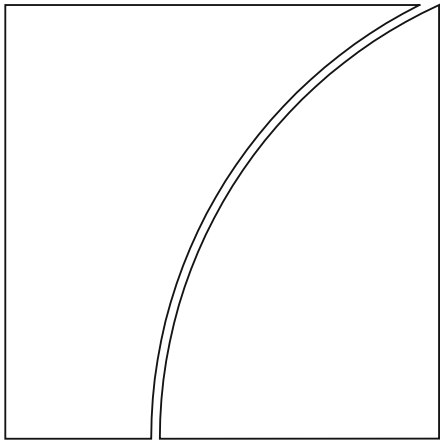

# BIS Papers

## No 161

## The transformation of the life insurance industry: systemic risks and policy challenges

by Matteo Aquilina, Fabian Garavito, Gaston Gelos, Ulf Lewrick, Frank Packer, Gabor Pinter, Vladyslav Sushko and Karamfil Todorov

Monetary and Economic Department

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Keywords: Life insurance, non-bank financial institutions, systemic risk, reinsurance.

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# The transformation of the life insurance industry: systemic risks and policy challenges

Matteo Aquilina, Fabian Garavito, Gaston Gelos, Ulf Lewrick, Frank Packer, Gabor Pinter, Vladyslav Sushko and Karamfil Todorov[1]

## Abstract

The life insurance industry has undergone a profound structural transformation since the Great Financial Crisis, amid a prolonged period of exceptionally low interest rates and evolving regulatory frameworks. This paper examines the systemic risks and policy challenges emerging from this transformation, with a particular focus on the growing involvement of private equity firms, the shift in investment strategies towards riskier and opaque assets, increased use of derivatives and greater reliance on asset-intensive reinsurance, often through offshore jurisdictions. Standard risk metrics indicate that the sector's systemic importance has risen, notably in the Americas and Asia, due to heightened interconnectedness with the broader financial system. Liquidity risks have become more pronounced, stemming from greater use of short-term funding, policy surrenders, and use of derivatives, while governance complexities and opacity in asset valuation further complicate supervision. Several measures could be considered to address these challenges, such as enhancing supervisory frameworks and disclosures, prudential charges to mitigate concentration risk and liquidity risk, harmonisation of international standards and complementing supervision with a macroprudential perspective to monitor and address concentration risks and financial interlinkages at the system level. Overall, while the sector has demonstrated adaptability and resilience, its growing complexity and interconnectedness highlights the need for vigilant regulation to safeguard financial stability and preserve the sector's critical role in the financial system.

Keywords: Life insurance, non-bank financial intermediaries, systemic risk, reinsurance.

JEL classification: G22, G23, G28, G32.

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## Contents

# 1. Introduction

Life insurers have long been important financial intermediaries, offering households essential financial protection against longevity, morbidity and mortality risks, as well as savings options, while channelling funds to governments, corporations and other financial institutions. Traditionally, their business model was straightforward: sell long-term policies and invest in safe long-term assets – largely fixed income – that generate sufficient yield to meet expected payout obligations. Thanks to the long-term nature of their liabilities, insurers were usually thought of as potential stabilisers during times of financial market turbulence. The near failure of AIG in 2008 due to excessive exposure to collateralised debt obligations (CDOs), securities lending and insufficient risk controls was generally seen as an exceptional case.

Since the Great Financial Crisis (GFC), however, the sector has undergone profound structural changes. Losses during the crisis, the extended period of low interest rates that followed, and the evolution of prudential frameworks towards market-consistent and risk-based approaches all weighed heavily on profitability and solvency positions. To adapt, many life insurers have adjusted their business models and scaled up their balance sheets. These developments have been underpinned by several trends, which have each added to the complexity of the risks associated with the life insurance sector.

Some life insurers have been increasing their involvement with private equity (PE) firms. There are benefits to both sides in such partnerships, since life insurers often look to reduce capital-intensive business lines and access new sources of capital, while PE firms often look to gain access to the steady funding streams from insurance policies, as well as exposure to the long-term assets under management that support insurers' liabilities. PE firms have acquired or partnered with life insurers or assumed insurance portfolios through affiliated reinsurers, often in other jurisdictions with different regulatory regimes and, in some cases, less stringent capital requirements (Cortes et al (2023)). Because they have an incentive to allocate insurers' funds to the assets they originate, PE-linked firms can face conflicts of interest. These changes have added to the complexity and opaqueness of life insurance balance sheets as well as of their governance.

Beyond the influence of private equity, life insurers have increasingly shifted their investment strategies towards riskier and opaque assets, such as real estate and alternative credit instruments. These assets often lack transparency and liquidity, making them more challenging to value accurately, which poses potential risks to financial stability in the form of drains to liquidity from fire sales which can amplify price movements during periods of economic stress.

On the liability side, insurers in some jurisdictions are increasingly depending on non-core liabilities, such as funding agreement-backed securities. While offering an opportunity to scale up their investments, many of these funding sources give institutional investors the ability to withdraw funds at short notice by not rolling over their funding, heightening exposure to liquidity risks.

Insurance companies increasingly use derivatives to manage risks related to their duration and currency mismatches. While these instruments allow insurers to hedge exposures, the growing reliance on interest rate derivatives also increases liquidity

risks since margin/collateral calls on these positions can be highly correlated with policyholder behaviour (eg surrenders, or policyholder terminations of their contracts). Additionally, use of FX derivatives by insurers to hedge foreign currency investments has grown notably, particularly in a number of Asian jurisdictions. To the extent that insurers in specific jurisdictions have similar FX exposures, unwinding of hedges or changes in dynamic hedging strategies may amplify local currency moves and exacerbate the cyclical fluctuations in financial markets.

While some of the prudential risks that arise from the shifts outlined above are relatively well understood, their broader implications for financial stability are less straightforward. Assessing how these risks might aggregate across firms, interact with financial markets, or amplify under stress remains a challenge. Few anticipated that AIG would be incapable of honouring its counterparty commitments ahead of the GFC, nor how exposed so many of the world's largest financial institutions were to this risk. Likewise, during the 2022 gilt crisis, few anticipated that the LDI (liability-driven investment) fund strategies adopted by formerly staid pension funds would result in them struggling to meet margin calls and engaging in forced selling, exacerbating market instability.

The objective of this paper is to take stock of these developments from a system-wide perspective, namely, the potential for sector-wide vulnerabilities to emerge as a source of systemic risk. Section 2 provides an overview of the current landscape of the sector and recent trends. Section 3 then offers a primer on the ways in which the life insurance sector might pose systemic risk, while Section 4 presents several metrics of systemic risk in the sector. Section 5 reviews key structural changes in the sector, including the rise of asset-intensive reinsurance and the involvement of private equity. Section 6 provides an overview of the use of derivatives and discusses the associated potential vulnerabilities. Section 7 concludes with select policy implications.

The main takeaways of the paper are as follows:

- Globally, the duration gaps of life insurers – the mismatches between the duration of their liabilities and assets – have narrowed somewhat over the past years, related at least in part to an overall rise in interest rates.
- At the same time, in some jurisdictions, insurers have moved towards riskier, less liquid asset portfolios, such as private credit and structured products. Some insurers have increased their reliance on wholesale and short-term funding.
- Standard metrics of systemic risk indicate that the life insurance sector has grown more systemically important since the GFC, notably in the Americas and Asia. This increase is largely attributed to a growing interconnectedness of the sector with the broader financial system.
- PE firms have increasingly partnered with or acquired insurers. Such insurers have been more likely to rebalance their portfolios towards higher-risk investments, such as structured products, affiliated assets and riskier mortgages, and to more complex reinsurance structures. Asset-intensive reinsurance (AIR), particularly with offshore reinsurers, has become a key strategy for capital management. At the same time, the growing influence of PE investors has also created governance challenges.

- The sector's growing reliance on private or internal credit ratings – which are not publicly disclosed and thus lack external validation – could obscure the true risk of complex assets and complicate effective oversight.
- The use of derivatives by life insurers has increased. While mitigating solvency risks, this exposes insurers to greater risks of liquidity shortage related to collateral and margin calls. When interest rates are rising, drains on liquidity from their interest rate swap positions can be correlated with those arising from policy surrenders.
- The use of FX derivatives by insurers to hedge currency mismatches, while mitigating solvency risk, introduces two other risks: (1) the foreign currency liquidity risk to fund margin calls on long-term hedges or to cover the rise in the cost of rolling over short-term hedges when the foreign currency suddenly appreciates; and (2) rollover risks in periods of dollar funding strains, due to the short maturities of FX swaps relative to the underlying exposures being hedged.
- Overall, the combination of greater liquidity risks, riskier assets and more complex business and governance structures have raised the risk that losses or problems in individual insurers or reinsurers could act as a "wake-up call" among investors and policyholders. In light of the sector's size, market footprint, common exposures and interlinkages with the rest of the financial system, such an event could have systemic implications in some jurisdictions.
- Consequently, several measures could be considered to address these challenges: (1) requiring standardised and detailed reporting on AIR and PE interlinkages to improve monitoring; (2) capital charges or required buffers that scale with geographical or operational concentration to mitigate concentration risks; (3) going beyond risk management guidance to hardwire liquidity risks into existing regulatory frameworks; (4) enhancing transparency and disclosure to narrow the room for ratings shopping in structured deals; (5) harmonising international standards to reduce incentives for regulatory arbitrage; (6) strengthening governance frameworks to mitigate conflicts of interest; and (7) adopting a macroprudential perspective that tracks common exposures and funding risks, as well as financial interlinkages.
- While the life insurance sector has demonstrated adaptability to changes in the external environment since the GFC, the transformation it has undergone highlights the need for vigilance in the regulatory community amid the systemic risks posed by growing complexity and interconnectedness. Policymakers must balance fostering innovation with ensuring stability to bolster resilience and protect the sector's vital role in the financial system.

# 2. Landscape

*The life insurance sector is large and its footprint significant in many financial markets, including sovereign bonds. The sector is also characterised by a duration gap between its liabilities and assets, in both advanced and emerging market and developing economies. Debt makes up only a small fraction of total liabilities for the life insurance sector. The composition of assets varies significantly across regions, with the Americas having greater ownership of corporate debt, commercial mortgages and securitised products, and Europe and Asia having more significant investments in sovereign debt and equities. Surrenders as a share of net written premiums have risen markedly since 2019. Derivatives occupy an increasingly significant role in life insurers' portfolios. Reliance on offshore financial centres to share risk is growing, with complex arrangements that include ceding of assets together with liabilities, to both affiliates and non-affiliates.*

## 2.1 What life insurers do

A life insurer's traditional business is to protect individuals from idiosyncratic longevity, morbidity and mortality risks through products like life insurance and life annuities. By selling these products, insurers create liabilities in the form of future payouts. Insurers establish reserves equivalent to the present discounted value of net payouts on the liabilities side of the balance sheet. Applicable solvency frameworks determine how these reserves are calculated. Insurers' focus on meeting their actuarial liabilities is why they are often termed *liability-driven institutions*.

Insurance companies must carefully invest their premium income while managing the risks tied to these investments to meet their policy obligations. Alongside addressing interest rate mismatches caused by long-term liabilities that are only partially hedged by market investments, insurers must manage the credit risks of their investments.

## 2.2 Size and footprint

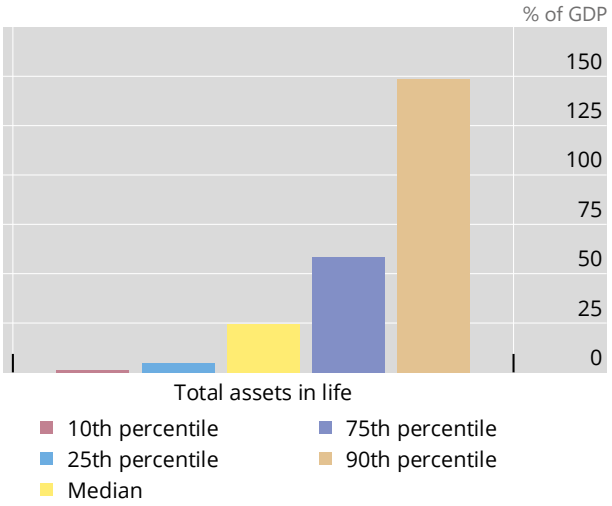
In many jurisdictions, the life insurance sector manages significant amounts of assets (Graph 2.1.A).[2] For instance, in 2023, while the median ratio of life insurance assets to GDP was 25%, it was around 50% and 150% of GDP for the 75th and 90th percentile of jurisdictions, respectively. Off the chart are the outlying jurisdictions, offshore financial centres such as Bermuda and the Cayman Islands, where the insurance sector is very active (discussed further below). The Financial Stability Board reports an aggregate size of the insurance sector (both life and non-life) of 29 reporting jurisdictions of $38.2 trillion, or 8% of total financial assets. (FSB (2024a)).[3]

[2] Data from the International Association of Insurance Supervisors (IAIS); we draw on their Sector-Wide Monitoring (SWM) data set. This data set is collected at the jurisdictional level, covering 29 advanced economies (AEs) and 12 emerging market and developing economies (EMDEs) (IMF classifications). It provides annual data spanning the period from 2019 to 2023. Reporting is at the insurance licensee level (local companies), as opposed to the group level.

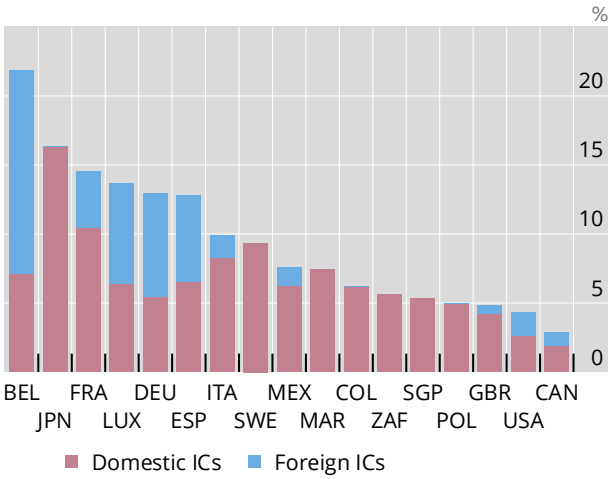
[3] While this share has declined somewhat from 8.9% 10 years earlier in 2013, so has that of banks (from 40.3% to 38.1%), as the share of assets of other financial institutions (including money market funds, hedge funds, other investment funds, broker-dealers, among others) has increased.

Size and footprint Graph 2.1

A. Size of life insurance sector




B. Share of sovereign debt held by ICs




For more details on right-hand panel estimates, see discussion in Farkas et al (2023a).

Sources: Arslanalp and Tsuda (2014, updated in 2024); IAIS, SWM 2024; authors' calculations.

The footprint of the insurance sector is large in many sovereign bond markets. In a representative sample of 17 economies in Europe and Africa, the Americas and Asia, insurance companies (inclusive of non-life ICs) held 20% of sovereign bonds in one jurisdiction and between 10 and 20% in six others at end-2023. In several European sovereign bond markets, foreign insurance companies are as significant investors as domestic ones (Graph 2.1.B). While Japan has very few foreign insurance companies holding its bonds, we will see in Section 6 that Japanese insurance companies hold large amounts of overseas fixed income securities, not least US Treasuries.

## 2.3 Duration mismatch

The duration of the liabilities in the life insurance sector tends to be long relative to assets, which is often referred to as a "negative duration gap". For developed economy jurisdictions in the SWM sample, the median (negative) duration gap between liabilities and assets has generally narrowed over the sample period, from over four years in 2020 to less than two years at the time of writing (Graph 2.2.A). This reflects a more marked decline in the duration of liabilities – the present value of which falls more significantly due to discounting – than that of assets over a period of rising interest rates. Insurers in emerging market and developing economies have also been characterised by (negative) duration gaps between their liabilities and assets, somewhat narrower than those in advanced economies, that diminished over most of the sample period.

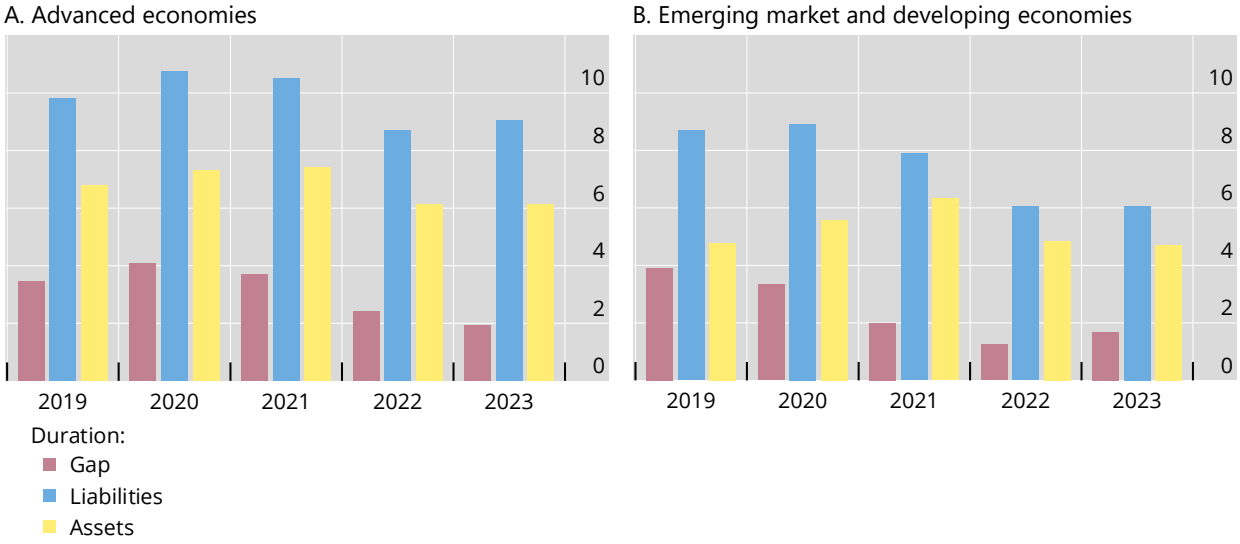
## 2.4 Composition of liabilities

A decomposition of liabilities for the insurance sector (including both life and non-life insurers) illustrates the dominance of technical provisions (Graph 2.3). These are reserves – calculated using actuarial methods – that insurers are required to hold to

## Duration[1]

In years

Graph 2.2




[1] Median values.

Sources: IAIS, SWM 2024; authors' calculations.

meet their future policyholder obligations. Gross technical provisions, related to policies sold (including unit-linked products – insurance products where policy holders bear the risk of the investment component –– in the separate accounts), comprise around 80% of total liabilities and equity in both advanced and developing economies. Debt (total borrowing) makes up only a small fraction of total liabilities, 3.3% in advanced economies, and just 0.8% in developing economies. Overall, the ratio of liabilities to assets is close to 90%.

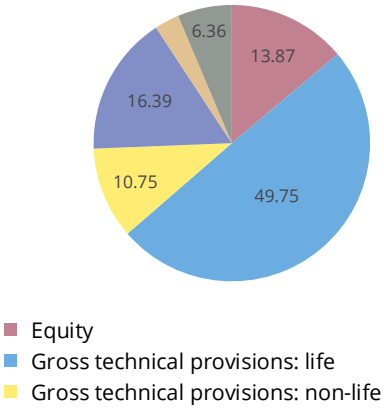
As life insurer technical provisions are the key component of overall liabilities, and at their core they represent the net present value of policies sold, it is important to understand how these policies and products have evolved over time. During the prolonged low interest rate environment that had prevailed since the late 2000s, guarantees embedded in traditional life insurance and annuity products became both economically and capital intensive. Insurers responded by shifting new business towards products with lighter or no guarantees, transferring more investment risk to policyholders and easing capital strain. In Europe, this meant greater reliance on unit-linked and hybrid products; in Asia, markets such as Singapore saw strong growth in investment-linked policies, while Japan and Korea gradually tilted towards protection lines. In the United States, the shift was most visible in the rapid growth of indexed annuities and other designs with limited guarantees. The common thread across jurisdictions was a turn towards capital-light products that reduced insurers' guarantee burdens.

After interest rates began to rise in 2022, the product mix shifted back towards guaranteed savings business as insurers competed for household assets. This was reflected in record sales of multi-year guaranteed annuities (MYGAs) and fixed indexed annuities in the United States, a revival of the individual annuity market and record bulk purchase annuity volumes in the United Kingdom, and renewed demand for guaranteed products in Europe. These contracts reintroduced longer-dated

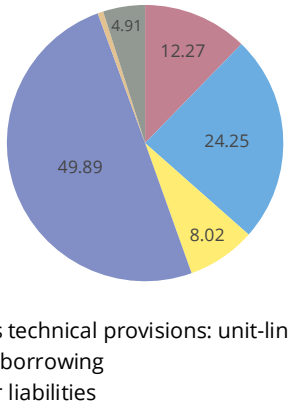
Composition of liabilities and equity[1]

As a percentage of assets Graph 2.3

A. Advanced economies




B. Emerging market and developing economies




Equity
Gross technical provisions: life
Gross technical provisions: non-life
Gross technical provisions: unit-linked
Total borrowing
Other liabilities

[1] Weighted averages.

Source: IAIS, SWM 2024; authors' calculations.

promises, but on more constrained terms than before the financial crisis – such as shorter maturities, lower minimum guarantees, or caps and buffers to contain risk.

## 2.5 Composition of assets

The composition of life insurers' assets globally varies significantly across jurisdictions (Graph 2.4). (Here we focus on assets held by life insurers in their general accounts.) Sovereign debt exposure, for example, accounted for merely 10% of total assets in the Americas but represented around 20% in Europe in 2023.[4] In Asia, these exposures stood at 30%, down from 40% in 2021.

When it comes to corporate bonds, the Americas stand out with around 30% of total assets invested in these instruments – a proportion that has been steadily increasing since 2019. At around than 20%, insurers in Europe and Asia maintain much smaller allocations to corporate bonds.

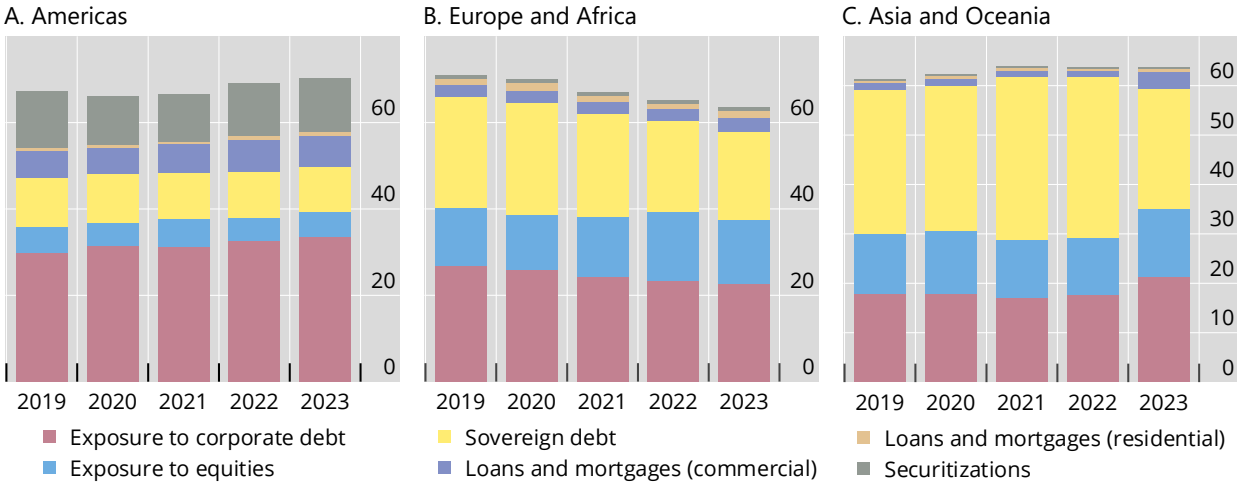
Equity exposures also differ markedly. Insurers in Europe and Asia allocate between 15 and 20% of their assets to equities, a proportion that has been rising since 2019. In contrast, life insurers in the Americas allocate only around 7% of their assets to equities. Instead, they allocate approximately 10% of their assets to loans and mortgages in commercial real estate, an investment class of marginal importance for European and Asian life insurers.

Finally, investments in structured securities are significantly higher in the Americas, accounting for close to 18% of total assets. In Europe and Asia, however, such investments remain virtually negligible, highlighting another key difference in asset allocation strategies across regions.

[4] Another increasing portion of European insurers' assets that are not covered by the six categories of Graph 2.4 are assets of financial firms (eg equities, bonds).

Asset composition (general account)[1]

As a percentage of total assets Graph 2.4




[1] Weighted averages.

Source: IAIS, SWM 2024; authors' calculations.

These differences in asset allocation are related to capital charge regimes, accounting treatments for solvency purposes and local capital market conditions, including taxes. For example, the US solvency framework treats structured securities more favourably than the EU's; conversely, Solvency II in the EU favours high-quality bonds, leading to a larger sovereign bond allocation. Jurisdictions in Europe and Asia also to tend to have more bank-reliant financial systems with less developed corporate bond markets, which can account for lower holdings by regional insurers (Du et al (2023)).

## 2.6 Surrenders and derivatives usage

Surrender options embedded in products such as universal life, whole life and annuities allow policyholders to withdraw funds under certain conditions. Since 2019, surrenders as a share of net written premiums have risen markedly, rising from norms of 30 to 40% of net written premiums during the period of low interest rates to over 50% in 2023 (Graph 2.5.A). Among other reasons, increasing surrenders probably reflected rising interest rates that made other investments more attractive than outstanding policies.

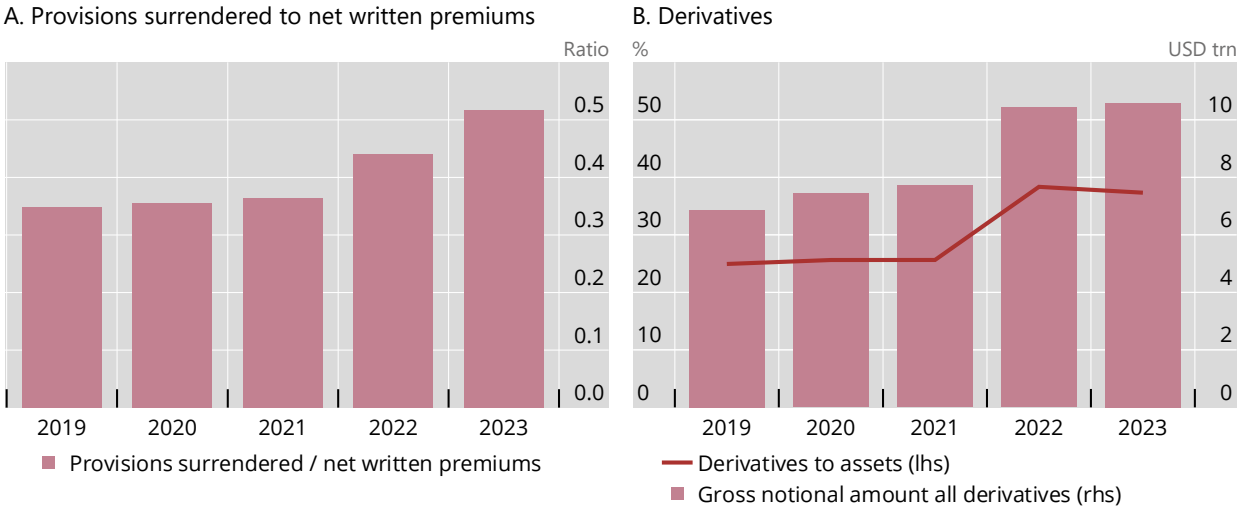
Life insurers hold large gross derivatives positions, mostly for purposes of hedging duration mismatches and FX exposures. The median value of these among jurisdictions increased from around 25% of total assets in 2019 to close to 35% in 2023 (Graph 2.5.B). Increased use of derivatives is evident among the life insurers of nearly all advanced economies, not least the United Kingdom (See Box A).

Approximately 30% of life insurers' derivatives portfolios consist of interest rate derivatives, which aligns with the need to manage the risks posed by the duration gap (see above and Section 6).

Exchange rate (FX) derivatives also play an increasingly important role in many major life insurers' portfolios. Data reported by jurisdictions to the IAIS show a rise in FX derivatives exposures within the gross notional derivatives amounts (IAIS (2024)).

Non-US insurance companies, especially those in Asia, often invest in foreign bonds, particularly those denominated in US dollars, to obtain long-duration assets of high quality or to access deeper foreign markets for investment grade corporate bonds. This can create an exposure to home currency appreciation that is hedged, at least in part, with FX derivatives.

Provisions surrendered and use of derivatives — Graph 2.5




Source: IAIS, SWM 2024, authors' calculations.

## 2.7 Rising offshore life reinsurance

A key element of many insurer business models worldwide is securing reinsurance partners to share a portion of the risks they have underwritten. A notable aspect of this practice is the significant role played by offshore financial centres. This issue will be discussed in detail in Section 5.

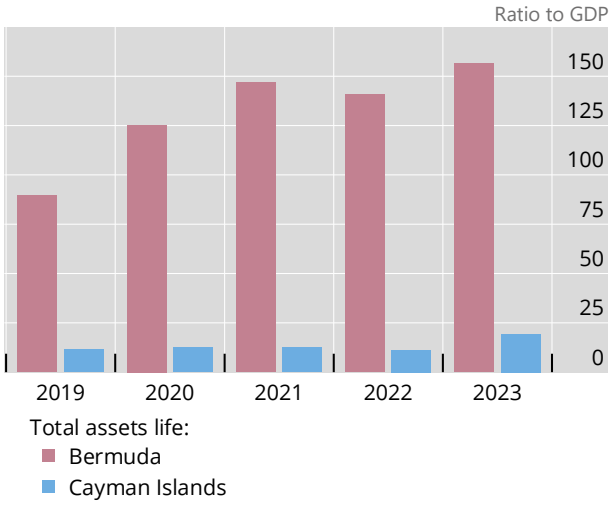
In this context, reliance on offshore financial centres has grown notably (Graph 2.6.A). In the Cayman Islands, the insurance sector accounts for approximately 20 times the size of the country's GDP – several orders of magnitude higher than the median value observed for other jurisdictions (see Graph 2.1 above) Bermuda's insurance sector is even more striking, with a size exceeding 150 times GDP, highlighting its extraordinary importance to Bermuda's economy and to the global insurance sector.

Data from US company filings provide further insights into this trend (Graph 2.6.B). In 2023, major life insurance companies had ceded over $2 trillion in reserves to reinsurers, including their own affiliates – more than four times the amount recorded in 2017. These ceded reserves now represent around 25% of their total assets. A notable portion of this growth is attributed to the increasing share of risks ceded to reinsurers based in offshore centres. In 2023, these offshore reinsurers accounted for 40% of ceded risks, up from 15% in 2017.

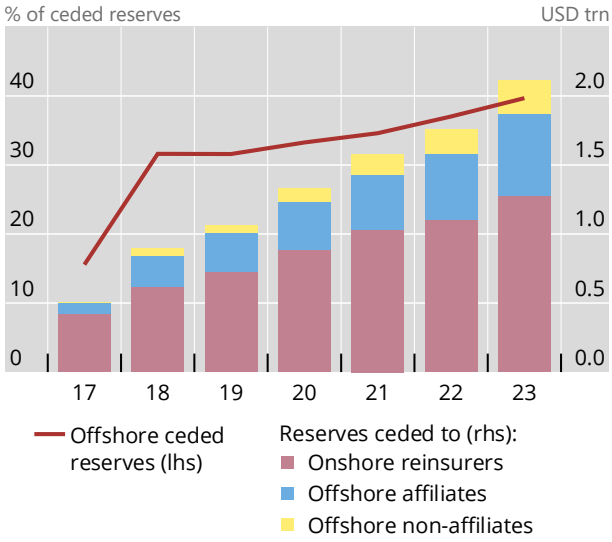
## Offshore centers and reinsurance

Graph 2.6

A. Life insurance sector assets to GDP




B. Surge in risks shifted offshore




Sources: Garavito et al (2024); Cayman Islands Monetary Authority (CIMA); Bermuda Monetary Authority (BMA); Iauthors' calculations.

Box A

## Recent developments in the UK insurance sector

*David Humphry, Alex Kontoghiorghes, Gabor Pinter and Jean-Charles Wijnandts* ①

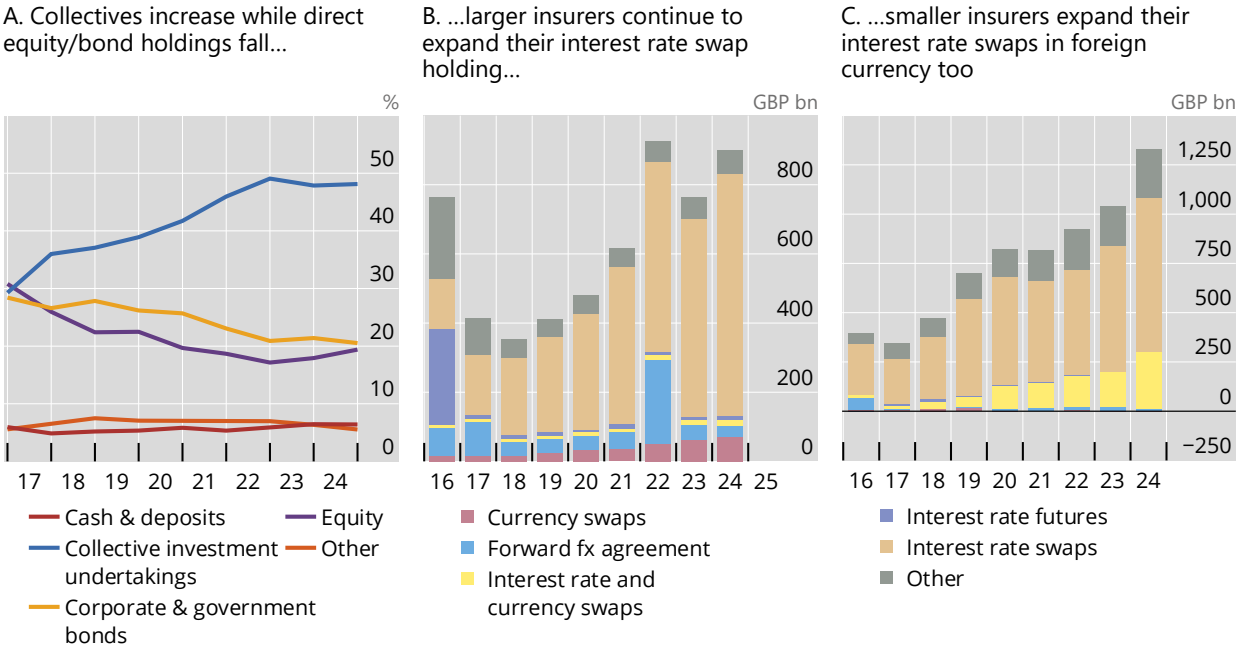
The United Kingdom has one of the largest insurance sectors in the world, providing valuable insights and lessons that may be applicable to the global insurance industry. This box presents four key stylised facts about the structure and evolution of the UK insurance sector, using Solvency II data spanning the 2016–24 period. The data set covers the full population of insurers subject to the UK's prudential regime and provides unique insights into how the sector's asset composition, risk management, and institutional structure have shifted over time. We focus our analysis on the largest UK life insurers.

Fact 1: Asset allocations have shifted towards fund-based vehicles

Over the past eight years, UK insurers have significantly altered their asset allocation strategies (Graph A1.A). Direct holdings of equities and fixed income instruments have declined, while exposures to collective investment undertakings (CIUs) – such as equity funds, debt funds, money market funds and alternative investment funds – have grown steadily from about 30% to nearly 50%. This shift reflects a broader industry trend towards outsourcing portfolio management and seeking diversification through pooled investment vehicles, as well as policyholders' choices for unit-linked savings policies. From a regulatory standpoint, this transition may complicate risk assessments, as look-through data on underlying fund exposures are less granular and updated less frequently. It may also obscure insurers' effective sectoral or geographic risk concentrations.

### Shifts in asset and derivatives composition of UK insurers

Graph A1




Source: UK Solvency II data set.

Fact 2: Use of interest rate swaps continues to expand

The composition of insurers' derivatives books has evolved over time (Graph A1.B). Interest rate swaps remain the dominant instrument, with their use continuing to expand – especially among large life insurers managing long-duration guarantees. At the same time, foreign currency interest rate swaps have become increasingly common, particularly among smaller insurers (Graph A1.C). This probably reflects their efforts to manage currency mismatches

in diversified investment portfolios. The growing use of swaps across institution types suggests increasing reliance on derivatives for balance sheet management. It also underscores the need for effective collateral and counterparty risk management practices, especially during episodes of market stress.

Fact 3: Losses on derivatives exposures spiked during the 2022 rate shock

While derivatives account for a modest share of insurers' balance sheets under normal conditions, their mark-to-market values proved volatile in recent years. In particular, the sharp rise in interest rates in 2022 triggered significant mark-to-market losses on insurers' interest rate swap and futures positions, amounting to around 1–2% of total assets at sector level (Graph A2.A). These losses were driven primarily by the mechanical repricing of liabilities and hedging portfolios (Graph A2.B). Although insurers typically use swaps and futures for asset-liability management rather than speculative purposes, the episode highlights how rate shocks can materially affect reported solvency positions – even absent changes in underlying exposures. This reinforces the importance of high-frequency market risk monitoring under Solvency II's market-consistent valuation framework.

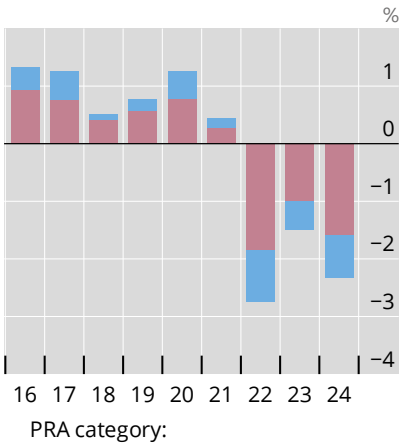
Fact 4: The sector is highly concentrated among a few firms

The UK insurance sector is marked by a high degree of concentration. The top 10 insurers consistently account for roughly two thirds of total assets under management (Graph A2.C). This structure has remained stable over the past decade, despite market entries, exits and mergers. From a policy perspective, such concentration means that idiosyncratic shocks to a small number of firms can have disproportionately large effects on system-wide outcomes. It also implies that policy changes – such as reforms to Solvency II or accounting standards – are likely to be transmitted quickly and uniformly, at least among the largest firms. At the same time, the tail of smaller insurers may display more heterogeneity in both resilience and business models, posing challenges for proportionate regulation.

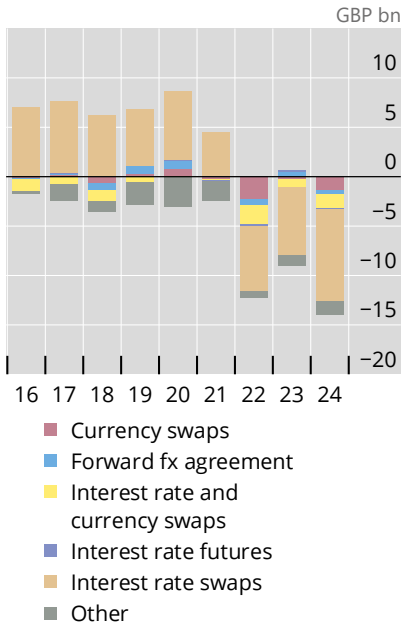
## Higher interest rates induced derivatives losses, and concentration persists

Graph A2

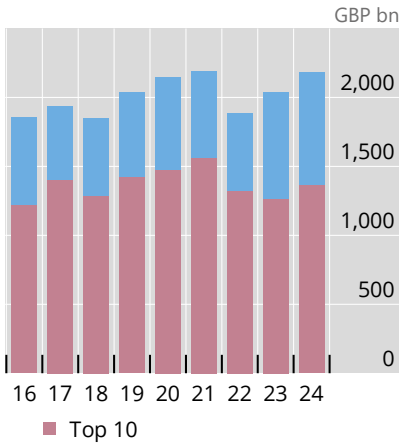
A. During rate hikes, losses on derivatives around 1–2% of assets…




B. …mainly driven by interest rate swaps




C. Top 10 insurers account for the majority of the sector's assets




The graphs are based on market values.

Source: UK Solvency II dataset.

① The views expressed in this box are those of the authors, and not necessarily those of the Bank of England, the Bank for International Settlements, or their committees.

# 3. How might the life insurance industry pose systemic risks?[5]

*The life insurance sector's traditional image as a bastion of stability is increasingly challenged by its evolving business model, growing complexity and deeper interconnectedness with the broader financial system. In line with these changes, stress in individual companies may be more likely to spread to the rest of the financial system, and it is less clear whether life insurers could still be counted on to play their traditional stabilising role in periods of stress.*

Traditionally, life insurers were regarded as shock absorbers in the financial system. Their business model – collecting predictable streams of premiums and investing them to cover long-term, actuarially modelled liabilities – meant they could weather market cycles with relative calm. Unlike banks, insurers faced little risk of a sudden run due to the long-term, illiquid nature of their liabilities (Cummins and Weiss (2014), Koijen and Yogo (2023)).

However, significant structural changes since the GFC may require a reassessment of this benign view. Life insurers have scaled up balance sheets through non-traditional wholesale funding, invested in riskier assets, expanded leverage through reinsurance and shifted towards capital-light businesses, including unit-linked products (Swiss Re Institute (2024)). These transformations raise questions about whether life insurers can be expected to mitigate, rather than contribute to, systemic risk.[6]

## 3.1 (Changes in) the structure of liabilities

The growing reliance of insurers on short-term funding in some jurisdictions has aggravated vulnerabilities, reminiscent of risks materialising in the run-up to the GFC. Foley-Fisher et al (2016) document that US life insurers became subject to self-fulfilling runs by institutional investors in the extendable funding agreement-backed securities (FABS) market, triggered by bad fundamentals, as early as 2007. The outstanding amount of FABS issued by US life insurers exceeded $200 billion in 2024 (Board of Governors of the Federal Reserve (2025); see also NAIC (2025)). At the same time, advances to US life insurers by Federal Home Loan Banks grew to over $150 billion in 2024 (Financial Stability Oversight Council (2024)). This reliance creates rollover risks that can impair insurers' liquidity positions at precisely the moments when funding stability is most needed. For example, short-term funding pressures could force insurers to engage in asset sales to meet immediate cash flow needs. Given the sector's large footprint in some markets (eg the corporate bond market in the United States), such sales could have a systemic impact.

[5] Many factors discussed in this section – such as market footprint, concentration, commonality of exposures – were already incorporated as standard indicators for global systematically important insurers (G-SIIs) (IAIS (2016)). In recent years, the focus has shifted from designating G-SIIs to assessing activities-based risk in the insurance sector as a whole (IAIS (2023b)).

[6] Systemic risk is defined as the "risk of disruption to financial services that is caused by an impairment of all or parts of the financial system and has the potential to have serious negative consequences for the real economy" (FSB et al (2009)).

Surrender risks have also become a greater concern in the rising rate environment, reflecting both the design of life insurance products and the economic incentives of policyholders. In Section 2, a rise in surrenders was documented. While surrender penalties are designed to discourage early withdrawals, their impact varies significantly across jurisdictions and product types and may also be influenced by competitive pressures in the market (see Farkas et al (2023b)). In the United States, for instance, surrender penalties typically start at 10% of the contract's cash value in the first year and decline by 100 basis points annually, with up to 10% of the cash value often withdrawable penalty-free. In contrast, surrender penalties in the European Union tend to be lower, and many products guarantee minimum surrender values, making withdrawals more attractive in certain scenarios, particularly during periods of rising interest rates (BIS (2024)).

When interest rates rise, the attractiveness of surrender options can increase significantly. Policyholders may seek to withdraw funds to reinvest in higher-yielding opportunities, potentially triggering waves of surrenders that strain insurers' liquidity. When surrenders rise, insurers must rely on their liquid assets to meet obligations unless they can replace surrendered policies with new ones (premium income) or reduce dividend payouts from profits. Numerical simulations by Grochola et al (2023) suggest that a sustained interest rate increase of 25 basis points per year could force insurers to sell nearly 2% of their assets annually to meet surrender demands. Globally, surrender values represent up to 30% of total life insurer assets, with approximately half of these policies redeemable within one week and often lacking contractual penalties (IAIS (2024)), though they may still be tax disincentives. Elevated surrender rates, particularly during periods of stress, can force insurers into procyclical asset sales (see case of Eurovita, Box B).

## 3.2 Derivatives

Life insurers are naturally exposed to interest rate risk through duration mismatch and FX risk through foreign securities purchases.

The increased use of derivatives for hedging exposure to these risks introduces liquidity risks that can exacerbate systemic risks. During periods of market volatility, margin calls on derivatives can create sudden and severe liquidity demands, forcing insurers to sell assets into falling markets (eg Carraro et al (2021)). In the case of interest rate hedges, these can be a drain on cash flow due to collateral and margin calls arising at precisely the same time that surrenders tend to increase – that is, during periods of rising interest rates. Such systemic risk issues related to the use of derivatives are explored in detail in Section 6.

## 3.3 Riskier assets, more complex and opaque structures

On the asset side, insurers' shift towards higher-yielding, yet riskier, less liquid and difficult-to-value assets has increased their vulnerability to concentrated losses.[7] In combination with the growth in complex and opaque business and governance structures, this has potentially raised the risk that individual losses could act as a "wake-up call" among investors and policyholders. A significant, but initially

[7] For example, on the shift towards privately placed debt on insurers' balance sheets, see Fournier et al (2024). On insurers' role in the intermediation chain of public and private credit to risky firms, see Carlino et al (2025). Ellul et al (2022a) document how guarantees embedded in variable annuities policies incentivise insurer to invest in more risky and less liquid assets.

idiosyncratic event could thereby quickly undermine trust, while rating downgrades could trigger a cascade of collateral calls, exercise of recapture rights (to regain business transferred earlier) and increased funding costs (see, for example, Grochola et al (2023)).

Box B

## The failure of Eurovita

A case study of the interaction of solvency and liquidity risks in insurance

The collapse of Italy's Eurovita in 2023 illustrates how liquidity risks can balloon in a rising rate environment. Owned by private equity firm Cinven since 2017, Eurovita had grown rapidly via bancassurance, accumulating a large book of guaranteed contracts. As rates rose in 2022, unrealised losses on Eurovita's fixed income portfolio reduced its solvency capital ratio (SCR) from ~230% to near 130% by end-2022. At the same time, surrenders increased sharply as policyholders sought better returns elsewhere.

With its capital eroded and redemptions rising, Eurovita required substantial recapitalisation. According to media reports, Italy's insurance supervisor (IVASS) estimated that Eurovita needed a €400 million recapitalisation, but Cinven only agreed to inject €100 million.① By early 2023, redemption requests had surged further, forcing asset sales at losses and increasing the likelihood of contagion to other firms. In February 2023, IVASS intervened, placing the firm in special administration and freezing all redemptions under macroprudential emergency powers. This "surrender holiday" was extended through October 2023, giving regulators time to arrange a rescue.

The final resolution involved five large Italian insurers – Generali, Intesa Sanpaolo Vita, Poste Vita, UnipolSai and Allianz Italy – who took over Eurovita's policies and recapitalised the portfolio. Policyholders faced no losses, and contracts were preserved. The decision to freeze redemptions probably prevented wider contagion.

The Eurovita case and broader data from 2021–23 illustrate how liquidity risks in a rising rate environment can magnify existing solvency problems. Rising rates reduce the value of liabilities but create collateral and surrender pressures. Market-based solvency frameworks like Solvency II make these shocks visible and enable proactive supervision – but they can also amplify liquidity strain if hedges and valuations are marked to market. Policymakers must remain alert to these tensions, especially as they contemplate relaxing investment eligibility rules for illiquid asset classes such as structured securities in the European Union.

The findings also underscore the need for robust liquidity stress testing. The 2023 pilot exercise carried out by the European Insurance and Occupational Pensions Authority (EIOPA) covered only a subset of firms and did not directly model margin calls. Expanding this framework – while considering lessons from bank runs and social media-driven withdrawals – will be vital. Channels like bancassurance may accelerate surrender dynamics when bank advisers guide clients out of insurance products.

① See "Italy close to securing industry safety net for Cinven owned Eurovita, sources say", Reuters, 30 March 2023. ② See Bank of Italy, *Financial Stability Report*, April 2023.

## 3.4 Common exposures and interconnectedness

Insurers' portfolios often display strong commonalities, especially given the need to match similar long-duration liabilities, as well as capital requirements linked to credit ratings that incentivise similar investment strategies (IMF (2016)). Acharya and Richardson (2014) warn that this "commonality of exposures" can result in correlated moves, where many insurers react to shocks in the same way, amplifying market swings. The sector's interconnectedness with banks and other financial firms is also large, further increasing the risk of contagion. Research suggests that this interconnectedness has risen across jurisdictions (IMF (2016), Jourde (2022)). At the

same time the sector is characterised by the presence of very large entities. Issues of interconnectedness and metrics for measuring the vulnerability to common exposures are examined in more detail in Section 4.

## 3.5 Concentration

When aspects of the life insurance business have high geographic or operational concentration, this implies that idiosyncratic shocks to a small number of firms can have a large impact on system-wide activity. Reinsurance activity is increasingly concentrated in jurisdictions with lighter regulatory frameworks or capital requirements, which can increase the potential impact of a reinsurer's failure. This aspect of systemic risk is more fully discussed in Section 5.

## 3.6 Evidence on procyclical behaviour

While, traditionally, the long-term nature of their liabilities used to allow life insurers to act countercyclically in markets, the higher share of short-term funding structures and increased surrender risk may have lessened the sector's ability to play this stabilising role.

The empirical record so far is mixed. On the one hand, insurers have often been found to act as stable, countercyclical investors, increasing asset allocations to illiquid investments when the liquidity premium is higher, dampening asset market volatility (Kubitza (2023); Knox and Sorensen (2024)). Furthermore, corporate bonds held predominantly by insurers rather than mutual funds are found to suffer milder losses in downturns (Coppola (2025)). Huang et al (2025) show that insurers with higher capitalisation, stronger operational cash flow and a preference for highly rated, longer-maturity bonds that are more likely to supply liquidity during "rainy days". During the Covid-19 liquidity crisis, well capitalised insurers with stable, long-term funding stepped in as buyers of corporate bonds when mutual funds and other investors were forced to sell (O'Hara et al (2025)).

On the other hand, the ability of insurers to play this stabilising role is not uniform, and seems to depend on their financial health, investment horizon and risk appetite. And insurance companies with greater exposures to the subprime shock sold more of their liquid corporate bond holdings during the 2007–09 period (Aslan and Kumar (2018)). Comerton-Forde et al (2025) find that insurers' regulatory constraints limit their ability to hold high-yield bonds also limit their ability to act as countercyclical buyers in corporate bond markets. Evidence for the counter- vs procyclical liquidity provision in government bond markets is also mixed (see Box C).

Moreover, insurers' ability to act countercyclically may also be constrained by regulatory requirements, designed to safeguard insurers' solvency. Jurkatis et al (2025) argue that insurance companies, unlike less regulated investors such as hedge funds, often face regulatory disincentives – particularly following bond downgrades to high-yield – that can restrict their ability to provide liquidity. For example, after a downgrade, higher capital requirements may apply to the exposure, reducing insurers' incentives to act as buyers of last resort.

Box C

## UK insurers – herding behaviour and liquidity provision in the gilt market

*David Humphry, Alex Kontoghiorghes, Gabor Pinter and Jean-Charles Wijnandts* ①

This box examines two important questions regarding the behaviour of UK insurers in the gilt market: First, do UK insurers exhibit herding behaviour in their gilt investment decisions? Second, do they act as liquidity providers to other participants in the gilt market? To answer these questions, we draw on a granular, transaction-level data set covering UK gilt trades over the 2011–17 period.

Institutional investors, including mutual funds (Borensztein and Gelos (2003)) and pension schemes (Blake et al (2017)), are widely recognised to display herding behaviour – whereby investment decisions are influenced more by the actions of peers than by changes in fundamentals. While such behaviour can arise for a range of reasons – including shared information sources, incentives tied to peer-relative performance, or agency problems – it can also pose risks to financial stability. For example, the 2022 gilt market crisis demonstrated how correlated selling by liability-driven investment (LDI) funds can trigger severe market dysfunction (Pinter et al (2024)). However, it remains an open question whether insurance companies – despite being large institutional investors themselves – exhibit such procyclical herding tendencies to a comparable degree.

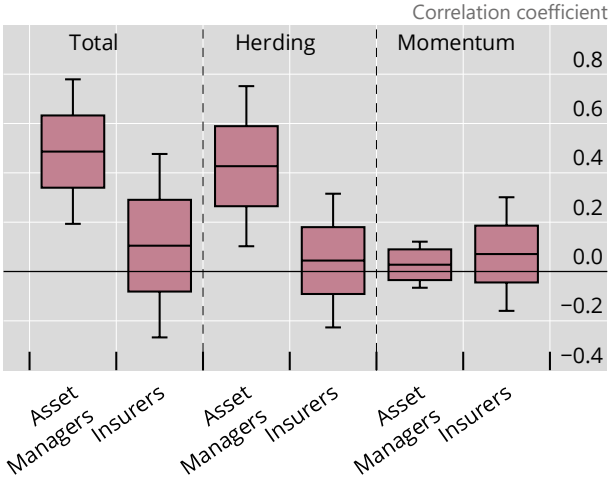
To measure herding behaviour, we examine the correlation between net gilt purchases by UK insurers across consecutive months. Following the methodology of Sias (2004), we decompose the total correlation into two components: (i) herding – where investors mimic the trades of others, and (ii) momentum – where investors follow their own past trades. We compute these metrics separately for insurers and for asset managers (including LDI funds).

The results reveal that UK insurers display relatively weak herding behaviour (Graph C1.A). The total correlation is around 0.11 for insurers, much lower than the 0.5 correlation observed for asset managers. Notably, for asset managers, most of the total correlation is attributable to herding (0.43), whereas for insurers, momentum trading (0.07) dominates herding (0.04). This suggests that UK insurers are more likely to adjust their positions based on internal investment strategies than on imitation of peer behaviour. This limited herding behaviour is in stark contrast to the pronounced herding observed among asset managers and LDI funds. The relative independence of insurers from peer-driven trading behaviour may help explain why they did not participate in the destabilising wave of gilt sales during the 2022 crisis.

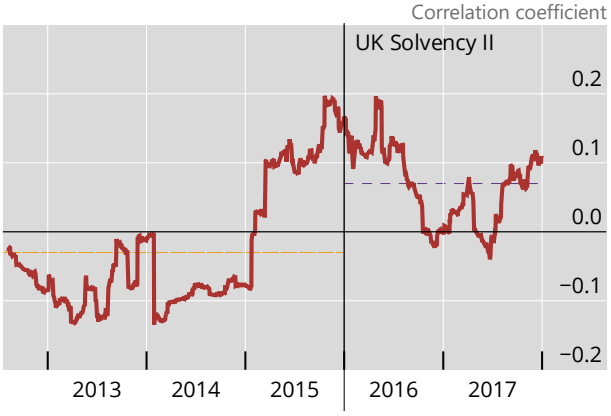
### Insurers in the gilt market: herding and liquidity provision

Graph C1

A. Insurers exhibit little herding behavior compared to asset managers in the gilt market[1]




B. Insurers trading became more procyclical in the gilt market[2]




[1] The candle charts show the correlation of monthly gilt flows with previous monthly flows for the asset managers and insurers ("Total"), decomposed into herding and momentum components as in Sias (2004). [2] The red line shows the 250-day moving average correlation of daily net purchase of gilts by insurers and by other clients.

Sources: ZEN database maintained by the U.K. Financial Conduct Authority (FCA); authors' calculations.

To investigate whether UK insurers provide liquidity to the gilt market, we analyse the correlation between daily net purchases by insurers and those by other market participants. A negative correlation suggests countercyclical behaviour – buying when others sell – implying liquidity provision. Conversely, a positive correlation may indicate procyclical behaviour, potentially amplifying market stress.

The analysis reveals that insurers' trading behaviour shifted from countercyclical to procyclical around the introduction of Solvency II. When examining a 250-day moving average of the correlation between insurers' trades and the rest of the market a shift is observed around 2016 (Graph C1.B). Prior to 2016, insurers' gilt trading behaviour tended to be negatively correlated with the market – suggesting a liquidity-providing role. However, post 2016, in the period up to 2018, this correlation turned positive, implying a more procyclical stance. This shift coincides with the introduction of Solvency II regulations, which aimed to improve insurers' resilience through more risk-sensitive capital requirements and enhanced governance standards, and also with falling gilt yields in the United Kingdom.

While this behaviour may reflect yields falling to very low levels at the time, disincentivising insurers to buy gilts at elevated prices when liquidity traders need to sell, the observed shift may reflect the introduction of Solvency II. The liability valuation rate under Solvency II is based on swaps, whereas under the United Kingdom's previous regime it was based on gilts, prompting a change in behaviour. In addition, Solvency II may have imposed tighter balance sheet constraints, by increasing capital requirements and reducing flexibility, and unintentionally weakened insurers' ability to act as stabilising counterparties in times of stress in the gilt market. This interpretation aligns with recent findings from UK corporate bond markets, where similar post-Solvency II procyclicality has been documented (Jurkatis et al (2025)).

In summary, while UK insurers have historically contributed to gilt market resilience by trading countercyclically, their capacity to do so appears to have diminished under the post-Solvency II regime, based on data up to 2018. At the same time, their relatively limited herding behaviour distinguishes them from other institutional investors and may explain their more limited role in recent episodes of gilt market volatility.

① The views expressed in this box are those of the authors, and not necessarily those of the Bank of England, the Bank for International Settlements, or their committees.

## 4. Measures of systemic risk

*The life insurance sector's contribution to the overall risk of the financial system has increased in recent years. This trend is primarily driven by the life insurance industries in North America and Asia, while European insurers have maintained the same level of contribution or even reduced it compared to the late 2000s. The rising contribution is largely attributed to the growing interconnectedness of the life insurance sector with the broader financial system, rather than an increase in the standalone systemic importance of individual insurance firms.*

Aggregate measures of systemic risks can shed light on high-level trends in the systemic risk contribution of the insurance industry and provide insights into how these trends compare with those observed in other sectors such as banking. More generally, they can underpin the more in-depth analysis of the following sections.

In this section we present the evolution of aggregate measures of systemic risks for the insurance industry, with a specific focus on life insurance. We focus on two measures of systemic risk (SRISK and ΔCoVaR) and complement them with an analysis of the co-movement and interconnectedness of banks and insurance companies.

## 4.1 Systemic risk measures and data sources

SRISK and ΔCoVaR, the two measures of systemic risk we use, look at the issue from two complementary angles. SRISK gives information on how insurance companies would be impacted by a severe and relatively prolonged market downturn. ΔCoVaR gives an indication of how an insurance company being in distress would affect the overall system's value-at-risk (VaR).

SRISK, developed by Brownlees and Engle (2016), measures the expected capital shortfall (CS) of a firm conditional on a severe market decline. It is a function of a firm's size, leverage and risk. CS is defined as the difference between the capital reserves a firm holds and the firm's market value of equity (*W*). Capital reserves are assumed to be a fraction *k* of assets (*A*). Formally, SRISK is defined as

$$SRISK_{it} = \mathbb{E}_t\left(CS_{i,t+h} \middle| R_{m,t+1:t+h} < C\right) = \mathbb{E}_t\left(kA_{it} - W_{it} \middle| R_{m,t+1:t+h} < C\right),$$

where $R_{m,t}$ is the market return at time $t$ and $C$ is the market decline threshold on which the estimate is based (ie a 40% drop). Estimating this quantity for each firm requires a decomposition of total assets between debt and equity and relatively few additional assumptions. For our purposes, we rely on the detailed estimates of SRISK by company provided by the V-Lab of New York University's Stern School of Business.[8]

We calculate the total SRISK for the life insurance sector (and other sectors or subgroups of companies) by summing across the SRISK of each individual company in the sector (assuming that a company with no capital shortfall has SRISK equal to zero). The monetary sum can be interpreted as the total amount of resources that would be required to bail out that group of companies in the event of a crisis.

ΔCoVaR (Adrian and Brunnermeier (2016)) is a measure that aims to capture the dependency between the overall financial system and a particular institution. It can be conceptualised in three steps: the first is the VaR of the financial system as a whole, ie the potential loss of the system as a whole given a confidence level (eg 5%). The second step is to recognise that such VaR could vary depending on the status of each financial institution, hence the CoVaR of institution $i$ is the VaR of the system as a whole conditional on institution $i$ being in a specific state. The final step is to assess how the VaR of the system would change if institution $i$ were in distress and compare it to the VaR of the system when the same institution is in its median state, thereby resulting in ΔCoVaR.

Hence, the ΔCoVaR of a specific institution can be formally defined as

$$\Delta CoVaR_q^{s|i} = CoVaR_q^{s|i=stress} - CoVaR_q^{s|i=median\ state},$$

where *s* and *i* refer to the system as a whole and to the institution respectively and *q* is the quantile for which the VaR is calculated, in our case the 5th percentile of returns. There are multiple ways to estimate ΔCoVaR; we rely on the commonly used quantile regressions as in Adrian and Brunnermeier (2016).

Estimating ΔCoVaR with quantile regressions also has another advantage. It allows us to decompose the measure into two distinct parts: the ΔVaR of an institution, which represents a specific institution's tail risk, and a systemic risk

[8] Detailed information on the methodology used to estimate SRISK is available on the V-Lab's website https://vlab.stern.nyu.edu.

coefficient (δ), which in our case is determined by the fifth quantile of the regression. The first part captures how severe the institution's own distress is and the second how much risk changes because of the interaction of the various institutions.

In practice we estimate the following equation for each company:

$$\Delta CoVaR_5^i = \delta_5^i(VaR_5^i - VaR_{50}^i).$$

We estimate ΔCoVaR's for life and non-life insurance companies as well as banks (classified by LSEG Datastream). This sample includes 24 life insurance companies, 60 non-life insurance companies and 257 banks.

We first estimate ΔCoVaR for each company based on weekly price returns between January 2000 and May 2025. The returns of the S&P 500 serve as a proxy for the financial system's returns. The estimation is run on an expanding window, starting with January 2000–December 2004. As a second step, the individual company-level estimates of ΔCoVaR are aggregated for the entire industry as a weighted average. The weights are assigned based on year-end values of market capitalisation.

Given their different approaches to estimating systemic risks, SRISK and ΔCoVaR together offer a comprehensive assessment of how an institution contributes to the risk of the system as a whole. SRISK aggregated across a group of firms measures the amount that taxpayers would need to come up with to bail out that group, should the system be in trouble. ΔCoVaR measures how much the risk of the system changes if a specific institution is in trouble, which can then be aggregated across a group of companies.

We complement these systemic risk measures with an analysis of the co-movement of insurance companies' returns and volatility with that of banks. These measures can shed light on the degree of interconnectedness within the insurance sector and between the sector and banks.

## 4.2 The insurance industry's contribution to measures of systemic risk

### SRISK

The total SRISK of life insurers in the sample, while large at around $400 billion, is still one order of magnitude lower than that of banks.[9] However, the SRISK of the life insurance sector has grown considerably in recent decades. Graph 4.1 reports the total amount of SRISK for three wide geographical areas: North America, Europe and Asia, which make up essentially the entire sample available. Results are reported for the overall sample and for a balanced sample. The balanced sample excludes companies that were added to the sample after 2007. We select 2007 as the threshold year to keep the number of excluded companies minimal while having a balanced sample for as long as possible.

Both the full and the balanced sample convey relevant information. The full sample measures the total amount of capital needed to fill in any gap but may overestimate the growth in SRISK if companies enter the sample only because of previous data availability issues. The balanced sample, on the other hand, is biased downwards because it does not capture new companies entering the market but can

[9] This is the reason why we do not show the SRISK for banks in the graph.

shed light on whether the insurance sector is becoming riskier for reasons other than its overall size.

Though overall both the full and the balanced sample show an increase in the SRISK of life insurance companies, the trend differs across geographies (Graph 4.1). In North America and Asia, SRISK has doubled in the last decade, hovering around the $150 billion mark in both regions in more recent years. In Europe however, SRISK has declined substantially to roughly $40 billion.

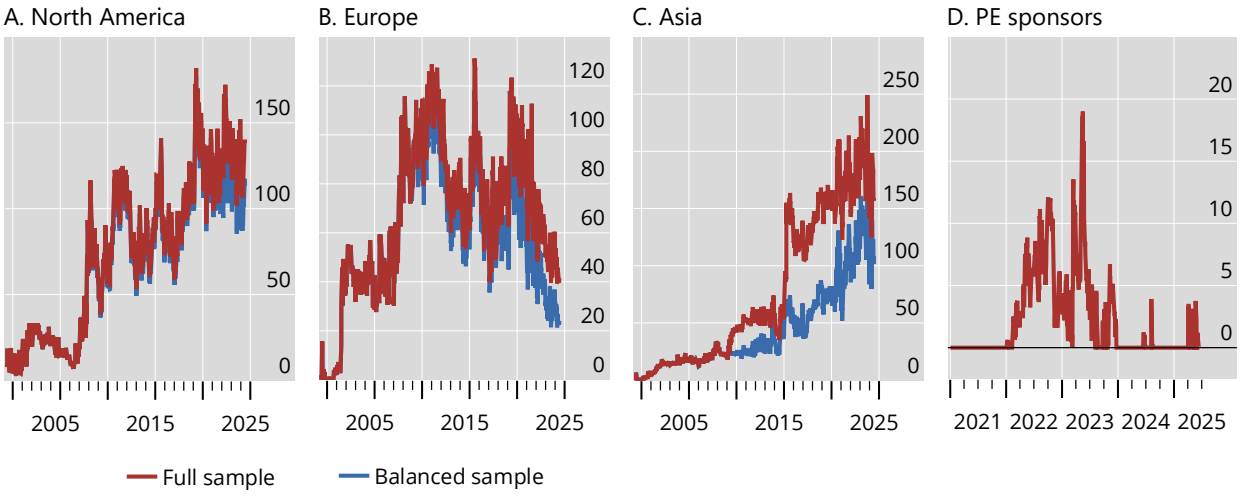
In unreported results, we also find that the SRISK of life insurance companies has particularly increased in EMDEs. Here, while the total capital shortfall was negligible up to the early 2010s, a significant increase has been evident since then. By early 2025 the total SRISK in EMDEs was comparable in size to the total SRISK in AEs.[10]

Overall, while the total amounts involved are still considerably smaller than those needed for a potential banking sector bailout, a bailout of the life insurance sector in North America and Asia would impose a significantly greater burden on taxpayers than in previous decades, while the opposite is true for Europe. Ellis et al (2024) provide evidence that Solvency II may be a significant contributor to this trend.

SRISK in the life insurance sector and for life insurers' PE sponsors

In billions of US dollars

Graph 4.1




PE = private equity.

Sources: Volatility Laboratory of the NYU Stern Volatility and Risk Institute (V-Lab); authors' calculations.

## SRISK of private equity sponsors

Insurance companies sponsored by private equity are sometimes viewed as more likely to take on risky business models. As some of the PE sponsors of life insurance companies are included in the data set produced by V-Lab, we examine the SRISK estimates for these entities in isolation.

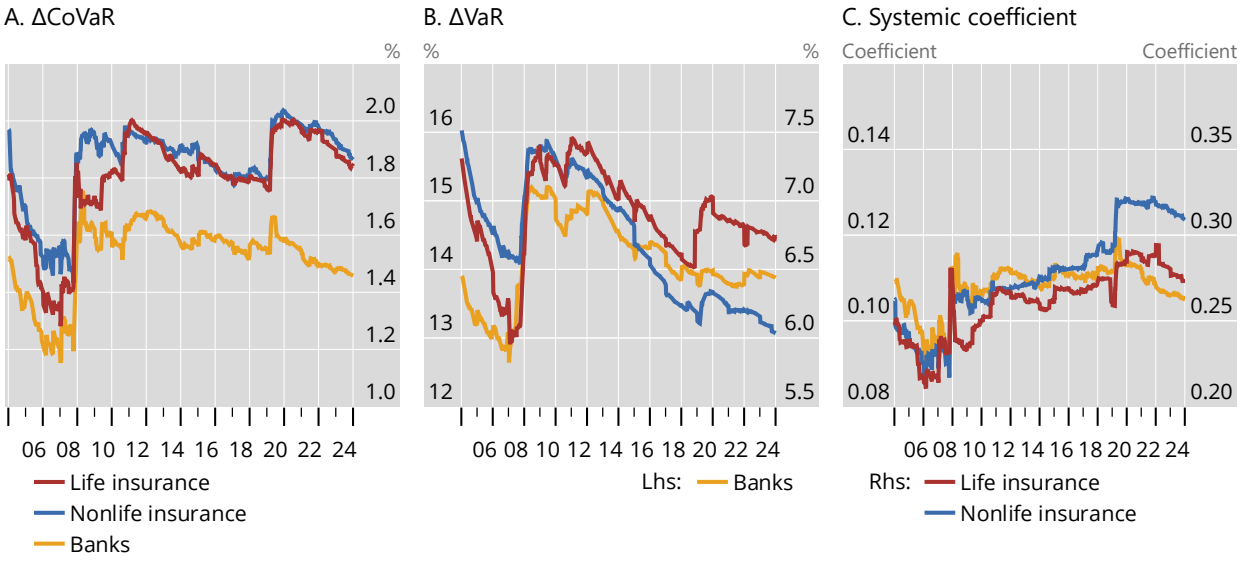
[10] It should be noted that the SRISK of non-life insurance companies does not follow a similar path. Instead, the trend is one of decreasing capital shortfalls since the GFC. And while there is some growth in EMDEs, total amounts are in single digits of US billion dollars.

The number of sponsors is small and therefore overall amounts are both small overall and quite volatile, as they depend on the capital shortfall of a very small number of companies. That said, one interesting pattern emerges: while the SRISK estimates for such entities were essentially zero up to late 2021, they subsequently increased, reaching a peak of $17.5 billion in mid-2023. While these amounts subsequently declined again, they show that these companies may represent a higher risk to the financial system than they did in the past.

## ΔCoVaR

The ΔCoVaR measure also documents a significant contribution of the life insurance industry to overall systemic risk. While the level of the ΔCoVaR in the life insurance sector is slightly off its peak, it is still much greater than before the GFC and at a higher level than that of banks (Graph 4.2.A), which highlights the increasing importance of this sector from a systemic standpoint.

ΔCoVaR in the financial sector[1] Graph 4.2




ΔCoVaR= delta conditional Value-at-Risk; ΔVaR = delta Value-at-Risk.

[1] Weekly frequency, estimation based on an expanding window starting with a five-year period from 2000 to 2004.

Sources: LSEG Datastream; authors' calculations.

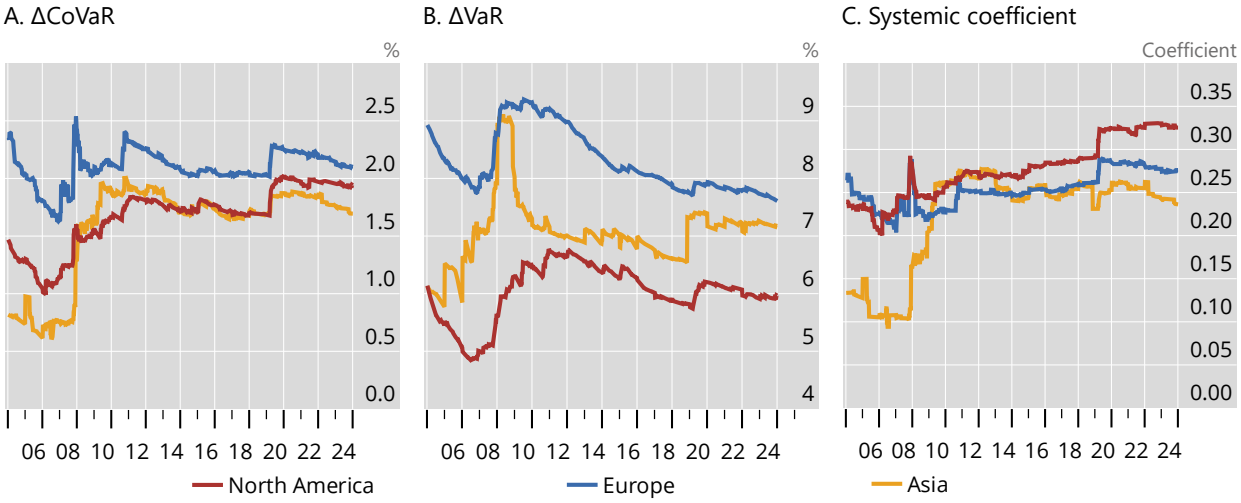
ΔCoVaR jumped during the GFC and then remained relatively flat at a high level. This is despite a continued decline in the ΔVaR of the life insurance sector – and indeed of the banking and non-life insurance sector (Graph 4.2.B), which highlights that the risk of individual institutions diminished substantially, potentially as a result of the significant policy interventions since the GFC. But the trend decline in ΔVaR has been more than outweighed by an increase in the systemic coefficient δ of the insurance sector (both life and non-life) to levels higher than those observed during the GFC (Graph 4.2.C). Given that the systemic coefficient measures the effect on the potential change in risk of the interactions of the various institutions, this suggests that despite the declining ΔVaR, the sector as a whole has become riskier since the

second half of the 2010s.[11] An increase in common exposures to the rest of the financial system has been identified previously as a likely driver of this trend (IMF (2016)).

Looking at the results for different geographies highlights once more that these trends are mostly driven by North America and Asia. In Europe, both the ΔVaR and the systemic coefficient have either declined slightly or remained flat, while in North America and Asia the systemic coefficient increased substantially (Graph 4.3).

Overall, these results are broadly consistent with the earlier findings from the SRISK analysis. The increase in the systemic coefficient implies that life insurers have become more systemic because of how they behave as a group. This additional commonality also implies that they could all be subject to higher capital shortfalls in case of a large decline in market prices as measured by SRISK.

ΔCoVaR in the life insurance sector across geographic regions[1] Graph 4.3




ΔCoVaR= delta conditional Value-at-Risk; ΔVaR = delta Value-at-Risk.

[1] Monthly frequency, estimation based on an expanding window starting with a five-year period from 2000 to 2005.

Sources: LSEG Datastream; author's calculations.

## 4.3 Connectedness with banks

The propagation of shocks across the financial system plays a critical role in determining its resilience. To examine the insurance sector's contribution to such propagation, we first apply the Diebold and Yilmaz (2009) DY framework to measure the interconnectedness between large insurance companies and systemically important banks, and then analyse whether the systemic risks of banks and insurance companies have become increasingly correlated over time.

The DY approach characterises a financial firm's connectedness based on its centrality within a network. The measure is based on the estimation of two-lag vector

[11] While we do not report the results here, there is little differentiation between AEs and EMDEs in the trends exhibited by ΔCoVaR, with ΔVaR declining and the systemic coefficient increasing across both sets of countries.

autoregressions on weekly data, which are then used to estimate 10-week ahead forecast errors. The variance of these forecast errors can be decomposed into each firm's own shocks, and contributions from other firms' shocks. The connectedness measure used here is the sum of all contributions from other firms, ie the part of forecast error variance that can be attributed to other firms' shocks. In other words, it is a fraction which represents the share of variance of returns (or of the volatility of returns) that is explained by the transmission of shocks across firms. The higher the connectedness measure, the more observed firm-level returns (or their volatility) depend on shocks from other firms.

The return connectedness between systemically important banks and insurers[12] has remained broadly stable following the GFC. In contrast, volatility connectedness declined until 2015, then increased, peaking during the early stages of the pandemic before resuming its decline. Graph 4.4. (panel A) highlights these trends. Overall, these results point to the fact that the interconnectedness between banks and insurance companies has not declined in the last 15 years.

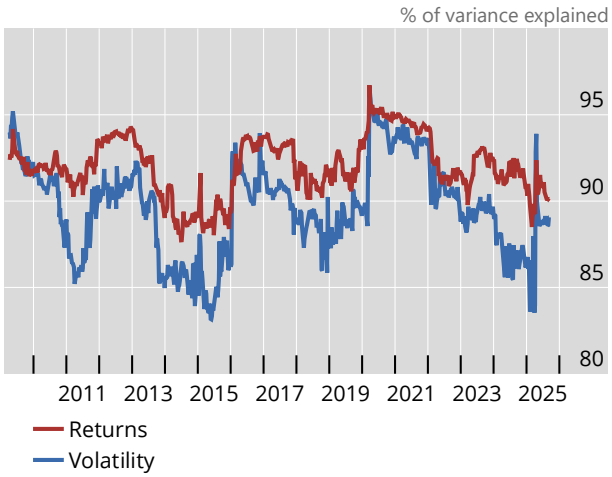
Looking at correlation in systemic risk measures yields similar results. Graph 4.4 (panel B) reports median correlation coefficients of the changes in SRISK of banks and insurers for the pre- and post-GFC periods and for the most recent (post-2020) period. These coefficients are calculated by aggregating the SRISK measure for banks and insurers and then calculating correlation coefficients of these two time series. Changes are significant, with correlation of the systemic risk measure increasing from approximately 56% to approximately 85%.

Taken together, the indicators of systemic risk highlight that the life insurance sector has become more systemically important since the GFC, and that the source of

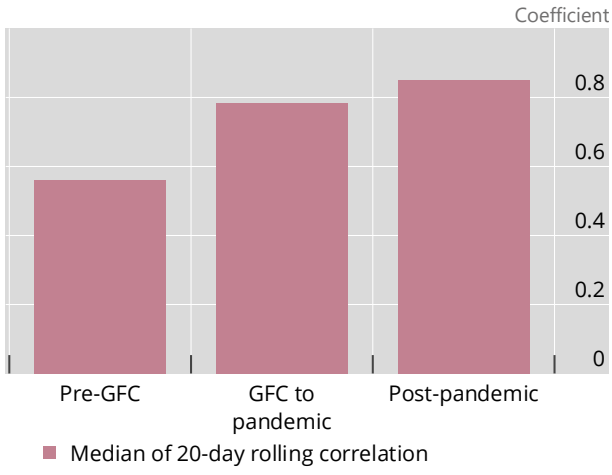
## Life insurers' connectedness with banks

Graph 4.4

A. Diebold-Yilmaz connectedness[1]




B. Correlation of life insurers' and banks' SRISK




[1] Excluding insurance companies and banks from China.

Sources: LSEG Datastream; authors' calculations.

[12] The companies in the list of systemically important insurers that the FSB published until 2016 and the list of systemically important banks that is still published characterise our sample.

this mostly lies in its increased commonality and interconnectedness rather than in the risk posed by individual insurers.

# 5. Structural shifts and related risks

*The life insurance sector has fundamentally changed since the GFC in response to persistent low interest rates and regulatory changes. Insurers have increasingly been relying on non-traditional debt-like funding in some jurisdictions and have shifted their portfolios towards riskier, less liquid assets, such as private credit and structured products. The growing involvement of private equity (PE) firms, which have partnered with or acquired insurers, further accelerated this search for higher yields and resulted in more complex reinsurance structures. Asset-intensive reinsurance (AIR), particularly with offshore reinsurers, has become a key strategy for capital relief. However, it has also introduced new layers of complexity and risk concentration and created potential conflicts of interest. PE-linked insurers now hold significantly larger exposures to structured products, affiliated assets and riskier mortgages, heightening their vulnerability to market shocks and liquidity stress. Additionally, the sector's growing dependence on private or internal credit ratings could obscure the true risk of complex assets and complicate effective oversight.*

The life insurance sector has undergone significant transformations after the GFC, driven by a prolonged low interest rate environment and, in some jurisdictions, changes in regulation that have impacted traditional insurance business models. To counter pressure on their profitability, many life insurers have increasingly relied on non-traditional liabilities for their funding and have shifted towards riskier and less liquid investments, while also seeking opportunities to reduce capital needs and expand business lines that require less capital. Some have deepened their ties with private equity (PE) firms and have embraced the use of asset-intensive reinsurance (AIR). While these adaptations have supported profitability and capital efficiency, they may have introduced systemic vulnerabilities, including heightened exposure to market volatility, liquidity risks and supervisory complexities. This section examines these trends, their drivers and the implications for financial stability.

## 5.1 Evolving business models: legacy of the low-rate environment

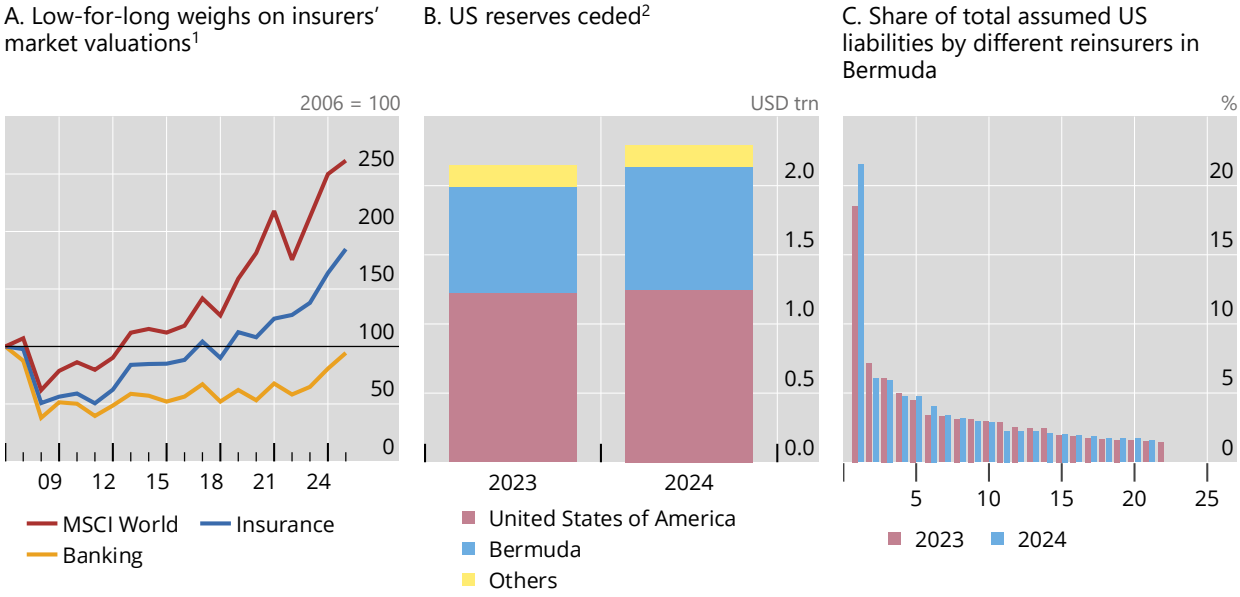
The extended period of low interest rates posed challenges to traditional life insurance business models, particularly for policies with high guaranteed returns. Insurers faced declining profitability as fixed income assets failed to generate sufficient yields, reflected in insurers' stock market valuations underperforming broader markets (Graph 5.1.A). This pressure led to widespread adjustments in business strategies. To adapt to the low interest rate environment, insurers reduced guarantees, which dampened demand for new policies and intensified their search for yield, which fundamentally reshaped their investment portfolios and business strategies. This shift not only altered how insurers operate but also introduced new risks.

In recent years, many life insurers have rebalanced their investment portfolios towards higher allocations in private assets to achieve higher returns (see also IMF (2024a)). Key investment areas include structured credit, direct lending and

infrastructure projects. These assets typically offer yields above those of traditional bonds but come with trade-offs, as they are less liquid and more challenging to value due to their bespoke nature and the limited availability of secondary markets (Cortes et al (2023), Foley-Fisher et al (2023a)). While the initial shift was driven by the low interest rate environment, the trend has continued even as rates rose, suggesting a more structural change in life insurers' asset management strategies. Life insurers controlled by private equity firms ("PE-linked insurers") stand out in this trend, with significantly larger investments in structured credit, such as collateralised loan obligations (CLOs). By the end of 2024, structured securities constituted approximately 27% of the investment portfolios of major PE-linked insurers. In contrast, other large life insurers reported lower holdings, with around 12% in CLOs.

## Bermuda is the largest non-US ceding jurisdiction, with high concentration

Graph 5.1




[1] End-of year observation of daily data. For 2025, data until 22 June. [2] Data for the United States. An affiliate is an entity within the same holding company system or a party. Following Koijen and Yogo (2016), reserves (technical provisions) ceded to reinsurers are approximated by the sum of US life insurers' reserve credit taken and modified coinsurance reserves. The sample includes all reinsurance relationships involving coinsurance arrangements associated with annuities, life insurance and long-term care insurance policies. The classification of offshore financial centres is based on Groups II and III from IMF (2000) that is controlled by the reporting entity.

Sources: Garavito et al (2024); S&P Global Market Intelligence, NAIC statutory filings.

Some life insurers have increasingly turned to non-traditional funding sources, heightening their exposure to liquidity risks. For instance, before the GFC in 2008, US life insurers significantly increased their reliance on repurchase agreements (repos), derivatives and securities lending to finance their assets – a trend that was later curbed by tighter regulations. In the post-GFC period, they have also expanded their use of funding agreement-backed securities, and Federal Home Loan Bank (FHLB) advances (Foley-Fisher et al (2020)). Funding agreements (FAs) are insurance contracts that allow insurers to secure funding directly from institutional investors. These agreements can be pooled into a special purpose vehicle (SPV) and securitised into FA-backed securities, which are then distributed to institutional investors. The increased use of FA-backed securities raises concerns about rollover risk, since these instruments depend on being refinanced at maturity. A failure to roll over funding could create liquidity challenges for insurers. Similarly, FHLB advances to US life

insurers have risen steadily, reaching over $150 billion in 2024. This underscores the growing reliance on non-traditional funding sources by some life insurers.

The evolving risk appetite in the life insurance sector may give rise to new vulnerabilities that could impact financial stability. While diversified portfolios can enhance resilience by spreading risk across asset classes, the shift towards higher-risk investments has increased the sector's exposure to credit and liquidity risks and heightened exposure to shocks in markets where insurers were traditionally not present. The 2023 failure of a PE-linked European insurer (see Box B), triggered by a surge in policy surrenders amid rising interest rates and solvency concerns, exposed such liquidity gaps. Additionally, valuation uncertainty in private markets, where assets are often marked to model rather than marked to market, can mask unrealised losses, delaying recognition of financial distress. For example, in contrast to the decline observed at many banks, life insurers' investment in Level 3 (illiquid and hard-to-value) assets has grown in the past years, rising to 10% of insurers' portfolios in some jurisdictions and complicating risk assessment (IAIS (2024)). During periods of liquidity shortages, these assets may be subject to fire sales at steep discounts, amplifying losses and potentially destabilising the broader financial system.

## 5.2 Rise of asset-intensive reinsurance

The growing reliance on asset-intensive reinsurance (AIR) has significantly influenced insurers' risk management practices, bringing both opportunities and challenges. AIR has become an important strategy for life insurers addressing capital and profitability pressures (Kartasheva (2023)). By 2023, US life insurers had ceded $2.1 trillion in reserves, up from $500 billion in 2017, representing 25% of their total assets (recall Graph 2.6). Offshore reinsurers accounted for 40% of these risks, up from 14% in 2017, with some of this activity occurring in jurisdictions with less stringent regulatory frameworks (Garavito et al (2024)).

AIR enables insurers to transfer risks to a reinsurer, thereby reducing the insurer's capital requirements. It involves transferring both liability risks (eg mortality, longevity) and asset risks (eg credit, market) to reinsurers, who manage the assets under agreed investment guidelines. AIR frees up capital for cedants (primary life insurers who cede risk to reinsurers) by transferring the risk of a ceded block and the assets supporting it to a third party. As a result, the primary insurer's capital requirements are reduced, since the responsibility for meeting the capital requirements for the ceded block shifts to the reinsurer. Reinsurers may benefit from regulatory differences in offshore jurisdictions, where less stringent solvency frameworks allow for greater flexibility in calculating technical provisions and capital requirements. For instance, the solvency framework in Bermuda allows for more discretion in assumptions related to policy lapse rates, liability discount rates, and expenses, compared to the more prescriptive rules in the United States. Bermuda remains the most important non-US ceding jurisdiction for US life insurers with about $1 trillion of ceded reserves in 2024 (Graph 5.1.B). More than 20% of ceded liabilities are concentrated in a single entity (Graph 5.1.C).

While AIR can enhance operational efficiency and centralise risk management within insurance groups, the increasing scope and sophistication of AIR agreements have introduced new complexities. Intricate risk intermediation chains, such as sidecars – special purpose reinsurance vehicles – have proliferated, transferring risks to external investors, including asset managers, sovereign wealth funds and family offices. Sidecars introduce maturity transformation, as investor commitments, due to

redemption rights, may have shorter durations than the long-term liabilities they support. These redemption rights can increase vulnerabilities during market stress if policyholders redeem en masse in a short period of time.

The geographic and operational concentration of reinsurance activity, particularly in jurisdictions with lighter regulatory frameworks, could increase the potential impact of a reinsurer's failure. The ratio of ceded liabilities offshore to US state-level GDP is highly skewed due to the presence of outlier states with high ratios (eg exceeding 100% in certain states), implying elevated regional economic exposures. The 2023 failure of Bermuda-based 777 Re, a PE-linked reinsurer, underscored the importance of robust risk management, as excessive risk ceding and inadequate collateralisation led to significant losses for ceding insurers.[13]

Procyclicality embedded in AIR agreements can also amplify market instability during financial shocks. Many AIR contracts include triggers that allow cedants to recapture assets and liabilities if the reinsurer's financial condition deteriorates or market conditions worsen (IAIS (2025)). While designed to mitigate counterparty risk, widespread activation of these triggers during a market shock or reinsurer failure could lead to fire sales, as cedants rush to liquidate assets to cover recaptured liabilities. This procyclicality exacerbates instability, as evident from similar past stress episodes such as the GFC, for obscure assets like CDOs and MBS. Uncertainty and lack of transparency in AIR agreements may prompt insurers to recapture risks prematurely rather than collaborate on remedial actions. Prudential regulators have begun including the funded reinsurance recapture risk into their stress test scenarios for the life insurance sector (see, for example, Bank of England (2025)). A key question is at what point the insurance sector exposure to the recapture risk becomes widespread enough to have systemic implications.

## 5.3 Growing influence of private equity firms

The rise of AIR has coincided with another transformative trend: the increasing influence of PE firms in the life insurance sector. These firms have significantly expanded their footprint in insurance companies, benefiting from insurers' capital needs and depressed valuations during the low-rate period (see also Cortes et al (2023)). Since 2010, cumulative PE investment in the sector has grown nearly sevenfold, predominantly in the United States, outpacing other financial sectors (Garavito et al (2024)). This influx of PE capital has reshaped the sector's structure and strategies and created new opportunities, but it has also introduced new risks (Kartasheva (2025)).

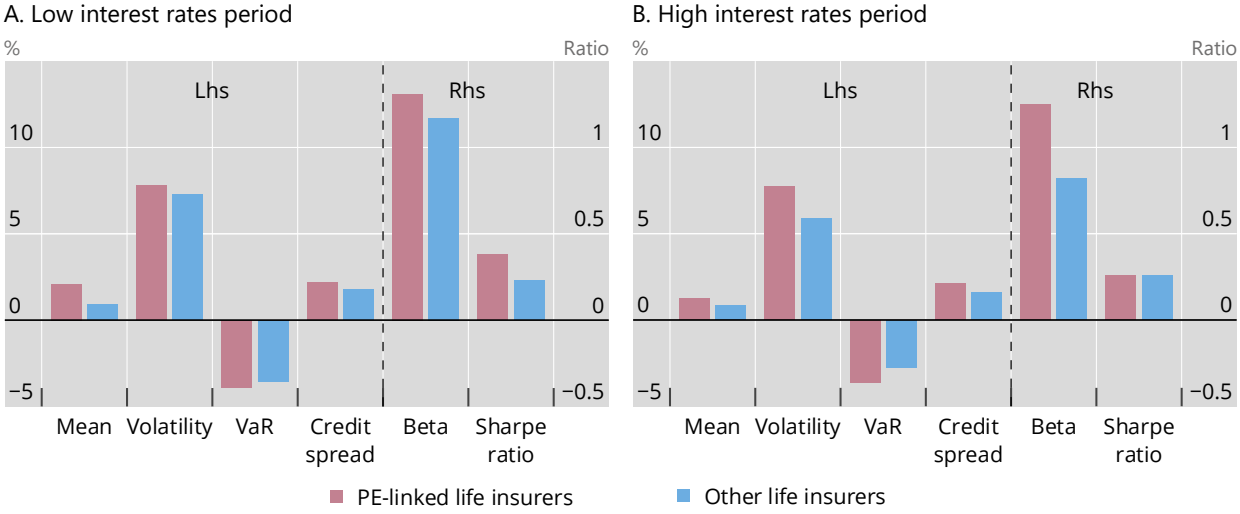
The strategies pursued by PE firms have bolstered insurers' returns but may have also increased systemic vulnerabilities. PE firms have used three primary strategies: acquiring primary insurers, establishing or investing in reinsurers for AIR, and providing asset management services in private markets. By mid-2024, PE-linked

[13] In 2024, when conflicts of interest and opaque, illiquid, hard-to-value investments surfaced, A.M. Best sharply downgraded 777 Re, triggering downgrades of A-CAP's life insurers, which depended heavily on 777 Re for reinsurance. As the crisis escalated, the state conducted examinations and issued emergency "no-new-business" orders, while the Bermuda Monetary Authority revoked 777 Re's registration. Although A-CAP was forced to recapture risk, sell illiquid assets, and secure new financing, leadership remained unchanged, and the extent of realized losses from asset sales remains unclear. The case of 777 Re highlights the supervisory challenges posed by governance issues, offshore reinsurance and complex affiliated assets, as well as the difficulty regulators face in placing troubled firms into conservatorship despite serious concerns.

insurers had assumed significant portfolios via AIR, channelling premiums into PE-originated assets like structured credit, direct lending and infrastructure. PE investments in the sector have injected capital, enabling insurers to sustain policyholder offerings and boost returns.

During the low-rate period (2019–22), PE-linked insurer stocks outperformed peers, with mean returns twice as high and Sharpe ratios 50% larger (Graph 5.2.A). However, their reliance on riskier assets and complex reinsurance has amplified vulnerabilities. As interest rates rose, this became evident as their market betas stayed elevated, in contrast to other insurers (Graph 5.2.B). Volatility and tail risks (5% VaR) of PE-linked insurers have also remained elevated, with risk-adjusted returns declining significantly. In contrast, non-PE insurers demonstrated greater resilience, with lower volatility and beta values (Graph 5.2.B). This dynamic highlights distinct differences between PE-linked and non-PE-linked insurers.

Stocks of private equity-linked life insurers hurt by rise in volatility[1] Graph 5.2




PE = private equity.

[1] The indicators are based on equity prices for a sample of US life insurers. The low interest rate period is from February 2019 to February 2022; the high interest rate period from February 2022 to June 2024. Based on a sample of 93 US life insurance companies, of which 16 were categorised as linked to PE firms. Beta is with respect to the S&P 500 index. Value-at-risk (VaR) is 5% historical VaR calculated from stock prices. Credit spread is calculated from PE-linked and other life insurers' bonds outstanding.

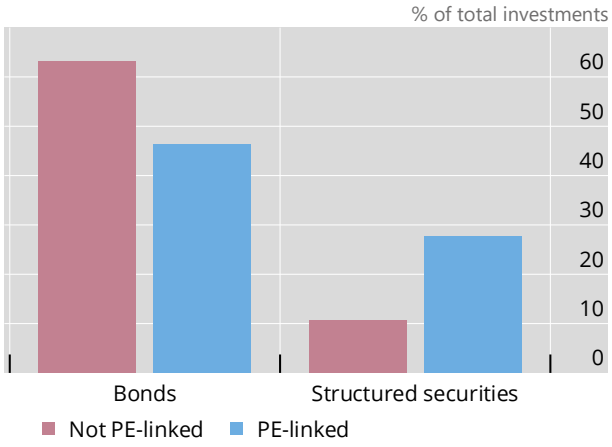
Sources: Garavito et al (2024); S&P Global Market Intelligence, NAIC statutory filings.

PE-linked insurers tend to exhibit a higher risk appetite, with greater exposure to structured products. While aggregate fixed income allocations are similar for PE vs non-PE insurers (86% vs 87%), PE-linked insurers allocate over twice as much to structured products (26% vs 11%) and considerably less to corporate bonds (46% vs 62%) (Graph 5.3.A). These findings are in line with Cortes et al (2023), who also show a higher allocation of PE-linked insurers to structured credit. Additionally, PE-linked insurers invest significantly more in affiliated assets (14% vs 8%) compared to other insurers (Graph 5.3.B), raising potential concerns about conflicts of interest. If anything, this probably understates the extent of PE firm involvement in investment decision-making, as the classification excludes unaffiliated investments originated by the PE sponsor.

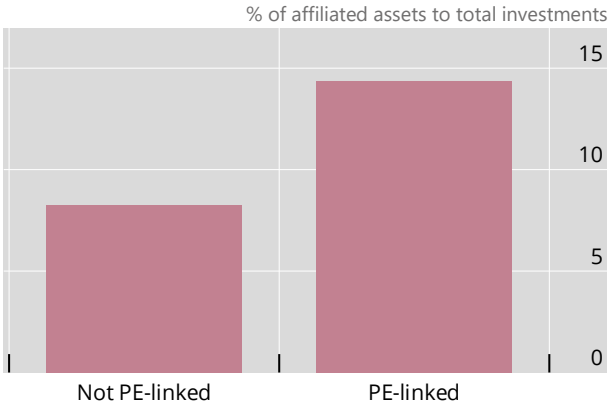
## Distribution of holdings[1]

Graph 5.3

A. PE-linked insurers invest more in structured products




B. Affiliated assets as a percentage of total assets held by each group




PE = private equity.

[1] Sample is US life insurers. Investments consist of securities reported in Schedule B, Parts 1 and 2, together with assets reported in Schedule BA by insurers in the sample.

Source: S&P Global Market Intelligence, NAIC statutory filings.

PE-linked insurers are also increasingly shifting their strategy towards directly purchasing residential mortgages, allocating a more than six times larger proportion of their mortgage book to such mortgages (Graph 5.4.A). Mortgage exposure of PE-linked insurers is almost twice as large compared to other insurers (Graph 5.4.B), with higher holdings of individual mortgage loans. PE-linked insurers appear to hold riskier non-qualified mortgages[14] (so-called "non-QMs") that often feature higher loan-to-value ratios and do not meet traditional agency standards. This approach introduces risks from both the underlying assets, which are more prone to default, and the operational complexities of originating and servicing these loans. While non-QMs offer higher spreads and allow insurers to capture income across the mortgage value chain through vertical integration, it remains uncertain whether the extra yield justifies the added risks, particularly during housing downturns or liquidity stress.

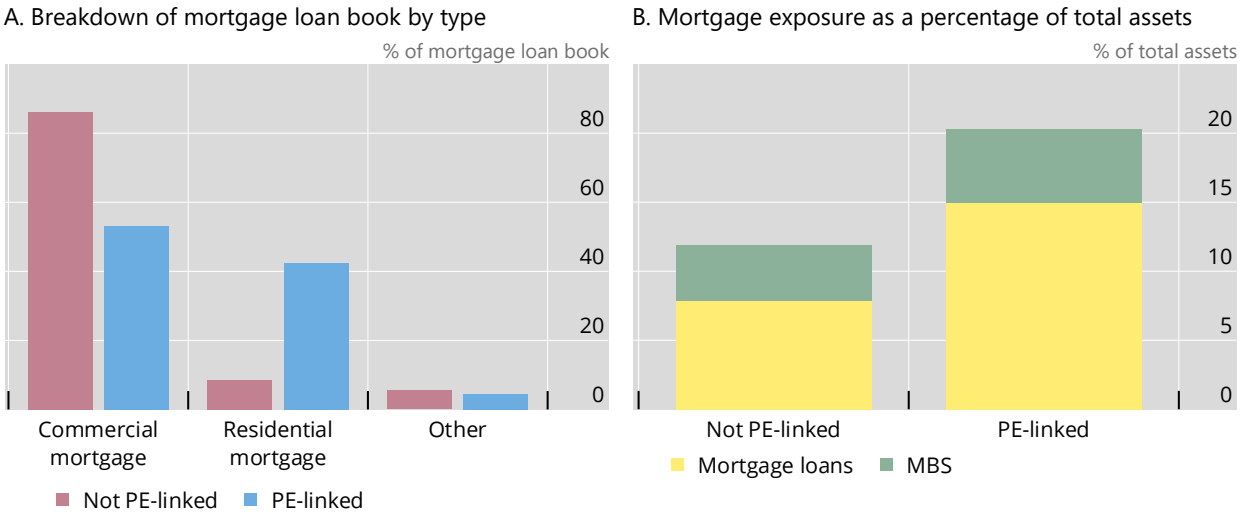
The growing influence of private equity investors has also reshaped governance structures in the insurance sector, potentially amplifying risks. PE firms, often focused on short-term share price performance, have driven increased leverage and investment in riskier assets (Kirti and Sarin (2024)). PE-linked insurers are more likely to underwrite annuities to generate premium income for PE-owned asset origination platforms, echoing practices from the subprime mortgage crisis, where securities were created to sustain fee-driven business models. Additionally, their heavy investment in in-house and affiliated assets (see Graph 5.3.B above) creates potential conflicts of interest, since PE firms may prioritise high-fee assets over policyholder interests.

Governance challenges are further compounded by the complexity of PE-linked insurers' investment strategies. These often involve layered transactions with affiliates that reduce transparency for regulators and investors and raise questions about the reliability of credit ratings for these assets. Market concerns about the elevated risk

[14] See S Carpenter, "Insurers tied to Apollo, KKR buy mortgages outright in new twist", *Bloomberg*, 16 July 2024.

PE-linked life insurers have higher exposure to mortgages and hold more residential mortgage loans[1]

Graph 5.4




PE = private equity.

[1] Sample is US life insurers.

Sources: S&P Global Market Intelligence, NAIC statutory filings.

profile and leverage of PE-linked insurers are reflected in higher credit spreads, with investors demanding a premium for securities issued by these firms. This gap in spreads, which widens during stress events such as April 2025's "liberation day" (Graph 5.5.A), underscores the heightened volatility and potential instability associated with PE-linked insurers.

## 5.4 Challenges in credit risk assessment

Structural vulnerabilities may also arise from the reliance on credit ratings to determine capital charges for credit risk in many solvency regimes. Credit ratings, being ordinal measures, provide a relative ranking of creditworthiness but do not convey the precise probability of default or loss-given-default for a fixed income security. Despite this limitation, higher ratings often directly translate into lower capital requirements, creating strong incentives for insurers to seek exposures with higher ratings. This dynamic may inadvertently reinforce weaknesses in the rating process, particularly in the life insurance sector, where the interplay between ratings and capital requirements can have significant implications for risk management. Three issues with private ratings warrant closer attention.

First, structured securities such as CLOs and asset-backed finance present unique challenges for credit ratings. These instruments rely on tranched cash flow structures that can become highly correlated in periods of stress. As a result, securities with similar ratings may have vastly different loss profiles. A structured security may appear low-risk based on its rating but suffer disproportionate losses in tail events – as evidenced by the case of AIG during the GFC – highlighting the limitations of traditional rating scales in capturing risk in complex instruments.

Second, the use of private credit ratings – so-called "private letters" – has grown in the United States, especially for PE-linked insurers. As of late 2024, 23% of PE-

linked insurers' investments rely on private letter ratings, compared to only 8% for other insurers (Graph 5.5.B). Moreover, many of these investments are more obscure, with information hardly obtainable in common data sources (blue bars). Private ratings are not publicly disclosed, which prevents external validation and facilitates rating shopping. These ratings are concentrated among smaller rating agencies, which may face commercial incentives to assign more favourable ratings. This opacity can lead to inflated assessments of creditworthiness and, correspondingly, undercapitalised exposures.

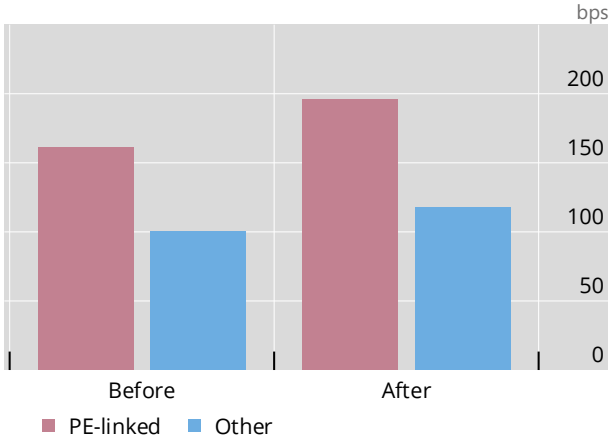
Third, in the European Union, internal credit ratings used by life insurers under approved internal capital models pose additional governance concerns. While the models themselves are subject to supervisory review, the underlying internal credit ratings are not directly overseen, or subject to external scrutiny. Given the capital impact of those ratings, insurers have incentives to systematically assign higher credit assessments, potentially distorting their true risk profile.

These issues – structural mismeasurement in ratings, incentives for inflated assessments, and weak governance – interact with and are often amplified by the capital framework's reliance on ratings. Together, they raise concerns about the adequacy of credit risk capital buffers and the robustness of solvency assessments in the face of growing exposure to complex, opaque and unrated assets.

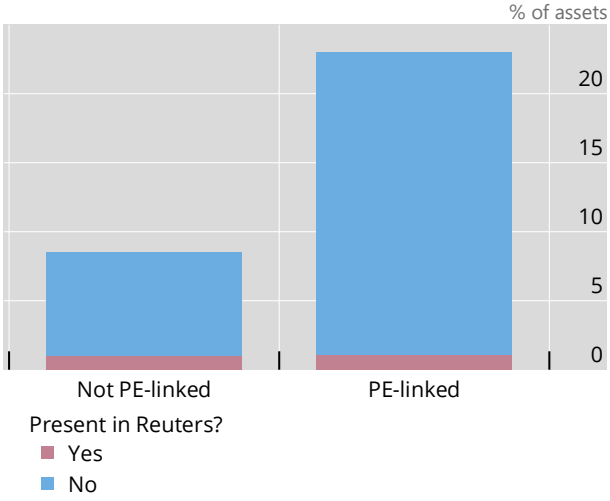
## PE-linked insurers invest in riskier assets

Graph 5.5

A. Spread of fixed income securities issued by life insurance companies around liberation day[1]




B. Percentage of investments identifiable in Refinitiv with private credit ratings




PE = private equity.

[1] "Around liberation day" refers to a seven-day window around liberation day. Sample is US life insurers.

Sources: Bloomberg; LSEG Workspace; S&P Global Market Intelligence, NAIC statutory filings.

# 6. The use of derivatives and liquidity risks

*Derivatives books of life insurers have grown significantly since the GFC. Drivers of this growth include the expansion of their investment portfolios, stricter hedging needs due to a shift towards risk-based capital requirements for insurers, and greater complexity of their investments. While mitigating solvency risks stemming from balance sheet duration gaps or currency mismatches, the use of derivatives exposes insurers to greater liquidity risk related to collateral and margin calls. In periods of rising interest rates, such liquidity risks from their interest rate swap positions could correlate with lliquidity risks arising from policy surrenders. Moreover, in periods of dollar funding strains, rollover risk of FX derivatives for non-US life insurers rises and their demand to keep the FX hedges on can, in turn, exacerbate the aggregate dollar funding stress. In interest rate derivatives, insurers exhibit greater reliance on hedging strategies that require less collateral by clearing their swaps bilaterally. PE-linked insurers also use derivatives more intensively, especially currency derivatives because of their greater exposure to foreign assets.*

Insurance companies constitute major users of derivatives contracts, which they enter into to immunise themselves from interest rate and currency risk. Aggregate data from the IAIS suggest that the ratio of gross notional amounts of derivatives relative to the assets of insurance companies is around 30–35% (IAIS (2024)). Interest rate and currency derivatives, estimated at 50% and 30% of their total derivatives book, respectively, represent the bulk of the exposures (FSB (2023)).

The use of interest rate derivatives introduces liquidity risks through margin calls. Thus, even in the absence of financial leverage, insurers can nonetheless have significant amounts of off-balance sheet (synthetic) leverage through their exposures embedded in derivatives contracts. The use of FX swaps to hedge risks exposes insurers to short-term rollover risks and funding squeezes.

## 6.1 Interest rate derivatives

One of the main risks faced by life insurers is the interest rate risk arising from the duration mismatch between their assets and their long-term liabilities. Because of their longer duration, the present discounted value of liabilities exhibits higher sensitivity to interest rate changes than assets. For example, in periods of low or falling rates, the value of assets may become insufficient to cover the rapidly rising present discounted value of liabilities. Insurers rely on interest rate derivatives to hedge against lower interest rates, mainly by entering into long-term interest rate swaps as fixed rate receivers. When interest rates rise, margin/collateral calls on these derivatives will be a drain on liquidity.

Insurance companies can also hedge their interest rate risk by altering the composition of their assets and liabilities. For example, during the period of ultra-low interest rates in the euro area, German insurers added duration to their asset holdings by purchasing long-term government bonds and did so at an increasing rate as interest rates tumbled (Domanski et al (2017)). However, doing so necessitated buying bonds at increasingly higher prices and consumed cash reserves. Insurers can also finance a portfolio of long-duration assets with collateralised short-term funding, (eg cash from securities lending). For example, during the 2011–15 period of low interest rates, US life insurers were proactively using securities lending as part of their

asset-liability management (Foley-Fisher et al (2016)). By contrast, when hedging with interest rate swaps, insurers only pay the initial margins on the notional amount, which enables them to invest the remaining cash in higher-yielding assets to meet their return targets. Hence, a more common practice is to rely at least partly on hedging interest rate risk with derivatives.

## 6.2 Currency derivatives

Globally, currency risk ranks second after interest rate risk in insurers' over-the-counter (OTC) derivatives exposures (FSB (2023)). This reflects insurance companies' hedging of currency risk on their foreign currency investments predominantly with FX derivatives.[15] US insurers are the exception, with FX derivatives ranking also lower than equity derivatives because their asset allocation is predominantly domestic.[16]

FX derivatives differ from interest rate derivatives in two important ways, which affect the risks associated with their use. First, unlike interest rate derivatives, counterparties in most types of FX derivatives exchange - effectively borrow and lend - the entire notional amounts in the two currencies. For example, from the perspective of either party, a currency swap is like a loan collateralised with foreign currency. Hence the funding and counterparty risk contributions are more material. Second, apart from non-deliverable forwards (NDFs), futures and exchange trade options – markets that are relatively small in size – the FX derivatives market, which is mainly comprised of outright forwards, FX swaps and currency swaps, is not subject to central clearing mandates.

Insurers mainly rely on FX swaps, currency swaps and forwards to hedge currency risk. FX swaps tend to be short-term, with only two transactions taking place, at the inception of the contract and at maturity. Currency swaps are longer-term instruments, of seven- to 10-year maturities on the insurers' books (Graph 6.4.B), in which counterparties exchange the notional amounts in two different currencies at the beginning and at the end of the life of the swap and periodically (eg every quarter) exchange floating interest payments referenced to benchmark rates in the two currencies. In an FX forward, only one transaction takes place when the notional amounts in the two currencies are exchanged at maturity at the forward exchange rate agreed upon at the inception of the contract.[17]

Among institutional investors, insurance companies rank as top users of FX derivatives,[18] as they face stricter regulatory caps on open (unhedged) FX positions. FX derivatives markets have expanded rapidly in the past decade and a half, tracking the steep growth of international portfolios of institutional investors (McGuire et al

[15] In addition to FX derivatives, insurers can also hedge part of the currency risk using on-balance sheet instruments, specifically by issuing policies denominated in foreign currencies. However, such natural hedges with foreign currency-denominated policies (reserves) cover a much smaller portion of currency risk compared to FX derivatives.

[16] More generally, FX exposure depends on the international focus of an insurance company. For insurance groups that only issue policies in their home currency, the FX exposures can be substantial and material for solvency. For large insurance groups, with business lines in many countries, they are part of the day-to-day business and can be mutualised at the group level.

[17] For an explanation of FX swap and currency swap markets, see eg Ranaldo (2023).

[18] For instance, Du and Huber (2024) document higher average FX hedge ratios among insurers across different countries compared to pension funds or mutual funds (although pension fund hedging policies can differ markedly across jurisdictions).

(2021); Nenova et al (2025)). Still, insurers typically do not hedge all the currency risk in their portfolios. Fixed income investments tend to command higher FX hedge ratios than equities, since the returns to the latter are typically more volatile than FX returns, which diminishes the value of hedging.

FX hedging practices differ across jurisdictions. Structural market factors such as the availability of hedging instruments (eg FX derivative market depth) and regulatory regimes largely determine insurers' approaches to hedging. For example, Korean insurers' hedge ratios are around 80%, with hard regulatory limits on the fraction of foreign asset holdings that can go unhedged. Similarly, Thai insurance companies hedge close to 100% of FX bonds, but due to stringent risk-based capital (RBC) requirements. By contrast, regulatory limits are less restrictive for Taiwanese insurers, who exhibit hedge ratios below 50% (not accounting for natural hedges, see below), as well as Japanese insurers, whose hedge ratios have oscillated between 30% and 70% since the mid-2000s.

FX hedging practices also vary over time, especially with the US monetary policy cycle. Non-US life insurers have been structurally underhedged since the Federal Reserve began raising rates in 2022. There were at least three economic reasons for the "under-hedge". First, high FX hedging costs: since currency hedging costs move almost one-for-one with the differential of short-term interest rates in the two currencies (plus a small "basis"), a steep rise in US short-term rates drives up the cost of hedging. Second, a relatively strong dollar that resulted in variation margin payments on their dollar forward short positions (rolling over short-dated FX swaps effectively entails paying variation margins, akin to having a long-term hedge). Third, the historical "dollar smile", ie the tendency of the dollar to appreciate in bad times, tended to compensate for market losses on dollar-denominated assets when unhedged for currency risk. Yet, this structural under-hedge exposed life insurers to a wrong-way risk in April and May 2025, when, breaking with historical pattern, the US dollar depreciated sharply amid market turbulence. In extreme cases, this could potentially impact the solvency of non-US life insurers.

## 6.3 Possible implications for systemic risk

*The solvency-liquidity trade-off*. While the use of derivatives to hedge on-balance sheet duration and currency mismatches reduces insurers' solvency risk and procyclicality in their investment behaviour, the rise in the use of derivatives could have its own systemic risk implications. Since counterparties in derivatives markets are exposed to margin and collateral calls, hedging of asset-liability mismatches with derivatives introduces additional liquidity risk for insurers. In other words, synthetic leverage helps manage on-balance sheet mismatches but at the expense of introducing a solvency-liquidity trade-off (Alfaro et al (2024)).[19]

Without the use of interest rate derivatives to hedge duration mismatches on their balance sheets, insurers' trading in fixed income markets would be more procyclical. Due to their negative balance sheet convexity (because of their longer

[19] In computing synthetic leverage exposure, it is not sufficient to simply take the ratio of the initial margin to the total notional amount of a derivative contract, but one must also account for the impact of variation margins, which depend on future fluctuations in the market value of the contract, hence are unknown at the inception and represent an additional source of risk. See Ianiro et al (2022) and Ianiro et al (2025) for methodologies and Macchiati et al (2025) for an indicator framework of NBFI exposures to margin call-induced liquidity shocks.

maturities, liabilities are more sensitive to interest rate changes than assets), the duration hedging motive may force insurers to buy (sell) long-term bonds into a rising (declining) market. In aggregate, this can amplify the underlying market dynamics. This dynamic management of the duration gap on life insurers' balance sheets with cash securities could thus exacerbate their negative balance sheet convexity (Domanski et al (2017); Rousová and Giuzio (2019)).

*Contemporaneous with liquidity risks from policy surrenders***.** At the same time, when hedging duration with interest rate derivatives, liquidity pressures from margin calls on derivatives could lead to additional financial stability risks through several channels. First, in a period of rising interest rates, such pressures could coincide with surrenders of life insurance policies (Aldridge et al (2024), IAIS (2024)).[20] Amid rising interest rates, as net receivers of fixed rates in interest rate swaps, life insurance companies will face losses on the market values of their swap positions, and hence margin calls, exactly when surrender risk also rises (see Box D for the case of EU insurers). Hence, they will have to meet a twofold liquidity drain, one arising from their off-balance sheet derivatives positions, and the other from their on-balance sheet liabilities.

*Incentives for bilateral clearing to economise on collateral*. While the direct costs of posting margins amount to billions of dollars per year, hardly unbearable for the life insurance industry as a whole, the bulk of this amount probably falls on a handful of larger firms. For example, in 2022, US life insurers' estimated cash needs to meet margin calls on interest rate swap positions amounted to approximately $15 billion (see below), or 10% of their total cash reserves and short-term security investments. To economise on cash and collateral, the industry may thus respond by moving towards hedging strategies that reduce exposures to procyclical margin calls and economise on collateral (Berends and King (2015)). One such indication is apparent in the tendency of life insurers to clear more of their interest rate swaps bilaterally, as opposed to via a central counterparty (CCP), than the market average (see Section 3.2).[21] The share of bilaterally cleared swaps is especially high for PE-linked life insurance companies.

*Interconnectedness and counterparty risk*. PE-linked insurers' reliance on bilaterally cleared derivatives increases counterparty risks, which could amplify systemic stress during periods of market volatility. It also increases complexity and interconnectedness through interdependence of bilateral positions.

*Risks of asset encumbrance to meet margin calls*. Balance sheet segmentation or asset encumbrance may leave insurers with a liquidity shortage if cash buffers are insufficient to meet sudden margin calls. For example, during the Covid-19 pandemic financial market stress, the most liquid assets of US life insurers, in particular their Treasury security holdings, were encumbered, and therefore their cash buffers had to

[20] More recently, liquidity risks stemming from investment in alternative, illiquid, assets, have been gaining increasing attention (Geneva Association (2024)).

[21] The Dodd-Frank Wall Street Reform and Consumer Protection Act mandates that most standardised swaps be cleared through CCPs to reduce systemic risk. However, exemptions exist for certain types of swaps and market participants. For example, life insurance companies that use swaps to hedge or mitigate commercial risks (eg managing interest rate or investment risks associated with their insurance products) may qualify for the end user exception under the Dodd-Frank Act. Life insurance companies that are state-regulated entities may have unique considerations under US law and some might qualify for exemptions if they meet specific criteria outlined by the Commodity Futures Trading Commission (CFTC).

be largely replenished through about $20 billion in loans from Federal Home Loan Banks (FHLBs) (Foley-Fisher et al (2022)). While this liquidity drain concerned insurers' equities and other assets, their interest rate swaps positions posted gains of about $20 billion in margins received (Foley-Fisher et al (2022)), as the market values for fixed rate receivers went up amid falling interest rates. Had the insurers not benefited from the valuations of their interest rate hedges, FHLB advances might have had to be at least twice as large. More recently, the inability of liability-driven investment funds (LDIs) to meet margin calls on their interest rate swap positions, because they could not access the liquid asset holdings of their pension fund sponsors, led to fire sales, exacerbating the initial rate rise and leading to a record spike in UK gilt yields (Pinter et al (2024)).

Similarly, the use of derivatives to hedge currency risks on trillions of US dollars of insurers' global assets mitigates solvency risk, but exposes insurers to dollar funding risk in FX swap markets.

If currency risk is left unhedged, a sharp depreciation of foreign currency could potentially impact the solvency of life insurers. To avoid further losses, the insurance sector may rush to hedge ex post by selling foreign currency forward in the midst of the turmoil. However, in aggregate this puts further depreciation (appreciation) pressure on foreign (home) currency, thereby exacerbating the adverse currency move. The experience of the Taiwanese life insurance sector during the sharp dollar depreciation in April and May 2025 is a case in point (Box E).

*Exposure to dollar funding shortages in FX derivatives markets***.** While under-hedging introduces the aforementioned "wrong-way risk", strict hedging: (i) exposes insurers to margin calls during periods of dollar appreciation; and (ii) introduces rollover risks in FX derivatives, which can contribute to system-wide dollar funding stresses.

During periods of dollar appreciation, non-US institutions with significant US dollar asset holdings face increased variation margin calls on their FX hedging positions. This liquidity pressure often forces institutions to liquidate domestic safe assets, amplifying stress in local financial markets. For example, during the Covid-19 crisis in March 2020, UK insurance companies and pension funds sold nearly £4 billion of UK gilts to meet margin calls on FX derivatives, contributing to a sharp rise in gilt yields (Czech et al (2021)).

Rollover risks rise because insurance companies and other asset managers mostly roll over short-term FX derivatives (eg three-month FX swaps) contracts to hedge their long-term foreign currency investments.[22] As swap market liquidity worsens and hedging costs spike, rolling over the hedges becomes costly and, if large enough in aggregate, can in turn create negative feedback by raising the dollar funding costs in FX swap markets further. This introduces procyclicality into FX derivatives markets and can exacerbate the aggregate dollar funding stresses. Importantly, the nature of FX swaps implies that, when an FX swap is not rolled over, the dollar-borrowing NBFI has to come up with the cash dollars to close out the position.

[22] An FX swap is essentially a collateralised borrowing operation. With an FX swap, two parties exchange currencies at the current spot rate (spot leg) and agree to unwind that transaction (exchanging the full principal amount) at a pre-agreed exchange rate at some pre-agreed time (forward leg). Despite the full exchange of principal at the end of the contract, accounting convention does not count FX swaps as debt, but as off-balance sheet obligations.

Pressures in FX swap markets due to rollover needs of FX hedges appear to have played a role in the March 2020 Covid-19 dollar funding squeeze, when dollar premium in FX swaps (the FX swap basis) shot up rapidly. Among them, the Korean won exhibited one of the most extreme bases at three-month tenors, a typical hedging tenor. Following the Covid-19 experience, in 2021 Korean authorities relaxed the cap on insurance companies' open FX positions from 20% to 30% of solvency capital, to allow them to hedge more flexibly (McGuire et al (2021)).

The liquidity risks resulting from synthetic leverage and currency hedging have increased over the past decade and a half, partly for regulatory reasons. Risk-sensitive solvency frameworks include capital charges on unhedged foreign exchange exposures. As a result, insurers have increased their hedging activity to reduce these capital costs, which has, in turn, amplified liquidity risks. In fact, much of insurers' derivatives-based hedging activity reflects accounting and regulatory considerations, not necessarily economic ones (Berends and King (2015)).[23] Furthermore, with the implementation of the Dodd-Frank Act of 2010, the European Market Infrastructure Regulation (EMIR) in 2021 and similar approaches in other jurisdictions, collateralisation and margining requirements for OTC derivatives have tightened; first, for the centrally cleared segments and, more recently, for non-centrally cleared derivatives as well.

*Unlike solvency risk, liquidity risk is considered an ancillary risk*. In contrast to banking regulation, there is no Liquidity Coverage Ratio (LCR) or similar requirement for insurers. However, liquidity has to be incorporated into insurers' economic risk modelling (ERM) and should also be part of a firm's own risk and solvency assessment (ORSA). Insurers have to have contingency plans for liquidity risk. Hence, the IAIS considers liquidity an ancillary risk that is subject to some requirements (IAIS (2022)).

A number of central banks have been granting insurance companies access to their contingent liquidity facilities, a de facto recognition that the liquidity risk in the sector can have systemic implications. For example, significant federally or provincially regulated pension funds and insurance companies constituted the only non-bank entities eligible for Bank of Canada's Contingent Term Repo Facility (CTRF) since 2020. Analogously, in January 2025 the Bank of England opened its Contingent Non-Bank Financial Institution Repo Facility (CNRF) to supply cash to eligible liability-driven investors: pension funds, insurance companies and LDI funds. In Switzerland, insurance companies that participate in the local repo market have access to the Swiss National Bank's standing facilities (intraday liquidity and liquidity-shortage financing facility) and may be admitted as counterparties for monetary policy operations. In Japan, a liquidity line is available from the Deposit Insurance Corporation of Japan (DICJ) to a distressed insurer in cases where, without the liquidity line, the insurer might cause systemic risk that would lead to severe disruption to the financial system including financial markets. In the United States, in turn, FHLBs have long been an important source of contingent liquidity for the insurance sector.

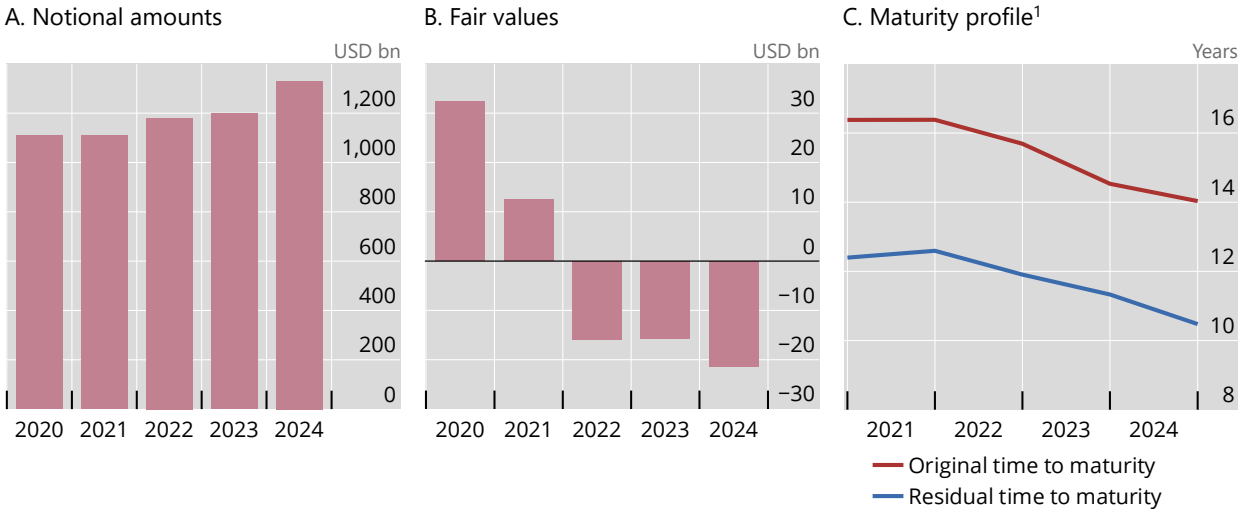
## 6.4 Interest rate derivatives in the US life insurance sector

In 2024, US life insurers increased their interest rate swap exposures to hedge risks of a widening duration gap in anticipation of rate cuts, as the monetary policy tightening

[23] Focusing on variable annuity products of US life insurers, Sen (2023) similarly finds that when the regulatory regime recognises certain risks, insurers start to hedge these risks in a substantial way.

cycle came to an end. The notional value of interest rate swaps alone on US life insurers' books reached $1.3 trillion in 2024 (Graph 6.1.A), roughly equivalent to 15% of total assets and exceeding the notional value of all the OTC derivatives held by US life insurers just a decade ago.[24]

US life insurers' interest rate swap exposures — Graph 6.1




[1] Averages weighted by outstanding positions.

Sources: National Association of Insurance Commissioners (NAIC); authors' calculations.

During the period of rising interest rates from 2022 to 2024, US life insurers faced liquidity needs to meet collateral and margin calls, because the fair value of their rate swap positions turned negative (Graph 6.1.B). As fixed rate receivers, insurers typically face margin calls in periods of rising rates. The same liquidity drain through changes in market value of derivatives positions was evident with European insurers (see Box D) and liquidity problems led to a loss of confidence in one insurer in the euro area, which suffered a wave of surrenders by policyholders (see Box D).[25] And, as interest rates rose, the maturity profile of outstanding interest rate swaps contracted (Graph 6.1.C).

Another feature of US life insurers' interest rate swap books is their greater share of bilaterally cleared positions compared to the overall market. While the overall share of non-centrally cleared positions in US dollar interest rate swaps hovers at 18%, it was 40% (35%) in 2023 (2024) for US life insurers (Graph 6.2.A). The bilaterally cleared swap positions of US life insurers have longer initial and residual maturities compared to the centrally cleared ones (Graph 6.2.B). This suggests that for longer-duration swaps, ie those with higher interest rate risk and more unpredictable collateral or margin calls, life insurers are more likely to clear with a dealer rather than a CCP.

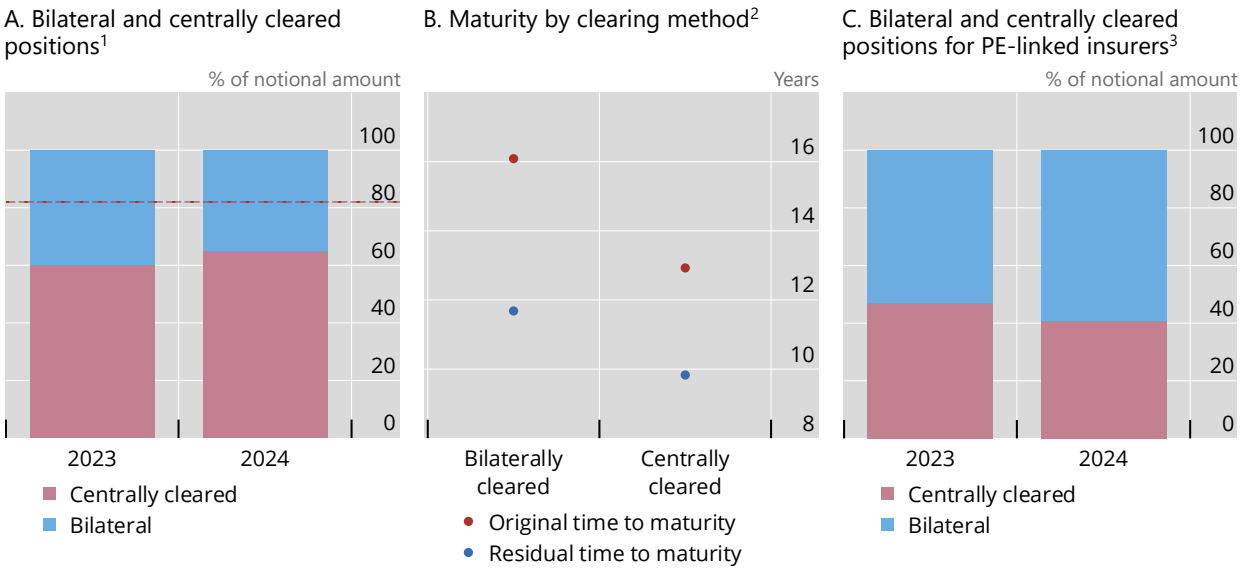
[24] At end-2023, the total notional amount of all the OTC derivatives of US life insurers stood at $3.1 trillion (Raimondi and Piccin (2024)), roughly triple the amount compared to a decade earlier.

[25] Before the tightening cycle, insurers were paying low variable rates on their swaps while receiving fixed rates. As rates rose from 2022 onwards, the variable rates they had to pay increased significantly, while the fixed rates they received remained unchanged. This rate mismatch triggered higher margin calls, putting pressure on insurers' liquidity.

Unlike CCPs, dealers may offer greater flexibility when it comes to margining and collateral requirements.

## US life insurers' exposure to non-centrally cleared interest rate swaps

Graph 6.2




PE = private equity.

[1] Dashed line shows the share of centrally cleared IRS for US dollar interest rate swaps market aggregate, based on BIS OTC derivatives statistics. [2] Averages weighted by outstanding positions. [3] Based on the classification of PE-ownership among 100 top US life insurers by assets.

Sources: National Association of Insurance Commissioners (NAIC); authors' calculations.

The share of bilaterally cleared interest rate swaps is particularly high for PE-linked life insurance companies, at 53% in 2023 and 59% in 2024 (Graph 6.2.C).[26] Since PE-linked insurers tend to invest in riskier and less liquid assets they may have a stronger incentive to clear their swaps bilaterally, at bespoke terms for margins and collateral, as they are likely to have lower liquidity buffers to meet sudden margin calls.

Bilateral clearing is riskier due to higher counterparty and systemic risks.[27] Regulatory reforms, such as those introduced after the 2008 financial crisis, have

[26] A life insurance company is classified as PE-linked if a PE firm has a controlling equity stake in the company, if it has a controlling equity stake in the reinsurance company to which the operating company has ceded part of its balance sheet, or if a PE firm holds a minority equity share in the company but manages its assets.

[27] First, in bilateral clearing, counterparties in a trade are exposed directly to each other. If one party defaults, the other bears the full credit risk of the defaulting counterparty. This creates significant counterparty risk, especially in stressed market conditions. Second, risk management in bilateral clearing is decentralised, meaning each counterparty must assess and manage the creditworthiness of its trading partners. This can lead to inconsistent or inadequate risk management practices. Third, collateral requirements are less standardised, and counterparties often have to post collateral to multiple trading partners, leading to inefficiencies and higher overall collateral costs. Fourth, the network of bilateral agreements can create a complex web of interdependencies. If one counterparty defaults, the ripple effects can propagate through the financial system, amplifying systemic risk. While central clearing mitigates many of these risks, it introduces its own set of challenges that need to be carefully managed, such as risk concentration at CCPs.

strongly encouraged the use of central clearing to enhance the stability of OTC derivatives markets.

## 6.5 Interest rate derivatives in the euro area life insurance sector

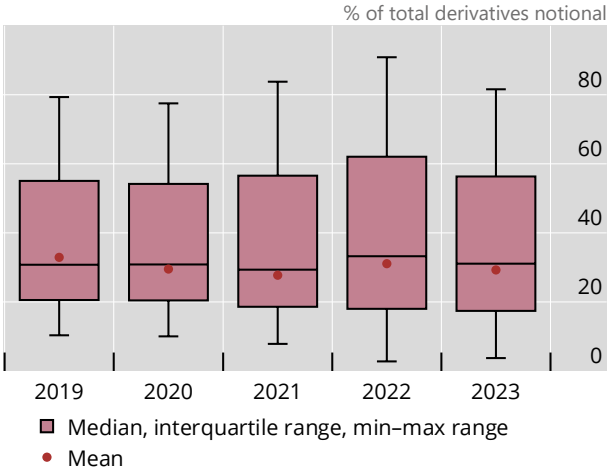
Interest rate hedging practices by life insurers in the euro area vary across countries. The average share of interest rate derivatives in total derivatives books of euro area insurers hovers at around 30% (Graph 6.3.A). However, the cross-country dispersion is significant. In one major jurisdiction it was 10.3% in 2019 and 11.0% in 2023. In another, the share was 76.9% in 2019 and 78.3% in 2023.

The wide dispersion of the share of interest rate derivatives in total derivatives suggests that that life insurers in different member states of the euro area take different approaches to hedging interest rate risk. In jurisdictions with a high share of interest rate derivatives, they clearly rely on interest rate swaps and similar off-balance sheet instruments to hedge asset-lability duration mismatches. In jurisdictions where the share of interest rate derivatives is low, they are more likely to use on-balance sheet instruments to hedge duration mismatches; that is, by altering the duration of their asset holdings, eg cash bonds, or of their liabilities, say through securities lending. For example, German life insurance companies hedged against falling interest rates in the 2013–14 period by extending the maturity of their government bond holdings (Domanski et al (2017)). In line with wide differences in the use of interest rate derivatives for hedging, there was also a wide dispersion in duration gaps of insurers in euro area member states during a period of rapidly falling interest rates (EIOPA (2014)).

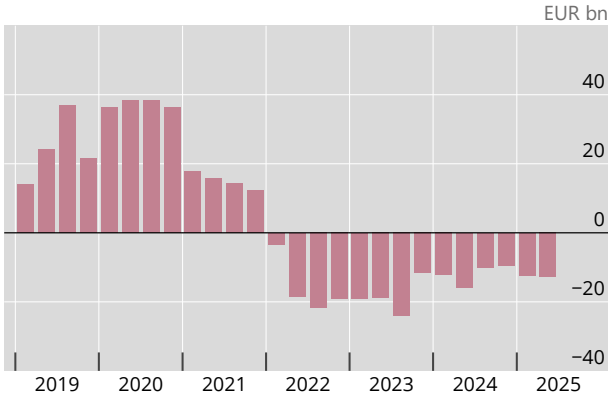
Even though interest rate derivatives account for less than a third of all derivatives exposures of euro area insurers, for the sector as a whole, the losses on the market values of their entire derivatives books appeared correlated with rapidly rising interest rates beginning in 2022 (Graph 6.3.B). The impact of the interest rate

Interest rate risk hedging and market values of derivatives of euro area insurers — Graph 6.3

A. Share of interest rate derivatives in total derivatives, distribution among member states




B. Net market value of financial derivatives of euro area insurance companies[1]




[1] Values of derivatives assets minus derivatives liabilities.

Sources: ECB; IAIS; authors' calculations.

portion of their derivatives books may have been outsize due to the convexity of interest rate hedges – at lower rate levels, the sensitivity of derivative valuations to changes in rates is amplified. At an aggregate level, the liquidity drains stemming from margin calls on outstanding derivatives positions in the red persisted through the period of rising interest rates, exceeding €20 billion in some quarters.

Given the high concentration of interest rate derivatives use by life insurers in just a handful of euro area member states, as gleaned from the dispersion in the share of interest rate derivatives shown above, the pressures to fund margin calls on their market value losses were also concentrated within a few jurisdictions.

Rising interest rates also trigger a second source of liquidity drain, that stemming from policy surrenders. Somewhat ameliorating the two channels of liquidity risk for life insurers is the fact that the transmission of interest rate shocks on liquidity operates at different speeds. Margin calls on interest rate derivatives occur almost immediately with interest rate changes, whereas policyholder surrenders tend to take time to materialise (See Box D). If these shocks were to occur in close succession or simultaneously, the liquidity risks for life insurance companies would increase materially.

Box D

# The impact of interest rate normalisation on life insurers in Europe

## Margin calls and surrenders as key transmission channels

*Alessandro Fontana (European Insurance and Occupational Pension Authority), Fabian Garavito* ①

While rising interest rates generally improve solvency of life insurers by reducing the present value of liabilities, they can also trigger significant liquidity stresses. This box reviews two primary channels through which liquidity stresses emerged in Europe in 2021–23: variation margin calls on derivatives, and policy surrenders.

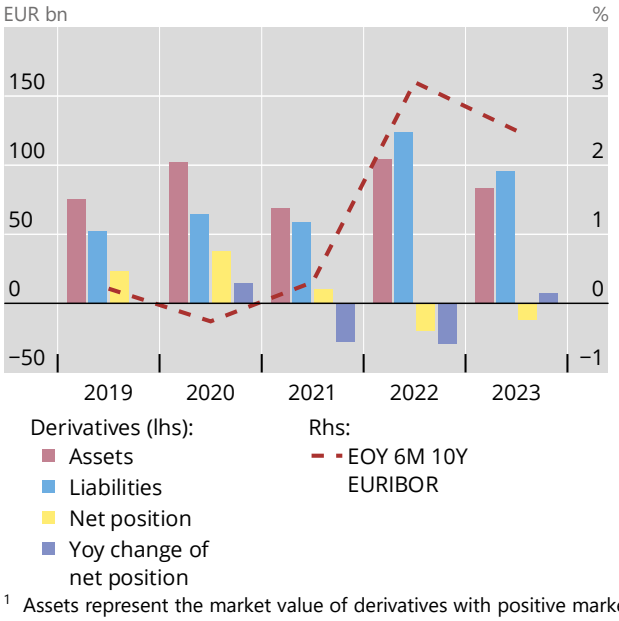
Interest rate increases can create liquidity strain for life insurers due to the mechanics of their hedging strategies. European life insurers hedge against falling interest rates using derivatives such as interest rate swaps, typically receiving the fixed leg and paying the floating one. These contracts rise in value when interest rates fall, offsetting liability increases and stabilising solvency positions. However, when rates rise, the derivatives lose value, generating variation margin calls and increasing liquidity needs.

This dynamic was evident as euro swap rates began to rise in 2021, well before the ECB's policy rate hikes in mid-2022. Inflation pressures, early tightening in the United States and United Kingdom, and forward guidance all contributed to the upward pressure on euro interest rates. By early 2022, 10-year euro swap rates had climbed substantially (Graph D1.A)., triggering widespread unrealised losses on receive-fixed swap positions. This impact was particularly pronounced due to the convexity of interest rate hedges – at lower rate levels, the sensitivity of derivative valuations to changes in rates is amplified.

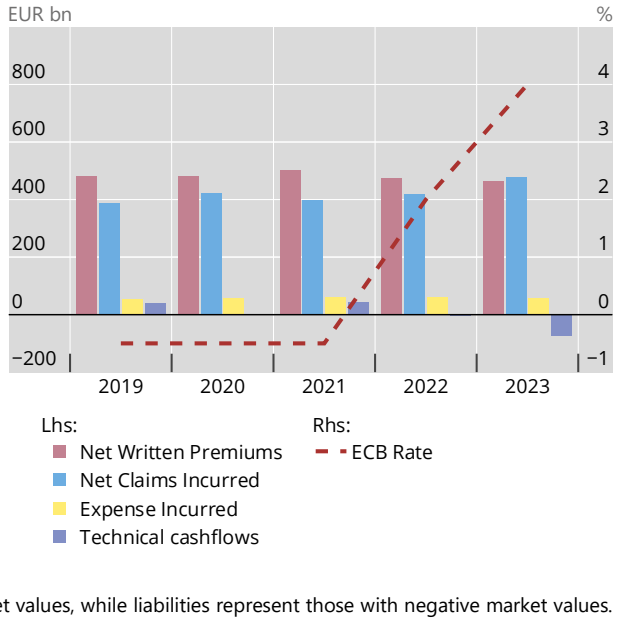
The year-over-year changes in the net value of the derivative positions of European insurers demonstrate the result (Graph D1.A). Reflecting the mark-to-market pressures that typically drive margin calls, the change in net positions moved inversely with 10-year swap rates – as would be expected from a predominance of receive-fixed swap positions. The aggregate year-over-year change in the derivatives book② turns negative in 2021 and troughs in 2022.

### Value of derivative positions and technical cash flows of European insurers — Graph D1

A. Value of derivative positions and the 10-year swap rate[1]




B. Technical cash flows and the ECB rate[2]




[1] Assets represent the market value of derivatives with positive market values, while liabilities represent those with negative market values. The difference (yellow bars) is the net position (assets minus liabilities), and the year-on-year change (purple bars) reflects the annual variation in this net position (proxy for margin calls). [2] Technical cash flows are defined as the difference between inflows from net written premiums and outflows from net claims (including surrenders) and expenses.

Sources: ECB; LSEG Workspace; S&P Global Marketplace, S&P Global Market Intelligence, Solvency and Financial Conditions Reports (SFCR).

Over half of the insurers in the sample saw negative changes in both years, and aggregate losses were €27 billion and €30 billion in the two years, respectively. For firms with negative net value changes in their derivatives book, these

aggregate figures were €27 billion and €37 billion in 2021 and 2022. The convexity effect is evident in the similar aggregate magnitude of losses in 2021 and 2022, despite the steeper rate rises in 2022.

Rising interest rates also increase surrender risk for products. By 2022 and 2023, many retail products offered more attractive yields than legacy insurance contracts. In some cases, common distribution channels (eg banks selling both savings products and insurance) may have encouraged policyholders to surrender their policies and switch to other investment products with higher rates. Surrenders heighten liquidity needs, as assets may have to be liquidated to meet redemptions, while simultaneously reducing liquidity sources due to declining premium income.

The surrender-driven liquidity impact can be gauged by the level of technical cash flows, or the difference between inflows from net written premiums and outflows from net claims (including surrenders) and expenses (Graph D1.B). Aggregate technical cash flows turned negative in 2022 and reached –€73 billion in 2023. Just focusing on firms with negative technical cash flows, this figure reaches –€121 billion in 2023. These results are consistent with increased lapse behaviour observed when rates have risen in Germany (Grochola et al (2023)) and elevated surrenders confirmed by EIOPA (2025) and IVASS (2024) in Italy, France and Germany.

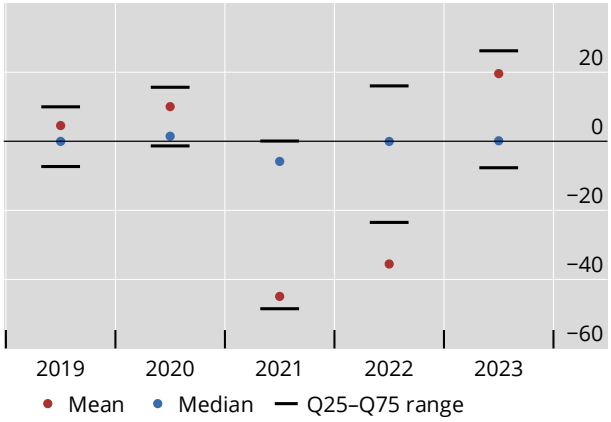
The impact of changes in the value of net derivative positions at the firm level can be gauged by scaling them against cash balances at the start of each year (Graph D2.A) The median ratio was negative in both 2021 (–5.8%) and 2022 (-0.1%), while the average was significantly negative in the same years (–44.9% and –35.5%), with the distribution displaying a pronounced negative skew. Although firms may access short-term liquidity through, for example, repurchase agreements, such large shocks could test the resilience of their liquidity management frameworks.

Technical cash flows can also be divided by cash balances at the start of the year (Graph D2.B) to look at the firm distribution. Both the mean and median ratios are positive from 2019 to 2022. However, in 2023, both turn negative (mean = –119%, median = –11%), with the distribution exhibiting a negative skew. This aligns with the earlier findings on net technical cash flows turning negative in 2023, coinciding with the ECB's rate hikes.

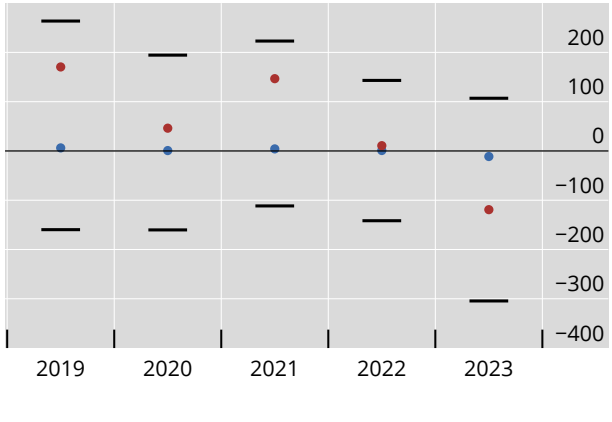
## Value of derivative positions and technical cash flows (at the firm level)

In per cent — Graph D2

A. Value change in derivative positions / cash




B. Technical cash flows / cash




Mean · Median — Q25–Q75 range

Sources: S&P Global Marketplace, Solvency and Financial Conditions Reports (SFCR).

The normalisation of interest rates has restored monetary policy space but has also exposed vulnerabilities, particularly new sources of liquidity risk for EU life insurers. The two liquidity shocks in question – margin calls (2021–22) and surrender spikes (2023) – were manageable in isolation. It is important to note that the transmission of interest rate shocks on liquidity operates at different speeds: margin calls demand an immediate response, whereas surrenders occur with some delay. If these shocks were to occur simultaneously, however, they could lead to a contemporaneous liquidity shock, posing significant challenges. Supervisors should integrate liquidity monitoring alongside solvency assessments and ensure firms are prepared to address both anticipated and unexpected outflows.

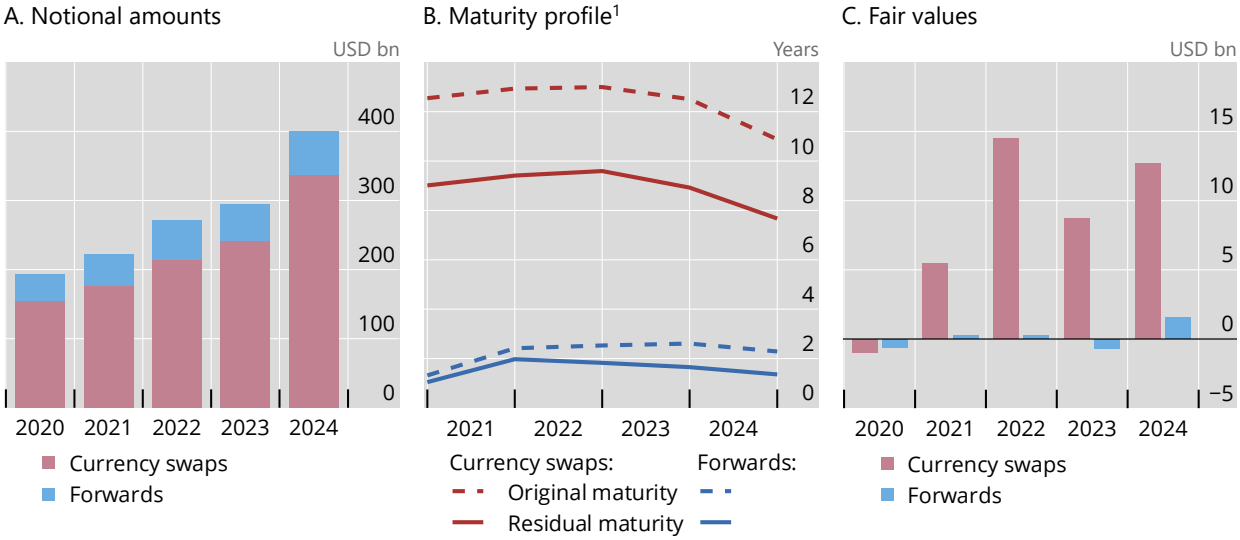
① Fabian Garavito was working for the Bank for International Settlements at the time of writing this box. ② The sample consists of solo life insurance companies in the EEA, with data extracted from Solvency and Financial Conditions Reports (SFCR) via S&P Capital IQ, covering the period from 2019 to 2023.

## 6.6 FX derivatives in the US life insurance sector

The notional amounts of FX derivatives on the books of US life insurers have more than doubled over the past several years, rising to $400 billion by end-2024. Currency swaps dominate and have grown more rapidly, while outright forward positions now account for about one sixth of the outstanding notional amounts (Graph 6.4.A). Similar to interest rate swaps, the maturities of currency swaps have contracted with rising interest rates (Graph 6.4.B).

US life insurers' FX derivatives exposures

Notional amounts, maturity profile and fair values — Graph 6.4




[1] Averages weighted by outstanding positions.

Sources: S&P Global Marketplace, National Association of Insurance Commissioners (NAIC); authors' calculations.

Over recent years, as the US dollar appreciated, US life insurers were on the receiving side of margin and collateral calls on their currency swap positions in aggregate, thus benefiting in terms of dollar liquidity. The fair value of the US life insurance sector's currency swap positions has ranged from about $5 billion to $15 billion since 2021 (Graph 6.4.C).

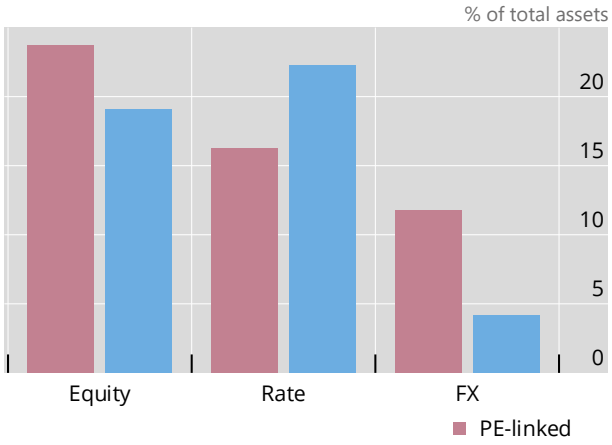
The composition of different types of FX derivatives on insurance companies' books generally reflects their hedging purposes. According to their financial reporting, US life insurers mainly use currency swaps to fund the purchases of foreign bonds, ie to hedge the foreign bond principal. They use outright forwards mostly to hedge coupons (interest) on foreign bonds or structured products. According to the financial reporting, the latter are predominantly investments in collateralised loan obligations (CLOs). CLOs are structured financial instruments that pool loans (typically corporate loans, such as leveraged loans) and issue securities backed by these loans.

Among US life insurance companies, PE-linked insurers use FX derivatives much more intensively compared to non-PE-linked insurers. The ratio of notional amounts of FX derivatives to total assets of major PE-linked life insurers examined earlier was 12% in 2024, compared to 4% for non-PE-linked ones (Graph 6.5.A). The difference reflects in large part PE-linked insurers' greater exposure to structured securities (see Section 5). CLOs comprise roughly 15–20% of the underlying exposures hedged with

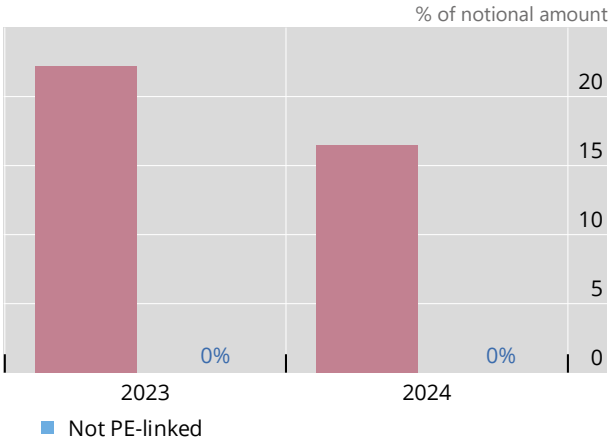
FX forwards on PE-linked insurers' books, whereas CLOs are not found among the underlying for FX hedging by non-PE-linked firms (Graph 6.5.B).

Derivatives use by PE-linked compared to non-PE linked life insurers — Graph 6.5

A. Ratio to total assets by derivative type




B. Fraction of foreign currency CLOs in the underlying exposures being hedged with outright forwards[1]




PE = private equity.

[1] Based on the classification of PE ownership among 100 top US life insurers by assets.

Sources: S&P Global Marketplace, National Association of Insurance Commissioners (NAIC); authors' calculations.

The usage of FX derivatives can also be driven by market features in a given currency or jurisdiction. US insurers' reliance on currency swaps rather than FX swaps (which are effectively a combination of a spot and a forward transaction) can be partly explained by the availability of a deep and liquid currency swap market, particularly in the EUR/USD pair. Major US corporates run big funding programmes in foreign currencies, especially in the euro, in which they issue co-called reverse Yankee bonds exploiting cheaper euro funding, which they then swap into dollars. Thus, US corporates issuing euro-denominated bonds represent a natural counterparty to US insurers seeking to swap into euros to hedge their foreign securities portfolio.

## 6.7 FX derivatives in the Japanese life insurance sector

Japan has the third largest insurance sector in the world, which plays a major role in the country's large net international investment position, with more than $2.6 trillion in assets under management. At end-2024, Japan's life insurance companies' foreign securities holdings accounted for 25% of their total securities portfolios, with close to 60% of these being US dollar-denominated. Among the different types of foreign securities, bonds account for the vast majority. At end-2024, Japanese life insurers' investments in foreign currency bonds amounted to $530 billion.[28]

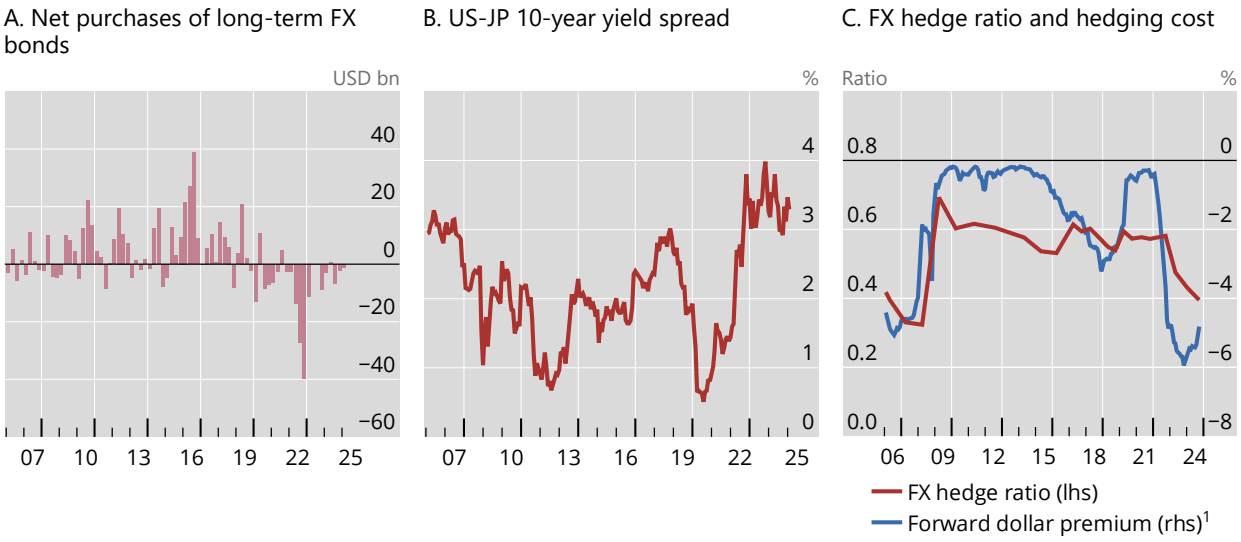
Japanese life insurance companies manage their allocation of foreign bonds taking into account both the prevailing foreign asset returns and currency hedging costs. At first it might seem puzzling that Japanese insurers divested from foreign currency, mainly US, bonds in 2022 and early 2023 when the 10-year US Treasury yield spread over 10-year Japanese government bonds (JGBs) was nearing its peak (Graph

[28] See Life Insurance Association of Japan (2024).

6.6.A and 6.6.B). But this can be explained by rising hedging costs based on short rate differentials as the Federal Reserve was rapidly raising short rates at the time. In fact, the hedged yield on US Treasuries turned negative during this period for yen-based investors, disincentivising investment on a hedged basis. As the US yield curve steepened in the second quarter of 2025, Japanese life insurers' net purchases of foreign currency bonds began to recover.[29]

## Japanese life insurers' foreign bond investment and FX hedging

Graph 6.6




[1] Hedging cost for a dollar borrower in a three-month USDJPY FX swap: the percentage dollar premium/discount in the forward relative to the spot exchange rate, annualized.

Source: Japan Ministry of Finance; Barclays; Bloomberg; authors' calculations.

Japanese life insurers also actively manage their FX hedge ratios in response to changes in interest rates and hedging costs. During the period of the most recent US monetary policy tightening, as hedging costs of US dollar securities holdings reached 6% per annum at their peak, Japanese life insurers dropped their hedge ratios from almost 60% to about 40% (Kadota et al (2025)), consistent with the tendency of the industry-wide average hedge ratio to track with a lag the fluctuations in hedging costs (Graph 6.6.C).

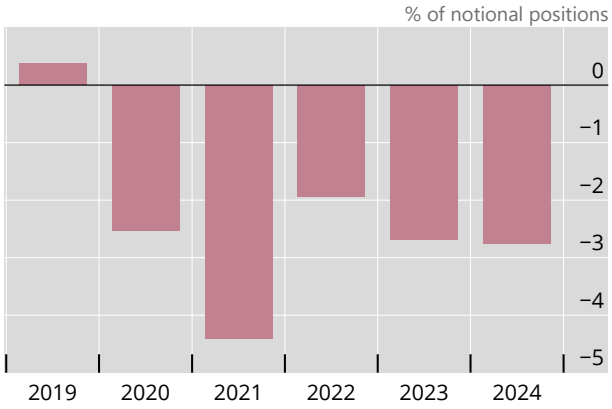
Finally, on top of the high (ex ante) hedging costs, the dollar strength of the past years has resulted in (ex post) losses on market values of currency derivatives of Japanese insurers, which has necessitated posting foreign currency collateral or more foreign currency funding to maintain the same hedge ratio. Over each of the past five years, Japanese life insurers have recorded net losses on the market values of their currency derivatives. Based on major insurers' financial reports, from 2020 to 2024, these losses ranged from approximately 2% to over 4% of their notional positions (Graph 6.7.A). Relative to their foreign securities holdings, the losses and thus the associated foreign currency cash needs to fund margin calls ranged each year

[29] See also Kadota and Ehara (2025). Additionally, by the first quarter of 2025, the Japanese life insurance sector had largely completed the purchases of ultra-long JGBs to meet duration targets under the new Economic Value-Based Solvency Framework (EVBSF), consistent with international capital standards, which went into effect in 2025. This freed up balance sheet space for foreign bond purchases.

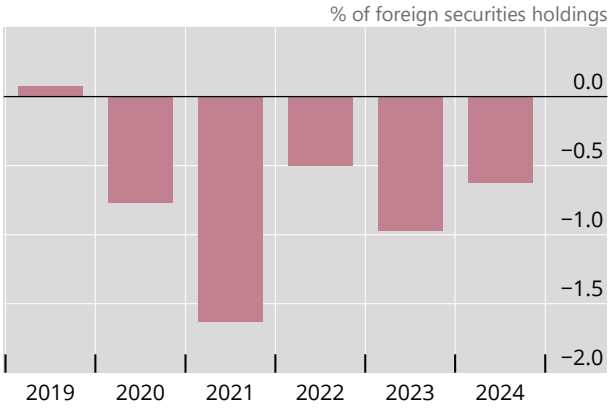
between 0.5% and 1.5%, (Graph 6.7.B), summing to 4% of foreign securities holdings over the period.

Japanese life insurers gains/losses on FX derivatives positions — Graph 6.7

A. Net gains/losses on FX derivatives relative to total notional




B. Net gains/losses on FX derivatives relative to foreign securities holdings




Sources: Financial statements of major life insurers; authors' calculations.

## 6.8 FX derivatives and the life insurance sector of Chinese Taipei

The insurance sector of Chinese Taipei is quite large, with assets under management of the Taipei life insurance sector having doubled over the past decade to over $1 trillion, or over 100% of GDP. Life insurers in Chinese Taipei have the highest share of portfolio allocation to foreign securities among major jurisdictions. Due to the insufficient depth of local securities markets, as well as relatively low local yields, the life insurers' overseas allocation has risen to as high as 70%. In 2024, overseas investment assets of the life insurance sector amounted to $700 billion, surpassing that of Japan's life insurers' overseas investments (estimated at about $650 billion).

With FX allocations at regulatory limits, Chinese Taipei's life insurers have been growing their allocations to international credit through bond ETFs (exchange-traded funds) denominated in New Taiwan dollars (TWD). Since ETF shares are denominated in local currency, they do not count towards the FX exposure limits while offering a relatively attractive yield. These ETFs mostly invest in long-term US Treasury securities, investment grade US corporate bonds and US dollar-denominated EME sovereign bonds. Though not adding to on-balance sheet currency mismatches, the returns on these ETF holdings embed a currency risk component.

During the 2022–24 period of US monetary policy tightening, life insurance companies in Chinese Taipei faced headwinds to their currency risk management similar to those of their Japanese counterparts. First, the cost of hedging in the currency forward market increased rapidly; second, the strengthening dollar translated into market losses on their FX derivatives books and a drain on FX liquidity to meet collateral and margin calls (see Box E). Hence, analogous to Japan's life insurance sector, both the rising hedging costs and the drain of FX liquidity related to margin calls from 2022 were factors that probably drove the FX hedging ratios of Chinese Taipei insurers lower.

The FX derivatives market in TWD is not very liquid. The life insurers partially overcome this by entering into dollar swaps with the central bank,[30] and partly by hedging using non-deliverable forwards (NDFs). That said, NDF supply can be quite volatile as it depends on the risk appetite of currency speculators, hence the hedging costs with NDFs can also fluctuate widely, which is another source of operational risk to life insurance companies when hit by a currency shock.

Box E

## FX hedging by Chinese Taipei insurers and the sharp TWD appreciation in May 2025

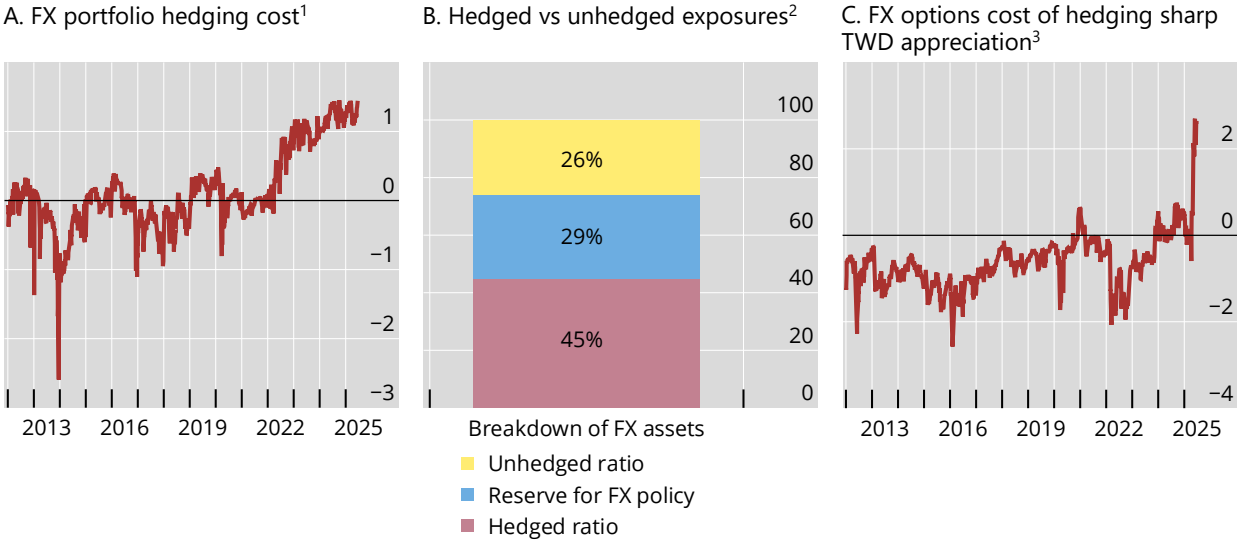
Currency risk management of Chinese Taipei life insurers became a front-page matter in the financial press the first week of May 2025, when the New Taiwan dollar appreciated 8% versus the US dollar. The industry in aggregate had not hedged sufficiently for such a sharp US dollar depreciation against its home currency.

Earlier, similar to their Japanese counterparts, Chinese Taipei life insurers had been facing increasing costs of hedging as the United States began monetary policy tightening in 2022. Three-month NDF-implied hedging costs rose from near zero in early 2022 to close to 1.5% per annum in 2024 (Graph E1.A). The strengthening dollar had also been translating into market losses on their existing hedges and a drain on FX liquidity to meet collateral and margin calls. It is possible that these factors diminished incentives to hedge their exposures.

As of the quarter ending March 2025, the aggregate FX derivatives hedge ratio of the largest life insurers in Chinese Taipei was 45% (Graph E1.B). Another 29% was backed by a natural hedge in the form of reserves from policies issued in foreign currencies. Thus, their overall effective hedge ratio ahead of the tariff announcements in April was 74%. However, it still proved insufficient given the size of the shock.

### Chinese Taipei life insurers' FX hedging practices and hedging costs

In per cent — Graph E1




[1] Three-month USDTWD forward premium, annualised. [2] Based on total FX assets of top 5 Chinese Taipei life insurers, as of March 2025. [3] Three-month 25-delta USDTWD risk-reversal.

Sources: Quarterly financial filling of TW life insurers; Bloomberg; authors' calculations.

[30] See Setser (2019).

As the industry in aggregate was positioning for TWD weakness at that time, in line with FX option pricing (see Graph E1.C), the sudden, large TWD appreciation shock in early May wiped out the FX reserves of major insurers, putting them in the position where any further losses would impact their net income and hence capital position.① In the end, the sector as a whole remained solvent, although at least one company appears to have probably breached the minimum capital requirement.②

While the initial trigger of the New Taiwan dollar appreciation against the US dollar was attributed to hedging by Chinese Taipei exporters against the background of US tariff announcements, the dynamic hedging of balance sheet currency mismatches by life insurance companies is likely to have amplified TWD strength.③ Specifically, as the TWD appreciated sharply, to minimise further market losses in local currency terms on the unhedged portion of the USD bond holdings, many life insurance companies would have had to sell more US dollars forward in FX derivatives markets.

The continued strength of the New Taiwan dollar against the US dollar and higher FX volatility posed a major challenge to Chinese Taipei life insurers, which have no alternative to overseas investment. They have probably had to raise their hedge ratios, which, given elevated costs of hedging, could put downward pressure on profitability.

The supervisory response to the May market turmoil has since provided some relief. First, the authorities allowed insurance companies to use backward-looking average exchange rates for the purposes of calculating capital adequacy ratios. Second, they raised the discounted rate for calculating liability reserves by 10 bp, thereby reducing the present discount value of the liabilities. In return, life insurers have been mandated to increase their FX volatility reserves and to submit financial resilience enhancement plans.④

① See Chinese Taipei Insurance Bureau (2024). ② See, eg, Goldman Sachs (2025). ③ See Shin et al (2025). In addition, exporters' repatriation of US dollars and an unwinding of carry trades in regional currencies with short leg in TWD also likely amplified the move. ④ Financial Supervisory Commission (2025).

# 7. Conclusions and policy implications

The transformation of the life insurance industry has led to a range of potential financial stability issues, reflecting the sector's evolving risk profile and its growing interconnectedness with the broader financial system. Changes that have supported growth and alleviated capital pressures have also increased exposure to riskier, less liquid assets, introduced complexities through AIR agreements, and concentrated risks in specific jurisdictions and entities. These developments call for a measured and proactive policy response to mitigate potential vulnerabilities while preserving the sector's critical role in the financial system.

The evolving structure of the sector has introduced significant challenges for regulators and supervisors in monitoring and managing risks effectively. The greater reliance on private markets, where valuations are often opaque, and the use of proprietary valuation models for illiquid assets have obscured risk profiles and hindered transparency. The rise of offshore reinsurance arrangements further complicates risk management and solvency assessments, since they obscure the full risk picture and create jurisdictional mismatches. The 2024 failure of 777 Re, a Bermudian PE-linked reinsurer, highlights these vulnerabilities: large affiliate investments in opaque assets, offshore reinsurance failures, and the subsequent recapture of liabilities to cedants, which can trigger liquidity pressures and forced asset disposals. Furthermore, limited data availability constrains the ability of supervisors and stakeholders to identify the build-up of risks.

Structural changes on the asset side can also heighten risks associated with synthetic leverage through derivatives. For example, increased exposure to non-US dollar-denominated assets by PE-linked insurers is reflected in higher synthetic

leverage through FX derivatives. At the same time, insurers exhibit a clear tilt away from CCPs and towards clearing their derivatives positions bilaterally, presumably to economise on collateral requirements. Hence, risks associated with bilateral clearing of OTC derivatives are particularly relevant for insurers.

To address these challenges, several policy measures could be considered to strengthen the sector's resilience and reduce systemic risks:

- **Mitigating concentration risks**: Direct tools may be needed to address the geographic and operational concentration of reinsurance activity identified above. Capital charges that scale with measures of counterparty concentration could incentivise firms to internalise the externalities of correlated exposures and encourage diversification. Where concentration cannot be reliably estimated, supplementary limits may be necessary as a backstop. Measures such as capital buffers for concentrated counterparty exposures or capping reliance on correlated assets, such as CLOs or infrastructure debt, could enhance the sector's ability to withstand shocks.
- **Hardwiring liquidity risks into regulatory frameworks**: Unlike solvency risk, liquidity risk is considered an ancillary risk (IAIS (2022)). Yet, the exposure to liquidity risk appears to have increased. First, the aforementioned concentration risks and greater use of opaque and illiquid assets may call for a more proactive approach to liquidity stress tests. Second, exposures to liquidity risks due to margin calls on off-balance sheet derivatives have risen, adding to long-standing balance sheet liquidity risks from policy surrenders. National authorities differ in their approaches to liquidity regulation for insurance companies, with many limiting them to regulatory guidance (FSB (2024b)). That said, there is a general trend towards the more prominent role of liquidity in insurance supervision (see FSB (2022)).[31]
- **Enhancing transparency and disclosure**: Transparency is foundational to market discipline and systemic oversight. Consistent disclosure on alternative asset holdings, valuation practices, liquidity profiles and the terms and flows of cross-border reinsurance is necessary for external stakeholders to assess risk. Improved disclosure would narrow the room for ratings optimisation in bespoke or structured deals and support effective supervision.
- **Aligning international regulatory frameworks**: Greater alignment of international standards would reduce incentives for regulatory arbitrage and promote consistent outcomes across jurisdictions. A key area of focus is capital standards, where differences in adoption or implementation across jurisdictions can create inconsistencies. Assessing the implementation of these standards is a crucial step towards ensuring a level playing field. Such

[31] While, for example, Solvency II in the European Union and United Kingdom has general requirements on insurance firms to assess and manage liquidity risk as part of their overall risk management framework, there are no specific rules related to liquidity risks stemming from their derivatives positions. In the United Kingdom, insurance firms are expected to maintain sufficient liquidity to meet obligations, including potential margin and collateral calls, consistent with the holistic liquidity risk management framework (IAIS (2022)). In Canada, life insurers often use an LCR as part of their internal risk management. However, since it is not part of a standardised regulatory framework, specifications of LCR, such as the stress horizon or the definition of high-quality liquid assets, differ across companies (Aldridge et al (2024)). In Switzerland, the role of liquidity in insurance supervision became more prominent when FINMA Circular 2025/3 "Liquidity - Insurers" came into force on 1 January 2025, as it includes a number of new provisions aimed at enhancing liquidity risk management, liquidity requirements and related reporting by insurers.

assessments should be conducted independently and at arm's length, with an emphasis on ensuring comparability of outcomes.

- **Addressing governance challenges and conflicts of interest**: Strengthening governance frameworks is essential to mitigate conflicts of interest across the full investment chain, including origination. Measures such as mandating independent oversight of affiliated transactions, enforcing transparency in investment decisions and aligning compensation for origination with long-term performance could reduce conflicts of interest and ensure that policyholder interests are prioritised.
- **Adopting a macroprudential perspective**: The types of risks discussed in this paper highlight the need for a macroprudential approach in the monitoring of activities of the life insurance sector; namely, by tracking common exposures and funding risks, as well as the interlinkages within both the insurance sector and across the financial system as a whole, authorities can complement the prudential supervision of individual entities with an awareness of how problems of individual insurers can transform into system-wide stress. Internationally, the IAIS applies the so-called holistic framework, an approach to assessing and mitigating systemic risk in the insurance sector that incorporates many of these considerations.

While the life insurance sector has demonstrated adaptability in navigating a changing environment, its growing complexity and interconnectedness underscore the importance of continued vigilance. Policymakers and regulators need to strike a careful balance between fostering innovation and ensuring stability, with targeted measures to address emerging vulnerabilities. By doing so, they can support the sector's resilience and safeguard its critical role in the financial system.

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# Glossary

## A

**Affiliated investments –** Investments made by an insurer in entities that are part of the same corporate group or with which they have a close business relationship. In the insurance industry, these can take the form of insurance and investment subsidiaries that are subject to a look-through risk-based capital calculation; and subsidiaries that are not subject to risk-based capital.

**Annuities –** Insurance contracts that provide policyholders with a steady income stream, typically during retirement. Annuities transfer longevity risk from individuals to insurers.

**Asset-intensive reinsurance (AIR) –** Also referred to as "funded reinsurance", is a strategy used by life insurers to optimise capital by transferring the risks associated with capital-intensive policies to reinsurers. The reinsurer assumes all risks from the cedant, including those tied to issued policies (eg mortality, longevity) and the assets backing these policies (eg credit risk, market risk).

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## B

**Bilateral clearing –** In the context of over-the-counter (OTC) derivatives, bilateral clearing refers to the process where two counterparties to a derivative transaction directly manage the settlement and risk management of the trade between themselves, without the involvement of a central counterparty (CCP). This approach exposes each party to the counterparty risk of the other.

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## C

**Central counterparties (CCPs) –** Financial institutions that act as intermediaries between counterparties in derivatives and securities transactions, reducing counterparty risk by guaranteeing the performance of both parties in the contract.

**Collateralised debt obligations (CDOs) –** Structured financial products backed by a pool of debt instruments. Insurers may invest in CDOs for yield enhancement but face risks from their complexity and sensitivity to market conditions.

**Collateralised loan obligations (CLOs) –** Structured financial securities backed by a pool of loans, typically corporate loans. Insurers invest in CLOs to achieve higher returns, but these instruments carry risks due to their complexity and sensitivity to market fluctuations.

**Contingent liquidity facilities –** Prearranged agreements that provide insurers with access to liquidity during times of stress, helping them meet unexpected cash flow needs.

**Cross-currency swap** – an agreement for two reciprocal transfers of funds in two different currencies at initiation and maturity of the contract, along with the recurring exchanges of floating rates during the life of the contract. The notional amounts in each currency are usually exchanged at the beginning and end of the life of the swap. The repayment obligations of both parties and margins act as collateral. The rate of exchange of the floating payments during the contract term is specified when writing the contract, typically using reference money market rates in the two currencies.

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**D**

**Direct lending –** Loans provided directly by insurers to borrowers, bypassing traditional banks. This allows insurers to achieve higher returns but introduces credit and liquidity risks.

**Duration gap –** Refers to the mismatch between the duration of an insurer's liabilities and its assets. A wide duration gap can expose insurers to interest rate risk. When the duration of liabilities is greater than the assets, as is usually the case in the life insurance sector, sometimes referred to as a negative duration gap.

**Dynamic hedging –** A risk management strategy where insurers continuously adjust their hedge positions in response to changes in market conditions to protect against adverse movements.

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**F**

**Funding agreement-backed securities (FABS) –** Financial instruments issued by life insurance companies that are backed by funding agreements. These agreements provide predictable cash flows but can introduce rollover and liquidity risks.

**FX swap** – an agreement for two reciprocal transfers of funds in two different currencies such that the transfer at maturity cancels out. The initial exchange is usually conducted at the spot exchange rate and the exchange at maturity at the forward exchange rate.

**FX swap basis (or cross-currency basis) –** The difference between the interest rates implied by the FX swap (or a cross-currency swap) and the reference interest rates in the respective money markets; the basis often reflects funding imbalances or market frictions between two currencies.

**FX volatility reserves –** Foreign currency reserves held by insurers in some jurisdictions to absorb potential losses from fluctuations in foreign exchange rates.

**G**

**General account –** The general account is the central pool of assets managed by an insurance company to support its traditional insurance products and contractual obligations. To be distinguished from separate account.

**I**

**Interest rate swap –** An interest rate derivative in which one party pays an interest rate that is fixed at the inception of the contract, while the other party pays a floating interest rate benchmarked to a refence money market rate. These payments are exchanged periodically in reference to the notional amount of the swap. However, unlike a cross-currency swap, the notional amount in an interest rate swap is never exchanged.

**L**

**Level 3 assets –** Illiquid or complex assets whose valuation relies on internal models rather than market prices, posing challenges for insurers in times of stress.

**M**

**(Variation) Margin/collateral calls –** Requests for additional funds or assets to be posted as collateral in response to changes in the market value of a derivative or other financial contract. These calls can create liquidity pressures, especially during periods of market volatility.

**N**

**Non-deliverable forward (NDF) –** A forward contract settled in cash based on the difference between the agreed forward exchange rate and the prevailing spot exchange rate at maturity.

## O

**Offshore reinsurance –** Reinsurance services offered in offshore financial centres. While this type of reinsurance can reduce capital requirements, it may also introduce the possibility of regulatory arbitrage and opacity in risk management.

## P

**Private equity (PE)-linked life insurer –** A life insurance company is classified as PE-linked if a PE firm has a controlling equity stake in the company, if it has a controlling equity stake in the reinsurance company to which the operating company has ceded part of its balance sheet, or if a PE firm holds a minority equity share in the company but manages its assets.

**Private ratings –** Credit ratings assigned to financial instruments or securities that are not publicly disclosed. These ratings are often used for bespoke or structured products and are typically issued by smaller rating agencies.

## R

**Recapture rights –** Provisions allowing insurers to regain risks transferred to reinsurers under certain conditions, often used to retain profitable business.

**Reinsurance –** The transfer of insurance risk from one insurer (the ceding company) to another (the reinsurer). Reinsurance helps insurers manage risk, free up capital and protect against losses.

**Risk reversal** – The difference in implied volatility between out-of-the-money (OTM) put and call options, typically with the same expiration date and moneyness. This asymmetric is often used to gauge the extra cost investors are willing to pay for protections against a large price movement in a particular direction.

## S

**Separate account –** A segregated pool of assets maintained by the insurer, primarily for investment-linked products where policyholders bear the investment risk.

**Sidecars –** Special purpose vehicles used by insurers to share risks with investors, particularly in catastrophe or reinsurance markets.

**Surrender –** The option embedded in life insurance policies that allows policyholders to terminate their contracts and withdraw the accumulated value under certain conditions.

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**T**

**Technical cash flows –** Cash flows arising from insurance liabilities, including premiums, claims, benefits and expenses. These cash flows are essential for valuing insurance obligations and managing liquidity and solvency within the insurance sector.

**Technical provisions –** Reserves that insurers are required to hold to meet their future policyholder obligations. These are calculated using actuarial methods and account for expected claims and expenses.

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**U**

**Unit-linked products –** Life insurance products that combine insurance coverage with an investment component. Policyholders bear the investment risk as the value of the investment fluctuates with market performance.

**Universal life policies –** Flexible life insurance products combining insurance coverage with an investment component, allowing policyholders to adjust premiums and benefits.

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**W**

**Whole life policies –** Life insurance products providing coverage for the entire life of the insured, with a savings component that accumulates over time.