FINANCIAL STABILITY REPORT

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European Insurance and
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CONTENTS

FOREWORD BY THE CHAIRPERSON

The COVID-19 pandemic continues to challenge European countries with the increased trend in new infections, high level of uncertainties and extensive fiscal measures in place increasing government debts. The current stretched asset valuations in some market segments cause high sensitivity of financial markets to any unexpected negative news. It is clear that the crisis is not over and the adverse scenario used within this year's EIOPA EU-wide insurance stress test is still highly relevant. Notwithstanding the recent pick up in long-term yields, the low interest rate environment remains the main narrative, putting pressure, in particular, on life insurers and pension funds. Moreover, inflation remains elevated with a negative impact on profitability of non-life business lines exposed to unexpectedly inflated claims. Looking ahead, further economic developments will be the crucial factor for the risk assessment of the European insurance and pension sector.

Climate and cyber risk remain on the top of EIOPA agenda. The tragic outcome of natural catastrophes in summer raised awareness of the impact of environmental risk on the sector and society as a whole. In this respect, supervisors need to ensure that robust risk management practices to address underwriting risk, especially for reinsurers, are in place. Going forward, climate risks remains the top risk in terms of expected increase in intensity and frequency of excessive weather circumstances. Here the insurance sector can play a crucial role in closing the protection gap. An increased demand for new insurance solutions and services, could expand the industry's business opportunities as well as it's ability to incentivize mitigating measures. Besides these opportunities, insurers and pension funds themselves need to ensure the proper risk management of climate transition risk in their investment portfolios.

In relation to the digitalisation trend, cyber risk has become one of the most important concerns with increasing momentum, however so far expertise, data collection and modelling remains limited. In this context, EIOPA is organising preparatory work in view of implementing the cyber incident reporting envisaged in the European Commission's proposal for a Digital Operational Resilience Act (DORA). Until DORA is in place EIOPA will continue to liaise with national supervisors taking a facilitator role in the exchange of

information on cyber security and cyber-attacks. Here there is also an opportunity for insurers, as the demand for cyber insurance will grow. Furthermore, the new technologies being used could lead to enhanced underwriting of operational and cyber risks for insurers that are more digitally advanced.

Although the pandemic crisis is still ongoing, it has already provided some new challenges and lesson learnt. Policies coverage gaps and the related decrease in trust in insurance has exposed insurers to reputational risk. Moreover, new complexities in assessing risks steaming from the unprecedented governmental support amid accommodative monetary policy have distorted risk assessment frameworks for supervisors, insures and pension funds alike. In light of this consideration, risk managers and supervisors must avoid underestimating risks when using data from the crisis. It is important to further continue enhancing our methodological approaches to address all new challenges. In this respect, EIOPA facilitates a continuous dialogue among all stakeholders including external researchers to ensure financial stability of both the insurance and pension sector.

Petra Hielkema

KEY DEVELOPMENTS AND RISKS

The European economy continued to improve facing a strong second quarter supported by the vaccination campaigns and the reopening of the economies, with the expectations regarding real GDP pointing at exceeding pre-pandemic levels (2019 q4) by the end of 2021. The development of the pandemic and the supply chain disruptions remain key risks weighing on growth with high frequency data point to growth although with weaker momentum than before.[1] In the euro area the projections for yearly growth have been revised to 5% for 2021[2] (4.6% and 2.1% for 2022 and 2023, respectively), an upward revision of 0.4 percentage points from previous forecasts. Yet, the quarterly forecasts for the second half of 2021 have been marginally deteriorating, driven, among others, by the supply chain disruptions and concerns over the recent increase of coronavirus infections. **In fact, uncertainties remain high looking ahead due to the recent surge in infections and a further potential adverse development of the pandemic.**

Inflation remains elevated (Figure 1), with expectations pointing to persistence in the upcoming months. The inflationary pressures encompass a mechanical increase, due to previously low levels of prices during the pandemic, but also reflect the disruption in the global supply chain system and the general accommodative fiscal and monetary policies. Besides these, other temporary effects include the rise of oil and energy prices, the reversal in January 2021 of the temporary VAT cut in Germany and the changes in the timing and scope of sales periods are also contributing factors.[3]

Figure 1: HICP main components (annual % changes)
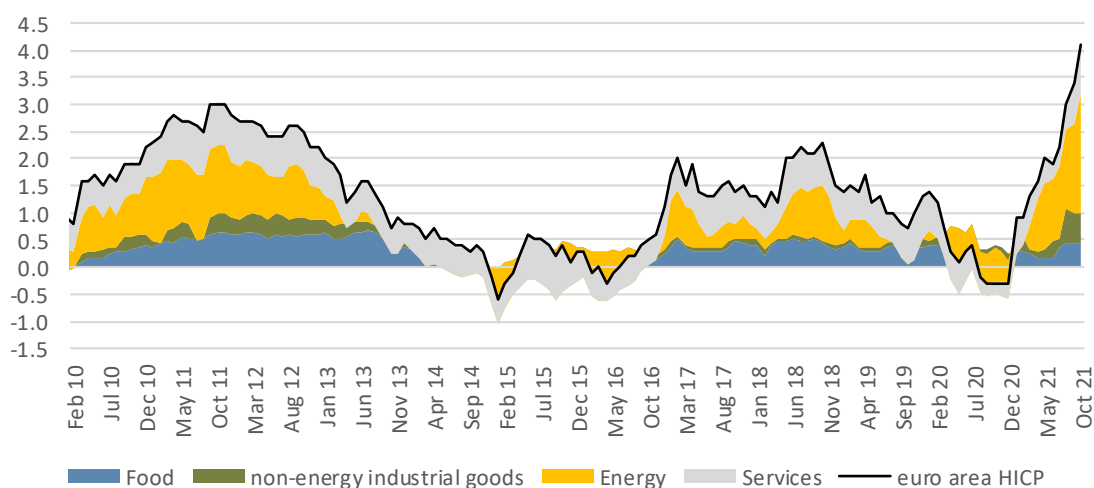
Source: ECB. Last observation: 21/09/2021.

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[1] Eurozone composite PMI was 55.2 for end of October compared to 60.06 for beginning of August.
[2] ECB staff macroeconomic projections for the euro area, September 2021.
[3] ECB Economic Bulletin, issue 6 2021.

Many central banks consider the inflationary pressures as transitory and expecting to subside in 2022. Inflation forecasts have been revised upwards for the euro area to 2.2% for 2021 (compared to 1.9% of June's forecasts), whereas it is expected to fall to 1.7% and 1.5% for 2022 and 2023, respectively.[4] Market based indicators for medium-to-long-term inflation expectations, measuring the average inflation over the five-year period starting five years from now (5y5y inflation swap), keep increasing being approximately at 1.9% (as compared to just above 1.25% at 2020 year-end).[5]

This unanticipated increase in inflation could be a significant source of risk for non-life insurers, due to potential coverage of claims in real terms as well as typically positive duration gaps. In case inflation were to persist (e.g. if pandemic-induced supply-demand mismatches continue for longer than expected), some segments of the insurance sector would be impacted as future claims payment could increase more than insurers have planned for when calculating their reserves. For life insurers, inflation is less of a concern because claims are mostly set in nominal terms. Assuming that inflation risk would result in higher long-term yields, the life insurance sector could benefit from lower valuations in the liability side, to the extent that liabilities have longer durations than assets. On the other side, the profitability of business lines exposed to inflated claims, especially for non-life and reinsurance, could deteriorate, at least in the short term.[6] Notwithstanding the impact on the written business, the decrease of purchasing power of potential future policyholders and lower attractiveness to enter new life contracts could potentially weaken the writing of new business and increase lapse rates (see further details in the fifth special theme - Key market factors: Inflation and government bond yields).

Sovereign yields have increased in Europe after summer, potentially on the back of increased inflation expectations. This development reverts the temporary decline over the summer (Figure 2), which could be associated to concerns regarding the pandemic developments and future growth. In fact, the changes in individual sovereign spreads over the risk-free rate are limited, meaning that the sovereign risk across countries is kept contained.

Although policy makers largely consider the ongoing rise in inflation as transitory, central banks could react by tapering monetary easing and increasing interest rates if they expected this trend as more long-term. The fade out of monetary easing, knock on effects from increasing interest rates in US and also concerns on the long-term sovereign debt sustainability could trigger asymmetric yield movements within Europe, effectively increasing the spreads. Insurers are a big player in the sovereign bond market, being vulnerable to sovereign bonds' price volatility. Currently, spreads are remaining contained across sovereigns within Europe, but the fact that debt stocks increased substantially to facilitate post-pandemic recovery represent a potential concern going forward.

A sudden repricing of sovereign risk would adversely affect insurers. Insurers hold a significant share of sovereign bonds in their portfolios. The result of the conducted empirical analysis suggest that while yield increases have a positive effect on asset over liabilities, an increase in credit spreads

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[4] ECB staff macroeconomic projections for the euro area, September 2021.
[5] As of 15/10/2021. Source, Bloomberg.
[6] Please refer to chapter 6 for a topical discussion and analysis on the inflation risk and the impact it could potentially have for the insurance sector.

has a negative effect. A 100 basis point increase in credit spreads for countries with high sovereign risk is associated with a 7% decrease of asset over liabilities (see further details of the analysis in the fifth special theme - Key market factors: Inflation and government bond yields).

Besides government bond yields, it is noteworthy that the trajectory across the various corporate yields (Figure 2) is synchronised, implying that the spreads for corporate bonds remain also relatively contained and without huge variation. In any case, the risk of abrupt repricing of spreads, due to higher defaults and liquidity risk for the corporates (e.g. for sectors affected by the pandemic the most), remains relevant, in particular if financing conditions would tighten and policy measures fade out.

Figure 2: Bond yields (in %)
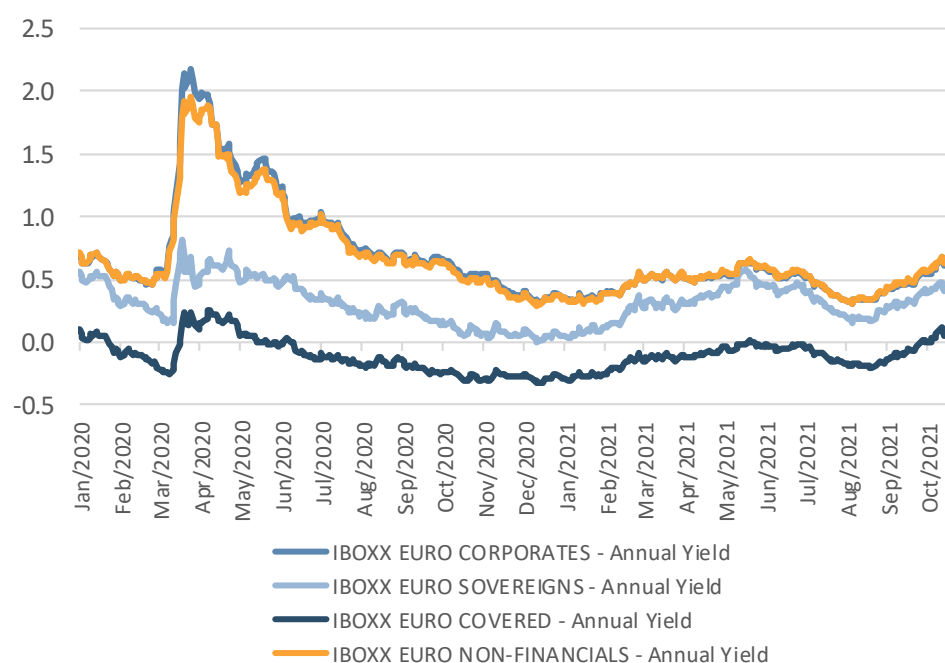
Source: Refinitiv. Last observation: 22/10/2021.

Notwithstanding the recent pick up in long term yields, the narrative of the low interest rate environment remains relevant, with the Euro swap curve still at lower levels than 2018 and 2019. This persistent low interest rate environment could cause a search for yield behaviour for insurers, either tilting to illiquid or risker assets. For example, the latest EIOPA risk dashboard shows a slight deterioration in the median average credit quality for financial stability groups. [7]

Insurers outperformed the market at the beginning of the year but since then they underperformed reflecting that other sectors are benefiting more from the current macro environment (Figure 3). In fact, insurers' stock prices (Stoxx Europe 600 Insurance in Figure 3) have not yet recovered the losses occurred due to pandemic shock. In terms of valuation, the price-to-earnings ratio reverted to the area of 12x, following the higher earnings in the first half of the year.

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[7] Please refer to this link.

Figure 3: Equity performance vs market and price-to-earnings ratio of insurers

Stoxx Europe 600 Insurance to Stoxx Europe 600 (LHS, rescaled)
Stoxx Europe 600 Insurance price-to-earnings ratio (LHS)
Stoxx Europe 600 Insurance - (RHS)
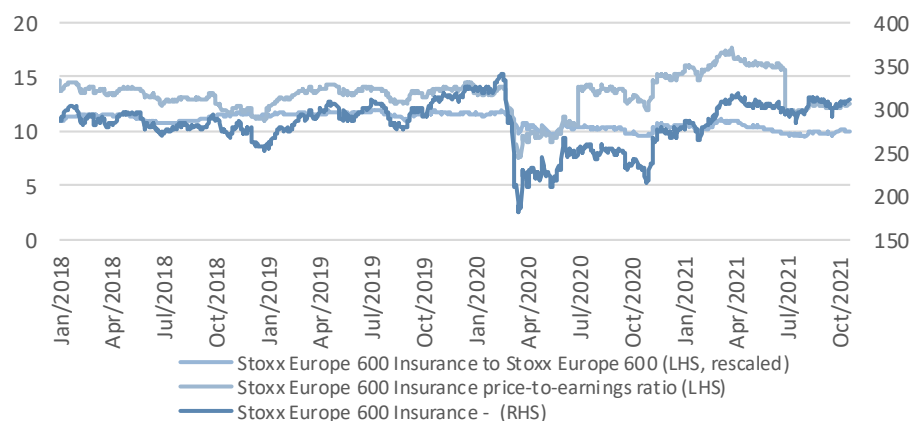
Source: Bloomberg and EIOPA calculations. The performance relative to the market it is taken as the ratio of the two indices. Last observation: 22/10/2021.

Financial market performance has positively affected insurers' profitability for the first half of 2021 (Figure 5). Moreover, life and non-life gross written premiums increased respectively by 24 and 14% on a year-on-year basis (Chart A.2.1 in Statistical annex). In addition, the solvency position for the sector remains solid. Life and composites undertakings improved their SCR ratio in the second quarter of 2021, with the median for life undertakings increasing from 212% in Q2 2020 to 233% in Q2 2021 and from 204% to 220% for composites (Figure 4), driven by the rise of the risk-free rate. For non-life, instead, the median of the SCR ratio remains stable in the second quarter of 2021 around 215% in comparison with the previous year.

Figure 4: SCR ratio by type of undertaking

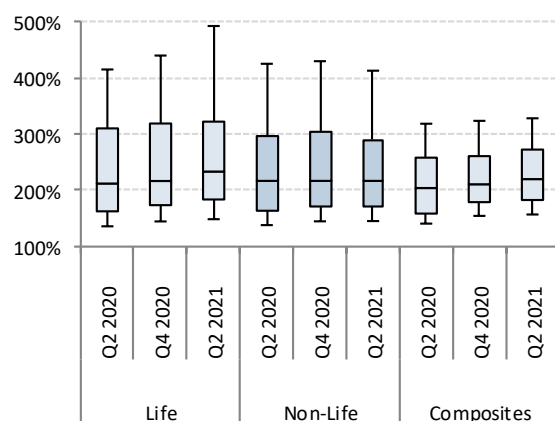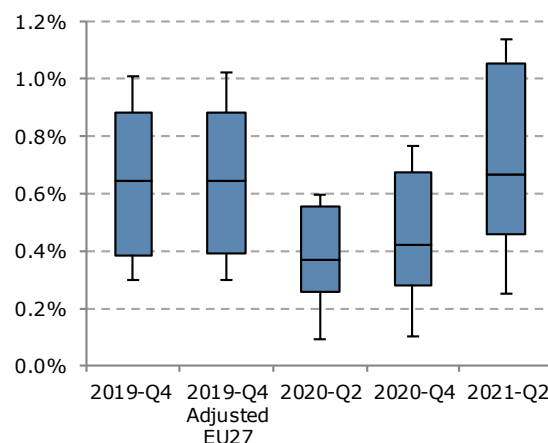Figure 5: Return on assets (in %; median, interquartile range and 10th and 90th percentile)

Source: SII Quarterly Reporting Solo.

Although the European insurance sector shows a certain degree of resilience towards an adverse scenario with a corporate yield shock combined with credit rating downgrades, insurers might be affected indirectly via bank exposures in case of failures of several banks. The exposure to non-

financial companies remains the main driver for credit risks, followed by exposure to sovereigns and financials due to concerns about delayed second round effects such as downgrades or insolvencies driven by the potential deterioration of macroeconomic conditions when supporting measures will be phasing out. Considering the importance of corporate bonds in European insurers' investments, EIOPA conducted a sensitivity analysis testing a scenario of yield shock combined with a transition analysis of rating downgrades. The estimated aggregate losses amount to 5-6% of the corporate bond portfolio. Most of the losses are due to the increase in spread, rather than to rating changes. Some insurers incur losses above 10% on the corporate bond portfolio. There is significant variation across countries, with those that have the highest duration of the bond portfolio being hit the hardest (see further details of the analysis in the second special theme - An analysis on the potential increase of corporate credit risk).

Nevertheless, the described scenario could be also materialised indirectly via insurers' exposures to banks. In this respect, **EIOPA conducted an empirical analysis of the direct impact of a bank failure on the insurance sector.** Insurers hold a significant portion of their investments in assets issued by banks. Therefore, the European insurance sector could suffer significant losses in the event of a hypothetical bank failure. These losses vary widely from country to country and from bank to bank. While for most banks there is little effect, a few banks are notably interconnected with the insurance sector. Their failure could lead to significant contagion and subsequent drop in the Solvency II ratios of some insurers. However, the overall direct contagion risk in case of idiosyncratic shocks appears currently contained (see further details of the analysis in the first special theme - Contagion risk analysis of the impact of a bank's failure on the insurance sector).

Cyber risk has become one of the most important risks for the European insurance sector with increasing momentum, but its understanding remains limited and data collection and cyber risk modelling need to be improved. Risk related to digitalization are expected to increase over the next 12 months. The home working set-up is becoming structural for some undertakings, raising concerns on the cyber security going forward. The number of cyber-attacks has increased, affecting banks and other types of institutions, and although the impacts are difficult to estimate, respondent NCAs fear that there will be more incidents affecting insurers. On the other hand, the new technologies being used could lead to enhance underwriting, operational and cyber risks for digital leaders (e.g. impact on profitability or claims reserving). In this respect, EIOPA has constructed indices confirming growing importance of cyber risk for the sector. Furthermore, the conducted empirical analysis indicates that market investors has not considered the overall sector being significantly affected by global cyber-attacks so far. It could suggest that cyber risk might be still underestimated and further work on data collection and cyber risk modelling will be needed to avoid any potential build-up of vulnerabilities of the sector (see further details of the analysis in the third special theme - Cyber risk and the European insurance sector).

Further developments regarding the expiration of temporary recognition of the UK-based Central Counterparties (CCPs) needs to be monitored due to the fact that many European insurers use derivatives that are subject to mandatory clearing in CCPs. Since the United Kingdom left the European Union, the regulatory landscape for clearing of derivatives is changing and there is some

uncertainty. While the share of derivative transaction cleared in the European Union increases over time, a large proportion is still cleared in UK-based CCPs. The temporary recognition of the UK-based CCPs is about to expire and the European Commission announced[8] its intention to propose the extension of the equivalence (see further details in the fourth special theme - EEA insurers' derivative transactions cleared in UK-based Central Counterparties).

This reports concludes with an **appendix** containing two additional items. The first discusses in detail the results of EIOPA's survey amongst NCAs on the risks and key vulnerabilities of the insurance and IORP sectors.[9] The second is a statistical annex showing the key relevant figures of the insurance and IORP sectors.

The results of the qualitative questionnaire, among national competent authorities (NCAs) suggest that both international and country specific macroeconomic conditions pose significant challenges. The most relevant concerns being the potential repricing of risks in financial markets if global liquidity conditions change, high inflation expectations and sovereign debt sustainability. Nevertheless, given the ongoing economic recovery, macro risks are expected to decrease, according to the respondents to the questionnaire. The exposure to non-financial companies remains the main driver for credit risks, followed by exposure to sovereigns and financials due to concerns about delayed second round effects such as downgrades or insolvencies when monetary and fiscal supporting measures will be phasing out.

Profitability and solvency positions for insurers remain robust, in any case, the tragic outcome of natural catastrophes in summer, raised awareness on the impact of environmental risk on the sector and the society as a whole. Results of the questionnaire also indicate that, going forward, ESG risks remain the top risk in terms of the highest expected increase in materiality for the insurance and IORP sectors, because of the increasing intensity and frequency of excessive weather circumstances. The exposure to commercial real estate (CRE) investments and the potential repricing on CRE remains a vulnerability. The EEA residential real estate market is experiencing rapid growth mainly triggered by the prevailing home working practises, low borrowing rates and economic recovery, with prices most likely exceeding their fundamental values. While exposures to the residential real estate market tend to be low for insurers and IORPs, imbalances could affect in a larger degree the banking sector and thus, the financial sector as a whole. Following the ongoing transition towards green assets, insurers and IORPs highly exposed to carbon based assets may lose value in their investment portfolios.

Moreover, **risks related to digitalization are also expected to increase.** The number of cyber-attacks has increased, affecting banks and other types of institutions, and although the impacts are difficult to estimate, NCAs fear that there will be more incidents affecting insurers. At the same time, cyber insurance demand will grow providing new business opportunities for insurers. Moreover, the new technologies being used could lead to enhanced underwriting of operational and cyber risks for digital leaders.

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[8] https://ec.europa.eu/commission/presscorner/detail/en/statement_21_5905
[9] For the full results and further discussion of the questionnaire, please refer to the annex.

SPECIAL THEMES

1. CONTAGION RISK ANALYSIS OF THE IMPACT OF A BANK'S FAILURE ON THE INSURANCE SECTOR[10]

The uncertainty on the macroeconomic and financial stability outlook surrounding the Covid-19 pandemics have resurfaced the discussion on the resilience of the insurance sector, including the risk of spillovers from insolvencies in other sectors. This chapter presents an analysis on the potential direct effect of a bank's failure on the insurance sector. Results show that although European insurers' exposures towards the banking sector are material, the direct contagion risk appears currently contained.

INTRODUCTION

Insurers hold a significant part of their investments in banking related assets. Banks' issued securities account for approximately 14% of total EEA[11] insurers' investments.[12] Given their relevance, it is important to better understand to what extent insurers are exposed to contagion risk stemming from a bank's failure.

Spill-over effects of the bank failures on the insurance sector have been observed in past crises in the European Union (EU). Historically, distress of insurers had multiple causes with investment losses often among the most important (in addition to reasons related to the management of insurers and underwriting issues). This was particular the case during the 2008-2009 Financial Crisis.[13] Prominent insurers' distresses were related to spill-overs from banks. In the Netherlands, ING, a bank-led conglomerate at the time, Aegon, an insurance-led conglomerate, and SNS Reaal, a financial conglomerate with approximately the same size of banking and insurance activities, were all rescued by the Dutch government.[14] Similarly, in Belgium, Ethias, one of the country's leading insurers, had to be rescued by the Belgian authorities following the near failure and bailout of Dexia bank, given an equity participation of Ethias. In all the examples above, where troubles originated in the banking sector, the respective governments concluded that the potential failure of the individual insurers could lead to systemic consequences and decided to bail them out instead.

This chapter presents results of a what-if analysis on the potential direct contagion of a bank's failure on the insurance sector. Granular asset-by-asset data of European insurers' holdings of bank

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[10] This note is an outcome of a joint pilot project between EIOPA and the Single Resolution Board. This analysis should not be reported as representing the SRB's view.

[11] EIOPA is an independent advisory body to the European Commission, the European Parliament and the Council of the European Union. The geographical scope of EIOPA is the EEA and the Solvency II reporting data are collected from the all National Competent Authorities. EEA refers to European Economic Area, which consists of European Union Member States and Iceland, Liechtenstein and Norway.

[12] See EIOPA FSR July 2021. This figure underestimates the total exposure because it does not account for holdings of banks' securities through investment funds holdings. This identification is not possible with Solvency II data from the Quantitative Reporting Templates.

[13] EIOPA (2018) - Failures and near misses in insurance: Overview of the causes and early identification.

[14] ESRB report on Recovery and resolution for the EU Insurance Sector: A Macroprudential View – August 2017

instruments are combined with detailed information on the liability structure of large European banks. This work is the result of a collaboration between EIOPA and the Single Resolution Board (SRB).[15]

APPROACH

The contagion effect is measured in terms of the impact on insurers' solvency positions, as defined by the Solvency ratio.[16] In the assessment, losses on bank instruments held by insurers would directly reduce an insurer's eligible own funds, while an unchanged Solvency Capital Requirement (SCR) is assumed. The analysis focuses on direct contagion and does not consider bank-insurance interconnectedness through indirect channels and second-round effects.

A what-if analysis is conducted on the basis of assuming an idiosyncratic failure of a bank. Each time, a failure of an individual bank under SRB remit was tested for any direct contagion effects towards the insurance sector. No simultaneous bank failures were considered. The starting point is a bank failure, which is simulated for each bank in turn. This work does not contain an assessment of a bank's vulnerability and does not take into account the business model, profitability or any other characteristics of analysed banks. Three scenarios with different levels of severity have been tested: low, medium and high severity, represented by a loss or initial exogenous shock of 5%, 10% or 15% of total liabilities including own funds of a given bank (see Table T1.1).

The assumed failure of a bank leads to a write down of its liabilities according to the national insolvency waterfall treatment. Losses are imposed on owners and creditors of a failing bank, including insurers, by taking into account how shareholders and creditors would incur losses if a bank were subject to normal insolvency proceedings. For this, information on the actual liability structure of the banks has been used. The approach takes into account the statutory ranking in insolvency as well as the differences in insolvency laws across EU Member States.[17]

Table T1.1: Percentage write down for liabilities and own funds items in each scenario

Scenario 1	Scenario 2	Scenario 3
Bank-specific percentages of haircuts applied to liabilities to reach write-down of		
5% bank's total liabilities including own funds	10% bank's total liabilities including own funds	15% bank's total liabilities including own funds

The write down of banks' liabilities is mapped into losses on insurers' assets. For each insurer's asset class in Solvency II data, the analysis sets a corresponding bank liability, defined in line with

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[15] Both institutions contributed with methodology and by analysing granular data without any exchange of confidential information.

[16] The Solvency ratio is the ratio between eligible own funds and the solvency capital requirement (SCR).

[17] Please note that there is no bank-specific insolvency framework within the EU. Moreover, the national frameworks are not fully harmonized and may vary across the individual EU Member States, reflecting national regulatory traditions.

the national insolvency hierarchy. For instance, covered bonds held by insurers are mapped into secured liabilities of banks (see table T1.2). Moreover, the granular insurers' list of assets is used to map each security with the issuer (bank) and to create a multilayer network of insurers-banks links, with each insolvency category representing one layer. The main data limitation in the analysis is that Solvency II data do not distinguish the holdings of non-preferred senior claims by insurers. In this exercise, it is assigned following the assumption that an insurer would broadly mimic the same distribution/shares in its portfolio as the share of non-preferred senior claim (of total senior corporate bonds) in the bank liability structure. Losses on banks' liabilities are mapped into haircuts of insurers' assets (holdings of banks' instruments).

Table T1.2: Mapping of bank liability structure to insurer list of asset structure

Bank liability	Insurer assets – SII Complementary Identification Code (CIC)	Sample share of insurers' bank assets
L1 Equity	Equity (CIC 3)	1%
L2 Subordinated	Convertible bonds, hybrid bonds, subordinated bonds (CIC 22, 25, 28)	13%
L3 Senior non-preferred	Share of corporate bonds* (CIC 21)	11%
L4 Senior unsecured	Share of corporate bonds*, commercial paper, money market instruments, uncollateralized loans, other mortgages and loans (CIC 21, 23, 24, 29, 81, 89)	47%
L6 Deposits	Transferable deposits, other deposits (CIC 72,73,74,79)	14%
L9 Secured	Covered bonds, collateralized loans (CIC 26, 27, 82, 85)	14%

Note: * The split of corporate bonds between the two categories has been defined based on bank liability structure.

The contagion analysis uses two outcome variables related to the impact on insurers' solvency positions. The first one is the number (and market share) of insurers falling short of solvency capital requirements, i.e. the SCR ratio drops below 100%. The second is the market share (and the number) of those insurers for which the SCR ratio falls by more than 10 percentage points. Market share is measured in terms of total assets of the insurance sector. This measure provides an indication on how the overall health of the insurance sector might have been affected, even if this was not translated into individual insurers' distress. In case a large number of insurers lose some of their buffers, as measured by the percentage loss of eligible own funds exceeding the SCR, the sector as a whole might become vulnerable to any future shock. Indicators at EEA level as well as at individual countries level were looked at.

DESCRIPTIVE STATISTICS OF THE BANK-INSURANCE NETWORK

The analysis focuses on around 100 significant banks in the Banking Union (BU). In the scope are banks under remit of the SRB,[18] including significant banks under the direct supervision of the European Central Bank as well as cross-border less significant banks under the supervision of national bank supervisory authorities. This puts the emphasis of the analysis on banks, which are, due to their size, interconnectedness or importance for national economies, expected to pose financial stability risk in case of their failure.

For the insurance sector, the analysis covers all solo insurers in the EEA.[19] Out of the total Solvency II sample, there are 1,388 insurers with holdings in their assets of instruments issued by banks under the remit of the SRB (i.e. considered in the analysis). All type of insurers are covered: life, non-life, composites insurers as well as reinsurers.

The bank-insurer network[20] **exhibits very low density, with a subset of a few well connected banks and insurers.** In total, across all insolvency layers, 12 770 bank-insurer combinations were observed in the sample, which implies a density of the network of almost 9% (see Figure T1.2).[21] The majority of links are small in volume. On average, holdings of 28 million Euro are observed. There are only 38 bank-insurer combinations with holdings of more than 1 billion Euro and there are 614 combinations of more than 100 million Euro. Moreover, median level of interconnectedness with the other sector is around 38 for banks and around 7.5 for insurers (see Figure T1.1). However, the sample is very heterogeneous: there is a group of a few highly interconnected entities across the two sectors while one quarter of entities does not show large cross-sectorial interconnectedness (1st quartile equals to 15 connections for banks and to 3 connections for insurers).

Bank instruments held by insurers are heterogeneous in terms of the type of assets. Insurers' assets issued by banks under SRB remit are around 350 bn. Euro or 4% of total insurers' investments. The sample covers around 30% of all bank instruments held by EEA insurers.[22] Bank bonds are the most important asset class issued by banks in which insurers invest. Exposures of insurers towards SRB banks (i.e. banks in our sample) are tilted more towards bonds and less for example towards equity than the full SII reporting sample.[23] When focusing on bonds, it is also

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[18] List of banks here: https://www.bankingsupervision.europa.eu/banking/list/html/index.en.html. Note, that the SRB is the central resolution authority within the Banking Union, which consists of 19 Euro Area countries, Bulgaria and Croatia. This means that banks of other EU countries (namely Denmark, Poland, Czechia, Hungary, Romania and Sweden) are not covered in this analysis.

[19] EIOPA collects insurers' Solvency II reporting data from all National Competent Authorities in the EEA. This analysis looks at the impact of the potential individual failure of each of the around 100 significant banks in the Banking Union (BU) under remit of the SRB on the EEA insurance sector.

[20] Please note that the analysis considers only one direction, i.e. direct contagion risk from banks to insurers due to insurers investing in banking related assets and not vice-versa.

[21] Density is defined as a share of existing bank-insurer connections over the amount of possible bank-insurer connections. Connections among banks, connections among insurers, and insurers with zero bank connection are not taken into account.

[22] Not covered bank assets in this analysis are either issued by non-BU banks or by less significant BU banks which are not under remit of the SRB.

[23] Financial Stability Report July 2021 | Eiopa (europa.eu) Figures 5.33 and 5.34.

noteworthy that exposures towards SRB banks are tilted more towards senior and subordinated bonds rather than covered bonds, which tend to be characterized by low risk.

Figure T1.1: Boxplot of degree (by type)	Figure T1.2: Bank-insurer network (binary)
	Note: blue dots represent banks and red dots represent insurers. Size of dots is conditional on degree (number of connections) by type.
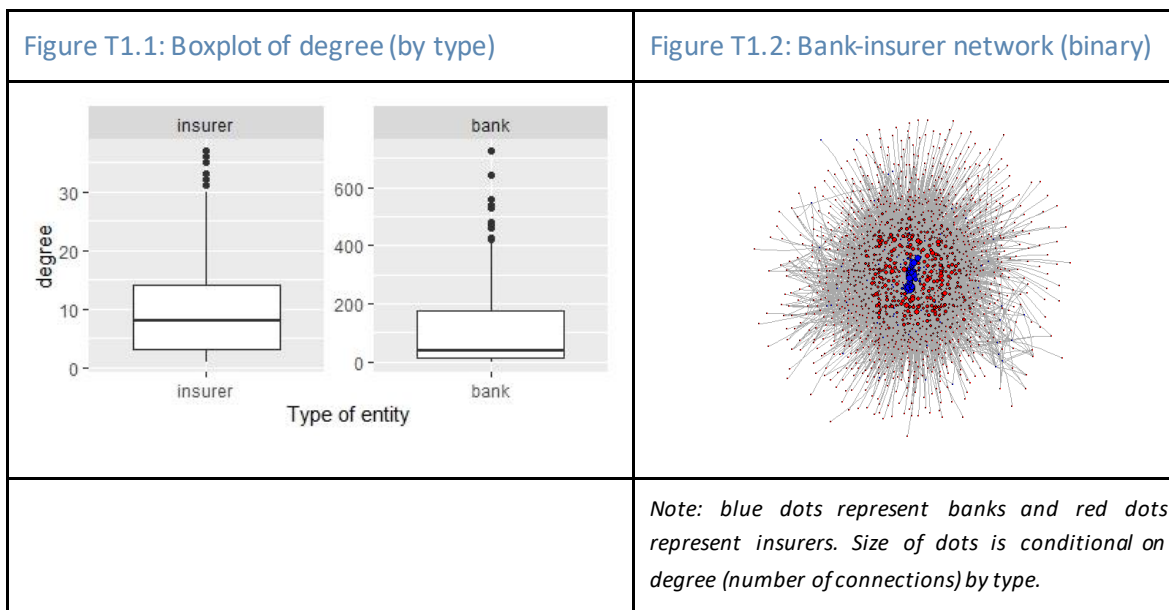
Overall, the network is very concentrated. It follows that in case of a highly interconnected bank failing, a large number of insurers would get affected while a highly diversified and interconnected insurer would be affected by a large number of idiosyncratic failures in the banking sector. The picture differs if individual insolvency layers are looked at.

POTENTIAL LOSSES OF THE INSURANCE SECTOR

In case of a bank's failure the potential loss to the whole insurance sector does not exceed 2% of overall holdings of bank assets by the insurance sector in Scenario 1. The frequency of higher loss ranges increases with the severity of the tested scenarios, however the vast majority of single bank failures across the three scenarios does not impose overall losses on the whole insurance sector larger than 1 billion EUR (less than 0.3% of overall holdings). Moreover, in half of cases under Scenario 1 and almost one third under Scenario 2, the total loss to the insurance sector across the EEA is below 10 million EUR. However, when interpreting the losses, one needs to acknowledge that in some countries with a smaller insurance sector, even small losses might still have a contagion effect on the national insurance sector.

Figure T1.3: Histogram – Losses for the European insurance sector by failing banks across different scenarios
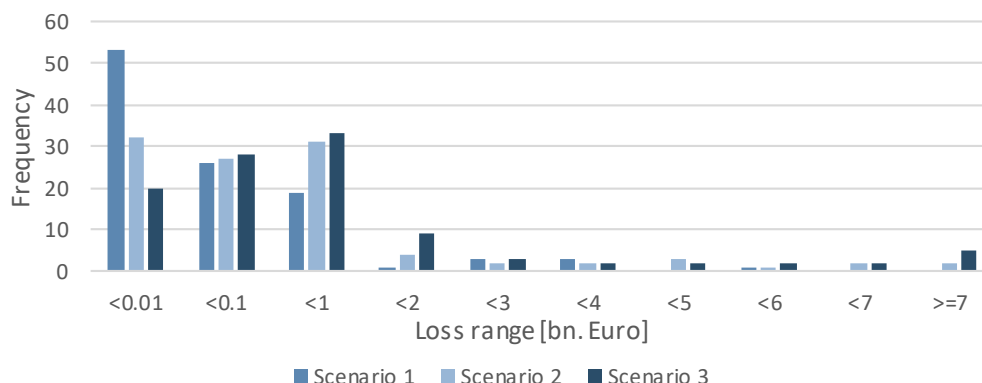
Majority of potential losses seem to be concentrated within the insurance sector in a few countries. Differences in average loss between countries indicate heterogeneity in insurers' investment strategies across countries. For instance, while French insurers predominantly hold instruments issued by large banks in the sample, German insurers tend to also hold non-negligible portion of banks instruments of banks, which are out of the scope of this analysis.[24]

Figure T1.4 - Average loss by insurer country in the three scenarios [bn. Euro] (left-hand axis) and average loss (%) in relation to total assets of national insurance sector in scenario 3 (right-hand axis)
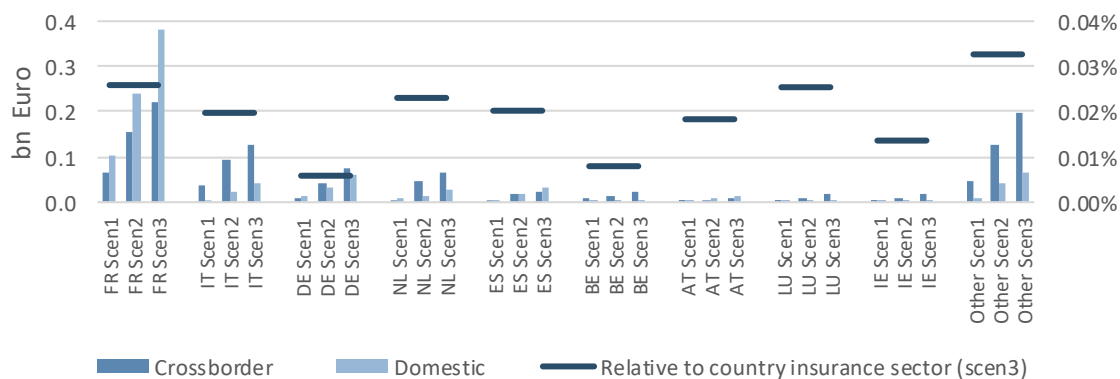
Note: Bars display the bank-average loss of a country's insurance sector by scenario split in domestic and cross-border loss. Lines display the combined bank-average loss relative to the size of country's insurance sector. For the FR example, bank-average loss of 0.6 bn. compares to total assets of the insurance sector of 2,300 bn.

In relative terms, however, with respect to the size of the insurance sector in individual countries, the potential losses in all the countries of the analysis remain below 2.5% of total insurance assets on average (by idiosyncratic bank failure) and in the largest countries below 1% of total insurance assets on average in the most severe scenario. An interesting finding is that besides domestic

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[24] In this analysis, German insurers' exposures are low even though German insurers hold many bank assets (17% of total investments) as shown in the EIOPA July 2021 Financial Stability Report (table 5.31). The largest holdings of banks' assets of German insurers regard banks that are not under the SRB remit.

contagion (bank and insurer domiciled in the same country), cross-border contagion (bank and insurer are from different countries) is relevant too, and even higher on average in some countries consistently across the three scenarios.

Potential losses of individual insurers are scenario and failing bank dependent. A number of factors interplay the individual insurer's potential loss in the three scenarios. More specifically, on the insurer's side, these are the volume and type of bank's assets holdings (with more junior instruments being of higher risk of being written down) and on the bank's side, it is the liability structure of the failing bank which affects which types of instruments will be written down following an exogenous shock in line with the three scenarios. Following an exogenous shock (a failure of a single bank), an insurer will be exposed to a loss of 9%, 23% and 36% respectively on average on its holdings of instruments of this single bank in Scenarios 1, 2 and 3 respectively. The holdings by insurers of instruments of banks other than the failing bank will not get affected.

Figure T1.5 - Effects of loss scenarios on an insurer holdings of bank instruments (stylized example)
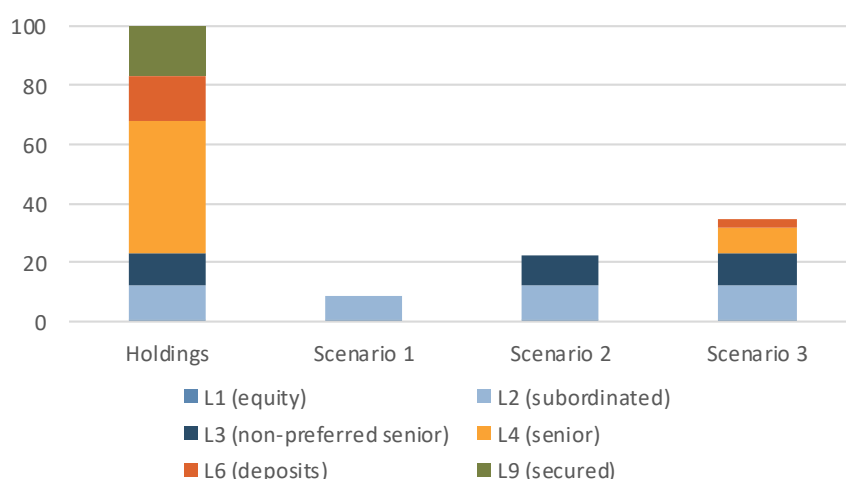
Note: In the first column, this stylized example assumes holdings by an insurer of a bank instruments of the same structure as the average holdings by EEA insurers of SRB banks instruments. It also assumes that the bank issued instruments across all insolvency categories as well as that the insurer holds instruments of the bank across all these categories. The write-down percentages across scenarios are illustrative and represents the average size of the loss of insurers across each of the three scenarios.

In case of a bank's failure, insurers' holdings will get affected in line with insolvency hierarchy. Across all three scenarios, the most junior instruments, namely equity and to a large extent also subordinated bonds, will be written down. In Scenario 1, the majority share of subordinated debt is not lost, whereas this insolvency category is fully written down for the other two scenarios. Scenario 2 and 3 might also affect non-preferred senior debt but also senior unsecured debt and deposits, with Scenario 3 using these instruments with higher frequency. The stylized example in Figure T1.5 shows the details of possible effects.
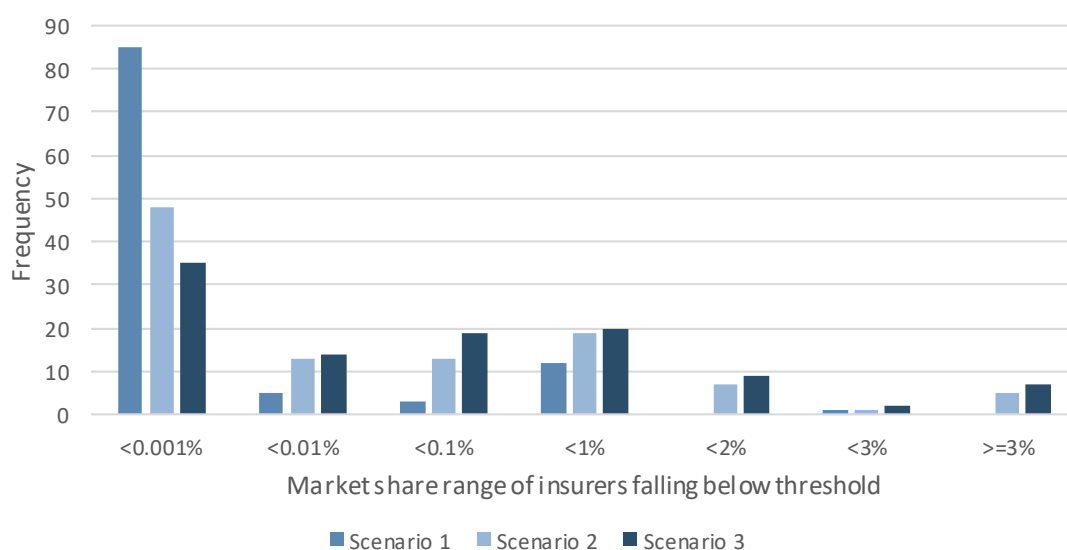
DIRECT CONTAGION EFFECTS

The results indicate resilience of the insurance sector in general, however a failure of a few banks (only idiosyncratic failures are assumed, simultaneous failures of several banks are not considered) could lead to contagion towards individual insurers under the most severe scenario. The contagion effects increase with the severity of the scenario, but the vast majority of idiosyncratic bank's failures does not lead to non-compliance with SCR ratios in the insurance sector. Their resilience is supported by the diversification of insurers' portfolios as well as by the high presence of banks' covered bonds in portfolios of many insurers. For almost all banks no insurer would fall below 100% under any of the three scenarios. For scenario 1, an idiosyncratic failure of one bank under SRB remit could lead to a situation where one insurer in the EEA could see their solvency ratios falling below 100%.[25] For scenario 2, the failure of up to 8 banks could lead to a situation where up to two insurers could see their solvency ratios falling below 100%. With the most severe scenario 3, the failure of up to 18 banks could lead to a situation where up to three insurers could see their solvency ratios falling below 100%.

The overall risk to the insurance sector seems to be contained too. Despite the overall positive outcome, the result of previous analysis could be driven by insurance entities which have relatively lower solvency ratios already at the start of the analysis. Figure T1.6 displays the market share of insurers which would be affected by a 10 percentage points loss in terms of the SCR ratio. The distribution illustrates that for the majority cases there is only a small effect. Nevertheless, with the most severe scenario, a few cases of significant contagion of insurer with more than 3% of market share could also be observed.

Figure T1.6: Histogram of market share of insurers with significant contagion by failing bank

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[25] Each time, a failure of an individual bank under SRB remit was tested for any direct contagion effects towards the insurance sector. No simultaneous bank failures were tested.

Contagion on a country-level appears to be different. The overall results may be dominated by large countries. Insurers from the large jurisdictions such as Germany and France dominate the picture when interpreting figures such as market shares of the EEA in terms of total assets, such that significant contagion of banks on insurers in smaller jurisdictions may not be fully visible. The following analysis calculates the bank average market share of insurers for each country. As above, the outcome variable is a loss of 10 percentage points by insurer in terms of the SCR ratio when a given bank fails. For any of the countries, the market share of insurance companies with significant contagion effect is below 1.5%, even in the most severe scenario. The effects in Scenario 1 at the country level are negligible (reaching maximum 0.2% of affected market share). With the increased severity of the scenario, more insurers get impacted, but the effect is not linear and not identical across individual countries. When looking at Scenario 3, France reaches a market share of significantly affected insurers of 1.4%, Italy of 1%, followed by Portugal and Latvia (around 0.9%).

Figure T1.7: Country-level market share in terms of total assets of insurers with significant contagion (average by all failures tested within each scenario).
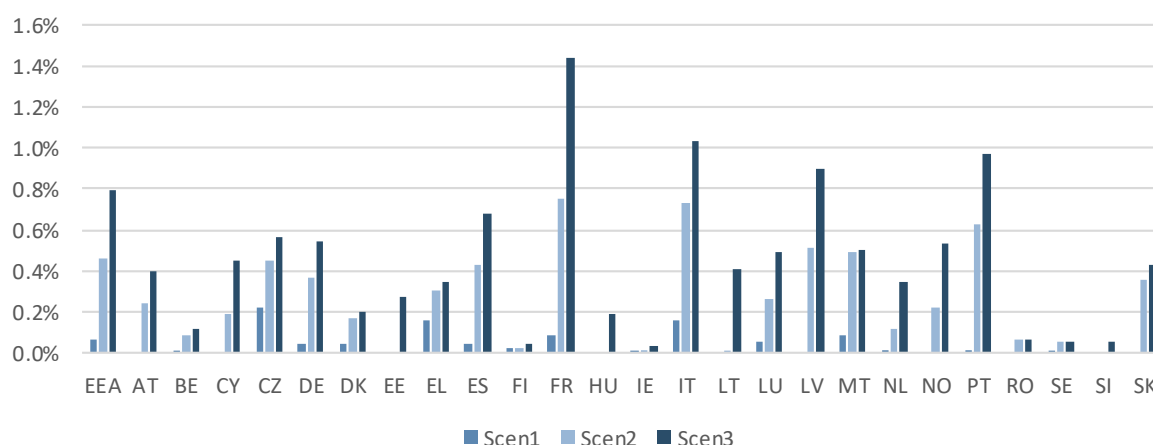
Note. Only countries with non-zero market share of significant contagion are displayed. Note, that the analysis covers insurers from NO, IS, DK, SE, PL, CZ, HU, RO but not banks from those countries.

FINAL REMARKS

This chapter analyses the impact of a hypothetical failure of a given bank under SRB remit on the European insurance sector in a multi-layer network set-up. The assessment looks exclusively on the direct contagion risk via insurers' investment channel. This is a relevant channel, as insurers put a significant proportion of their investments into instruments issued by banks. Having said this, the results might underestimate the overall interlinkages, as no indirect contagion has been considered in the analysis.

This is the first time the properties of the bank-insurance network have been analysed by using Insurers Solvency II reporting data. Following the insolvency hierarchy, a multi-layer network has been constructed. The structure of the network points out that there is a small number of banks which are highly interconnected with the insurers in the scope and their failure could be a possible source of concern. Similarly, there is a small number of well diversified and interconnected insurers

with the banking sector, which would get affected in case of a large number of idiosyncratic failures in the banking sector.

There are a number of interesting results from the direct contagion analysis. The results are unique as this is the first time the information on insurers holdings of banks instruments were analysed, in a scenario set-up, from the perspective of their likelihood of being written down in case of a bank's distress. First, the vast majority of bank's failures do not lead to subsequent failures in the insurance sector. Second, a failure of a few banks could lead to Solvency II ratios of some insurers falling significantly. However, the overall health of the insurance sector does not seem to be affected. Lastly, there is a high heterogeneity between countries of all considered direct contagion effects.

Designing scenarios is a powerful way to encourage discussion and to understand the consequences of any possible future events. Therefore, three scenarios of different severity have been tested for the purpose of this report. This is to address the uncertainty related to the situation in which a bank might be failing, but the plausibility of each of the scenarios depends on the bank in question. More specifically, there is a large diversity of the banks under SRB remit in terms of their solvency ratios and excess of capital. A possible failure of a bank with sufficient excess of capital would require a large exogenous initial shock to declare such a bank failing, as compared to a bank operating on the margins of the minimum capital ratio. It follows that not every bank will be in breach of its capital requirements (and thus failing) following a shock of magnitude of scenario 1 (or even scenario 2). At the same time, for many banks under SRB remit the initial shock of the magnitude as presented in scenario 3 could be considered as very extreme. It could be reasonably expected that policy actions towards such a bank will be taken before such an initial shock materializes and before it translates into spillover effects towards the insurance sector.

From both macroprudential and resolution perspective, cross-sectorial interconnectedness is needed and desirable for favourable financing conditions if the contagion is contained and well understood. Conditional on the insurers understanding the risk, it is a positive development when insurers invest in bank instruments, as they represent long term investors well suited to also bear losses in case of the tail risk of bank failures. Moreover, insurers investing into bank instruments diversify the pool of shareholders and creditors and thus tend to reduce the magnitude of the shock on an individual shareholder or creditor. It is crucial, however, to ensure continuous monitoring of the interconnectedness between banks and insurers, to better understand the different channels and related interconnectedness within the financial sector, to ensure that the joint goal of financial stability across all economic agents is maintained at all times.

2. AN ANALYSIS ON THE POTENTIAL INCREASE OF CORPORATE CREDIT RISK

Since the outbreak of the Covid-19 pandemic, risks to non-financial corporations and potential second round effects for financial institutions have been a main concern. So far, public support measures have succeeded in preventing widespread defaults and somewhat alleviated concerns. As corporate bonds represent a large part of EEA insurers' investments, this article evaluates the sensitivity of EEA insurers' corporate bond portfolios to a scenario of an increase in the corporate credit risk environment with subsequent downgrades. Results point to overall resilience in the sector, with some pockets of risk in portfolios with especially long durations.

INTRODUCTION

This article seeks to assess the vulnerability of EEA insurance undertakings to a scenario of a significant rise in the credit risk environment with potential downgrades of bonds and its issuers. Corporate bonds are a major investment class for insurers in the EEA, accounting for about a quarter of total investments in assets not belonging to unit-linked or index-linked contracts. Compared to government bonds, corporate bonds offer higher yields, while being historically more stable than e.g. equity investments in firms. However, downside risks remain, as the recovery since the outbreak of the Covid-19 pandemic is still ongoing. Several uncertainties loom, e.g. in global value chains, which could amplify corporate vulnerabilities and lead to a possible scenario of repricing and downgrades.

The assessment of credit risk in EEA insurers' portfolios builds on the scenario of the EIOPA insurance stress test 2021[26]. The narrative of the stress test is a prolonged Covid-19 scenario that entails a further economic slowdown and sustained drop in GDP. On the corporate side, the scenario cites increasing concerns about the sustainability of corporate debt leading to a widening of corporate credit spreads and provides a set of calibrated yield shocks to corporate bonds, reflecting the heightened credit risk environment. As an extension to this scenario, the following analysis evaluates the impact of a set of transition matrices calibrated in line with the GDP drop assumed for the stress test scenario, in order to estimate the impact of potential downgrades on the corporate bond portfolio of EEA insurers. The downgrades may be considered more long-term than the instantaneous shocks to the spreads that are prescribed in the stress test. This analysis therefore sheds light on potential longer-term consequences of a prolonged Covid-19 scenario by explicitly considering rating migrations.

DATA AND METHODOLOGY

The analysis relies on data reported by undertakings through the Solvency II Quantitative Reporting Templates (QRTs). In particular, template S.06 which lists undertakings' asset-level

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[26] For more details please refer to 2021-stress-test-technical-specifications-v1.1.pdf (europa.eu)

holdings was used to retrieve undertakings' corporate bond holdings. The reference date is year-end 2020, in order to ensure consistency with the calibration of the market shocks in the stress test, as well as the transition matrices. The data comprises all holdings listed as CIC code 2, which refers largely to classic corporate bonds, but also includes holdings in covered bonds.

The yield shocks owing to a general increase in the credit risk environment are taken from the EIOPA insurance stress test 2021. The application of the yield shocks is also in line with the technical documentation to the EIOPA insurance stress test 2021 per rating grade and world region. The rating classification of the insurers' portfolio uses three sources (all reported in template S.06). Wherever possible, we take the reported credit quality step (CQS). Where CQS is not available, we take the reported external rating and finally, as a last resort, reported internal rating. This approach increases the coverage for holdings of corporate bonds with a reported rating to 95% overall[27]. Unrated holdings that remain after the rating enrichment are thus assigned a yield shock according to the shock for BBB-rated holdings.

Transition matrices have been calibrated to be in line with the scenario of the EIOPA insurance stress test 2021[28]. In order to calculate the post-downgrade value of corporate holdings, i.e. the additional increase in yield over the general increase in credit risk due to the downgrade, an estimated change in spread is used. This change in spread is approximated by the past year's average yield differential between EU, UK and US corporate bond indices per rating grade. Rating withdrawals (WR) after the rating transitions are treated as unrated holdings[29].

The market value for each bond after the application of the yield shocks, as well as the transition matrix and downgrade shocks is estimated as:

$$New\,Value = Reported\,value \times (1 - \frac{Duration \times \frac{Spread\,change\,in\,bp}{100}}{100})$$

The analysis provides an estimation for the materialisation of a scenario of increased credit risk and also a good approximation of the impact of including rating transitions in it. Still, they it is based on a "top-down" approach and results could therefore differ somewhat from the impact calculated by undertakings or groups with more detailed information about each individual asset, its specificities or group structure. As detailed data on cash-flows per bond are not available, new market values are approximated via the formula above using the bonds' modified duration as reported in the QRTs. An underlying assumption is thereby linearity of the price impacts, which is a simplification of the actual, convex relation. The estimated price impacts might therefore overestimate the impact of a yield shock on the market value of a bond. Further, the data does not detail whether a bond has a floating rate or a fixed coupon. All corporate bonds are treated as plain

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[27] Assets with reported CQS cover 85% of corporate bond holdings. The coverage was increased by including external and internal ratings reported by the undertakings.

[28] Chart 1 in the appendix shows the portfolio allocation per rating grade before and after applying the transition matrices.

[29] As rating withdrawals often refer to bonds maturing, those holdings can also be assumed to be rolled over, i.e. replaced with bonds of the same rating. Therefore, as a robustness check, the rating withdrawals have been taken as retention in the same rating grade, which did not significantly alter the results.

vanilla corporate bonds, i.e. having a fixed coupon, which might overestimate the impact of the yield shocks on a floating rate bond's market value. Finally, the analysis is carried out on a solo undertaking level and thus includes intragroup transactions, which might be consolidated on group-level.

RESULTS

The results presented in the following refer to corporate bond holdings belonging to neither unit-linked or index-linked contracts, which amount to 1,826 bn EUR. They represent 96% of total EEA corporate bond holdings by insurers (the rest are assets belonging to unit-linked or index-linked contracts). The figures for the impact of the increase in credit risk, as estimated by yield shocks per rating grade, as well as the transition matrices and shocks on downgrade are presented as losses on the initial market value of the corporate bond portfolio. Losses expressed in the following refer only to losses in market value and do not consider any hedging, effects on the liabilities or hold to maturity strategies. Further, the analysis only focuses on corporate bonds. In a scenario as outlined in the introduction, impacts on other asset classes such as e.g. equities are likely to arise, but are not addressed here.

EEA AGGREGATE

A total of four scenarios are calculated to evaluate the impact of rating transitions, as well as differences in the sequence of events. In a scenario analysis of increased credit risk, effects are usually expected to be simultaneous, i.e. increases in yields as well as rating transitions happening at the same time. As the transition matrix however alters the portfolio composition per rating grade, assumptions are needed to establish a sequence of events with which the shocks are applied to the portfolio under which composition. The calculated scenarios are:

(1) As a baseline scenario, only the general increase in credit risk and the corresponding yield shocks are considered and applied to the initial portfolio holdings.

(2) The transition matrices are applied to the initial holdings, afterwards the yield shocks are applied to the then post rating transition-portfolio.

(3) On top of scenario (1), i.e. on post yield shock-holdings, transition matrices are applied, as well as corresponding shocks on downgrade.

(4) First applying the transition matrix and corresponding shocks on downgrade to the initial portfolio, then applying the yield shocks owing to the general increase in credit risk to the post transition matrix and downgrade shock-holdings.

The assumptions on the sequence of events in a scenario of an increase in the credit risk environment, i.e. general increase in yields and rating transitions, are shown in scenarios (3) and (4). Intuitively, one would expect markets to reprice and adjust before credit rating agencies restate ratings of bonds or issuers. This corresponds to the sequence of events in scenario (3), while scenario (4) assumes the inverted sequence of events as a robustness check.

Table T2.1. Scenarios and impacts

		(1) Impact of yield shocks	(2) Impact of rating transitions and yield shocks	(3) Impact of yield shocks; rating transitions and downgrade shocks	(4) Impact of rating transitions and downgrade shocks; yield shocks
Total		**-5.31%**	**-5.38%**	**-5.55%**	**-5.59%**
Financial	Total	**-5.50%**	**-5.57%**	**-5.69%**	**-5.74%**
	EU-EEA	-5.56%	-5.61%	-5.74%	-5.79%
	UK	-5.18%	-5.28%	-5.38%	-5.43%
	US	-4.77%	-4.98%	-5.09%	-5.19%
	Other advanced economies	-6.15%	-6.22%	-6.24%	-6.30%
	Emerging markets	-5.99%	-6.05%	-6.12%	-6.14%
Non-financial	**Total**	**-5.02%**	**-5.09%**	**-5.35%**	**-5.37%**
	EU-EEA	-4.99%	-5.04%	-5.32%	-5.33%
	UK	-5.51%	-5.71%	-5.89%	-5.89%
	US	-4.88%	-5.03%	-5.27%	-5.32%
	Other advanced economies	-5.06%	-5.09%	-5.19%	-5.22%
	Emerging markets	-5.70%	-5.76%	-5.93%	-5.93%

The overall impact of the four scenarios range from losses of 5.3% (1) to 5.6% (4) of market value on the initial value of the corporate bond portfolio. For the scenarios considered, the impact of the transition matrix and corresponding additional yield shocks for downgraded bonds is thus limited and only adds about 5% of additional losses, i.e. 0.3 percentage points, over the yield shocks owing to the general increase in credit risk. On aggregate, the losses on the corporate bond portfolio amount to 7% of excess of assets over liabilities. The sequence of applying either the transition matrix and shocks on downgrade or the general yield shocks does in this scenario not affect the results significantly. The discussion will in the following thus focus on scenario (3), as it poses the more economically intuitive sequence of events.

DISTRIBUTION ACROSS UNDERTAKINGS

The distribution of losses by country shows some heterogeneities but does not exhibit serious outliers. Median losses range between 2% and 6%, while the EEA median loss amounts to 4.2%. Differences across countries (and undertakings) can largely be explained by the duration of the respective portfolio, as the approach to calculate the new market value of a given bond approximates the price discount through the yield shock as multiples of the duration.

Figure T2.1: Distribution of losses on the initial corporate bond portfolio after yield shocks and rating transitions (lhs, in %) and median duration of corporate bond portfolio (rhs)
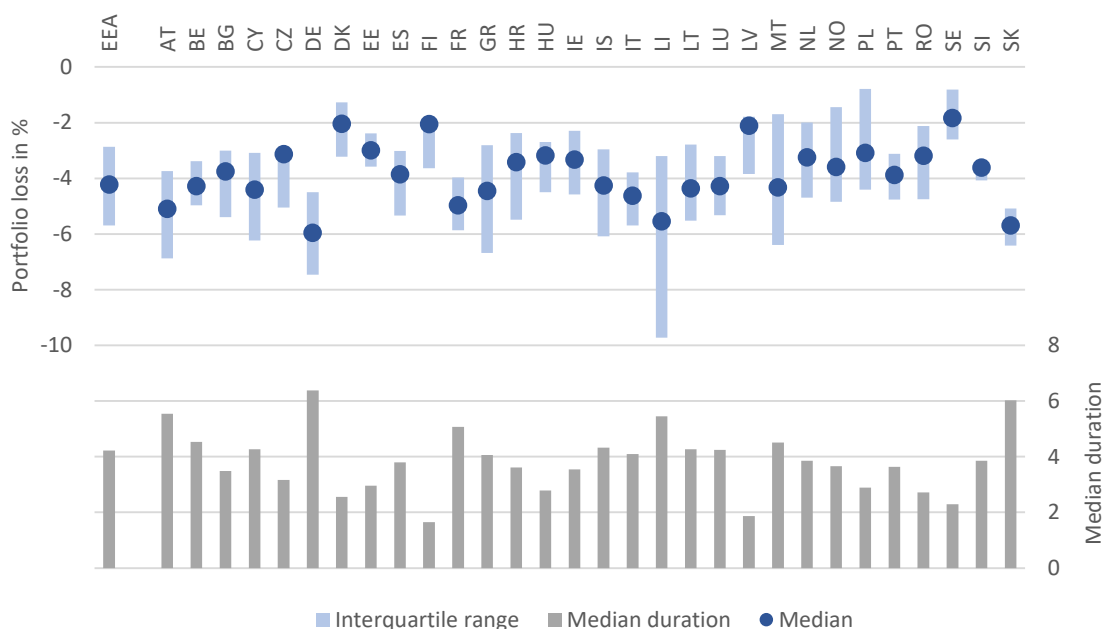
Note: The distribution of losses on the corporate bond portfolio across undertakings is reported on the left axis in percent. Blue dots denote the median loss, while light blue bars mark the interquartile range of losses for undertakings in a given country. The grey bars depict the median portfolio duration.

Overall, the vulnerability to the downgrade scenario is limited, with only few undertakings exhibiting an increased sensitivity to rating transitions. Compared to the baseline scenario (1), i.e. only taking into account the yield shocks owing to a general increase in credit risk, a maximum of 2.5 percentage points of losses on the initial corporate bond portfolio is added. For most undertakings, the additional loss through the rating transition scenario is in line with the overall impact of adding about 5% of losses, only in a limited number of cases do the additional losses add more than 10%.

Similarly, the total losses from a scenario of increased credit risk with rating transitions only surpass 10% of initial corporate bond holdings or 20% of excess over liabilities for a limited number of undertakings. Losses on the initial corporate bond portfolio peak at 47% (amounting to 17% of excess of assets over liabilities). Undertakings with the largest losses exhibit portfolio durations well above the EEA average of about 6 and reach up to 50.

Figure T2.2: Additional losses through rating transitions and shocks on downgrade (lhs, in percentage points) and relative increase over initial losses through general yield shocks (rhs, in %)
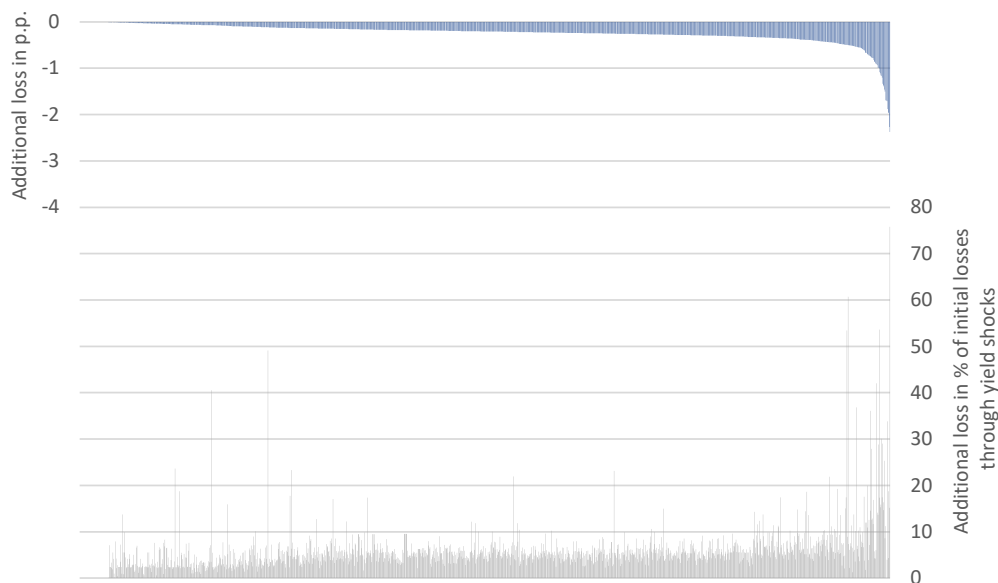
Note: Blue bars denote the additional loss incurred through rating transitions and shocks on downgrade over the general yield shocks, i.e. the difference between scenario (1) and scenario (4). Grey bars depict the additional loss as a percentage of initial losses through scenario (1).

Figure T2.3: Total losses through yield shocks, rating transitions and shocks on downgrade on corporate bond portfolio (lhs, in % of initial value) and relative to excess of assets over liabilities (rhs, in % of EAoL)
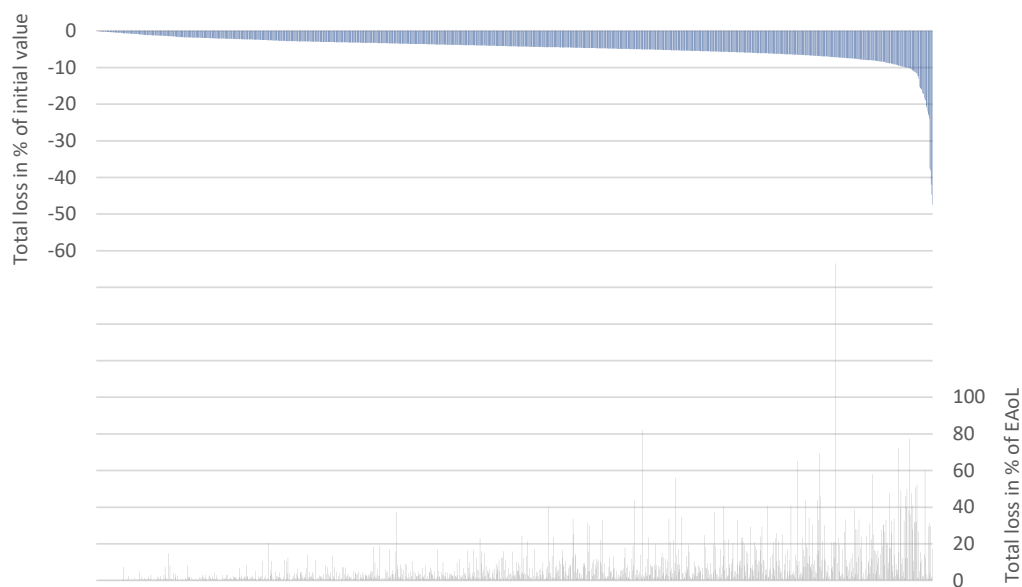
Note: Losses refer to scenario (4), i.e. the impact of general yield shocks, rating transitions and shocks on downgrade. Blue bars denote the loss incurred on the initial value of the corporate bond portfolio in percent. Grey bars depict the loss as a percentage of assets over liabilities.

FINAL REMARKS

On aggregate, the scenario analysis suggests that EEA insurers' corporate bond portfolio is resilient towards a scenario of increased credit risk accompanied by rating downgrades. The overall losses in market value on the corporate bond portfolio amount to 5.6%, which corresponds to 7% of total excess of assets over liabilities. The distribution across undertakings however shows a number of undertakings that incur losses above 10% on the corporate bond portfolio. Further, for a small number of undertakings losses exceed 50% of excess of assets over liabilities. While these losses do not consider any hedging, effects on the liabilities (for instance due to LTG measures) or hold to maturity strategies, they still point to pockets of risk in certain portfolios, e.g. with especially long durations. Moreover, the analysis focuses on corporate bonds only, while in a scenario as described above, losses on other assets such as e.g. equities are likely to arise. The results also show that in the scenario assessed, the largest share of the losses can be attributed to the increase in spread, rather than from rating migrations (which include both downgrades and upgrades).

APPENDIX

Figure T2.4: Portfolio composition of EEA insurance undertakings per rating grade before and after application of transition matrices
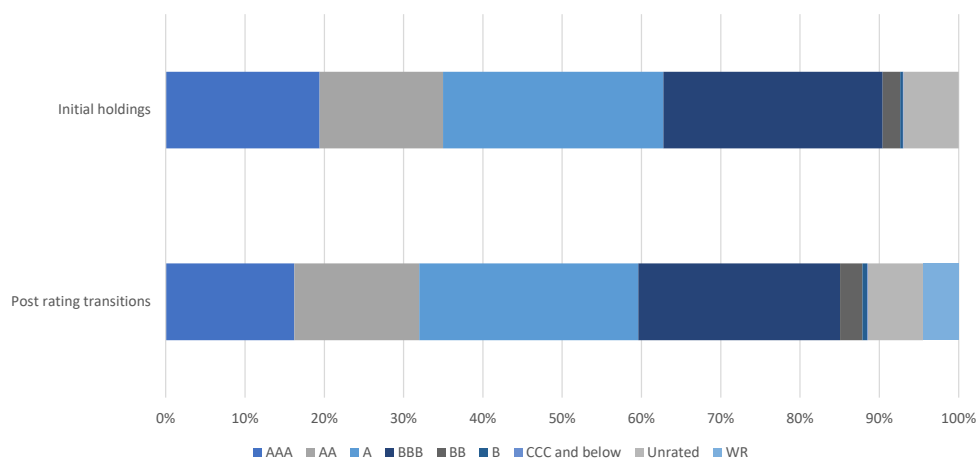
Table T2.2: Shocks to corporate bond yields

Shocks to corporate bond yields (bps) - CQS in brackets								
Country	Type	AAA (0)	AA (1)	A (2)	BBB (3)	BB (4)	B (5)	CCC (6)
EU	Financial	79	94	109	123	172	220	269
	Non-financial	71	75	79	83	88	92	97
UK	Financial	94	109	124	138	187	235	284
	Non-financial	92	94	96	98	103	107	112
US	Financial	54	65	87	110	141	173	205
	Non-financial	41	49	66	82	89	96	104
Emerging markets	Financial	131	146	161	175	274	322	321
	Non-financial	119	121	123	125	133	141	149
Other advanced economies	Financial	83	98	117	136	183	231	278
	Non-financial	75	80	88	96	102	109	104

Source: EIOPA insurance stress test 2021.

Table T2.3: Shocks to covered bond yields

Shocks to covered bond yields (bps) - CQS in brackets				
Country	AAA (0)	AA (1)	A (2)	BBB (3)
EU	72	80	87	94
North America	41	54	61	69
Asia	91	115	122	129
Others	73	83	90	97

Source: EIOPA insurance stress test 2021.

Table T2.4. Shocks on downgrade

Shocks on downgrade (bps)						
Type	AAA -> AA	AA -> A	A -> BBB	BBB -> BB	BB -> B	B -> CCC and below
Financial	7	34	77	117	163	217
Non-financial	7	24	55	110	276	369

Note: Average observed yield differential for 2020 per rating grade.

Source: Markit IBoxx.

Table T2.5: Transition matrices

EU-EEA Non-financial

	AAA	AA	A	BBB	BB	B	CCC	CC	C	SD,D,R	NR	WR
AAA	86.7	11.8	0.5	0	0	0	0	0	0	0	0	1
AA	0	85.7	12.1	0.8	0	0	0	0	0	0	0	1.4
A	0	0.6	89.7	7.6	0.1	0	0	0	0	0	0	2
BBB	0	0	2.9	89.2	3.8	0.6	0	0	0	0	0	3.5
BB	0	0	0.1	4.4	79.2	7.9	0.3	0	0	0.2	0	7.9
B	0	0	0.5	0.7	6.8	73.8	4.9	1.1	0	1.7	0	10.5
CCC	0	0	0	0	0.3	11.7	53.7	5	0	6.6	0	22.7
CC	0	0	0	0	0	6.2	13.9	49.1	0	0	0	30.8
C	0	0	0	0	0	4.6	0	0	95.4	0	0	0
SD,D,R	0	0	0	0	0	11.3	5.7	0	1.8	47.8	0	33.4
NR	0	0	0	0	0	0	0	0	0	0	100	0

EU-EEA Financial

	AAA	AA	A	BBB	BB	B	CCC	CC	C	SD,D,R	NR	WR
AAA	82.8	9.8	2.5	0	0	0.2	0	0	0	0	0	4.7
AA	0.3	86.4	9	0.5	0	0	0	0	0	0	0	3.8
A	0	1.8	87.5	4.6	0.2	0	0.1	0	0	0	0	5.8
BBB	0	0.1	5.3	77	4.9	0.4	0	0	0	0	0	12.3
BB	0	0	0.1	8.4	67.9	5.2	1.6	0	0	0	0	16.8
B	0	0	0	1.8	9.4	62.8	2.1	1.8	0	0.5	0	21.6
CCC	0	0	0	0	0	7.5	74.4	5.4	0	3.6	0	9.1
CC	0	0	0	0	0	0.7	0	88.7	0	0	0	10.6
C	0	0	0	0	0	0	0	0	100	0	0	0
SD,D,R	0	0	0	0	0	1.3	3.6	0	0	83.3	0	11.8
NR	0	0	0	0	0	0	0	0	0	0	100	0

US Non-financial

	AAA	AA	A	BBB	BB	B	CCC	CC	C	SD,D,R	NR	WR
AAA	87	8.4	0.3	0	0	0	0	0	0	0	0	4.3
AA	0	87.3	9.2	1.1	0	0	0	0	0	0	0	2.4
A	0	0.4	91.1	5.7	0.2	0.1	0	0	0	0.1	0	2.4
BBB	0	0	2	91.9	3.2	0.4	0	0	0	0.1	0	2.4
BB	0	0	0	2.8	82.6	7.7	0.4	0.1	0	0.3	0	6.1
B	0	0	0.1	0.1	3.7	78.5	5.4	0.4	0	1.2	0	10.6
CCC	0	0	0	0.1	0	12.5	47	2.2	0	6.4	0	31.8
CC	0	0	0.8	0	1.4	2	17.4	21	0	10.4	0	47
C	0	0	0	0	0	0	0	0	85.2	5.2	0	9.6
SD,D,R	0	0	0	0.7	0.6	9.7	5.1	0.1	0	17.1	0	66.7
NR	0	0	0	0	0	0	0	0	0	0	100	0

US Financial

	AAA	AA	A	BBB	BB	B	CCC	CC	C	SD,D,R	NR	WR
AAA	78.8	20.2	0.1	0	0	0.1	0.1	0	0	0	0	0.7
AA	0.3	83.9	8.1	0.7	0	0	0	0	0	0	0	7
A	0	2	88.6	3.6	0.3	0.1	0.1	0	0	0.1	0	5.2
BBB	0	0.1	3.4	83.6	3.1	0.5	0.1	0.1	0	0.2	0	8.9
BB	0	0.2	0.1	5.3	75	4.8	0.7	0.1	0	0.7	0	13.1
B	0	0.2	0.2	0.4	5.5	75.1	4.3	0.5	0	1.6	0	12.2
CCC	0	0	0	0	0.4	11	58.7	0.6	0	5	0	24.3
CC	0	0	0	0	0	9.3	0	53.3	0	12.8	0	24.6
C	0	0	0	0	0	0	0	0	100	0	0	0
SD,D,R	0	0	0	0	0	0.1	0.1	0	0	65.3	0	34.5
NR	0	0	0	0	0	0	0	0	0	0	100	0

UK Non-financial

	AAA	AA	A	BBB	BB	B	CCC	CC	C	SD,D,R	NR	WR
AAA	93.5	4.6	1.9	0	0	0	0	0	0	0	0	0
AA	0	83.2	16.3	0	0	0	0	0	0	0	0	0.5
A	0	0.2	91.5	6.1	0.4	0	0	0	0	0	0	1.8
BBB	0	0	2.5	92.1	1.9	0.1	0	0	0	0.3	0	3.1
BB	0	0	0	2.8	81.3	7.3	0	0.5	0	0.8	0	7.3
B	0	0	0	0	4.6	74.7	5.4	0.3	0	1.1	0	13.9
CCC	0	0	0	0	0	12.8	54.3	2.8	0	3.7	0	26.4
CC	0	0	0	0	0	0	0	75.2	0	0	0	24.8
C	0	0	0	0	0	0	0	0	100	0	0	0
SD,D,R	0	0	0	0	0.9	1.4	0	0	0	64.5	0	33.2
NR	0	0	0	0	0	0	0	0	0	0	100	0

UK Financial

	AAA	AA	A	BBB	BB	B	CCC	CC	C	SD,D,R	NR	WR
AAA	84.6	12.3	0	0	0	0.8	0.8	0	0	0	0	1.5
AA	0	87.1	9.2	0.1	0.1	0	0	0	0	0	0	3.5
A	0	1.2	89.2	3.7	0.3	0.1	0.1	0	0	0.1	0	5.3
BBB	0.1	0.2	4.4	80	3.1	0.1	0.2	0	0	0	0	11.9
BB	0	0	0.5	9.1	68.8	5.6	0.9	0	0	0	0	15.1
B	0	0	0	0	16.1	71	2.3	2.7	0	0.4	0	7.5
CCC	0	0	0	0	0	1.9	2.2	80.7	2.7	0	0	12.5
CC	0	0	0	0	0	0	0	90.2	0	0	0	9.8
C	0	0	0	0	0	0	0	0	100	0	0	0
SD,D,R	0	0	0	0	0	0	0	0	0	92.8	0	7.2
NR	0	0	0	0	0	0	0	0	0	0	100	0

Emerging markets Non-financial

	AAA	AA	A	BBB	BB	B	CCC	CC	C	SD,D,R	NR	WR
AAA	91.3	7	0	0	0	0	0	0	0	0	0	1.7
AA	0.2	93.2	4.1	0	0	0.2	0	0	0	0	0	2.3
A	0	1.2	92.9	2.1	0.1	0.3	0	0	0	0	0	3.4
BBB	0	0	2.8	87.6	3.1	0	0	0	0	0	0	6.5
BB	0	0	0	5	81.6	5.3	0.1	0.1	0	0.2	0	7.7
B	0	0	0	0	7	74.8	2.6	0.5	0	1.9	0	13.2
CCC	0	0	0	0	0.8	22.2	44.9	6.8	0	7.3	0	18
CC	0	0	0	0	0	4.4	4.6	70.7	0	12.2	0	8.1
C	0	0	0	0	0	0	0	0	100	0	0	0
SD,D,R	0	0	0	0	0	1.9	4.1	1.3	0	51.5	0	41.2
NR	0	0	0	0	0	0	0	0	0	0	100	0

Emerging markets Financial

	AAA	AA	A	BBB	BB	B	CCC	CC	C	SD,D,R	NR	WR
AAA	81.6	18.4	0	0	0	0	0	0	0	0	0	0
AA	0.2	86.7	9.2	0	0	0	0	0	0	0	0	3.9
A	0	1.5	93.3	3.1	0	0.1	0	0	0	0	0	2
BBB	0	0	4.7	86	2.6	0.1	0.1	0	0	0.1	0	6.4
BB	0	0	0	3.7	83.1	3.2	0.1	0.2	0	0.3	0	9.4
B	0	0	0	0	4.5	83.1	2.1	0	0	1.5	0	8.8
CCC	0	0	0	0	0.5	11.7	62.5	0	0	0.9	0	24.4
CC	0	0	0	0	0	0	0	95.4	0	0	0	4.6
C	0	0	0	0	0	0	0	0	100	0	0	0
SD,D,R	0	0	0	0	0	2.9	0	0	0	62.3	0	34.8
NR	0	0	0	0	0	0	0	0	0	0	100	0

Other advanced economies Non-financial

	AAA	AA	A	BBB	BB	B	CCC	CC	C	SD,D,R	NR	WR
AAA	96.9	0	0	0	0	0	0	0	0	0	0	3.1
AA	0.5	90.2	2.9	0.7	0	0	0	0	0	0	0	5.7
A	0	0.7	92.3	4.7	0	0	0	0	0	0	0	2.3
BBB	0	0	1.5	93.1	1.7	0.1	0	0.1	0	0	0	3.5
BB	0	0	0	6.3	77.1	6.3	0	0	0	0	0	10.3
B	0	0	0	0	4.8	82	5	0.9	0	0.2	0	7.1
CCC	0	0	0	0	0	2.7	81.1	0	0	7.7	0	8.5
CC	0	0	0	0	0	3.8	4.7	83	0	8.5	0	0
C	0	0	0	0	0	0	0	0	100	0	0	0
SD,D,R	0	0	0	0	0	0	0	0	0	81.1	0	18.9
NR	0	0	0	0	0	0	0	0	0	0	100	0

Other advanced economies Financial

	AAA	AA	A	BBB	BB	B	CCC	CC	C	SD,D,R	NR	WR
AAA	89.9	10.1	0	0	0	0	0	0	0	0	0	0
AA	0.1	90.2	4.9	0.3	0	0	0	0	0	0	0	4.5
A	0	1	91.9	2.9	0	0	0	0	0	0	0	4.2
BBB	0	0.1	1.7	87.2	1.7	0	0	0	0	0	0	9.3
BB	0	0	0	8.7	78.5	0.5	0	0	0	0	0	12.3
B	0	0	0	0	3.9	84.7	0	2.6	0	2.5	0	6.3
CCC	0	0	0	0	0	0	91.2	4.9	0	0	0	3.9
CC	0	0	0	0	0	3.1	4.2	92.7	0	0	0	0
C	0	0	0	0	0	0	0	0	100	0	0	0
SD,D,R	0	0	0	0	0	0	0	0	0	80.3	0	19.7
NR	0	0	0	0	0	0	0	0	0	0	100	0

Note: Calibration in line with GDP decline assumed in the stress scenario of the EIOPA insurance stress test 2021. Source: ESRB Secretariat

3. CYBER RISK AND THE EUROPEAN INSURANCE SECTOR

Although 2021 has been connected primarily with the pandemic crisis, it has been also another year when the frequency and severity of ransomware incidents have grown considerably. This constitutes one of the key vulnerabilities for the European insurance sector not only due to cyber incidents, but also due to cyber underwriting policy both affirmative and non-affirmative. Despite limited data availability, we construct indices reflecting cyber interest and net sentiment of European Insurers in order to assess the importance of cyber risk for the sector. Moreover, we use an event study framework to investigate whether insurers' equity prices were affected by the two globally recognised cyber-attacks - WannaCry and NotPetya in 2017. In addition, we also tested the recent Microsoft Exchange Server data breaches that occurred this year. All obtained results suggest that market investors did not consider the overall sector being significantly affected in all those cases. However, further analysis needs to be done to fully understand the risk and avoid its underestimation by both insurers and supervisors.

INTRODUCTION

Following the recent cyber-attacks and the rapid growth of cyber insurance market 30, cyber risk is increasingly becoming a source of vulnerability in terms of financial stability especially for insurers. Unlike market risks, cyber is a new territory where the risk assessment models and available data are still quite scarce. Moreover, the long-term upward trend in this risk class driven by digitalisation and its further intensification by the Covid-19 crisis is rather permanent. This is also supported by the fact that working from home will most likely stay in some form even when the pandemic will be over. However, cyber risk also has to be seen as an opportunity for the insurance sector due to cyber underwriting policies, notwithstanding of course the need for appropriate risk management when offering such products. The limited availability of data and the difficulty in identifying the total exposure to cyber insurance risks in insurers' balance sheets poses challenges for both underwriters and supervisors. In this context and focusing on cyber insurance market, this chapter discusses and analyses possible implications for EU insurers from two perspectives. First, we describe channels through which cyber risk can affect EU insurers' financial stability. Second, although the data available remains limited, we provide a possible framework to assess how the risk is perceived by European insurers as well as the potential impact of cyber events on insurance company equity prices.

CYBER INSURANCE MARKET

Silent or so called non-affirmative cyber risk could be the main source of systemic risk and should be better assess and monitored. When talking about the cyber risk insurance market, affirmative

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[30] According to Munich Re's projection, cyber market could reach approximately USD $20bn by the year 2025 – see Cyber insurance: Risks and trends 2021, Munich Re, 2021.

cyber insurance exposures should be distinguished from non-affirmative cyber insurance exposures.[31] Indeed, if affirmative cyber insurance exposures represent standard standalone cyber insurance policies or cyber endorsements clearly specify insurance cover concerning cyber risks, non-affirmative cyber insurance exposures refer to cases where cyber risks are neither explicitly included nor excluded within an insurance policy.[32] Two main implications can result from non-affirmative cyber exposures: first, some insurers may pay claims for unforeseen cyber losses when they have not charged a premium for this risk in certain circumstances, and second, depending on the cyber incident, it can trigger accumulation of losses within other policies.

A TEXT-BASED ANALYSIS OF CYBER RISK

A text analysis based on earnings call transcripts could partially overcome lack of data to analyse cyber risk. In order to analyse the interest on cyber risk and how the risk is perceived by European insurers we have conducted a text-based analysis. The methodology adopted is the one developed by Jamilov et al. (2021)[33] which is based on numbers of cyber related terms in companies' earnings call transcripts. Earnings call transcripts constitute a precious source of data for this type of analysis since they are available at a regular frequency, they are usually published in a timely manner and are not affected by under reporting issues since companies' executives are pushed by analysts to talk about all the most relevant problems that their companies are facing.

Several indices could be built up using earnings call transcripts to capture companies' cyber exposure and their characteristics. Jamilov et al. (2021) built several indices with the purpose to capture companies' cyber exposure and their characteristics: a main index based on the number of cyber related terms in each transcript and others that are instead based on conditional searches and are aimed to capture also the specific content of each discussion. They showed that indexes based on this methodology have several interesting properties. For instance, they found a positive correlation between their main index ("*CyberExposure_it*") and a cyberattack on a company in the next two quarters. They also revealed that a high level of this index not only negatively affect the stock return of the company to which it refers, but also the returns of the other companies that are in the same country and industry, providing evidence of significant spill-over effects.

Nevertheless, due to the cyber insurance, cyber indices constructed for insurers have to be interpreted as a measure of interest in cyber risk rather than a risk metric. Since in our analysis we consider only insurance companies, a direct link between such text based indices and the actual risk faced by companies is less obvious. Many discussions about cyber risk in insurance companies' transcripts is focused on cyber underwriting and only to a smaller extent on the threats that cyber risk pose to insurers, from an operational point of view. For this reason, in this context, we interpret

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[31] As a peril, cyber risk can be defined as any risk emerging from the use of information and communication technology that compromises the confidentiality, integrity or availability of data, systems or services. In affirmative cyber, coverages for cyber perils are contained within either stand-alone network security and privacy policies or the endorsements that are added on to property and casualty policies covering the costs that arise from the impact of a data breach, network attack or failure covering first-party and third-party liability. On the contrary, "silent cyber", also known as "unintended" or "non-affirmative" cyber, refers to the unknown or unquantified exposures originating from cyber perils that may trigger traditional property and liability insurance policies, which may not explicitly provide a cyber coverage grant, or from a cyber exclusion that is poorly worded or ambiguous.

[32] In this latter case, the exposure is also called "silent" cyber risk insurance.

[33] Jamilov, R., Rey, H., and A. Tahoun (2021):"The Anatomy of cyber risk", NBER Working Papers 28906.

the main index of Jamilov et al. (2021) more as a measure of interest in cyber risk rather than a risk metric.

The main index, which we call "Cyber Interest" to remark our different interpretation, is computed in the following way. First, for each transcript we compute the total number of cyber related terms (e.g., "cyber risk", "ransomware", etc.).[34] Then the value obtained is normalized using the total number of words in the transcript. Finally, an aggregate indicator is obtained computing a simple average along all the companies in the sample. In addition to this main indicator, we build also other two indicators, "Cyber Positive Sentiment", and "Cyber Negative Sentiment" which aim to capture how cyber risk is perceived by firms' senior managers and earnings calls participants. The computation of these indicators is carried out adopting a methodology similar to the one described above. However, in this latter case, we do not count the number of terms related to cyber risk, but the ones which can be associated respectively to a positive or a negative sentiment, provided that they are pronounced together with a cyber related terms (e.g., the distance between them and a cyber related word should be less than 50 words). Examples of words indicating a positive sentiment are "good", "strong", or "great" while words associated with a negative sentiment are for instance "loss", "decline" or "difficult". Finally, a "Cyber Net Sentiment" is obtained computing the difference between "Cyber Positive Sentiment" and "Cyber Negative Sentiment" at firm level.

For our analysis, we take all the transcripts using Thomson Reuters Street Events, starting from January 2003 to August 2021 and consider all the insurance companies included in the STOXX EUR 600 Insurance. In this way we obtain a total of 1798 transcripts, since the number of available transcripts per quarter slightly changes from quarter to quarter.

The results of the analysis show a clear upward trend in the "Cyber Interest" index starting from 2014, indicating an increasing interest towards this new emerging risk (Figure 1). The sentiment of the conversations analysed has remained positive over time. This result is interesting if compared to the one obtained by Jamilov et al. (2021) in their original paper that provides evidence of an increasingly negative sentiment surrounding cyber risk at a global level. The positive sentiment of insurers' transcripts may be an indication of the fact that call participants are perceiving cyber risk more as a new business opportunity than a threat for insurance companies and is confirmed by a low number of discussions about cyberattacks, feared or suffered.

Figure T3.1: "Cyber Interest" and "Net Sentiment" of European Insurers

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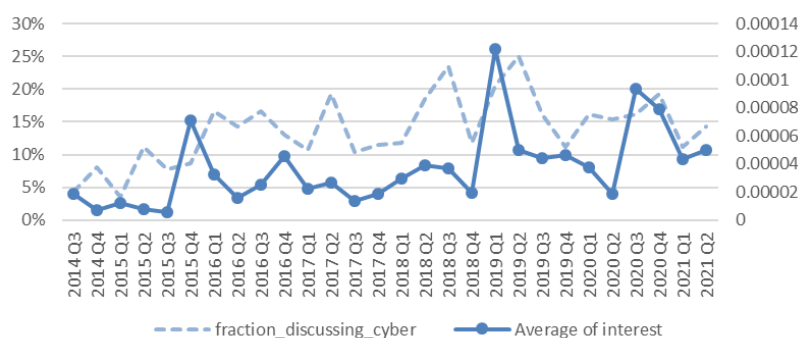
[34] Cyber words: cyber, cybersecurity, network security, cyberattack, cybercrime, cyber threat, cyber incident, cyber event, data loss, data integrity, data security, information theft, data breach, data theft, data leak, data compromise, data fraud, worm, spyware, phishing, trojan, malware, ddos attack, ransomware, hacker, hack, hacked, card fraud, card breach, system outage, email compromise.
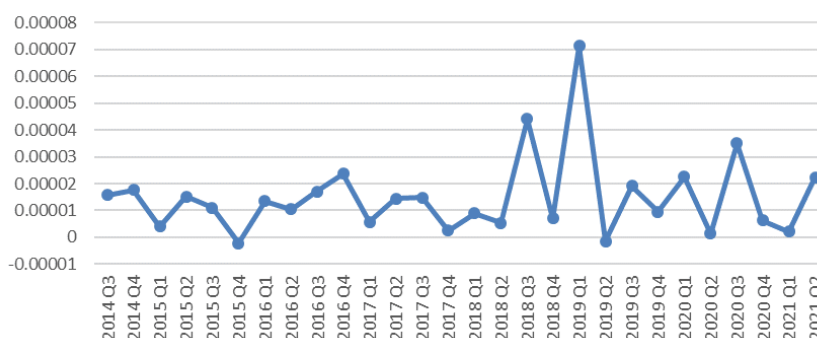
Note: "Cyber Net Sentiment" is obtained computing the difference between "Cyber Positive Sentiment" and "Cyber Negative Sentiment" at firm level.

IMPACT OF CYBER EVENTS ON INSURANCE EQUITY PRICES

In absence of regulatory data at European level, the impact of cyber event on the European insurance sector could be investigated via changes in equity prices of the European listed insurers using an event study framework. Towards this aim, equity of 34 European insurers listed were analysed to find out market reaction to several publicly known major cyber-attacks.

We focus on worldwide cyberattacks that might have a potential to impact European insurers in a more systemic rather than idiosyncratic way. As such event we consider the WannaCry ransomware attack on 12th May 2017, which targeted computers running the Microsoft Windows operating system by encrypting data and demanding ransom payments in the Bitcoin cryptocurrency. While Microsoft had released patches previously to close the exploit, much of WannaCry's spread was from organizations that had not applied these, or were using older Windows systems that were past their end-of-life. It is estimated that over 230,000 systems in 150 countries have been affected, with financial losses up to 4 billion dollars. Moreover, it is widely recognized that the overall losses could have been much higher if a kill switch had not been discovered few days after the beginning of the attack. Another global recognised systemic event was NotPetya ransomware that began spreading internationally on 27th June 2017. Targeting Windows servers, PCs, and laptops, this cyberattack appeared to be an updated variant of the Petya malware virus. This cyber-attack primarily targeted Ukraine with several institutions involved in the incident, among which major stock markets and the central bank. Nevertheless, there were many companies affected also in other countries with total losses in the order of $10 billion.

Finally, in 2021, there were several data breaches of Microsoft Exchange Server recorded that might have a potential to be systemic.[35] In particular, the breach were reported and acknowledged on 5th and 6th January and 2nd March 2021. Moreover, on 8th March Cybersecurity & Infrastructure Security Agency (CISA) issued an alert urging all organizations across all sectors to follow guidance to address the widespread domestic and international exploitation. On 9th March, the Microsoft hack was escalated as criminal groups had rushed to exploit flaws. Finally, on 22nd March Microsoft

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[35] In fact, it is ranked as the biggest threat in Q1 2021 by Cisco Talos in their quarterly report – see Cisco Talos Intelligence Group - Comprehensive Threat Intelligence: Quarterly Report: Incident Response trends from Spring 2021.

announced that in 92% of *Exchange* servers the exploit has been patched or mitigated. Hence, the following events were tested.

Table T3.1: Description of cyber events

Date	Event name	Event description
12/05/2017	WannaCry	WannaCry ransomware
27/06/2017	NotPetya	Series of malicious (NotPetya) cyber incidents in Ukraine
Microsoft Exchange Server data breaches		
02/03/2021 - 03/03/2021	Acknowledged	Microsoft Exchange Server data breach acknowledged
07/03/2021	EBA	Cyber-attack on the European Banking Authority

The conducted analysis suggests that the key globally recognised cyber events did not have a significantly negative impact on equity prices of the European insurance sector. The event window from one to two days after event day were considered, i.e. (0,0), (0,1), (0,2). Our empirical results suggest that WannaCry and NotPetya attacks did not cause any significantly negative downward move of European insurance equity prices. The statistically upward positive move of equity prices for the second day after the NotPetya event might be caused by some other event not directly linked to cyber-attack. Similarly, the several data breaches of Microsoft Exchange Server seems to have only a limited impact on equity prices. The only significantly negative impact could be observed for the attack on EBA on the first day.

Table T3.2: Cumulative abnormal return (CAR) and its statistical significance

Event name	Average cumulative abnormal return		
	(0,0)	(0,1)	(0,2)
WannaCry	0.1001%	-0.1510%	-0.1232%
NotPetya	0.3068%	1.4869%***	0.2475%
Microsoft Exchange Server data breaches			
Acknowledged	0.5670%	0.1000%	0.1264%
EBA	-1.1521%*	-0.4479%	-0.5742%

Note: * significance at 10%, ** significance at 5%, *** significance at 1%

Furthermore, the analysis focused on the impact at the company level as different insurance companies might be exposed to the investigated events differently.

The analysis at individual level confirms that the investigated cyber events had only limited impact on the European insurers' equity prices.

Table T3.3: Number of insurers with significant negative CAR at 10% confidence level

Event name	Average cumulative abnormal return		
	(0,0)	(0,1)	(0,2)
WannaCry	0	0	1
NotPetya	2	0	0
Microsoft Exchange Server data breaches			
Acknowledged	2	3	4
EBA	7	8	11

Note: There are 34 insurance companies in total in the sample.

FINAL REMARKS

The clear upward trend of cyber incidents further intensified by the Covid-19 crisis has highlighted the need to better understand and assess cyber risk. The strong concerns of insurance supervisors stem not only from cyber incidents, but also cyber underwriting policy both affirmative and non-affirmative. In this section, we constructed indices for the European insurers capturing cyber interest and net sentiment. Both indicators point out the growing importance of cyber risk for insurers. Furthermore, an event study framework could be used to test the impact of cyber incidents on insurers' equity prices. Although, insurers' equity prices do not seem to be affected by the tested global cyber incidents, more research needs to be done to avoid any potential underestimation of this risk by both insurers and supervisors.

4. EEA INSURERS' DERIVATIVE TRANSACTIONS CLEARED IN UK-BASED CENTRAL COUNTERPARTIES

A large fraction of derivatives transactions subject to the clearing obligation has been historically and, is still, cleared in UK-based Central Counterparties (CCPs). Since the United Kingdom left the European Union, the regulatory landscape for the clearing of derivative transactions is changing and there is some degree of uncertainty. This topical focus elaborates on the current situation and potential risks to insurers and IORPs using derivatives.

BACKGROUND

The aim of this chapter is to discuss the use of derivatives by insurers and the potential impact of outstanding regulatory decisions concerning the clearing of over-the-counter (OTC) derivatives by UK-based Central Counterparties (CCPs). The analysis is primarily anecdotal and is supported by Solvency II data on insurers' use of derivatives[36].

Approximately 550 EEA insurers use derivatives, these tend to be life insurers typically belonging to large groups. Derivatives management is usually coordinated at the group level, because of the technical expertise needed and related collateral management issues.

Insurers use derivatives primarily to hedge risks and this is recognized in the SII regulatory framework, resulting in lower capital requirements. Derivatives are primarily used to manage interest rate risk. Interest Rate Swaps (IRSs) and Put and Call Swaptions are the most common category, together summing up to approximately 55% of the total notional amount. Another relevant motive why insurers use derivatives is to hedge currency risk; this is achieved by means of instruments such as forward exchange rate agreements (FX) that represents 21% of the total notional amount of derivatives. Other risks such as equity risk and credit risk represent only small shares. Derivatives are used to hedge the above mentioned market risks, but entail counterparty risk, if they are not centrally cleared, as well as liquidity risk because of margin requirements and operational risk.

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[36] Further verification will be performed to check Solvency II reporting derivatives data in order to ensure consistency with EMIR data. Preliminary checks across the two databases have delivered similar figures.

Table T4.1. EEA insurers' derivatives positions: breakdown by category and sub-category.

	Notional amount % to total
Swaps	**43.2%**
Interest rate swaps	38.0%
Currency swaps	2.1%
Other	3.0%
Forward	**23.37%**
Forward exchange rate agreement	21.41%
Others	1.96%
Call options	**17.71%**
Swaptions	7.59%
Bond options	4.10%
Others	5.27%
Put options	**11.86%**
Swaptions	9.38%
Others	2.48%
Futures	**2.57%**
Credit Derivatives	**1.29%**
	100%

Data: SII Quantitative Reporting Templates for Solo Q2-2021. EEA total notional amount is EUR 3,161 EUR Bn.

90% of the amount of derivatives notionals is concentrated in the following 5 countries: Denmark, France, Germany, the Netherlands and Sweden (see Figure T4.1).

Figure T4.1. EEA insurers' notional amount of derivatives: breakdown by country
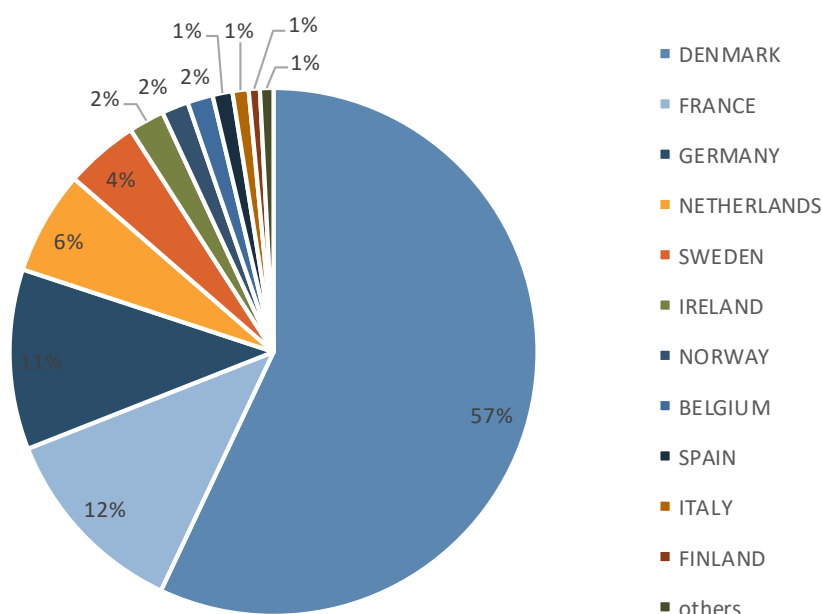
Data: SII Quantitative Reporting Templates for Solo Q2-2021.

In any case, Figure T4.2 shows that the number of insurers using derivatives is relatively well distributed across countries and that the notional amount of derivatives to total investment for insurers using derivatives is material (e.g. around 20-30%) for more countries (than those already discussed above) such as Spain, Norway, Ireland Czechia and Finland.

Figure T4.2. EEA insurers' notional amount of derivatives to total investment for insurers using derivatives (bars with scale on the left-hand axis) and number of insurers using derivatives by country (dots with scale on the right-had axis)
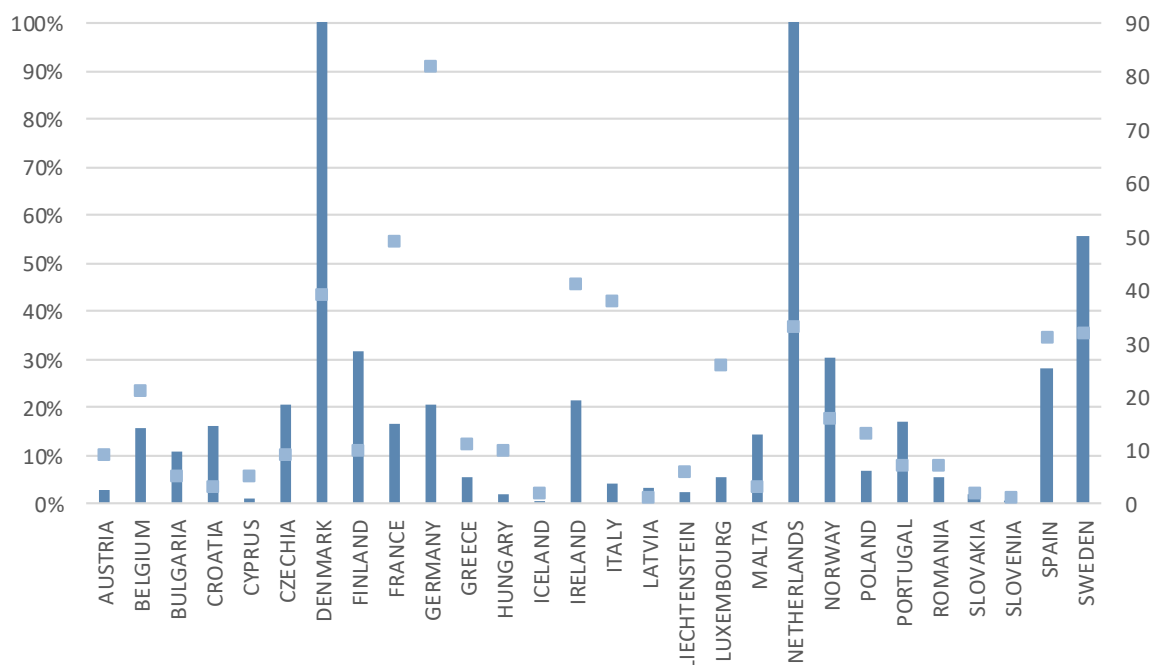
Data: SII Quantitative Reporting Templates for Solo Q2-2021. Note that the left-hand axis is capped at 100% but the value for Denmark is 390% and for the Netherlands is 133%.

Insurers use derivatives as these contribute to a reduction of market risks or facilitate efficient portfolio management in line with the Prudent Person Principle contained in the Solvency II Directive. The use of derivatives is also acknowledged as a risk-mitigation tool meaning that under certain conditions it could help insurers to lower the Solvency Capital Requirements. One of these conditions is that derivatives' transactions are cleared by 'recognized' clearing houses.

A lion's share of the derivatives' contracts on insurers' books is subject to the so-called clearing obligation (EMIR regulation). These have to be cleared in clearing houses–which are intermediaries for derivatives transactions that act as central counterparties (CCPs), i.e. as the buyers to all sellers and as the sellers to all buyers after a trade has been agreed, but before cash and securities or contracts have changed hands. Non-centrally cleared derivatives transactions (over-the-counter - OTC) were one of the key reasons why the Lehman collapse amplified the Global Financial Crisis.[37]

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[37] In 2008 Lehman Brothers was a major player in the worldwide OTC derivatives market. Following its collapse, there remained large open claims on derivatives creating risks for the counterparties.

Subsequently, the regulatory community introduced mandatory clearing in CCPs for some derivatives and institutions with the aim to reduce counterparty risk in the global financial system.

Based on Solvency II data, up to 26% of derivatives held by insurers in the EEA in Q2 2021 were centrally cleared.[38][39] These are almost entirely IRS and the vast majority is cleared in UK-based CCPs (21% of the total is cleared in UK and 5% in the EU). These are mainly in EUR currency (i.e. 82 %, see Table T4.2). As of Q2 2021, the notional amount of IRS is approximately EUR 1.2 Tr, 65% of which is centrally cleared.[40] Only around 6% (both for cleared and non-cleared) of the notional amount of IRS mature before June 2022 (Table T4.3).

Figure T4.3. EEA insurers' derivatives positions: Share of centrally cleared derivatives in UK-based versus EU-based CCPs.

■ Not cleared in CCPs   ■ Cleared in UK Based CCPs   ■ Cleared in EU Based CCPs
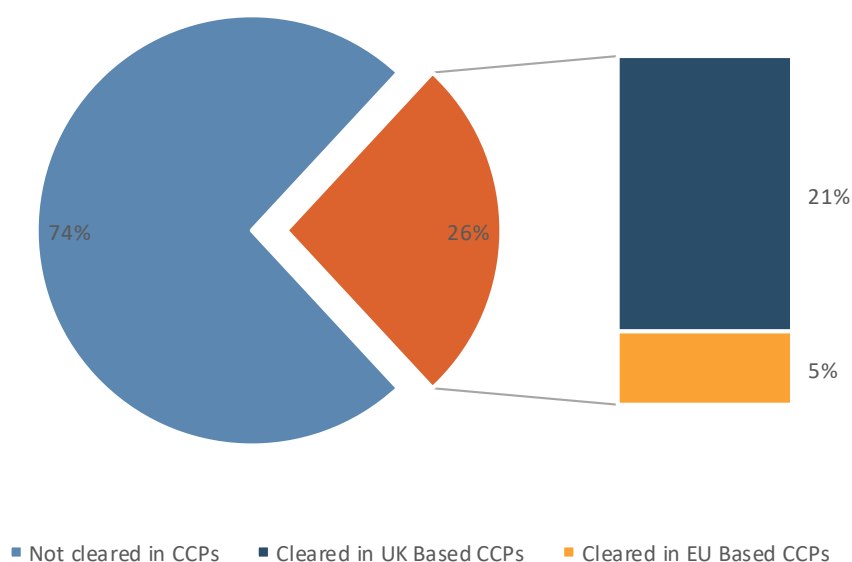
Data: SII Quantitative Reporting Templates for Solo Q2-2021. The total notional amount for the EEA insurance sector is EUR 31. Tr.

Solvency II data documents a gradual shift of EEA insurers' activities since 2019.

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[38] Derivatives might not be cleared through CCP because of the three possible following reasons: 1) Specific derivative categories are not mandatory to be cleared (e.g. FX currency derivatives which insurers use to a substantial extent). 2) Derivative positions were opened before the asset category or the type institution (there are categories and insurers fall in one particular https://www.emirreporting.eu/clearing-obligation/) became mandatory to be cleared; Interest Rate Swaps opened before 21st June 2019 onwards are not necessarily cleared by insurers. 3) The insurers do not go beyond the clearing threshold on a specific derivative category (e.g. for interest rate swaps EUR 3 bn) https://www.esma.europa.eu/policy-activities/post-trading/clearing-thresholds

[39] The time evolution of "Not cleared in CCPs" versus cleared is such that exposure to CCP is increasing. In Q2 2021, a share of 74% of the notional derivatives is not cleared, one year before in Q2-2020 it was 80%.

[40] As discussed in footnote 2, if derivative positions were opened before the asset category became mandatory to be cleared (i.e. before 21st June 2019 for IRS) then these does not necessarily have to be cleared. Also, if insurers do not go beyond the clearing threshold on a specific derivative category (e.g. EUR 3 bn for interest rate swaps) then clearing is not mandatory.

Figure T4.4. EEA insurers' centrally cleared derivatives: share UK based versus EU based CCPs
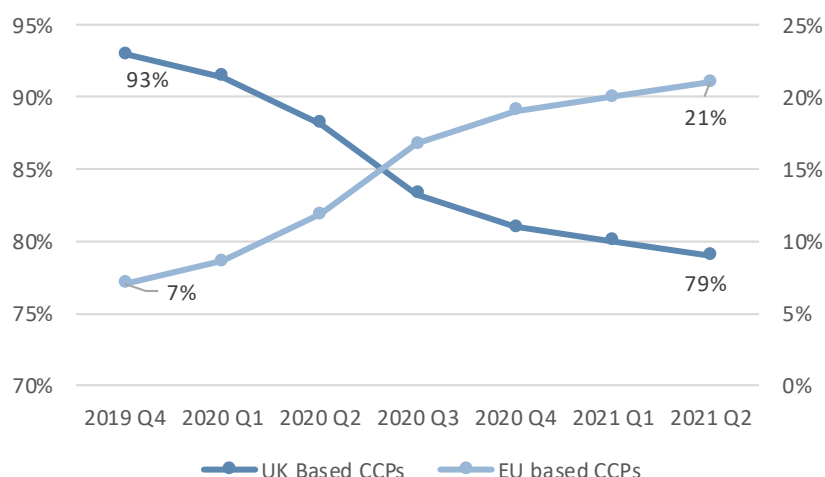
Data: SII Quantitative Reporting Templates for Solo. Sample from Q4-2019 to Q2-2021.

Table T4.2. EEA insurers Interest rate Swaps positions: breakdown by currency

Currency	Notional amount % to total
EUR	82.3%
USD	5.7%
SEK	5.4%
DKK	3.6%
NOK	1.5%
GBP	1.0%
JPY	0.2%
AUD	0.1%
CZK	0.1%
CHF	0.1%
Others	0.1%
Total in 1,202 EUR Bn	**100%**

Data: SII Quantitative Reporting Templates for Solo Q2-2021.

Table T4.3. EEA insurers Interest rate Swaps positions: breakdown by maturity

Maturity	Notional amount % to total
<1 Year	5.9%
between 1 and 2 years	5.4%
between 2 and 3 years	6.7%
between 3 and 6 years	22.6%
between 6 and 11 years	19.8%
between 11 and 21Y years	18.6%
> 21 years	21.1%
Total in 1,202 EUR Bn	**100%**

Data: SII Quantitative Reporting Templates for Solo Q2-2021.

IORPs are currently exempted from the clearing obligation. The temporary exemption is currently valid until 18 June 2022, and could potentially be extended once more by 1 year.

RECENT REGULATORY DEVELOPMENTS

The decision of the UK to leave the EU produced a potential challenge for future central clearing in the EU. Temporary legal certainty to market participants was provided by the temporary equivalence decisions by the European Commission regarding the UK regulatory and supervisory framework for CCPs and ESMA decision to recognize three UK CCPs.[41] As a result, until 30 June 2022, EU market participants can continue to use UK CCPs. To determine the situation and rules beyond, a new set of decisions by the European Commission and ESMA is expected around year end 2021.

The European Commission took the first temporary equivalence decision[42] regarding the UK regulatory and supervisory framework for CCPs in December 2018. This temporary decision was later extended until 30 June 2022. Before this date, the European Commission must review on whether or not to grant further equivalence. Moreover, the criteria underlying the equivalence should be monitored by ESMA and the European Commission on an on-going basis. Should these no longer be sufficiently fulfilled, the European Commission has the right to withdraw the equivalence decision. This would have a knock-on effect on the recognition as well since an equivalence of regulatory and supervisory regimes is one of the pre-requisites; in other words: no recognition without equivalence.

The currently valid assessment by ESMA was issued on 28 September 2020 and assessed the CCP LME Clear Ltd as Tier 1 (non-systemically important) and the CCPs LCH Ltd and ICE Clear as Tier 2 (systemically important). At that time ESMA also stated that the Tier 2 CCPs (LCH Ltd and ICE Clear) will be reassessed for possible Tier 2+ status within 18 months. This is in line with the requirement put forward in the second decision on equivalence by COM which specifies that " (…) This Decision gives ESMA time to conduct a comprehensive review of the systemic importance of UK CCPs and their clearing services or activities to the Union (…) including recommending to the Commission that a UK CCP **should** not be recognized or withdrawing its recognition."

In line with this, ESMA is currently in the process of evaluating the systemic importance of two UK CCPs for the EU; this process is expected to be completed by end 2021. The output will be in the form of a recommendation on which the European Commission may or may not further follow-up.

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[41] 'Recognition of CCPs' (which only applies to CCPs in third countries for which the regulatory framework is deemed equivalent) refers to the assessment of whether or not the level of importance of the services or activities that a third country CCP provides to the EU financial system is such that they should be authorized in the EU. The assessment process of recognition is also referred to as 'tiering', as CCPs are classified into three tiers: Tier 1 (not systemically important, and thereby subject to exchange of information via the customary 'supervisory colleges'), Tier 2 (systemically important, and thereby requiring direct supervision by the ESMA) and category Tier 2+ (systemically super-important, to the point that they should not be authorized to provide certain clearing services or activities in the EU).

[42] 'Equivalence' refers to the assessment of whether or not the regulatory and supervisory framework for third-country CCPs is deemed to be sufficiently similar to the European Markets and Infrastructure Regulation (EMIR) such that EU entities can use authorized third-country CCPs on the same terms as EU CCPs.

FINAL REMARKS

Temporary equivalence of the UK supervisory and regulatory framework and temporary recognition of the UK-based CCPs are about to expire by June 2022. On the 10th of November, Commissioner for Financial Services, Financial Stability and Capital Markets Union Mairead McGuinness announced that in order to address possible short-term financial stability risk, linked to an abrupt interruption in access to clearing services, the Commission will soon propose an extension of equivalence for UK-based CCPs[43]. Regarding recognition, the possible way forward is currently being explored by ESMA. The analysis presented is therefore highly topical and aims at reflecting the latest state of affairs. However, a number of important questions cannot be answered until the months succeeding the publication of this report, such as for how long will the equivalence be extended and whether recognition be extended or not and if so only for specific services or currencies.

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[43] https://ec.europa.eu/commission/presscorner/detail/en/statement_21_5905

5. KEY MARKET FACTORS: INFLATION AND GOVERNMENT BOND YIELDS

This chapter assesses insurers' vulnerability to inflation and a possible increase in government bond yields. These are two important factors in assessing risk in the insurance sector in the current post-pandemic economic environment. Regarding the first factor, unanticipated inflation is a significant source of risk for non-life insurers, especially those in long-tail lines of business. This is because future claims payment could increase more than insurers have planned for when calculating their reserves. Inflation also affects the asset side, which can mitigate potential negative effects on the liability side. As for the second factor, a sudden revaluation of government bonds could have a negative impact on insurers, since this asset class accounts for a large share of insurers' investments. Results of a simulation provide a grid with potential impacts of the asset-over-liabilities ratios of European insurance groups.

CURRENT DEVELOPMENT OF INFLATION

An upward pressure on inflation accompanies the reopening of the economies after several phases of lockdown due to Covid-19 pandemic. Besides the "mechanical" increase in inflation due to the low levels of prices during the pandemic, inflation is also supported by the strong fiscal and monetary stimulus provided and still being provided, rising oil and energy prices and disruptions in supply chains.[44]

Current inflation rates surge significantly in the US and in Europe. This happens after many years of very low inflation. Central banks consider this to be a transitory pick-up. They argue that inflation will remain in check against the targets when supply chains return to normal and the economy has fully recovered. The view that inflation is only transitory is explained with broader macroeconomic developments. Inflationary episodes have historically been associated with demand persistently in excess of supply, sustained wage increases and de-anchoring of inflation expectations.[45] All this is currently not observed. Even though demand is currently high relative to supply, this is likely temporary because the economy is recovering from adverse effects of the pandemic.[46] In addition, Europe has not seen a material increase in wages so far.[47] Finally, market-based measures of inflation expectations are still below the inflation target of the Eurosystem, even though they have risen well above pre-pandemic levels.[48]

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[44] For a description of current inflation driver, see e.g. Isabel Schnabel – Prospects for Inflation: Sneezes and Breezes, Speech 7 Oct 2021.

[45] Flora Budianto, Giovanni Lombardo, Benoit Mojon and Daniel Rees: Global reflation? BIS Bulletin 43, July 2021

[46] Mismatch, Speech given by Ben Broadbent, Deputy Governor Monetary Policy, Bank of England 22 July 2021.

[47] Seasonal adjusted euro area labour cost index is below 1% in Q2 2021. https://ec.europa.eu/eurostat/databrowser/view/lc_lci_r2_q/default/table?lang=en

[48] The euro area 5y5y inflation swap was 1.92 at 18 Oct 2021 up from 1.26 at the beginning of the year. Source: Bloomberg.

The rise in inflation leads to an increased perception of long-term inflation risk. In addition, there is a heightened risk that future inflation may surprise on the upside. Irrespective of either being transitory or permanent, increased inflation rates have an impact on the insurance sector. Against this background, this topical focus looks on the effect of inflation on insurers.

INSURANCE AND INFLATION

Inflation has an indirect effect on the insurers' asset side. Insurers hold large investment portfolios whose market prices are sensitive to inflation. Most importantly, inflation is associated with higher interest rates and hence lower bond prices. A higher duration of assets implies that inflation sensitivity is higher through the effect of inflation on interest rates.

Inflation affects insurers on the liability side through higher cost of claims. This is relevant mostly for non-life lines of business, because non-life guarantees are in nominal terms. Crucially, insurers build-up provisions for future claims payments and in doing so they must make today assumptions about future price developments. This assumption is a significant factor for the level of provisions.

The net effect depends on the relationship between the inflation sensitivity of both sides of the balance sheet. When considering the effect of inflation on interest rates, the duration gap, the difference in duration between assets and liabilities, could be a relevant metric. Non-life insurers are more tilted to positive duration gaps (assets are more sensitive than liabilities) and therefore might suffer from inflation. Life insurers typically have negative duration gaps which implies they might benefit from higher inflation.

TYPES OF INFLATION

In insurance, what tends to be more relevant is claims inflation, which is the price development relevant for claims expenses. Claims cost depend only to a lesser extent on inflation typically measured by the Harmonized Index of Consumer Prices (HICP). The reason is that the goods for which insurers pay are significantly different from those that consumers buy. For example in motor insurance, relevant goods are in particular new cars and car spare parts. Moreover, claims of insurers encompass various costs, not just costs of goods and services. Claims expenses include among others expenses for immaterial damage such as compensation for pain and suffering and some of the expenses are directly related to wages such as wage-loss replacement.

Claims inflation tends to outpace the general inflation rate. For Europe, there is no time series available on estimates of future claims inflations. Each insurer makes its own business line specific forecast. Data in Solvency II QRTs on inflation assumption is incomplete.[49] For the U.S there is an estimate of a commercial provider available, the Willis Towers Watson Claim Cost Index. The data indicates that claims inflation outpaces the general inflation rate and that there is a large heterogeneity between business lines.

As an example for claims inflation, in the event of a flood, an insurance policy covers the construction expenses to indemnify the losses occurred by the flood. A relevant price index is the

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[49] S.19.01.01. includes estimates of historic and expected inflation rates.

cost of construction of new houses. This price has in recent years increased significantly more than the harmonized index of consumer prices (see Figure T5.1). As another example, in 2021 there has been a short-term surge in lumber price which strongly increased construction prices. Market observers estimate that this surge alone could have increased the industry loss cost from hurricanes in the United States by 10-15%.[50]

Figure T5.1 – Price development of construction costs compared to HICP in the European Union
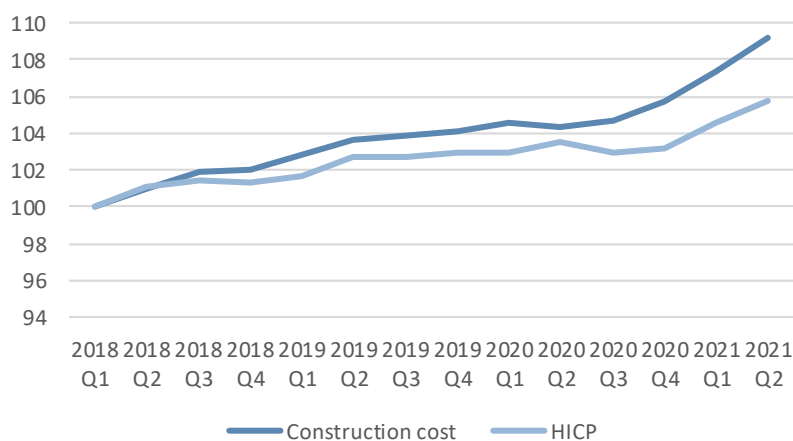
Source: ECB Statistical Data Warehouse. Construction cost is the time series construction cost (or producer prices), new residential buildings.

A specific case is health insurance with medical costs developing quite differently relative to the HICP. Typically health insurance claims increase over-proportionally each year. Reasons include higher cost of medical goods and service and also technological advancement which leads to more expensive medical treatments. Another reason is that an increase in the number of physicians can increase the number of medical treatments.

Another reason why cost of claims increase faster than inflation rates is an increase in frequency of claims over time. Anecdotal evidence is that technological advancements make products more sensitive or that claims management companies lead to policyholders filing more claims over time. This is not inflation per se but a significant driver in the increase of claims expenses over time. An additional factor is so-called social inflation. This is growth in insurers' claims costs due to "social cost escalations" including the effects of increased litigation and changes in social norms. For instance, similar bodily injuries may result in changing compensations over time.

IMPACT OF INFLATION ON LIFE SEGMENT

Life insurers typically have liabilities in nominal terms, i.e. claims do not increase with the price development. This is because potential future benefits are often stipulated when the life contract is initiated. On the other hand, increasing interest rates lead to net valuation gain of assets compared to liabilities with a negative duration gap.

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[50] UBS - Inflation creating elevated catastrophe risk, 10 June 2021.

In the case of products used for long-term saving, guarantees stay the same in nominal terms but decrease in real terms. Hence, the value of existing guarantees decreases with inflation. For term life contracts inflation is mostly born by policy holders. With inflation the death benefit that policyholders can buy today will be worth less in real terms in the future. Whole life and profit-sharing contracts are a better hedge against inflation because its cash value is generally invested, and it expected to be outperforming inflation. Finally, for market based products (unit-linked or similar) the inflation risk is in any case born by policyholders.

However, there are also inflation risks for life insurers. Increased inflation expectations may make it less attractive to enter life contracts. Moreover, an increase in inflation may lead to an abrupt increase of interest rates. This incentives policyholders to lapse long-term saving contracts, in particular those with relatively low guaranteed rates. This implies liquidity risk. [51]

IMPACT ON THE NON-LIFE SEGMENT

Non-life claims are mainly set in real terms as non-life contracts are indemnity contracts. In case of unanticipated inflation, there is usually an increase in loss ratios because of the typical lag in pricing response. Claims and expenses reserved by insurers might need to be adjusted to reflect the increase in inflation. Insurers usually set aside technical provisions whose calculation uses an assumption about inflation development.

An important dimension is the length of the settlement period of the particular line of business. Lines of businesses with longer duration would cumulate an unexpected one-off increases in inflation over more years. In this respect it is irrelevant whether inflation (either generic or claim specific inflation) is transitory or not. Non-life liabilities typically have a duration of several years (see Figure T5.2), in fact 55% of technical provisions have duration longer than 2 years.

Figure T5.2 – EEA insurers' non-life technical provisions (% to total): Year - projection of undiscounted expected cash out-flows
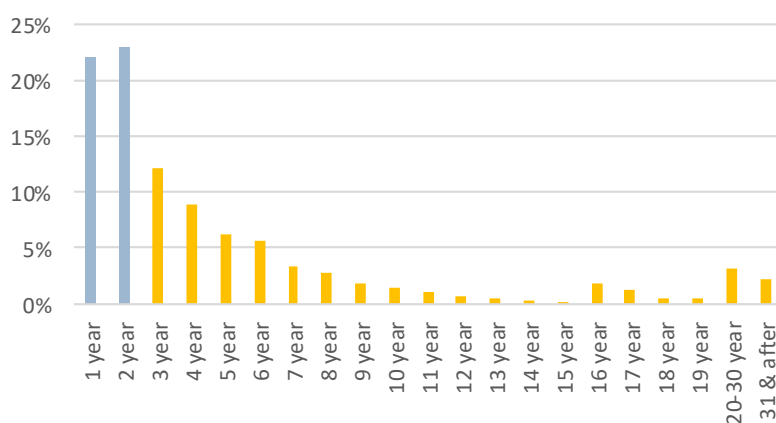
Source. EIOPA SII data from QRTs: Prudential annual Solo 2020

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[51] See EIOPA FSR December 2020: Liquidity: A Sensitivity Analysis to Lapse Risk.

In long-tail business lines a significant proportion of payments has to be made many years after the insured event. To account for length of settlement period, non-life liabilities are segmented into long and short tail business. A long tail lines of businesses would be expected to be more negatively affected by unanticipated inflation. For instance, property insurance claims tend to be settled relatively quickly, while liability insurance and worker compensation claims are paid to a large extent far in the future and hence classified as long-tail liabilities.

General liability and motor vehicle liability are the business lines which make up 47% of total non-life technical provisions (Figure T5.3). Both are long-tail business lines (Figure T5.4). This illustrates the relevance of long-term business lines. A significant part of long-tail business is re-insured, which can be seen that non-proportional reinsurance business lines are top business lines in terms of years until claims are paid.

Figure T5.3 – EEA Insurers' non-life technical provisions: breakdown by line of business
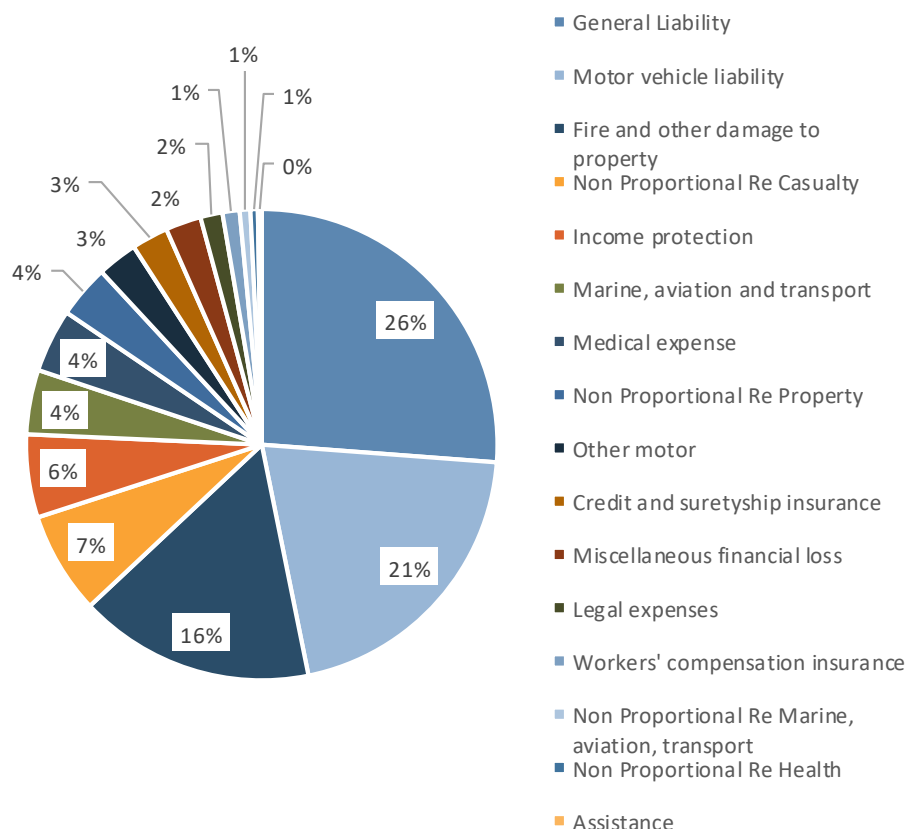
Source. EIOPA SII data from QRTs: Prudential annual Solo 2020

Figure T5.4 – Duration by non-life business line - Average number of years until claims are paid.
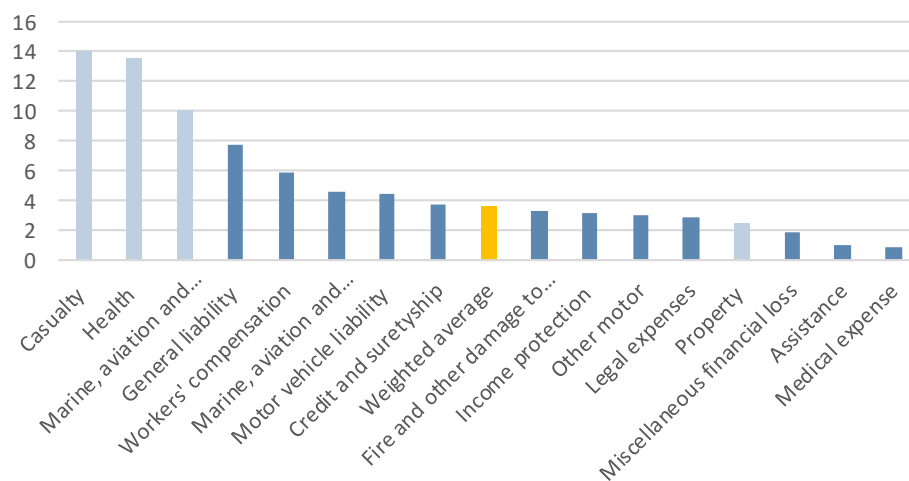
Source: EIOPA SII data from QRTs - Prudential annual Solo 2020. Calculated based on 2020 gross claims payment by accident / underwriting year before from S.19.01.02. Light blue indicates accepted non-proportional reinsurance. Dark blue indicates direct business and accepted proportional reinsurance.

TREATMENT OF INFLATION RISK IN SOLVENCY II AND IN THE INSURANCE STRESS TEST

Unanticipated inflation is a significant source of risk for non-life insurers. Solvency II is a risk-based framework in which all material risks need to be taken into consideration in the calculation of Solvency Capital Requirements and the Own Risk and Solvency Assessment (ORSA). If inflation increases persistently leading to higher claims in excess of the initially used assumptions, insurers may need to increase reserves, which impacts profitability.

Inflation risk was included in the EIOPA stress test exercises in various forms. Specifically, the EIOPA Insurance Stress Test 2021 includes a shock for a permanent increase of claims' severity of 2%, which is representing claims inflation. This permanent increase enters the calculation of technical provisions, the participating insurance companies should assume that cost per claim increase by 2% in every future year. The EIOPA Insurance Stress Test 2018 similarly included a shock in claims in the form of higher annual claims than assumed for the existing best estimate of liabilities calculations. In addition, the 2018 stress test included a yield-curve up scenario, which is to some extent motivated, with a potential increase in future inflation. Non-life technical provision increases in both the yield-curve-down scenario and yield-curve-up scenario by around 2%. This is mainly driven by the increase in claims inflation and has a significant effect on the overall stress test results.

GOVERNMENT BONDS YIELD SPREADS AND INSURERS EXPOSURES

European sovereign yields increased in the onset of 2021 (Figure T5.5). This could be related to two factors, namely, the economic development in the US at that time and the strong recovery in Europe, following the mass vaccination campaigns and the reopening of the economies. Although the risk posed by the delta variant during summer paused and reverted this trend, since September

2021 yields increased again. This development might be associated more to the prospects of strong recovery and demand rather than spill-over effects from US.

Figure T5.5: Sovereign yields (in %)
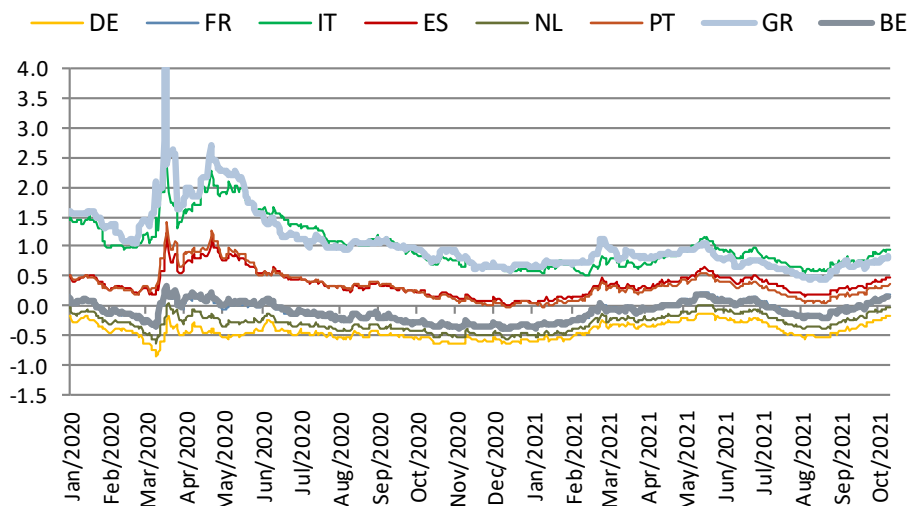
Source: Refinitiv. Last observation: 11/10/2021.

For both waves, yields increase across countries and, in fact, with a noticeable commoving path. The yield spreads (vs Germany) further confirm this synchronized movement revealing an almost flat overall trajectory (Figure T5.6). Nevertheless, yet there are periods when for some countries the spreads are slightly increasing or decreasing, indicating that the sensitivity of yields spreads (and also of the CDS) premia in terms of economic environment was heterogeneous.

Figure T5.6: Sovereign yield spreads (in bps)
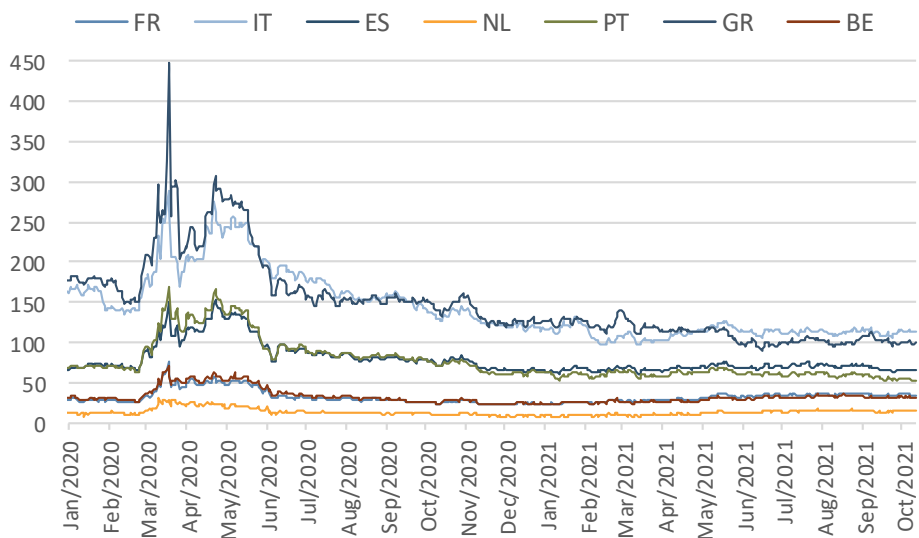
Source: Refinitiv. Last observation: 11/10/2021.

The economic conditions supporting this narrowing of the spreads can be identified also in the strong forecasts for growth regarding the European economy.[52] This is accompanied by the expectation of EU recovery stimulus even after the extraordinary Covid-19 measures (e.g. PEPP). On the other hand, the uncertainties raised from the Covid-19 pandemic and its development urged governments to provide fiscal stimulus resulting in high debt-to-GDP levels. Therefore, the different sensitivity of sovereign risk can potentially become more pronounced across countries depending on how the economic and pandemic developments will evolve. For example, the fade out of monetary easing, knock on effects from increasing interest rates in US and also concerns on the long-term sovereign debt sustainability could trigger asymmetric yield movements within Europe, effectively increasing the yield spreads.

The tail risk of a sudden repricing of the sovereign risk in relation to debt sustainability and fiscal stress considerations could have an impact on insurers. Insurers are big players in sovereign bond markets and hold significant share of this asset class in their portfolios. In fact, almost one-third of the portfolio is held in government bonds.[53] In addition, insurers are exposed to banks (the majority of the corporate holdings)[54], which, in turn, are exposed to sovereign risk. This implies an indirect channel of insurers' exposure towards sovereigns. Therefore, from a financial stability point of view, it is important to understand the exposures of insurers to sovereign risk aiming at understanding the potential transmission channels to the sector's balance sheet position. In the current analysis the indirect link of insurers to sovereign risk is ignored and the focus is only on the sovereign risk in terms of direct exposure to government bonds.

There are two dimensions where the risk in the balance sheets can be looked at – at a solo level and at a group level. A focus on solo insurers identifies potential home bias in terms of sovereign exposures. This perspective is already monitored and revealed useful insights in terms of concentrated exposures to specific countries.[55] Nevertheless, the current analysis on exposures focuses on groups reporting for financial stability purposes taking into account the group structure of insurers. This can provide meaningful insights from a financial stability perspective, since allows for diversification effects from different (and potentially home biased) exposures within the group. Finally, the current analysis groups the countries' sovereign risk into three groups (low, medium, high) aiming at reducing the heterogeneity.[56] Based on the sample considered, the low and high group compose the dominant part of sovereign bonds exposures (Table T5.1).

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[52] See IMF World Economic Outlook 2021 October.
[53] EIOPA 2021 July FSR.
[54] EIOPA 2021 July FSR
[55] EIOPA 2021 July FSR.
[56] The grouping follows the grouping used in the context of EBA 2021 stress test. Please refer to this and this link for more details.

Table T5.1: Descriptive statistics on key variables (2021 q1)

	Average	p10	p25	p50	p75	p90
Share of government (low+medium+high) to total investment	27%	8%	16%	22%	36%	51%
Share of low group (over low+medium+high)	26%	0%	2%	15%	30%	87%
Share of mid group (over low+medium+high)	9%	0%	2%	6%	11%	18%
Share of high group (over low+medium+high)	65%	11%	45%	76%	90%	98%

Although the descriptive statistics broadly signal the high materiality of the exposures, two indicators were constructed to better understand how sovereign risk is reflected on insurer's balance sheets. Both aim at capturing the sovereign risk, but using different metrics. The first indicator is based on the CDS premia and the second on the debt/GDP ratio. The rationale for constructing the two indicators is that the first captures the market based risk (CDS premia) that can quickly react to news whereas the second (debt/GDP ratio) is less volatile but (partially) signals the fundamentals of each country and can be interpreted as forward looking indicator for sovereign risk. Therefore, the higher (lower) the indicator, the higher (lower) the sovereign exposure for the group at focus is. Both indicators are, also, weighted over total investments, so that not only capture the measure (either CDS or debt/GDP) of sovereign exposures but also their materiality when compared to total investments.

Knowing that CDS premia are contained and debt-to-GDP has increased since the pandemic breakout, the reading of the two indicators would inform whether this opposite movement is evident for insurers diversified exposure and to which extend. In case of repricing of CDS premia the highly indebted exposures will potentially experience sharper increase.

In order to put these indicators into context, there are two points in time that are calculated, namely, pre and post Covid-19 shock (2019 q4 and 2021 q1, respectively). The groups considered in the analysis is the stable sample of the financial stability reporting universe for these two dates. The indicator based on CDS premia shows some shift in the distribution to the left (less risky). For example, there are more groups in the range 45-65 in 2021 q1 than in 2019 q4 and less in the range 70-80 (Figure T5.7). On the contrary, for the indicator based on debt-to-GDP the distribution tilts to the right, which corresponds to more risk (Figure T5.8). Finally, for both indicators, the exposure for the sector is negatively skewed and dispersed in both cases, meaning that sector-wide there are no concentrated exposures to a particular (high) segment.

Figure T5.7: Indicator based on CDS (in bps).
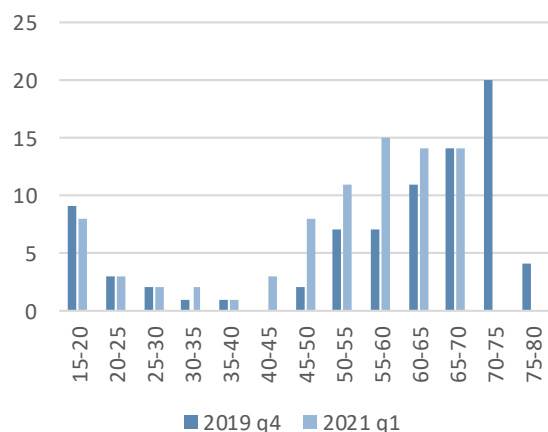
Figure T5.8: Indicator based on debt-to-gdp (in %).
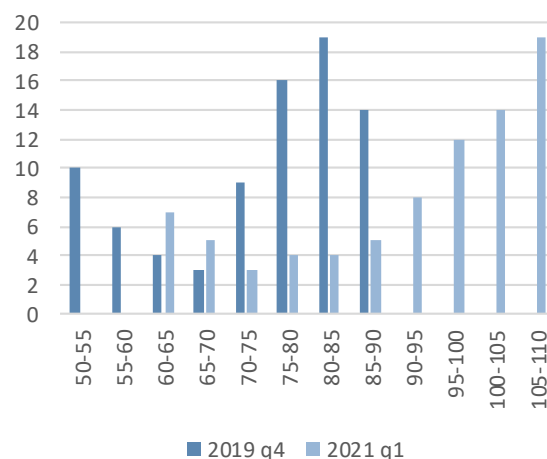
With this background, an empirical model was built to further quantitatively assess and approximate the mark-to-market impact in case the tail risk of sovereign spread repricing materializes. The interest is to focus on the aggregate insurance market impact, as captured by the ratio of assets over liabilities (AoL).[57] The empirical model uses as explanatory variables the changes in the discount rate (10y EIOPA swap rate and Volatility adjustment where applicable) and, for each sovereign risk group, the change in the CDS spread is interacted with the share of Solvency II value of that group divided by the total investments.

Empirical model

$$\%\Delta AoL =$$

$$b * \Delta y + c1 * \Delta CDS_{Low} \times Share_{Low} + c2 * \Delta CDS_{Medium} \times Share_{Medium} + c3 * \Delta CDS_{High} \times Share_{High}$$

$$2.65^{***} \qquad -0.00128 \qquad -0.00013 \qquad -0.00072^{***}$$

$$p_{value} < 0.001 \qquad p_{value} = 0.1014 \qquad p_{value} = 0.8171 \qquad p_{value} < 0.001$$

Based on the coefficients of the model reported above, positive (negative) changes in the discount rate result in a positive (negative) movement for AoL. This is in line with result of previous empirical analyses.[58] In terms of the CDS impact, as expected, the increase (decrease) in the CDS result is worse (better) AoL ratio, with the movement being more pronounced the higher the corresponding shares are. **The "what if" scenarios simulated reflect the tail risk of repricing of sovereign credit spreads.** Results are shown in Table T5.3. In fact, it was assumed that the CDS of high risk group increases by a grid of basis points, namely 50, 100, 150 and 200, while assuming 100% share for this

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[57] The model follows the approach of EIOPA FSR of December 2020. In fact, the coefficients are estimated after orthogonalizing, meaning that after each regression with a dependent variable the residuals are estimated and form the new independent variable against which the subsequent risk factors is to be regressed. The rationale of doing so is to control for the correlation of the CDS premia for the three risk groups.

[58] Please refer to EIOPA FSR December 2020, for more details on this coefficient.

risk group, with the other parameters assumed to remain equal (for example, no change in volatility adjustment). This grid of shocks can be considered severe looking at the sample history, however similar shocks have been experienced for individual countries by historical perspective. That said, the estimated impact on the aggregate sector seems relatively contained, although it reveals that the risk could be sizeable.

Table T5.3 Results of the "what if" simulation

Shock in bps for high group	Marginal impact on AoL
50	-3.60%
100	-7.20%
150	-10.80%
200	-14.40%

FINAL REMARKS

This chapter assesses insurers' vulnerability to inflation and the potential increase in government bond yields. These are two important factors in the current economic environment.

Inflation can be beneficial for life insurers but challenging for non-life insurers. If the risk-free interest rate (i.e. the discount factor) adjusts to inflation, inflation can be beneficial for life insurers, insofar they are characterized by negative duration gaps (i.e. liabilities with longer duration than assets) and nominal liabilities. On the other hand, the non-life business, due to potential coverage of claims in real terms, is challenged in terms of inflated loss ratios (in the short-term); this could be more pronounced for long-tail business, which tend, also, to be the more material part in terms of technical provisions e.g. general liability. Nevertheless, lines of business affected by the recent pick up of inflation cannot be easily isolated, since the effects could potentially be heterogeneous depending on the particular sector or economy. Also, if the risk-free interest rate adjusts to inflation, this could be translated in net asset value depreciation for non-life insurers which tend to have positive duration gaps (i.e. assets with slightly longer duration than liabilities). Finally, for both life and non-business, inflation encompasses, among others, strong underwriting and business generation risks due to the decrease in savings' capabilities and purchasing power of policyholders.

The simulation of a potential abrupt increase in sovereign credit spreads indicates relatively contained impacts, but yet material, on insurers' assets over liabilities ratios. Central banks consider the currently observed inflation increase as transitory, but if this would not be the case central banks could react to economic conditions by tapering monetary easing and increasing interest rates. The fade out of monetary easing, knock on effects from increasing interest rates in US and also concerns on the long-term sovereign debt sustainability could potentially trigger asymmetric yield movements within Europe, effectively increasing the spreads. Insurers are big players in the sovereign bond market, being vulnerable to sovereign bonds' price volatility. Currently, spreads are remaining contained across sovereigns within Europe, but debt stocks increased substantially to facilitate post-pandemic recovery.

APPENDIX

A.1. RESULTS OF CONDUCTED QUESTIONNAIRE AMONG NATIONAL COMPETENT AUTHORITIES

In order to assess the risks and key vulnerabilities for the insurance sector, EIOPA conducted a survey, using a qualitative questionnaire, among national competent authorities (NCAs).

Figure A.1.1: Risk assessment in terms of materiality for the insurance sector
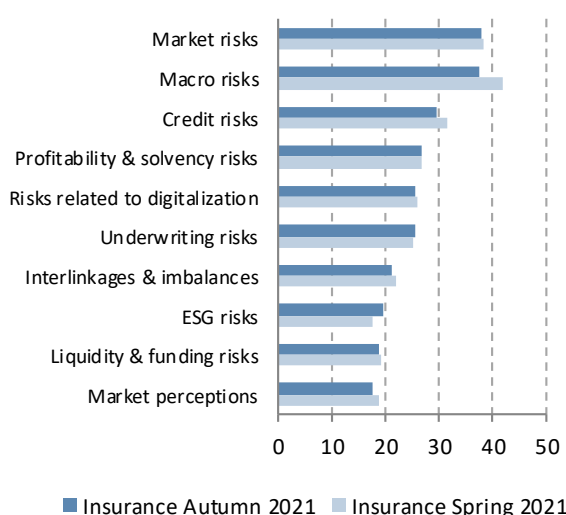
Figure A.1.2: Risk assessment in in terms of materiality for the IORPs sector
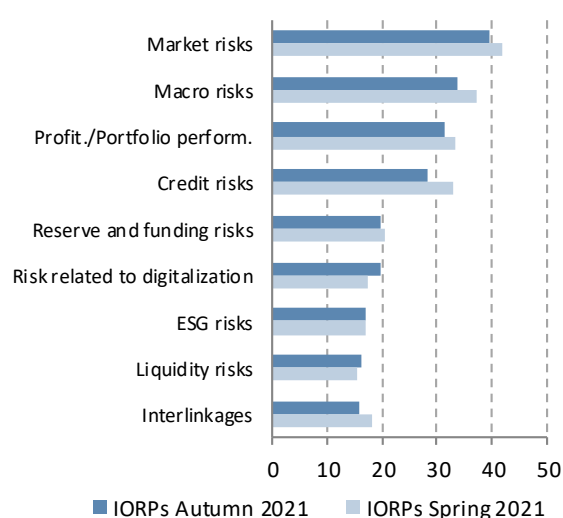
Source: EIOPA Insurance and pension Bottom Up Surveys Autumn 2021.
Note: Based on the responses received. (Left chart) Risks are ranked according to probability of materialisation (from 1 indicating low probability to 4 indicating high probability) and the impact (1 indicating low impact and 4 indicating 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.

Market and macro risks remain key risks for both the insurance and IORP sectors (Figures A.1.1 and A.1.2). Whereas the economic recovery has already begun in most of the EEA countries and might continue in the upcoming years, the concerns of rising inflation and the uncertainty surrounding the Covid variants path, positioned market and macro risks in the top risks both for insurers and IORPs. The different scenarios around the waves of the new Covid variants and the supply chain disruptions still pose concerns in the national and international macroeconomic environment (Figure A.1.3). But due to the success of the vaccination campaigns, only moderate lockdown measures are expected which probably will only have mild effects on the economy.

Market risks became the top concern for insurers and is remaining the top concern for IORPs. This is due to the vulnerability of financial markets to a potential repricing of risk if global liquidity

conditions change, to high inflation expectations and to sovereign debt sustainability concerns. All these factors might adversely affect insurer and IORPs'. Given the high insurers' exposure towards fixed-income assets and interest rate guarantees in some member state, interest rate risk is indicated as the main driver for market risks, followed by equity risk (Figure A.1.4).

In consideration of potential delayed second round effects such as downgrades or insolvencies driven by the deterioration of macroeconomic conditions and the phasing out of supporting measures, the exposure to non-financial companies remains the main driver for credit risks (Figure A.1.5), followed by exposure to sovereigns and financials. This could have a severe impact on insurers' and IORPs' balance sheets highly exposed to these types of bonds. Moreover, non-financial corporations are not subject to prudential supervision, increasing the vulnerability in relation to a potential deterioration of the business environment. Furthermore, under this adverse environment, households might experience difficulties in meeting their loan payments to insurers, and or potentially cancel 'non-mandatory' products.

Figure A.1.3: Main drivers for macro risks[59]
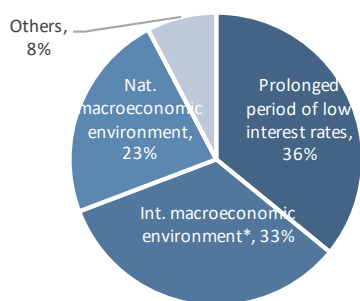
Figure A.1.4: Main drivers for market risks
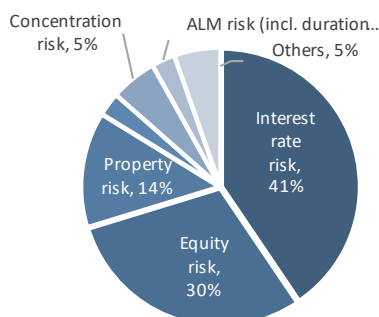
Figure A.1.5: Main drivers for credit risks
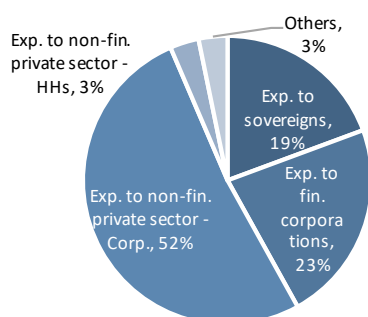
Figure A.1.6: Main drivers for risks related to digitalization
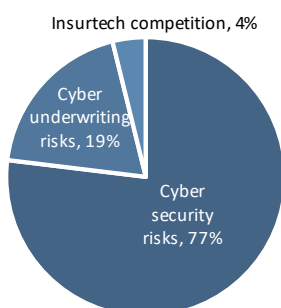
Source: EIOPA Insurance Bottom Up Survey Autumn 2021
Note: Based on the responses received.

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[59] International and national macroeconomic environment drivers in macro risk category exclude prolonged low interest rates.

Profitability and solvency positions for insurers remain robust and solid, albeit remaining among the top risks for insurers (Figure A.1.1). The impact on the overall profitability and solvency positions of EEA insurers has been limited so far, with an observed improvement of profitability and solvency positions in the second half of 2021 in comparison with the previous year, in particular for life and composite undertakings, although the potential pandemic evolution could still adversely impact insurers. Furthermore, for some EEA country, the increase of floods during 2021 summer, raised the concerns on the profitability risk, although the impact is considered manageable.

Risks related to shift away from guaranteed products is still a concern for some EEA insurers. The privatisation of risk on policyholders from the transition from guaranteed products to unguaranteed products (UL/IL products), raise concerns not only about market risk, but also longevity risk triggered by higher risk taking in UL/IL-products, and a more exotic risks such as alternative investments, which tend to be illiquid.

Risks related to digitalization are ranked in the 5th place for insurers and 6th place for IORPs (Figures A.1.1 and A.1.2), with increasing concerns for cyber security, in particular for insurers (Figure A.1.6). Since the onset of the pandemic, the extensive digitalisation and use of home working arrangements, has generated a more vulnerable environment for insurers and IORPs. This is reflected in the responses received by NCAs, indicating a rise of cyber security risk. This risk is especially relevant for insurers due to the amount of personal data collected by them, which might attract hackers.

The exposure to commercial real estate investments and the potential repricing on CRE remains a potential vulnerability. The EEA residential real estate market is experiencing rapid growth mainly triggered by the prevailing home working practises, borrowing rates remaining low and economic recovery, with prices most likely exceeding their fundamental values. While some EEA insurance undertakings have low exposures to the residential real estate market, imbalances could affect in a larger degree the banking sector and thus, the financial sector as a whole.

Maintaining appropriate funding levels in the IORP sector remains critical (Figure A.1.2), standing in the 5th position of top risks. Cover ratios (i.e. assets covering liabilities) in the DB IORPs sector remain overall stable in the first quarter of 2021, compared to end-2020 values. Looking ahead, the different scenarios around the Covid-19 waves along with the financial market developments, could adversely affect DB schemes' cover ratios.

Going forward, ESG risks remain the top risk for what concerns the highest expected increase in materiality over the next 12 months for the insurance and IORP sectors (Figures A.1.7 and A.1.8). The increasing intensity and frequency of excessive weather circumstances is expected to be challenging insurers and IORPs. The main risk driver remains climate transition risk, as following the ongoing transition towards green and more sustainable assets, insurers and IORPs highly exposed to carbon based assets may lose value in their investment portfolios.

Risk related to digitalization are also expected to increase over the next 12 months (Figures A.1.7 and A.1.8). The home working set-up is becoming structural for some undertakings, raising concerns on the cyber security going forward. The number of cyber-attacks has increased, affecting banks

and other types of institutions, and although the impacts are difficult to estimate, respondent NCAs fear that there will be more incidents affecting insurers. On the other hand, the new technologies being used could lead to enhance underwriting, operational and cyber risks for digital leader (e.g. impact on profitability or claims reserving).

Given the economic recovery, macro risks are expected to decrease over the next 12 months (Figures A.1.7 and A.1.8). The Covid-19 pandemic has had a profound impact on the EEA economies, however some of the EEA countries have already recovered to pre-pandemic levels, while others already facing economic recovery are expected to return to their pre-pandemic growth paths in 2022. Although, there is still an uncertainty about the length of the pandemic, and in particular to the development of current and new waves, the potential negative impact to the economy is expected to be milder to the preceding waves.

Figure A.1.7: Risk assessment in terms of expected increase in materiality over the next 12 months for the insurance sector

Figure A.1.8: Risk assessment in terms of expected increase in materiality over the next 12 months for the IORP sector
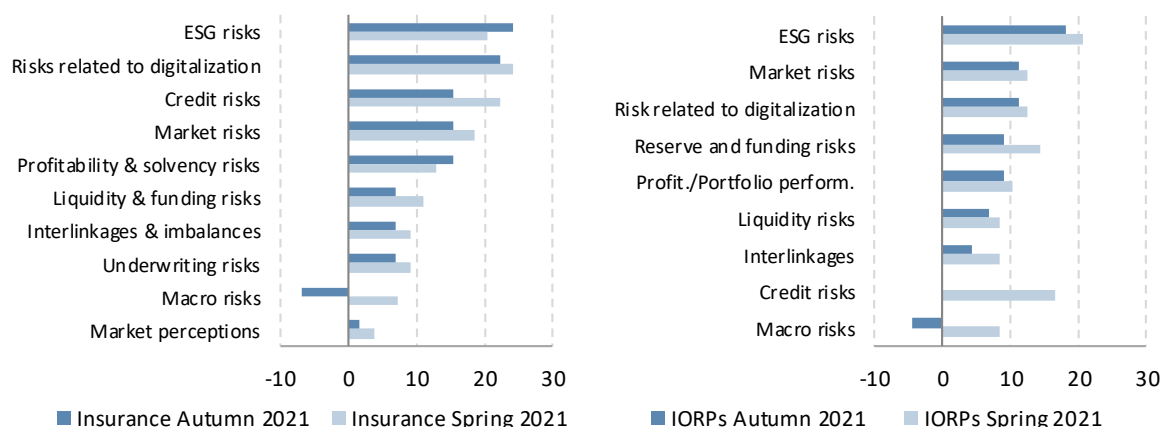
Source: EIOPA Insurance and pension Bottom Up Survey Autumn 2021
Note: Based on the responses received. Risks are ranked according to the expectation for the future movements of each exposure (from -2 indicating strongly decrease to +2 indicating strongly increase). The figure shows the aggregation of the average scores assigned to each risk. The results were subsequently normalised on a scale from -100 to 100.

ESG and risks related to digitalization remain a challenge for insurers and IORPs (Figures A.1.9 and A.1.10). The expected increase in the materiality over the next 12 months coupled with the inadequacy of the measures to mitigate the risks - could pose additional challenges to the latent consequences of the pandemic. Insurance undertakings are gradually adapting and integrating sustainability and cyber security aspects into their business models, as well as, developing strategies to the newness ESG and digitalization risks related framework. In order to ensure a smooth transition to efficient implementation and future compliance monitoring of the ESG and digitalization factors integration, supervisory dialogue is critical.

Figure A.1.9: The risk of mitigation measures inadequacy and expected increase in materiality over the next 12 months for the insurance sector


Source: EIOPA Insurance and pension Bottom Up Survey Autumn 2021
Note: Based on the responses received. Risks are ranked according to (X axis) the need of mitigation measures taken by insurance undertakings (from -2 indicating no measures are necessary to +2 indicating introduction of new measures are necessary) and (Y axis) the expected increase in materiality over the next 12 months (-2 indicating substantial decrease and +2 indicating substantial increase). The figure shows the aggregation of the average scores assigned to each risk in each axis. The results were subsequently normalised on a scale from 0 to 100.

Figure A.1.10: The risk of mitigation measures inadequacy and expected increase in materiality over the next 12 months for the IORPs sector
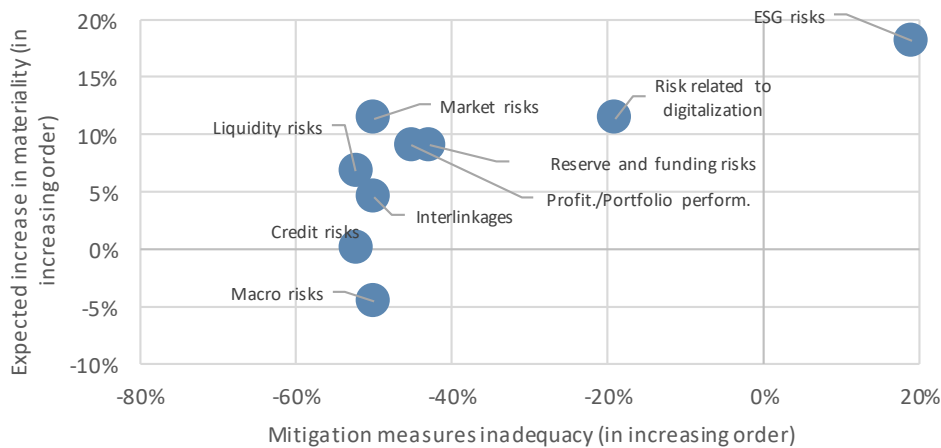
Source: EIOPA Insurance and pension Bottom Up Survey Autumn 2021
Note: Based on the responses received. Risks are ranked according to (X axis) the need of mitigation measures taken by insurance undertakings (from -2 indicating no measures are necessary to +2 indicating introduction of new measures are necessary) and (Y axis) the expected increase in materiality over the next 12 months (-2 indicating substantial decrease and +2 indicating substantial increase). The figure shows the aggregation of the average scores assigned to each risk in each axis. The results were subsequently normalised on a scale from 0 to 100.

A.2. STATISTICAL ANNEX

Insurance sector

Figure A.2.1: GWP growth in Q2 2021 (in %, year-on-year)
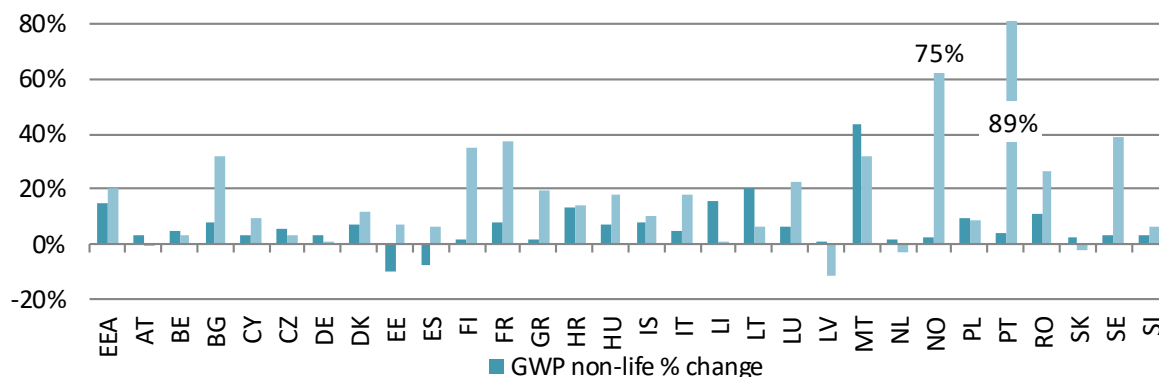
Source: EIOPA Quarterly Reporting Solo
Note: EEA weighted average

Figure A.2.2: GWP as a Share of GDP (in %) (LHS) and total GWP (in EUR million) (RHS) by country in Q4 2020
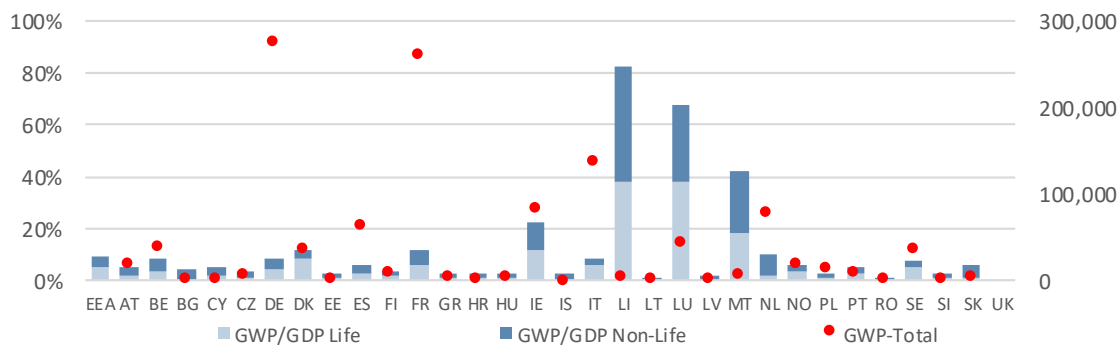
Source: EIOPA Quarterly Reporting Solo and Eurostat
Date: Q4-2020 and 2020

Figure A.2.3: Gross Combined Ratio across lines of business (in %; median, interquartile range and 10th and 90th percentile)
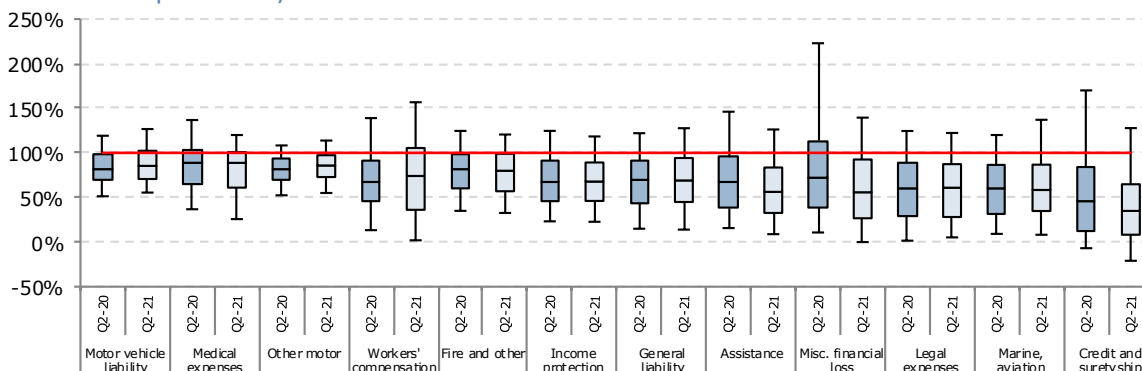
Source: EIOPA Quarterly Reporting Solo

Figure A.2.4: Lapse rates (in %; median, interquartile range and 10th and 90th percentile)
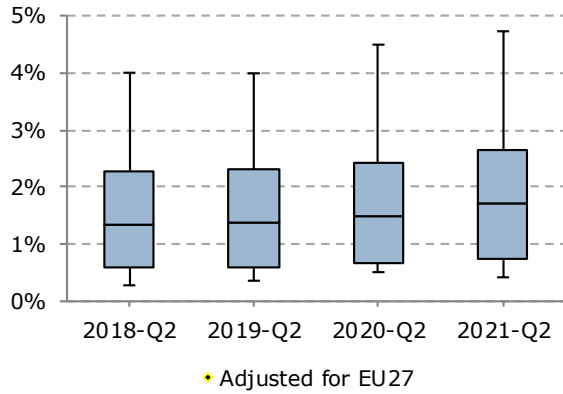
Figure A.2.5: Investment split in Q2 2021 compared to Q2 2020, Q2 2019 and Q2 2018
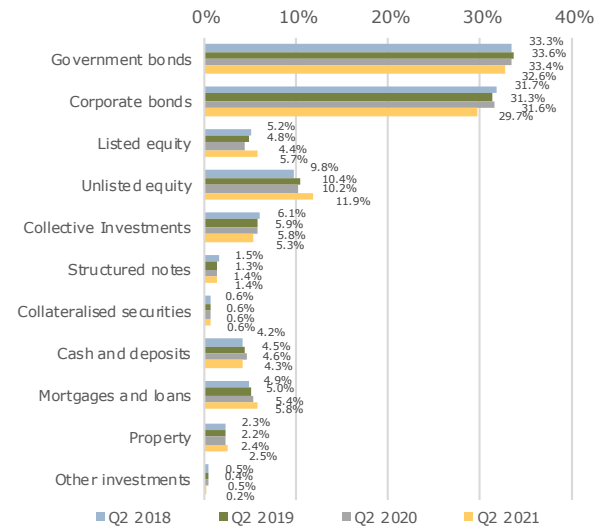
Source: EIOPA Quarterly Reporting Financial Stability Group

Source: EIOPA Quarterly Reporting Solo

Figure A.2.6: Credit quality of bonds portfolio across countries
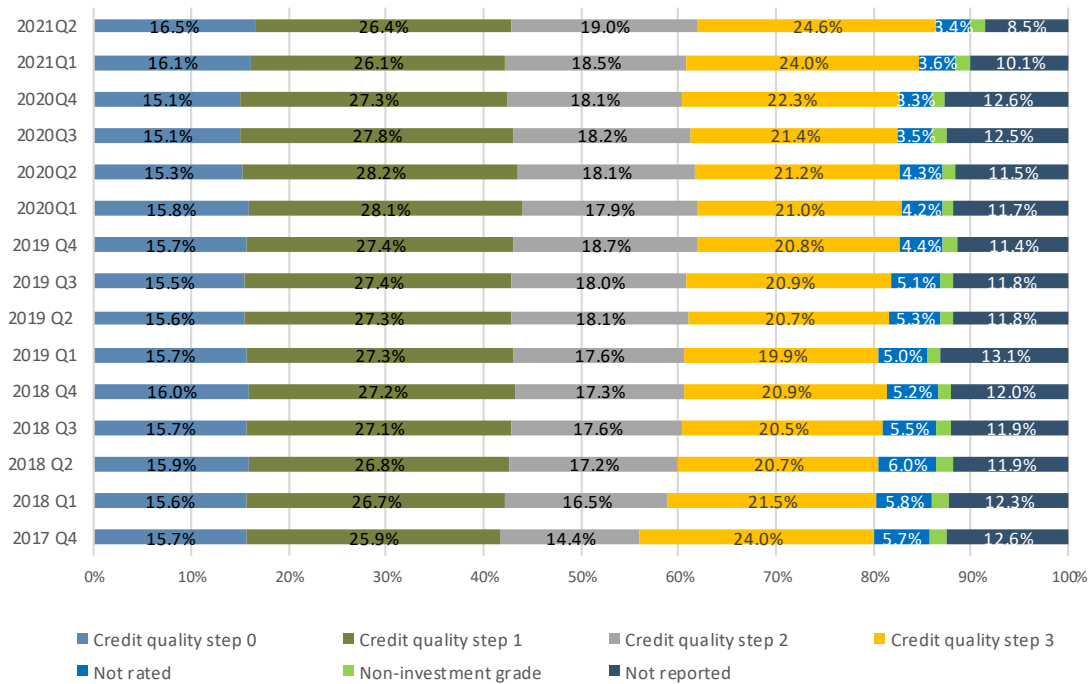
Source: EIOPA Quarterly Reporting Solo
Note: Government and corporate bond portfolios combined. Assets held for unit-linked are included.

Figure A.2.7: Investment breakdown by issuer country for insurers' holdings of government bonds in Q2 2021

Legend:
- Home
- EU institutions
- USA
- Canada
- Supranational issuers
- Other EU/EEA countries
- United Kingdom
- Switzerland
- Japan
- Emerging markets and other advanced economies
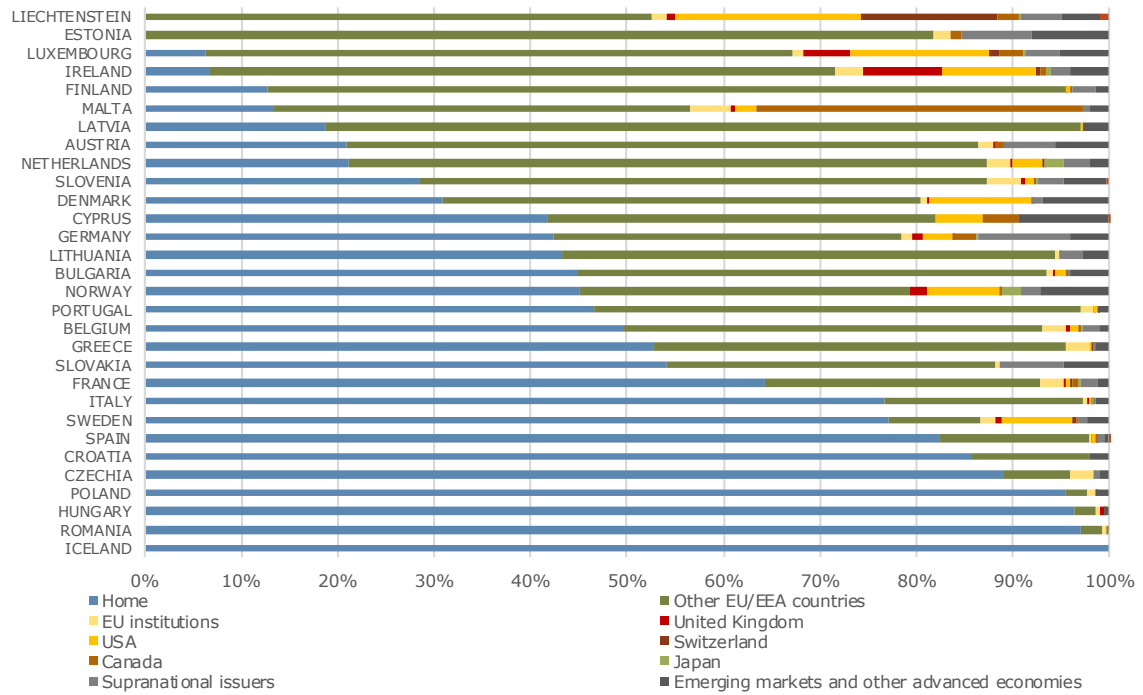
Source: EIOPA Quarterly Reporting Solo

Figure A.2.8: Investment breakdown issuer country for insurers' holdings of corporate bonds in Q2 2021

Legend:
- Home
- United Kingdom
- Switzerland
- Japan
- Other EU/EEA countries
- USA
- Canada
- Supranational issuers
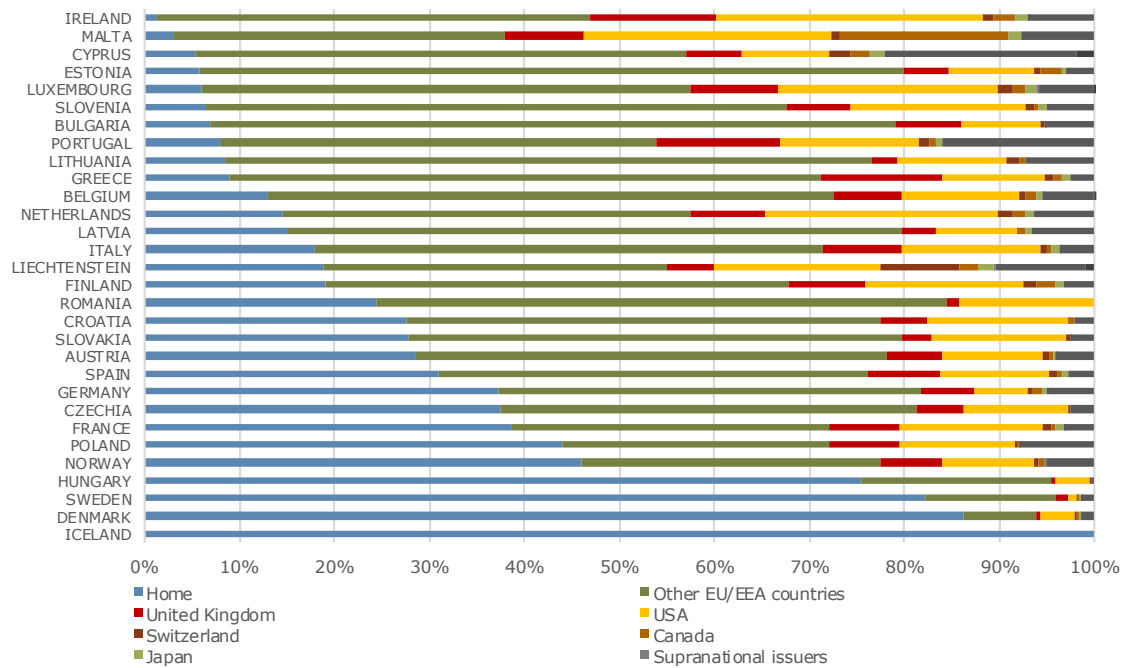
Source: EIOPA Quarterly Reporting Solo

Reinsurance sector

Figure A.2.9: Gross Written Premiums in the EEA (in EUR billion and %)

Non-life direct business		Life direct business		Life reinsurance obligations		Non-life reinsurance accepted	
	40%		47%		3%		10%
€	274	€	325	€	24	€	70

Source: EIOPA Quarterly Reporting Solo
Reference date: Q2 2021

Figure A.2.10: Reinsurance Gross Written Premiums in the EEA (in EUR billion)
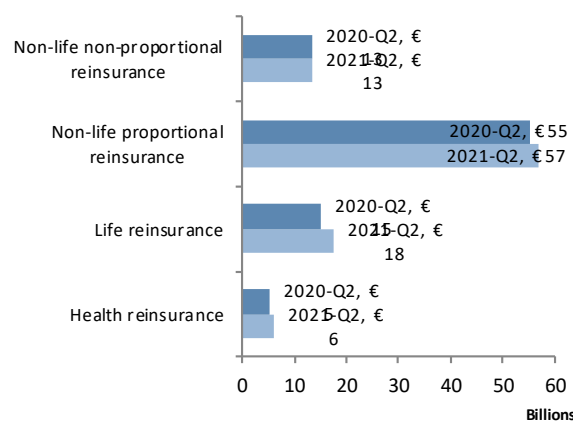
Figure A.2.11: Solvency ratio of EEA reinsurance undertakings (median, interquartile range and 10th and 90th percentile)
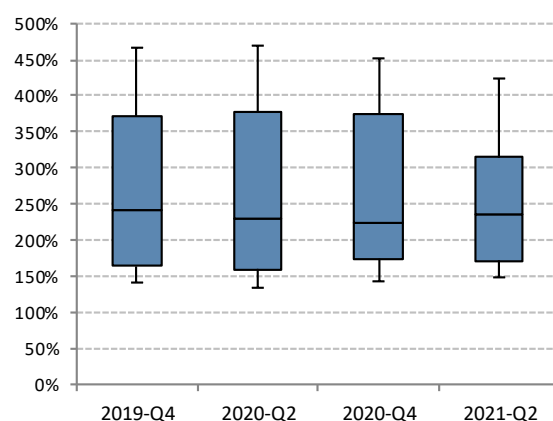
Source: EIOPA Quarterly Reporting Solo
Note for figure 7.2.10: Year-to-date amounts. Non-life reinsurance accepted includes proportional and non-proportional reinsurance. Life reinsurance obligations include life reinsurance and health reinsurance.

Figure A.2.12: Gross Combined Ratio for non-life direct business of EEA reinsurance undertakings (median, interquartile range and 10th and 90th percentile)
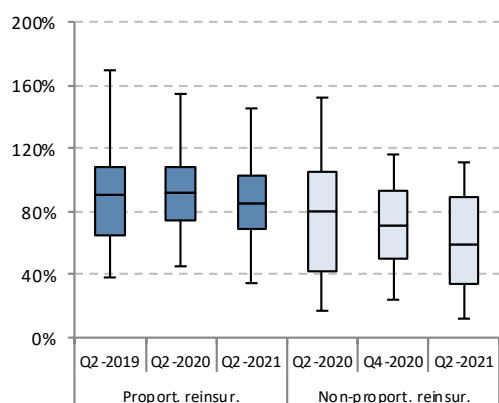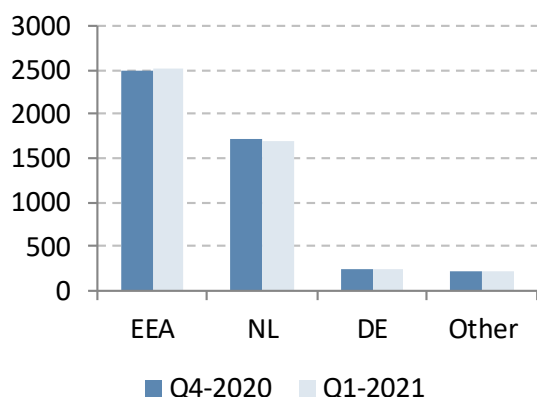
Figure A.2.13: Return on investments for EEA reinsurance undertakings (median, interquartile range and 10th and 90th percentile)

Source: EIOPA Quarterly Reporting Solo
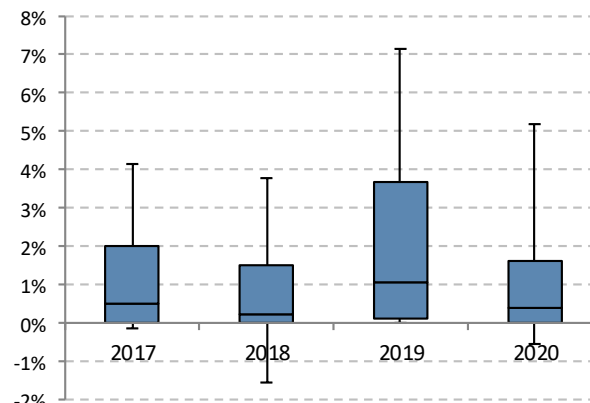
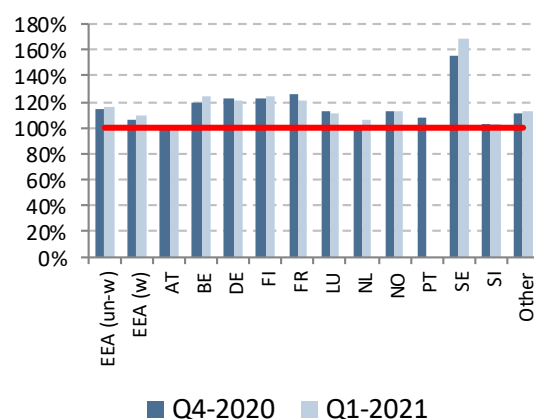*Source: EIOPA Annual Reporting Solo*

IORP sector[60]

Figure A.2.14: Total Assets (in EUR bn)

Figure A.2.15: DB IORPs assets covering liabilities for selected countries (in per cent)

Source: EIOPA PF quarterly.
Note: Figure 7.2.14 is based on data received by 16 countries which provided total assets for both quarters. The category "other" includes all countries except NL and DE.

Source: EIOPA PF quarterly.
Note: "Other" category aggregates three member states with a small number of IORPs in DB scheme. The figures include assets allocated to the DB schemes of mixed IORPs. That allocation may be subject to judgment where assets of mixed IORPs' DB and DC schemes are pooled together. Both the weighted (EEA (w)) and un-weighted (EEA (un-w)) averages are calculated on the basis of the 14 countries that provided data and are depicted in this chart.. Due to different calculation methods and legislation, the reported cover ratios are not fully comparable across jurisdictions.

Figure A.2.16: Penetration rates (total assets as % of GDP)

EEA (w)	EEA (un-w)	NL	SE	NO	PT	LI	IT	BE	AT	DE	ES	LU	SK	DK	SI	FI	FR	LV	HR	PL	BG
149%	17%	212.8%	41.1%	10.7%	10.5%	10.4%	10.0%	7.9%	7.1%	7.1%	3.3%	3.1%	3.0%	2.5%	2.1%	1.6%	1.5%	0.9%	0.3%	0.1%	0.0%

Source: EIOPA PF quarterly and Eurostat
Date: Q1-2021 and 2020

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[60] Figures may be subject to revisions, as they could not cover all Member States due to missing submissions. Information on small IORPs, which are exempted from the full reporting requirements, are excluded, so that for some Member States data may not represent 100% of the total national IORPs sector.

Figure A.2.17: Investment Allocation in Q1-2021 (in %)
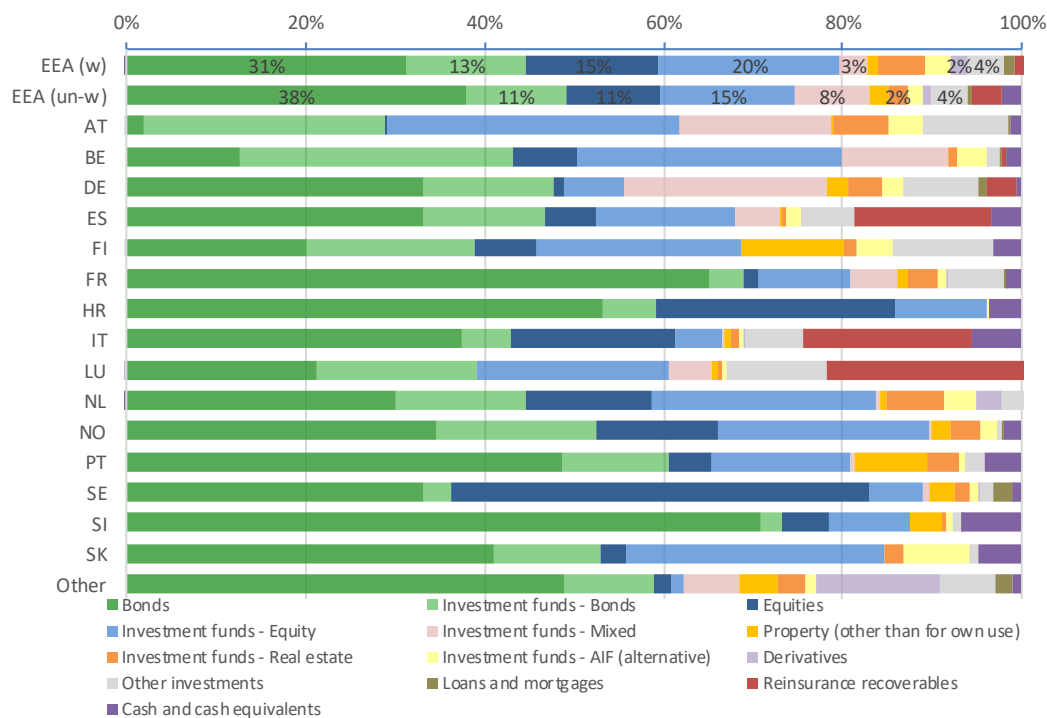
Source: EIOPA PF quarterly.
Date: Q1-2021
Note: EEA (w) is the weighted average, while EEA (un-w) is the un-weighted average. "Other" category aggregates four member states (BG, DK, LI and PL) with a small number of IORPs in at least one scheme (DC/DB). Other investments comprise investment funds and direct investments

Figure A.2.18: Total number of active members (in mil.) by scheme breakdown (in %)
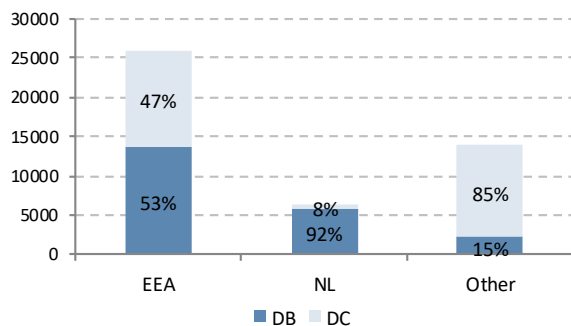
Source: EIOPA PF annual.
Date: 2020
Note: Figure is based on data received by 15 countries. The category "other" includes all countries except NL.

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