EUROPEAN CENTRAL BANK
EUROSYSTEM

# Working Paper Series

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## Macroprudential policy, monetary policy and non-bank financial intermediation

No 3130

*Abstract*

*This paper examines the interplay between macroprudential policy, monetary policy and the non-bank financial intermediation (NBFI) sector, drawing on recent research and zooming in particularly on evidence from the euro area.[2] It documents the growth in the NBFI sector over the past two decades and its particular role in financing the real economy, assesses systemic risks that can emanate from the sector, considers how it interacts with monetary policy, and discusses the implications for macroprudential regulation. Firms are increasingly turning to capital markets for debt financing, with the NBFI sector thereby increasing its provision of credit to the real economy relative to banks. At the same time, the growth of market-based finance has been accompanied by increased liquidity and credit risk in the NBFI sector, together with pockets of high leverage. Monetary policy has also intersected with these dynamics. Recent episodes have shown that vulnerabilities in the NBFI sector can amplify market dynamics and create systemic risk in a highly interconnected financial system. Against this backdrop, the resilience of the NBFI sector should be strengthened, including from a macroprudential perspective, to support financial stability and the smooth transmission of monetary policy. Several open issues and challenges remain for future research and policy making.*

*JEL classification:* G01, G23, G28

*Keywords:* Non-bank financial intermediation, investment funds, insurance corporations, financial stability, financial regulation, monetary policy

[2] This paper is based on a conference presentation, given at King's College London on 28 September 2023, and will be published in 2026 as a chapter in *The Research Handbook of Macroprudential Policy*, edited by David Aikman and Prasanna Gai.

## Non-technical summary

The Non-Bank Financial Intermediation (NBFI) sector represents about half of total financial system assets globally. The sector, which includes all intermediaries outside the traditional banking system, such as investment funds, insurance companies, pension funds and money market funds, has grown in importance over the past fifteen to twenty years. This has been particularly the case in the euro area: total assets of the key non-bank financial sectors have more than doubled since 2010, rising from 50% to close to 100% of banking sector assets in 2023.

This growth can be attributed to various structural changes in the financial system, such as the development of capital markets, technological advancements, shifting consumer preferences and increasing demand for financial assets. It was also affected by changes in monetary policy and financial regulation in the aftermath of the global financial crisis and the European sovereign debt crisis. These events weakened European banks and incentivised non-financial corporations to issue bonds to alleviate the contraction in bank credit supply.

The growth of the NBFI sector poses many important questions, which are the focus of a growing body of research. This paper provides an overview of this literature, focusing on several different dimensions, with a particular focus on the euro area. First, the paper examines the substitutability and complementarity between bond financing, primarily provided by the NBFI sector, and bank loans, and their interplay with business cycle dynamics.

The paper then discusses financial stability risks and prominent financial stress episodes that originated in the NBFI sector. These risks and vulnerabilities include liquidity mismatches in the investment fund sector, leverage, and the interconnectedness between the NBFI sector and the wider financial system, which can create risks of financial contagion. These vulnerabilities may impair the ability of the sector to remain resilient under stress and provide a stable source of funding to the real economy at all times, while also precipitating spillovers via interconnectedness with the broader financial system.

Subsequently, the paper discusses how the growing NBFI sector can increase pro-cyclicality in the financial system, with a focus on monetary policy. For example, low interest rates, quantitative easing and compressed risk premia may have contributed to a search for yield in the NBFI sector. Part of this risk-taking is an intended consequence of expansionary

monetary policy, as it helps to ease financing conditions for the real economy. But it can also lead to a build-up of vulnerabilities, making markets more susceptible to financial stress and potentially impairing the smooth transmission of monetary policy. Recent episodes have shown that NBFI vulnerabilities can indeed amplify market stress and create systemic risk.

All these considerations highlight the need to strengthen the resilience of the NBFI sector, including from a macroprudential perspective. The paper discusses these regulatory implications, focusing on the mitigation of liquidity mismatch in money market and investment funds, on how to enhance the liquidity preparedness of non-bank market participants to meet margin and collateral calls, and on how to address risks from non-bank leverage.

Finally, the paper highlights five areas where further policy and research work could be useful in informing macroprudential debates relating to the NBFI sector: improving data and the sharing of information across authorities and jurisdictions; enhancing risk modelling and system-wide macroprudential stress testing; considering time-varying or cyclical macroprudential instruments for the NBFI sector; considering policies to tackle systemic spillovers from NBFI sector entities; and assessing the trade-offs between private and public liquidity provision for the NBFI sector during crises.

# 1. Introduction: the changing structure of the financial system

The Non-Bank Financial Intermediation (NBFI) sector represents about half of total financial system assets globally (FSB, 2024a). The sector, which includes all intermediaries outside the traditional banking system, such as investment funds, insurance companies, pension funds and money-market funds (MMFs) has grown in importance over the past fifteen to twenty years. This has been particularly the case in the euro area: total assets of the key non-bank financial sectors have more than doubled since 2010, rising from 50% to close to 100% of banking sector assets (**Chart 1**). Investment funds more than tripled their assets since 2010 and represent the largest NBFI sub-sector, managing over €16 trillion. Insurance corporations and pension funds almost doubled their assets in the same period, reaching over €11 trillion at the end of 2023.

This growth can be attributed to various structural changes in the financial system, such as the development of capital markets, technological advancements, shifting consumer preferences and increasing demand for financial assets. It was also affected by changes in monetary policy and financial regulation in the aftermath of the global financial crisis and the European sovereign debt crisis. These events weakened European banks and incentivised non-financial corporations (NFCs) to issue bonds to alleviate the contraction in bank credit supply (Altavilla et al., 2019). In addition, the reduction in bond yields following the introduction of the ECB's Asset Purchase Programme was larger than the reduction in loan interest rates (Altavilla et al., 2021), making bond issuance more attractive to NFCs.

As non-banks continue to expand globally, so does their role in providing credit to the real economy, with some heterogeneity across countries. In the euro area, the share of NBFI financing in total credit to NFCs, which includes outstanding loans and debt securities, grew steadily from about 13% in 2008 to around 27% in 2022 (Cera, 2022). The concept of non-bank financial intermediation is distinct from but closely related to market-based finance. Measures of non-bank financing focus on the entities extending loans to NFCs or purchasing shares and debt securities issued by NFCs. Market-based finance refers to the type of instruments, e.g., equity shares, debt securities and securitized loans as opposed to bank loans, regardless of the entities purchasing or holding them. But much market-based finance is supplied by the NBFI sector. For example, the NBFI sector holds the vast majority of privately held debt securities issued by NFCs in the euro area.

**Chart 1: Total assets of the euro area non-bank financial sector**

(Q1 2010 – Q3 2023, € trillions, percentages)

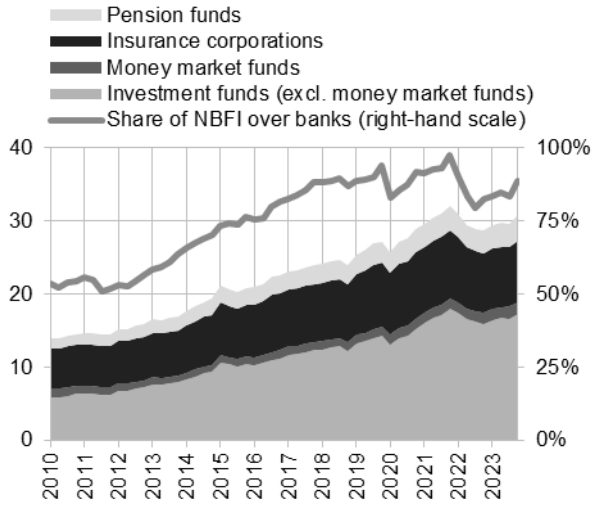
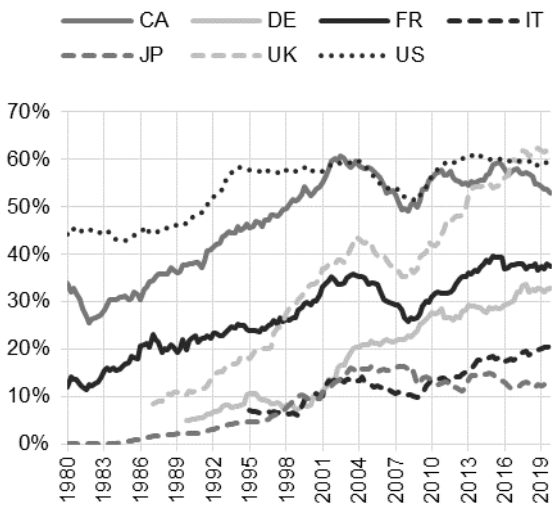



**Chart 2: Share of market-based credit to NFCs in G7 countries**

(Q1 1980 – Q4 2019, percentage of total credit)




Sources: ECB SDW, BIS, Dealogic, Bank of Canada, Bundesbank, Banque de France, Banca d'Italia, Bank of Japan, Office for National Statistics, FRED and ECB calculations.

Notes: Left panel: The NBFI sector as shown in the chart includes insurance corporations, pension funds, money market funds and investment funds. The share represents a lower bound, as there can be further non-bank financial institutions beyond the considered here. Right panel: Market-based credit is computed as the share of NFC debt securities in the total of NFC debt securities and NFC bank loans. Start dates vary across countries (see Cera, Kapadia, Rousova and Weistroffer, 2025, "Market-based finance and the business cycle", ECB Working Paper, forthcoming).

While the importance of bank loans has fallen in most countries, the increase in market-based credit has been driven, to a significant extent, by developments in some euro area countries (Darmouni and Papoutsi, 2022). In France and Germany, over 30% of the outstanding NFC credit by end-2019 was market-based, mainly composed of debt securities, compared to less than 20% in Italy. In other G7 economies, the share of market-based credit is generally higher: in the US, the UK and Canada, NFCs are more reliant on debt securities than on bank loans (**Chart 2**). These differences reflect the heterogeneous structure of countries' economies and financial systems, including the development of domestic intermediaries specialised in placing and underwriting corporate debt instruments (OECD, 2023) and the share of small and medium-sized enterprises (SMEs). In countries where SMEs account for the majority of firms, for example in Spain, Italy and Portugal, market-based credit tends to remain relatively low, as bond issuance has high fixed costs associated with underwriting fees, regulatory compliance, transparency, and credit ratings costs (European Commission, 2024). SMEs may also lack the financial track record needed to attract bond investors.

The growth of the NBFI sector poses many interesting questions, which are the focus of a growing body of research. These include the substitutability and complementarity between bond financing, primarily provided by the NBFI sector, and bank loans, and their interplay with business cycle dynamics. It also raises questions on the financial stability risks that different parts of the NBFI sector can introduce across the financial cycle, such as those related to liquidity risk, credit risk and pockets of high leverage. These vulnerabilities may impair the ability of the sector to remain resilient under stress and provide a stable source of funding to the real economy at all times, while also precipitating spillovers via interconnectedness with the broader financial system. Another area of interest concerns how monetary policy has intersected with these dynamics. For example, low-interest rates, quantitative easing and compressed risk premia may have contributed to search for yield in the NBFI sector. Part of this risk-taking is an intended consequence of expansionary monetary policy, as it helps ease financing conditions for the real economy. But it can also lead to a build-up of vulnerabilities, making markets more susceptible to financial stress and potentially impairing the smooth transmission of monetary policy. Recent episodes have shown that NBFI vulnerabilities can indeed amplify market stress and create systemic risk. All these considerations highlight the need to strengthen the resilience of the NBFI sector, including from a macroprudential perspective. This includes mitigating liquidity mismatch in MMFs and open-ended investment funds (OEFs), enhancing the liquidity preparedness of non-bank market participants to meet margin and collateral calls, and tackling risks from non-bank leverage.

This paper focusses on all of these issues, with a particular emphasis on the euro area in relation to the evidence. Relative to existing work, it takes a synthetic approach to discussing these issues in a coherent manner, while also setting out future challenges for policy and research. In this regard, it can be seen as complementing the recent reviews of some of these issues by Aramonte et al. (2023) and Claessens (2024).

The remainder of this paper is organised as follows. Section 2 analyses the interplay between corporate loans and market-based finance. The subsequent sections focus on the NBFI sector. Section 3 reviews past episodes of stress linked to the sector, highlighting how vulnerabilities such as leverage and liquidity mismatch, can be a source of systemic risk. Section 4 discusses vulnerabilities and risks emanating from the NBFI sector from a more structural perspective. Section 5 discusses how the NBFI sector can amplify risks in a procyclical manner and may be affected by monetary policy. Section 6 argues that a

comprehensive set of policy measures across non-bank entities and activities is needed to increase the sector's resilience from a macroprudential perspective. Finally, Section 7 concludes by discussing five open issues for future policy and research.

# 2. The interplay between corporate loans and market-based finance over the business cycle

The debt financing structure of euro area firms has broadened since the introduction of the euro, as NFCs are increasingly turning to capital markets in comparison to bank borrowing. This development was driven mainly by large NFCs rather than by SMEs, as they tend to have greater access to capital markets and lower borrowing costs (Giuzio and Lenoci, 2022). Deep and broad capital markets supported by the NBFI sector can stimulate the economy by facilitating an efficient allocation of capital and providing an alternative financing source to banks. Diversified funding sources and a flexible capital structure can help firms access a wider pool of investors and funding instruments, tailor their financing needs with market conditions and reduce their dependence on bank loans. Integrated capital markets also help to improve the risk-sharing of local shocks in a monetary union (Cimadomo et al., 2018).

Fluctuations in market-based finance can also contribute to macroeconomic booms and busts. Both loan and market-based finance supply play an important role in driving the business cycle in the euro area. A wide cross-country literature explores the role of credit – and within that bank credit – in contributing to economic and financial booms, busts and recoveries (e.g. Claessens et al., 2012, Schularick and Taylor, 2012, Jordá et al, 2017 and Mian et al, 2017). Diversified funding sources can foster a faster recovery from downturns and enhance the resilience of the real economy to financial and global shocks. But in euro area countries where corporate debt markets are relatively well developed, such as France and Germany, the impact of fluctuations in the provision of market-based credit exceeds that of loan supply (Barauskaité et al., 2022). This effect is stronger and more persistent than in other large and, often more bank-based euro area economies, such as Italy and Spain. In a global sample of developed economies, Cera et al. (2025) find that rapid growth in market-based credit has predictive power for recessions unrelated to financial crises, and all types of recessions in economies with a higher share of market-based credit. At the same time, they find that strong growth of market-based credit prior to recessions is associated with a stronger subsequent recovery than rapid pre-recession growth in bank-based credit.

**Chart 3: Average NFC debt securities and bank loans growth after business cycle peak**

(Q4 1951 – Q4 2019, estimates)

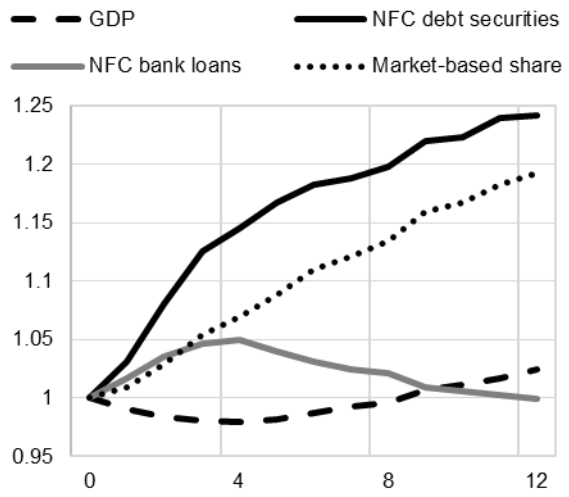
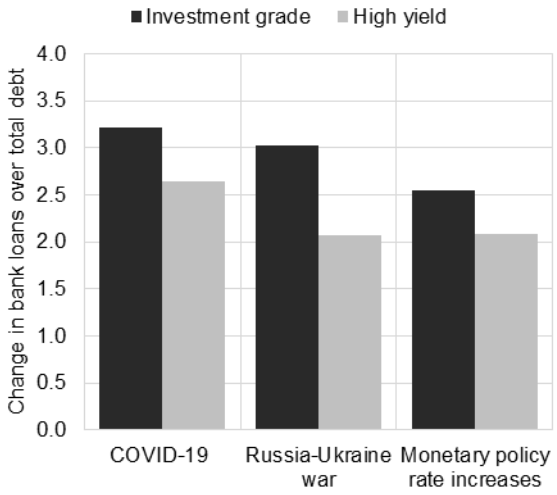



**Chart 4: Estimated change in NFC financing structure when credit volume increases**

(Sep. 2018-Dec. 2022, coefficient estimates)




Sources: Dealogic, ECB and authors' calculations.

Notes: Left panel: see Cera et al. (2024). Right panel: the estimated coefficients are obtained via a panel regression, where the change in financing structure over two subsequent months is regressed on the change in bond and loan credit volumes, interacted with the periods of analysis. Firms' financing structure is measured as the share of bank loans in total debt. The set of control variables includes firms' size in t-1, firms' profitability in t-1 measured as turnover, the difference in firms' cost of credit in the bond market relative to the loan market, firm-time fixed effects, firms' demand for loans and bonds and country-level fixed effects. COVID-19 refers to March-April 2020, the Russia-Ukraine war to February-June 2022 and monetary policy rate increases to July-December 2022.

Bond and loan financing can be complementary sources of credit, but also act as spare tyres in periods of economic and financial distress. Recent evidence shows that the replacement of bonds by loans occurs regularly after crises, and economies with high bond shares recover faster (**Chart 3**) (Grjebine et al., 2018 and Cera et al., 2025). NFC debt securities experience significantly stronger growth globally after a business cycle peak than NFC bank loans, implying an overall growth in the market-based share. This trend accelerates during the second year after the recession starts, which on average corresponds to the recovery phase of the business cycle. At the same time, bank credit replaced bond funding during the market turmoil period in March 2020, in the four months following the Russian invasion of Ukraine in February 2022, and also during the recent period of monetary policy normalisation, in the face of increased market volatility and rising financing costs (**Chart 4**) (ECB, 2021a and Giuzio and Lenoci, 2023). Having a balanced financial structure in which bank loans and marketable instruments complement each other offers clear diversification gains to firms (De Fiore and Uhlig, 2011) and is associated with lower systemic risk (Bats and Houben, 2020). But the benefits are heterogeneous across firms. While large and better-rated firms benefit the most from substituting bonds with loans, smaller and riskier firms may

find it harder to access credit as their ability to tap bond markets is more limited and they are more reliant on bank loans. As a result, in periods of financial market distress, such as at the start of the pandemic and the onset of the Russia-Ukraine war, overall credit to riskier firms was crowded out (Giuzio and Lenoci, 2023).

# 3. NBFI sector vulnerabilities – insights from previous stress events

While a more diversified financial system has clear benefits for the real economy, several episodes in the past few years have also shown that the growing NBFI sector is subject vulnerabilities which can be a source of systemic risk and amplify market-wide shocks.

During the COVID-19 market turmoil in March 2020, liquidity mismatch and leverage in the more vulnerable segments of the NBFI sector contributed to dislocations in short-term funding markets and amplified stress in wider bond markets through large asset sales. At the core of the stress were liquidity pressures among money market funds (MMFs) and other investment funds that invest in less liquid assets, such as commercial paper or high yield corporate bonds. The liquidity of MMFs and other investment funds deteriorated rapidly following the large redemptions from investors due to a wider dash-for-cash (**Chart 5**) and the rapid surges in margin and collateral calls. Investment funds were selling almost EUR 300 bn worth of assets, more than any other sector at the time, while MMFs liquidated a very large share of their holdings (**Chart 6**). Liquidity stress mounted and propagated to underlying markets when these one-sided selling pressures met inherently illiquid secondary markets. Ultimately, central bank interventions helped to restore market functioning and prevented a procyclical tightening of financial conditions, thereby alleviating the liquidity strains in the NBFI sector (see FSB, 2020, Falato et al. (2021) and Breckenfelder and Hoerova (2023)).

**Chart 5: Cumulative flows in EA-domiciled funds**

(20. Feb – 30. June 2020, percentage of Total Net Assets)

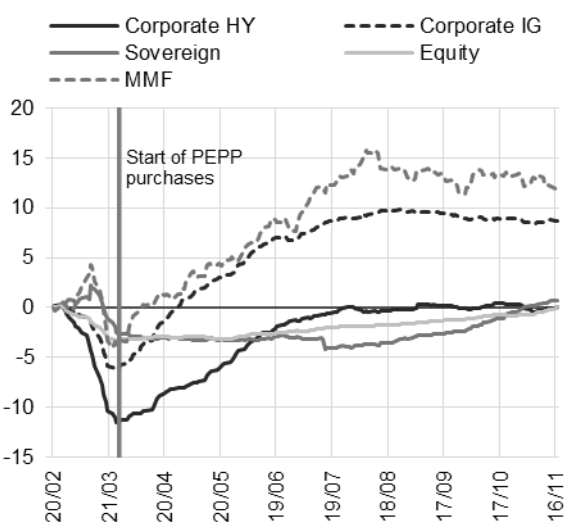
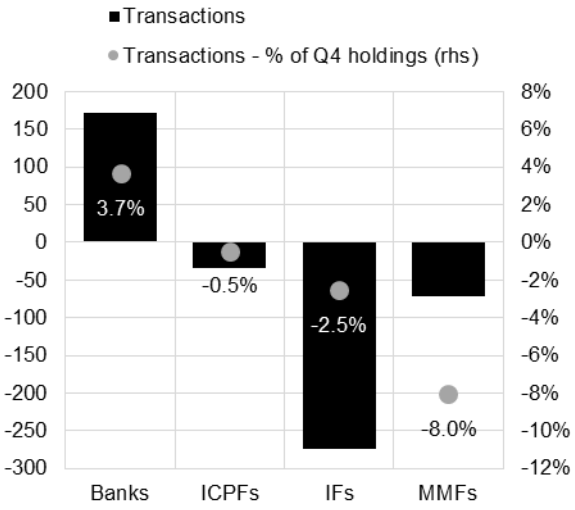



**Chart 6: Transactions in securities by euro area sector**

(Q1 2020, € billions and percentage of securities portfolios)




Sources: EPFR Global, SHSS and ECB calculations.

Vulnerabilities in investment funds and MMFs have been extensively analysed in recent years, including following the stress in March 2020. A key lesson from this episode is that liquidity mismatch in open-ended funds (OEFs) increased the risk of procyclical asset sales and fund suspensions (see, for example, Jiang et al. 2022; Grill et al. 2022; and Dekker et al., 2024). Likewise, MMFs investing in illiquid short-term paper and bonds were vulnerable to liquidity risk from large redemptions (see, for example, Cipriani and La Spada, 2020; Li, Li, Macchiavelli and Zhou, 2021; and Bouveret, Martin, McCabe, 2022). In normal times, MMFs do not usually rely on selling assets to raise liquidity and let their assets mature, while OEFs can manage routine redemptions via cash holdings or by selling liquid parts of their portfolio to repay investors. However, during stress periods such as at the onset of the pandemic, outflows can become exceptionally large, including because investors redeem to raise cash for margining, prompting MMFs to sell short-dated paper and OEFs to liquidate illiquid assets, further exacerbating market stress. Market functioning has often been cited as a relevant factor amplifying liquidity stress. But MMF and OEF activity have an important role in shaping funding markets, due to the large market footprint of these sectors, similar investment strategies and overlapping portfolios.

A further lesson relates to the systemic relevance of MMFs. The pressure on MMFs to sell assets in inherently illiquid markets at the onset of the pandemic led to dislocations in short-

term funding markets which threatened to distort monetary policy transmission. There were also concerns that risks in MMFs could spill over to the broader financial system. Those risks did not spiral out of control, as the outflows slowed and then reversed following large-scale central bank asset purchases, as well as targeted measures to stabilize short-term funding markets, such as expanding the ECB's asset purchases to corporate securities with shorter maturities, and increasing the risk concentration limit for unsecured bank bonds (ECB, 2020a; ECB, 2020b). Fiscal measures also helped contain the broader and longer-term fallout from the pandemic, but the quick and sizable action by central banks played a key role in alleviating systemic risk in this acute phase of the crisis (ECB, 2020c).

The March 2020 market turmoil exposed further important interconnections within the NBFI sector. Typically, insurance corporations and pension funds (ICPFs) use MMFs to manage liquidity needs from margin calls, alongside other means to store and manage cash. During the March 2020 market turmoil, initial margins increased (ECB, 2021b) and there were significant fluctuations in variation margin.[3] And a strong correlation could be observed between flows in euro-denominated MMFs and variation margin calls faced by Dutch pension funds around this period (Ghio et al., 2023). Towards the end of February and in early March 2020, when long-term interest rates declined and the euro appreciated against the US dollar, ICPFs received large amounts of variation margin from their FX and interest rate derivative exposures. However, when rates reversed by mid-March, ICPFs had to return most of this margin adding to the outflows from MMFs. These volumes are estimated to have reached almost €50 billion between 11 and 23 March. This example demonstrates the importance of ensuring that MMFs remain resilient under stress, so as to avoid liquidity shortages and risks spreading to other parts of the financial system.

Leverage can also amplify stress by forcing entities to sell assets and unwind their positions abruptly when significant margin calls are accompanied by large mark-to-market losses. Such dynamics affected US hedge funds in March 2020. More recently, UK pension funds using leveraged liability-driven investment (LDI) funds were subject to large margin calls when the value of long-dated government bonds fell following the UK Government's mini-budget in September 2022. The resulting spike in the demand for liquidity and deleveraging

[3] Initial margins are usually collected to cover potential future exposure over the appropriate close-out period in the event of counterparty default. They typically rise when volatility significantly exceeds previously observed values and when prices increase, but the exact sensitivity depends on the underlying model and its calibration. Variation margins are collected to set the current market exposure to zero, reflecting market price changes.

pushed those funds to sell government bonds, putting further downward pressure on asset valuations, with the risk of spillovers to other financial institutions or markets increasing (Mosk et al., 2023). The Bank of England was prompted to intervene on financial stability grounds, making temporary purchases of UK government bonds.[4] The systemic nature of this episode highlights the importance of liquidity preparedness among NBFI sector entities to meet margin calls (FSB, 2024b). In particular, while margins offer protection against counterparty risk in derivative transactions, they may amplify liquidity stress if market participants are not well prepared to meet large and abrupt increases in margin calls (Macchiati et al., 2025).

High leverage in an interconnected financial system can also lead to counterparty risk and contagion, raising financial stability concerns. The failure of Archegos Capital Management in March 2021 and associated losses demonstrate the risks arising from excessive leverage in the NBFI sector for the banking sector. As Archegos defaulted on a portfolio of equity total return swaps, bank counterparties suffered total losses of over $10 billion. While the event was not considered systemic, it did trigger bank supervisors to raise their expectations regarding counterparty risk management for prime brokerage services.[5]

However, the cases of Long-Term Capital Management (LTCM) in 1998 and American International Group (AIG) in 2008 represent two key examples of non-bank financial institutions contributing to systemic risk in the global financial system are. Both institutions were highly leveraged, deeply interconnected with other financial intermediaries, and insufficiently capitalized. Albeit affecting very different types of institutions, these cases revealed significant vulnerabilities in the NBFI sector at those times, in particular related to leverage, opaqueness, as well as direct and indirect links to the core of the financial system. LTCM was a hedge fund engaged in relative value trading strategies, relying on high leverage and concentrated positions in global government bond markets. When the Russian government defaulted on its bonds in 1998, the fund incurred substantial losses on its balance sheet. The potential collapse of LTCM posed a serious risk of contagion, as it was deeply intertwined with major global banks. To prevent losses spreading throughout the financial system, the Federal Reserve organised a bailout by several private-sector financial institutions. AIG, a global insurance company, was heavily exposed to credit default swaps

[4] See "Bank of England announces gilt market operation", Bank of England, News Release, 28 September 2022.
[5] See "Supervisory expectations for prime brokerage", ECB, Supervision Newsletter, 17 August 2022.

(CDS), which it, in effect, used to provide insurance against the default of mortgage-backed securities (MBS). As the housing market collapsed and defaults on MBS surged, AIG faced massive payouts on these contracts. Despite its large exposure to CDS, AIG had not set aside sufficient capital reserves to cover potential losses, leading to a liquidity crisis and its likely failure. But due to AIG's systemic importance, the US government stepped in with a bailout to prevent wider financial contagion.

# 4. Structural vulnerabilities and risks from the NBFI sector

As illustrated in the previous section, crisis episodes originating in the NBFI sector or individual entities can have the potential to generate wider systemic stress. This stress frequently arises from structural vulnerabilities that facilitate the materialisation of risks. Frictions and risk-taking in the NBFI sector can take several forms and vary across different types of entities. As the sector continues to grow, monitoring and managing these vulnerabilities has become increasingly important. A resilient NBFI sector should be able to withstand shocks and limit the risk of financial contagion. This, in turn, is a precondition for the sector’s ability to provide the real economy with stable market-based financing.

*Liquidity mismatches in open-ended investment funds*

Structural vulnerabilities are a particular concern in open-ended funds (OEFs). OEFs engage in liquidity transformation to various degrees, offering their investors share redemptions at short notice, while simultaneously investing in both liquid and less liquid assets. These liquidity mismatches can give rise to first-mover advantages if the pricing of fund shares does not fully account for the cost of liquidating underlying assets. The cost of selling assets – including the price impact in underlying markets – will typically be reflected in a fund’s net asset value only after investors have redeemed their shares. Such costs will then be borne by the remaining shareholders, leading to possible run-like behaviours (e.g., see Chen et al., 2010).

Even in the absence of first-mover advantages, asset managers may not have incentives to sufficiently prepare for exceptionally large redemption requests. Empirical evidence shows that the positive response of investors to past returns creates incentives for cyclical risk-taking. If non-linearities in the flow-performance nexus have a cyclical element, e.g., if the sensitivity of flows to returns become stronger as the market rises, or if investors care less about poor returns during times of crisis, asset managers have incentives for coordinated

cyclical risk-taking (Ryan 2024). Consequently, large redemptions may hit asset managers unprepared and prompt procyclical asset sales, affecting liquidity and prices in underlying markets, especially in times of stress. Liquidity risk can, in turn, spill over to other funds or other financial institutions holding similar assets, and potentially also affect firms' financing costs (see, for example, e.g. Cifuentes et al. (2005), Wagner (2011), Greenwood et al. (2015), Cont and Schaanning (2019), Fricke and Fricke (2021), Darmouni et al. (2022), and Cetorelli et al. (2023) for the relevance of overlapping portfolios and asset liquidations as a source of systemic risk.). Under even more severe circumstances, asset managers may need to suspend redemptions, increasing the risk of informational spillover to other funds and a wider loss of confidence in the sector.

Due to differences in investment mandates, cash buffers and liquid asset holdings can vary significantly across funds. This is also reflected in the ratio of issued shares relative to liquid assets held in OEFs (**Chart 7**). Property funds, such as real estate funds, are especially vulnerable due to the very illiquid nature of their investments. But bond funds, in particular those invested in less liquid types of bonds, are also frequently ill-prepared to meet a sudden rise in share redemptions. It is noteworthy that average cash holdings of investment funds in the euro area over the past decade have not only been very low (below 4%) but have also shown a tendency to decline. During this period, episodes with elevated market volatility and financial stress events have, at times, led to significant fund outflows. Indicators combining liquidity levels and redemption risk can help to identify pockets of vulnerabilities within the sector. Redemption coverage ratios (RCRs)[6] express the share of outflows that are covered by the fund's available liquidity when simulating a severe, but plausible outflow scenario over 30 days. Based on this indicator, a sizeable share of open-ended bond funds in the euro area – with the notable exception of those funds investing in advanced economy sovereign bonds – are at significant risk of a high liquidity shortfall **(Chart 8)**. **Section 6** discusses different policy options to mitigate risks related to liquidity mismatch in OEFs.

[6] See Daly et al. (2023): "Assessing liquidity vulnerabilities in open-ended bond funds: a fund-level redemption coverage ratio approach", ECB Financial Stability Review.

**Chart 7: Changes in sector size and liquidity mismatches in different types of euro area open-ended investment funds**

(Dec 2015 vs Jun 2024; x-axis: ratio, y-axis: bn EUR)

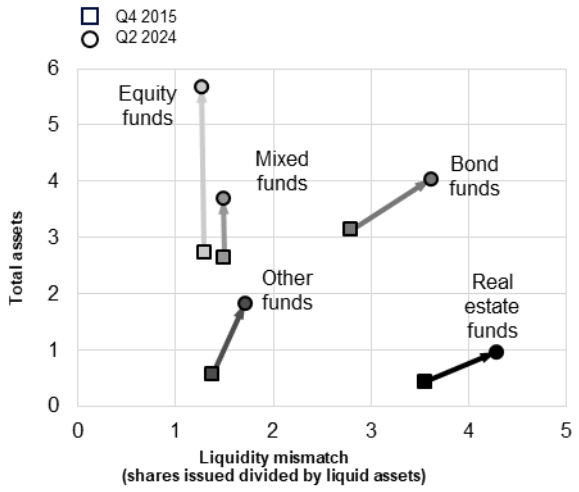
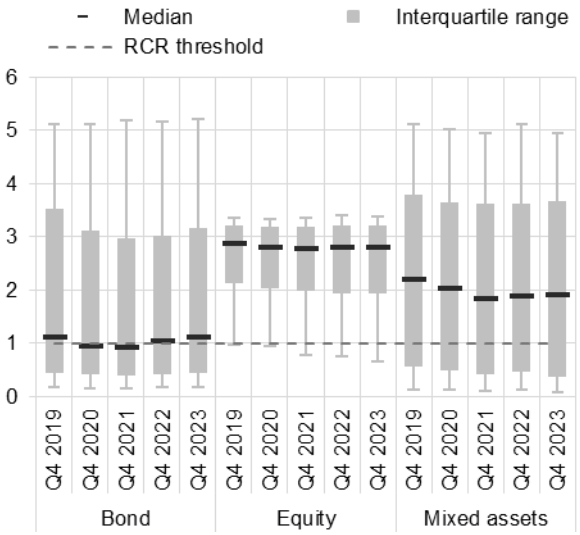



**Chart 8: Redemption coverage ratios in euro area open-ended investment funds**

(2019 vs 2023, percentages)




Sources: ECB, LSEG Lipper IM and ECB calculations.
Notes: Panel a: 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). Panel b: the RCR is the ratio between the fund-level high-quality liquid asset (HQLA) stock and the calculated group-level redemption shock, both expressed as a percentage of total net assets.

*Synthetic and financial leverage*

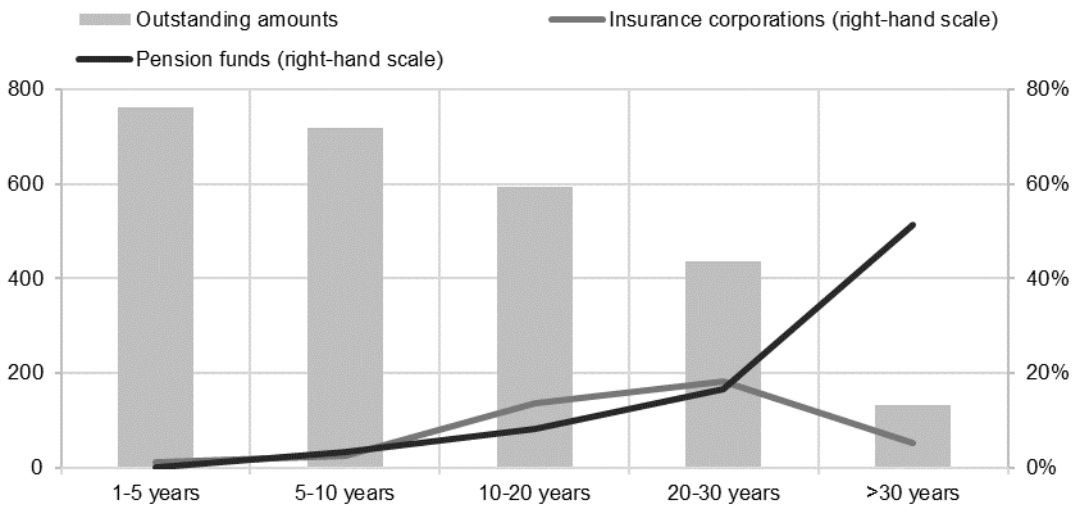
While leverage can enhance profits during favourable market conditions, it can also magnify losses during downturns, leading to severe financial distress. NBFI sector entities can leverage their positions synthetically using derivative instruments, or take on financial leverage via repo borrowings or bank loans. Hedge funds, or other investors using hedge fund-like strategies, tend to be the subsector most prone to taking high, and at times excessive, leverage . The complexity in using synthetic leverage and dealing with counterparty risk can obscure the true level of risk exposure, making it challenging to assess and manage potential systemic threats, as exemplified by the failure of family office Archegos (see **Section 3**).

Leverage used to amplify returns can increase a fund's return volatility, which can also imply a higher risk of sudden fund redemptions from investors, making the fund especially vulnerable to forced asset sale dynamics. Molestina Vivar et al. (2020) use European investment fund-level data to study flow performance relationships. While the relationship is similar for leveraged and unleveraged funds in the case of positive returns, there are

significant differences for negative returns. In particular, leveraged funds receive stronger outflows than unleveraged funds when returns are negative, thus exacerbating selling pressures and, hence, asset price deteriorations further.

**Chart 9: Euro area interest rate swap market shares by maturity bucket**

(End of 2023, bn EUR, percentages of total outstanding)




Sources: EMIR, ECB and ECB calculations.

Notes: Data reflect the notional outstanding for receive-fixed interest rate swaps. Exposures are netted for each institution for each maturity bucket. Central counterparties are excluded.

The use of financial derivatives for hedging purposes can also expose NBFI sector entities to sudden liquidity needs from margin or collateral calls. ICPFs are key investors in long-maturity interest rate derivatives (**Chart 9**) or follow liability-driven investment strategies. As balance sheets of ICPFs are characterised by very long-maturity liabilities in the form of guaranteed pension or life insurance payouts, leverage can be used to help extend the average maturity of their investments, thereby aligning the interest rate risks on both sides of the balance sheet. This provides hedging against a decline in the interest rate environment, ensuring that guaranteed returns can be provided, also over policy horizons that frequently exceed 20 years. However, these long-term strategies may trigger sudden liquidity needs when interest rate volatility rises or rates increase, in particularly for the long end of the yield curve. Margin calls can be sizeable in this context, and the liquidity to service them typically must be provided within a day. While collateral may be posted to meet initial margins covering the risk of usual short-term price variations, variation margin commonly has to be paid in cash, which further increases the risk of forced asset sales. Similarly, investment and hedging strategies based on repo borrowing or derivatives are subject to collateral or margin

calls as valuations of collateral pledged or underlying assets decline. Over the past years, insurance companies and pensions funds have been exposed to such vulnerabilities, resulting in a sudden need to raise cash or deleverage by selling assets in stressed market conditions (Ghio et al., 2023). While at times the sector managed to cope well with such shocks and raised liquidity in an orderly fashion (e.g., Dutch pension funds during the 2022 ECB rate hikes[7]), other market events triggered spillovers to the wider financial system, e.g., at the onset of the pandemic in March 2020 or during the UK gilt turmoil in Autumn 2022 (**see Section 3**).[8]

*Non-bank interconnectedness and risks for financial contagion*

The NBFI sector has both direct and indirect interlinkages with financial markets and the banking sector which makes prudent regulation essential not only to ensure stability within the sector, but also to limit the risk of financial contagion. As large investors in different markets, NBFI sector entities can catalyse and amplify adverse market dynamics if their structural vulnerabilities lead to liquidity constraints and trigger forced asset sales, as seen during the Covid-19 shock in March 2020 (**see Section 3, Chart 6**). Bond markets may be particularly affected due to the NBFI sector's large footprint in this segment. The sector has also increased its presence in real estate markets over the past decade, both via a growing real estate investment fund sector and through direct investment of ICPFs in property markets. This can add to procyclicality (Bandoni et al., 2023) and affect general market conditions, with fire sales during periods of stress having the potential to impair the financial positions of other investors with common asset holdings. Moreover, financial contagion risks can arise from direct NBFI sector connections with banks through borrowing, lending or ownership links (Acharya et al. (2024), Franceschi et al., 2023, Franceschi et al., 2024). Through their investments, the NBFI sector directly provides money market and bond funding to banks: at the end of 2022, euro area banks obtained around 14% of their funding from the sector. Vice versa, some NBFI sector entities obtain funding from banks when taking on leverage. Stress to individual entities can thus lead to funding shocks in both directions.

Although most vulnerabilities described in this section are of a structural nature, financial stability concerns related to the NBFI sector may change over time and can be amplified by additional portfolio risk-taking. This may increase the likelihood of liquidity events, which

[7] See De Nederlandsche Bank (2022)
[8] See also Tucker (2024).

subsequently expose structural weaknesses. The sector adjusts its portfolios in response to the monetary policy environment, which influences investment returns. In this way, monetary policy may induce cyclical dynamics, affect the overall size of the NBFI sector and its levels of liquidity, credit and duration risk-taking.

# 5. Procyclical amplification of risks and links to monetary policy

While NBFI sector financing grew significantly over the last two decades, the size of the sector and, hence, the financing it provides to the wider economy is subject to cyclical factors as well. A growing number of papers document the presence of separate credit cycles for banks and non-banks, which have varying correlations over time and across countries (see Kemp et al. 2018 and Durdu and Zhong, 2023).

Monetary policy is one of the key drivers behind the cyclical dynamics of credit provisioning through the NBFI sector, which can interact with the structural vulnerabilities and risks outlined in **Section 4**. Hau and Lai (2016), Choi and Kronlund (2017), Giuzio et al. (2021), Holm-Hadulla et al. (2023) and Kaufmann (2023) all find that monetary policy loosening implies higher inflows to the investment fund sector (by total assets the largest segment in the NBFI space), implying a growing financial intermediation capacity. In terms of financing instruments, there is also evidence that asset purchase programs have encouraged market-based financing, mainly provided through the NBFI sector, by making bond issuance more attractive to firms (De Santis and Zaghini, 2021).

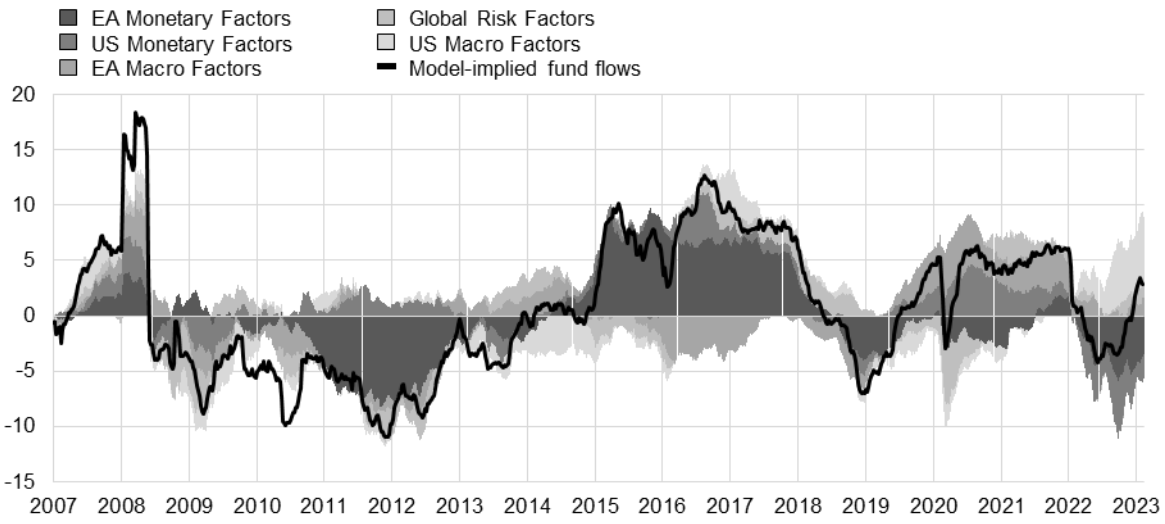
Mazzolini and Kaufmann (2024) decompose corporate bond and equity fund flows into different shocks using sign restrictions in a Bayesian vector autoregressions framework. Results for European-focused bond funds between 2007 and 2023 presented in **Chart 10** show that 44% of the variation in fund flows can be attributed to monetary policy related factors, both domestic and international. Other contributing factors include the domestic and international macroeconomic environment as well as investor risk sentiment, which played a significant role in the unprecedented outflows from the investment fund sector at the onset of the Covid-19 pandemic.[9] Regarding the underlying mechanisms, Feroli et al. (2014) argue that monetary policy loosening, by driving up asset valuations, can trigger momentum in

[9] Notably, there is a strong overall contribution of global or non-domestic factors in driving investor flows. Kaufmann (2023) shows how investment funds are both driving and are affected by the global financial cycle. Instead, banks' relevance has deteriorated since the global financial crisis (Miranda-Agrippino and Rey, 2020).

returns from investment funds. Due to pro-cyclical flow-performance dynamics, investment funds can then attract further inflows (Chen et al. 2010; Goldstein, Jiang, and Ng 2017).

**Chart 10**: **Decomposition of cumulative flows into European bond funds**

(Percentage of past net asset value)




Sources: Mazzolini and Kaufmann (2024).

Notes: Historical shock decomposition based on BVAR model with weekly data between 2007 week 1 and 2023 week 10. Analysis is based on linearly-detrended globally-domiciled bond funds with European investment focus.

Insurance corporations, by assets the second largest type of NBFI, also increase significantly in size when interest rates are falling. Kaufmann et al. (2024) provide evidence for this and argue that monetary loosening can stimulate the demand for insurance products due to its expansionary effect on real economic activity and households' income. This higher demand translates into larger total assets under management by insurers and, thus, higher asset demand. By contrast, when yields rise, insurance assets tend to fall as policy holders surrender contracts whose guaranteed returns have become less attractive (Kubitza et al., 2025).

The size and credit provision of other parts of the NBFI sector – that are arguably of less importance in European financial markets – may instead fall when monetary policy is loose. Xiao (2019) shows that monetary tightening leads to deposit inflows to MMFs because of competition for deposits with the banking system. Similarly, Cetorelli et al. (2022) document a strong cyclical link between higher policy rates and inflows to loan funds. Nelson et al. (2018) find that non-banks involved in asset securitisation activities grow larger when monetary policy rates rise. Elliott et al. (2022) show that fintech lenders and finance companies

increase credit supply and risk-taking increase after monetary tightening, as opposed to the traditional banking sector.

Importantly, the procyclical growth of the NBFI sector in response to monetary policy loosening also comes along with more risk-taking in asset portfolios, making the sector more vulnerable to credit, liquidity, and duration risks. On the one hand, such risk-taking can be an intended consequence of expansionary monetary policy to the extent it helps to ease financing conditions for the real economy. On the other hand, when risk-taking is excessively strong, it may imply a build-up of vulnerable asset holdings and make markets more prone to financial stress (see Jimenez et al., 2022 and Grimm et al., 2023).

**Chart 11: Initial fund inflow response to long- and short-end euro area monetary policy loosening shocks of 25 basis points**

(Percentage of net asset value (lhs), EUR billions (rhs))

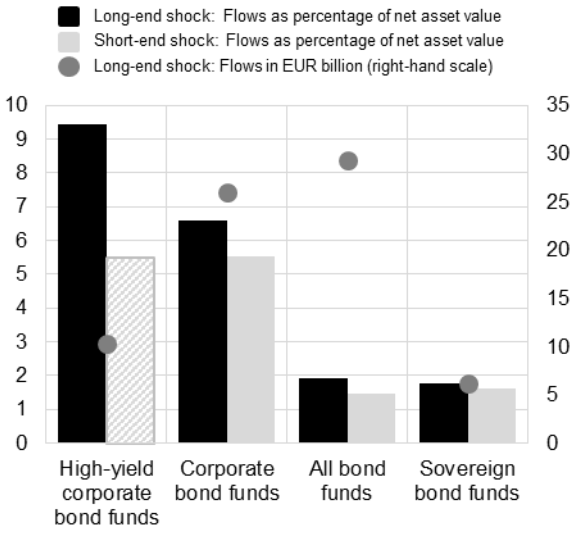
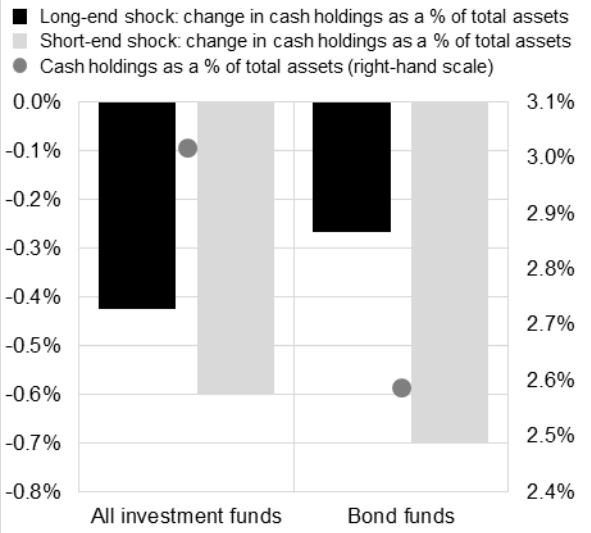



**Chart 12: Investment funds reduce cash holdings after monetary loosening shock**

(Change as percentage of total assets (lhs); percentage of total assets (rhs))




Sources: Giuzio et al. (2021)

Notes: Analysis based on structural BVAR with monetary policy shock identification following Jarocinski & Karadi (2020). Sample period from April 2007 to June 2023. Short (Long)-end shocks correspond to 25 bps reduction of the 3-month OIS (5-year Bund). Shaded areas indicate statistically insignificant results. Right chart: Red dots indicate cash buffers in 2020 Q4.

Giuzio et al. (2021) and Kaufmann (2023) show that after a monetary loosening, euro area investment funds obtain higher inflows but that such inflows are largest for riskier fund types. There is also evidence of risk-taking in the context of low interest rates by US funds (Di Maggio and Kacperczyk, 2017; Choi and Kronlund, 2017; and Daniel et al., 2021). **Chart 11** shows initial fund flow responses to different types of monetary policy measures in the euro area based on Bayesian vector autoregressions, where shocks are identified using high-

frequency methods. Monetary policy shocks to the long-end of the yield curve aim to capture the effects of policy tools such as quantitative easing programmes and forward guidance, which have played a key role in shaping financial conditions since the global financial crisis. Shocks to the short-end, instead, capture surprise changes to short-term interest rates. While inflows to bond funds overall are of similar amounts after same-sized shocks, there is evidence of more risk-taking after long-end shocks. Instead, in case of short-end monetary policy shocks, high-yield bond funds do not receive statistically significant inflows, while the flow response for sovereign funds is broadly similar. In the same vein, **Chart 12** examines the response of funds' liquidity buffers to both shock types. Fund managers reduce the cash holdings of their funds after all types of monetary loosening, but the effects are more pronounced after short-end shocks, given the stronger effect of such shocks on money market rates which determine the remuneration of cash holdings. Such increased liquidity risk-taking by fund managers may be a particular cause for concern, as this may decrease the sector's capacity to deal with large investor redemptions during a crisis scenario and impede funds' ability to provide stable credit to the real economy (see the related discussion in **Section 4**).

Kaufmann, Leyva and Storz (2024), in turn, provide evidence for portfolio rebalancing of insurance corporations, consistent with the risk-taking channel of monetary loosening. **Chart 13** shows results from local projections for the balance sheet of euro area insurers after a monetary loosening based on data for the insurance sectors of 19 euro area countries. Insurers increase the share of relatively riskier asset classes, such as equity and investment fund shares, while they reduce exposures to debt securities, MMF shares and cash. Within their bond portfolio, they tilt their exposures towards bonds with lower credit ratings and longer duration.[10] This makes insurers' balance sheets more vulnerable to liquidity, credit, and market risks – for example, when corporate defaults rise, or liquidity needs surge abruptly due to policy lapses or high margin calls.

[10] On (duration) risk-taking by insurance corporations, see also Domanski et al. (2017) and Ozdagli and Wang (2019).

**Chart 13: Projection of insurance corporations' balance sheet after monetary policy loosening**

(x-axis: quarters after monetary policy shock, y-axis: percentages of total assets)

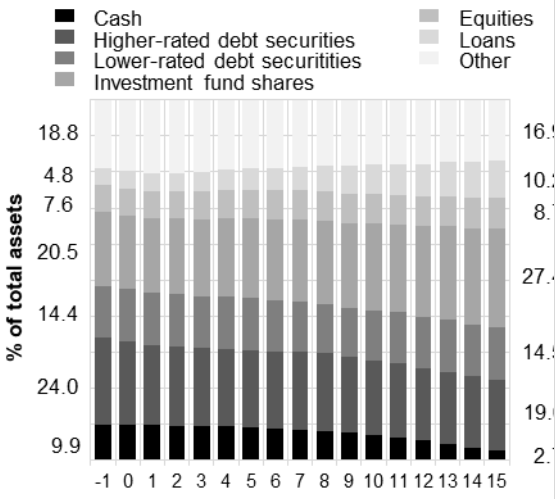
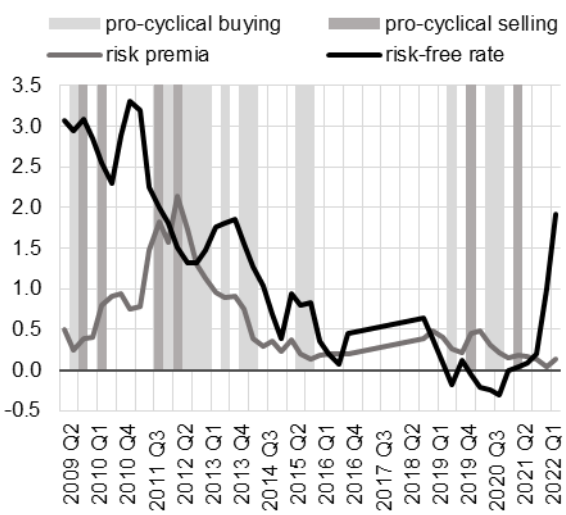



**Chart 14: Insurer's trading behaviour in relation to risk-free rates and risk premia**

(percentage points)




Sources: Kaufmann, Leyva, Storz (2024), Fache Rousová and Giuzio (2019)

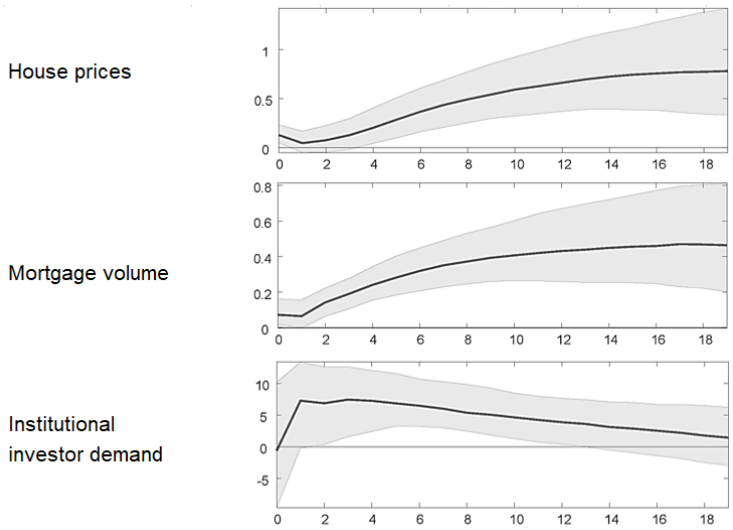
Notes: *Left:* Analysis based on local projections and monetary policy shock identification following Jarocinski & Karadi (2020) showing 10 bps reduction of the 5-year Bund rate. Sample period from 2010 Q1 and 2019 Q4. Initial values depict sample means. Cash also includes MMF shares. Higher-rated debt securities are securities of issuers rated above BBB. Other assets include unrated debt securities. *Right:* Analysis based on security-level analysis of euro area insurer's non-domestic government bond holdings.

Timmer (2018) finds that the asset demand of insurers counter-cyclically rises after lower asset returns which are typically associated with high yields. But the cyclicality of insurers' trading behaviour may also depend on the source of yield movements. Fache Rousová and Giuzio (2019) find that euro area insurers buy sovereign bonds when risk-free rates rise, but procyclically sell when risk premia increase (**Chart 14**). The reason for this difference in trading behaviour is due to the negative duration gap usually found in insurers' balance sheets, in combination with mark-to-market accounting. Risk-free rate changes affect both asset and liability side valuations, with the latter being affected more strongly in case of a higher duration gap. When rates are falling, this implies lower capitalisation of insurers, which can force the sector to shed assets. Instead, changing risk premia only affect asset side valuations. Falling risk premia can imply a strengthening of capital positions, which insurers may use to pro-cyclically purchase further securities. At the same time, O'Hara et al. (2024) show that insurers absorbed corporate bonds at the onset of the Covid-19 pandemic when risk premia surged.

Non-bank investors can also procyclically amplify house price dynamics when monetary policy is loose. Based on Bandoni et al. (2023), **Chart 15** presents impulse responses of house prices to a monetary policy shock from a Bayesian VAR model that focuses on the euro area. Consistent with the wider literature, monetary policy easing transmits to the residential real estate market mainly through lower bank lending rates and leads to a positive yet delayed response in house prices. However, an accommodative shock also has a positive impact on institutional investors' residential real estate purchases. This provides evidence for institutional investors' search for yield in times of easing monetary policy when residential real estate assets become more attractive relative to other asset classes. Moreover, the authors also present evidence that house prices deviate more from economic fundamentals when institutional investors are present in a regional market.

**Chart 15: Impulse responses of real estate market after monetary policy loosening**

(x-axis: quarters following the shock; y-axis: percentages)




Sources: Bandoni et al. (2023).

The cyclical risk-taking behaviour related to the monetary policy environment makes the NBFI sector as well as wider financial markets more vulnerable to shocks. With regards to investment funds, Feroli et al. (2014) argue that an abrupt change in interest rate levels, for example triggered by a monetary policy tightening, can suddenly revert flows. Indeed, evidence from the tightening cycle starting in 2022 indicates that funds experienced outflows when interest rates started rising (Giuzio et al. 2021). Such outflows can get exacerbated by flow-performance effects and may force funds to sell assets at short notice. While the selling pressure is higher when NBFI sector liquidity buffers are low, further empirical evidence

suggest that funds can even start hoarding cash when faced with outflows (Morris et al., 2017; Schrimpf et al., 2021). This behaviour can even lead to significant price movements of otherwise highly-liquid assets, such as US Treasuries (Ma et al., 2022).

# 6. The need to strengthen the resilience of the NBFI sector from a macroprudential perspective

With non-bank financial institutions gaining a larger footprint in the financial system and increasingly financing the real economy, vulnerabilities in the sector may contribute to exuberant risk-taking during market upswings and amplify episodes of financial market stress, with potential spillovers to the macroeconomy (**Sections 1-5**). Some of these vulnerabilities are structural, such as those arising from liquidity mismatch in the investment fund sector, non-bank leverage and interconnectedness. But asset managers and insurance companies can also be prone to take on additional risk when financial conditions are benign and tend to respond procyclically to changes in monetary policy. Such vulnerabilities and procyclicality may be associated with fire sale and aggregate demand externalities during crises (Lorenzoni, 2008; Korinek and Simsek, 2016; Bianchi and Mendoza, 2018) or network spillovers (Allen and Gale, 2000; Gai and Kapadia, 2010, 2019; Gai, Haldane and Kapadia, 2011), as the wider impact of these on the financial system and real economy may not be fully internalised by market participants. Herding in financial markets (Gennaioli, Shleifer, and Vishny, 2012; Aikman, Nelson and Tanaka, 2015) may also play a role, together with disaster myopia (e.g., see Gennaioli, Shleifer, and Vishny, 2012). For example, the latter may contribute to an under-estimation of the likelihood of abrupt and sizable market shocks, which is potentially one factor behind insufficient liquidity preparedness to meet margin and collateral calls. At the same time, the neglect of systemic risk increases the likelihood of future crises. But since past crisis episodes emanating from the non-bank financial sector have often been met with extraordinary central bank policy action (**Section 3**), this can raise moral hazard concerns (Farhi and Tirole, 2012).

*Towards a macroprudential approach for NBFI*

These types of frictions and externalities justify the case for public policy intervention in relation to the NBFI sector to ensure financial stability and support a more stable provision of funding to the real economy at all times. This requires taking a system-wide – or macroprudential – perspective in the design and implementation of regulatory frameworks.

While macroprudential policies for banks have been instrumental in increasing banking sector resilience since the global financial crisis, this perspective is less well developed in the policy framework for the NBFI sector, with very few tools designed to address systemic risk. Instead, market supervision often focusses on investor protection or conduct issues. Strengthening the policy framework from a macroprudential perspective could thus help to enhance the resilience of the NBFI sector.

Bringing a systemic perspective to existing regulation in the investment fund or insurance sector can be a useful starting point. But it may also be useful to consider additional macroprudential policy tools to tackle systemic risk in a more flexible manner. The following discusses concrete policy options to tackle risks in open-ended investment funds and MMFs, enhance liquidity preparedness to meet margin and collateral calls (FSB, 2024b), and address risk from NBFI sector leverage.

Throughout all of this, given that the NBFI sector comprises a wide range of entities and activities, it is important that the policy response should be correspondingly differentiated and tailored to specific entity types and their business models, while remaining comprehensive. For example, liquidity buffers are an important tool for MMFs, whereas a minimum notice period of several months or even a year to redeem fund shares for cash may be better suited to limit liquidity mismatch in open-ended funds that invest in illiquid assets, such as real estate.

There is also a strong need for international policy coordination given the large cross-border dimension of NBFI sector activities. While different market structures and legal frameworks across jurisdictions require flexibility in the implementation of international policy recommendations, this needs to be balanced against mitigating cross-border arbitrage and ensuring consistency in the measurement and treatment of risk.

*Mitigating liquidity mismatch in open-ended funds (OEFs)*

Sections 3 and 4 discussed how structural vulnerabilities resulting from liquidity mismatches in OEFs may compromise their ability to absorb shocks and prompt them to sell assets in a procyclical manner. Due to agency problems and industry-wide competition for market share, there is a tendency for the asset management sector to engage in too much liquidity transformation. If asset managers cannot otherwise commit to act in the sole interest of investors, they may use the open-ended form to signal their commitment, leading to a sub-optimal, i.e. too high, level of open-endedness across the sector (Stein, 2005). While

investors can benefit from liquidity transformation, the social costs associated with fire sales and wider risk amplification during stress periods are usually not internalised during tranquil times. Since market discipline may be insufficient to mitigate first-mover advantages among fund managers and ensure sufficient self-insurance against rare but plausible stress scenarios, there is a case for regulatory intervention from a macroprudential perspective.

Although policies to mitigate liquidity mismatch ex ante are less developed in global standards, aligning asset liquidity with redemption terms is generally seen as an effective way of limiting structural vulnerabilities in the asset management sector.[11] Such an approach can address both the asset and liability side of a fund's balance sheet. For example, on the liability side, several jurisdictions require minimum notice periods or impose constraints on redemption frequency for OEFs that invest in illiquid assets, such as real estate. On the asset side, funds may be required to invest only in certain eligible marketable securities, such as under the UCITS directive in the EU.[12] Liquidity buffers are less commonly used as a policy tool for OEFs, but they can also effectively reduce vulnerabilities related to liquidity mismatch.[13] For example, evidence for the Covid stress episode shows that corporate bond funds with higher liquidity buffers were better able to manage large outflows, and the funds engaged less in procyclical cash-hoarding (Dekker et al., 2024).

Recent international recommendations tend to focus on requiring funds to adopt anti-dilution liquidity management tools.[14] Likewise, in the EU, recent legislation aims to promote greater availability and use of liquidity management tools, including redemption fees, swing pricing, dual pricing, anti-dilution levies among other tools.[15] Anti-dilution liquidity management tools can help reduce first-mover advantages by enabling OEFs to pass on to redeeming investors the explicit and implicit costs of selling assets under both normal and stressed market

[11] See "Policy Recommendations to Address Structural Vulnerabilities from Asset Management Activities", FSB, January 2017.
[12] See "Issues note on policy options to address risks in corporate debt and real estate investment funds from a financial stability perspective", ESRB, September 2023.
[13] In the US, authorities have proposed a minimum share of highly liquid assets for open-ended funds. See "SEC Proposes Enhancements to Open-End Fund Liquidity Framework", November 2022. Di Iasio et al. (2023) show in a macroeconomic model framework how liquidity buffers can enhance welfare and reduce the severeness of economic downturns.
[14] See "Revised Policy Recommendations to Address Structural Vulnerabilities from Liquidity Mismatch in Open-Ended Funds", FSB, December 2023; and "Anti-dilution Liquidity Management Tools – Guidance for Effective Implementation of the Recommendations for Liquidity Risk Management for Collective Investment Scheme", IOSCO, December 2023.
[15] See amendments to the Alternative Investment Fund Managers Directive (AIFMD) and the Undertakings for Collective Investment in Transferable Securities Directive (UCITS Directive).

conditions (Jin et al., 2022; Dunne et al., 2024). While swing pricing – reflecting the cost of liquidating assets in share redemption prices – can help disincentivise early redemptions, in practice, such tools are often difficult to calibrate, and the swing-factor may be too small to incentivise outflows in crisis situations (Lewrick and Schanz, 2023). Moreover, swing-pricing may be difficult to utilise if robust and timely price information becomes unavailable in distorted markets, while investors may be prompted to redeem their shares before the swing-factor is activated. Hence, the tools cannot substitute for other structural measures which directly limit the liquidity mismatch of OEFs ex ante.

*Enhancing money market fund resilience*

Despite their perceived cash-like properties, MMFs are not immune to credit and liquidity risks, particularly when they invest in less frequently traded instruments like commercial paper and certificates of deposit issued by the private sector (e.g., see Bouveret et al., 2022). In stable market conditions, MMFs manage liquidity by allowing assets to mature. However, during periods of stress, MMFs may be forced to liquidate assets to meet redemption demands, which can lead to wider systemic spillovers, as seen during the COVID-19 crisis (**Section 3**).

Following the global financial crisis, legislators around the world have tried to address systemic risk in the MMF sector, including by recommending a conversion of MMFs with stable NAV to floating NAV.[16] The events during March 2020 prompted another round of policy reforms to increase resilience in the sector internationally. To that end, the FSB proposed a set of policy options to address MMF vulnerabilities by imposing on redeeming investors the cost of their redemptions, enhancing the ability to absorb credit losses, addressing regulatory thresholds that may give rise to cliff effects, and reducing liquidity transformation, for instance, by requiring higher liquidity buffers.[17]

Measures proposed by European authorities focus on strengthening MMF liquidity requirements and removing the stable value of funds that invest predominantly in privately issued debt.[18] Higher liquidity buffers and better usability of such buffers are seen as

[16] See "Policy Recommendations for Money Market Funds – Final Report", IOSCO, October 2012.
[17] See "Policy Proposals to Enhance MMF Resilience – Final Report", FSB, October 2021.
[18] See "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; "Eurosystem contribution to the European

essential for supporting the cash management function of MMFs during stress periods. In addition, it has been proposed that a fraction of buffers should be held in liquid government debt securities to help reduce externalities and increase resilience by diversifying MMFs' sources of liquidity (Grill et al., 2022a, 2022b).

Another set of policy proposals aims to remove regulatory threshold effects linked to the activation of liquidity management tools, which can undermine investors' confidence in times of market distress, and enhance buffer usability. If fund suspensions or gating are linked to breaching regulatory liquidity thresholds, investors may pre-emptively redeem their shares to avoid the consequences of a fund crossing those thresholds, potentially exacerbating outflows. For example, Li et al. (2021) show that private debt MMFs in the US with low levels of weekly liquid assets (WLAs), which are thus more likely to consider fees and gates, experienced higher outflows than MMFs with high levels of WLAs during the March 2020 market turmoil. Dunne and Giuliana (2021) find similar results for the EU MMF sector. Capota et al. (2022) find that EU MMFs subject to fees and gates saw higher outflows compared to similar MMFs not subject to those provisions, and that outflows were higher for funds with lower levels of WLA. Encouraging fund managers to actively use liquidity buffers or making part of the liquidity buffer releasable during periods of stress could further enhance usability.

For MMFs invested in private debt, consideration could also be given to removing their stable value. Bouveret at al. (2024) demonstrate in a model that MMFs cannot provide liquidity and preserve capital for investors at the same time. And Capota et al. (2022) find that low volatility net asset value (LVNAV) funds, which invest in non-public debt assets while offering a stable NAV, faced higher redemptions during the March 2020 market turmoil than other fund types. Removing the stable value would both reflect the underlying asset value more accurately and eliminate first-mover advantages and unintended threshold effects associated with crossing the collar around the stable value, especially during stress times. At the same time, it might also be possible to preserve the stability of such funds by requiring them to hold relatively high levels of liquidity buffers.[19] Since a large off-shore segment exists for USD-

Securities and Markets Authority (ESMA) consultation on the framework for EU money market funds", Eurosystem, June 2021.

[19] See "Eurosystem contribution to the European Securities and Markets Authority (ESMA) consultation on the framework for EU money market funds", European Central Bank, June 2021.

and GBP-denominated MMFs in the EU, international policy coordination is particularly important in the MMF sector to minimise the risk of cross-border regulatory arbitrage.

*Enhancing liquidity preparedness for margin and collateral calls*

**Sections 3 and 4** discussed how weaknesses in the liquidity risk management of investment funds, insurance corporations and pension funds can lead to difficulties in responding to large liquidity demands from margin and collateral calls, with negative externalities for the wider financial system.[20]

Although authorities have started to address imminent risk from insufficient liquidity preparedness following past stress events, typically targeted at specific market segments, [21] consistent standards in relation to these risks are limited. In view of this, and emphasising the need for a systemic perspective, a range of measures have recently been proposed by the FSB to improve the liquidity preparedness of non-bank market participants to meet margin and collateral calls (FSB, 2024b). A combination of such measures is likely to be important.

First, NBFI sector entities could be mandated to establish more effective contingency planning – such as enhanced collateral management practices and access to credit lines – and governance practices to manage liquidity risks from margin or collateral calls. This would foster better assessment of such liquidity risks and enable authorities to tailor further liquidity measures based on the effectiveness of these plans.

Second, NBFI entities active in derivative and repo markets could be required to conduct liquidity stress tests under system-wide stress scenarios. By assessing both entity-level and system-wide liquidity needs, authorities and entities would be better positioned to evaluate their capacity to meet margin and collateral demands during stressed periods. Conducting such stress tests could also improve data availability at the entity level, serve as a disciplining mechanism, and enhance entities' risk management functions and contingency planning. However, stress tests may be resource-intensive for authorities and face data

[20] See also "Holistic Review of the March Market Turmoil", FSB, 17 November 2020; " The Financial Stability Aspects of Commodities Markets", FSB, 20 February 2023; "Non-banks' liquidity preparedness and leverage: insights and policy implications from recent stress events", Financial Stability Review, ECB, May 2023; and "Lessons learned from initial margin calls during the March 2020 market turmoil", Financial Stability Review, ECB, November 2021.
[21] See "Non-banks' liquidity preparedness and leverage: insights and policy implications from recent stress events", Financial Stability Review, ECB, May 2023.

challenges, particularly regarding the availability of entity-level data for top-down assessments.

Third, more vulnerable NBFI sector entities could be required to hold sufficient levels of highly liquid assets to protect them from risks associated with high volatility in liquidity demand from margin and collateral calls.[22] For example, Jukonis et al. (2024) and Macchiati et al. (2025) show that a significant share of euro area funds with sizeable derivatives exposures may not have sufficient liquidity buffers to meet margin calls under stress. At the same time, trade-offs exist between the costs of greater self-insurance, such as from foregone revenues and potentially greater market-wide scarcity of high-quality collateral, and benefits of enhanced resilience for individual NBFI entities and the broader financial system. Liquidity stress testing could help to guide the appropriate level of liquidity buffers.

Finally, NBFI sector entities often depend on similar liquidity sources and may not fully consider how their actions in stress could exacerbate systemic risk. To mitigate this, entities could be required to diversify their liquidity sources across and within asset classes and avoid concentration in specific types of collateral. On the funding side, diversification requirements could help to prevent excessive counterparty concentration for credit and repo lines. The specific design of such measures could also be informed by entities' contingency plans.

*Addressing risk from NBFI leverage*

A number of non-bank financial institutions are subject to capital requirements, such as insurance cooperations or pension funds, and hence restrained in their use of leverage. Others, such as hedge funds or family offices, do note face direct or indirect leverage constraints. Data to assess NBFI leverage is often fragmented and differences in the regulation of NBFI leverage exist across products and jurisdictions. There is also no common understanding internationally on how to best measure synthetic leverage used in complex investment strategies. For example, previous work by the International Organization of

[22] 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;

Securities Commissions (IOSCO) stopped short of developing globally consistent metrics to assess leverage-related risks in the asset management sector.[23]

As a result, leverage can build up, especially in the less constrained market segments, and give rise to solvency risk, fire sales and liquidity spirals that can arise from deleveraging in crisis times (**Section 3**). Leverage may also interact with liquidity risk from margin or collateral calls across a broad range of institutions and amplify redemption risk in investment funds (**Section 4**). Policies aimed at containing the build-up of leverage thus aim to mitigate amplification and contagion effects, and, by extension, increase resilience of the broader financial system. To achieve this, regulators and policymakers focus on several key areas.

Firstly, improving transparency is essential for assessing and constraining risk from NBFI leverage. Comprehensive and timely data on leverage levels, risk exposures, and interconnections among NBFIs allow public authorities to better understand and monitor systemic risks. International collaboration and sharing of best practices can enable authorities to better measure and identify risk from NBFI leverage. By mandating that non-banks disclose their leverage ratios, risk exposures, and risk management practices, regulators can incentivise prudent behaviour and enable leverage providers to make more informed decisions, allowing them to exert pressure on their NBFI counterparties to maintain sound risk management practices. Enhancing the counterparty credit risk management at banks and broker dealers can, in this way, help mitigate the build-up of leverage in the NBFI sector, especially for entities that are not subject to regulatory leverage constraints, ultimately supporting financial stability.

Secondly, regulators may impose leverage limits or other requirements to constrain excessive risk-taking. This could include setting concrete leverage limits and/or using discretionary restrictions for specific entity types with similar risk exposures. Such measures aim to ensure that NBFI entities maintain sufficient capital buffers to absorb losses and continue operations during periods of financial stress. The calibration of such limits would require an assessment of cost and benefits of such measures, considering the specific business models, the economic benefits of such leverage, and the level of leverage-induced externalities that the financial system could withstand. Leverage limits can also prevent the buildup of systemic risk by discouraging excessive borrowing and speculative activities. One example includes measures

[23] See “Recommendations for a Framework Assessing Leverage in Investment Funds”, Final Report, No 18/2019, IOSCO, December 2019.

to ensure a minimum level of resilience among LDI funds, which are used to manage duration risk of UK pension funds.[24]

Thirdly, activity-based measures that affect funding in securities financing and derivative transactions can usefully complement the policy toolkit for tackling risk from NBFI leverage. Several international standards govern the exchange of variation and initial margins in centrally cleared and non-centrally cleared derivatives transactions,[25] while the degree of central clearing varies across market segments and jurisdictions. Although existing measures are designed to mitigate counterparty credit risk, activity-based measures, such as haircuts and margins, can also limit the leverage created through derivative exposures or repo borrowing. This approach can be effective especially in markets where non-bank market participants are not constrained by entity-based leverage limits. One example is the Financial Stability Board's minimum haircut framework for securities financing transactions, which aims to constrain the leverage in the NBFI sector that is generated via securities lending and repo transactions backed by non-government debt collateral.[26] Another is the mandating of central clearing in government bond repo markets,[27] which means that such transactions become subject to initial margining, affecting the conditions for borrowing in repo markets and hence leverage.[28]

# 7. Open issues for policy and research

This paper has highlighted how the growth of the NBFI sector has been accompanied by expanding research on its interplay with the macroeconomy while also catching the attention of macroprudential policy makers. Yet, compared to the banking sector, policy and research thinking still remains nascent and many important issues remain open. From this potentially

[24] For example, a "yield buffer" can be set at levels ensuring that an LDI fund can absorb a corresponding increase in yields before its net asset value falls to zero. 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.
[25] See Margin requirements for non-centrally cleared derivatives", BCBS, IOSCO, April 2020; "Transparency and responsiveness of initial margin in centrally cleared markets – review and policy proposals", consultative report, BCBS, CPMI, IOSCO, January 2024; "Streamlining variation margin in centrally cleared markets – examples of effective practices", CPMI, IOSCO, February 2024.
[26] See "Regulatory framework for haircuts on non-centrally cleared securities financing transactions", FSB, originally published in November 2015, last updated in September 2020. The minimum haircuts would apply only to transactions in which non-banks received funding against non-government debt collateral.
[27] For example, see "Central Clearing in the U.S. Treasury Market: The Why and the How", speech by Michelle Neal, Federal Reserve Bank of New York, 15 October, 2024.
[28] For a wider discussion of policy options to address risks from NBFI leverage, see "Leverage in Non-bank Financial Intermediation", consultation report, FSB, 18 December 2024.

long list, the paper concludes by highlighting five areas where further policy and research work could be useful in informing macroprudential debates relating to the NBFI sector.

*(i) Improved data and better information sharing across authorities and jurisdictions*

Significant efforts have been made to enhance data collection on the NBFI sector in recent years, both at the entity level and in relation to some key NBFI sector activities. For example, transaction-level data on derivatives and securities financing transactions is now reported globally,[29] and some of the analysis discussed above has exploited those data. Yet further progress is still needed in some areas to develop globally consistent data standards, close data gaps, enhance transparency and increase the frequency of data reporting. As noted above, this is particularly important in relation to NBFI sector leverage. But current data is also insufficient to quantify the majority of interconnections among NBFI sector entities, at least on a global basis.

At the same time, the cross-border nature of non-banks' activities means that sharing of information across authorities may be just as important as having better data. Within jurisdictions, this includes the sharing of data across central banks, securities market regulators, insurance supervisors and banking supervisors. But sharing key information internationally across jurisdictions may also be vital for risk identification and monitoring purposes. For example, one reason why Archegos was able to build-up large, concentrated equity derivative positions largely unnoticed was because nationally fragmented data did not allow authorities to establish a comprehensive and consolidated view of the entity's global equity exposures. Had authorities been sharing information on Archegos, they may have been able to identify the risk it posed and tackle it accordingly. As such, global sharing of legal identifiers and red flags of entities identified as risky at the national level could help authorities to better identify emerging systemic vulnerabilities in the NBFI sector. Even more ambitiously, international data sharing – for example via the BIS, as implemented for certain

[29] All but one FSB member jurisdictions have comprehensive trade reporting requirements for derivatives transactions, see "OTC Derivatives Market Reforms Implementation progress in 2022", FSB, 7 November 2022. Recommendations and guidelines have also been developed globally for the reporting of SFTs, see "Standards and processes for global securities financing data collection and aggregation", FSB, 18 November 2015; and "Securities Financing Transactions - Reporting Guidelines", FSB-BIS, 5 March 2018.

data on global systemically important banks[30] – could facilitate truly integrated global risk assessment of the NBFI sector.

*(ii) Enhanced risk modelling and system-wide macroprudential stress testing*

Better data and greater information sharing may be important components for enhancing risk assessment of the NBFI sector. But these also need to go hand in hand with enhanced risk modelling and stress testing. Analytical tools need to be developed to analyse new granular datasets, ideally with a view to support real-time monitoring of emerging risks. Integrating information across multiple data sources in novel ways would enhance risk monitoring and could also be used to overcome some of the limitations from existing data gaps (Cheng, Liu, Pezzini and Yu, 2023).

System-wide macroprudential stress testing is likely to be a particularly fruitful avenue. Since the global financial crisis, stress tests have transformed the approach to risk assessment in the banking sector, with such stress tests increasingly incorporating contagion and interaction effects within the banking system, together with macroeconomic feedbacks (Aikman et al, 2023). Some NBFI sector stress tests have also been conducted, such as for money market funds or the insurance industry in the EU (see ESMA, 2023 and EIOPA 2024), but these have typically focused on the sectors' resilience and less on interactions across the financial system or with the macroeconomy. Emerging research has highlighted the potential of system-wide stress tests to examine cross-cutting vulnerabilities stretching across the financial system, including different types of NBFI sector entities (Aikman et al, 2019; di Iasio et al, 2022; Sydow et al, 2024). But to enhance the ways in which these models can be applied for policy exercises, it is important to enrich them so that they truly span all different parts of the financial system, while also using sufficiently rich and granular data for realism.[31] In addition, it would be useful to develop such models so that they incorporate clearer channels linking macroeconomic and monetary policy developments to the NBFI sector, while also incorporating potential feedbacks from stress in the NBFI sector back to the macroeconomy.

[30] An international data hub was established at the BIS in 2013 to compile, store and analyse confidential credit, funding and balance sheet data for a set of large global financial institutions. See BIS website on "International Data Hub", https://www.bis.org/statistics/about_int_dh.htm.
[31] Qualitative information may also be gathered from market participants to complement the data-driven assessment of system-wide risk under adverse scenarios, e.g., see "The Bank of England's system-wide exploratory scenario exercise final report", 29 November 2024.

*(iii) Time-varying / cyclical macroprudential instruments speaking to NBFIs*

Current macroprudential policy efforts relating to the NBFI sector tend to focus on repurposing or recalibrating existing tools and regulations to incorporate macroprudential perspectives, as described in Section 6. Such initiatives are a vital first step in strengthening the resilience of the sector. At the same time, a key focus of macroprudential policy frameworks for banks relates to the deployment of policy instruments, such as the Basel III countercyclical capital buffer, which may be adjusted by authorities in a time-varying or flexible manner to respond to changing vulnerabilities and cyclical risk-taking during periods of exuberance (Aikman, Haldane and Kapadia, 2013). As such, it may be useful to consider the potential role of time-varying policies applicable to the NBFI sector that allow resilience to be strengthened pre-emptively and help to reduce procyclical behaviours so that the NBFI sector provides a stable source of funding to the real economy at all times. This is especially the case since tightening the countercyclical capital buffer for banks is likely to be less effective when market-based finance plays an important role in the economy and may even prompt a shift of risk-taking from banks to NBFI sector entities (Aikman, Giese, Kapadia and McLeay, 2023).

Given the central role of liquidity risk in systemic crises emanating from the NBFI sector and the evidence suggesting that liquidity risk taking could be procyclical, flexible liquidity buffers might be one potential macroprudential policy which warrants further exploration. For example, liquidity standards or requirements applicable to NBFI sector entities could incorporate in-build releasable buffers or be tightened via add-ons applied during periods of abundant liquidity which can be released in times of heightened stress (see ECB, 2018 for a discussion and di Iasio et al., 2023 for a model-based analysis in the context of investment funds). Leverage limits could in principle also be deployed in a time-varying manner. And the use of countercyclical margins or haircuts could allow for time-varying targeting of some of the key activities that NBFI sector entities are engaged in (ESRB, 2017).

*(iv) Policies to tackle systemic spillovers from NBFI sector entities*

The BCBS Global Systemically Important Bank (G-SIB) framework introduced another key macroprudential policy for the banking sector after the global financial crisis (BCBS, 2013). This framework imposes more stringent capital requirements on banks judged to be more systemically important, according to a graduated scale. For the insurance sector, the IAIS Holistic Framework plays a somewhat similar role in allowing for enhanced supervisory

measures for macroprudential purposes (IAIS, 2019). But other NBFI sector entities may be systemically important either because of their interconnectedness with other parts of the financial system or due to concentrated risk exposures. This was highlighted by the failure of the hedge fund Long-Term Capital Management as far back as 1998.

There may, therefore, be a case for considering whether there are systemically important entities or activities beyond the banking and insurance sectors. This would allow authorities to enhance the regulation and/or supervision of parts of the NBFI system that are most likely to be a source, transmitter or amplifier of systemic stress with a view to reducing the likelihood of systemic stress events emanating from the sector. For example, the US FSOC has adopted a methodology for designating non-bank financial companies for enhanced supervision.[32] But given the cross-border nature of NBFI sector entities, developing a global framework could be valuable. While lessons could be drawn from the existing BCBS and IAIS frameworks, such an approach would also need to be underpinned by new methodologies to identify systemic NBFI sector entities or activities at the global level, supported by the type of enhanced data, information sharing and risk modelling discussed above.

*(v) Public versus private liquidity provision*

The growing size and footprint of the NBFI sector in financial markets and its role in several recent crisis episodes raise questions over the potential provision of public liquidity to the NBFI sector during such events. For example, motivated by both the March 2020 and the 2022 LDI crises, the Bank of England (2024) has established the Contingent NBFI Repo Facility (CNRF) for eligible insurance companies, pension funds and liability-driven investment funds. This allows for the emergency provision of public liquidity support in response to sudden surges in liquidity demand by the NBFI sector during episodes of severe gilt market dysfunction that threaten financial stability. At the same time, Breckenfelder and Hoerova (2023) show that less targeted monetary policy instruments, such as asset purchase programmes, have been effective in channelling liquidity to all parts of the financial

[32] See "FSOC Approves Analytic Framework for Financial Stability Risks and Guidance on Nonbank Financial Company Determinations", press release by U.S. Department of the Treasury, November 3, 2023

system during crisis episodes, thereby also stabilising NBFI sector entities subject to liquidity stress.[33]

Future research should aim to better understand the trade-offs between private and public liquidity provision. Appropriately stringent regulation and supervision of NBFI sector entities is an important consideration for schemes providing public liquidity, both to foster greater self-insurance by the sector and to contain potential moral hazard effects and regulatory arbitrage.[34] The cost-benefit calculus of such schemes is also likely to depend on the relative importance of the NBFI sector relative to banks in different jurisdictions. This reiterates the importance of central banks reviewing developments in the NBFI sector on an ongoing basis, including with reference to many of the themes discussed in this paper.

[33] See also Darmouni et al. (2022) who apply an empirical demand system model calibrated to March 2020 to show that asset purchases but even more so direct central bank liquidity support to the NBFI sector can be highly effective in stabilising markets and asset prices. For a recent discussion of whether NBFI should be granted access to central banks' balance sheets, see also Pelizzon et al. (2025).
[34] See Buiter et al. (2023) for considerations about design features of enhanced public lender or market maker of last resort facilities.

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**Acknowledgements**

This paper is based on a conference presentation, given at King's College London on 28 September 2023, and will be published in 2026 as a chapter in The Research Handbook of Macroprudential Policy, edited by David Aikman and Prasanna Gai. We wish to thank David Aikman, Lorenzo Cappiello, Nicola Cetorelli, Federic Holm-Hadulla, Linda Rousová, Livio Stracca, Thomas Vlassopoulos and Michael Wedow for helpful comments and discussions, and Paolo A. Baudino for excellent research assistance.
The views expressed in this paper are those of the authors only and do not necessarily reflect the views of the European Central Bank or the Eurosystem.

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PDF ISBN 978-92-899-7452-3 ISSN 1725-2806 doi: 10.2866/0702445 QB-01-25-224-EN-N