

FINANCIAL STABILITY REPORT

December 2018

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FOREWORD BY THE CHAIRMAN



Solvency II has now been in force for almost two years and we continue to see the benefits of the new regulatory regime. Solvency II has laid the basis for a more transparent and robust industry, with harmonized supervisory reporting and enhanced public disclosure. The improved availability of granular and high quality data enables us to perform deeper financial stability assessments, focusing on topics such as solvency positions, investment allocations and interconnectedness. Going forward, the new reporting framework for the occupational pension sector will produce a more complete and relevant data set for the pension sector from Q3 2019 onwards as well. This will allow both National Supervisory Authorities and EIOPA to better identify and monitor risks for pension funds and take informed policy decisions to address potential vulnerabilities.

Looking back on recent developments, the second half of 2018 saw considerable volatility in financial markets, with equity markets suffering their biggest losses in recent years in November, while emerging markets experienced substantial distress over the summer. Although overall financial conditions remain loose and challenging for insurers and pension funds, the risk of a sudden reassessment of risk premia has become more pronounced over recent months amid rising political uncertainty, trade tensions and gradual tightening of monetary policy. The imminent departure of the UK from the EU further adds to economic uncertainty. While most insurers with cross-border business between the UK and EEA³⁰ have implemented contingency planning to ensure service continuity on cross-border contracts even in the case of a hard Brexit, the risk remains that a disorderly Brexit will have significant repercussions across financial markets. We will therefore continue to closely monitor the situation.

Analysis by EIOPA further suggests that insurers and pension funds could be significantly affected in a sudden yield up scenario. Indeed, results from the 2018 Insurance Stress Test show that insurers are not only vulnerable to a prolonged low-interest rate environment, but also to a sudden reassessment of risk premia. Furthermore, this report also shows that exposures to real estate and interconnectedness with banks remain substantial in certain countries, making insurers vulnerable to potential spillovers from the banking sector and/or a downturn in real estate markets.

Climate and cyber risk are also key emerging risks for insurers and pension funds. Extreme weather related events are expected to become more frequent and severe, with potentially significant impact on the liabilities of non-life insurers and reinsurers, while the transformation towards a low carbon economy carries significant transition risks in the investment portfolios of insurers and pension funds. Indeed, this report shows that investment exposures to climate-sensitive industries can be substantial in certain countries, making insurers potentially vulnerable in the transition to a more carbon-neutral economy. On the other hand, the digital transformation and the onset of cyber attacks makes insurers and pension funds increasingly susceptible to cyber risk. EIOPA will use the results from the questionnaire on cyber risk included in the 2018 Insurance Stress Test to analyse the exposure to cyber risk in more detail in 2019.

Going forward, EIOPA will continue to deliver on its mandate in the financial stability area, assessing vulnerabilities at both the macro level and micro level. In particular, incorporating new emerging risks in the stress test methodology will be investigated further. In this regards, enhanced transparency will also help market discipline and will contribute to keep the system well-prepared for potential vulnerabilities in the short, medium and long terms.

A handwritten signature in blue ink, appearing to read 'Gabriel Bernardino', is centered on the page.

Gabriel Bernardino

EXECUTIVE SUMMARY

Although the prolonged low interest rate environment continues to pose significant challenges to insurers and pension funds, the risk of a sudden reassessment of risk premia has become more pronounced over recent months. Considerable political and policy uncertainty, trade tensions and gradual monetary tightening triggered a sharp corrections in equity markets, in particular for emerging markets. While the direct exposures of European insurers and pension funds on (affected) emerging markets is limited, they could still be impacted through their interconnectedness with banks and potential spillovers effects following further 'flight-to-quality' investment behavior.

Valuations also continue to remain stretched in certain bond and real estate markets, indicating a still elevated risk appetite. A potential sudden reassessment of risk premia could significantly affect the financial and solvency position of European life insurers and pension funds in the short term. Sharply rising credit spreads could lead to insurers and pension funds suffering large losses in their fixed-income investment portfolios, which may only be partly offset by lower long-term liabilities, depending on the interaction between risk-free-rates and credit spreads, duration mismatches and the type of (guaranteed) contracts.

While overall Solvency ratios of European insurers have slightly improved further and remain high around 200%, the profitability of insurers is under increased pressure. Investment returns have deteriorated in the current low yield environment, making it increasingly difficult for insurers to cover guaranteed rates on policies issued in the past. A similar story holds for the European occupational pension fund sector. The overall cover ratio has slightly improved across countries, but the current macroeconomic environment and ongoing low interest rates continue to pose challenges for pension funds, with the weighted average return on assets significantly down in 2017.

Furthermore, climate and cyber related risks are still considered key emerging risks for insurers and pension funds. Extreme weather related events are expected to become more frequent and severe, with potentially significant impact on the liabilities of non-life insurers, while the transformation towards a low carbon economy carries significant transition risks in the investment portfolios of insurers and pension funds. On the other hand, the digital transformation and the onset of cyber attacks makes insurers and pension funds increasingly susceptible to cyber risk.

Concerning the reinsurance sector, overall catastrophe activity was relatively benign in the first half of 2018, strengthening the resilience of reinsurance undertakings after the record losses in 2017. The renewals in 2018 saw only moderate price increases, however, indicating potential excess capacity in the reinsurance market, with the alternative reinsurance capital market in particular showing a strong appetite for insurance risks. Against this background setting risk-adequate prices at the upcoming renewals is crucial for reinsurance undertakings.

With regards to investments, insurers in certain countries continue to show a high degree of home bias in fixed-income and equity investments and remain highly interconnected with banks, while exposures to real estate markets can also be substantial in certain jurisdictions. This could make insurers susceptible to potential spillover effects from (domestic) sovereigns, banking sectors and/or a potential downturn in real estate markets. Derivatives trading of insurers also shows significant counterparty concentrations, with most transactions executed bilaterally with banks located in the UK. Although the overall investment composition has remained broadly stable, the EIOPA qualitative risk assessment survey suggests that close monitoring of potential search for yield behavior is warranted in the current low yield environment.

The report consists of two parts – the standard part and the thematic article section.

The standard part is structured as in previous versions of the EIOPA Financial Stability Report. The first chapter discusses the key risks identified for the insurance and occupational pension sector. The second, third and fourth chapter elaborate on these risks covering all sectors (insurance, reinsurance and pension). The fifth chapter provides a more in-depth qualitative and quantitative assessment of the risks identified. Finally, a thematic article discusses an Early Warning System for the European insurance sector.

ABOUT EIOPA FINANCIAL STABILITY REPORTS

Under Article 8 of Regulation 1094/2010, EIOPA is, inter alia, mandated to monitor and assess market developments as well as to undertake economic analyses of markets. To fulfil its mandate under this regulation EIOPA performs market intelligence functions regarding its supervisory universe, develops a market surveillance framework to monitor, and reports on market trends and financial stability related issues. The findings of EIOPA's market development and economic analyses are published in the Financial Stability Report on a semi-annual basis. (Re) insurance undertakings and occupational pension funds are important investors in the financial market and provide risk sharing services to private households and corporates. In the financial markets, they act as investors, mostly with a long-term focus. Their invested assets aim to cover liabilities towards policy holders or members of pension schemes to which long-term savings products are offered, for example in the form of life assurance or pension benefits. Aside from offering savings products, (re)insurance undertakings provide risk sharing facilities, covering biometric risks as well as risks of damage, costs, and liability.

Financial stability, in the field of insurance and pension funds, can be seen as the absence of major disruptions in the financial markets, which could negatively affect insurance undertakings or pension funds. Such disruptions could, for example, result in fire sales or malfunctioning markets for hedging instruments. In addition, market participants could be less resilient to external shocks, and this could also affect the proper supply of insurance products or long-term savings products at adequate, risk-sensitive prices.

However, the insurance and pension fund sectors can also influence the financial stability of markets in general. Procyclical pricing or reserving patterns, herding behaviour and potential contagion risk stemming from interlinkages with other financial sectors, are negative examples that could potentially make the financial system, as a whole, less capable of absorbing (financial) shocks. Contrary to this, the investment behaviour of both pension funds and (re)insurers could also contribute to an overall market stabilization. Finally, (re)insurance undertakings might engage in non-traditional/non-insurance business such as the provision of financial guarantees or alternative risk transfer, which needs to be duly reflected in any financial stability analysis.

The Financial Stability Report draws on both quantitative and qualitative information from EIOPA's member authorities. Supervisory risk assessments as well as market data are further core building blocks of the analysis.

Second half-year report 2018

EIOPA has updated its report on financial stability in relation to the insurance, reinsurance and occupational pension fund sectors in the EU/EEA (European Union and European Economic Area).

The current report covers developments in financial markets, the macroeconomic environment, and the insurance, reinsurance and occupational pension fund sectors as of Q2 2018, unless stated otherwise. Solvency II data was extracted on the 09/2018, while the cut-off date for most other market indicators is 11/2018.

PART I

1. KEY DEVELOPMENTS

Although the prolonged low interest rate environment continues to pose significant challenges to insurers and pension funds, the risk of a sudden reassessment of risk premia has become more pronounced over recent months, following considerable political and policy uncertainty. Meanwhile, concerns over trade tensions escalations and the gradual process of monetary policy normalisation – particularly in the US - also triggered considerable distress in emerging markets, most notably in Turkey and Argentina, with spillover effects to several European banks highly exposed to these markets. All those factors could lead to further intensification of ‘flight-to-quality’ investment behaviour with a potential negative impact on lower-rated European sovereigns, which could have spillovers effects to the European financial market and the real economy. Additionally, while the direct exposures of European insurers and pension funds to emerging markets are limited, they could still be impacted through their interconnectedness with banks exposed to emerging markets. Any distress in emerging markets is also likely to amplify an economic downturn scenario, with potential repercussions across financial markets.

Macroeconomic indicators continue to show a robust performance for the moment, but growth prospects in the EU and euro area have been slightly revised downwards amid growing trade tensions, political uncertainty, tightening labour markets and concerns over debt sustainability in certain countries. Valuations also remain stretched in certain equity, bond and real estate markets, indicating a still elevated risk appetite. Concerns over rising rates, inflation and geopolitical instability also caused the sharpest corrections in equity markets across the globe in recent months. A further change in market sentiment could therefore trigger a sudden reversal of risk premia.

Furthermore, climate related risks are still considered key emerging risks in 2018. Extreme weather related events are expected to become more frequent and severe, with potentially significant impact on the liabilities of non-life insurers, while the transformation towards a low carbon economy carries significant transition risks in the investment portfolios of insurers and pension funds. The ongoing shift towards sustainable finance also means that insurers and pension funds increasingly need to incorporate

Environmental, Social and Governance (ESG) factors into their business models and investment decisions.

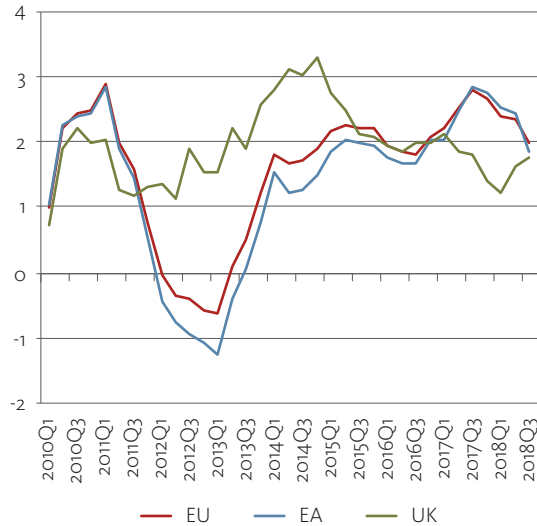
Finally, technological innovation continues to be one of the major drivers of change in the insurance sector, carrying both risks and opportunities. On the one hand, the digital transformation and the onset of cyber attacks makes companies increasingly susceptible to cyber risk, while on the other hand, technological advances in general have led to the rise of InsurTech. The increased awareness of cyber risk is also expected to lead to growing demand for cyber insurance

1.1. MARKET RISKS

The economic expansion in the euro area and the EU slowed in the first half of 2018 amid global and domestic uncertainties (Figure 1.1). The slowdown in economic growth is mainly due to weakening global trade, following concerns over protectionism and Brexit. While the medium term outlook remains broadly stable, economic growth forecasts have been slightly lowered in the euro area and the EU for 2018 and 2019 (for the EU from 2.3% to 2.1% and from 2.0% to 1.9%, in 2018 and 2019 respectively).¹ Labour market conditions continue to improve in the first half of 2018, with overall unemployment rates steadily declining in the euro area and the EU (Figure 1.2), although significant disparities remain across countries, with unemployment ranging from 3.5% in Germany to 19% in Greece.

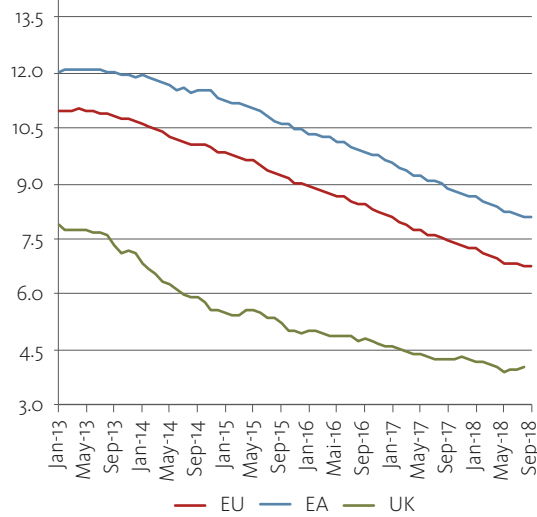
¹ European Economic Forecast Autumn 2018 (European Commission, November 2018)

Figure 1.1: Real GDP growth (%) y-o-y



Source: Eurostat
Last observation: September 2018

Figure 1.2: Unemployment rate (in %)



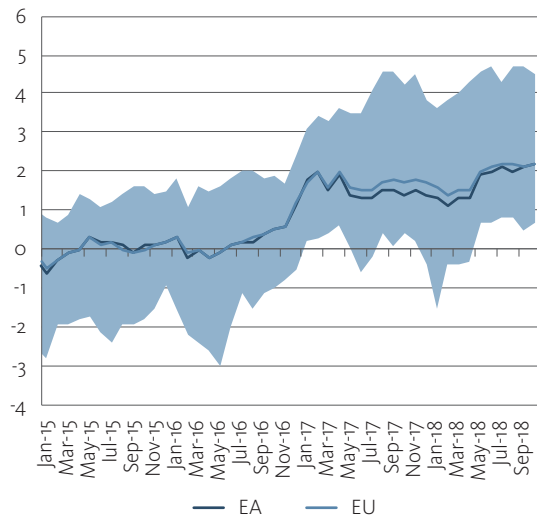
Source: Eurostat
Last observation: September 2018

Headline inflation in the EA has picked up in the first half of 2018 and is close to the ECB target of 2%, although the increase is primarily due to higher oil and energy prices (Figure 1.3 and Figure 1.4). At the end of September, the Harmonised Index of Consumer Prices (HICP) for the EA was 2.1 per cent. The rise in inflation is mainly due to more expensive oil and energy, however, with oil prices reaching its highest level in four years before dropping off again recently. Core inflation (exclud-

ing energy and food prices) remains well below the HICP around 1%. HICP inflation is projected to average around 1.7% over the medium term, as energy inflation is expected to decline in the coming period.²

Central banks have continued to gradually tighten monetary policy in response to higher inflation and strong labour market performance, but overall financial conditions remain loose. The yields on 10-year gov-

Figure 1.3: Average inflation euro area and EU (in %)



Source: HICP, ECB and Eurostat
Last observation: September 2018
Noted: Shaded area shows minimum and maximum inflation in the EU.

Figure 1.4: Oil price (USD/barrel)



Source: Bloomberg
Last observation: 3 December 2018

² European Economic Forecast Autumn 2018 (European Commission, November 2018) and ECB macroeconomic staff projections.

ernment bonds have increased over recent months for the US, UK and – to a lesser extent – the EA, as both the US Federal Reserve and the Bank of England have continued to slowly raise benchmark interest rates (Figure 1.5). Meanwhile, the ECB has started phasing out its bond buying programme (QE), reducing monthly purchases of bonds in October from €30 bn to €15 bn until the end of the year, when the bond buying programme is set to end. Benchmark interest rates in the Eurozone are expected to remain unchanged until at least the summer of 2019, however. The interest rate swap curves for the Euro have continued to gradually rise as well, especially for longer maturities (Figure 1.6). Euro swap rates are up from the lowest levels observed in June 2016 for longer maturities, but overall financial conditions remain loose with interest rates subdued by historical standards.

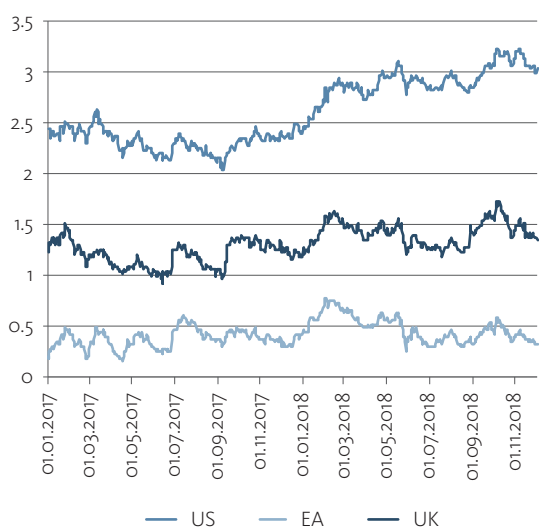
Monetary tightening in advanced economies and concerns over trade tensions and economic fundamentals have caused distress in certain emerging markets, with spillover effects to European banks. Equity market performance has deteriorated significantly in emerging markets, partly due to rising interest rates in the US and concerns over trade war escalations, which has led to a ‘flight to safety’ mainly towards US investments (Figure 1.7). It should be noted, however, that emerging markets are a heterogeneous group with significant disparities in performance among them. Currently, Turkey and Argentina have suffered the strongest market and exchange rate deteriorations, amid growing concerns over the economic fundamentals in these countries. While overall contagion to the EU and US financial markets has remained limited,

European banks most heavily exposed to these emerging markets have been affected with a significant drop in their share prices as a result.

While the direct exposures of European insurers and pension funds towards emerging markets are limited, they may still be affected through their interconnectedness with banks and potential second-round effects. Overall direct exposures of European insurers towards emerging markets amount to 3.75% of total investments. However, the risk of contagion from other financial sectors remains and this risk is especially pronounced for insurers with high levels of interconnectedness with affected banks (see Chapter 5). Overall, share prices of European banks have lost considerable value in 2018 and significantly underperformed the general market (see also Figure 1.13). Furthermore, the risk remains that further ‘flight to quality’ investment behaviour might also spill over to lower-rated European sovereigns, putting further pressures on the bond holdings of insurers in affected countries, which continue to show significant home bias (see Chapter 5). Finally, continued stress in emerging markets is also likely to amplify a potential global economic slowdown scenario.

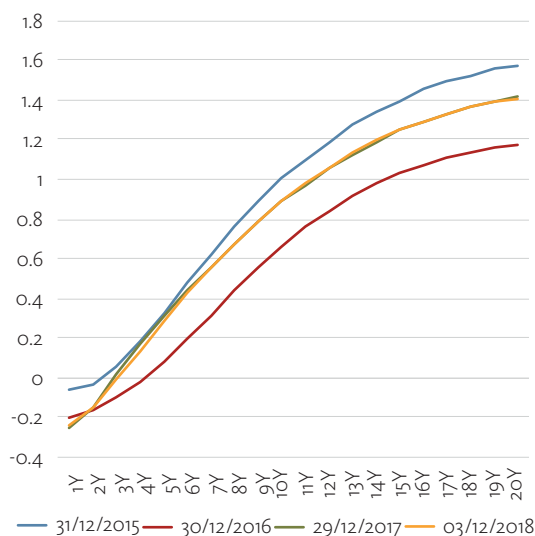
Although the first half of 2018 saw partial market corrections and small bouts of volatility, market valuations remain stretched in equity, bond and certain real estate markets. The recent turmoil in emerging markets has had only limited impact on equity market volatility in the EU and the US, compared to the volatility observed in February (Figure 1.8). However, concerns over rising

Figure 1.5: 10-year government bond yields



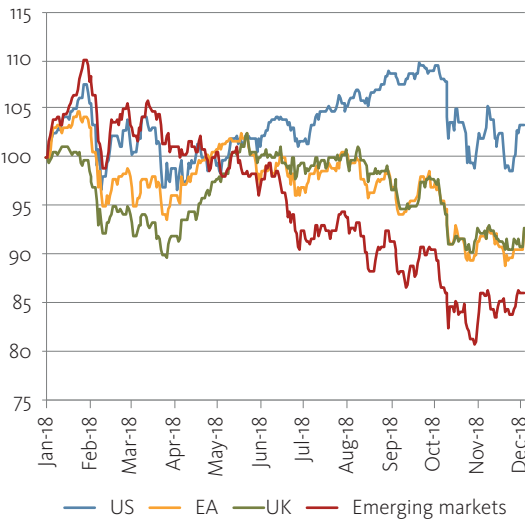
Source: Bloomberg
Last observation: 03 December 2018

Figure 1.6: Swap curves



Source: Bloomberg
Last observation: 03 December 2018

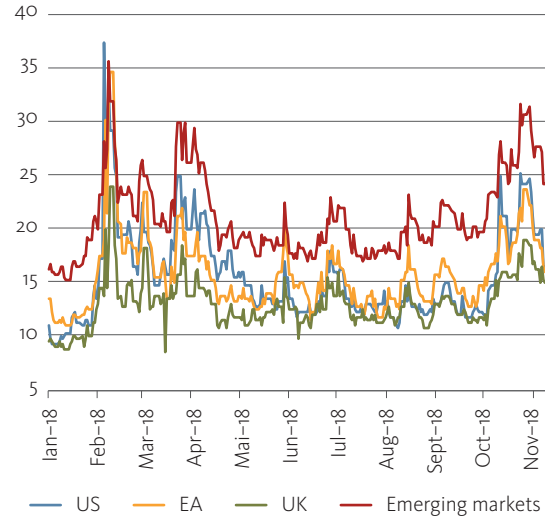
Figure 1.7: Equity market performance



Source: Bloomberg
Last observation: 3 December 2018

interest rates, inflation and trade tensions led to a sharp sell-off in equity markets, with markets in the US suffering their sharpest fall in months (Figure 1.7). Corporate bond spreads, however, remain at historically low levels, in particular for high-yield bonds, despite rising debt levels/leverage in both the EU and the US, leaving financial markets vulnerable to potential shocks.³ The recent inverted term

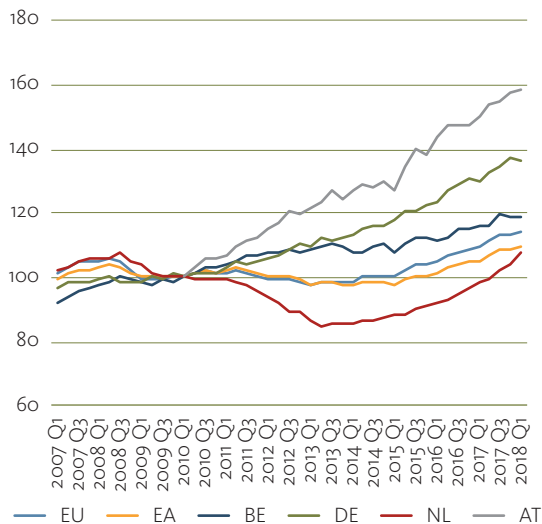
Figure 1.8: Market volatilities



Source: Bloomberg
Last observation: 3 December 2018

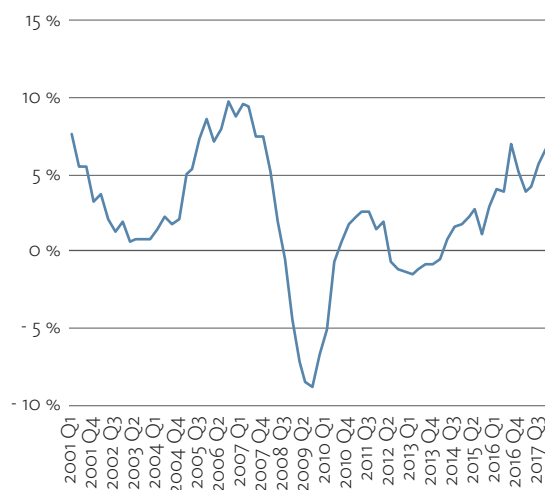
structure observed in the US further hints at a potential imminent turn-of-the-cycle sentiment.⁴ Real estate markets in certain European countries also increasingly show signs of stretched valuations (Figure 1.9 and Figure 1.10), and a downturn in real estate markets could have significant impact on the investment portfolios of insurers and pension funds, in particular for those insurers high-

Figure 1.9: RRE prices



Source: Eurostat
Last observation: Q3 2017
Note: Residential Real Estate (RRE), EIOPA calculations for selected countries, 2010Q1=100

Figure 1.10: CRE prices growth rates (y-o-y)



Source: ECB SDW
Last observation: Q4 2017
Note: Commercial Real Estate (CRE), EA average

3 IMF Global Financial Stability Report (October 2018)

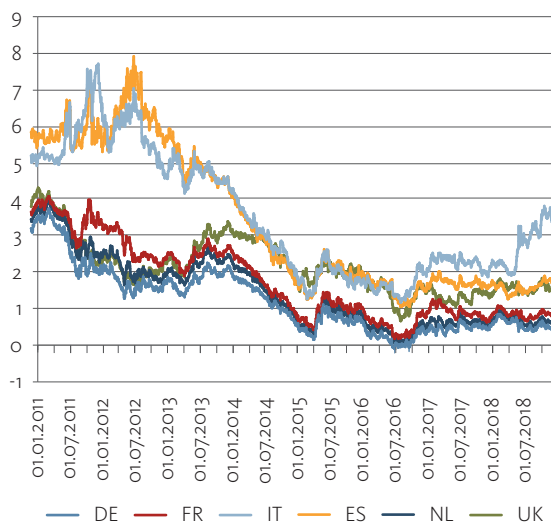
4 An inverted term structure implies that yields on short maturities are higher than yields on long maturities. Historically, an inverted term structure has typically preceded a recession in the US.

ly exposed to real estate markets (see also Chapter 5). In response to the low-yield environment, insurers in some countries have increasingly focused on alternative, high-yielding investments such as real estate. In fact, insurers' exposures to residential real estate are highest precisely for those countries that have experienced strong housing market performance.

The risk of a sudden reassessment of risk premia remains elevated amid concerns over debts sustainability and high political and policy uncertainty. Concerns over sovereign debt sustainability have resurfaced in the EU following the recent uncertainty on the orientation of economic and financial policies in Italy. Spreads on Italian government bonds rose sharply as a consequence,

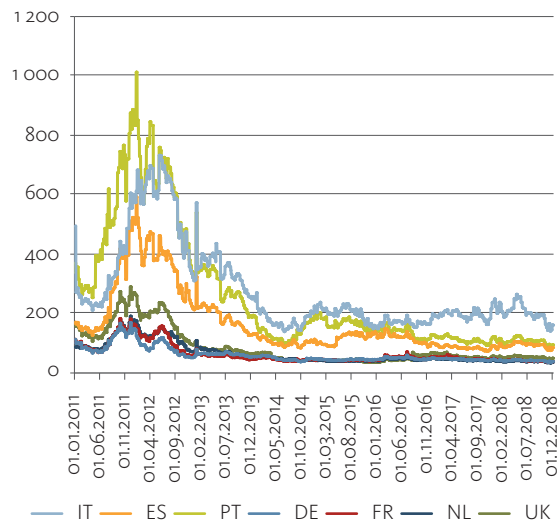
though contagion to other European countries has so far remained limited (Figure 1.11 and Figure 1.12). Furthermore, the escalation of geopolitical tensions and considerable uncertainty over the outcome of negotiations on Brexit could further undermine financial market confidence and spark abrupt adjustments of market sentiment and risk premia. On top of that, Brexit also poses several insurance specific related risks (see Box 1.1). Finally, faster-than-anticipated monetary policy normalization could also trigger a sudden tightening of financial conditions in the EU and reversal of risk premia, while overall market adjustments could be exacerbated by redemptions and (forced) fire sales of investment funds and other financial institutions in the shadow banking sector (accounting for approximately 39% of total financial sector in the EU).⁵

Figure 1.11: 10-year government bond yields (in %)



Source: Bloomberg
Last observation: 3 December 2018

Figure 1.12: Sovereign Credit Default Swap



Source: Bloomberg
Last observation: 3 December 2018
Note: the 5 Year CDS (credit default swap) spread implied by the Bloomberg Issuer Default Risk model Likelihood of Default.

⁵ ESRB Shadow Banking Monitor (September 2018)

BOX 1.1: BREXIT-RELATED RISKS FOR THE EUROPEAN INSURANCE SECTOR

On 29 March 2017 the UK notified the European Council of its intention to withdraw from the EU (Brexit). The withdrawal will take place on the date of entry into force of a withdrawal agreement or, failing that, two years after the notification on 30 March 2019. There are ongoing negotiations between the EU and the UK on a withdrawal agreement, including on a transition period until 2020. The outcome of the political negotiations is uncertain at this stage. In the absence of an agreement between the UK and the EU, the withdrawal of UK from the EU poses several potential risks specific to the European insurance sector:

- 1) UK insurance undertakings will not be authorized anymore to service cross-border insurance contracts between the UK and the EEA
- 2) The solvency position of EEA insurers may be affected as a consequence of the UK becoming a third-country for the purposes of Solvency II

EIOPA has urged insurance undertakings and national supervisors in an Opinion published in December 2017⁶ to make contingency planning and take the necessary steps to ensure service continuity on cross-border insurance contracts even in the event of a Brexit without a withdrawal agreement (hard Brexit). EIOPA is closely monitoring the contingency planning of insurance undertakings, in particular of the undertakings from the UK with cross-border business in the EEA, and so far the insurers with the largest cross-border business have taken action and are implementing contingency measures. However, for a small amount of cross-border business in the EEA (representing only 0.16% of overall insurance liabilities in the EEA) there is currently no or insufficient contingency planning to ensure service continuity in case of a hard Brexit. EIOPA continues to call for action of insurance undertakings to ensure service continuity in cross-border insurance and is working closely with the national competent authorities to address this residual risk.

While potential disruptions in service continuity of cross-border contracts could significantly affect individual policyholders and insurance undertakings, EIOPA's assessment is that they currently do not give rise to financial stability risks due to the nature and scale of the business concerned.

Furthermore, EIOPA has also urged insurance undertakings in an Opinion published in May 2018⁷ to take the possibility of the UK becoming a third-country into account in their risk management. In particular, the UK becoming a third country and leaving the internal market may affect the determination of technical provisions, own funds and capital requirements of insurance and reinsurance undertakings in the EU, as for instance risk mitigation techniques conducted with UK counterparts may longer be recognized under Solvency II. The overall impact on the Solvency position depends on the specific situation of individual undertakings and not all of the changes may be relevant for each insurance and reinsurance undertaking.

EIOPA will continue to monitor and assess potential financial stability risks stemming from Brexit as the withdrawal date draws nearer and closely work together with national supervisors to ensure adequate contingency planning is in place.

⁶ Opinion on service continuity in insurance in light of the withdrawal of the United Kingdom from the European Union (December 2017)

⁷ Opinion on the solvency position of insurance and reinsurance undertakings in light of the withdrawal of the United Kingdom from the European Union (May 2018).

Despite increasing volatility and political uncertainty, the overall impact of recent financial market developments on European insurers has so far been limited.

Although the share prices of European insurers have lost around 4% since the beginning of the year, they have outperformed the general market in 2018 (-4.0% versus -8.1% on a year-to-date basis, see Figure 1.13). Insurers have received some relief through the economic expansions and recent rise in yields, though interest rates remain at historically low levels. Spreads on insurance in CDSs rose temporarily over the summer following concerns in emerging markets, but have recently come down again and remain at relatively low levels (Figure 1.14).

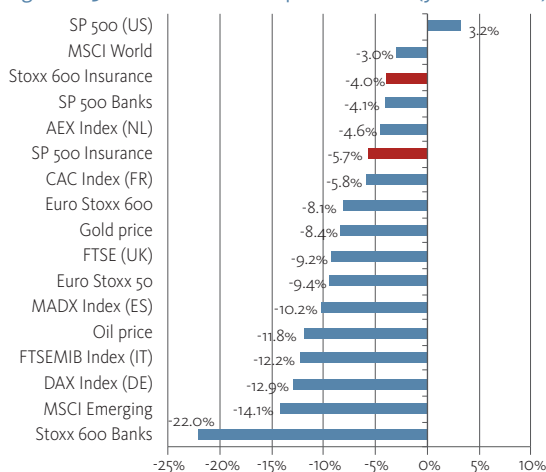
Although a prolonged low interest environment remains a significant challenge for insurers and pension funds, a sudden reassessment of risk premia could also have major repercussions, depending on the interaction between rising bond spreads and the risk-free-rates.

Low long-term interest rates increase the present discounted value of the long-term liabilities of life insurers and pension funds, while at the same time making it harder to achieve the required investments returns to cover policyholder obligations, in particular for products with high

guaranteed rates issued in the past. Rising yields are therefore generally favourable for life insurers and (DB) pension funds, in particular in the presence of negative duration gaps.⁸ However, the overall impact of rising yields depends crucially on the relation between increasing credit spreads and the risk-free interest rates used for discounting long-term liabilities (technical provisions).

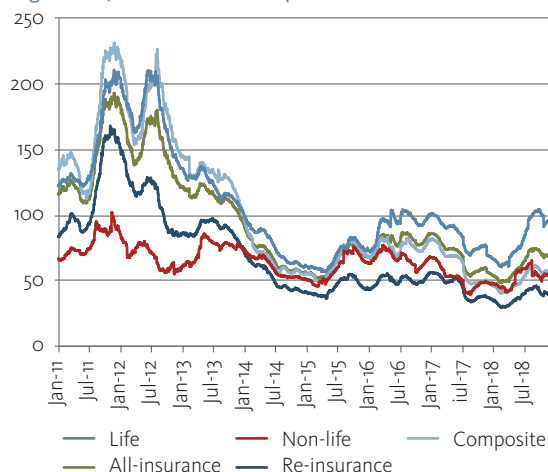
If the increase in yields is primarily driven by rising risk-free-rates, the decrease in the value of liabilities typically compensates for the losses suffered on the asset side in the event of sudden yield reversals, depending on the maturity mismatches, types of guaranteed contracts and interest hedging of individual undertakings. For negative duration gaps, this would normally imply an improved financial position. If, however, the rise in yields is primarily due to rising credit spreads (due to, for instance, a reassessment of risk premia), insurers and pension funds would suffer immediate losses in their fixed-income investment portfolios, which may only be partly offset through a lower value of liabilities (which are typically discounted based on the risk-free-rate⁹). Hence, losses on the assets side may not be fully compensated through lower liabilities in this case, leading to a wors-

Figure 1.13: Selected markets performance (year-to-date)



Source: Bloomberg
Last observation: 3 December 2018

Figure 1.14: Insurance CDS spreads



Source: Bloomberg
Last observation: 3 December 2018
Note: the 5 Year CDS (credit default swap) spread implied by the Bloomberg Issuer Default Risk model Likelihood of Default.

8 A negative duration gap means that the duration of liabilities is longer than the duration of assets. Hence, following a rise in interest rates the value of liabilities will decrease more than the value of assets, everything else being equal.

9 For pension funds this depends on the relevant accounting framework. Also, for insurers the Volatility Adjustment (VA) under Solvency II does partially compensate for the rise in risk premia, by adding a premium to the risk-free-rate curve to be used for discounting liabilities. The VA is based on 65% of the risk-corrected spread between the interest rate that could be earned from a reference portfolio of assets and the risk-free interest rates without any adjustment.

ening financial position in the short term (see Box 1.2 for a stylized example).¹⁰

Moreover, life insurers could also be faced with a sudden increase in lapses and surrenders following a sharp increase in yields, as other financial investments become more attractive or because policyholders can no longer sustain their premium payments (insofar as the rise in yields is accompanied by an economic downturn negatively affecting households). As a result, life insurers could face an increase in both lapses

and surrenders in the short term, leading to possible liquidity constraints. Although several legal implications could limit the direct impact of lapses and surrenders in some countries, its ramifications could add additional strains on insurers' financial position once yields start increasing.

Indeed, the results from the 2018 European-wide Insurance Stress Test show that insurers may be significantly affected in a sudden yield up scenario combined with an increase in lapses and surrenders.¹¹

BOX 1.2: STYLIZED EXAMPLE OF THE IMPACT OF RISING YIELDS ON THE FINANCIAL POSITION OF INSURANCE UNDERTAKINGS

An increase in yields affects both the profitability and solvency position of insurers, in particular for life undertakings with long-term liabilities – often with guaranteed returns – and large holdings of fixed-income investments (approximately two-thirds of all investments for life undertakings). While a rise in yields typically improves profitability in the long run by allowing insurers to invest in higher-yielding assets to cover guaranteed rates in long-term contracts, the short term impact on the financial position may actually be negative even in the case of negative duration gaps, depending on the relation between the increase in the risk free rate and the risk premium.

To illustrate this, consider a stylized example of the impact of a parallel 200bps increase in yields on the financial position of stylized life undertaking, for different combination of increases in risk free rates and risk premia (Figure B1.2.1)¹². As can be seen from the figure, the impact on Own Funds depends crucially on the specific mix of risk free rate and risk premia increases. In case the risk free rate increases more than the risk premium the impact is positive, however, if the increase in yields is mainly driven by a repricing of the risk premium the impact is negative. Hence, a sudden reversal of risk premium could negatively impact the financial position of insurance undertakings in the short run.

Figure B1.2.1: Illustrative impact on Own Funds of stylized life undertaking for different combination of risk free rates and risk premium



Notes: The graph shows the impact for a stylized life undertaking with assets of EUR 30 bn (of which 13 bn in fixed-income investments with a modified duration of 10), technical provisions of EUR 17.5 bn (with a modified duration of 14), other liabilities of EUR 10.8 bn and an initial excess of liabilities of EUR 1.7 bn. Hence, the undertaking has negative duration gap of 4, which is approximately the duration gap for the median European insurance undertaking. Please note this is a highly stylized example for a possible yield up scenario and that potential compensating impacts of the VA and specific insurance contract optionalities – such as loss absorbing capacity of technical provisions) are not taken into account.

¹⁰ Please note that for unit-linked insurance and DC pension contracts, any loss on the asset side is typically offset by a similar decrease in the obligations to policyholders and pension fund members. Hence, investment risk is primarily borne by policyholders and pension fund members in these type of contracts.

¹¹ EIOPA 2018 Insurance Stress Test Report.

¹² Please note that this stylized example is only used to illustrate the direction of the impact and does not say anything about the magnitude.

1.2. CLIMATE RISK AND SUSTAINABLE FINANCE

While the losses from natural catastrophes in the first half of 2018 are well below the record levels seen in 2017, climate related risks remain a key emerging risk.

Total natural catastrophes and weather related losses amounted to approximately USD 33 bn globally in the first half of 2018, compared to USD 65 bn in the first half of 2017.¹³ However, the long term trend still points towards increased extreme weather related events and the hurricane and typhoon season is likely to add significant losses in the second half of the year, with the first indications from the hurricanes and typhoons in the US and Asia already estimating losses up to USD 20 bn.¹⁴ Scientific climate models used to evaluate the impact of climate change continue to indicate more frequent periods of heat and drought, along with more intensive storms and rainfall as a consequence of climate change.¹⁵ These increased physical risks arising from climate and extreme weather events can significantly affect the liabilities of non-life insurers and reinsurers, while potentially also having an impact on financial assets of insurers and pension funds, for instance on real estate portfolios in affected regions. In addition, insurers could also be exposed to liability risks, which includes climate-related claims under liability policies, as well as direct claims against insurers for failing to manage climate risks.¹⁶ Although the ability to re-price annually or to withdraw cover can mitigate physical and liability risks to non-life insurers in the short-term, it is important that insurers and catastrophe model vendors take into account recent climate trends and pos-

sible future scenarios in their risk modelling and that insurers continue their efforts in mitigating climate risks to strengthen their business models in the long run.

Beyond insured losses from physical climate-related disasters, climate trends can also pose significant disruptions in the real economy. The insurance “protection gap” for weather related losses remains significant, with roughly 70% of global losses uninsured – resulting in a significant burden on households, businesses, and governments.¹⁷ At the macro-economic level, uninsured losses from physical risks may affect economic productivity across sectors, pose supply chain disruptions, and ultimately impact the financial system. While the impact is currently hard to quantify, uninsured losses arising from physical risks may spillover to the financial system through its exposure towards affected sectors. Similarly, the availability of insurance – or risk of uninsurability due to high physical risk profiles – may have significant impacts on the performance of credit and investment across the economy (including, for instance, mortgage lending), while changing market dynamics could alter the demand for insurance coverage.

In addition, insurers and pension funds remain exposed to considerable climate-related transition risk in their investment portfolios. Reaching the objectives of the 2015 Paris Agreement on Climate Change (keeping global warming ‘well below’ 2 degrees Celsius compared to pre-industrial levels) requires significant and unprecedented global efforts aimed at greening the economy and reducing greenhouse gas emissions. In fact, a recent report by the UN IPCC even argues that a more stringent target is necessary, stressing that the risks and potential damage to the environment of allowing global temperatures to rise by more than 1.5 degrees Celsius are far greater compared to a 2 degree scenario. Reaching either target would entail a major transformation of the economy. Transition risks arise in this transition to a more carbon-neutral economy, with potentially significant and disorderly write-downs in certain financial assets, in particular for exposures to carbon-intensive industries, which could have repercussions across the financial system. Chapter 5 analyzes the climate-related investments exposures of European insurers in more detail, showing that transition risk vary considerably across countries and can be substantial, in particular for life insurers with large investment portfolios. Overall, an initial assessment shows

¹³ Munich Re NatCatService and Swiss Re. The last 10-year average losses from natural disasters are approximately USD 105 bn and the last 30-year average losses are approximately USD 68 bn.

¹⁴ See also the Bank of England’s Q2 2017 Quarterly Bulletin for an indication of the increase in average weather-related losses over time. It is shown that insured losses have increased from an average of around US\$10 billion per annum in the 1980s to an average of around US\$45 billion per annum so far this decade, with indications that this is partly driven by climate change. Estimations on losses from the hurricanes in 2018 are taken from Artemis.

¹⁵ IPCC (October 2018). In fact, 80% of the natural disasters between 2005 and 2015 have been found to be climate-related and extreme weather related events have occurred twice more often in the period between 1995 and 2015 than just two decades ago <https://www.un.org/sustainabledevelopment/blog/2015/11/un-report-finds-90-per-cent-of-disasters-are-weather-related/>

¹⁶ Research by UN Environment has found that climate-related litigation has increased significantly around the world, including over action – or inaction – relating to climate mitigation and adaptation efforts. Liability risks could arise from management and boards of insurers not fully considering or responding to the impacts of climate change, or appropriate disclosure of current and future risks (including through damages and tort litigation). There may also be exposure to under D&O, PI, and third-party environmental liability policies (IAIS Issues Paper on Climate Change Risks to the Insurance Sector – July 2018).

¹⁷ IAIS Issues Paper on Climate Change Risks to the Insurance Sector (July 2018). Please note that the figure of 70% refers to end of 2017 uninsured losses. Uninsured losses were approximately 50% for the first half of 2018.

that climate-sensitive exposures of European insurers amount to 10-13% of total assets.

Insurance companies are slowly improving governance and transparency on climate-related risks and are gradually shifting their investment portfolios towards green finance. While different approaches can be observed in the market, many European insurance companies identify climate-related risks now for their underwriting and investment activities as part of an enhanced approach towards so-called Environmental, Social and Governance (ESG) factors. Some insurers are also taking a more “active green” approach by exploring opportunities to invest in clean energy, taking initiatives aimed at mitigating their carbon footprints and ceasing coverage to companies that have a considerable share of the revenues from non-sustainable energy sources.¹⁸ However, more effort is still needed to properly identify, monitor, manage and mitigate climate-related risks in both underwriting and investment activities. In particular, this relates to formalizing the approach to climate-related risks, developing appropriate risk, emission and reporting metrics and enhancing the use of scenario analysis in risk modelling and portfolio management.

At the same time, the rapid rise of green finance also carries the risk of a green bubble and greenwashing in the transition towards a low-carbon economy. Total green bonds issuance in 2018 by October stands at approximately USD 117 bn and is estimated to reach USD 210 bn by the end of the year (compared to USD 162 bn in 2017).¹⁹ As investors hoping to capitalize on the energy transition move their funds to new technologies collectively, green investments may become overvalued and unable to deliver on optimistic profit forecasts. Moreover, as clear standards and definitions for green finance are still missing, certain investments may be presented as ‘green’ whereas the overall environmental benefits are doubtful. This so-called greenwashing of investments potentially carries significant reputational risks for investors in green finance. It is important that both insurers and supervisors monitor and manage these risks on a timely basis as part of the Prudent Person Principle.

While green finance potentially contributes to a more sustainable business model and investment portfolio, the associated risks should not be overlooked. Recently, policymakers have considered proposals on potential ‘brown penalising’ and ‘green supporting’ factors in pru-

dential regulation for banks and insurance companies.²⁰ However, like all other types of investments, green finance involves risks. It is important that insurers manage these risks appropriately and that capital requirements adequately reflect risks in order to cover unexpected losses at all times.

Continuous assessment of climate-related exposures, enhanced reporting and transparency on climate risks and, where necessary, mitigation of climate-related risks are important factors for financial stability. It is increasingly important that insurers and pension funds manage and mitigate ESG risks appropriately to ensure a sustainable business model, in particular for climate-related risks with potential far reaching consequences. Furthermore, as data on climate-related exposures is still limited, EIOPA welcomes and supports the initiative by the FSB TCFD and the EC Action Plan on Sustainable Finance to enhance transparency and reporting on climate-related risks, including the work on a ‘green taxonomy’. Improved reporting and disclosure is important for assessing the extent of transition risks for insurance companies and pension funds and ultimately improve governance, risk management and decision-making by financial actors. Finally, a stable and coherent climate policy framework could facilitate a gradual and smooth transition and mitigate the risk of disorderly write-downs of financial assets.

1.3 CYBER RISK AND TECHNOLOGICAL DEVELOPMENTS

Cyber risks continue to pose significant risks to insurers, pension funds and the financial system as a whole. Cyber-attacks have become more frequent, severe and sophisticated in recent years and the first half of 2018 again saw its fair share of cyber incidents and an increasing threat of cyber warfare.²¹ Moreover, cyber risks are a continuously involving threat and can spread quickly across the financial system in case critical functions are affected, requiring continuous enhancement of

²⁰ See for instance the European Commission’s Action Plan on Sustainable Finance published in March 2018: https://ec.europa.eu/info/business-economy-euro/banking-and-finance/sustainable-finance_en#commission-action-plan-on-sustainable-finance

²¹ Notable cyber incidents in 2018 include several high-level data breaches at big tech firms, whereas several cybersecurity firms have highlighted the increasing threat from cyber warfare by nation states. Cyber-attacks also rank 3rd in the list of risks most likely to occur in the next 10 years (up from rank 6 in 2017), according to The Global Risks Report 2018, World Economic Forum.

¹⁸ Got it covered? Insurance in a changing climate (ShareAction and Assets Owners Disclosure Project, May 2018)

¹⁹ Climate Bonds Initiative (October 2018).

cyber resilience of financial institutions. Insurance companies have, by nature, possession of a huge amount of sensitive data and a data breach could cause significant reputational damage and undermine confidence in the insurance sector. On top of that, the disruption of insurance services due to a cyber-incident could also threaten financial stability, particularly in case insurers are collectively affected and/or in case a systemically relevant insurer is targeted. It is therefore crucial that insurers continue to improve their data control, cyber resilience and operational risk management framework to safeguard critical business functions and information systems. EIOPA and NCA's are closely monitoring the cyber security for all (re) insurance undertakings and continue to strengthen supervisory convergence on cyber risk, in line with the European Commission's recently published FinTech action plan. This work also includes the potential development of an EU-wide, cross sectoral cyber resilience testing framework for significant players. EIOPA expects to have the first results of the current activities together with the next steps, available in the first half of 2019.

The growing threat of cyber risk also has significant implications for the cyber insurance market, in particular for silent exposures. Global cyber insurance premium is currently estimated to be around USD 3bn to USD 4bn, but is expected to grow significantly over the coming years as a consequence of more frequent and severe cyber-attacks and increased awareness of cyber risk. So far, explicit cyber insurance products have mostly been sold in the US, but European insurers are increasingly looking to offer cyber insurance as well as the market expands in response to tightened regulations and raised awareness of the risks involved.²² However, significant challenges remain to further develop the European cyber insurance, in particular related to the lack of historical data and the need for a deeper understanding of cyber risk (see Box 1.2 on the European Cyber Insurance Market).

In addition, many insurers could also have significant 'silent' (non-affirmative) cyber risk exposures in the form

of more general insurance coverage for business disruptions. So far, the specific exposures of insurers and the potential impact of cyber incidents and data breaches are not well understood, but the associated losses could potentially dwarf the economic costs of natural disasters, with estimates ranging from USD 57bn, to USD 120bn to as much as USD 600bn on an annual basis.²³ In order to get a better view of the exposures and approaches towards underwriting cyber risk in Europe, EIOPA will further analyze cyber risk exposures in the first half of 2019, based on a separate questionnaire on cyber risk that has been included in the EIOPA Stress Test 2018 exercise for insurers.

Investments in InsurTech have continued to rise in the first half of 2018, but increasingly take the form of partnerships with established insurers. Total global InsurTech investment amounted to approximately USD 1.3 bn in the first half of 2018 and investments are on track to at least equal USD 2.3 bn in funds raised last year, which was the industry's second-highest level of financing.²⁴ While most investment is still located in the US, InsurTech is becoming increasingly global, with two-thirds of investments now taking place outside of the US. Within Europe, most InsurTech activity is seen in the UK, Germany and France. So far, most InsurTech investment and associated start-ups have focused on improving certain parts of the insurance value chain (as opposed to the full scale value chain disruption) and incumbent insurers are increasingly forming partnerships with InsurTech start-ups, as these new entrants typically lack the resources and capital to offer fully-fledged insurance services. Indeed, there is growing recognition among insurers that InsurTech – and in particular adoption by big tech – could potentially disrupt the insurance business and insurers are therefore increasingly looking at ways to enhance their business model, customer experience and/or operational efficiency – either through strategic partnerships with start-ups or through their own InsurTech investments.

²² The new EU General Data Protection Regulation, which came into force in May 2018 and tightens regulation on data security, is expected to act as an catalyst as well.

²³ White House Report (2018), Lloyds Report (2017), McAfee and Center for Strategic and International Studies (2018)

²⁴ Quarterly InsurTech Briefing Q2 2017 (September 2018), Willis Towers Watson.

The further development of InsurTech could ultimately lead to a more fragmented insurance value chain and the blurring of traditional boundaries of the insurance industry. Currently, most insurance companies operate throughout the entire insurance value chain. However, as InsurTech players mature and specialize on certain parts of the value chain a more fragmented insurance industry seems likely in the medium to long-term, with different players focusing on different parts of the value chain. Furthermore, the onset of forward looking data analytics and the internet-of-things is expected to gradually change the role of insurers from risk carrier to risk or financial man-

ager. As insurers increasingly look to harness their data, a shift towards advising clients on prevention strategies is therefore expected. While this potentially allows insurers to broaden their business models, it also leads to the blurring of traditional boundaries of the insurance industry, with tech and manufacturing companies increasingly offering their own insurance solutions. The rise of InsurTech could ultimately enhance financial stability in the long run by making the insurance sector more diversified and efficient, but it carries the risk of business interruptions during the transition process as new players disrupt the market.

BOX 1.2: THE EUROPEAN CYBER INSURANCE MARKET – A STRUCTURED DIALOGUE WITH INSURANCE COMPANIES

In August 2018, EIOPA published a report on the European Cyber Insurance market, based on a survey among 13 European (re)insurers with expertise and exposures in cyber insurance. The report covers a range of topics such as supply and demand of cyber products, cyber underwriting strategies and potential build-up of (silent) cyber exposures. The key findings in this report are as follows:

- There is a clear need for a deeper understanding of cyber risk, both on the supply and demand side, in order for the European cyber insurance industry to develop further. This relates not only to the assessment and treatment of risks in new cyber insurance propositions, but also to the understanding of clients' own needs.
- In terms of products and services, coverages are mainly focused on commercial business. However, interest in providing cyber insurance for individuals is increasing as technology such as the Internet of Things (IoT) develops and consumers are increasingly exposed to infringement of digital services.
- The cyber insurance industry expects a gradual increase in the demand for cyber insurance, mainly driven by new regulations, increased awareness of risks and by a higher frequency of cyber events. The relevance and importance of cyber coverage in the overall functioning of the economy is expected to increase significantly.
- Qualitative models are more frequently used than quantitative models to estimate pricing, risk exposures and risk accumulations. Lack of data is a relevant obstacle in the context of most models. Such limitations may not allow the proper estimation and pricing of risks.
- Non-affirmative exposures are identified as a key concern regarding the proper estimation of accumulation of risks.
- Lack of specialized underwriters, data and quantitative tools are key obstacles for the development of the industry and the provision of proper coverage to the economy.
- Regulation may be welcomed by the industry in a moderate fashion, as it could help to address some of the identified challenges.

EIOPA will follow-up on the challenges identified above in 2019 and continue its structured dialogue with insurance undertakings, making use of additional insights from the qualitative and quantitative questionnaire on cyber risk included in the Insurance Stress Test 2018 exercise. In addition, EIOPA will also continue its cooperation with the US on cyber risk in the context of the EU-US dialogue on Insurance.

2. THE EUROPEAN INSURANCE SECTOR

The prolonged low interest rate environment, growing trade tensions and considerable political and policy uncertainty, not least regarding the outcome of on-going negotiations on Brexit, continue to challenge the European insurance sector. Even though life insurers are trying to adapt to these challenging circumstances by lowering guaranteed rates and focusing on unit-linked products, not all of them are able to transform their business models successfully. For non-life insurers, the challenge is mostly focused on increasing losses stemming from climate-related risks and cyber events, which may not be adequately reflected in risk models based on historical data.

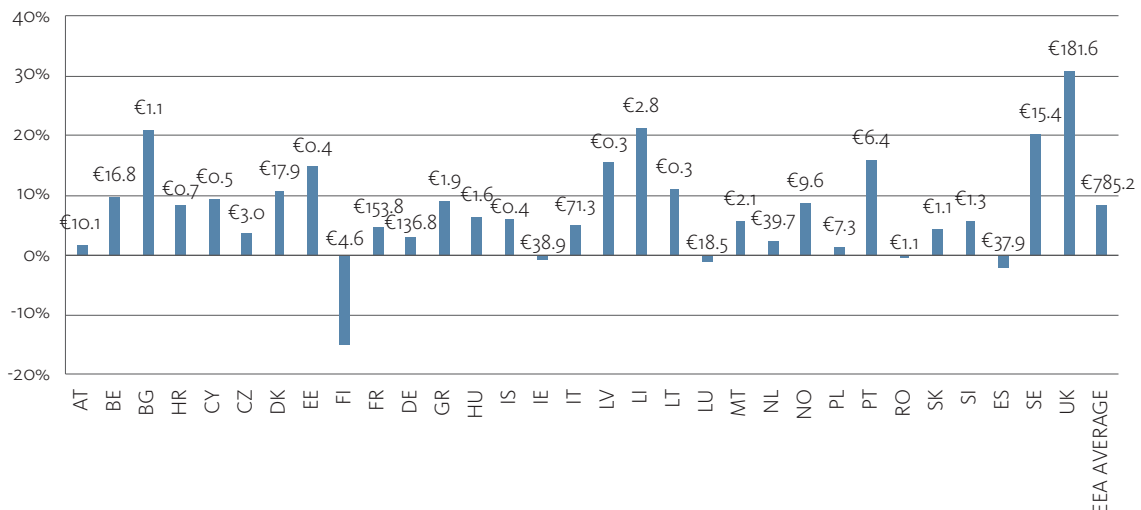
driven by a strong increase in life GWP (12%), compared to a modest increase in non-life GWP (2%). The growth in insurance business is associated with the continued robust economic performance, with GWP as a percentage of GDP only increasing slightly across the EEA (0.4%). On a country level, the highest GWP growth in Q2 2018 (y-o-y) considering both life and non-life business was recorded in the UK (30% – see Figure 2.1).

2.1. MARKET SHARE AND GROWTH

Despite the challenging environment, the European insurance sector overall gross written premiums grew by 7.6 % on an annual basis in Q2 2018. This is primarily

A significant diversity in the relative size of insurance sector is observed across the EEA countries (Figure 2.2). Overall penetration rates have remained stable in the first half of 2018.²⁵ Liechtenstein and Luxembourg continue to have large insurance sectors relative to the size of their economy. Looking at absolute figures, the UK continues to be the biggest insurance market in the EEA with total GWP of EUR 181 bn in the first half of 2018, followed by France (EUR 154 bn), Germany (EUR 137 bn), Italy (EUR 71 bn) and Spain (EUR 38 bn).

Figure 2.1: Total GWP growth in H1 2018 (in %, year-on-year) and total GWP in H1 2018 (in EUR bn in labels)



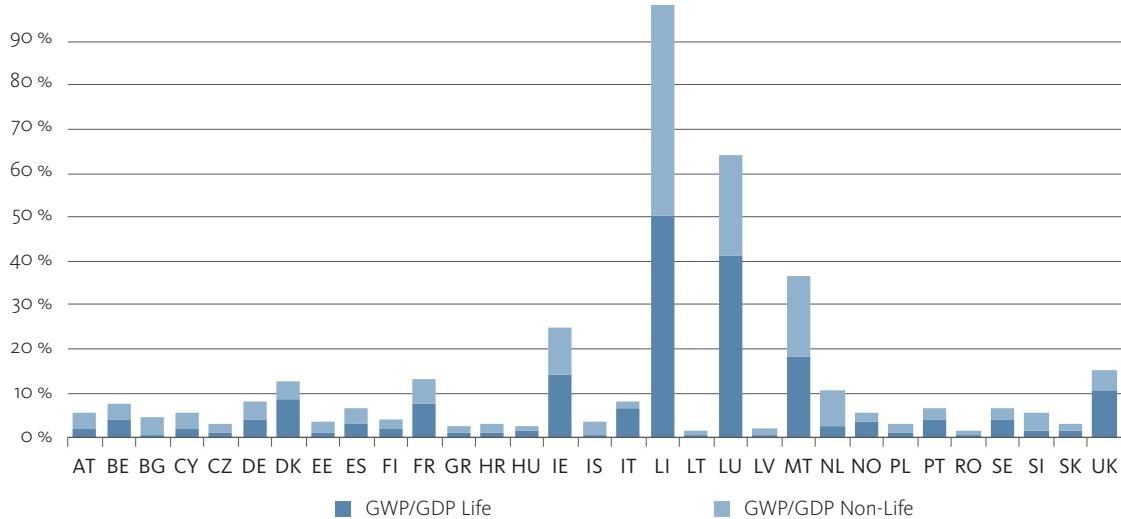
Source: EIOPA Quarterly Solo

Reporting reference date: Q2 2017 and Q2 2018

Note: Growth rates based on local/reporting currency. The decrease in GWP in FI is due to a cross-border merger, for which business is now carried out through a branch in FI.

²⁵ The penetration rate is defined as the percentage share of Gross Written Premiums (GWP) over Gross Domestic Product (GDP) and gives an indication of the size of insurance sector relative to the economy of the country.

Figure 2.2: GWP as a Share of GDP in % by country

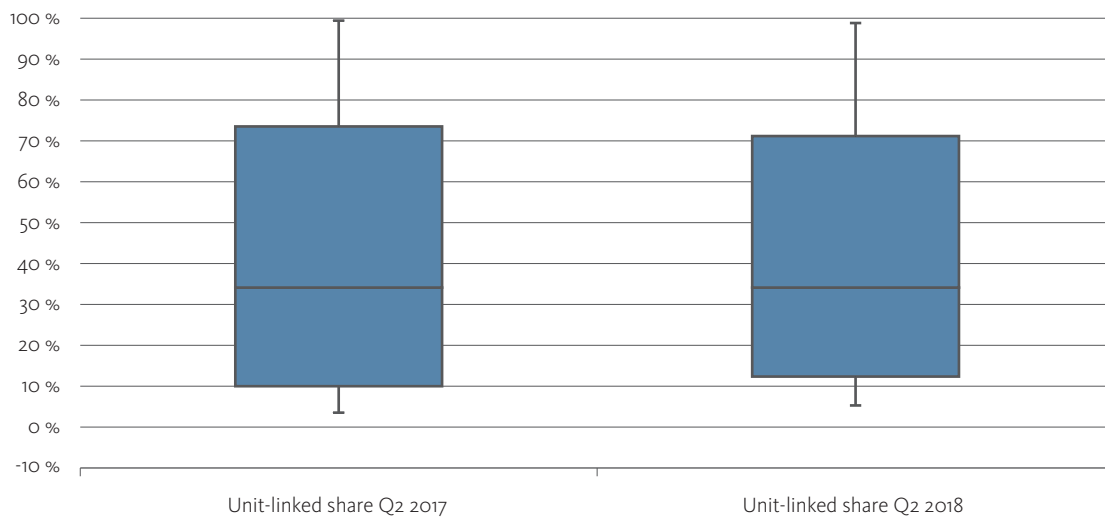


Source: EIOPA Quarterly Solo and Eurostat
Reference date: Q2 2018

The share of unit-linked business has remained broadly stable, but is expected to grow further. The total share of unit-linked business in life GWP has grown by only 1 percentage point from 39% in Q2 2017 to 40% in Q2 2018, while the share for the median insurance company remained the same at 34% (Figure 2.3). Partly in response to the low-yield environment, insurers continue to focus on unit-linked products as these contain few financial guarantees, and hence, are cheaper to provide and have a lower capital charge under Solvency II. However, considerable differences remain across countries, with some

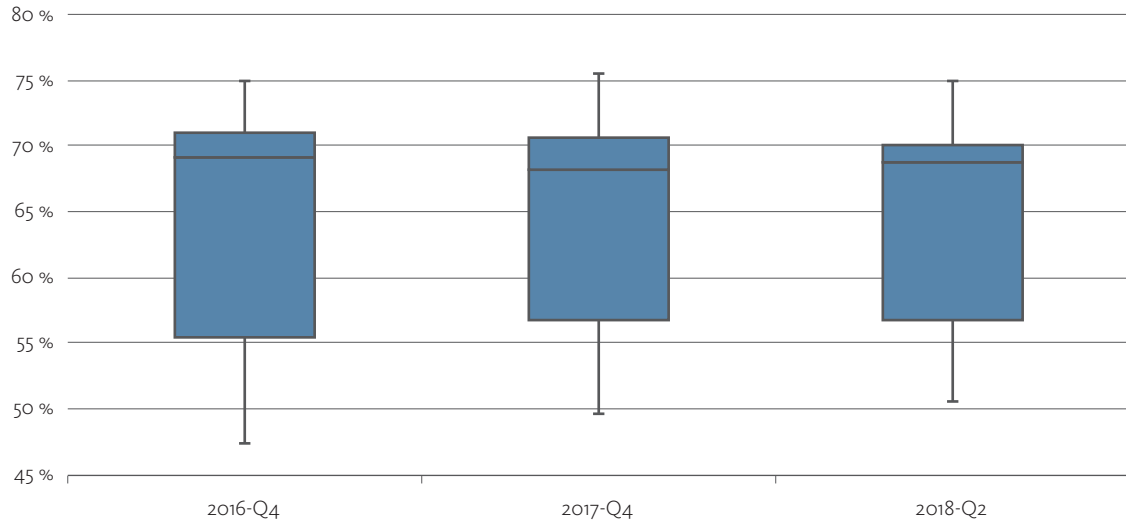
countries still being plagued by low trust due to misselling issues in the past. Overall, investment risks are increasingly transferred to policyholders with potential reputational risks to the insurance sector in case investment returns turn out lower than anticipated. In addition, the shift towards unit-linked business also means that insurers are increasingly competing with asset managers, making cost-effectiveness increasingly important. EIOPA will therefore keep monitoring the trend towards unit-linked business and insurers' behaviour.

Figure 2.3: GWP-Life business: Unit-linked share (in %; median, interquartile range and 10th and 90th percentile)



Source: EIOPA Quarterly Solo
Note: Sample sized on insurance companies which have reported unit-linked business (life and life part of composite insurance companies)

Figure 2.4: Liquid assets ratio (in %)



Source: EIOPA Quarterly Financial Stability Group Reporting (QFG)

Note: The liquid assets ratio shows the proportion of liquid assets on total assets (excluding assets held for unit-linked). 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 liquid asset ratio has improved slightly. Liquid assets are necessary in order to meet payment obligations when they are due. Furthermore, a potential increase in interest rate yields might directly impact the liquidity needs of insurers due to a significant increase in the lapse rate as policyholders might look for more attractive alternative investments. The median liquid asset ratio has remained broadly stable for the last two years, but the bottom of the distribution has become narrower, implying that fewer insurers hold relatively low liquid assets (Figure 2.4).

turn on investment decreased significantly in 2017 to only 1.95%, compared to 2.83% in 2016 (Figure 2.7). In particular government and corporate bonds – which approximately account for two-thirds of insurers' total investment portfolios – have generated considerably lower returns in 2017 (Figure 2.8). As a consequence, insurers may increasingly look for alternative investments, such as equities, mortgages and infrastructure to improve investment returns (see Chapter 5). This potential search for yield behavior might differ per country and warrants close monitoring by supervisory authorities as insurers may suffer substantial losses on these more illiquid investments when markets turn sour.

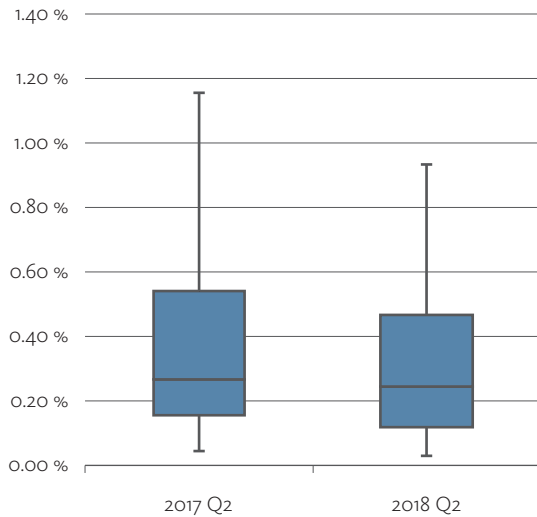
2.2. PROFITABILITY

The profitability of insurers is under pressure in the current low yield environment and has deteriorated further. The low yield environment makes it increasingly difficult for insurers to generate sufficient investment returns to meet policyholder obligations. The median return on assets (ROA) decreased from 0.27% in Q2 2017 to 0.24% in Q2 2018, whereas the median return on excess of assets over liabilities (used as a proxy of return on equity), decreased from 3.2% in Q2 2017 to 2.8% in Q2 2018 (Figure 2.5 and Figure 2.6). The distributions also show that more insurers have lower returns on assets in the first half of 2018 compared to a year ago.

The drop in profitability is primarily due to lower investment returns in the bond portfolio. The median re-

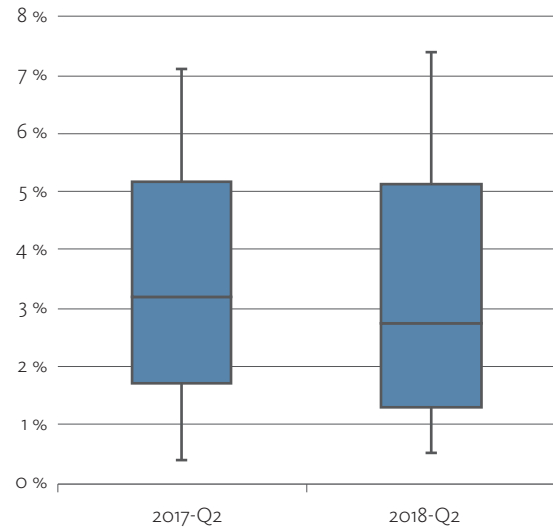
The low yield environment makes it increasingly hard for insurers to make investment returns in excess of guaranteed returns issued in the past, which are still prevalent in many countries. Many insurers in the life segment have offered guaranteed returns on their insurance policies in the past. These investment guarantees have become comparatively high in the current low yield environment and it is increasingly difficult for insurers to cover the offered guaranteed rates in certain countries (Figure 2.9). While most insurance undertakings have stopped offering investment guarantees on new insurance policies and increasingly focus on unit-linked products, the legacy products with investment guarantees still make up the majority of technical provisions in the EEA (approximately two-thirds of the total life best estimate in the EEA have some form of guaranteed rate). This continues to put a significant strain on the profitability of insurers.

Figure 2.5: Return on Assets (in %; median, interquartile range and 10th and 90th percentile)



Source: EIOPA QFG (templates S.39.01.11 and S.02.01.02)
 Note: Data is cumulative

Figure 2.6: Return on Excess of Assets over Liabilities (in %; median, interquartile range and 10th and 90th percentile)

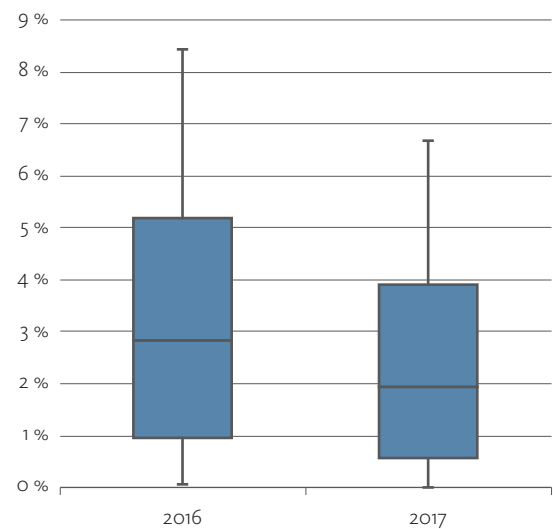


Source: EIOPA QFG (templates S.39.01.11 and S.02.01.02)
 Note: Data is cumulative

Underwriting profitability remained stable and overall positive in the first half of 2018.

The median Gross Combined Ratio for non-life business remained below 100% in the first half of 2018 across all lines of business, indicating that most EEA insurers were able to generate positive underwriting results (excluding profits from investments (Figure 2.10)).²⁶ However, significant outliers can be observed across lines of business, in particular for credit and suretyship insurance, indicating that several insurers have experienced substantial underwriting losses in this line of business. Furthermore, concerns of underpricing and underreserving remain in the highly competitive motor insurance markets. In addition, natural disasters generally have a significant impact on the overall combined ratio of non-life business, but in the first half of 2018 the losses from catastrophes were lower compared to last year. Concerning the relatively new cyber insurance market, coverage is currently only provided by few European insurers and the exact data about the amount of gross written premiums, losses incurred and expenses is not yet available. However, in the Stress Test 2018 exercise, participating insurers were asked to provide the data about the cyber risk products and coverage. Subsequently, a further analysis of this particular line of business will be done in 2019.

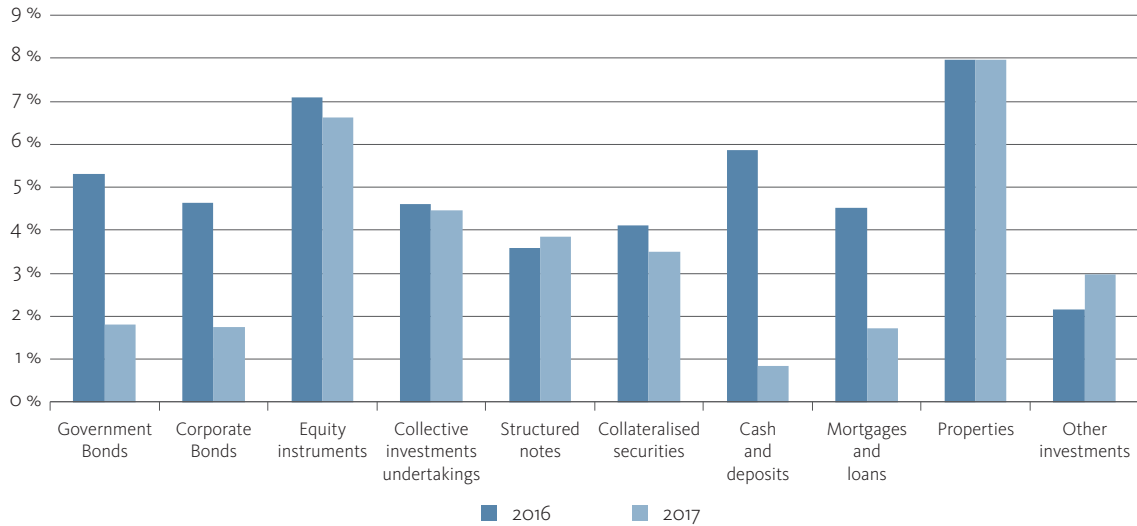
Figure 2.7: Return on Investments (in %; median, interquartile range and 10th and 90th percentile)



Source: EIOPA Annual Solo
 Reference date: 31/12/2017
 Note: Investment returns are taken from template s.09.01 and include dividends, interest, rent, net gains and losses and unrealized gains and losses.

²⁶ The Gross Combined Ratio is the gross loss ratio plus the gross expense ratio.

Figure 2.8: Return on Investments per asset class (in %)

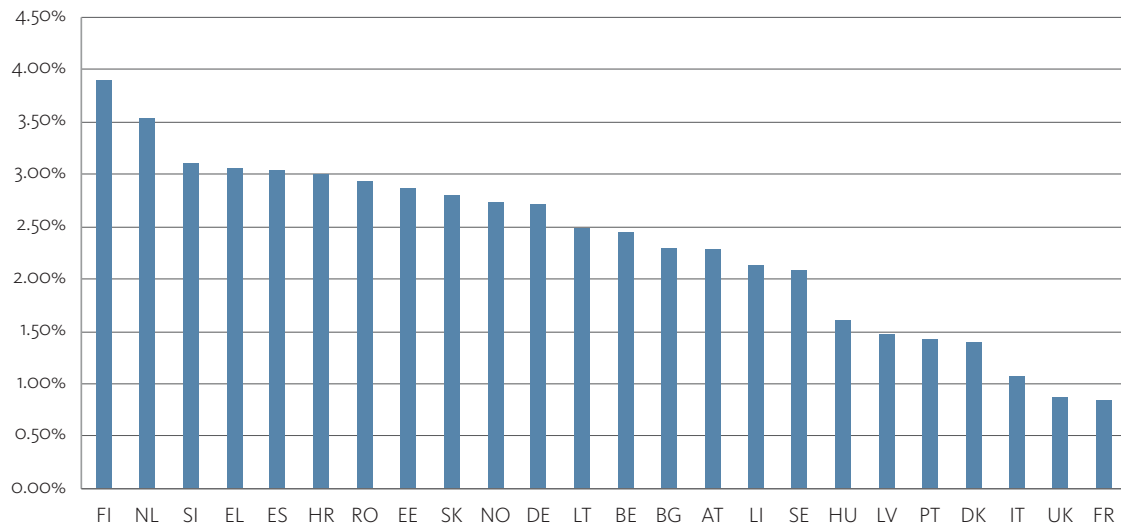


Source: EIOPA Annual Solo

Reference date: 31/12/2017

Note: Investment returns are taken from template s.09.01 and include dividends, interest, rent, net gains and losses and unrealized gains and losses.

Figure 2.9: Average guaranteed rates on insurance with profit participation in selected countries

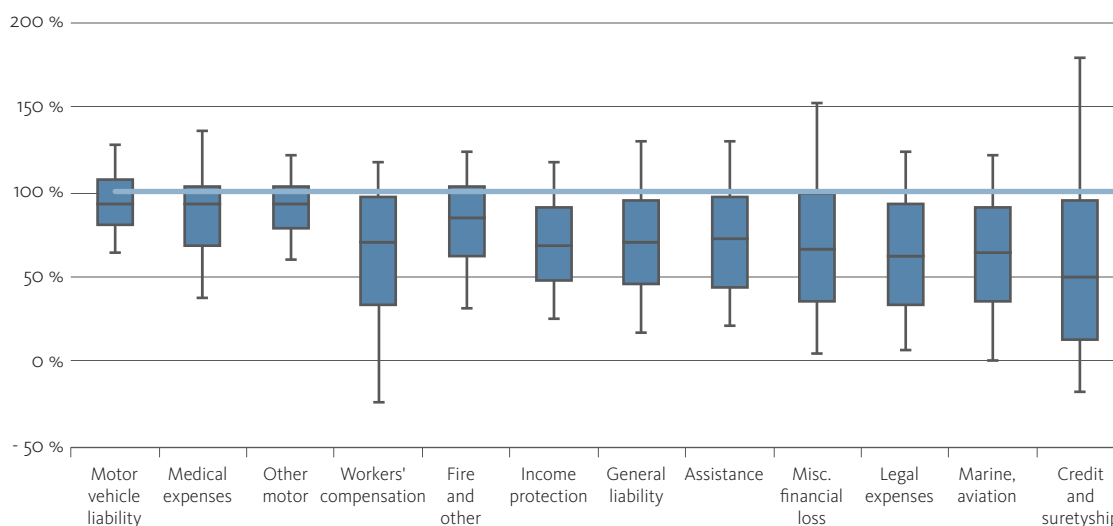


Source: EIOPA Annual Solo

Reference date: 31/12/2017

Note: Only countries with material guaranteed rates are shown. Average guaranteed rates are calculated for life insurance with profit participation (LoB 30) only as a weighted average at country level, using the best estimate at the homogeneous risk group as weight. Insurance with profit participation accounts for around half of the total life technical provisions in the EEA.

Figure 2.10: Gross Combined Ratio across lines of business (in %; median, interquartile range and 10th and 90th percentile) as of Q2 2018



Source: EIOPA Quarterly Solo

Reference date: Q2 2018

Note: Premiums, claims and expenses by line of business (Claims Incurred Gross Direct Business + Expenses incurred by line of business divided by Gross Earned Premiums)²⁷

2.3. SOLVENCY

The overall solvency position of insurance undertakings slightly improved in the first half of 2018 and remains high across EEA countries. (Figures 2.11 - 2.13). Despite lower profitability, the financial position of insurance has slightly improved in the first half of 2018 due to slowly rising interest rates used for discounting liabilities.²⁸ Furthermore, the number of insurance undertakings with SCR ratios below 100% also declined further. Only 1 life insurer and 7 non-life insurers now have SCR ratios now below the 100% threshold, compared to 2 and 9 at the end of 2017, respectively (Figure 2.12). The median SCR ratio for life insurers is the highest compared to non-life insurers and composite undertakings. However, the SCR ratio differs substantially among countries (Figure 2.13).

The impact of the LTG and transitional measures varies considerable across insurers and countries. The long term guarantees (LTG) and transitional measures were introduced in the Solvency II Directive to ensure an appropriate treatment of insurance products that include long-term guarantees and facilitate a smooth transition of the new regime.²⁹ These measures can have a significant impact on the SCR ratio by allowing insurance undertakings, among others, to apply a premium to the risk free interest rate used for discounting technical provisions. The impact of applying these measures is highest in DE and the UK, where the distribution of SCR ratios is significantly lower without LTG and transitional measures (Figure 2.14). While it is important to take the effect of LTG measures and transitional measures into account when comparing across insurers and countries, the LTG measures do provide a potential financial stability cushion by reducing the impact of short-term market movements.

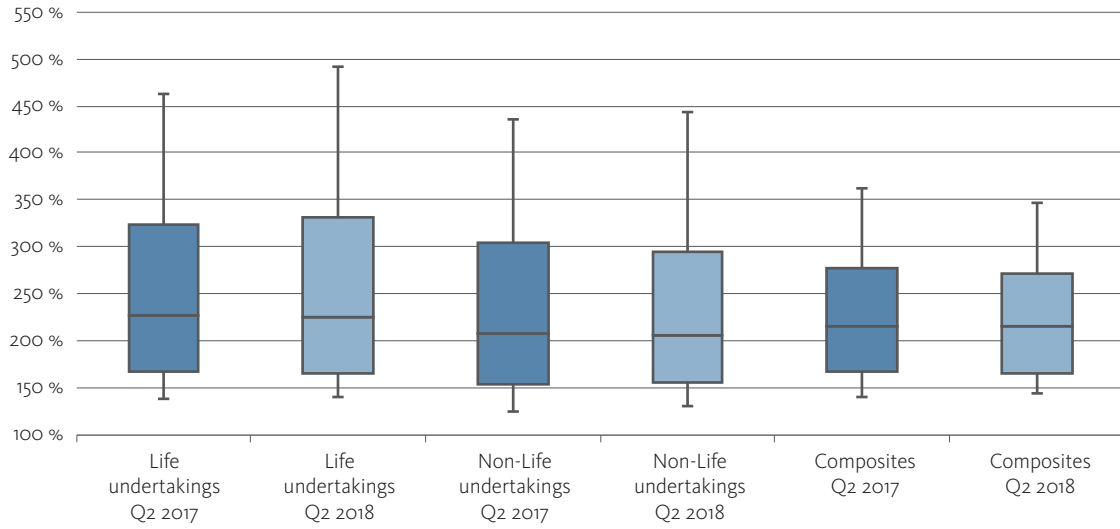
Overall, the quality of own funds remains high in the European insurance sector. Total own funds amounted to EUR 1.56 tn and the majority of total own funds consists of Tier 1 unrestricted capital items, representing more than 90% per solo undertaking. Composite insurers have the highest share of Tier 2 own funds at approximately 8% of total own funds (Figure 2.15). Regarding the tiering limits, Tier 3 own funds only account for approximately

²⁷ Nominator S.05.01.02 [(R0310+ R0550, C0010-C0160)]; Denominator S.05.01.02 [R0210, C0010-C0160]

²⁸ It should be noted however that the Ultimate Forward Rate (UFR) used in the derivation of the risk free rate curve for discounting long-term liabilities under Solvency II was lowered by 15bps as of 1-1-2018, following the application of the EIOPA methodology to derive the UFR. This has counterbalanced the observed rise in interest rates for long-term liabilities.

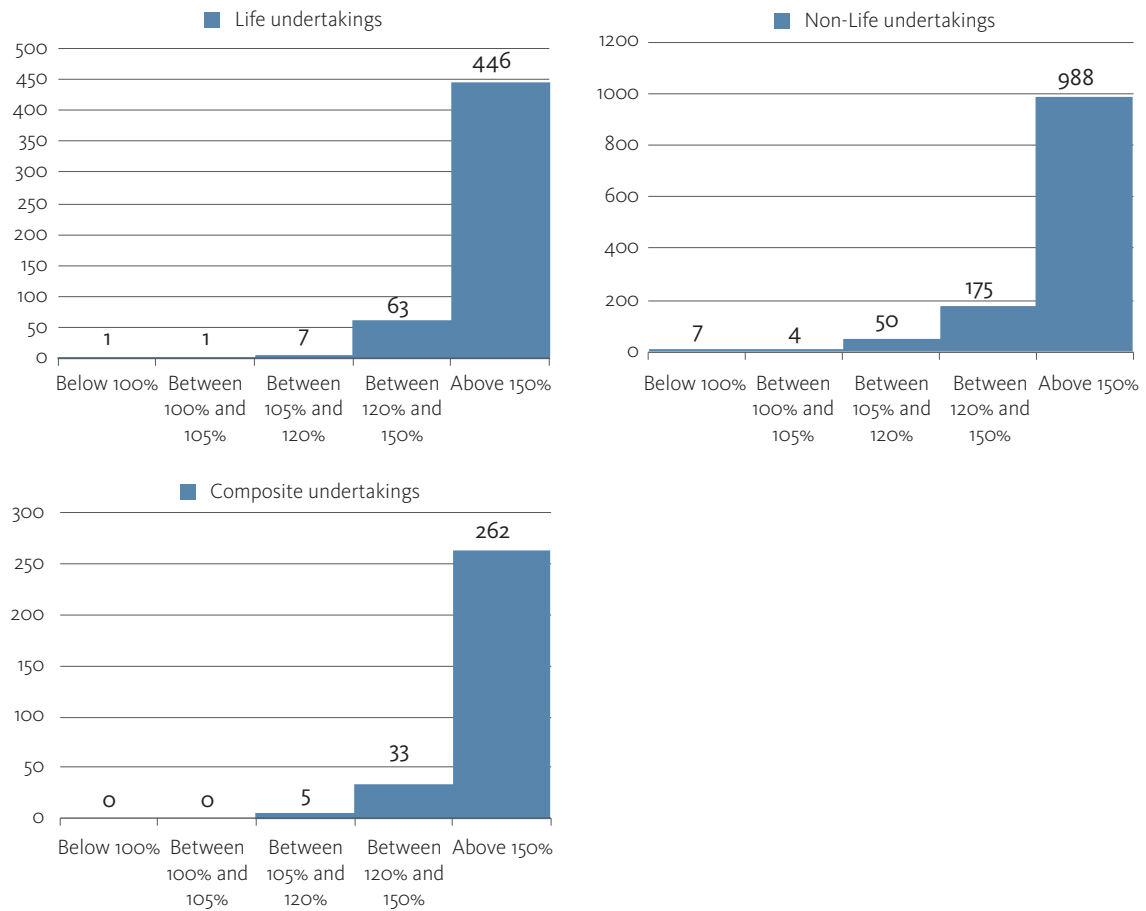
²⁹ Please refer to the annual EIOPA LTG report for more information on the LTG and transitional measures.

Figure 2.11: SCR ratio (in %; median, interquartile range and 10th and 90th percentile) in Q2 2018



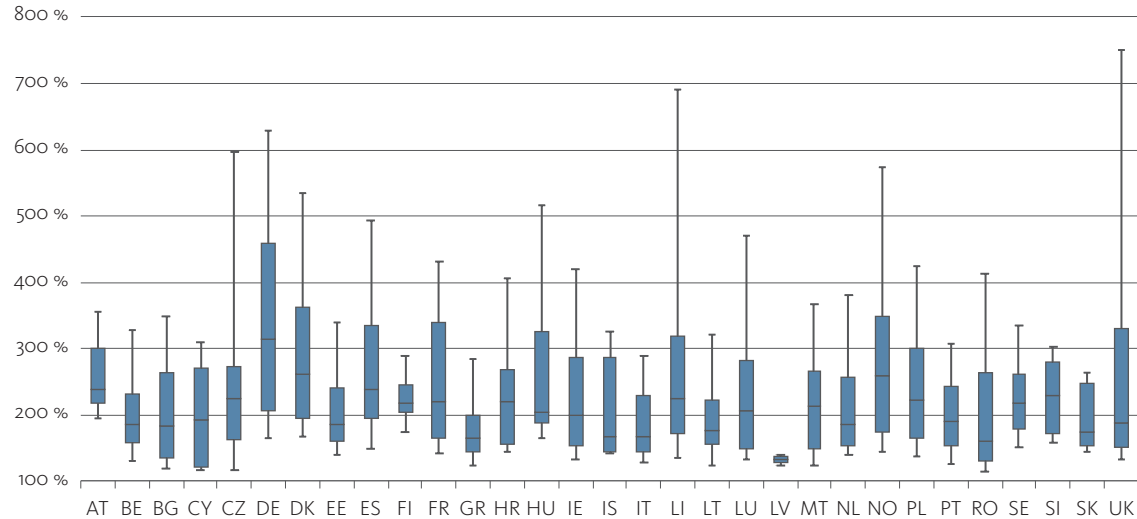
Source: EIOPA Quarterly Solo

Figure 2.12: Intervals of SCR ratios for solo undertakings as of Q2 2018 by type of undertakings



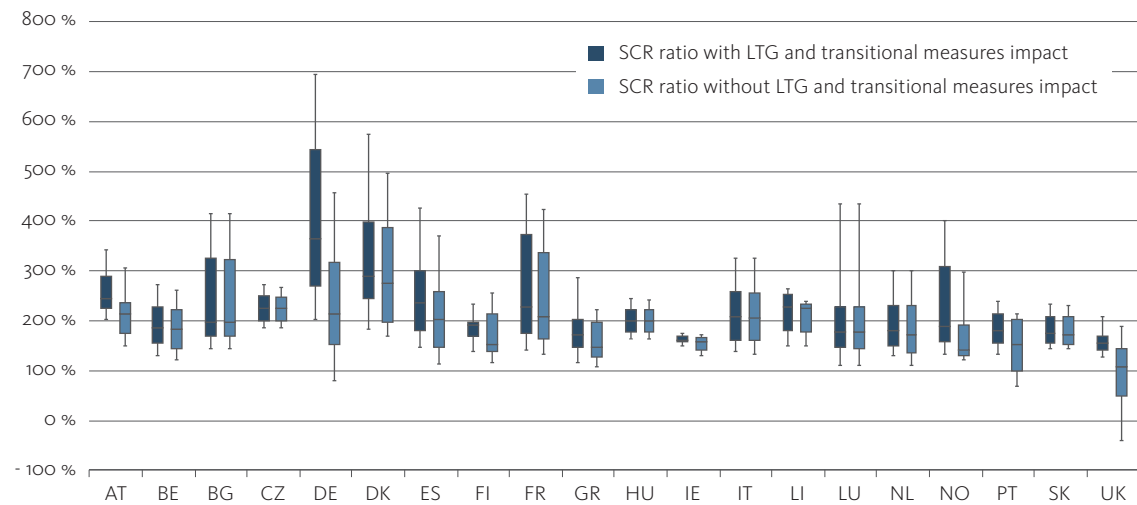
Source: EIOPA Quarterly solo
Reference Date: Q2 2018

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



Source: EIOPA Quarterly Solo
Reference date: Q2 2018

Figure 2.14: SCR ratio by country with and without LTG and transitional measures (in %; median, interquartile range and 10th and 90th percentile)



Source: EIOPA Annual Solo
Reference date: 31/12/2017

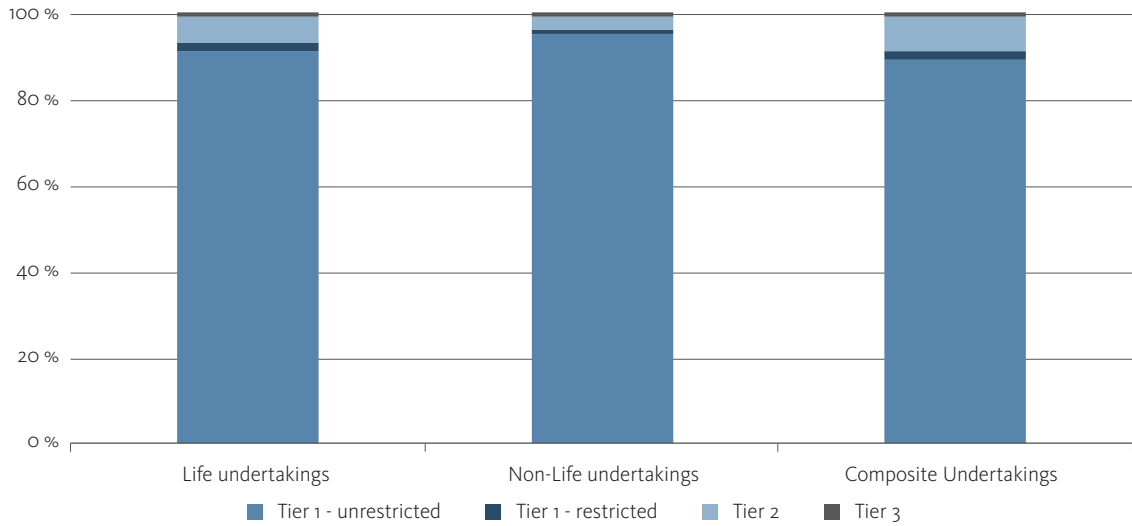
Note: Sample based on 702 solo insurance undertakings in EEA that use transitional and/or LTG measures.

1% of the total SCR for all types of undertakings, whereas the sum of Tier 2 and Tier 3 own funds are 19%, 15% and 9% of the total SCR for composite undertakings, life undertakings and non-life undertakings, respectively, and hence on aggregate well below the limit that their sum shall not exceed 50% of the SCR.³⁰ The tiering of own

funds varies considerably across countries, however, with countries such as Norway, UK, Italy and Belgium relying relatively more on Tier 2 own funds items (Figure 2.16). As for Tier 3 own funds, this is especially pronounced in Greece, with approximately 5% of own funds consisting of Tier 3 own funds.

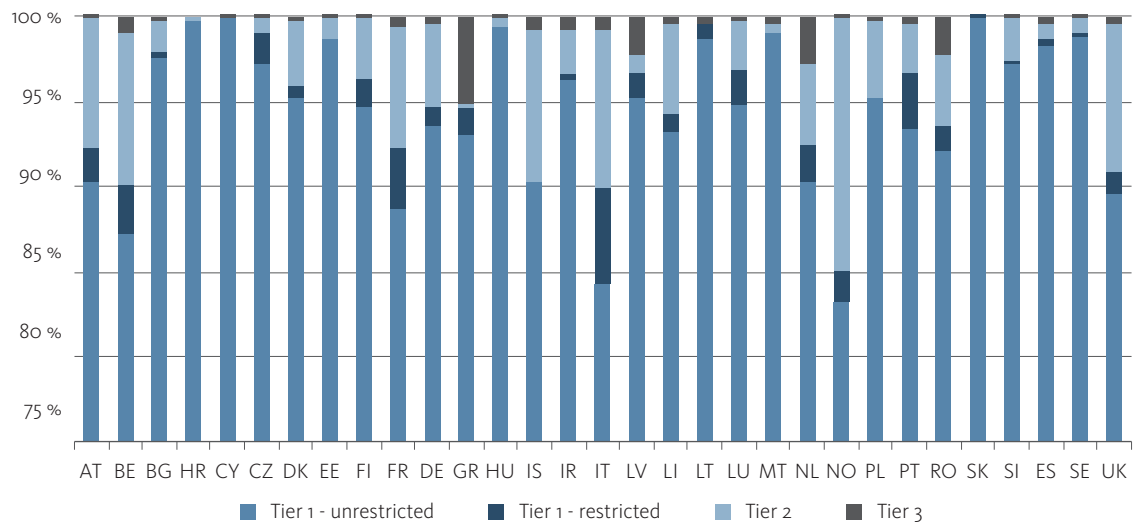
³⁰ Further description on Solvency II insurers' own funds and tiering limits is included in Chapter 6. Also, please refer to Commission Delegated Regulation (EU) 2015/35 <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32015R0035&from=EN> for the further description on Solvency II insurers' own funds.

Figure 2.15: Split of Own Funds per type of undertaking (in %)



Source: EIOPA Quarterly Solo
Reference date: Q2 2018

Figure 2.16: Split of Own Funds per country (in %)

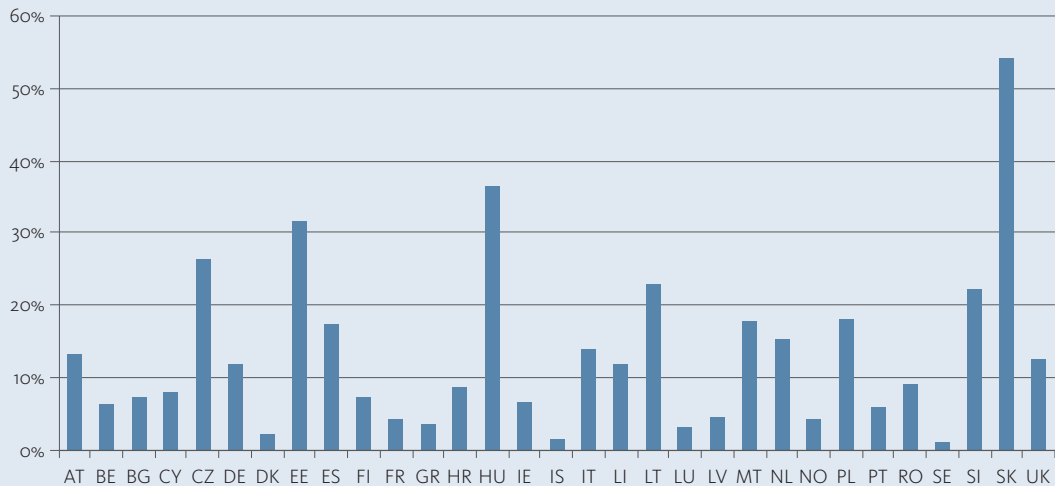


Source: EIOPA Quarterly Solo
Reference date: Q2 2018

BOX 2.1: EXPECTED PROFITS IN FUTURE PREMIUMS (EPIFP)

According to Article 70(2) of Delegated Regulation³¹, the Expected Profit included in Future Premium (EPIFP)³² is a part of the reconciliation reserve which is classified as Tier 1 basic own fund capital³³. Based on European insurance data, it was observed that the average share of EPIFP to own funds is considerably high in some European countries (Figure B.2.1.1). In case that EPIFP is used extensively, e.g. in Slovakia the average share of EPIFP to own funds is more than 50%, this might represent a potential source of risk as EPIFP may be more uncertain and volatile, warranting close supervisory attention. Some undertakings also acknowledge the uncertainty stemming from EPIFP and for the purpose of their own risk assessment they also calculate the SCR ratio without EPIFP.

Figure B.2.1.1: Average share of EPIFP in own funds per country (in %)



Source: EIOPA Annual Solo

Reference date: 2017

Note: The expected profit in future premiums (EPIFP) expressed as a percentage of the eligible own funds to meet the solvency capital requirement. The average value for each country is displayed.

31 COMMISSION DELEGATED REGULATION (EU) 2015/35 of 10 October 2014 supplementing Directive 2009/138/EC of the European Parliament and of the Council on the taking-up and pursuit of the business of Insurance and Reinsurance (Solvency II)

32 EPIFP represent premiums relating to existing insurance and reinsurance contracts that are expected to be received in the future, but that may not be received for any reason other than the insured event having occurred, regardless of the legal or contractual rights of the policyholder to discontinue the policy.

33 As written in Article 71 of Delegated Regulation, the basic own-fund items classified as Tier 1 should not include features which may cause the insolvency of the insurance or reinsurance undertaking or may accelerate the process of the undertaking becoming insolvent. Tier 1 capital should also be immediately available to absorb losses.

2.4 REGULATORY DEVELOPMENTS

EIOPA has issued two additional Opinions related to the consequences of the Brexit for the insurance market.

Following EIOPA's Opinion on supervisory convergence in light of Brexit in July 2017 and EIOPA's Opinion on service continuity in insurance in light of the withdrawal of the United Kingdom from the European Union in December 2017, EIOPA published an opinion on the solvency position of insurance and reinsurance undertakings in light of the withdrawal of the United Kingdom from the European Union in May 2018. The aim of this opinion is to call upon national supervisory authorities to ensure that the risks for the solvency position of undertakings arising from the UK becoming a third country are properly identified, measured, monitored, managed and reported. Furthermore, EIOPA issued an opinion in June 2018 to remind national supervisory authorities about the duty of insurance undertakings and insurance intermediaries to inform customers about the possible impact of the withdrawal of the UK from the EU on insurance contracts and of the relevant contingency measures taken by insurance undertakings and about the continuity of their contracts.

Furthermore, the European Commission adopted a package of measures on sustainable finance in May

2018. The package included proposals aimed at establishing a unified EU classification system of sustainable economic activities ('taxonomy'); improving disclosure relating to sustainable investments and sustainability risks; creating a new category of benchmarks, which will help investors compare the carbon footprint of their investments. In July 2018, the European Commission has requested the ESMA and EIOPA to provide technical advice supplementing the initial package of proposals and to advise the Commission on potential amendments to, or introduction of, delegated acts under, amongst others, the IDD and the Solvency II Directive with regard to the integration of sustainability risks and sustainability factors. EIOPA and ESMA are requested to provide their advices by April 2019.

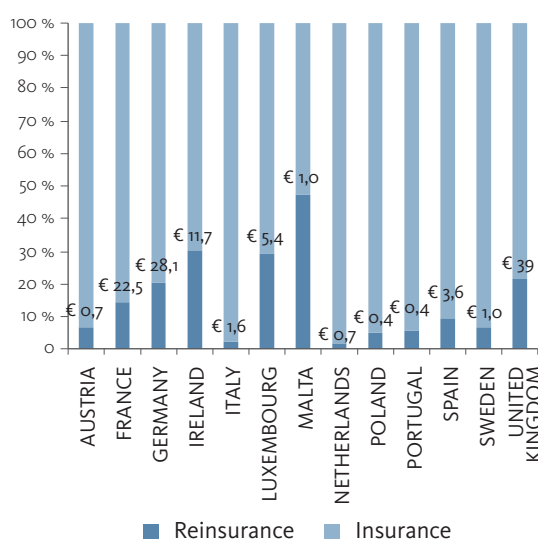
On the 16th July 2018 EIOPA submitted to the European Commission draft amendments to the Implementing technical standards (ITS) on reporting and the ITS on public disclosure.

The proposed amendments are intended to provide legal certainty and to facilitate correct reporting as well as the disclosure process for insurance undertakings. After the adoption by the European Commission and publication in the Official Journal the amendments will enter into force and become applicable. It is expected that the ITS will be applicable for the submissions and disclosures at the end of 2018.

3. THE EUROPEAN REINSURANCE SECTOR

Overall catastrophe activity was relatively benign in the first half of 2018, strengthening the resilience of the reinsurance undertakings after the record losses in 2017. Despite the substantial insured losses in 2017, however, the renewals in 2018 saw only moderate price increases, mostly in the regions and lines of business affected by the three hurricanes (Harvey, Irma, Maria), indicating potential excess capacity in the reinsurance market. The alternative reinsurance market in particular has continued to show a strong appetite for insurance risks, with substantial growth in NatCat bonds and Insurance Linked Securities (ILS) issuances. A re-strengthening of the soft market therefore seems likely and competitive pressures remain high. Moreover, the ability to release reserve from previous years appears to have been diminished amid lower solvency positions, whereas the long-term business is getting less profitable or even unprofitable due to the prolonged low interest rate environment. Against this background setting risk-adequate prices at the upcoming renewals is crucial for reinsurance undertakings.

Figure 3.1: Reinsurance share of GWP per country (in %, and EUR bn)



Source: EIOPA Quarterly Solo
Reference date: Q2 2018

3.1. MARKET SHARE AND GROWTH

The overall share of reinsurance GWP in total GWP increased slightly across EEA countries. Total reinsurance GWP amounted to EUR 118 bn, approximately 15% of total GWP (compared to 13% in the same period a year before). The biggest reinsurance markets in absolute terms are located in the UK, Germany and France, whereas the reinsurance sector is relatively large in Malta, Ireland and Luxembourg compared to total GWP in these countries (Figure 3.1). Globally, total reinsurance capital remained stable at USD 605 bn as of June 2018.³⁴ Traditional capital fell slightly by 2% to USD 507 bn, however, mainly driven by unrealised investment losses in light of rising interest rates in the United States. Overall, reinsurer capital has increased by 78% over the last decade.

Alternative reinsurance capital rose sharply in the first half of 2018. A strong issuance of natural catastrophe bonds, ILS and collateralized reinsurance has allowed alternative capital to rise by 10 percent to USD 98 bn over the first half year of 2018, reflecting a renewed investor appetite for insurance risk despite the substantial insured losses in 2017.³⁵ The ILS-market proved itself particularly resilient with record issuances in the first half year of 2018, showing that the alternative reinsurance market is still attracting investors. Total outstanding catastrophe bond and ILS amounted to USD 36.6 bn by the end of September, an all-time high in comparison with the prior full-year totals.³⁶ Nevertheless, collateralized reinsurance transactions still represent the bulk of the alternative capital. The relatively high yields as well as the diversifying nature of catastrophe-exposed business attract investors who are searching for alternative sources of income in the current low yield environment. Consequently, the capital-inflow into the reinsurance market, especially the alternative reinsurance market, is likely to continue.

34 See AON Benfield: Reinsurance Market Outlook September 2018, page 3.

35 See AON Insurance Linked Securities (September 2018).

36 See ARTEMIS Website: <http://www.artemis.bm/dashboard/>

The price renewals in the first half of 2018 indicated relatively soft market conditions. Overall prices increases in the reinsurance market were only moderate, despite record losses in 2017. Price hikes in the double digits were limited to the lines of business and regions most affected by the heavy hurricanes in the US and Caribbean. However, in other lines of business the rates were stable or rose only slightly, as the persisting capital-inflow into the reinsurance market continues to keep a lid on prices.

3.2. PROFITABILITY

Global insurance industry catastrophe losses were relatively low over the first half year of 2018. Insured losses decreased by one third to USD 17 bn compared to the same period last year and are more or less in line with the average insured losses for the first six months over the last 30 years (USD 17.5 bn).³⁷ The overall economic losses fell roughly by half to USD 33 bn, less than half of the average for the last 30 years. The costliest natural disaster event in the first half of 2018 was winter storm Friederike, which swept across Western Europe in mid-January (see Table 1). The overall economic losses came to USD 2.7 bn, of which USD 2.1 bn were insured, reflecting the high insurance density of windstorm cover in Europe. In total, winter losses in Europe came to USD 4.8 bn, of which USD 3.6bn were insured. In comparison with 2017, the hurricane season 2018 was relatively benign. Nevertheless, strong hurricanes made landfall in the United States. Especially hurricane Michael, which made landfall

as a category 4 hurricane on Florida Gulf Coast, caused huge damages. The loss estimations are preliminary, ranging from 4.5bn to 20bn USD.³⁸ However, overall the losses seem manageable, as the three HIM hurricanes caused insured losses of about 100bn USD in 2017 and they did not really rock the market long term.³⁹

The relatively low natural catastrophe losses are reflected in the gross combined ratios for the first half year of 2018, which improved overall. The overall median gross combined ratio across all lines of proportional reinsurance business was approximately 91% in the first half of 2018 (Figure 3.2), and improved for the most important lines of business in terms of GWP (Fire and other damage to property, motor insurance and general liability, representing 35%, 25% and 11% of total GWP for proportional reinsurance, respectively). However, significant differences can be observed across lines of business in more niche markets, with large outliers for the legal expenses and workers' compensation lines of business. The same holds for non-proportional reinsurance, where both the property and casualty lines of business showed improving underwriting performance (Figure 3.3). However, severe losses were still observed for some reinsurers in the niche market for marine, aviation and transport reinsurance.

Despite low catastrophe losses in the first half of 2018, competitive pressures remain high in the reinsurance sector. The combination of the continuing capital-inflow into the reinsurance market and low investment returns increasingly put pressure on profitability in the reinsurance business. Investment returns in particular have de-

Table 3.1: The five largest natural catastrophes in the first half of 2018, ranked by insured losses

Date	Event	Region	Overall losses USD bn	Insured losses USD bn
18.1.2018	Winter storm Friederike	Europe	2.7	2.1
1-3.3.2018	Winter storm	USA	2.2	1.6
12-16.5.2018	Severe storm	USA	1.4	1.0
18-20.3.2018	Severe storm, hail, tornado	USA	1.3	1.0
2-3.1.2018	Winter storm Burglind (Eleanor)	Europe	1.2	0.9

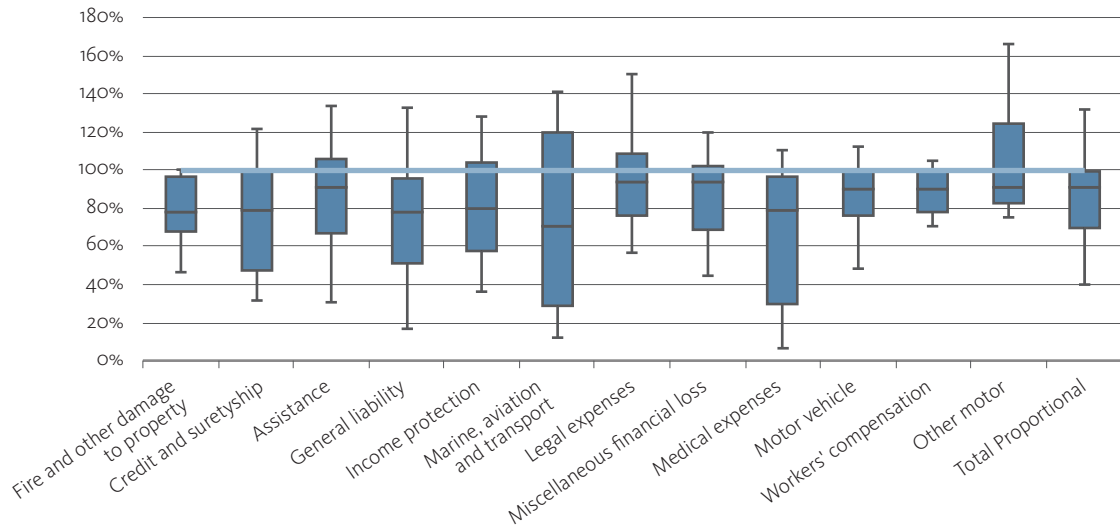
Source: Munich Re, NatCatSERVICE.

³⁸ See ARTEMIS-Website: <http://www.artemis.bm/blog/2018/10/11/hurricane-michael-losses-unlikely-to-move-the-re-insurance-market/>

³⁹ See ARTEMIS-Website: <http://www.artemis.bm/blog/2018/10/11/hurricane-michael-losses-unlikely-to-move-the-re-insurance-market/>

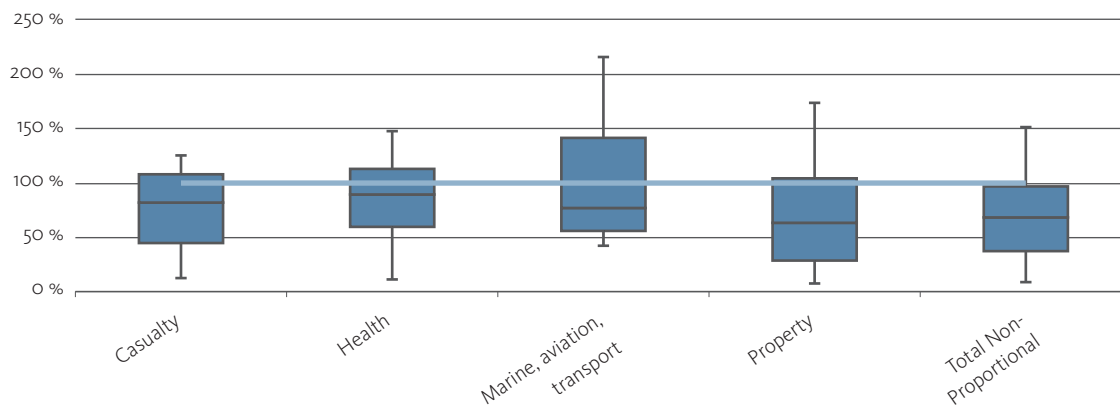
³⁷ See Munich Re: NatCatSERVICE.

Figure 3.2: Gross Combined Ratio Proportional Reinsurance H1 2018



Source: EIOPA Quarterly Solo
Reference date: Q2 2018

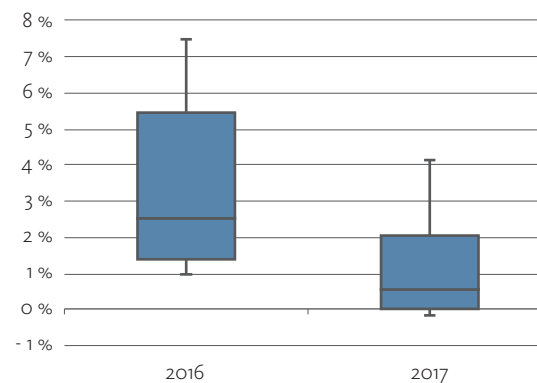
Figure 3.3: Gross Combined Ratio Non-Proportional Reinsurance H1 2018



Source: EIOPA Quarterly Solo
Reference date: Q2 2018

teriorated significantly in 2017 due to the sustained low interest rate environment (Figure 3.4), while the 2018 renewals revealed that even record losses in 2017 did little to increase prices. Moreover, the ability to release reserve from previous years appears to have been diminished, whereas the long-term business is getting less profitable or even unprofitable as the high interest rates calculated in previous rates are difficult to earn. Against this background getting risk-adequate prices at the upcoming renewals is crucial for the reinsurance companies, as the outlook for profitability remains challenging.

Figure 3.4: ROI Reinsurance sector



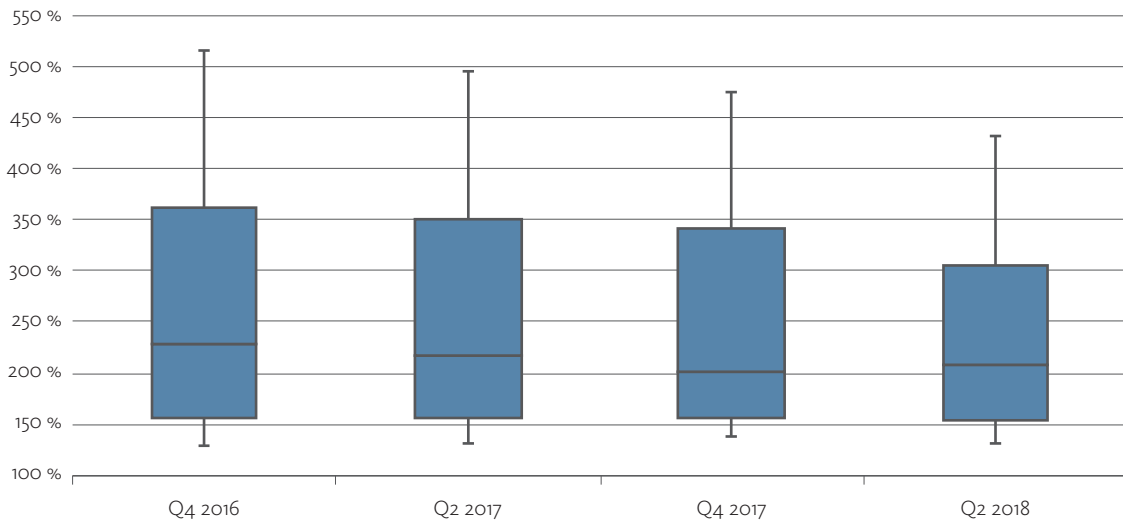
Source: EIOPA Quarterly Solo
Reference date: Q2 2018

3.3. SOLVENCY

While solvency positions deteriorated over the first half of 2018 following the record losses in 2017, overall the reinsurance sector proved resilient. The median SCR ratio remained broadly stable in the first half of 2018, but some reinsurers have seen a significant deterioration in their financial position (Figure 3.5), as the losses from 2017 materialized and investment returns reached record lows. In fact, 1 reinsurer now has a SCR ratio below 100%

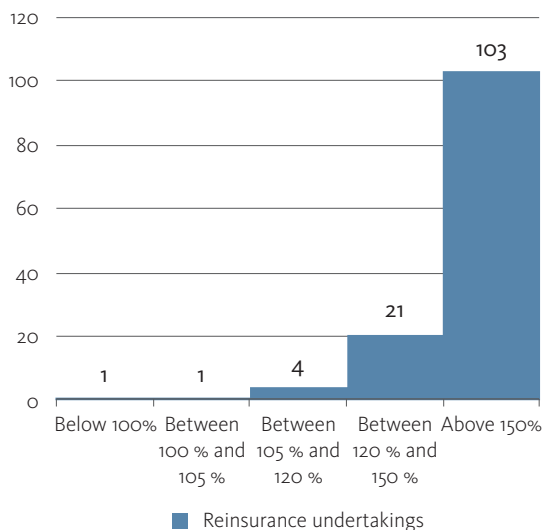
and 5 more reinsurers are in the critical zone between 100 – 120% as of Q2 2018 (Figure 3.6). However, despite these record losses the reinsurance sector remains overall well capitalized, indicating that reinsurers generally coped well with the events of last year.⁴⁰ Due to the relatively benign catastrophe activity in 2018 so far, the solvency position is expected to remain relatively stable in the short run. However, as the future price development is largely uncertain, and a re-strengthening of the soft market is not unlikely, the outlook remains challenging.

Figure 3.5: Solvency position reinsurance sector



Source: EIOPA Quarterly Solo
Reference date: Q2 2018

Figure 3.6: Intervals of SCR ratios for reinsurance undertakings as of Q2 2018



Source: EIOPA Quarterly Solo
Reference date: Q2 2018

⁴⁰ In fact, S&P estimates that the reinsurance sector has sufficient capital to absorb a 1/250 aggregate net loss event. See ARTEMIS Website: <http://www.artemis.bm/blog/2016/09/15/reinsurance-rate-softening-to-continue-ils-to-grow-influence-sp-execs/>

4. THE EUROPEAN PENSION FUNDS SECTOR

The current macroeconomic environment and ongoing low interest rates continue to pose challenges to the European occupational pension fund sector. Low interest rates keep up the pressure on pension funds: especially on traditional, guaranteed Defined Benefit plans (DB), which account for the majority of the sector in terms of assets. This type of pension plans provide employees with a defined level of pension, sometimes conditional on market developments, and a degree of risk-sharing between employers, current and future plan members. The low interest rate environment also affects defined contribution funds (DC), yet the investment risks are borne by the member or beneficiary, not by the DC fund as such.

A sudden increase in yields could significantly affect the funding position of (DB) pension funds in the short term, depending on how the interest rate hike materializes and the applied accounting standards. The risk of a sudden reassessment of risk premia has become more pronounced over recent months. As mentioned in chapter 1, if the yield increase happens due to a sharp increase in credit spreads, pension funds may suffer large losses in

the market value of fixed-income investment portfolios. If the yield increase takes place due to rising risk free rates, the net financial position of pension funds may improve due to the higher discounting effect on the technical provisions with longer durations than assets. The exact impact on the funding position would, however, depend on the situation at individual pension funds, the type of contract and the respective accounting standards.

EIOPA closely monitors potential negative impacts of macroeconomic developments on the IORP sector and financial stability through stress test exercises.

In order to improve its ability to better analyse the European pension sector, EIOPA developed a common set of reporting requirements.⁴¹ The new framework will allow EIOPA to effectively monitor market developments in the area of occupational pensions as well as to undertake in-depth economic analyses. Hereby, EIOPA focused on three areas: balance sheet information, inputs and assumptions used for valuations and flow data. The reporting requirements would apply as of the third quarter of 2019 for quarterly reporting and as of end-2019 for annual reporting.

Table 4.1: Total assets per country as a share of total assets reported for 2017

UK	NL	DE	IT	IE	NO	BE	IS	ES
46.28%	35.81%	6.18%	3.45%	2.61%	0.92%	0.84%	0.77%	0.62%
AT	SE	PT	RO	LI	DK	FI	SI	LU
0.59%	0.54%	0.49%	0.23%	0.17%	0.15%	0.11%	0.07%	0.05%
SK	GR	LV	PL	HR	BG	MT	Total	
0.05%	0.04%	0.01%	0.01%	0.003%	0.0002%	0.0001%	100.00%	

Source: EIOPA

Note: Figure for UK contains DB and HY schemes only

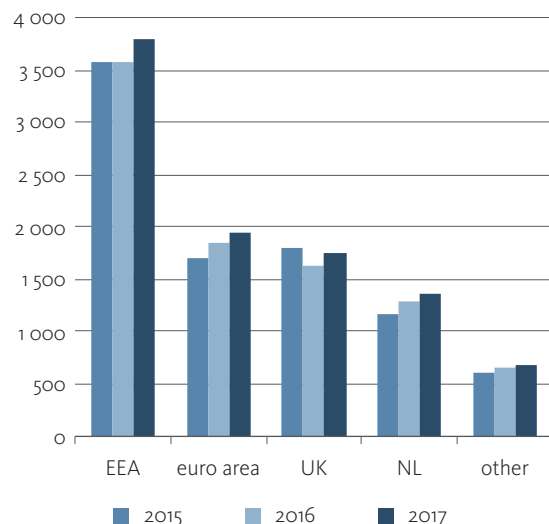
⁴¹ In April 2018, EIOPA published its decision at: (<https://eiopa.europa.eu/Pages/News/EIOPA-is-significantly-enhancing-European-pensions-statistics.aspx>)

4.1. MARKET GROWTH OF THE OCCUPATIONAL PENSION FUND SECTOR

The UK and the Netherlands (82%) continue to account for the vast majority of the European occupational pensions sector in terms of assets under management (Table 4.1). Cross-country differences in the importance of the sector are mainly driven by the national set-up of pension systems and the relative share of private and public pension provision. Both the UK and NL are providing their citizens with relatively modest flat-rate state pensions, which are complemented by significant private pension provisions. Pension funds under Pillar I are not covered in this chapter.

Total assets owned by occupational pension funds increased by 6 per cent for the EEA and 5 per cent for the euro area in 2017 (Figure 4.1). These increases can be attributed mainly to the results of two countries: the UK (+7%) and the NL (+5%). Finally, when looking at all other countries in the sample (excluding UK and NL) total assets increased by 4% in value compared to the previous year.

Figure 4.1: Total Assets (in EUR bn)



Source: EIOPA

Note: For the UK data refer only to DB and HY schemes.

Figure 4.1 is based on data received by 25 countries (EEA) and 15 countries (euro area) which provided total assets for 2017. The category "other" includes all countries except UK and NL.

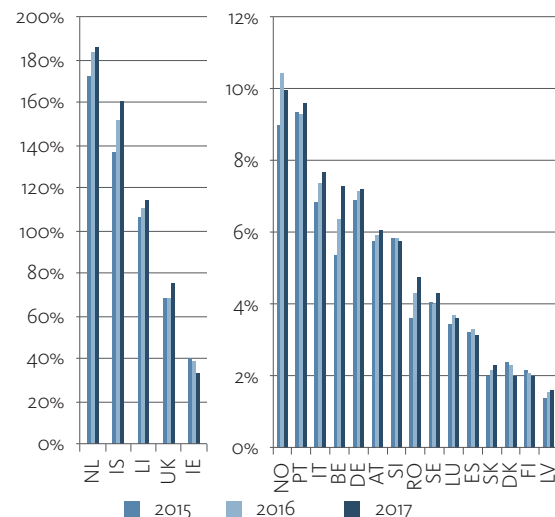
Figure 4.2 Penetration rate for GR, HR, PL, MT and BG is lower than 1 per cent. For RO, the data refers to 1st Pillar bis and 3rd Pillar private pension schemes only

The penetration rate⁴² remained broadly unchanged in 2017, both for the EEA (24%) and the euro area (17%). This ratio gives an indication of the relative wealth accumulated by the sector. It has to be noted that there is large heterogeneity across countries (Figure 4.2), which is mainly driven by the different relative share of private and public pension provisions.

4.2. INVESTMENT ALLOCATION AND PERFORMANCE

In aggregate terms, the investment allocation of pension funds remained almost unchanged in recent years (Figure 4.3). Debt and equity investments account for the highest share in the portfolio investment allocation of pension funds. The total exposure to sovereign, corporate financial and 'other bonds' added up to 49 per cent in 2017 and the total exposure of equity remained almost unchanged at 29 per cent (Figure 4.4). The stability in the investment mix is partly due to legal or contractual investment restrictions, which are put in place for prudential reasons or to ensure long-term investments, as well as due to naturally, relatively infrequent trading or reallo-

Figure 4.2: Penetration rates (total assets as per cent of GDP)



42 The size of the occupational pension fund sector with respect to the GDP

cations in the investment portfolios. Furthermore, it can be observed that the aggregate equity exposure in the pension sector is relatively higher than in the insurance sector. This is mainly driven by significant equity investments in a few countries (Figure 4.5).

Investment allocation for 2017 across countries remains very heterogeneous (Figure 4.5). Direct investments in bonds and equity may vary substantially across the countries of the sample. However, countries with particularly low direct investments to debt and equity usually invest in these categories through UCITS.

Figure 4.3: Investment Allocation for 2015 to 2017 (in per cent)

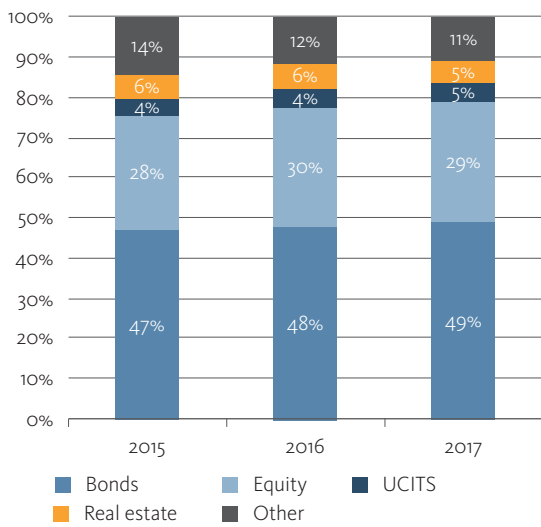
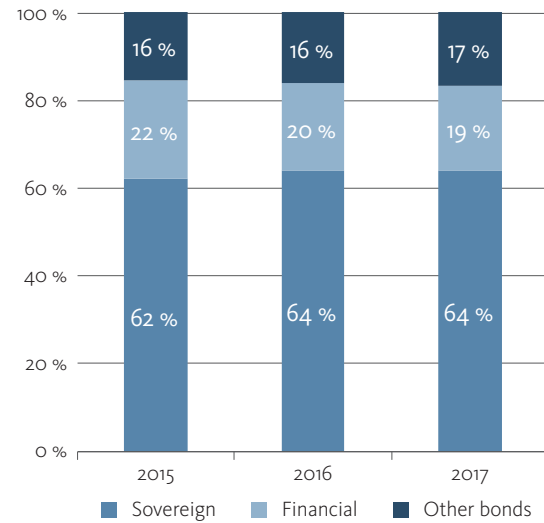
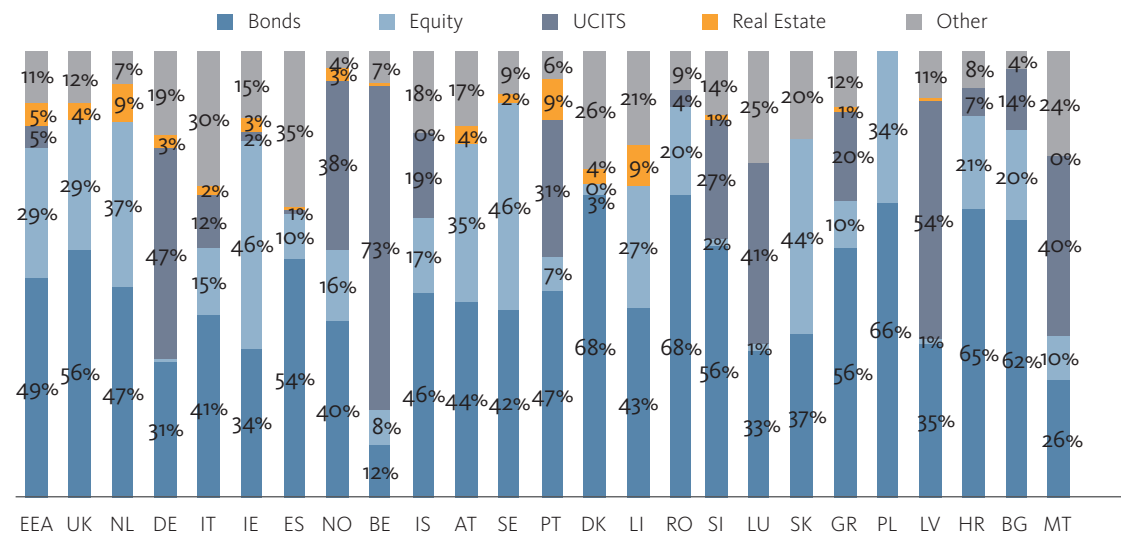


Figure 4.4: Bond investments breakdown for 2015 to 2017 (in per cent)



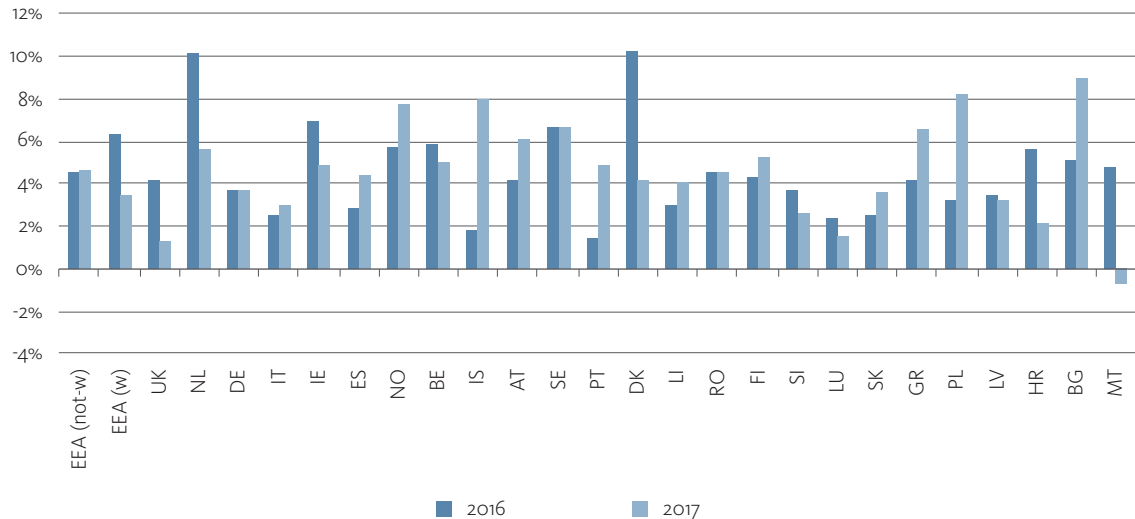
Source: EIOPA
 Note: UCITS stands for Undertakings for Collective Investment in Transferable Securities. For all variable definitions, please refer to the statistical annex published at: <https://eiopa.europa.eu/financial-stability-crisis-prevention/financial-stability/statistics>.

Figure 4.5: Investment Allocation per country for 2017 (in per cent)



Source: EIOPA
 Note: "Other" includes: Derivatives, loans, reinsured technical provisions, other investments and other assets. For all variable definitions please refer to the statistical annex published at: <https://eiopa.europa.eu/financial-stability-crisis-prevention/financial-stability/statistics>. The UK figure used for the calculations of these figures relates to DB and HY schemes only. Finally, please note that the information on investments in UCITS is not available for all countries

Figure 4.6: Rate of return on assets (ROA) in %



Source: EIOPA.

Note: Both the weighted and un-weighted averages for ROA were calculated on the basis of the countries that are depicted in the chart. The weighting is based on total assets.

The weighted average ROA for the EEA decreased in 2017 compared to the previous year. The average ROA (Figure 4.6) in 2017 (un-weighted 4.7%, weighted 3.4%) decreased compared to 2016 (un-weighted 4.6%, weighted 6.4%). This is attributed to the decrease in the rate of return in the two large IORP countries, UK and the NL, primarily due to lower returns on fixed-income assets.

4.3 FUNDING RATIOS AND MEMBERSHIP DEVELOPMENTS

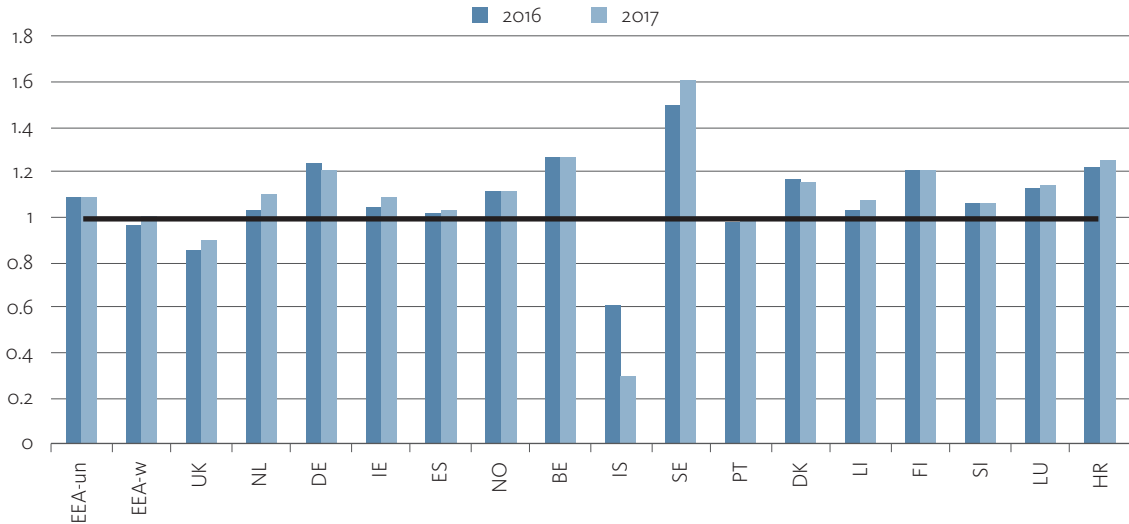
The weighted cover ratio for DB schemes increased in 2017.⁴³ Overall, the weighted average cover ratio increased from 97% in 2016 to 101% in 2017, whereas the un-weighted average coverage ratio remained unchanged at 110%. Due to differences in national regulatory frameworks, IORPs across Europe are not subject to the same funding requirements. However, cover ratios close to or below 100 per cent remain a concern for the sector if low interest rates persist. In some countries such as the UK, there is full sponsor support and pension protection

schemes exist to support schemes in the event of shortfalls. However, an extreme adverse scenario may strain the ability of the sponsors or other protection mechanisms to deal with the potential increases in contributions. In some countries a (partial) suspension of benefit increases as well as benefit reductions are ways to tackle low cover ratios.

The overall active membership increased in 2017 by 3 per cent in the EEA and remained unchanged in the euro area (Figure 4.8) The overall increase in active membership can be attributed to a large extent to the introduction of auto-enrolment in the UK (+8% since 2016). Since October 2012, larger employers are required to automatically enrol workers in a workplace pension. This requirement will apply to all employers by 2018. Furthermore, new members in most of the countries automatically enrol into DC schemes (Figure 4.9). This trend is likely to continue in the coming years since DB schemes are often closed to new members. This implies a significant shift of risks from pension funds and/or employers to members and beneficiaries. From a financial stability and consumer protection point of view, this trend requires close monitoring.

⁴³ Cover ratio (%) is defined as net assets covering technical provisions divided by technical provisions.

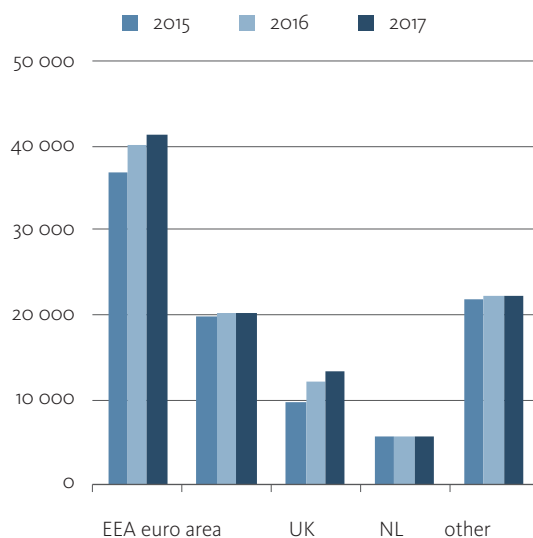
Figure 4.7: Cover ratios (in per cent)



Source: EIOPA; Notes:

- (1) Cover ratios refer to DB schemes. Countries with predominant pure DC schemes are not included in the chart and in the average calculations.
- (2) Both the weighted and un-weighted averages for the cover ratio were calculated on the basis of the 16 countries depicted in the chart. The weighting was based on total assets.
- (3) Due to different calculation methods and legislation, the reported cover ratios are not comparable across jurisdictions.
- (4) For PT, the amount of liabilities reported corresponds to the one calculated under the financing scenario. At the end of 2016 this amount was higher than the amount calculated according to the applicable funding requirements. Therefore, the fact that assets are lower than liabilities does not necessarily mean that the market is in deficit in terms of applicable funding requirements.
- (5) Resulting from a pension reform in IS at the end of 2016 most of the traditional DB pension funds were transformed into DC with no guarantees. The data shown in the figure refer to only a small part of the sector, which did not transform and is currently into deficit. (The remaining DB part of the sector stays fully guaranteed regarding its obligations to members and beneficiaries.

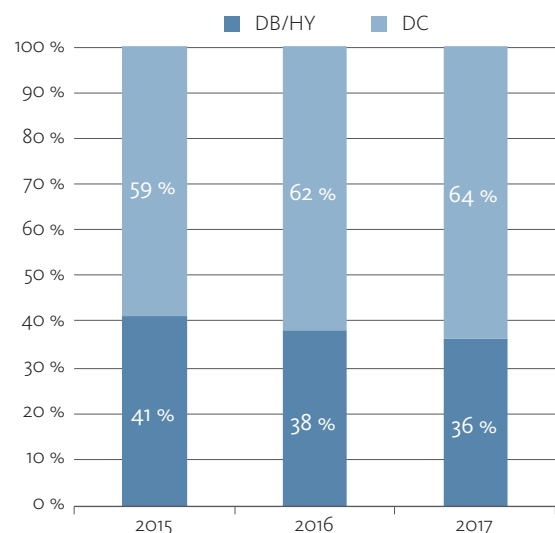
Figure 4.8: Active members (in thousands)



Source: EIOPA

Note: Figure 4.8 does not include SE and IS. BG, DK, FI, GR, HR, HU, LI, LU, MT and PL have below 100 thousand active members. Figure 4.9 does not include AT, IS, and SE.

Figure 4.9: DB/HY and DC breakdown of active members (in per cent)



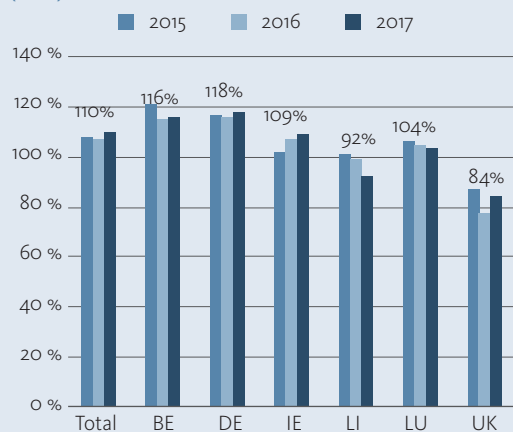
BOX 4.1: DEVELOPMENTS IN CROSS-BORDER IORPS

Directive 2003/41/EC (IORP Directive) has enabled IORPs to take advantage of the internal market by accepting sponsorship and managing an occupational pension scheme from a company located in another Member State since 2005. In absence of a fully harmonised framework, such cross-border activities follow the Social and Labour Law (SLL) of the “host Member States” and the prudential rules of the “Home Member State” in which the IORP is established. Operating a cross-border activity may lead to achieve economies of scale by centralising the management of, for example, various occupational pension schemes of a company operating in several Member States in a single IORP (i.e. cross-border IORP). Prior to the IORP Directive, IORPs would tend to operate exclusively in the Member State in which they were established.

In line with the status quo over the last years⁴⁴, one could not observe any significant changes in the number of active or authorised cross-border IORPs in 2017. Cross-border IORPs continue to remain clustered geographically, carrying out cross-border activities from eight⁴⁵ home Member States to a total of 16⁴⁶ host Member States.

Cross-border activities have to be fully funded at all times, see Article 16(3) of the IORP Directive⁴⁷. EIOPA observed that in the vast majority of Member States the fully funded requirement applies to the whole IORP rather than specifically to the cross-border activity. Further, in the majority of home Member States, a recovery plan for the cross-border IORP may be set up if the IORP does not meet the requirement of fully-funded at all times. Subject to the Member States’ specificities, the recovery period may range between 3 months and 10 years. Recovery measures to mitigate underfunding may include increasing contributions or reduction of benefits.

Figure B.4.1.1: Cross border DB assets over liabilities (in %)



Source: EIOPA

Table B.4.1.1: Cross border IORPs - Total assets per country (in EUR mil)

	2015	2016	2017
BE	2,577	5,080	8,865
DE	33,310	34,564	36,010
IE	11,470	13,969	14,567
LI	430	479	507
LU	757	815	856
MT	1.45	1.99	2.64
UK	12,158	8,453	8,321
Total	60,704	63,361	69,129

Source: EIOPA

Note: For BE, DE, LI and UK assets include domestic activities.

44 Eiopa Market Development Report 2017 p.19

45 AT, BE, DE, IE, LU, LI, MT, UK

46 UK, IE, NL, DE, LU, BE, AT, CY, LI, ES, HU, LT, MT, PT and GR

47 Article 16 (3) of the IORP Directive requires that the technical provisions of a cross-border IORP to be fully funded at all times in respect of the total range of pension schemes operated. If these conditions are not met, the competent authorities of the home Member State shall intervene in accordance with Article 14 of the IORP Directive. Furthermore, to comply with the requirement of “fully funded at all times”, the home Member State may require ring-fencing of the assets and liabilities.

5. RISK ASSESSMENT

5.1. QUALITATIVE RISK ASSESSMENT

EIOPA conducts twice a year a bottom-up survey among national supervisors to determine the key risks and challenges for the European insurance and pension fund sectors, based on their probability and potential impact.

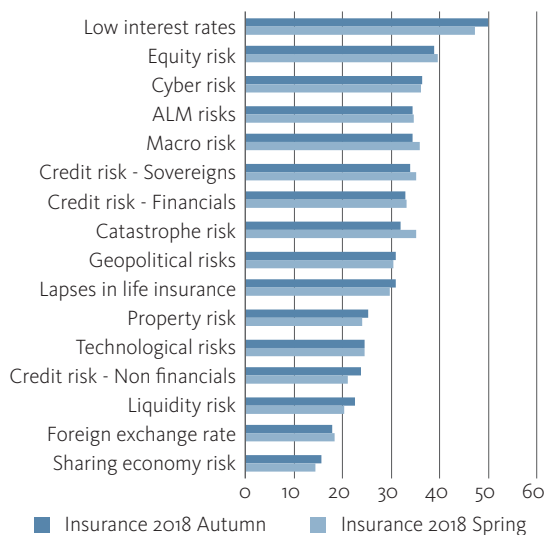
The EIOPA qualitative Autumn 2018 Survey⁴⁸ reveals that low interest rates remain the main risks for both the insurance and pension fund sectors (Figure 5.1 and Figure 5.2). Equity risks also remain prevalent for both insurers and pension funds, ranking as the 2nd biggest risk for both sectors. The cyber risk category, which was firstly introduced to the survey in the Spring 2018 edition, ranks as 3rd for the insurance sector. Macro risks and financial credit risk also continue to be present in the insurance

sector, partially due to concerns over protectionism, debt sustainability and uncertainty concerning the future Brexit landscape.

For the pension fund sector, credit risk for both sovereigns and financials has remained unchanged throughout the year, while longevity risk (which was newly introduced in the Spring 2018 survey alongside with Cyber risk) ranks only as the 8th biggest risk facing pension funds now. Sovereign credit risk continues to rank on the 3rd place, but ALM risks have risen for the pensions sector compared to Spring 2018.

The survey further suggests that geopolitical, property, cyber and equity risks are expected to increase over the coming year (Figure 5.3). This is very much in line with the observed market developments highlighted in Chapter 1, indicating increased geopolitical uncertainty,

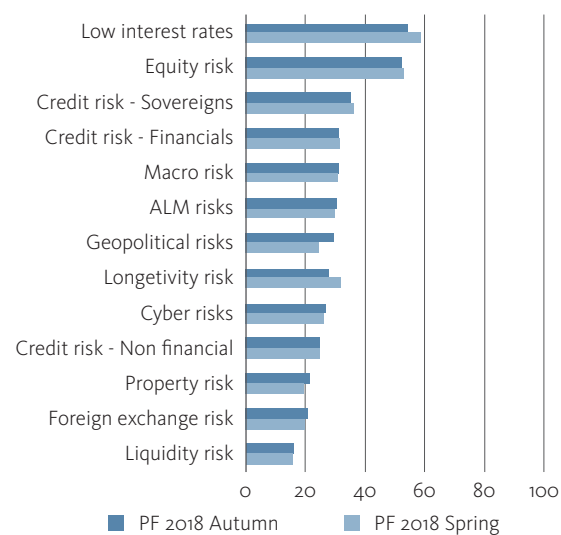
Figure 5.1: Risk assessment for the insurance sector



Source: Qualitative EIOPA Autumn 2018 Survey

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

Figure 5.2: Risk assessment for the pension funds sector



48 The survey was carried out in August 2018 and only reflects market developments until then. Therefore, the survey does not reflect concerns over the recent market developments such as sovereign spreads widening for some countries.

trade tensions, stretched valuations in equity and real estate markets and more frequent and sophisticated cyber attacks which could all potentially affect the financial position of insurers and pension funds. On the other hand, ALM risks, low interest rates and credit risks are expected to decrease in the coming period.

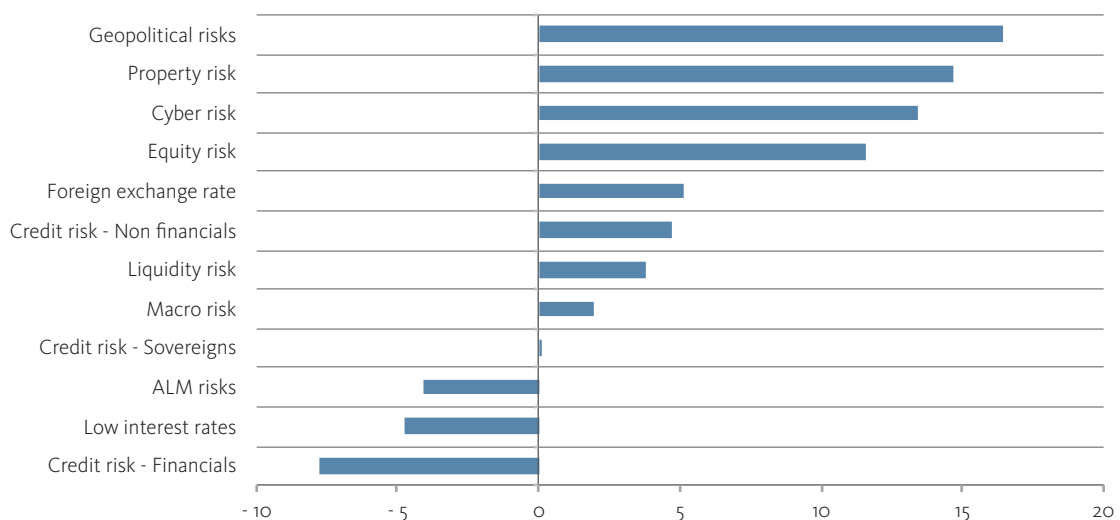
Although cyber risk is ranking as one of the top risks, many jurisdictions also see cyber-related insurance activities as a growth. Cyber insurance policies remain a relatively new phenomenon in Europe, but rising awareness of potential cyber threats could help develop the European cyber insurance market further. Most supervisors expect an increase in cyber insurance underwriting in their jurisdictions, although the scarcity of data and lack of proper understanding of cyber risks continue to remain a challenge. However, long-term developments are likely to make cyber insurance increasingly relevant as cyber threats are on the rise across the globe. In order to analyse the exposure of the insurance industry towards cyber risks and cyber underwriting, EIOPA has included a questionnaire on cyber risk in the 2018 insurance Stress Test. As this risk category is not limited to national borders safeguarding market confidence and creating legislative convergence is a key objective of the current regulatory work of EIOPA.

The survey shows that insurance undertakings in many jurisdictions continue applying risk-mitigating actions due to the low interest environment. Low yields negatively affect profitability and put increased pressure on

regulatory capital in the context of typically negative duration gaps for life insurance companies. In particular, the risk-mitigation actions target a reduction of the volume in products entailing minimum guaranteed rates (e.g. so-called “buy-back” programmes as one national supervisor reported). A trend towards unit-linked businesses has also been noted by most jurisdictions. The majority of jurisdictions have, moreover, implemented measures to evaluate potential consequences of a prolonged period of low interest rates with regard to key regulatory indicators. One national supervisor mentioned an additional premium reserve which insurance companies have to build for interest rate guarantees as a risk-reducing measure. Stress tests, sensitivity analysis and scenario analysis are listed as other evaluation tools for the extended period of low interest rates.

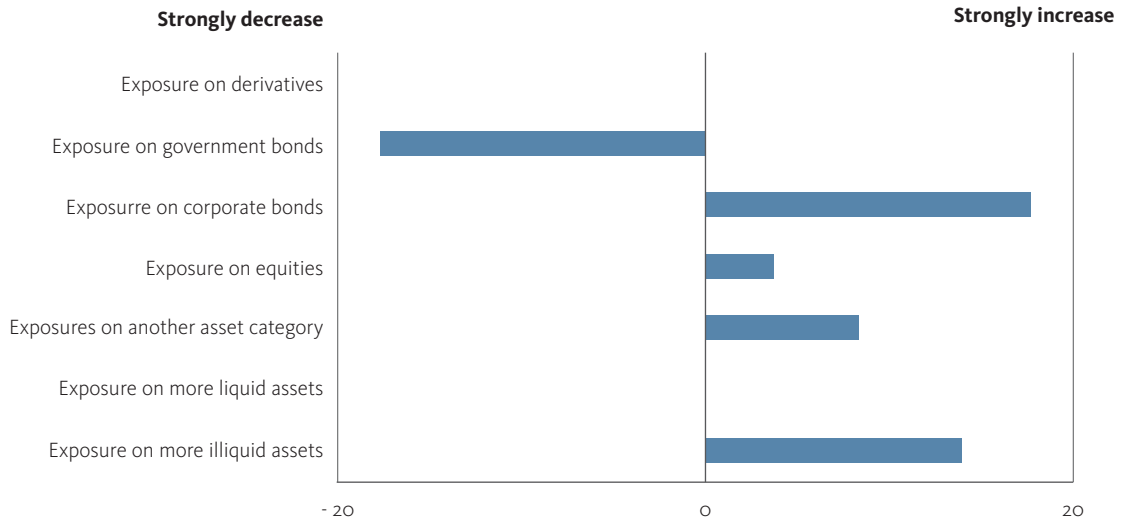
The survey further indicates that national authorities expect the decrease of investments in government bonds to continue. Conversely, holdings of corporate bonds and equity are both expected to rise within the next 12 months, albeit at a lower rate than in the first two quarters of 2018. Overall this might indicate potential search for yield behaviour and a shift towards more illiquid assets continues throughout numerous EU jurisdictions (Figure 5.4). Property investments – through for instance mortgages and infrastructure investment - are also expected to increase in some jurisdictions, for both insurers and pension funds. A potential downturn of real estate markets could therefore also affect the soundness of the insurance and pension fund sectors.

Figure 5.3. Supervisory risk assessment for insurance and pension funds - expected future development



Source: Qualitative EIOPA Autumn 2018 Survey
 Note: Based on the responses received. EIOPA members indicated their expectation for the future development of these risks. Scores were provided in the range -2 indicating considerable decrease and +2 indicating considerable increase.

Figure 5.4. Supervisory assessment on expected change on investment exposures in the coming 12 months



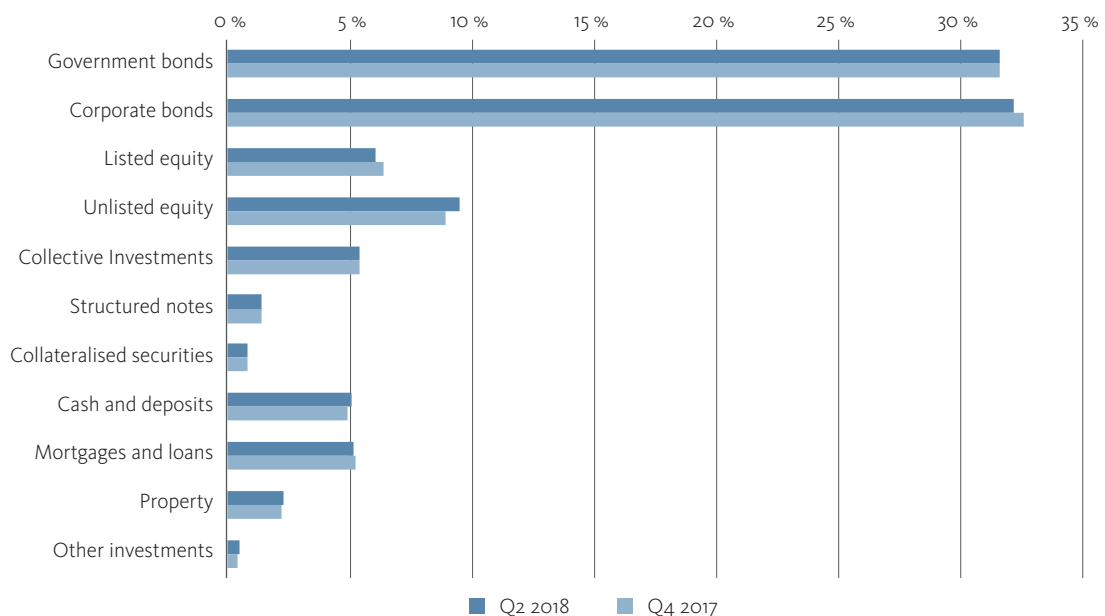
Source: Qualitative EIOPA Autumn 2018 Survey
 Note: Based on the responses received. EIOPA members indicated their expectation for the future movements of each exposure. The aggregate level is ranked from 0 indicating considerable decrease to 100 indicating considerable increase.

5.2. QUANTITATIVE RISK ASSESSMENT EUROPEAN INSURANCE SECTOR

This section further assesses the key risks and vulnerabilities for the European insurance sector identified in this report. A detailed breakdown of the investment portfolio

and asset allocation is provided, focusing on specific country exposures, real estate exposures, counterparty concentrations in derivatives trading and interconnectedness with the banking sector. Moreover, an overview of the climate-related risks in the investment portfolios of insurers is provided as well. Finally, the cross-border business of insurers is analysed in more detail.

Figure 5.5: Investment split in Q2 2018 compared to Q4 2017



Source: EIOPA Quarterly Solo
 Reference Date: Q2 2018
 Note: Look-through approach applied. Assets held for unit-linked business are excluded.

INVESTMENTS

Insurance companies investments are dominated by fixed-income assets that could be significantly affected in case of a sudden reassessment of risk premia.

Government and corporate bonds make up around two-thirds of the total investment portfolio, with life insurers relying most heavily on fixed-income assets, due to the importance of asset-liability matching of their long-term obligations (Figure 5.5 and 5.5).

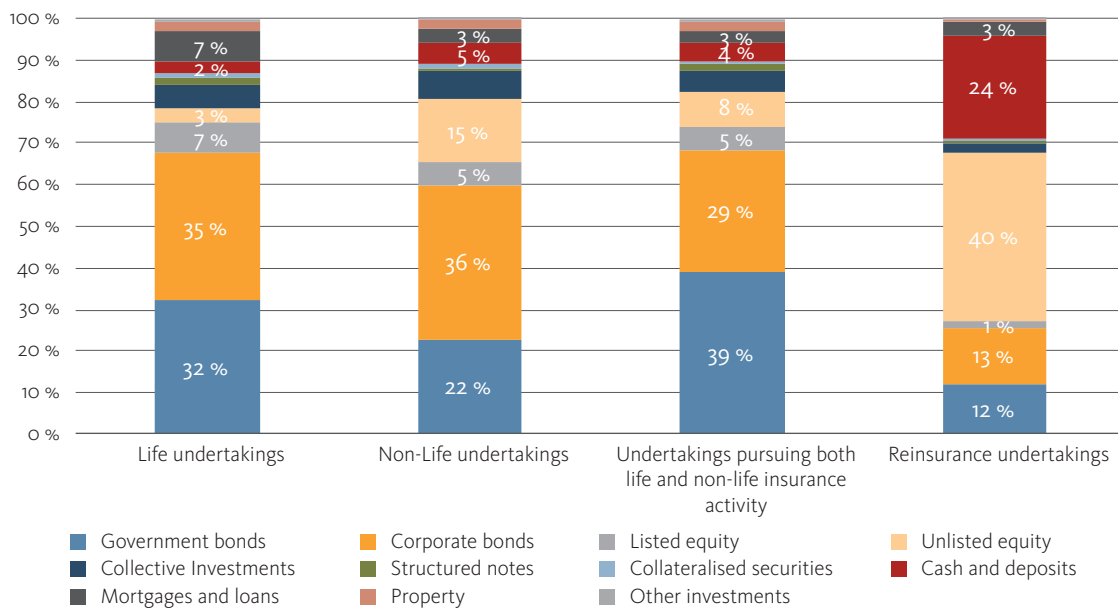
Insurers' investment portfolios at country level continue to show significant differences across countries

(Figure 5.7). Insurers from HU, RO and LT invest more than two thirds of their portfolio in government bonds while insurers from IS, FI, NO and SE prefer other types of investments, such as equity. IS insurers are the largest investors in equity, closely followed by SE and DK insurers, whereas NL and BE have relatively high investments in mortgages and loans.

Fixed-income investments continue to show significant home bias, while direct exposures of the European insurance sector towards emerging markets are very limited.

In order to assess the risk of a sudden reassessment of risk premia, it is important to analyse investment exposures from a geographical point of view. In this respect, exposures of insurers to emerging markets that are currently a source of a potential instability are relatively limited for most countries as well as at a European level (Figures 5.8-5.12). However, insurers could still be impacted through their interconnectedness with affected banks and second-rounds effects, in case the distress in emerging markets would spillover to lower rated European sovereigns. Indeed, fixed-income investments of insurers continue to show significant home bias, which is particularly relevant in light of the concerns over debt sustainability which have recently resurfaced in the EU (Figure 5.8). On the one hand a significant home bias poses a higher concentration risk in affected countries, while, on the other hand, a potential risk originating in the given country may also be more contained with limited spillover to other countries.

Figure 5.6: Investment split in Q2 2018 by type of undertaking



Source: EIOPA Quarterly Solo
Reference Date: Q2 2018

Note: Look-through approach applied. Equities include holdings in related undertakings, which account for most equities held by reinsurers. Assets held for unit-linked business are excluded.

Figure 5.7: Investment split at country level

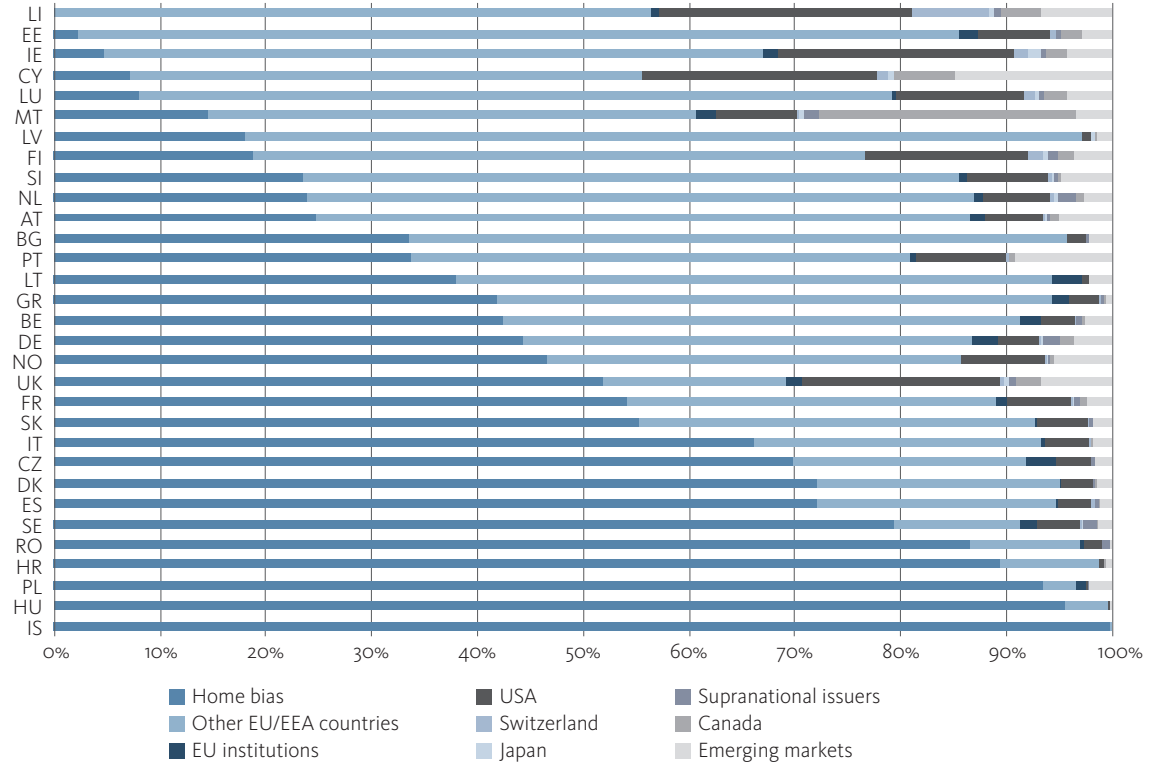
	Government bonds	Corporate bonds	Equity	Cash and deposits	Mortgages and loans	Property	Other
EU/EEA	32%	32%	16%	5%	5%	2%	8%
AT	22%	31%	24%	5%	5%	7%	7%
BE	49%	23%	7%	3%	12%	3%	4%
BG	47%	22%	11%	10%	3%	4%	3%
HR	64%	4%	8%	6%	8%	8%	2%
CY	21%	34%	13%	17%	3%	6%	8%
CZ	50%	18%	7%	8%	10%	0%	7%
DK	19%	40%	27%	3%	3%	3%	5%
EE	30%	49%	1%	14%	1%	0%	5%
FI	12%	39%	16%	8%	5%	6%	14%
FR	33%	36%	13%	4%	2%	2%	11%
DE	25%	37%	22%	4%	5%	2%	6%
GR	61%	21%	5%	7%	1%	2%	4%
HU	80%	4%	5%	4%	0%	0%	7%
IS	27%	17%	36%	6%	3%	0%	12%
IE	30%	34%	5%	21%	4%	1%	5%
IT	51%	21%	13%	3%	1%	1%	10%
LV	58%	16%	2%	19%	1%	2%	2%
LI	19%	34%	7%	31%	5%	0%	4%
LT	71%	14%	3%	6%	1%	1%	5%
LU	30%	36%	9%	12%	8%	1%	6%
MT	29%	20%	8%	18%	8%	2%	16%
NL	37%	15%	7%	4%	26%	2%	9%
NO	18%	38%	20%	4%	3%	0%	17%
PL	57%	4%	22%	5%	4%	0%	8%
PT	44%	31%	11%	9%	1%	3%	2%
RO	68%	8%	7%	13%	1%	1%	1%
SK	50%	33%	4%	6%	2%	1%	5%
SI	34%	33%	21%	4%	2%	2%	4%
ES	57%	20%	7%	9%	1%	2%	4%
SE	15%	31%	34%	4%	4%	3%	9%
UK	21%	34%	16%	10%	9%	3%	7%

Source: EIOPA Quarterly Solo

Reference date: Q2 2018

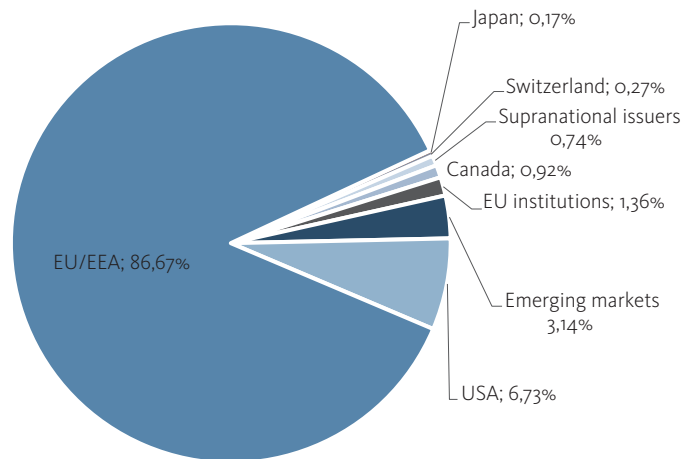
Note: Red - above 90th percentile, Blue - below 10th percentile; look-through approach applied. Other investments include collective Investments, structured notes, collateralised securities and other investments not classified in the mentioned categories. Assets held for unit-linked business are excluded.

Figure 5.8: Home bias for insurers' fixed income assets investments in Q2 2018



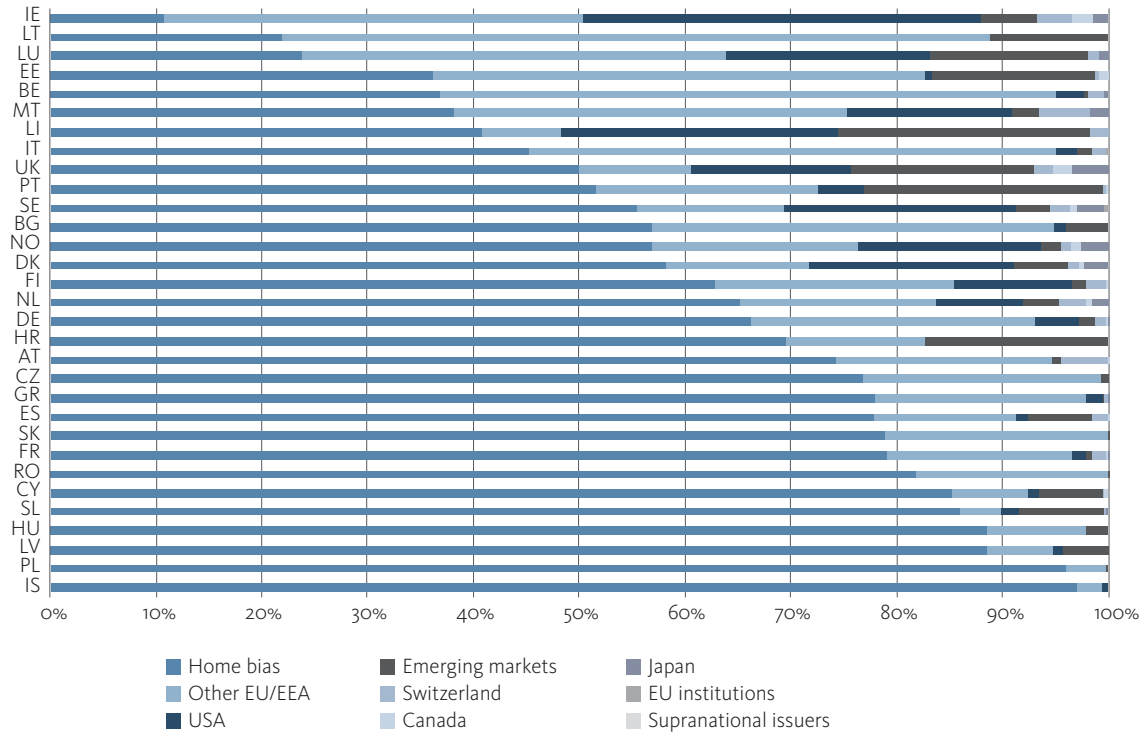
Source: EIOPA Quarterly Solo
 Reference Date: Q2 2018
 Note: Look-through approach applied. Assets held for unit-linked business are excluded.

Figure 5.9: Overall fixed income assets exposures of the European insurers to different countries in Q2 2018



Source: EIOPA Quarterly Solo
 Reference Date: Q2 2018
 Note: Look-through approach applied. Assets held for unit-linked business are excluded.

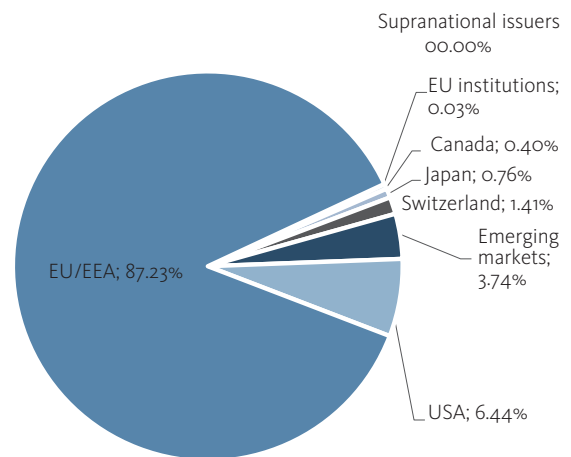
Figure 5.10: Home biased behaviour for insurers' equity investments in Q2 2018



Source: EIOPA Quarterly Solo
 Reference Date: Q2 2018
 Note: Look-through approach applied. Assets held for unit-linked business are excluded.

Despite limited exposures of European insurers towards equity emerging markets, the insurance sector may still be vulnerable to a potential pronounced equity market drop. The recent episode of equity market drop triggered by restrictive monetary policy in the US, demonstrates that insurers' exposures towards equities could serve as additional transmission channel of risks from emerging markets to the European insurance sector. Again, while direct exposures toward emerging markets are very limited for most countries as well as at a European level (Figure 5.10 and 5.11), potential spillover of risks from emerging markets to advanced economies and subsequent drop of the whole equity market cannot be ruled out, as witnessed by the deteriorating equity market performance observed recently in advanced economies (Figure 1.6). This would have a significant impact on insurance sectors in countries with substantial exposures to equities (Figure 5.7).

Figure 5.11: Overall equity exposures of the European insurers to different countries in Q2 2018



Source: EIOPA Quarterly Solo
 Reference Date: Q2 2018
 Note: Look-through approach applied. Assets held for unit-linked business are excluded.

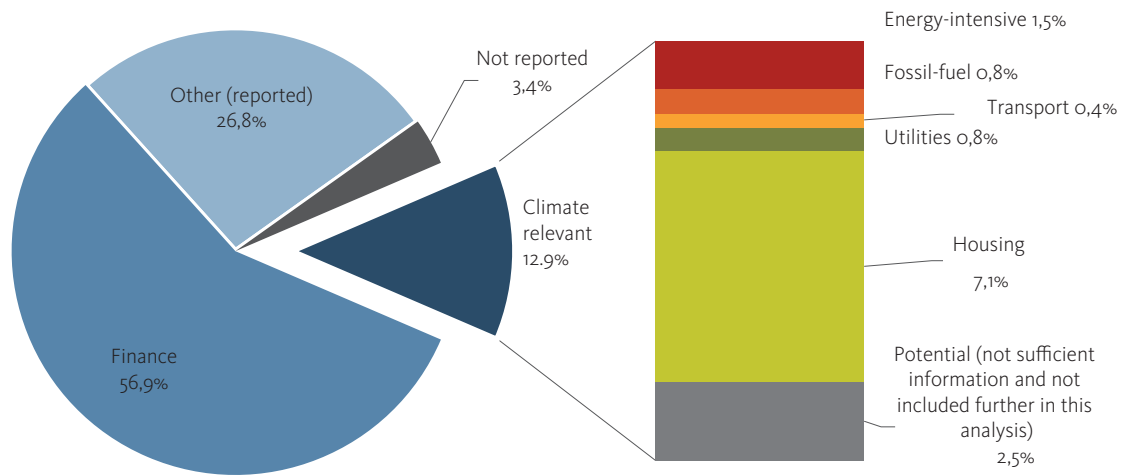
CLIMATE-RELATED EXPOSURES

Insurers and other financial institutions can be exposed to considerable climate-related risk in their investment portfolios. Transition risks may arise from the transition to a more carbon-neutral economy, with potentially significant and disorderly write-downs in climate-sensitive sectors, which could have repercussions across the financial system. In addition, physical risks could significantly affect the value of real estate portfolios, particularly in high-risk areas. In order to analyse the investment exposure of European insurers to climate-sensitive sectors, the approach developed by Battiston et al (2017)⁴⁹ is followed. This framework defines five climate-relevant sectors (fossil fuel, utilities, energy-intensive, transport and housing) based on their greenhouse gas emissions, their role in the energy supply chain and the so-called carbon leakage risk classification⁵⁰, and provide a mapping at NACE Rev2 4-digit level.⁵¹ Applying this

framework to the investment portfolios of insurers provides only a first indication of the investments that could be at risk in a transition to a more carbon neutral economy. More granular analysis would be needed to assess the climate-related risks in more detail.⁵²

Housing exposures are included for multiple reasons. First, the introduction of stricter energy efficiency standards could significantly affect the value of real estate portfolios, in particular for 'brown' commercial and residential real estate. Second, housing accounts for a significant portion of energy consumption and carbon emissions. The introduction of a carbon price (or other climate policy intervention) could therefore significantly affect the energy costs of housing and, hence, affect the credit standing of users in the built environment. Finally, physical risks in high-risk areas could also affect the value of real estate portfolios. The identification of exposures to the housing sector are to be seen as a first indicator of climate-related

Figure 5.12: Climate related asset exposures of the European insurance sector



Source: EIOPA Quarterly Solo

Note: Sample consists of solo undertakings reporting for 2018Q1.⁵² Assets held for unit-linked business are included.

49 Battiston et al., 2017. "A climate stress-test of the financial system", Nature Climate Change 7, 283-288. The benefit of this study is that it provides a mapping of climate-relevant sectors to the NACE industry Code Classification, which can be combined with Solvency II data. The climate-relevant sectors identified in this paper correspond broadly to the ones used in similar studies conducted by the PRA (2015 and 2018) and DNB (2017). One exception is agriculture, which is not included in this analysis, as greenhouse gas emissions in agriculture are more methane intensive (as opposed to carbon intensive).

50 The carbon leakage risk classification identifies activities (mostly within manufacturing) for which either costs or competitiveness is heavily affected by introduction of a carbon price (or other climate policy intervention), according to the EC Directive 2014.

51 NACE is the statistical classification of economic activities in the European Community and corresponds to a four-digit classification providing the framework for collecting and presenting a large range of statistical data according to economic activity.

52 While undertakings often report the full NACE code, only the first letter is required (except for category K, finance), limiting the detail on those assets. For assets where we rely on the reported NACE code where there is not sufficient information to either exclude or include the assets in the "climate relevant" category, they are classified as "potential". The exposures classified as "potential" are not included further in this analysis. Moreover, investments in collective investment undertakings are classified using the sector code of the CIUs, not at the level of individual assets (no look-through applied).

risks, with further and more granular analysis needed to assess the full extent of the climate-related risks based on, for instance, the location and energy efficiency of the real estate portfolio.

Overall, between 10 and 13% of the assets held by insurers may be vulnerable in a climate-related transition scenario. Based on the methodology described above and using Solvency II item-by-item investment data reported by European solo insurers for Q1 2018⁵³, between 10% and 13% of the assets held by insurers can be identified as climate-relevant (see Figure 5.12). This amounts to more than 1 trillion euro in assets and corresponds to almost two-thirds of total own funds in the EEA. It is important to note that this figure might still understate the total potential risks to insurers from climate-change relevant assets, as further climate-related assets could be held in funds in the finance sector (for which look-through was not possible).

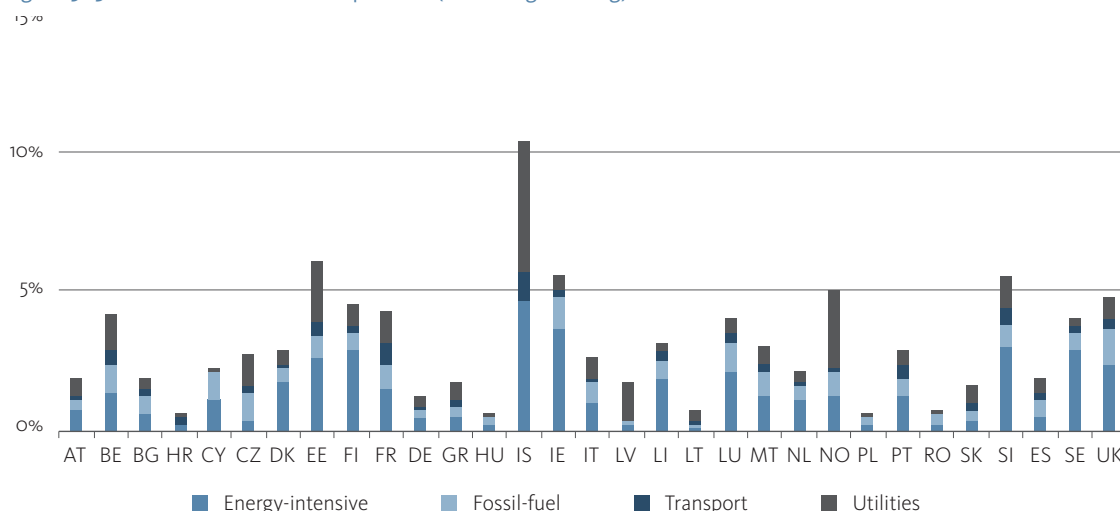
Most of the climate-related exposures are in housing (7%), followed by energy intensive sectors (1.5%), fossil fuels (0.8%), utilities (0.8%) and transport (0.4%). As discussed above, there are valid reasons to include housing as a climate-relevant exposure. However, as housing exposures can be particularly diverse, a more granular analysis would be needed to identify those port-

folios most heavily exposed to climate-related risks (on top of the other real estate related risks discussed later in this chapter). Considering those countries and undertakings heavily exposed to housing could therefore serve as a useful point of departure to further assess the climate-related risks involved.

A country-by-country comparison of climate-related exposures shows considerable heterogeneity across the EEA. The overview of climate-related exposures on a country-by country basis (excluding housing), shows climate-related investments are particularly pronounced for IS, EE, IE, NO and SI (Figure 5.13). This mainly driven by exposures to energy-intensive sectors and utilities in those countries. Fossil-fuel and transport exposures are relatively low across countries. Housing exposures are analysed in more detail in Figure 5.17 (section below).

In addition, the high share of exposures to other financial institutions can lead to significant second round effects. First-round losses are defined as losses in insurers' investment portfolios due to direct exposures to climate-related shocks. Second-round losses can be seen as indirect losses in insurers' investments due to the devaluation of financial counterparties' with high exposures to climate-sensitive sectors themselves. The conducted

Figure 5.13: Climate related asset exposures (excluding housing)



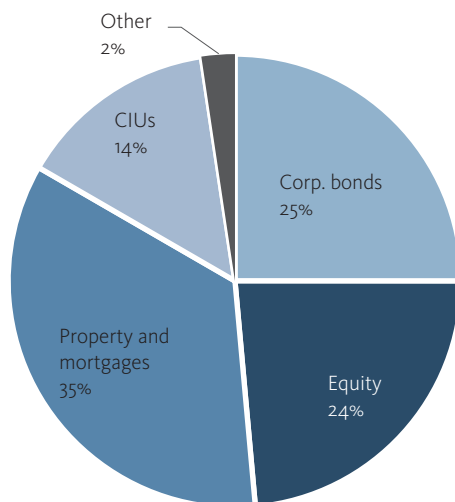
Source: EIOPA QRT data (S.o6.o2)
 Note: Sample consists of solo undertakings reporting for 2018Q1. Assets held for unit-linked business are included. Housing exposures are excluded to facilitate comparison across other climate-relevant sectors. Please note that housing exposures are also climate-related and can be substantial for certain countries (see Figure 5.17).

53 Reported ISINs are linked to NACE codes using a proprietary database of the European Central Bank (the CSDB database). This ensures a uniform identification of sectors per ISIN, including the full NACE code. In cases where ISIN is not reported or a match cannot be made, we rely on the NACE codes reported by the undertakings. Note that housing is identified in a similar manner as "real estate exposures" later in this chapter, taking both CIC codes and NACE codes into account.

research indicates that the magnitude of second-round effects can vary significantly and can even be comparable in magnitude to first-round effects, especially for high levels of interconnectedness.

The highest share of climate-related exposures is in the form of property and mortgages, followed by corporate bonds and equity (Figure 5.14). The high-level of property and mortgage exposures related primarily to the housing sector. Exposures in the form of equity are considered to be most at risk, as they will absorb first losses in case of climate-related shock. Holdings in corporate bonds typically have longer maturity horizons and do not take first losses, but could still be susceptible to market fluctuations. In addition, there are smaller exposures in assets such as collateralised securities and structured notes (reported as “other category”).

Figure 5.14: Climate related asset exposures split by financial instruments



Source: EIOPA Quarterly Solo
Note: Sample consists of solo undertakings reporting for 2018Q1. Assets held for unit-linked business are included.

Most climate-related exposures are dispersed across different geographical locations. A detailed overview over the location of the holders (y-axis) and the location of climate-relevant exposures (x-axis) can provide further insight into climate related risks (Figure 5.15). It further shows the total share of climate relevant exposures in the portfolio (far-right column) per home-country of the insurers.

Moreover, several observations stand out. First of all, there seems to be a home-bias in climate-related exposures, with most exposures situated in the same country as the insurers. Second, diversification means that most climate-relevant exposures are small in each national market and for each location. One exception is Iceland, where more than 25% of insurers' investment are climate-relevant. These investments are almost exclusively carried out by insurers located in Iceland, but are mainly in the “housing” category (60% of climate exposures), meaning that it is difficult to conclude on the actual vulnerability of these exposures in a transition scenario – more granular data on the composition of the real estate portfolio would be needed. The relatively high share of climate-relevant investments for Dutch and Norwegian insurers (10%) also stem primarily from this category.

In terms of location of risks, two thirds of all climate-relevant exposures are located in five countries: FR, US, UK, DE and IT. This naturally reflects the sizes of these markets. Hence, it is interesting to see which markets have higher share of climate related investments to total investments in that country (i.e. not only by local insurers). The figures indeed show high heterogeneity among countries with 40% climate-relevant investments carried out by European insurers in EE, compared to 10% for the EEA average (Figure 5.16). On average, the share of climate-relevant investments outside of the EEA in main markets such as US and JP are above the EEA.

Figure 5.15: Holders of climate relevant exposures and location of investment

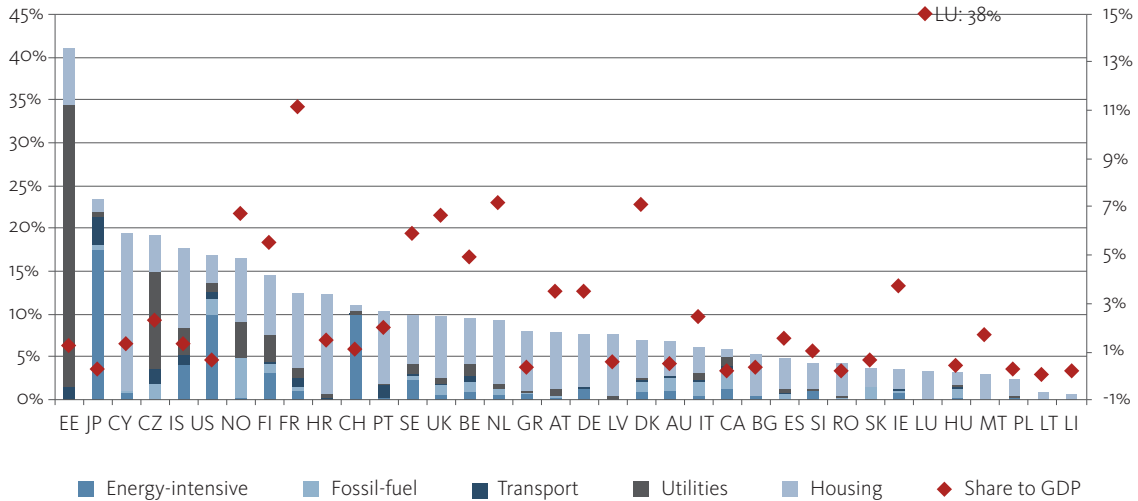
		Location of investment																		
		AT	BE	BG	HR	CY	CZ	DK	EE	FI	FR	DE	GR	HU	IS	IE	IT	LV	LI	LT
Location of investor	AT	7.8	0.1	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.5	0.2		0.1	0.0	0.0	0.1			
	BE	0.1	4.3				0.1	0.1	0.0	0.1	2.0	0.6		0.0		0.0	0.4			
	BG	0.1		4.6			2.6			0.2	0.1	0.3		0.2			0.0			
	HR	0.0			13.5		0.0		0.0		0.1	0.0								
	CY			0.0		5.1		0.0		0.0	0.3	0.1	0.2				0.0			
	CZ	0.1	0.0				5.5		0.0	0.0	0.1	0.1		0.2			0.0			
	DK	0.0	0.0		0.0		0.0	3.9		0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0			
	EE		0.0				0.4	0.1	1.8	3.1	0.1	0.5						0.1	0.1	0.1
	FI	0.0	0.0				0.1	0.1	9.2	0.3	0.3					0.0	0.0			
	FR	0.0	0.1			0.0	0.0	0.0	0.1	8.4	0.4					0.0	0.4			
	DE	0.1	0.1				0.0	0.0		0.0	0.4	4.4				0.0	0.0			
	GR		0.1			0.0	0.1	0.0		0.0	0.6	0.1	3.3					0.2		
	HU		0.0				0.1	0.0			0.0	0.0		2.1		0.0	0.0			
	IS															25.0				
	IE	0.0	0.1			0.0	0.0	0.1	0.0	0.1	0.6	0.4		0.0		1.7	0.2			
	IT	0.0	0.1		0.0	0.0	0.0	0.0	0.0	0.8	0.2		0.0			0.0	3.0			
	LV						0.1	0.0	0.7		0.1	0.0						2.8		0.6
	LI	0.0	0.0			0.0	0.0	0.0		0.0	0.3	0.4				0.1	0.1		0.0	
	LT						0.0		1.1	0.0	0.1	0.1		0.1				0.1		1.4
	LU	0.0	0.2			0.0	0.0	0.1	0.0	0.1	1.8	0.5	0.0	0.0	0.0	0.0	0.2			
MT	0.0	0.0				0.1	0.1		0.1	0.7	0.3				0.0	0.1				
NL	0.0	0.1				0.0	0.0	0.0	0.0	0.4	0.2		0.0		0.1	0.1				
NO	0.0	0.0			0.0		0.2		0.1	0.1	0.0			0.0	0.0	0.0	0.0			
PL	0.0			0.0		0.0				0.0	0.0		0.0		0.0					
PT	0.0	0.0				0.0	0.0		0.0	0.5	0.2				0.5	0.2				
RO	0.0		0.3										0.0							
SK	0.4					0.9		0.0	0.2	0.4	0.2		0.1			0.0				
SI	0.1	0.0		0.0		0.3	0.1	0.2	0.2	0.7	0.3		0.1		0.0	0.3				
ES	0.0	0.1				0.0	0.0		0.0	0.6	0.1				0.0	0.2				
SE	0.0	0.0					0.1	0.0	0.2	0.1	0.1				0.0	0.0	0.0			
UK	0.0	0.0			0.0	0.0	0.1		0.0	0.3	0.2	0.0	0.0		0.2	0.0				

Source: EIOPA Quarterly Solo

Note: Sample consists of solo undertakings reporting for 2018Q1. Assets held for unit-linked business are included.

Location of investment																		Total climate-relevant
LU	MT	NL	NO	PL	PT	RO	SK	SI	ES	SE	UK	CH	AU	US	CA	JP	Other	
0.1		0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0		1.4	11%
0.3	0.0	0.7	0.1	0.0	0.0	0.0	0.0		0.2	0.1	0.2	0.0	0.1	0.5	0.0	0.0	4.6	15%
		0.2		0.0		0.1				0.0				0.1			0.8	9%
		0.0						0.0	0.0					0.0			2.1	16%
		0.1	0.0						0.0	0.2	0.1	0.1	0.0	0.5	0.0	0.0	8.0	15%
0.1		0.1		0.0		0.1	0.2			0.1	0.0			0.0			0.4	7%
0.2		0.1	0.0	0.0	0.0				0.0	0.1	0.3	0.1	0.0	1.6	0.0	0.2	1.8	9%
0.0		0.1	0.0							0.6		0.0		0.6			0.2	8%
0.2		0.2	0.2		0.0				0.0	0.4	0.2	0.1		0.9	0.0	0.0	1.2	13%
0.1		0.2	0.1		0.0				0.1	0.1	0.1	0.0	0.0	0.7	0.0	0.0	0.3	11%
0.5		0.1	0.0		0.0		0.0		0.0	0.1	0.1	0.0	0.0	0.3	0.0	0.0	2.6	9%
0.0		0.0	0.1						0.0		0.1	0.0		0.2	0.0	0.0	1.4	6%
0.0				0.0		0.0		0.0						0.0			0.2	3%
											0.1						0.8	26%
0.1		0.2	0.1	0.0	0.0	0.0	0.0		0.2	0.2	0.8	0.2	0.1	2.7	0.1	0.3	0.5	9%
0.2		0.2	0.1		0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.4	0.0	0.0	0.3	6%
		0.1	0.1											0.1			1.1	6%
0.2	0.0	0.1	0.0		0.0				0.0	0.1	0.1	0.8	0.0	1.0	0.1	0.0	0.3	4%
0.0																	0.3	3%
0.3		0.2	0.1		0.0				0.0	0.1	0.2	0.2	0.0	1.0	0.1	0.0	1.0	6%
0.0	2.1	0.0	0.0		0.0				0.1	0.0	0.3	0.2	0.0	0.5	0.4	0.0	0.6	6%
0.0		8.0	0.1	0.0	0.0		0.0		0.1	0.0	0.3	0.1	0.0	0.6	0.0	0.0	8.1	18%
0.0		0.1	9.1		0.0				0.0	0.4	0.2	0.1	0.0	0.8	0.0	0.1	5.9	17%
0.0		0.0		2.7							0.0			0.0	0.0		0.4	3%
0.0		0.1	0.1		6.0		0.0		0.1	0.0	0.2	0.0	0.0	1.1	0.1		0.6	10%
		0.0				4.6					0.2						0.6	6%
0.0		0.1		0.0			4.2							0.1			0.3	7%
0.1		0.2	0.1		0.0	0.1	0.0	5.5	0.3	0.1	0.2	0.0		1.1	0.0	0.0	0.6	11%
0.1		0.1	0.0		0.0		0.0		3.9	0.0	0.1	0.0	0.0	0.3	0.0	0.0	0.3	6%
0.0		0.0	0.2		0.0				0.0	6.3	0.1	0.2	0.0	0.8	0.1	0.2	1.1	10%
0.1		0.1	0.1	0.0	0.0		0.0		0.0	0.1	6.3	0.1	0.1	1.8	0.1	0.4	1.9	12%

Figure 5.16: Geographical exposure – share of climate-related exposures to total investments in target country



Source: EIOPA Quarterly Solo
 Note: Sample consists of solo undertakings reporting for 2018Q1. Assets held for unit-linked business are included.

BOX 5.1: SUSTAINABILITY AND GOVERNANCE FACTORS IN ESG

In the current debate, while climate-related issues have received most attention in academic analysis in terms of investment portfolios, broader sustainability and governance issues are also very important in the context of managing ESG factors in investment and business decisions. These issues can generally not be analysed in-depth relying only on sector-level data. Instead, they require an assessment on a name-by-name basis and there is no uniform understanding on how exactly to assess these issues and only few publicly available sources exist by which to assess and categories individual exposures.

However, the Norwegian Sovereign Wealth fund, the worlds’ largest sovereign wealth fund with close to EUR1 trillion in assets, including 1.3% of global stocks and shares, employs ethical guidelines in its investment strategy universe.² Based on these guidelines, it excludes certain companies from its investment universe and publishes a list of excluded companies (and the reasons for exclusion). The impact of its decisions is larger than its own investments as its decisions may be followed by other investment funds. These type of investments are vulnerable to shifts in public opinion as recent experience have shown that public pressure have led both insurers, but also other investors to reconsider certain investments.

In the table below, we provide insurers’ investments in companies that have been excluded due to production of certain types of weapons, tobacco or violations of human or individual rights to be subject to potential social concerns. Governance issues relate to companies excluded for gross corruption or breach of other ethical norms.

Table B5.1.1: Single-name analysis of exposures to companies excluded by the Norwegian Sovereign Wealth Fund (share of total investments)

S - Social concerns	G - Governance concerns
0.31%	0.00%
Production Of Cluster Munitions	Gross Corruption
0.01%	0.00%
Production Of Nuclear Weapons	Other Particularly Serious Violations Of Fundamental Ethical Norms
0.09%	0.00%
Production Of Tobacco	
0.20%	
Serious Violations Of Human Rights	
0.01%	
Serious Violations Of Individuals' Rights In Situations Of War Or Conflict	
0.00%	

Source: EIOPA QRT data (S.06.02)

Note: Sample consists of solo undertakings reporting for 2018Q1. Assets held for unit-linked business are not included.

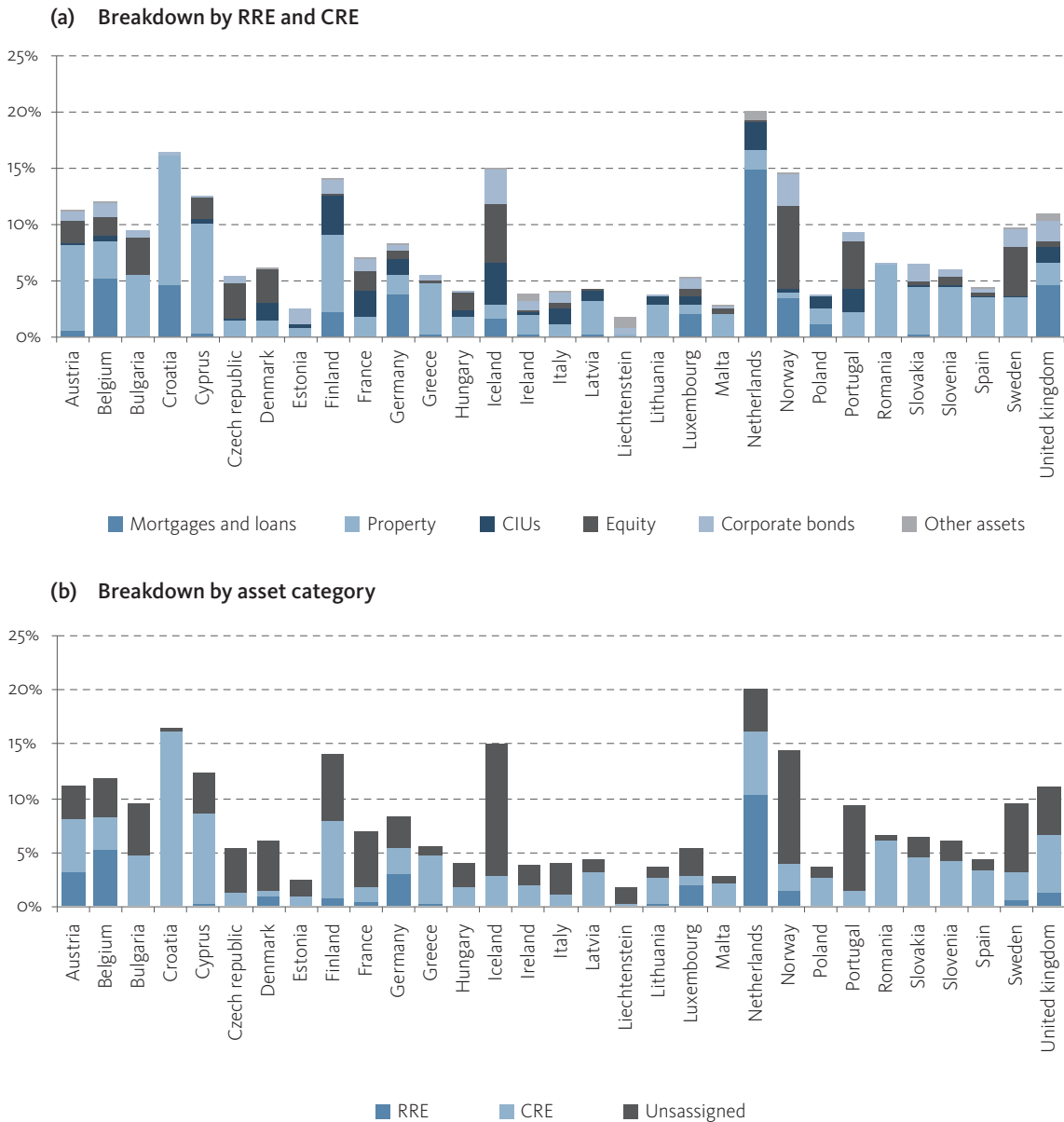
While the table shows that those type of exposures are small (as anyway would be expected in a diversified portfolio), several European insurers do hold investments in undertakings that produce cluster munitions and tobacco, or have been considered in relation to human rights violations. Insurers with such exposures might be vulnerable to losses or public pressure and bad PR. Investments in companies subject to governance concerns seem negligible on an EEA level, and mostly on national level as well.

REAL ESTATE EXPOSURES

Real estate exposures of insurers remain high in certain countries. Insurers' direct and indirect exposures to real estate are particularly pronounced for Austria, Belgium, Croatia, Cyprus, Finland, Iceland, Netherlands, Norway and United Kingdom, all with exposures greater than 10% (Figure 5.23). Other countries, such as Bulgaria, Portugal and Sweden are just below 10%. Potential sudden reversals in real estate prices might affect the asset side of insurers' balance sheets through changes in the value of their property holdings and/or mortgage loans. Furthermore, the potential decline in households' wealth due to changes in real estate prices and/or interest rates could affect their debt-servicing capacity increasing credit risk for exposed insurers.

The composition of exposures both in terms of residential (RRE) and commercial (CRE) real estate and in terms of asset categories varies across countries. Insurers in Belgium and Netherlands, for example, have a higher exposure to RRE than to CRE, with these exposures corresponding mostly to mortgages and loans. In these two countries RRE prices have been on an increasing trend and picking up, respectively, since the 2008 financial crisis. Insurers in Austria, Croatia, Cyprus, Finland and United Kingdom are mostly exposed to CRE, with the bulk of the exposures corresponding to property holdings, except in United Kingdom where the exposures seem to be balanced between (mortgage) loans and property. Insurers in Iceland and Norway are most heavily exposed to assets that cannot be directly allocated to neither RRE nor CRE; their exposures are a combination of investments in real estate collective investment undertakings (real estate funds), equity and corporate bonds (Figure 5.17, a).

Figure 5.17 – Exposures of EEA insurers to real estate in % of total assets



Source: EIOPA Quarterly Solo

Notes: All exposures exclude assets held for unit-linked and index-linked securities. Unassigned exposures include those that cannot be directly allocated into Residential Real Estate (RRE) and Commercial Real Estate (CRE). CIUs stands for Collective Investment Undertakings. Last observation refers to 2018Q2.

The size of insurers' exposures and real estate market developments in some countries justify an appropriate risk monitoring. In Belgium, this has resulted in a new monitoring framework for residential mortgage loans (Box 5.2).

BOX 5.2: RISK OF REGULATORY ARBITRAGE IN RESIDENTIAL MORTGAGE LOANS AND NEW MONITORING FRAMEWORK IN BELGIUM

The Belgian insurance sector has the second largest relative exposure to mortgages and loans (Figure 5.23, b). These exposures have slightly increased in recent years as insurers, especially those in the life business, have looked for alternative sources of income in response to the low interest rate environment. Mortgages and loans are the most material exposures of Belgian insurers to real estate (5.3% of total assets), followed by property holdings (3.3%) and equity in real estate corporations (1.8%). The bulk of the exposures of Belgian insurers to mortgages is to residential real estate (94%), while only 6% is to commercial real estate.

A characteristic of the Belgium market is the strong presence of financial conglomerates. The presence of such conglomerates could contribute to the shifting of investment portfolios from banks to insurers in a context of intensified capital requirements for banks' mortgage loans. As part of its horizontal review of Belgian insurers' investment portfolios, the National Bank of Belgium (NBB) decided to analyse the risk of shifting of residential mortgage loan portfolios between banks and insurers. Both differences in capital requirements and differences in valuation were analysed. The analysis revealed that there is a risk of regulatory arbitrage. Relative to the capital requirements, the Solvency II standard formula requires no capital to be held when the loss-given-default (often assessed through the indexed loan-to-value, ILTV) of the residential mortgage loan is lower than 80%, which is the bulk of the residential mortgage loans exposures in Belgium. Furthermore, the probability of default (often measured by debt-service-to-income, DSTI) is not taken into account in the Solvency II standard formula capital requirements for residential mortgage loans. Therefore, loans with a low ILTV and high DSTI, receive a more beneficial capital treatment for insurers compared to banks, creating the possibility for regulatory arbitrage, especially within a financial conglomerate. On top of the differences in capital requirements, also the valuation is different for European banks versus insurers: banks have to value their mortgages at the outstanding amount adjusted for expected losses (introduced in IFRS 9 in 2014), whereas insurers have to value their mortgages at the Solvency II value, which is equal to the fair value where no market value is available. Which valuation is most beneficial depends on a number of parameters including the extent of loss provisioning, the amount of interest rate payments, the discount rates, etc.

The results of this analysis, as well as the key recommendations regarding the Belgian insurance sector following the IMF's 2018 FSAP, led the NBB to develop a comprehensive monitoring and reporting framework for the risks arising from mortgage lending by insurers. The new framework consists of both a micro- and macroprudential dimension and adds important information to that currently collected through the Solvency II Quantitative Reporting Templates. The microprudential dimension focusses on the risks of residential mortgage lending for the individual insurers, whereas the macroprudential dimension serves to monitor the evolutions of the real estate market in Belgium. This yearly reporting will be in place as of 31st December 2018 and will have to be submitted to the supervisor before 30th April of the following year.

The microprudential residential mortgage loans reporting collects information on forward-looking risk drivers, related to three key risks: default risk, interest rate risk and prepayment risk. It covers all insurance undertakings for whom the share of residential mortgages in their total investment portfolio (excluding unit-linked investments) is higher than 5%, or higher than 650 million euro as an absolute amount.

To cover default risk, the reporting includes information on total outstanding amounts and new production, impairments amount, loan-to-value, debt-to-income, loan-to-income and debt-service-to-income average ratios, estimated probability of default and loss-given-default of the residential mortgage loan portfolio of the undertakings. To cover interest rate risk and prepayment risk, the reporting focuses on questions related to average original and residual maturity, average duration, average interest rate and discount rate, internal rate of return, age of borrowers and expected amount of prepayments over 1 year horizon.

Going forward, the new reporting should help supervisors to identify and to monitor developments in mortgage loan exposures over time. This should help assess how mortgage lending fits into the undertakings' asset-and-liability management, investment policy and prudent person principle.

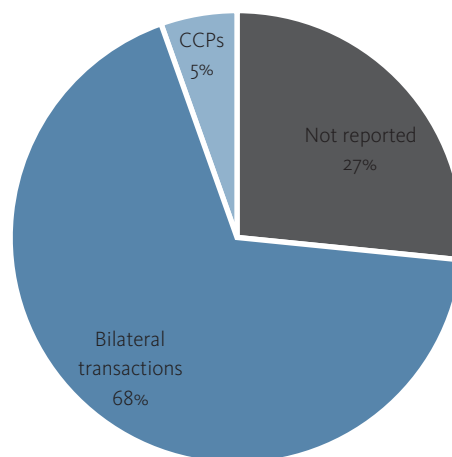
DERIVATIVE EXPOSURES

In order to further assess relevant financial stability risks, counterparties in insurers derivative transactions are analysed by considering open positions at reporting reference date. From a counterparty-risk point of view, the exposure to banks (bilateral transactions) is more relevant, given that CCPs are designed to mitigate counterparty risk. In derivatives contracts, the amounts at risk are those as captured by positive market values (SII Value) of the derivatives, whereas the notional amount is more a measure of volume of the activity. The analysis here is based on the reporting on derivatives in the Solvency II reporting framework and does not incorporate more detailed reporting under EMIR.

Banks are the most typical reported counterparties in insurers derivative transactions under Solvency II, as 68% of the derivatives are traded bilaterally (Figure 5.18). However, for a large share of positions, the counterparty information is missing. CCPs clear around 5% of the derivatives transactions, however, this share is slowly increasing throughout the quarters since the introduction of SII regulation in January 2016. Moreover, it is important to note that the share of derivatives cleared through CCPs could be higher in practice, as derivatives traded by banks on behalf of insurers may also be cleared through a CCP. However, this is currently not captured in the Solvency II reporting and would show up as a bilateral transaction with the clearing member/bank. Typically, insurers are not clearing members.

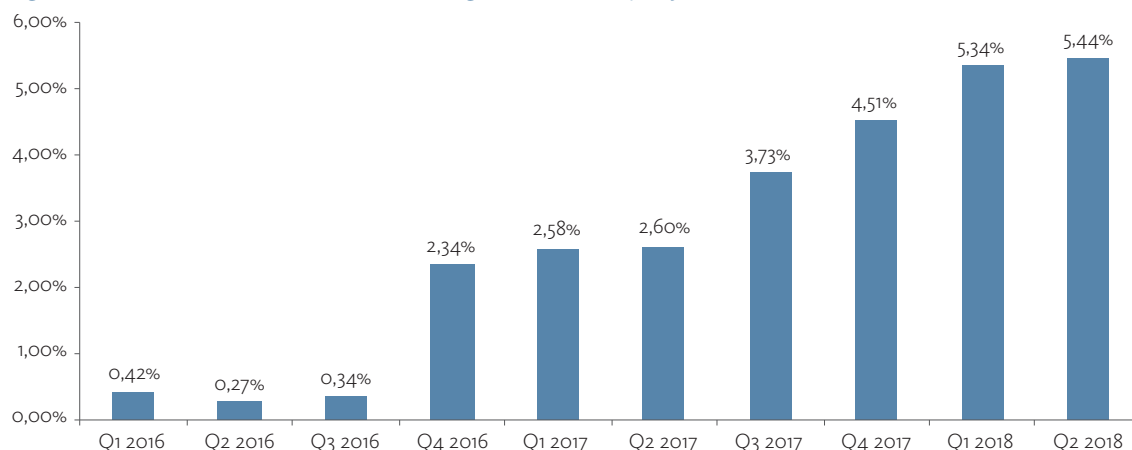
There is a high degree of concentration in counterparty exposures for derivatives trading. The top five counterparties represented 27.81% of the notional value outstanding in the insurance industry (Table 5.1), while most trades take place with counterparties located in the UK (Figure 5.20). J.P. Morgan Securities PLC was the largest counterparty to the insurance industry, representing

Figure 5.18: Derivative transaction with banks vs. with CCP (notional amount of derivatives by type of counterparty)



Source: EIOPA Quarterly Solo
Reference Date: Q2 2018
Note: "Not reported" means that the attribute capturing the counterparty (i.e. bank or CCP) in a specific transaction is missing in the database.

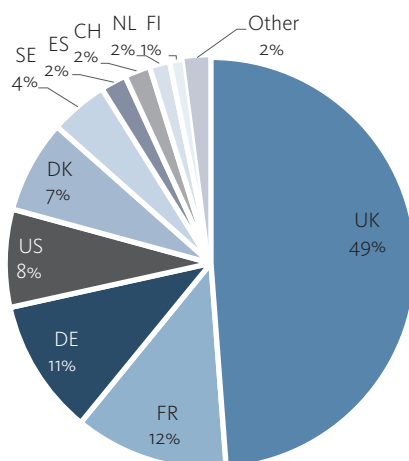
Figure 5.19: Derivative which are cleared through CCPs counterparty



Source: EIOPA Quarterly Solo data
Reference Date: Q2 2018

7.37% of the industry's total notional value outstanding as of September 2018. Deutsche Bank Aktiengesellschaft and Danske Bank AS were the second- and third-largest counterparties, with 6.19% and 4.94%, respectively, of the notional value outstanding. Again, it is important to note that the ultimate counterparty risk may still be transferred through central clearing depending on the specific contract. Nevertheless, these high concentrations of counterparties could potentially lead to operational risks. Furthermore, from the EUR 4.1 trillion notional amounts traded (including both CCPs and banks as counterparties), roughly 12% (i.e. EUR 493bn) are transactions carried out within the same group. These intra-group transactions are most pronounced in the Netherlands, accounting for approximately 85% of all intra-group derivatives transactions (Table 5.2).

Figure 5.20: Insurer's trading of derivatives through banks by notional amount of derivatives



Source: EIOPA Central Repository, Quarterly Solo Q2-2018.

Table 5.1: Top 5 counterparties according to their notional value outstanding

Counterparty	% of total derivatives traded by EEA insurers
J.P. Morgan Securities PLC	7.37%
Deutsche Bank Aktiengesellschaft	6.19%
Danske Bank AS	4.94%
Goldman Sachs International	4.72%
Morgan Stanley	3.81%

Source: EIOPA Quarterly Solo
Reference Date: Q2 2018

Table 5.2: Countries with intragroup transactions on derivatives

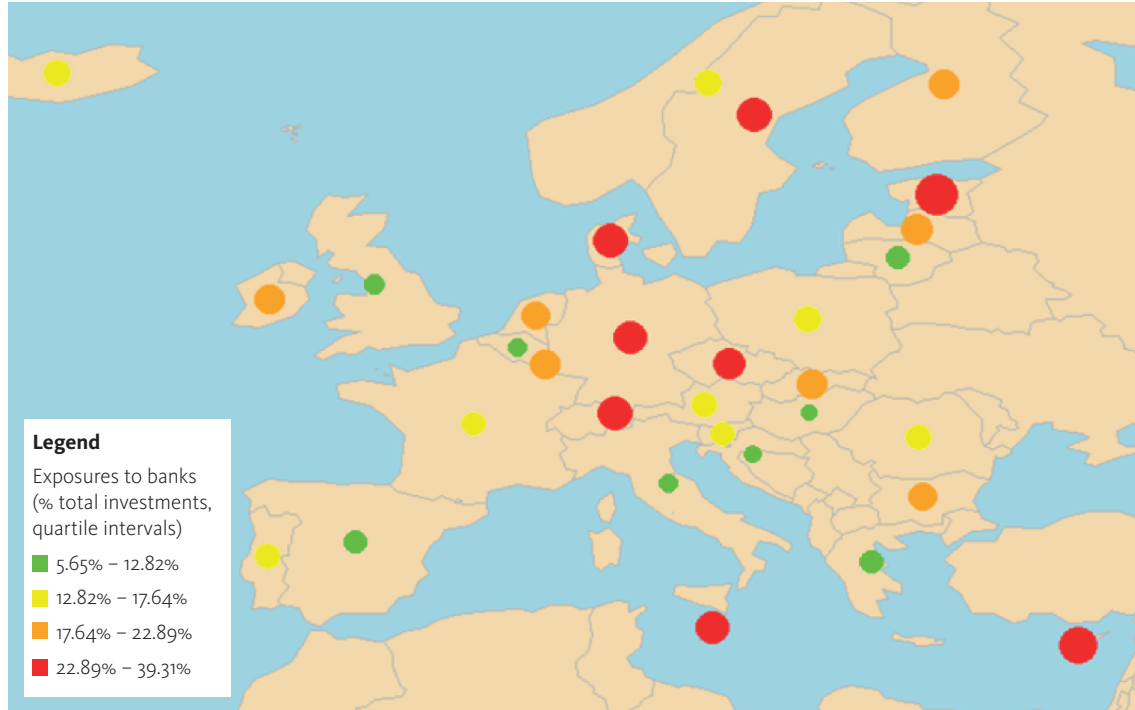
Country	Notional amounts
Netherlands	€423,062,780,264
France	€35,605,161,902
Spain	€23,263,847,315
United Kingdom	€9,627,887,331
Portugal	€743,591,644
Italy	€439,185,358
Germany	€422,340,585
Norway	€71,585,403
Austria	€276,575

Source: EIOPA Quarterly Solo
Reference Date: Q2 2018

INTERCONNECTEDNESS BETWEEN INSURERS AND BANKS

Insurers continue to have significant exposures towards the banking sector, which could be one potential transmission channel in case of a sudden reassessment of risk premia. This interconnectedness could amplify shocks across the financial system through common risk exposures. Indeed, a potential sudden reassessment of risk premia may not only affect insurers directly, but also indirectly through exposures to the banking sector. This is also a potential transmission channel of emerging markets distress, as banks have on average more significant exposures to emerging markets compared to insurers. Additionally, high exposures of banks to sovereign debt could further intensify negative impact on insurers if the sovereign debt concerns further re-emerged. Hence, insurance sectors which are substantially exposed to banks are relatively more vulnerable (Figure 5.21 and Table 5.3). In fact, insurers' exposures towards banks are diverse across the EU/EEA countries, with different levels of home bias as well (Figure 5.22). Hence, countries with primary banks exposed to emerging markets or weak banking sectors could be impacted the most.

Figure 5.21: European insurers' exposures towards banks as a percentage of total investments



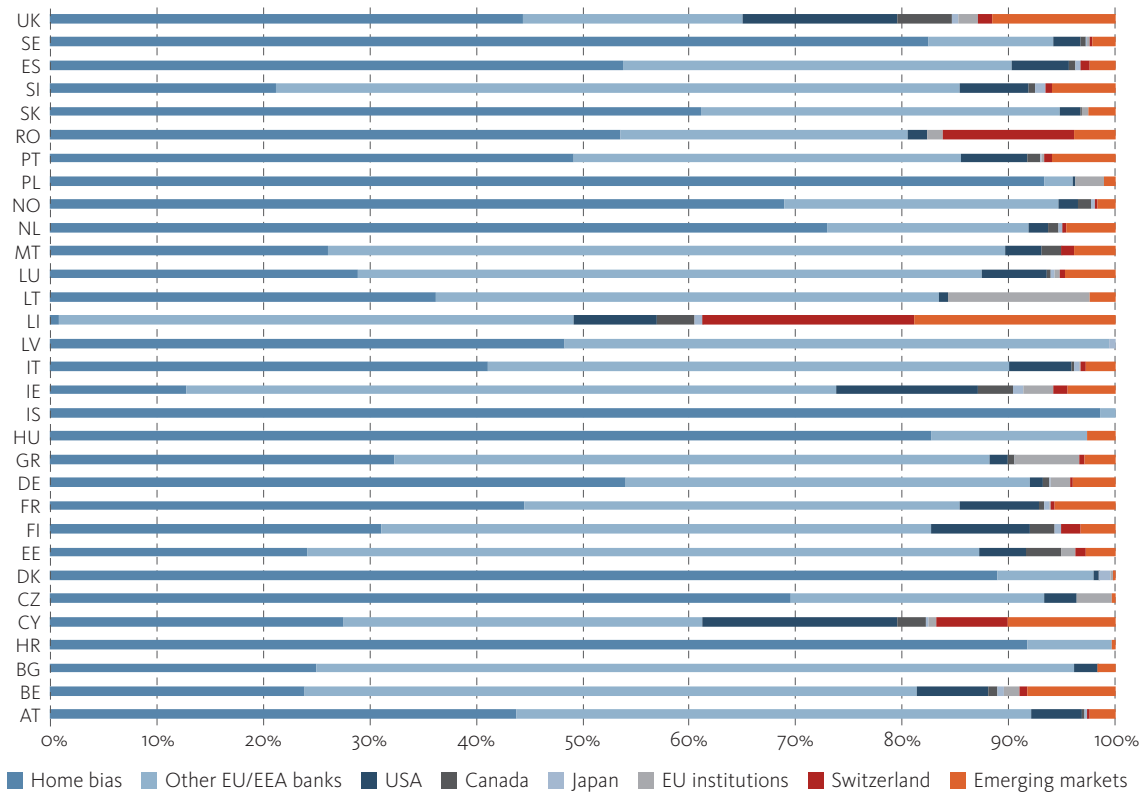
Source: EIOPA Quarterly Solo
 Reference Date: Q2 2018

Table 5.3: EU/EEA insurers' exposures towards banks as a percentage of total investments at country level

COUNTRY	Exposure to banks	COUNTRY	Exposure to banks
AT	15.72%	LV	22.23%
BE	8.19%	LI	27.77%
BG	18.38%	LT	12.42%
HR	6.52%	LU	20.11%
CY	32.94%	MT	24.41%
CZ	23.55%	NL	18.47%
DK	26.98%	NO	16.28%
EE	39.31%	PL	16.76%
FI	21.26%	PT	16.09%
FR	13.23%	RO	15.75%
DE	24.22%	SK	21.04%
GR	11.79%	SE	13.65%
HU	5.65%	ES	12.38%
IS	17.64%	SE	27.82%
IE	21.41%	UK	9.96%
IT	8.25%		

Source: EIOPA Quarterly Solo
 Reference Date: Q2 2018

Figure 5.22: Insurance sector exposure towards the banking sector, domestic versus cross-border in %



Source: EIOPA Quarterly Solo
Reference Date: Q2 2018

INSURERS AND BANKS BAIL-IN BONDS

A potential transmission channel of risks from banking sectors might occur through financial instruments holdings (Figure 5.23). Insurers' exposures towards banks are mainly driven by holdings of bank bonds. Other significant exposures are through cash and deposits which are not effected by change in the market sentiment.

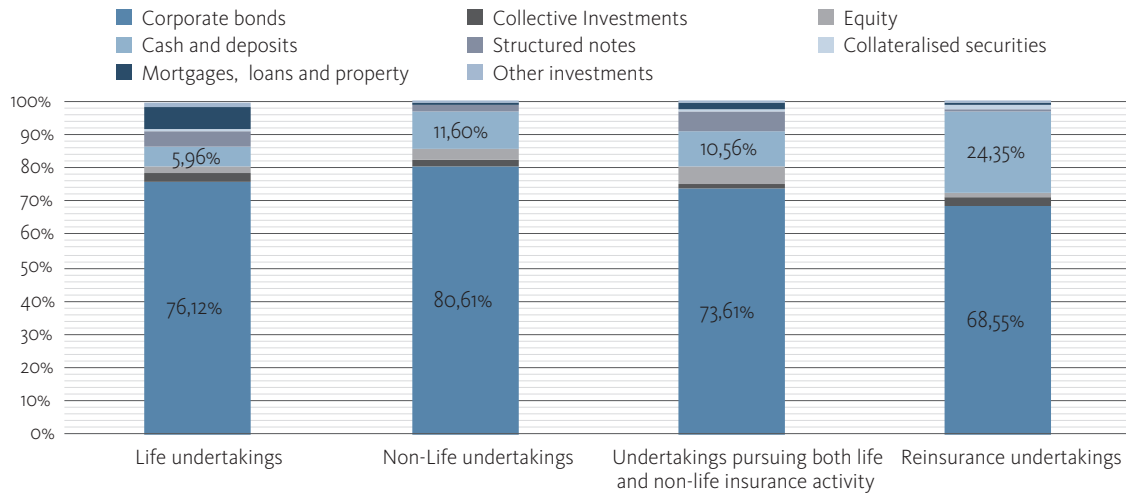
Insurer's exposures towards banks through debt instruments might become riskier in the future considering the recent changes in the banking supervision legislation. A new EU Directive adopted in December 2017 will enable EU banks to issue a new debt class, so-called 'senior non-preferred' debt instruments, member states having to implement it in their national legislations by January 2019. It would only apply to newly issued debt, but market expectations are that banks will look to issue more non-preferred senior debt in the future to comply with tighter MREL/TLAC requirements. The idea behind the introduction of this new instrument is to facilitate the application of bail-in under BRRD and to allow banks to maintain enough subordinated ('bail-inable') capital. The

role of bail-in bonds issued by banks is to absorb losses in a crisis before depositors lose money combining elements of equity and debt (hybrid instruments).

For some insurers that are highly exposed to banks, this might become a concern depending on whether there will still be enough preferred senior debt on the market and/or whether they will turn towards non-preferred debt in the light of a higher yield. In Q2 2018, approx. 76% of the exposure towards banks of the EU insurers was driven by holdings of senior bank corporate bonds (Figure 5.24)⁵⁴. Assuming that subordinated bonds, hybrid bonds and convertible bonds could be considered as bail-inable bonds, these categories account only for 8.42% of the total corporate bonds exposure. In the overall portfolios of insurers this type of debt is around 1% of the total investments. However, as around 25% of corporate bonds will mature within the next 3 years, the share of 'bail-inable' bonds might increase in the future in case these holdings are replaced with the new non-preferred senior debt instruments.

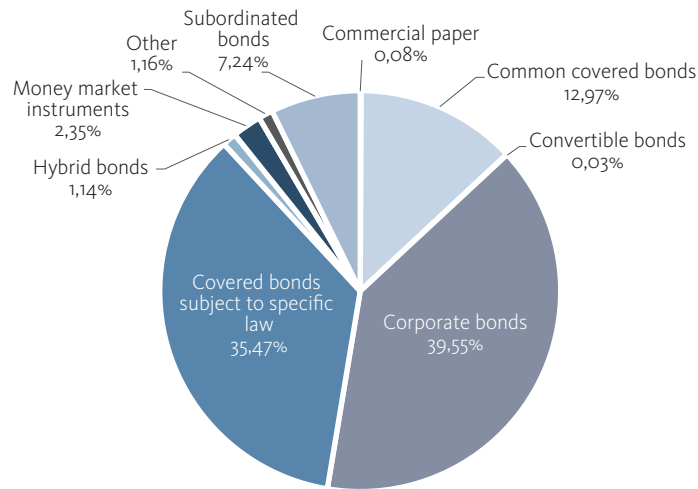
⁵⁴ The breakdown of preferred and non-preferred senior debt is currently not available.

Figure 5.23: Exposures to banks by type of instruments and type of business



Source: EIOPA Quarterly Solo
Reference Date: Q2 2018

Figure 5.24: Breakdown of exposures to bank corporate bonds



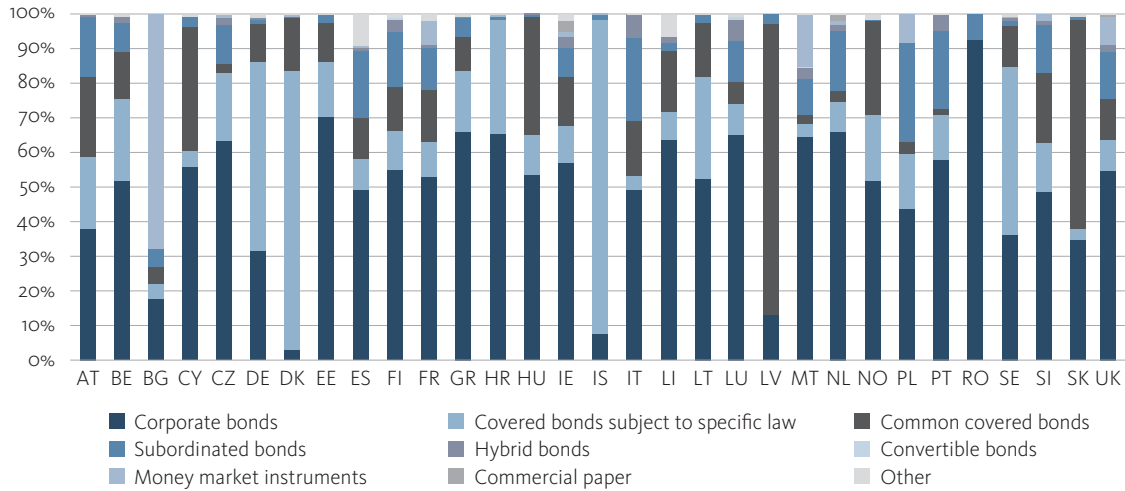
Source: EIOPA Quarterly Solo
Reference Date: Q2 2018

Furthermore, a breakdown by country (Figure 5.25) of the bank corporate bonds held by EU/EEA insurers reveals that insurers from several countries hold significant exposures to subordinated, hybrid and convertible bonds that could be bail-inable in case of a bank failure. The role of bail-in bonds issued by banks is to absorb losses in a crisis before depositors lose money combining elements of equity and debt (hybrid instruments).

Banks bail-in bonds could become even more attractive to insurers as they could offer a higher return without requiring additional capital charge as it depends on the

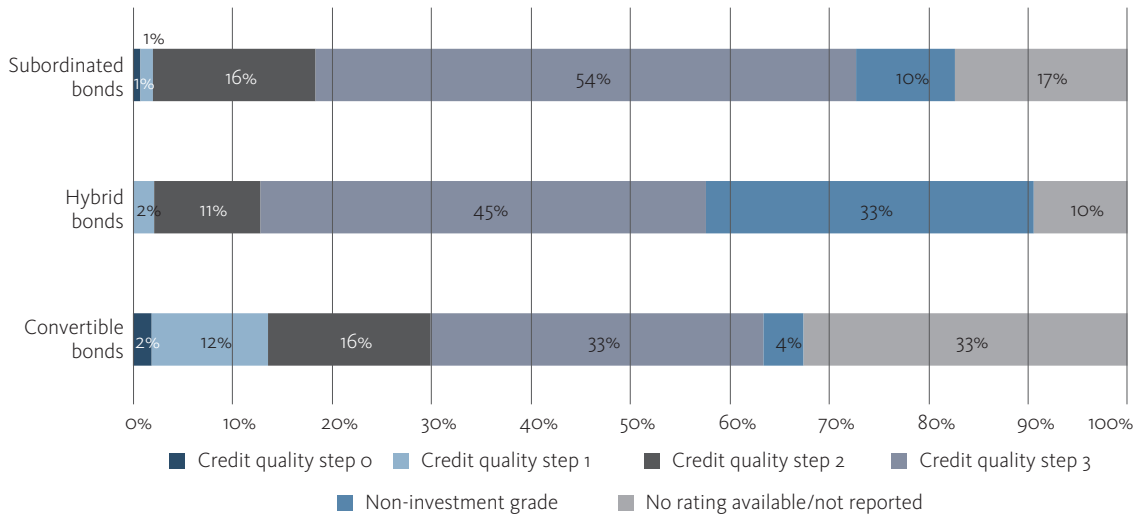
group of credit quality steps where they are placed in when assigning a certain capital charge. Insurers seem to have a high preference towards subordinated bonds rated with credit quality step 3 (54%), trend somehow followed by the ratings of hybrid bonds and CoCo bonds (Figure 5.26). Investing in bail-in bonds with lower credit quality ratings could turn to be risky for insurers in times of turmoil as this could create a spillover effects over the insurance sector. The exposures towards banks bail-in bonds are yet small but require supervisory and policymaker's monitoring in the upcoming years.

Figure 5.25: Breakdown of exposures to bank corporate bonds by country in Q2 2018



Source: EIOPA Quarterly Solo
Reference Date: Q2 2018

Figure 5.26: Breakdown of ratings of *subordinated, hybrid and convertible bonds* in Q2 2018



Source: EIOPA Quarterly Solo
Reference Date: Q2 2018

CROSS-BORDER BUSINESS IN THE EUROPEAN ECONOMIC AREA (EEA)

Cross-border exposures could contribute to risk diversification, but also increase interconnectedness and potential risk transfers. Insurance undertakings authorised in an EEA country may carry out insurance activities in another EEA country (“host country”) via Freedom of Establishment (FoE) or via Freedom of Services (FoS). FoE requires the establishment of a branch, while FoS can be done without physical presence in the host country. In the case of branches, capital and liquidity might

be moved around without significant constraints compared to the case of subsidiaries. In the EEA, EUR 66.5 bn gross written premiums (GWP) are reported via FoS and EUR 75.5 bn via FoE, accounting together for approx. 10% of all GWP in the EEA at the end of 2017 showing an increase cross-border business compared to the previous year when the cross-border business accounted for 8% of GWP in EEA. The share of the cross-border business to the total EEA insurance market depends on the type of business. For direct business life, the share is 3.85% and 1.00% for life reinsurance. For direct business non-life and reinsurance the share 3.21% and 1.67% respectively. Out of

2686 insurance and reinsurance undertakings under Solvency II, 847 reported cross-border business within the EEA in 2017 compared to 750 in 2016.

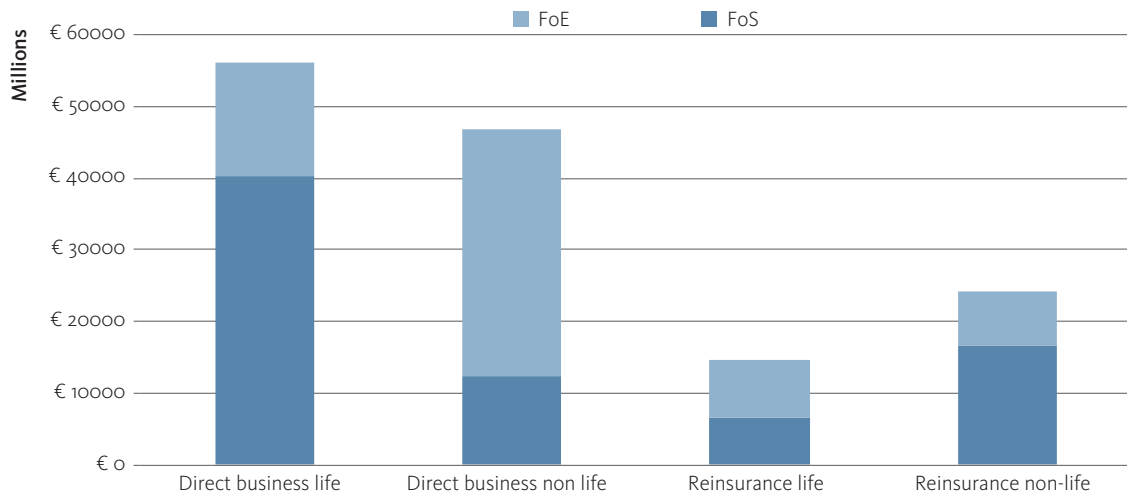
The degree of cross border business varies significantly among the EEA countries, while the amount of cross-border business and the interconnectedness between countries depend not only on the line of business, but also on regional specificities. The cross border business of insurers varies also by lines of business. For direct business, i.e. insurance sold directly to customers, a clear distinction between the life and non-life segments can be seen (Figure 5.27). While cross-border life business is mainly written via FoS, cross-border non-life business is mainly written via FoE. Customers of non-life business are likely to prefer to have a local branch through which damage claims can be sent and settled. For reinsurance, where both counterparts are professionals, the need for a local branch seems less important (indeed, non-life reinsurance relies more on FoS than FoE most likely due to the relatively higher share of Business-to-Business). Unit-linked or index-linked business accounts for more than EUR 42 bn cross-border GWP in EEA, about 30% of the total (Figure 5.28) compared to 25% in 2016 suggesting an

increasing volume of this type of business. In line with the observation above, the vast majority of this life business is written via FoS, while all non-life business is dominated by business written via FoE.

The share of cross-border GWP can highly concentrate in certain countries. In terms of volume, the share of cross-border GWP within the top 5 countries (in terms of outgoing share), indicates the main host countries. Off all written premiums issued by insurance undertakings authorised in Luxembourg, 80.86% reflect cross-border business in other EEA countries (Table 5.4). The top line of business that Luxembourg undertakings write in these countries is unit-linked or index-linked business. The main countries where Luxembourg undertakings write business to are France, UK and Italy.

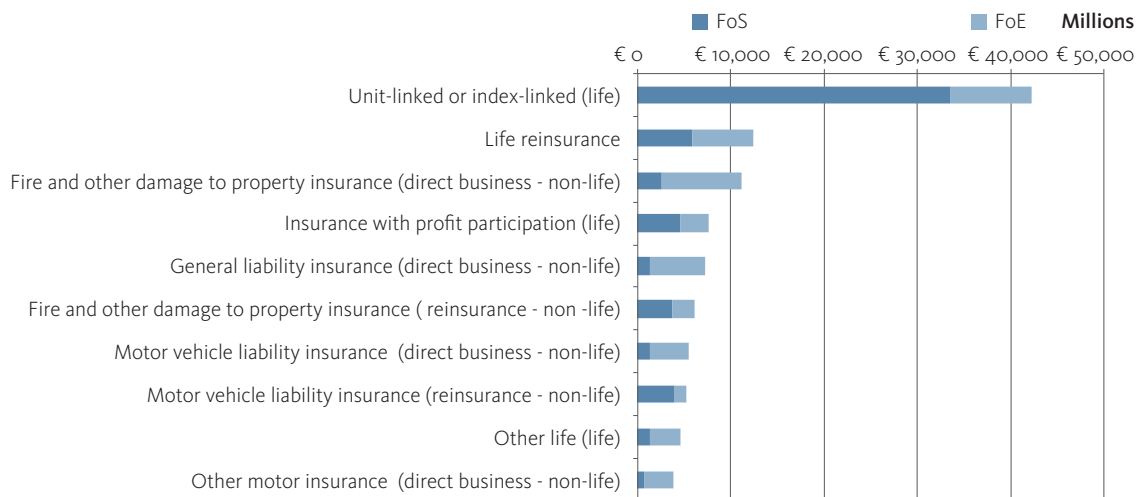
While cross-border business is mainly driven by unit-linked or index-linked business at EEA level, other lines of business can dominate bilateral cross border activity (Table 5.5). The Baltic countries (Estonia, Lithuania, Latvia) have a relatively open insurance market with a high share of incoming business. Moreover, the markets have a high level of interconnectedness among them-

Figure 5.27: Cross-border insurance business (EUR mn) at the end of 2017



Source: EIOPA Annual Solo
Reference Date: 31/12/2017

Figure 5.28: Top 10 lines of business by GWP (EUR mn) for cross-border business at the end of 2017



Source: EIOPA Annual Solo
Reference Date: 31/12/2017

Table 5.4: Outgoing cross-border business in other EEA countries

Country	outgoing (EUR)	% outgoing in GWP	Top 3 host countries
LU	28,894,615,248	80.86%	FR, UK, IT
IE	40,534,429,576	55.15%	IT, UK, DE
MT	2,013,866,867	54.95%	UK, FR, ES
EE	381,741,631	54.01%	LT, LV, UK
LI	2,097,350,657	49.59%	IT, IE, DE

Source: EIOPA Annual Solo
Reference Date: 31/12/2017

selves relative to their national insurance market, with Estonia in particular exporting to its neighbours (Table 5.4). While highly relevant for the national markets, the cross-border business between the three Baltic countries accounts for only 0.6% of the total EEA cross-border business.

The financial interlinkages derived from the cross border business support risk diversification, but also facilitate transmission of shocks in case financial distress.

This could be especially pronounced for countries with high-interlinkages. Figure 5.29 presents the network of cross-border business in the EEA. Countries that receive

Table 5.5: Incoming cross-border business in other EEA countries

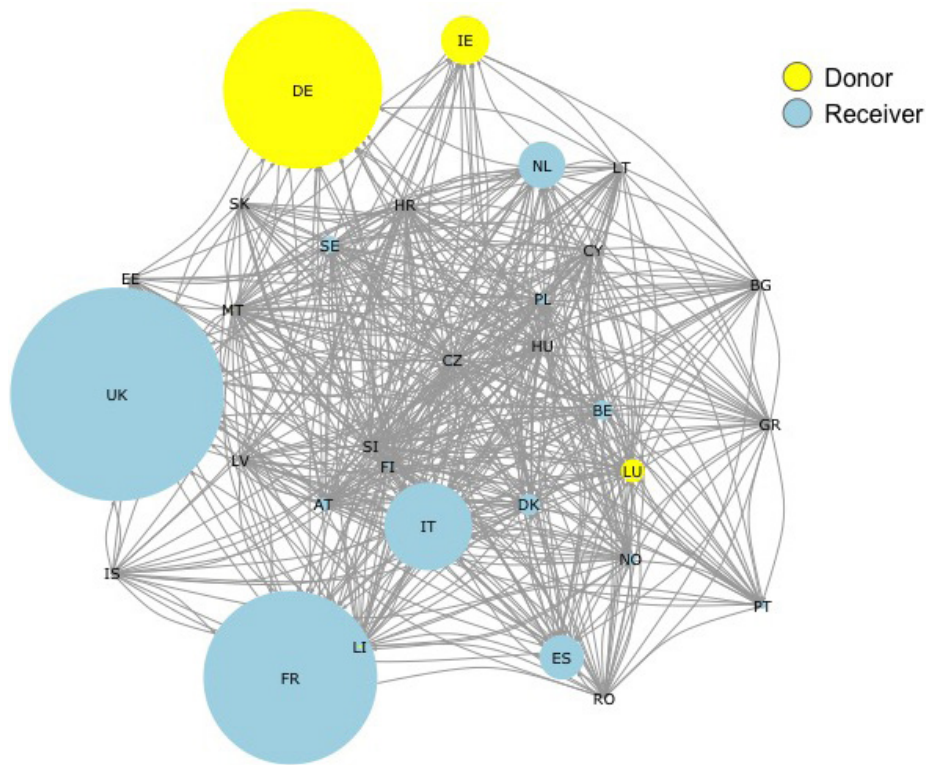
Country	incoming (EUR)	% incoming in GWP	Top 3 host countries
LV	291,541,227	70.96%	EE, LT, AT
LT	402,948,852	68.65%	EE, LV, AT
CY	283,442,848	30.48%	UK, DE, IE
RO	503,655,272	24.18%	DE, AT, IE
CZ	1,341,234,796	22.95%	BG, AT, NL

Source: EIOPA Annual Solo
Reference Date: 31/12/2017

more premiums than they subscribe as a percentage of their total GWP are coloured in blue (“receiver country”) while the yellow colour suggests that the country subscribes more cross-border (“donor country”) as a percent-

age of their total GWP. Moreover, the size of the bubble shows the size of the insurance market by total GWP (Figure 5.29).

Figure 5.29: Cross-border business among EEA countries in terms of GWP



Source: EIOPA Annual Solo
Reference Date: 31/12/2017

6. BACKGROUND INFORMATION AND DATA DESCRIPTION

OVERVIEW AND DATA (RE) INSURANCE SECTOR

EIOPA publishes statistics based on quantitative Solvency II reporting from insurance undertakings and groups in the European Union and the European Economic Area (EEA). These statistics are published on a quarterly basis. Every publication is accompanied by a note describing the key aspects of the statistics published. The tables and charts are available in PDF and Excel format and are based on information from the statistics at the publication date.⁵⁵

The new supervisory regime Solvency II came into full force on 1 January 2016 as a result of timely preparation and appropriate transitional periods.

The Solvency II Directive (Directive 2009/138/EC) introduces advanced solvency requirements for insurers based on a holistic risk assessment, and imposes new assessment rules for assets and liabilities, which must be assessed at market values.

Currently the following type of information is available:

INDICATORS BASED ON INDIVIDUAL INSURANCE UNDERTAKINGS (SOLO DATA)

Quarterly and annual publication of statistics based on solo prudential reporting data and available on a country-by-country basis.

INDICATORS BASED ON INSURANCE GROUPS (GROUP DATA)

Annual publication of key indicators based on group reporting and available at EEA level from Autumn 2017.

INDICATORS BASED ON REPORTING FOR FINANCIAL STABILITY PURPOSES

Pursuant to Art. 51 Solvency II Directive 2009/138/EC insurance companies have to publish annual Solvency and Financial Condition Reports (SFCR) for groups as well as solo reports for its Solvency II regulated legal entities since May 2017. The structure of this Financial Stability Report covers Q2 2018 and focuses on European (re) insurance undertakings and groups that report regularly under Solvency II. EIOPA bases its analysis mainly on Quarterly Prudential Reporting Solo (QRS) for Q2 2018. But as not all templates and/or companies report under QRS, EIOPA also uses Annual Reporting Solo (ARS) and Quarterly Financial Stability Reporting Group (QFG) for some indicators.

Information is provided on different sample sizes as some (re)insurance companies are exempted from quarterly reporting in accordance with Art. 35 (6). Therefore, the sample of undertakings is not identical in the annual and quarterly publications. Each Figure EIOPA uses in this report is hence accompanied by a source mentioning the sample size and a note on data (if needed).

INSURANCE SECTOR

Solvency II has put in place long term guarantees (LTG) and transitional measures to ensure an appropriate treatment of insurance products that include long-term guarantees and facilitate a smooth transition of the new regulatory framework regime. The LTG measures are a permanent feature of Solvency II, whereas the transitional measures will be gradually phased out until 2032, by which time the balance sheet position of insurance companies will be fully estimated at market value. For a period of 16 years after the start of Solvency II (re)insurance undertakings may apply the transitional measure on the technical provisions and the risk-free interest rate.

⁵⁵ <https://eiopa.europa.eu/Pages/Financial-stability-and-crisis-prevention/Insurance-Statistics.aspx>

The use of LTG and transitional measures is transparent and insurance companies publish their solvency ratios with and without the application of these measures. LTG and transitional measures form an integral part of Solvency II and are intended to limit the procyclicality of the regulatory changes and to facilitate the entry into the new regime by giving companies the time needed to adapt to the new solvency requirements.

The EIOPA Insurance Stress Test Report 2016 and the Report on Long-Term Guarantees (LTG)⁵⁶ have shown that, in the absence of the easing effect of the LTG and transitional measures, insurers might be induced to force sales and de-risk in order to lower their SCR and MCR, possibly pushing asset prices further down, adding to the market volatility and potentially affecting financial stability.

Pursuant to Art. 51 Solvency II Directive 2009/138/EC solo insurance companies were required to publish annual Solvency and Financial Condition Reporting (SFCR) for the first time in May 2017, followed by groups at the end of June. Hence, this report uses a huge amount of comprehensive information on Solvency II results for the first time.

The publication of SFCR reports gives access to Solvency II results. Capital requirements under Solvency II are twofold. The Solvency Capital Requirement (SCR) is the level above which there is no supervisory intervention for financial reasons. Supervisors will take measures once the SCR is breached and ultimate measures (loss of licence) once the MCR is breached.

While the quarterly templates do contain SCR and MCR information, the SCR is not necessarily recalculated for the quarterly templates which only require annual recalculation. Hence, the quarterly SCR ratios will represent a snapshot, but not necessarily the fully recalculated SCR ratios. Also, the MCR might be affected by this because the SCR is used to define a cap and a floor for the MCR value.

The SCR ratio is calculated either by using a prescribed formula, called the standard formula, or by employing an undertaking-specific partial or full internal model that has been approved by the supervisory authority. Being risk-sensitive the SCR ratio is subject to fluctuations and undertakings are required to monitor it continuously. A variety of degrees of freedom and options in the calcu-

lation of Solvency II results allows insurance companies to adjust the calculation of the SCR ratio to their risk profile.

According to Solvency II, insurers' own funds are divided into three "Tier" classes. Tier 1 capital, such as equity, is divided into restricted and unrestricted capital and has the highest ranking. Items that are included in Tier 1 under the transitional arrangement shall make up less than 20% of the total amount of Tier 1 items. Tier 2 capital is mostly composed of hybrid debt while Tier 3 is composed mostly of deferred tax assets. The eligible amount of own funds to cover the SCR has several restrictions: the eligible amount of Tier 3 capital shall be less than 15% of the SCR, while the sum of the eligible amount of Tier 2 and 3 capital shall not exceed 50% of the SCR. In order to ensure that the application of the limits does not create potential pro-cyclical effects, the limits on the eligible amounts of Tier 2 and Tier 3 items should apply in such a way that a loss in Tier 1 own funds does not result in a loss of total eligible own funds that is higher than that loss.

REINSURANCE SECTOR

The section is based on information from the Quarterly Reporting Templates (QRTs) where the reinsurance sample is calibrated with Q2 2018 data. A solo undertaking is listed as a reinsurer if it meets one or more of the following criteria: listed as a reinsurance undertaking on the EIOPA register. The global and European market overview is also based on publicly available reports, forecasts and quarterly updates of rating agencies and other research and consulting studies.

PENSION FUND SECTOR

The section on pension funds outlines the main developments in the European occupational pension fund sector, based on information received from EIOPA's members. It covers all EEA Member States with active IORPs (i.e. occupational pension funds falling under the scope of the EU IORP Directive). There are a few Member States without such pension funds and/or where the main part of occupational retirement provisions is a line of insurance business, respectively underwritten by life insurers, and is therefore not covered. The country coverage is 81% (25 out of 31 countries).

⁵⁶ Note EIOPA's third LTG (long term guarantee) report will be published in late 2018

Data collected for 2017 was provided to EIOPA on a best effort basis to report the financial position of IORPs during the covered period. For Romania, the data refers to 1st Pillar bis and 3rd Pillar private pension schemes only.

Data availability and valuation approaches vary substantially among the Member States, which hampers a thorough analysis and comparison of the pension market developments between Member States. Due to differences in objective, scope, coverage and reporting period or timing of the data received by EIOPA, information reported in the different EIOPA reports may differ

COUNTRY ABBREVIATIONS

Countries		Countries	
AT	Austria	IT	Italy
BE	Belgium	LV	Latvia
BG	Bulgaria	LI	Liechtenstein
CY	Cyprus	LT	Lithuania
CZ	Czech Republic	LU	Luxembourg
DE	Germany	MT	Malta
DK	Denmark	NL	Netherlands
EE	Estonia	NO	Norway
FI	Finland	PL	Poland
FR	France	PT	Portugal
ES	Spain	RO	Romania
GR	Greece	SK	Slovakia
HR	Croatia	SI	Slovenia
HU	Hungary	SE	Sweden
IS	Iceland	UK	United Kingdom
IE	Ireland	CH	Switzerland

PART II
THEMATIC ARTICLE

EARLY WARNING SYSTEM FOR THE EUROPEAN INSURANCE SECTOR

Lorenzo Danieli and Petr Jakubik⁵⁷

ABSTRACT

This article proposes an Early Warning System model composed of macro-financial and company-specific indicators that could help to anticipate a potential market distress in the European insurance sector. A distress is defined as periods in which insurance companies' equity prices crash and CDS spreads spike simultaneously. The model is estimated using a sample of 43 insurance companies that are listed. Based on a panel binomial logit specification, empirical evidence shows that economic overheating that could be manifested by high economic growth and inflation as well as high interest rates have negative impact on insurance sector stability. At the company level, increasing operating expenses increase the likelihood of distress occurrence.

1. INTRODUCTION

The devastating impact of the financial crisis of 2008-09 has urgently posed the question to raise awareness of an early detection of potential factors which can lead to a crisis. In this respect, policymakers interest has increasingly focused on a crisis prevention and prediction of risks of systemic nature. Although there is not a universally recognized definition of systemic risk, it is possible to refer to it as the risk that some trigger events cause such a widespread financial instability that it impairs the functioning of the financial system to the extent that economic growth and welfare suffer materially (ECB, 2009). A recursive problem with past approaches by financial regulators to the crises has been to deal with each institution's risk in isolation. This implied that firms may have taken actions to prevent their own collapse, but not necessarily to avoid the collapse of the whole system (Acharya and Richardson, 2014). Within the recent academic literature, there is an elaborated view on the causes of systemic, banking and stock markets crises, which sheds light on potential mitigating regulatory interventions.

The insurance industry, despite its relevance in the financial system, has been at the margin of research interest and, as a consequence, several aspects of its potential sources of systemic risk are still partially latent. The limited focus on measuring risk in the insurance industry derives from the traditional view of insurers being considered safer than other financial institutions.⁵⁸ Notwithstanding, the near-miss and government bailout of AIG

⁵⁷ European Insurance and Occupational Pensions Authority (EIOPA).

⁵⁸ Statement reported e.g. by Valckx et al. (2016) in the third chapter of the Global Financial Stability Report by the IMF (2016).

has drastically changed this point of view. Indeed, the events of the recent financial crisis showed that turmoil and clients' runs can be extended even to non-banking institutions such as money market funds or insurance companies. Whatsoever the origins of distress, neither existing literature nor contemporary models pay much attention to identify and develop possible measures of systemic risk, designed to facilitate monitoring and regulation of insurers.

To fill this gap, this study proposes an Early Warning System (EWS) model examining the causes of market distress in the insurance sector. Section 2 elaborates on the available studies on EWS in literature. Section 3 provides a description of the applied methodology and the employed dataset. On this basis, section 5 presents the obtained empirical results. The last section concludes.

2. LITERATURE REVIEW

The global financial crisis increased the interest of researchers and policy makers alike in putting considerable effort into understanding and predicting systemic crises. Despite there is an elaborated view of Early Warning System models in the banking sector as well as in assessing risk and predicting systemic events in the aggregate economy supported by the extensive literature, not much research focuses on the insurance sector could be found.

Davis and Karim (2008) underline and push forward the need of practical use of EWS to predict banking crisis. In their seminal paper they assess the properties of a logit-model EWS compared to a signal-extraction method for banking crisis, using a comprehensive dataset of 105 countries for the period from 1979 to 2003. The outcome of the research leans towards the better performance of the logit model in predicting global crisis and the signal approach being superior in predicting country-specific crisis. The main drivers to banking crises in their sample are terms of trade and growth.

Alessi and Detken (2011) contribute to the financial crisis literature testing the performance of real and financial variables as Early Warning indicators for costly aggregate asset price booms/bust cycles. In this respect, they use a combination of the price index of weighted real private property, commercial property and equity prices to identify asset price booms. Their results show that it is possible to find early warning indicators that perform reasonably well for individual countries and also for groups of countries. They found financial variables as the best predictors of price booms, in particular the global private credit gap.

Likewise, Lo Duca and Peltonen (2013) complete the build-up on the methodology through the assessment of systemic risk and prediction of systemic events. The novelty of their paper is the definition of systemic events rather than the methodology itself. They identify systemic events as "episodes of financial stress that has led to negative real economic consequences", using a composite index measuring the level of systemic events in the financial system of a country. In this respect, stand-alone measures of asset price misalignments and credit booms are typically useful indicators that anticipate systemic events

Notable exceptions for the insurance sector are Billio et al. (2012) and Chen et al. (2014) who attempt to establish econometric measures of systemic risk in the insurance sector.

3. DATA SAMPLE AND METHODOLOGICAL BACKGROUND

In order to understand the transmission channels through which risks materialize at the event of crisis in the insurance sector, it is necessary to lay down the methodology that allows tackling such a challenge. As data on insurers' default are not available, the concept of insurers' distress using available market data is employed. Furthermore, the list of potential variables that could serve as early warning indicators is provided. Finally, the modeling framework allowing to use those indicators to predict an insurer's distress is described.

3.1. SAMPLE DESCRIPTION

Given that the study is based on market data only, the aim is to include as many listed companies as possible. There are 109 listed (re)insurers in Europe, but individual level statistics are available for less than half of them. Therefore, the sample has to be narrowed to 43 listed (re)insurance entities (7 solos and 36 groups), located across the European countries. More specifically, solo (re)insurers are from Denmark, Germany, Great Britain, Italy, and Switzerland. The final sample is decomposed into 7 property and casualty, 22 Multi-line, 10 Life & Health, and 4 reinsurance companies. The sample encompasses the top 30 European groups, 6 other groups, and 7 solo insurers. This corresponds to a market coverage of 75% based on total assets.⁵⁹ Hence, it is possible to consider that the sample is representative for the EU.⁶⁰

Furthermore, the sample covers the years from 2004 to 2017.⁶¹ The company data were complemented with macroeconomic/financial data. While European level data were used for the groups, country level data were utilized for solos. In all cases market data, as well as balance sheet indicators, have been extracted from the Bloomberg platform. The data warehouse of the European Central Bank and the database of Eurostat were used for macroeconomic indicators. Concerning Switzerland, observations are taken from the data stock of the Swiss National Bank. Since many balance sheet items are reported annually, yearly data rather than quarterly or monthly are employed.

3.2. THE INSURANCE SECTOR DISTRESS

In absence of data on insurers' defaults, the main challenge in developing early warning systems is the definition of proxy for insurance sector distress. Market valuations of publicly traded companies are a reflection of their overall financial healthiness. Specifically, markets mirror investors' expectations of the ability of corporations to generate future profits. The proxy indicators capturing insurers' distress should reflect markets' uncertainties and imbalances. Hence, the crash in the company-specific market share price with a simultaneous spike in the company-specific issued Credit Default Swap (CDS) spread are employed in this paper to define insurers' distress. A sudden crash of the stock price might reflect emerging economic crisis as well as serious catastrophic events. Similarly, an increase in insurance CDS spreads corresponds to the higher likelihood of the insurer to default on its debt. The employed approach is based on seminal literature

⁵⁹ Based on EIOPA Solvency II statistics.

⁶⁰ Most solos across Europe are not listed and, if they are, do not report their financial data in many cases.

⁶¹ The sample was reduced to 2016 in a second stage, since some figures for 2017 of the sample countries were not available at the time of conducting this study.

related to the measurement of systemic risk in the insurance sector. Chen et al. (2014) uses CDS spreads and intra-day stock prices as terms of reference to estimate the probability of default of insurers and the default correlations respectively. Furthermore, Billio et al. (2012) use monthly returns data of financial institutions (insurers included) as main indicator for the establishment of measures of systemic risk in financial and insurance sectors. Finally, Gottschalka and Walkerb (2011) show that CDS changes have predictive power over corporate defaults.

3.3. DEFINITION OF THE DEPENDENT VARIABLE

In order to measure insurance distress, the market stress index (MSI) incorporates both the effects of CDS spikes and equity price crashes. The both components are calibrated in a way that they reflect annual changes (in this respect see e.g. Corsi, 2009).⁶² The MSI is calculated as the arithmetic average of the CDS realized volatility and the realized share price volatility for each company i at time t .⁶³

$$MSI_{i,t} = \frac{\sigma_{CDS_{it}} + \sigma_{Price_{it}}}{2}$$

After the computation, a percentile rank is assigned to each of the values of the MSI such that, every year, for each company, the indicator is ranked between 0 and 1. The crucial feature of the EWS framework is the identification of crisis events from the specific market stress measure, as it indicates crisis occurrence (or absence), that is used as a dependent variable for the purpose of the study. Therefore, it is necessary to set an appropriate threshold above which the company-specific MSI would capture crisis events. In this respect, the values of the index of the 43 companies are aggregated using weighted average, obtaining a new indicator capturing one average single value each year. This allows to establish common standards for crisis signaling. Furthermore, percentile values are assigned, so that the aggregate MSI ranks between 0 and 1. High values of the indicator represent periods of distress. The construction of the aggregate index is challenged by the trade-off between guaranteeing a certain extent of precision at the company level, at the expense of uniformity across the sample, and ensuring homogeneity across companies and time. The cross-section dimension of the panel dominates in this study; therefore, priority is given to homogeneity across companies because the objective is to calculate average distress in the sector as a whole.

In order to make sure that the MSI behaves as a proper early warning indicator by signaling upcoming distress events, it is necessary to introduce a binary variable (D_{it}) that takes the value of 1 in the most unfavorable outcome and 0 otherwise. In this sense, when the individual MSI crosses the predefined threshold (m), the parameter takes the value of 1, signaling distress.

$$D_{it} = \begin{cases} 1 & \text{if } MSI_{it} \geq m \\ 0, & \text{otherwise} \end{cases}$$

Finally, the major concern is that the “post-crisis bias” could alter the final results. Indeed, it could be the case that the econometric results of models that try to explain or predict crises can at least in part, or even fully be explained by the behavior of the independent variables during and directly after a crisis (Bussiere and Fratzscher, 2006). Therefore, in

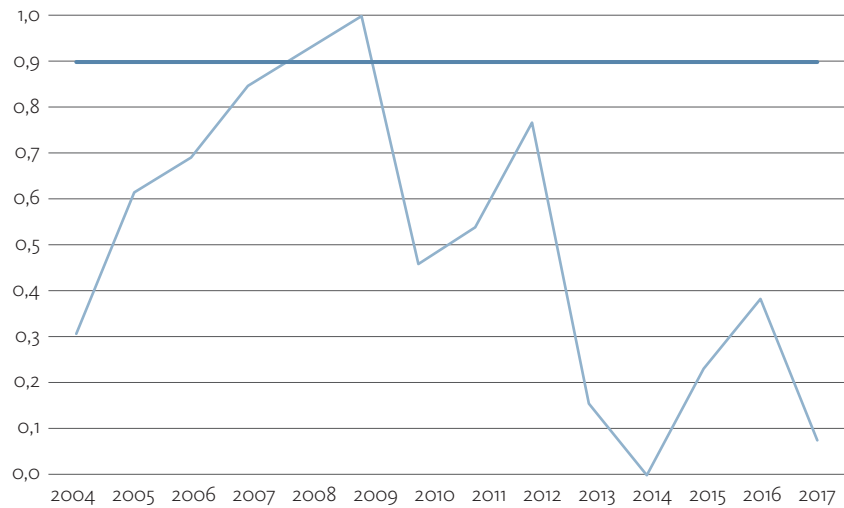
⁶² Equity price and CDS spreads raw observations are trending daily measures.

⁶³ A more complex weight calibration reflecting the specific features of the relevant markets might vary over time therefore both components are given equal importance. For example, weight assignment in relatively tranquil years (e.g. 2004-05) would not be equal to that in more harmful periods (2008-09).

a second stage, all consecutive periods of distress (e.g. years in which the MSI equals 1, but had already signaled distress the previous period) are dropped from the sample.

Figure 1 displays the aggregate MSI. The index is able to capture the great recession of 2008-09, the sovereign debt crisis of 2012, and in a minor way Brexit in 2016. The reliability of the indicator stands in the fact that it captures the three historical events that most negatively characterized the whole economy within the last 13 years. In this spirit, the threshold at the 90th percentile of the distribution (red line) captures periods of extreme crisis such as the Great Recession.⁶⁴ Following the methodology from Lo Duca and Peltonen (2013), the 90th percentile is the benchmark that reflects real consequences on average, observing GDP growth severely dropping below zero to -4.3%.

Figure 1: Aggregate Market Stress Indicator



3.4. EXPLANATORY VARIABLE CHOICE

The Early Warning Systems aim to predict events of stress using several forward-looking variables. While the relevance of macroeconomic variables has been vastly explored, the role of balance sheet items still lack some research. In order to contribute to close this gap, a pre-selection of plausible variables will include both macroeconomic and company-level indicators. It is expected that at the macroeconomic level, episodes of distress are anticipated by economic overheating (high interest rate, high inflation and unsustainable GDP growth). At the company level, imbalances are characterized by drops in profitability and increases in costs of managing claims.

64 The attempt to set the threshold at the 75th percentile did not yield satisfactory results. Setting only the threshold at the 75th percentile may be too vague since it captures all the distress, but, at the same time, may also be likely to issue false alarms. Raising the threshold allows to reduce the likelihood of type I errors, at the expense of increasing the frequency of ignoring actual episodes of distress.

Table 1: List of indicators considered

Indicator	First Difference	Percentage Change	Expected Sign
Real GDP Growth		x	+
Long-term Government Bond Yield	x		+
Inflation		x	+
Decomposition of Real GDP		x	+
Cash Flow to Net Income	x		-
Net Written Premia		x	-
Operating Expenses		x	+
Underwriting Costs		x	+
Return On Assets	x		-
Return on Equity	x		-
Price to book value	x		-
Price-Earnings Ratio	x		-

To avoid any kind of endogeneity bias, as well as to fulfill the role of “early” warning indicators, all explanatory variables have been lagged by one year. In this way the occurrence of reverse causality is avoided, as it could be the case that the crisis itself may hit simultaneously some explanatory variables values. Furthermore, all potential indicators are expressed in growth rates or first differences in order to guarantee their stationarity.

3.5 THE MODEL

In order to explain risk of potential distress in the insurance sector, the study will rely on a binomial logit approach. This allows identifying those indicators that positively or negatively affect the likelihood of distress. The simple logit panel regression can be expressed as follows:

$$Prob(D_{it} = 1) = \frac{e^{(X_{t-1}\beta'_{i,t-1} + Z_{i,t}\gamma'_{i,t-1})}}{1 + e^{(X_{t-1}\beta'_{i,t-1} + Z_{i,t}\gamma'_{i,t-1})}}$$

where $Prob(D_{it} = 1)$ is the probability that company i at time t is in state of distress. The vector $X_{i,t}$ contains the set of different independent macroeconomic variables presented in the previous paragraph. On the other hand, the vector $Z_{i,t}$ corresponds to the company-specific indicators. The underlying goal is to find a set of indicators, which predicts crises well in advance, such that potential policy maker actions would be effective.

4. EMPIRICAL RESULTS

To identify a set of predictive EWS indicators, the binomial logit model at the predefined threshold is ran and the sign and the significance of the coefficients are checked at the first step. In a second stage, the classical methodology requires the assessment of the in-sample performance of the model, which can be classified via the area under the ROC

curve. Given the nature of the logit model, the coefficients take the form of log-odds ratios. In this respect, estimates should be interpreted in terms of how the likelihood of an event of distress evolves as the explanatory variables change by a unit. Quantitatively, for a one unit increase in the explanatory variables, it is expected an increase in the log-odds ratio of the dependent variable equal to the coefficient reported. The sign in front of the coefficient indicates the positive or negative likelihood of the occurrence of an unfavorable event.

Table 2 shows the results of the model including only macroeconomic variables. Results suggest that positive GDP growth, high level of long term interest rate, and elevated inflation increase the likelihood of a crisis event in the insurance sector in one-year horizon. The positive sign in front of the coefficients is in line with the theory. When splitting down GDP into its components, extreme crisis episodes are more likely to occur when government expenditure and disposable income are high.

Table 2: EWS model with macroeconomic variables only

	(1) Distress ₁	(2) Distress ₁	(3) Distress ₁	(4) Distress ₁
GDP	0.838*** (0.000)	0.334* (0.071)		
Inflation	1.329*** (0.000)	0.641** (0.027)	1.051*** (0.004)	0.634** (0.025)
Long term IR		1.782*** (0.000)	2.128*** (0.000)	2.229*** (0.000)
Consumption			1.490*** (0.006)	
Investment			-0.0425 (0.669)	0.0939 (0.262)
Government expenditure			0.176 (0.645)	0.719** (0.029)
Export			0.194 (0.292)	0.146 (0.384)
Import			-0.336* (0.094)	-0.219* (0.097)
Household disposable income				0.399* (0.074)
Number of observations	490	490	490	490
R ²	0.242	0.301	0.410	0.383

p-values in parentheses
* p<0.1, ** p<0.05, *** p<0.01

The combination of macroeconomic and company level data, shows that GDP growth, interest rate level and inflation maintain their sign and statistical significance (Table 3). Although the coefficient is quite small in terms of weight (a one unit increase in operating expenses increases the log-odds of distress by 0.00134), extensive operating expenses costs increase probability of insurer's distress. A drop in return on assets, which can be interpreted as a proxy for profitability, tend to increase the probability of distress. This highlights the initial insurers internal difficulties that are accompanied by macroeconomic imbalances at the eve of the crisis. When combining macroeconomic and balance sheet data, GDP growth loses significance.

Table 3: EWS model with macroeconomic variables and balance sheet indicators

	(1) Distress	(2) Distress	(3) Distress	(4) Distress	(5) Distress	(6) Distress
GDP	0.334*		0.259		0.207	0.0105
	(0.071)		(0.159)		(0.275)	(0.957)
Inflation	0.641**		0.690**		0.898***	1.105***
	(0.027)		(0.017)		(0.005)	(0.001)
Long term IR	1.782***		1.826***		1.667***	1.903***
	(0.000)		(0.000)		(0.002)	(0.001)
Price-to-earning ratio		-0.00246	0.00191			-0.00418
		(0.812)	(0.851)			(0.843)
Price-to-book value		0.430**	0.278			0.527*
		(0.015)	(0.127)			(0.058)
ROA		-0.206**				-0.351**
		(0.049)				(0.023)
ROE		0.0399*				0.0859**
		(0.084)				(0.037)
CF to net income				-0.00337	-0.00889	-0.000996
				(0.805)	(0.661)	(0.965)
Net premiums				0.0140	0.0173	0.0179
				(0.187)	(0.200)	(0.216)
Operating expenses				0.00147*	0.00145	0.00125*
				(0.050)	(0.102)	(0.071)
Underwriting costs				0.00338	0.00448	0.00440
				(0.358)	(0.253)	(0.276)
Number of observations	490	487	488	371	371	371
R ²	0.301	0.039	0.311	0.035	0.332	0.379

p-values in parentheses
* p<0.1, ** p<0.05, *** p<0.01

5. MODEL PERFORMANCE EVALUATION

A valuable tool to assess the performance of a logit model is the Receiving Operator Characteristics (ROC) Curve, which displays the ratio of true distress signals (sensitivity) over false alarms (1-specificity).⁶⁵ The advantage of this method is that with multiple regressors it is possible to construct a curve that shows the sensitivity and specificity of the model for each and every cutoff point.⁶⁶ In other words, it summarizes the predictive power of the indicators for all possible thresholds. For this reason, as post-estimation classification, the ROC curve is more informative than the confusion matrix.

Therefore, to test goodness of fit or in other words the reliability of the model, the analysis relies on the magnitude of the area under the ROC curve (AUROC) generated by the models presented above. The AUROC ranges between 0 and 1. The closer the AUROC produced by the Early Warning System gets to 1, the better the predictive accuracy. Hence, for values greater than 0.5 the EWS model can be considered to hold some predictive power.⁶⁷

Table 4 shows the AUROC scores for the models employed in this study. Even when controlling for company specific factors, the performance of the model does not deteriorate. The rate of correctly signaled crisis is kept quite high, with the magnitude of AUROC scoring between the range of 0.80-0.85.

Table 4: Model Performance Comparison

Model	90th Percentile
AUROC GDP	0.8149
AUROC GDP - Decomposed	0.8845
AUROC Balance Sheet	0.8342

6. CONCLUSION

This article contributes to the existing literature by developing an early warning system (EWS) being able to anticipate a period of financial distress in the European insurance sector. The employed empirical analysis is based on a set of 36 insurance groups and 7 insurance solos with yearly data covering years 2004 - 2017. The study employs the concept of market distress applied for the insurance sector. In this respect, the Market Stress Index (MSI) is calculated as the arithmetic average of the CDS realized volatility and the realized share price volatility for each insurance company at every point in time. In the next step the value of the index is transferred into quantiles and subsequently transformed into a binomial variable using a threshold that is able to capture historical distress in the sector for the aggregated MSI. Finally, this variable is employed to develop an EWS model for the insurance sector.

⁶⁵ Sensitivity measures the ability of the model to correctly classify episodes of distress. Specificity measures the correct classification of tranquil periods.

⁶⁶ Cut-off points can be set up according to the policymaker preferences. The higher the cut-off point, the higher the policymaker preference towards detecting distress periods regardless of false alarms.

⁶⁷ AUROC = 1 corresponds to perfect classification; AUROC = 0 corresponds to random guess.

The obtained results suggest that interest rate as well as other macroeconomic related risks are the main sources of instability in the sector. In particular, the empirical evidence reveals that market imbalances are anticipated by economic overheating, characterized by high interest rates, positive unsustainable growth and high inflation. When further determinants of economic growth are considered, investment growth, terms of trade, and household disposable income could explain a potential distress in the insurance sector. Moreover, including company-specific variables could further help to anticipate distress in the sector. The conducted analysis reveals that extensive operating expenses costs and a drop in return on assets could also anticipate insurer's distress.

Being aware of the sources of risk allows policymakers to take appropriate policy responses. Some risks can be mitigated through supervision guidance both at the national and European level ensuring level playing field for insurance undertakings across the continent. Nevertheless, signals obtained by the provided toolkit should be interpreted carefully and assessed only in the context of all supervisory information and tools available.

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