

GLOBAL INSURANCE MARKET REPORT

[GIMAR]

2019



IAIS

INTERNATIONAL ASSOCIATION OF
INSURANCE SUPERVISORS

About the IAIS

The International Association of Insurance Supervisors (IAIS) is a voluntary membership organisation of insurance supervisors and regulators from more than 200 jurisdictions. Since its establishment in 1994, its mission has been to promote effective and globally consistent supervision of the insurance industry in order to develop and maintain fair, safe and stable insurance markets for the benefit and protection of policyholders and to contribute to global financial stability.

The IAIS is the international standard setting body responsible for developing principles, standards and other supporting material for the supervision of the insurance sector and assisting in their implementation. It also provides a forum for members to share their experiences and understanding of insurance supervision and insurance markets.

The IAIS coordinates its work with other international financial policymakers, supervisors and regulators, and assists in shaping financial systems globally. It is a member of the Financial Stability Board and the Standards Advisory Council of the International Accounting Standards Board, and a partner in the Access to Insurance Initiative. In recognition of its collective expertise, the IAIS is routinely called on by the G20 leaders and other international standard setting bodies for input on insurance issues and the regulation and supervision of the global financial sector.

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Acronyms and Abbreviations

ACPR	French Prudential Supervision and Resolution Authority
BaFin	German Federal Financial Supervisory Authority
BIS	Bank for International Settlements
BMA	Bermuda Monetary Authority
EIOPA	European Insurance and Occupational Pensions Authority
ESRB	European Systemic Risk Board
EU	European Union
FINMA	Swiss Financial Market Supervisory Authority
FSA	Japan Financial Supervisory Authority
FSC/FSS	Korean Financial Services Commission/Supervisory Service
GDP	Gross domestic product
GIMAR	Global Insurance Market Report
IAIS	International Association of Insurance Supervisors
IMF	International Monetary Fund
InsurTech	Insurance technology
IT	Information technology
IVASS	Italian Institute for the Supervision of Insurance
NAIC	National Association of Insurance Commissioners
NBB	National Bank of Belgium
OECD	Organisation for Economic Co-operation and Development
PRA	Prudential Regulation Authority, Bank of England
UK	United Kingdom
ULIP	Unit-linked insurance product
US	United States
USD	United States dollar
VIX	Volatility index
ZZR	Zinszusatzreserve

This edition of the Global Insurance Market Report (GIMAR) discusses the global (re)insurance¹ sector in 2019 from a supervisory perspective, focusing on recent performance and risks. The (re)insurance sector operates in a challenging global financial setting that is highly prone to vulnerabilities. Persistent trade tensions and slower economic growth may lead to the repricing of risks. This in turn may amplify low-yield vulnerabilities that have built up over previous years.

Growth in non-life (re)insurance is mainly driven by emerging markets. The market and its profitability remained fairly stable in 2018 compared to previous years. Property rates have increased every quarter since the series of natural catastrophes that took place in 2017. Losses, especially those stemming from natural catastrophes, are at a period low. The expansion of alternative capital slowed down in 2019, although it retained a high relative share of overall reinsurance capital.

The life insurance industry has operated in a low interest rate environment for a decade.² This strains profitability, but abrupt rate increases also pose a risk. Sudden spikes could not only affect leverage and liquidity profiles but also lead to policy lapses and surrenders (full policy cancellations).

The life insurance sector is experiencing several challenges. Sales of guaranteed rate products are struggling to grow because yields are low. As a result, in some jurisdictions, unit-linked business is the main driver of growth in life insurance.

Several insurers are also shifting their focus towards asset management or were taken over by asset managers, while some markets have seen more insurers owned by private equity funds.

Cyber-insurance is a new and rapidly growing line of insurance business. This report illustrates how market participants price this risk in the absence of historical data sets and points to the main challenges of managing the risks involved in this type of business. It also covers the main regulatory considerations for cyber-insurance. This report discusses these issues in four chapters:

- ▶ **Chapter 1** analyses the overall macroeconomic and financial environment.
- ▶ **Chapter 2** focuses on global (re)insurance market developments.
- ▶ **Chapter 3** covers the measurement of cyber-risk, the movement out of low interest rates and the risk of interest rate spikes, and the current challenges facing the life insurance industry.
- ▶ **Chapter 4** summarises the results of the IAIS survey of the global reinsurance market, covering 47 reinsurers in nine jurisdictions in North America, Europe and Asia, and links the financial position of reinsurers to the broader financial economy.

This is the seventh issue of the GIMAR.

This report assesses developments relevant to the (re)insurance industry and identifies key risks and vulnerabilities for the industry to promote awareness among IAIS Members, stakeholders and interested parties.

By assessing developments and risks across the whole financial system, the GIMAR plays an important role in the IAIS macroprudential policy and surveillance framework. Importantly, a global macroprudential view complements microprudential insurance supervision, which focuses on the soundness of individual financial institutions.

This report was prepared by the IAIS Macroprudential Policy and Surveillance Working Group and draws on IAIS data on (re)insurers and contributions from several jurisdictions. It is not part of the IAIS' supervisory or supporting material, and is not intended to reflect the official views of IAIS Members. The report was drafted between August 2019 and January 2020 and is based on data available during that period.

MACROECONOMIC AND FINANCIAL ENVIRONMENT

The economic growth in markets at the beginning of 2018 began to slow down in the second half of the year, driven by a decrease in worldwide output. This trend continued in the first half of 2019. The Bank for International Settlements (BIS) reports shrinking global trade, manufacturing and investments as the main causes, although the negative effects are partially offset by consumption.³ Due to its interconnectedness within the global financial system, China's debt-reduction strategy (deleveraging) is also a factor in these trends.

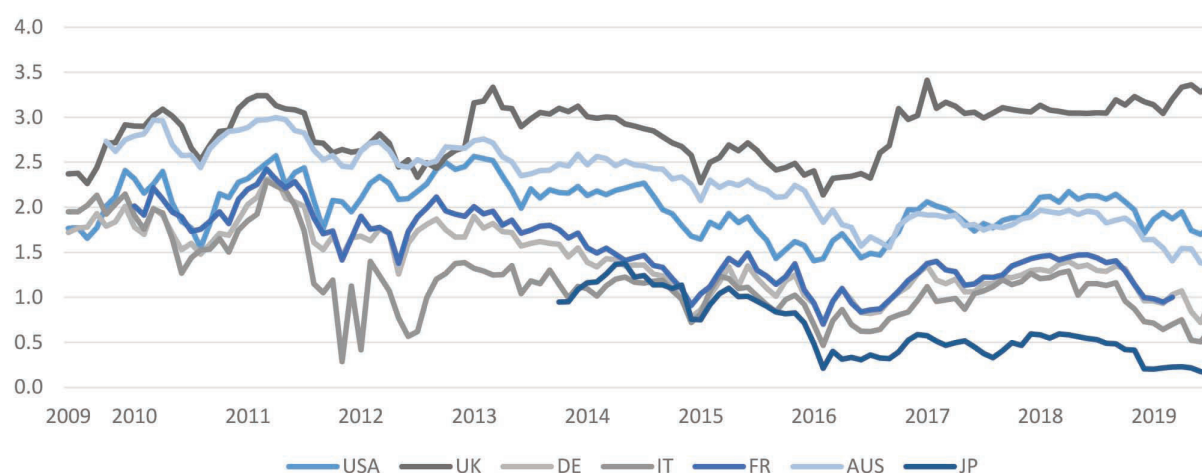
1.1 INTERNATIONAL ECONOMIC GROWTH AND INFLATION

The International Monetary Fund (IMF) October 2019 World Economic Outlook⁴ forecasts global growth of 3% in 2019 and 3.4% in 2020. These figures are 0.3 percentage points and 0.2 percentage points lower, respectively, than the April 2019 forecast,⁵ based on a drop

in corporate and domestic long-term spending and sluggish global trade.

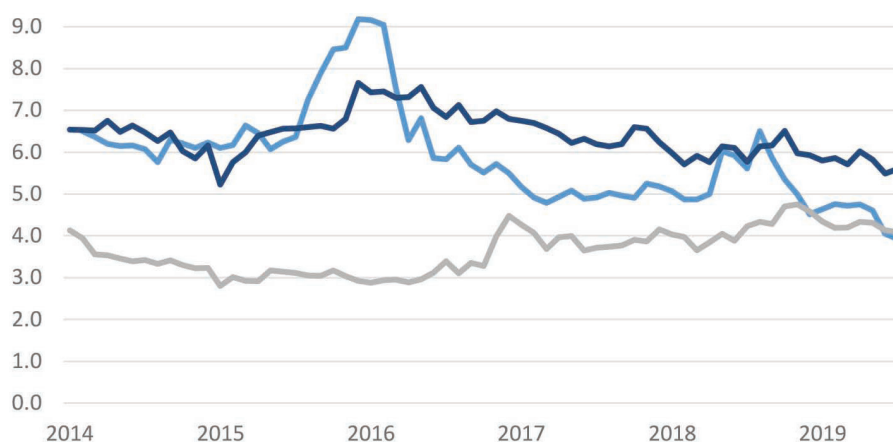
In its July 2019 World Economic Outlook,⁶ the IMF observed a softening in the lower-bound target of core inflation in the United States (US), and inflation well below the lower-bound target in the euro area and Japan. This is consistent with subdued growth in final demand. Market-based inflation expectations, measured by 10-year government bond break-even yields, dropped by about 36 basis points over the past year in the US, to 2.10% in July 2019. In Germany, they reached a 40-month minimum of 0.72% in June 2019, while Japan's rates dropped to 0.16% in July 2019, compared with 0.53% in July 2018. Comparatively, market-based inflation expectations' yields in the United Kingdom (UK) have risen by 30 basis points over the past 12 months, remaining well above 3%.

Figure 1.1a: Market-based inflation expectations, break-even rates of 10-year bonds (% , June 2009 – July 2019⁷)



Source: Bloomberg

Figure 1.1b: Market-based inflation expectations for selected emerging market economies, break-even rates of 10-year bonds (% , February 2014 – July 2019)



Source: Bloomberg

In its Annual Economic Report, the BIS explains the low levels of inflation amid rising wages by suggesting that in mature markets, like the US, Japan and Germany, higher wages are slow to translate into higher price inflation. This may be due to globalisation and the relocation of production to developing economies, unions' diminished ability to capture the benefits of productivity, as well as technological advancements.

Similar trends can be observed in emerging markets with declining inflation expectations over the past year.

1.2 FINANCIAL MARKETS

Globally, monetary policy has focused on reducing interest rates to address global trade tensions and declining economic growth. However, financial markets remain vulnerable to a sudden tightening of financial conditions, materialising through a sharp repricing of risk, escalating trade tensions or ongoing slow growth. These triggers could unearth vulnerabilities that built up during the low-yield environment since the 2007–2008 financial crisis.⁸ In its 2019 Global Financial Stability Report, the IMF estimated that corporate debt has increased. Notably, the stock of BBB-rated bonds has quadrupled and speculative-grade debt has doubled in the US and the euro area since the financial crisis. This may lead to credit risk repricing, which in turn will affect lending and borrowing capacity.

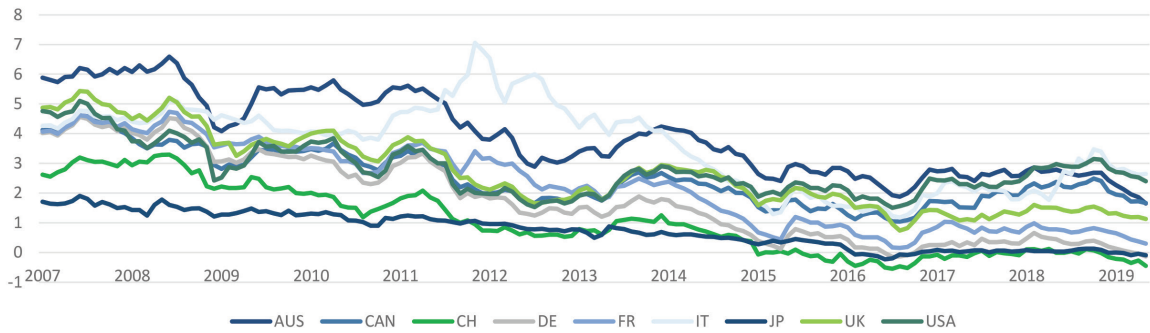
On 31 July 2019, the Federal Reserve cut its interest rate for the first time since 2008, from

2.25% to 2%, as a precautionary measure against ongoing global trade tensions, subdued global growth and volatility in the euro area.⁹ In addition, both the European Central Bank¹⁰ and the Bank of Japan¹¹ announced that they will carry on with their expansionary monetary policy through their asset-purchase programmes. Several commercial banks have started to offer negative interest rates to their wealthier clients in order to pass on part of the low and negative interest rates offered by central banks. A “low-for-long” interest rate environment¹² is setting in, with some jurisdictions observing negative rates for various maturities.

In the 2019 Annual Economic Report, the BIS discusses how volatility in financial markets reappeared towards the end of 2018. The US stock market declined, mainly due to lower growth expectations and earnings uncertainty. Previous expectations of further monetary policy tightening may have also contributed to these trends.

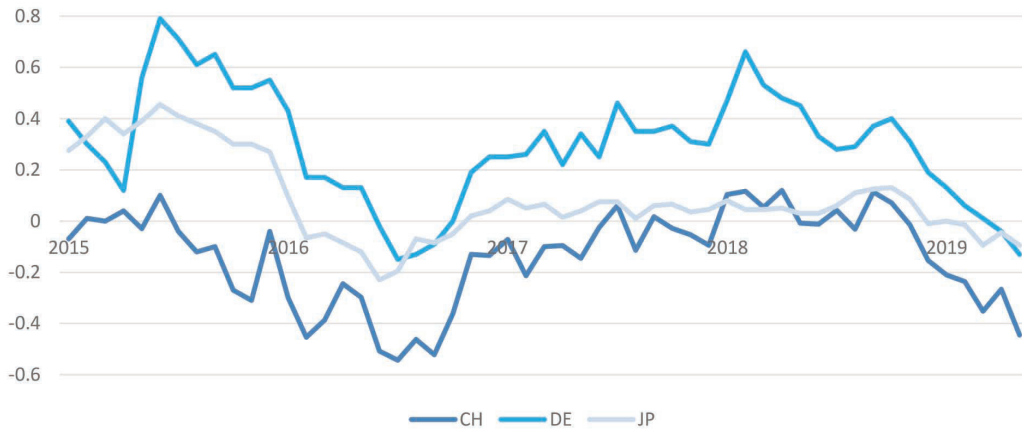
Generally speaking, with notable exceptions that can be observed in the figures below, housing prices maintained their upward momentum of previous years. Trends appear to be fairly stable and are mainly shaped by the downward pressure created by the further decrease in long-term interest rates. As a result, several supervisors and international organisations, such as the European Systemic Risk Board (ESRB),¹³ have warned against a potential overheating of certain residential real estate markets and the risks of high or rising household indebtedness.

Figure 1.2a: Long-term interest rates (% , January 2007 – May 2019)



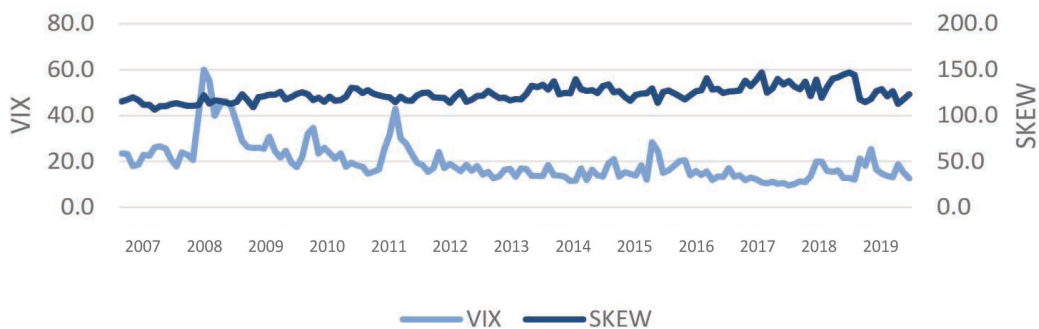
Source: Organisation for Economic Co-operation and Development (OECD)

Figure 1.2b: Long-term interest rates – negative territory snapshot (% , January 2015 – May 2019)



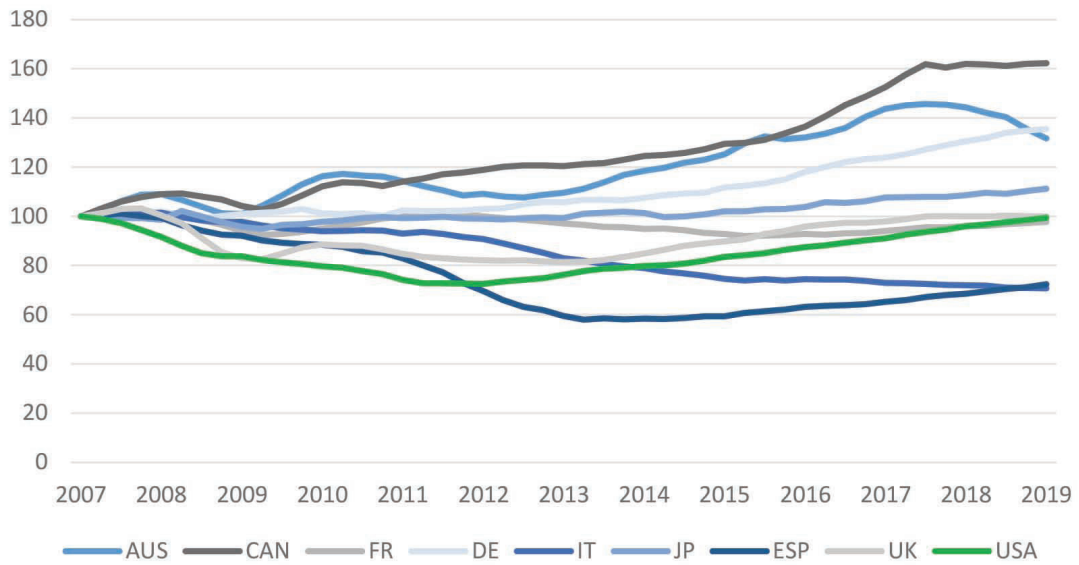
Source: OECD

Figure 1.2c: Volatility in the financial markets (July 2007 – July 2019)



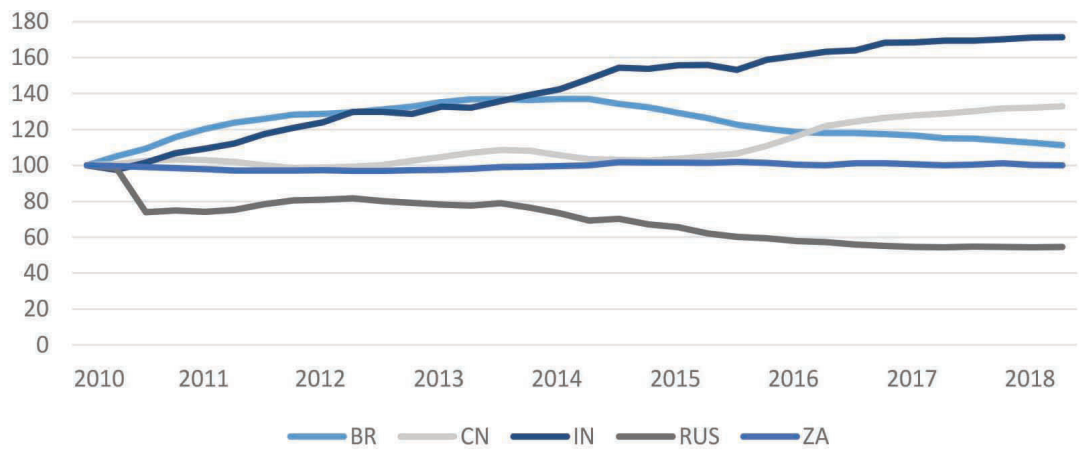
Source: Bloomberg

Figure 1.2d: Real house price indices in selected advanced economies (Q1 2007 – Q1 2019, Index 2007: Q1=100)



Source: OECD

Figure 1.2e: Real house price indices in selected emerging economies (Q3 2010 – Q4 2018, Index 2010: Q3=100)



Source: OECD

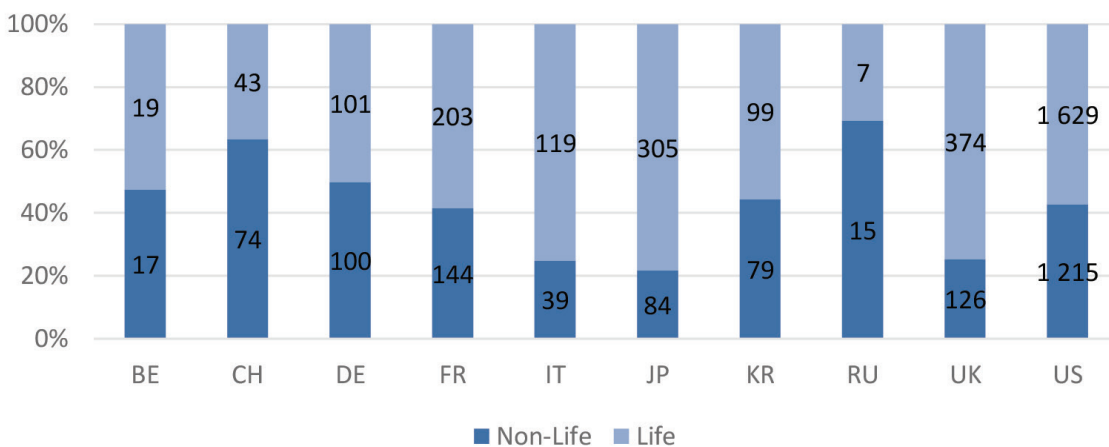
GLOBAL INSURANCE MARKET DEVELOPMENTS

The global insurance market operates in the larger macroeconomic environment and is subject to an environment where interest rates remain low over the long term. Such a low-for-long environment may not only directly hurt the profitability and solvency of insurers, but also increase the probability of a reassessment of risk premia (spreads), resulting in an abrupt spike in interest rates. The interest rate risk to which an insurer is exposed is linked to its asset-liability mismatch risk, especially in companies offering long-term guaranteed rates on their products. Previous editions of the GIMAR have highlighted these challenges. In this year's report, a more detailed analysis of the challenges linked to an environment of suddenly increasing rates can be found in Chapter 3.

The Swiss Re Institute¹⁴ forecasts that emerging markets will further consolidate their share of global direct insurance premiums to 34% by 2029. In 2018, global direct premiums reached their highest level yet at \$5,193 billion, or 6.1% of global gross domestic product (GDP). Although this is a historical maximum, growth has since slowed as a result of a contraction in life markets in China, Europe and Latin America. Technological developments could continue to put downward pressure on pricing and may disrupt markets even further.

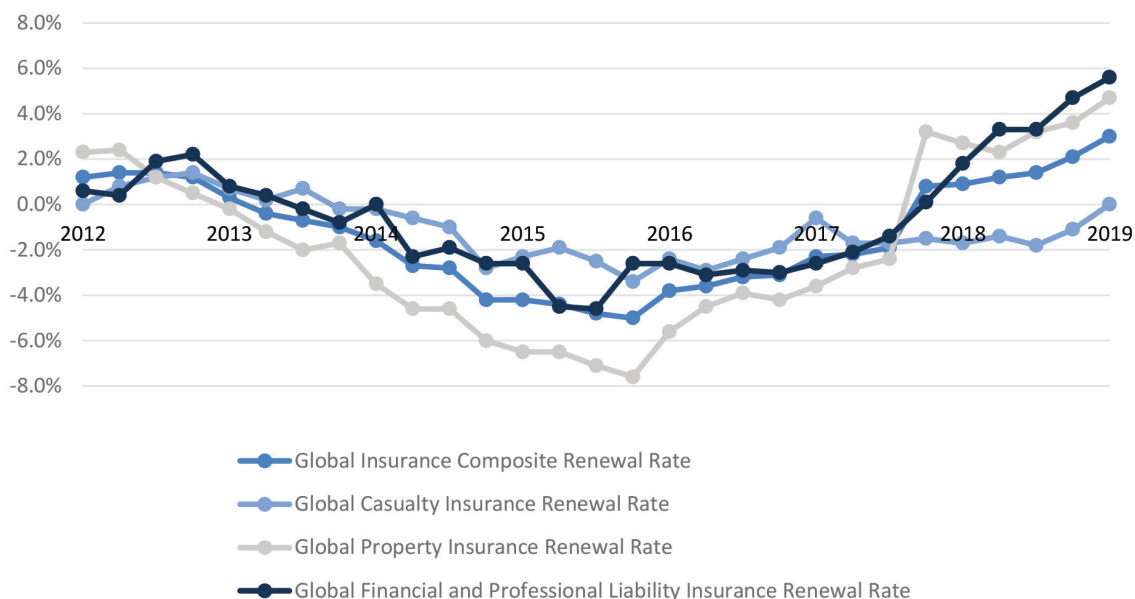
The gross written premiums at year-end 2018 for several selected jurisdictions are set out in Figure 2a. The figure shows life and non-life premiums as a proportion of total gross written premiums. The life sector is dominant in many jurisdictions, while in Switzerland, for example, the non-life insurance industry drives the market.

Figure 2a: Selected jurisdictions' gross written premiums (USD billion, year-end 2018)



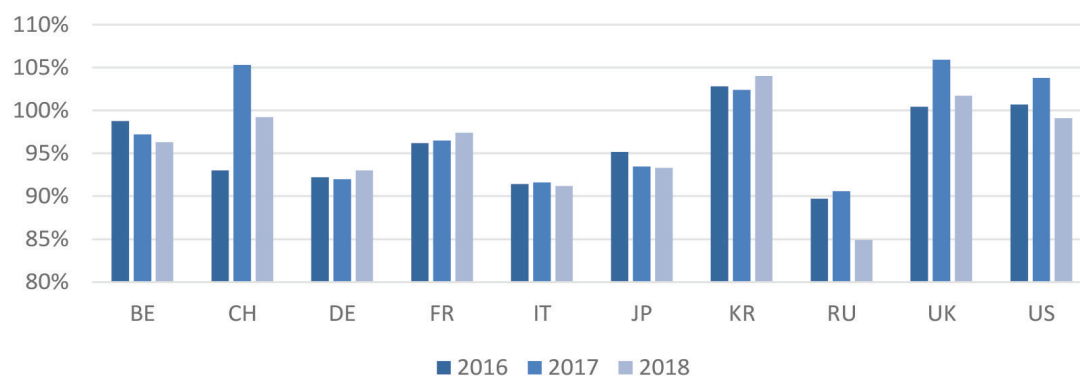
Sources: NBB, FINMA, BaFin, ACPR, IVASS, FSA, FSS, Bank of Russia, PRA, NAIC

Figure 2.1a: Global insurance market renewal rates (Q1 2012 – Q1 2019)



Source: Marsh: “Global Insurance Market Index – First Quarter 2019”

Figure 2.1b: Non-life profitability of selected jurisdictions – combined ratio



Sources: NBB, FINMA, BaFin, ACPR, IVASS, FSA, FSS, Bank of Russia, PRA, NAIC

2.1 NON-LIFE INSURANCE

The non-life insurance market is expected to grow by 3% each year between 2018 and 2020, driven by a growth rate of 8% in emerging markets and 2% in advanced economies.¹⁵

In its Global Insurance Market Index: First Quarter 2019 outlook, Marsh reports a sixth consecutive quarter of increasing commercial

rates, with a 3% average rise in the first quarter of 2019. This trend has been mainly supported by developments in property insurance and directors’ and officers’ liability insurance. Prices in the non-life insurance market fluctuated within a narrow range. Property rates have consistently increased in all regions since the fourth quarter of 2017, following the extreme natural catastrophes that occurred that year.

In its sigma research publication (no. 3/2019), the Swiss Re Institute discusses the events of 2018, in which half of total economic losses from natural and man-made disasters were insured (\$81 billion out of \$161 billion). The most severe event was the California Camp Fire, which made 2018 the year with the fourth highest one-year aggregate industry payout (above the \$71 billion 10-year average).

The non-life market remains soft, although it is showing weak signs of recovery. This puts further downward pressure on its profitability, with returns barely covering the cost of capital. Natural catastrophes made 2017 and 2018 the highest consecutive two-year period of insured losses (\$219 billion) in recorded history.¹⁶ Increasing climate risks have led insurers and supervisors to develop tools to understand the natural catastrophe protection gap. Disasters driven by rising temperatures have a considerable impact on the global economy, with less developed regions being the most vulnerable.¹⁷

The combined ratio¹⁸ for selected jurisdictions between 2016 and 2018 can be seen below.

2.2 LIFE INSURANCE

The Swiss Re Institute's Global Economic and Insurance Outlook 2020 calculates a 1.6% increase in real terms in the global life insurance market throughout 2018. This growth is slightly lower than in previous periods, mainly as a result of a life premiums contraction in China. However,

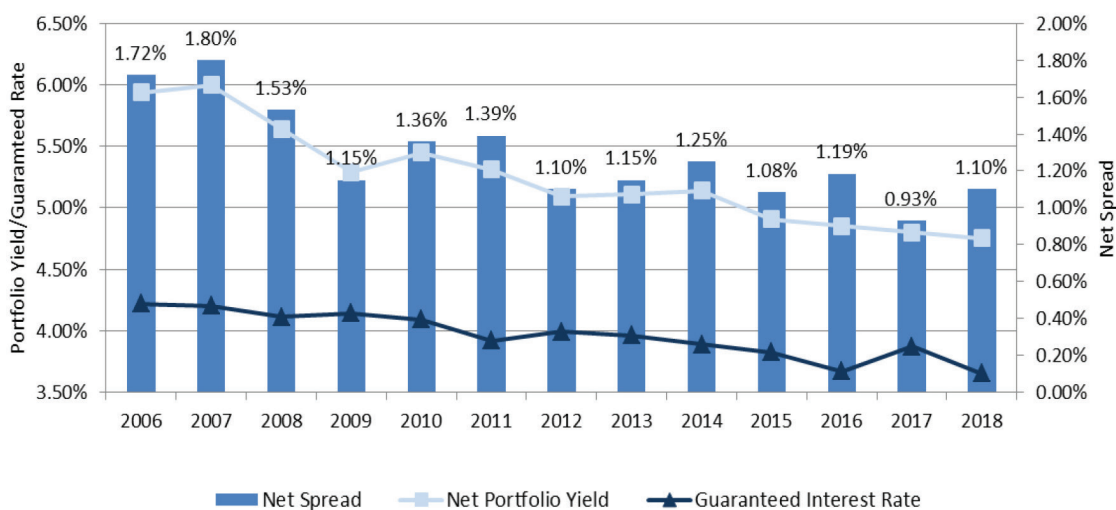
life insurance premiums in emerging markets are expected to increase by 9% in 2019–20, with those in advanced economies remaining stable.

Given the low interest rate environment, the life insurance market will struggle to retain profitability. Traditional life products with fixed guaranteed rates may remain unattractive and policyholders may direct their savings to other markets and risk profiles, even though the opposite trend is being observed in some jurisdictions, such as Italy and France.

Life insurers may respond to these challenges by innovating under the current regulatory regime or offering products with lower or no guaranteed benefits at all. As discussed in Chapter 1 and in the 2018 GIMAR, life insurers will need to prepare to operate in a low-for-long environment and protect themselves against interest rate spikes that could lead to lapses and surrenders. Given the current macroeconomic environment, a shift towards riskier investments, such as equities, real estate and collateralised assets, may need to be monitored by insurance supervisors.

Supervisors track the difference between net investment yields and guaranteed crediting rates for the life industry. In the US, the margin widened last year, with the overall net spread (the difference between the portfolio rate and the guaranteed rate) increasing from 93 basis points in 2017 to 110 basis points in 2018.

Figure 2.2a: US life insurance market net spreads¹⁹ (2006–2018)

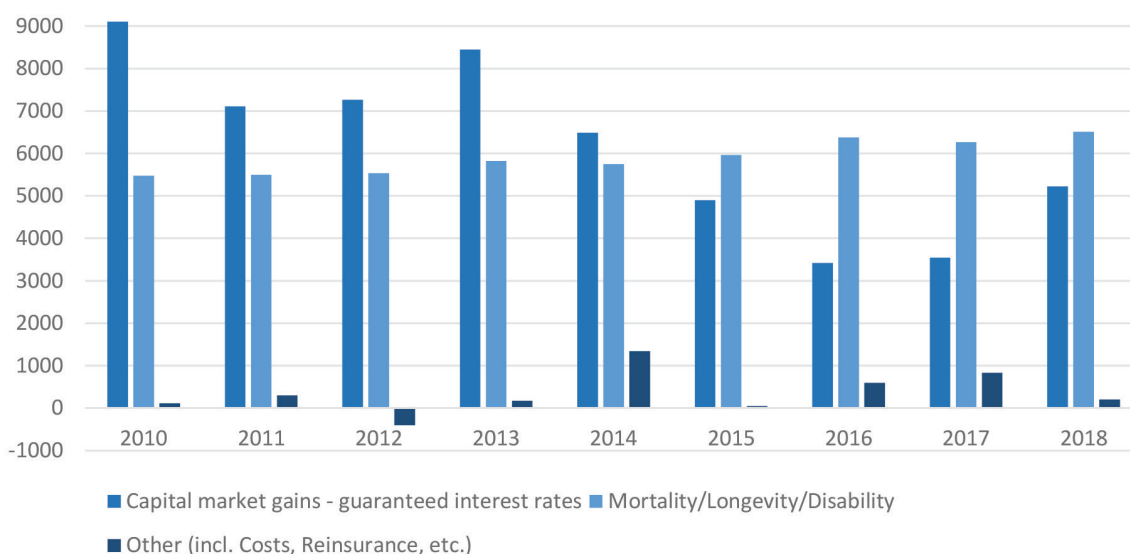


Source: NAIC

Data from selected European jurisdictions show that interest rate margins remain low, with net spreads in 2018 of 41 basis points in Belgium, 76 basis points in Switzerland, 121 basis points in Italy and 223 basis points in France. A full analysis of underwriting profits would also need to take into account the undertakings' reserve levels.

As Figure 2.2b shows, German life insurers' profits and losses are split into components: capital/interest rate gains, risk/mortality gains and other profits. As the method to derive the Zinszusatzreserve (ZZR) has changed slightly, the expenses to build up the ZZR reduced in 2018.²⁰ As a result, the profits from capital gains increased.

Figure 2.2b: Profits and losses in the German life insurance market (EUR million, 2010–2018)



Source: BaFin

2.3 REINSURANCE²¹

The global reinsurance market remains well capitalised. Losses incurred have not increased rates significantly. Reinsurers are still operating in a soft market, with ongoing consolidation (albeit at a smaller scale than in the past). These and other findings are discussed further in the IAIS Global Reinsurance Market Survey presented in Chapter 4 of this report.

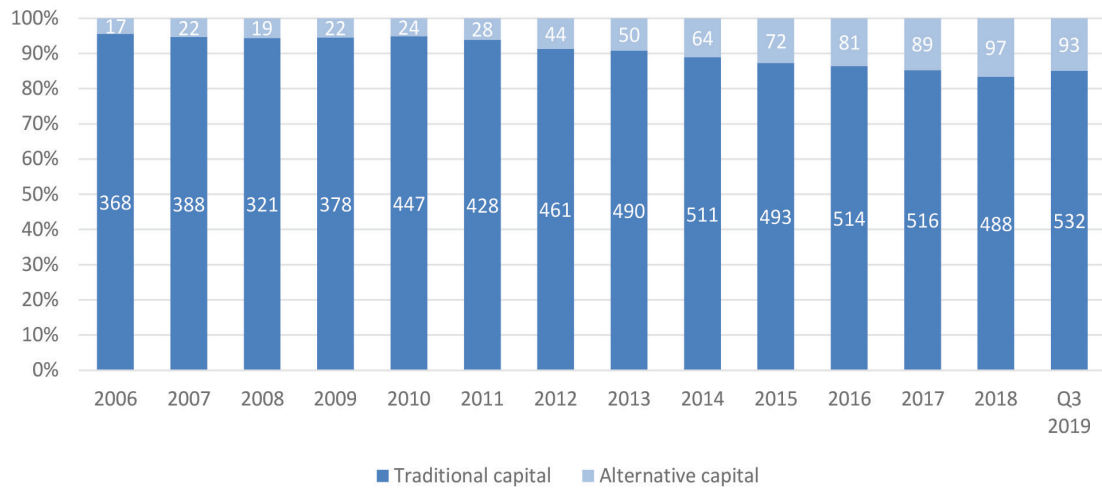
As observed in Figure 2.3a, global reinsurance capital recovered in the first three quarters of 2019, mainly driven by an increase in traditional capital. This trend was supported by the lower levels of natural catastrophe losses and an upswing in capital markets.²² The proportion of alternative capital reached 14.9% of total reinsurance capital in the first three quarters of 2019, slightly above the percentage attained for the whole of 2017 (14.7%) but below the

2018 figure (16.6%). The growth of alternative reinsurance capital in recent years is partly explained by investors searching for higher yields in the capital markets.

In its sigma no. 3/2019 report, the Swiss Re Institute estimates that primary insurers ceded \$260 billion in 2018.²³ This represents 5% of all direct premiums written. Catastrophe bonds and insurance-linked securities issuances have remained strong at \$3.3 billion in the fourth quarter of 2019 – \$1.1 billion above the 10-year average for the quarter and \$1.4 billion above the level observed during the same quarter of 2018.²⁴

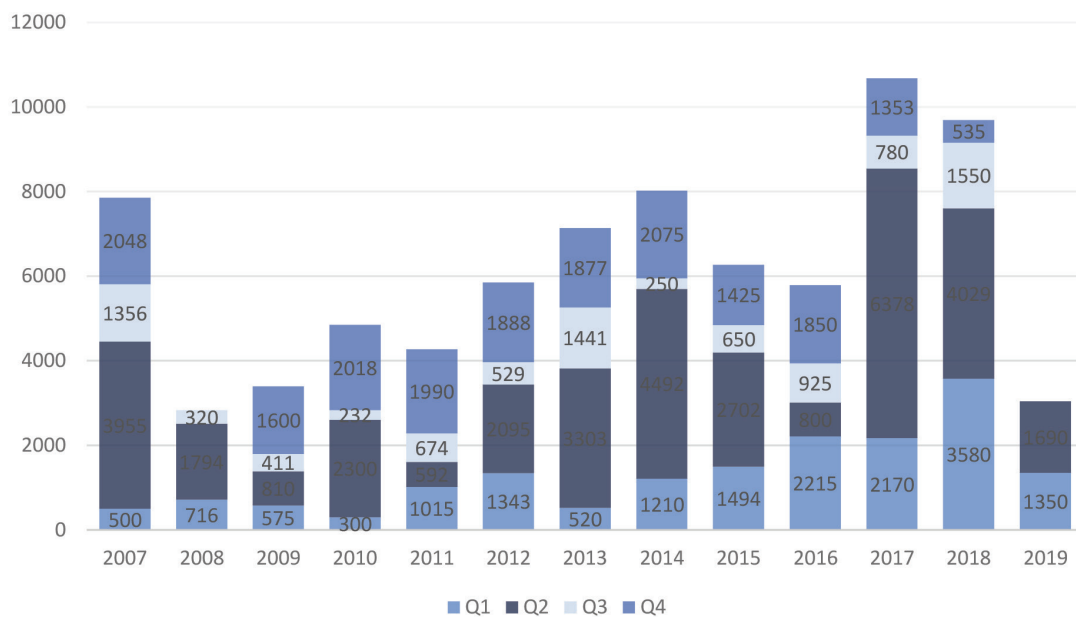
At the end of 2019, property catastrophe bond issuance dropped by \$2.7 billion below the level reached in 2018. However, the total limit outstanding reached an all-time high of \$41 billion. This trend could be the result of

Figure 2.3a: Global reinsurance capital (USD billion, 2006 – Q3 2019)



Source: AON Benfield Reinsurance Market Outlook, January 2020

Figure 2.3b: Property catastrophe bond issuance (USD million, 2007 – Q2 2019)



Source: AON Benfield Reinsurance Market Outlook, September 2019

trapped capital – where collateral is temporarily “trapped” to act as a buffer against losses. Renewals during 2018 and the beginning of 2019 have seen moderate rate increases, particularly in regions and lines of business affected by natural catastrophes. Competitive pressures are still high,

while the ability to release reserves decreased in line with lower solvency positions. Taking these developments into consideration, the European Insurance and Occupational Pensions Authority (EIOPA) emphasises the need for risk-adequate prices for reinsurers.²⁵

SPECIAL TOPICS

13

3.1 CYBER-UNDERWRITING: REGULATORY CONSIDERATIONS

3.1.1 Introduction

This section provides an overview of the cyber-insurance market and the main risk management and regulatory considerations. It concludes with a discussion on market access and potential barriers to entry.

3.1.2 Market Overview

Defining key cyber-related terms

Cyber-attacks can affect the company itself, infrastructure providers (such as cloud services and payment systems) and individuals whose data, identities and privacy may be exposed in a data breach.²⁶

The Financial Stability Board's Cyber Lexicon, published in November 2018, provides the following definitions:

- ▶ **Cyber-risk** is the combination of the probability of cyber-incidents occurring and their impact.
- ▶ A **cyber-incident** is a cyber event that:
 - 1) jeopardises the cyber-security of an information system or the information the system processes, stores or transmits;
 - or 2) violates security policies, security procedures or acceptable use policies, whether as a result of malicious activity or not.
- ▶ **Cyber-resilience** refers to an organisation's ability to continue to carry out its work by anticipating and adapting to cyber-threats and other relevant changes in the environment, and by withstanding, containing and rapidly recovering from cyber-incidents.

- ▶ **Cyber-insurance** is an insurance product primarily created to transfer risk, but has evolved into a product that also helps policyholders reduce the impact of their cyber-risk.

Types of cyber-insurance products

Because cyber-insurance is a relatively new risk, coverage may be provided in one of two ways: affirmative cyber-insurance or non-affirmative (or "silent") cyber-insurance. Affirmative cyber-insurance is a product that explicitly covers cyber-risks. Coverage is contained within a standalone insurance policy (covering only cyber-risk) or offered as a package (covering both cyber-risk and other types of property and casualty coverage). Some insurers also offer cyber-related ancillary services (for example, assessing risk management and security practices, and recommending prevention programmes) in combination with cyber-products, which are tailored to the buyer's needs.

In contrast, non-affirmative cyber-insurance refers to products in which cyber-risk is assumed to be covered because the policy does not include an explicit exclusion for cyber-risk. Although including cyber-risk in these policies may be intentional, it may also be a form of "unintended insurance", referring to an unknown or unquantified cyber-risk exposure that may trigger other traditional property and casualty insurance events.

Market size and growth outlooks

According to AON, global cyber-insurance premiums have grown steadily, with an annual growth rate of about 15% since 2009. If growth continues at this pace, the cyber-insurance market may be worth \$7 billion by 2022.

Figure 3.1a confirms that the US continues to make up the majority of the global cyber-insurance market, but other markets started to develop rapidly from 2015.²⁷ Despite steady growth, the global cyber-insurance market remains relatively small, making up less than 1% of the total insurance market. The projections for growth shown in Figure 3.1a are driven by two assumptions: 1) current silent cyber-insurance policies will not translate into affirmative cyber-products; and 2) the frequency and magnitude of cyber-events will not grow drastically in future. If either of these assumptions is incorrect, the cyber-insurance market may exceed projected levels.

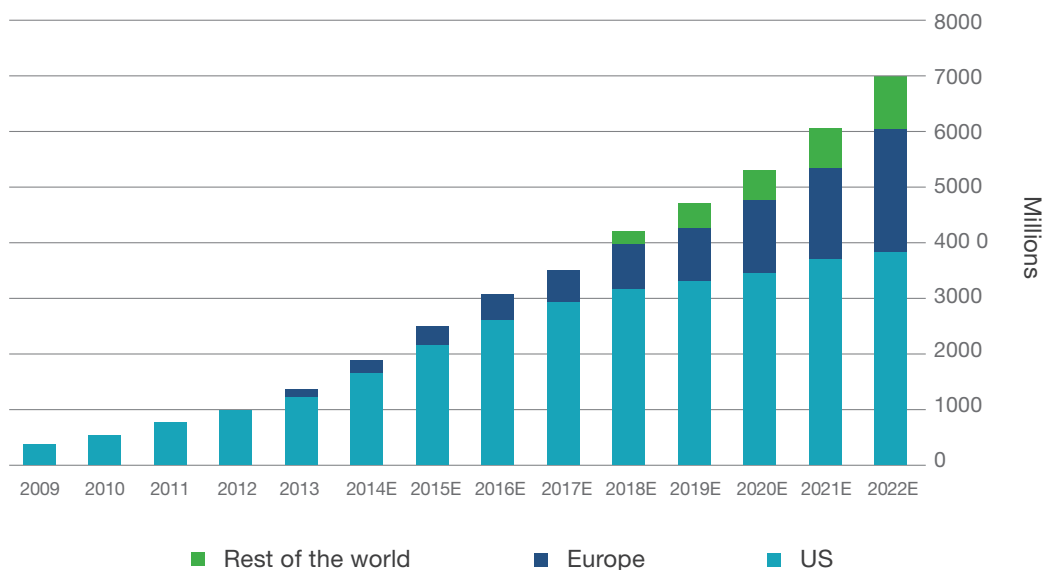
Given that the cyber-insurance market is relatively young, detailed information about markets other than the US is not yet publicly available. The penetration rate varies across countries,²⁸ amounting to about 30% in advanced economies, which is low compared to other lines of insurance.²⁹ The IAIS Global Monitoring Exercise, starting in 2020, may provide more detailed information on the cyber-insurance market.

Future market growth is expected to be largely propelled by technological innovation, which will amplify customers' vulnerabilities and is likely to increase the frequency, magnitude and volatility of cyber-attacks.

Digital transformation and technological progress are creating a more competitive environment, producing business opportunities for new entrants and incumbents seeking to enter the cyber-insurance marketplace. Customers will benefit from the bundling of products, such as insurance sold with information technology (IT) mitigation and recovery services. Insurers can take advantage of this undeveloped market, given its high capacity and the potential for increased take-up rates. They can adjust their overall market strategies and operations, enter into partnerships, and/or offer new products, which in turn could lead to high insurer growth rates and profits.³⁰

Insurance technology (InsurTech) startups and other partnerships may provide an opportunity to encourage market participation. InsurTech could facilitate the development of new products or offer innovative methods of assessing IT risks. Startups and partnerships could also provide other valuable services such as access to a large database of information or customer support in risk mitigation and incident response (whether from a technical or legal perspective).

Figure 3.1a: Global cyber-insurance premiums and future estimates (USD million, 2009–2022)



Source: Aon Cyber Insurance Market Insights – Q3 2018

This type of business collaboration is already happening in other markets and incentivises further developments in the insurance market. As these opportunities develop, insurers will need to assess the potential value of new partnerships, while supervisors will need to assess their role in supervising the activities of these business partners. The hope is that new players in the market may improve efficiency and create innovative solutions that meet insurers' specific business needs and expectations.

3.1.3 Risk Management and Regulatory Considerations

Cyber-risk measurement

At a basic level, measuring cyber-risk uses the same methodology as other risks: an underwriter must project the likelihood of covered incidents at different levels of severity. Insurers may use a variety of data sources, including:

- ▶ Insurer experience data
- ▶ Counterfactual risk assessment
- ▶ Third-party cyber-risk models
- ▶ Worst-case scenario analysis
- ▶ Compliance with cyber-security standards.

Four main approaches have been used in the past,³¹ but an overall lack of harmonisation creates wide variations in pricing and product offerings. Insurers may quote differently for the same type of risk, depending on what they define as a cyber-risk, cyber-incident or cyber-attack, and this determination will be based on a variety of available data sets and other underlying information used to price the risk coverage.

Questions remain about the reliability of traditional cyber-models as very few insurers have the capability to accurately measure cyber-risk. The Geneva Association has noted that property catastrophe modelling took between 25 and 30 years to mature,³² and that modelling was based on a risk that had a clear geographic footprint and extensive experience data. In addition, accurately measuring cyber-risks involves several challenges: given that this risk has only recently developed, experience data is limited; the occurrence of an event relies on the unpredictability of human nature; and the severity of the loss depends on a nearly endless number

of variables that occur in a highly connected digital environment.

As the industry continues to develop advanced modelling techniques to account for these factors, deterministic scenario-based methods have provided a working solution in the interim. Some modelling vendors are developing dedicated cyber-risk models, with several creating predictive models that seek to specifically quantify non-affirmative risk. All cyber-models must be continuously developed on an iterative basis in response to the dynamic nature of cyber-risk.

Insurers and modellers can examine previous cyber-events (and near misses) using counterfactual analysis to identify potential worst-case scenarios and calculate maximum probable exposure levels. Insurers, particularly new entrants to the cyber-insurance market, also rely on knowledge gained from modelling and underwriting in established categories, particularly in complex and specialty risk classes, such as pandemics and terrorism. These risk classes influence the development of algorithms, and underwriters can draw on policy language used for these complex risks to limit their potential exposure in the event of a claim.

Other insurers rely on external services (outsourcing), integrating the information they receive with their experience and public data, or they develop premiums by replicating – with some adjustments – the rates applied by their main competitors. In this scenario, where data and modelling are scarce, the risk of mispricing and over/under-reserving is high, especially when comparing rates applied to products with different characteristics (type and scope of coverage, risk included/excluded) and a low degree of standardisation.

QUESTIONS
REMAIN ABOUT
THE RELIABILITY
OF TRADITIONAL
CYBER-MODELS
AS VERY FEW
INSURERS HAVE
THE CAPABILITY
TO ACCURATELY
MEASURE
CYBER-RISK.

Given the limitations of current models, some insurers rely on other methods to measure cyber-risk. Primarily, pricing reflects a qualitative assessment of the insured's security environment. This level of assessment will depend on the amount of protection being sought under a policy. A lower level of coverage may rely on the use of checklists and assessing the presence of standard security protocols. Large clients posing a high level of risk are generally subject to highly

individualised and detailed IT security audits. These underwriting processes also help identify areas of vulnerability and provide an opportunity for the insured to improve their resilience and reduce the overall level of risk.

A qualitative assessment also supports the insurer's ability to form a comprehensive understanding of its client base's overall security defences, and improves its ability to differentiate risks and refine pricing among policyholders. This leads to the development of certain standardised data protocols used to measure cyber-risk in an insurer's portfolio. Similarly, supervisors can also play a role in reviewing an insurer's practices to ensure appropriate risk management. As part of this effort, insurers and supervisors can review external standards and incorporate them into their own risk assessment processes.

Insurers may also attempt to measure risk by analysing scenarios or using other risk assessment tools.³³

Data availability

The market suffers from a lack of experience data, which makes underwriting cyber-risk difficult. Although more data are becoming available, most cyber-incidents are underreported by companies, whether due to fear of reprisal or concerns about reputational damage. In addition, cyber-risk experience data can quickly become dated and lose value as attackers rapidly adapt to exploit new vulnerabilities and evade cyber-security measures.

Only a few big players with extensive experience in the cyber-market can generate their own mass of data, and they are reluctant to share that experience with other companies to ensure they remain competitive and gain an advantage in underwriting.³⁴ This data paucity may weaken the insurer's confidence in pricing and underwriting cyber-insurance. At the same time, buyers may question the appropriateness of the premium and coverage offered. These factors depress sales and reduce the penetration rate.³⁵

Although current measurement methods attempt to access a broad range of information, insurers still need a centralised source of information/data repository about cyber-events. Consensus is building that the evolving nature of cyber-risk, combined with the cross-border and cross-industry economic implications of a cyber-attack, demand an increased level of coordination – both within the insurance industry and beyond.

Insurance supervisors can assist with monitoring overall cyber-risk aggregation within the industry by collecting data. In the US, the National Association of Insurance Commissioners (NAIC) requires insurers to include a cyber-supplement in their annual data reporting.

Supervisors can also help mitigate systemic risk by facilitating the sharing of information related to cyber-risk, and encouraging insurers to share information with each other. Not only does this increase resilience levels of similarly situated policyholders, but the collected information could contribute to the ability of the insurance industry to accurately assess aggregate risk levels and predict how risk may evolve in future. Although an insurance-centric repository is ideal, current information-sharing repositories include:

- ▶ Financial Services Information Sharing and Analysis Center (FS-ISAC): www.fsisac.com
- ▶ National Institute of Standards and Technology's National Vulnerability Database (US): nvd.nist.gov
- ▶ Department of Homeland Security's Cyber Information Sharing and Collaboration Program (US): www.dhs.gov/cisa/cyber-information-sharing-and-collaborationprogram-ciscp
- ▶ FBI's Infraguard (US): www.infraguard.org
- ▶ Malware Information Sharing Platform's Threat Intelligence Platform: www.misp-project.org

Closer analysis of the governance and security issues that are preventing the creation of an incident data repository is needed,³⁶ but for now supervisors can continue to share general best practices and experiences with each other in order to improve the industry's ability to measure and mitigate cyber-risk. Supervisors will also need to build a level of trust and ensure ongoing communication with insurers to ensure that they can freely share information (with both supervisors and each other) without concerns about competition or fear of reprisal.

The Operational Riskdata eXchange Association is an example of a successful industry-led data-sharing mechanism outside of cyber-risk. The association was set up to "provide a platform for the secure and anonymised exchange of high-quality operational risk loss data from around the world".³⁷ Banks and insurers provide anonymised data on operational risk losses in return for access

to the data set. This creates a growing pool of data that can be used to improve the industry's understanding of operational risk. A similar mechanism for cyber-risk could also be effective.

To encourage the development of an insurance-centric repository, supervisors could standardise the amount and type of data needed on each cyber-incident. This would make it easier for insurers to share information.

Non-affirmative cover and risk accumulation

Supervisors and the industry have expressed concern about non-affirmative cyber-risks. The Bank of England's Prudential Regulation Authority (PRA) survey on cyber-underwriting found that, for non-affirmative risks, most firms reported considerable exposure on many traditional lines of business, including casualty, financial, motor, and accident and health. The survey found that firms did not have well-developed quantitative assessment frameworks for non-affirmative exposure and that the assessments generally involved stress tests and expert elicitation.³⁸

In 2018, the EIOPA asked 11 insurers if it was possible to quantify non-affirmative exposure. Nine described it as "very difficult" and the other two as "nearly impossible".³⁹ In a later survey, only five insurance groups out of the 26 that responded to the question reported that they had cyber-exclusions on property and casualty policies.⁴⁰ Some of those that did not provide exclusions said that it was due to the difficulty of relating the risk – for example, personal injury – to a cyber-incident. Other respondents did not see cyber-risk as a current threat.

The Monetary Authority of Singapore, in collaboration with the IMF, conducted a stress test on cyber-risk as part of the 2019 financial sector-wide stress test exercise and the IMF's Financial Sector Assessment Program. Direct insurers were asked to measure their exposures to cyber-risk as a result of the affirmative and non-affirmative coverage that they had written. The insurers expected claims from affirmative and non-affirmative cyber-coverage to be manageable, mainly due to the reinsurance arrangements in place. However, one key observation from the

exercise was that insurers' non-affirmative cyber-exposure was five times more than their affirmative exposure. Moving forward, insurers with exposures to non-affirmative cyber-coverage intend to include appropriate exclusion clauses in their contracts.⁴¹

Potential mitigants to non-affirmative exposure include writing explicit cyber-exclusions, increasing premiums to reflect the increased risk, and attaching specific limits to coverage. Many insurers are starting to carefully review policy language to minimise their potential exposure to unintentional cyber-coverage, which has lowered the perceived level of non-affirmative risk by insurers. Although this action occurs after a policy has been written, it is one way in which insurers have been developing their capabilities to measure cyber-risk and ensure healthy loss ratios.

In some jurisdictions, regulators have issued guidance on non-affirmative risk. In a supervisory statement in July 2017, the PRA advised that it expected insurers to be able to "identify, quantify and manage" both affirmative and non-affirmative cyber-exposure.⁴²

Non-affirmative cyber-risks can quickly accumulate. A cyber-incident may affect multiple businesses at the same time due to shared connections

(such as payment systems, operating systems, internet providers and cloud services). A cyber-incident that takes advantage of the interdependency of businesses and infrastructure may even compromise the supply chain, resulting in extensive economic losses and large-scale disruptions. Although no such attack has occurred to date, a large-scale cyber-attack that exploits a mass vulnerability or cloud service provider could result in catastrophe-level losses – an extreme act of cyber-terrorism affecting infrastructure could result in up to \$1 trillion in economic losses.⁴³ Concerns about this type of event have led the industry to take a fairly conservative approach to underwriting cyber-risk, even though the line of business has been largely profitable to date. Until a large-scale event happens, it will be difficult to predict the impact it would have on the insurance industry.

Concerns about the aggregate level of risk have led to discussions about ways to properly address potential accumulation risk.

IN 2018, THE EIOPA ASKED 11 INSURERS IF IT WAS POSSIBLE TO QUANTIFY NON-AFFIRMATIVE EXPOSURE. NINE DESCRIBED IT AS "VERY DIFFICULT" AND THE OTHER TWO AS "NEARLY IMPOSSIBLE".

Currently, companies use models and stress testing scenarios to identify and quantify accumulation risk. This risk is then transferred to reinsurers and risk-sharing pools as part of an insurer's overall risk management strategy.

3.1.4 Market Access and Potential Barriers to Entry

Insurers are struggling to grow in a slow-recovering economy, and cyber-insurance presents an opportunity to gain market share. But new entrants face several challenges, including limited historical data, evolving methods of measuring cyber-risk and a high degree of uncertainty about the level of risk. This section focuses on the additional drivers that insurers must consider when deciding whether to enter the cyber-insurance marketplace. It also discusses current government initiatives supporting the market's growth.

Development of cyber-expertise

A key priority for insurers exploring the cyber-insurance market is to ensure they have sufficient technical expertise to understand the risks associated with this type of underwriting and to support new cyber-related business projects. Access to skilled experts is important for the success of market participants, but uncertainty around market development makes it difficult to find people with the skills needed to understand the nature of cyber-risk, design contracts, underwrite and price risk, and manage an insurer's risk portfolio. This shortage of skilled experts is being addressed through training programmes and recruitment campaigns to hire experienced individuals. Insurers may also rely on external expertise, as noted by respondents to a PRA survey.

Methods of risk transfer and pooling for insurer consideration

In the absence of actuarial/historical underwriting data and given the difficulty in accurately measuring risks, many insurers rely on mechanisms to transfer their own risk.⁴⁴

Reinsurance in the cyber-market is expected to grow at a fast pace. Insurers have a strong preference to work with reinsurers because they can provide broader data sets of information, give comprehensive underwriting information to support their premium pricing process, and quantify cyber-risks. Reinsurers have access to information on threats and vulnerabilities and, as such, could help reduce the gap in data availability for underwriting and modelling cyber-risk. Reinsurers are currently the main method of transferring risk to reduce

insurers' exposure and losses. In Europe, quota share treaty contracts⁴⁵ appear to be the most common type of contract used, followed by proportional facultative reinsurance.^{46, 47}

Cyber-risk can also be transferred to the capital markets using alternative risk-transfer instruments, although using insurance-linked securities such as catastrophe bonds, sidecars and industry-loss warranties can be challenging. For example, while insurance-linked security vehicles are primarily issued to cover catastrophe risks (and, to a lesser extent, products in other business lines), issuing such an instrument to cover cyber-losses is difficult due to a lack of data and modelling capabilities. Using insurance-linked securities for cyber-risks may also be less appealing to capital market investors due to the unpredictability of cyber-risk and the potential correlated impact on bonds and equity. However, a pooling mechanism could potentially facilitate the issuing of insurance-linked securities for cyber-risk, supported by regulatory measures or tax incentives to encourage risk transfer to capital markets.⁴⁸

Some jurisdictions use consortiums or risk-pooling mechanisms to manage insurer cyber-risk. Risk-pooling mechanisms are instruments that can:

- Carry a higher level of risk through diversification, which reduces overall uncertainty and leads to lower coverage prices.
- Facilitate the participation of smaller insurers by providing access to others' experience and limiting risk exposure.
- Standardise products among pool members (who are likely covering similar risks).
- Allow insurers to share claims experience and reduce the data gap for underwriting and modelling cyber-risk.
- Allow the industry to cover cyber-events that would otherwise be uninsurable and permit further risk mitigation through the use of reinsurers and capital markets.

3.1.5 Conclusions

Non-affirmative cyber-risk remains prominent and a lack of standardisation in policy language has exacerbated this issue, resulting in many insurers being uncertain about their overall levels of exposure. Cyber-risk models are relatively immature due to the lack of underwriting experience and availability of data, paired with a volatile and fast-evolving risk. Insurers therefore rely on other methods of risk measurement, including individualised risk assessments, which provide policyholders with a map of risk mitigation guidelines but make it difficult for insurers to

engage in comparative pricing and assess their overall risk portfolio. Information sharing is critical but underused. The use of reinsurance and other risk-pooling mechanisms can help promote the flow of information while offering insurers the benefits of risk transfer.

Although many public and private initiatives and studies have collected information on previous cyber-incidents, coordinated actions by supervisors will play a key role in streamlining the variety of data sources available to measure cyber-risk, encouraging the standardisation of data collection while maintaining the benefits of competition, and fostering information sharing to improve insurer underwriting and encourage market growth.

Insurers may not be fully aware of their overall risk exposure, which affects their ability to accurately calculate premiums, set appropriate limits and adopt appropriate pricing strategies. Given the evolving nature of the cyber-landscape, companies should demonstrate a continued commitment to developing their knowledge of cyber-insurance underwriting risk. Supervisors need to share information and best practices to enhance their own ability to evaluate the pricing and exposure of insurers within their jurisdictions. They also need to consider how they can support an integrated approach to cyber-risks that will adequately reflect the risk in insurers' strategy and risk appetite. Initiatives are under way in several countries to foster greater risk awareness and to push insurers to adopt conscious risk management and supervision, but additional efforts are required by both supervisors and insurers.

3.2 THE RISKS OF INTEREST RATE SPIKES WHEN MOVING OUT OF A LOW INTEREST RATE ENVIRONMENT

3.2.1 Introduction: The Different Aspects of Interest Rate Risk for an Insurer

There is a time gap between insurers receiving premiums and making payments if a claim arises. During this gap, premiums are invested in financial assets. Ideally, the cash flows of these financial assets closely match the cash flows of liabilities but, in practice, these cash flows don't match perfectly for various reasons. One reason is that finding assets with a maturity and cash flow profile similar to the liabilities is challenging. It is also possible that insurers prefer to take on more risk in order to increase their expected returns. As a result, insurers actively participate in capital and money markets.

According to data from the Federal Reserve Bank of Chicago,⁴⁹ US life insurers invested \$5.4 trillion in total in 2013, while US non-life insurers⁵⁰ invested \$1.7 trillion in 2018. Respectively, about 75.5% and 57.9% of US life and non-life insurers' investment portfolios comprise bonds. Similarly, insurers in the European Union (EU) invested 51% (not taking into account unit-linked investments) of their total assets of €11.3 trillion in bonds and an additional 5% in loans and mortgages.⁵¹ The value of these bonds is directly affected by interest rate changes, exposing insurers to risk. Insurers are also exposed to interest rate risk through liabilities when there is a mismatch between the cash flows of assets and liabilities.

If interest rates move, insurers are affected in the following ways:

- ▶ **Portfolio revaluation effects.** As interest rates change, the market value of assets and liabilities that are sensitive to the interest rate also changes. Longer-term bonds and liabilities are affected more than shorter-term items because they are more sensitive to rate changes.
- ▶ **Reinvestment effect.** Insurers also rely on bond interest payments to match liabilities' cash flows. When interest rates rise, buying bonds with large enough coupon payments to match liabilities' cash flows is easier. However, the opposite is true when interest rates go down.
- ▶ **Lapse rates.** Moving interest rates (and related commercial incentives) may influence policyholder behaviour. Rising interest rates may increase the appetite of policyholders to lapse and seek other investment alternatives, while decreasing interest rates may induce policyholders to stay in contracts with high guaranteed interest rates longer than expected.

Life and non-life insurers often have a different sensitivity to interest rate movements. Life insurers offer long-term products such as whole life insurance with and without a savings component. To match these products' liability cash flows, life insurers try to buy long-term assets with similar cash flows. The better the insurer can match asset and liability cash flows, the less pronounced its sensitivity to interest rate movements will be. But finding the right match is not always possible. Non-life insurers invest in bonds and other assets that are sensitive to interest rates, but are affected to a lesser extent than life insurers. Property insurers, for example, tend to have short duration liabilities and therefore require shorter-term bonds to match their liabilities. As it is often easier for

non-life insurers to find these shorter duration bonds, their sensitivity to interest rate changes is less pronounced.

Whether or not this interest rate sensitivity is translated to the balance sheet of the insurer depends on the valuation system applied. For example, in its most basic form, a life insurance reserve reflects the changes in the company's net asset value, based on actuarial assumptions about interest rates, mortality, lapses and so on. In mark-to-market regimes, such as Solvency II, the market prevailing risk-free rates are used to calculate the best estimate of liabilities/reserves (the actuarial present value of claims and expenses minus the actuarial present value of premiums, gross of expenses). As risk-free interest rates change in the market, the valuation of life insurance reserves under such a regime changes as well (see Box 1).

Not all regulatory systems are fully mark-to-market. Under US Generally Accepted Accounting Principles, for example, reserves are valued using the prevailing economic assumptions at the date when the insurance contract was written. Insurers make an allowance for a deficiency reserve, but in general interest rate volatility is not fully apparent in the valuation of the liabilities in such a regime.

Under US accounting principles, mark-to-market assets can be revaluated based on changes in interest rates, with liabilities exhibiting less volatility due to little revaluation.

Spread movements also affect insurers' balance sheets under a full mark-to-market regime. While such movements directly affect spread-sensitive assets, the degree to which they affect liabilities depends on the valuation approach used (particularly the discounting features).

Solvency II has long-term guarantee measures, which partly transfer the spread movements of assets to liabilities by adding part⁵² of the spread to the risk-free discounting rate. This portion often represents the part of the spread that is not related to credit fundamentals.

There is no agreement among economists about the extent to which the risk-free rate should be adjusted for spread changes.

Certain types of life insurance are not sensitive to interest rate movements. Unit-linked insurance often transfers investment risk to the policyholder, while the insurer bears some residual risk (for example, if there is rider coverage).

Box 1. Interest rate changes and valuation of cash flows

A cash flow occurring at time t years from now, at the amount of $\$C$ and at an interest rate of $r\%$ effective for t years from now, is valued according to this formula:

$$\frac{C}{(1 + r/100)^t}$$

As the interest rate $r\%$ increases to $r\% + \Delta r\%$, the denominator increases and the fraction as a whole decreases. The economic interpretation is that if interest rates rise, investors want to take advantage of the higher rate of return, so they will value any cash flow contracted under interest rate $r\%$ for less. The longer the time period, the more pronounced the effect of revaluation.

Assume $C=1$, $r=1\%$, $\Delta r=1\%$ and $t=1$ and $t=10$. The valuations for $t=1$ and $t=10$ and $r=1\%$ are:

$$\begin{aligned} \frac{1}{(1 + 0.01)^1} &= 0.99 & \frac{1}{(1 + 0.01)^{10}} &= 0.905 \\ \frac{1}{(1 + 0.01 + 0.01)^1} &= 0.98 & \frac{1}{(1 + 0.01 + 0.01)^{10}} &= 0.82 \end{aligned}$$

The value of a 10-year cash flow decreased by 9.4% ($0.82/0.905 - 1 = -9.4\%$) compared to 1% for the value of a one-year cash flow when interest rates increase by one percentage point.

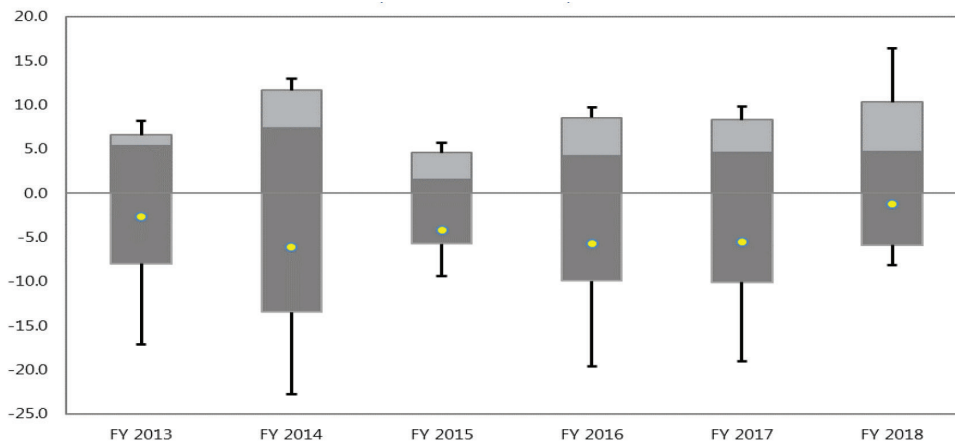
Although insurers are not liable to compensate investment losses for these types of insurance, changing interest rates can affect the desirability of these products. If interest rates are low, exposure to higher risk may be desirable and unit-linked products may be more appealing⁵³ than traditional products.

The interest rate environment also determines the profitability of all types of insurers. For example, although they are less sensitive to interest rate

movements, non-life insurers' profitability also depends on their investment income.

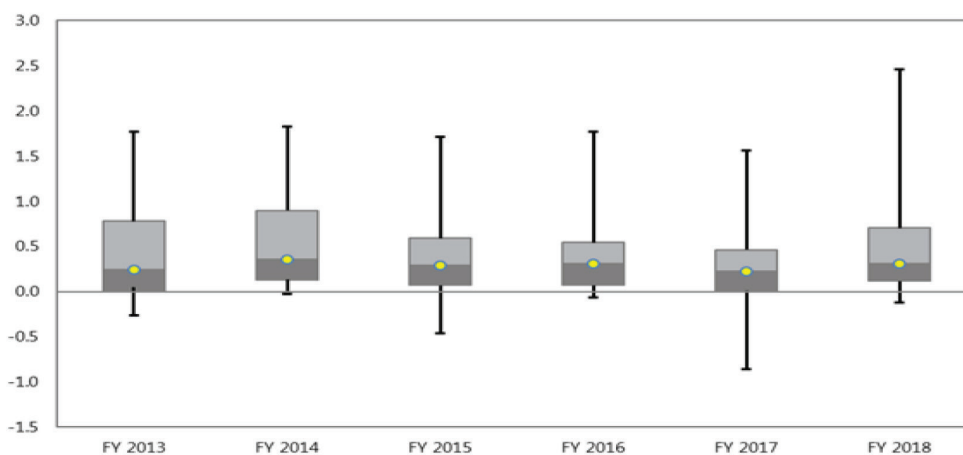
The extent to which investment income is required to meet profitability goals depends on the ability of non-life insurers to achieve sound technical underwriting – the better they manage to write premiums that cover their claim payments and expenses, the less non-life insurers depend on their investment income to be profitable.

Figure 3.2a: Underwriting profit – life sector (USD billion, 2018)⁵⁴



Source: Bloomberg

Figure 3.2b: Underwriting profit – non-life sector (USD billion, 2018)



Source: Bloomberg

However, in a highly competitive underwriting environment, downward pressure on insurance premiums may decrease underwriting gains and, as a result, increase non-life insurers' reliance on investment income. If life insurer products have a guaranteed savings component (such as universal life or variable annuities with guaranteed rates), their profitability is also strongly affected by the prevailing interest rates.

By guaranteeing a return, insurers assume the obligation to cover the difference between the investments' return and the guaranteed return, even if the investment return is lower than the guaranteed rate. The relation between investment income and profitability of different types of insurers is further discussed below.

Figure 3.2a shows the life underwriting profit of 50 large life insurers, covering broad geographic regions such as Asia, Europe and North America. The sample for 2018 indicates that the median underwriting loss was \$1.24 billion, with the lowest 10th percentile losing \$8.13 billion. At the same time, the 90th percentile's underwriting profit reached \$10.54 billion due to an extraordinary year for one life insurer. In previous years, the 90th percentile underwriting profit was negative. Figure 3.2b shows the underwriting profit of 50 large non-life insurers,⁵⁵ covering the same broad geographic regions. The graph illustrates how non-life insurers have, on average, profitable underwriting activities. For 2018, the median non-life underwriting profit was \$0.31 billion, while the 10th percentile underwriting loss was \$0.13 billion and the 90th percentile underwriting profit was \$2.16 billion.

The figures above illustrate that, while many life insurers rely on investment income to achieve positive profits, most non-life insurers are profitable without accounting for investment income. As such, the profitability of life insurers is more vulnerable to interest rate risk. In some instances, composite insurers can cross-fund their activities by having life segments at an underwriting loss and non-life segments at an underwriting profit.

The next part of this special topic discusses the macroeconomic aspects and impact of the current low-yield environment on insurers, before listing the possible implications of a scenario where interest rates revert to higher levels. This section relies on existing studies and impact analyses performed by supervisory authorities and central banks.

3.2.2 Moving Out of a Low Interest Rate Environment

The impact of a low interest rate environment on the insurance sector

As highlighted in Chapter 1 (see Figure 1.2a), several developed economies are still experiencing low nominal and real interest rates. When the financial crisis hit in 2007, policymakers around the world responded by easing monetary conditions. As a result, interest rates fell precipitously. When the recession hit, the Federal Reserve moved swiftly to cut rates, which eventually reached close to zero. After 2016, rates slowly climbed, but events in 2019 have prompted the Federal Reserve to start cutting rates again for the first time since 2008. An analysis of data spanning July 1954 to June 2019 shows that the federal funds rate has experienced an average of 4.8% and a maximum of 19.1%, demonstrating how recent rates are far below historical averages. Since 2011, the European Central Bank has gradually lowered its policy rates. The marginal lending facility rate and main refinancing operations rate have been as low as 0.25% and 0% respectively since 2016. The deposit facility rate turned negative – as low as -0.50% since 18 September 2019. Based on these recent developments, it is becoming evident that developed economies are increasingly considered to be in a protracted low, and sometimes even negative, interest rate environment.

For several of the economies confronted with low interest rates, there is a debate about whether this low-yield environment is a temporary phenomenon, or whether it will remain over the longer term. These two opposing views were discussed by the ESRB in its report⁵⁶ on low interest rates. Each argument is based on different views on the main drivers of interest rate evolutions in recent decades. One view attributes the current environment to cyclical (“financial cycle”) factors; the other relates it to structural (“secular stagnation”) factors.

The “financial cycle” view highlights how different factors drove interest rates down in recent years. These low rates could be here for a long time, but are not necessarily expected to stay permanently and should recover. It is argued that, following the excessive debt that economic agents accumulated in the period leading up to the global financial crisis, the need to deleverage contributed to lower investment and interest rates. In addition, nominal interest rates fell in response to the recession and the accompanying monetary policy responses by major central banks.

As the factors are bound to reverse at some point, interest rates are also expected to increase.

The “secular stagnation” view reasons that, beyond cyclical factors relating to the global financial crisis, there could also be structural factors causing low interest rates in several developed economies. These structural factors have a more permanent effect on interest rates. Demographic trends and a decline in total factor productivity growth (supply-side factors), as well as an increased preference for scarce safe assets and rising inequality (demand-side factors), have all contributed to the low interest rate environment.

Consequently, even if the role of cyclical factors diminishes over time, nominal interest rates are expected to stay relatively low for a long time due to structurally depressed real rates.

Because of the potentially devastating effects of long-lasting low interest rates on the insurance sector, particularly for life insurance, many insurance supervisors around the world have focused on measuring the impact of a long-lasting low-yield environment.

The EIOPA, for example, has tried to measure the impact of a low-for-long interest rate scenario on the EU’s insurance industry through a series of stress test exercises conducted over the last few years. The 2011, 2014, 2016 and 2018 stress tests all contained at least one scenario focusing on the impact of low interest rates. In the most recent stress test exercise (2018), a scenario of low yields was combined with a series of stresses on other asset classes and a positive shock on longevity (more details can be found in the 2018 EIOPA stress test report).⁵⁷ In this downward yield curve scenario, the aggregate solvency capital ratio of the participating insurers dropped by 64.9 percentage points to 137.4%, with seven participants reporting a ratio below 100% (see Figure 3.2c). When excluding Solvency II transitional measures,⁵⁸ the solvency capital ratio would drop even further, to 124.1%, with 20 participating groups showing a ratio below 100%.

The 2018 EIOPA stress test illustrates how low yields increase the market value of the participating insurers’ technical provisions. For example, the participants’ life insurance

technical provision increased by 6.1% due to the lower discounting curve (and the longevity shock). Often this is partly compensated by an increase in the value of the assets on the insurers’ balance sheets (bond portfolios in particular are positively affected by interest rate decreases). As several insurers in the EU still have material life insurance portfolios with long durations that offer a guarantee and are not always fully matched by corresponding assets, the overall net effect of low interest on the Solvency II capital ratio is often negative for insurers. As such, the 2018 stress test confirmed the vulnerability of the EU’s insurance sector to long-lasting low interest rates.

IF THE LOW-YIELD ENVIRONMENT PERSISTS, DEMAND FOR LOWER-RATED AND/OR LESS LIQUID ASSETS MAY INCREASE IN THE HOPE OF FINDING HIGHER RETURNS.

As explained above, life insurers typically derive part of their profits from the spread between their portfolio earnings and what they guarantee on insurance policies. During times of persistently low interest rates, life insurers’ investment income is expected to decline, calling into question whether insurers will still be able to meet contractually guaranteed rates to policyholders. The NAIC

regularly conducts a study on the impact of the low interest rate environment on the life insurance industry in the US, including the effect on the net investment spread.⁵⁹ Data have been gathered from 2006 to 2018 and the results are discussed in Chapter 2 of this report (Figure 2.2a). The data show a gradual decline in the life insurance industry’s net portfolio yield over the period, reflecting the lower interest rate environment within which the industry had to invest its positive cash flows (premiums plus investment income less policy claims). The US life industry lost 62 basis points of net yield between 2006 and 2018.

As many developed economies have had low interest rates for a considerable length of time, market players are already adapting to this new reality. These adaptations may create several risks and structural changes in financial markets.⁶⁰ Investors searching for yields may pursue risky asset positions beyond their normal risk-bearing capacities. If the low-yield environment persists, demand for lower-rated and/or less liquid assets may increase in the hope of finding higher returns. According to a study conducted at the EIOPA level, the EU insurance sector has shown signs of such behaviour.⁶¹ Low interest rates may also prompt life insurers and pension funds to switch

to unit-linked/defined contribution products, increasing the competition with investment funds, for example.⁶² Different types of investors may start to pursue similar investment strategies, looking for those few asset classes that still promise a decent return. This could, in turn, lead to crowded asset positions.

This behaviour will make the insurance sector vulnerable when interest rates start to rise again. Increasing interest rates are expected to drive asset prices down, which means bond prices will fall. This may cause market participants to dispose of certain asset classes. The disposal of crowded asset positions could be combined with liquidity pressures. The degree of the insurance sector's vulnerability to rising interest rates is strongly linked to the business model of the insurer and the speed of this interest rate reversal scenario. It is generally agreed that a gradual rise in interest rates would positively affect the insurance sector because earnings (particularly for life insurance) and solvency would be expected to increase again. However, a sudden reversal in yields and asset re-pricing may materialise if market players start to reassess risk premia in light of low growth prospects, or collectively unwind potentially crowded asset positions. If this sudden reversal of yields is combined with lower structural market liquidity, several financial market players could suffer severe losses. The losses for the insurance sector would be even more pronounced if this scenario is combined with consumers' insurance contracts lapsing. This could happen if consumers have better prospects elsewhere (banks and asset managers can react more rapidly to the changing interest rate environment),⁶³ or if they lose their trust in insurers facing losses.

The likelihood of such a sudden reversal in yields is being debated. However, following institutional investors' search for yields and a potential build-up of crowded and leveraged positions in higher-yielding, lower-quality asset classes, even a gradual rise in interest rates could have a significant adverse impact on financial markets. As liquidity and spreads revert to previously observed levels, asset prices would be corrected, creating stress in these markets. Such stress, in combination with asset price misalignments, increases the likelihood of abrupt price reversals. As these reversals negatively affect different financial players at the same time, corrections could happen promptly and abruptly as investors try to look for the "same way out" in a market characterised by lower liquidity. The remainder of

this section focuses on the potential impact on the insurance sector of a sudden reversal of yields. Where studies are available that could help assess this impact, the assumptions are described and the results are discussed in more detail.

Measuring the quantitative impact on insurers of suddenly increasing interest rates

There are various ways to measure the impact of increasing yields on the balance sheet and the profitability of the insurance sector. Through a bottom-up stress test, supervisors can ask a sample of participating insurers to assess the quantitative impact of the scenarios using their models and projections. Supervisors can also assess the impact of a varying set of interest rate scenarios using their own top-down model, without having to involve the insurers themselves.

EIOPA stress test

In its 2018 bottom-up stress test exercise, the EIOPA included an upward yield curve scenario. This scenario assumed an abrupt and sizeable reversal of the risk premia observed in global financial markets. As part of this scenario, the 10-year euro swap rate's term structure shifted upwards by 85 basis points and by more than 100 basis points for currencies in other major advanced economies (such as the pound sterling and the US dollar). The increase in risk premia was then assumed to trigger further concerns about the debt sustainability of some EU sovereigns, widening the spreads of EU government bonds. Government bond spreads increased by 36 basis points on average. The economic uncertainty stemming from the abrupt change in yields would also trigger shocks in other financial markets (equity markets),⁶⁴ along with an increase in lapses, as explained above. Lapse rates were assumed to increase by 20% for all non-mandatory life insurance products, assuming policyholders prefer to shift their investments away from such products. Higher-than-expected inflationary pressures were assumed to induce a shortfall in liability claims reserves in general insurance. This shortfall was triggered by annual claims inflation of 2.24% higher than assumed for non-life liabilities.

In the upward yield curve scenario, total assets over liabilities in the EU insurance sector would drop from 109.5% to 107.6%. Excess assets over liabilities would drop by 32.2%. The scenario's impact would be driven by a significant drop in the value of assets (-12.8% for government bonds, -13% for corporate bonds

and -38.5% for equity holdings). The technical provisions would only decrease by 17% (mainly driven by a decrease in life technical provisions), which means asset losses would outweigh liability gains. These drivers would cause the aggregate solvency capital ratio to drop by 57.2 percentage points to 145.2%. Six out of 42 participants would drop below a solvency capital ratio of 100%. Not taking into account the long-term guarantee measures on the mark-to-market balance sheet of Solvency II, which were designed to reduce the impact of short-term spread volatility, would result in 21 out of 42 participants dropping below a solvency capital coverage ratio of 100%.

The upward yield curve scenario demonstrates that EU insurers would be vulnerable not only to prolonged low interest rates, but also to sudden increases in yields. The scenario also illustrated how a sharp and sudden increase in yields, driven by a revaluation of the risk premia, higher lapses in insurance contracts and increasing non-life claim costs due to higher inflation, can have a substantial negative effect on the capital position of EU insurers.

Banque de France

Twice a year, Banque de France publishes a report on risks, vulnerabilities and strengths in the French financial system.⁶⁵ A chapter is dedicated to risks facing financial institutions, including the French insurance sector. In June 2017, the report noted that the unprecedented low interest rate environment was eroding the margin and return of insurers by forcing them to rethink their traditional business models. Based on this finding, the report highlighted that, whether the low-yield environment continues or whether it comes to an abrupt end, both scenarios represent a considerable risk to the French insurance sector.

In the event of a 200 basis points increase in long rates, French insurers' rate of return would remain at a level that was relatively equivalent to the rate offered by a new player entering the market, who would not be stuck with a legacy bond portfolio.

As insurers' portfolios are still largely composed of bonds with high nominal yields and long durations, they would be able to benefit from these bonds for quite a while. However, if the low interest rate environment persists, older higher-yield bonds would need to be replaced with new, often lower-yielding, bonds. If interest rates suddenly increased, a new player entering the French market would be able to offer more attractive guaranteed rates, potentially triggering policyholders to switch products. Current market players would have to use profit-sharing and capitalisation reserves to maintain their attractiveness and prevent policyholders from moving out of non-unit-linked contracts to invest in higher-earning or more liquid savings vehicles.

This strategy will be more difficult to apply the longer the low-yield environment persists. The different scenarios projecting the rate of return on insurers' investments are set out in Figure 3.2c.

The Banque de France study clearly illustrates the link between the duration of the low-yield environment, the dynamics of a sudden interest rate shock and the risk of lapses in policyholders' insurance contracts. The longer the low-yield environment persists, the more impact a sudden increase in interest rates may have as insurers could be "stuck" in low-yielding

investments, whereas other saving alternatives (bank deposits, investment funds) may be able to adapt more swiftly to the new interest rate environment. This, in turn, could trigger a significant number of lapses in policyholders' contracts. The impact on insurers would then strongly depend on the surrender behaviour of policyholders.

The vulnerability of an insurance contract to surrender is linked to many factors:

- Is there a fiscal penalty in case of surrender?
- Do policyholders need to pay a surrender penalty?
- How high is the difference between the rate guaranteed/obtained in the current contract and the rate that can be obtained in other saving alternatives?

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The results of the study underlined the sensitivity of several prudential metrics to insurers' assumptions regarding policyholder behaviour. As such, Banque de France recommended that insurers test different sets of surrender assumptions within the framework of their own risk and solvency assessment. This should help inform insurers about their vulnerability to surrender risk under different scenarios and improve the management of this risk.

US Federal Reserve

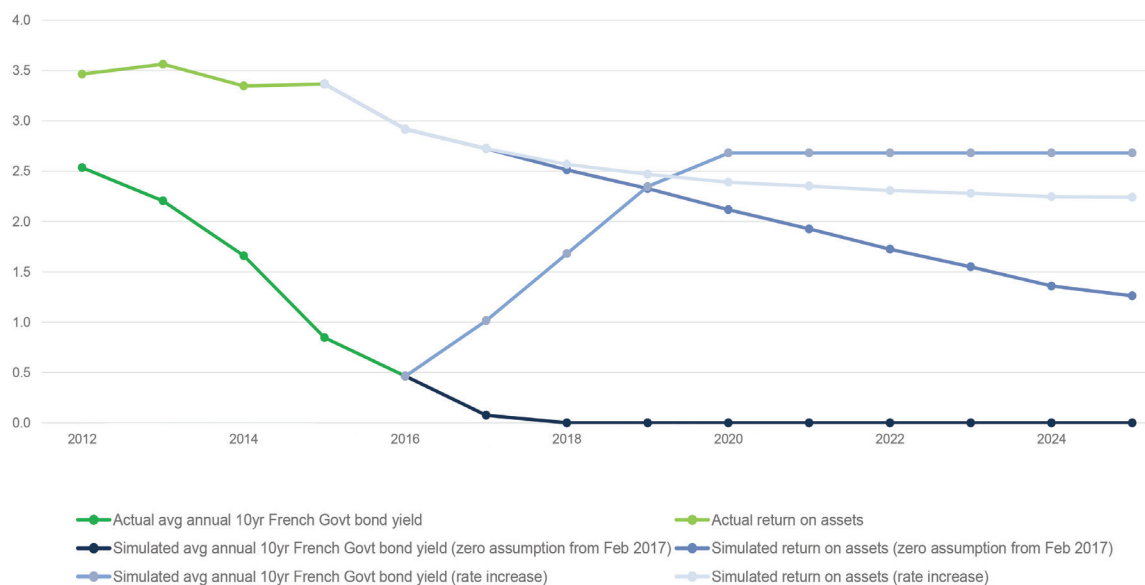
The US Federal Reserve also conducted a study on how life insurers would be affected by the economy moving out of the current low interest rate environment. A top-down model of interest rate risk in Hartley et al. (2016), as compared with the bottom-up analysis presented above, was used to measure the effect of an increase in interest rates on the performance of life insurers in the US.⁶⁶ The model includes a broad stock market return factor to control for changes in the overall economy, as well as a 10-year Treasury bond return factor. The coefficient on the Treasury bond returns is the measure of interest rate sensitivity.

The model is estimated using a two-year rolling window of weekly returns data.

The model in Hartley et al. was updated to include data from 2004 to 2019. As seen in Figure 3.2d, the coefficient on the Treasury bond returns (left axis) is negative. While it is significant after 2011, it is not statistically different from zero before 2011. A negative coefficient means that negative Treasury returns (an increase in Treasury yields) generally translate into positive returns for insurers. According to the model, an interest rate increase would be good for insurers. For example, a hypothetical increase from 2% to 3% in the 10-year Treasury bond yield would generate a positive return for insurers of 8.1%.⁶⁷

The negative correlation between Treasury returns and insurers' returns (or positive correlation between Treasury yields and insurers' returns) arises because the duration of life insurers' liabilities is longer than the duration of their assets. This means that when yields increase, the decrease in the present value of assets is smaller than the decrease in the present value of liabilities.

Figure 3.2c: Projected return on assets⁶⁸ in the event of an increase in interest rates (%)⁶⁹



Source: 2018 IAIS survey

Figure 3.2d: Life insurers' interest rate sensitivity (2014–2019)



Source: Hartley et al.

The model of interest rate sensitivity indicates that, based on historical data analysis, moving out of the current low interest rate environment would be beneficial for life insurers. Higher interest rates would increase the discount rate and reduce the present value of cash flows. Since insurers' liabilities have a longer duration than their assets, this works in favour of insurers.

However, under certain circumstances this correlation can change. An increase in interest rates might indirectly decrease the value of the companies insurers invest in, reducing the value of the insurer's capital. For example, companies in a deteriorated financial condition with high leverage might lose value if the cost of debt increases. For insurers heavily invested in these types of companies, an increase in interest rates might result in a significant loss of capital. An increase may also make insurance savings products less attractive for policyholders. These products are usually structured to generate returns above those of safe investments like government bonds but below those of risky investments like stocks. If safe investment returns increase after a rise in interest rates, the relative attractiveness of insurance retirement products for policyholders might decrease.

Steady and slow changes in interest rates may be easier for insurers, and the distressed companies they invest in, to handle. For example, insurers would have enough time to launch products that are competitive relative to other safe investments in the new interest rate environment. The leveraged companies that insurers invest in would

be better able to adjust their borrowing over time, reducing the negative effects on their capital – and on insurers' investment portfolios.

Policyholders facing higher risk from deteriorated insurance assets and lower-than-expected returns on insurance policies might withdraw their retirement balances. If enough policyholders withdraw, insurers will struggle to pay these balances. Policyholders anticipating liquidity problems might hurry to withdraw their funds before insurers' assets are exhausted, triggering runs on insurers. Furthermore, these runs might force insurers to sell assets at a discount, further affecting their stock price and accelerating the runs.

The US economy has not experienced rapid increases in interest rates in recent years, and those that did take place in the past occurred before insurance statutory data were available. This makes it difficult to measure the relative magnitude of these countervailing forces. However, the model shows that, in a context of slow-moving interest rates, an increase in yields would either be neutral or positive for insurers. In short, an orderly and slow move out of low interest rates would likely increase insurers' stock prices. However, a sudden rise in yields might cause harm if the incentives to withdraw early trigger insurance runs.

Bermuda Monetary Authority

The Bermuda Monetary Authority (BMA) has developed an in-house model for interest rate stresses. It relies on a statistical technique called

principal component analysis. Using this method, the time series of risk-free interest rates of different maturities and the yields of corporate bonds from different rating classes⁷⁰ are broken down (decomposed) into factors.⁷¹ These factors have smaller dimensions than that of the time series⁷² in question and are able to perfectly predict the time series that have been decomposed.

The principal component analysis method is designed to provide 100% accurate in-sample forecasts that reproduce the decomposed time series. At the same time, these factors can be treated as random variables and projected forward. Once these factors are projected, they can be recomposed to produce forecasts about the time series from which they were created. In the BMA model, the factors are fitted with a vector autoregression model, which accounts for correlation between factors. Once the vector autoregression model has been estimated, it is simulated forward for 12 months. At the end of this period, the factors are recomposed back into risk-free interest rates and corporate bond yields for different rating classes.

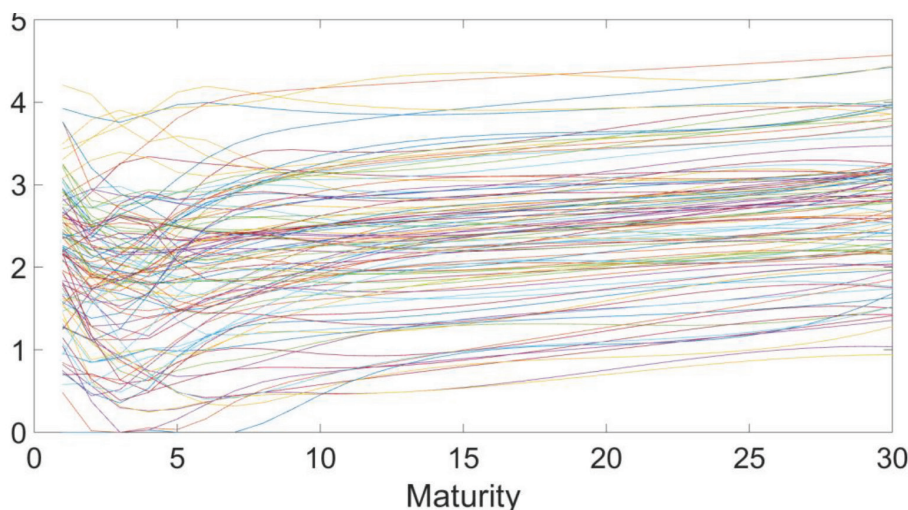
Because risk-free rates are given in discrete maturities, a set of techniques is used to create smooth curves for all maturities. Initially, for maturities of 20 years, for example, new data points are added (interpolation) between the 15th

and 30th year to close an important gap in the US yield curve.⁷³ The end product is a collection of risk-free curves and corporate bond yield forecasts for rating classes from AAA to non-investment grade. Figure 3.2e shows 100 sample US risk-free curves, produced by the BMA model.

The model produces multiple curves, from regular increasing curves to inverted ones. The relative frequency of each curve is based on historical data and, as can be seen in Figure 3.2f, most curves increase with an inversion at shorter maturities. Based on the 10,000 curves produced, the mean curve, the median curve, the 10th percentile curve and the 95th percentile curve can be estimated. These are the four main scenario curves. In addition, the same mean, median, 10th percentile and 95th percentile yields for corporate bonds are produced for different rating classes. Since there isn't a curve with different maturities of corporate bond yields for each rating category, the assumption is that shifts in the yield curves of corporate bonds are parallel for all maturities.

The mean risk-free curve is produced by averaging 10,000 projected risk-free rates for every maturity. The median curve is produced by taking the median of 10,000 projected risk-free rates for every maturity. Similarly, the 10th and 95th percentile curves are respectively the 10th

Figure 3.2e: Samples of risk-free curves (%)



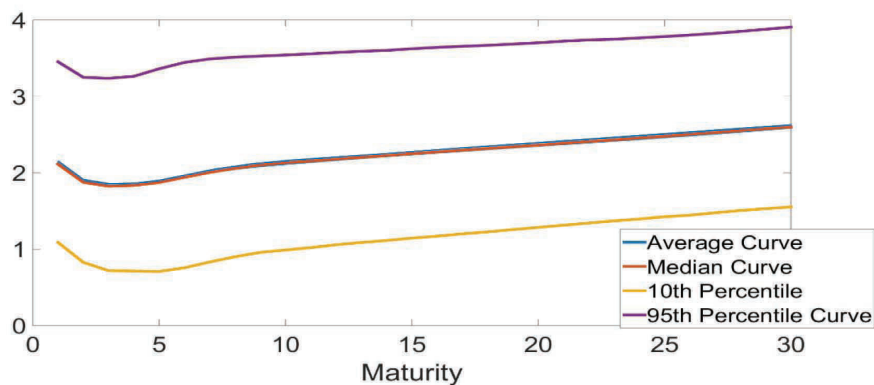
Source: BMA

and the 95th percentile of the projected 10,000 rates for each maturity. Figure 3.2f gives an overview of these curves.

Based on the scenarios of risk-free curves in Figure 3.2f, the asset portfolios of Bermuda's (re)insurers are stressed. These scenarios are applied to large commercial property and casualty (re)insurers (class 3B/4 insurers). In addition to the stress of changing yields, a stress scenario of equity portfolios and credit migrations, including defaults and rating upgrades and downgrades, is also considered. For the purposes of this section, only stress scenarios from risk-free interest rate changes are covered. In Figure 3.2g, the results of the stresses on the portfolio of sovereign assets held by Bermudan (re)insurers are shown.

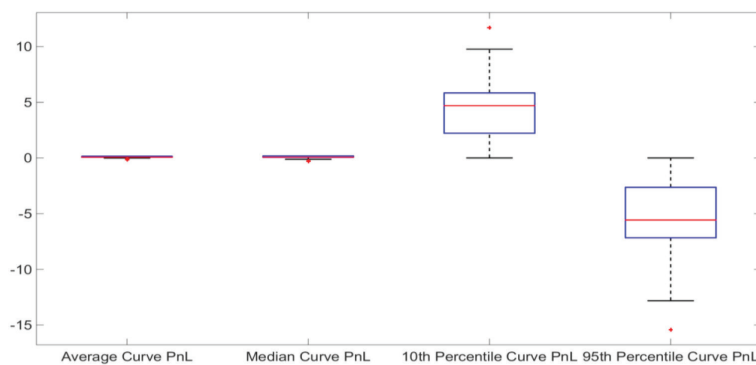
Figure 3.2g demonstrates that the average and median curve have very little effect on the valuation of the sovereign portfolio of assets held by all (re)insurers. This is due to the fact that the average projected yield curve does not change significantly from the base yield curve used at the beginning of the simulation.⁷⁴ For the 10th and the 95th percentile curves, significant valuation changes are observed. The 10th percentile curve is below the base yield curve, so bonds would be valued higher as a result. The 95th percentile curve is higher than the base curve; therefore, bonds decrease in value after revaluation. For the 95th percentile curve, we can observe that, except for a few outliers, most portfolio decreases stand at about 5%. As shown in Figure 3.2f, these portfolio changes correspond to a

Figure 3.2f: Projected risk-free curves (%)⁷⁵



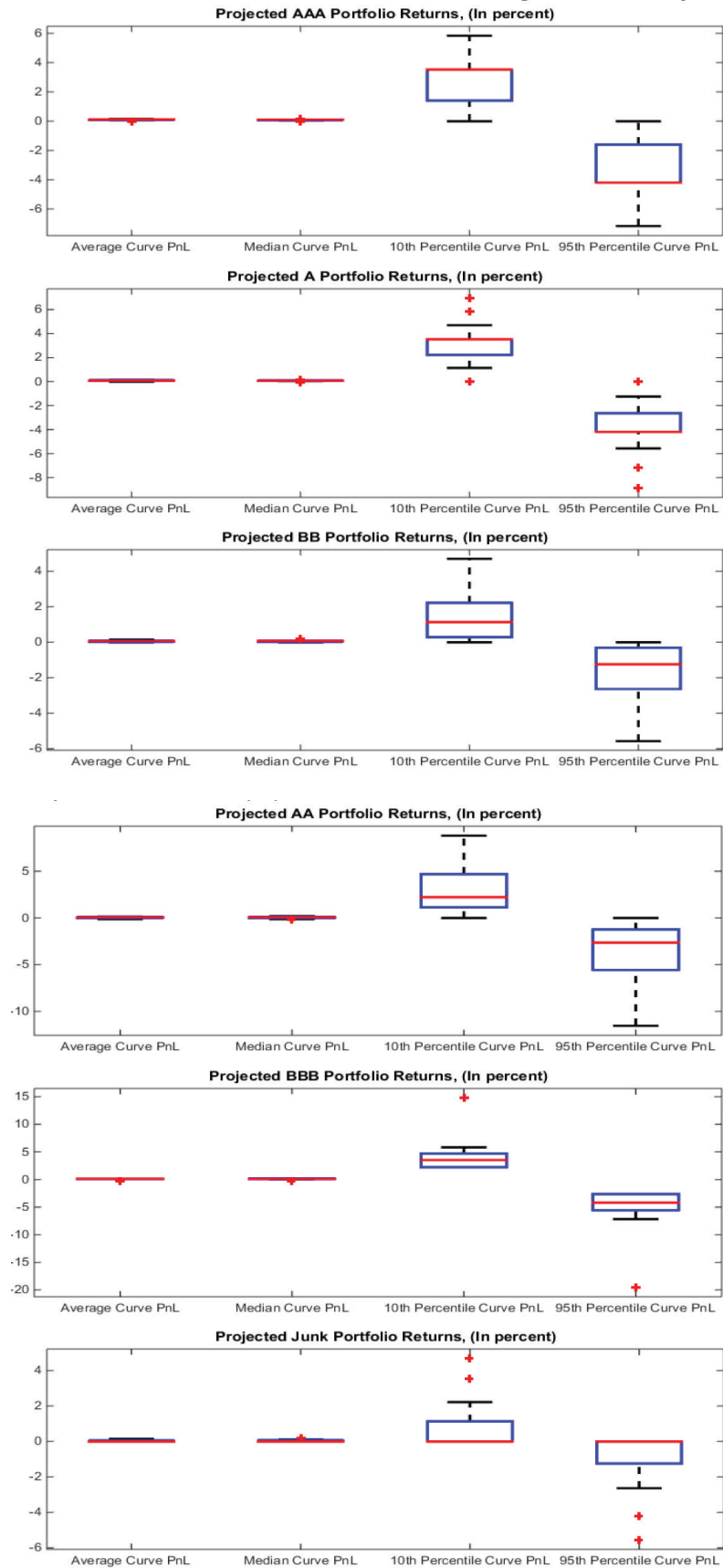
Source: BMA

Figure 3.2g: Projected sovereign bond portfolio returns (%)



Source: BMA

Figure 3.2h: Projected corporate bond portfolio returns (%)



Source: BMA

150 basis points shift upwards for the risk-free yield curve. This is an extreme scenario given that the 90th percentile yearly increase in the federal funds rate has been around 127 basis points since 2000.⁷⁶

These results are driven by the short durations of assets held by (re)insurers in Bermuda. These firms, which are mostly active in the property and casualty space, have liabilities of short duration and therefore require short duration assets to match. In addition to sovereign bonds, (re)insurers are also active buyers of corporate bonds. As was done in the previous exercise, the shocks for corporate bonds' different rating classes are applied, assuming constant credit spreads.⁷⁷ The results can be found in Figure 3.2h.

As with the sovereign bond portfolio, the mean and median curve have very little revaluation effects on the corporate bond portfolios of (re)insurers for all rating classes. The 95th percentile curve produces losses between 2% and 5% on average.

However, there are outliers because some companies have long duration corporate bonds to match liabilities in the casualty business, and some may be conducting life business as well. Overall, the revaluation effects are different between rating classes, as specific (re)insurers prefer certain durations for specific rating classes. From the above example, AA and BBB-rated securities are preferred by a few longer-term (re)insurers. The impact of the portfolio's revaluation on the companies' solvency was estimated using a rough measure of the probability that assets would be lower in value than liabilities. For all companies that were stressed, this probability was estimated to be zero.

Although it is a rather crude measure, the results of the exercise show that, on average, the revaluation effects are manageable after a sudden increase in interest rates in the Bermudan property and casualty sector, although some outliers may need extra supervisory attention. Although at higher interest rates there are revaluation effects and fixed-income portfolios lose value, as the older bonds mature and (re)insurers purchase new ones with higher

coupon rates, their investment income would improve and the revaluation effect would be a temporary strain that does not significantly affect the longer-term survival of the firm. Of course, this is more relevant for property and casualty (re)insurers that do not have to lock in bonds for long durations.

3.2.3 Conclusions

Interest rate risk affects insurers in different ways. Changing interest rates may, depending on the valuation regime applied, impact both asset and liability valuations of insurers, which in turn influences the value of the company. Interest rates can also determine the behaviour of policyholders in terms of lapsed life insurance contracts. As insurers invest in assets that are sensitive to interest rates, their profitability is determined by the way in which interest rates move. For insurers selling life insurance products with a guaranteed savings component, interest rates are considered one of the main drivers of the viability of their business model.

A GRADUAL RISE IN RISK-FREE INTEREST RATES WILL POSITIVELY AFFECT THE PROFITABILITY AND SOLVENCY OF LIFE INSURERS, BUT SUDDEN INCREASES MAY TRIGGER SEVERAL ADVERSE CONSEQUENCES.

The current macroeconomic environment indicates the likelihood of a continued low-yield environment in many developed economies. As a result, insurance supervisors have tried to measure the negative impact of this environment on the profitability and/or solvency of the insurers active in their markets. Many of these studies have pointed to the vulnerability of life insurers should this low-yield environment continue.

Although economists may disagree on the length of the continuation of the low interest rate environment, many insurance supervisors have found it worthwhile to explore the consequences of a reversal of the low-yield environment. It is generally accepted that a gradual rise in risk-free interest rates will positively affect the profitability and solvency of life insurers, but sudden increases may trigger several adverse consequences. Increasing spreads as a result of a possible revaluation of risk premia and/or a direct increase in observed defaults may, depending on the valuation regime, directly negatively affect the solvency of insurers. Increasing yields may also trigger lapses in contracts if policyholders seek investment alternatives with a better return.

This disadvantages insurers that are “stuck” with recently bought low-yield assets.

These analyses and studies have helped the supervisory community understand the different effects rising interest rates may have on insurers and be wary of suddenly increasing interest rates, even in a macroeconomic environment characterised by low yields across all maturities.

3.3 CURRENT CHALLENGES IN THE LIFE INSURANCE INDUSTRY

Low interest rates have put significant pressure on life insurers by reducing investment yields, sometimes below guaranteed rates. This has been a common feature internationally, with long-term yields in many developed economies declining fairly consistently since the mid-1980s, although the effects on local insurers differ.

Because of the perceived effect on insurers’ solvency and profitability, it is becoming increasingly accepted that the life insurance industry itself is changing. Insurers have been pursuing different strategies to adapt to the changing macroeconomic environment. In some cases, strategies are straightforward, such as lowering the interest rate guarantees on life insurance portfolios or changing the asset allocation. Other, more radical, strategies affect insurers’ entire business models, such as decisions by some mixed insurers to no longer sell certain life insurance products or to put parts of the business

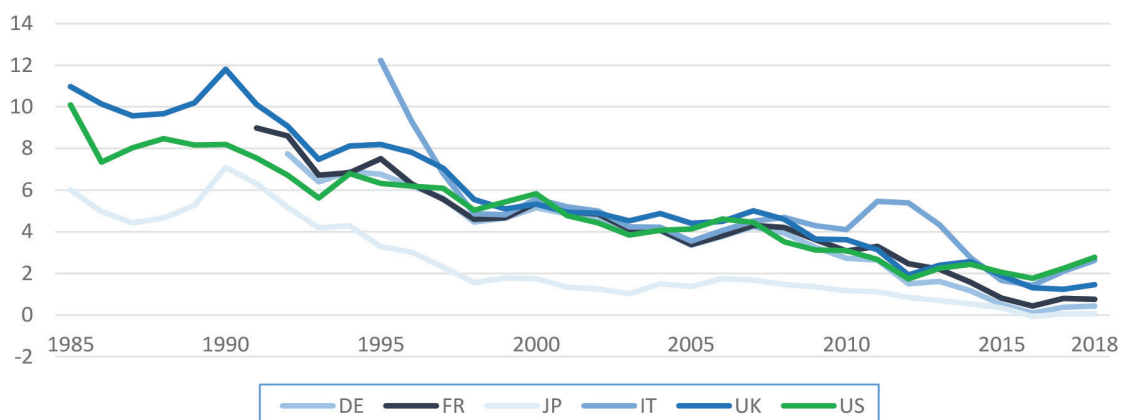
in run-off. At the same time, other players, such as private equity firms and asset managers, have taken over life insurance portfolios.

This special topic looks at data across several jurisdictions to examine two trends observed in the life insurance industry. In Europe, a growing share of the market is being captured by unit-linked insurance, but there is mixed evidence that the shift is driven by interest rates. In the US, however, the more notable change has not been a shift to a lower volume of guaranteed products, but rather an increased number of private equity firms that have purchased insurers to invest in illiquid or exotic assets.

3.3.1 Unit-linked Insurance Products

Unit-linked insurance products (ULIPs) are hybrids, consisting of a traditional life insurance policy and a capital appreciation component in the form of an investment plan. In several jurisdictions, such as the US, they may be called annuities. The policyholder still pays a premium, but this amount is split to cover life insurance and investments in equity and debt instruments to earn market-linked returns. The investment vehicle portion is similar to a mutual fund, where all premiums received are pooled together and invested. The policyholder holds fund units and the net asset value is regularly reported. The market risk of the ULIP is solely borne by the policyholder, although some products offer guarantees or minimum rates of return.

Figure 3.3a: 10-year government bond yields from selected jurisdictions (1985–2017)



Sources: Thomson Reuters (DE, FR, IT, JP), OECD (UK), Federal Reserve Board (US), authors’ calculations

In the US, these products are referred to as separate accounts and assets are typically invested in mutual funds. However, not all annuities are linked to separate accounts.

ULIPs, sold mainly by insurers, have several distinct features. Policy premiums benefit from several charge deductions, which can help companies manage their tax expenses and costs. The ULIP market has developed to offset decreasing interest rates and limit the pressure on life insurers to match guaranteed payout rates. This has also affected the insurance-investment proportion of ULIPs, with the latter increasing its relative share over time.

ULIPs can also be split into contracts with and without guarantees. A product with investment guarantees establishes a minimum limit on the unit value held or the contract value. These may take the form of a capital guarantee, a minimum return guarantee or guaranteed payouts. On the other hand, ULIPs without guarantees have their value determined solely based on the performance of the underlying assets.

As the ULIP market has grown, assets under management linked to the investment portion of the premiums are now mainly directly managed by asset managers. The EIOPA has found that less than 3% of ULIP assets are directly managed by insurance undertakings, while in-house asset managers (within the same group as insurers) manage 69% of these assets and external asset

managers manage 28%.⁷⁸ This allows the insurer to keep making decisions regarding the insurance contract, while investment decision-making is deferred to the asset manager.

The relative share of unit-linked premiums presented in Figure 3.3b shows an increase between 2015 and 2016 of 4%, which is a 6.4% increase in nominal terms.

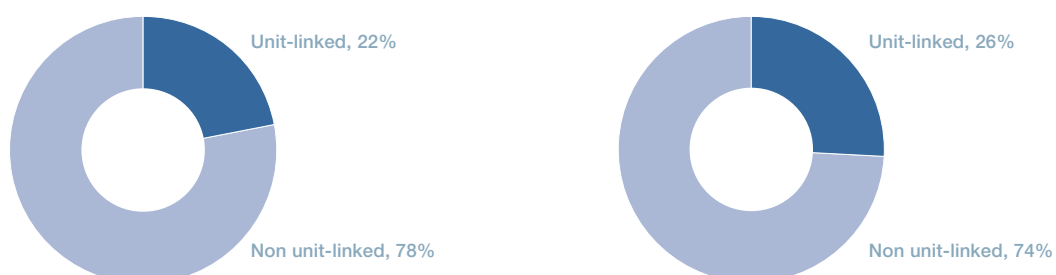
With markets now operating in a low-for-long interest rate environment (see Chapter 1), insurers are shifting towards ULIPs in response to the economic pressure they are under. To increase their profits through higher income inflows, private equity companies are targeting life insurers for mergers and acquisitions, particularly in the US.

3.3.2 Jurisdictional Developments

In the UK, since 1985, unit-linked business has risen from below 37% of premiums written to a peak of nearly 82%. There has been a steep decline in premiums for non-linked business, both with and without profit participation.

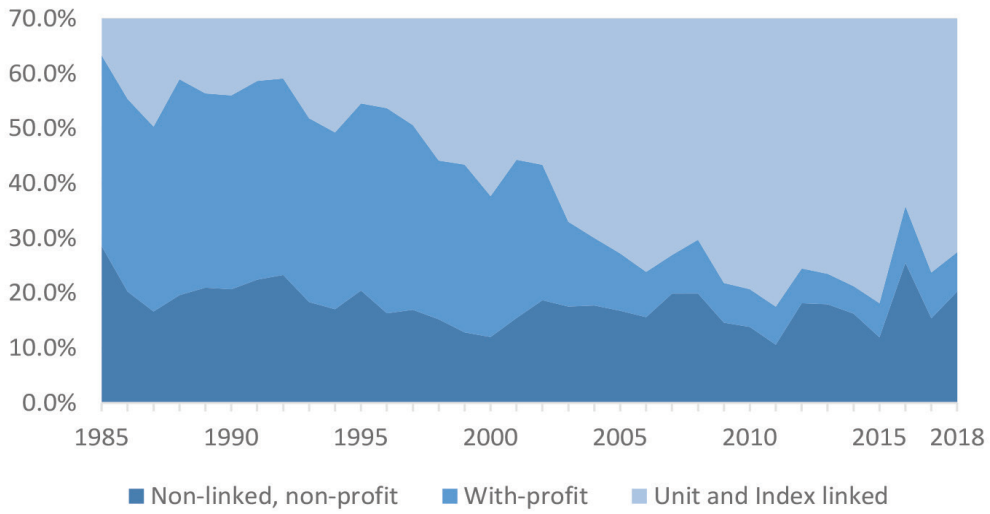
In the UK, the decline in the share of premiums was gradual for non-profit business (generally immediate annuities) in the 1990s, largely following the path of long-term interest rates. After 2000, however, the share of premiums was volatile but largely flat. After 2016, bulk purchase annuities, which tend to have large single premium payments, began to grow in popularity, which accounts for some of the volatility.

Figure 3.3b: European Economic Area life premiums by type of contract (2015 – LHS and 2016 – RHS)



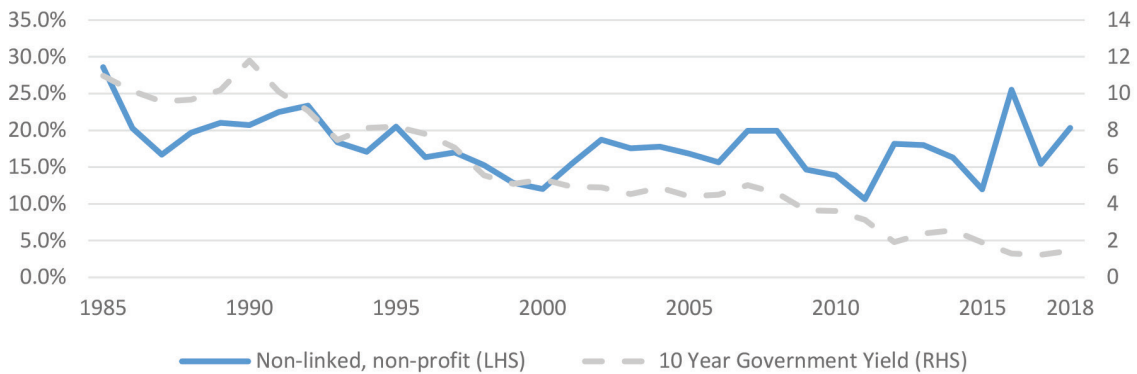
Source: Insurance Europe

Figure 3.3c: UK non-linked, non-profit, with-profit, and unit- and index-linked premiums share (1985–2018)



Source: Bank of England

Figure 3.3d: UK non-profit gross written premiums (1985–2018)



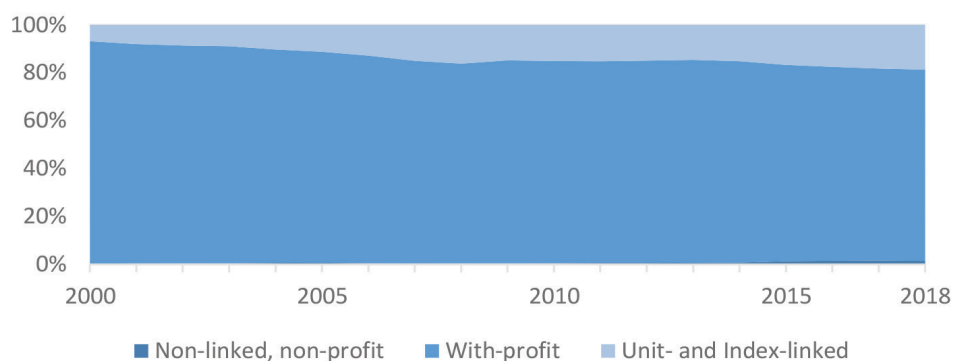
Sources: Bank of England, OECD,⁷⁹ authors' calculations

The trend in the UK for with-profits business has moved in the opposite direction. Premiums for with-profits products grew over the 1980s and 1990s, although market share was broadly flat. The widely publicised failure of Equitable Life in 2000, combined with widespread miss-selling of mortgage endowments in the 1990s, largely discredited with-profits products in the UK. In 2003 alone, new business premiums declined by nearly 56% and fell by another 45% by 2011.

In Germany, the share of unit-linked business has grown in 18 years, from representing less than 7% of premiums written to just under 19%, coinciding with premium growth of nearly 300%.

While the share of premiums for ULIPs has grown quickly over the last 18 years, as shown below, it still represents a fairly small portion of the German life insurance market.

Figure 3.3e: Germany non-linked, non-profit, with-profit, and unit-linked premiums share (2000–2018)



Source: BaFin

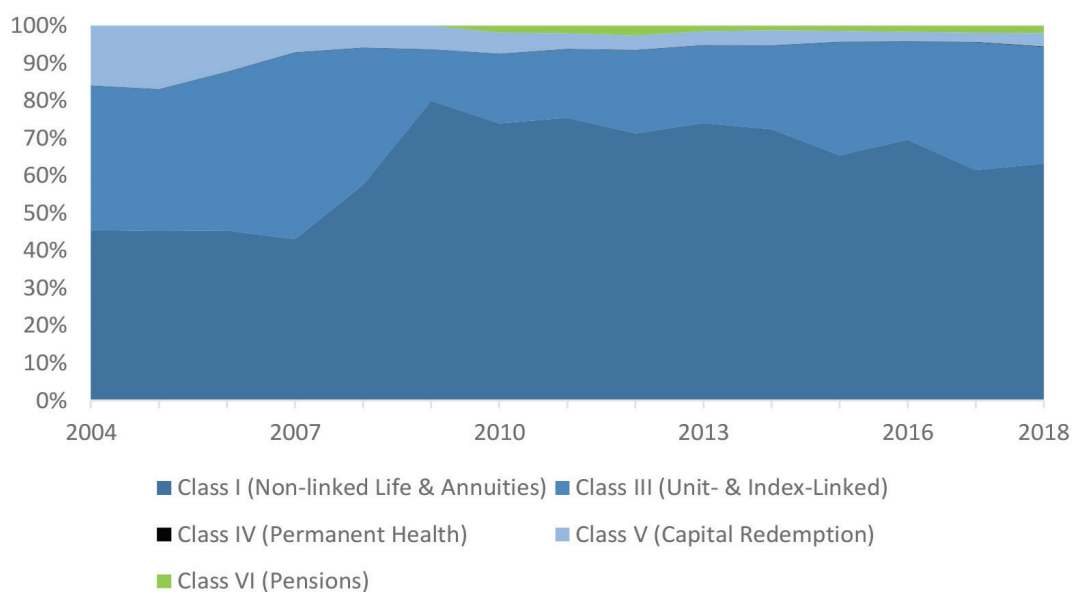
Italy is an outlier in that, rather than a steady upward trend in unit-linked business, there was a major contraction in the volume of premiums written during the financial crisis, which cut premiums for unit-linked business by nearly two thirds.

Since the financial crisis, unit-linked premiums have grown to their previous size, but they still

only represent a third of insurance business (by premium share) in Italy.

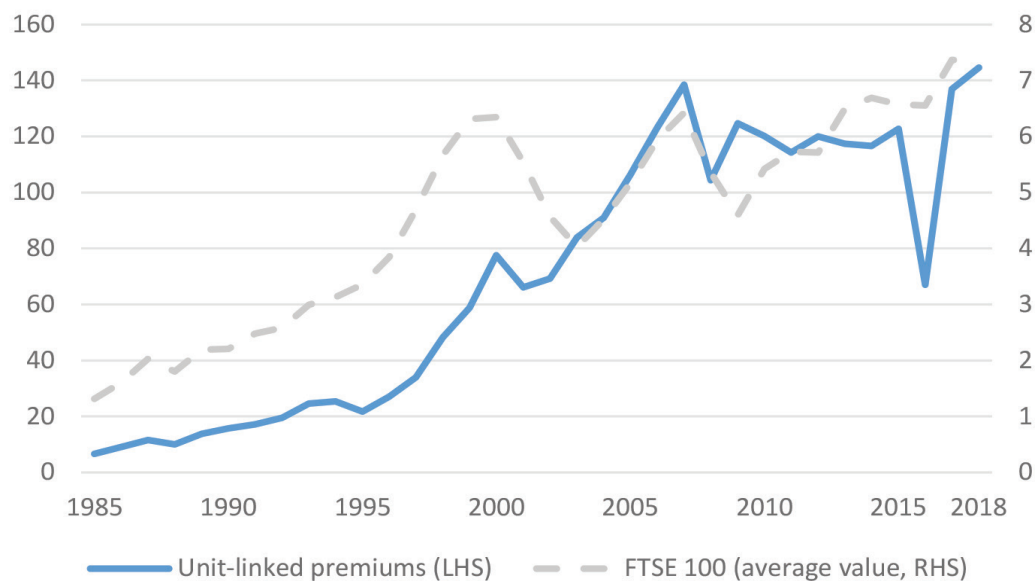
In the largest European jurisdictions (the UK, Germany, France and Italy), gross written premiums for ULIPs are closely linked to the local stock index, with correlation coefficients exceeding 0.85 for the UK, 0.9 for France and Italy, and 0.75 for Germany.

Figure 3.3e: Italy non-linked, non-profit, with-profit, and unit-linked premiums share (2004–2018)



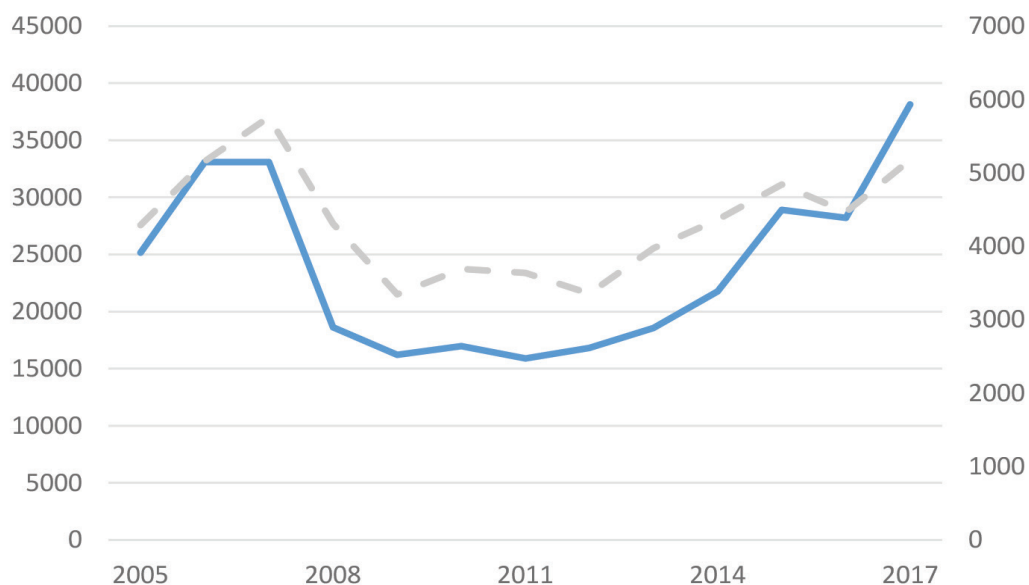
Source: IVASS

Figure 3.3g: UK unit-linked premiums share, FTSE 100 (GBP million, 1985–2018)



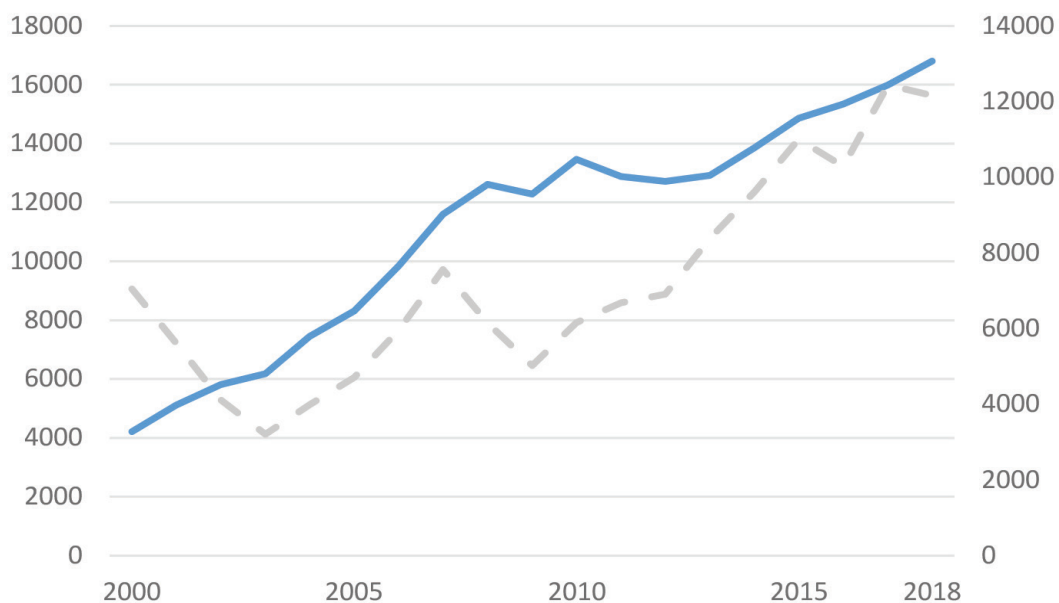
Sources: Bank of England, Thomson Reuters,⁸⁰ authors' calculations

Figure 3.3h: France unit-linked premiums share, CAC 40 average (EUR million, 2005–2017)



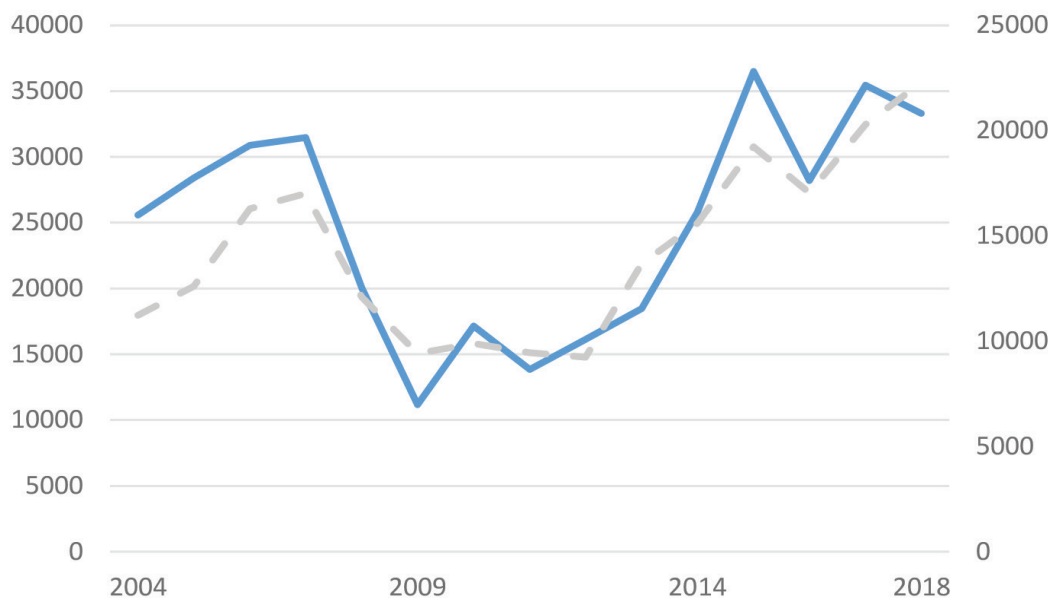
Sources: ACPR, Thomson Reuters,⁸¹ authors' calculations

Figure 3.3i: Germany unit-linked premiums, DAX 30 average (EUR million, 2000–2018)



Sources: BaFin, Thomson Reuters,⁸² authors' calculations

Figure 3.3j: Italy unit-linked premiums, FTSE-MIB average (EUR million, 2004–2018)



Sources: IVASS, Thomson Reuters,⁸³ authors' calculations

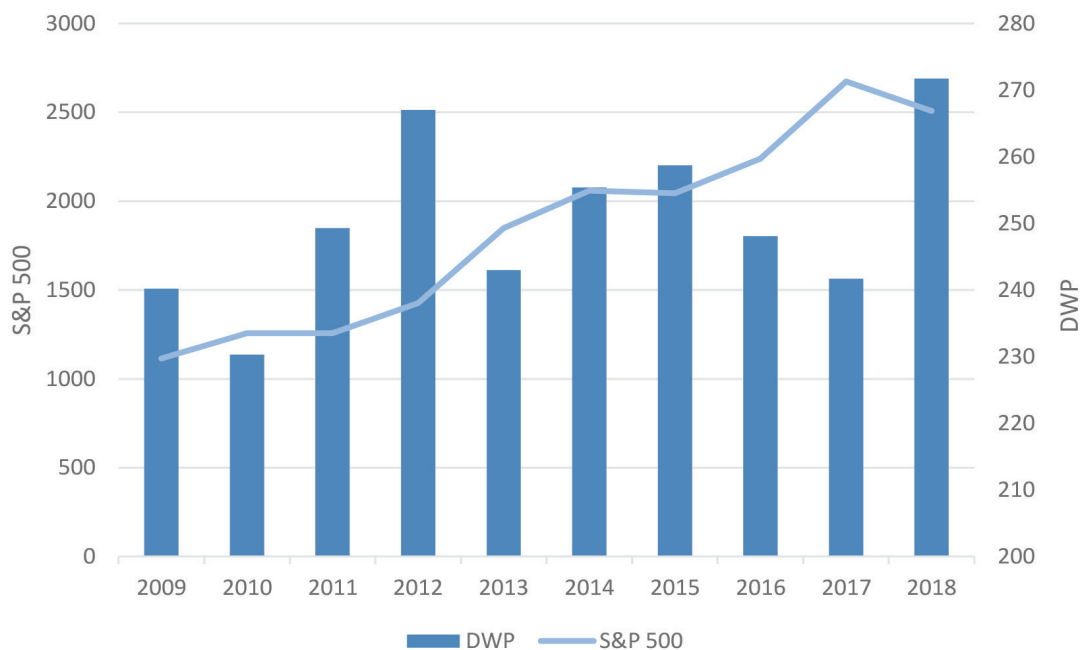
This relationship is understandable given that rising equity markets would make unit-linked products more attractive to policyholders. As equity markets have grown, interest rates have fallen. In general, this would reduce the guarantees that insurers could offer on non-linked products, making those products less attractive. Other than France, the correlation with interest rates is quite strong in Europe, and it appears that both interest rates and equity markets are affecting premiums for unit-linked business.

The US had a noticeable increase in annuity premiums in 2018, with direct written premiums up 12.4% and fixed annuities contributing the most growth. As seen in the UK, there is not much of a correlation between annuity direct written premiums and the S&P 500 in the US

(see Figure 3.3k). The US has not experienced the consistent correlation observed in Germany, France and Italy. Premiums in 2016 and 2017 were noticeably lower than 2015 levels. The US Department of Labor’s proposed fiduciary rule may have accounted for the decrease in 2016 and 2017.

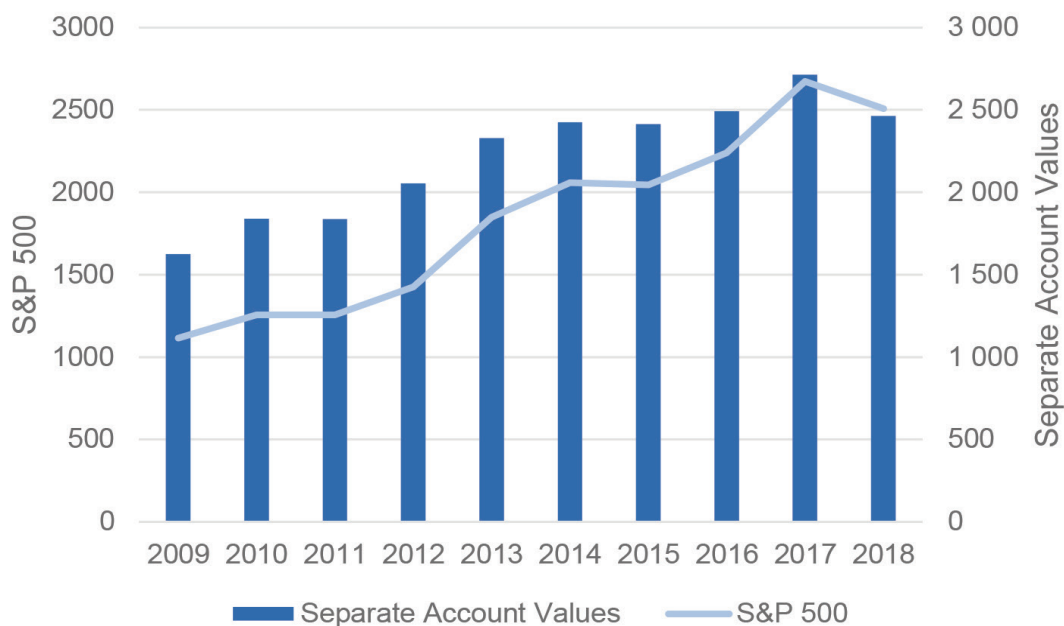
Under the fiduciary rule, financial advisers who handle retirement accounts must act in the best interests of their clients and charge compensation considered to be “reasonable”. They must also disclose this compensation to their clients. The vast majority of annuities are sold on commission, which largely explains why many advisers have moved away from annuity sales due to the uncertainty around the rules on compensation.

Figure 3.3k: US annuity direct written premiums vs S&P 500 (USD billion, 2009–2018)



DWP = direct written premiums
Source: NAIC

Figure 3.31: US separate account values vs S&P 500 (USD billion, 2009–2018)



Source: NAIC

Separate account values indicate ULIP activity in the US, but not all annuities are linked to separate accounts or are equivalent to unit-linked products. Although separate account asset values have grown steadily over the past 10 years, there was a 9% decline in 2018. This is primarily due to the decline in equity markets, which most separate account assets are invested in, at the end of 2018.

On 15 March 2018, the US Court of Appeals for the Fifth Circuit issued a decision vacating the Department of Labor’s fiduciary rule in its entirety. However, since the regulation of annuities by insurers is state-based, the states are updating their regulations to be consistent with the Department of Labor’s proposed standards.⁸⁴ Increased certainty around annuity sales regulation contributed to sales growth in 2018 and projected growth in 2019.

Insurers have been quick to launch new lines of fee-based annuities, which are designed to comply with the fiduciary rule. These annuities do not sell on commission but rather are included in an adviser’s fee-based accounts.

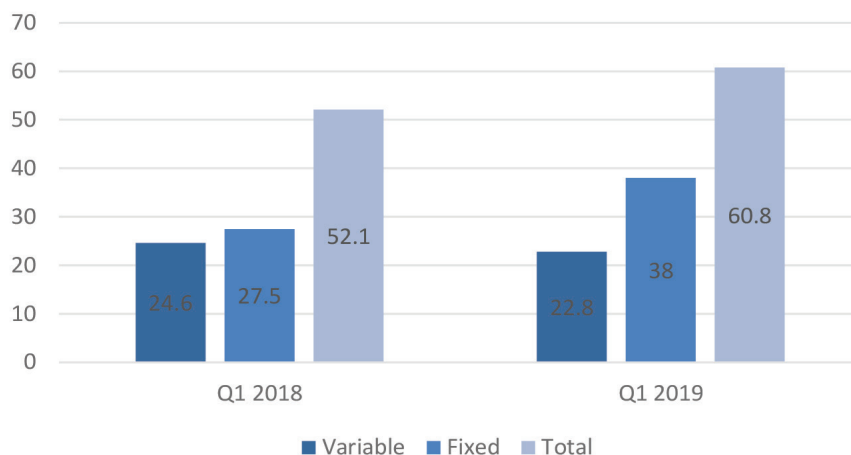
The NAIC’s data support growth projections, showing a significant 9.5% increase in annuity direct written premiums in the second quarter of 2019 (year over year). According to the Life Insurance Marketing and Research Association, this record growth will continue – the association’s midpoint forecast predicts a 5% increase in sales in 2019. Sales could jump more than 20% over the next five years to \$280 billion.

S&P has a more conservative forecast, expecting direct life, annuity, and accident and health premiums and considerations, including renewal business, to grow 3.1% in 2019 and 3.7% in 2020.

When considering consumer demand, another factor that may contribute to increased annuity sales is persistent low interest rates. As investment yields and spreads decline, insurers continue to look for avenues of growth and annuity sales are a viable solution.

Demographics also play a role – the NAIC continues to see many people from the “Baby Boom” generation (born between 1946 and 1964) moving into retirement.

Figure 3.3m: Annuity sales (USD billion, Q1 2018 – Q1 2019)



Source: LIMRA Secure Retirement Institute

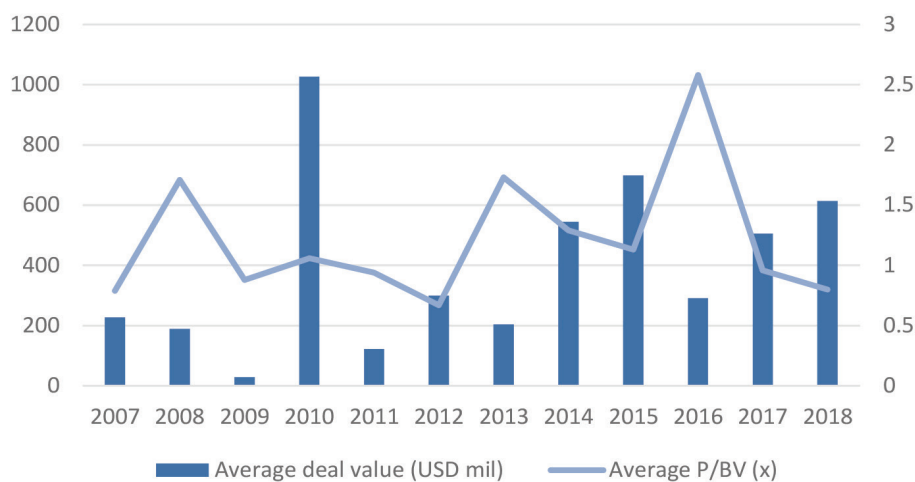
Annuities offer retirees and near retirees the ability to create secure, guaranteed lifetime income from their investments, which makes them an in-demand retirement product.

Increased annuity sales have put traditional asset managers under competitive pressure. Many investors see annuities as a win-win product – guaranteed income or death benefit and an opportunity to invest in capital markets.

This, combined with annuities being invested in separate mutual funds typically managed by asset managers, has led to some mergers and acquisitions in the insurance space.

Historically, merger and acquisition activity in the life industry was anticipated to increase in tandem with interest rate increases, which made insurers more attractive investments. However, recently the number of merger and acquisition deals has

Figure 3.3n: Life and health transactions; price-to-book-value multiples (2007–2018)



Source: Deloitte's 2019 Insurance M&A outlook

declined as rates have declined. That said, while there was a decrease in the number of deals, there was an increase in deal values in 2018, as shown in Figure 3.3n.

Low interest rates have forced insurers to reassess their core business and capital allocation strategies and consider selling non-core businesses. Selling non-core business, like annuities, can free up capital for investment in core and more profitable business lines, thereby improving earnings. The sales of non-core businesses announced by Ameriprise Financial, Wells Fargo and AmTrust Financial Services realised these benefits. While the sellers freed up capital, the buyers (American Family Insurance, Principal Financial Group and Liberty Mutual) realised underwriting economies of scale, generated additional distribution channels and leveraged existing lines of business.

Insurers are discussing possible deals focused on blocks of legacy annuity business, and such activity could pick up in the fourth quarter of 2019. Private equity firms continue to provide an option for insurers to sell legacy annuities that may require more capital or are outside their core lines of business. Publicly traded insurers with legacy annuities may face growing pressure to divest these blocks of business.

3.3.3 Private Equity

In the US, private equity firms have become some of the most active participants in mergers and acquisitions in the insurance sector since 2012, buying insurers or blocks of their business. Although primarily a US trend, this activity may also be observed elsewhere as opportunities within the country diminish. Private equity firms are attracted to insurers for some of the same reasons asset managers are drawn to this industry. Private equity companies invest in life and annuities businesses because the returns are predictable and steady, and they can boost their assets under management and generate fee income from investment management expertise. According to Optis Partners, an investment banking and financial services firm, there were 359 mergers and acquisitions involving US and Canadian insurers in 2014, which increased to

456 in 2015 and 449 in 2016. Elliott Management and Apollo Global Management were the most named private equity firms involved (with 12 each, out of a total of 47 reported private equity owners). The Carlyle Group and the Blackstone Group are among the competitive buyers that have been expanding their insurance industry investments and acquisitions.

One of the largest deals involved Athene Holding and Apollo Global Management. Through a string of acquisitions, Athene has amassed a \$130 billion portfolio of assets that is managed by Apollo, making it the private equity firm's biggest and most lucrative client. In 2018, Athene paid Apollo more than \$400 million in fees. In 2019, private-equity-backed firms such as Acrisure, AssuredPartners, HUB International and the Hilb Group were most actively involved in transactions, with each averaging nine announced deals during the second quarter.

The trend with private equity firms acquiring US insurers is due in part to the continued low interest rate environment, with both sides seeking benefits: private equity firms take on an additional, steady source of premium income from insurers, and insurers' investment portfolios potentially achieve higher investment returns and improved access to capital and asset sourcing through the firms' capital markets networks, according to a Fitch Ratings report. Competitive buyers may continue to pursue insurance acquisitions, particularly in the reinsurance sector, which has a mix of level income and relative stability.

Fitch Ratings research indicates that "investment in the insurance industry by alternative investment managers is expected to continue into 2019".⁸⁵ In particular, private equity firms, also known as alternative investment managers, are expected to seek exposure to life insurers through equity investments. Such investments will help grow assets under management and improve the stability of investment management fees. Insurers benefit, gaining access to broader deal originations, and they can access capital through the alternative investment manager rather than issuing stock in a public offering, which involves more regulatory requirements. Being private-

IN THE US,
PRIVATE EQUITY
FIRMS HAVE
BECOME
SOME OF THE
MOST ACTIVE
PARTICIPANTS IN
MERGERS AND
ACQUISITIONS IN
THE INSURANCE
SECTOR.

equity-owned, an insurer's asset-sourcing capabilities expand, but the investments could shift towards higher-returning, and therefore higher-risk, assets that are also less liquid.

Although the private equity/insurer relationship creates many synergies and benefits for each, many regulators see a conflict between the private equity firms' quest for short-term profit and the prudent management of long-term life insurance liabilities. In their pursuit of short-term profits, firms may be tempted to invest more aggressively in riskier assets. However, there are investment laws and regulations insurers must adhere to, which helps limit such investments.

3.3.4 Conclusions

While ULIP development has been quite volatile over the past few years, it has fluctuated within a narrow range. ULIP sales are somewhat correlated with long-term interest rates and equity market movements, especially in Europe. While still comprising a relatively small share of the entire life market, the ULIP business continues to grow, particularly given the current low-for-long environment. Demographic trends may further support the ULIP market as an increasing number of retirees are looking for more sustainable ways to support their financial future.

In the US in particular, the current market has led private equity firms to acquire life insurers in order to grow their assets under management and management fees. Supervisors may wish to monitor how the short-term view of private equity investors interacts with the longer-term horizon of life insurance business. While this trend is particularly prominent in the US, supervisors in other jurisdictions are starting to observe a similar pattern, which suggests a need for coordinated supervisory monitoring.

GLOBAL REINSURANCE MARKET SURVEY

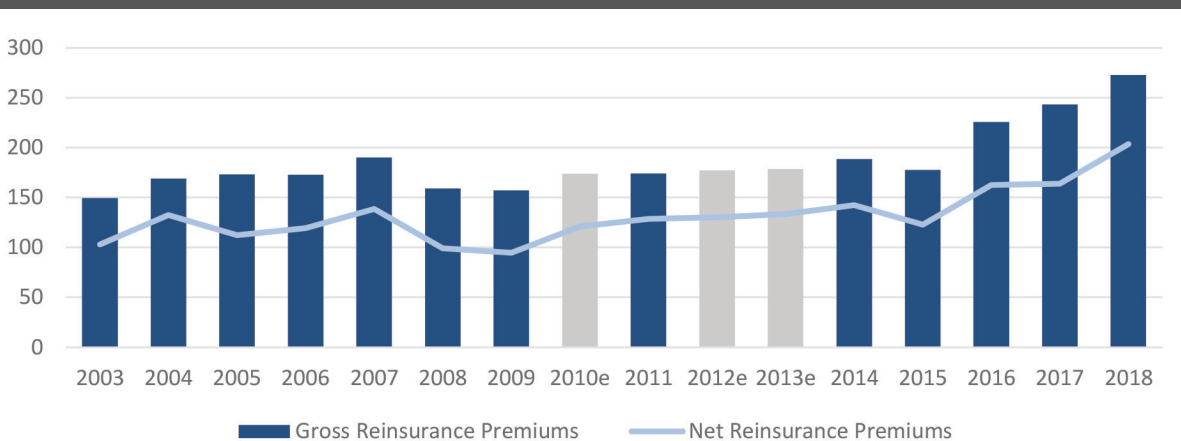
The IAIS gathers data on the global reinsurance sector through its annual Global Reinsurance Market Survey of its Member jurisdictions.⁸⁶ The survey was first conducted in 2003. The 2019 survey⁸⁷ covers 47 reinsurers in nine different jurisdictions.⁸⁸ These are the same reinsurers that took part in the 2018 survey, as the participating reinsurers have remained largely consistent throughout the years. The survey captures data from reinsurers that have gross unaffiliated reinsurance premiums of more than \$800 million. It mainly covers gross and net premiums written, claims paid and provisions, investments by asset class, business profitability, shareholders' equity, and available and minimum capital requirements.

This section of the report analyses the data collected from the 2019 survey.

4.1 REINSURANCE PREMIUMS

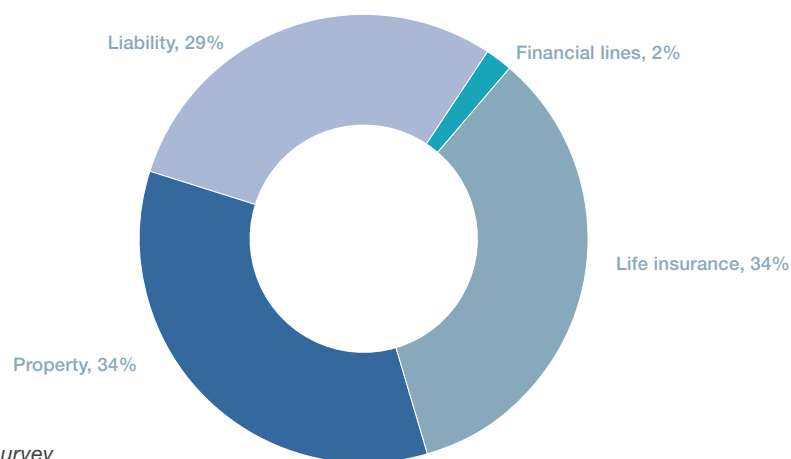
Between year-ends 2017 and 2018, gross reinsurance premiums written by survey participants sustained the growth observed over the past couple of years, increasing by 12%. Net reinsurance premiums grew by 24%, while retrocession⁸⁹ decreased by 12.5%. Life business increased more than non-life, by 15% compared with 11% respectively. Liability and financial business grew substantially, by 30% and 27% respectively, while property decreased by 2%.

Figure 4.1a: Gross and net reinsurance premiums written (USD billion, year-end 2003–2018)



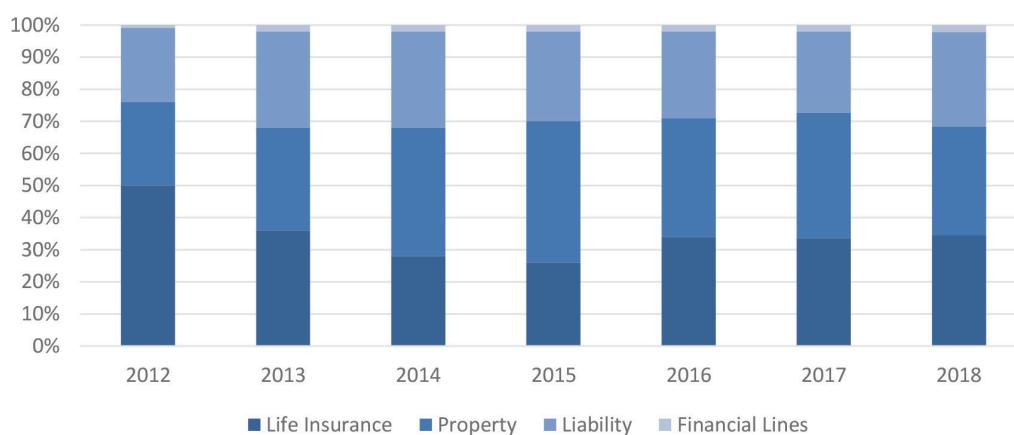
Source: 2019 IAIS survey

Figure 4.1b: Distribution of gross written premiums by class of business (year-end 2018)



Source: 2019 IAIS survey

Figure 4.1c: Distribution of gross written premiums by class of business (2012–2018)



Source: 2019 IAIS survey

Overall, reporting reinsurers retroceded \$70 billion in 2018 – 25% of total reported gross written premiums. Non-life retrocession accounts for 64% of the entire reported volume, while life retrocession accounts for 36%. As a result, in 2018 the change in retrocession was mainly driven by non-life risks.

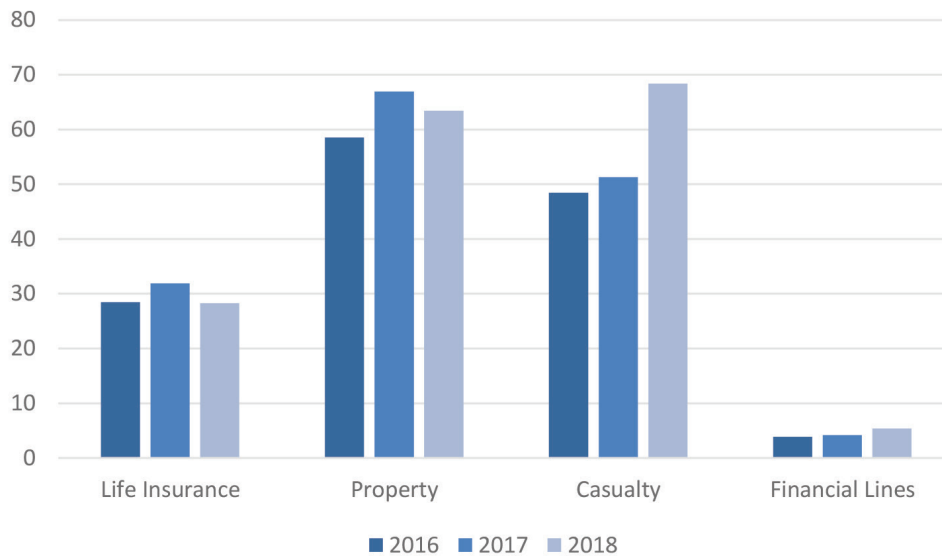
The development of the relative share of gross written premiums per business line is shown in Figure 4.1c. The liability class of business accounted for 29% of the total share in 2018 (compared with 25% in 2017) and property accounted for 34% (compared with 39% the previous year).

Figures 4.1d and 4.1e show the proportional and non-proportional gross reinsurance premiums based on class of business and type of contract. Both total reported values have increased since 2017, with non-proportional business growing by 19% and proportional by 7%. The largest year-over-year movements experienced were in proportional contracts: casualty business increased by 33% while life business decreased by 11%. Under non-proportional, life business increased by 32%.

4.2 RISK TRANSFER BETWEEN REGIONS

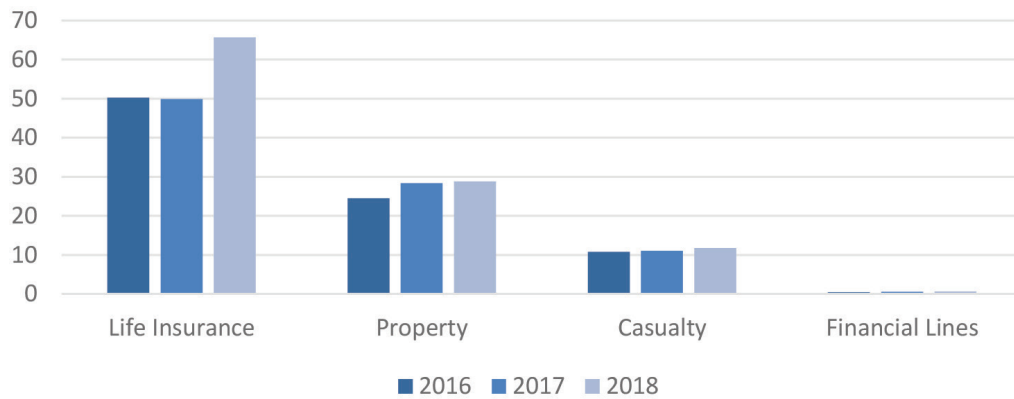
Table 4.2a shows gross reinsurance premiums transferred between reporting entities, grouped by the region where the reporting entity is domiciled. For example, \$3,013.95 million of European insurance business is ceded to reporting companies based in North America. In 2018, companies in North America assumed the majority of the risk, especially from companies within North America. The European region assumed most of the premiums ceded by Asia

Figure 4.1d: Gross proportional reinsurance premiums assumed by class of business (USD billion, 2016–2018)



Source: 2019 IAIS survey

Figure 4.1e: Gross non-proportional reinsurance premiums assumed by class of business (USD billion, 2016–2018)



Source: 2019 IAIS survey

Table 4.2a: Risk transfers between regions, ceding and assumed amounts (USD million, year-end 2018)

Ceding region	Assuming region			TOTAL
	North America	Europe	Asia	
Europe	3,013.95	53,855.76	810.38	57,680.08
North America	141,626.21	26,595.78	629.56	168,851.54
Asia and Australia	4,813.23	24,379.44	2,264.51	31,457.18
Africa, Near and Middle East	105.00	3,752.06	21.99	3,879.05
Latin America	1,959.00	7,277.15	29.94	9,266.10
Worldwide premiums	1,483.10	5,742.43	0.00	7,225.53
Total	153,000.48	121,602.62	3,756.39	278,359.48

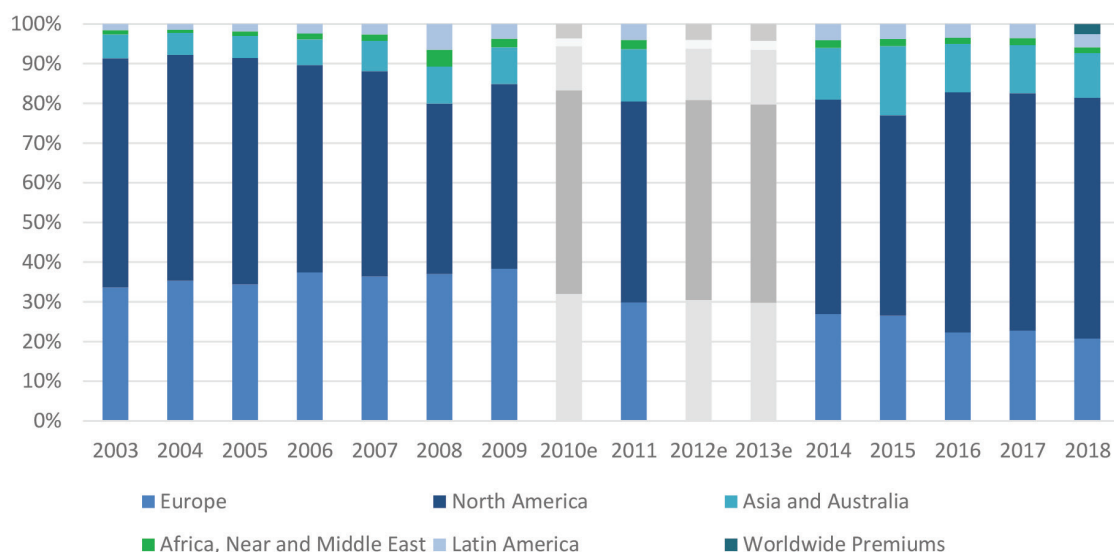
Source: 2019 IAIS survey

and Australia; Africa and the Near and Middle East; and Latin America. Worldwide premiums were first captured in the 2019 survey to record any premiums not classified in any of the other regions (for example, when the exposure spans multiple geographic areas).

Figure 4.2a presents gross reinsurance premiums assumed according to the region of the ceding insurer. In 2018, North America accounted for 60.7% (slightly more than 59.8% in 2017) of the

global reinsurance market, followed by Europe with 20.7% (two percentage points less than the figure observed in 2017), and Asia and Australia with 11.3% (slightly less than the 12.1% reported in 2017). The risks assumed in Latin America and Africa and the Near and Middle East remained relatively stable, cumulatively accounting for 4.7% (similar to 2017, when they accounted for 5.4%) of global risks. Worldwide premiums accounted for 2.6%.

Figure 4.2a: Gross premiums assumed by region (year-end 2003–2018)



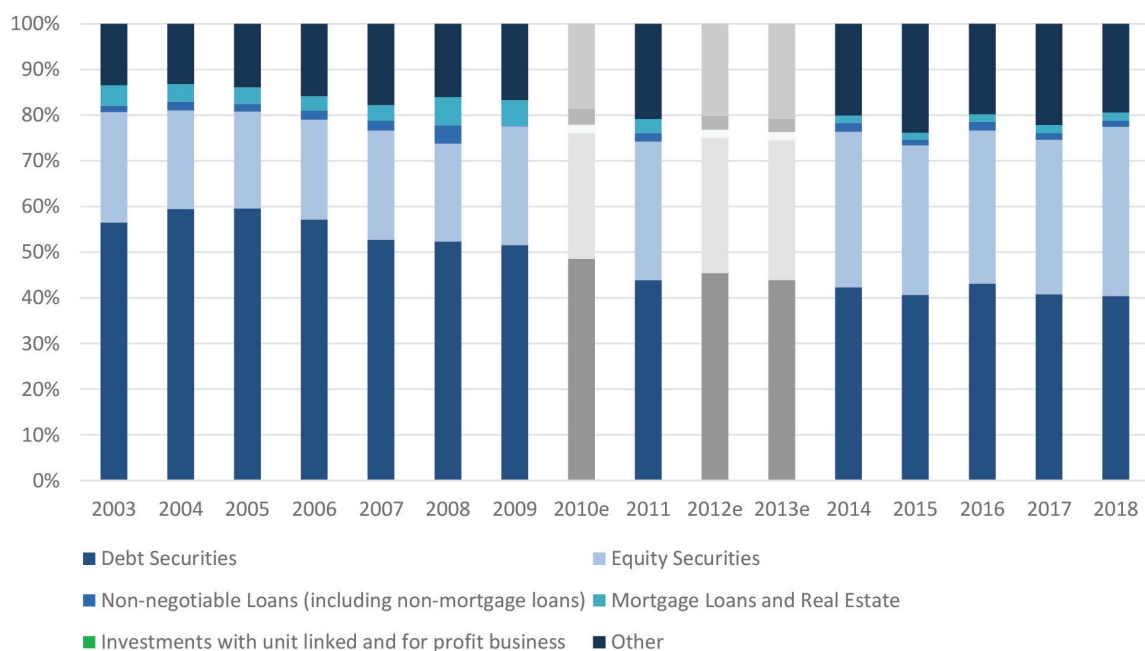
Source: 2019 IAIS survey

4.3 ASSETS

The Global Reinsurance Market Survey captures data on the financial instruments held by reporting reinsurers at balance sheet value and market value. An analysis of this data shows that the total book value of invested assets held by reporting reinsurers increased by 2.4% (\$21 billion), from \$880 billion in 2017 to \$901 billion in 2018.

In recent years, reinsurers' asset composition (excluding cash) has shifted marginally. However, fixed-income debt securities have remained the largest asset class held by reinsurers. In 2018, debt securities comprised 40% of total assets (increasing by 1.4% in nominal terms from 2017). Equity securities hold a 37% share of invested assets, while exhibiting a 12% increase in nominal terms.

Figure 4.3a: Asset composition (year-end 2003–2018)



Source: 2019 IAIS survey

4.4 PROFITABILITY

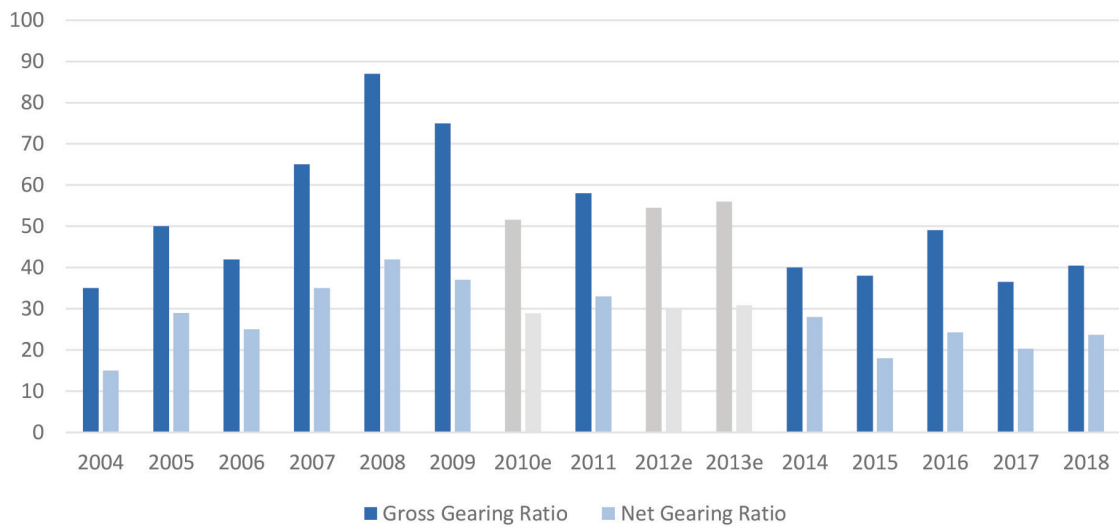
The reinsurance industry's performance can be assessed using financial indicators such as gearing and net gearing ratios, and combined, expense and loss ratios. Gearing ratios reflect the overall capital improvement of reinsurers in the year and measure reinsurers' dependency on reinsurance (for direct business) and retrocession (for assumed reinsurance business) by comparing recoverables with total available capital.

In 2017, reinsurers reported a gross gearing ratio⁹⁰ of 40.5% and a gearing ratio net of collateral and offsetting items of 23.7%. As shown in Figure 4.4a, gearing ratios dropped

between 2009 and 2015, mainly driven by an increase in reinsurers' capital base. This reduced the impact of recoverables on reinsurance and retrocessions. In 2016, the ratios increased substantially as a result of increasing recoverable values (as the capital base also improved). In 2017, the ratios decreased to similar levels observed in 2015, before increasing by 4 percentage points in 2018.

Figure 4.4b shows the average combined ratio of reinsurers surveyed over a 16-year period. From 2003 to 2018, the average combined ratio was 96.6%, with 2005 reflecting the highest ratio (113%) and 2007 the lowest (87%).

Figure 4.4a: Gross and net gearing ratio (% , year-end 2004–2018)



Source: 2019 IAIS survey

The combined ratio improved slightly from 99.3% in 2017 to 98.6% in 2018.

The expense ratio (net operating expenses to net premiums earned) provides insight into reinsurers' operational performance. The loss ratio measures the total losses incurred as a proportion of total premiums earned. While the loss ratio improved from 72.4% in 2017 to 68.4% in 2018, the

expense ratio increased by 330 basis points to 30.2%.

The constant movement in the combined and gearing ratios indicates the volatility in the reinsurance sector's profitability. The ratios are, however, very sensitive to large payouts, such as those experienced following severe natural catastrophes.

Figure 4.4b: Combined and loss ratio (% , year-end 2003–2018)



Source: 2019 IAIS survey

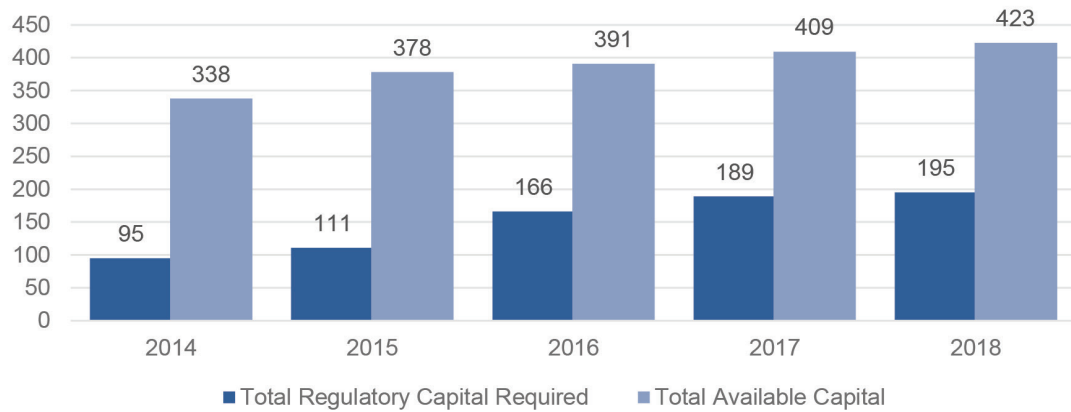
4.5 CAPITAL ADEQUACY

Traditional reinsurers maintained a strong capital base in 2018. Capital levels of reporting reinsurers increased to \$423 billion, growing by 3.4% between 2017 and 2018. This is largely due to inflows to maintain or increase coverage against losses following extreme weather events in 2017. During the same period, the total regulatory

capital required of reporting reinsurers increased by 3.2%, while the survey sample's capital base was \$228 billion above its regulatory capital requirement (slightly above the \$220 billion requirement in 2017).

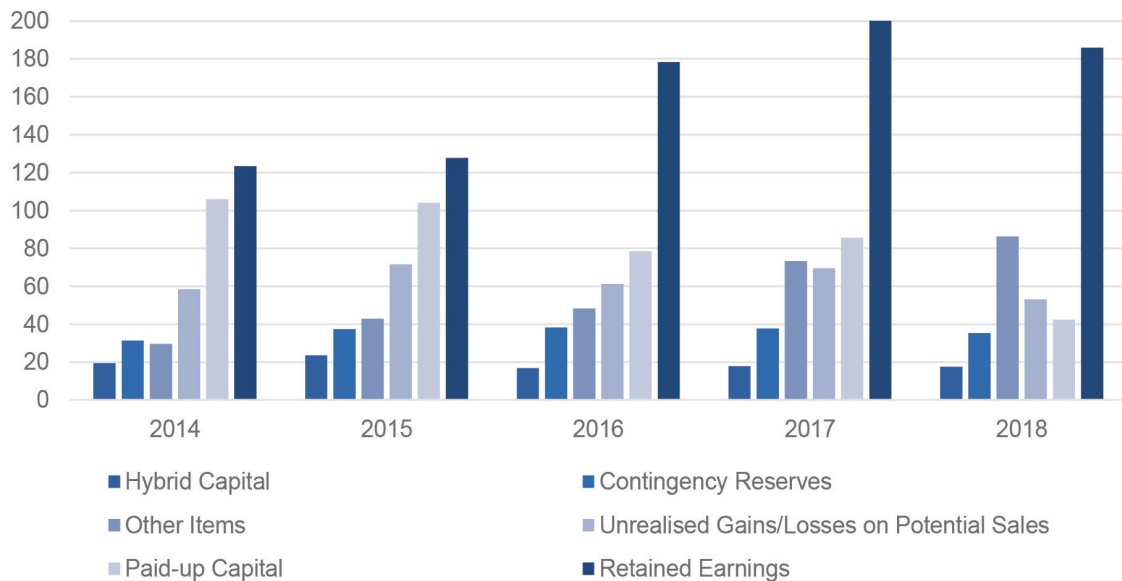
Figures 4.5b and 4.5c show that retained earnings represented 44% of the total available

Figure 4.5a: Reinsurance capacity (USD billion, year-end 2014–2018)



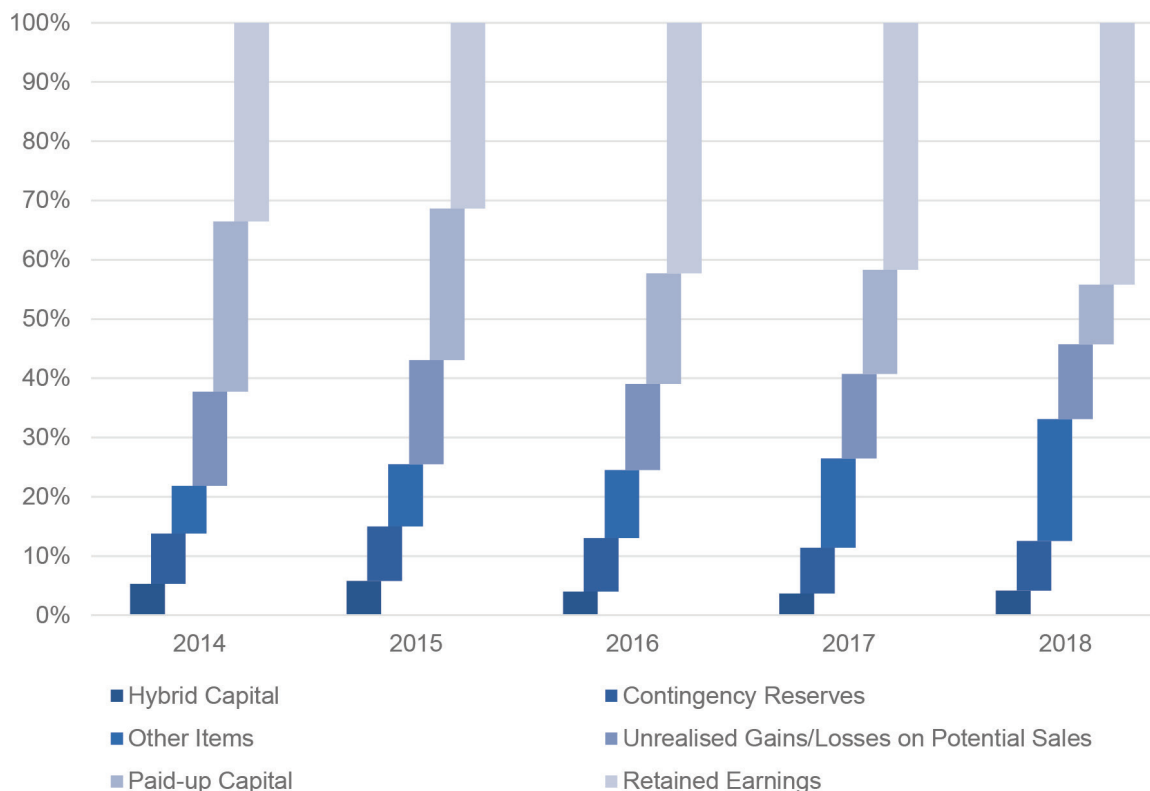
Source: 2019 IAIS survey

Figure 4.5b: Reinsurance capacity – composition of total available capital (USD billion, year-end 2014–2018)



Source: 2019 IAIS survey

Figure 4.5c: Reinsurance capacity – composition of total available capital (% , year-end 2014–2018)



Source: 2019 IAIS survey

capital portfolio in 2018, despite decreasing nominally by 8%. Paid-up capital decreased by 50%, resulting in a 10% relative share. The unrealised gains/losses on potential sales held a 13% relative share and the “other items” category increased to 21%. Hybrid capital decreased by 2% and contingency reserves decreased by 6%, both in nominal terms.

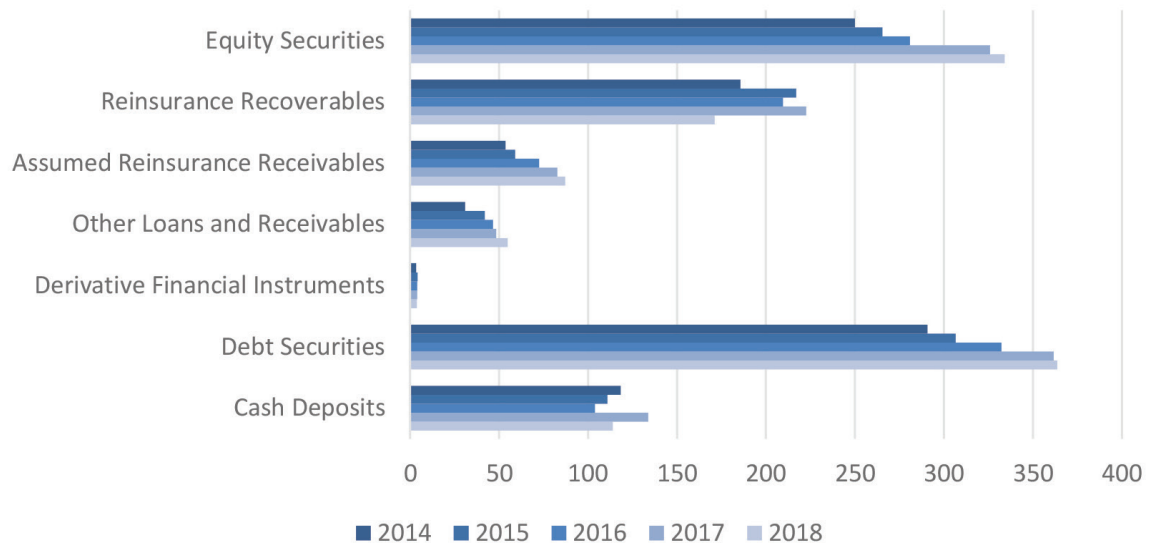
4.6 ASSETS AND LIABILITIES ALLOCATION

In 2018, total reported asset exposure decreased by 4.3%, from \$1,179 billion the previous year to \$1,129 billion. The decrease may be explained by the fact that debt securities, representing 32% of all asset exposures, increased by only 0.6% to \$354 billion, while cash decreased by 15% (and accounts for 10% of the pool) to \$114 billion and reinsurance recoverables decreased by more than 23% (while holding a 15% relative share) to \$171 billion.

Equity securities increased by 2.5% to \$334 billion, while constituting almost 30% of all asset exposures. Looking at the period 2014 to 2018, both equity and debt securities peaked in 2018, while reinsurance recoverables hit a trough in 2018.

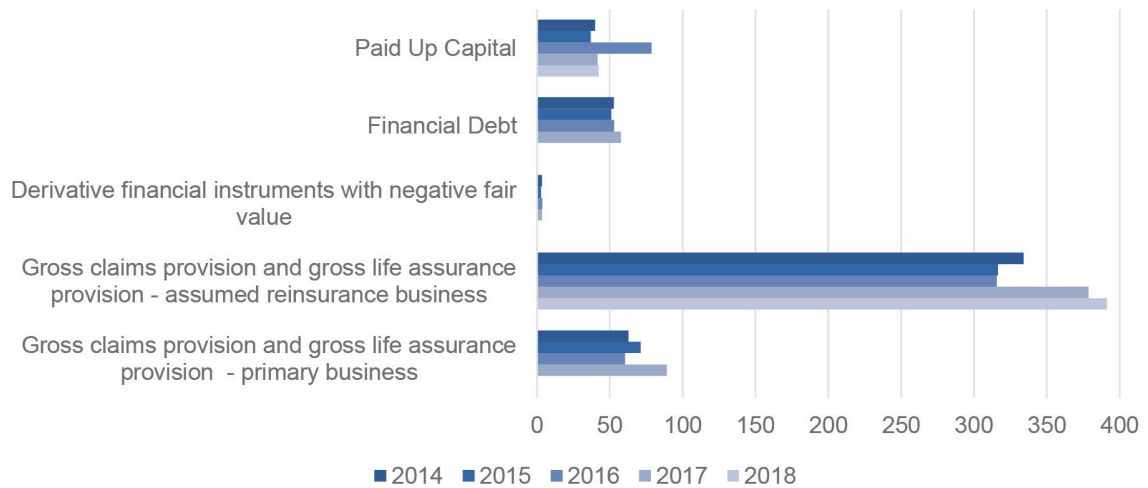
In terms of reported liabilities allocation, gross claims and life assurance provisions for assumed reinsurance business accounted for 67% of all key liabilities exposures in 2018, and increased by 3.4% to \$391 billion. The gross claims and life assurance provisions for primary business only accounted for 16%, with a 2.5% increase to \$91 billion. Financial debt held a 10% relative share, which translates to \$58 billion in nominal terms, while paid-up capital had a 7% share, or \$42 billion in nominal figures. Derivative financial instruments with negative fair value accounted for 0.6%, or \$3.5 billion.

Figure 4.6a: Asset allocation (USD billion, year-end 2014–2018)



Source: 2019 IAIS survey

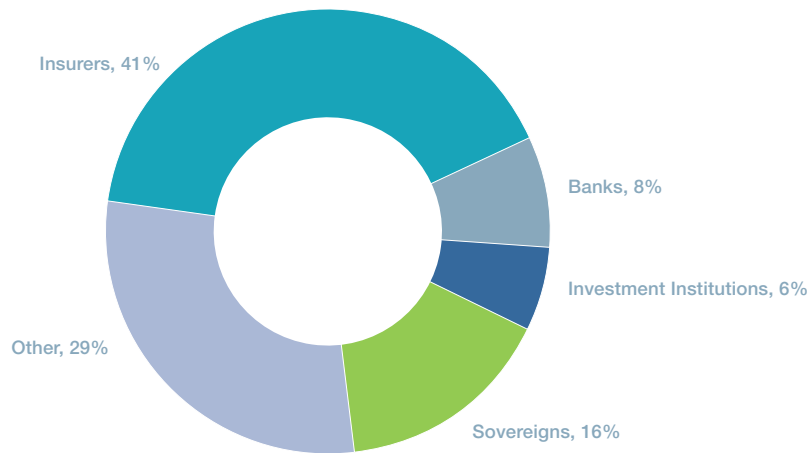
Figure 4.6b: Liability allocation (USD billion, year-end 2014–2018)



Source: 2019 IAIS survey

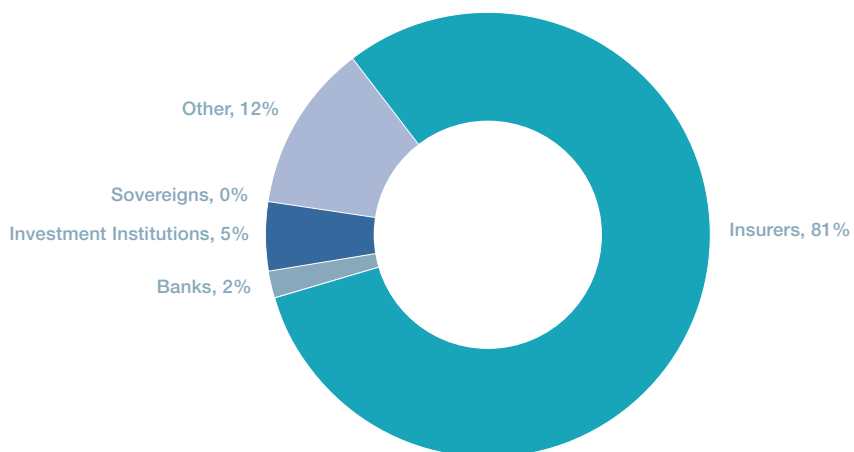
Figures 4.6c and 4.6d show selected assets, key liabilities and paid-up capital per counterparty exposure. Both assets and liabilities show most of their exposures to the insurance market. While assets show a 16% exposure towards sovereigns, liabilities exposure is negligible.

Figure 4.6c: Counterparty exposure – selected assets (% of reported assets, year-end 2018)



Source: 2019 IAIS survey

Figure 4.6d: Counterparty exposure – key liabilities and paid-up capital (% of reported liabilities, year-end 2018)

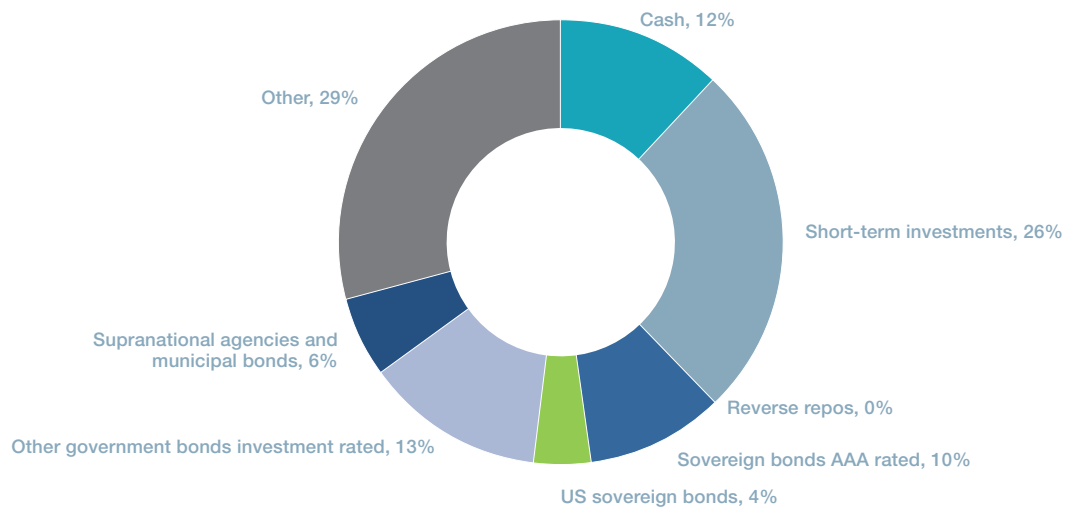


Source: 2019 IAIS survey

4.7 LIQUIDITY

In 2019, the IAIS asked survey respondents to report on assets within their one-year liquidity pool for the first time. Short-term investments accounted for 26%, cash for 12%, and sovereign, supranational agencies and municipal bonds (investment grade) for 33%. Corporate debt falls under “Other”, which accounted for 29%. Reverse repos accounted for only 0.01%.

Figure 4.7a: One-year liquidity profile (year-end 2018)



Source: 2019 IAIS survey

4.8 SUMMARY OF MAIN FINDINGS

The reinsurance market is still recovering and further consolidating its capacity following the series of severe natural catastrophes that took place in 2017. However, capital has proven an effective loss buffer when held at sufficient levels. The combined ratio has decreased compared to 2017, albeit still being at a high level. The Global Reinsurance Market Survey demonstrates the extent to which the reinsurance industry relies on retrocession as a tool to reduce and diversify risk. If the trend of declining retrocession persists, the industry may experience a shift towards other risk-mitigating mechanisms.

Equity and debt securities still remain the largest asset classes for investment in the reinsurance industry, cumulatively accounting for 77.5%. Short-term portfolios tend to be invested in highly liquid securities, while reinsurers' exposures are mainly concentrated in the insurance market.

References

- 1 In this document, the term “insurer” means insurance legal entities, insurance groups and insurance-led financial conglomerates. References to “individual” insurers or institutions distinguishes between risks stemming from an individual insurer and risks stemming from collective exposures, and does not refer to individual legal entities only. Insurance business refers to the business of insurers and reinsurers, including captives.
- 2 The IAIS has discussed the implications of a prolonged low interest rate environment extensively in previous years. Please see previous Global Insurance Market Reports for full details.
- 3 Bank for International Settlements (2019): “Annual Economic Report”, June 2019.
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- 5 International Monetary Fund (2019): “World Economic Outlook: Growth Slowdown, Precarious Recovery”, April 2019.
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- 7 Data unavailable for France over the April–July 2019 period.
- 8 International Monetary Fund (2019): “Global Financial Stability Report: Vulnerabilities in a Maturing Credit Cycle”, April 2019.
- 9 Board of Governors of the Federal Reserve System (2019): “Press Release: Federal Reserve Issues FOMC Statement”, <https://www.federalreserve.gov/newsevents/pressreleases/monetary20190731a.htm>, 31 July 2019.
- 10 European Central Bank (2019): “Press Release: Monetary Policy Decisions”, <https://www.ecb.europa.eu/press/pr/date/2019/html/ecb.mp190725~52d3766c9e.en.html>, 25 July 2019.
- 11 Bank of Japan (2019): “Statement on Monetary Policy”, https://www.boj.or.jp/en/announcements/release_2019/k190730a.pdf, 30 July 2019.
- 12 “Low-for-long” refers to the situation where interest rates are kept low over the long term.
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- 14 Swiss Re Institute (2019): “Sigma no. 3/2009: World Insurance: The Great Pivot East Continues”, 2019.
- 15 Swiss Re Institute (2018): “Sigma no. 5/2018: Global Economic and Insurance Outlook 2020”, 20 November 2018.
- 16 Swiss Re Institute (2019): “Sigma no. 2/2019: Natural Catastrophes and Man-made Disasters in 2018: Secondary Perils on the Frontline”, 2019.
- 17 International Monetary Fund (2019): “Annual Report 2018”, 2019.
- 18 The combined ratio is a metric used to assess profitability and financial performance. It is a commonly used benchmark for non-life insurers (expenses plus incurred insurance losses relative to earned premiums) for underwriting performance and measures the amount of earned premiums that an insurer must pay to cover the claims and expenses generated by the business.
- 19 Net spread refers to the net portfolio yield over the guaranteed rate.
- 20 The interest rate component (capital market gains minus guaranteed interest rate) takes into account the implementation of an additional reserve requirement, the ZZR, which reduces capital gains. The ZZR was introduced in 2011 to help life insurers in times of consistently low interest rates. Since 2014, profits due to mortality can be used to compensate for this reduction, which reduces the need to generate extraordinary capital gains and contributes to greater stability in insurers’ financial soundness.
- 21 The topic of reinsurance is also covered elsewhere in this GIMAR. Chapter 4 introduces findings from empirical research conducted by the IAIS on a sample of global reinsurers.
- 22 AON Benfield (2020): “Reinsurance Market Outlook”, January 2020.
- 23 This refers to the portion of risk that a primary insurer passes to a reinsurer.
- 24 Artemis (2019): “Q4 2019 Catastrophe Bonds & ILS Market Report: Catastrophe Risk Rebounds in a Record Fourth-quarter”, 2019.
- 25 European Insurance and Occupational Pensions Authority (2019): “Financial Stability Report”, June 2019.
- 26 Ferma (2019): “Preparing for Cyber Insurance”, October 2018.
- 27 AON (Q3 2018): “Cyber Insurance Market Insights”, 2018.
- 28 Deloitte (2017): “Demystifying Cyber Insurance Coverage”, 2017. US market penetration is more advanced than other countries and cyber-risk coverage is offered to businesses and individuals. In the EU, cyber-risk insurance is primarily addressed to businesses and, to a very limited extent, individuals (but interest is increasing).
- 29 OECD (2017): “Enhancing the Role of Insurance in Cyber Risk Management”, 2017.
- 30 Deloitte (2017): “Demystifying Cyber Insurance Coverage”, 2017.

- 31 Romanosky, Ablon, Kuehn and Jones (2019): Journal of Cybersecurity, “Content Analysis of Cyber Insurance Policies: How Do Carriers Price Cyber Risk?”, 2019.
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- 42 PRA (2017): Supervisory Statement, SS4/17: “Cyber Insurance Underwriting Risk”, 2017.
- 43 See, for example, <https://www.lloyds.com/news-and-risk-insight/risk-reports/library/society-andsecurity/business-blackout>.
- 44 RMS (2017): “Cyber Risk Landscape Report”, 2017.
- 45 A quota share treaty is a pro-rata reinsurance contract in which the insurer and reinsurer share premiums and losses according to a fixed percentage.
- 46 Facultative reinsurance is a one-off deal where the primary insurer purchases cover for a single risk or a block of risks. Proportional reinsurance requires that the proportion of premiums, expenses and losses be prorated.
- 47 EIOPA (2018): “Understanding Cyber Insurance – A Structured Dialogue with Insurance Companies”, 2018.
- 48 OECD (2017): “Enhancing the Role of Insurance in Cyber Risk Management”, 2017.
- 49 <https://www.chicagofed.org/~/-/media/publications/chicago-fed-letter/2013/cflapril2013-309-pdf.pdf>
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- 51 EIOPA statistics, solo level data, Q4 2018.
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- 53 International Investment (2017): “Unit-linked Life Insurance Products Evolve to Remain Competitive”, <https://www.internationalinvestment.net/internationalinvestment/news/3502609/unit-linked-life-insurance-products-evolve-remain-competitive>, 24 February 2017.
- 54 Boxplots include the median (yellow dot), the 25th and 75th percentiles (grey box, with the change of shade indicating the median), and the 10th and 90th percentiles (whiskers).
- 55 Some of the firms in this sample are composite, but the non-life segment is larger.
- 56 European Systemic Risk Board (2016): “Macroprudential Policy Issues Arising from Low Interest Rates and Structural Changes in the EU Financial System”, November 2016.
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- 59 Net spread = net portfolio yield over guaranteed interest rate. The guaranteed rate was proxied by calculating the weighted average valuation interest rate.
- 60 European Systemic Risk Board (2016): “Macroprudential Policy Issues Arising from Low Interest Rates and Structural Changes in the EU Financial System”, November 2016.
- 61 EIOPA (2017): “Investment Behaviour Report”, November 2017.
- 62 Please also see Section 3.3.
- 63 As insurers are generally long-term investors, they may still be stuck in lower-earning asset classes for a while, even if interest rates start to increase again.
- 64 A more detailed overview of all stresses can be found in the EIOPA 2018 Stress Test Report.
- 65 Banque de France (2017): “Assessment of Risks to the French Financial System”, June 2017.
- 66 Hartley et al. apply the model to US and UK insurers.
- 67 This number comes from multiplying a 6.25% negative return on the 10-year Treasury bond caused by a 1% decrease in yield by the 1.3 coefficient on the Treasury bond return factor in the Hartley et al. model (coefficient estimated using data as of July 2019).
- 68 The figure shows the projected rate of return on all investments (excluding unit-linked) and corresponding interest rate scenarios.
- 69 The simulated average annual 10-year government bond yield was assumed to be zero from February 2017 onwards.
- 70 The BMA uses freely available indices with average yields for different rating classes.

- 71 The yields and the rates are for the US.
- 72 If X time series are decomposed, Y factors are produced, with X greater than Y.
- 73 Cubic splines are used for all in-between maturities to produce a smooth, continuous yield curve.
- 74 Note that it is the interest change that drives the valuation adjustment.
- 75 The median curve overlaps with the average curve, which may explain why the latter is not fully visible.
- 76 Prior years were excluded due to the Federal Reserve's aggressive disinflation policy, which had a significant effect on the interest rates. Older data before 2000 reflect a higher level of rates and are not relevant for the current low-rate environment.
- 77 Only risk-free curve changes are assumed; no changes in credit risk.
- 78 EIOPA (2017), "Report on Thematic Review on Monetary Incentives and Remuneration between Providers of Asset Management Services and Insurance Undertakings", 26 April 2017.
- 79 Organisation for Economic Co-operation and Development, long-term government bond yields: 10-year: main (including benchmark) for the United Kingdom [IRLTLT01GBM156N], retrieved from FRED, Federal Reserve Bank of St. Louis; <https://fred.stlouisfed.org/series/IRLTLT01GBM156N>. Calculated as the yearly average of daily data.
- 80 Thomson Reuters Eikon, FTSE 100 Index; trade close [FTSE]. Calculated as the yearly average of daily data.
- 81 Thomson Reuters Eikon, CAC 40 Index; trade close [FCHI]. Calculated as the yearly average of daily data.
- 82 Thomson Reuters Eikon, DAX 30 Index; trade close [GDAXI]. Calculated as the yearly average of daily data.
- 83 Thomson Reuters Eikon, FTSE MIB Index; trade close [FTMIB]. Calculated as the yearly average of daily data.
- 84 Suitability in Annuity Transactions Model Regulation (#275).
- 85 Fitch Ratings (2019): "Alt Investment Managers Place a Premium on Insurance Tie-Ups", January 2019.
- 86 Note the IAIS Global Reinsurance Market Survey is voluntary and as such may be subject to survey bias.
- 87 Data collected was year-end 2018 data (end of March 2019 for Japan).
- 88 The jurisdictions are Bermuda, France, Germany, Japan, Luxembourg, Spain, Switzerland, the UK and the US.
- 89 When a reinsurer transfers risks it has reinsured to another reinsurer.
- 90 The gearing ratio is the ratio between recoverables from reinsurance and retrocessions and total capital available.





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