recent years, the euro area banking sector has proven its resilience during a series of adverse shocks, thanks in part to decisive and comprehensive macroprudential action. Since the pandemic, rising capital buffers have further boosted the banking sector's resilience to shocks and have helped to create additional macroprudential space.⁴⁹ They have complemented the existing borrower-based measures that have been effective in bolstering borrowers' resilience, as demonstrated by the limited deterioration in mortgage credit quality seen so far.

Maintaining existing macroprudential buffer requirements remains a priority, with a view to ensuring that banks are resilient to potential headwinds.

Notwithstanding the tentative improvements seen in the financial stability outlook, global macroeconomic prospects are surrounded by a high level of uncertainty and tail risks remain (**Chapter 1**). Moreover, asset quality is slowly deteriorating, with commercial real estate and low provisioning levels of most concern (**Chapter 3**). In this context, and in the absence of signs of widespread losses and credit supply constraints arising from bank capital, it is advisable to maintain existing capital buffer requirements in case they are needed in the event of a deterioration in banking sector or macro-financial conditions. Borrower-based measures should continue to fulfil their

⁴⁹ Since the November 2023 issue of the Financial Stability Review was published, two macroprudential authorities have introduced a positive neutral rate for the countercyclical capital buffer (CCyB). At present, seven of the 14 banking union countries with a positive CCyB rate have implemented a positive neutral CCyB rate (Estonia, Ireland, Cyprus, Latvia, Lithuania, the Netherlands and Slovenia). 11 countries have a sectoral systemic risk buffer (SyRB) in place to address emerging broad or sector-specific vulnerabilities, while borrower-based measures are active in 16 countries.

role as structural backstops and should be maintained to ensure that lending standards remain sound.⁵⁰ Furthermore, the ECB has continued to highlight its concerns over the implications of initiatives to impose extraordinary taxes on credit institutions in the interests of financial stability.⁵¹ Not only may such diverse, ad hoc fiscal actions create uncertainty for banks and their investors, they may also make it harder for banks to build up further capital buffers at a time when ensuring a sound capital base is essential.

Over the medium term, further enhancing macroprudential space through releasable buffers is a robust policy strategy for enhancing the resilience of the banking sector. Since the pandemic, authorities in the banking union have increased the amount of releasable buffers through more active use of the countercyclical capital buffer (with several authorities activating a positive neutral rate for this buffer) or the systemic risk buffer. By increasing the macroprudential space available to support the banking sector in the event of (potentially severe) shocks that could occur at any phase of the cycle, a higher amount of releasable capital buffers enables macroprudential authorities to act countercyclically in a more effective manner (**Chart 5.1**, panel a). More widespread use of releasable buffers has resulted in a noticeable increase in macroprudential space, with the total amount of releasable buffers in the banking union reaching around €82 billion,⁵² although some jurisdictions do not have any releasable buffers in place. Where favourable conditions limit the likelihood of procyclical effects, it is therefore desirable to broaden macroprudential space still further, for example through the implementation of a positive neutral rate for the countercyclical capital buffer. The economic cost of recent increases in the buffer requirements has been low because of banks' existing capital headroom and robust profitability (**Chart 5.1**, panel b).⁵³

⁵⁰ At the same time, targeted adjustments to design elements of borrower-based measures, as recently applied by some euro area authorities, help to avoid excessive procyclicality in mortgage supply and preserve access to credit for specific segments of borrowers.

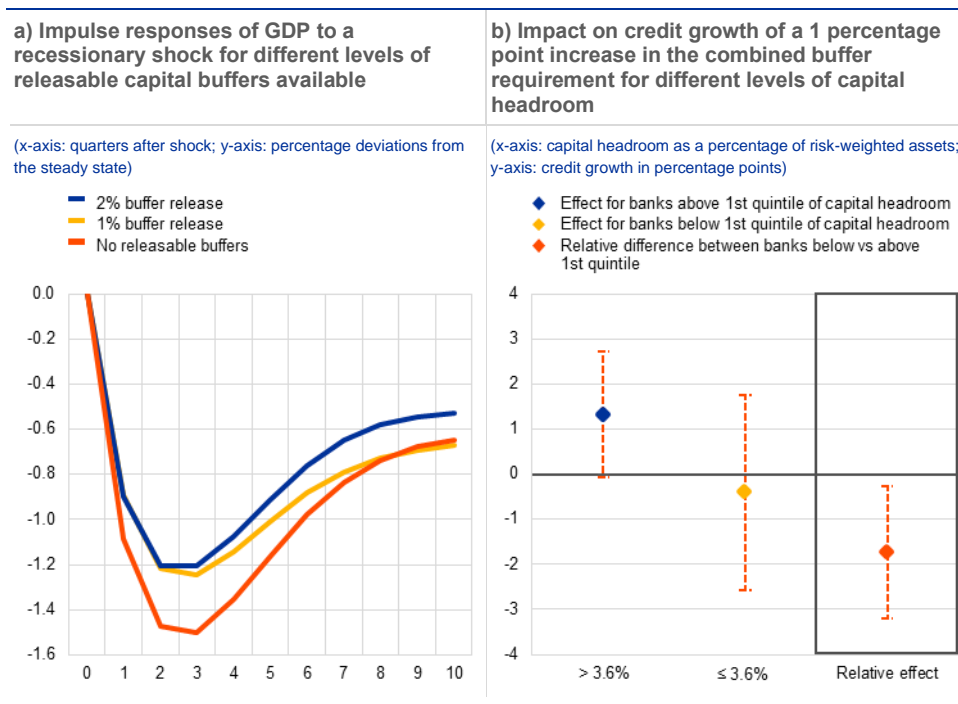
⁵¹ See the [Financial Stability Review](#), ECB, November 2023, the [Opinion of the European Central Bank of 11 December 2023 on a temporary mortgage loan borrower protection fee payable by credit institutions](#) (CON/2023/42), the [Opinion of the European Central Bank of 15 December 2023 on the imposition of a tax on credit institutions](#) (CON/2023/45) and the [Opinion of the European Central Bank of 14 February 2024 on a special levy for credit institutions](#) (CON/2024/4).

⁵² The figure refers to all releasable buffers announced by national authorities as of the fourth quarter of 2023. A more proactive use of the CCyB in the banking union resulted in an increase in the weighted average CCyB rate from 0.23% at the onset of the pandemic to 0.5% in the fourth quarter of 2023.

⁵³ See Chart 5.1, panel a) in the chapter entitled "[Macroprudential policy issues](#)", *Financial Stability Review*, ECB, November 2023.

Chart 5.1

Macroprudential space enhances the effectiveness of countercyclical macroprudential action while favourable banking sector conditions mitigate the economic costs of increasing capital requirements



Sources: ECB (AnaCredit, supervisory data), ECB calculations and national notifications.
 Notes: Panel a: a higher share of releasable buffers provides macroprudential authorities with greater leeway to respond to severe shocks. Simulations were performed using the 3D DSGE model calibrated for the euro area*. The chart shows the impulse responses of GDP to a mix of negative housing and physical capital price shocks triggering a (peak) -1.5 percentage point decline in GDP in the baseline scenario with no releasable capital buffers (red line). The yellow line depicts the GDP response when the macroprudential authorities fully release the available 1% capital buffer, while the blue line represents the GDP response when the macroprudential authorities fully release the available 2% capital buffer. The exercise assumes that (i) capital buffers are fully usable and are not constrained by other parallel requirements; and (ii) banks fully use the released buffer, decreasing their capital ratios in line with the amount of the release. Panel b: higher capital headroom limits the cost of capital buffer increases. The chart shows the impact on credit growth of a 1 percentage point increase in the combined buffer requirement (CBR) for different levels of capital headroom (defined as the distance to the CBR) based on bank-firm level panel regressions using a sample of almost 15 million observations for 2,088 euro area banks (significant institutions and less significant institutions) over the period from Q2 2021 to Q2 2023. The econometric model also includes a set of bank-level controls, bank fixed effects and firm-quarter dummies. The red lines indicate the 90% confidence intervals around the point estimate. The blue diamond represents the impact on credit growth for banks above the first quintile of the capital headroom distribution, while the yellow diamond represents the impact on credit growth for banks below the first quintile of the capital headroom distribution. The red diamond represents the estimated differential impact between banks with capital headroom below the 1st quintile of the capital headroom distribution (3.6%) and those with capital headroom above 3.6%. Confidence intervals overlapping at zero indicate that the effect on credit growth is not statistically significant.
 *) See Mendicino, C., Nikolov, K., Suarez, J. and Supera, D., "Bank capital in the short and in the long run", *Journal of Monetary Economics*, Vol. 115, November 2020, pp. 64-69.

In this context, further progress on regulatory initiatives aimed at improving the efficiency and effectiveness of the EU macroprudential framework remains a priority. The ECB welcomes the European Commission’s [report](#) on the review of the EU macroprudential framework and strongly supports proposals aimed at enhancing the effectiveness and consistency of the macroprudential toolkit, simplifying macroprudential coordination mechanisms and broadening macroprudential space.⁵⁴ In this regard, promoting the build-up of releasable buffers, including through a more flexible use of the countercyclical capital buffer, and enhancing their usability are of key importance. While the full applicability of final targets for minimum requirements for own funds and eligible liabilities (MREL) as of 2024 will significantly improve the

⁵⁴ See the “[ECB response to the European Commission’s call for advice on the review of the EU macroprudential framework](#)”, ECB, March 2022.

resolvability of EU banks, it is important to assess the resulting implications for capital buffer usability arising from parallel capital requirements.⁵⁵ This will warrant enhanced information-sharing between macroprudential and resolution authorities on MREL targets.⁵⁶ The ECB also reiterates its call for a more consistent use of macroprudential instruments across jurisdictions, particularly of the sectoral SyRB, to promote the coherent treatment of systemic risks across countries.

Recent initiatives by the Basel Committee and the implementation of the final Basel III reforms in the EU will further enhance the effectiveness of macroprudential policy and contribute to financial stability. In April 2024 the Basel Committee published its revised Basel Core Principles for Effective Banking Supervision, emphasising the importance of close cooperation between supervisory and macroprudential authorities and reflecting regulatory and supervisory developments since the last revision.⁵⁷ In the EU, the final Basel III reforms are being introduced via the EU banking package, which is currently being adopted by the European Parliament and the EU Council. The reforms will become effective on 1 January 2025 and will further bolster the resilience of the EU banking system, enhance the supervisory toolkit and address climate-related and other sustainability risks.

5.2 Progress towards a capital markets union requires a solid institutional and policy framework for non-banks

Non-banks play a pivotal role in the development of capital markets but, unlike banks, they largely lack a macroprudential framework. As the euro area non-bank financial intermediation (NBFi) sector has grown considerably in size since the global financial crisis, it has become an increasingly important source of funding for the real economy.⁵⁸ By reducing reliance on bank-based financing, this expansion has helped to diversify the sources of financing and contributed to the development of capital markets. However, parts of the NBFi sector exhibit significant vulnerabilities (**Chapter 4**), and the institutional and policy framework largely lacks a macroprudential perspective.

Enhancing the macroprudential framework for non-banks could help ensure that they provide a stable source of financing through the financial cycle – a key feature for building a strong capital markets union. But there is more work to be done to achieve this goal, as illustrated by several periods of stress in recent years.

⁵⁵ See, for instance, “[Report of the Analytical Task Force on the overlap between capital buffers and minimum requirements](#)”, European Systemic Risk Board, December 2021, and Leitner, G. et al., “[How usable are capital buffers?](#)”, *Occasional Paper Series*, No 329, ECB, 2023.

⁵⁶ At the same time, other factors will also affect and improve buffer usability. For example, the entry into force of the final Basel III rules, the expiration of both TLTRO III and public guarantees for non-financial corporation loans will increase banks’ risk density and reduce the overlap between minimum requirements and buffers.

⁵⁷ These principles, first adopted in 1997, set global standards for the sound prudential regulation and supervision of banks. They were previously revised in 2012.

⁵⁸ See the box entitled “[Measuring market-based and non-bank financing of non-financial corporations in the euro area](#)”, *Financial Integration and Structure in the Euro Area*, ECB, April 2022.

For example, the March 2020 market turmoil and the UK government bond (gilt) market stress in 2022 brought to the fore structural vulnerabilities in non-banks, such as excessive leverage, inadequate liquidity preparedness, liquidity mismatches and interconnectedness.⁵⁹ Against this background, the ECB welcomes the European Commission's plan for a targeted consultation on macroprudential policies for the NBFIs sector in 2024.⁶⁰

A comprehensive macroprudential framework for non-banks should be based on several key principles. First, a system-wide perspective is needed to address the vulnerabilities in the NBFIs sector holistically. This involves taking into consideration interdependencies between non-banks and linkages with the banking sector and the real economy. In the March 2020 market turmoil, for instance, forced asset sales by non-banks amplified the adverse market dynamics and liquidity risk spilled over to short-term debt securities issued by banks and firms through money market funds (MMFs).⁶¹ Second, a macroprudential framework should also focus on building up resilience *ex ante* rather than relying on *ex post* measures. This would help to prevent stress from emerging in non-banks so as to ensure that, even in times of market stress, they can provide a resilient source of funding. Finally, given the varied nature of the NBFIs sector, the macroprudential framework should allow for policies to be tailored to the diverse set of entities and activities involved.

In this regard, the Financial Stability Board (FSB) has issued recommendations that are crucial for the EU to implement. Implementing these regulations would increase resilience and foster a level playing field across the NBFIs sector, both within the EU and globally. The level playing field is needed to mitigate the risk of cross-border fragmentation, regulatory arbitrage and/or business reallocation, as well as risks stemming from globally interconnected entities and activities.

The first concern is reform of MMFs. Overall, the progress made in implementing the international standards for MMFs developed in response to the March 2020 market turmoil has been uneven across jurisdictions.⁶² Authorities in the United States recently raised the liquidity requirements for MMFs, requiring them to hold weekly liquid assets of at least 50% of a fund's total assets.⁶³ In the United Kingdom, the authorities recently proposed the same requirements in a public consultation. By contrast, in the euro area these requirements range from 15% to 30%, depending on

⁵⁹ See the box entitled "[Non-banks' liquidity preparedness and leverage: insights and policy implications from recent stress events](#)", *Financial Stability Review*, ECB, May 2023.

⁶⁰ See the European Commission's [report](#) on the review of the EU macroprudential framework.

⁶¹ See, for example, the section entitled "[Forced asset sales by non-banks amplified market dynamics](#)" and the box entitled "[Recent stress in money market funds has exposed potential risks for the wider financial system](#)", *Financial Stability Review*, ECB, May 2020, and the box entitled "[Interconnectedness of derivatives markets and money market funds through insurance corporations and pension funds](#)", *Financial Stability Review*, ECB, November 2020.

⁶² At the international level, see "[Policy Proposals to Enhance Money Market Fund Resilience: Final Report](#)", FSB, October 2021. At the European level, see "[Eurosystem contribution to the European Securities and Markets Authority \(ESMA\) consultation on the framework for EU money market funds](#)", ECB, June 2021; "[Recommendation of the European Systemic Risk Board of 2 December 2021 on reform of money market funds](#)", ESRB, January 2022; and "[ESMA opinion on the review of the Money Market Fund Regulation](#)", *Final Report*, ESMA, February 2022.

⁶³ On 12 July 2023 the US Securities and Exchange Commission adopted [amendments to certain rules that govern MMFs](#).

fund type. This leaves MMFs domiciled in the euro area less resilient to liquidity shocks in comparison. Moreover, for euro area MMFs which invest in assets denominated in foreign currencies (e.g. GBP-denominated MMFs domiciled in Ireland), rules that diverge globally can create opportunities for regulatory arbitrage, while weaker resilience could also trigger spillovers to funding markets in jurisdictions outside the euro area.^{64,65}

Second, the FSB recently published its revised recommendations on liquidity mismatch in open-ended funds (OEFs).⁶⁶ These recommendations aim to better align fund redemption terms with the liquidity of a fund's asset portfolio and to enhance the availability and use of liquidity management tools. This would enable OEFs to pass on to redeeming investors the explicit and implicit costs of selling assets under both normal and stressed market conditions.⁶⁷ It should, in turn, reduce first-mover advantage and disincentivise procyclical investor redemptions.

Implementation of the FSB's recommendations for OEFs should continue in the EU, and the effectiveness of the reforms should be assessed in due course. In the EU, amendments to the regulatory frameworks for funds were published in November 2023 and are expected to enter into force in the first quarter of 2026.⁶⁸ Among other things, this new legislation aims to promote greater availability and use of liquidity management tools, including the suspension of redemptions, redemption gates, the extension of notice periods, redemption fees, swing pricing, dual pricing, anti-dilution levies, redemptions in kind and side pockets. Going forward, the extent to which these reforms will be effective in reducing vulnerabilities arising from liquidity mismatch in OEFs remains to be seen. It should also be borne in mind that the European Securities and Markets Authority (ESMA) is still in the process of developing more detailed standards on the implementation of these liquidity management tools.

The FSB is also working on recommendations which would enhance liquidity preparedness across the NBFi sector to meet margin and collateral calls. Specifically, it recently published a consultation paper proposing eight policy recommendations. These cover non-banks' liquidity risk management and governance, their stress testing and scenario design, and their collateral management practices, all of which aim to mitigate liquidity risks arising from spikes in margin and collateral calls.⁶⁹ The FSB's recommendations apply to a wide range of non-banks and cover both centrally and non-centrally cleared derivatives and securities markets.

⁶⁴ The FSB recently recommended that "FSB jurisdictions that have not yet done so should review their policy frameworks and adopt tools to address identified MMF vulnerabilities, taking into consideration the 2021 FSB policy proposals. [...] including by taking account of experience with previous stress events, potential cross-border spillovers and regulatory arbitrage." See "[Thematic Review on Money Market Fund Reforms: Peer review report](#)", FSB, February 2024.

⁶⁵ See also the discussion in Box 6 of this issue of the Financial Stability Review on measures targeted at GBP-denominated liability-driven investment funds domiciled in Ireland, Luxembourg and the United Kingdom.

⁶⁶ See "[Revised Policy Recommendations to Address Structural Vulnerabilities from Liquidity Mismatch in Open-Ended Funds](#)", FSB, December 2023.

⁶⁷ See also IOSCO's [guidance](#) on anti-dilution liquidity management tools.

⁶⁸ These are [amendments](#) to the Alternative Investment Fund Managers Directive (AIFMD) and the Undertakings for Collective Investment in Transferable Securities Directive (UCITS Directive).

⁶⁹ See "[Liquidity Preparedness for Margin and Collateral Calls: Consultation report](#)", FSB, April 2024.

Because of the important interlinkages between liquidity preparedness and transparency, the recommendations are being developed at the same time as other international recommendations for good margining practices in centrally and non-centrally cleared markets.⁷⁰ For instance, if central counterparties were required to provide margin simulation tools to clearing members and clients (typically non-banks), this could provide significant support to non-banks carrying out liquidity stress tests.

Once finalised, the recommendations on margin and collateral calls should be swiftly implemented in the EU across a wide range of non-banks. Box 5

suggests that over 15% of euro area OEFs and exchange-traded funds do not appear to be adequately prepared to cope with potential spikes in margin calls. Based on previous studies, this is the case not only for euro area investment funds but also for some insurers and pension funds, where the latter might be able to meet margin calls but only if money markets are functioning properly.⁷¹ In view of this vulnerability, it is vital for the forthcoming recommendations to be implemented swiftly in the EU in both entity-level regulations (e.g. AIFMD, UCITS, Solvency II and IORP II Directives) and activity-based regulations (e.g. EMIR and SFTR), including through the ongoing EU reforms.⁷²

The FSB is currently also exploring policies which aim to address the risks arising from NBFi leverage, including ways to contain its build-up.⁷³

Given the complexities involved in using leverage in an interconnected financial system, leverage-related risks should be tackled from several angles, ensuring that measures can be targeted to specific types of entities or activities. **Table 5.1** provides an overview of the different policy measures that can contain the build-up of leverage as well as key considerations for assessing their potential effectiveness and costs. These include (i) activity-based measures (e.g. haircuts/margins and clearing mandates), (ii) entity-based measures (e.g. leverage limits), (iii) supervisory and regulatory guidance on leverage providers (e.g. risk management practices), and (iv) enhanced transparency (e.g. disclosures to counterparties and/or market participants to foster market discipline). Measures that can contain the build-up of leverage can do so directly (e.g. entity-level leverage limits) or indirectly (e.g. rules on leverage providers), and can also do so when they have different primary objectives (e.g. mitigating the probability of procyclical deleveraging or counterparty losses).

⁷⁰ See the BCBS-IOSCO report “[Streamlining VM processes and IM responsiveness of margin models in non-centrally cleared markets](#)”, Bank for International Settlements, January 2024; the BCBS-CPMI-IOSCO report “[Transparency and responsiveness of initial margin in centrally cleared markets – review and policy proposals](#)”, Bank for International Settlements, January 2024; and the CPMI-IOSCO report “[Streamlining variation margin in centrally cleared markets – examples of effective practices](#)”, Bank for International Settlements, January 2024.

⁷¹ See “[Impact of variation margining on EU insurers’ liquidity: an analysis of interest rate swaps positions](#)”, 2019 Thematic Review, EIOPA, January 2023; the special feature entitled “[Derivatives-related liquidity risk facing investment funds](#)”, *Financial Stability Review*, ECB, May 2020 (especially the box entitled “[Liquidity stress simulations of euro area pension funds’ interest rate swap portfolios](#)”); the box entitled “[Interconnectedness of derivatives markets and money market funds through insurance corporations and pension funds](#)”, *Financial Stability Review*, ECB, November 2020; and the joint DNB-AFM study “[Liquidity risks of pension funds’ derivatives portfolios under various stress scenarios](#)”, De Nederlandsche Bank, February 2024.

⁷² IORP stands for institutions for occupational retirement provision, EMIR for the European Market Infrastructure Regulation and SFTR for Securities Financing Transactions Regulation.

⁷³ See “[FSB Work Programme for 2024](#)”, FSB, January 2024.

Table 5.1

Policy options for containing the build-up of NBF1 leverage and key considerations

Type of policy measure	Description	Key considerations
Activity-based (e.g. haircuts/margins, clearing mandate)	<p>Initial margin for derivatives determines the amount of exposure that can be created.</p> <p>Haircuts for repos determine the amount of funding that can be obtained for a given amount of collateral.</p> <p>Clearing mandate may contain the build-up of risk exposures via stricter risk management and requirements on collateral.</p>	<p>Activity-based measures can act as a backstop for entities not subject to direct leverage constraints.</p> <p>Margins/haircuts help to reduce the level of leverage in aggregate but are less effective against the build-up of concentrated positions. May be costly for non-leveraged users.</p> <p>Clearing mandates already exist for key derivative classes but would not be suitable for others, especially those which are less liquid.</p>
Entity-based (e.g. leverage limits)	<p>Simple limits impose a direct constraint on the amount of leverage a fund is able to take on.</p> <p>Risk-based limits, usually informed by risk metrics (e.g. VaR) or stress testing, ensure that funds maintain a certain level of resilience.</p>	<p>Leverage limits can effectively target the build-up of leverage in specific entities/sectors and activities, especially for highly leveraged funds and concentrated positions.</p> <p>Effective stress-testing practices can be helpful in informing the calibration of limits and the appropriate level of resilience.</p> <p>The measurement and calibration of leverage limits may be more difficult for funds employing complex strategies.</p>
Leverage providers (e.g. risk management practices)	<p>Rules on counterparty credit risk management for banks/prime brokers can reduce the level of leverage by promoting more prudent provision of leverage to NBF1 counterparties.</p>	<p>Offers a complementary angle for mitigating the build-up of leverage in the NBF1 sector globally, especially for entities that are not subject to regulatory leverage constraints.</p> <p>The focus is usually microprudential to mitigate counterparty risk and may therefore lack a systemic dimension.</p> <p>Depends also on having adequate information.</p>
Transparency (e.g. disclosures)	<p>Disclosures can help ensure that investors/counterparties are better informed of risks – especially concentrated positions – and may contain leverage via enhanced market discipline.</p>	<p>Requires market participants or counterparties to use information to price risks adequately.</p> <p>Can support market discipline of entities/activities that lie outside the regulatory perimeter or are subject to less stringent rules.</p> <p>Can be an important complement to other policies but on its own is unlikely to have a material impact on containing the build-up of NBF1 leverage.</p>

Authorities need to carefully balance key trade-offs when designing policy measures – their effectiveness, feasibility and potential costs. A wide range of policy measures are used by authorities across the globe to address leverage-related risks (Box 6). The choice of measure requires careful consideration of the given circumstances, as these affect how suitable a tool is for targeting specific risks. At the same time, authorities may face significant constraints, including the scope of their financial stability mandates and the complexity involved in calibrating the measures. Moreover, it is important to ensure that the resulting actions do not impose disproportionate costs, such as those associated with negatively affecting liquidity and pricing in underlying markets or hedging incentives. To cite one example, while entity-based measures (e.g. leverage limits) can be effective in targeting leverage directly, their use may not always be feasible as entities may lie outside the regulatory perimeter (e.g. family offices), for instance, or engage in highly complex investments (e.g. multi-strategy hedge funds). In such cases activity-based measures (e.g. haircut/margin requirements or clearing mandates) may be an important complement. However, haircuts and margins may be less effective in targeting the build-up of concentrated positions and, if set too strictly, could impose excessive costs on hedging for end users.

In addition to developing macroprudential tools, more deeply integrated EU-wide supervision of non-banks would help to mitigate financial stability

risks across the EU. European supervisory authorities are already helping to promote supervisory convergence to non-banks across the EU. There is, however, a case for enhancing the supervisory architecture of EU capital markets to reflect the growing importance of the cross-border activities of the NBFIs sector. This would ensure that it remains resilient under stress and does not amplify systemic risk or generate cross-border contagion. A more integrated supervisory framework would also promote the EU level playing field and reduce the potential for regulatory arbitrage. It is therefore essential to ensure that the European supervisory authorities (especially ESMA and EIOPA) have independent, European governance, sufficient resources and comprehensive oversight powers. They should directly supervise the most systemic cross-border capital market actors, in cooperation with their national supervisors.⁷⁴ In addition, the availability of data to all European and national authorities with a financial stability mandate, including central banks, should be enhanced through greater data sharing and/or direct access to these data.

A resilient NBFIs sector would help to promote and complement the objectives of the capital markets union. Policies supporting the resilience of the NBFIs sector are key to safeguarding Europe's financial stability. Furthermore, deep, integrated capital markets are essential to mobilise the kind of private risk-sharing that would help to enhance economic growth and smooth out asymmetric shocks. Making full use of Europe's capital markets is also key to mobilising private investment in the green and digital transitions needed to enhance the EU's productivity and competitiveness in a challenging geopolitical landscape.

In addition to policies safeguarding the stability of the NBFIs sector, the capital markets agenda would benefit from policies supporting the efficiency and liquidity of equity markets. European firms would gain from deeper and more integrated capital markets, which would allow them to access a large and diversified pool of equity finance in the EU. The current fragmentation of the EU stock exchange landscape is a concern as it constrains stock market efficiency and initial public offering activity. In addition to the measures taken in recent years to reduce the regulatory cost of listing for smaller companies, the market would also benefit from initiatives supporting large EU-based institutional investors such as asset managers and pension funds. It would also gain from a better integrated trading and post-trading infrastructure, which could be achieved by harmonising listing requirements and consolidating stock exchanges and market infrastructures.

Finally, securitisation could play a role in financing the real economy by transferring risks from banks to non-banks and by providing a source of funding to non-banks. Securitisation could be part of a diversified funding mix for banks and non-banks alike. Banks could use it as a tool to free up their balance sheets, thereby creating room for lending to the real economy. This is particularly important in view of the investment needed for the green and digital transitions. From a financial stability perspective, policy measures in the regulatory framework should aim to ensure that the market develops prudently and sustainably and should lead to

⁷⁴ See also the "Statement by the ECB Governing Council on advancing the Capital Markets Union", ECB, 7 March 2024.

genuine risk transfer. This would ensure that risks are distributed across the financial sector to those best placed to assume them. Public guarantees and further standardisation through pan-EU issuances could support targeted segments of securitisation, such as specific securitisation to support the green transition. Because securitisations are currently concentrated in a limited number of countries, further standardisation could widen the investor base and facilitate the development of the market across the EU.

5.3 Other ongoing policy initiatives that support euro area financial stability

Topic	
Crypto-assets	Implementation of the regulatory framework for crypto-assets in the EU, the Markets in Crypto-assets (MiCA) Regulation , is progressing. ⁷⁵ The European Banking Authority and the European Securities and Markets Authority are finalising a large number of technical standards to implement the regulation. At the same time, the European Commission has adopted a number of associated delegated and implementing acts . The most relevant of these for financial stability specifies the criteria for classifying asset-referenced tokens and e-money tokens as significant, which would make them subject to stricter prudential requirements and heightened supervision, given their higher financial stability risks. At the international level, the Financial Stability Board (FSB) is focusing on the implementation of its high-level recommendations for regulating crypto-asset activities and markets as well as global stablecoin arrangements in FSB jurisdictions. It is, however, also trying to capture non-FSB jurisdictions. In December 2023 the Basel Committee on Banking Supervision published a consultation aimed at clarifying aspects of its standard on banks' exposures to crypto-assets and tightening the criteria that stablecoins need to satisfy to receive preferential regulatory treatment. While it is important for the full Basel standard on crypto-assets to be implemented in the EU in a timely manner, the finalisation of the amended Capital Requirements Regulation already includes a welcome transitional treatment of banks' crypto-asset exposures, including disclosure requirements.
Digital euro	<p>Following the requests for opinions from the European Council and the European Parliament in September 2023, in October the ECB published its Opinion on the digital euro. The legal framework for the digital euro is key to ensuring that central bank money remains widely accessible and is accepted throughout the euro area in an increasingly digitalised economy. The ECB remains committed to contributing to the ongoing debate on the digital euro project and to liaising closely with European institutions and authorities.</p> <p>The initial preparation phase of the digital euro project started in November 2023 and will last two years. After that, the ECB's Governing Council will decide whether to move on to the next preparation stage, paving the way for the possible future issuance and roll-out of a digital euro.</p>
Climate	In December 2023 the ECB and the European Systemic Risk Board (ESRB) published a joint report entitled "Towards macroprudential frameworks for managing climate risk" that presents policy options for addressing climate risks in the banking sector. The report sets out options encompassing the use of the systemic risk buffer, concentration measures and targeted adjustments to borrower-based measures, alongside initiatives aimed at reducing the insurance protection gap and addressing information failures in non-bank financial intermediation.
Crisis management and deposit insurance	In July 2023 the ECB published its Opinion on the European Commission's proposal to reform the EU's crisis management and deposit insurance (CMDI) framework and called for improved options for handling failures of mid-sized and smaller banks. This would be achieved by broadening the scope of resolution, enhancing the tools available in national liquidation frameworks and empowering deposit guarantee schemes to intervene in bank crisis management in ways that are more effective than a payout for covered depositors. Since then, the European Council and the European Parliament have made progress on establishing their negotiation positions, and the ECB is encouraging legislators to conclude the CMDI reform as a matter of priority following the elections to the European Parliament in June 2024. This would at least maintain momentum on completing the banking union.

⁷⁵ Regulation (EU) 2023/1114 of the European Parliament and of the Council of 31 May 2023 on markets in crypto-assets, and amending Regulations (EU) No 1093/2010 and (EU) No 1095/2010 and Directives 2013/36/EU and (EU) 2019/1937 (OJ L 150, 9.6.2023, p.40).

Box 6

Containing risks from leverage in the NBFi sector – insights from recent policy initiatives

Prepared by Michael Grill, Luis Molestina Vivar, Charles O'Donnell and Christian Weistroffer

Recent stress episodes have shown how leverage in the non-bank financial intermediation (NBFi) sector can be a source of systemic risk and amplify stress in the wider financial system.

Excessive leverage in the NBFi sector can increase the likelihood of procyclical deleveraging and counterparty losses, with potential spillovers to banks and the broader financial system. Prominent examples of procyclical deleveraging include the role of leveraged hedge funds in the US Treasury market in March 2020 and liability-driven investment (LDI) funds in UK gilt markets in September 2022.⁷⁶ Both reveal how NBFi vulnerabilities associated with high leverage can spill over to core government bond markets. The failure of Archegos Capital Management in March 2021 highlights how the build-up of concentrated derivative positions combined with a lack of transparency on these positions can impose significant counterparty losses on systemically important banks.

In response to these events, policymakers around the world have launched a range of policy initiatives to contain risks from leverage in the NBFi sector more broadly (Table A).

As the NBFi ecosystem comprises a wide range of entities performing different economic functions, with varying degrees of complexity in their use of leverage, authorities need to carefully choose and calibrate their measures. In doing so, they face certain trade-offs concerning, for example, the effectiveness of measures to target specific risks (e.g. procyclical deleveraging), their feasibility (e.g. complexity in their use) and potential costs (e.g. impact on hedging). This box provides an overview of recent policy initiatives aimed at addressing risks from NBFi leverage, including policy responses to the examples above. In other instances, policymakers have acted pre-emptively after identifying systemic vulnerabilities, as in the case of Irish real estate funds.

Authorities in Ireland, Luxembourg and the United Kingdom have used entity-based measures to address leverage-related risks in government bond and real estate markets.

In response to deleveraging by LDI funds in September 2022, authorities in the United Kingdom as well as in Ireland and Luxembourg, where a significant share of GBP-denominated LDI funds are domiciled, introduced entity-based measures to ensure a minimum level of resilience among these funds, which also acts to (indirectly) limit leverage.⁷⁷ Moreover, authorities in Ireland have responded to heightened concerns regarding real estate risks by imposing macroprudential measures to mitigate the potential for deleveraging in these markets in times of stress. Irish authorities have introduced a leverage limit on borrowing of 60% for real estate funds, calculated as the ratio of a fund's total debt to its total assets.⁷⁸

⁷⁶ See the box entitled “Non-banks’ liquidity preparedness and leverage: insights and policy implications from recent stress events”, *Financial Stability Review*, ECB, May 2023.

⁷⁷ In the case of Ireland and Luxembourg, this tool is referred to as a “yield buffer”, which is set at between 300 and 400 basis points, thus ensuring that the fund can absorb a corresponding increase in yields before its net asset value falls to zero. It can be seen as a measure to ensure minimum resilience, which indirectly affects leverage at LDI funds but does not impose a leverage limit as such. See “The Central Bank’s macroprudential policy framework for Irish authorised GBP-denominated LDI funds”, Central Bank of Ireland, April 2024, and “CSSF communication on macroprudential measures for GBP denominated Liability Driven Investment funds”, *Communiqué*, CSSF, April 2024.

⁷⁸ All new property funds will need to comply with this limit, while existing funds are granted up to five years to comply. See “The Central Bank’s macroprudential policy framework for Irish property funds”, Central Bank of Ireland, 24 November 2022.

In the United States, new rules mandating the central clearing of US Treasury (UST)-backed repos are part of a broader package to enhance UST market resilience. The U.S. Securities and Exchange Commission (SEC) has recently introduced rules mandating the central clearing of UST securities in repo transactions, which is an important example of an activity-based measure. This followed periods of turbulence in UST markets, which was partially driven by deleveraging of hedge funds engaging in basis trades. Moreover, the use of leverage by these funds was often facilitated via uncleared repo transactions, which were typically contracted with 0% haircuts. Due to the stricter risk management practices for cleared transactions (relative to the terms provided by prime brokers), the new rule will also help to ensure that higher haircuts are applied to such trades.⁷⁹ The SEC has also introduced rules to improve the regulatory oversight of NBFIs market participants that play a significant liquidity-providing role in overall trading and market activity in UST markets. These rules may also affect some large hedge funds.⁸⁰

The failure of Archegos Capital Management prompted global efforts to review the risk management practices of leverage providers and assess risks from “hidden” leverage. The collapse of Archegos in 2021 and the fallout in the banking sector raised serious questions regarding banks’ counterparty credit risk (CCR) management practices for their NBFIs exposures.⁸¹ The ECB recently reviewed the CCR management practices of a sample of banks that are particularly active in providing prime brokerage services to NBFIs entities and has issued guidance and outlined sound practices on areas such as governance, risk management and stress testing.⁸² In addition, the Basel Committee on Banking Supervision is currently reviewing its guidance on CCR regarding banks’ NBFIs exposures.⁸³ The Financial Stability Board has also examined the issue of “hidden” leverage in the financial system, which may lead to important policies to enhance transparency as part of a broader policy initiative to address NBFIs leverage risks.⁸⁴ In this light, joint work by the Federal Reserve Board, the Bank of England and the ECB to share information on their banking sectors’ NBFIs exposures provides a useful example for how broader international efforts could improve transparency in cross-border and cross-sectoral exposures.⁸⁵

The examples presented in this box suggest that a broad and tailored set of policies is required to address the various risks posed by NBFIs leverage. Authorities around the world have engaged in a wide range of policy initiatives to address risks posed by NBFIs leverage. In doing so, they have needed to balance various trade-offs, which is reflected in their policy choices. A key takeaway from these recent experiences and policy initiatives is that no single tool can be uniformly

⁷⁹ See “[Final rule: Standards for Covered Clearing Agencies for U.S. Treasury Securities and Application of the Broker-Dealer Customer Protection Rule with Respect to U.S. Treasury Securities](#)”, U.S. Securities and Exchange Commission, 13 December 2023.

⁸⁰ See “[Final rule: Further Definition of “As a Part of a Regular Business” in the Definition of Dealer and Government Securities Dealer in Connection with Certain Liquidity Providers](#)”, U.S. Securities and Exchange Commission, 6 February 2024.

⁸¹ In 2021 Archegos defaulted on portfolio losses related to highly leveraged and concentrated positions using total return swaps in equity markets. At the end of March 2021, bank losses linked to the failure totalled over USD 10 billion.

⁸² See “[Sound practices in counterparty credit risk governance and management](#)”, ECB, October 2023, and “[Supervisory expectations for prime brokerage services](#)”, *Supervision Newsletter*, ECB, 17 August 2022. The ECB also identified counterparty credit risk as a broader supervisory priority in 2022.

⁸³ See “[Basel Committee work programme and strategic priorities for 2023/24](#)”, Basel Committee on Banking Supervision, 16 December 2022.

⁸⁴ See “[The Financial Stability Implications of Leverage in Non-Bank Financial Intermediation](#)”, Financial Stability Board, 6 September 2023.

⁸⁵ See “[Supervising counterparty credit risk – a European perspective](#)”, keynote speech by Elizabeth McCaul, Member of the Supervisory Board of the ECB, ECB, 28 February 2024.

applied to address risks stemming from NBFIs leverage. An effective policy response requires a broad range of tools to be made available, which should be appropriately tailored to the specific circumstances and can serve as complements to each other. Given the significant cross-border and cross-sector dimension of these risks, close coordination and cooperation between various authorities is essential, ensuring that risks are addressed from a system-wide perspective.

Table A

Authorities around the world are actively engaged in initiatives to contain risks from NBFIs leverage

Overview of policy measures

Event/ vulnerability	Risk channel	Policy measures			
		NBFI activities	NBFI entities	Leverage providers	Transparency
COVID-19 market turmoil (March 2020)	Procyclical deleveraging by leveraged (multi-strategy) hedge funds in UST markets	SEC proposals on mandating clearing of repos (part of broader package)			
UK gilt market crisis (September 2022)	Procyclical deleveraging by LDI funds in UK gilt markets		Indirect leverage limits for GBP-denominated LDI funds domiciled in IE, LU and UK		
Excessive leverage among Irish real estate funds	Potential procyclical deleveraging of funds in Irish property markets		Direct leverage limits for Irish real estate funds (phased-in for existing funds)		
Archeegos fallout (March 2021)	Counterparty losses due to inadequate risk management and transparency			ECB review of banks' CCR practices BCBS review of its CCR management guidelines	Cross-border information-sharing (BOE-ECB-FRB) International work on transparency and data

Source: ECB.

Special Features

A Turbulent times: geopolitical risk and its impact on euro area financial stability

Prepared by Daniel Dieckelmann, Christoph Kaufmann, Chloe Larkou, Peter McQuade, Caterina Negri, Cosimo Pancaro and Denise Rößler

Geopolitical risk can be a threat to financial stability and the global economy. It can adversely affect the economy and financial markets and consequently have a negative impact on the funding, lending, solvency, asset quality and profitability of banks and non-banks alike. Recent history suggests that adverse geopolitical events alone are unlikely to cause a systemic crisis, although they may act as a trigger for systemic distress if they interact with pre-existing vulnerabilities. Looking ahead, policy authorities need to monitor geopolitical risk and assess its possible consequences for financial stability. Financial institutions should apply a combination of sound risk management and business diversification to address geopolitical risk.

Introduction

Geopolitical risk, which has increased of late, can be a threat to financial stability. Recent conflict in the Middle East, fears of an escalation in US-China tensions over Taiwan and the Russian invasion of Ukraine have all raised concerns about geopolitical stability. Adverse geopolitical events can trigger rapid shifts in market sentiment and sharp increases in uncertainty, exposing existing vulnerabilities in financial institutions and markets. Moreover, they can dent consumption and investment plans, with knock-on effects for economic growth, and activate adverse feedback loops between the real economy and the financial world. This special feature starts by providing a conceptual overview of the channels through which geopolitical risk can affect euro area financial markets, the economy and the financial sector. It then goes on to present empirical evidence on the effects of geopolitical risk on euro area non-banks and banks.

Geopolitical risk is the threat, realisation and escalation of adverse events associated with wars, terrorism and tensions among states and political actors that affect the peaceful course of international relations. This definition is consistent with the geopolitical risk (GPR) index created by Caldara and Iacoviello and used in this special feature.⁸⁶ Higher values for the GPR index suggest an increase in the likelihood or intensity of adverse geopolitical events, and vice versa. By contrast,

⁸⁶ See Caldara, D. and Iacoviello, M., “[Measuring Geopolitical Risk](#)”, *American Economic Review*, Vol. 112, No 4, April 2022, pp. 1194-1225. The GPR index is constructed by counting the number of newspaper articles related to adverse geopolitical events as a share of the total number of newspaper articles at a monthly frequency. The global GPR index is based on one Canadian, three UK and six US newspapers.

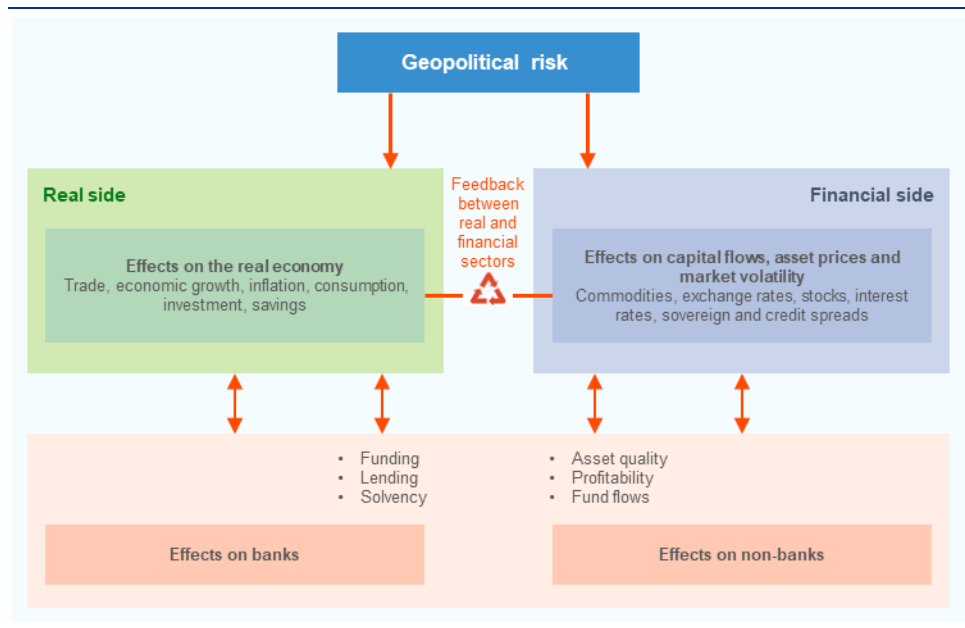
the concept of geopolitical fragmentation is different – it captures the reversal of global economic and financial integration due to geopolitical considerations.⁸⁷

Channels through which geopolitical risk affects financial stability

Geopolitical risk could adversely affect the global economy and spark financial instability through a variety of channels. On the real-economy side, geopolitical risk can impact the economy by negatively affecting real GDP growth, inflation, trade, investment, consumption and savings (**Figure A.1**). On the financial side, geopolitical risk can affect capital flows and asset prices, among other things, and lead to volatility in commodity markets, exchange rates, stock prices, interest rates and credit spreads. Given the linkages between the real economy and the financial sectors, feedback processes may reinforce direct effects. These adverse effects on the real economy and financial markets could have negative consequences for the funding, lending, solvency, asset quality and profitability of non-banks and banks.

Figure A.1

Transmission channels of geopolitical risk to financial stability



Source: ECB staff.

Geopolitical risk can have adverse effects on the economy. Adverse geopolitical events tend to increase uncertainty, causing a deterioration in investor and consumer sentiment that weighs on economic growth. In addition, international trade could also be curtailed as confidence is hit or trade restrictions and sanctions are increased. Furthermore, disruptions to global supply chains and commodity markets, such as the oil shocks in the 1970s that arose from geopolitical developments in the Middle East,

⁸⁷ For more on this topic, see “Global Financial Stability Report: Safeguarding Financial Stability amid High Inflation and Geopolitical Risks”, International Monetary Fund, April 2023.

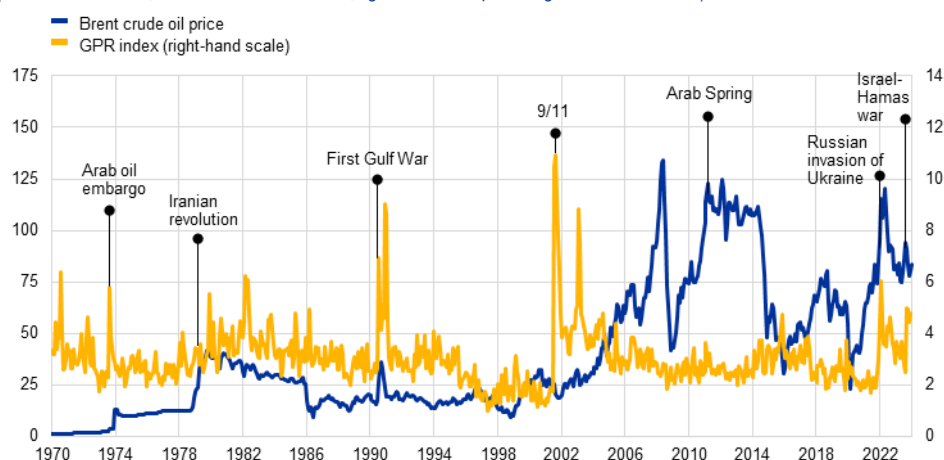
may also have a negative impact on growth (**Chart A.1**).^{88,89} An empirical analysis estimating the effect of global geopolitical risks on macroeconomic variables suggests that inflation increases by almost 0.1 percentage points and industrial production declines by around 0.15% six months after a 1 standard deviation geopolitical shock (**Chart A.2**, panel a).⁹⁰ In some circumstances, this could necessitate tighter monetary policy, which would have an adverse effect on financing conditions for firms and governments.

Chart A.1

Severe geopolitical risk events have often had large effects on oil prices

Brent crude oil price and GPR index since 1970

(Jan. 1970-Feb. 2024; left-hand scale: USD/barrel, right-hand scale: percentage share of all articles)



Sources: Bloomberg Finance L.P., Energy Intelligence Group, OPEC, World Bank, and Caldara and Iacoviello*.
*) Caldara, D. and Iacoviello, M., op. cit.

Geopolitical risks could destabilise financial markets by increasing uncertainty and weighing on the macroeconomic outlook.⁹¹ Expectations of slower macroeconomic growth and higher inflation can weigh on the outlook for firm profitability. This, together with increased credit risk, would reduce equity and corporate bond valuations and raise the rates banks charge on loans, tightening financing conditions for non-financial corporations. The threat of adverse geopolitical developments can also increase financial market uncertainty more broadly, undermining confidence among investors and heightening risk aversion. Empirical estimates confirm that euro area financial variables react to geopolitical risk. The EURO STOXX 50 index is estimated to fall by around 1% on impact in response to a

⁸⁸ See Góes, C. and Bekkers, E., “The impact of geopolitical conflicts on trade, growth, and innovation”, *Staff Working Papers*, ERSD-2022-9, World Trade Organization, July 2022.

⁸⁹ See the box entitled “Geopolitical risk and oil prices”, *Economic Bulletin*, Issue 8, ECB, 2023; Caldara, D., Conlisk, S., Iacoviello, M. and Penn, D., “Do Geopolitical Risks Raise or Lower Inflation?”, mimeo, 2023; and Smith, S. and Pinchetti, M., “The transmission channels of geopolitical risk”, Bank of England, Bank Underground, 4 April 2024.

⁹⁰ For reference, the Russian invasion of Ukraine in 2022 was an event of roughly 5 standard deviations for the global GPR index.

⁹¹ In the event of a war, governments may close financial markets – making it impossible to trade financial assets in the normal venues or exchanges – impose debt moratoria or suspend currency convertibility, while also seizing or requisitioning real or financial assets. Such extreme scenarios are not considered here. See Ferguson, N., “Earning from History? Financial Markets and the Approach of World Wars”, *Brookings Papers on Economic Activity*, Vol. 2008, Spring 2008, pp. 431-477.

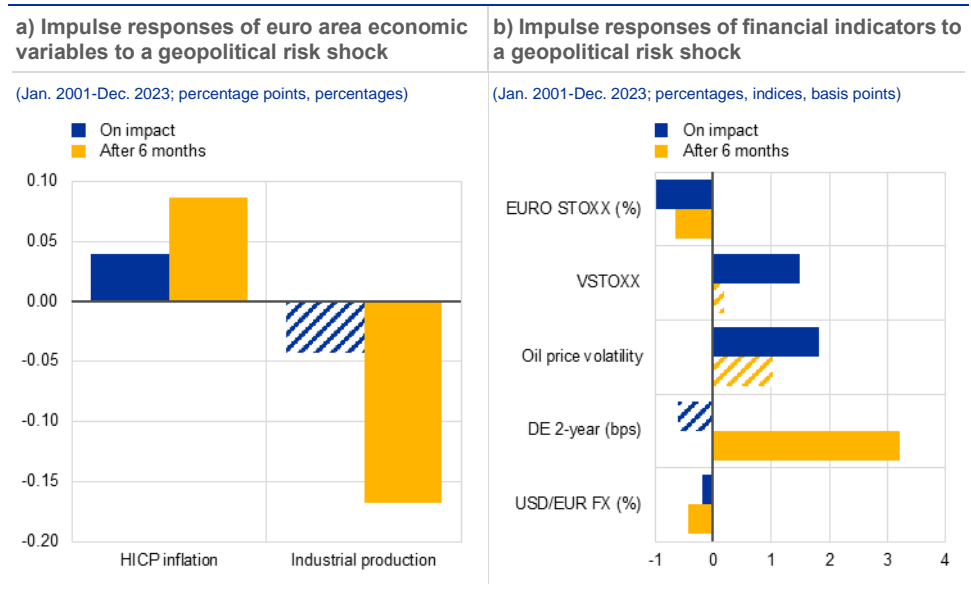
geopolitical shock of 1 standard deviation. The VSTOXX (an option-implied equity market volatility index) increases by around 1.5 index points in the same scenario, suggesting that geopolitical risk not only affects asset prices but also increases market uncertainty (Chart A.2, panel b).⁹² The effects of geopolitical risk events on financial markets are found to be strongest on impact, after which they tend to fade somewhat.⁹³ However, the persistence of the effects on markets is likely to vary depending on the underlying geopolitical risk, with larger and longer-lasting tensions leading to more severe and more persistent effects.

Financial market volatility may prompt investors to reduce the weight of riskier assets in their portfolios and potentially engage in flight-to-safety behaviour.

Econometric estimates suggest that initially yields on risky assets go up (as reflected in widening corporate bond spreads) while those on safe assets, such as German sovereign bonds, go down in response to a geopolitical shock (Chart A.2, panel b). This is consistent with flight-to-safety behaviour, as also seen in the appreciation of the US dollar in response to rising geopolitical risk, which is consistent with its role as a safe-haven currency.

Chart A.2

The materialisation of geopolitical risk could push up inflation, reduce industrial production and lead to a deterioration in financial conditions



Sources: ECB, Bloomberg Finance L.P. and ECB calculations.
 Notes: Impulse responses to a 1 standard deviation global geopolitical risk shock (Caldara and Iacoviello*), based on a Bayesian vector autoregression model with monthly data from January 2001 to December 2023. The shocks are identified using a Cholesky decomposition, with geopolitical risk ordered first. All values are statistically significant at levels of at least 10%, except where shaded. Panel a: results are based on a model including the GPR index, the VSTOXX index, the EURO STOXX 50, the two-year Bund rate, the corporate bond spread, euro area HICP inflation and euro area industrial production. Panel b: results are based on a baseline model including the GPR index, the VSTOXX index, the EURO STOXX 50, the two-year Bund rate (extended to the USD/EUR exchange rate) and the oil price volatility index in separate estimations.
 *) See Caldara, D. and Iacoviello, M., op. cit.

⁹² Caldara, D. and Iacoviello, M., op.cit., find that the S&P 500 index falls by almost 5% after 12 months in response to a 2 standard deviation shock to the GPR index, with considerable diversity across industry lines.

⁹³ For instance, the Russian invasion of Ukraine triggered a large initial market reaction, yet many euro area financial markets recovered most of their initial losses after around a month.

Geopolitical risk can also have profound consequences for banks and non-banks. The following sections describe what can happen to banks and non-banks when geopolitical risk increases and presents empirical estimates of the magnitude of these effects.

Non-banks are among the first to feel geopolitical stress

Investors are exposed to geopolitical risk through their asset portfolios. The degree of vulnerability varies between the different industrial sectors and depending on firms' geographical location and trade links. Businesses related to transport, the aircraft industry and specific areas of manufacturing, such as steel, are most vulnerable to geopolitical risk.⁹⁴ Industries like technology and most types of manufacturing have an intermediate risk exposure, while the least exposed business lines include mining and consumer goods. Some sectors, such as fossil fuels, natural gas and defence, may even profit from geopolitical risk-related stress.

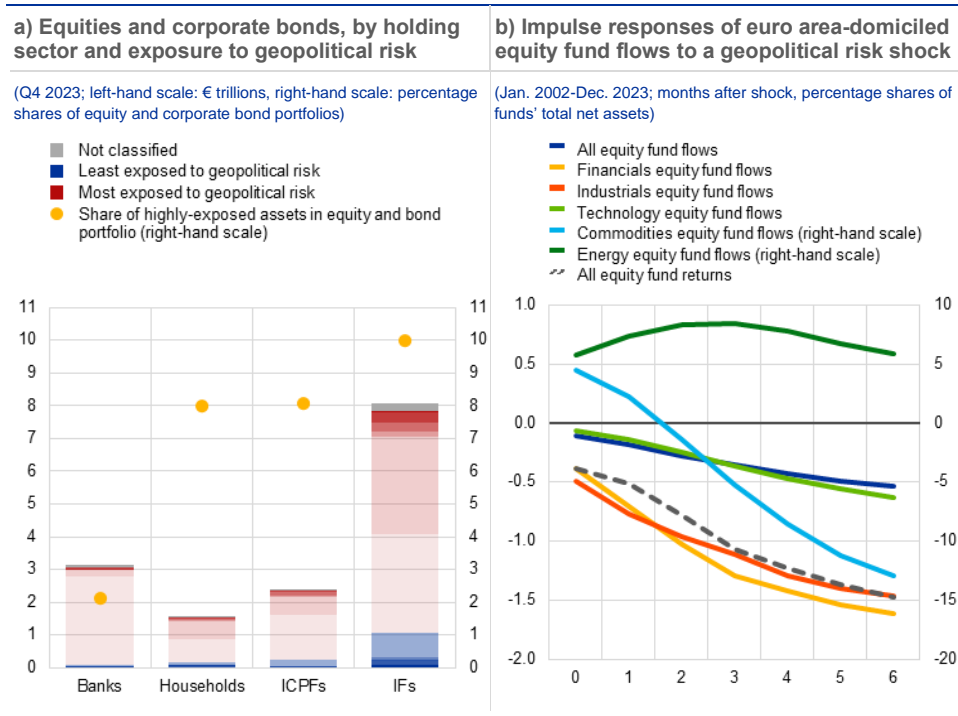
Stock and bond exposures to industries most vulnerable to geopolitical risk are concentrated among non-banks. This exposure makes them vulnerable to market risk since asset valuations tend to fall when adverse geopolitical events occur (**Chart A.2**, panel b). Credit risk could also materialise when real economic activity deteriorates after an adverse event (**Chart A.2**, panel a). Investment funds hold more than €8 trillion in corporate stocks and bonds, of which around 10% are invested in the most vulnerable industry categories (**Chart A.3**, panel a). Banks' holdings mainly consist of securities issued by other financial corporations – these are classified in the intermediate risk categories. Households' exposures are more limited in absolute terms. Such direct securities investments only make up a relatively small share of their total wealth that also includes real estate assets and bank deposits, among other things.

Investment funds' exposure to valuation losses and credit risk could exacerbate financial stress stemming from geopolitical tensions. Investment fund returns tend to fall after geopolitical shocks and can be subject to sizeable investor redemptions (**Chart A.3**, panel b). The latter may induce investment funds, especially those with small cash positions, to sell assets, exacerbating any initial pressure on asset prices and, as a result, firms' financing conditions. Equity funds experience sizeable and persistent outflows, although investors differentiate between fund types focusing on specific industries. Funds investing in financials and industrials, which include some of the sectors most heavily exposed to geopolitical risk, have immediate and persistent outflows (**Chart A.3**, panel b). At the same time, equity funds focusing on energy companies, and to a lesser extent commodities, receive strong inflows. This is consistent with the observation that the prices of fossil fuels and raw materials often rise when geopolitical tensions increase (**Chart A.1**).

⁹⁴ The classification is based on the response of the stock prices of different industry sectors to geopolitical shocks and is taken from Caldara, D. and Iacoviello, M., op. cit.

Chart A.3

Stocks and bonds of industries vulnerable to geopolitical risk are held by non-banks that could withdraw their funding quickly



Sources: ECB (SHS, CSDB), EPFR Global, Bloomberg Finance L.P. and ECB calculations.
Notes: Panel a: equity and corporate bond holdings of euro area investors at market value, classified into heatmap of SIC-classified industry sectors' exposure to geopolitical risk using stock returns following the methodology of Caldara and Iacoviello*. Most exposed sectors include transport, aircraft, steel works and electronics. Least exposed sectors include mining, petroleum and gas, defence and consumer goods. ICPFs stands for insurance corporations and pension funds; IFs stands for investment funds. Panel b: impulse responses to a 1 standard deviation global geopolitical shock (Caldara and Iacoviello*) based on a Bayesian vector autoregression model with monthly data from January 2002 to December 2023. All responses are based on separate models that include the GPR index, one category of cumulative flows into euro area-domiciled equity funds, the VSTOXX index, the EURO STOXX 50 and the two-year Bund rate. The shocks are identified using a Cholesky decomposition with geopolitical risk ordered first. All values statistically significant at levels of at least 10%. Estimation for industrials equity funds begins in March 2006 due to data availability.
*) See Caldara, D. and Iacoviello, M., op. cit.

Corporate bond funds are directly affected and experience both strong outflows and lower returns when geopolitical risk rises.

Interest rates on sovereign bonds fall mildly on impact, while corporate bond spreads tend to rise, pointing to reduced risk appetite in financial markets (Chart A.4, panel a). Bond yields tend to rise in the months following a shock, implying that financing conditions are deteriorating for both firms and governments (Chart A.2, panel b). Returns on both corporate and sovereign bond funds fall in the wake of a geopolitical shock because of the asset valuation losses caused by the shock (Chart A.4, panel b). Specifically, a 1 standard deviation shock decreases the returns of corporate and sovereign bond funds by almost 0.5 percentage points and 0.4 percentage points respectively after six months. At the same time, investors persistently withdraw from corporate bond funds, potentially forcing fund managers to sell assets.

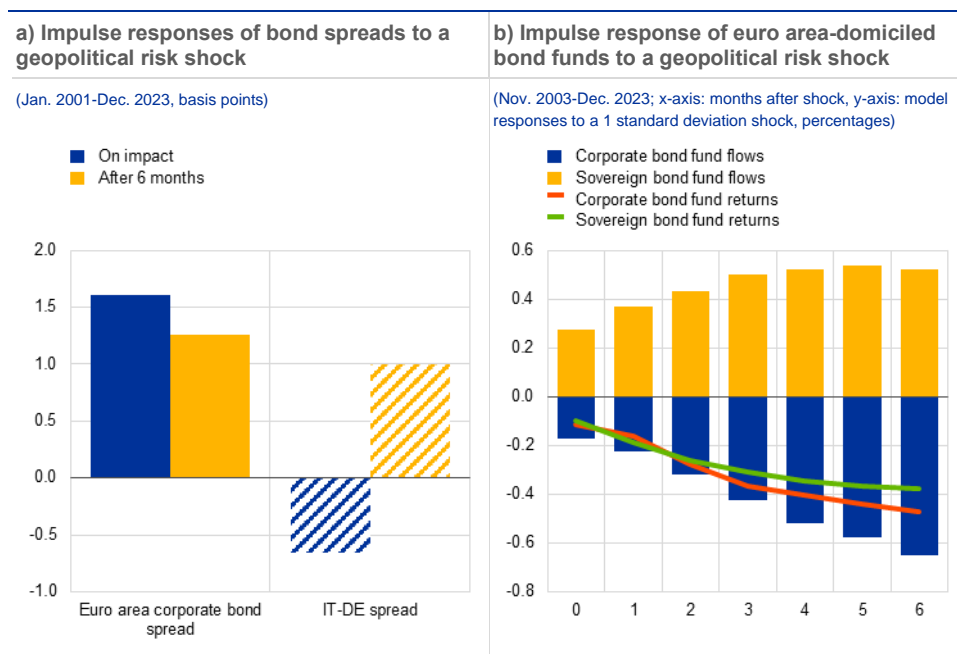
Sovereign bond funds receive sizeable inflows, pointing to flight-to-safety behaviour on the part of investors.

This could support government financing needs,

which often rise in the context of geopolitical tensions.⁹⁵ Interestingly, geopolitical stress does not lead to elevated fragmentation risks in euro area sovereign bond markets. Spreads between more and less indebted euro area sovereigns do not react significantly to geopolitical shocks (Chart A.4, panel a). Sovereign debt holdings of countries directly involved in conflicts could be subject to credit or repudiation risks if a belligerent decides not to honour its debt obligations to international investors, as was the case with Russian government debt during 2022.

Chart A.4

Geopolitical risk can trigger flight to safety and stress corporate bond markets



Sources: ECB (SHS, CSDB), EPFR Global, Bloomberg Finance L.P. and ECB calculations.
 Notes: Impulse responses to a 1 standard deviation global geopolitical risk shock (Caldara and Iacoviello*) based on a Bayesian vector autoregression model with monthly data. The shocks are identified using a Cholesky decomposition with geopolitical risk ordered first. All values are statistically significant at levels of at least 10%. Panel a: the model includes monthly observations from January 2001 to December 2023 for the GPR index, the VSTOXX index, the EURO STOXX 50, the two-year Bund rate, the European corporate bond market spread and the spread between ten-year Italian and German government bonds. Panel b: the model includes monthly observations from November 2003 to December 2023 for the GPR index, the VSTOXX index, the EURO STOXX 50, the two-year Bund rate and one category of cumulative returns or flows into euro area-domiciled bond funds, measured as a share of past total net assets.
 *) See Caldara, D. and Iacoviello, M., op. cit.

Geopolitical risk can also have adverse implications for banks

The vulnerability of euro area banks to geopolitical risk varies from institution to institution, depending on their actual exposure to adverse geopolitical developments.

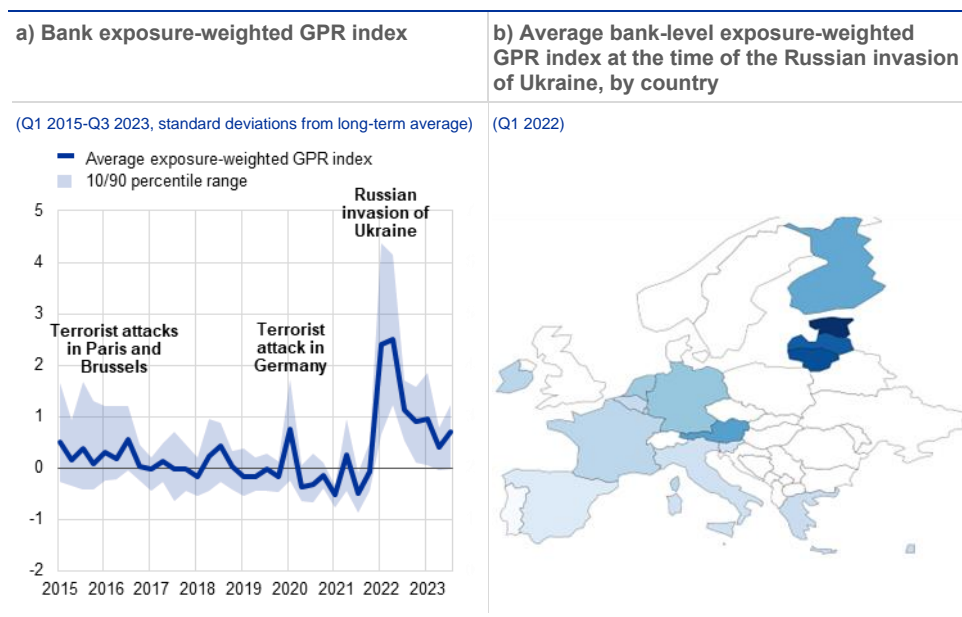
To evaluate the exposure of individual banks to geopolitical risk, we construct a new bank-level indicator of geopolitical risk which uses the GPR index and ECB supervisory data on banks' asset exposures across countries. More specifically, the new indicator is built by weighting the standardised country-level geopolitical risk indices with bank-level asset-side exposure to the different countries where banks

⁹⁵ Caldara, D. et al., op. cit., find that government debt and spending, including military expenditure, rise significantly after geopolitical risk materialises.

operate (Chart A.5, panel a).⁹⁶ The indicator exhibits significant variation and peaks around the start of the Russian invasion of Ukraine.⁹⁷ As expected, the peaks are especially high for banks operating in countries located closer to Ukraine and Russia as they face relatively higher levels of geopolitical risk (Chart A.5, panel b). The indicator exhibits other highs corresponding, for example, to the terrorist attacks in Paris in the third quarter of 2015, in Brussels in the first quarter of 2016 and in Germany in the first quarter of 2020.

Chart A.5

Euro area bank exposure to geopolitical risk spiked when Russia invaded Ukraine



Sources: ECB (supervisory data), Caldara and Iacoviello*, Factiva and ECB staff calculations.

Notes: The exposure-weighted bank-level GPR index is constructed by weighting the country-level GPR indices with bank-level asset-side exposure shares to different countries, obtained from ECB supervisory data. The GPR index is available at the country level for 44 countries (including eight euro area countries). To make the analysis more comprehensive, we use the same methodology and the Factiva news monitoring platform to extend the coverage of the index to all missing euro area and EU countries, meaning that the analysis considers a total of 62 countries. This ensures that for all 73 euro area significant institutions considered in our sample, at least 80% of their asset-side exposure is accounted for. Country-level GPR indices are weighted by asset-side geographical exposure shares divided by total assets. Moreover, to make levels more comparable across banks, we standardise the country-level GPR indices by transforming them into z-scores based on historical time series going back to 1985 (where available) before weighting them. Panel a: standard deviations for the GPR index are calculated in respect of the long-term average of the series (1985-2023). Panel b: darker colours indicate a higher average exposure-weighted GPR index for the country's significant institutions.

*) Caldara, D. and Iacoviello, M., op. cit.

Geopolitical risk events can have an adverse impact on bank credit default swap (CDS) spreads and stock prices. Bank-level estimations show that there is a positive and statistically significant relationship between the bank-level GPR index and the CDS spreads of euro area banks. By contrast, stock prices are affected negatively. More specifically, the estimated coefficients suggest that a 1 standard deviation increase in the bank-level GPR index is significantly associated with an increase in CDS spreads of 38 basis points and a decline in stock prices of around 6% (Chart A.6, panels a and b). These results are driven primarily by weakly capitalised and less-profitable banks. The finding is consistent with the theory of geopolitical risk

⁹⁶ The notes to Chart A.6 explain how the bank-level GPR index is constructed.

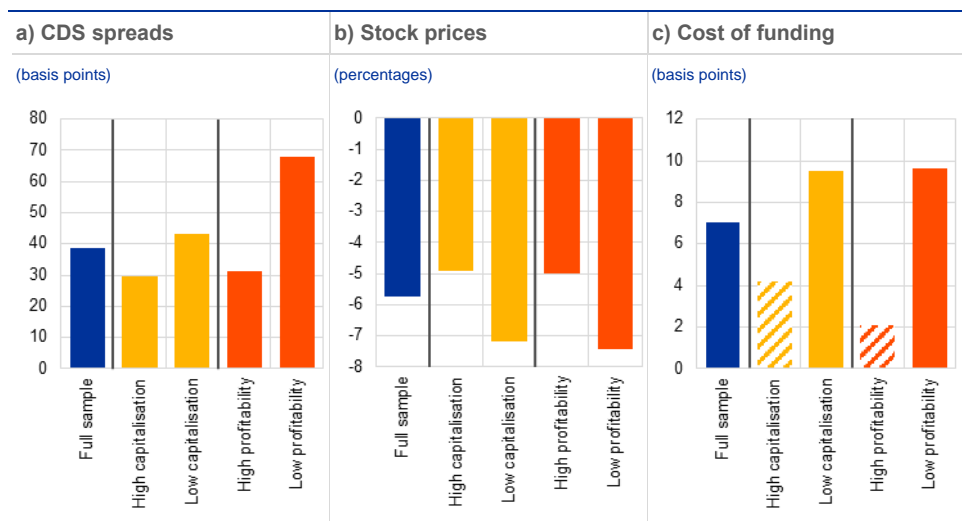
⁹⁷ On average, 65% of euro area significant institutions' asset exposures are domestic and the remaining 35% are foreign. Foreign exposures are divided into intra-euro area (40% of total foreign exposures) and extra-euro area (60% of total foreign exposures).

triggering risk aversion, causing investors to sell assets and demand a higher return for bearing the risk associated with certain banks, especially those perceived as less resilient to adverse shocks due to their weaker solvency and profitability.

The funding and liquidity positions of banks could also come under strain, undermining their stability.⁹⁸ Geopolitical tensions triggering a rise in risk aversion could lead to reduced funding (including cross-border credit), a higher cost of funding and greater recourse to short-term funding. These effects could also result in heightened rollover risk and potential liquidity stress. Empirical evidence shows that there is a positive and statistically significant relationship between the bank-level GPR index and the bond yields of euro area banks. A 1 standard deviation increase in the bank-level GPR index is associated with an increase of 7 basis points in bond yields (**Chart A.6**, panel c). This result is also driven by weakly capitalised and less-profitable banks.

Chart A.6

Greater market reaction to geopolitical risk for weakly capitalised and less-profitable banks



Sources: Eurostat and ECB (GFS, ICP, MNA), ECB (RTD, supervisory data), Bloomberg Finance L.P., LSEG, S&P Dow Jones Indices LLC and/or its affiliates, Caldara and Iacoviello*, Ahir et al.** and ECB staff calculations.
 Notes: Coefficient estimates indicate the effect on the dependent variable of a 1 standard deviation shock to the bank-level GPR index. Based on panel regressions on a sample of 34 significant institutions for CDS spreads, 31 institutions for stock prices and 37 institutions for cost of funding, from Q1 2015 to Q3 2023. The regressions control for lagged bank-level characteristics (equity/asset ratio, cost of risk, cost/income ratio, return on assets, total loans/deposits ratio) as well as the World Uncertainty Index⁹⁹ and country-level macroeconomic variables (real GDP growth, inflation rate, stock market index, one-year sovereign bond yields). Regressions control for bank fixed effects and time (quarter) fixed effects. The regressions also include a dummy for Greek banks in the period 2015-16. All coefficient estimates are statistically significant at levels of least 10%, except where shaded. For the sub-sample analysis, banks with an equity/asset ratio above the median are considered highly capitalised (with high profitability) while banks with an equity/asset ratio below the median are considered to have low capitalisation (low profitability).
 *) Caldara, D. and Iacoviello, M., op. cit.
 **) Ahir, H., Bloom, N. and Furceri, D., op. cit.

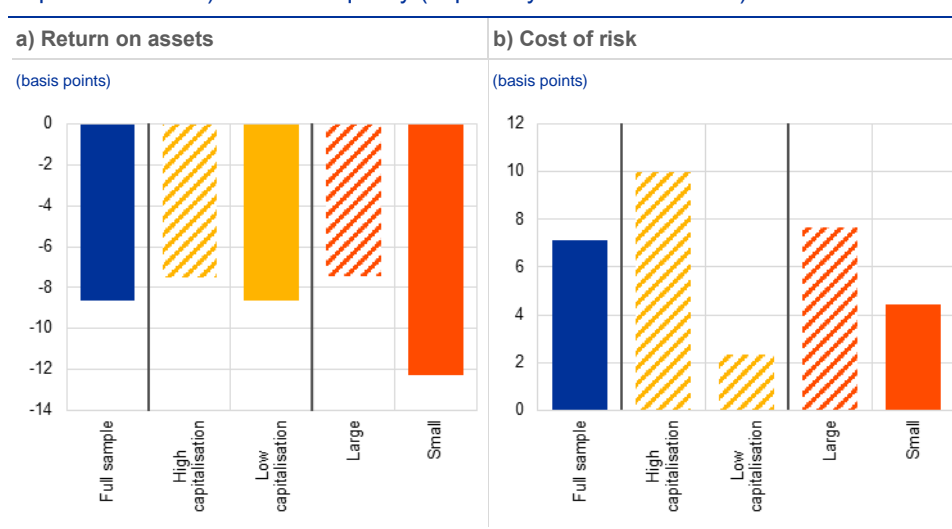
Banks may respond to geopolitical risk by raising lending rates and reducing risk by adjusting exposures and decreasing lending. Both credit supply and credit demand may be dampened by adverse macroeconomic developments caused by

⁹⁸ See Phan, D.H.B., Tran, V.T. and Iyke, B.N., "Geopolitical risk and bank stability", *Finance Research Letters*, Vol. 46, Part B, 2022, and Banna, H., Alam, A., Alam, A.W. and Chen, X.H., "Geopolitical Uncertainty and Banking Risk: International Evidence", *SSRN Working Paper*, No 4325966, 2023.
⁹⁹ See Ahir, H., Bloom, N. and Furceri, D., "The World Uncertainty Index", *Working Paper Series*, No 29763, National Bureau of Economic Research, 2022.

geopolitical risk. On the credit supply side, greater uncertainty may make banks less willing to lend to non-financial corporations and households.¹⁰⁰ On the credit demand side, households and corporations may be reluctant to take out loans or invest in times of elevated uncertainty. That said, the empirical evidence on the effect of geopolitical risk on bank lending is mixed. Some studies suggest that geopolitical risk is not associated with a reduction in overall bank lending.¹⁰¹ The effects on bank lending may also vary across sectors, as lending to households tends to be domestically focused while corporate lending may be targeted more towards export-oriented sectors. It may also be used to fund overseas investment or trade finance, and as such may be more exposed to foreign geopolitical risk. Banks' efforts to reduce exposure to those sectors most affected by geopolitical risk could act as headwinds to economic activity in these sectors. For instance, international trade could be curtailed if banks decided to limit the availability of trade finance or increase its cost.¹⁰²

Chart A.7

Geopolitical risk negatively affects bank profitability (especially for smaller and weakly capitalised banks) and asset quality (especially for smaller banks)



Sources: Eurostat and ECB (GFS, ICP, MNA), ECB (RTD, supervisory data), Bloomberg Finance L.P., LSEG, S&P Dow Jones Indices LLC and/or its affiliates, Caldara and Iacoviello*, Ahir et al.** and ECB staff calculations.

Notes: Coefficient estimates indicate the effect on the dependent variable of a 1 standard deviation shock to the bank-level GPR index. Based on panel regressions on a sample of 71 significant institutions from Q1 2015 to Q3 2023. The regressions control for lagged bank-level characteristics (equity/asset ratio, cost of risk, cost/income ratio, return on assets (ROA), total loans/deposits ratio) as well as the World Uncertainty Index and country-level macroeconomic variables (real GDP growth, inflation rate, stock market index, one-year sovereign bond yields). Regressions control for bank fixed effects and time (quarter) fixed effects. For regressions with the ROA as the dependent variable, the ROA is omitted as an explanatory variable. Similarly, for regressions with the cost of risk as the dependent variable, cost of risk is omitted as an explanatory variable. All coefficient estimates are statistically significant at levels of at least 10%, except where shaded. For the sub-sample analysis, banks with an equity/asset ratio (total assets) above the median are considered highly capitalised (large) while banks with an equity/asset ratio (total assets) below the median are considered to have low capitalisation (small).

*) Caldara, D. and Iacoviello, M., op. cit.

**) Ahir, H., Bloom, N. and Furceri, D., op. cit.

¹⁰⁰ See Ashraf, B.N. and Shen, Y., "Economic policy uncertainty and banks' loan pricing", *Journal of Financial Stability*, Vol. 44, 2019.

¹⁰¹ See Demir, E. and Danisman, G.O., "The impact of economic uncertainty and geopolitical risks on bank credit", *The North American Journal of Economics and Finance*, Vol. 57, 2021, and Niepmann, F. and Shen, L.S., "Geopolitical risk and Global Banking", mimeo, 2024.

¹⁰² See Niepmann, F. and Schmidt-Eisenlohr, T., "No guarantees, no trade: How banks affect export patterns", *Journal of International Economics*, Vol. 108, 2017, pp. 338-350.

The macroeconomic consequences of geopolitical risk could weaken bank asset quality. Slower economic growth could weaken the ability of borrowers to repay loans, thus leading to higher provisioning and more non-performing loans. For instance, there was a sharp increase in the average probability of default for bank loans to Russian and Ukrainian borrowers after Russia invaded Ukraine in 2022. Bank-level estimates show that increases in geopolitical risk result in weaker asset quality, measured by the cost of risk. The estimated coefficient suggests that a 1 standard deviation increase in the bank-level GPR index is associated with a 7 basis point increase in the cost of risk (**Chart A.7**, panel b). The asset quality results are driven by the increase in the provisions of smaller banks, which are generally less diversified internationally and have less opportunity to spread their risk if their domestic market is exposed to geopolitical risk.

Higher funding costs, weaker lending and a deterioration in asset quality arising from geopolitical risk could undermine bank profitability. A higher cost of funding could squeeze banks' net interest margins, while lower loan volumes could reduce interest income. Loan losses and valuation losses on asset holdings could also weigh on profitability.^{103,104} Bank-level estimates show that a 1 standard deviation increase in bank-level geopolitical risk is significantly associated with a decline in bank profitability, measured by return on assets, of 9 basis points (**Chart A.7**, panel a). This result is driven by weakly capitalised and smaller banks, as they would likely experience higher funding costs and a more marked deterioration in asset quality in times of heightened geopolitical risk.

Conclusions

Recent history suggests that geopolitical shocks alone are unlikely to cause a systemic crisis, but the latest developments call for heightened vigilance.¹⁰⁵

The major geopolitical risk events of recent decades, such as the 9/11 attacks, did not immediately trigger financial crises, even in the countries directly affected by the events. In this context, recent history may not be a good guide to the severity of future shocks. Geopolitical shocks may act as a trigger for systemic distress if they interact with pre-existing vulnerabilities. In particular, financial instability could arise if a combination of different factors materialises, such as (i) a very large shock, (ii) other sources of amplification, and (iii) strong contagion.

Geopolitical risk can have adverse implications for the resilience of financial institutions. Several academic and policy studies, as well as the empirical evidence reported in this special feature, suggest that the materialisation of geopolitical risk could have negative effects on the soundness of euro area banks and non-banks.

¹⁰³ Geopolitical risk could also increase the operational risks faced by banks. For instance, banks may be affected by the imposition of financial sanctions or legal requirements to seize foreign assets, while the risk of state-sponsored cyberattacks may increase.

¹⁰⁴ Hampered profitability could in turn contain bank capital accumulation, which would then lead to a lower supply of credit, dampening economic activity.

¹⁰⁵ See also Baron, M. and Dieckelmann, D., "Historical Banking Crises: A New Database and a Reassessment of their Incidence and Severity", in Schularick, M. (ed.), *Leveraged: The New Economics of Debt and Financial Fragility*, University of Chicago Press, 2021, pp. 209-226.

Geopolitical risk could result in significant outflows and falling returns from investment funds, among other things. Equally, geopolitical risk could lead to declining bank stock prices, widening CDS spreads and greater funding costs and provisioning needs for banks, which in turn would weigh on their profitability.

Policy authorities need to monitor geopolitical risk and assess its possible consequences for financial stability. Assessing these risks will enable policy authorities to enhance their ability to identify vulnerabilities, better understand how geopolitical events might propagate through the financial system and draw up possible policy responses in advance. This would facilitate a swift and coordinated policy response when needed and strengthen the overall resilience of the financial system.

Financial institutions should apply a combination of risk management strategies and business diversification to address geopolitical risk. First, institutions need to have robust capital adequacy and liquidity management frameworks in place to withstand shocks, including those arising from possible geopolitical risk events. Institutions should also set up dedicated teams or utilise specialised services to continuously monitor geopolitical developments. Such a proactive approach would allow them to anticipate risks and adjust their strategies accordingly. They should regularly assess their resilience to geopolitical risk by carrying out dedicated and thorough assessments and stress tests. Additionally, they could purchase political risk insurance to protect themselves against losses resulting from geopolitical events. Finally, financial institutions should develop robust contingency plans so that they can respond swiftly to unexpected events and minimise disruption to their operations.

B The rise of artificial intelligence: benefits and risks for financial stability

Prepared by Georg Leitner, Jaspal Singh, Anton van der Kraaij and Balázs Zsámboki¹⁰⁶

The emergence of generative artificial intelligence (AI) tools represents a significant technological leap forward, with the potential to have a substantial impact on the financial system. Conceptually, AI brings both benefits and risks to the financial system. Practically, the overall impact will depend on how the challenges related to data, model development and deployment are addressed – both at the level of financial institutions and for the financial system as a whole. If new AI tools are used widely in the financial system and AI suppliers are concentrated, operational risk (including cyber risk), market concentration and too-big-to-fail externalities may increase. Furthermore, widespread AI adoption may harbour the potential for increased herding behaviour and market correlation. Should concerns arise that cannot be tackled by the current regulatory framework, targeted initiatives may need to be considered.

Introduction

Since late 2022 public interest in AI has increased sharply, and the volume of AI-related jobs, innovations and patents is growing constantly. Google searches for AI-related terms have surged since the launch of ChatGPT. At the same time, the number of AI-related jobs, AI models and patents connected to AI is growing constantly. Most of the recently launched models are language or multimodal models, and in recent years Europe has had more people working in AI-related roles than the United States (**Chart B.1**). According to a recent study, 64% of businesses believe that AI will increase their productivity, while 40% of business owners are concerned about technology dependence.¹⁰⁷ Other estimates show that among industries globally, generative AI could add the equivalent of between USD 2.6 trillion and USD 4.4 trillion of economic value annually. Banking is expected to be a large beneficiary.^{108,109}

¹⁰⁶ With contributions from Nicola Doyle.

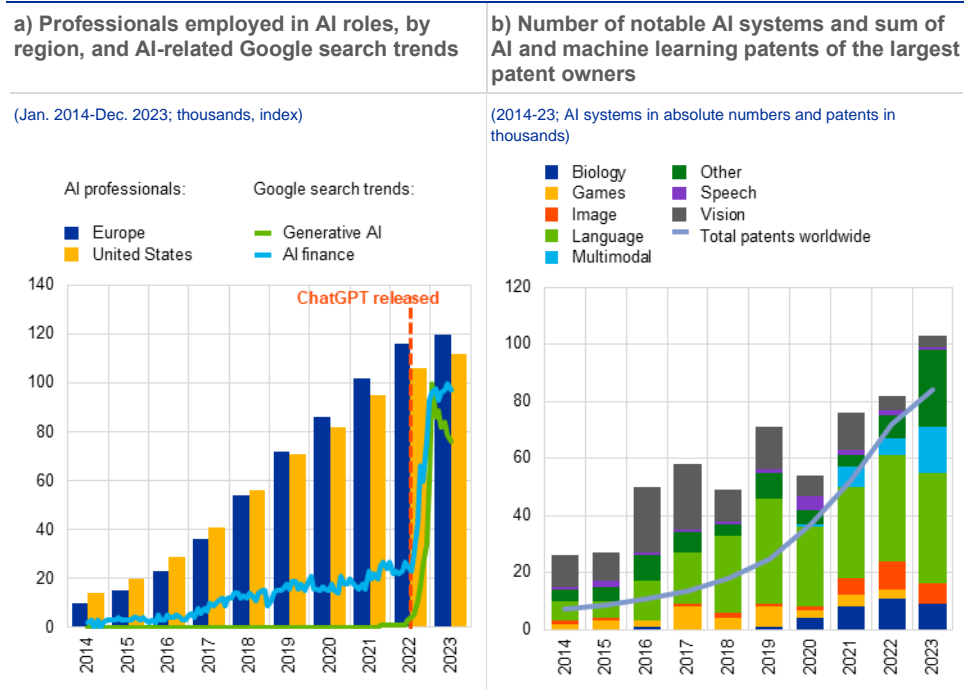
¹⁰⁷ Case study conducted among 600 business owners. See Haan, K., “[How Businesses Are Using Artificial Intelligence In 2024](#)”, Forbes Advisor, April 2023.

¹⁰⁸ See Kamalnath, V. et al., “[Capturing the full value of generative AI in banking](#)”, McKinsey & Company, December 2023.

¹⁰⁹ Banking is expected to have an annual potential of USD 200 billion to USD 340 billion of added economic value (equivalent to 9-15% of operating profits), largely from increased productivity. See Chui, M. et al., “[The economic potential of generative AI: The next productivity frontier](#)”, McKinsey & Company, June 2023.

Chart B.1

Attention on AI has spiked and AI-related jobs, innovations and patents are increasing



Sources: [Google Trends](#), [State of European Tech*](#), [Epoch**](#), [Statista***](#) and ECB calculations.

Notes: Panel a: Google search trends represent monthly global search interest relative to the highest point, indicated by the value 100 and for each search term. Figures on AI jobs comprise all companies, non-tech included, based on an analysis of the job titles of 216 million professionals. The universe of professionals considered to be actively employed in AI/ML roles is based on a search utilising both common job titles in the field (e.g. AI researcher, ML engineer) and key phrases used in job titles (e.g. deep learning). Panel b: patents are cumulative over the ten largest patent owners (one South Korean, two US and seven Chinese companies and institutions) in machine learning and AI worldwide from 2013 to 2022 and are lagged by one year in the plot "Number of notable AI systems". The authors of the Epoch dataset have established a set of criteria used to identify key AI systems which they refer to as "notable". Such systems must demonstrate the ability to learn, show tangible experimental results and contribute advancements that push the boundaries of existing AI technology. In terms of notability, the AI must have garnered extensive academic attention, evidenced by a high citation count, hold historical significance in the field, mark a substantial advancement in technology or be implemented in a significant real-world context. The authors recognise the difficulty of evaluating the impact of newer AI systems since 2020 given the fact that less data are available for the period. They therefore also employ subjective judgement when selecting recent developments.

*) "Embrace risk, shape the future", State of European Tech, 2023.

**) Epoch (2024) – with minor processing by Our World in Data. "Annual number of AI systems by domain" [dataset]. Epoch, "Parameter, Compute and Data Trends in Machine Learning" [original data].

***) Wunsch, N.-G., "Companies with the most machine learning & AI patents worldwide 2013-2022", Statista, April 2023.

The pace and scale of AI, like any sweeping innovation, is likely to bring benefits but could also pose risks for financial stability.

International standard-setters and regulatory authorities have intensified their efforts regarding the consequences of AI for the financial system.¹¹⁰ There is a broad consensus that the use of AI is associated with possible benefits for numerous sectors, including the financial sector. It is therefore no surprise that euro area banks are exploring and using innovative technologies such as AI to support their digital transformation

¹¹⁰ See, for example, Yong, J. and Preno, J., "Humans keeping AI in check – emerging regulatory expectations in the financial sector", *FSI Insights*, No 35, Bank for International Settlements, August 2021; "Artificial Intelligence and Machine Learning", *Discussion Paper*, No 5/22, Bank of England, October 2022; Shabsigh, G. and Boukherouaa, E.B., "Generative Artificial Intelligence in Finance", International Monetary Fund, August 2023; "Artificial intelligence and machine learning in financial services", Financial Stability Board, November 2017, and as part of the [FSB Work Programme for 2024](#), a follow up report on AI and their potential implications for financial stability. The EU is establishing the European Artificial Intelligence Board under the [Artificial Intelligence Act](#) and the [European AI Office](#); the United Nations has established an [AI Advisory Body](#); for the United States, see the [Select Committee on AI](#) and the [Executive Order on the Safe, Secure, and Trustworthy Development and Use of Artificial Intelligence](#).

(**Chart B.2**, panel b). At the same time, there could also be AI risks for financial institutions and, potentially, the wider financial system.

This special feature provides a conceptual framework for assessing the systemic implications of AI for the financial system. To this end, the feature first investigates how the benefits and risks for individual financial institutions using AI are related to the technological aspects of AI. Next, it assesses how these benefits and risks at the firm level could unfold at the macro level, potentially leading to implications for financial stability.

What is AI?

AI is a broad term including various sub-fields and technological concepts. AI comprises two broad strands (**Figure B.1**)¹¹¹: (1) data-driven machine learning systems; and (2) rule-based approaches such as deterministic chatbots, built on if/else instructions. Machine learning contains traditional statistical models and artificial neural networks. A hallmark of such networks is that they aim to replicate the learning process of the human brain. These models can capture non-linear properties of data and apply previously gained knowledge to new problems. Recently, the capabilities of artificial neural networks have been significantly boosted by increasing their complexity and training them on a vast amount of data. The rise of this new class of models, generally called foundation models,¹¹² was mainly enabled by the decreasing cost and increasing efficiency of computational power.¹¹³

Foundation models form a knowledge base for generative AI. These models are “trained” in a self-supervised¹¹⁴ manner on a vast amount of both structured (e.g. tables) and unstructured (images, sound, text) raw data with only minimal human intervention. In the pre-training phase, the model learns the fundamental structure (“ground truth”) of the data in a generic way, covering aspects like use of human language, recognition of objects and images, and numerical input. Generative AI models can make use of the generic knowledge of foundation models.¹¹⁵ A key feature of generative AI is its ability to produce unique output in the form of text, images and audio which share some properties of the input data but differ in others (generative capabilities). Most current generative AI models are based on text (large language models, or LLMs), thus eliminating the need for proficient coding skills to

¹¹¹ The overview aims to capture only the sub-fields of AI relevant for financial stability – it omits other sub-fields. Alternative approaches consider the two broad categories to be (1) weak AI or narrow intelligence (ANI), and (2) strong or general AI. (1) describes algorithms which are designed for a narrow task and try to mimic human behaviour. (2) defines algorithms which match and exceed human intelligence. There is a broad consensus that all AI technologies are currently weak AIs.

¹¹² See Bommasani, R. et al., “[On the Opportunities and Risks of Foundation Models](#)”, ArXiv, Cornell University, 2021. The definition of foundation models is based on the author’s definition.

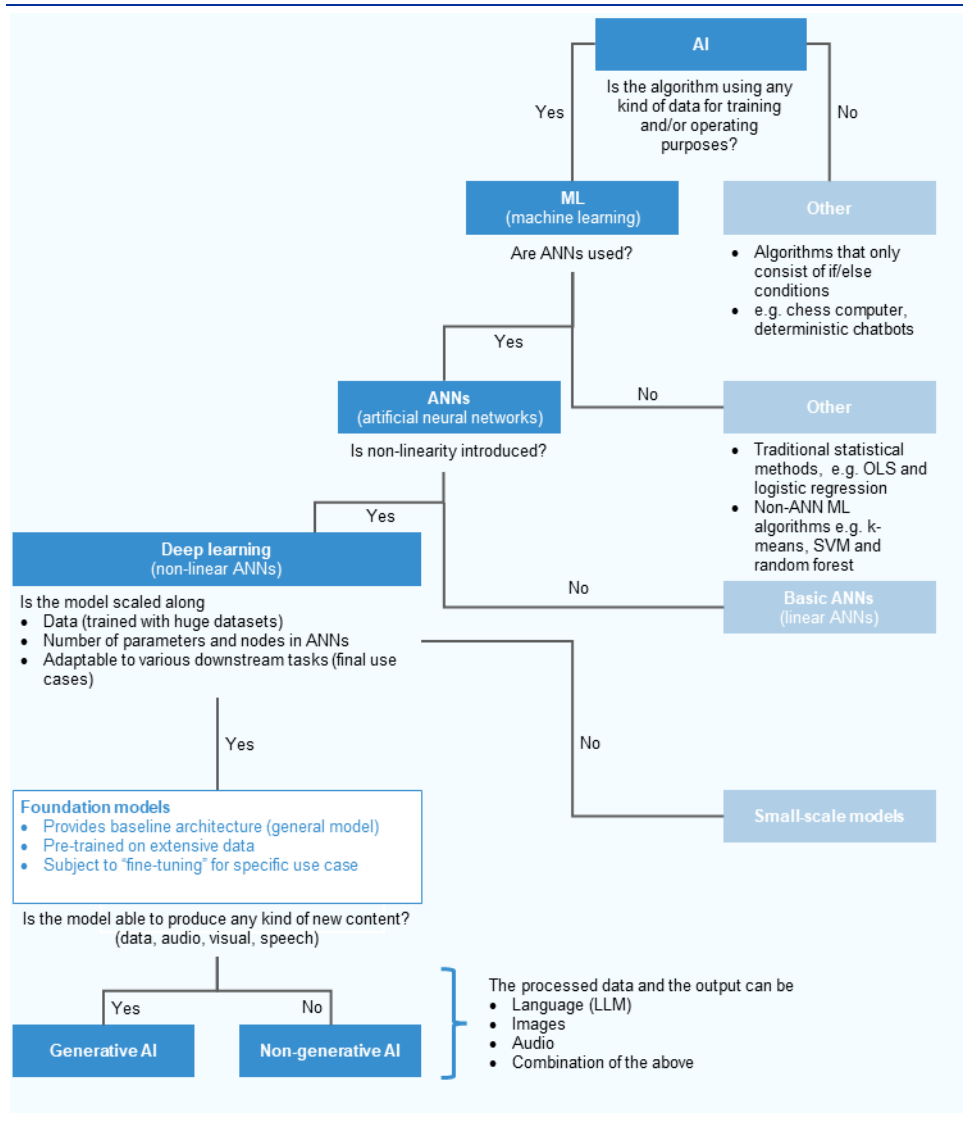
¹¹³ See Paunov, C. et al., “[On the concentration of innovation in top cities in the digital age](#)”, *OECD Science, Technology and Industry Policy Papers*, OECD, December 2019.

¹¹⁴ Self-supervision in machine learning utilises unlabelled data. Unlike labelled data, which provide indicators for predictions, unlabelled data lack these labels. Algorithms employing self-supervision initially discern patterns and structures in unlabelled data, then proceed to label the data themselves.

¹¹⁵ The pre-training on vast amounts of data is used to pre-calibrate the weights in the artificial neural network. The pre-calibration defines the “knowledge” of the artificial neural network (the foundation model) and can be used for generative AI models serving different specific downstream tasks.

modify or use them. The performance of foundation models can be enhanced by providing additional training on task-related data (fine-tuning) or by embedding additional tools like search engines.

Figure B.1
Systematic overview of AI and sub-fields



Source: ECB analysis.

Notes: This chart shows a possible systematic overview of AI and its sub-fields to facilitate understanding and distinguish different sub-fields of AI. Although its purpose is to facilitate an understanding and an evaluation of the impact of AI on financial stability, the overview could be extended to a more granular level for other use cases (e.g. distinguishing AI in machine learning, robotics, vision etc.). There is no clear scientific taxonomy of AI and its sub-fields at this stage, but this chart represents a possible classification, which is in line with scientific discussions and approaches. For the distinction between AI and machine learning, see Das, S. et al. "Applications of Artificial Intelligence in Machine Learning: Review and Prospect", *International Journal of Computer Applications*, Vol. 115, No 9, 2015. The paths from machine learning, artificial neural networks (ANNs) and deep learning mostly follow the definition found in Montesinos, L. et al., "Fundamentals of Artificial Neural Networks and Deep Learning", *Multivariate Statistical Machine Learning Methods for Genomic Prediction*, Springer, Cham, 2022. For the definition of foundation models and their connection to generative AI, see, for example, Bommasani, R. et al., "On the Opportunities and Risks of Foundation Models", ArXiv, 2021.

Henceforth, when discussing AI we will generally refer to foundation models and generative AI. Foundation models and the generative AI models based on such models add new aspects to consider when assessing implications for the financial system. Therefore, this discussion focuses explicitly on these models.

Although AI has made significant progress, its cognitive limits should be acknowledged. Generative AI models have been referred to as “stochastic parrots”.¹¹⁶ The language they generate is often hard to distinguish from human interaction, yet in essence it is the outcome of a stochastic process that combines text based on probabilistic information. The term artificial intelligence may thus be a misnomer as it suggests “intelligence”, whereas in fact the model does not fundamentally understand the underlying logic of the text.¹¹⁷

Benefits and risks of AI for financial institutions

It is challenging to establish a comprehensive assessment of the implications of AI for the financial system as the technology is still evolving. Accordingly, any discussions of the benefits, risks and systemic consequences of AI are largely based on conjecture. That said, a preliminary view can be drawn from the latest trends, concepts and debates in publications, industry reports and ECB market intelligence reports.¹¹⁸

The benefits and risks of AI depend on the use case. The development and deployment cycle (**Figure B.2**) establishes a conceptual framework for a structured assessment of the benefits and risks stemming from AI at the level of individual financial firm. Three main building blocks are required to apply AI to a specific use case: training data, the model itself and the deployment or implementation of the tool.

Although AI greatly enhances the processing and generation of data, it may be prone to significant data quality issues. AI systems based on foundation models can process and analyse unstructured data beyond numerical input. These data include text, computer code, voice and images. AI can also be used to manage and create data.¹¹⁹ However, the way foundation models are trained means that they may be more likely to “learn” and sustain biases or errors inherent in the data they have been trained on. Hence, foundation models may be prone to data quality issues.¹²⁰ One additional challenge concerns data privacy, notably whether publicly available systems respect user input data privacy (which could, for instance, also be confidential firm-specific information) and whether there is a risk of data leakage.

¹¹⁶ See Bender, E.M. et al., “[On the Dangers of Stochastic Parrots: Can Language Models Be Too Big?](#)”, Proceedings of the 2021 ACM Conference on Fairness, Accountability, and Transparency, March 2021, pp. 610-623.

¹¹⁷ See Perez-Cruz, F. and Shin, H.S., “[Testing the cognitive limits of large language models](#)”, *BIS Bulletin*, No 83, Bank for International Settlements, January 2024. The analysis suggests that caution should be exercised in deploying LLMs in contexts that demand rigorous reasoning in economic analysis.

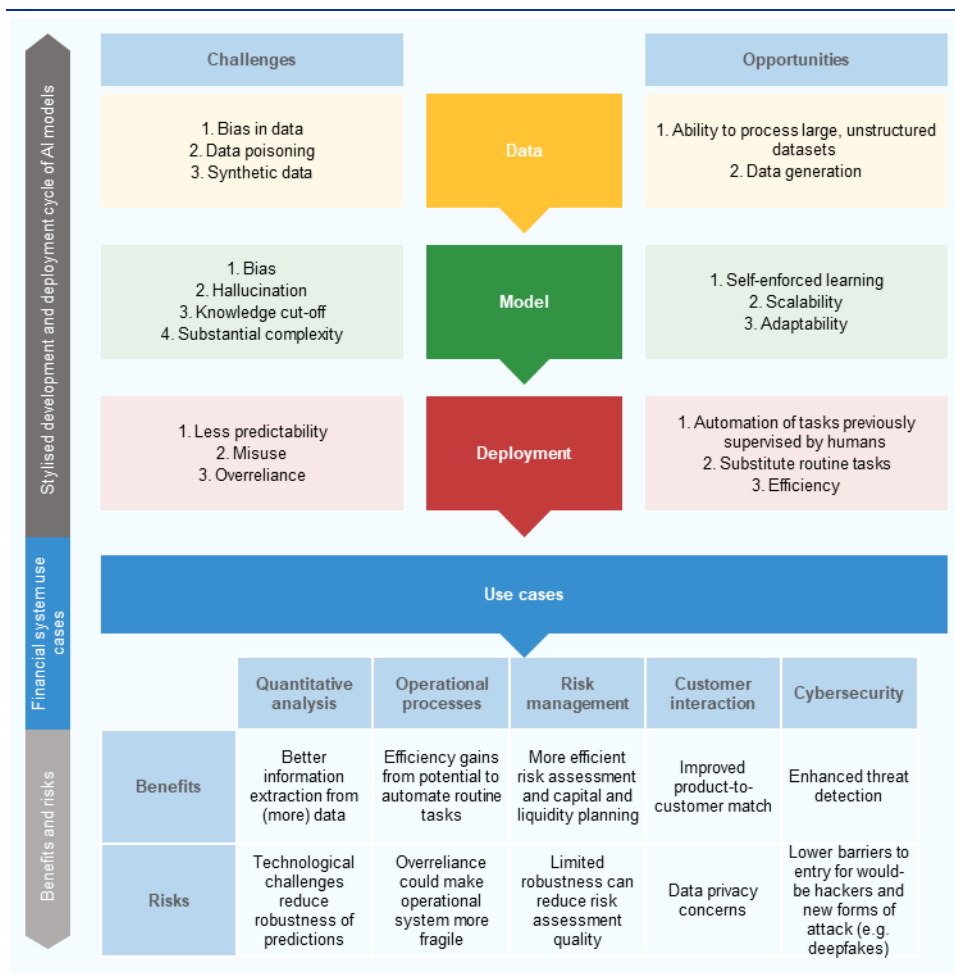
¹¹⁸ For further considerations, see among others Shabsigh, G. and Boukherouaa, E.B., op. cit.; Anderljung, M. et al., “[Frontier AI Regulation: Managing Emerging Risks to Public Safety](#)”, ArXiv, Cornell University, November 2023; Bommasani, R. et al., op. cit.; Yong, J. and Prenio, J., op. cit.; “[Artificial Intelligence and Machine Learning](#)”, Bank of England, October 2022; “[Artificial intelligence and machine learning in financial services](#)”, Financial Stability Board, November 2017; and Loric, B. “[Generative AI in Finance: Opportunities & Challenges](#)”, Gradient Flow, August 2023.

¹¹⁹ This could entail the creation of not only synthetic data – which could make the training of new models more affordable – but also measured data.

¹²⁰ In general, any AI output drawn from a data-based application depends on the quality of the data. If AI models, including machine learning and deep learning models, rely heavily on data that are biased, incomplete or contain errors, then the AI model will likely produce unreliable or biased results.

Figure B.2

The AI development and deployment cycle – a conceptual framework for a structured assessment of the benefits and risks to financial system



Source: ECB analysis.

Notes: The first part of Figure B.2 describes the different phases in the development and deployment of an AI system, mentioning possible opportunities and challenges. opportunities and challenges are inherited throughout the phases and only take specific form in terms of benefits and risks, depending on the final use case. The table showing use-case-specific benefits and risks could change in the future, depending on technological developments and how institutions use the technology.

AI models are adaptable, flexible and scalable, but prone to bias, hallucination and greater complexity, which makes them less robust. The general-purpose base architecture of AI can be fine-tuned to perform more specialised tasks. This can be achieved by training the model on specific data, for instance. This feature significantly enhances a model’s capabilities in a targeted area while retaining its overall generative capabilities. AI is thus adaptable and scalable for different use cases.¹²¹ That said, AI is prone to algorithmic bias, whereby the model systematically favours certain outcomes which have inequitable results. It may also present false or misleading information as facts – known as “hallucinations”.¹²² As recent AI models

¹²¹ See Bommasani, R. et al., op. cit. The authors extensively discuss and explain the adaptable, flexible and scalable features of AI.

¹²² Some studies find factual errors in up to 46% of generated outcomes. See, for example, de Wynter, A. et al., “An evaluation on large language model outputs: Discourse and memorization”, *Natural Language Processing Journal*, Vol. 4, September 2023.

are much more complicated than traditional models, it is very difficult for humans to comprehend and reconstruct the predictions made.¹²³ Furthermore, as AI may not be trained on the most recent information available, its capabilities may be limited by a technological knowledge cut-off. Together, these challenges strongly limit the robustness of AI predictions.

When deployed, AI can increase efficiency, but its performance is difficult to predict and subject to possible misuse or overreliance. Thanks to AI's inherent flexibility, it is expected that financial institutions will be able to deploy AI tools in a large variety of use cases, including tasks that have so far been performed by human labour. This is likely to result in greater efficiency and significant cost savings. At the same time, such deployment in new tasks and processes presents a risk, as it is difficult to predict and control ex ante how AI will perform in practice. AI systems can develop unexpected, potentially harmful capabilities when applied to new use cases.¹²⁴ Furthermore, it is not inconceivable that AI could be misused in a harmful manner. For example, criminals could fine-tune and spoil otherwise harmless AI for specific operations (e.g. cyberattacks, misinformation, market manipulation, use of deep fakes to undermine confidence in a financial institution, etc.), increasing their threat potential.

Financial institutions can be expected to deploy AI in several ways. In view of the enhanced capabilities of AI and the wealth of data available for financial institutions from which predictions can be made or new information generated, AI models could be usefully deployed in quantitative analysis, operational processes, risk management, client interaction and cybersecurity, among other areas. Given the rapid developments in these areas, the suggested conceptual framework does not exclude possible further use cases or alternative classifications.

AI may improve the processing of information and the accuracy of quantitative predictions, but the robustness of its predictions remains a challenge. AI's flexibility in analysing various forms of input data, together with its generative and predictive capabilities, will allow financial institutions to use it for data management, data creation and assessment functions. As such, AI could be used to systematically extract and prepare information in real time from various sources simultaneously (media, industry reports, conversations, market data, etc.) that can be used to form predictions. This could significantly improve the available information, leading to more precise decision-making and hence better outcomes (e.g. in trading, asset allocation, etc.). However, hallucination, algorithmic bias and vulnerability to data quality issues present risks to the accuracy of AI predictions. If financial entities base their decisions on faulty AI predictions which are not checked, this could lead to outcomes that may

¹²³ Often referred to as AI's black box problem (see "[AI's mysterious 'black box' problem, explained](#)", University of Michigan-Dearborn, 6 March 2023). This further relates to a more fundamental discussion on the trade-off between accuracy and explainability. More complex model structures may achieve more accurate predictions which are, however, difficult to explain. On the other hand, simpler models can be more transparent, although they may be less accurate.

¹²⁴ AI system capabilities might depend on the concrete deployment of foundation models. Post-deployment enhancements, such as fine-tuning or allowing models to use external tools (like internet connection), can reveal new capabilities that are potentially dangerous or unexpected. See, for example, Anderljung, M. et al., op. cit.

result in economic losses or even disorderly market moves. Furthermore, the complexity of AI could make it difficult to identify the root cause of errors or explain and justify any decision based on AI.¹²⁵

AI may improve the efficiency of financial institutions' operational processes, but operational risk and third-party dependence may increase. AI could be applied in various internal operational processes. These could range from co-piloting functions that automatically proofread or complete drafting text or coding, to more sophisticated algorithms (e.g. chatbots or digital assistants) that can automate routine tasks or entire workstreams.¹²⁶ These applications would free up human resources, improve cost structures and potentially reduce human-induced error. On the other hand, data-, model- and deployment-related challenges may undermine AI's robustness and, if AI is used to back up critical operational processes, this could significantly increase operational risk. Furthermore, depending on whether financial institutions have the in-house capacity to develop foundation models, the base architecture may need to be acquired from external companies. This will increase third-party reliance and could also raise data privacy concerns if the models provided by third parties are fine-tuned using confidential internal data (e.g. internal records, financial statements, etc.).

AI could enhance the risk management functions of financial firms, but could also weaken them if its predictions prove unreliable. Risk management functions could be seen as sub-groups of the areas of quantitative analysis and operational processes. AI in this domain could be used for fraud detection and monitoring (e.g. for anti-money-laundering purposes), for capital and liquidity risk monitoring and planning, and for regulatory compliance.¹²⁷ The considerations that apply to any AI-based quantitative analysis in terms of expected benefits and risk similarly apply to its deployment in risk functions. AI could enhance risk management capabilities, leading to more accurate risk assessment and predictions and more efficient capital and liquidity planning. At the same time, algorithmic bias, hallucination and other challenges could make institutions' risk assessments that rely on AI less reliable and robust. Any benefits or risks that can be implied from AI use in risk management will have direct implications for the resilience of the financial sector from a prudential point of view, necessitating close monitoring by all stakeholders, including financial institutions' management bodies and supervisory authorities.

AI in customer-facing operations may improve the product-to-customer match, but its use could also lead to customer discrimination if it goes unchecked. It is expected that AI will unlock multiple new applications in customer-facing activities. These could be in communication, onboarding and complaints management (e.g. using automated chatbots), advisory functions (e.g. using digital assistants/robo-advisors) or for customer segmentation and targeting. AI will be able

¹²⁵ This also raises the question of who is accountable in the event of a malfunction with unforeseen consequences.

¹²⁶ Examples could include the gathering and documentation of information for internal reporting purposes, complaints management, legal assistance, HR processes, staff training, IT support lines, etc.

¹²⁷ This also includes applications used by institutions to facilitate regulatory compliance (regtech), but supervisory authorities may also enhance supervision processes with AI (suptech).

to better analyse a variety of customer-related data which could lead to better tailored products and services. This could improve financial institutions' product-to-customer match, increasing economic efficiency for both the institution and the customer.¹²⁸ However, algorithmic bias may lead to discriminatory customer treatment and be difficult to identify and monitor. Furthermore, the issue of data leakage is particularly sensitive in the case of AI trained on customer-specific data, raising consumer protection considerations, and could also expose institutions to increased reputational or legal risk.

Financial stability implications of AI

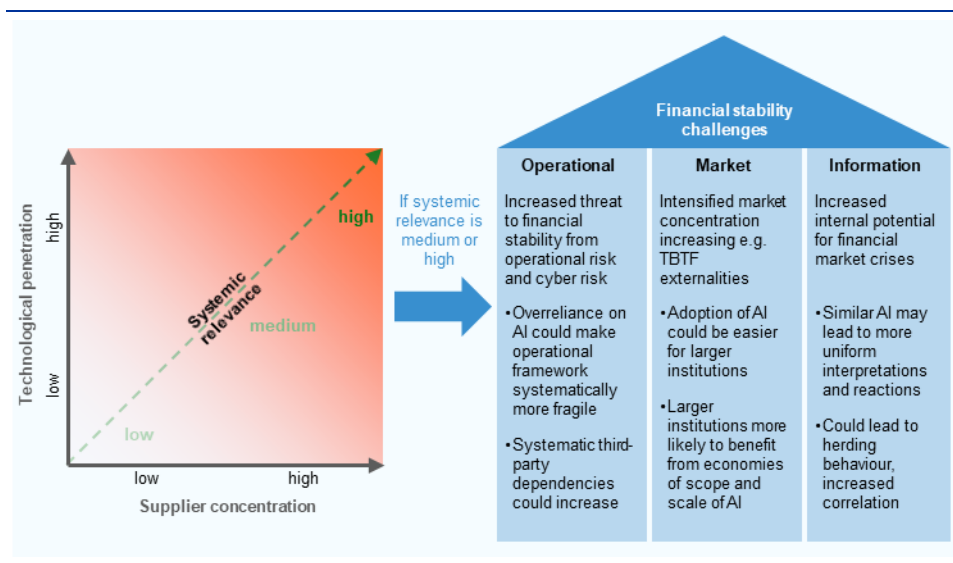
The implications of AI for individual firms can become amplified to a systemic level through technological penetration and supplier concentration. There are two systemic amplifiers through which the implications of AI for single firms could become systemic. The first amplifier is technological penetration. If AI is widely adopted across different financial entities for an increasing number of processes and applications, more areas of the financial system will be affected by the challenges and opportunities associated with AI. The second amplifier is supplier concentration.¹²⁹ If a majority of financial institutions use the same or very similar foundation models provided by a few suppliers, it is likely that decisions based on AI will suffer from similar biases and technological challenges, and reliance on system providers will increase. The interplay between these two dimensions will determine whether or not the benefits and risks stemming from use cases at individual institution level become systemic (left side of **Figure B.3**).

Financial stability could be at risk if supplier concentration and technological penetration are high. On the one hand, if only a few institutions use AI and there are a large number of different providers of the technology, risks may occur at the micro level, depending on the use cases of individual institutions. On the other hand, if technological penetration and supplier concentration are high, any risk from AI that is relevant at the micro level could be amplified and lead to financial stability consequences. The transition from micro to macro could be gradual, but not necessarily linear.

¹²⁸ Overall efficiency could be increased not only by financial institutions deploying AI but also by customers themselves relying on third-party AI advisors to find the cheapest financial products from different providers, for instance. This greater transparency could translate into lower margins for banks but higher overall efficiency.

¹²⁹ Supplier concentration on the AI market can be seen as a result of rising oligopoly-like structures, which can already be observed e.g. on the market for cloud computing providers. See Narechania, T. N., and Sitaraman, G., "An Antimonopoly Approach to Governing Artificial Intelligence", *Vanderbilt Law Research Paper*, No 24-9, November 2023 and Joy, M., "How Cloud Computing Companies Created an Oligopoly", OnSIP, May 2021

Figure B.3
Systemic amplifiers of AI and financial stability challenges



Source: ECB analysis.

Notes: The left side of the chart shows how the interplay between the widespread use of AI (technological penetration) and supplier concentration of AI models can raise institution-level benefits and risks, as described in Figure B.2, to a systemic level. Different combinations result in different levels of systemic relevance. Systemic relevance increases with technological penetration and supplier concentration, but not necessarily on a straight-line basis. For illustration purposes, it has been shown as linear here. If systemic relevance is given, then institution-specific benefits and risks can result in financial stability challenges, which can broadly be categorised into three buckets. Given the future technological development and use of AI by financial institutions, other financial stability consequences could arise through these three main channels. The risks listed above may be even larger for proprietary and non-auditable systems.

Overreliance and a limited number of AI suppliers may make the operational backbone of the financial system more fragile. To leverage potential efficiency gains, financial institutions may increasingly substitute AI resources for human resources, potentially inducing an overreliance on AI in core functions that could render the financial system more vulnerable to inherent operational flaws and failures or cyberattacks. Both would be amplified if the number of AI suppliers is limited, as this would additionally increase the financial system’s dependency on third-party providers and introduce single-point-of-failure risks. This constitutes a potential threat to financial stability from the perspective of operational risk and cyber risk (**Box A**).

The widespread adoption of AI may increase market concentration in the financial services industry. The integration of AI into business structures may require large initial fixed investments and entail economic risks. It may be easier for larger firms with well-established data infrastructure and third-party networks to obtain the requisite technological knowledge and levels of data availability. Accordingly, some financial institutions may miss the transition or be unable to make the necessary investments, ending up permanently behind and dropping out of the market. Like other information technology, AI may prove to be a winner-takes-all market. AI may thus contribute to a further shift in market power amid an increasingly digitalised environment, leading to a higher concentration in the financial system, among either existing players or new players (e.g. from the technology industry). Ultimately, this

could result in fewer institutions remaining on the market, accelerate too-big-to-fail externalities¹³⁰ and transfer economic rents from consumers to financial institutions.

AI may distort the information processing function of markets, increasing financial markets' endogenous crisis potential. Conceptually, AI can be thought of as a filter through which information is gathered, analysed and assessed. The interpretation of information may become more uniform if increasingly similar models with the same embedded challenges and biases are widely used to understand financial market dynamics. As a result, AI may make market participants' conclusions systematically biased, leading to distorted asset prices, increased correlation, herding behaviour or bubbles. Should many institutions use AI for asset allocation and rely only on a few AI providers, for example, then supply and demand for financial assets may be distorted systematically, triggering costly adjustments in markets that harm their resilience. Similarly, extensive use of AI by retail investors may result in large and similar shifts in retail trading patterns, which would increase volatility in market sentiment, trading volumes and prices.

It is difficult to predict what level of technological penetration and supplier concentration AI will reach in the financial system. Just over half of the investment in AI firms was in four companies (**Chart B.2**, panel a), indicating a high degree of supplier concentration. Whether AI will be widely used in the financial system will depend on the expected benefits and return on investment.¹³¹ A survey of banks supervised by the ECB indicates that the majority of banks are already using traditional AI systems (**Chart B.2**, panel b).¹³² ¹³³ ECB market intelligence suggests, however, that the use of generative AI is still in the early stages of deployment. Market contacts indicate that euro area financial institutions may be slower to adopt generative AI, given the range of previously discussed risks,¹³⁴ making the decision to be an early adopter or follower more complex in finance than in other sectors, also considering potential reputational risks. In addition, the technological adoption strategy implies a complex trade-off between partnering with external suppliers (including big tech firms as opposed to smaller start-ups) and establishing in-house AI expertise. The latter may become more feasible if more AI base architecture becomes available as open source. Ultimately, it is these decisions that will determine the levels of technological penetration and supplier concentration.

¹³⁰ See, for example, Bernanke, B.S., “[Causes of the Recent Financial and Economic Crisis](#)”, Testimony, Federal Reserve, September 2010, who defines the too-big-to-fail externality like this: “A too-big-to-fail firm is one whose size, complexity, interconnectedness, and critical functions are such that, should the firm go unexpectedly into liquidation, the rest of the financial system and the economy would face severe adverse consequences.”

¹³¹ According to an ESMA study, market participants in the euro area are increasingly using AI in investment strategies, risk management, compliance, data analysis and post-trade processes. See “[Artificial intelligence in EU securities markets](#)”, *ESMA TRV Risk Analysis*, ESMA, 1 February 2023.

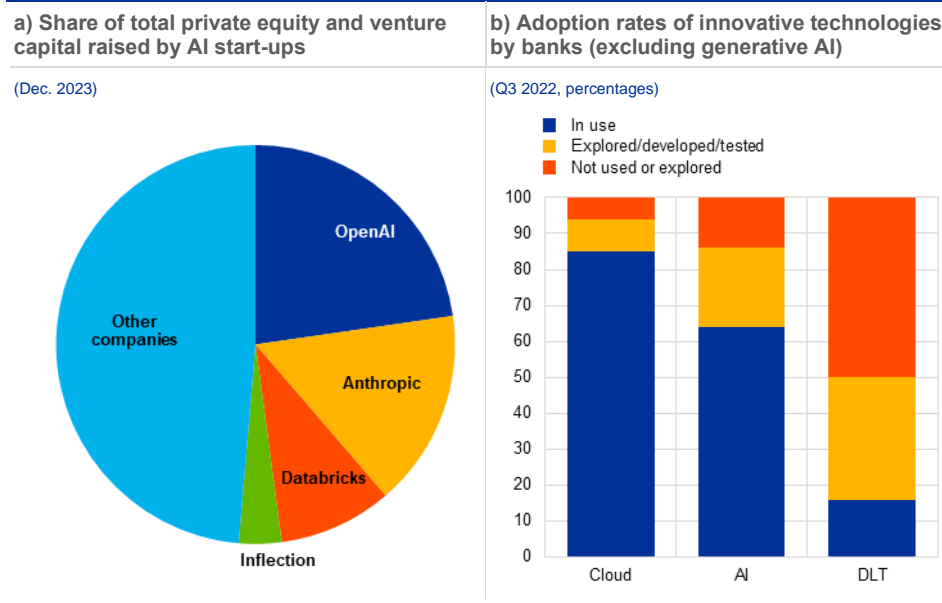
¹³² See “[Banks' digital transformation: where do we stand?](#)”, *Supervision Newsletter*, ECB, February 2023.

¹³³ This survey does not capture generative AI tools based on foundation models.

¹³⁴ From a financial stability perspective, concerns centred in particular on concentration risk arising from the limited number of vendors possessing the capabilities and technology to provide generative AI solutions, the scale of investment required (which some felt could favour large incumbents), data protection, the clustering of decision patterns, herding behaviour and cybersecurity.

Chart B.2

Investments in AI start-ups are concentrated among a few companies and European banks are already relying on traditional AI



Sources: ECB and PitchBook Data, Inc.

Notes: Panel a: shares represent the total amount of private equity and venture capital raised by individual AI start-ups to December 2023. Only AI start-ups that are actively financed with private equity or venture capital, raised at least €100 million and are classified by PitchBook as working on horizontal platforms are considered. PitchBook's definition of horizontal platforms is as follows: "Horizontal platforms empower end users to build and deploy AI&ML algorithms across a variety of use cases. Some horizontal platforms are used to improve AI&ML algorithms but do not use AI&ML themselves." 175 start-ups are grouped together under "Other companies". The total capital raised also includes financing before the recent innovations around generative AI, meaning that the concentration shown can be seen as a lower limit of concentration among generative AI and foundation model suppliers, as the largest and explicitly named companies work on generative AI. Panel b: Cloud comprises migration/IT optimisation and data platforms using software-as-a-service (SaaS) solutions; AI comprises chatbots, credit scoring and algorithmic trading; DLT (distributed ledger technology) comprises trade finance (smart contracts) and settlements including custody of crypto-assets and tokenisation of traditional financial instruments. The data are drawn from the ECB's horizontal assessment of the survey on digital transformation and the use of fintech, conducted with all banks supervised by the ECB.

Conclusion

AI may bring benefits and risks at the financial institution level as well as for the entire financial system. The significant technological leap forward in the domain of AI may be a driver of economic progress that benefits consumers, businesses and the economy as a whole. AI can increase the efficiency of financial intermediation via faster and more comprehensive information processing that supports decision-making, which may strengthen the financial system and contribute to financial stability as well. At the same time, the technological challenges associated with AI limit its robustness and increase risks related to bias, hallucinations or misuse. These may distort financial market outcomes, impair the robustness of the operational framework or systematically bias information processing and institutions' risk management or decision-making.

The systemic implications of AI will depend on the levels of technological penetration and supplier concentration, which are difficult to predict. AI

technology and its usage in the financial sector is still evolving. Furthermore, additional considerations, such as the broader macroeconomic and climate-related effects of AI as well as the moral and ethical aspects of the (mis-)use of AI, need to be

explored further. The latter could have an impact on public trust in financial intermediation, which is a cornerstone of financial stability. Therefore, the implementation of AI across the financial system needs to be closely monitored as the technology evolves. Additionally, regulatory initiatives may need to be considered if market failures become apparent that cannot be tackled by the current prudential framework.¹³⁵

Box A

The implications of artificial intelligence for cyber risk: a blessing and a curse

Prepared by Sándor Gardó, Benjamin Klaus, Luca Mingarelli and Jonas Wendelborn

Cyber incidents can pose systemic threats to the financial system. Systemic events can arise if many institutions are affected at the same time (e.g. when a widely used program or service provider is involved) or an incident at one entity propagates to the broader system via financial, operational or confidence channels.¹³⁶ As digitalisation progresses, potentially driven further by the rise of artificial intelligence (AI), additional layers of interdependence between financial firms, digital service providers and software vendors may emerge and may act as propagation channels for cyber incidents. As such, there has been a marked increase in the number of cyber incidents in recent years (**Chart A**, panel a), with the trend picking up beyond key events like the US elections in 2016 and 2020 and the Russian invasion of Ukraine in 2022, which were likely associated with increased cyberattacks. This led to sizeable losses for the global economy and triggered a debate on the insurability of large-scale attacks and on system-wide safeguards.¹³⁷

AI tools have been met with growing public and investor interest, including in the context of cyber risk. The number of publicly available AI models has grown substantially since the launch of ChatGPT in November 2022 (**Chart A**, panel b). Most of these models specialise in text processing, but a growing number are also designed for audio or visual purposes. At the same time, concerns have grown that recent advances in this technology may not only yield productivity-enhancing benefits but may also be used by cyber attackers for malicious purposes, highlighting the need for enhanced cyber defences. These aspects are mirrored by both Google search trends and the stock market performance of related sectors (**Chart A**, panels b and c).

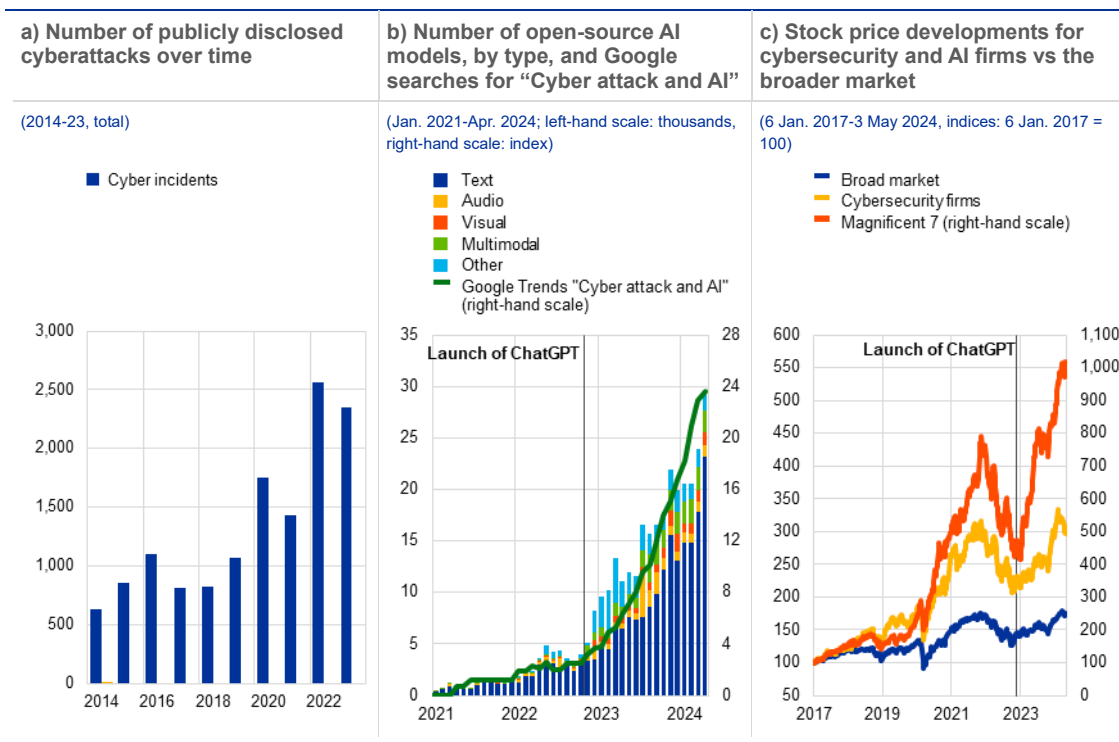
¹³⁵ See also in this context the [EU's Artificial Intelligence Act](#) as a general legislative initiative to promote the uptake of AI and address the risks associated with certain uses of such systems.

¹³⁶ See, for example, the article entitled "[Towards a framework for assessing systemic cyber risk](#)", *Financial Stability Review*, ECB, November 2022, and "[Systemic cyber risk](#)", ESRB, February 2020.

¹³⁷ "[Advancing macroprudential tools for cyber resilience](#)", ESRB, February 2023.

Chart A

The advance of AI technology has sparked public and investor interest, including on its implications for cyber risk and cybersecurity



Sources: University of Maryland CISSM Cyber Attacks Database, Google Trends, Hugging Face, Bloomberg Finance L.P. and ECB calculations.

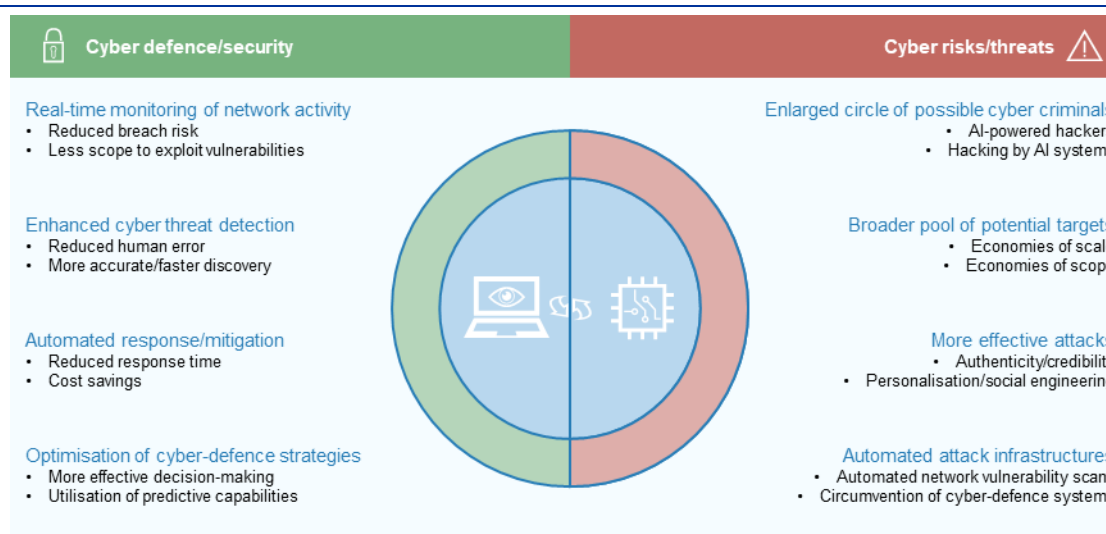
Notes: Panel b: the number of open-source models uploaded to the Hugging Face platform. Open-source models without information on the model type have been excluded from this chart: as at April 2024 they accounted for 49% of all models. “Multimodal” refers to models which are capable of processing information from different modalities, including audio, images, videos and text. The Google Trends shown here are measured as the 12-month moving average of an index which takes the value 100 for the point of highest search interest for the term since 2004. Panel c: “Broad market” depicts the MSCI ACWI IMI, while “Cybersecurity firms” reflects the MSCI ACWI IMI Cyber Security Index. “Magnificent 7” comprises the stocks of Amazon, Apple, Alphabet, Nvidia, Meta, Microsoft and Tesla. This is used as a proxy for AI firms, as most of them are active in the AI field, while many firms specialised only in AI are not publicly traded.

When it comes to the interplay between AI and cyber risks, AI tools will enhance the capabilities of threat actors while also benefiting cybersecurity. From a conceptual perspective, opportunities arise for cyber defence where AI can, for instance, be useful for analysing large amounts of security signals, allowing for the real-time monitoring of network activity (**Figure A**). Pattern recognition can spot unusual user behaviour, which helps to enhance threat detection. This could also help mitigate insider threats – risky user behaviour could be identified and sensitive information could be blocked from leaving a financial institution’s network. Ultimately, there is potential for automated responses and risk mitigation. AI-driven productivity gains for cyber defenders can also help mitigate a shortage of cybersecurity experts, generate cost savings and optimise cyber-defence strategies. Nonetheless, cyber threats could also rise as AI may enlarge the pool of potential cyber criminals as well as victims, while also improving the efficiency and effectiveness of underlying techniques. For instance, AI models could be used to research potential target systems and victims or help with coding.¹³⁸ AI could help to significantly lower the entry barrier for would-be hackers or increase the effectiveness of professional hackers by finding vulnerabilities or helping evade detection. In addition, AI tools can be used as vehicles for an attack by manipulating the output they provide. AI tools with visual or audio output can be used to create deepfakes for social engineering attacks.

¹³⁸ See “Staying ahead of threat actors in the age of AI”, Microsoft Threat Intelligence, 14 February 2024.

Figure A

Potential implications of AI for cyber risks



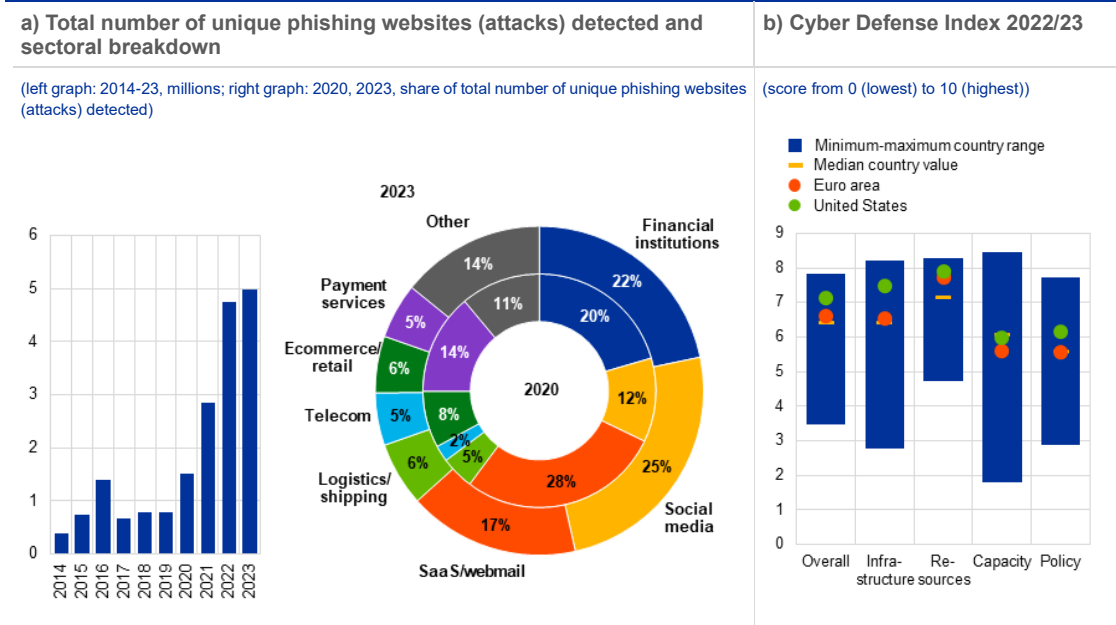
Source: ECB.

Phishing, among all types of cyberattack, seems particularly relevant for the financial industry and prone to enhancement with AI. As phishing¹³⁹ attacks rely heavily on projecting authenticity and trust, AI has a particular potential to strengthen the attacks. First, it can enhance the persuasiveness of attackers, making them sound more convincing, not just by improving written text and making it more personalised, but also by employing deepfakes for voice- or video-based communication. Second, it can automate large-scale phishing campaigns, increasing their reach and effectiveness. In fact, detected phishing activity has grown considerably in the last couple of years (**Chart B**, panel a), coinciding with the broader availability of AI models. These attacks target a wide range of individuals, possibly with the ultimate objective of gaining elevated or privileged level access within financial institutions' systems (privilege escalation attack). As at year-end 2023, over a fifth of all phishing activities targeted the financial sector, making it the second most affected industry after social media (**Chart B**, panel a). The ensuing interlinkages are crucial not only for the financial sector but also for other industries, as information gleaned from social media profiles can often be used to gain privileged level access within an individual's place of employment. In addition, more widespread use of social media may also help spread rumours and disinformation faster, which could raise financial stability concerns to the extent that they trigger herding behaviour.

¹³⁹ Phishing is a form of social engineering attack that aims to gather sensitive information by impersonating trusted sources or individuals. This can happen in writing or by phone, or a combination of both.

Chart B

Phishing activity has boomed in recent years, with both financial institutions and social media increasingly targeted, highlighting the need for enhanced cyber defences



Sources: APWG, MIT Technology Review and ECB calculations.

Notes: Panel b: "Euro area" is an unweighted average of Germany, Spain, France, Italy and the Netherlands. SaaS stands for software as a service. The Cyber Defense Index ranks the world's 20 largest economies according to their collective cybersecurity assets, organisational capabilities and policy stances. It measures the degree to which they have adopted technology practices that advance resilience to cyberattacks and how well governments and policy frameworks promote secure digital transactions.

Looking ahead, the use of AI for both cyber defence and cyberattacks is expected to evolve over time. While AI tools in their current form may be particularly useful for creating more credible cyberattacks or exploiting deepfakes for social engineering, they could also be used to design new types of attack in the future. This highlights the need for cybersecurity professionals to exploit the benefits of technological advances such as AI to keep up with an ever-evolving cyber threat landscape and enhance cyber resilience. This is an area where, by international standards, at least some euro area countries appear to have room for improvement (**Chart B**, panel b). Dynamics in cybersecurity are essentially driven by an arms race between cyber defenders and threat actors – and AI is adding to the tools of both sides. It is currently difficult to assess who will gain the upper hand, and the momentum may well change over time. Nevertheless, given the potential for disruption if a systemic cyber incident occurs, it is important for financial institutions, as well as supervisors and regulators, to closely monitor associated developments.

C Private markets, public risk? Financial stability implications of alternative funding sources

Prepared by Katharina Cera, Pierce Daly, Lieven Hermans, Philippe Molitor, Oscar Schwartz Blicke, Andrzej Sowiński and Elisa Telesca

Euro area private markets have grown significantly in recent years, providing alternative funding sources for companies and diversification benefits for investors. While private markets are currently small relative to public markets and bank lending in the euro area, continued strong growth, financial innovation and opaqueness in private markets could contribute to financial stability risks. Adverse economic shocks could result in rising defaults, valuation corrections and losses for private funds and their investors. Additionally, such shocks may be exacerbated by multiple layers of leverage at company, fund and investor level, or by liquidity mismatches for some open-ended private funds. For banks, risks could arise from lending exposures to these markets, as well as from rising competition with private funds, which could incentivise lower underwriting and credit standards.

Introduction

Private markets have experienced remarkable growth in the euro area over recent years, bringing both benefits and risks for euro area financial stability.

Private markets offer an alternative funding source to companies and real assets, next to public equity, corporate bond markets and bank lending. They fulfil an important economic function, as they match the financing needs of riskier economic entities with the risk-bearing capabilities of long-term investors. Their growth has been driven both by investors' wishes for high returns, especially during the period of ultra-low interest rates, and by the need of companies for faster and more flexible sources of finance.¹⁴⁰ Despite their strong growth in recent years, private markets in the euro area remain relatively small compared with domestic public markets, bank balance sheets or global private markets. This special feature discusses the main developments in these markets since 2010, as well as risks to financial stability stemming from characteristics of investors, portfolio companies, the structure of intermediaries and links with the banking sector.¹⁴¹

Overview of private market segments and strategies

Private markets offer financing to companies through private equity and private credit, and for real assets (Figure C.1). Private market transactions are mainly

¹⁴⁰ Private credit may offer advantages over bank debt, such as higher leverage, a more flexible covenant structure and greater certainty and speed of execution; see Block, J., Jang, Y.S., Kaplan, S.N. and Schulze, A., "A Survey of Private Debt Funds", *Working Paper Series*, No 30868, National Bureau of Economic Research, 2023.

¹⁴¹ Financial stability considerations from the global private credit market have been discussed recently. See, for example, "Chapter 2: The Rise and Risks of Private Credit", *Global Financial Stability Report*, International Monetary Fund, April 2024.

conducted via closed-ended funds (“private funds”). Private funds include private equity, private credit and real asset funds. Private equity funds invest into firms’ equity, while private credit funds lend to firms and real asset funds invest in assets such as property. These funds are typically accessible only to institutional investors, many of which have a long investment horizon.¹⁴² They also receive debt financing from banks (**Figure C.1**). When a private fund is set up, the investors commit capital which is typically called over the first years of the fund’s lifetime to finance investment opportunities.¹⁴³ Accordingly, the assets under management of a private fund can be split into the net asset value (NAV) of the fund’s portfolio and its “dry powder” – committed, but not yet called capital. Depending on the fund type, investors either receive regular income streams from these investments or are paid out as the fund exits its individual investments or when it is liquidated at the termination date. Some funds, however, have indefinite lifespans (“evergreen” funds). Private markets are regulated relatively lightly, as most funds have limited liquidity mismatches or are closed-ended and focus on institutional investors.¹⁴⁴

Private equity strategies can be split by the stage of maturity of target companies and degree of equity investment. There are three main private equity strategies. First, venture capital funds typically hold minority equity stakes in young firms and engage operationally with their portfolio companies. Second, by contrast, leveraged buy-out (LBO) funds acquire controlling stakes in mature companies to raise their value by restructuring them and often also replacing their management. Such transactions are typically executed in the context of mergers and acquisitions. They involve a high degree of leverage in the form of syndicated loan financing arranged by banks or through private credit markets. Third, growth capital strategies are usually associated with taking a minority stake in the company, preferring to target mature businesses looking for capital to expand or restructure operations. Across all these strategies, private equity funds realise their returns mainly by selling a portfolio company to a strategic or financial buyer¹⁴⁵ or by conducting an initial public offering.

Private credit strategies differ in the seniority and purpose of lending and usually generate a constant revenue stream. The four most common strategies for funds located in the euro area are direct lending, mezzanine debt, special credit situations and distressed debt.¹⁴⁶ In principle, direct lending is less risky, while other

¹⁴² In some jurisdictions, private market products are also increasingly offered to high-net-worth and retail clients; see “[Case study on private finance and non-bank financial intermediation](#)”, *Global Monitoring Report on Non-Bank Financial Intermediation 2023*, Financial Stability Board, December 2023, pp. 63-71.

¹⁴³ A private fund’s legal documentation specifies the timing and frequency of capital calls. A private fund manager commonly has the discretion to make capital calls based on an assessment of investment opportunities and capital requirements. Investors are expected to respect their capital commitments when the fund manager makes a capital call. While relatively rare, an investor default carries very serious implications, such as reduced ownership stakes or removal from the investment.

¹⁴⁴ For a more detailed discussion on the characteristics of private markets, see “[The rise of private markets](#)”, *BIS Quarterly Review*, Bank for International Settlements, December 2021.

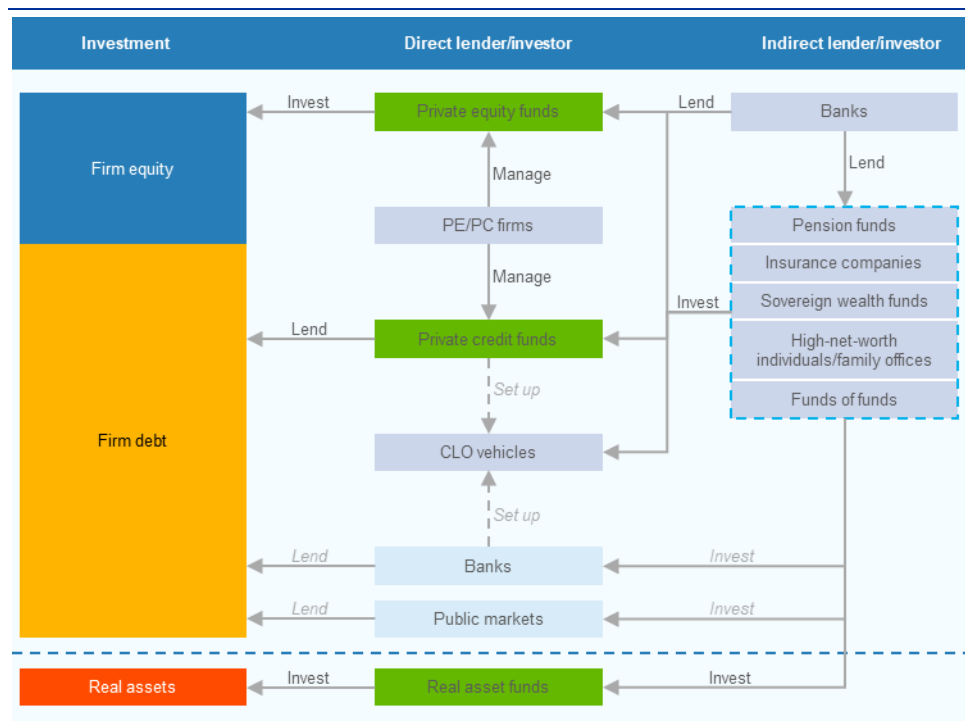
¹⁴⁵ A strategic buyer is a buyer within the same industry as the portfolio company. A financial buyer is often another private equity firm.

¹⁴⁶ There is no consensus on what types of credit exposures should be included in the definition of private credit. Some only consider direct lending while others take a wider view, including any asset-backed structures. In addition, the private credit market can also encompass bridge financing, special situations, direct lending, distressed debt, infrastructure debt, mezzanine, real estate debt and venture debt.

strategies are associated with higher probabilities of default. Until recently, private credit loans have commonly been provided to mid-sized (“middle market”) companies, featured floating interest rates and were neither rated nor broadly syndicated.¹⁴⁷ Private credit loans are not considered transferable securities and are not issued via public offers. They come with lower reporting requirements than (public) corporate bond markets, thus permitting more flexible and more rapid financing. More recently, however, some private credit funds have started bundling their debt into collateralised loan obligation (CLO) vehicles, which are sold to investors in tranches (**Figure C.1**).

Figure C.1

Private market funds channel funding from institutional investors to the real economy



Source: ECB.

Notes: PE stands for private equity; PC stands for private credit; CLO stands for collateralised loan obligation. Banks also lend to private credit and real asset funds through NAV lending, which is not shown in the chart.

Some private equity and private credit funds are connected by ownership links and co-investments in the same portfolio companies.

Most asset managers active in private markets have expanded their business from the equity space to credit, resulting in private equity and private credit funds often being managed by the same asset manager (**Figure C.1**).¹⁴⁸ The growth in private credit funds is also related to such funds increasingly moving into the business of financing the debt required by private equity funds in LBO transactions, which had traditionally been financed by

¹⁴⁷ These are firms with revenues between USD 10 million and USD 1 billion; see Hancock, K., “What is middle market private equity”, PitchBook Data, Inc., March 2023. In this sense, private credit loans are distinct from leveraged loans or broadly syndicated loans, which are generally loans originated by a syndicate of banks to typically larger, highly indebted companies.

¹⁴⁸ According to Block, J. et al., op.cit., 40% of surveyed European private debt funds are affiliated with private equity firms.

syndicates of investment banks. In 2023, 81% of European LBOs were financed by private credit, compared with 56% in 2021.¹⁴⁹

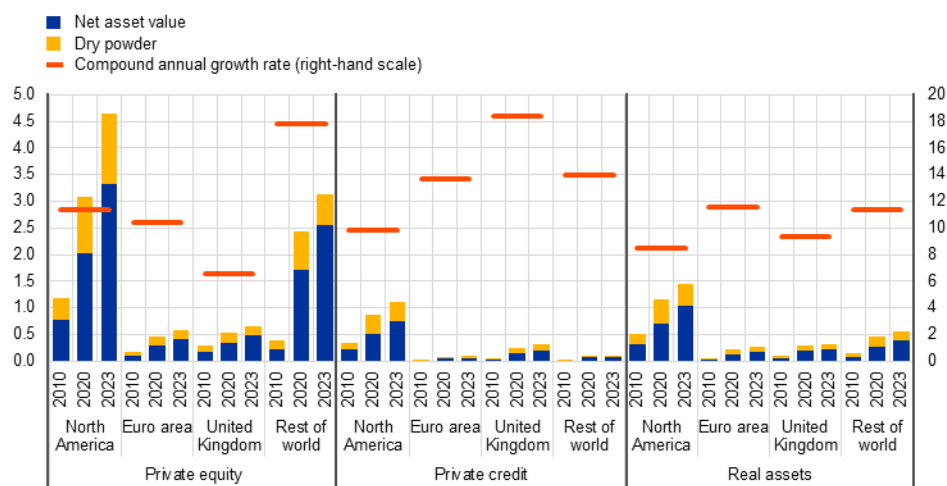
Real asset funds invest into real estate, infrastructure and natural resources via equity and debt instruments. While this special feature mainly focuses on the private equity and private credit subsegments, real assets are usually also considered a subsegment of private markets when investments are carried out via private transactions. This includes private real estate funds, which might be particularly vulnerable to the current downturn in the commercial real estate market.¹⁵⁰

Chart C.1

Private markets remain concentrated in North America, but other jurisdictions have recently experienced significant growth

Private market funds' assets under management, by fund location and fund type

(Q4 2010, Q4 2020, Q3 2023; left-hand scale: € trillions, right-hand scale: percentages)



Sources: PitchBook Data, Inc. and ECB calculations.

Notes: Private equity includes venture capital funds. Fund location is defined as where the fund management team is located. The red line shows the compound annual growth rate of assets under management between Q4 2010 and Q3 2023 for funds split by location and fund type. Real asset funds comprise funds investing into real estate, infrastructure and natural resources.

Although private market funds remain concentrated in the private equity segment and in North America, other segments and locations have grown significantly over recent years.

In the third quarter of 2023, the lion's share of assets under management in private funds was held by funds located in North America. Private equity funds remain the largest asset class, accounting for 68% of global assets under management in private funds, followed by real asset funds at 20% and private credit at 12%. While assets under management in private funds located in the euro area are still small compared with funds investing in public markets,¹⁵¹ they have

¹⁴⁹ See *Q4 2023 European Credit Markets Quarterly Wrap*, PitchBook Data, Inc., January 2024.

¹⁵⁰ Real estate funds are important actors in the euro area commercial real estate (CRE) market and are sometimes owned by private equity firms. Their growing market footprint makes them vulnerable to a CRE market downturn, especially in the case of open-ended funds with structural mismatches between asset liquidity and redemption terms. See the article entitled "[The growing role of investment funds in euro area real estate markets: risks and policy considerations](#)", *Macprudential Bulletin*, ECB, April 2023.

¹⁵¹ As of the third quarter of 2023, assets under management of euro area private market funds stand at €960 billion, or 6% of the euro area investment fund sector's total assets (source: ECB IVF statistics).

seen steep growth over the last decade. Compound annual growth rates stand at 14% for private credit funds, 12% for real asset funds and 10% for private equity funds (**Chart C.1**).¹⁵²

Benefits and risks for financial stability

Private markets provide benefits to the economy. They offer an alternative source of funding, with often faster and more reliable execution. For investors, they provide a portfolio diversification option and constant income streams. For the wider economy, private markets often finance the kind of smaller, riskier and innovative firms that are important for future economic growth. In particular, the equity segment of private markets – venture capital, for instance – could play an important role in funding the innovation that is essential for the green and digital transitions.¹⁵³ In this respect, growth in euro area private markets can also support the development of the capital markets union in the euro area.

Nonetheless, the opaqueness and strong growth of private markets may give rise to financial stability risks. This special feature later assesses some potential contagion channels by reviewing the characteristics of investors into private markets, portfolio companies, the structure of fund intermediaries, and links between private markets and the banking sector.

Large institutional investors tend to be the main investors in private funds.

Globally, insurance corporations and pension funds (ICPFs) account for close to 75% of investments into private equity funds and around 86% into private credit funds.¹⁵⁴ Focusing on entities domiciled in the euro area, the latest available data indicate that occupational pension funds had invested around 4% of their total assets into private equity funds and 2% into infrastructure funds in the third quarter of 2023, while exposures to private credit were likely substantially lower. Insurers had even smaller exposures to private equity, private credit and infrastructure funds, but they had a more substantial share of direct loans on their balance sheets (**Chart C.2**, panel a). While the general move of ICPFs into illiquid assets – including private funds – was to some extent driven by their search for yield during the period of ultra-low interest rates, they represent the financial sector with the highest capacity to hold illiquid exposures, given their very long-term investment horizons. ICPFs also seem well prepared for managing the liquidity needed to meet the capital calls that are a characteristic of private market investments.

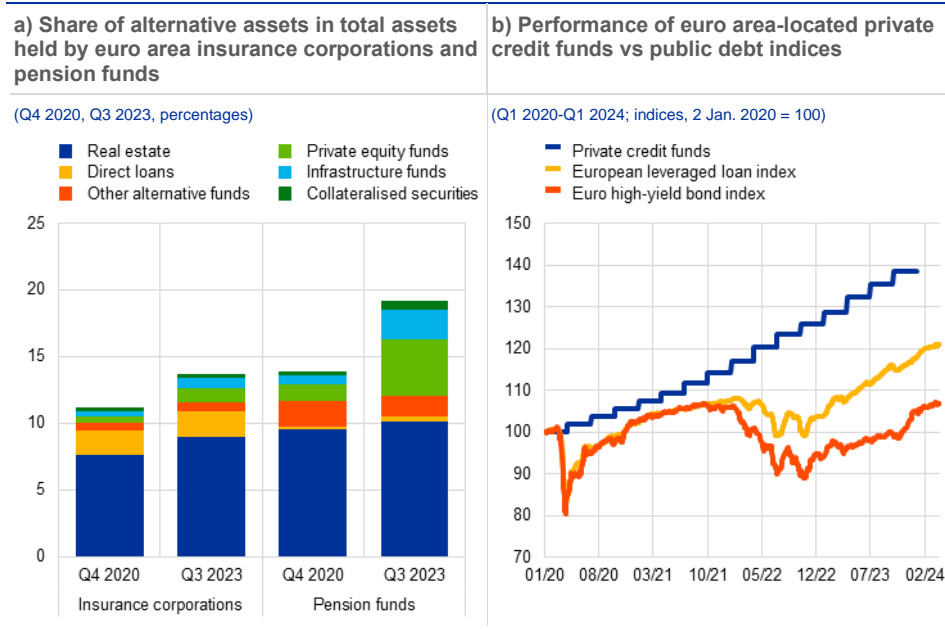
¹⁵² While the European private credit segment in particular is somewhat concentrated in the United Kingdom, growth in private credit funds in the EU may be supported by the Alternative Investment Fund Managers Directive (AIFMD) II, which establishes common rules for loan-originating alternative investment funds.

¹⁵³ See in particular the box entitled “[Making euro area equity markets fit for green and digital innovation](#)”, *Financial Integration and Structure in the Euro Area*, ECB, April 2022.

¹⁵⁴ See Graph 3 in “[The rise of private markets](#)”, *BIS Quarterly Review*, Bank for International Settlements, December 2021.

Chart C.2

Uncertainty in private asset valuations might hide losses for institutional investors, who could nonetheless also profit from lower volatility



Sources: EIOPA, Bloomberg Finance L.P., PitchBook Data, Inc. and ECB calculations.

Notes: Panel a: pension funds include only occupational pension funds. Real estate includes direct holdings of real estate (i.e. physical property) and indirect holdings (i.e. real estate fund and company shares, securities and mortgages). Direct loans exclude mortgages. Other alternative funds are alternative funds as categorised by EIOPA, which also includes private credit funds. Panel b: the performance of private credit funds is calculated as quarterly compounded median internal rates of return. The European leveraged loan index corresponds to the Morningstar European Leveraged Loan TR EUR Index. The euro high-yield bond index corresponds to the ICE BofA Euro High Yield Index. All indices are indexed to 100 as of 2 January 2020.

Despite banks' limited direct investments into private funds, risks might spill over from private markets via their lending exposures and incentives to lower credit standards.

In addition to common exposures to companies which are financed by banks and private markets, banks also lend to private funds and fund investors. These loans are usually collateralised by the funds' NAV ("NAV lending") or, in the case of lending to private funds, also by the funds' dry powder. Private funds might use the additional funding from banks to support their portfolio companies, lever up returns or pay out their investors in a challenging exit environment like the current one.¹⁵⁵ The credit risk from such bank exposures seems contained in both cases, however. First, typical loan-to-value ratios in NAV lending range between only 10% and 15%.¹⁵⁶ Second, market intelligence suggests that the risk of investors defaulting on capital calls, thus undermining the value of loan collateral, is rather small, as the contractual obligation to deliver the capital is strong. Nevertheless, aside from lending exposures, growing private credit markets are increasingly competing with banks' syndicated

¹⁵⁵ Various reports point to a slowdown in exit activity attributable to less deal-making amid tighter financing conditions, which has led to a decrease in distributions to investors (see, for example, *2024 Allocator Outlook*, PitchBook Data, Inc., December 2023). Some sources point at NAV loan proceeds being used mainly for distributions – a debatable practice – while others estimate this use at only 8% of proceeds; see *Case study on private finance and non-bank financial intermediation*, *Global Monitoring Report on Non-Bank Financial Intermediation 2023*, Financial Stability Board, December 2023, and *"Is NAV Lending Good or Bad for GPs and LPs?"*, Crestline Investors, Inc., October 2023.

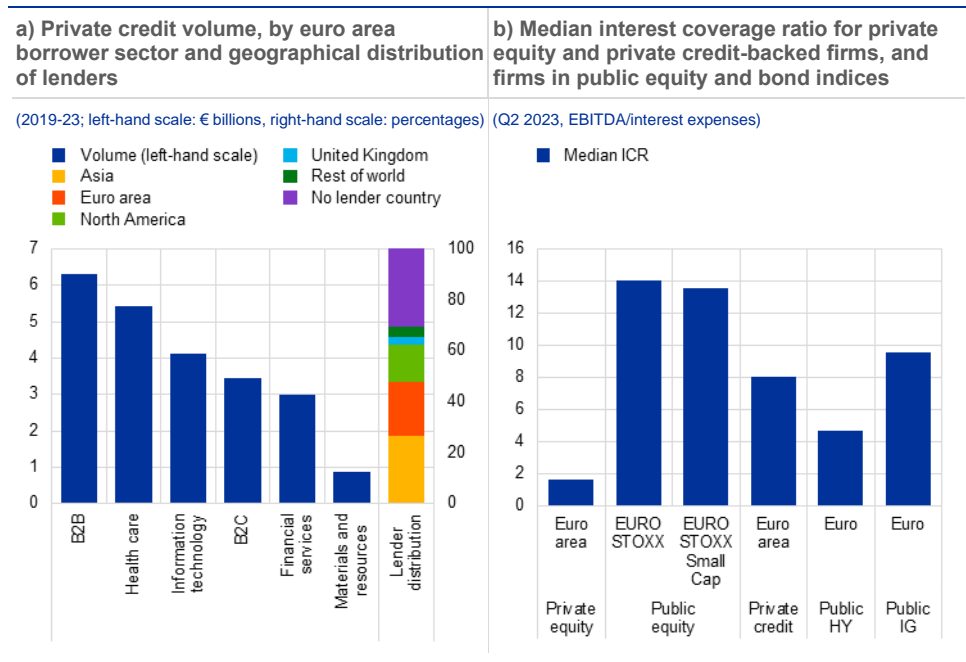
¹⁵⁶ See *"NAVigating Considerations and Controversies Around NAV Loans"*, PitchBook Data, Inc., December 2023.

lending activities. This, in turn, might incentivise banks to lower their lending standards to protect their market share.

Valuation methods in private markets may disguise potential losses. The nature of holdings in private funds makes it challenging to mark these types of assets to market. In turn, private funds' assets are valued less frequently and under more subjective model assumptions, which can conceal potential losses, underlying volatility and the correlation between the returns on private funds with other markets. This can lead to cliff-edge losses for institutional investors if private funds only recognise write-downs at the end of individual investments. At the same time, lower reported volatility artificially boosts risk-adjusted returns and might help some investors meet their internal or regulatory risk limits, another incentive for investing into these markets. Compared with high-yield bonds and leveraged loans, median returns on private credit funds did not suffer losses during the pandemic stress period or since the start of the monetary policy tightening cycle (**Chart C.2**, panel b).

Chart C.3

Private credit is provided to relatively stronger euro area companies than private equity



Sources: PitchBook Data, Inc., Bloomberg Finance L.P. and ECB calculations.
 Notes: Panel a: sector volume is calculated as the aggregated lending to each sector in 2019-23. Geographical distribution refers to the share of total lending in 2019-23, broken down by lender location. In a debt with several loan underwriters with different geographies, the debt volume is divided evenly between lenders. This is done to avoid double-counting private credit volume in geographical distribution. B2B refers to business products and services; B2C refers to consumer products and services. Panel b: ICR stands for interest coverage ratio; HY stands for high-yield debt; IG stands for investment-grade debt. The ICR of euro public HY is based on median ICRs of companies with bonds in the ICE BofA Euro High Yield Index. The ICR of euro public IG is based on companies with bonds in the ICE BofA Euro Corporate Index. Euro area private equity ICR is based on a sample of 7,093 euro area firms, while euro area private credit ICR is based on 388 euro area firms. Most private credit-backed firms are also publicly listed, but there is little overlap between private credit and private equity-backed companies in the sample considered. The sample includes firms with any available ICRs between Q2 2022 and Q2 2023.

Private lending to euro area companies mainly comes from non-euro area private credit funds and seems concentrated in more innovative sectors.

Cross-border lending is an inherent feature of private credit markets, with only around 20% of the volume borrowed by euro area companies being lent by euro area

borrowers (**Chart C.3**, panel a). While private credit funds used to focus on lending to smaller and riskier companies, market intelligence suggests that, in recent years, they have moved further up the credit quality spectrum and into larger deals. According to data from PitchBook covering a sample of 258 deals, median private credit deals in the euro area increased from €75 million in 2021 to €168 million in 2023. In addition, private credit funding seems concentrated in more innovative sectors, such as business products and services, health care and information technology.

Companies backed by private credit do not seem to have worse credit quality than their public peers. Based on available data, on average, private credit-backed companies do not appear to have lower interest coverage ratios – which indicates the extent to which earnings cover interest expenses – than their exclusively public debt-financed peers (**Chart C.3**, panel b). Importantly, this may suggest that the comparative advantage of private lenders is the greater flexibility and speed of execution rather than their ability to offer funding to riskier borrowers. Additionally, the use of “amend and extend” agreements might prevent defaults from materialising, although it might also add to the risk of delayed recognition of losses for funds and their investors.¹⁵⁷

By contrast, private equity-backed companies tend to display worse credit quality than their public peers, which raises financial stability concerns. While interest coverage ratios of publicly listed companies average around 13.8 – i.e. on average, their earnings cover almost 14 times their interest expenses on their outstanding debt – those of private equity-backed companies are significantly lower, at 1.6 on average (**Chart C.3**, panel b). This is likely due to LBO strategies which lever up funds’ portfolio companies, enhancing investor returns. Higher leverage is also connected with higher probabilities of default and lower recovery rates. These vulnerabilities are more likely to materialise in an environment of slow growth and might bring material losses to lenders, including banks and private credit funds. Private equity firms might also have fewer incentives to support struggling companies than strategic investors.¹⁵⁸ On a positive note, globally, private equity funds currently have €2.3 trillion of dry powder available, which gives them room to act countercyclically.

A sizeable share of euro area private credit funds are open-ended funds, which may raise liquidity risks. In contrast to private equity funds, which are primarily closed-ended,¹⁵⁹ approximately 42% of private credit funds have an open-ended structure. Of these funds, most are domiciled in France and Luxembourg (**Chart C.4**, panel a). Although an open-ended fund structure may help attract investors,¹⁶⁰ it may also highlight potential liquidity mismatches between the illiquid nature of funds’

¹⁵⁷ According to PitchBook, 16% of newly originated private credit loans to euro area borrowers in 2023 were attributed to debt refinancing, up from 0% in 2022. This implies that private credit funds might enable firms to refinance and extend loans.

¹⁵⁸ For further details, see, for example, the box entitled “Financial stability implications of private equity”, *Financial Stability Review*, ECB, May 2020.

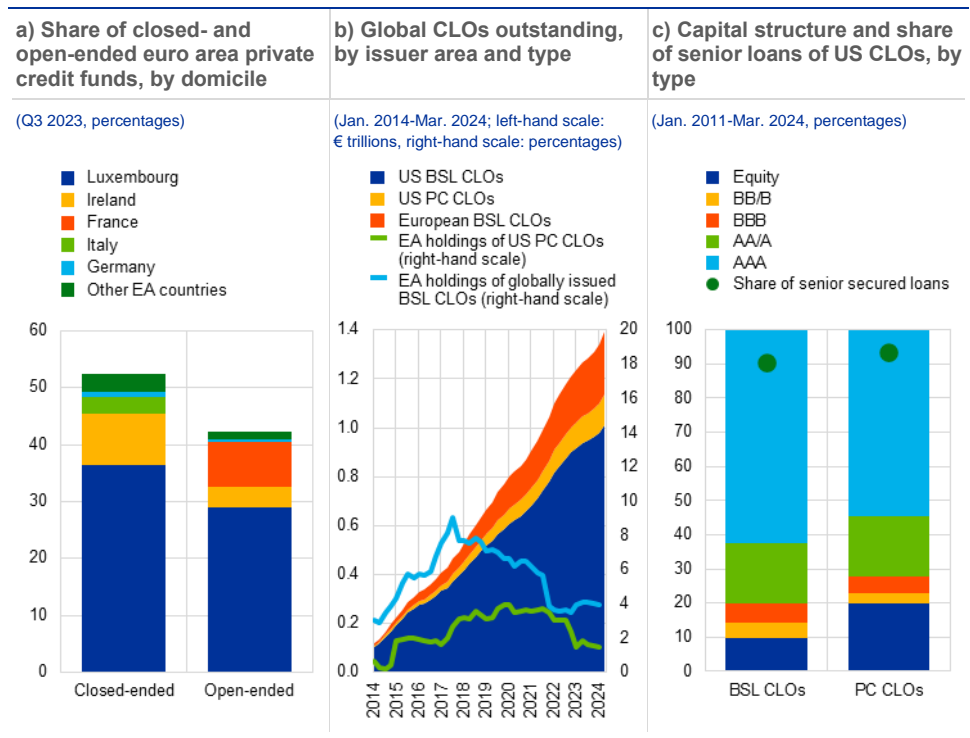
¹⁵⁹ See “EU Alternative Investment Funds 2023”, *ESMA Market Report*, European Securities and Markets Authority, January 2024.

¹⁶⁰ See, for example, Mounguia, M.-L. and Dubar, J., *Private Debt – An Expected But Uncertain “Golden Moment”?*, Ernst & Young, 8 January 2024.

assets and their redemption terms. Such vulnerabilities may nonetheless be mitigated, depending on funds' redemption frequency, presence of lock-in periods and availability of liquidity management tools (e.g. redemption gates and temporary suspensions). In addition, the role of ICPFs as main investors may limit liquidity risks for such funds, thanks to their long investment horizons (**Chart C.2**, panel a).

Chart C.4

Open-ended private credit funds may be exposed to liquidity mismatches, while euro area holdings of private credit CLOs remain low



Sources: PitchBook Data, Inc., ECB (investment fund list, SHS, CSDB) and ECB calculations.
 Notes: EA stands for euro area; CLO stands for collateralised loan obligation; BSL stands for broadly syndicated loan; PC stands for private credit. Panel a: the sample of funds is calculated based on euro area private credit funds identified by PitchBook as well as funds with "private credit", "middle market", "direct lending" and "loan origination" in their name as shown in the ECB's list of investment funds. The chart excludes approximately 5% of funds that do not report whether they are closed- or open-ended. Panel b: the euro area holdings of CLOs are identified by matching CLO issuer names from PitchBook to SHS data. The two lines show the total euro area sectoral CLO holdings as a share of total CLO amount outstanding, by type. Panel c: the bars depict the tranches' aggregate shares of the total historical issuance of US BSL and private credit CLOs between January 2011 and March 2024. The dots represent the average share of senior secured loans within each CLO portfolio, weighted by the respective CLO size for the total BSL and private credit US CLO historical issuance.

Private credit CLOs are on the rise, although so far solely in the US market and with little exposure to euro area holders. Private credit CLOs – securities that are backed by a pool of private loans and divided into tranches with varying credit quality – have been growing rapidly in recent years. At the beginning of 2024, they accounted for 11% of all outstanding US CLOs (**Chart C.4**, panel b). While this segment is so far only present in the US market and exposures of euro area holders are negligible, some market observers expect a pick-up in Europe in the course of 2024.¹⁶¹ Private

¹⁶¹ See, for example, Rae, M., "2024 European CLO Outlook: Steady state, with private credit on horizon", PitchBook Data, Inc., December 2023; Rae, M., "Middle market CLOs only a matter of time for Europe, managers say", PitchBook Data, Inc., November 2023; Thiele, V., "Stop dreaming of private credit CLOs, the arb is enough of a nightmare", GlobalCapital, October 2023; and Tipping, N., "Why Europe still awaits a private credit CLO", Risk.net, April 2024

credit CLOs typically have a larger equity tranche and a slightly smaller AAA tranche than traditional, or broadly syndicated loan, CLOs (**Chart C.4**, panel c), which may signal higher credit risk.¹⁶² Moreover, unlike in traditional CLOs, private credit CLO issuers often retain the entirety of the equity tranche, which along with the tranche's larger size, increases exposures to future potential losses. However, private credit CLOs typically have a slightly higher share of senior secured loans than their traditional peers,¹⁶³ as well as a significantly lower share of covenant-lite loans.¹⁶⁴ A covenant-heavy portfolio could nonetheless also increase the effective credit risk under some circumstances, as more stringent conditions applied to loans included in the CLO might increase the probability of default. In light of these considerations, it would be important to also monitor the resilience of a future private credit CLO market in Europe, were this to emerge.

Private markets still need to prove their resilience in an environment of higher interest rates as they have grown to a significant size only in the past decade.

Higher interest rates might affect private markets through two channels. First, higher discount rates reduce the fundamental value of assets (affecting all private funds) and increase default risk in private credit portfolios, especially when interplaying with slowing growth. Losses might remain hidden until maturity or the exit from the investment due to the lack of marking to market. Second, it remains to be seen to what extent higher returns on safe assets will slow investor demand for alternative assets. The relatively high level of dry powder in private funds is a mitigating factor.

While financial stability risks from private markets seem contained in the euro area, some concerns remain. Aggregated exposures, opaqueness and private markets' resilience are all elements that warrant monitoring, especially in an environment of higher interest rates. Given the limited liquidity mismatches of private funds in aggregate, and the long-term investment horizons of their main investors, risks to euro area financial stability from private markets appear limited. Still, it is conceivable that while the aggregate picture seems benign, risks may lurk in concentrated exposures. It is important to continue monitoring developments in private markets, including newer trends like the increase in private credit CLOs and NAV lending, and potential challenges from higher interest rates. However, monitoring remains hampered by opaqueness and data scarcity. This makes it all the more important to improve transparency concerning private markets.

¹⁶² In CLOs, the equity tranche is at the bottom of the priority ladder and has the highest risk and potential for return. Equity investors are the last to receive payments and the first to absorb any losses from defaults in the loan pool. However, if the performance of the first lien loans is strong, equity tranches can realise significant returns after all other tranches have been paid. After the senior and mezzanine tranches have been satisfied, the cash flows from first lien loans flow to the equity tranche.

¹⁶³ Senior secured loans, or first lien loans, are secured by the borrower's assets and by a first-priority claim on the collateral of the borrower. This means that in the event of liquidation, the proceeds from the sale of the collateral must first be used to repay these loans before subordinate loans.

¹⁶⁴ According to PitchBook and ECB calculations, the average share of covenant-lite loans, defined as loans which have fewer or less stringent covenants than traditional loans, within US traditional CLOs weighted on their total historical issuance decreased from 70% to 60% between 2019 and 2023. At the same time, the share for US private credit CLOs increased from 10% to 20%.

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Postal address 60640 Frankfurt am Main, Germany
Telephone +49 69 1344 0
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