

FINANCIAL STABILITY REPORT

June 2023

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FOREWORD BY THE CHAIRPERSON



Over the last years, the financial sector and the economy have faced several exogenous economic shocks such as the Covid pandemic, supply chain disruptions, war of aggression in Ukraine and the energy crisis. European insurers and pension funds have weathered these challenges notably well. Nonetheless, the European economy is currently experiencing a new period of heightened uncertainty and elevated financial stability risks. Insurers and pension funds remain well capitalised on aggregate, but monitoring developments is needed. Recent events and concerns with respect to financial stability allow us to distil some key lessons for further improving the sectors' resilience.

The decade long trend of low interest rates seems to have ended. Several EEA countries experienced double digit inflation rates for the first time in many years. The switch from the low yield environment with moderate inflation rates to a new regime with higher inflation and interest rates creates new risks but also offers opportunities for the business prospects of European insurers going forward. While the short-term impact of higher interest rates on profitability is mainly negative due to lower values of interest rate sensitive investments, this might reverse over the longer term thanks to higher returns on new investments. Protracted inflation would increase the future costs of claims for non-life business and might reduce the ability of households and companies to buy insurance products. Second round effects could be lower growth as well as losses on investments.

The effect of inflation on policyholders and pension funds beneficiaries is also significant. Lower real incomes might potentially trigger lapses as policyholders might need the funds to cover their cost of living. The risk of surrenders in each Member State depends among other factors on the penalties that need to be paid and the loss of tax benefits. People with a voluntary pension might reduce their contributions or even access their pension pots to navigate through the cost-of-living-crisis. At the same time, market-based products such as unit-linked policies and defined contribution pension schemes which have grown in importance during the period of low interest rates have shifted risks to consumers. If inflation couples with low growth and poor performance of financial

investments, the low real returns will translate into reduced future purchasing power.

Interconnectedness across sectors is extremely relevant, particularly in times of financial crisis. The recent turmoil in relation to US banks underscored the risk of sudden loss of confidence and rapid contagion in the banking sector. In the recent case, the aggregate exposures were very limited, though both, the EU insurance and pension fund sector have significant investments in EU banks. Moreover, the events around the US banks put a spotlight on the increasing role of social media in spreading a crisis (or even creating it). Supervisors will think about the resulting risks and potential measures.

The breath-taking speed of progress in artificial intelligence promises many new useful applications but may also create new risks. Due to the geopolitical tensions cyber risks remain a source of concern. EIOPA puts considerable effort (also in cooperation with the other ESAs) into tools for improving the quantification and management of cyber risks. Also, insurers are in the business of managing risks. They may therefore play an important role in helping other sectors to cope with the new risks by providing cyber underwriting policies.

Insurers are in a unique situation with respect to climate change. Its consequences affect both their assets and liabilities. More frequent, severe and unpredictable natural catastrophes pose risks for their solvency. At the same time, their role is crucial for helping consumers and companies to mitigate the new risks. In addition to the personal hardship, a widening protection gap could also have negative effects on economic growth with economic activity being distorted due to uninsured catastrophes. A recent initiative of EIOPA together with ECB was the publication of a joint discussion paper with possible actions including public-private partnerships to increase the uptake and efficiency of catastrophe insurance while creating incentives to adapt to and reduce climate risks.

Several key lessons can be drawn from the recent events. First, there are “slow burning” risks as well as risks that suddenly materialise. The recent events around US regional banks and the LDI funds are examples for the latter. This makes it essential that insurance and pension funds have buffers and supervisors have the necessary data available. As we do not know which risks will actually materialize, a robust supervisory framework is essential as are appropriate capital requirements. There should be no regulatory “gaps” Moreover, data is needed: Liquidity risk

monitoring as well as continuous assessment of risks arising from interconnectedness in financial markets are key to contain the impact of adverse economic and market developments. Finally, pensions are an important part of financial stability and consumer trust. Maintaining stability in the financial system is key to meet the fundamental objectives of pension funds and the pension system as a whole. This also leads me to stress the importance of having the three-pillar structure in place for saving for retirement. The pensions landscape in Europe is quite diverse, and although the use of all three pillars differs per country, such three-pillar system is key to ensure an adequate retirement income to all EU citizens. This is a discussion which is even more important today, where we see the pension gap growing. We see across the EU discussions about sustainability of pensions (pension reforms at national level) as well as a move from defined benefit to defined contribution schemes. In order to further enhance these discussions we need a better understanding of the pension gap at individual, national and European level. As such the implementation of pension dashboards and Personal Tracking Systems will be essential as the current lack of overview over the Pillars I to III is concerning.

All the above-mentioned topics are very high on EIOPA agenda, and we will continue our mission to preserve a robust insurance and pension industry to the benefit of all European citizens.

Petra Hielkema

EXECUTIVE SUMMARY

The European economy is currently experiencing a period of heightened uncertainty and elevated financial stability risks. After a prolonged period of low interest rates, yields have significantly increased in response to persistently high and sticky inflation. This, coupled with ongoing geopolitical tensions presents significant challenges for the growth prospects in Europe and the business conditions of financial institutions.¹ The recent turmoil in the banking sector underscores the risk of sudden loss of confidence and rapid contagion. On the positive side, GDP forecasts and business sentiment have improved, and it is likely that the European Union will avoid a recession. Headline inflation rates have recently declined, largely due to lower energy and commodity prices, while labour markets continue to develop positively.

In the financial markets, the sudden and sizable rise in yields presents challenges for financial institutions. The central banks of the United States and the United Kingdom intervened to prevent contagion from market turmoil triggered by rising yields. Corporate vulnerabilities are a cause for concern, though credit spreads and defaults remain low. Equity markets remain strong despite higher yields. Negative developments and high uncertainty have led to increased volatility across financial markets. The March 2023 financial turmoil affected primarily the financial sector with higher spreads for financial bonds. The macro and market environment remains challenging for insurers. Their equity prices reversed their previous gains during the recent turmoil, and the risk of an abrupt correction remains material.

The trend of high natural disaster losses continued in 2022. After the record summer floods of 2021 in Europe the last year was characterized by extreme heat during summer and severe winter storms. 2022 saw several EIOPA initiatives to improve the quantification of direct and indirect climate change risks for insurers and IORPs including the first climate stress test for the European occupational pension sector.

Digitalisation has become a major trend in the insurance industry. Despite its benefits it also creates potential risks for insurers, particularly in the form of cyber-attacks. While cyber insurance helps other businesses manage their IT-related risks it creates also cyber underwriting risks for insurers. EIOPA put considerable efforts (a part of it in cooperation with the other ESAs) into tools for improving the quantification and management of cyber risks.

EIOPA prepared advice in several important policy areas. The EIOPA draft advice on the review of the IORP II Directive was published in March 2023 with the overall approach to embrace the future and to protect the legacy. Other important contributions were a discussion paper on the prudential treatment of sustainability risks, the revised dashboard for natural catastrophes which contributes to addressing the sustainable finance protection gap and the EIOPA report on Impact underwriting.

¹ In the following this term refers to banks, insurers and IORPs.

The EEA insurance sector entered 2023 with a solid capitalization notwithstanding the weaker investment returns and underwriting profitability in 2022. Premiums continued to grow for non-life business while life business stagnated. The median SCR ratio for life and non-life insurers continued to improve. Life insurers benefitted from the higher interest rates. Composite undertakings experienced a moderate drop in their median SCR ratio. The share of unit linked business in the Gross Written Premiums of life business remained high and even increased for the median insurance undertaking while the EEA aggregate figure dropped slightly.

Underwriting profitability declined in 2022. The combined ratios for assistance and credit and suretyship saw particularly large increases due to higher claims. Transport related lines of business such as other motor, marine and aviation, exhibited a more moderate decline in underwriting profitability.

The switch from the low yields environment to an inflationary regime with higher interest rates could bring new challenges and opportunities for the business prospects of European insurers going forward. Higher interest rates have a negative impact on the profitability of the insurance sector in the short term, mainly due to the losses on interest rate sensitive investments, however, over the long term they could be positive due to higher returns on new investments. Protracted inflation would increase the future costs of claims for non-life business, reduce the ability of households and companies to buy insurance products. Second round effects could be lower growth as well as losses on investments.

The EEA reinsurance sector remained resilient in 2022 despite continued challenges that included high catastrophe losses, high inflation and uncertain economic conditions. Solvency positions were robust with little change compared to 2021. Premium Rate increases contributed to higher gross written and gross earned premiums while underwriting profitability varied significantly across segments. Despite the challenging renewals during January 2023, the European reinsurers were broadly able to obtain the reinsurance cover they sought.

The European sector for occupational pensions continues to have strong financial positions in 2023 despite multiple challenges in the last year. The macroeconomic developments caused a drop in the value of the assets for the sector. Its liabilities were also lower year-on-year but the magnitude of the change depended very much on the characteristics of the individual pension scheme (in particular defined benefit (DB) or defined contribution (DC)). DB IORPs managed to improve their already strong financial position after the recovery from the covid-crisis in the course of 2022 even further. This allowed many of them to compensate their members fully or at least partially for the effect of inflation where this is conditional on a minimum funding ratio.

Based on a survey among National Competent Authorities macro risks driven in particular by geopolitical instability are currently the most material ones for insurers and IORPs. This is followed by markets risks resulting mainly from interest rate and equity risks. Digitalization and cyber risks were in third place for insurers while concerns about profitability and portfolio performance took this rank for IORPs.

While the share of government and corporate bonds in total investments continued its decrease fixed income assets remain the dominant component of the investments by insurers. This is also

the case for IORPs, but their equity investments represent a much larger portion. Notably, insurers became in 2022 for the first-time since the introduction of Solvency II net sellers of non-bank corporate bonds as well as government bonds on a yearly basis. Lower quality bonds could potentially be a risk transmission channel as they are exposing insurers to higher credit risk. The vast majority of bonds held by European insurers are investment grade, with most (24 %) rated CQS 3 (BBB).

The exposure of insurers to alternative assets has grown in the past years. The share of alternative-like funds now represented 5.6 % of total investments in 2022 compared to 3.3. % five years ago.

Both the insurance and IORP sector are connected to the banking sector through their investment exposures which represented 13 % and 6 % respectively of their total investments at the EEA level at the end of 2022. The collapse of Silicon Valley Bank (SVB), the pressure on US regional banks and the emergency merger of Credit Suisse with UBS illustrated the risks. The exposure of both sectors to US regional banks is limited. This is also the case at an aggregate level for the three banks that were at the epicentre of events (SVB, Signature Bank and Credit Suisse).

After a prolonged period of increasing real estate prices, there are clear indications that the European real estate market now has peaked with several risk factors for their near-term prospects. Insurers allocate around 10 % of their investments to real estate. In the recent years the valuations of direct property moved upward in line with the general development in property values.

The Gilt crisis in the UK in the last years illustrated the risks associated with liability driven investment strategies. According to the currently available information the main strategies used by European insurers are based on direct holdings of derivatives and possibly repurchase agreements backed by government bonds. Based on an analysis presented in Chapter 5 insurers using derivatives held enough liquid assets to cover potential margin calls resulting from a plus or minus 100 basis points shift in the yield curve. IORPs were also heavy users of derivatives. At the same time the currently limited information suggests that insurers and pension funds in aggregate do not have material investments in LDI funds.

PART I

1 KEY DEVELOPMENTS AND RISKS

The European economy is currently experiencing a period of heightened uncertainty and elevated financial stability risks. After a prolonged period of low interest rates, yields have significantly increased in response to persistently high and sticky inflation. This, coupled with ongoing geopolitical tensions, presents significant challenges for the growth prospects in Europe and the business conditions of financial institutions. The recent turmoil in the banking sector underscores the risk of sudden loss of confidence and rapid contagion. On the positive side, GDP forecasts and business sentiment have improved, and it is likely that the European Union will avoid a recession. Headline inflation rates have recently declined, largely due to lower energy and commodity prices, while labour markets continue to develop positively.

In the financial markets, the sudden and sizable rise in yields presents challenges for financial institutions. The central banks of the United States and the United Kingdom intervened to prevent contagion from market turmoil triggered by rising yields. Corporate vulnerabilities are a cause for concern, though credit spreads and defaults remain low. Equity markets continued to be strong despite higher yields. Negative developments and high uncertainty have led to increased volatility across financial markets. The March 2023 financial turmoil affected primarily the financial sector with higher spreads for financial bonds. While rising interest rates are beneficial to insurers by decreasing the present value of their liabilities, the macro and market environment remains challenging. Their equity prices reversed their previous gains during the recent turmoil, and the risk of an abrupt correction remains material.

The trend of high natural disaster losses continued. After the record summer floods of 2021 in Europe the last year was characterized by extreme heat during summer and severe winter storms. This is in line with the expected impact of climate change and thus forecasted to become more common. The possible consequences include higher insurance claims but also losses on investments due to policy measures to fight climate change. Both have been a focus of the EIOPA work. 2022 saw several initiatives to improve the quantification of these risks including the first climate stress test for the European occupational pension sector. EIOPA will follow up on these efforts in 2023 with its participation in a climate risk scenario analysis for the EU financial system on the way to the EU targets for 2030. Going forward EIOPA will intensify its work on broader nature-related risks.

Another area of activity is the management of protection gaps. Recent activities were the publication of the first EEA-wide dashboard on the insurance protection gap and a pilot exercise on impact underwriting practices.

Digitalisation has become a major trend in the insurance industry. Despite its benefits it also creates potential risks for insurers, particularly in the form of cyber-attacks. While cyber insurance helps other businesses manage their IT-related risks it creates also cyber underwriting risks for insurers. Recent publications by EIOPA, the EU Agency for Cybersecurity (ENISA), the Bank for International Settlements (BIS) and the Financial Stability Board (FSB) as well as Allianz show the importance of the topic as well as its very dynamic nature. In line with the high relevance of the

topic, EIOPA has put considerable efforts into tools for improving the quantification and management of cyber risks. A part of this continuing work is done in cooperation with the other ESAs.

EIOPA prepared advice in several important policy areas. The EIOPA draft advice on the review of the IORP II Directive was published in March 2023 with the overall approach to embrace the future and to protect the legacy. EIOPA published also a discussion paper on the prudential treatment of sustainability risks which provides an overview of methodologies and data sources for assessing the potential for a dedicated prudential treatment of assets and underwriting activities associated with environmental or social objectives.

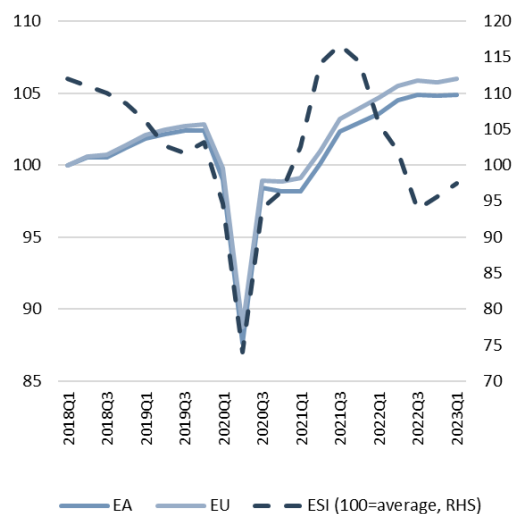
One of the EIOPA contributions to addressing the sustainable finance protection gap was the publication of its revised dashboard for natural catastrophes. In relation to underwriting and sustainable finance, more in depth analysis was provided in the “EIOPA report on Impact underwriting: Report on the Implementation of Climate-Related Adaptation Measures in Non-Life Underwriting Practices” published in February 2023.

1.1 MACRO AND MARKET RISKS

Entering 2023 there are positive signs that the economy will prove more robust than previously feared. European economies face significant headwinds including quickly rising interest rates and real wage declines with record high inflation. Growth rates were around zero in Q4 2022 and Q1 2023, but so far Europe narrowly avoided a recession (Figure 1.1). While economic sentiment was volatile over the past year, there has been improvement since November 2022. Against this background, current growth forecasts are mildly optimistic. The ECB March 2023 projections sees GDP growth of 1.0% in 2023, 1.6% in 2024 and 1.6% in 2025. The positive outlook reflects the unwinding of supply bottlenecks and shocks, improving confidence and the fading uncertainty related to future energy bills. The IMF World Economic Outlook of April 2023 forecasts euro area growth of 0.8% for 2023 and 1.4% for 2024, largely unchanged from the January forecast. The Commission Spring 2023 Economic Forecast of GDP growth in the EU is 1.0% in 2023 and 1.7% in 2024, slightly better than the Winter Forecast.

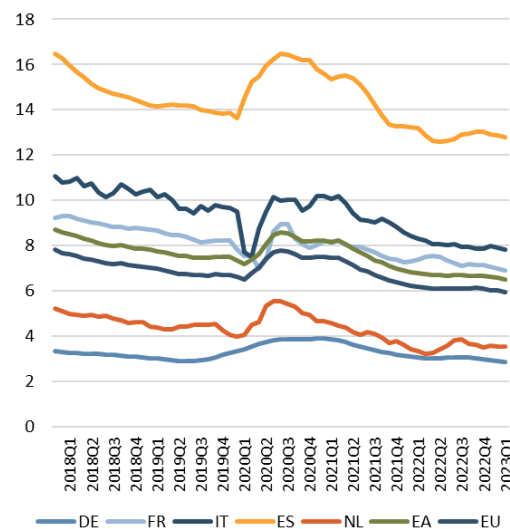
The recent turmoil in the banking sector has increased macro uncertainty. In March 2023, Silicon Valley Bank and Signature Bank of New York, two US regional banks, failed after the rapid flight of depositors. The sudden collapses spread contagion fears globally and led to loss of confidence and a sharp repricing of financial assets. This was the catalyst for higher uncertainty in the European banking sector and the Credit Suisse rescue acquisition by UBS on 19th of March. In May 2023, First Republic Bank, also a US regional bank, was closed and sold to JPMorgan Chase Bank. The higher risk aversion of market participants could result in reduced credit supply on top of the already higher financing costs with adverse effects for the real economy. Economic sentiment remained stable despite the turmoil in the financial sector (Figure 1.1).

Figure 1.1: Real GDP growth (2018 Q1=100) and economic sentiment.



Source: ECB, Eurostat and European Commission.
 Last observation: Q1 2023 for GDP and April 2023 for economic sentiment. Note: EU and Euro Area (EA) time series refer to fixed composition.

Figure 1.2: Unemployment rates (% of active population).



Source: ECB
 Last observation: Mar 2023. Note: EU and Euro Area (EA) time series refer to fixed composition.

Geopolitical tensions are a main risk for macro-economic development. Geopolitical risks are in the spotlight since the unprovoked Russian invasion of Ukraine and they remain elevated. The IMF highlights that rising geopolitical tensions among major economies have intensified concerns about global economic and financial fragmentation, a reversal of economic and financial integration that is costly for trade and ultimately impairs economic growth.² In addition to this real economy channel there is a financial channel, with tensions increasing uncertainty and the risk aversion of investors.

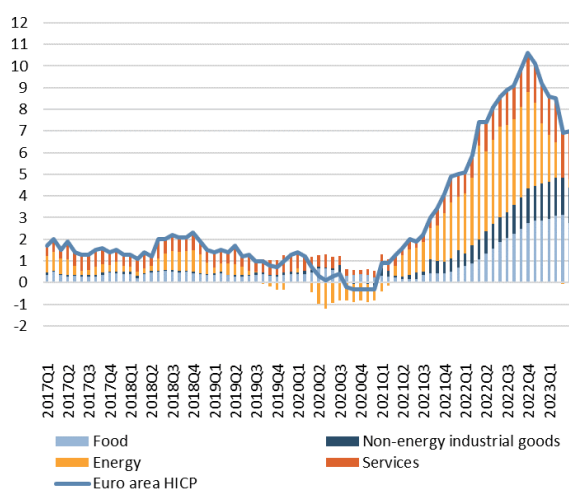
Labour markets continue their positive development. The euro area is seeing unemployment rates at long-term lows (Figure 1.2). While low unemployment rates are generally indicative of economic strength, tight labour markets can contribute to slower economic growth and to inflation due to wage pressures. Indeed, there are increasing signs of a labour shortage and that the intensifying struggle to find workers reduces growth. Unemployment in the euro area is expected to stay constant at 6.6% for 2023 and 2024 based on the ECB March Projection. The Commission Spring 2023 Economic Forecast projects unemployment for the EU to be slightly higher than most recent observations at 6.2% for 2023 and 6.1% for 2024.

Inflation rates are historically high, but recently coming down. The cost of living in the euro area has increased by an annualised 10% in Q4 2022, which is much higher than in previous years and well above the Eurosystem target of 2%. This is driven by all components in the consumption basket (Figure 1.3). The ECB March inflation projection for 2023 is 5.3% with a forecasted decrease to 2.9% in 2024 and 2.1% in 2025. While this projection is lower than previous ones, it remains at elevated levels. Compared to last year estimates, high inflation is stickier than anticipated. The IMF World Economic Outlook of April 2023 forecasts euro area inflation rates of 4.9% in 2023 and 3.0% in 2024.

² IMF Global Financial Stability Review April 2023. Chapter 3: Geopolitics and Financial Fragmentation: Implications for Macro-Financial Stability

Inflation risk remains high. Market based indicators show inflation expectations persistently above 2% (Figure 1.4). Long-term inflation (5Y5Y) expectations remain anchored (which is also confirmed by consumer surveys) but are above the Eurosystem target of 2%. There are different dynamics between headline and core inflation. Lower energy prices removed the pressure from the headline number. However, excluding energy, prices continue to increase and are well above target. In particular, food price inflation increased and there is persistence in services inflation, which is expected to remain high throughout 2023. Wage growth and expanding profit margins could contribute to keeping core inflation elevated. There are also structural reasons for potentially higher inflation such as deglobalization, i.e. a rerouting of supply chains and a reduction in international trade as a consequence of increasing geopolitical tensions.

Figure 1.3: HICP main components (annual % changes).



Source: ECB; Last observation: Apr 2023. Note: EA in fixed composition

Figure 1.4: Market based inflation expectations



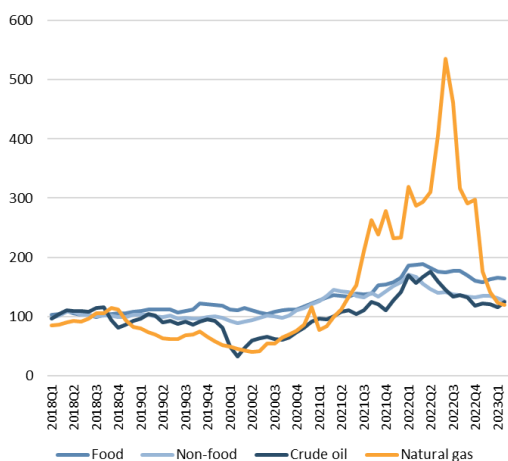
Source: Bloomberg, Last observation 16/05/2023.

Decreasing energy prices contribute significantly to a decline in headline inflation. However, high and volatile commodity prices still pose significant risks to the global economy. The Russian invasion triggered skyrocketing commodity prices in 2022. The price of natural gas in Europe spiked in August 2022 when gas imports from Russia were significantly reduced. This triggered a supply shock to the European economy. As of now high and volatile commodity prices weigh on global growth and add to inflation. Figure 1.5 shows how commodity prices have moved in the last years compared to 2018. Natural gas prices have come significantly down starting a trend reversal in September 2022 while food and non-food commodities have already declined since June 2022. Non-food commodity prices as well as oil and gas prices are only moderately above end-of-2021 levels. Only food commodity prices remain elevated even though they have dropped significantly. These commodity price decreases contributed to a lower inflation rate and an improved economic sentiment at the end of 2022. However, there is significant uncertainty surrounding future energy prices.

The yields of sovereign bonds increased sharply in 2022 as monetary policy tightened. The ultra-low yield environment that persisted for several years has come to an end. In Q1 2023 sovereign yields were at the highest level for years (Figure 1.6). Following a long period of accommodative policies, central banks have changed course. In July 2022 the ECB raised its key interest rates for the first time in a decade. So far the Eurosystem took multiple monetary policy steps and until May 2023

the key interest rate moved up from zero to 3.75%. More recently, the increase of sovereign yields stopped and partly reversed in a period of high yield volatility as a result of the turmoil in the banking sector. Within the short period from 9 March to 17 March, the ten year German sovereign bond yield fell from 2.6% to 2.1%. This reflects heightened uncertainty over the future financial market developments and monetary policy path.

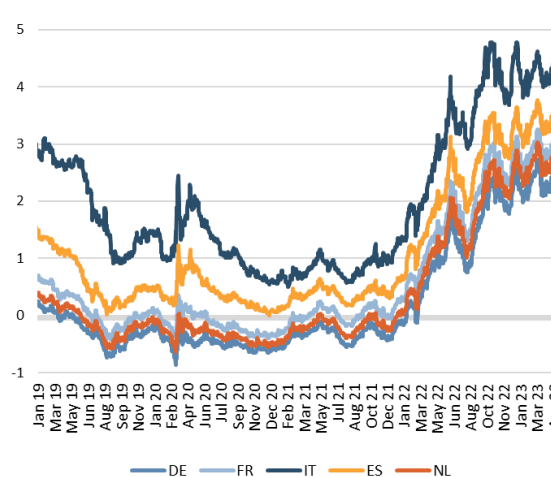
Figure 1.5: Commodity prices (Jan 2018=100).



Source: ECB and World Bank.

Last observation: Apr 2023. Note: Food and non-food are commodity price indices compiled by the ECB. Crude oil price displayed is Brent. Natural gas prices displayed is an index covering numerous locations provided by World Bank.

Figure 1.6: 10y government bond yields (in %).



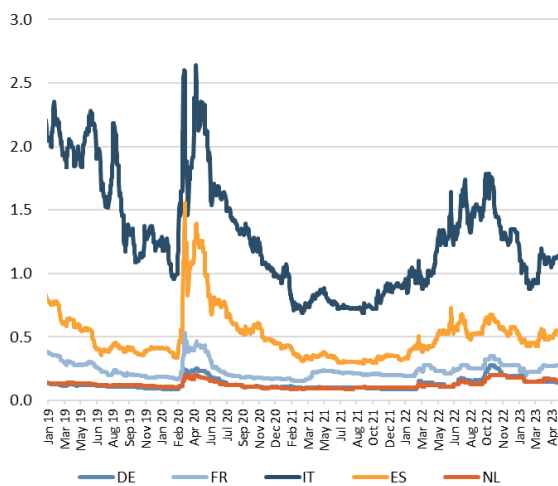
Source: Refinitiv. Last observation: 16/05/2023.

The abrupt and large increase of interest rates creates challenges for financial institutions. Central banks in the United States and United Kingdom have intervened to prevent contagion from market turmoil triggered by rising yields. In the United States, the failure of regional banks in March 2023 was partly triggered by the realization of losses on long-term securities. Bond prices had substantially declined as the result of rising yields and the securities had to be sold to meet heavy deposit withdrawals. To avoid a broader bank run, the Federal Reserve announced a new lending facility, the Bank Term Funding Program. Earlier in September 2022, the Bank of England announced temporary and targeted purchases of long-dated UK government bonds in response to an abrupt surge in long-term sovereign bond yields. This was the result of investors in long-duration bonds having to resort to fire sales to meet margin calls. Forced sales further lowered the prices of the bonds, essentially creating a self-reinforcing downward spiral.

In the first half of 2022, sovereign bond spreads increased (Figure 1.7). This prompted monetary policy action which led to a narrowing of the spreads. The high fiscal spending to cushion the impact of higher energy prices and a weaker economic outlook increased sovereign vulnerabilities. Furthermore, the quantitative tightening of the Eurosystem will lead to a decrease in demand in the sovereign bond markets and new buyers will need to step in. The combination of high deficits and rising funding costs can reduce the possibilities for fiscal intervention, thus limiting the ability of governments to protect their economies from future shocks. Due to the above factors, spreads widened in the first half of 2022. To limit this, the Governing Council of the ECB approved the Transmission Protection Instrument (TPI) on 21 July 2022. Once activated this tool would be used

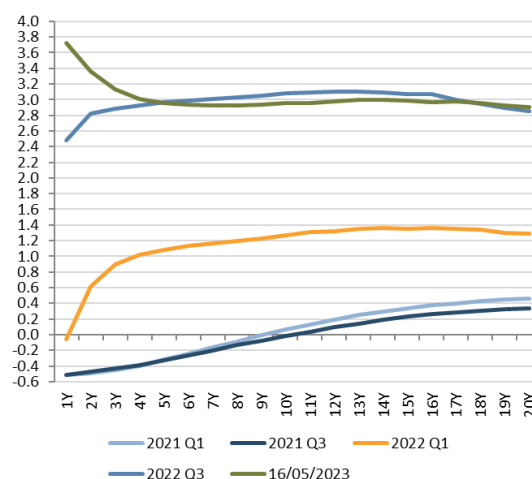
to counter excessive, unwarranted movements of sovereign spreads. It was motivated by concerns about a self-enforcing dynamic of sovereign spreads and fragmentation in the euro area. The announcement of the TPI led to a tightening of the spreads of southern European government bond yields over German yields.

Figure 1.7: Sovereign Credit Default Swaps (5Y) (in %).



Source: Refinitiv. Last observation: 16/05/2023.

Figure 1.8: Swap curve, in %.



Source: Refinitiv. Last observation: 16/05/2023.

The swap curve inverted since last year. The Euro swap curve is widely above the level of preceding years (Figure 1.8). Over the course of 2022 the swap curve flattened and is in 2023 downward sloping. The inversion of the curve suggests that the market had priced in a more aggressive monetary policy stance mostly in the short-term. While the continuation of the ECB hiking cycle has led to an increase in short-term rates, market participants perceive a cap on the potential upside of interest rates in the long run. The government bond yields are now above 2% across sovereigns and maturities (Table 1.1).

Corporate bond yields increased with a widening spread between financial and non-financial corporate bonds. In line with sovereign bond yields, corporate bond yields have strongly risen from the low levels in 2021 (Figure 1.9). While spreads for both financial and non-financial corporate bonds initially moved in parallel there has been an increasing spread between them since Q3 2022 which expanded further during the March 2023 turmoil. This indicates that markets perceive an increased risk for the financial sector.

Corporate bond spreads relative to sovereign bonds widened in 2022 and again in March 2023 during the financial turmoil. Against the background of high macroeconomic uncertainty corporate spreads increased in the first half of 2022. Then they significantly came down again before increasing abruptly during the turmoil in March 2023. Corporate vulnerabilities are a cause for concern in some parts of the markets. Other arguments for the increasing corporate spreads are the demand for risk reduction in the bond portfolios and the general increase in interest rates that is reducing search for higher yields. The tightening of monetary policy will also affect corporate spreads in 2023. In the past, central bond purchases by the central banks led in part to scarcity of bonds and to bond prices diverging from their economic fundamentals.³ With quantitative

³ [Quantitative tightening: rationale and market impact \(europa.eu\)](https://www.europa.eu/quantitative-tightening-rationale-and-market-impact)

tightening, this reverses: an increased net supply of bonds can lead to higher corporate spreads and more volatility, which in turn may reduce credit supply.

Table 1.1: Government bond yields for different maturities (in %).

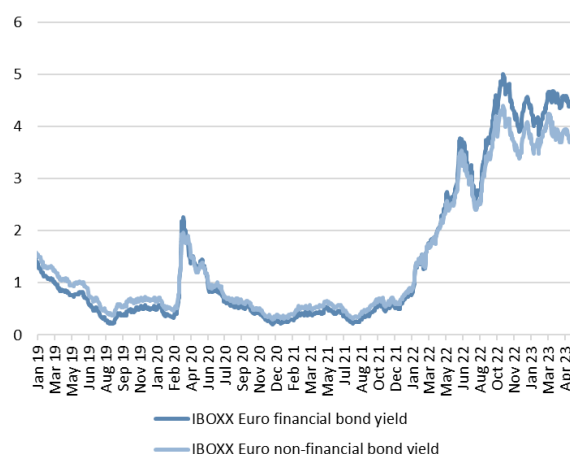
| | | 1Y | 2Y | 5Y | 10Y | 15Y | 20Y |
|--------------------------|----------------|-------|-------|------|------|------|------|
| EU- euro area | Austria | 2.86 | 2.65 | 2.67 | 3.02 | 3.19 | 3.22 |
| | Belgium | 3.10 | 2.79 | 2.60 | 3.00 | 3.33 | 3.53 |
| | France | 3.05 | 2.75 | 2.60 | 2.89 | 3.23 | 3.35 |
| | Germany | 2.87 | 2.57 | 2.21 | 2.31 | 2.53 | 2.54 |
| | Ireland | 2.98 | 2.67 | 2.54 | 2.83 | 3.14 | 3.30 |
| | Italy | 3.42 | 3.34 | 3.63 | 4.28 | 4.65 | 4.74 |
| | Netherlands | 2.86 | 2.65 | 2.47 | 2.66 | 2.82 | 2.88 |
| | Spain | 2.72 | 2.65 | 2.70 | 3.20 | 3.58 | 3.75 |
| EEA/ EU-non euro area | Bulgaria | 3.13 | 2.92 | 2.97 | 3.39 | 3.83 | 4.02 |
| | Czech Republic | 2.55 | 2.89 | 3.47 | 4.72 | - | - |
| | Denmark | 5.63 | 5.29 | 4.65 | 4.37 | 4.40 | 4.52 |
| | Hungary | 2.86 | 2.70 | 2.48 | 2.56 | 2.73 | 2.80 |
| | Norway | 13.97 | 12.03 | 8.41 | 7.30 | 7.41 | - |
| Others | United States | 3.55 | 3.41 | 3.21 | 3.19 | - | - |
| | United Kingdom | 4.77 | 4.04 | 3.53 | 3.48 | 3.72 | 4.10 |
| | Switzerland | 4.39 | 3.96 | 3.69 | 3.89 | 4.19 | 4.37 |
| | Japan | 1.04 | 0.93 | 0.85 | 0.97 | 1.08 | 1.11 |
| | | -0.13 | -0.07 | 0.10 | 0.44 | 0.81 | 1.08 |

Source: Refinitiv. Reference date: 16/05/2023.

An indication for increasing risk going forward is the number of bankruptcy declarations by EU businesses that increased substantially in Q1 2023. Corporate bond defaults have been low until recently, also due to the broad fiscal support measures taken during the pandemic and the capped energy prices. However, this is not guaranteed to continue given the substantially more challenging economic conditions. Insurers are particularly vulnerable to an increase in default rates, which would reduce the value of their bond portfolios. Additionally, downgrades and wider spreads reduce own funds of insurers under Solvency II due to lower valuations and increased capital requirements.

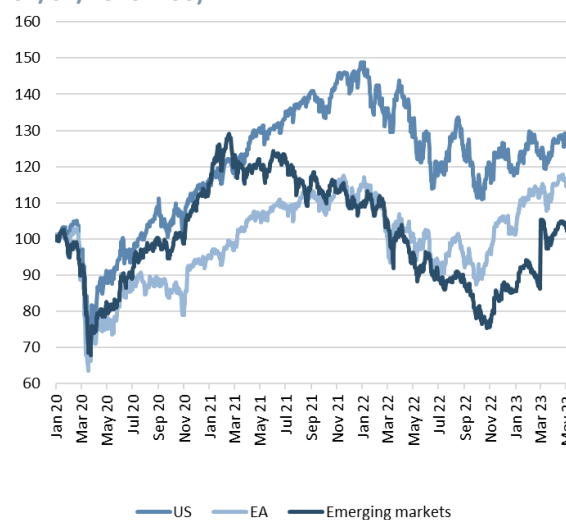
Equity markets in Europe had an impressive start in 2023 after a weak performance in 2022. In 2023, European equities outperformed U.S. equities (Figure 1.10). However, taking a longer term perspective, European equity markets lag significantly behind. The reasons for the positive development for equities in 2023 include the improvement in the headline inflation and the re-opening of China which led to improved investor confidence. But the equity price increases seem overly-optimistic and not entirely sustainable considering the big picture. They are mainly due to higher valuations, not higher earnings. Given the economic environment as discussed above, it is difficult to argue convincingly that these higher valuations are sustainable going forward.

Figure 1.9: Corporate bond yields (in %).



Source: Refinitiv. Last observation: 16/05/2023.

Figure 1.10: Equity market performance (Index: 01/01/2020=100).



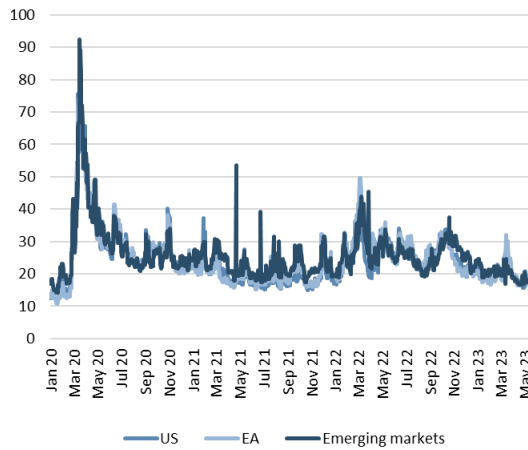
Source: Refinitiv. Last observation: 16/05/2023.

Note: S&P 500 Index, EURO STOXX 50 EUR Price Index, MSCI Emerging Markets Price Index USD End of Day

Adverse developments and high uncertainty led to an increase in volatility across financial markets. In March 2023, volatility increased during the emergence of financial market tensions (Figure 1.11), in particular for bank stocks. This reflects the elevated uncertainty. Markets are on full alert and on the lookout for any bad news and adverse events. This illustrates the fragility of markets and the speed of contagion through soft channels such as fear. However, market volatility is lower than during previous stress events such as the Covid-19 pandemic. In 2022 the European Systemic Risk Board issued the first general warning of its kind in which it stated that the likelihood of tail risk scenarios materializing had significantly increased over the past months. It called for a heightened awareness of the risks to financial stability in the EU.

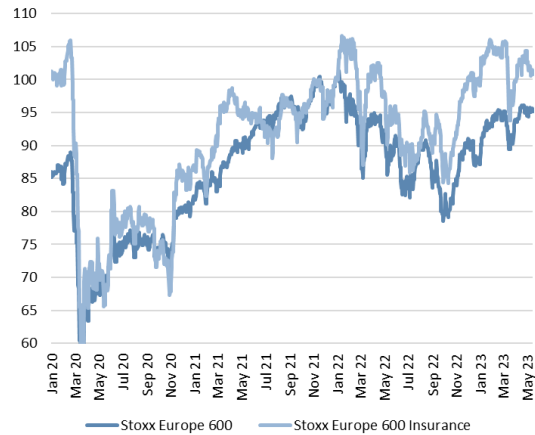
The equity market performance of insurers was better in 2022 than the overall stock market. However, insurers equities lost significantly in the March 2023 turmoil. The equity prices of listed insurers rose significantly in 2022 and the insurance sector outperformed the broader market. After the Russian invasion stock prices dropped quickly but then recovered over the course of the year (Figure 1.12). Relative to the market, insurer stocks fell more but then also recovered stronger resulting in an overall outperformance. In the first week of March 2023, the equities of insurers traded near prices of pre-Covid highs. They profited in particular from higher interest rates – historically, the share price development of insurers correlates positively with interest rates. Higher yields are particularly beneficial for portfolios of traditional life insurance policies with guarantees. This positive development turned in mid-March 2023 when insurance stocks fell along banking stocks in the turmoil around the failure of Silicon Valley Bank and the emergency merger of Credit Suisse with UBS. Year-to-date the equities of insurers have underperformed the broader stock indexes (Figure 1.13).

Figure 1.11: Market volatilities.



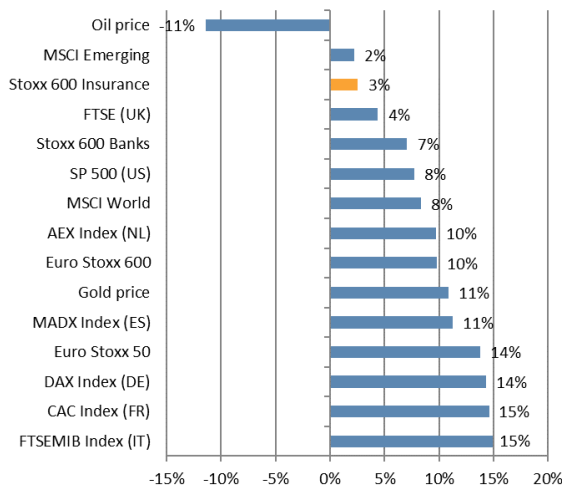
Source: Refinitiv. Last observation: 16/05/2023
 Note: US: CBOE SPX VOLATILITY INDX, EA: VSTOXX Index, Emerging markets CBOE EM ETF Volatility.

Figure 1.12: Equity performance of insurers vs. the market (01/01/2022=100).



Source: Refinitiv. Last observation: 16/05/2023.

Figure 1.13: Selected market performances (year to date).



Source: Refinitiv. Last observation: 16/05/2023

1.2 CLIMATE RISK AND SUSTAINABLE FINANCE

2022 continued the trend in recent years with high annual natural disaster losses of USD 270 bn, while insured losses amounted to USD 120 bn⁴ for a second year in a row. The costliest event of the year was the Hurricane Ian that made landfall on the coast of Florida in September 2022 and led to USD 100 bn in total losses, of which USD 60 bn were insured. The second costliest and greatest

⁴ Munich Re: [Climate change and La Niña driving losses: the natural disaster figures for 2022](#) | Munich Re

humanitarian disaster was the severe flooding in Pakistan, where at least 1,700 people were killed, leading also to about USD 15 bn in losses, most of which were uninsured.

In Europe, following the record summer floods of 2021, 2022 was characterized by extreme heat during summer and severe winter storms. Heavy hailstorms during the summer affected especially Spain and France, and caused USD 7.2 bn of damages in France alone (about USD 5.6 bn of which were insured). During the past decade, losses from hailstorms in France exceeded the threshold of USD 1 bn on three occasions, which might warrant a reassessment in expected return period losses going forward⁵. The extreme heat also led to severe drought, temporarily rendering main European waterways non-navigable and leading to supply-chain disruptions.

The occurrence of heatwaves and stationary weather patterns but also the 2021 summer floods and wildfires, are in line with the expected impact of climate change and thus forecasted to become more common in Europe. Losses from natural catastrophes have further increased due to macro factors, such as urbanization and population growth, often in regions susceptible to natural perils, as well as economic growth and the recent surge in inflation⁶. Taken together, the increased hazard from natural perils and the higher asset values in exposed areas suggest that physical risks from climate change will be a challenge for the (re)insurance sector going forward.

To assess the materiality of the exposure to physical climate change risk of the European insurance sector, EIOPA has published an analysis based on a large data collection with selected insurers⁷. Windstorm is the most insured peril in Europe with EUR 42.6 trillion in exposures for buildings, content, and business interruption coverage, followed by river flood with EUR 28.9 trillion. While participants in the data collection have been historically well placed to handle claims from natural catastrophes, a lot remains to be done as more than 50% of them had not undertaken any forward-looking climate change analyses so far. In addition to its other activities in the area, EIOPA aims to support the assessment of physical climate change risks and the understanding of the likely impact of climate change by promoting the use of open source modelling and data, such as the work described in the Article “Assessing future river flood risk for the European insurance sector using the open-source CLIMADA model” which is part of this report.

The management of protection gaps is another key area where EIOPA seeks to contribute, most recently by publishing the first EEA-wide dashboard on the insurance protection gap⁸, producing a staff paper on reducing the climate insurance protection gap⁹ and running a pilot exercise on impact underwriting practices¹⁰. Against the backdrop of physical climate change risks impacting all property-related lines of business, there is an emerging consensus among participants in the aforementioned data collection that premiums are likely to increase and insurance conditions likely to tighten (e.g., higher deductibles, lower limits and exclusions in risky areas). Therefore, adaptation and mitigation measures will play a crucial role in reducing risk levels in the future, to avoid the

⁵ [Severe 2022 hail damage in France sets new benchmarks, underscores shift of risk and calls for pricing adjustments | Swiss Re](#)

⁶ [Natural catastrophes and inflation in 2022: a perfect storm - Swiss Re sigma | Swiss Re](#)

⁷ [Discussion paper on physical climate change risks \(europa.eu\)](#)

⁸ [Dashboard on insurance protection gap for natural catastrophes \(europa.eu\)](#)

⁹ [Staff Paper on Policy options to reduce the climate insurance protection gap \(europa.eu\)](#)

¹⁰ [Impact underwriting: Report on the Implementation of Climate-Related Adaptation Measures in Non-Life Underwriting Practices \(europa.eu\)](#)

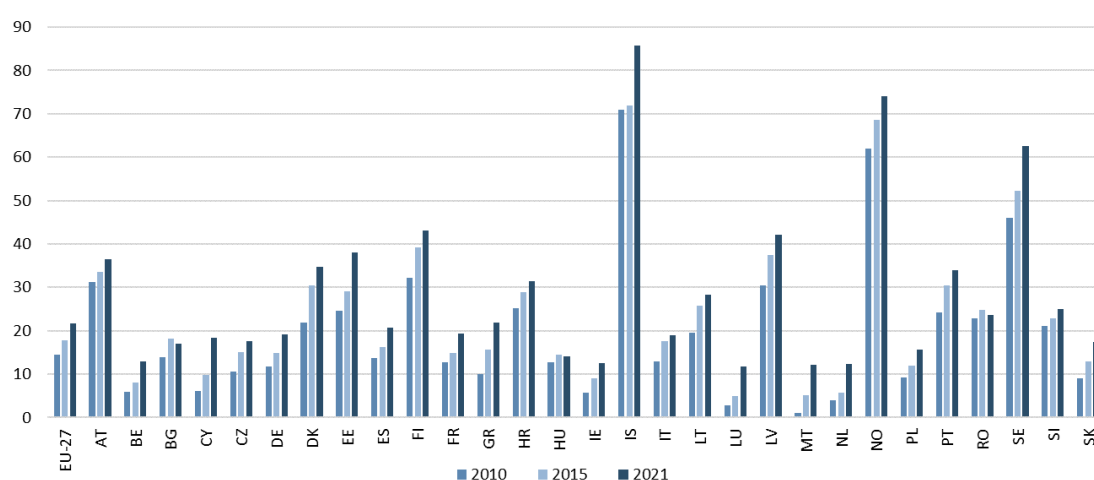
exacerbation of protection gaps, with potentially detrimental consequences for both policyholders and the economic recovery from natural catastrophes. The staff paper describes a ladder approach to natural catastrophe insurance, which includes for example public-private partnerships to absorb higher loss layers and address limits of private insurance markets, while incentivising risk reduction and adaptation. Climate-related adaptation measures in non-life underwriting are however still at an early stage as the pilot exercise on impact underwriting shows.

In addition to physical risk exposures for insurers, EIOPA has also advanced the assessment of transition risks for IORPs in its first climate stress test for the European occupational pension sector¹¹. Based on the scenario of a disorderly transition to a green economy due to delayed policy action, resulting in a sharp rise in carbon prices, the findings indicate that IORPs have a material exposure to transition risks. The stress scenario provokes a sizeable overall drop of 12.9% in the value of assets, while a drop in the value of liabilities due to rising risk-free rates helped cushion the impact on the funding ratios of IORPs. The latter decreased in aggregate by 2.9 percentage points. According to the answers to the accompanying qualitative questionnaire more than 90% of participating IORPs already consider ESG factors when determining their investment policy.

Following the global energy market disruption caused by the Russian invasion in Ukraine, the European Commission launched the REPowerEU Plan, which entails fast forwarding the green transition. It proposes for example to expand the total renewable energy generation capacities to 1,236 GW by 2030, in comparison to the previously envisaged 1,067 GW (which implies a share of 45 instead of 40 % of renewables in the energy consumed in the EU-27).

The latest available figures show that in 2021, renewable energy represented approximately 22% of energy consumed in the EU-27, which illustrates the considerable efforts needed to meet the objectives (Figure 1.14). EIOPA will support this effort for an orderly transition with its participation in a one-off climate risk scenario analysis to assess the resilience of the EU financial system on the way to the EU targets for 2030¹² in cooperation with the other ESAs, the ECB and the ESRB.

Figure 1.14: Share of energy from renewable sources (% of gross final energy consumption).



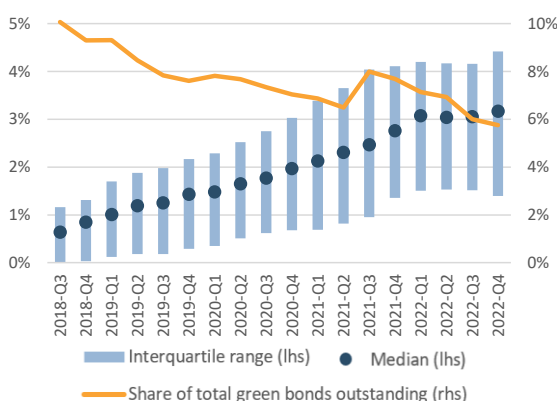
Source: Eurostat, table nrg_ind_ren, Eurostat - Data Explorer (europa.eu); Last observation available: 2021.

¹¹ [2022 IORP Climate Stress Test Report \(europa.eu\)](https://europa.eu/eiopa/eiopa-2022-iorp-climate-stress-test-report)

¹² [Mandate for the FF55 one-off exercise.pdf \(europa.eu\)](https://europa.eu/eiopa/eiopa-2022-iorp-climate-stress-test-report/mandate-for-the-ff55-one-off-exercise.pdf)

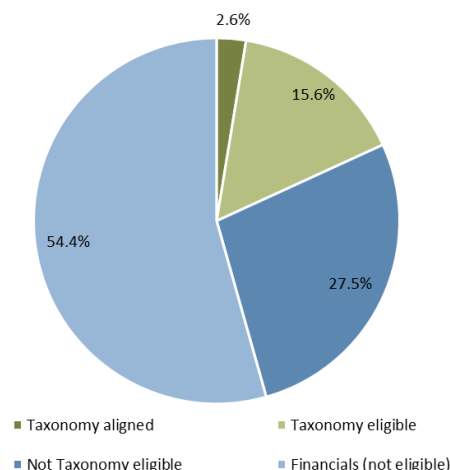
As major long-term investors, insurers can play a significant role in putting the EU economies on a more sustainable track and supporting the transition towards a low-carbon economy. Insurers already invest in green bonds that are issued to support such initiatives. Figure 1.15 shows that the median investments in green bonds as a share of the total corporate bond portfolio had steadily increased over the last years and have recently levelled off at about 3% throughout 2022. Investments in assets eligible to or aligned with the EU Sustainable Finance Taxonomy can give another indication. The Taxonomy broadly follows the NACE classification of economic sectors, listing economic activities that could be considered sustainable and thus Taxonomy-eligible. Taxonomy-aligned activities constitute a subset of the Taxonomy-eligible activities and have to meet a set of technical screening criteria. Currently, only a small fraction of the eligible NACE sectors are estimated to be already sustainable, i.e., aligned with the Taxonomy¹³. An analysis of direct corporate bond and equity holdings of insurers finds that currently 2.6% of these investments could be considered Taxonomy-aligned, while another 15.6% are Taxonomy-eligible (Figure 1.16)¹⁴.

Figure 1.15: Share of investments by insurers in green bonds relative to corporate bonds.



Source: EIOPA Risk Dashboard. Refinitiv and own calculations based on SII QRT S.06.02. Note: LHS axis shows the distribution across insurers' investments in green bonds over their total corporate bond investments. RHS axis shows the share of insurers' aggregate investment in green bonds over total green bonds outstanding.

Figure 1.16: EU Taxonomy-alignment and -eligibility of equity and corporate bond holdings of insurers.



Source: Own calculations based on Group SII QRT S.06.02 and Alessi and Battiston (2022). Note: Data does not include equity holdings in related undertakings (participations) that are consolidated at group level and concerns only EEA-issued securities.

While climate risk as one dimension of sustainability risks has already been and will continue to be extensively studied, the management of broader nature-related risks has recently come to the fore. The European Commission issued a proposal for a Regulation on Nature Restoration in June 2022. In December 2022 the Parties to the UN Biodiversity Conference (COP15) adopted the Kunming-Montreal Global Biodiversity Framework to secure biodiversity and ecosystems for the next decade, including initiatives on 'nature finance'. EIOPA has recently published a staff paper¹⁵

¹³ For example, the relevant green activity is a niche activity (e.g. the low-carbon manufacture of hydrogen), but corresponds to a broader NACE sector (e.g. C 20.11 'Manufacture of industrial gases'). For more detail on the estimation of alignment of economic activities see: Alessi and Battiston (2022). *Two sides of the same coin: Green Taxonomy Alignment versus transition risk in financial portfolios*.

¹⁴ [Insurers green investments \(europa.eu\)](https://www.europa.eu/insurers-green-investments)

¹⁵ [EIOPA Staff paper on nature-related risks and impacts for insurance \(europa.eu\)](https://www.europa.eu/eio-pa-staff-paper-on-nature-related-risks-and-impacts-for-insurance)

exploring how nature-related risks can affect balance sheets and business conduct of (re)insurers and what role the sector can play in the restoration and conservation of nature through investment and underwriting activities.

Going forward, EIOPA will seek to identify the relevant data sets and tools for performing risk assessments, while a first attempt at an exposure analysis is presented in Box 1.1. It introduces the transmission channels of nature-related risk into society and the economy, as well as their translation into risks for the assets of (re)insurers. As part of its sustainable finance strategy EIOPA aims to establish supervisory expectations for the management of nature-related risks and impacts in a step-by-step approach, similar to the initial treatment of climate risks.

BOX 1.1: EXPOSURE OF INSURERS TO NATURE-RELATED PHYSICAL RISKS THROUGH THEIR INVESTMENTS IN CORPORATE BONDS AND EQUITY

The analytical findings presented in this box are part of a collaboration between EIOPA and the ECB within the ESRB Project team on climate risk.

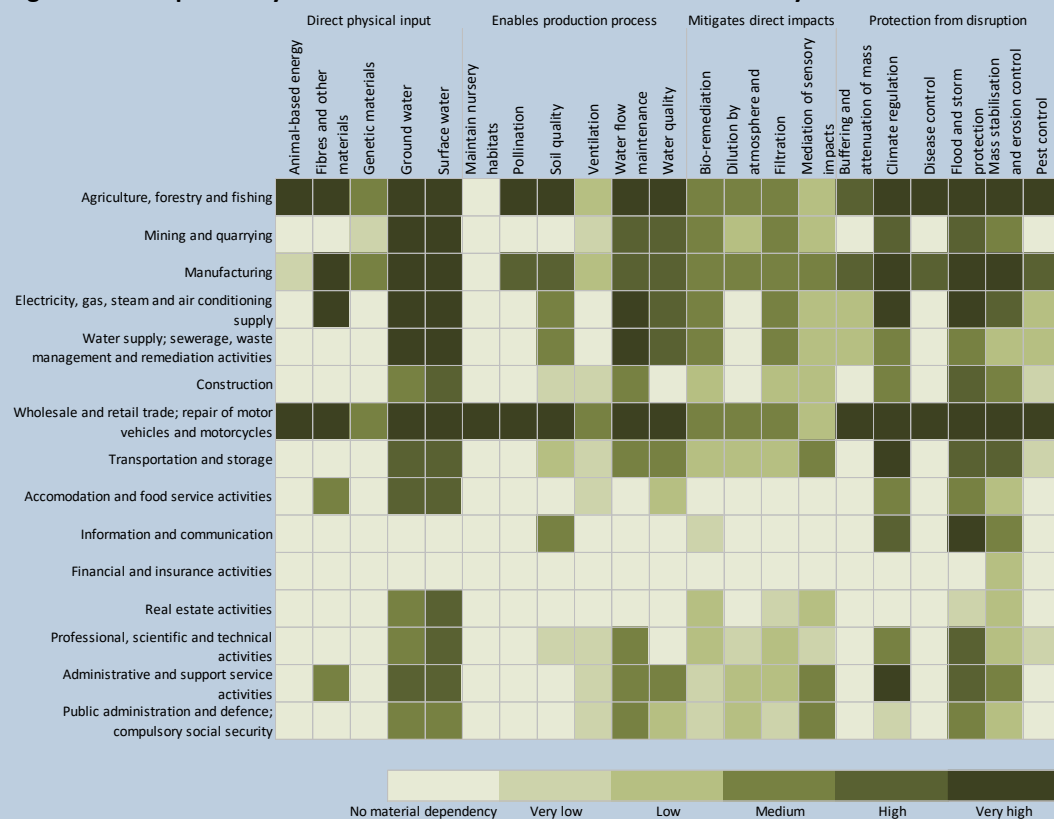
Nature-related risks refers to the risk of loss of nature, i.e. the loss of natural capital, the reduction of the stock of renewable and non-renewable natural resources, plants and animal species on earth, as well as damage to the way in which they interact with each other ('ecosystems'). Nature-related risks are transmitted into society directly ('first-order'), indirectly (i.e. 'second order', for example through value chains) or through spill-over impacts (contagion), affecting citizens, businesses and the economy at large. The dependency or impact on nature of the (re)insurance sector itself is limited: Through its direct operations, the (re)insurance industry neither impacts heavily on nature nor consumes many natural resources compared to other sectors. (Re)insurers will thus mostly experience indirect nature-related risks through their investments and liabilities in the form of:

- ▶ **Nature-related transition risk:** Misalignment of the asset and liabilities portfolios of (re)insurers with developments (policy, technological, legal, consumer preferences) aimed at reducing or reversing damage to nature can result in increased counterparty defaults or declining asset values (market risk) for their investments, as well as risks of mispricing and higher claims (underwriting risk). For example, due to the 'tightening' (increase) of legal requirements for due diligence or mandatory liability for environmental damage, transition risks may materialize in liability insurance, credit and suretyship insurance.
- ▶ **Nature-related physical risk:** Materialization of damage to nature as well as changes in natural stock and flows, can result in losses in investments or higher insurance liabilities. Where insured goods or activities suffer nature-related damage, insurers may face increasing numbers and amounts of claims, for example in property and business interruption insurance or crop insurance.

This box presents initial findings on exposures of insurers towards nature-related physical risks via their direct investments in corporate bonds and equity. The methodology employed assesses the dependency of an economic activity (e.g. agriculture) on a range of ecosystem services and maps it to the investments of insurers by NACE sector of economic activity. The dependency

scores are derived from the Natural Capital Finance Alliance [ENCORE database](#). Each industrial activity is linked to a set of 21 ecosystem services, which can be direct inputs into the production process (e.g. ground and surface water for agriculture) or enabling the production process (e.g. pollination for agriculture). ENCORE further provides a materiality score for each ecosystem-economic activity combination, ranging from 0 (no material dependency) to 1 (very high dependency). Figure B1.1 provides an overview of how material the dependence of selected economic sectors on ecosystem services is.

Figure B1.1: Dependency scores of selected economic activities on ecosystem services



Source: ECB calculations based on Natural Capital Finance Alliance [ENCORE database](#).

Note: Sector dependencies are aggregated up from four-digit NACE level, taking the maximum dependency score for each ecosystem service as dependency for the top-level NACE dependency.

The methodology presented above only considers direct dependencies on ecosystem services and not indirect dependencies through the supply chain. Furthermore, ENCORE does not take into account geography-specific characteristics, i.e. dependency scores are the same across all geographies. The sector dependencies are mapped to the lowest level of granularity, i.e. four-digit NACE sectors (e.g. A.1.1.1 – Growing of cereals). For higher levels of granularity (e.g. A.1 – Crop and animal production), ecosystem service dependencies are aggregated up from four-digit NACE level. Adopting a prudent approach and to assess the maximum exposure, the maximum materiality score for each ecosystem service out of all four-digit NACE sectors is assigned to the higher-level NACE sectors.

The investments of insurers in corporate bonds and equity that were analysed amount to EUR 2.3 trillion. Figure B1.2 shows that almost 30% of them are in economic activities that have a

high direct dependency on at least one ecosystem service. The largest portion of investments, about 60%, exhibits only a low direct dependency on ecosystem services. However, 80% out of these low dependency exposures are towards financial firms. While financial firms have typically low direct dependencies, indirect exposures e.g. for loan exposures of banks might be significant, but are not captured in this analysis.

As Figure B1.3 shows, the majority of relevant holdings could be matched at the four-digit NACE level, i.e. the lowest level of granularity. However, especially for assets classified as highly dependent on ecosystem services, about half could only be matched at higher levels of granularity, with 23% at top-level NACE (i.e. letter code). The results for assets highly dependent on at least one ecosystem service could thus be considered an upper bound for the direct exposures of insurers, given the prudent approach employed in aggregating to higher-level NACE sectors.

Figure B1.2: Dependency of direct equity and corporate bond portfolio on ecosystem services

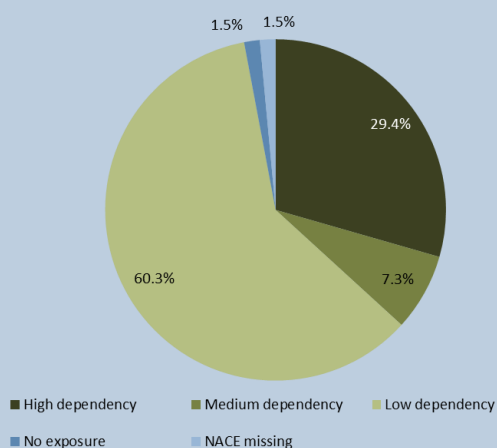
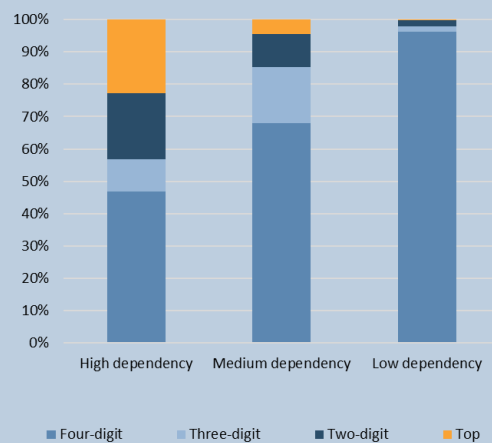


Figure B1.3: Dependency of direct equity and corporate bond portfolio on ecosystem services by granularity of NACE sector matched



Source: ECB and own calculations based on Group SII QRT S.06.02 and ENCORE database. Note: An asset is classified as having a ‘high dependency’ if its economic activity (proxied by its NACE-sector code reported) has at least one high dependency (materiality score ≥ 0.8) on at least one ecosystem service. The general rule is ‘High dependency’ if materiality score for at least one ecosystem service ≥ 0.8 , ‘medium dependency’ if ≥ 0.6 and ‘low dependency’ if ≥ 0.4 .

These initial findings indicate that, while the majority of investments in corporate bonds and equity are towards firms active in economic sectors with low direct dependencies on ecosystem services, there is still a substantial portion of 30% of investments with high direct dependency to at least one ecosystem service. Future work should focus on incorporating indirect dependencies through the supply chain and extending the analysis to indirect holdings via investment funds, as well.

1.3 CYBER RISK AND THE INSURANCE SECTOR

Digitalisation has become a major trend in the insurance industry with insurers leveraging technology to better serve their customers. Insurers are investing heavily in digital tools and processes to streamline operations, reduce costs, and improve customer service. The use of artificial intelligence (AI) and machine learning is also becoming increasingly common, allowing companies to gain better insights and improve their risk management. This trend is expected to continue in 2023, with insurers continuing to invest in digitalisation and AI to better understand their customer base and gain a competitive advantage¹⁶.

Despite the benefits of digitalisation, it also creates potential risks for insurers, particularly in the form of cyber-attacks. While some insurance companies offer cyber insurance to help other businesses manage their IT-related risks, this poses another source of risk for themselves.

With the increasing reliance on technology and digital tools, insurance companies become more vulnerable to cyber threats. The impact of a cyber-attack on an insurance undertaking can be significant. It can result in direct financial losses due to physical damage or theft of data, unauthorized transactions, or ransom payments to threat actors.¹⁷ Additionally, there may be financial losses from the non-availability of systems and efforts to restore them, including the need for external support to deal with the consequences of the attack. Legal consequences may also arise, such as fines from data protection authorities under the GDPR (General Data Protection Regulation) or civil lawsuits from damaged third parties. Another important consequence is the potential loss of reputation, which could impact existing business relationships and future opportunities.

For these reasons it is crucial for insurance companies to implement robust cybersecurity measures and have contingency plans in place to protect their assets and customer data from cyber threats. As the trend of digitalisation and AI continues in the insurance industry, managing cyber risks will be a critical aspect of ensuring business continuity and maintaining the trust of customers.

Cyber underwriting carries significant risks and insurers may lack the expertise and resources necessary to assess and price cyber risks adequately, leading to under-priced policies and potential large-scale losses. Consequently, there are concerns from the insurance industry about the insurability of cyber-attacks¹⁸. The insurance industry has previously dealt with systemic risks such as pandemics and climate change, but the pressing risk facing the industry are now cyber-attacks. Insurers are used to dealing with large-scale risks such as the formerly mentioned ones, but cyber risks pose new challenges due to their ever-evolving nature. It seems there are already efforts by the industry to allow investments into cyber risks via insurance-linked securities.¹⁹

¹⁶ [Top digital transformation themes for insurance in 2023 | Swiss Re](#)

¹⁷ [DISCUSSION PAPER ON METHODOLOGICAL PRINCIPLES OF INSURANCE STRESS TESTING \(europa.eu\)](#)

¹⁸ [Cyber attacks set to become 'uninsurable', says Zurich chief | Financial Times \(ft.com\)](#)

¹⁹ [Insurer Beazley launches first catastrophe bond for cyber threats | Financial Times \(ft.com\)](#)

Risk landscape

This section summarises a number of surveys and studies on the current and future level of cyber and digitalisation risk as well as possible future developments.

The results of the January 2023 EIOPA Risk Dashboard show digitalisation and cyber risks at a medium level with no change in the last 3 months. The materiality assessment of these risks for insurance by supervisors remains unchanged with cyber security and hybrid geopolitical conflict as main concerns. The frequency of cyber incidents in all sectors of activity, as measured by publicly available data, increased since the same quarter of last year. Cyber negative sentiment indicates a high amid decreasing concern in the last quarter of 2022. However, the outlook for the next 12 months shows increasing concerns about the materiality of these risks.²⁰

The EIOPA Spring 2023 insurance bottom-up survey (BUS) among supervisors ranked digitalisation and cyber risks in third place (same position as in Autumn 2022 BUS) in terms of materiality, after macro and market risks, but before e.g. credit and profitability and solvency risks. When considering the expected developments in terms of risk materiality over the next year, digitalisation and cyber risks are ranked first. Cyber security risks are seen as the main driver of digitalisation and cyber risks (92% of supervisors), followed by cyber underwriting risks (4%).

The Bank for International Settlements (BIS) and the Financial Stability Board (FSB) have emphasized the increasing significance of "big techs," companies with substantial digital service offerings, in assessing cyber and digitalization risks in 2023. This is due to ongoing technological advancements and the widespread adoption of the internet of things (IoT), which are expected to lead to a rapid evolution of cyber risks in the years ahead. The IoT can help organizations in keeping pace with the constantly changing cyber risks and potential threats by enabling real-time monitoring and response to potential attacks. The evolution of cyber risks is directly linked to technological advancements and the growing prevalence of IoT, which suggests that cyber risks will continue to evolve rapidly in the future²¹. It is therefore crucial for organizations to remain up-to-date with the latest cyber security developments and utilize cutting-edge solutions to protect their data and systems from potential threats.

The Allianz Risk Barometer 2023 reports that cyber incidents and business interruption are again the biggest concerns for companies.²² The report predicts also that cyber security will continue to be a major issue in the coming years. Respondents to the survey identified data breaches as the most significant cyber risk faced by companies given the increased global legislation related to data privacy and protection. The average cost of a data breach reached an all-time high in 2022, and more data breaches are expected this year, with criminals finding ways to breach standard multi-factor authentication technologies. Ransomware attacks rank as the second most important risk, with the frequency of attacks remaining high, and related claims costs increasing due to double and

²⁰ [January 2023 Risk Dashboard.pdf - EN.pdf \(europa.eu\)](#)

²¹ [The Top Five Cybersecurity Trends In 2023 - Forbes](#)

²² [Report: Allianz Risk Barometer 2023](#)

triple extortion attacks that are now the norm. These attacks are expected to continue as criminals target larger companies, supply chains, and critical infrastructure.

According to the EU Agency for Cybersecurity (ENISA) a number of trends and patterns have emerged in the cyber threat landscape during the last year.²³ Ransomware attacks, including those with the aim to disrupt availability, have been prevalent, as have attacks using 0-day exploits (security loopholes that were previously unknown to anyone). Resourceful threat actors have used these methods to achieve their goals, making it harder for organizations to defend against them. The war and the other geopolitical tensions have also impacted the cyber landscape, with state actors conducting destructive attacks in concert with military action. Other trends include the rise of hacker-as-a-service business models, an increase in DDoS attacks and the use of phishing as the most common vector for initial access. Disinformation, deepfakes, and AI-enabled attacks are also on the rise, and threat groups are increasingly targeting supply chains and Managed Services Providers. While organizations are improving their defences, adversaries are adapting, and the cyber threat landscape remains complex and dynamic.

Regulatory developments and supervisory activities

The increasing digitalization of financial services and the prevalence of cyber threats have prompted the creation of rules by legislators and of new policies and frameworks by supervisors with the aim to ensure digital operational resilience.

On 16 January 2023 the Digital Operational Resilience Act (DORA) entered into force.²⁴ From this date on the ESAs, the supervisory community, the EU financial entities and their stakeholders will have 24 months to implement it. DORA includes several policy mandates for the ESAs to produce draft technical advice, draft technical standards, guidelines and reports. To meet them the Joint Committee has set up a JC Sub Committee on Digital Operational Resilience (JC SC DOR)²⁵, with the involvement of National Competent Authorities and relevant European Authorities. This structure will help the ESAs to ensure consistency in this cross-sectoral policy work.

In January 2022, the European Systemic Risk Board (ESRB) published a Recommendation on the development of a pan-European systemic cyber incident response framework for financial authorities (EU-SCICF)²⁶ as one of the envisaged roles of the ESAs under DORA. The objective of the framework is to enable an effective Union-level coordinated response to major cross-border ICT related incidents or related threats with a systemic impact on the whole financial sector of the Union. The ESAs have started preparatory activities to establish the framework. Interim and final reports to the European Parliament, the Council, and the Commission on the EU-SCICF implementation are due 6 and 18 months respectively after DORA entered into force.

²³ [ENISA Threat Landscape 2022 — ENISA \(europa.eu\)](https://www.enisa.europa.eu/press/news/enisa-threat-landscape-2022)

²⁴ [EUR-Lex - L:2022:333:TOC - EN - EUR-Lex \(europa.eu\)](https://eur-lex.europa.eu/eli/L/2022/333/TOC)

²⁵ [Joint Committee | Eiopa \(europa.eu\)](https://www.joint-committee.europa.eu/)

²⁶ [Recommendation of the European Systemic Risk Board of 2 December 2021 on a pan-European systemic cyber incident coordination framework for relevant authorities \(ESRB/2021/17\) \(europa.eu\)](https://www.esrb.europa.eu/en/press/pr/2021/17)

Until the DORA rules apply , EIOPA will continue to promote an effective exchange of information with national supervisors on cyber security and cyber-incidents in accordance with Article 29(1)(b) of its Founding Regulation. This contributes to the overall objective of EIOPA to build a common supervisory culture, and closely intertwines with the on-going regulatory developments at the European level on the digitalisation of financial services and the strengthening of operational digital resilience.

The ESRB has published a report in February to advance macroprudential tools for cyber resilience. The report highlights three key elements that can enhance cyber resilience in the EU and that should be considered by relevant authorities: (i) Cyber Resilience Scenario Testing. Its aims are to evaluate the response and recovery capacity of the financial system in severe but plausible scenarios involving a cyber incident and to assess their impact on financial and operational stability; (ii) Systemic Impact Tolerance Objectives, which shall support the assessment of the impact of cyber incidents on the financial system; and (iii) existing financial crisis management tools and their effectiveness.²⁷ The report complements the work of the Joint Committee of the ESAs on DORA.

On 22 September 2022, EIOPA published a Supervisory Statement on the management of non-affirmative cyber exposures. EIOPA recommends that NCAs intensify their supervision of cyber underwriting risk, in particular for undertakings with potentially significant exposure to non-affirmative cyber insurance risk and those which have not yet developed a plan to identify and manage non-affirmative cyber underwriting risk. NCAs should follow a more holistic and risk-based approach in the supervision of the following aspects: (i) top-down strategy and appetite for undertakings to underwrite cyber risk; (ii) identification and measurement of risks exposure with the purpose of implementing sound cyber underwriting practices; (iii) cyber underwriting risk management and risk mitigation, including the reinsurance strategy.

EIOPA submitted draft amendments to ITSs to the European Commission for adoption, which lead to fit-for-purpose reporting requirements, the reduction of reporting costs for the majority of insurance undertakings and better supervision through the inclusion of some new information on emerging risks and new areas for which supervisors identified a number of data gaps. The proposed amendments include the introduction of a regular reporting template on cyber risk, which should allow a good mapping of product clusters and definitions used in the medium to long term. The information will have to be submitted for the first time in the end 2023 reporting.

EIOPA developed a voluntary procedure to facilitate the exchange of information between NCAs on cyber security and cyber-attacks. This contributes to the overall objective of EIOPA to build a common supervisory culture, and closely intertwines with the on-going regulatory developments at European level on the digitalisation of financial services and strengthening of operational digital resilience. The procedure represents an interim system allowing for the exchange of cyber-related information until DORA enters into application and is also in line with the objectives of the ESRB Recommendation on the establishment of an EU systemic cyber incident coordination framework.

²⁷ [ESRB publishes report on advancing macroprudential tools for cyber resilience \(europa.eu\)](https://www.europa.eu)

EIOPA launched the Digitalisation Market Monitoring Survey, as a tool to keep up-to-date with innovations and digitalisation trends in insurance.²⁸ One aim of the survey is to collect information on available cyber coverages, claims development, pricing, non-affirmative cyber exposures and exclusions. Given the increasing importance of digitalisation for the insurance sector, it is of key importance for EIOPA to keep pace with the rapid changes which innovation brings to insurance.

EIOPA has published a discussion paper on the methodological principles of insurance stress testing, with a focus on cyber risk.²⁹ The paper proposes a range of approaches to support the design phase of potential future insurance stress tests with a focus on cyber risk. It also complements the EIOPA bottom-up stress test toolbox, which previously covered liquidity and climate risks. The focus is on assessing the financial resilience of insurers with the two dimensions cyber resilience and cyber underwriting risk.

The paper outlines key risks for insurance from both a cyber resilience and cyber underwriting perspective. It proposes an approach for the identification of insurers to be included in a cyber risk stress test exercise, a set of key assumptions to assess cyber risk, a set of relevant scenarios and guidance for assessing the impact of selected scenarios. It also discusses the particularities of communicating and disclosing the results of a stress test exercise with a focus on cyber risk.

EIOPA initiated a public consultation to engage with stakeholders collecting their views and input on the assumptions and approaches proposed in the discussion paper. Comments were due until the end of February 2023, and feedback received will be considered in the preparation of a final methodological paper to be published on the EIOPA website later in 2023.

1.4 REGULATORY DEVELOPMENTS

The EIOPA draft advice on the review of the IORP II Directive was published in March 2023. When occupational pension schemes in the Netherlands have made the transition to defined contribution (DC) schemes, 84% of active pension scheme members in the EU will be in a DC scheme, and DC assets will account for 92% of total assets. Separately, 20% of pension scheme members already belong to IORPs established by service providers rather than employers.

Advice is being prepared on six areas: governance and prudential standards, cross-border activities and transfers, information to members and beneficiaries, shift from defined benefit to defined contributions, sustainability and diversity and inclusion. In addition, EIOPA is asked to advise on any recommendations for the review of IORP II arising from the events in the UK at end-September 2022 involving liability driven investment strategies.

The overall approach of EIOPA is to embrace the future and to protect the legacy. The former approach is reflected in proposals for change in the areas of DC pensions, sustainable finance and

²⁸ [Digitalisation Market Monitoring Survey \(europa.eu\)](https://europa.eu)

²⁹ [Discussion Paper on Methodologies of Insurance Stress Testing - Cyber component \(europa.eu\)](https://europa.eu)

diversity and inclusion on the management boards of IORPs. At the same time improvements are suggested in existing areas, for example cross-border activities.

EIOPA continues to reflect on regulatory developments in the area of sustainable finance. In December 2022 EIOPA published a discussion paper on the prudential treatment of sustainability risks. The discussion paper considers the role of insurers as risk managers and investors, and provides an overview of methodologies and data sources for assessing the potential for a dedicated prudential treatment of assets and underwriting activities associated with environmental or social objectives.

Regarding underwriting activities, the paper considers the role of risk prevention measures taken to adapt to climate change. If these measures lead to differences in prudential risks compared to insurance products without these features, the capital requirements should recognise the resulting risk differential. The paper considers what is meant by adaptation measures and what the relevant prudential risks are. In relation to insurers as investors the focus is on equities, bonds and property as the main asset classes for insurance undertakings with the greatest relevance to transition risk. On social issues there is the recognition that these are becoming increasingly of prudential concern.³⁰ The concepts already used in climate risk such as transition and physical risk, and double materiality, are considered in relation to social issues, and potential asset- as well as underwriting-related risk channels are discussed.

One of the EIOPA contributions to addressing the sustainable finance protection gap was the publication of its revised dashboard for natural catastrophes in December 2022. It covers all 30 EEA countries and five different perils: flood (inland and coastal), windstorm, wildfire, and earthquake. The dashboard provides a current view of the protection gap, that is the risks arising from the peril compared with the depth of insurance coverage. It also provides an historical view of the gap from 1980 to 2021 as well as information on how natural catastrophe insurance works in each EEA member. The dashboard shows that currently the peril with the highest protection gap is earthquake and the lowest is windstorm.

In relation to underwriting and sustainable finance, more in depth analysis was provided in the EIOPA report on Impact underwriting: Report on the Implementation of Climate-Related Adaptation Measures in Non-Life Underwriting Practices published in February 2023³¹. In relation to physical risks from climate change there is a potential risk of increasing damage leading to increased premiums and consequently to reduced affordability and cover. The report studies the current underwriting practices in the insurance sector with respect to adaptation measures to reduce exposures to physical risks in insurance products, such as water resistant doors. The report considers the outcome of a pilot exercise that EIOPA conducted in 2022 with 31 volunteering insurance undertakings from 14 European countries. It notes that the most exposed line of business is property risk and that some adaptation measures, for example in relation to retail property, have

³⁰ According to IORP II call for advice: “Exploring prudential requirements to include diversity and inclusion issues in relation to management bodies” i.e. a social issues (diversity of management bodies) are being considered with respect to prudential requirements.

³¹ [Impact underwriting: Report on the Implementation of Climate-Related Adaptation Measures in Non-Life Underwriting Practices \(europa.eu\)](https://www.europa.eu)

been implemented. Among the challenges for a wide-spread implementation of adaptation measures in insurance products it identifies the extent of policyholder awareness of adaptation measures; the extent to which such measures are recognised in insurance pricing; and lack of financial incentives for policyholders to take up adaptation measures.

One aspect of insurance regulation which EIOPA advised on was its contribution to the December 2022 Joint Committee advice on the review of the securitisation prudential framework. The EIOPA advice considered three aspects. Firstly, the extent of investments in securitisations by insurers. Secondly, whether the current calibrations of capital requirements for investments in securitisations are appropriate. Thirdly, whether the treatment of securitisations under Solvency II should be made more consistent with the treatment under the banking regulation.

The level of investments in securitisations is low. On average, 0.33% of total investments by insurers are in securitisations, a share which has remained stable since the introduction of Solvency II. The Solvency II framework does not seem to be a significant driver for investment decisions about securitisations. In respect of the calibrations under Solvency II for securitisations, there is no sufficient evidence to conclude that the current calibrations are not fit for purpose. Finally, the advice did not recommend greater consistency with the banking framework. While some changes in that respect could be feasible, they would increase the complexity of an already complex framework and their effectiveness to the revival of the securitisation market remains, at this stage, uncertain.

Finally, EIOPA continues its international work. In 2022, EIOPA held regulatory dialogues with six major jurisdictions (China, US, UK, Switzerland, Japan, Bermuda) and played a major role in the International Association of Insurance Supervisors notably in relation to the Insurance Capital Standard.

2 THE EUROPEAN INSURANCE SECTOR

The European insurance sector entered 2023 with a solid capitalization notwithstanding the weaker investment returns and underwriting profitability in 2022. The median SCR ratio for life insurers continued to improve as the result of higher risk-free interest rates from 227% in Q4 2021 to 232% one year later. The median SCR ratio for non-life insurers also improved from 211% to 216%. On the other hand, composite undertakings experienced a moderate drop in their median SCR ratio but maintained a solid ratio of 207%.

Premiums continued to increase for non-life business while a slight reduction was observed in the case of life business. During 2022 gross written premiums (GWP) for the non-life business continued to grow (by 11%) reaching 663 bn., while the corresponding figure for life business decreased by -6% to 655 bn. The switch from the low yields environment to an inflationary regime with higher interest rates could bring new challenges and opportunities for the business prospects of European insurers going forward.

The profitability of insurers was lower in 2022. The outlook for financial markets remains highly uncertain. Higher interest rates and high inflation impact profitability through their effect on the value of investments and their returns. In the short term, the impact is negative mainly due to losses on interest rate sensitive investments, over the long term it could however be positive due to higher returns on new investments. The median return on assets (ROA) decreased to 0.40% from 0.56% observed in 2021. So far, financial losses related to Russia's invasion of Ukraine and the turbulences in the banking sector in March 2023 have been limited for EEA insurers. However, the situation could escalate further with a more negative impact on the profitability of insurers.

Underwriting profitability also declined in 2022. In particular, the combined ratios of assistance (+6 pp) and credit and suretyship (+5 pp) increased due to higher claims. Transport related lines of business such as other motor as well as marine and aviation also saw a moderate decline in underwriting profitability with an increase of around 6 pp. in their combined ratios. On the other hand, workers' compensation and general liability's underwriting profitability improved as the result of increased premiums.

The future cost of claims for non-life business could increase further as a result of the high inflation. A persistent and high inflation regime increases the claims payments for the non-life business lines, especially those with a relatively longer duration³² (long-tail LoBs), posing a challenge for underwriting profitability. Premium increases (Figure 2.1) could partially offset the negative impact. A slowdown of economic activities resulting in a reduction of premiums paid and lower new business could on the other hand exacerbate the negative impact.

The share of unit-linked business in the life segment remained high in 2022. The share of unit-linked GWP in the total EEA life business, after reaching a peak in 2021, dropped slightly in 2022 to around 36% but was still above the 2020 level. The observed decline was driven by a few large

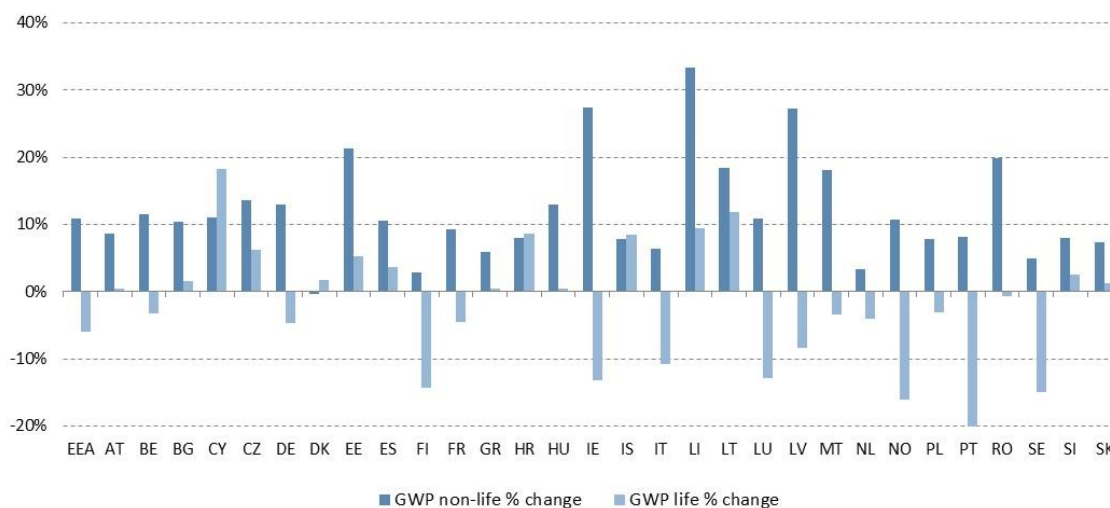
³² See topical focus on inflation in December 2021 EIOPA FSR.

undertakings with high share of unit-linked products. For the median company the share of unit-linked GWP in its GWP for life-business actually increased.

2.1 MARKET SHARE AND GROWTH

Gross written premiums (GWP) dropped slightly for the life sector in the EEA while they continued to increase for the non-life sector in 2022. After the growth in the previous year life business shrank by -6% in 2022 to 655 bn. (Figure 2.1), with heterogeneous trends across Member States. Some countries such as Portugal (-22%), Norway (-16%) and Sweden (-15%) saw a large drop, while life business in others like Cyprus (+18%) and Lithuania (+12%) grew. Non-life GWP continued their growth from last year with an increase of 11% year-on-year, reaching 663 bn. The highest growth rates were observed in Liechtenstein (+33%) and Latvia (+27%) while only Denmark experienced a small reduction of 0.4% .

Figure 2.1: Total Life and Non-Life GWP growth from 2021 to 2022 (in %, year-on-year)



Source: EIOPA Quarterly Reporting Solo.

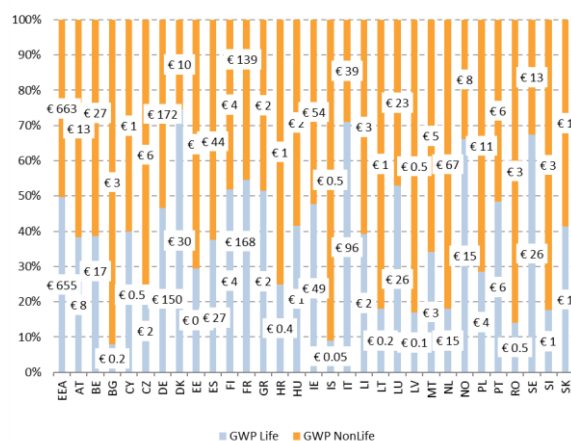
Note: EEA weighted average. Growth rates are computed by weighting the GWP per reporting currencies. Figure for RO adjusted to reflect the partial activity of an insurer throughout 2021.

The future costs of claims for non-life business could increase further as a result of the high inflation. The current macroeconomic environment with higher interest rates and inflation has a direct impact on the costs insurers face when paying claims, in particular for the non-life sector, but also leads to losses on investments due to higher interest rates. A potential consequence could be increased premiums.

A protracted period of high inflation could pose challenges for the business prospects of European insurers. Households and companies are already faced with high inflation which might persist or even accelerate. A macroeconomic environment with cost-driven higher inflation and interest rates could trigger an economic slowdown. The potential impact on the demand of insurance could vary significantly across EEA countries and undertakings due to country specificities and differences in the business mix of insurers (Figure 2.2.).

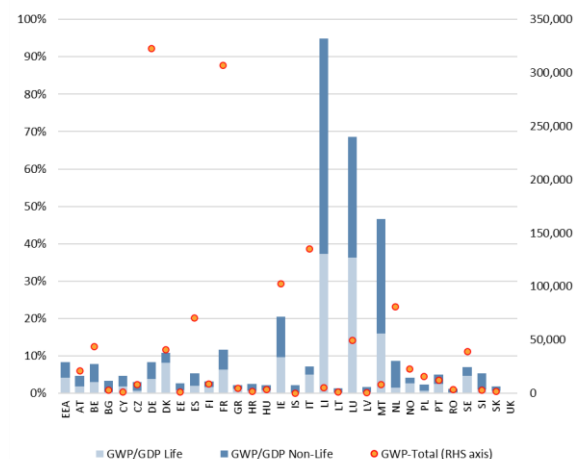
Geopolitical risks on the other hand appear at the moment contained for European insurers although there is high uncertainty. The resurgence of geopolitical risk in Europe could cause a deterioration in the current economic conditions. In this context it is worth noting that the direct investment exposures of EEA insurers towards Russia, Ukraine and Belarus are very low and the largest share is via collective investment funds.

Figure 2.2: GWP Non-life as a share of total GWP (in %) and GWP Life as a share of total GWP (in %), and in EUR billions in 2022.



Source: EIOPA Quarterly Reporting Solo.

Figure 2.3: GWP life and non-life as a share of GDP (in %) (LHS) and total GWP (in EUR million) (RHS) by country in Q4 2022.



Source: EIOPA Quarterly Reporting Solo and Eurostat.
Note: Figure for EEA weighted average.

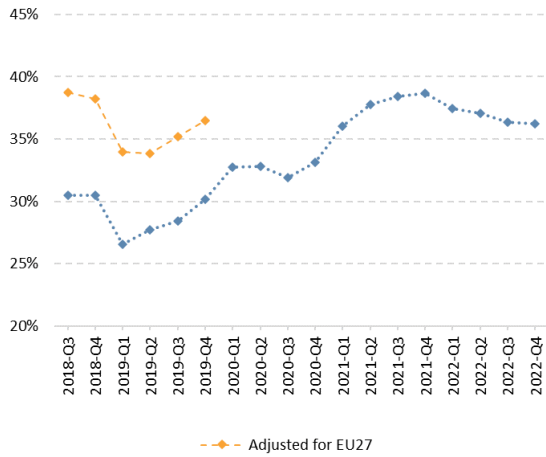
The GWP of EEA insurers as a percentage of total GDP decreased to 8% compared with 9% in 2021. This is due to the 10% growth in nominal GDP in 2022. Total assets as a percentage of GDP decreased by 16 pp to 56% (73% in 2021) as a result of the growth in GDP and the drop in the value of total assets.

The share of unit-linked business in the life segment remained high in 2022. The share of aggregated unit-linked GWP in the total EEA life business, after reaching a peak in 2021 (39%), dropped slightly in 2022 to around 36% but was still above the 2020 level (Figure 2.4). The observed decline at aggregate level was driven by a few large sized undertakings with high share of unit-linked products. For the median company, the share of unit-linked premiums in GWP for life business actually increased by 6% (reaching 37% in Q4 2022) compared to the previous year (Figure 2.5). There remain considerable differences in the popularity of unit-linked products across countries (Figure 2.6). The demand for unit-linked products increased in countries such as Denmark (+3 pp), Luxembourg (+2 pp), and Norway (+17 pp), while it dropped in Finland (-2 pp), Lichtenstein (-4 pp) and Ireland (-4 pp).

The growth in the unit-linked segment observed in the last years was mostly the result of a shift in the product and sales strategies of insurers in response to the low interest rate environment. It remains to be seen whether the new regime with high inflation and increased interest rates will change the trends observed in the last years. Potential causes for a reversal could be falling prices in financial markets and resulting poor investment outcomes triggered by the revival of geopolitical

risks or a banking crisis. Another reason for lower demand for unit-linked products could be the potential deterioration in growth prospects that discourages risk taking.

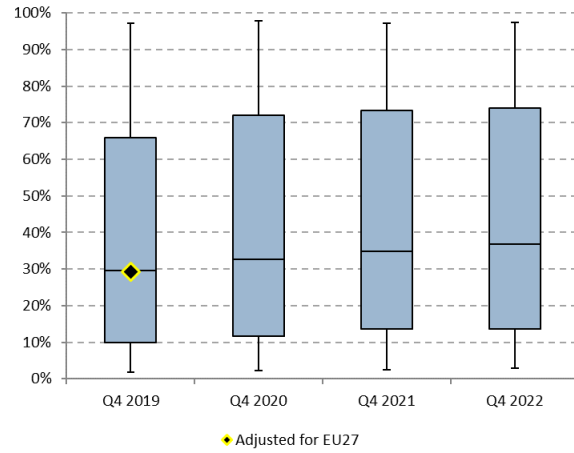
Figure 2.4: GWP-Life business: Unit-linked share development over time.(% UL in GWP life)



Source: EIOPA Quarterly Reporting Solo.

Note: The orange line includes the UK which stopped reporting under Solvency II at the end of 2019. As the EEA figures prior to 2020 include the UK figures before 2020 are also reported for EU27 (excluding UK).

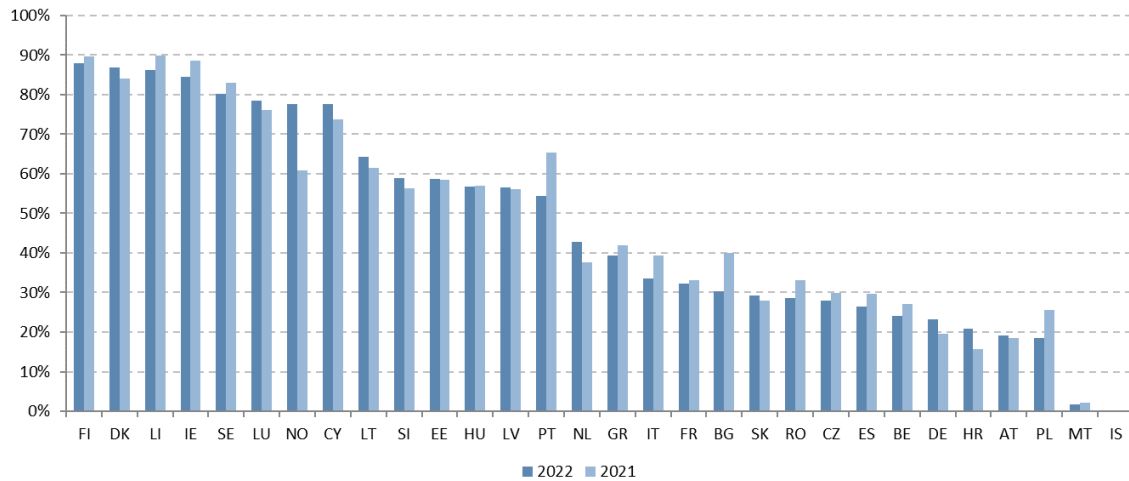
Figure 2.5: Unit-linked as a share of GWP-Life business (in %; median, interquartile range and 10th and 90th percentile).



Source: EIOPA Quarterly Reporting Solo.

Note: The sample includes only insurance companies which have reported unit-linked business (life and life part of composite insurance companies). As the figures prior to 2020 include the UK, the median values before 2020 are also reported for EU27 (excluding UK).

Figure 2.6: Unit-linked as share of GWP-Life business across countries (in %).



Source: EIOPA Quarterly Reporting Solo

2.2 LIQUIDITY

The liquid assets ratio of insurers remains quite stable throughout the years (Figure 2.7), but varies considerably across EEA countries. The median value at the end of 2022 was around 46% while the 10% percentile dropped by 4 pp to 13% which illustrates the deterioration in the liquid asset ratio for the undertakings holding the smallest proportion of liquid assets. For Austria, Cyprus, France, Iceland,

Norway and Sweden the 10 % percentile of the liquid asset ratio for individual companies was below the EEA median. In contrast, insurers in Croatia, Hungary, Poland and Romania held relatively more liquid assets with the distributions well above the EEA median (Figure 2.8).

Figure 2.7: Liquid assets ratio (in %; median, interquartile range and 10th and 90th percentile).

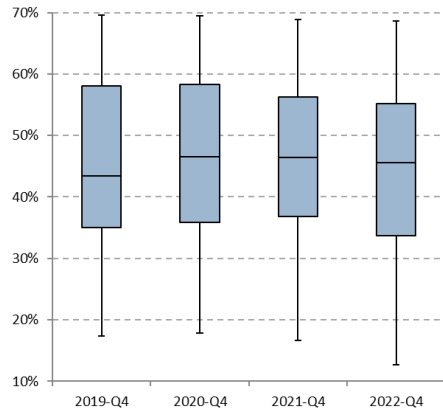
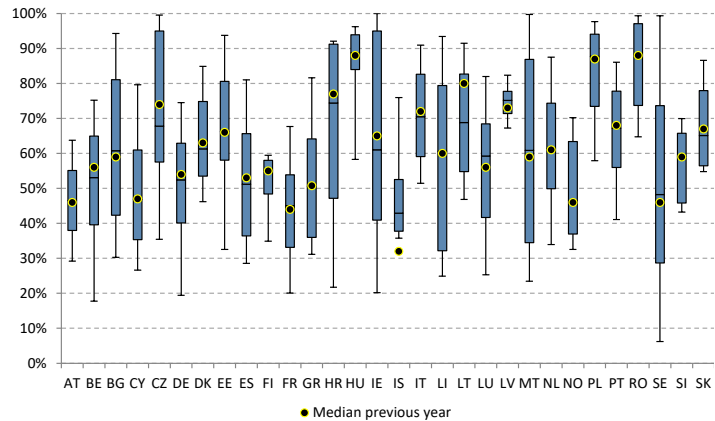


Figure 2.8: Liquid assets ratio by country (in %; median, interquartile range and 10th and 90th percentile)

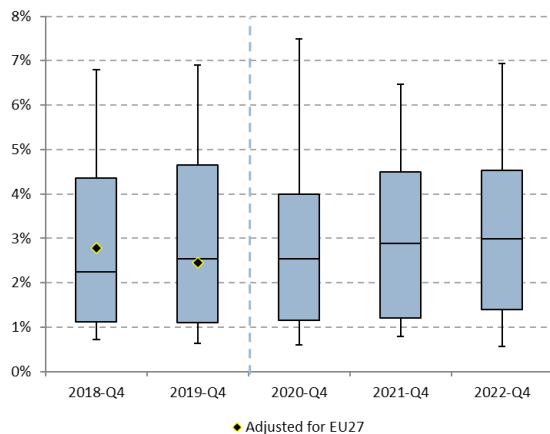


Source: EIOPA Quarterly Reporting Solo.

Note: The liquid assets ratio shows the proportion of liquid assets to total assets (excluding assets held for unit-linked contracts). The ratio is calculated by applying different weights (ranging from 100% for cash to 0% for intangible assets) to different assets according to their liquidity profile. The methodology has been reviewed in order to align with the enhancement of the liquidity risks category from October 2021 onwards in the EIOPA Risk Dashboard. Distributions from Figure 2.7 are weighted by total assets.

Lapse rates in the life business remained also stable (Figure 2.9) in 2022. The median lapse rate remained unchanged around 3% in 2022. Looking ahead, two developments might potentially cause an increase in lapse rates. The first would be an economic recession with negative effects on the income of policyholders. The second would be a strong increase in yields which could create incentives to lapse on existing contracts and seek higher returns elsewhere.

Figure 2.9: Lapse rates (in %).



Source: EIOPA Quarterly Financial Groups.

Note: As the figures prior to 2020 include the UK the median values before 2020 for the EU27 (excluding UK) are also reported.

2.3 PROFITABILITY

The profitability of insurers deteriorated in 2022. The higher interest rates and high inflation impact profitability through changes in the value of investments and their returns. In the short term, the impact is negative mainly due to losses on interest rate sensitive investments, over the long term it could however be positive due to higher returns on new investments. The median return on assets (ROA) decreased to 0.4% from 0.56% in the previous year. The median return on excess of assets over liabilities (a proxy for return on equity) dropped as well from 8% to 6% (Figures 2.10 and 2.11).

Figure 2.10: Return on Assets (in %; median, interquartile range and 10th and 90th percentile).

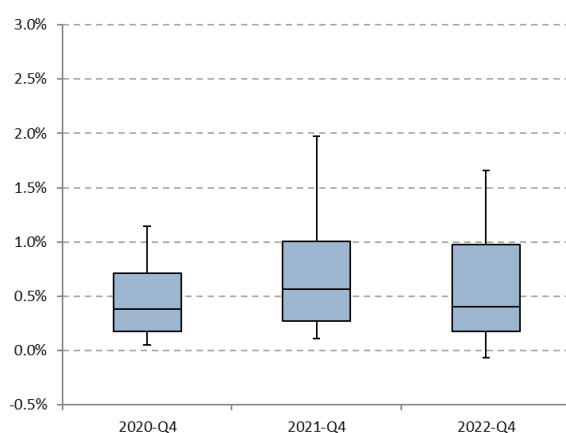
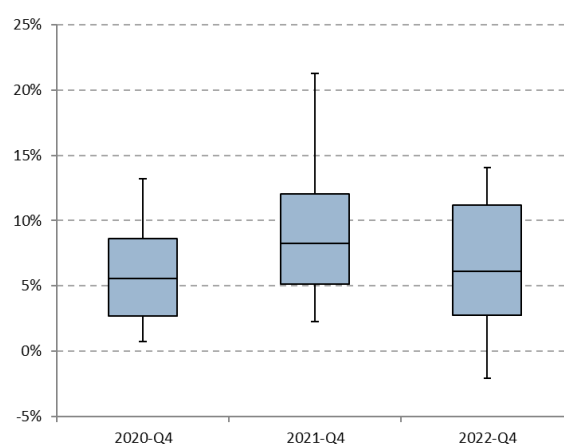


Figure 2.11: Return on Excess of Assets over Liabilities (in %; median, interquartile range and 10th and 90th percentile).



Source: EIOPA Quarterly Financial Groups (Templates S.39.01.11 and S.02.01.02).

The outlook on financial markets remains highly uncertain. So far, financial losses related to the Russian invasion of Ukraine and the collapse of Silicon Valley Bank are limited. However, the situation could escalate further with a more negative impact on the profitability of insurers. A positive development in terms of profitability is the upward trend of the risk-free interest rate. This is expected to result in further improvements in the capital positions of life insurers during 2023, as their liabilities tend to have a longer duration than their assets. Another medium- to long-term benefit of upward trending interest rates would be an improved profitability of fixed-income portfolios as maturing bonds are replaced with higher coupon bonds. In line with this the increase in expected profits in future premiums (EPIFP)³³ from YE 2021 (10.9%³⁴) to YE 2022 (12%) suggest improved expectations of profitability.

Underwriting profitability was lower in 2022. For assistance (combined ratio +6 pp) and credit and suretyship (+5 pp) this was due to an increase in claims only partially compensated by higher premiums. Transport related lines of business such as other motor as well as marine and aviation, saw a moderate decline in their underwriting profitability of around 6 pp as the result of higher claims. On the other side, workers' compensation and general liability's underwriting profitability

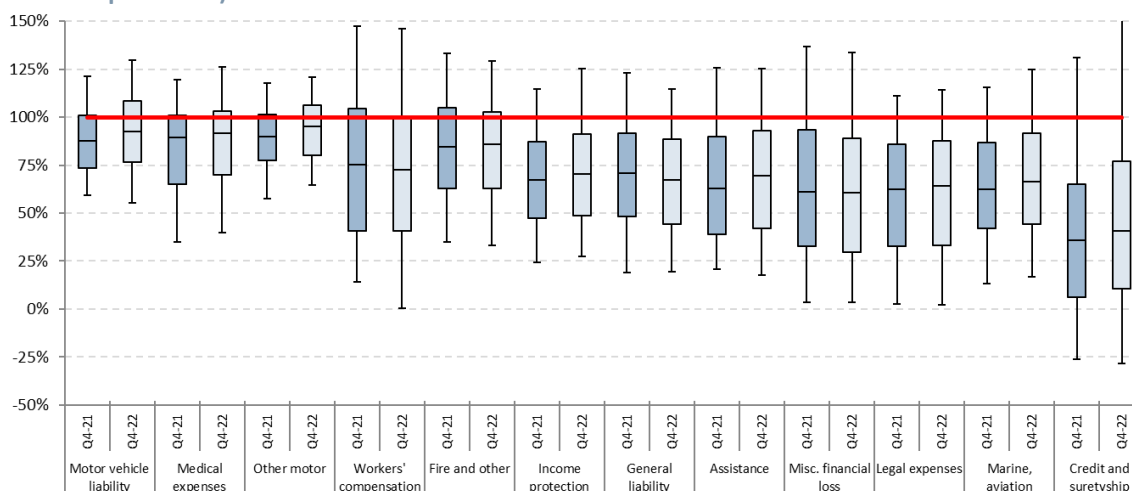
³³ "Expected profits included in future premiums" (EPIFP) are profits which result from the inclusion in technical provisions of premiums on existing (in force) business that will be received in the future, but that have not yet been received.

³⁴ Expected profit in future premiums as a share of eligible own funds to meet SCR.

improved thanks to an increase in premiums. The median gross combined ratio for non-life business remained below 100% for all lines of business which can be seen as an indication that most EEA insurers generated positive underwriting results (Figure 2.12).

A persistent and high inflation increases the claims to be paid to policyholders, especially for those non-life contracts with liabilities that have a relatively longer duration³⁵ (long-tail LoBs), posing a challenge for underwriting profitability, in particular for non-life business. Increases in premiums (Figure 2.1) could partially offset the negative impact. On the other hand, a slowdown of economic activities resulting in a reduction of premiums paid and lower new business could exacerbate the negative impact.

Figure 2.12: Gross Combined Ratio across lines of business (in %; median, interquartile range and 10th and 90th percentile).



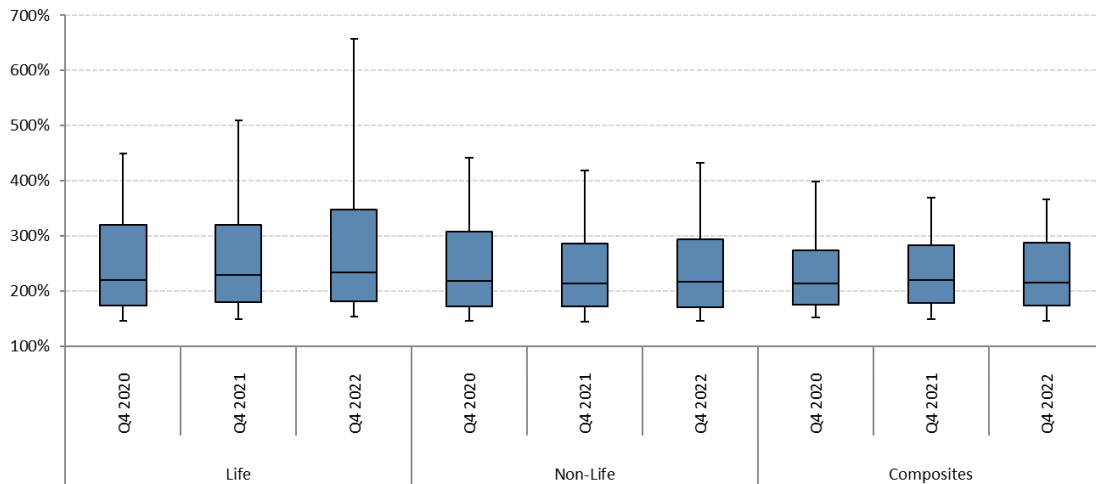
Source: EIOPA Quarterly Reporting Solo

2.4 SOLVENCY

The insurance sector entered 2023 with solid capital buffers (Figure 2.13). The Median SCR ratio for life insurers continued to improve as a result of higher risk-free interest rates from 228% in Q4 2021 to 234% one year later. Due to the long duration of their liabilities the value of technical provision decreased more in relative terms than the value of their assets with a positive effect on the excess of assets over liabilities. The median SCR ratio for non-life insurers also improved from 213% to 216%. On the other hand, composite undertakings experienced a moderate drop in their median SCR ratio but maintained a solid ratio of 214%.

³⁵ See topical focus on inflation in December 2022 EIOPA FSR.

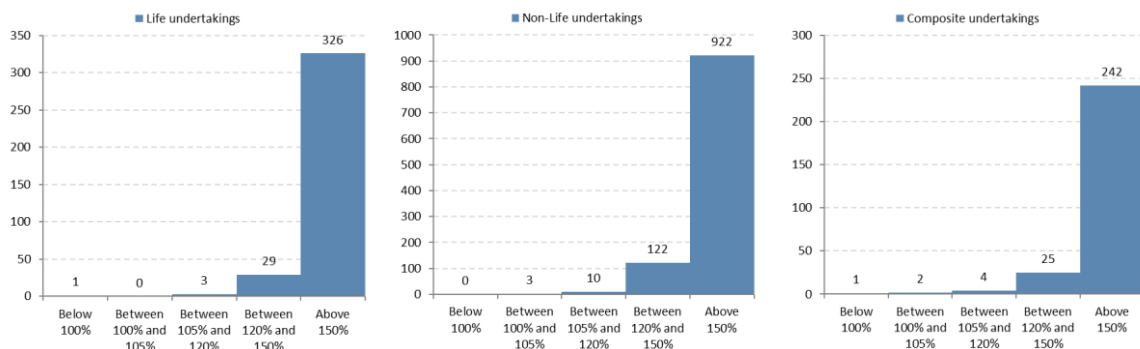
Figure 2.13: SCR ratio (in %; median, interquartile range and 10th and 90th percentile).



Source: EIOPA Quarterly Reporting Solo

Only one life undertaking and one composite undertaking reported a SCR ratio below 100% at the end of 2022. The number of non-life undertakings with SCR ratios between 100 and 105% rose from zero to three (composites from zero to two). In addition, the SCR ratio for 10 composite insurers dropped below 150 %.

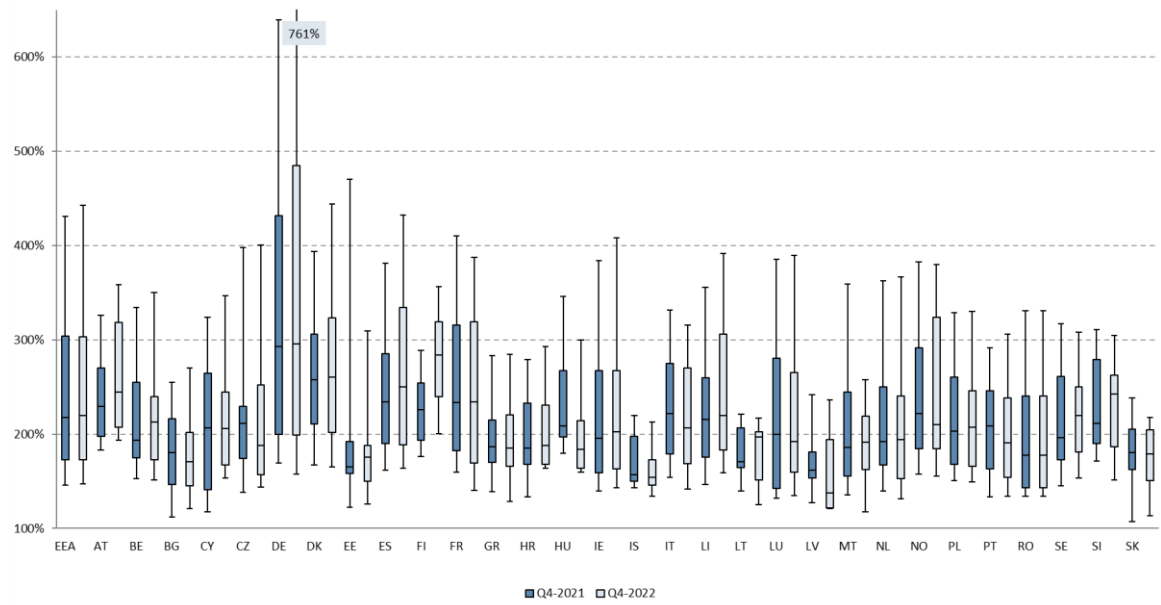
Figure 2.14: Frequencies of SCR ratios for solo undertakings as of end 2022 by type of undertaking.



Source: EIOPA Quarterly Reporting Solo

The capitalization of insurers across countries remains heterogeneous. The median SCR ratio for EEA insurers in aggregate improved in 2022 (Figure 2.15), there were however significant differences across Member States. Finland (66 pp), Slovenia (30 pp) and Lithuania (26 pp) saw the largest increases, while the median SCR ratio dropped in Hungary (-28 pp), the Czech Republic (-23 pp) and Portugal (-18 pp).

Figure 2.15: SCR ratio by country (in %; median, interquartile range and 10th and 90th percentile).



Source: EIOPA Quarterly Reporting Solo

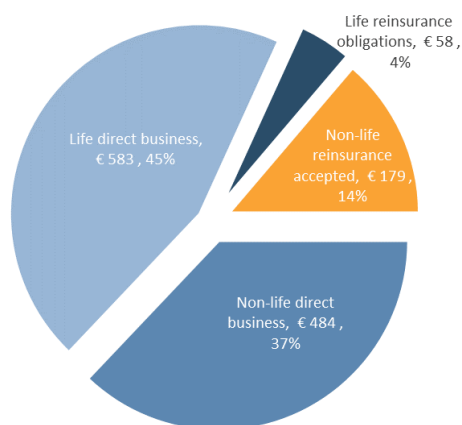
3 THE EUROPEAN REINSURANCE SECTOR

The European reinsurance sector remained resilient in 2022 despite continued challenges that included high catastrophe losses, high inflation and uncertain economic conditions. Premium Rate increases contributed to higher gross written and gross earned premiums. Despite the challenging renewals during January 2023, the European reinsurers were broadly able to obtain the reinsurance cover they sought. The solvency positions of European reinsurers remained robust in 2022.

3.1 MARKET SHARE AND GROWTH

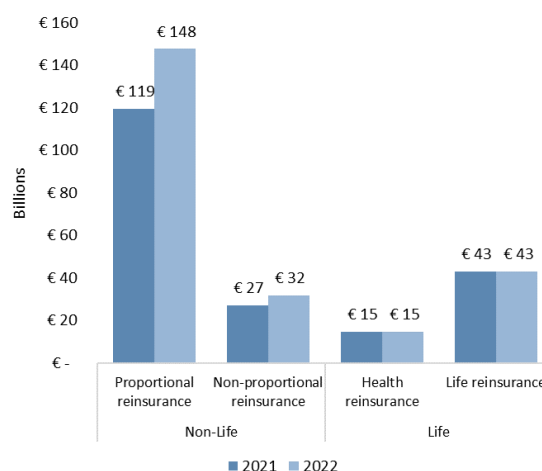
While reinsurance gross written premiums (GWP) for non-life segment increased significantly in 2022, it remained almost the same for life segment. Reinsurance GWP comprised 18% of the total GWP for insurance and reinsurance business in the EEA in 2022, standing at EUR 237 bn (Figure 3.1). Within this category, non-life reinsurance represents 14% of total GWP (EUR 179 bn), while life reinsurance accounts for 4% (EUR 58 bn). Like in 2021, non-life proportional and non-proportional reinsurance witnessed double digit growth in 2022 with 24% and 17% respectively (Figure 3.2). Within proportional reinsurance, the biggest increases came from credit and suretyship insurance (33%), medical expense insurance (30%) and miscellaneous financial loss (29%) (Figure 3.3). All lines in non-proportional business witnessed premiums growth in the range of 15-17% (Figure 3.4). Substantially higher growth in non-life reinsurance premiums relative to that for direct business (5%) is indicative of both greater demand for reinsurance coverage and increasing prices for it.

Figure 3.1: Gross Written Premiums in the EEA in 2022 (in EUR billion and %).



Source: EIOPA Quarterly Solo.
Reference date: Q4 2022.

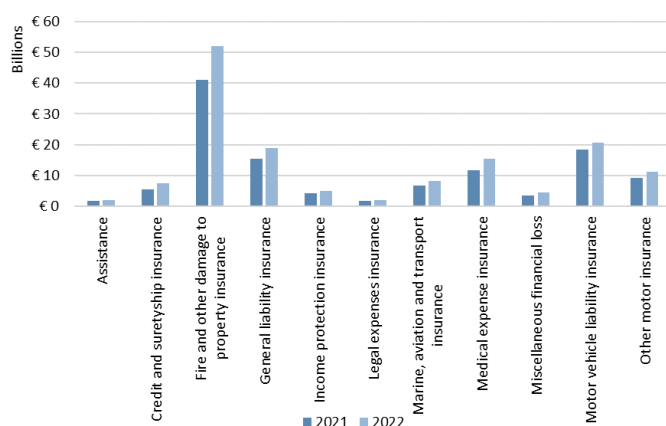
Figure 3.2: Reinsurance Gross Written Premiums in the EEA in 2022 and 2021 (in EUR billion).



Source: EIOPA Quarterly Solo.
Reference date: Q4 2022.

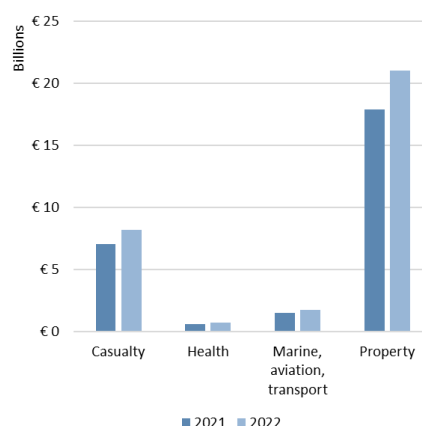
At the end of 2022, the global reinsurance capital stood at USD 575 bn (YE 2021: USD 675 bn), a decrease of 17.4% driven by substantial unrealised losses on investment portfolios³⁶. The traditional reinsurance capital stood at USD 482 bn, 16.8% below the previous year-end value of USD 579 bn. The underwriting results of reinsurers were generally resilient, but investment portfolios were impacted by unrealised losses, stemming from rising bond yields, widening credit spreads and declining equity markets. This negatively affected overall earnings as well as excess of assets over liabilities values. Alternative capital³⁷ decreased by 3% to USD 93 bn in 2022. In contrast, the outstanding amount of property catastrophe bonds grew by roughly 7% during 2022.

Figure 3.3: Gross Written Premiums for non-life proportional reinsurance by Line of Business (in EUR bn.).



Source: EIOPA Quarterly Solo.
Reference date: Q4 2022.

Figure 3.4: Gross Written Premiums for non-life non-proportional reinsurance by Line of Business (in EUR bn.).



Source: EIOPA Quarterly Solo.
Reference date: Q4 2022.

Negotiations for January 2023 renewals lasted longer than usual and resulted in increasing reinsurance prices³⁸. Global Property Catastrophe prices increased by 27.5% on average. Especially property insurance experienced substantial price increases and rising attachment points across all regions and lines of business.

Retrocession experienced significant price increases and constrained capacity in the property retro market. Due to this, the majority of retro programs were restricted to peak risks. The late retro renewal led to further delays and uncertainty in the reinsurance renewals which take place at the same time.

³⁶ AON Benfield: Reinsurance Market Dynamics April 2023

³⁷ Comprises of catastrophe bonds, sidecars, insurance linked warranties, collateralized reinsurance and other

³⁸ Gallagher Re: 1st View January 2023

3.2 PROFITABILITY

After record-high losses caused by natural catastrophes in 2021, the losses in 2022 were in line with the average of the last five years. According to estimates³⁹, natural catastrophes caused worldwide economic losses of USD 270 bn, a decrease of 12.9% compared with the previous year (USD 310 bn). The insured losses of USD 120 bn were comparable with the 2021 figures, thus leading to another costly year for the insurance industry. The number of fatalities increased from 9,320 in 2021 to 11,000 in 2022.

As in the previous year, natural catastrophes in North America dominated the statistics. Mainly due to the losses caused by Hurricane Ian, the North American share of losses stood at 55.6% in terms of economic losses and 75.0% in terms of insured losses. The costliest natural disaster in 2022, both in terms of overall and insured losses, was Hurricane Ian, which made landfall in September on the Florida west coast. Overall losses amounted to approximately USD 100 bn, of which approximately USD 60 bn were insured. After inflation adjustment, Hurricane Ian was the second-costliest tropical cyclone on record for the insurance industry after Hurricane Katrina in 2005.

A series of winter storms hit northern and north-western Europe in February with wind speeds of hurricane force. This led to overall losses of EUR 5 bn (USD 5.6 bn) with EUR 3.9 bn (USD 4.3 bn) insured. Additionally, the extremely hot and dry summer caused droughts, wildfires and low water levels affecting commercial shipping – but also lead to severe thunderstorms with heavy hail, e.g., in France and Spain.

Table 3.1: The five largest natural catastrophes in 2022, ranked by insured losses.

| Date | Event | Region | Fatalities | Overall losses (USD bn) | Insured losses (USD bn) |
|-----------------|-----------------------|---------------------|------------|-------------------------|-------------------------|
| 27 Sep - 1 Oct | Hurricane Ian | United States, Cuba | 150 | 100.0 | 60.0 |
| 16 - 21 Feb | Winter storm (series) | Europe | 56 | 5.6 | 4.3 |
| 20 Feb - 11 Mar | Floods | Australia | 22 | 6.6 | 3.9 |
| 16 Mar | Earthquake | Japan | < 10 | 8.8 | 2.8 |
| 18 Jun - 4 July | Severe storms, hail | France | < 10 | 3.3 | 2.6 |

Source: Munich Re, NatCat SERVICE 2022 [\[link\]](#).

Underwriting profitability of European reinsurers varied significantly across segments in 2022.

The median gross combined ratio for EEA reinsurers for non-life accepted proportional reinsurance increased from 90% in 2021 to 93% in 2022 (Figure 3.5). However, the median gross combined ratio for accepted non-proportional reinsurance decreased from 89% to 77% during the same period (Figure 3.6). Indeed, the growth rate in incurred claims for proportional reinsurance outpaced that in earned premiums whereas the non-proportional segment witnessed a decline in claims but a strong growth in premiums (Table 3.2). The effect of premium rate increases can be observed across most lines of business in terms of strong growth in earned premiums (Table 3.2).

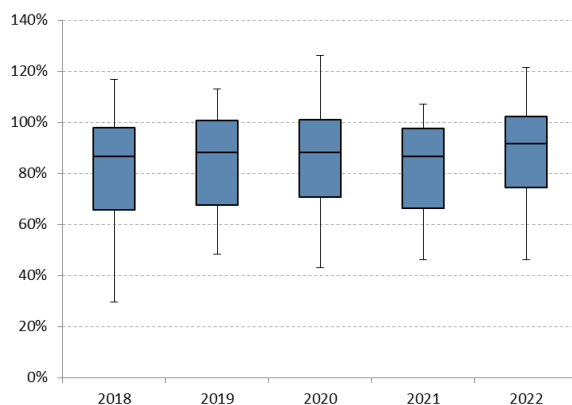
³⁹ Munich RE NatCatSERVICE [\[link\]](#)

Table 3.2: Gross Earned Premium and Claims incurred per line of business for EEA reinsurance undertakings.

| Line of business | 2021 | | 2022 | |
|---|----------------------|-----------------------|----------------------|-----------------------|
| | Gross earned premium | Gross claims incurred | Gross earned premium | Gross claims incurred |
| | € bn | € bn | € bn | € bn |
| Medical expense insurance | 2.6 | 2.0 | 2.9 | 2.8 |
| Income protection insurance | 1.6 | 0.9 | 2.3 | 2.2 |
| Workers' compensation insurance | 0.4 | 0.3 | 0.5 | 0.3 |
| Motor vehicle liability insurance | 15.0 | 10.2 | 17.8 | 13.3 |
| Other motor insurance | 7.5 | 5.0 | 9.4 | 6.7 |
| Marine, aviation and transport insurance | 4.5 | 2.8 | 5.3 | 4.0 |
| Fire and other damage to property insurance | 29.5 | 19.6 | 38.2 | 27.7 |
| General liability insurance | 10.7 | 7.1 | 13.3 | 8.7 |
| Credit and suretyship insurance | 4.2 | 1.4 | 5.8 | 2.3 |
| Legal expenses insurance | 0.5 | 0.3 | 0.6 | 0.3 |
| Assistance | 0.2 | 0.1 | 0.2 | 0.0 |
| Miscellaneous financial loss | 2.1 | 1.7 | 2.8 | 1.6 |
| Proportional Reinsurance - total | 78.9 | 51.3 | 99.1 | 69.8 |
| Health | 0.5 | 0.3 | 0.6 | 0.4 |
| Casualty | 5.9 | 4.8 | 6.6 | 4.6 |
| Marine, aviation, transport | 1.1 | 0.6 | 1.5 | 1.3 |
| Property | 14.3 | 16.0 | 17.3 | 13.7 |
| Non-Proportional Reinsurance - total | 21.7 | 21.7 | 25.9 | 20.0 |
| Non-Life - total | 100.6 | 72.9 | 125.0 | 89.8 |
| Health reinsurance | 12.5 | 9.3 | 12.4 | 9.0 |
| Life reinsurance | 27.5 | 24.8 | 27.8 | 23.5 |
| Life - total | 40.1 | 34.1 | 40.2 | 32.5 |
| Total | 140.7 | 107.0 | 165.2 | 122.4 |

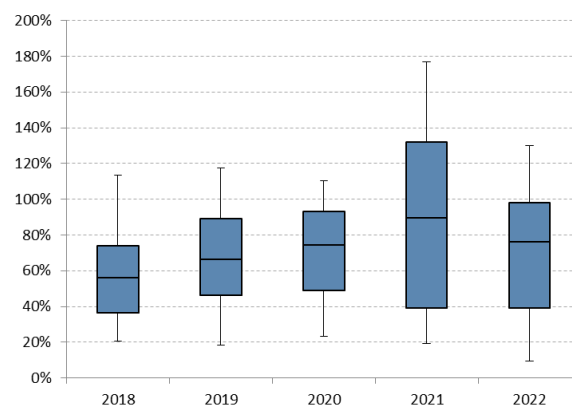
Source: EIOPA Quarterly Solo (reinsurance undertakings)

Reference date: Q4 2022 and Q4 2021.

Figure 3.5: Gross Combined Ratio for non-life accepted proportional reinsurance of EEA reinsurance undertakings (in %; median, interquartile range and 10th and 90th percentile).


Source: EIOPA Quarterly Solo.

Reference date: Q4 2022.

Figure 3.6: Gross Combined Ratio for accepted non-proportional reinsurance of EEA reinsurance undertakings (in %; median, interquartile range and 10th and 90th percentile).


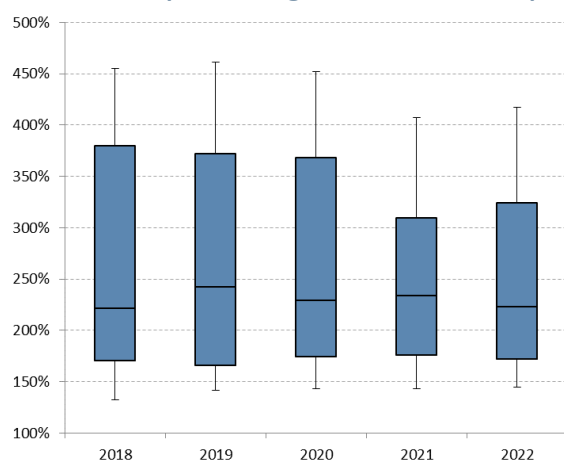
Source: EIOPA Quarterly Solo.

Reference date: Q4 2022.

3.3 SOLVENCY

The solvency positions of EEA reinsurers remained stable in 2022 and broadly in-line with those in 2021. The median solvency ratio decreased slightly from 234% at end of 2021 to 223% at end of 2022 (Figure 3.7). Inflation and climate change risks will likely be continuing challenges for solvency positions with possible impacts on the cost and availability of reinsurance over the long-term. In this context, the Box 4.1 takes a closer look at how the supply of reinsurance is affected by current market conditions.

Figure 3.7: Solvency ratio of EEA reinsurance undertakings (in %; median, interquartile range and 10th and 90th percentile)



Source: EIOPA Quarterly Solo.

Reference date: Q4 2022.

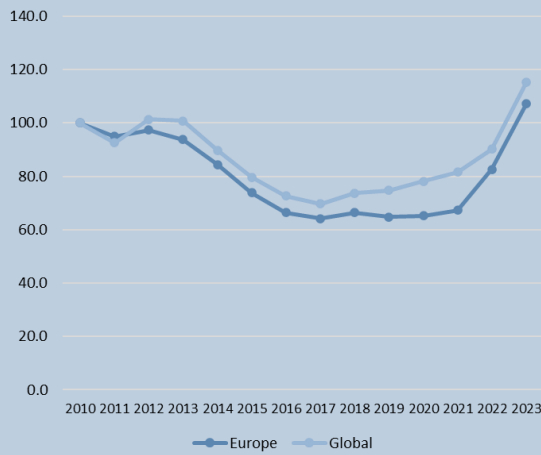
BOX 3.1: ARE EUROPEAN (RE)INSURERS ABLE TO SECURE ADEQUATE REINSURANCE IN A HARD MARKET?

Six consecutive years of above average⁴⁰ insured catastrophe losses in 2022 contributed to a strong rise in the prices for property catastrophe reinsurance. The Guy Carpenter Rate-on-Line (RoL) index for property catastrophe grew by about 30% (YOY) for the European January 2023 renewals (Figure B3.1).

While the global RoL index has been increasing steadily since 2018, the increases for Europe have only been prominent since 2021 (Figure B3.1). The floods caused by weather system Bernd (2021), hailstorm in France (2022) and winter storms Dudley and Eunice (2022) have made the reinsurers in Europe more cautious. Additionally, high inflation and the Ukraine war have contributed to higher cost of claims and consequently higher premiums. The question remains whether European (Re)insurers can continue to access adequate reinsurance cover in current market conditions.

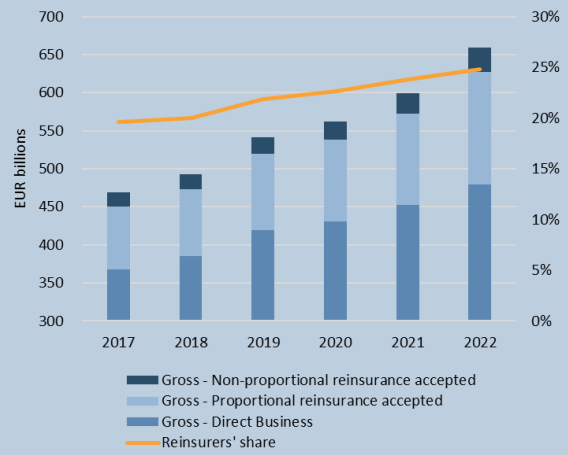
⁴⁰ calculated for the period 2000 to 2022

Figure B3.1: Guy Carpenter Global and Continental Europe Property Catastrophe Rate-On-Line Index (2010 – 2023)⁴¹



Source: Guy Carpenter and Artemis

Figure B3.2: Gross Written Premiums and reinsurers' share (2017 – 2022)



Source: EIOPA Quarterly Solo.

Reference date: Q4 of 2017 - 2022

Non-life reinsurance written premiums, which represent 82% of total reinsurance written premiums, grew by 24% during 2022, significantly outpacing the growth in direct written premiums (6%) and the growth in reinsurers' share (17%). This would appear to suggest that European (Re)insurers sought to take advantage of rising reinsurance prices by writing more business. At the same time, they strived to cede a similar share of written premiums as in 2021 as measured by the ratio of reinsurers' share of gross written premiums to the overall gross written premiums. This ratio increased only marginally from 24% to 25% which does not indicate that cedants on aggregate fell significantly short of securing adequate reinsurance cover. This would be consistent with market commentary on the January 2022 and 2023 renewals which noted that notwithstanding pricing challenges, the majority of European property cat programmes got renewed at desired levels.

⁴¹ Source: Guy Carpenter and Artemis[[link](#)]

4 THE EUROPEAN OCCUPATIONAL PENSION SECTOR

The European sector for occupational pensions faced multiple challenges in the past year. The ongoing war in Ukraine still dominated worldwide financial developments triggering inflationary pressures especially in the energy market, but also in other parts of the economy. Monetary authorities responded by tightening their monetary policy and thus raising interest rates at an intense pace. For IORPs, which hedge their duration mismatch by using interest rate derivatives, it became increasingly important to hold sufficient liquidity to meet margin calls on their interest rate derivatives positions. This especially affected IORPs in the UK, but also had consequences for IORPs based in the EEA. Furthermore, stock prices at the end of 2022 were lower than 12 months before, resulting in losses on the equity portfolios of IORPs. In addition, the early 2023 turmoil in the banking sector sparked contagion fears globally, increasing the uncertainty in the markets. On the assets side, these developments affected IORPs mainly negatively. The consequences for the liabilities of IORPs were mixed and depended to a large extent on the characteristics of the pension scheme: defined benefit (DB), or defined contribution (DC) and the valuation method used.

An ongoing policy, financial inclusion and conduct concern with potentially broader financial stability implications in the long-term are the looming pension gaps. Europeans are not saving enough for their retirement and women are in this respect in a worse position than men. EIOPA provided in 2021 advice to the European Commission on best practices for setting-up national pension tracking systems which provide citizens with an overview of their pension entitlements. Another advice was the development of a pension dashboard with transparent information on the adequacy and sustainability of national pension systems. These two tools constitute an important step towards raising citizens' awareness of their future retirement income, enhancing the monitoring of national pension systems and ultimately towards closing pension gaps.

4.1 FINANCIAL POSITION AND SIGNIFICANCE OF THE PENSION SECTOR

DB IORPs improved their already strong financial position after the recovery from the covid-crisis in the course of 2022 even further. This allowed many IORPs to compensate their members fully or partially for the effect of inflation where this is conditional on a minimum funding ratio: The estimated funding ratio for DB IORPs improved from 118% to 120%. This is explained by the fact that, on aggregate, the decrease in the value of their liabilities exceeded the losses that IORPs incurred on their assets.

The total assets of IORPs dropped during 2022 by EUR 362 bn from EUR 2,740 bn to EUR 2,378 bn (Figure 4.1)⁴². This was mainly driven by losses on their derivatives portfolios and by lower values

⁴² Unless stated otherwise, the graphs and figures in the following sections refer to all EEA IORPs.

for their investments via investment funds and for direct holdings of government and corporate bonds. Portfolio investments in shares grew slightly in 2022.

Despite an increase in the fourth quarter the liabilities of IORPs also decreased in 2022 (Figure 4.2). Overall, the value of the technical provisions dropped year-on-year from EUR 2,327 bn to EUR 2,033 bn. For IORPs providing defined contribution pension schemes, the value of their technical provisions followed more-or-less the changes in the value of their assets. For DB IORPs using market consistent methods to value their pension entitlements, higher interest rates lowered the value of their technical provisions. In 2022 Q4, however, in some member states IORPs announced to compensate fully or partially for inflation which consequently resulted in a increase of the technical provisions. Nonetheless, the financial position of these IORPs remained overall healthy. DB IORPs valuing their technical provisions by using a fixed interest rate or valuing their technical provisions only annually (or less frequently),⁴³ did not report a significant change in their liabilities.

Figure 4.1 Breakdown of total assets (in bn euro).

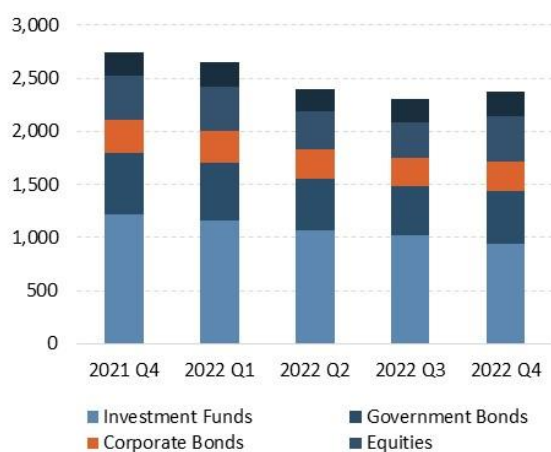


Figure 4.2 Breakdown of total liabilities by type of pension scheme (in bn euro).

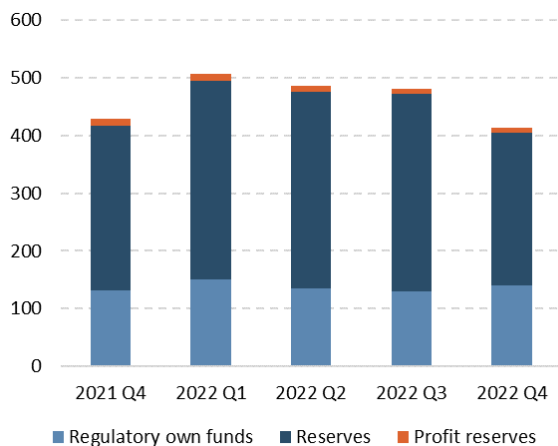


Source: EIOPA Occupational Pensions Statistics – Balance Sheet, quarterly.

As the drop in the value of liabilities exceeded the decrease in the value of assets, the financial position of IORPs in the EEA improved. However, there are significant differences between EEA Member States. The improved financial position for the EEA on aggregate was mainly the result of the financial developments in the dominant (in terms of assets) Dutch IORP sector. Due to some of its characteristics, for example the market consistent valuation of technical provisions, the financial position for the Dutch IORP sector improved considerably. In many other countries with DB pension schemes different rules apply, for example a fixed discount rate to value the technical provisions. In the latter countries, the financial position of DB IORPs deteriorated in 2022.

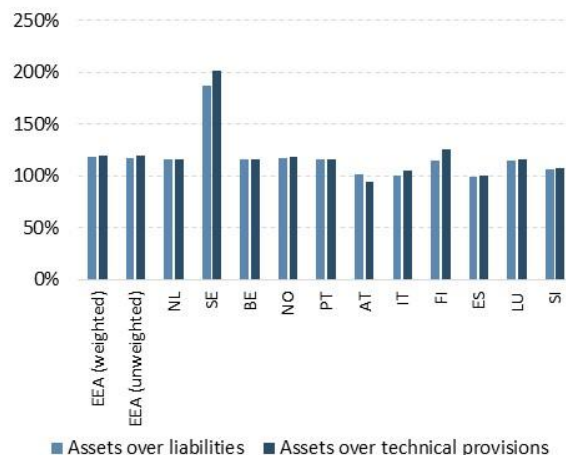
⁴³ For the latter category, the annual calculation of the technical provisions takes place in the first few months of the year. This means that the reported technical provisions will often be based on calculations from early 2022.

Figure 4.3 Components of the Excess of Assets over Liabilities (in bn euro).



Source: EIOPA Occupational Pensions Statistics – Balance Sheet, quarterly.

Figure 4.4 Cover ratios by EEA Member State (DB schemes).

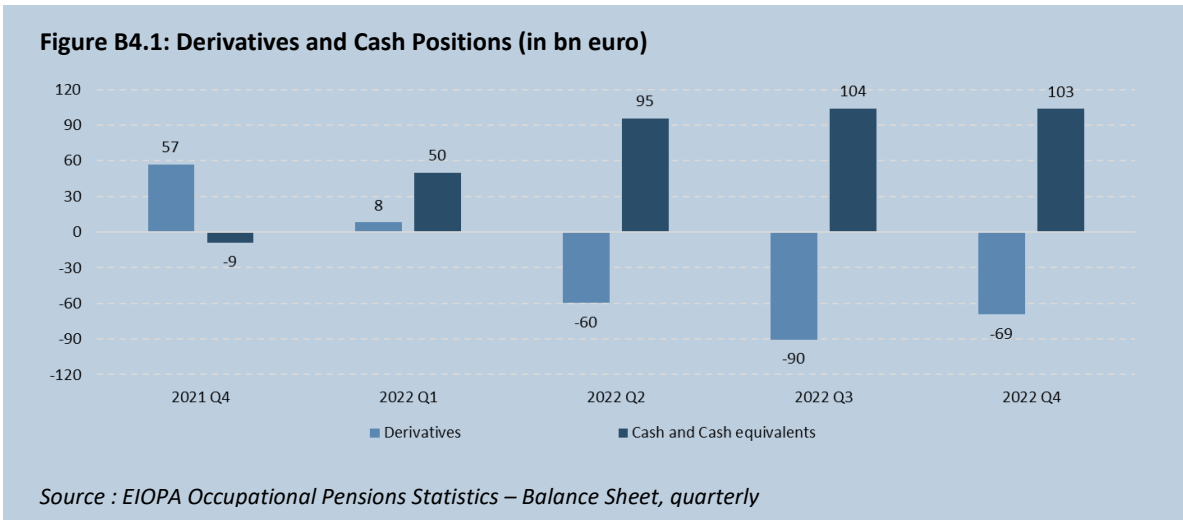


Source: EIOPA Occupational Pensions Statistics – Balance Sheet, quarterly. Reference date: Q4 2022. The weighting is based on total assets. In the case of Italy, due to discontinuation of many DB schemes, the data on technical provisions that are reported to EIOPA are set as equal to the assets held. Notice that the overall share of DB schemes in Italy is only around 2.6% of total assets.

Some EEA IORPs hedge against interest rate risk by using derivative contracts. As 2022 proved to be characterized by a period of heightened macro uncertainty and by an upward trend in interest rates, IORPs using derivatives were already faced with margin calls over the past quarters. Box 4.1 focuses on the derivative positions of IORPs in the light of the past events.

BOX 4.1: MOVEMENTS IN INTEREST RATES AND DERIVATIVES POSITIONS

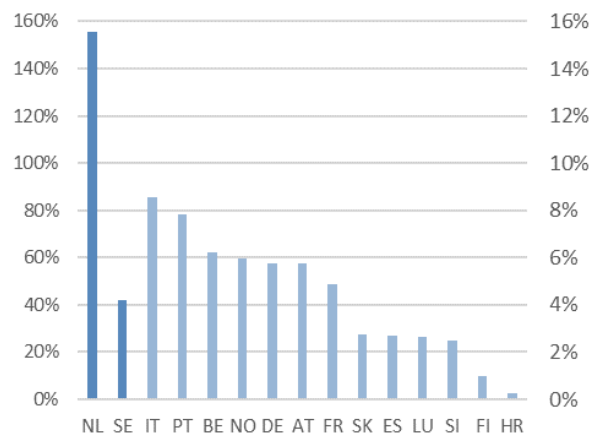
During 2022, the increase in interest rates resulted in losses on the derivative positions of IORPs. Their net market value switched from positive (+EUR 57 bn in Q4 2021) to negative (EUR -69 bn in Q4 2022), as shown in Figure B4.1. These fluctuations were the result of IORPs hedging their duration mismatch by using interest rate derivatives. DB and mixed IORPs that value their technical provisions market consistently, try in general to hedge this duration mismatch (most of them partially). As the duration of their liabilities normally exceeds the duration of their assets, they protect themselves against a decline in interest rates. When the opposite movement occurs, as in 2022, the net market value of derivative positions drops and IORPs receive margin calls from their counterparties, which lead in some cases to strained liquidity ratios. To meet margin calls IORPs sold liquid assets such as short-term debt securities, government bonds and equities. As a consequence, the cash positions on the balance sheets of IORPs increased considerably.



The structure of the pensions sector depends very much on the characteristics of the national pensions system. It consists normally of three pillars, with Pillar I being a government provided old age pension, Pillar II an occupational pension and Pillar III an individual pension. Each of the pillars contribute eventually to the income of pensioners. A certain level of complementarity exists between the three pillars which varies between Member States. Some countries put more emphasis on Pillar I, whereas in other countries Pillar II or III are more important.

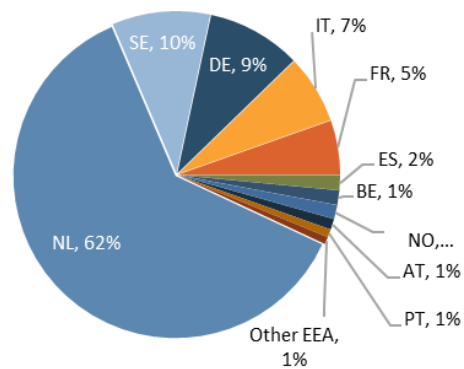
The penetration rate provides an indication of the importance of the second Pillar in a Member State. It is defined as the ratio between the value of the total assets of all IORPs and the gross domestic product (GDP) and shows the size of the IORP sector relative to the size of the economy (Figure 4.5). The holdings of Dutch IORPs amount to nearly 160% of its annual GDP. For the other Member States, penetration rates are lower (Sweden 40%, Italy and Portugal around 8%). For DE with the third largest IORP sector in the EEA measured in size of assets, the figure is about 6%. In terms of size, Figure 4.6 shows that 62% of all EEA IORP assets are held by Dutch entities, followed by Sweden (10%), Germany (9%) and Italy (7%).

Figure 4.5 Penetration rates by EEA Member State



Source: EIOPA Occupational Pensions Statistics & EUROSTAT. Reference date: Q4 2022.

Figure 4.6 Relative size of the pension sector by EEA Member State

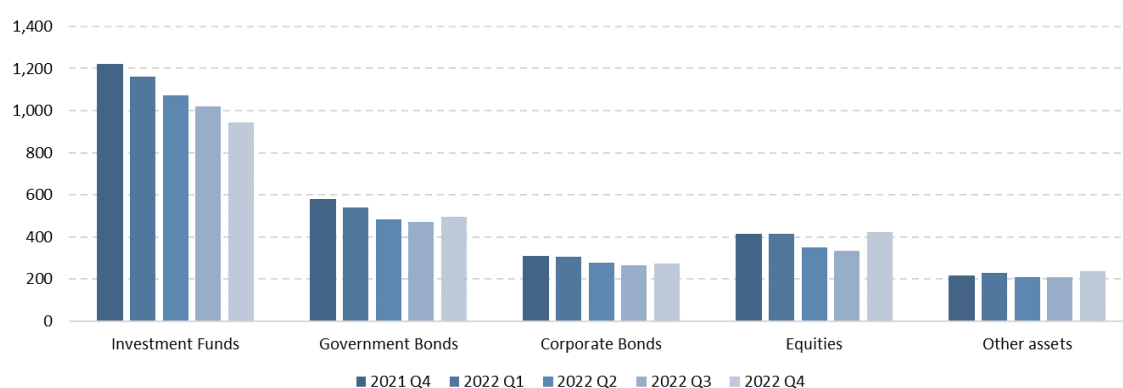


Source: EIOPA Occupational Pensions Statistics – Balance Sheet, quarterly. Reference date: Q4 2022. Relative size is determined as the ratio of total assets in the Member State to EEA total assets.

4.2 ASSET ALLOCATION OF IORPS

The asset allocation of IORPs changed somewhat in the course of 2022. A striking development was the lower allocation to investment funds, both in absolute (Figure 4.7) and relative terms. The relative share of investment funds in IORP portfolios dropped from 51% at year-end 2021 to 42% at the end of 2022 (Figure 4.8). This development is connected to the need to generate cash for their margin accounts that provides collateral on their derivative positions. Furthermore, IORPs allocated a slightly larger share of their portfolio to direct equity investments (from 15% to 18%). Their direct investments into government and corporate bonds remained more or less stable (around 20% and 11% respectively).

Figure 4.7 Allocation to asset categories (in bn euro).



Source: EIOPA Occupational Pensions Statistics – Balance Sheet, quarterly.

Huge differences exist between Member States (Figure 4.8). The allocation at the EEA level basically reflects the asset allocation of the Dutch IORP sector (due to its dominant size). Among the countries with a larger IORP sector, pension institutions in DE and BE allocate most of their assets via investment funds, whereas direct investments dominate in SE. The differences in asset allocation, expose IORPs from different countries to different investment risks.

There are also differences between Member States in the asset allocation of investment funds which are held by IORPs (Figure 4.9). In nearly all Member States, the share of equities in the investments held via investment funds is at least 40%. One exemption is DE with a much smaller percentage. German IORPs invest via investment funds mainly in debt funds, asset allocation funds (funds with mixed allocation assets) and so-called ‘other investment’ funds.

Figure 4.8 Asset allocation by EEA Member State.

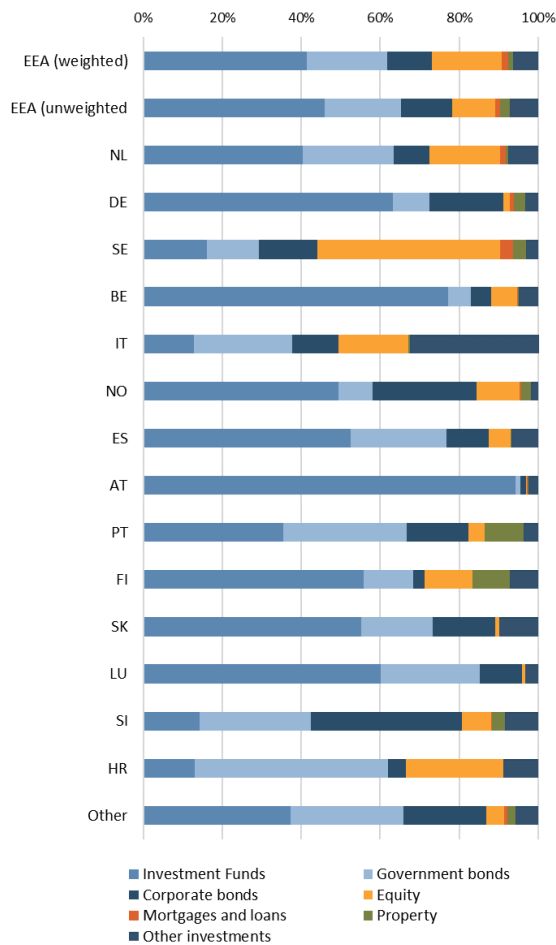
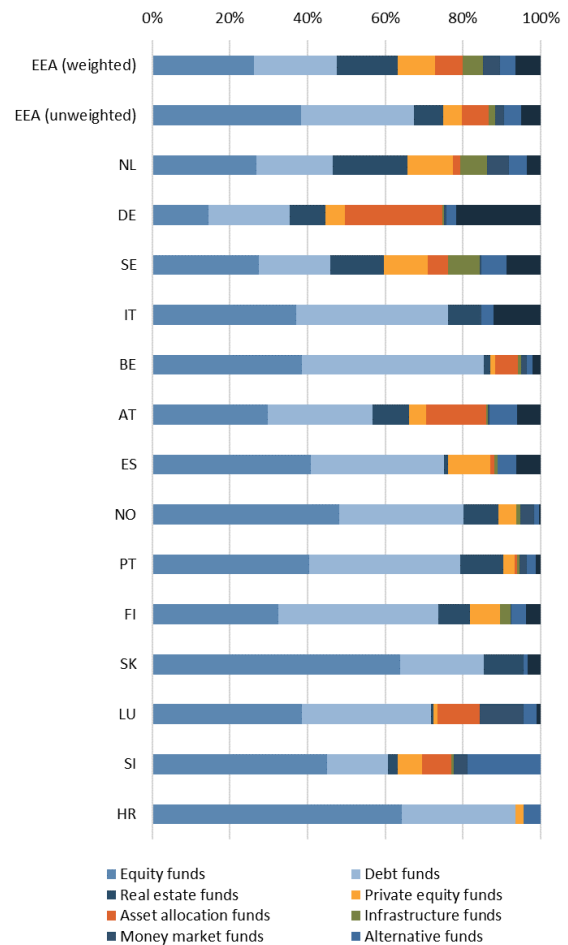


Figure 4.9 Investment funds: breakdown into subcategories by EEA Member State.



Source: EIOPA Occupational Pensions Statistics - Asset Exposure, quarterly; Reference date: Q4 2022.

The asset allocation of DB and DC IORPs differs substantially. On a look-through basis the former normally hold a larger proportion of their investments in less risky asset categories (Figures 4.10 and 4.11). For example, bonds represent 45% of DB IORP assets, whereas the value for DC IORPs is 29%. For equities, on the contrary, DB IORPs allocate 34% and DC IORPs 40%. DC IORPs allocate also a larger share of their investments to property and other investments, which are deemed riskier than bonds. As a result DC IORPs would be more exposed to a fall in prices of riskier assets than DB IORPs in the event of adverse financial market developments, at least in the short run.

Figure 4.10: DB schemes: Asset allocation with full look-through for investment funds by EEA Member State.

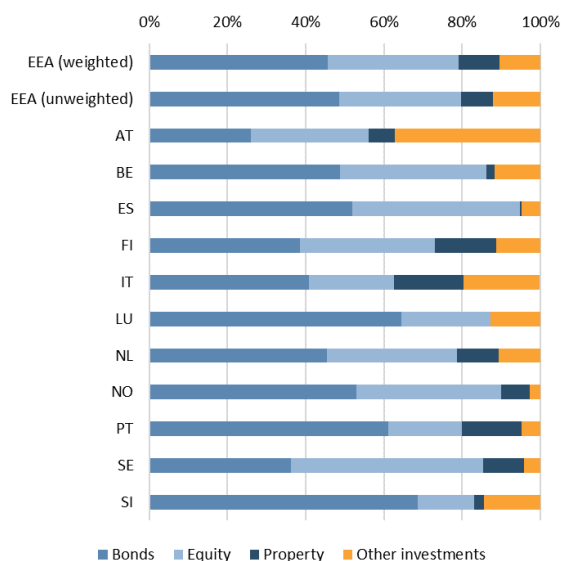
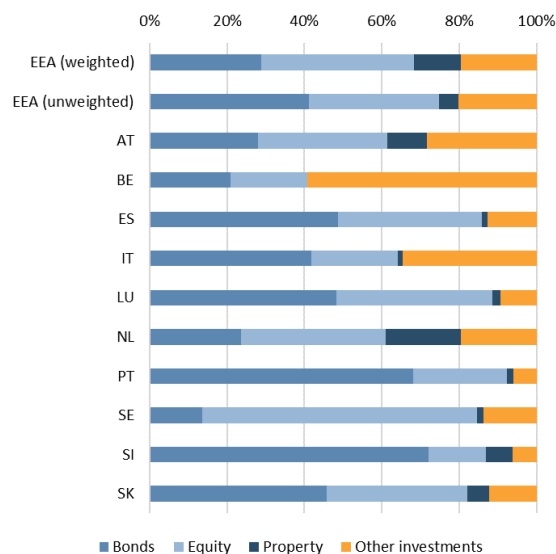


Figure 4.11: DC schemes: Asset allocation with full look-through for investments by EEA Member State.



Source: EIOPA Occupational Pensions Statistics - Asset Exposure, quarterly. Reference date: Q4 2022

Note: Bonds consist of government bonds, corporate bonds, mortgages and loans, debt funds and money market funds. Equity consists of direct equity, equity funds and private equity funds. Property consists of direct property, real estate funds and infrastructure funds and ‘other’ investments consists of direct other investments, asset allocation funds, alternative funds and other funds.

4.3 MEMBERS AND BENEFICIARIES

At the end of 2021 IORPs in the EEA had nearly 29 million active members (i.e. persons currently accruing claims – see Figure 4.12). Around 9.5 mil of them participate in DB pension schemes and 12.4 mil in DC pension schemes. For the rest, the data does not provide a split between DB and DC.

The number of deferred members (i.e. persons who had left service with an entitlement to future benefits) was nearly 21 million (11.2 million in DB pension schemes)⁴⁴. The Netherlands, Germany and Italy are the three EEA Member States with the most active members, nearly 63% of all active members in the EEA were registered with IORPs from these countries, followed by Sweden, Spain and Belgium (Figure 4.13).

⁴⁴In these figures double counting can occur. For example, a person can be registered as an active member at one IORP and a deferred member at another. Similarly, one person can be registered as a beneficiary at multiple IORPs.

Figure 4.12: Breakdown of IORP Members by pension scheme.

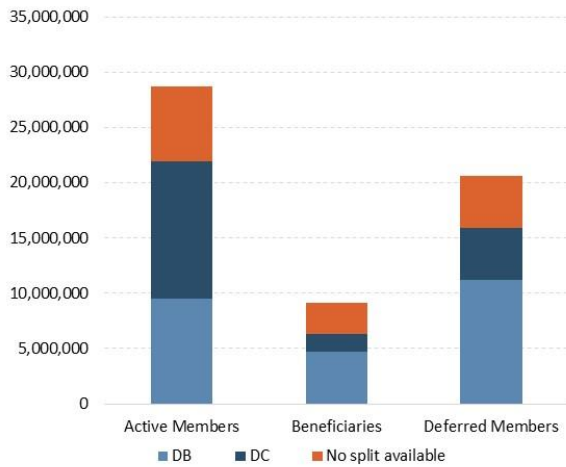
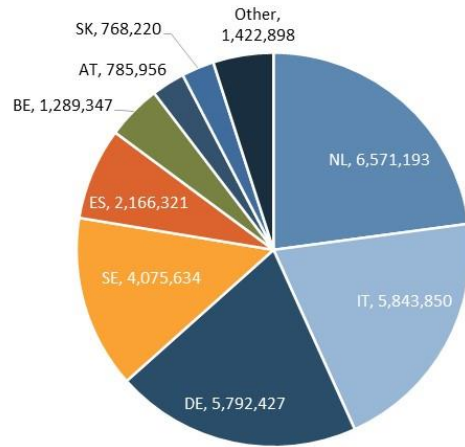


Figure 4.13: Active members.

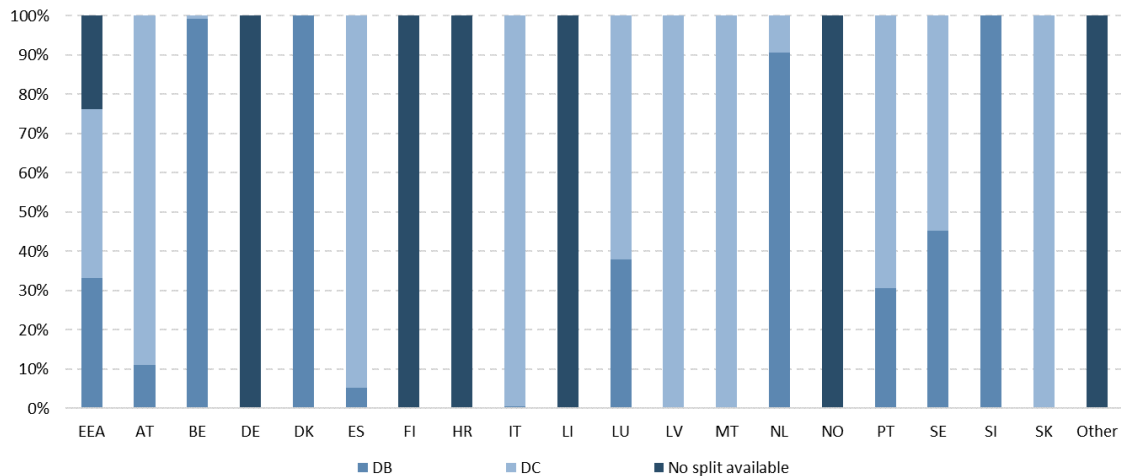


Source: EIOPA Occupational Pensions Statistics - Members.
Reference date: 2021.

Per year end 2021, 9.1 million beneficiaries received payments from IORPs, with 51% of them in DB pension schemes and 18% in DC pension schemes.⁴⁵ In some cases, DC pension schemes do not offer a lifetime benefit, but instead provide a lump sum at retirement. In this case the accumulated savings of a person are transferred to another financial institution, for example when the retiree buys an annuity from an insurer, and the person does not appear as a beneficiary in subsequent statistics.

The relative importance of DB and DC pension schemes varies widely across Member States. Whereas for example most active members of Dutch IORPs are contributing to defined benefit schemes, nearly all active members of Italian IORPs are enrolled in DC pension schemes (Figure 4.14).

Figure 4.14 :Active IORP members by Member State, broken down by type of pension scheme.



Source: EIOPA Occupational Pensions Statistics - Members.
Reference date: 2021

⁴⁵ The remaining part are beneficiaries for IORPs where no split is available.

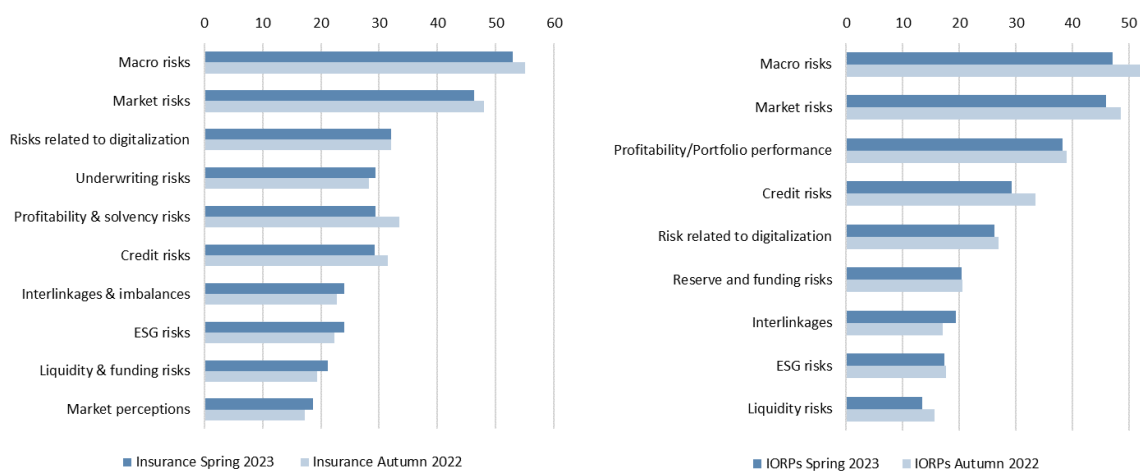
5 RISK ASSESSMENT

5.1 RESULTS OF THE SPRING SURVEY AMONG NATIONAL COMPETENT AUTHORITIES

In order to assess the key risks and vulnerabilities for the insurance and IORP sectors, EIOPA conducted its regular Spring qualitative survey among National Competent Authorities (NCAs).

According to the respondents the macroeconomic outlook for insurers and IORPs slightly improved since Autumn 2022 with macro and market risks remaining the main concerns in the Spring of 2023 (Figures 5.1 and 5.2). The high inflation and interest rates are a continuing challenge for insurers and IORPs. Despite lower returns and decreasing underwriting profitability (Chapter 2) the capital position of the EEA insurance sector remains solid. A macroeconomic scenario with persistent high inflation could lead to a further deterioration in the economic situation of households and lower their demand for insurance products. Second-round effects such as a drop in aggregate demand and a rise in unemployment could further amplify the economic downturn. This in turn could result in losses in the invest portfolios of insurers and IORPs. The geopolitical instability, which NCAs identified as the main driver for macro risks for insurers (Figure 5.3) and IORPs at the moment, introduces greater uncertainty around the outlook for inflation and growth.

Figure 5.1: Materiality of risks for the insurance sector. Figure 5.2: Materiality of risks for the IORP sector.



Source: EIOPA Insurance Bottom Up Surveys Spring 2023 and Autumn 2022.

Note: The ranking is based on the responses received. Risks are ranked according to the probability of their materialisation (from 1 indicating low probability to 4 indicating high probability) and their impact (1 indicating low impact and 4 indicating high impact). The figures show the aggregation (i.e. the product probability times impact) of the average scores assigned to each risk. The results were subsequently normalised on a scale from 0 to 100.

Higher inflation rates can impact the financial situation of IORPs, especially where pension entitlements are linked to inflation or wage growth. In pension schemes with no or conditional

indexation current and future beneficiaries may lose purchasing power if the increase in inflation is not fully compensated.

Market risks remain a key risk for insurers and IORPs due to the continuing heightened global uncertainties, the resulting expectations of further losses in asset values and increased volatility in financial markets. Among market risks the survey identified interest rate and equity risks as the main concerns (Figure 5.4). Due to the increase in interest rates in 2022 there have already been considerable losses in the fixed income asset portfolios of insurers and IORPs. Going forward, market risks are expected to decrease (Figures 5.6).

In the past years life insurers reduced guaranteed rates for newly sold traditional products and made a shift to products where benefits are linked to the performance of financial markets as well as to products offering protection against biometrical risks. While market linked products reduce the risks for insurers, they result for policyholders in an increased exposure to negative market developments⁴⁶. In the medium to long term insurers with interest rate guarantees should benefit from higher interest rates. But they also increase the credit risk in investment portfolios.

For IORPs the impact higher interest rates on their liabilities of IORPs was mixed and depended to a large extent on whether they offer defined benefit or defined contribution pensions.

Figure 5.3: Main drivers of macro risks⁴⁷ for the insurance sector.

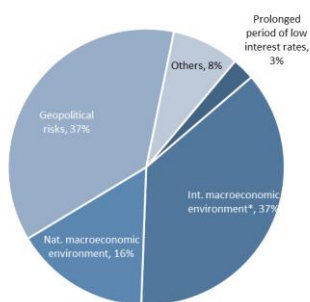


Figure 5.4: Main drivers of market risks for the insurance sector.

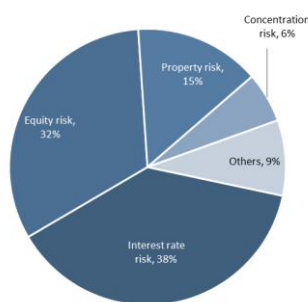
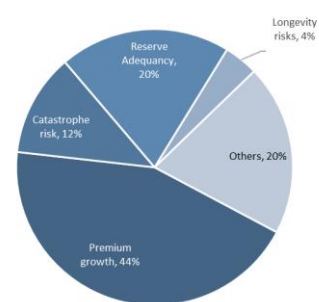


Figure 5.5: Main drivers of underwriting risks for the insurance sector.



Source: EIOPA Insurance Bottom Up Surveys Spring 2023 and Autumn 2022.
 Note: Based on the responses received.

Digitalization and cyber risks were ranked third in terms of their materiality for insurers and are expected to remain a key risk in the future (Figure 5.1 and Figure 5.6). The number of cyber-incidents continued to increase after the move to a more digital mode of working and the use of more digital distribution channels. This has direct effects for insurers both for the risks to their operations and their underwriting activities in a growing cyber insurance market. Concerns about cyber security issues remain high also due to worries about a hybrid geopolitical conflict.

According to the respondents portfolio performance remains a key concern for IORPs, ranked third among the top risks (Figure 5.2). Investment returns could be negatively impacted by a potential deterioration in economic and financial markets conditions.

⁴⁶ See discussion in Chapter 2 on unit-linked products.

⁴⁷ International and national macroeconomic environment drivers in macro risk category do not include prolonged low interest rates, which is a category *per se*.

The assessed materiality of underwriting risks for insurers increased since Autumn 2022. Higher inflation weakened underwriting profitability for EEA insurers in 2022 but the negative impact was partially offset by premium increases. High inflation challenges the underwriting profitability of non-life insurers due to higher claims costs and administrative expenses. Going forward underwriting risks are expected to remain a challenge for insurers (Figure 5.6).

Figure 5.6: Risks with the highest expected increase in their materiality over the next 12 months for the insurance sector.

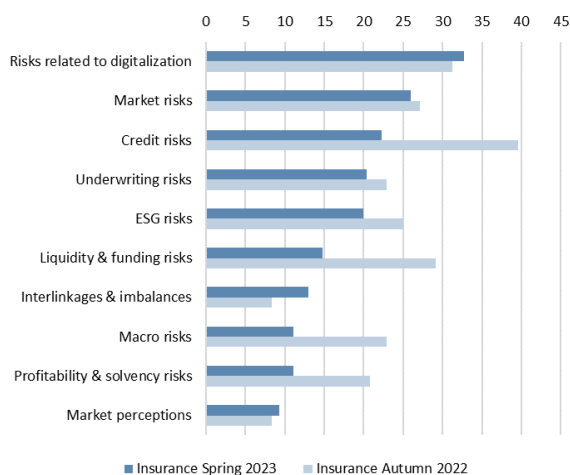
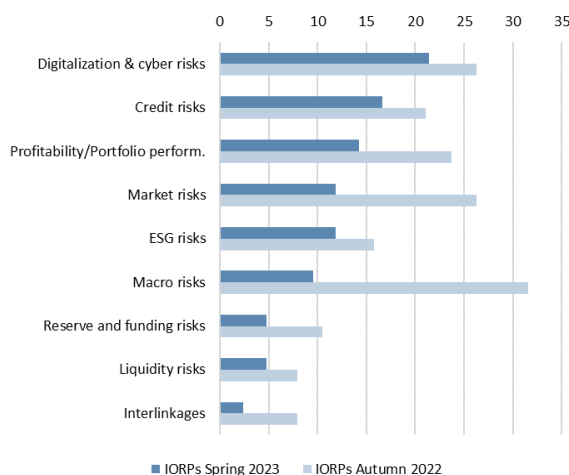


Figure 5.7: Risks with the highest expected increase in their materiality over the next 12 months for the IORP sector.



Source: EIOPA Insurance Bottom Up Surveys Spring 2023 and Autumn 2022.

Note: Ranking based on the responses received. Risks are ranked according to the expectation for the future change in their materiality (from -2 indicating strongly decrease to +2 indicating strongly increase). The figures show the aggregation of the average scores assigned to each risk. The results were subsequently normalised on a scale from -100 to 100.

5.2 QUANTITATIVE RISK ASSESSMENT FOR THE EUROPEAN INSURANCE AND IORPS SECTORS

This section continues the assessment of the key risks and vulnerabilities for the European insurance and IORPs sectors identified in previous parts of the report. It starts with shedding light on the investment behaviour of insurers and IORPs by providing a breakdown of their investment portfolios and asset allocations with a focus on specific country and sectoral exposures, as well as home bias and trading activities. Then the risks stemming from the interconnectedness with the banking sector are discussed with a particular focus on the recent events in US regional banks and the distress of Credit Suisse. The following subsection concentrates on the vulnerabilities coming from real estate investments before the background of increasing financing costs for real estate due to higher inflation and interest rates. The next and final section discusses the use of Liability Driven Investment strategies by EEA insurers and IORPs and possible liquidity risks for insurers as a result of variation margin calls on their interest rate swap positions.

5.2.1 INVESTMENT BEHAVIOR

5.2.1.1 Assets allocation

The investment behaviour of insurers and IORPs determines their exposures to market risks and gives an indication how they react over time to macroeconomic and geopolitical developments.

At the end of 2022, the total investment assets of EEA insurers reached a market value of approximately EUR 5.9 tr (excluding unit-linked assets) dropping by 15.8% compared to the end of 2021. For IORPs, total investment assets amounted to EUR 2.2 tr., EUR 511 bn lower than in 2021. In both cases the decrease can be broadly explained by the decrease of equity values at the end of 2022 and the increase in interest rates as both sectors have significant exposures towards fixed income assets.

Figure 5.8: Split of investments by insurers at YE 2019 to 2022.

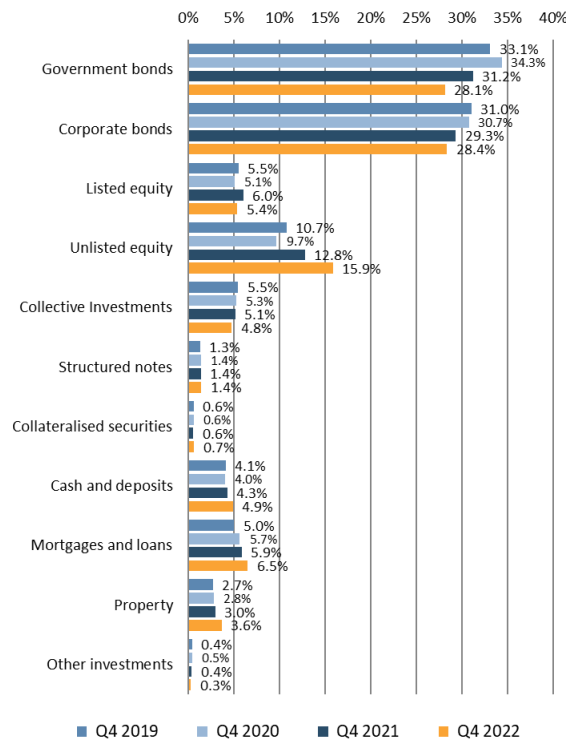
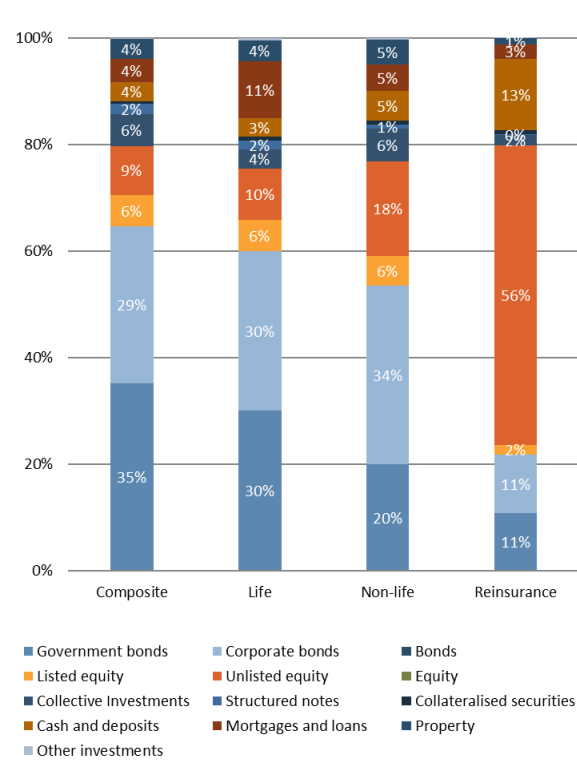


Figure 5.9: Split of investments at YE 2022 by type of undertaking.



Source: EIOPA Quarterly Reporting Solo.

Reference period: Q4 2019-2022. Note: Figures based on look-through for funds. Assets held for unit-linked business are excluded. Equities include holdings in related undertakings. Unlike for equity, exposures to corporate bonds cannot be further classified in terms of their liquidity based on SII reporting data.

In the insurance sector, the share of government and corporate bonds in total investments continued its decrease (Figure 5.8) dropping by 4.4 percentage points from the end of 2021 to the end of 2022. A partial explanation is the decrease in the market values of the fixed income holdings due to higher interest rates. But insurers were also net sellers of government and corporate bonds in Q4 2022 (see Figures 5.21, 5.22 and 5.30). In contrast the share of unlisted equity increased significantly,⁴⁸ and the proportion of investments in properties and mortgages and loans increased

⁴⁸ The jump in the share of unlisted equities is probably due to changes in the valuation of existing investments rather than new ones.

as well. On balance it seems that insurers have slightly decreased their exposure to interest rate sensitive assets in 2022 and moved towards less liquid and more alternative investments. The strong market movements in 2022, the continued geopolitical tensions and central banks reactions to inflation could be the main explanations for the change in portfolio composition. The increased volatility in financial markets and the decrease in equity prices at the end of 2022 were potential other factors.

Overall, the portfolios of insurers remained dominated by fixed income assets followed by investments in equities. Government and corporate bonds represent more than a half of the total investment portfolio with equities (listed and unlisted) in second place (Figure 5.8). This exposes portfolios to interest rate, credit and equity risk.

There are significant differences between the types of undertakings. For composite and life insurers government bonds represent the largest proportion in their portfolios, whereas non-life companies have their highest exposure to corporate bond and a larger allocation to unlisted equities (which are mainly participations). Reinsurers hold more than 50 % of their investment assets in unlisted equities but this includes holdings in related undertakings, which account for most of the equities. Reinsurers have also the largest holdings of cash and deposits (Figure 5.9).

The asset allocations of IORPs differ from those of insurers, but also between DB and DC schemes. On aggregate IORPs have lower exposures to fixed income assets and higher exposures to equity and property. The predominant investment class for EEA IORPs are bonds which represented 45% of total assets at the end of 2022 (see Chapter 4). The second most important asset class were equity investments with 33% of total assets. This means IORPs are more vulnerable to drops in stock prices than insurers. Exposures to property took mostly the form of real estate investment funds and represented about 10% of total assets at the end of Q4 2022. Due to the different asset allocations of DB and DC schemes, the former would be more vulnerable to a fall in the prices of riskier assets (see Chapter 4).

The uncertainty in financial markets makes investment decisions for insurers and IORPs difficult. Potential large short-term movements in interest rates (similar to what happened in the UK in 2022) and credit spreads need to be appropriately factored in. Possible higher liquidity needs pose another challenge to asset allocation as they increase the risk of asset liability mismatches.

Lower quality bonds could potentially be a risk transmission channel as they are exposing insurers to higher credit risk. With the economic outlook still uncertain, there is significant downside risk for the corporate sector with potentially negative impacts on the credit quality of bond portfolios. Box 5.1 explores this topic by calculating the impact of several scenarios with significant increases in spreads combined with downgrades on corporate bond portfolios with a specific focus on holdings in energy-intensive sectors.

Figure 5.10: Credit quality of bond portfolios for the insurance sector.

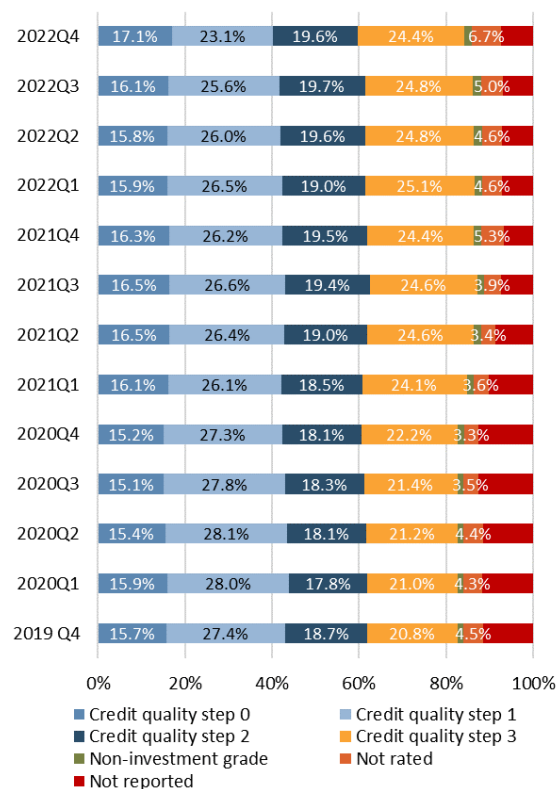
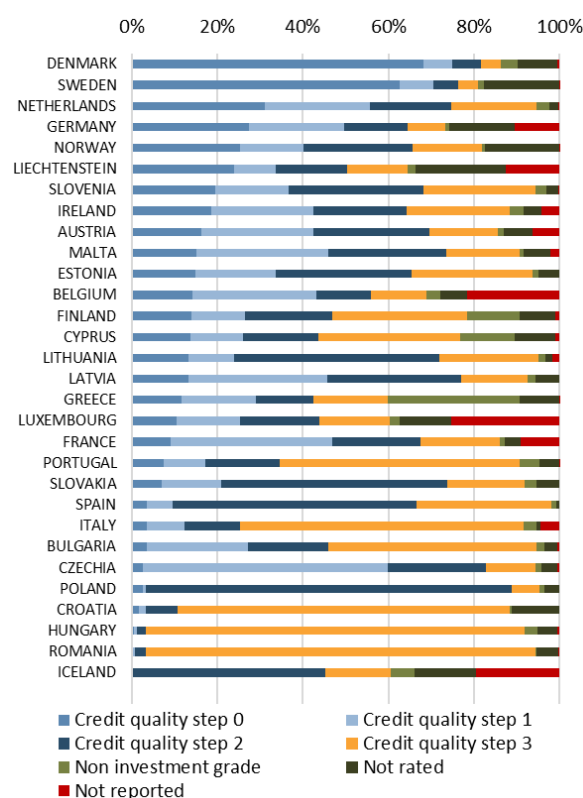


Figure 5.11: Credit quality of bond portfolios for the insurance sector across countries.



Source: EIOPA Quarterly Reporting Solo.

Reference date: Q4 2022. Note: Government and corporate bond portfolios combined. Assets held for unit-linked contracts are included.

The vast majority of bonds held by European insurers are investment grade, with most rated CQS 3 (BBB) (Figure 5.10). As in the previous year they represented approximately 24% of the aggregate government and corporate bond portfolio. These bonds have the highest risk of being downgraded below investment grade. A massive rating downgrade could significantly impact the market value of bond portfolios and, at the same time, increase the solvency capital requirement for spread risk. The share of CQS 1 (AA) rated bonds has decreased by 3 percentage points since the end of 2021.

The level of insurer exposures to low quality bonds differs greatly between countries. In Denmark Sweden, Czechia and Netherlands more than 50% of bonds are rated CQS 0 (AAA) or CQS 1 (AA) (Figure 5.11). For German insurers, this share dropped slightly below 50% in Q4 2022. In other countries as Spain, Poland, Croatia, Hungary, Romania and Iceland the share is below 10%. The main reason for this cross-country differences is the rating of the home sovereign, which also influences the rating of local corporates. Insurers tend to prefer to hold domestic corporate bonds (see next subsection on home bias). The credit quality split alone provides only a partial picture of investment risk which depends in particular also on the diversification within the individual credit quality steps.

BOX 5.1: SCENARIO ANALYSIS FOR THE IMPACT OF SPREAD EXPANSIONS AND WIDESPREAD DOWNGRADES OF CORPORATE BONDS WITH A FOCUS ON ENERGY-INTENSIVE SECTORS

Against the backdrop of the challenging macroeconomic environment, this box seeks to assess the vulnerability of the EEA insurance sector to a scenario of a significant increase in the credit risk assessment for corporate bonds by markets and rating agencies with expanding spreads and rating downgrades. Concerns around energy prices and energy-scarcity have recently eased due to substitution, energy saving efforts and a comparably mild winter. But as the situation remains fragile the analysis puts a special focus on possible vulnerabilities from holdings in energy-intensive sectors.

Corporate bonds represent a significant portion of EEA insurer investments, accounting for EUR 1,378 billion, or approximately 22% of the assets not backing unit- or index-linked contracts. 12% of the total corporate bond portfolio are issued by firms active in energy-intensive sectors (Figure B.5.1). On aggregate, 60% of the direct corporate bond holdings are rated A or BBB, while only 3% of investments are non-investment grade. The credit quality of exposures to energy-intensive corporates tends to be higher than for other non-financial firms, with fewer BBB rated bonds and the majority (58%) rated AAA to A (Figure B.5.2).

Figure B.5.1: Corporate bond portfolio by issuer sector

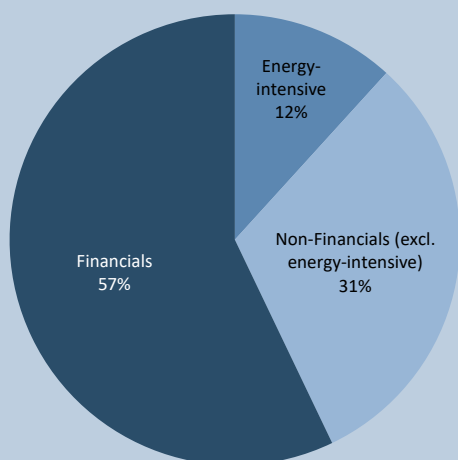
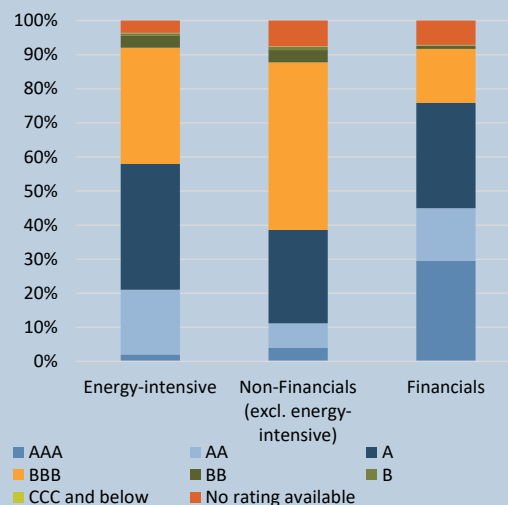


Figure B.5.2: Corporate bond portfolio by issuer sector and credit rating



Source: Solo SII QRT S.06.02, as of Q4 2022.

Note: Figures exclude hybrid bonds and assets backing unit- or index-linked contracts. ‘Energy-intensive’ bonds are defined as those issued by firms active in sectors with above median energy inputs as a share of their total output (see ECB FSR May 2022). Bonds issued by ‘Financials’ are those where the issuer NACE sector is ‘K’. All corporate bonds not falling into these two categories are classified as ‘Non-Financials (excl. energy-intensive)’

The aim of the analysis is to assess the impact of a set of scenarios (ranging from mild to severe) on direct corporate bond holdings. It is not designed as a stress test. The possible impact on other parts of the investment portfolios, especially movements in sovereign spreads or equity valuations, is not part of this analysis. The share of lower ratings or energy-intensive sectors might be higher in the indirect exposures to corporate bonds via

investment funds, which amount to another EUR 400 billion excluding unit and index linked portfolios. But the look-through reporting (QRT S.06.03) does not provide enough information on the issuers sector of industrial activity for indirect exposures to be included in the analysis. Finally, risk- and loss-reducing effects, such as the volatility or matching adjustment, as well as the loss-absorbing capacity of technical provisions were not included. They might cushion the impact of the scenarios on own funds.

The sensitivity analysis considers a set of scenarios for spread changes and rating transitions impacting all non-financial corporate bonds based on the following historical observations:

- ▶ Spread change in June 2022 which was a period of heightened spread volatility as baseline for the spread shocks per rating class.
- ▶ Long-term average transition matrices (LTATM) from the EIOPA Risk Free Rate calculations as baseline for rating transitions.
- ▶ Average spreads between corporate bond indices for different ratings during January 2023 to approximate the spread shock resulting from a downgrade.

The *Low* scenario uses as transition matrices the long-term average transition matrices, while the *Medium* and *Severe* scenarios assume respectively 50% and 100% additional downgrades per rating grade compared to the LTATM.⁴⁹ The proportion of the bond portfolio downgraded ranges from 6 % for the *Low* scenario to 11 % for the *Severe* scenario. The spread shocks are assumed to coincide with the downgrades. They are set to 50% of the spread movement observed in June 2022 under the *Low* scenario , while the *Medium* and *Severe* scenarios use 100% and 150% respectively. As firms active in energy-intensive sectors might face more downside risks, the spread and downgrade shocks on their bonds under all three scenarios are increased by 50% compared to the shocks for other bonds. For the purpose of the calculations the assumption is made that the spread increase occurs before the downgrades.

The market value for each bond after the spread shock for the rating class and the possible spread change due to a downgrade is calculated based on the reported marked value and modified duration of the bond with the formula:

$$Value_{post-shock} = Reported\ market\ value \times \left(1 - \frac{Duration \times \frac{Spread\ change\ in\ bp}{100}}{100} \right)$$

The linear approximation might overestimate the loss in market value as convexity is not taken into account. A further simplification which is necessary due to a lack of data is that all corporate bonds are assumed to have fixed coupons. This may overestimate the loss in market value for floating rate bonds⁵⁰.

As Figure B.5.3 shows, the losses on bonds issued by energy-intensive firms in the different scenarios are substantial, ranging from 3.8% to 11.1% of the initial market value. As holdings in energy-intensive sectors represent however only 12% of the entire corporate bond portfolio, it suffers only losses ranging from 3.0% to 8.6%. This corresponds to a reduction in

⁴⁹ Rating upgrades are not taken into account.

⁵⁰ The methodology follows the [EIOPA FSR December 2021](#) article “An analysis on the potential increase of corporate credit risk”.

the excess of assets over liabilities between 2.6% and 7.6%. Losses are thus significant, but seem to be manageable even under the *Severe* scenario. Losses on the corporate bond portfolio under all scenarios considered stem largely from the general increase in perceived credit risk, i.e. the spread shock. The losses resulting from downgrades account on average for 15% of the total losses as shown in Figure B.5.4. This is consistent with the results of earlier work and illustrates that the general market environment in which the downgrades occur is likely to have a larger impact on losses than the direct consequences of the downgrades.

Figure B.5.3: Losses on initial portfolio value by corporate sector and scenario (in % of initial market value)

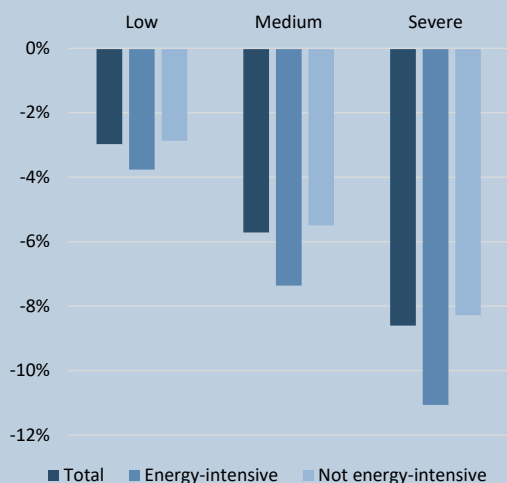
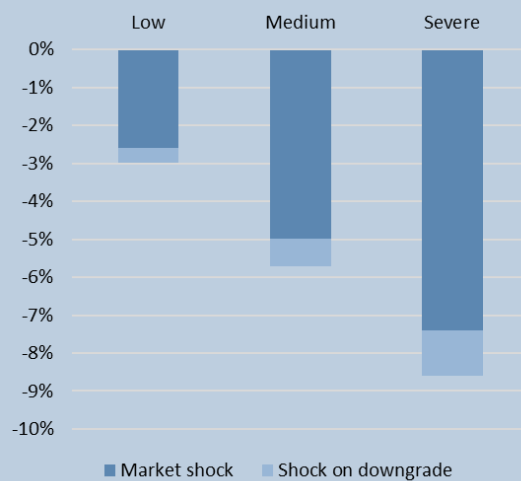


Figure B.5.4: Losses by scenario and type of shock (in % of initial market value)



Source: Own calculations based on Solo SII QRT S.06.02, as of Q4 2022

Note: Figures exclude hybrid bonds and assets backing unit- or index-linked contracts. ‘Total’ means the entire portfolio of direct corporate bond investments not backing unit- or index-linked contracts. ‘Energy-intensive’ is defined as bonds issued by firms active in sectors with above median energy inputs as a share of their total output (see ECB FSR May 2022). ‘Other’ means the remaining corporate bonds.

The calculations show that corporate bond portfolios of EEA insurers would be rather resilient even under the *Severe* scenario. This is due to the high credit quality of portfolios as measured by credit ratings, and the relatively small share of bonds issued by energy-intensive firms. However, it should be noted that this analysis looked only at direct corporate bond holdings and that under all scenarios losses on other parts of insurers portfolio can be expected.

5.2.1.2 Home bias

Insurers hold a sizeable proportion of bonds issued by counterparties in their home country. This implies concentration risks. A geographical investment focus amplifies concentration risk for the insurance and IORPs sectors. The holdings of government bonds by insurers continue to display significant home bias (Figure 5.12). In most countries, more than 30% of the government bonds held by insurers are issued by their home sovereign. This is particular the case for large countries with a deep sovereign bond market, but also for many smaller jurisdictions.

At the EEA aggregate level, most government bonds held by insurers are from EEA countries. The share of EEA government bonds has slightly decreased to 88.7% (Figure 5.13). US government bonds represent the largest portion among non-EAA bonds with 1.8% (a slight increase compared with 2021). The share of sovereign bonds of other advanced economies and emerging markets is slightly

up but still only 2.7%. Although emerging markets could be an option in the search for higher yields, they could also be a potential source of risk due to higher volatility and less stable economies which is also a consequence of geopolitical tensions.

Figure 5.12: Holdings of government bonds by issuer country for the insurance sector.

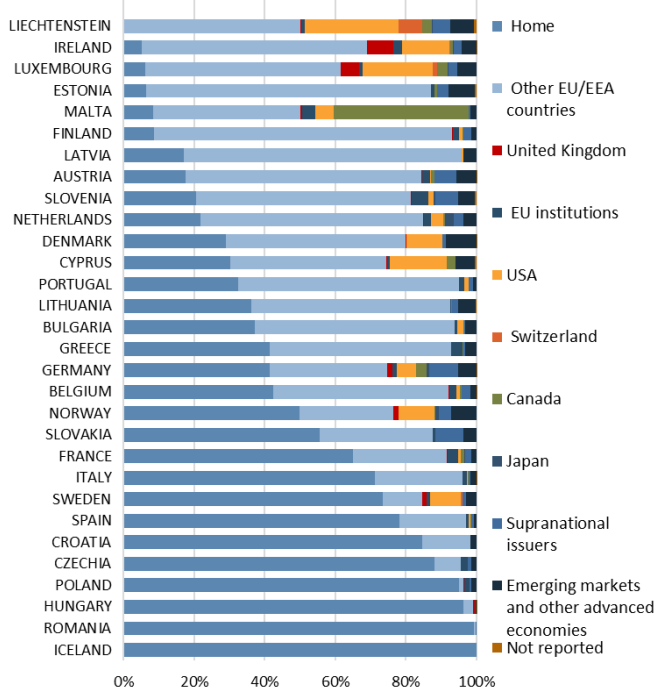
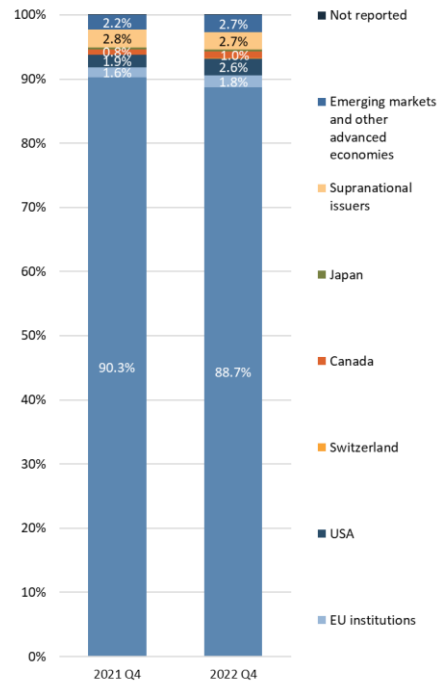


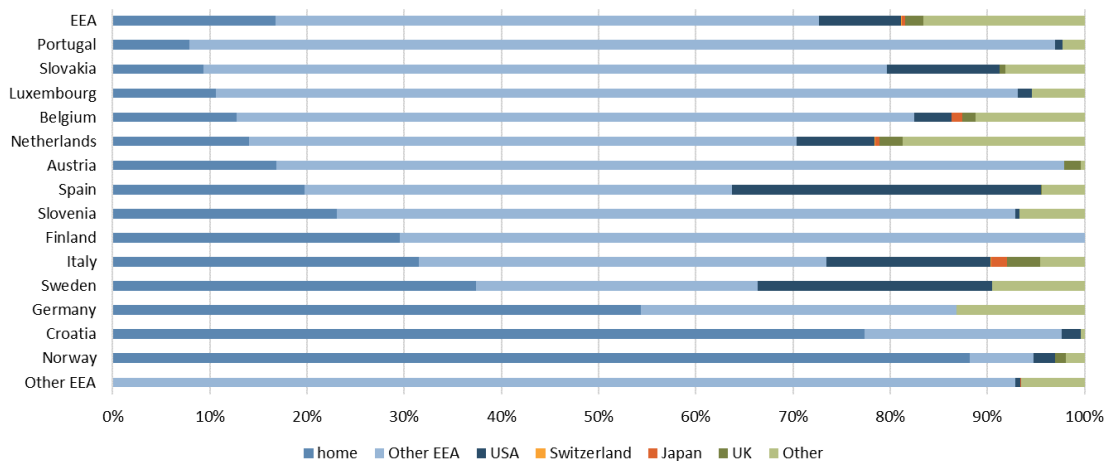
Figure 5.13: Aggregate government bonds exposures for the insurance sector.



Source: EIOPA Quarterly Reporting Solo. Reference date: Q4 2022. Note: Look-through approach is not applied. Assets held for unit-linked business are included.

IORPs also invest a large share in domestic government bonds even though it is smaller than for insurers (Figure 5.14). IORPs invest a larger share in U.S. sovereign bonds (8%).

Figure 5.14: Holdings of government bonds by issuer country for the IORPs sector.



Source: EIOPA IORPs reporting. Reference date: Q4 2022. Note: Look-through approach is not applied.

The home bias for corporate bonds is with a few exceptions generally low (Figure 5.15). Insurers invest approximately 80.8% of their aggregate corporate bond portfolio in EEA countries and 12.4% in US markets, the largest and most liquid corporate bond market in the world. The share of US corporate

bond investments has slightly increased compared to the previous two years (Figure 5.16). It is significantly higher than for government bonds. The share of corporate bonds from other advanced economies and emerging markets is with 3.8% slightly lower than in the previous year.

Figure 5.15: Holdings of corporate bonds by issuer country for the insurance sector.

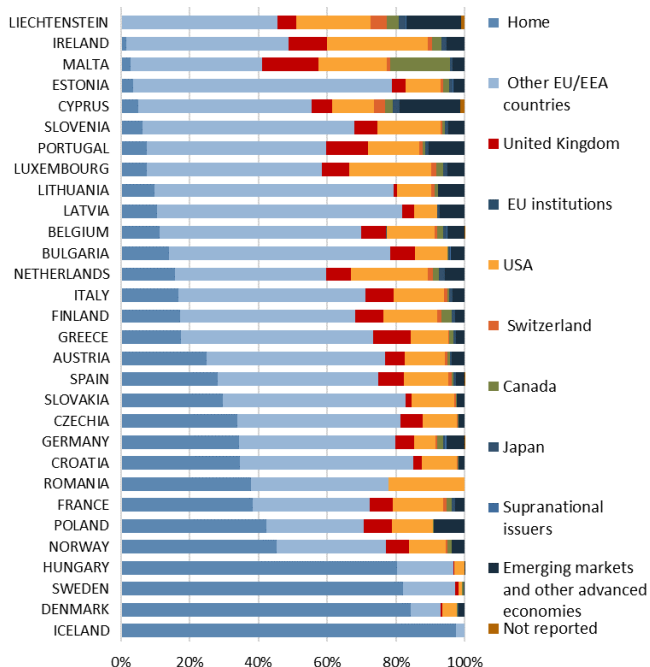
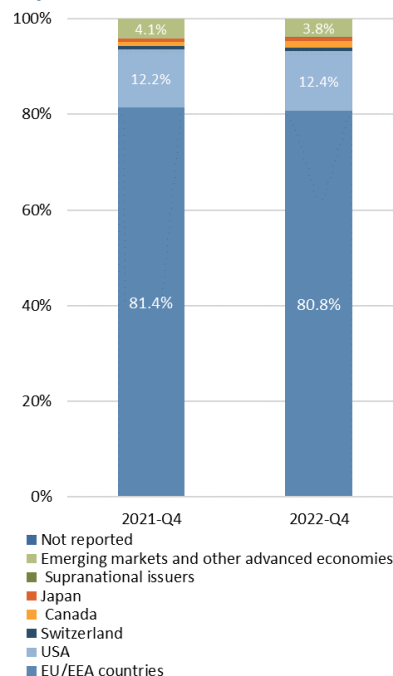


Figure 5.16: Aggregate corporate bonds exposures for the insurance sector.

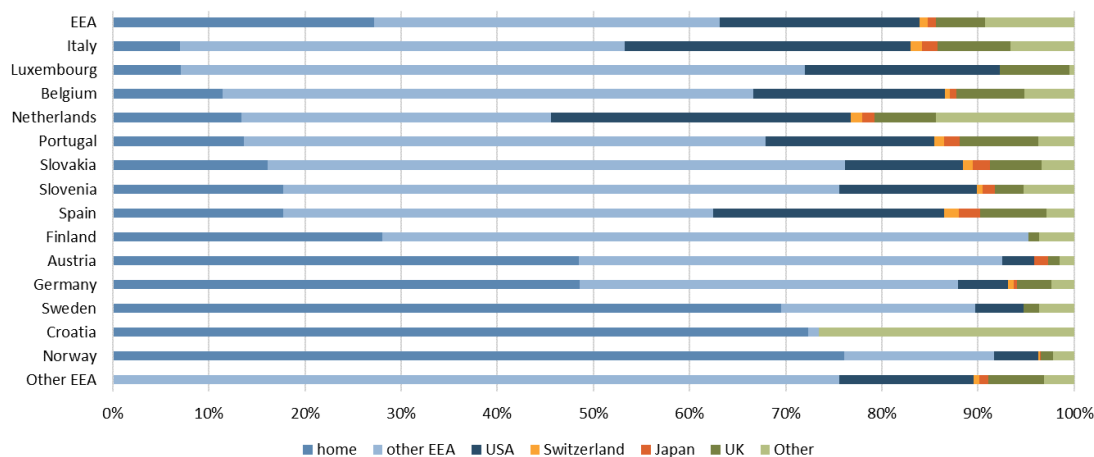


Source: EIOPA Quarterly Reporting Solo.

Reference date: Q4 2022. Note: Look-through approach is not applied. Assets held for unit-linked business are included.

IORPs also invest a large share in domestic corporate bonds. At the EEA level, 63% of the corporate bonds held by IORPs are issued by companies from EEA Member States. The share of US corporate bonds is 21 % while UK corporate bonds represent 5%. This means that IORPs hold more internationally diversified corporate bond portfolios than insurers. This pattern is similar to the one for government bonds. In the two countries with the largest IORPs sectors, Netherlands and Germany, the proportion of domestic corporate bonds is slightly lower than for the insurance sector (Figure 5.17).

Figure 5.17: Holdings of corporate bonds by issuer country for the IORPs sector.



Source: EIOPA IORPs reporting. Reference date: Q4 2022. Note: Look-through approach is not applied.

The equity investments of insurers and IORPs show also a high degree of home bias. (Figures 5.18 and 5.20). The share of domestic investments is higher for equities than for corporate bonds. For insurers the share of equity exposures to EEA countries and the US decreased in 2022 (Figure 5.19). A partial explanation could be the low or negative stock market returns over this period.

Figure 5.18: Holdings of equity by issuer country for the insurance sector.

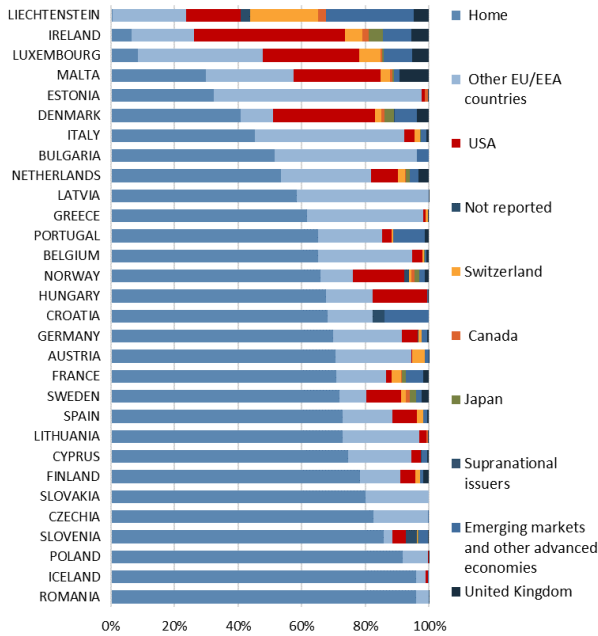
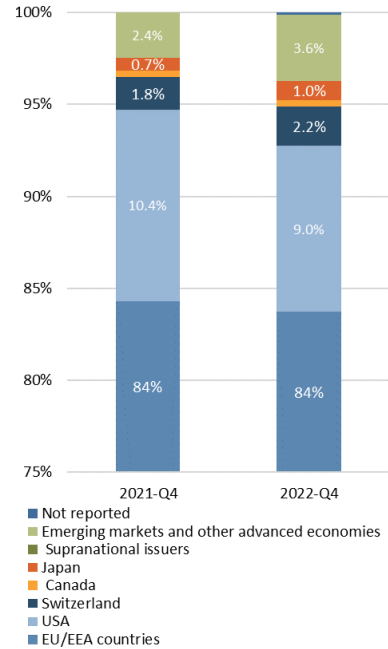
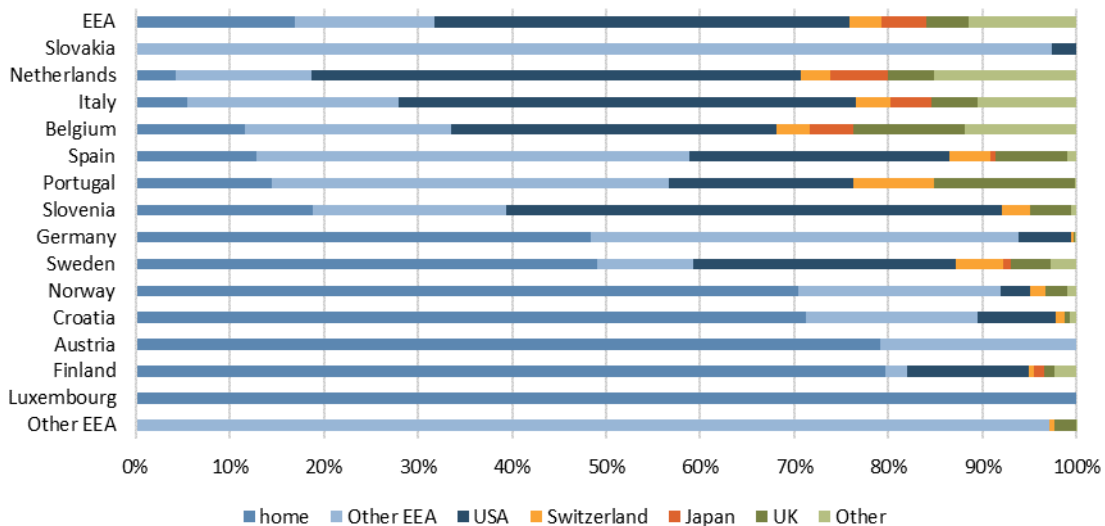


Figure 5.19: Aggregate equity exposures for the insurance sector.



Source: EIOPA Quarterly Reporting Solo. Reference date: Q4 2022. Note: Look-through approach is not applied. Assets held for unit-linked business are included.

Figure 5.20: Holdings of equities by issuer country for the IORPs sector.



Source: EIOPA IORPs reporting. Reference date: Q4 2022. Note: Look-through approach is not applied.

With respect to the equity investments of IORPs the very high share of US equities, with 44% of the total, stands out (Figure 5.20). The corresponding figure for insurers was only 9.0% in Q4 2022. This might be related to the generally higher geographical diversification of IORP investments and the fact that the biggest EEA IORP has an investment management subsidiary in the US.

Insurers and IORPs invest also in other asset classes, such as alternative assets and private equities. They are deemed to be less liquid and transparent than traditional assets. Box 5.2 describes the evolution of investments by insurers into alternative assets and private equity.

BOX 5.2: INVESTMENT OF INSURERS INTO ALTERNATIVE ASSETS AND PRIVATE EQUITY

Insurers have increased their exposure to alternative assets in the past 5 years, both through investments in collective investment undertakings (CIU) and direct investments in unlisted equities and participations. Insurers increased their investments in CIUs by 18% between 2017 to 2022, their allocation to alternative-like funds⁵¹ grew by 78% (from EUR 269 bn to EUR 479 bn). As a result alternative-like funds represented 5.6 % of total investments at the end of 2022 compared with 3.3. % five years before (Figure B5.5).

Insurers increased in particular the share of their investments in private equity (PE) funds. In absolute amounts their volume grew significantly from 45 bn in 2017 to 106 bn in 2022. While these investments still account for a small proportion their share of total EEA insurer investments has increased to around 1.2% (see Figure B5.6.). In the investment portfolios not backing unit- or index linked contracts the exposure to PE funds increased by 113%, from 39 bn in 2017 to EUR 85 bn in 2022 while the total investments in these portfolios decreased by 1%. In the unit- or index linked portfolios investments increased by an even more significant 251%. Nonetheless, the proportion of PE exposure remain very small in both portfolios. The current figures might be underestimating the total exposure to PE as they do not take into account equity participation.

While private equity investments by insurers can be an additional funding source for the real economy, their characteristics can expose insurers and policy holders to specific risks. The exposure of insurers to less transparent and liquid investments, such as private equity, creates higher valuation risks. Policy holders in their UL portfolio directly bear the market and credit risk of exposure to this segment.

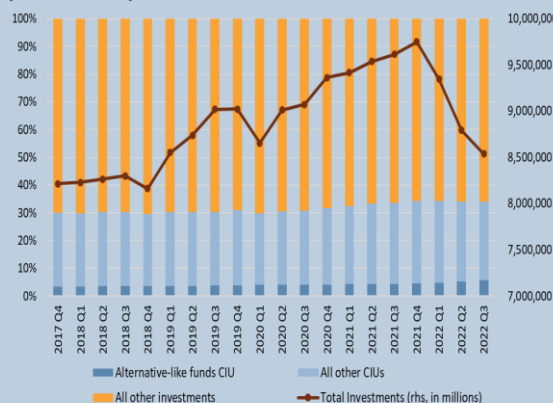
The new macroeconomic environment characterised by higher inflation and rising interest rates can expose the volatility of those investments and generate losses. Inflationary pressures can result in a less favourable environment for private equity due to increase in cost of funding, flattening valuation and margin pressure, impairing their valuation. Second round effects could have direct implication for insurers profitability.

New reporting information that EIOPA has started collecting from insurers on their investments will allow additional analysis. Starting with Q4 2022 EIOPA receives new information on the regulatory regime under which collective investment undertakings operate. This includes in particular whether a fund falls under the Alternative Investment

⁵¹ Alternative-like CIUs include Real Estate funds, Alternative funds, Private equity funds, Infrastructure funds. The classification is based on the strategy pursued by the fund according to Solvency II reporting.

Fund Manager Directive (AIFMD). Combining information on the investment strategies of funds and on their regulatory regime will enhance the understanding of risks and the comparability with analysis carried out at the European level (e.g. by ESMA and the ESRB).

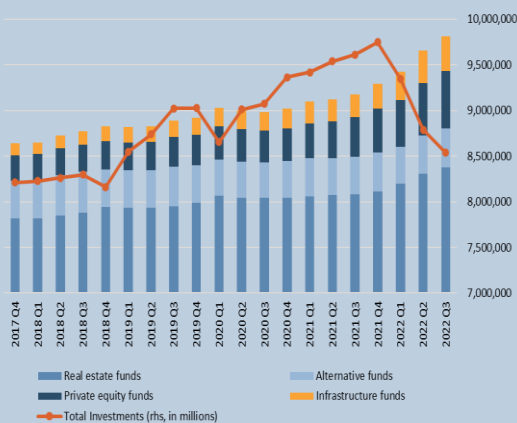
Figure B.5.5: Investments of insurers by type (in % of total investments) and total investments (in millions)



Source: EIOPA Quarterly Reporting Solo.

Note: Alternative-like CIUs include Real Estate funds, Alternative funds, Private equity funds, Infrastructure funds. The classification is based the strategy pursued by the fund according to Solvency II reporting.

Figure B.5.6: Exposure of insurers to Alternative-like funds in % of total investments



Source: EIOPA Quarterly Reporting Solo.

5.2.1.3 Trading activity of EEA insurers since 2020

In Q4 of 2022 the net sales of bonds issued by non-bank corporates by insurers reached the highest level since the introduction of SII reporting. They amounted to -2.8% of the positions at the beginning of the quarter ("initial positions"); In Q2 and Q3 insurers were also net sellers. An analysis of trading activities shows that historically insurers tended to be net buyers of corporate bonds (Figure 5.21).^{52, 53} Throughout the sample, up to Q4 2019, net purchases of corporate bond issued by non-banks were on average +1.4% per quarter.⁵⁴ Also in 2020 insurers remained net buyers of non-bank corporate bonds. A possible explanation for the large net purchases in Q2 2020 may be the supply side as there were record issuances of corporate bonds in that quarter followed by a significant reduction in issuances in the first three months of the year. The lower purchases from 2020 Q3 onwards could be a re-adjustment.

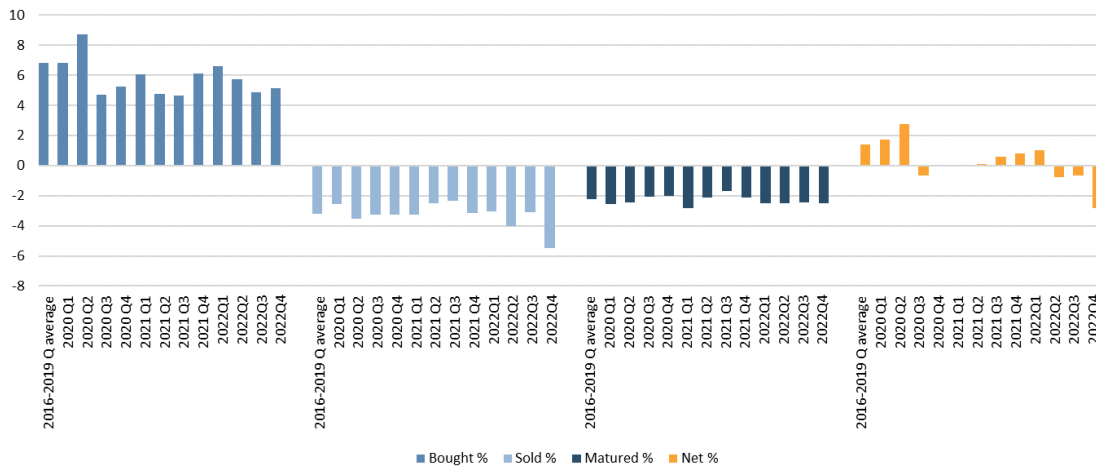
In 2022 insurers became for the first-time net sellers of non-bank corporate bonds on a yearly basis. The average net sales per quarter were -0.8% of the initial positions. A possible explanation is that insurers have been reducing exposures towards credit risk in reaction to the sharp increase of the risk-free interest rate in anticipation of a potential economic slowdown and an increase of credit risk.

⁵² Net buying is calculated as the difference between purchased, sold and matured bonds.

⁵³ In the analysis of trading activity, no-look-through is applied and only direct holdings are considered because only for these purchased and sold quantities can be calculated using item-by-item Solvency II reporting data. The analysis is based on quarter-end asset holdings, transactions within the quarters which are not reflected at the quarter-end cannot be observed. All aggregated numbers exclude the United Kingdom and therefore differ from the numbers reported in the Financial Stability Review December 2020. For the methodology see also EIOPA Financial Stability Report December 2020 chapter 2.

⁵⁴ For details on bank bonds please refer to subsection on insurers' exposure to the banking sector.

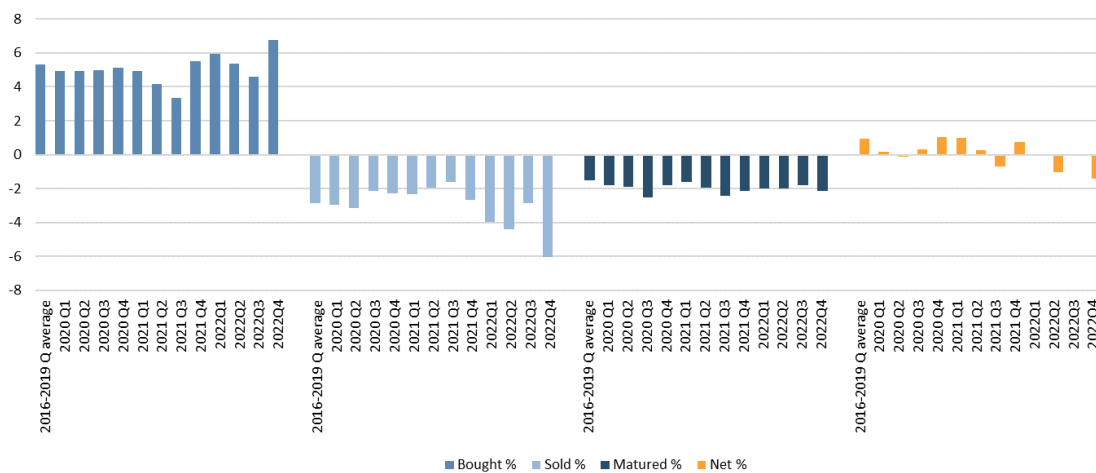
Figure 5.21: Break down of quarterly changes in the position of insurers in corporate non-bank bonds (% with respect to the initial quarter Solvency II market value of the positions).



Source: EIOPA Quarterly Solo and EIOPA calculations. Reference period: 2016 to Q4 2022.
 Note: Figures are in % with respect to the initial quarter Solvency II market value of the positions.

Furthermore insurers became in 2022 for the first time net sellers of government bonds on a yearly basis. Historically insurers tended to be net buyers of government bonds (Figure 5.22). But in 2022 average net sales per quarter were -0.6% of initial positions. There were net sales of -1% and -1.4% respectively in Q2 and Q4, while positions remained flat in Q1 and Q3.

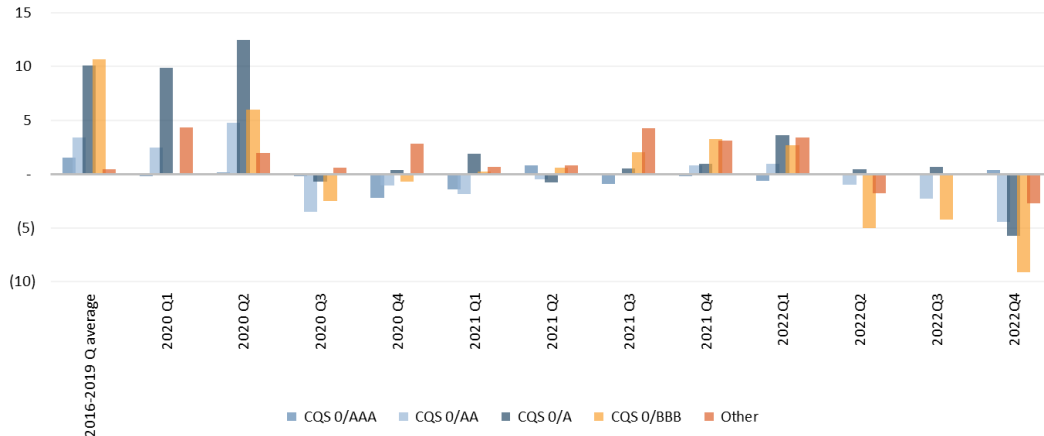
Figure 5.22: Break down of quarterly changes in the position of insurers in government bonds (% with respect to the initial quarter Solvency II market value of the positions).



Source: EIOPA Quarterly Solo and EIOPA calculations. Reference period: 2016 to Q4 2022.
 Note: Figures are in % with respect to the initial quarter Solvency II market value of the positions.

In 2022 insurers were net seller of non-bank corporate bonds across all ratings. In 2016 to 2019, the largest net purchases were of non-bank corporate bonds with a A or BBB rating (Figure 5.23). These rating classes dominate in the portfolios of insurers. In 2020 insurers were net sellers of AAA and AA rated bonds and net buyers of A rated bonds (albeit below the historical average). Net purchases of BBB rated bonds were higher in 2021 than in 2020 but still below the historical average. In the last two quarters of 2021 and the first quarter of 2022, net purchases of non-rated or non-investment grade bonds were above their historical average. In Q2 and Q3 2022, there were large net sales of BBB bonds. Finally, Q4 saw net sales across all ratings except AAAs.

Figure 5.23: Break down of quarterly changes in the position of insurers in non-bank corporate bonds by rating (bn. EUR).

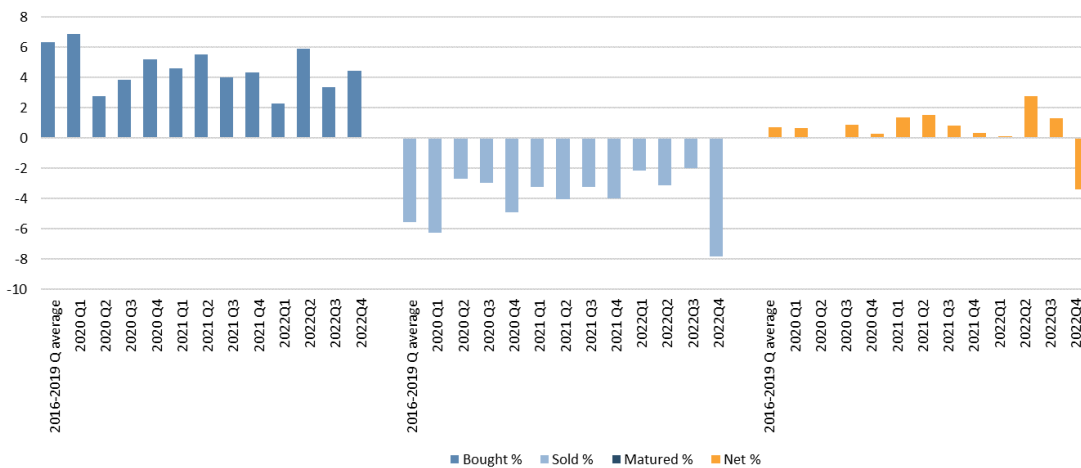


Source: EIOPA Quarterly Solo and EIOPA calculations. Reference period: 2016 to Q4 2022.
 Note: Figures are in bn EUR.

Insurers were net buyers of equity in 2022, but the trading activity was volatile across quarters.

(Figure 5.24). Up to 2019 quarterly equity net purchases were on average +0.7% of their initial positions. Insurers also remained net buyers of equity during 2020 and 2021. 2022 is also a year characterised by overall net purchases with an average of +0.22% across quarters, but large purchases in Q2 and Q3 (respectively of +2.8% and +1.3%) are followed by large sales in Q4 of -3.4% of the initial quarter positions. The aggregate Q4 figures result from net sales of listed equities and net purchases of non-listed equities.. In fact, in the last quarters insurers have been persistent net buyers of non-listed equity.

Figure 5.24: Break down of quarterly changes in the position of insurers in equities (% with respect to the initial quarter Solvency II market value of the positions).



Source: EIOPA Quarterly Solo and EIOPA calculations. Reference period: 2016 to Q4 2022.
 Figures are in % with respect to the initial quarter Solvency II market value of the positions.

5.2.2 EXPOSURES TOWARDS THE BANKING SECTOR

The insurance sector is connected to the banking sector through its investments exposures. At the end of 2022 exposures to banks represented 13% of total investments at the EEA level (Figure 5.25). This is roughly comparable to 2021 but slightly lower than in previous years (14% in 2019, 16% in

2020). There is however large heterogeneity across countries. As illustrated again by recent events (see Box 5.1), significant exposures towards banks could become a channel of risk transmission and contagion. At the same time, insurers could have a stabilizing effect on the banking sector, and hence on financial markets as a whole, as they are usually long-term investors and tend to trade less in response to short-term market fluctuations than other investors (see also EIOPA FSR December 2021 chapter “Contagion Risk Analysis of the Impact of a Bank’s Failure on the Insurance Sector”).⁵⁵

Figure 5.25: Exposures towards banks as a percentage of total investments at country level for the insurance sector.

| Country | % Exposure to banks | Country | % Exposure to banks |
|-----------------------|---------------------|---------------|---------------------|
| EU/EEA average | 13% | ITALY | 8% |
| AUSTRIA | 14% | LATVIA | 18% |
| BELGIUM | 7% | LIECHTENSTEIN | 28% |
| BULGARIA | 11% | LITHUANIA | 14% |
| CROATIA | 10% | LUXEMBOURG | 18% |
| CYPRUS | 19% | MALTA | 24% |
| CZECHIA | 18% | NETHERLANDS | 11% |
| DENMARK | 26% | NORWAY | 22% |
| ESTONIA | 41% | POLAND | 11% |
| FINLAND | 17% | PORTUGAL | 12% |
| FRANCE | 11% | ROMANIA | 18% |
| GERMANY | 13% | SLOVAKIA | 19% |
| GREECE | 12% | SLOVENIA | 11% |
| HUNGARY | 9% | SPAIN | 11% |
| ICELAND | 22% | SWEDEN | 28% |
| IRELAND | 17% | | |

Figure 5.26: Exposures towards banks as a percentage of total investments at country level for the IORPs sector.

| Country | % Exposure to banks |
|-------------------|---------------------|
| EEA (w) | 6% |
| EEA (un-w) | 11% |
| AT | 3% |
| BE | 2% |
| DE | 15% |
| DK | 29% |
| ES | 7% |
| FI | 6% |
| FR | 8% |
| HR | 3% |
| LU | 6% |
| LV | 10% |
| NL | 3% |
| NO | 13% |
| PL | 28% |
| PT | 11% |
| SE | 13% |
| SI | 13% |
| SK | 11% |

Source: EIOPA Quarterly Reporting Solo and IORPs. Reference date: Q4 2022 and Q4 2021 for IORPs.

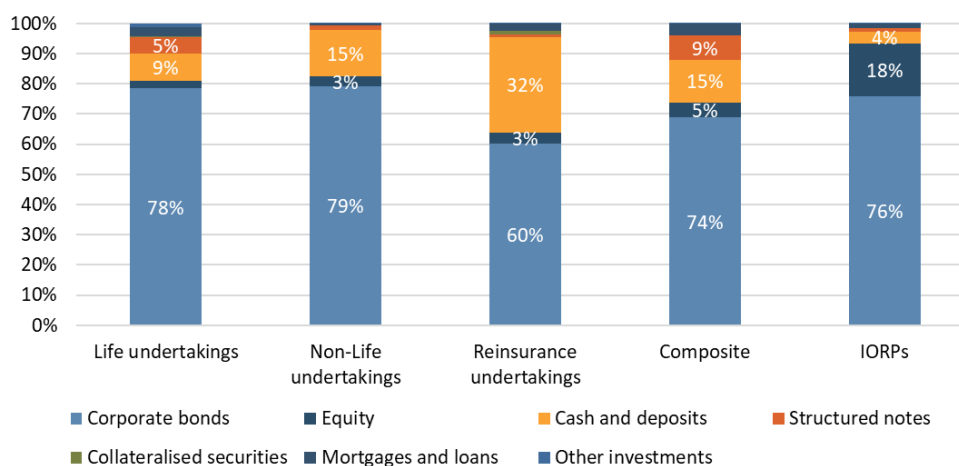
Note: “(w)” means weighted and “(un-w)” means non-weighted. Exposures to banks are defined as those where the NACE code for the issuer is K64.1.9 or K64.9.2. Assets backing unit- or index-linked contracts have been excluded. Exposures to banks include the following assets: equity, bonds, cash and deposits, structured notes, collateralised securities, mortgages and loans and other investments. As it is only possible to identify exposures to banks for direct investments indirect exposures via investment funds are not included (i.e. there is no look-through applied). The blue colour highlights the lowest exposures to banks and the red colour the highest ones.

The exposure of the IORP sector to the banking sector is also material. At the end of 2022 exposures to banks represented approximately 6% of total investments at the EEA level (Table 5.26). Also in this case there are large differences across countries.

Corporate bonds represent for insurers and IORPs the largest share of their exposures to banks (Figure 5.27). For insurers this is followed by cash and deposits while bank equity represents only a small share. In contrast to this the latter accounted for IORPs for approximately 18% of their exposures to banks.

⁵⁵ To better shed light on the interconnectedness between the insurance and the banking sector, EIOPA is collaborating with the Single Resolution Board (SRB). Based on scenarios of shocks to European banks, EIOPA and the SRB simulate potential losses to insurers’ investments in banks under consideration of the specific bank liability structure and the liability cascade. This makes it possible to monitor the amount of investment losses of European insurers in case of a shock to the banking sector, or to specific banks.

Figure 5.27: Exposures to banks by type of instruments and type of insurer.



Source: EIOPA Quarterly Reporting Solo and IORPS reporting. Reference date: Q4 2022.

The risk associated with the various types of bank bonds differs widely. Covered bonds (i.e. secured bonds) with their typically low risk represent no longer the largest portion of bank bonds held by insurers as their share dropped from approx. 45% in 2021 to approx. 43% in 2022 (Figure 5.28). They are now second to senior unsecured bonds, which accounted for approximately 44.5% of bank bonds at the end of 2022. The most junior bonds are the first to suffer losses when creditors are “bailed in”. Junior bonds include subordinated bonds, hybrid bonds and convertible bonds, which represent 8% of bank bonds. A different and potentially material exposure results from derivatives with banks as counterparties where the value of the contract from the perspective of the insurer is positive (i.e. where the bank owes the insurer). But the collateralisation of these positions removes most of the counterparty risk to the bank.

The wipe-out of Additional Tier 1 (AT1) bonds in the emerging merger of Credit Suisse with UBS illustrated the risks inherit in these investments. The regulatory reporting for insurers does not include a specific “flag” for these bonds. Most insurers reported them under the CIC Code 2.2. “Convertible bonds”. These bonds represented 0.02 % of all the exposures of EEA insurers to corporate bank bonds at the end of 2022 (Figure 5.28). In some cases insurers assigned instead the CIC codes 2.5 “Hybrid bonds” or 2.8 “Subordinated bonds” to AT1 bonds. These categories represented 1.68 % and 6.3 % respectively of all exposures to bank corporate bonds.

Large allocations to subordinated bank bonds could amplify the negative effects from distress in the banking sector. The breakdown of insurer bond portfolios by country shows that subordinated bonds represent in some cases a meaningful proportion (Figure 5.29). This could be a potential risk transmission channel, if the banking sector for certain countries faced severe challenges.

Figure 5.28: Breakdown of exposures to bank corporate bonds for the insurance sector.

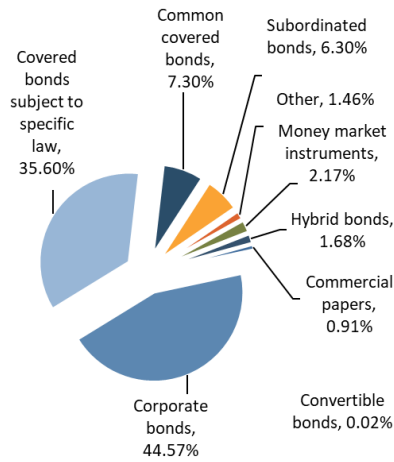
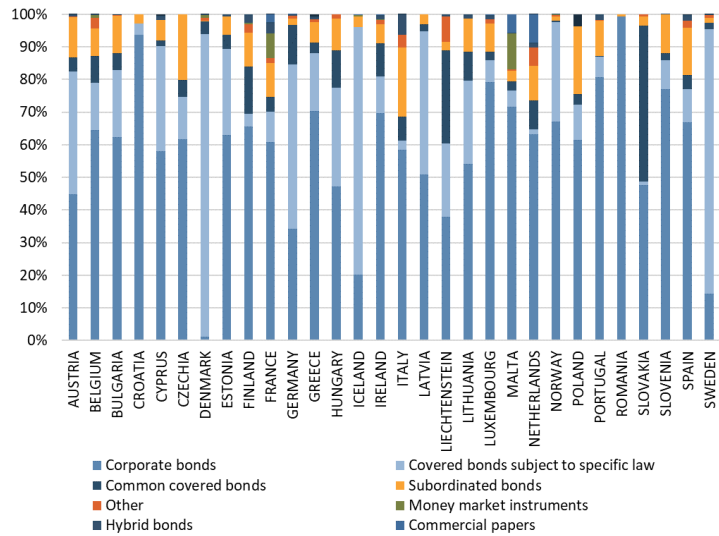


Figure 5.29: Breakdown of exposures to bank corporate bonds by country for the insurance sector.

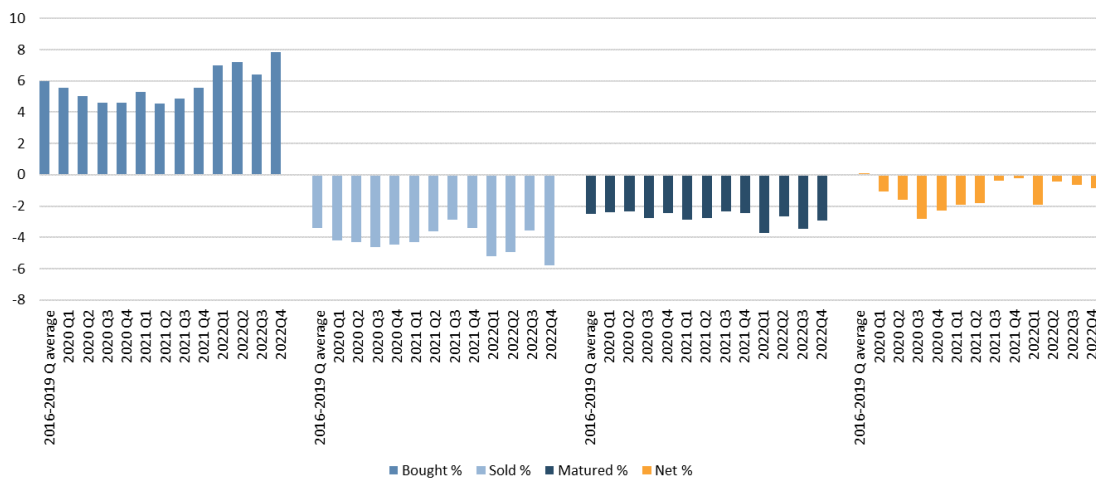


Source: EIOPA Quarterly Reporting Solo.

Reference date: Q4 2022. Note: The subcategory corporate bonds, i.e. CIC 21, includes both preferred and non-preferred senior unsecured bonds as the Solvency II reporting does not allow to distinguish them.

The latest data on trading activity shows that insurers keep reducing their allocation to bank bonds (Figure 5.30). This trend started in the second quarter of 2019, gained momentum in 2020 and continued in 2021 and 2022. It reversed the pattern from 2016 to the first quarter of 2019 when European insurer were net buyers of bank bonds (albeit only to a small extent).

Figure 5.30: Break down of quarterly changes in the position of insurers in corporate bonds issued by banks⁵⁶ (% with respect to the initial quarter Solvency II market value of the positions).



Source: EIOPA Quarterly Solo and EIOPA calculations

Reference period: 2016 to Q4 2022. Note: Figures are in % with respect to the initial quarter Solvency II market value of the positions.

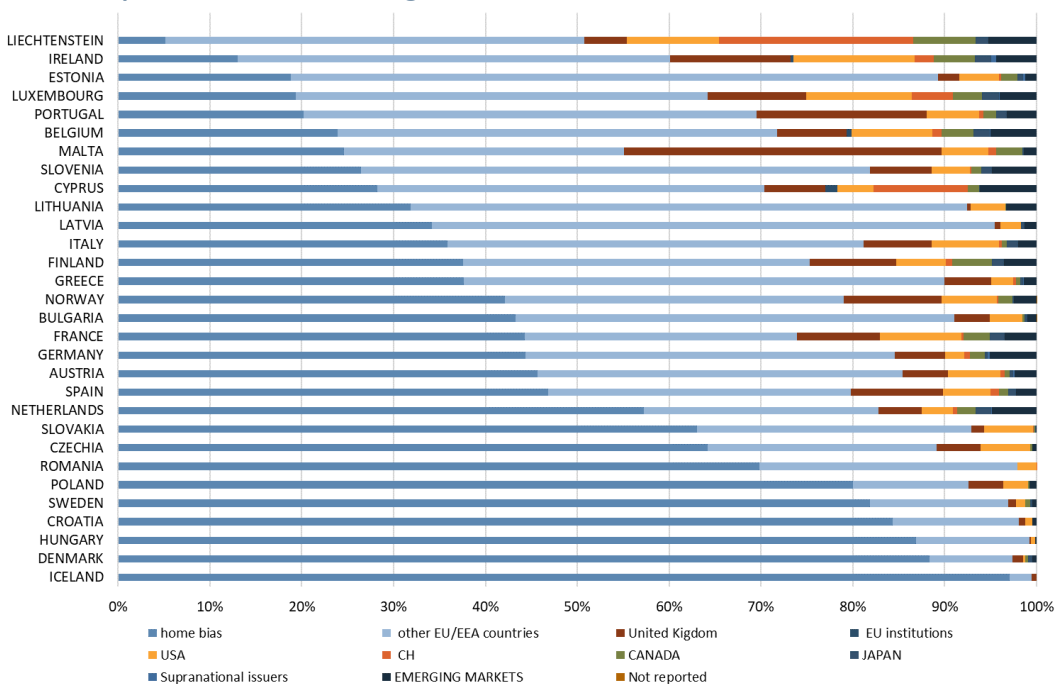
⁵⁶ All numbers are neither unit-linked nor index-linked and excluding the United Kingdom. In the analysis of trading activity, no-look-through is applied and only direct holdings are considered because only for these purchased and sold quantities can be calculated using item-by-item Solvency II reporting data.

In 2022 the net sales per quarter were on average -0.97% of their initial holdings. The corresponding figures for 2020 and 2021 were -1.1% and -1.9% of initial holdings respectively. The net sales were the result of both reduced buying and increased selling.

The reduction in the holdings of bank bonds from 2020 to 2022 could reflect a higher perceived risk of the banking sector. The financial turmoil at the beginning of 2020 highlighted the vulnerabilities of the banking sector – in particular compared to sectors less affected by the pandemic. This might have induced insurers to shift their allocation to sectors with lower perceived risk. The supply side might provide another explanation. There were record issuances of non-financial corporate bonds in 2021 while there was no comparable surge for bank bonds.⁵⁷ The recent developments in the US banking sector might lead to a continuation of the trend for lower allocations to bank bonds.

Insurers tend to have meaningful investments in their domestic banking sector. The share of the exposures towards domestic banking sector differs considerably across countries (Figure 5.31).

Figure 5.31: Exposure towards the banking sector, domestic versus cross-border in % for the insurance sector.



Source: EIOPA Quarterly Reporting Solo.

Reference date: Q4 2022.

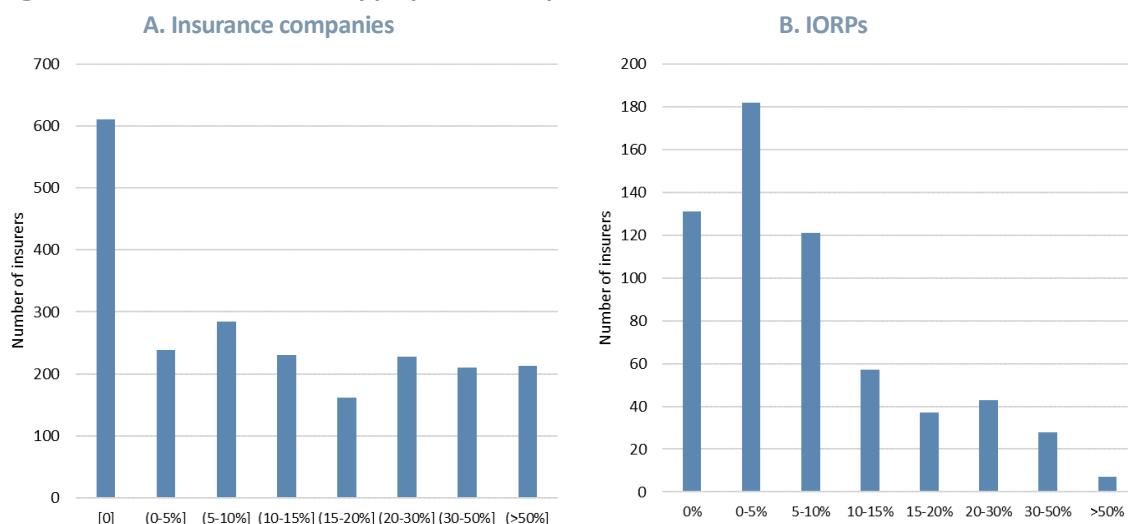
Note: See methodological explanations for Figures 5.25 and 5.26.

Figure 5.32 shows how the proportion of investments in the banking sector to total assets is distributed across insurers and IORPs. While more than 600 insurers have no exposure to the banking sector, there are also more than 200 undertakings where it exceeds 50% of their assets. These are small non-life undertakings which hold as part of their business model a large share of their investments in cash. Approximately 130 IORPs have no investments in banks while very few

⁵⁷ ECB Statistical Data Warehouse, Net issues of debt securities by euro area non-financial corporations vs. Net issues of debt securities by euro area MFIs.

pension funds are heavily exposed to the banking sector with a ratio of bank exposures to total assets higher than 50%.

Figure 5.32: Number of entities by proportion of exposures to banks to total assets



Source: EIOPA Quarterly Reporting Solo. Reference date: Q4 2022.

Note: See methodological explanations for Figures 5.25 and 5.26.

BOX 5.3: WHAT THE RECENT TURMOIL IN THE BANKING SECTOR MEANS FOR INSURERS AND PENSION FUNDS

The collapse of Silicon Valley Bank (SVB) triggered substantial fears for parts of the banking system. The pressure was notable for the US regional banks, but also for the European banking sector. In addition to the resulting drops in the equity prices of European banks, Credit Suisse was substantially impacted resulting in the emergency merger with UBS and the wipe of its Additional Tier 1 bonds. Credit Suisse did not really fall into the pattern of the US regional banks, but risk aversion due to US developments worsened the market sentiment for the bank that had already faced challenges for years.

Insurers and IORPs are exposed to these developments through their investments in the banking sector.

The exposure of both sectors to US regional banks is limited. There are 39 insurance groups with exposures to these banks. Excluding assets backing unit or index-linked contracts and the investments through CIUs (both less relevant in terms of direct impact) the exposure amounts to about EUR 1.2 bn, which represents approximately 0.02% of the total investments for all groups. The exposures of IORPs concentrate in two entities (EUR 1.3 bn, 0.13% of their total investments), although 67 have some exposure to US regional banks.

Looking more specifically at the three banks that were at the epicentre of events, namely SVB, Signature Bank and Credit Suisse, the exposures are also limited on aggregate. For insurance groups they amount to about 0.2% of their total investments irrespective of whether only the non-unit and index linked direct investments are considered. For IORPs they represent about 0.13% of their total investments (excluding funds approximately 0.19%).

5.2.3 VULNERABILITIES FROM REAL ESTATE INVESTMENTS

The real estate market in Europe may be at a turning point. After experiencing a prolonged period of increasing real estate prices, there are clear indications that the European real estate market has now peaked. Several factors have a negative impact on its near-term prospects. The main one is that interest rates have risen significantly, increasing the cost of financing real estate and discouraging investment in the sector. Additionally, high inflation puts a strain on the disposable income of households. In the commercial real estate sectors, the slowdown in economic growth reduces demand for property when businesses close or downsize. Commercial real estate is a cyclical market with price declines during times of crisis.⁵⁸ This cyclical development comes on top of the structural change that office attendance is still significantly lower than it was before the pandemic, which reduces demand for offices.

Data indicates falling real estate prices for the second half of 2022. Data from MSCI, a market data provider, indicates that asset values of properties held by institutional investors peaked in mid-2022 and declined since then. The price decrease accelerated in Q4 compared to Q3. This development is observed across Europe, despite the cross-country differences in the upward trend from 2018 to mid-2022. Across segments, the price decline is the strongest in commercial real estate, with industrial property being hit hardest. Office and retail property prices have also fallen notably. While the prices of residential real estate held by institutional investors have been more stable, this segment has also contracted.

The negative development in asset values is accompanied by several other indicators that point to a downward trend. For instance, the number of transactions had dropped significantly. Investment volume can be a leading indicator for real estate prices if deals are cancelled or postponed instead of being completed at lower prices. Additionally, purchasing intentions as reported in surveys are low and banks report a decrease in demand for housing loans, with lending standards for loans to households for house purchases tightening.⁵⁹ As a signal of challenges to secure financing, spreads of commercial mortgage backed securities (CMBS) strongly increased in 2023.

Risks in commercial real estate have come under increased scrutiny by the European Systemic Risk Board (ESRB) which issued a Recommendation to address its vulnerabilities. The ESRB has identified several vulnerabilities in the commercial real estate sector.⁶⁰ These stem from cyclical developments such as the increase in inflation and the deterioration in the growth outlook, as well as structural changes such as climate-related policies. Adverse developments in the sector can spill over to the broader financial system, given the interconnectedness of the commercial real estate market with banks, funds and insurers. This makes the commercial real estate sector a potential source of risk to financial stability. To address these vulnerabilities, the ESRB recommends that European and national authorities improve their monitoring of the commercial real estate sector.

⁵⁸ See ESRB (2023) - Report on Vulnerabilities in the EEA commercial real estate sector.

<https://www.esrb.europa.eu/pub/pdf/reports/esrb.report.vulnerabilitiesEEAcommercialrealestatesector202301~e028a13cd9.en.pdf>

⁵⁹ See January 2023 euro area bank lending survey.

https://www.ecb.europa.eu/stats/ecb_surveys/bank_lending_survey/html/ecb.blssurvey2022q4~e27b836c04.en.html

⁶⁰ ESRB (2023) - Recommendation on vulnerabilities in the commercial real estate sector in the European Economic Area

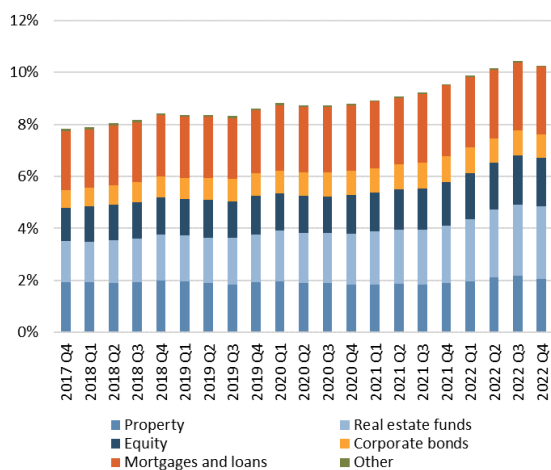
<https://www.esrb.europa.eu/news/pr/date/2023/html/esrb.pr230125~f97abe5330.en.html>

Additionally, supervisory authorities should ensure sound financing practices in the European commercial real estate market, and take steps to increase the resilience of financial institutions engaged in the sector. EIOPA welcomes the ESRB assessment and the Recommendation.

Insurers are directly exposed to real estate markets through their investments. European Economic Area insurers invested 10% of their total investments in real estate related assets (Figure 5.33). This share increased over time up from 7.8% in Q4 2017. Direct investments in property represent approximately 2.1%. Furthermore, insurers hold 1.9% in the equity of firms in the real estate sector (mostly participations in real estate firms belonging to the same group) and 2.8% in real estate funds. Mortgages and loans represent 2.6%. Further, insurers invest 0.9% in corporate bonds issued by real estate firms. The value of direct property investments has increased only slightly over time, with most of the growth in real estate related funds, corporate bonds and equity.

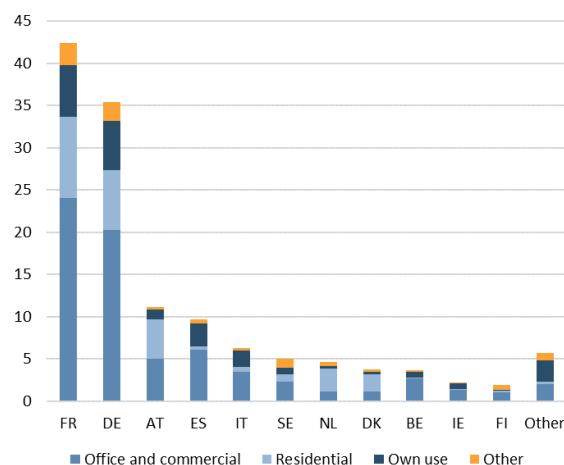
Insurers seek illiquid assets, such as property, because they match well with their illiquid liabilities. Property is an illiquid investment: It is infrequently sold, traded on private markets and transaction prices are often not disclosed to the public. In addition, low yields on bonds before 2022 made alternative investments more attractive. While the cyclicity of commercial real estate may be a concern for some investors, insurers are usually long-term investors, allowing them to hold assets through economic cycles. As a result, insurers can be buy-and-hold investors in real estate, and are to some extent able to ignore short-term price swings and re-valuations on their balance sheets. This is due to their stable financing and the limited use of financial debt. From this perspective, the investments of insurers in commercial real estate contribute to financial stability, because they can act counter-cyclically (or at least not pro-cyclically) in times of crisis and thereby stabilize markets.

Figure 5.33: Real estate related investments of EEA insurers relative to total investments



Source: EIOPA Insurance Statistics (public data). Unit-linked excluded.

Figure 5.34: Direct property investment of insurers by country (bn. Euro in Q4 2022)



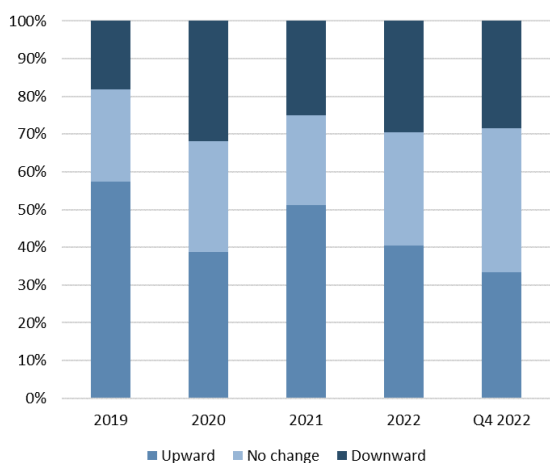
Source: EIOPA Insurance Statistics (public data). Unit-linked excluded.

Solvency II balance sheet valuations of direct property are subject to mark-to-market revaluations. Direct property investments held by EEA insurers total around 132 bn. Euro, the four largest holder countries in the EAA being France, Germany, Austria and Spain (Figure 5.34). Solvency II requires to account for assets at fair value, meaning that in times of booming real estate prices, the value of investments increased, leading to an increase in the own funds of insurers. However, in

a time of declining prices, valuations could suffer a significant hit, and own funds could decline. The lion’s share of property is assessed by Alternative Valuation Methods, which offer some flexibility in adjusting valuations. It is therefore not obvious, to which extent and with which speed declining real estate prices would show up in the balance sheets of insurers. An ECB analysis on real estate collateral of bank loans indicates that market price fluctuations are not fully reflected in the revaluation of exposures by banks with no revaluation of around 40-70% of real estate holdings over a one year period, depending on the type on real estate ⁶¹

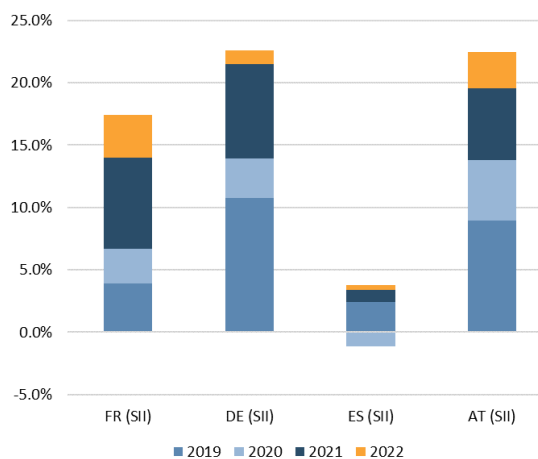
Insurers revalued their direct property holdings frequently. In order to analyse this, a balanced panel of property items was constructed, which excludes properties that were added or removed from the portfolio during the sample period. This permits to disentangle valuation change from volume change (property sold or purchased). Tracking the Solvency II valuations property-by-property over time makes it possible to gain insights into the frequency with which insurers revalue their direct property holdings. The analysis focuses on the four largest holder countries.⁶² The sample includes all office and commercial, residential, own use and other properties that were held from 2018 Q1 to 2022 Q4. Overall, it covers around 8,000 properties with a combined valuation of 67 bn Euro, or 8.3 million on average. The analysis focuses on domestic property which represents the large majority of direct property holdings. The results illustrate that insurers regularly revalue their properties (Figure 5.35). 73% of properties were revalued at least yearly (mostly in Q4). Both up- and downward revisions of valuations are frequent.

Figure 5.35: Share of direct property by type of revaluation



Source: EIOPA Quarterly Solo, QRT 06.02; Note: Investments covering unit- or index linked contracts excluded; SII valuation based on balanced panel of property items held from Q1 2018 to Q4 2022.

Figure 5.36: Valuation of direct property holdings by insurers in four selected countries



Source: EIOPA Quarterly Solo, QRT 06.02. MSCI Annual Property Indices; Note: See methodological note for Figure 5.35 .

⁶¹ https://www.ecb.europa.eu/pub/financial-stability/macprudential-bulletin/html/ecb.mpbu202210_4~0aa7d44e15.en.html

⁶² The analysis matches quarterly reporting of property items using a unique identifier of insurer and property item. This is mostly straightforward. However, at times, insurers change the asset ID code for properties over time. In many cases, this can be considered when the item title (often building name, city and address) is unchanged. Nevertheless, some properties are excluded from the sample when matching over time does not work. Because the sample includes a large number and share of properties, this does not affect the representativeness the results of the analysis. There is no indication that those properties with changing asset ID would systematically differ from the properties in the sample.

Over the past five years, property valuations in the balance sheets of insurers have significantly increased. Across the four countries in the sample, property valuations increased by 5% p.a. over the past five years. In Germany, overall property valuation increased by 7% p.a, in France by 4% p.a. and in Austria by 6% p.a. while Spain lagged behind with only 1% p.a. These valuation gains differ between residential and commercial properties: Residential property valuation increased by 6% p.a. which exceeds the growth for office and commercial property valuation of 5% p.a.

Insurer revaluations can to large extent be explained by the general development in property values. To better understand the mechanism of revaluation, the growth in property holding valuations was compared with external real estate asset value data as reported by MSCI in its European annual property indexes. Figure 5.36 compares the revaluations under Solvency II by year and country with MSCI estimates for asset value changes. The comparison data is largely in line with revaluations. For Germany and France, the MSCI estimates for the value increase are fully aligned with property revaluations by insurers until 2021 with a divergence for France in 2022. For Austria, SII valuation growth slightly exceeds the MSCI estimates. There is a large divergence for Spain, where MSCI estimates value growth in 2019 and 2021 which Solvency II valuations do not reflect. The difference could be well explained by the idiosyncrasies of the buildings in Spain that are held by EEA insurers.

In Q4 2022 property valuations in the balance sheets of insurers decreased slightly on average but overall did not reflect the estimated price decline. In Q4 2022, there was on average a downward revaluation of -0.4%, mostly driven by the French market with a downward revaluation of -1.1%. This is a notable change considering the upward revaluations over the past five years. However, this change is much lower than the asset value decline of -7% across Europe in Q4 2022 estimated by MSCI. One possible explanation is the time lag of market estimates, as insurers' quarterly balance sheets are submitted before reliable market data on the same quarter is available. This explanation would imply significant downward revaluations in 2023.

5.2.4 USE OF LIABILITY DRIVEN INVESTMENTS BY INSURERS AND IORPS AND LIQUIDITY RISKS FOR EEA INSURERS FROM POSSIBLE MARGIN CALLS ON THEIR INTEREST RATE SWAP POSITIONS

The turmoil in the UK Gilt markets in September and October 2022 illustrated the risks that may arise from exposures to Liability Driven Investment (LDI). The shock, originated in the UK Gilt (government bond) market, was triggered by an announcement of the UK government to implement unfunded expansionary fiscal policies. The reaction of the markets was sudden and material, causing a substantial repricing of the risk premia for UK government debt. Highly exposed sectors needed to react to the drop of Gilts' prices, and UK pensions funds were forced to react procyclical exacerbating the drop in Gilt prices. UK pension funds were particularly affected by the shock due to their liability driven investment (LDI) strategies which include the use of interest rate derivatives, repos and LDI funds. These exposures generated daily margin calls and triggered the liquidation of investments such as long-term Gilts, which proved to be illiquid during the crisis. While the crisis was very specific due to the characteristics and concentration in the markets and type of securities, lessons learned can be generalised.

The aim of liability-driven investments is to manage the risk to (regulatory) capital from interest rate fluctuations by generating assets matching the liabilities in terms of cash flows or their sensitivity to changes in interest rates.⁶³ Similar movements in the value of assets and liabilities in response variations in interest rates can be generated by *i)* direct investments in fixed-income securities, primarily long-term government bonds; *ii)* direct synthetic exposures through interest rate derivatives; *iii)* Direct use of repurchase agreements to generate additional funds to invest and *iv)* “LDI funds” that combine investments in fixed-income instruments with repurchase agreements and derivatives. The reduction in interest rate risk may come at the cost of incurring additional counterparty and/or liquidity risk.

EEA insurers and pension funds control large pools of assets (as of Q4 2022 total assets of approximately EUR 6.3 tr. and EUR 2.2 tr. respectively). The vast majority of their investments are driven (to varying degrees) by their liabilities.⁶⁴ This means that the risks associated with LDI both for insurers and pension funds merit close attention from a financial stability perspective. For this reason EIOPA continues to analyse and monitor the potential risks.

This section provides some insights into the extent to which insurers and pension funds use different LDI tools. In addition it explores the liquidity risks for EEA Insurers from possible variation margin calls on their interest rate swap positions. It complements the analysis of the use of derivatives by European insurers in the EIOPA December 2022 Financial Stability Report.

Liability driven investment strategies used by European insurers

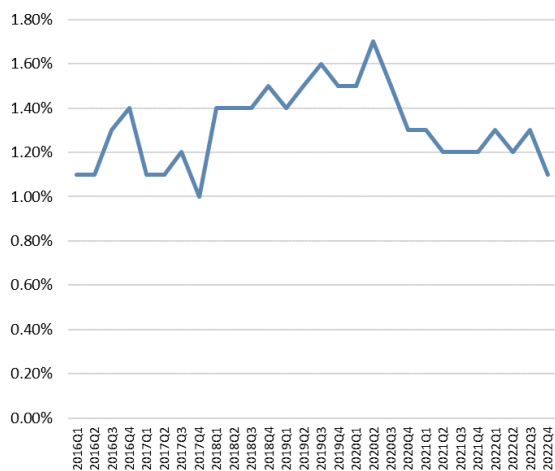
Liability driven investment strategies used by European insurers are mainly based on direct holdings of derivatives and repurchase agreements backed by government bonds. Regarding direct repo transactions of insurers, the Figure 5.37 shows the value of all government bonds used in repo transactions relative to the total assets of all EEA insurers and relative to the value of all government bonds as of end 2022. This is complemented in Figure 5.38 by the same ratios for the insurers which actually entered into repurchase transactions:

⁶³ The focus here is on interest rate risk. But insurers need to consider for example also the impact that currency fluctuations may have on the value of their assets and liabilities.

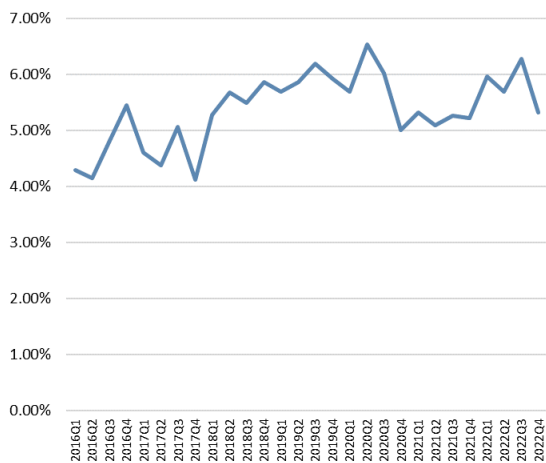
⁶⁴ This is most obvious for life insurers offering “traditional” products with guarantees and long duration liabilities. But also unit-linked (UL) insurance business with options and guarantees, which represents 12.5% of total life technical provisions (that are often labelled as Variable Annuities (VAs)), necessitates liability-driven investments. Unless they write very short-term business, non-life insurers that represent approximately 10% of the total EU insurance sector (2.4 tr. based on Solvency II Technical Provisions) need also to consider the interplay between their assets and liabilities

Figure 5.37: All EEA insurers

A. Share of government bonds used in repo transactions in total assets (average from 2016 to 2022 = 1.3%)



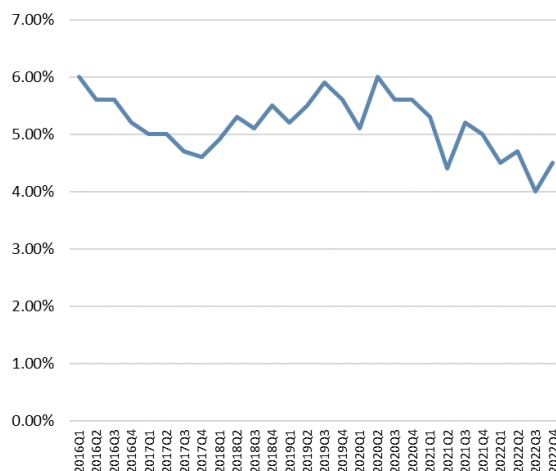
B. Share of government bonds used in repo transactions in total governments bonds (average from 2016 to 2022 = 5.4 %).



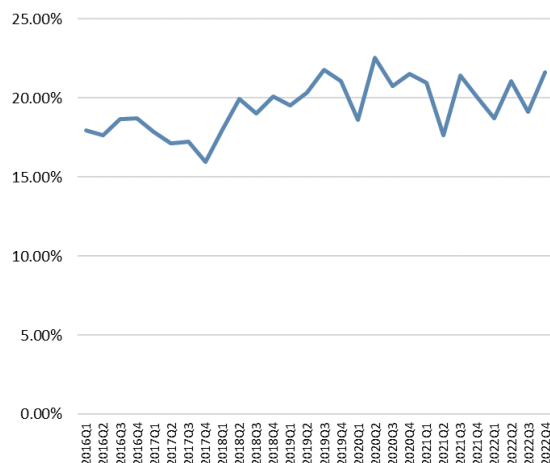
Source: EIOPA Quarterly Solo, QRT 06.02

Figure 5.38: EEA insurers using repos

A. Share of government bonds used in repo transactions to total assets (average from 2016 to 2022 = 5.2%)



B. Share of government bonds used in repo transactions in total governments bonds (average from 2016 to 2022 = 19.5%).



While the aggregate figures for all EEA insurers seem relatively low (in total around EUR 76 bn. at the end of 2022), Figure 5.38 shows that for repo users the government bonds employed in these transactions represent a large portion of their total government bond holdings. These repos are possibly part of LDI strategies. But as there could be as well other reasons (e.g. raising cash to post variation margin), their proportion cannot be quantified without an in-depth analysis. The above figures provides therefore only an upper limit for the extent to which repo transactions are used in LDI strategies by insurers. As repo transactions are not part of their regulatory reporting no corresponding analysis for IORPs is performed.

Investments of insurers and IORPs in LDI funds

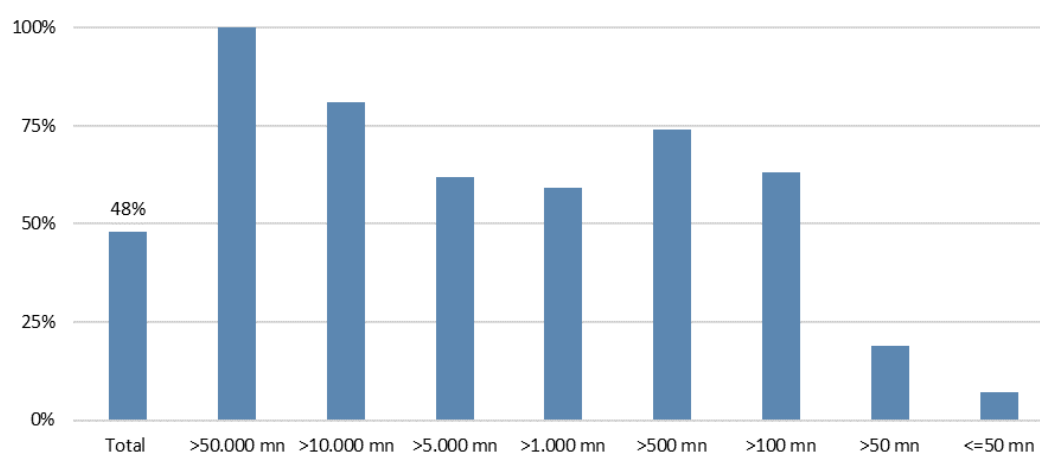
Regarding the investments of insurers and IORPs in LDI funds, ESMA came to the conclusion that **most LDI funds are EU-domiciled AIFs held by UK investors**. As of end-2021 there were around 500 AIFs (85% of which denominated in GBP) with a Net Asset Value (NAV) of around EUR 250bn and gross leverage of circa 370% of NAV (achieved mainly through interest rate derivatives and repo transactions).⁶⁵

The regulatory asset reporting for insurers and pension funds contains no “flags” for LDI funds. Based on a search for key words in the name/description of the funds, only three life insurance undertakings were identified in the aftermath of the UK Gilt crisis as using LDI-like funds. The value of their shares in these funds represented less than 0.1 % of EEA insurer investment portfolios and was consequently not material. The proportions at the undertaking level were limited to 1.6%, 0.7% and 0.4%. Based on the line-by-line IORP asset reporting, the same approach was used for IORPs.⁶⁶ The proportion of LDI funds in the total assets of DB IORPs was below 0.4 %. Only 24 primarily small IORPs had exposures between nearly zero and as high as 44% of their total investments to the identified LDI funds. This approach has considerable limitations. However, based on the currently limited information it seems that insurers and pension funds in aggregate do not have material investments in LDI funds.

Use of derivatives by IORPs

IORPs hedge their duration mismatch by using interest rate derivatives with their derivative positions normally structured to protect against a drop in interest rates. Restricting the focus on IORPs providing defined benefit pension schemes (“DB and mixed IORPs”), which represented 82% of the EEA IORP market in terms of assets as of Q4 2022, the analysis shows that 232 of the 480 DB or mixed IORPs submitting individual information to EIOPA (86% of DB and mixed IORPs in terms of assets) had derivatives on their balance sheet. The degree to which both IORPs enter directly into derivative transactions depends on their size (see Figure 5.39).

Figure 5.39: Percentage of DB and mixed IORPs using derivatives depending on their size (in total assets)



Source : EIOPA Occupational Pensions Statistics – Balance Sheet, quarterly

⁶⁵ [ESMA50-165-2438 ESMA Report on Trends, Risks and Vulnerabilities, No. 1, 2023 \(europa.eu\)](#)

⁶⁶ The information on the LDI nature of a fund is not a structured attribute in the reporting. The identification of LDI funds is based on a manual search on the name/description of the fund, which might lead to an underestimation of the exposures.

Figure 5.39 shows the widespread use of derivatives by larger entities. While there is no information on the underlying of the derivatives in the IORP reporting, it seems plausible to assume that a large part are interest rate derivatives. Box 4.1 in Chapter 4 shows the development of the aggregate market value of derivatives for EEA IORPs with DB pension schemes. In addition to these direct exposures to derivatives, there may be further indirect exposures through investment funds which use derivatives (these may or may be not LDI funds).

After the scheduled end of the clearing exemption for pension funds in June 2023, IORPs will have to use CCPs to clear specified interest rate derivatives. This is desirable to reduce counterparty risk. There are operational challenges, but pensions funds have started to clear trades on a voluntary basis for some time. Even though the events in the UK illustrated potential risks in pension funds, one important difference in the EEA sector is that the investment portfolios of derivative users tend to be well diversified in terms of asset classes, countries and maturities. This allows to liquidate different types of assets with a potential lower impact on liquidity in specific segments of the market.

Liquidity risks for EEA Insurers from possible variation margin calls on their interest rate swap positions.

The events during the UK Gilt crisis demonstrated that the liquidation of government bonds holdings by institutional investors to meet margin calls can result in a vicious cycle of rising rates. The analysis in the EIOPA Financial Stability Report December 2022 shows that EEA insurers with interest rate derivative positions hedging against interest rate decreases were net sellers of Money Market Funds (“MMFs”) and government and corporate bonds when bond prices fell in the first two quarters of 2022. But this did not result in similar developments as in the UK. Possible reasons are the deeper European bond market, the more gradual pace of the increase in rates and the diversification of derivative users in their government bond holdings across countries and maturities. Interest rates may remain highly volatile and keep rising. For these reasons the situation needs to be constantly monitored.

As the end of 2022 a 100 bps parallel upward shift in the yield curve would have caused an additional cash variation margin⁶⁷ requirement of circa EUR 26.7 bn. for insurers that are using interest rate swaps to hedge against interest rate decreases⁶⁸. The amount of hedging against interest rate increases is generally much lower than for hedging against interest rate declines. Consequently, the insurers with net IRS positions that gain in value when interest rates increase would have faced additional variation margin requirements of only EUR 4 bn. in case of a parallel 100 bps downward shift (Panel B) at the end of 2022.

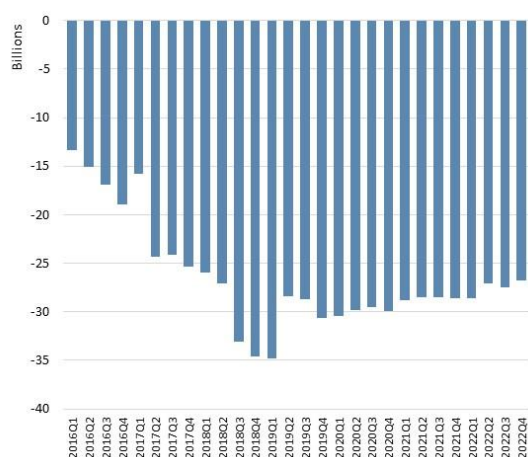
⁶⁷ Variation margin (VM) reflect the change in market value of Interest Rate Swap Contracts held by an insurer. For the analysis the change in market value of each derivative contract is calculated by multiplying the duration of each contract with a shift in the level of the interest rate. Then, VMs are aggregated across contracts at the company level netting positive and negative VMs. Finally. Aggregated figures of VMs are provided with a breakdown by insurers with positive versus negative net duration on IRSs.

⁶⁸ An extensive analysis of the liquidity implications resulting from variation margins on IRS positions was published in the [EIOPA Financial Stability Report of December 2019](#) with data for 2018 with key elements of the analysis replicated, at a later stage, to reflect the evolution of IRS positions as of Q4 2019 and the subsequent shock due to the virus outbreak: Analysis in paragraph “Variation margins and derivatives positions” at page 72 of [EIOPA Financial stability report- July 2020.pdf - EN \(2\).pdf](#)

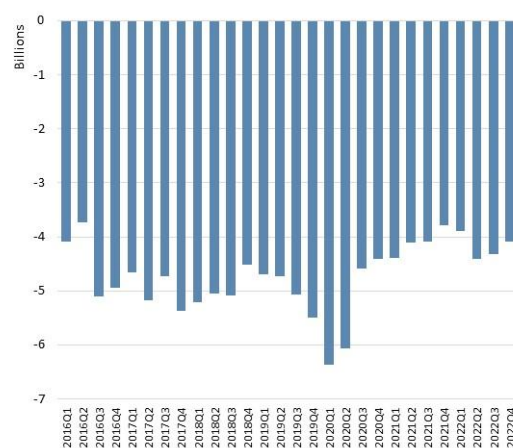
Hedging against potential declines in interest rates increased after the introduction of SII, then reached a peak at the beginning of 2019 after which it stabilized. In the last quarters, it has been on a slightly negative trend in the context of increasing interest rates (see Panel A). An explanation for the general upward trend might be the need of insurers to extend the duration of their assets in the context of the low yield environment and negative duration gaps. As a result EEA insurers have become more exposed to upward movements in interest rates.

Figure 5.40. Interest rate risk exposure (in EUR) through interest rate swaps.

A. Total EUR risk exposure to a 100 bps parallel upward shift in the yield curve through IRs for insurers that have to pay variation margins on a net basis when the yield increases⁶⁹



B. Total EUR risk exposure to a 100 bps parallel downward shift in the yield curve resulting from IRs for insurers that have to pay variation margins on a net basis when the yield decreases⁷⁰.



Source: Solvency II Quarterly solo QRT data (S.08.01) and EIOPA analysis

Note: The used measure is the loss in value of the aggregate derivative position resulting from the shift.

Insurers in aggregate hold enough liquid assets to cover potential margin calls resulting from a plus or minus 100 basis points shift in the yield curve. Insurers hold large quantities of liquid assets which can in “normal times” be easily sold or used in repurchase agreements (repos). The results of the calculations presented below suggest that the additional margin requirements based on plausible interest rate changes are comparably limited relative to the available liquid assets of the sector. For the sake of simplicity the calculations do not consider that when interest rates increase (decrease) sharply, fixed income assets such as government and corporate bonds will depreciate (appreciate). In any case, cash and proceeds from the redemption of Money Market Funds seem to be already sufficient to cover potential margin calls for the assumed interest rate increases and decreases: At the end of 2022, insurers hedging against falling interest rates held cash positions of approximately EUR 25 bn and had investments in MMFs of around EUR 12 bn. The corresponding figures for insurers hedging against rising rates were EUR 59 bn and EUR 11 bn respectively.

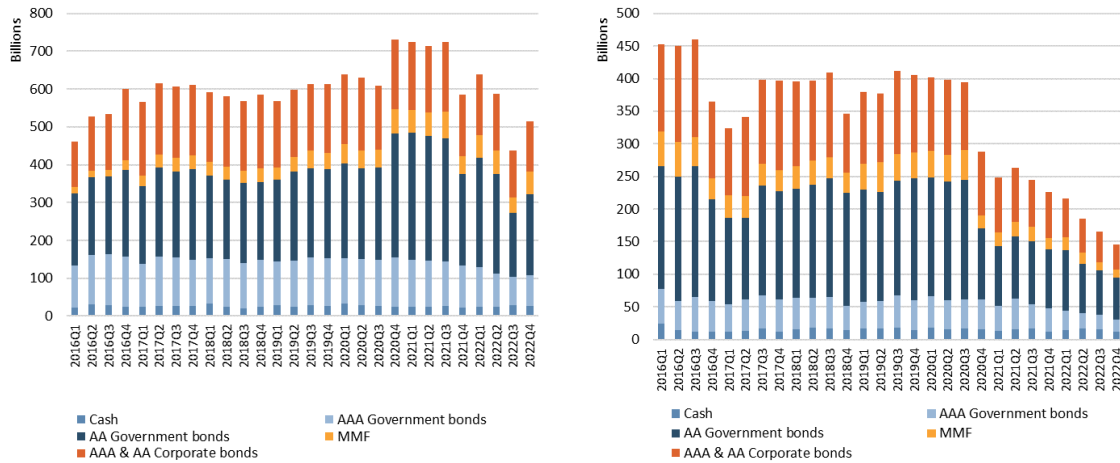
⁶⁹ As of 2022:Q4, 98 insurers pay variation margins on a net basis (i.e. positive IRS duration) when the yield increases.

⁷⁰ As of 2022:Q4, 64 insurers pay variation margins on a net basis (i.e. negative IRS duration) when the yield decreases.

Figure 5.41. Liquidity positions of EEA insurers⁷¹: breakdown by asset category.

A. Value of different liquid investments in Billion Euro for insurers which have to post variation margin on a net basis when interest rates increase.

B. Value of different liquid investments in Billion Euro for insurers which have to post variation margin on a net basis when interest rates decrease.



Source: Solvency II QRT data (S.06.02) and EIOPA analysis. In Panel B the large q-o-q change from Q3 to Q4 2020 might be explained by a rebalancing of bonds across rating (e.g. to A or BBB).

The results of this analysis at the aggregated sector level do not mean that the impact on individual insurers could not be substantial or that insurers would need to liquidate assets to re-establish pre-shock cash positions.

⁷¹ Note: Cash and equivalents refers to the sum of the two categories coin and notes (CIC71) and cash equivalents and transferable deposits (CIC72). For government and corporate bonds with rating AAA (CQS0) and AA (CQS1) encumbered securities are excluded.

PART II

Thematic Article

Assessing future river flood risk for the European insurance sector using the open-source CLIMADA model

Marie Scholer⁷², Luisa Mazzotta¹ and David N. Bresch⁷³

Abstract

Flooding is one of the most significant natural hazards affecting Europe. Global warming and continued development in flood prone areas will progressively increase river flood risk. This study used the open-source CLIMADA software to model the impact of climate change on river flood exposures for the European insurance sector. The results show that if no adaptation or mitigation measures are taken, climate change could significantly increase river flood risk across Europe over the coming decades for the EEA insurance sector. While uncertainty remains about the magnitude of the changes in estimated losses, this study suggests that the average annual insured losses would increase by more than 200% by the end of the century under the most severe scenario assuming no changes in the value of the exposure at risk. In general, the model shows that increases in future losses are larger in northern Europe than in southern regions. At individual country level, the changes of river flood losses due to climate change can vary significantly across regions. In several cases some regions would even see an increase of risks while risks in others decrease.

Keywords: River flood, climate change, exposures of insurers

1. Introduction

Human activities are already estimated to have caused more than 1°C of global warming above the pre-industrial level.⁷⁴ Continuing greenhouse gas emissions are likely to cause further long-term warming, and consequences in terms of changes in frequency and severity of natural catastrophes and climate-related extremes are becoming a certainty. The effects of these changes on the insurance sector, which business model involves offering financial protection against the consequences of such events, are likely to be substantial (EIOPA, 2022a).

River flooding is one of the costliest natural disasters in Europe. Global warming and continued development in flood prone areas will progressively increase river flood risk. Without climate mitigation and adaptation direct damages from flooding could significantly increase the current losses by the end of the century (Dottori et al., 2020). It is therefore of key importance to understand and model flood risk and climate change.

In alignment with the EIOPA sustainable finance strategic objective to promote the use of open-source modelling and data for climate change-related risks,⁷⁵ this study uses the open-source catastrophe model CLIMADA⁷⁶ to assess the impact of climate change on river flood EEA exposures

⁷² European Insurance and Occupational Pensions Authority (EIOPA).

⁷³ Institute for Environmental Decisions, ETH Zurich / MeteoSwiss

⁷⁴ [How close are we to reaching a global warming of 1.5°C? | Copernicus](#)

⁷⁵ See EIOPA [Final Single Programming Document 2023-2025 \(europa.eu\)](#)

⁷⁶ [CLIMADA – Weather and Climate Risks | ETH Zurich](#)

for the EEA insurance sector (for simplicity “European” and “Europe” are used in the following instead of EEA).

2. Background

Flood events are hydrological events which can be categorised in riverine, coastal or flash floods. Each type of flooding has different characteristics (e.g. in terms of duration, frequency, causes or forecasting technique) and impacts. Riverine or fluvial flooding is the overflow of water from a stream channel (i.e. river, lake or stream) onto normally dry land in floodplain areas. Extreme precipitation or snowmelt can generate such events. Coastal flooding results from higher-than-normal water levels along the coast, lakes or reservoirs; windstorm events or tsunamis can lead to the inundation of these areas. Finally, intense precipitations concentrated in a short period of time can trigger flash or pluvial events independently by overflowing water body (EM-DAT⁷⁷). This study focuses on riverine (“river”) flood risk, and it aims at assessing the potential consequences for the European insurance sector caused by climate change on this flood type.

Flooding is one of the most significant natural hazards in Europe, ranging from localized events to massive floods spanning multiple countries (RMS, 2021). Based on data from Munich Re, flooding accounted for 31% of economic losses and 28% of the insurance claims caused by natural catastrophes across the continent for the period 1980–2017 (European Environment Agency, 2019).

Climate change, jointly with socio-economic development, is expected to increase the impact of flooding in many regions across Europe (Alfieri et al., 2018). According to the 6th Intergovernmental Panel on Climate Change (“IPCC”) report (IPCC, 2021), extreme precipitation, pluvial and fluvial floods have already become more frequent and more severe in Western and Central Europe and this trend will intensify by mid-century if greenhouse gas emissions are not reduced. Based on the JRC Peseta IV study⁷⁸ (Dottori et al., 2021), riverine floods cause 7.8 bn euro in annual damages in the EU and UK and affect more than 170,000 people every year.

On the one hand, insurance is an important protection mechanism to limit this risk as it provides for example payments to rebuild the damaged properties after a disaster speeding up the economic recovery (Botzen, 2008 and Giuzio et al. 2021). On the other hand, changes in weather-related patterns are expected to have a cascading effect on the non-life insurance sector (for example through raising claims or limitations in reinsurance capacity). According to a recent study published by the commercial model vendor RMS (2021)⁷⁹, the impact of climate change on precipitation patterns is expected to increase the insured risk of flooding across Europe over the coming decades.

⁷⁷ [EM-DAT Glossary | EM-DAT \(emdat.be\)](#)

⁷⁸ In the Peseta IV study, a comprehensive modelling framework is applied to simulate the response of river flows (LISFLOOD hydrological model) in Europe to present and future climate conditions, to analyse the occurrence and intensity of flooding processes, and to estimate the impacts on economies and people across Europe. The authors considered future climate scenarios corresponding to an increase of global average temperature of 1.5, 2 and 3°C above the preindustrial temperature, combined with socioeconomic projections. Improvements in this study include, among others, a very good representation of present flood protection levels, and updated functions to represent flood damage to buildings.

⁷⁹ The analysis conducted by RMS is based on the catastrophe model “Europe Inland Flood HD Models”, and projections for future precipitation patterns were obtained from the EURO-CORDEX model ensemble based on four different greenhouse gas emission scenarios and two-time horizons (2050 and 2090).

Depending on the greenhouse gas emissions pathway considered, the average European annual insured losses are projected to increase between 34% to 75% by 2050 and between 33% to more than 200% by 2090 (with significant impact particularly in France, Germany and other north-western countries). It is therefore key for the insurance sector to be able to model and manage these risks correctly.

Catastrophe (cat) modelling is a data-driven approach to assess the damage and loss caused by a catastrophic event such as flood. Simulations are used to estimate the intensity, magnitude and location of the event. The resulting models provide insurers, reinsurers, emergency planners and others with information on potential outcomes. Cat models are an important tool for insurers to price risk, to manage portfolios of risks and to determine capital requirements.

The software available to build, run and analyse catastrophe models uses different platforms, data sets and models. The majority rely on proprietary software and data, with clients paying fees for getting access⁸⁰.

These models are often based on observed trends and are designed to describe the current/near future climate. They are not typically designed to quantify future risks rising from climate change due to expected changes in frequency and severity of future weather-related events. However, more and more insurers and model vendors are currently adjusting their models to be able to estimate the expected changes in losses resulting from climate change (i.e. under different Representative Concentration Pathway scenarios and time horizons).

Recently, the cat modelling industry — like many other data-driven industries — has seen a push towards open-source data and industry-wide collaboration (SwissRe, 2021). The Oasis Loss Modelling Framework for example provides an open-source platform for developing, deploying and running catastrophe models. Models are packaged in a standard format and the components can come from any source, such as model vendors, academics and research groups⁸¹. Another initiative, the OpenQuake Engine⁸² is an open-source application that allows users to compute seismic hazard and seismic risk for earthquakes on a global scale. The IDF risk modelling steering group has also spelled out its 2022 vision and mission⁸³ with a clear focus on working toward open modelling technology and standards.

Finally, the open source CLIMADA⁸⁴ software (see Box 1) allows the user to estimate the expected economic damage as a measure of risk today and the further incremental increase due to climate change. CLIMADA is developed in Python and available as open source. CLIMADA has been used in various scientific studies to for example assess the risk from:

- Tropical cyclone (Eberenz et al., 2021)

⁸⁰ Two of the biggest catastrophe model vendors are Risk Management Solutions (RMS) and Verisk. There are other vendors (such as Corelogic, Impact Forecasting, JBA...) that provide comprehensive platforms, along with some which provide only models or only data.

⁸¹ [Oasis Loss Modelling Framework | Open-source catastrophe modelling platform \(oasislmf.org\)](https://oasislmf.org/)

⁸² [OpenQuake Platform](https://openquake.org/)

⁸³ [Strategy: 2022 update \(insdevforum.org\)](https://insdevforum.org/)

⁸⁴ [CLIMADA – Weather and Climate Risks | ETH Zurich](https://climada.ethz.ch/)

- Wildfire (Luethi et al., 2021)
- River flood (Sauer et al., 2021)
- Windstorm (Welker et al., 2021)
- Heat waves (Stalhandske et al., 2022)

This software has also been used by the NGFS to create open-source climate scenarios⁸⁵. In this study, we use CLIMADA to model the impact of climate change on river flood exposure for the European insurance sector.

BOX 1: OPEN-SOURCE CAT MODEL - CLIMADA

CLIMADA, an open-source catastrophe risk modelling platform, is used to analyse risks, i.e. to estimate the likelihood of extreme events occurring and their impacts (Aznar-Siguan and Bresch, 2019 & Bresch and Aznar-Siguan, 2021). The CLIMADA code is curated and freely available on GitHub⁸⁶ and datasets via the CLIMADA data API⁸⁷. Three key factors are combined in the modelling framework: the level of exposure describing the set of assets, people, livelihoods, infrastructures, etc. within an area of interest in terms of their geographic location, their value etc.; the hazard describing the physical characteristics, such as frequency and intensity, of the events; and the vulnerability of exposures to extreme events.

CLIMADA allows to calculate monetary losses from extreme events under current climate and climate change conditions by considering the change in frequency and severity of extreme events associated with various climate scenarios.

While the sophistication of hazard models in CLIMADA may not fully match that of the commercial vendors, it has considerable value because it is open source and open access. This means all assumptions of the model are transparent and, with modifications to the source code, can be adapted as required by advanced users (ClimateWise, 2019). In addition, CLIMADA has been used in several academic studies⁸⁸ (e.g., Eberenz et al., 2021, Welker et al., 2021 and Sauer et al., 2021) which helps to understand its limitations and how the results can be interpreted (Kropf et al., 2022).

⁸⁵ [Climate Analytics – Climate impact explorer](#)

⁸⁶ https://github.com/CLIMADA-project/CLIMADA_python

⁸⁷ <https://climada.ethz.ch/data-types/>

⁸⁸ See https://github.com/CLIMADA-project/CLIMADA_papers, including script to replicate select results

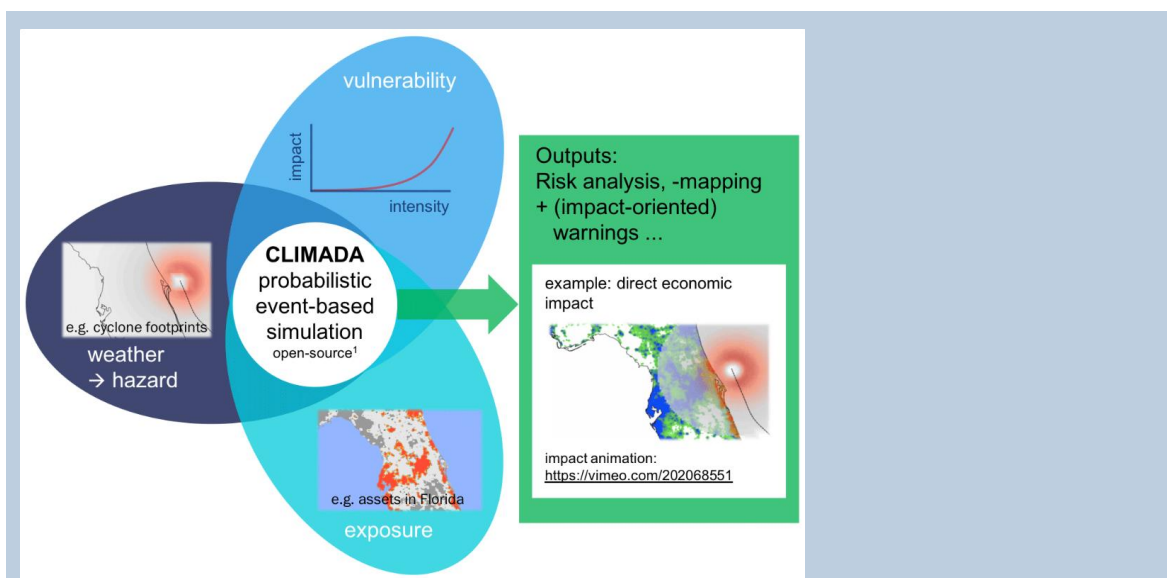


Figure 1: CLIMADA building blocks. Source: CLIMADA – Weather and Climate Risks | ETH Zurich

In order to facilitate the use of CLIMADA, EIOPA has developed an open-source user interface (UI)⁸⁹. EIOPA has also added the option to enter exposure data and to assess the results at NUTS2 level. Nomenclature of Territorial Units for Statistics or NUTS refers to the administrative divisions of countries defined by the European Commission for statistical purposes (NUTS-3 regions are the smallest regions within a country, while NUTS-0 regions refer to the entire country). This is a new feature which allowed the authors to model the exposure data collected in 2021 from the insurance industry (see Box 2).⁹⁰

For this analysis, CLIMADA was run on a 4x4 km² grid (consistent with hazards as currently available in the CLIMADA data API⁹¹). CLIMADA can provide different output metrics. This study uses the average annual loss (AAL) and the return period losses (RPL) (see Box 3). Using the UI, the modelling results from CLIMADA are then consolidated to obtain the output metrics at different aggregation levels, per country or per NUTS2 following the same approach as presented in CAS (2020).

⁸⁹ [Open-source tools for the modelling and management of climate change risks \(europa.eu\)](https://europa.eu)

⁹⁰ This exposure data has previously been employed for the [Dashboard on insurance protection gap for natural catastrophes | Eioipa \(europa.eu\)](https://europa.eu) and is used and described in the assessment of insurers' exposure to physical risks by EIOPA ([link](#))

⁹¹ <https://climada.ethz.ch/data-types/>

BOX 2: DISAGGREGATION OF NUTS2 EXPOSURE DATA AND AGGREGATION OF LOSS DATA IN CLIMADA

Geolocated exposures data at latitude, longitude level can be loaded from a file, specified by the user, or created from regional economic models accessible within CLIMADA. To facilitate the use of CLIMADA, EIOPA has added a new functionality to CLIMADA allowing users to use exposure data at NUTS2 level (see for example Figure 2). These data will then be disaggregated on a 4x4 km² grid (see for example Figure 3) using the same disaggregation as the estimated asset value from the Litpop data (Eberenz et al., 2020).

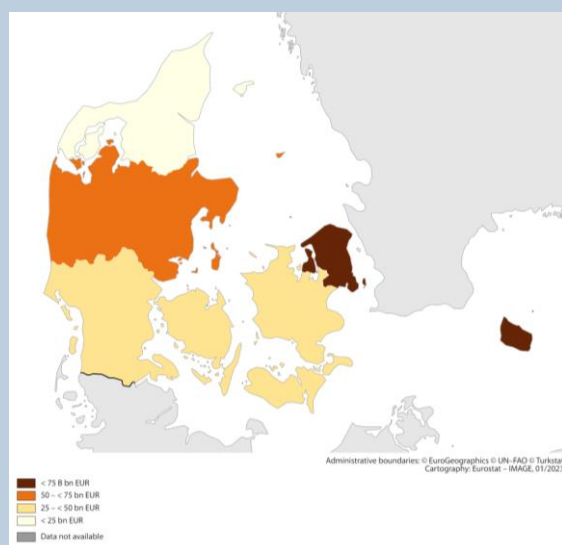


Figure 2: Example for exposure data at NUTS2 level for Denmark.

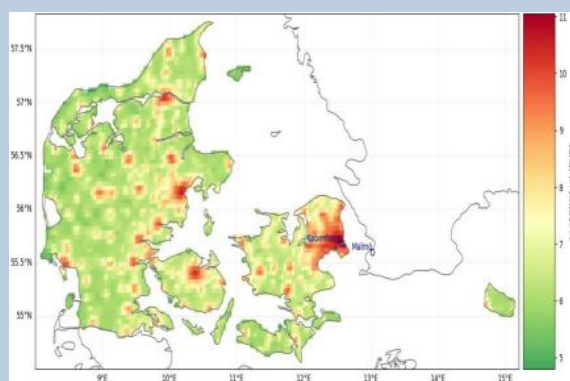


Figure 3: Example for disaggregated exposure values on a grid.

BOX 3: OUTPUT METRICS

The overall expected loss for the entire set of events is known as the AAL and is defined as the sum of the expected losses of each of the individual events for a given year. Let p_i and X_i be an annual probability of occurrence and the corresponding total loss associated with the natural disaster i (CAS, 2021). AAL is defined as:

$$AAL = \sum_{i=1}^{\infty} p_i X_i$$

A return period loss (RPL) gives two pieces of information—an amount and a probability. It is an amount that is expected to be exceeded with a given probability by an event or in a year. For example, a 100-year RPL of \$6 million (\$6M) means that there is a 1-in-100 (1 percent) chance of a loss of at least \$6M (American Academy of Actuaries, 2018).

3. Methodology

Exposure data

For the non-life property insurance business, the exposure of the insurer is driven by the overall value or replacement value of the buildings insured.⁹² The aggregated monetary replacement value for the buildings net of reinsurance business and coinsurance is called the sum insured. The sum insured data used in this analysis is based on the EIOPA year-end 2020 ad hoc data collected from large European insurance groups and solo undertakings. The sum insured against river flood risk has been collected at CRESTA low resolution or NUTS3 level (depending on the country and the scheme used in the Solvency II reporting).⁹³ For the purpose of this analysis the data has been converted to the NUTS2 level with the EIOPA “CRESTA to NUTS” tool.⁹⁴ It uses the EUROSTAT mapping between NUTS and postcodes.⁹⁵ CRESTA is a geospatial standard established by the insurance and reinsurance industry to facilitate the technical management of natural catastrophe insurance. The CRESTA zones are usually the first two digit of the postal code. Finally, the data for Spain has been enriched based on the data provided by the Consorcio de Compensación de Seguros.

At European level, river flood is the second most important peril in terms of sum insured. Residential and commercial properties worth more than EUR 25 trillion are insured against this risk and two thirds of the overall insured value is located in France, Spain and Germany.⁹⁶

⁹² Residential refers to buildings that are designed to be lived in. Commercial buildings are much more varied than residential properties. While residential properties are exclusively used for private living quarters, commercial refers to any property used for business activities. For the purpose of this analysis, industrial properties have been included into the figures for commercial buildings.

⁹³ For further information, please see: [Publications - NUTS - Nomenclature of territorial units for statistics - Eurostat \(europa.eu\)](#) and [CRESTA](#)

⁹⁴ The tool can be found here: [Open-source tools for the modelling and management of climate change risks \(europa.eu\)](#)

⁹⁵ <https://ec.europa.eu/eurostat/web/nuts/correspondence-tables/postcodes-and-nuts>

⁹⁶ The overall sum insured against river flood risk for residential and commercial buildings in the Netherlands is low as flood risk is usually excluded from insurance policies. In particular, flooding caused by failures of major dikes is generally not covered. In some cases, flooding caused by smaller rivers may be covered by insurance. Losses related to river or coastal flooding, for which no insurance exists and officially declared as national disaster, may be partially compensated on ad hoc basis by the government through the “Reimbursement for damages due to disasters Act” (Wet tegemoetkoming schade bij rampen – Wts).

Flood risk - sum insured by NUTS 2 regions Residential and commercial buildings

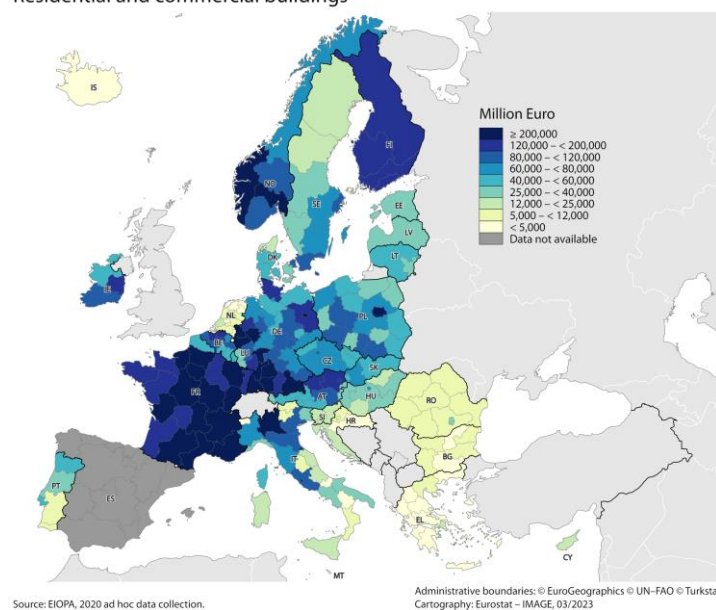


Figure 4: European insurance sector sum insured against river flood risk for residential and commercial buildings at NUTS2 level. Note: CCS sum insured for Spain, accounting for 6.06 trillion euros, has been removed due to confidentiality reasons.

Sample

The sample includes 35 large European groups active in non-life business and 9 non-life and composite solo undertakings, registered in 19 European jurisdictions, with relevant exposure to fire and other damages to property business (flood risk would be included in the latter).⁹⁷ The sample covers all EEA jurisdictions as the companies included in the sample typically write business in multiple countries. On aggregate, the groups and solos in the sample cover approximately 59% of the EEA-wide market in terms of gross premiums (for direct business) written in 2020 for the fire and other damages to property insurance LoB.

Hazard data

The river flood hazard set is derived from climate and hydrological models as part of the Inter-Sectoral Impact Model Intercomparison (ISIMIP) Project phase 2a and 2b (Frieler et al, 2017) and available as a ‘demonstration’ hazard set on the CLIMADA data API. The river flood hazard set has been built as follows (Sauer et al., 2021 & Kam et al., 2021):

- To obtain representations of daily precipitation and assess the effects of uncertainty regarding the response of the climate system to greenhouse gas (GHG) emissions as well as the response of terrestrial hydrology to climatic changes, an ensemble of six different global

⁹⁷ The selection of companies has been based on the annual direct business gross written premiums in 2019 for the fire and other damages to property insurance LoB as well as on expert judgment to ensure sufficient sample coverage at country level. The sample selection focused on fire and other damages to property as insurance coverages for natural catastrophe protection are generally part of the fire or property insurance and it’s likely to be among the LoBs at highest weather-related disaster risk (EIOPAA, EIOPAc, 2022).

hydrological models (GHMs) was employed by Kam et al. (2021). Each used weather variables simulated by four general circulation models (GCMs) within the Coupled Model Intercomparison Project phase 5 (CMIP5) (Taylor et al., 2012). The baseline consists of a historical catalogue of events.

- A flood model (CaMa-flood, Yamazaki et al., (2011)) has been used to turn precipitation (via run-off and routing) into flood heights globally at high resolution, storing (due to memory constraints) the maximum flood height and fraction of flooded area at a granularity of 150 arc seconds (approx. 4 kilometres) for each year.⁹⁸
- For the CLIMADA data API, these annual river flood maps were converted into the CLIMADA hazard class format and hence are readily available for use within CLIMADA. Therefore, there are composite⁹⁹ flood hazard sets for the current and future climate.

The forward-looking river flood hazard set considered in this study is based on the Representative Concentration Pathways (RCPs) published by the Intergovernmental Panel on Climate Change (IPCC) in its Fifth Assessment Report which describe future greenhouse gas concentrations based on an extreme scenario (RCP 8.5) where high levels of emission continue to occur.

This article focuses only on the business-as-usual or worst-case scenario (RCP 8.5 for the projected time period 2070-2090) where unmitigated climate change would lead to long-term irreversible changes. This allows to analyse the worst-case impact for the insurance sector. The decision to focus only on a specific climate scenario and time horizon gives the opportunity to explore the results in greater detail, discuss the limitations and identify potential ways forward.

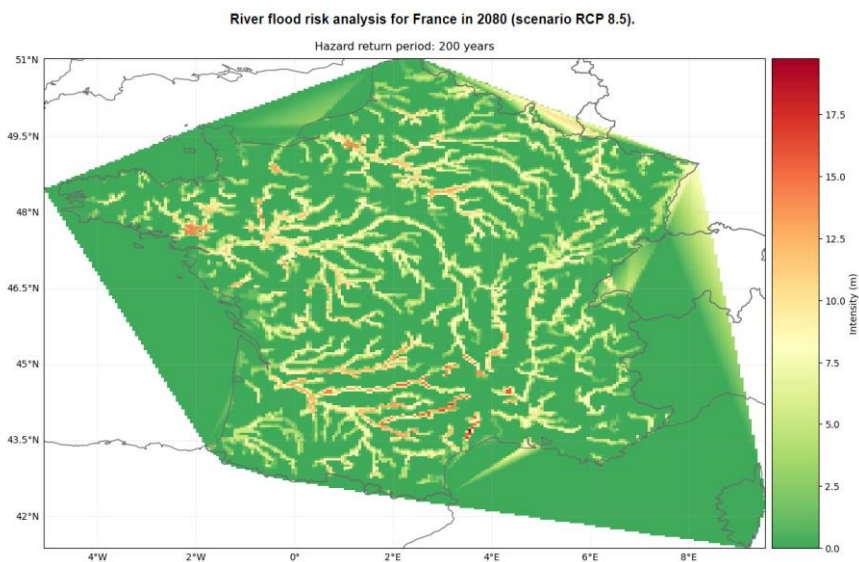


Figure 5: Example of river flood hazard set for 200 years return period for France under RCP 8.5 scenario and the 2070 to 2090 time horizon with the colour representing the inundation depth in meters. Note: A flood hazard map provides information on inundation for a specific return period.

⁹⁸ They are available at isimip.org.

⁹⁹ A composite flood hazard set means it can be used in the same fashion as a probabilistic set. As the present climate hazard set stems from the control simulations of the GCMs, there are no historic events matching.

Vulnerability data

The expected damage to physical assets exposed to these events is calculated using vulnerability functions which quantify the relationship between the amount of damage to an asset and the intensity of the hazard. Vulnerability is generally represented in the form of vulnerability functions to express the correlations among damage ratios (i.e., the cost of damage as a percentage of the appraised value of a property) and hazard intensity (i.e., wind speed or flood depth) (Yum et al., 2021). This mapping of hazard to damage is applied to all exposed assets and allows an estimate of the total loss from physical damages to be calculated for each extreme event.

For floods, the damage is calculated by translating flood-depth into a damage function using vulnerability curves. Damage assessments in this study use the residential damage function based on an empirical estimated damage function published in Huizinga et al. (2017) (see Figure 6). Huizinga et al. (2017) developed a globally consistent database of depth-damage curves. This dataset contains damage curves depicting fractional damage as a function of water depth and is based on an extensive literature survey. This study uses the same curve for all of Europe.

Similarly to Sauer et al. (2021), the analysis assumes that the residential damage function is representative of all other (i.e. commercial and industrial) damage categories. This is motivated by the fact that: (1) residential damages regularly make up the largest fraction of flood damages and (2) the variation in the damage functions for different categories is small, compared to the uncertainty of the regional distribution of specific asset classes on the European level.

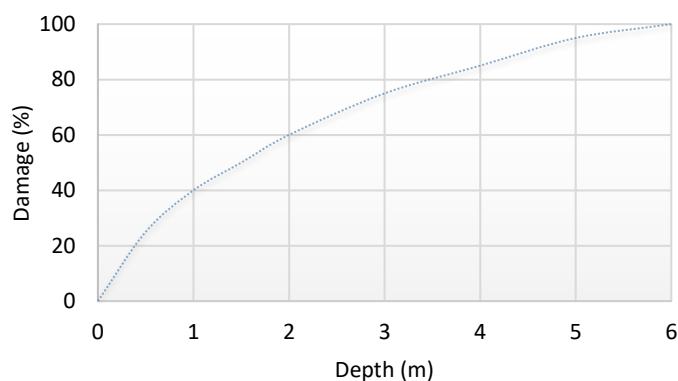


Figure 6: Damage function for European Residential Property.

4. Results

This section describes the results from the climate change modelling exercise for the peril of river flood risk in Europe and the changes in expected insured losses by the end of the century under the RCP 8.5 scenario for the projected time period 2070-2090.

The results are a first attempt to model the impacts of climate change on natural catastrophes could have for the European insurance sector exploiting one of the available open-source models (in this case CLIMADA). On the one hand, this study shows that it is possible to model current and

forward-looking river flood losses for the European insurance sector using CLIMADA. On the other hand, the analysis also demonstrates the need to get access to better open-source hazard and vulnerability data for river flood under different climate change scenarios in Europe. Indeed, the ISIMIP data have deficiencies and are more used here as a ‘demonstration hazard’. In fact, the ISIMIP dataset is one of the few (if not the only) globally open-source consistent flood hazard sets which represents ‘today’ and ‘climate change’ flood hazard and its fully integrated in CLIMADA. Moreover, when interpreting the results, it should be considered that the exposure data used in this analysis do not represent 100% of the European insurance market. Finally, the underlying exposures are assumed to remain constant over time to isolate the potential impact of climate change on river flood exposure on the European insurance sector.

In addition to these specific limitations, modelling present and future river flood impacts requires inevitable simplifications, and there is substantial uncertainty pertaining to models and datasets representing hazard, exposure and vulnerability (Dottori et al., 2018).

Overview of Europe-wide results

For this study, the modelled losses for the baseline (1980-2000) using the current exposure equal around 21 bn. Euros.

A possible explanation for the higher value than in the baseline calculated by the Peseta IV study (7.8 Bn Euros) could be the differences in the input exposure data. This study considers 2021 exposure data (sum insured) collected directly from the insurance sector. In the Peseta IV study, the exposure data were not directly expressed in monetary term, instead they used CORINE Land Cover data proposed by Rosina et al. (2018) as input data.

There are also differences in the hazard data used. The ISIMIP data used in this study tend to overestimate the losses (this can be attributed to: (a) the fact that ISIMIP are global data and the data used in Peseta IV are for Europe, (b) the methodology that considers the whole river network irrespective of the upstream area of catchments and (c) the coarser resolution of flood maps obtained for the ISIMIP data produces larger flood extents, and in turn, impacts). The hazard data used by the JRC have a better resolution, but the future projections data is not available open source to be used in CLIMADA at the time when this analysis was developed. In addition, the protection level considered in Peseta IV uses spatial information on the river flood protection level in Europe obtained from a new datasets of flood protection standards specifically developed for Peseta IV. The new dataset combines information on protection design levels with modelled protection standards. The hazard data used in this study make use of the FLOPROS global database (Scussolini et al., 2016). Finally, the vulnerability curve: a global time-independent damage function was applied to translate the changes in flood fraction and depth into damages, thus not accounting for country-specific vulnerabilities and their future changes. In the Peseta IV study, country-specific vulnerability curves were used.

Using the pessimistic (RCP 8.5) emission pathways, the average annual losses are estimated to increase by 249% in the period 2070 to 2090 compared to the baseline. The general increase in

flood risk across Europe is in line with the recent scientific publications (EEA report¹⁰⁰, IPCC AR5¹⁰¹). The results from the study done by RMS (2021) also suggested an overall increase of the flood losses in Europe with the average annual losses expected to increase by 264% in 2090. The results from this analysis therefore suggest a similar increase as in the RMS study. However, this represents a smaller increase than what the Peseta IV study found. The Peseta IV report estimated that the direct damages from flooding could become six times present losses by the end of the century in case of no climate mitigation and adaptation (Dottori et al., 2020). The differences could be linked to the fact that this study intends to estimate the change in insured losses whereas the Peseta study aimed at estimating the changes of the total economic losses. It also considered economic projections but started from a lower baseline than the estimate in this study.

Country and regional trends

Figure 7 compares the changes in the average annual riverine flood losses for the baseline (1980-2000) with RCP 8.5 scenario at the end of the century (2070-2090). Based on the modelled results, most European countries would see a significant increase in river flood losses. This can be explained by the fact that extreme one-day precipitation events are expected to become more frequent across most of Europe and particularly in Northern and Eastern Europe during winter (RMS, 2021 and EEA, 2017¹⁰²).

With the assumptions employed here, only Spain¹⁰³ and Czechia¹⁰⁴ would experience a decrease of the estimated AAL under the RCP 8.5 scenario compared to the baseline. Several countries in Southern and Eastern Europe would see a moderate increase in river flood losses by the end of the century. These trends are in line with the observations made by RMS (2021) that larger increases in projected river flood losses are observed for northern Europe than for southern regions.

However, it is important to note that clear patterns in future precipitation trends are more difficult to identify in Southern Europe. For this region, RMS results based on EURO-CORDEX data show mixed pattern of increases and decreases in extreme precipitation varying seasonally (i.e. the amount of precipitation in winter and summer time is different). Overall, mean precipitation is expected to decrease in the southern region. However, this does not necessarily translate into a decrease in extreme precipitation events and therefore in a river flood risk reduction. In addition, the southern region will be more impacted by droughts causing the hardening of the ground (Sandor et al., 2021). Under these conditions, rainwater might fail to saturate the ground and lead to more flooding. Once more, this highlights the complexity of performing climate change flood risk analysis.

¹⁰⁰ [Key observed and projected climate change and impacts for the main regions in Europe — European Environment Agency \(europa.eu\)](#)

¹⁰¹ [Fifth Assessment Report — IPCC](#)

¹⁰² [Key observed and projected climate change and impacts for the main regions in Europe — European Environment Agency \(europa.eu\)](#)

¹⁰³ It is interesting that in this study Spain would see a decrease of losses whereas Portugal would see an increase. This could be linked to the fact that Portugal is located on the Atlantic side where the river discharges with rising temperature have an increasing trend whereas Spain which lies on the Mediterranean side has a decreasing trend (Sauer et al, 2021).

¹⁰⁴ For Czechia, we compared our results with the results shown in Alfieri et al. (2018) where they compared the relative average change in expected damage for 3° C with respect to the baseline at country level for three different models (ISIMIP, JRC-Global and JRC Europe). ISIMIP is the only model which gives a negative change. The other models showed an increase of flood risks. This shows the large uncertainty that can be observed from using different models.

Change in AAL between baseline and RCP8.5 in 2070-2090 by country

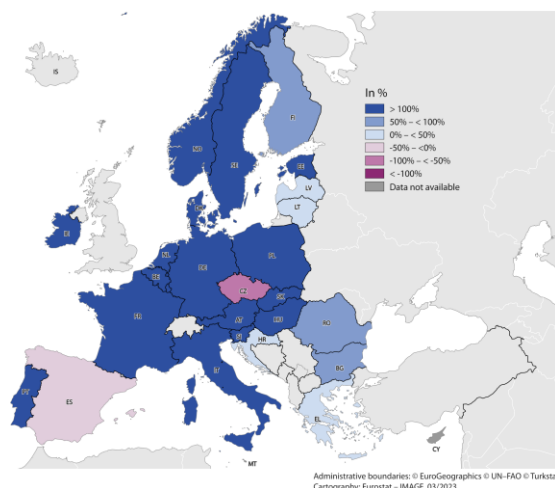


Figure 7: Changes in average annual river flood losses (AAL) between the baseline and the worst case (RCP 8.5) scenario at country level for the projected time period 2070-2090.

Change in AAL between baseline and RCP8.5 in 2070-2090 at NUTS2 level

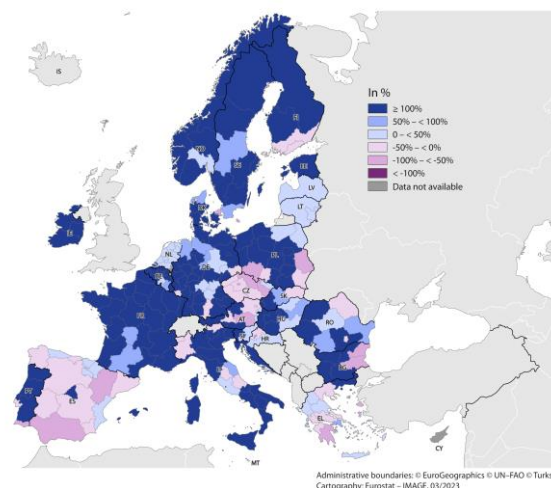


Figure 8: Changes in average annual river flood losses (AAL) between the baseline and the worst case (RCP 8.5) scenario at NUTS-2 level for the projected time period 2070-2090.

As mentioned in Box 2, the results can also be calculated at NUTS2 level. Figure 8 shows that the impact of climate change will vary significantly within a country for different NUTS2 regions. Some regions within one country will for example have less river flood risk, while others will see an increase of risks. Given this regional variability, results at country level would not provide sufficient details. This shows the complexity of climate change risk analysis and specifically flood risk analysis. Flood hazard levels, and consequently flood risk, may actually substantially change within a few meters. Therefore, although the model can calculate more granular results (here at NUTS2 level), more granular analysis requires also more detailed data (also better hazard data) which might not be available as open-source at this stage. There is the need for open-source comprehensive flood models at a high spatial and temporal resolution.

Figures 9 and 10 provide further insights on the magnitude of the expected AAL at country and regional level relative to the overall modelled losses at European level. The country view shows that the increase in European insured losses would be mainly driven by changes in FR and DE with more than two-thirds of the modelled average annual losses across Europe. This can mainly be explained by the high value of exposure in these countries (see Figure 4) and the fact that a lot of exposed objects are located along rivers. At the same time, it is possible to observe that, although in Portugal riverine flood losses are expected to increase, it would only contribute to less than 0.5% of the total European losses. Finally, the relative low level of AAL in the Netherlands can be explained by the low insurance penetration in the country and by the high level of flood protection measures in place, which are reflected in the river hazard set.¹⁰⁵

¹⁰⁵ In the Netherlands, insurance policies do not cover damages in case of failure of a primary flood defense. As discussed in Caloia and Jansen (2021), under certain conditions this could imply increased credit risk for banks.

AAL for RCP8.5 in 2070-2090 at country level as share of total AAL

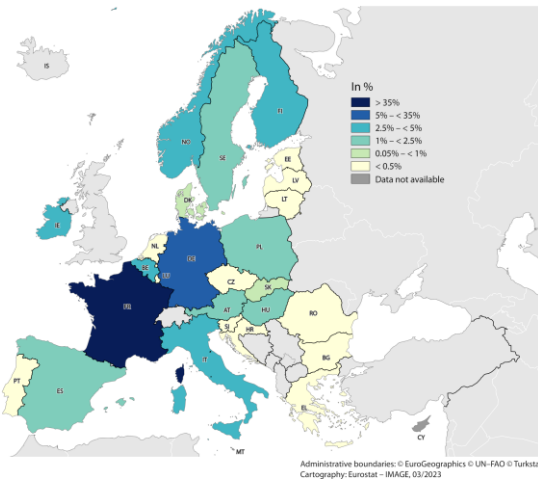


Figure 9: Country average annual river flood losses (AAL) under the worst case (RCP 8.5) scenario for the projected time period 2070-2090 as share of total AAL at EEA level.

AAL for RCP8.5 in 2070-2090 at NUTS2 level (% of total)

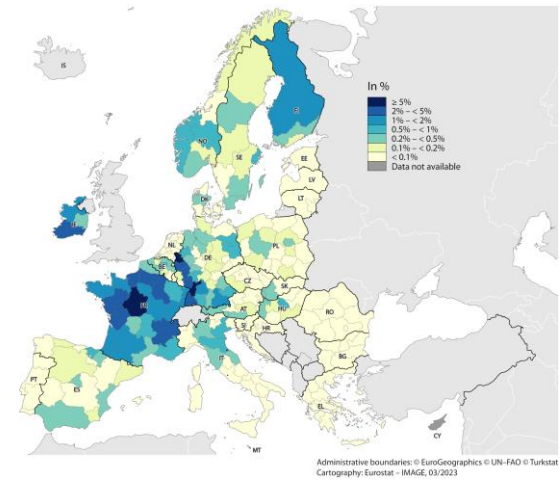


Figure 10: Average annual river flood losses (AAL) under the worst case (RCP 8.5) scenario for the projected time period 2070-2090 at NUTS2 level as share of total AAL at EEA level.

Under the assumption of no change in the insured exposure, different loss ratio metrics are calculated: Average annual losses and expected losses for two return periods (1-200 and 1-500 years) relative to the insured exposure at country level. Under the most the pessimistic emission pathway the estimated loss ratios at the end of the century show large variability between the average annual loss ratio and those for tail and less frequent events (such as 1 in 200 and 1 in 500 years events). There are also considerable differences in tail flood risk across countries with particularly high values for Hungary and Latvia.

Loss ratios in 2070-2090 under RCP 8.5 scenario by country

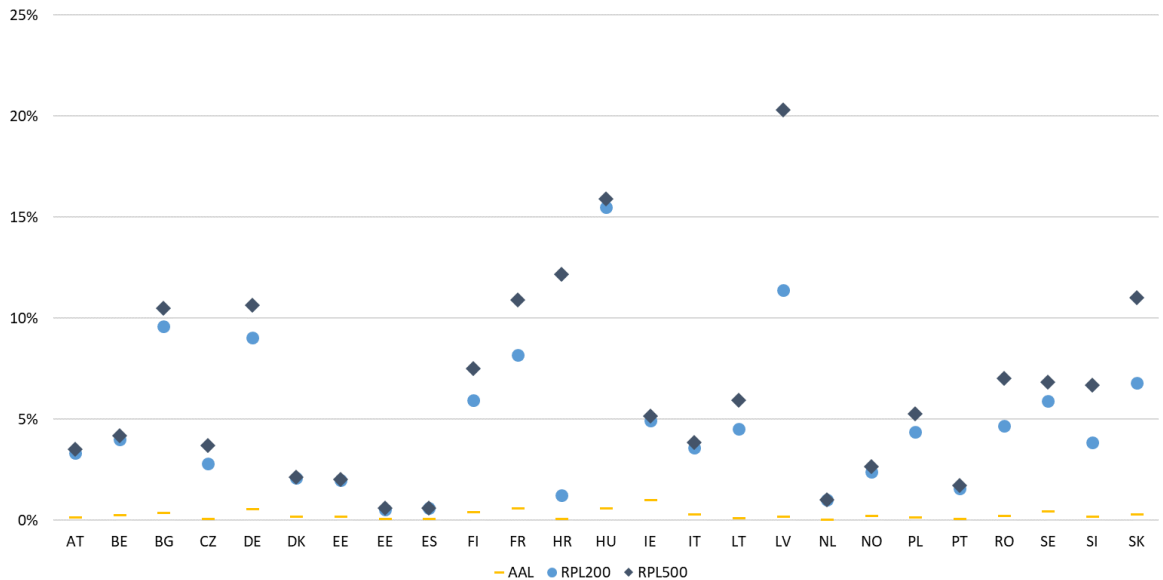


Figure 11: Country level loss ratio metrics for average annual losses (AAL), 200 and 500 years return period losses (RPL200 and RPL500) under the worst-case scenario (RCP 8.5) for the projected time period 2070-2090. Note: CY, LI, LU and MT have been removed from the chart for lack (or insufficient resolution) of hazard data.

In conclusion, under the most extreme scenario, most European countries are expected to be impacted by river flood risk by the end of the century, but some regions may be more vulnerable than others.

5. Conclusion

The results presented in this study show that the impact of climate change could significantly increase river flood risk across Europe over the coming decades for the insurance sector if no mitigation/adaptation measures were taken.¹⁰⁶ While uncertainty remains around the magnitude of the changes in expected losses, this study suggests that in an extreme scenario the average annual insured losses might increase by more than 200% in today's prices by end of the century (assuming no changes in the value of the exposure at risk).

At the national level, for the most extreme scenario, the majority of countries would see an increase of river flood risk. In particular, the results show for all countries in the northern part of Europe significant increases in river flood losses. Across the regions of the countries there is significant variability in the impact of climate change. In several cases some regions would see an increase of risks while the risk for other regions in the same country decreases.

Modelling present and future river flood impacts requires inevitable simplifications, and there is substantial uncertainty pertaining to models and datasets representing hazard, exposure and vulnerability. Nevertheless, understanding climate change risk, enhancing climate-related risk awareness and understanding of related prevention measures will be key tasks for a resilient society. Open-source models/platforms can help to address some of these challenges by fostering innovation, widening the use of cat models and potentially reducing the costs of climate change analysis. However, there is also the need for comprehensive open-source input data such as hazard and vulnerability data at a high spatial resolution to allow proper analysis.

Building on the study presented a next step could be the use of more granular hazard and vulnerability data (e.g. the flood data developed by the JRC) to improve the accuracy. In addition, other perils could be considered such as windstorms or wildfires. For this, additional data collection of exposure data would be needed.

The substantial increase in estimated river flood risk also highlights the need for more adaptation measures as some studies show that mitigation and adaption measures have the potential to effectively counteract, and in some cases even reverse, the increase in flood risk caused by climate change (RMS, 2021).

Given its long-standing central role in analysing and managing catastrophe risk, the insurance industry plays an important and unique role in raising the resilience of the society and real economy against climate change. The EIOPA concept of impact underwriting captures the ability of insurance undertakings, consistent with actuarial risk-based principles, to contribute to the adaptation of the society and real economy to climate change by means of their underwriting practices in terms of data, risk assessment and expertise, thereby promoting climate-related adaptation measures and incentivizing policyholders to implement them (EIOPA, 2021 and 2023).

¹⁰⁶ Climate change mitigation refers to efforts to limit the emission of greenhouse gases, while climate change adaptation refers to the actions taken to lower the negative consequences of changes in the climate.

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List of abbreviations

| | |
|--------|---|
| AAL | Average Annual Loss |
| Bn | Billion |
| CMCC | Centro Euro-Mediterraneo sui Cambiamenti Climatici |
| CCS | Consortio de Compensación de Seguros |
| EEA | European Economic Area |
| EEA | European Environment Agency |
| EP | Exceedance Probability |
| GDP | Gross Domestic Product |
| GCM | Global Climate Model |
| ISIMIP | Inter-Sectoral Impact Model Intercomparison |
| IPCC | Intergovernmental Panel on Climate Change |
| JRC | Joint Research Center |
| Litpop | “Lit population” (LitPop) a globally consistent methodology to disaggregate asset value data proportional to a combination of nightlight intensity and geographical population data |
| LoB | Line of Business |
| NGFS | Network of Central Banks and Supervisors for Greening the Financial System |
| NUTS | Nomenclature of territorial units for statistics |
| ORSA | Own Risk Solvency Assessment |
| PIK | Potsdam Institute for Climate Impact Research |
| RCM | Regional Climate Model |
| RCP | Representative Concentration Pathway |
| RMS | Risk Management Solutions |
| RP | Return Period |
| RPL | Return Period Loss |
| SME | Small and medium-sized enterprises |
| UI | User Interface |
| UK | United Kingdom |