GLOBAL INSURANCE MARKET REPORT

[GIMAR]

2018

IAIS 25 YEARS

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. Its mission is 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. Established in 1994, 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 and associations of supervisors or regulators, and assists in shaping financial systems globally. In particular, it is a member of the Financial Stability Board, a member of 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 as well as issues related to the regulation and supervision of the global financial sector.

CONTENTS

Acronyms and Abbreviations

ACPR	Autorité de Contrôle Prudentiel et de Resolution/French Prudential Supervision and Resolution Authority
AI	Artificial intelligence
AT	Austria
AUS	Australia
BACV	Book/adjusted carrying value
BaFin	Bundesanstalt für Finanzdienstleistungsaufsicht/German Federal Financial Supervisory Authority
BE	Belgium
BG	Bulgaria
BoE	Bank of England
CAN	Canada
CLO	Collateralised loan obligation
CY	Cyprus
CZ	Czech Republic
DE	Germany
DK	Denmark
D-SII	Domestic systemically important insurer
EE	Estonia
EIOPA	European Insurance and Occupational Pensions Authority
ES/ESP	Spain
ESRB	European Systemic Risk Board
EU	European Union
FCA	Financial Conduct Authority
FI	Finland
FinTech	Financial technology
FR/FRA	France
FSOC	Financial Stability Oversight Council
GB/GBR	United Kingdom
G-FIN	Global financial innovation network
GIMAR	Global Insurance Market Report
GR/EL	Greece
GRMS	Global Reinsurance Market Statistics
G-SII	Global systemically important insurer
HR	Croatia
HU	Hungary
IAIS	International Association of Insurance Supervisors
ICP	Insurance Core Principle
IE	Ireland
InsurTech	Insurance technology
IOSCO	International Organization of Securities Commissions
IT/ITA	Italy
JP/JPN	Japan
LI	Liechtenstein
LT	Lithuania
LU	Luxembourg
LV	Latvia
MT	Malta
NAIC	National Association of Insurance Commissioners
NL	Netherlands
NO	Norway
OECD	Organisation for Economic Co-operation and Development
ORSA	Own risk and solvency assessment
PL	Poland
PT	Portugal
RegTech	Regulatory technology
RO	Romania
SE/SWE	Sweden
SI	Slovenia
SK	Slovakia
UCITS	Undertakings for Collective Investments in Transferable Securities
UK	United Kingdom
US/USA	United States

This edition of the Global Insurance Market Report (GIMAR) discusses the global (re)insurance sector in 2018 from a supervisory perspective, focusing on recent sector performance and key risks.

Throughout the year, the (re)insurance sector remained stable with clear signs of growth, as evidenced by high capital levels, positive profitability and a persistent inflow of additional reinsurance capital. Despite these indicators of stability, the sector operates in a macroeconomic and financial environment characterised by rising global debt levels, rising inflation rates and low interest rates.

Non-life (re)insurance continues to operate in soft market conditions. Premiums charged by non-life (re)insurers in the commercial lines, property and catastrophe markets remain under pressure, partly due to continuously increasing competition and losses incurred by natural catastrophes in 2017. Capital levels (especially for reinsurers) are solid given the market's high capacity. Alternative capital continued to significantly increase, reaching record levels.

Prolonged low interest rates are a source of vulnerability for life insurers. Profitability is still under stress, especially given products with embedded guarantees. An abrupt rate rise is a potential disruptive risk, which could lead to policy lapses and surrenders.

Life insurers in the United States (US) have been using derivatives extensively to hedge their risks. The trend to buy mostly interest rate derivatives has recently shifted towards products mitigating stock market risk. Insurers continue to invest in their home jurisdiction ("home bias"), making them highly sensitive to the volatility of domestic capital markets while diminishing their geographical diversification. Potential reasons for adopting this strategy include reducing currency risk, extensive knowledge of the home jurisdiction and lower transaction costs.

Although insurers prefer to operate in a liquid market, holdings that are less liquid (higher risk) may lead to higher returns. Supervisors should consider different scenarios with liquidity under stress. To complement microprudential regulation, supervisors are increasingly using macroprudential tools to check for system-wide risks stemming from, among others, excessive leverage, common exposures and cross-holdings.

The insurance industry is relying on technology more than ever before. On the one hand, this is increasing access to insurance worldwide. On the other, it produces new risks that should be tackled by all supervisors: operational resilience, cyber risks and the need for increased consumer protection in the age of big data.

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 use of derivatives in hedging insurance risk; the home bias of investment and concentrations; the liquidity of insurance asset portfolios; the macroeconomic supervision of the insurance sector in various jurisdictions; and the digitalisation of the global insurance industry.

◗ **Chapter 4** summarises the results of the IAIS survey of the global reinsurance market. Using data provided by 47 reinsurers in nine jurisdictions in North America, Europe and Asia, the chapter links the financial position of reinsurers to the broader financial economy.

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 is the sixth GIMAR to be produced. It was prepared by the IAIS Macroprudential Policy and Surveillance Working Group and draws on IAIS data on (re)insurers and contributions from several jurisdictions. The report is not part of the IAIS' supervisory or supporting material, and is not intended to reflect the official views of IAIS Members.

MACROECONOMIC AND FINANCIAL ENVIRONMENT

A decade after the 2007/08 financial crisis, the global macroeconomic environment showed signs of stability in 2018, albeit uneven and fragile, and growth rates are slowly returning to pre-crisis averages, with regional variations. The global insurance[1] market is an integral part of the international financial ecosystem. It operates in a challenging macroeconomic and financial environment characterised by low inflation rates in some jurisdictions; low and, in many advanced economies, negative short- and long-term interest rates; and occasional bursts of financial market volatility.[2]

1.1 INTERNATIONAL ECONOMIC GROWTH AND INFLATION

Although global economic growth recovered to an estimated 3% in 2018, a number of headwinds threaten continued strengthening.[3] Global debt reached a new high of USD 247 trillion (327% of GDP) in the first three months of 2018,[4] while total debt in frontier markets increased by USD 2.8 trillion in the same quarter.[5] Debt levels, which mainly stem from the policy response to the financial crisis, continue to pose a risk to the financial system. High debt levels have the potential to increase spillover risk (especially in the case of maturities mismatch when seeking financing), increase liquidity risk, hinder the implementation of countercyclical policies[6] and increase the non-financial sector's sensitivity to interest rate changes.[7]

Yields on 10-year break-even bonds[8] rose throughout 2018, mainly due to an upturn in oil prices and stronger demand putting upward pressure on commodity prices. This is also consistent with the decline in headline unemployment.[9] In July 2018, headline inflation rose to 2.9% in the US[10] and 2.1% in the euro area.[11]

Japan's inflation remained close to zero with no change in expectations. The country's 10-year break-even rate since the Ministry of Finance

Figure 1.1a: Market-based inflation expectations: Break-even rates of 10-year bonds (%) (June 2009–October 2018)

Source: Bloomberg

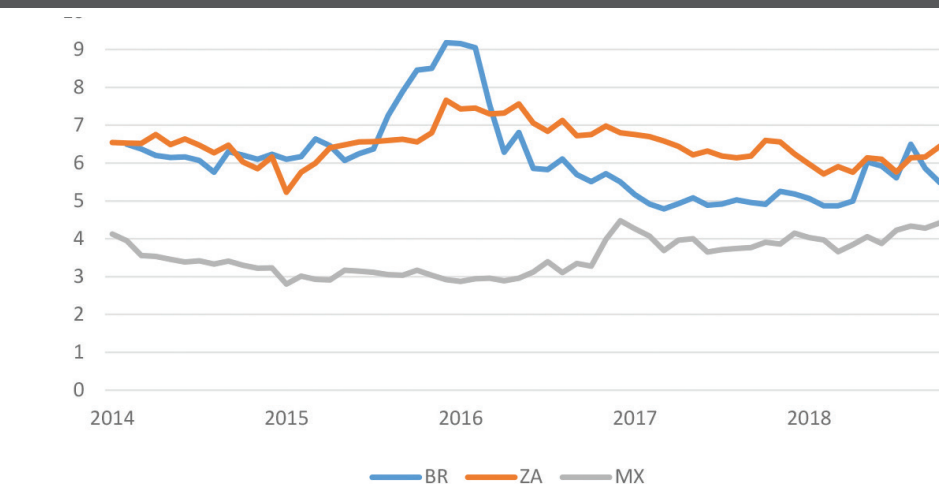*Source: Bloomberg*

started issuing such financial instruments in October 2013 has averaged about 0.7%, almost 10 basis points less than the average measured between 2013 and 2017. In October 2018, the average expected inflation for developing countries such as Brazil and South Africa was somewhat higher, at 6.1% and 6.3% respectively. However, this is slightly lower than the same average calculated in September 2017. Inflation expectations in Mexico have been increasing in recent years, rising to over 4%.

Towards the end of 2018, global expansion weakened and worldwide growth was revised downward. This is partly attributed to deepening trade tensions, which remain an important global risk source. Growing public and private debt levels may further contribute to a deterioration in risk sentiment.[12]

1.2   FINANCIAL MARKETS

In general, long-term interest rates gradually increased over the course of 2018, with the US, Canada and Italy presenting a clear upward trend, while the rates in the UK, Japan, France and Germany remained relatively unchanged from previous periods.

It is unclear whether the global financial system will experience a prolonged period of low interest rates or be disrupted by an abrupt interest rate spike. In the first scenario, associated risks will build up on companies' balance sheets. In the second scenario, inflation could increase and US monetary policy could tighten, as it did in February 2018 when equity corrections took place as a result of the largest year-on-year rise in wages in the US since the financial crisis. This

caused the Volatility Index to rise to its highest level in more than two years.[13] The perceived tail risk of S&P 500 investments has increased considerably, signalling an upturn in the demand for low strike puts, as observed in the SKEW index movements. According to the Bank for International Settlements, US-China trade tensions also sustain this trend.[14]

Under a low-rate state, riskier assets are more sought after (for example, equities, certain structured finance products and real estate). Nonetheless, rate increases started to gain momentum in 2018. An immediate correction in stock prices may have a significant impact on the financial market, according to the European Insurance and Occupational Pensions Authority (EIOPA). House prices, as seen in Figure 1.2c, continue to increase, with slight decreases in several European markets. This observed movement is partly due to the slow recovery from the low interest rate environment.

Similar to the vulnerabilities presented in the 2017 edition of the GIMAR, the financial markets remain fragile to a major shock that could trigger a reassessment of risk premiums in the markets. Such an abrupt increase in rates could have multiple implications across markets and the balance sheet. For example, if it prompts policyholders to shift their investments away from insurance products, thus resulting in an increase in surrenders, insurers' liquidity risk may increase.

Central banks, particularly in the US, are starting to reverse their expansionary monetary policy. It will be important to carefully monitor how this affects the wider financial markets.

Figure 1.2a: Long-term interest rates (January 2007–September 2018[15])
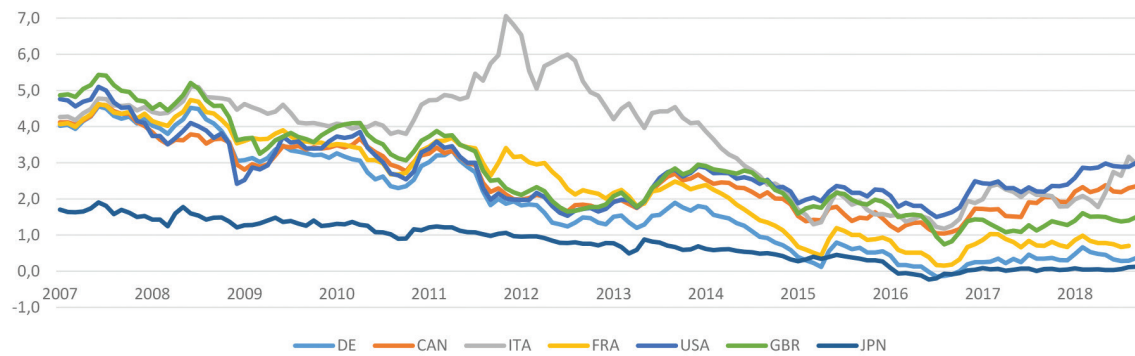
Source: Organisation for Economic Co-operation and Development (OECD)

Figure 1.2b: Volatility in the financial markets (2007–2018)
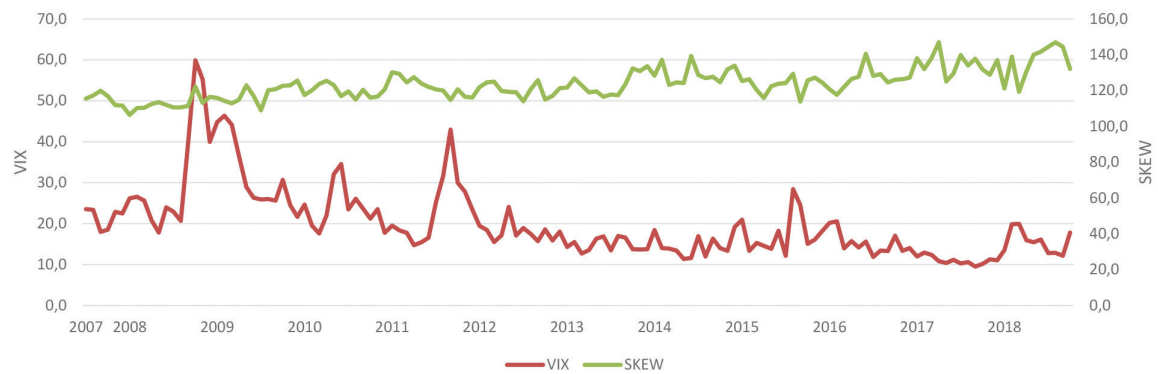
Source: Bloomberg

Figure 1.2c: Real house price indices in selected advanced economies
(Q1 2007–Q2 2018, Index 2007: Q1=100)
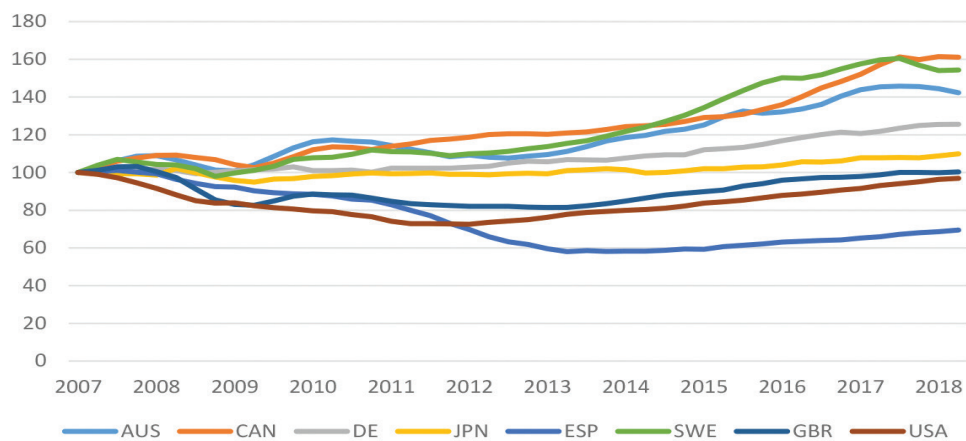
Source: OECD

GLOBAL INSURANCE MARKET DEVELOPMENTS

Global commercial insurance prices increased in Q2 2018 for the third consecutive period, driven mainly by increases in property, financial and professional lines. The market is relatively stable, with prices in the UK and Australia trending upwards while prices in continental Europe and Asia trend downwards.[16]

The 2017 GIMAR identified the low-yield environment as the main threat to the stability of the global insurance market, especially for companies offering long-term guaranteed rates on their products as they are prone to asset-liability mismatch risk.

With several high-profile natural catastrophes, especially in the Caribbean and North America, 2017 was the second costliest year in terms of natural catastrophes following 2005, the year of hurricanes Katrina, Rita and Wilma. In 2018, the market showed some sparse hardening, particularly given the slightly favourable macroeconomic climate as well as some upward trending rates due to the losses from natural catastrophes in 2017.

2.1   NON-LIFE INSURANCE

In 2017, the growth of global non-life insurance premiums slowed to 2.8% in real terms (from 3.3% in 2016), reaching USD 2,234 billion, mainly due to lower growth in emerging markets (6.1% in 2017 compared to 9.8% in 2016). China and North America mainly drove the increases, with each contributing 1% to the real non-life premium growth. Motor insurance remains the main determinant of growth in non-life insurance premiums, especially for the US market.[17]

Catastrophic events in 2017 caused USD 337 billion in losses. These losses were the result of fewer but more severe disasters than in 2016; for example, the three largest hurricanes, Harvey, Irma and Maria, accounted for almost one third of the total. More than 55% of these losses were uninsured.

In terms of profitability, according to the Swiss Re Institute, the return on equity declined in 2017 for the third consecutive year (to 5.1%). This was mainly due to the soft underwriting conditions or the underwriting losses from natural catastrophes. Nevertheless, average solvency ratios in the sector peaked at 130%. Conditions seem to be improving and market dynamics are changing. Although the large reinsurance and alternative capacity have offset the high losses from natural catastrophes, rates on property lines have increased in regions severely hit by hurricanes and earthquakes.[18]

In its Global Insurance Market Index: First Quarter 2018 outlook, Marsh reports an unsynchronised trend across lines of business and regions. In Q1 2018, global commercial insurance rates increased for the third consecutive quarter (0.9%), from a trough of -5% in Q4 2015 to -2.3% during the same quarter in 2017. The slow recovery of global insurance rates is likely due to increased global underwriting competition and significant excess capacity.

Figure 2.1a: Global insurance market renewal rates (Q1 2012–Q1 2019)
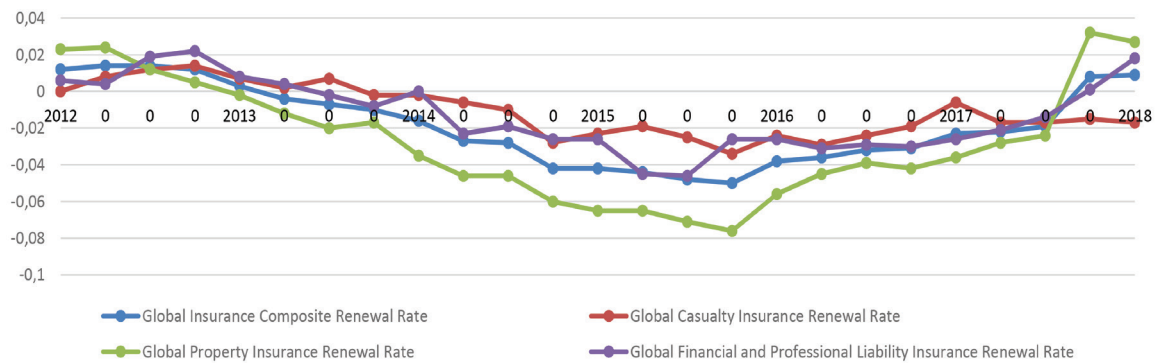
Source: Marsh Global Insurance Market Index – Q1 2019

Figure 2.1b: US combined ratio (1991–2017)
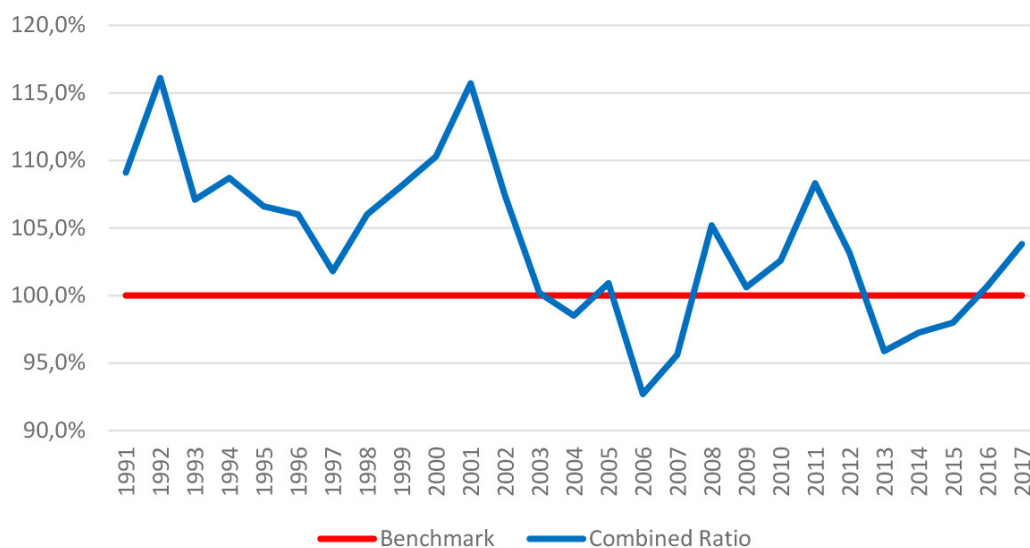
Source: National Association of Insurance Commissioners (NAIC)

Figure 2.1c: US property and casualty loss ratio, expense ratio and policyholder dividend ratio (1991–2017)
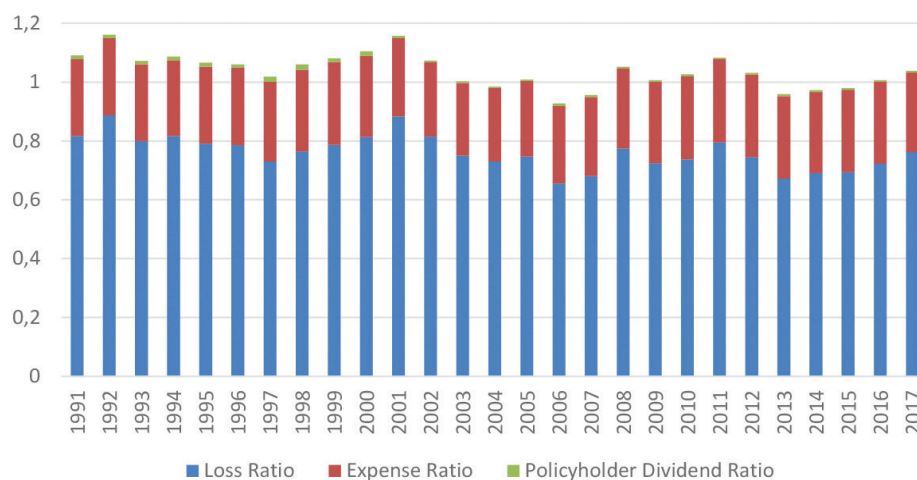
Source: NAIC data

Figure 2.1d: European Union member states' property and casualty net combined ratio[19] (Q3 2017–Q2 2018[20])
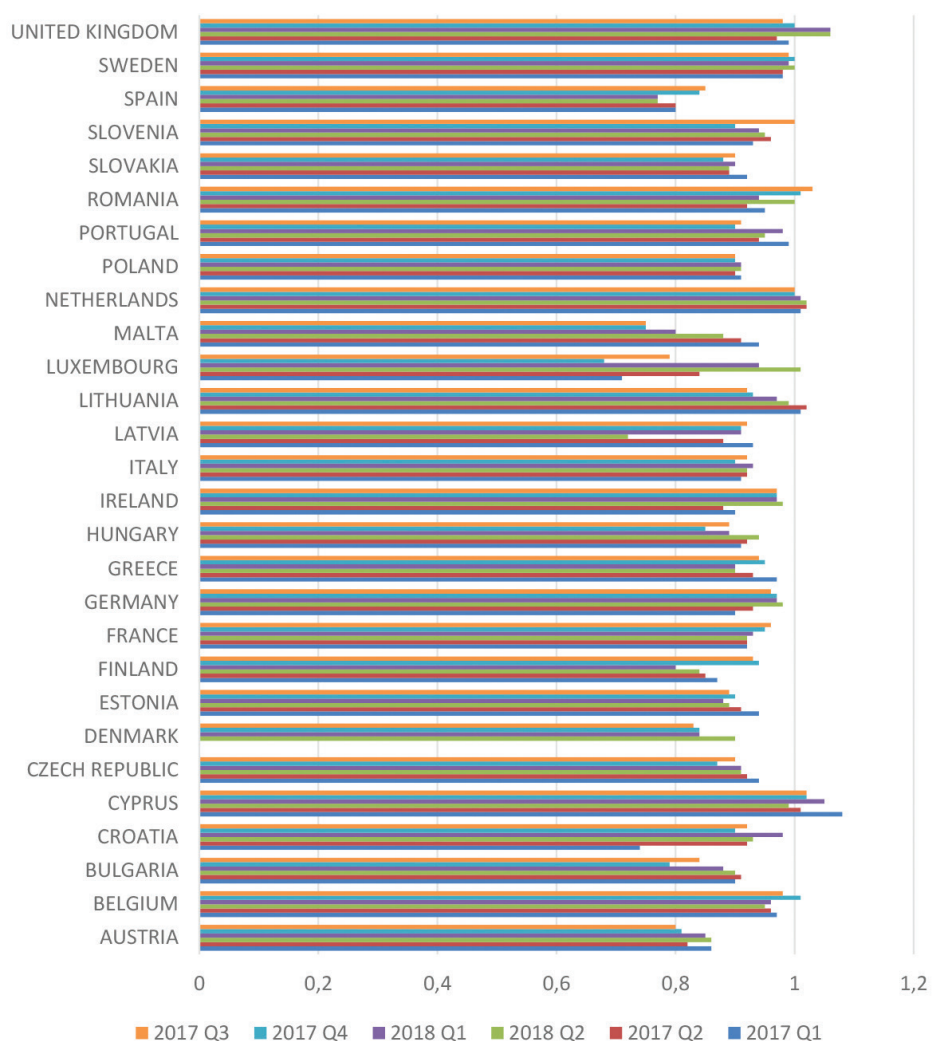
Source: EIOPA data

Figure 2.1e: Germany's property and casualty loss ratio and expense ratio (2011–2017)
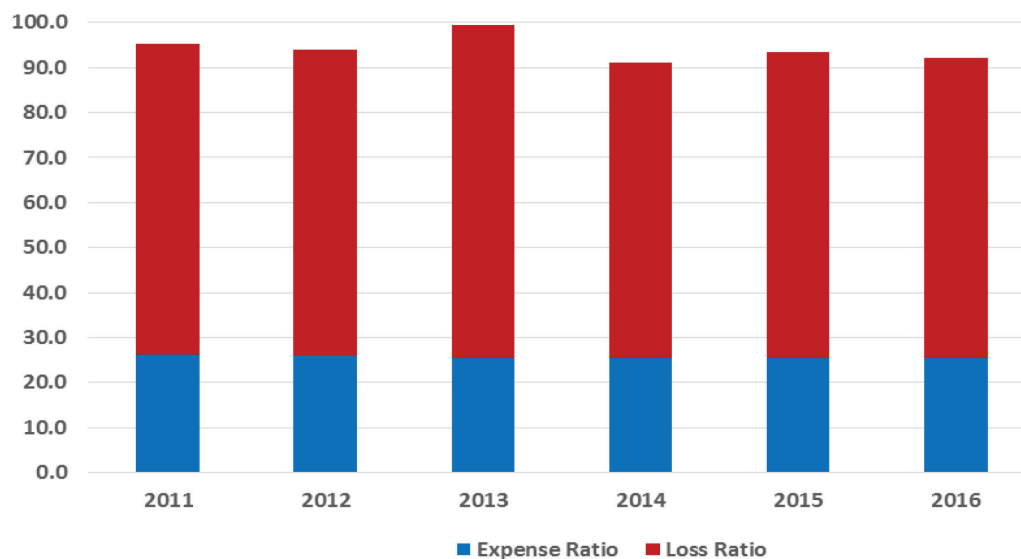
Source: Federal Financial Supervisory Authority (BaFin)

Reported profitability remained generally positive throughout 2018; however, it clearly captures the severe natural catastrophes that occurred during 2017, with the US combined ratio[21] jumping back above the 100% threshold after several years with no major losses. The long-run (1991–2017) average combined ratio of the US property and casualty insurance industry was 103.9%, which is consistent with the previous year.

The UK observed a combined ratio of 104.1% at the end of 2017, with a loss ratio of 64% and an expense ratio of 40%. The losses from hurricanes, wildfires and earthquakes pushed the combined ratio above 100%.[22]

Compared to the figures observed at the European level, the national figures better illustrate European non-life insurers' profitability. In the European Union (EU), the non-life direct insurers active in property and casualty business benefited from moderate growth in overall premium levels in 2017 and 2018.

In Germany, expenses for insured claims have risen at a faster pace than premiums, resulting in lower profitability. The profitability of non-life direct insurers in Germany was slightly lower than the previous year: the gross combined ratio was 92.5% in 2017, compared with 92.2% in 2016. Due to reinsurers' participation, German non-life property and casualty insurance undertakings' technical result net of reinsurance remained unchanged from the previous year. Because of the slight increase in investment income, the annual result for 2017 (after taxes) was higher than the previous year's figure. This development was mainly supported by the rising premium income in motor insurance (due to rising average rates and the growing number of underwritten policies).

In France, due to the limited increase in expenses compared to premiums, the French insurers' global technical results at the end of 2017 were at the same level as those observed at the end of 2015 (after weaker technical results in 2016).
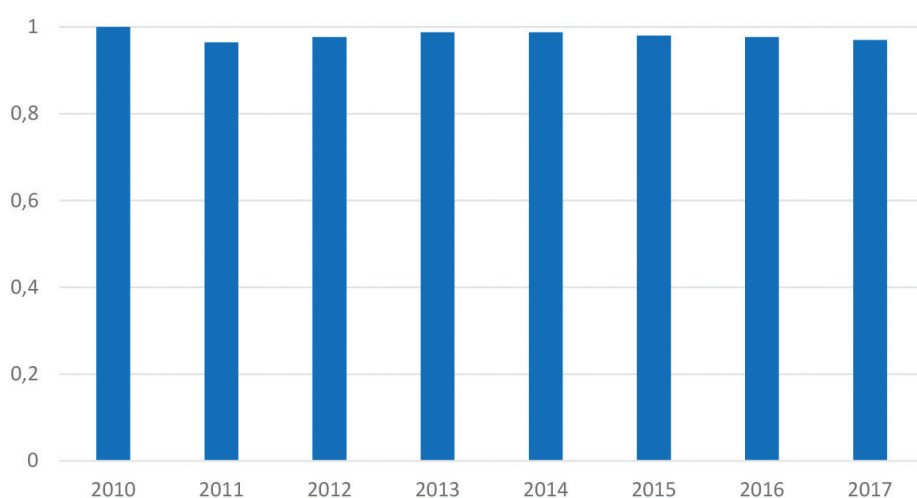
Source: French Prudential Supervision and Resolution Authority (ACPR)

However, natural catastrophes in France at the end of 2017 pushed the combined ratios of some non-life lines of business above 100%; the decrease observed from Q2 2017 to Q2 2018 in the net combined ratio of the property and casualty lines is due to an increase in claims. Italy's non-life sector registered a financial year profit for the sixth consecutive year (2.4 billion euros in 2017, an increase of 14% from 2016). The combined ratio has been comparatively stable since 2013. After six years of decline (2010–2015), the loss ratio was almost unchanged at 63.5% in 2017 (63.6% in 2016).

Figure 2.1g: Italy's property and casualty loss ratio and expense ratio (2007–2017)
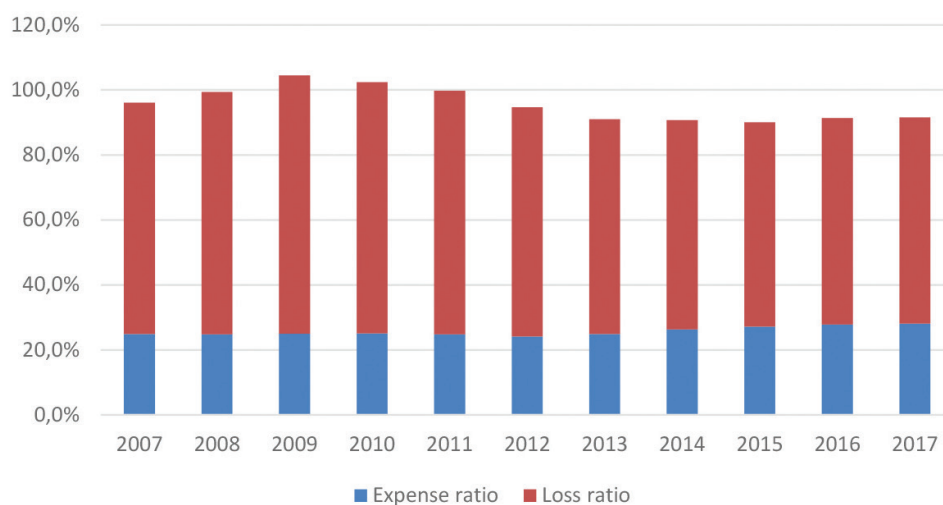
Source: Italian Institute for the Supervision of Insurance

Operating expenses also remained stable (8.3 billion euros compared with 8.2 billion euros in 2016), while their impact on premiums earned continued to grow, reaching 28.1% (27.8% in 2016), mainly due to the reduction in collected premiums income.

The Belgian property and casualty insurance market further improved its profitability in 2017, with a combined ratio of 97.21%, compared to 98.77% in 2016. In the past four years the property and casualty insurance market has been strong, with combined ratios well below the 17-year average of 102.44%.

Figure 2.1h: Belgium's property and casualty combined ratio (2001–2017)
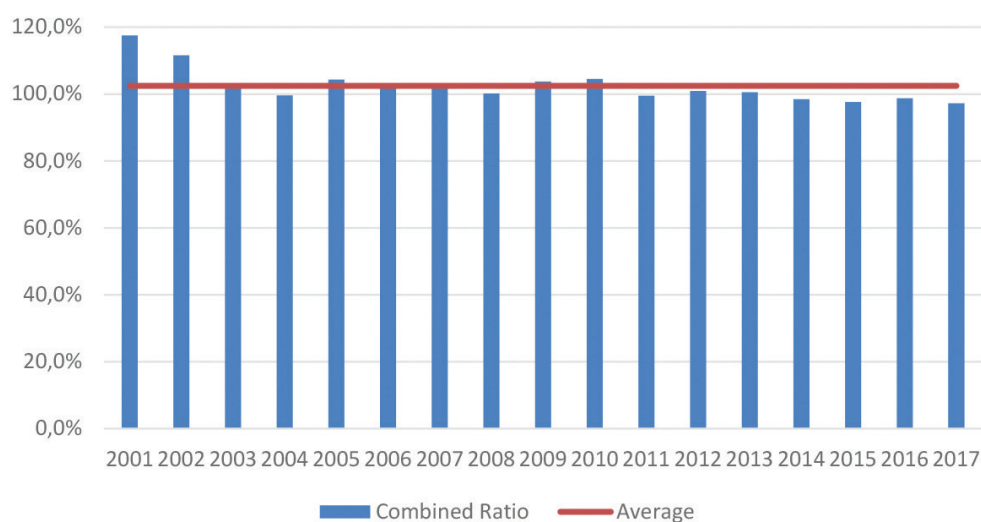
Source: National Bank of Belgium

Figure 2.1i: Japan's property and casualty loss ratio and expense ratio (March 2006–March 2018)
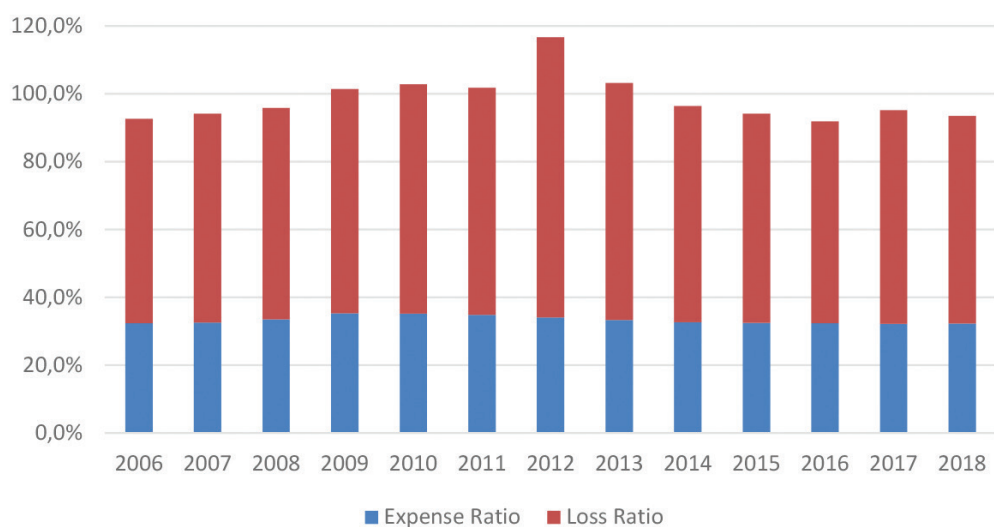
Source: Published data from non-life insurers in Japan

Figure 2.1j: Korea's property and casualty loss ratio and expense ratio (March 2011–March 2018)
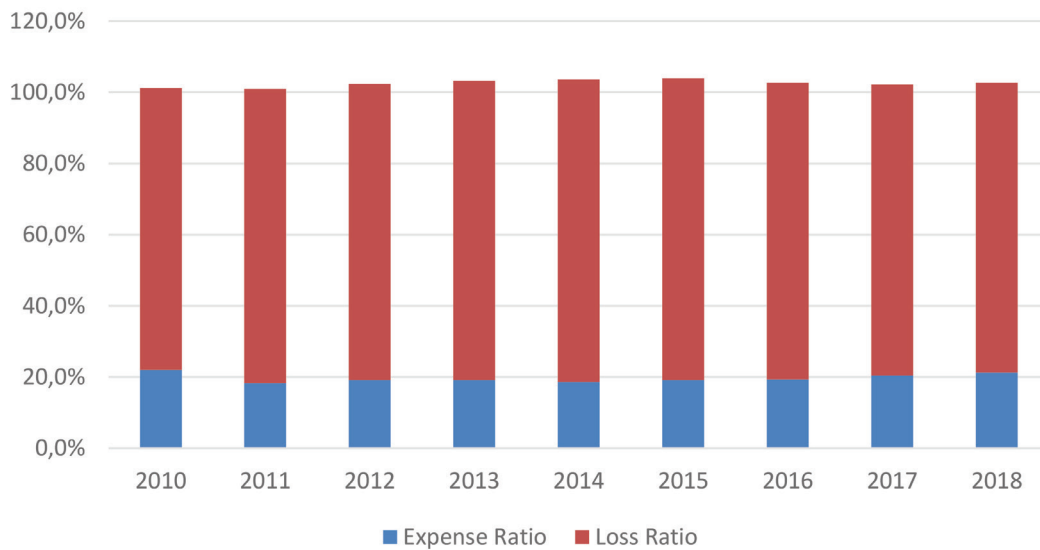
Source: Korean Financial Supervisory Service

In the Japanese property and casualty insurance market, the loss ratio decreased by 1.8% to 61.2%, thanks to a net premium increase and a decrease in claims, notwithstanding higher earthquake-related claims than in the previous year and loss adjustment expenses. In the Republic of Korea (Korea), profitability metrics remained generally stable.

2.2   LIFE INSURANCE

In 2017, global life insurance premiums only grew by 0.5% in real terms to USD 2,657 billion, primarily driven by a 14% increase in emerging markets, offset by a decrease of 2.7% in advanced economies. The decrease in advanced markets can be attributed mainly to the prolonged state of low interest rates, which might have directed consumers away from traditional life insurance to other savings instruments. The strong growth in emerging markets has mostly been driven by China, which has become the second largest life insurance market after the US. The Chinese market has grown to this extent due to the demand for unit-linked and traditional insurance products.[24]

Profitability in the global life insurance market remains under stress, especially given the large number of life insurers that issued insurance products with comparatively high embedded guarantees in the past. Increasing pressure also results from competition with other non-insurance products.[25] Life insurers are responding differently to these market challenges. Approaches include lowering guaranteed benefits, making them more flexible or even eliminating guaranteed benefits products from the market altogether.

At the same time, there are opportunities for life insurers to provide a viable alternative to close the pension savings gap and cover the benefits that governments cannot grant.

In its 2018 Financial Stability Review,[26] the European Central Bank posits that the slight increase in yields had a positive effect on life insurers' balance sheets, with the decrease in liabilities more than compensating for the decrease in asset values. As discussed in the first chapter, life insurers are particularly prone to abrupt interest rate spikes, which could hinder their asset-liability
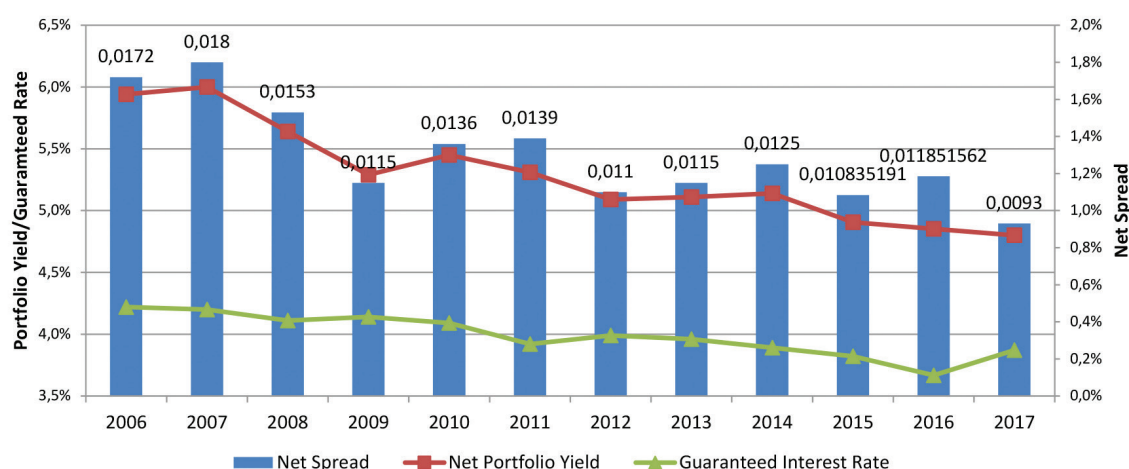
Source: NAIC

management and lead to policy lapses or surrenders. Although corporate and government bonds remain the preferred investments, if the low-yield state is not reversed soon, companies may increasingly seek higher returns by shifting their strategy towards riskier asset classes such as listed and unlisted equities, real estate and collateralised assets.

Supervisors track the difference between net investment yields and guaranteed crediting rates for the life industry. In the US, the margin continued to narrow throughout 2017, with the net spread decreasing from 119 basis points in 2016 to 93 basis points in 2017.

Data from selected European countries show that with interest rates remaining very low, the net spread has either increased or remained stable, and is higher than the US market's. However, this overview needs to be considered in conjunction with the analysis of the undertakings' reserves.

In Belgium, the investment return remained stable, while the average guaranteed interest rate continued to decline. This led to an increase in the net spread from 1.51% in 2016 to 1.64% in 2017.

In France, due to a decrease in the policyholders' remuneration rate, life insurers increased their reserves to remain competitive in the low-for-long interest rate environment or in case of sharp increases in interest rates.

In Germany, life insurers' profits and losses are split into its components (capital/interest rate, risk/mortality and other profits). The interest rate component (capital market gains minus guaranteed interest rate) takes into account the implementation of an additional reserve requirement, the "Zinszusatzreserve", which reduces capital gains. 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.

Figure 2.2b: Selected European life insurance market net spreads (2006–2017)
A. Belgium

- Net spread
- Average guaranteed rate of return on existing contracts
- Investment return on assets covering guaranteed rate contracts without adjustments (capital gains, impairments)
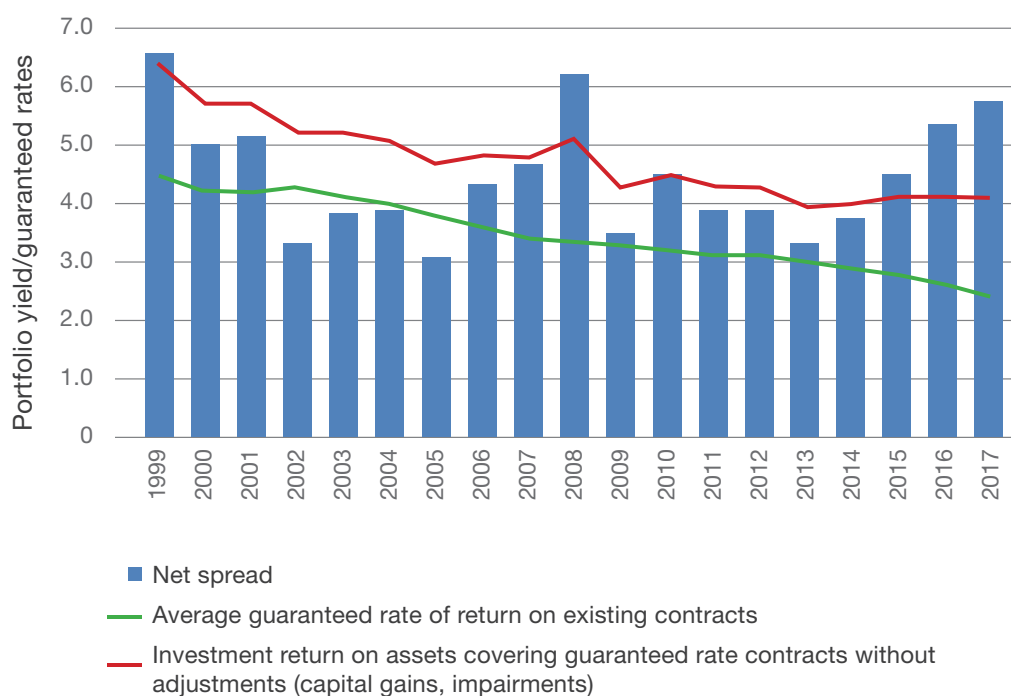
Source: National Bank of Belgium

B. France[28]

- Net spread
- Policyholders' remuneration rate
- Net portfolio yield
- Technical rate*
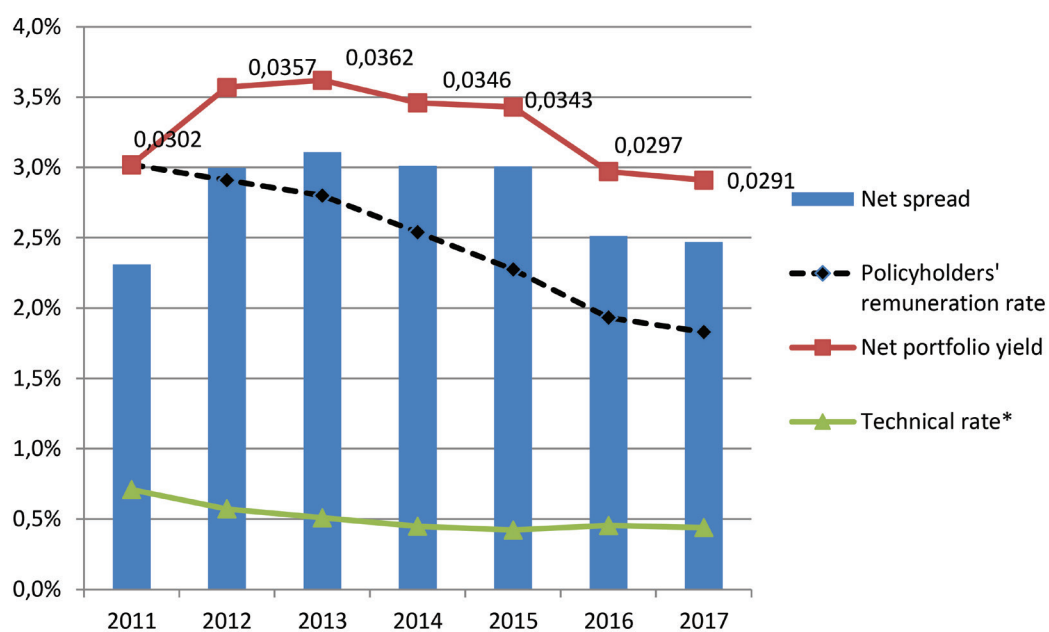
Source: ACPR

C. Germany (EUR millions)[29]

Legend:
- Capital market gains - guaranteed interest rates
- Mortality/Longevity/Disability
- Other (ia Costs, Reinsurance, etc.)

Source: BaFin

2.3   REINSURANCE[30]

The global reinsurance market remained fairly stable in 2018 compared to 2017 despite the record-high insured losses from natural catastrophes in 2017. The reinsurance market is well capitalised, as evidenced by the fact that the large losses incurred have not driven rates up too high. Reinsurers are still operating in a soft market, characterised by ongoing consolidation. These trends can also be observed in the IAIS' Global Reinsurance Market Statistics (GRMS) survey, presented in chapter 4 of this report.

According to S&P Global's Global Reinsurance Highlights 2018,[31] in 2017, the global reinsurance market generated returns on capital of 1.2% (6.3% below its cost of capital of 7.5%) – the lowest level in more than 13 years. For some jurisdictions, the cost of capital has also been declining for over a decade, due to the drop in risk-free rates. This leads to a decrease in the cost of equity and debt, with reinsurers favouring debt financing, which is cheaper than equity financing. Another downward driver could be the improved capitalisation and creditworthiness of primary insurers or other financial institutions (hedge funds, pension funds and sovereign wealth funds), which are tapping into the reinsurance market by adding catastrophe risk to their portfolio.

With increased competition and heavy price pressures, global reinsurers are still looking to merger and acquisition deals to build scale, increase their knowledge base and diversify portfolios. In mid-2018, AIG Inc acquired Validus Holdings Ltd for USD 5.56 billion, while AXA SA acquired the XL/Catlin Group Ltd for a reported price of USD 15.35 billion, only four years after XL acquired Catlin Group Ltd for about USD 4 billion.[32]

A relatively stable demand for reinsurance resulted in a similar level of global reinsurer capital in the first half of 2018 as in 2017. Traditional capital fell from USD 516 billion to USD 507 billion; however, this difference was offset by an increase in alternative capital from USD 89 billion to USD 98 billion.[33] The available alternative capital has increased sixfold since 2006 due to, among other things, prolonged low interest rates, which have prompted investors to search for other sources of returns, especially if they are not correlated with capital market movements.

Appetite for insurance-linked securities and alternative capital also continued to grow in 2018, accelerating since the natural catastrophe losses of 2017. The sector has reached a record high, with Aon estimating in its September 2018

Traditional capital values: 368 (2006), 388 (2007), 321 (2008), 378 (2009), 447 (2010), 428 (2011), 461 (2012), 490 (2013), 511 (2014), 493 (2015), 514 (2016), 516 (2017), 507 (H1 2018)

Alternative capital values: 17 (2006), 22 (2007), 19 (2008), 22 (2009), 24 (2010), 28 (2011), 44 (2012), 50 (2013), 64 (2014), 72 (2015), 81 (2016), 89 (2017), 98 (H1 2018)

Legend: ■ Alternative capital ■ Traditional capital
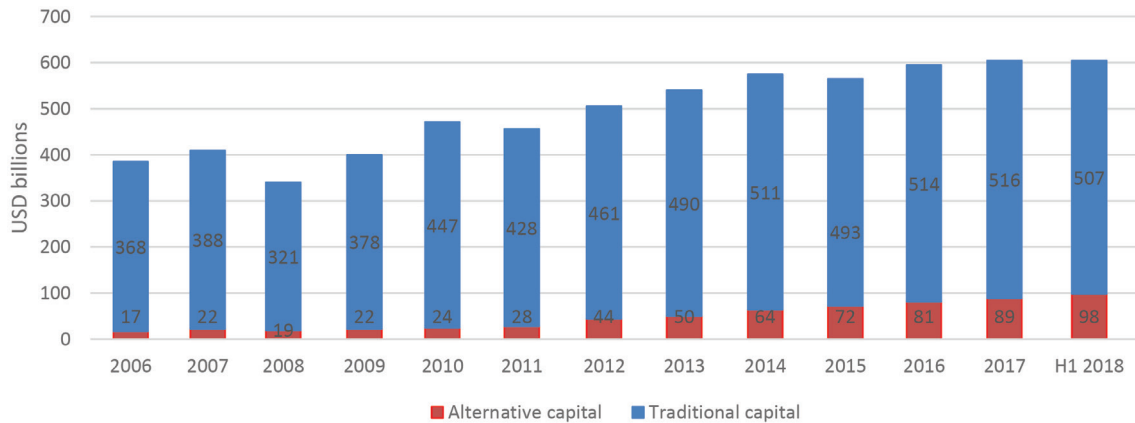
Source: Aon Benfield Analytics

Reinsurance Market Outlook that it could breach the USD 100 billion threshold, while Artemis cites a value already above this limit.[34]

Collateralised reinsurance and catastrophe bonds are particularly sought-after financial products. The total market of on-risk catastrophe bonds was valued at USD 29 billion on 31 March 2018,[35] increasing to well over USD 30 billion at the end of Q2. The catastrophe bond issuance in Q2 2018 exceeded USD 4 billion. Although property catastrophe bond issuance did not reach the same level at the end of H1 2018 as it did in 2017, it surpassed the annual level attained in 2015 and 2016.

Figure 2.3b: Property catastrophe bond issuance (2007–Q2 2018)

Legend: ■ Q1 ■ Q2 ■ Q3 ■ Q4
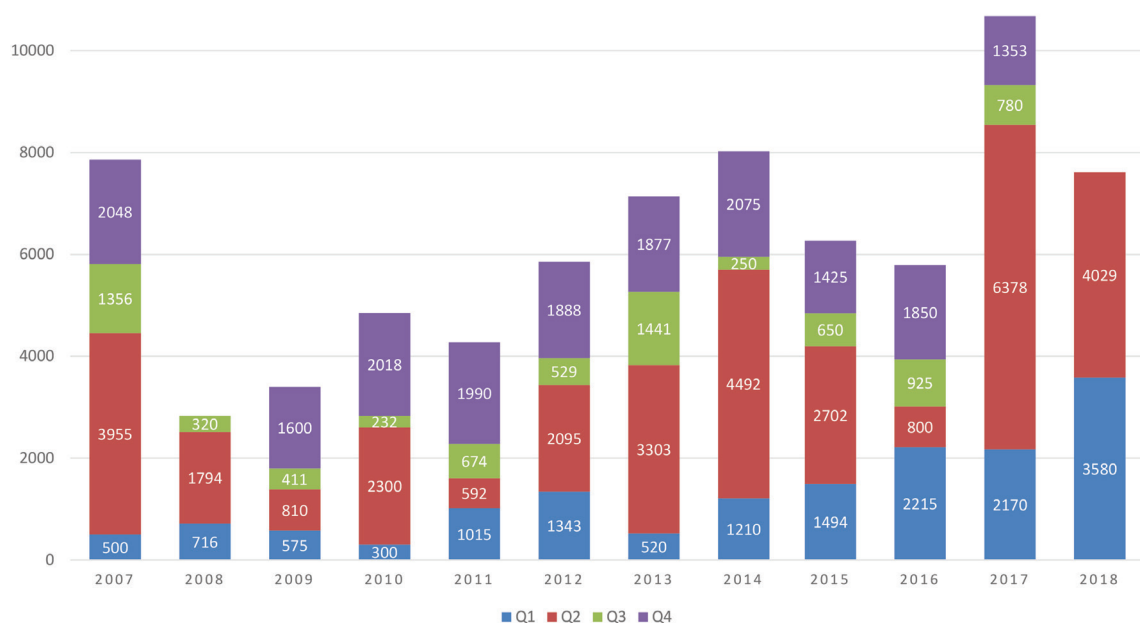
Source: Aon Securities Inc, Aon Benfield (2018) Reinsurance Market Outlook

SPECIAL TOPICS

The GIMAR's special topics vary each year, focusing on regulatory, financial and economic developments and risks. In this edition, special topics include the use of derivatives in hedging insurance risk, the home bias of investment and concentrations, and the liquidity of insurance asset portfolios. The chapter also examines the macroeconomic supervision of the insurance sector in various jurisdictions and addresses the digitalisation of the global insurance industry.

3.1 THE USE OF DERIVATIVES IN HEDGING INSURANCE RISK[36]

3.1.1 Introduction

Life insurers sell products that provide policyholders with funds when they need them the most. For example, disability insurance will supply funds if a policyholder suffers an accident that limits their ability to work, a universal life product will deliver funds to financially support the family of a policyholder after their death, and an annuity product will provide a source of income for a policyholder's retirement.

Insureds pay premiums to insurers to obtain these products. The premiums are paid upfront, but the insurance payments are made in the future. Between the time the premiums are received and the time the payments are made, the funds are invested in financial assets (usually stocks and bonds). Ideally, the future cash flows of these financial assets will closely match the insurance payments to policyholders. However, it is difficult to achieve this matching. For example, some payments are expected to occur after many years, but it may be difficult to find bonds that pay so far in the future; or market conditions beyond the insurers' control could affect the assets' cash flows and the payments to policyholders differently.

Insurers can fine-tune investment payments by adding derivatives. Derivatives are financial instruments with cash flows that depend on the value of other financial assets (the underlying assets). To avoid confusion, we will refer to non-derivative assets as "the investments" and to derivatives as "hedges" because they are used to hedge the risk that assets' cash flows and payments to policyholders do not match.

The mismatch between the cash flows from assets and liabilities for traditional products like universal life or fixed annuities is due mostly to interest rate risk. Interest rate risk is the potential for the value of an investment to decrease or the value of a liability to increase because of an unforeseen change in interest rates. For insurers, this risk arises because the expected payments to policyholders (liabilities) are in the far future, and the cash flows from assets are usually received before policyholders need to be paid. Therefore, as interest rates change, the increase or decrease in the value of assets is not equal to the change in the value of liabilities. This risk can be reduced by using interest rate derivatives.

However, the payments of more recent products offered by life insurers, such as variable annuities with guarantees and indexed annuities, are linked to stock market performance and therefore carry substantial market risk. This market risk arises because the payments promised to policyholders are different from the returns on the investments held by insurers.

The next section describes how US life insurers have used derivatives to reduce the risk of the products they sell, and how the introduction of products exposed to market risk has affected their use of derivatives.

3.1.2 Use of Derivatives by US Life Insurers

The extent to which US life insurers use hedges has substantially increased; for example, the notional amount, or face value, of the derivative holdings represented only about 30% of assets in the general account at year-end 2010, increasing to about 50% at year-end 2017 (see Figure 3.1a).[37] An insurer's general account holds their aggregate investments and assets allocated for paying policyholder claims and benefits.

Consistent with the view that traditional insurance products carry mostly interest rate risk, US life insurers have historically used interest rate hedges intensively. At year-end 2010, interest rate derivatives' notional value of about USD 696 billion accounted for roughly 68% of the derivatives portfolio, but decreased to 59% of all derivatives by year-end 2017 (Figure 3.1b).

Nevertheless, in recent years, US life insurers have increased the sale of annuity products exposed to stock market risk. For example, in 2010 life insurers' reserves associated with these products were USD 458 billion, representing 10% of their reserves. By 2017 this amount had increased to USD 747 billion, representing 14% of their reserves.

To manage the stock market risk associated with these products, the underlying assets of the derivatives need to be stocks. Hence, the rise of annuities described above is expected to translate into a larger holding of stock derivatives. As Figure 3.1c shows, equity hedges increased from 18% of total derivatives at year-end 2010 to 33% of derivatives at year-end 2017.

The annuities carrying market risk in the US can be classified into two broad groups: variable annuities with guarantees and indexed annuities. These products represent a substantial proportion of US life insurers' business. As of 2017, the reserves associated with variable annuities with guarantees represented 7% of total reserves and the reserves associated with indexed annuities represented 4% of total reserves. These products are widely offered. As of 2017, 24% of all US life insurers offered variable annuities with guarantees and/or indexed annuities. Of these firms, 81% use any type of derivative, and of these, 88% specifically use equity derivatives to hedge risk.

A variable annuity is a contract where the policyholder receives payments based on the performance of underlying securities. There is a minimum guaranteed payment for policyholders, but any additional amount above this depends on the securities' rate of return. The policyholder remains the owner of the investment's assets. Market risk arises when the market performs poorly. The insurer then needs to cover the gap between the market returns and the minimum guaranteed return.

Figure 3.1a: US life insurance derivatives holdings (USD billions and %)
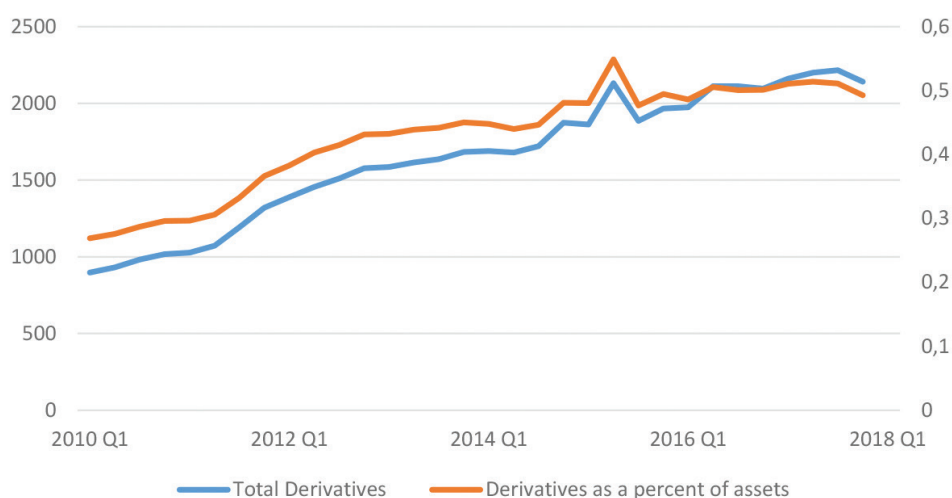
Source: US Federal Reserve Bank of Chicago

Figure 3.1b: Interest rate derivatives (%)
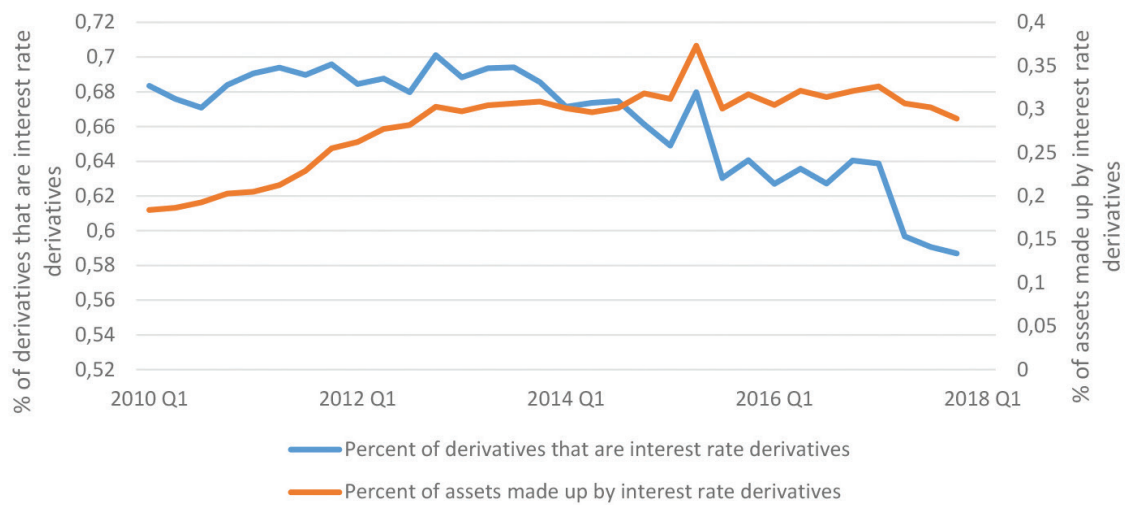
Source: US Federal Reserve Bank of Chicago

Figure 3.1c: Equity derivatives (%)
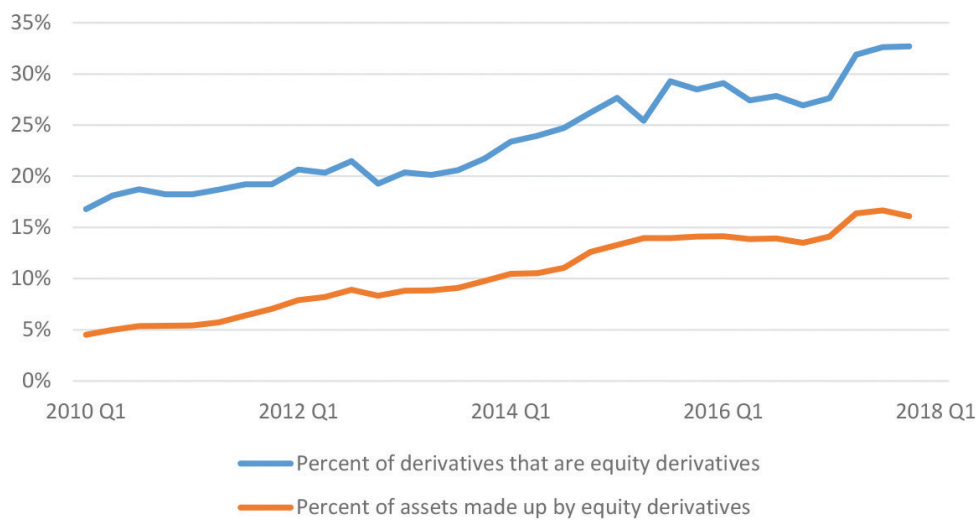
Source: US Federal Reserve Bank of Chicago

An indexed annuity is a contract where the policyholder's return depends on the return of a pre-stipulated index. When the index's return is below a minimum threshold, the policyholder obtains the minimum threshold return. When the index's return is above this threshold, but below a pre-established maximum threshold, the policyholder obtains the index's return.

They obtain the maximum threshold return when the market return is above this limit. The insurer invests the premiums and retains ownership of these investments. The risk associated with indexed annuities arises because the policyholder is promised returns that are linked to an index where the insurer is not required to hold the index assets.

A substantial proportion of the risk associated with variable annuities with guarantees and indexed annuities is hedged by insurers through options known as puts and calls. A put is a contract where the buyer has the option, but not the obligation, to sell an underlying asset at a specified price on a certain date. Similarly, the option to buy the asset is known as a call.

Generally, insurers use calls to hedge indexed annuities and puts to hedge variable annuities. To hedge risk associated with indexed annuities, the insurer can buy calls on the index that pay when the index's return is above the minimum return promised to the policyholder, and sell calls that have to be paid when the return is above the maximum return. To hedge risk associated with variable annuities with guarantees, the insurer can buy puts that pay when market returns fall below the guaranteed rate. If insurers are using hedging strategies, it is to be expected that they have increased the purchases of puts and calls in recent years, especially given the increase in the sale of these annuity products.[38] Figure 3.1d shows that, as expected, US insurers have increased the purchases of calls and puts from year-end 2010 to year-end 2017 – from USD 81 billion to USD 364 billion in the case of calls, and from USD 100 billion to USD 190 billion in the case of puts.

Comparing the derivative composition of top writers (insurers) of indexed annuities over this time period shows that short and long calls are significantly correlated to an insurer's percent of reserves made up of indexed annuities. Long puts are significantly correlated to a firm's percent of reserves made up of variable annuities. Share of short calls and share of indexed annuities have a strong, significant correlation of 0.8 and long calls and share of indexed annuities have a strong, significant correlation of 0.9. Share of long puts and share of variable annuities have a strong, significant correlation of 0.8.

As demonstrated in Figure 3.1e, US insurers use calls to hedge indexed annuities because payments to indexed annuity holders roughly match payments on call options with a bond. Policyholders receive a guaranteed return amount for indexed annuities (the initial flat portion of the graph). Indexed annuity policyholders also receive market returns that can continue until a pre-set cap is reached, at which point returns top out (the increasing portion, and then the subsequent flat portion, of the graph).

This graph also shows returns on a call option with a bond. Initially, the bond provides some steady returns, depicted by the first flat section. Then, the long end of the call kicks in at some strike price, and returns increase – hence the line's upward slope. This continues until the short call kicks in at some other strike price, whose decreasing returns balance out with the long end's increasing returns to produce the third,

Figure 3.1d: Derivative holdings, calls and puts (USD billions)
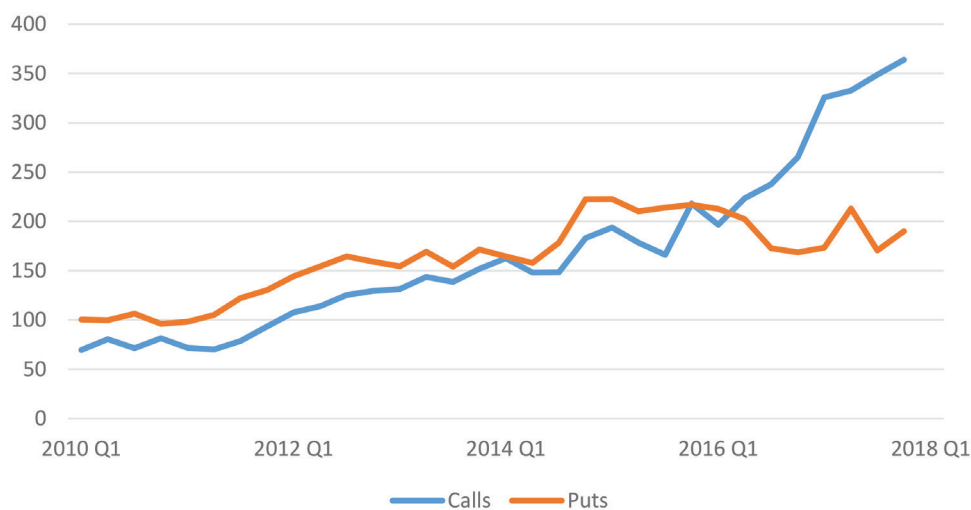
Source: US Federal Reserve Bank of Chicago

Figure 3.1e: Returns on indexed annuities and calls with a bond (%)

Cap/long + short call

Market return/long call

Guarantee/Bond
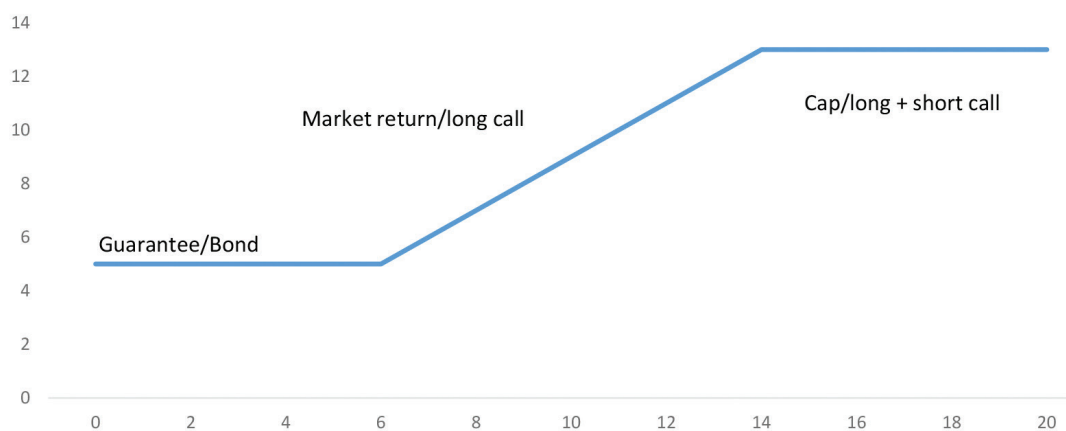
Source: US Federal Reserve Bank of Chicago

Figure 3.1f: Returns on variable annuities and put options (%)

Put (held by insurer)

Market (held by policyholder

Market + Put

Put — Bond — Market
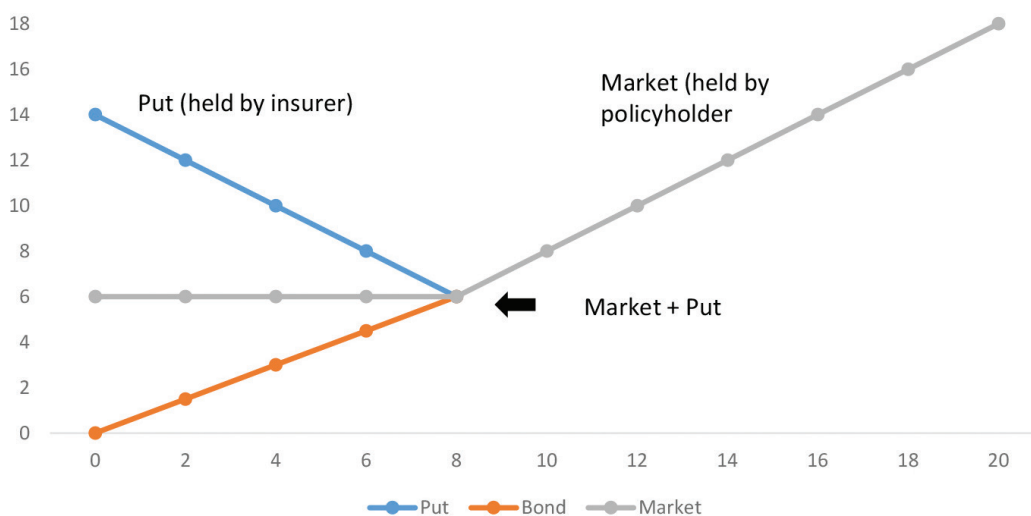
Source: US Federal Reserve Bank of Chicago

flat part of the line. Thus, a long call option with a short call option and a bond is an effective hedging strategy for insurers' indexed annuities.

As demonstrated in Figure 3.1f, insurers use put options to hedge variable annuities because payments to variable annuity holders roughly match payments on put options. Policyholders of variable annuities are promised a fixed rate if the market does worse than a certain fixed point, and all market returns beyond that point.

To cover this, the insurer buys a put with a strike price at this set guarantee. As shown in the graph, the return on a put option leads to a flat return for a policyholder, and the insurer holds the put. Once market returns surpass the strike price, the policyholder gets all market returns. The grey line depicts the returns of a variable annuity to a policyholder. A put option is useful for insurers in hedging variable annuities because using it ensures that policyholders receive returns regardless of how the market performs.

Figure 3.1g: Life insurance industry's long and short call amounts (USD billions)
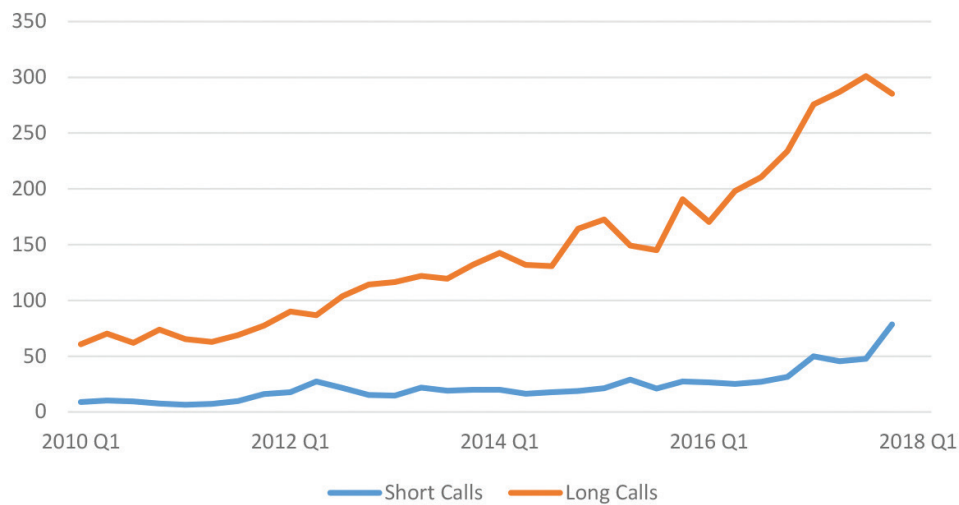
Source: US Federal Reserve Bank of Chicago

Figure 3.1h: Life insurance derivatives by underlying risk (USD billions)
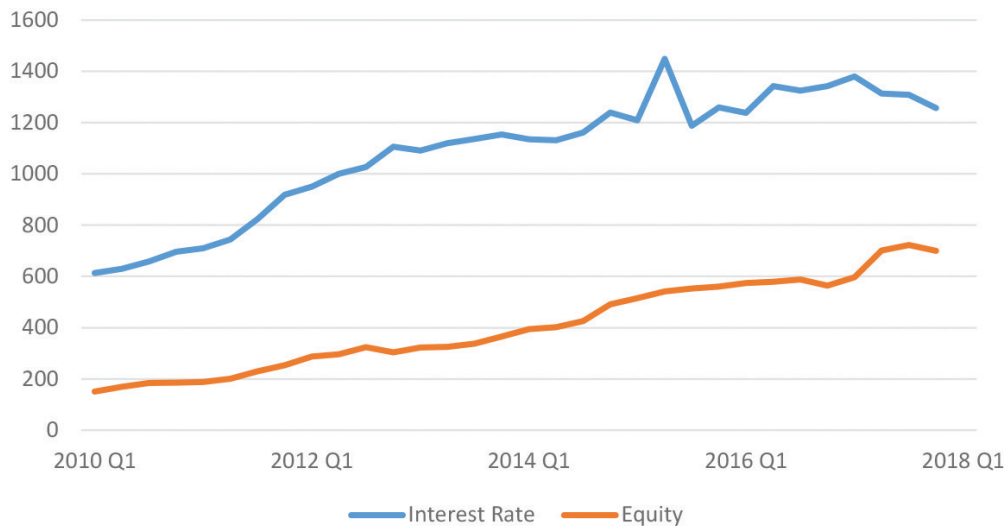
Source: US Federal Reserve Bank of Chicago

Figure 3.1g shows that short calls have increased more than long calls. Figure 3.1h indicates that in the same time frame when the equity calls showed a marked increase of 364%, the amount of interest rate hedges increased from USD 613 billion to about USD 1.3 trillion, equivalent to a 112% increase. This is roughly consistent with the increase in the share of all life insurance industry reserves that come from annuities, which rose from 56% to 74% over the period, while standard products decreased.

3.1.3 Conclusion

US insurers intensively use derivatives to hedge the risk associated with their life insurance products.[39] The use of these derivatives is strongly linked to the type of products being commercialised. In the past, when more traditional policies were the core of the business, the main risk was associated with interest rate fluctuations. Insurers bought mostly interest rate derivatives. In recent years, the core of the business has been shifting to products with stock market risk. Derivatives with stock as the underlying asset have been gaining weight in insurers' derivatives holdings.

Notably, for several other jurisdictions derivatives are useful financial instruments to hedge foreign exchange risk. Given this particular type of risk, and in the absence of efficient hedging options, investors may prefer to limit their foreign exchange risk exposure considerably. This concept is further discussed in section 3.2.

3.2 HOME BIAS OF INVESTMENTS AND CONCENTRATIONS

3.2.1 Introduction

When insurers' investment portfolios are concentrated in the home country more than their liability portfolio, this is typically referred to as "home bias". These common geographical investment concentrations imply common vulnerabilities and could trigger similar investment behaviour.

This special topic details the share of insurers' investments held in their home jurisdiction to give an idea of the extent to which insurers are affected by changes in the capital markets of their home jurisdiction. In addition, for the European market, this special topic compares the amount of insurers' investments in the home jurisdiction to the amount of insurance reserves in that jurisdiction, indicating the degree of home bias. Lastly, the section shows how much of the outstanding amount of government bonds is held by insurers in the US and across Europe.

3.2.2 Geographic Investment Concentrations of EU, US and Japanese Insurers

Europe

Figure 3.2a illustrates the geographical distribution of European insurers' investment portfolios across the 10 biggest European countries. The chart's top-left to bottom-right diagonal shows the percentage of investments located in the home country. This is clearly the most material geographical exposure for the average European insurer. The investment portfolio does not contain the investments held for index-linked and unit-linked business, and no look-through has been applied to investments held in collective investment undertakings. Of these 10 European countries, Denmark has the highest concentration of domestic investment from its insurers, with 71% of insurers' investments in the home country.

Figure 3.2a: European insurers' investment portfolios (excl. unit-linked) split by country (year-end 2017)

EU insurer jurisdiction	Investment jurisdiction % inv. (*)	EU										Non-EU
		FR	DE	GB	IT	NL	BE	ES	DK	SE	AT	
FR	28%	62%	2%	4%	4%	4%	2%	3%	3%	1%	1%	11%
DE	54%	5%	60%	2%	3%	5%	1%	1%	1%	1%	2%	13%
GB	68%	2%	2%	51%	0%	2%	0%	1%	1%	1%	0%	32%
IT	77%	7%	4%	4%	61%	5%	1%	4%	4%	0%	0%	7%
NL	82%	7%	11%	3%	1%	40%	3%	2%	2%	1%	3%	22%
BE	85%	16%	4%	2%	4%	5%	40%	3%	3%	1%	2%	15%
ES	89%	3%	2%	2%	5%	3%	0%	68%	68%	0%	0%	10%
DK	92%	1%	5%	2%	1%	0%	0%	1%	1%	2%	0%	13%
SE	94%	1%	2%	2%	0%	1%	0%	0%	0%	66%	0%	19%
AT	96%	5%	6%	2%	2%	3%	2%	1%	1%	0%	53%	11%

Per currency: Euro zone, UK, DK, SE, US, JP

(*) ordered by cumulative share of insurers' investments in Europe

Source: EIOPA statistics on asset exposures: https://eiopa.europa.eu/publications/statistics

This strong home bias could be the result of companies trying to limit currency risk by matching the currency of the insurance liability with investments in assets in the same currency. In the UK, only 51% of insurers' investments are situated in the home country.

Figure 3.2b shows that in the euro zone, 57.5% of insurers' investments are held in their home country. If we consider the euro zone as one jurisdiction, this percentage increases from 57.5% to 82.9%. In the UK, 51.4% of investments are in the home country, compared to 70.6% for Denmark, 65.7% for Sweden and 54.2% for Norway.

Looking at the distribution per asset class, the majority of the euro zone home country

investments are in sovereign bonds (28.4%), followed by corporate bonds (18.8%) and collective investment undertakings (18%). For the latter, no look-through has been performed, which implies that the entire fund is classified in the fund manager's country.

Considering the materiality of home jurisdiction investments, fluctuations in the home country capital markets could materially affect the balance sheets of insurers, especially when those balance sheets are market-value-based. For European insurers, the adverse impact of the assets' decreasing market value on the own funds would, however, be partly mitigated by the long-term guarantee measures, such as volatility and matching adjustments, and the loss-absorbing capacities of taxes and technical provisions.

Figure 3.2b: European insurers' home jurisdiction investments relative to total investments, split by asset class
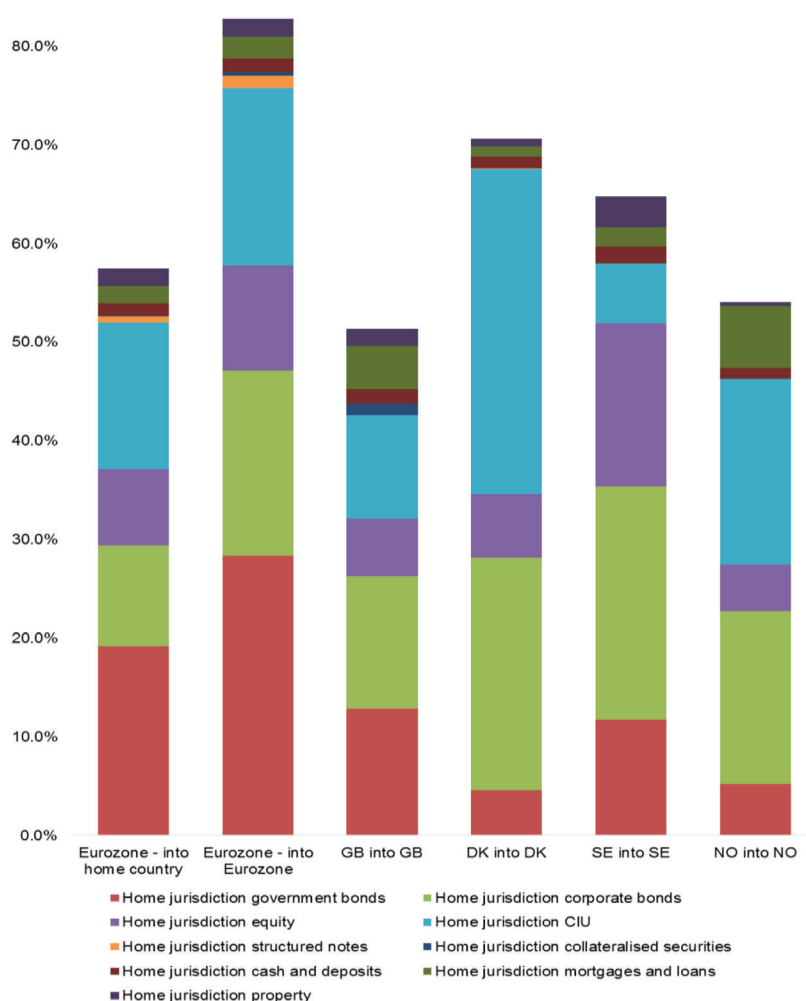
Source: EIOPA statistics on asset exposures: https://eiopa.europa.eu/publications/statistics

Figure 3.2c: Insurers' home jurisdiction bonds and equity investments (year-end 2017)
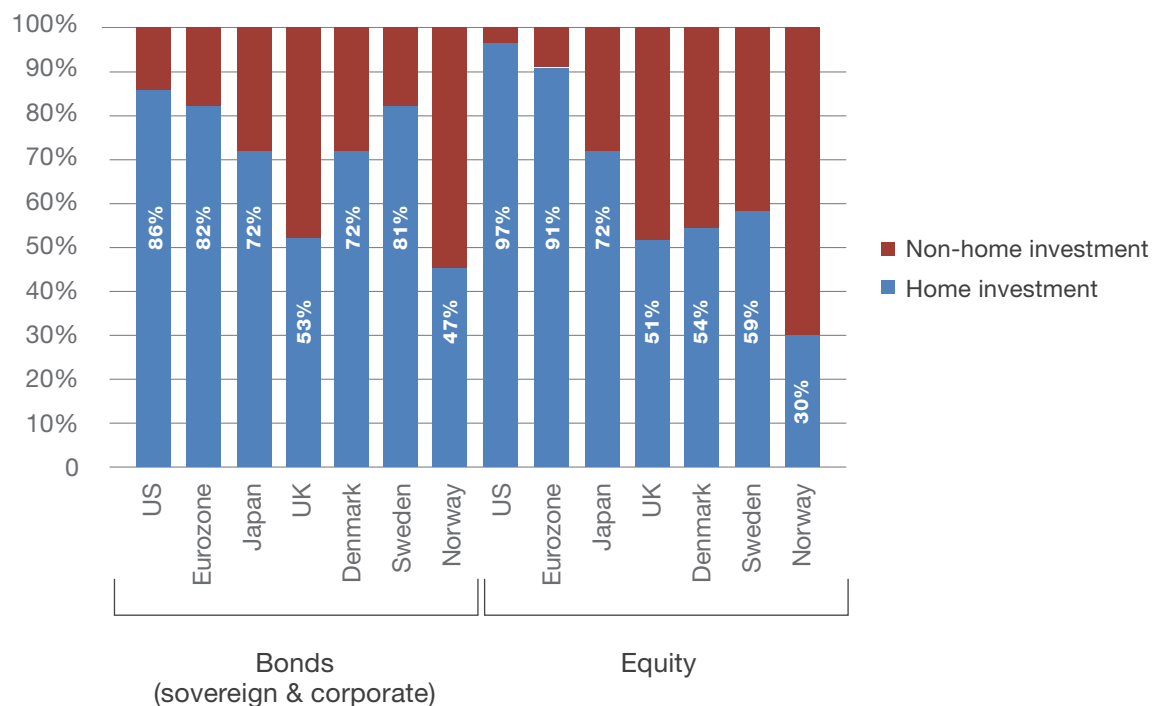
Source: EIOPA statistics, US NAIC, Japanese Financial Supervisory Authority

Figure 3.2c illustrates what percentage of US, euro zone, Japanese, UK, Danish, Swedish and Norwegian insurers' bonds and equity holdings are invested in their home jurisdictions. For the US, 86% of bonds held by insurers are invested in the home jurisdiction, compared with 82% in the euro zone and 72% in Japan. Both US and euro zone insurers have almost all of their equity holdings in their home jurisdiction, whereas Japanese and UK insurers invest more in foreign equity.

3.2.3 Geographic Investment Concentrations Compared to Insurance Reserves in Europe

Figure 3.2d compares the relative amount of insurance reserves[40] held in the home country with the relative amount of the investments in the home country. The blue line illustrates the 45-degree line. At the level of national markets, European insurers, except for Luxembourg, have more reserves than investments in their home country. Luxembourg is below the 45-degree line. The country's insurers have 21.4% of their investments located in Luxembourg, compared to 18.7% of their best estimate insurance liabilities.

For many of these countries, insurers have almost all of their reserves located in their home country. No clear trend can be derived from which countries' insurers have a strong home bias. This confirms the expectation that the choice of investment location depends on multiple factors, including the size of the capital market, the currency of the insurance liabilities, tax and other regulatory treatment of investments, knowledge of the capital market, transaction costs, the group's structure and risk appetite.

3.2.4 The Share of Sovereign Debt Securities Held by Insurers

Insurers have material holdings of home jurisdiction sovereign debt securities.

Source: EIOPA

Federal reserve and government accounts, $8,132

Other investors, $1,770

Foreign and international, $6,285

40%

8%

31%

Depository institutions, $634

U.S. savings, $160

Private pension funds, $387

State and local government pension funds, $228

Insurance companies, $371

3%

1%

2%

1%

2%

9%

3%

Mutual funds, $1,803

State and local governments, $723

Source: https://www.fiscal.treasury.gov/fsreports/rpt/treasBulletin/current.htm

Figure 3.2f: Ownership of EU sovereign debt (Q2 2017)

Legend:
- domestic MFIs
- PSPP
- domestic investment funds
- domestic insurance corporations and pension funds
- other domestic sectors
- rest of the world
- unspecified loans
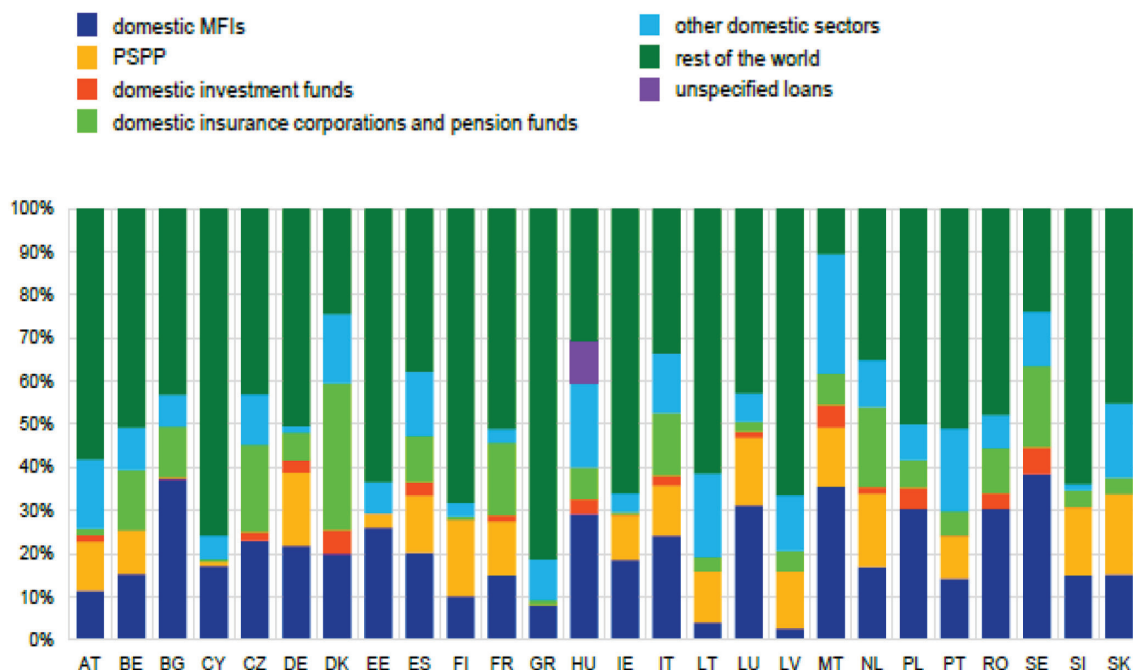
Source: European Systemic Risk Board (ESRB) 2017 Annual Report, page 21[41]

United States

US insurers hold only USD 371 billion (about 2%) of the total outstanding US federal securities of USD 20.4 trillion (Figure 3.2e). Most of the privately held outstanding US federal debt is held by foreign and international investors, notably China and Japan.

Europe

In Europe, the investor base of sovereign debt by issuing country differs across the member states. Overall, the vast majority of sovereign debt is held by non-domestic investors, as shown in Figure 3.2f. On average, domestic insurers and pension funds hold 9% of the outstanding sovereign debt. This can be considered as the lower bound because indirect exposures (for example, through investment funds) are not captured.

3.2.5 Conclusion

For many of the largest jurisdictions, insurers are strongly invested in their home country. This can, however, be put into perspective when comparing the amount of insurance business that insurers perform in the home jurisdiction and the goal of limiting currency mismatches between assets and liabilities. Other drivers of investment in the home country could be strong knowledge of the local market, higher transaction costs in foreign markets, the size of the local capital market, specific beneficial regulatory and tax treatment of home jurisdiction investments, and links to the local governments. As a benefit, domestic investment behaviour lowers currency risk, allows insurers to invest in many different local sectors and activities, and decreases direct contagion risks between countries in case of an isolated crisis in one country. A drawback is that insurers' investments are more concentrated and are less diversified geographically, implying less risk sharing across countries and financial markets and more common vulnerabilities to asset shocks in one market.

Looking at the small share of domestic debt securities held by insurers in the US and Europe, the impact on the sovereign debt securities market is arguably limited.

Nevertheless, to quantify the impact of a fire sale of a security on the financial stability of a capital market, a more granular analysis of individual securities would be required, taking into account the trading volume and liquidity characteristics of the security market.

An interesting area for further research would be to compare the level of home bias evidenced in the insurance industry with other financial market sectors. The analysis could help confirm the suggested rationale behind the investment decisions of insurers and assess any correlation and potential combined impact of the home country exposure.

Considering the materiality of the home country exposure in insurers' investment portfolios, financial market shocks in the home capital markets could significantly affect insurers' solvency positions. The extent to which changes in the market value of assets are reflected in insurers' solvency positions depends on the prudential regulatory framework and the embedded mechanisms to partially or fully mitigate these changes.

3.3 LIQUIDITY OF INSURANCE ASSET PORTFOLIOS

While the term "liquidity" may have different meanings, the most relevant to insurer investment portfolios is market liquidity, which is the ease with which market participants can transact, or the ability of markets to absorb large purchases or sales without much effect on prices. The more liquid an investment, the more readily it can be sold in the marketplace; that is, the more easily it can be converted into cash with minimal impact on the investment's market value. An illiquid asset, on the other hand, is not easily saleable due to uncertainty about its value or the lack of seasoning (length of time) in the market in which it is regularly traded. Illiquidity could also result from the asset's nature; in an opaque market with less pricing transparency, trading an asset becomes complex.

A liquidity crisis results when investors lose confidence in the value of certain securities, particularly those that do not trade in an active market, such as the events that occurred in the residential mortgage-backed securities market after 2007.

In contrast, liquidity risk for insurers is the inability to meet contractual obligations as they become due because of an inability to liquidate

assets or obtain adequate funding without incurring unacceptable losses. Insurers rely on the assets backing their reserves to satisfy claims from policyholders. As such, asset-liability matching is a critical aspect of their investment management processes. Investment portfolios should follow guidelines that include asset-liability matching rules to ensure that funds are available when claims need to be paid, by matching maturity or duration. Investing in liquid assets also ensures that funds will be available when needed, although it is not necessary for the entire portfolio to be liquid. Note that along with illiquidity comes increased risk, which, in turn, is typically associated with a higher return on investment. Periodically, insurers need to sell assets. Under stressed market conditions, the need to sell can increase significantly, resulting in the onset of illiquidity. An insurer's ability to liquidate, or sell, invested assets depends on various factors, including the nature of the assets and the breadth of the market for those assets, specific characteristics of the assets and the current market environment. An asset's liquidity can also vary significantly from one market environment to another.

3.3.1 Factors Affecting an Asset's Liquidity

An asset's liquidity may be impacted by the size, depth and breadth of a particular market. In general, the larger the market and the more depth it has, the more liquid an asset in that market will be. This means that large transactions can occur within that market without significantly affecting the trading price. The size of the issue and the size of an investor's holding will also affect liquidity – generally, the larger the size of the issue, the more liquid it is and, therefore, easier to sell. But, holding a large portion of an issue in proportion to the total issue size actually decreases an asset's liquidity, because it is usually more difficult to sell a larger stake than a smaller one.

Lastly, assets that are at risk of credit losses (that is, more likely to experience a default and incur losses) tend to be somewhat illiquid as they are less likely to be traded at an efficient price or quickly. As such, assigned credit ratings may be helpful. Regularly obtaining market value pricing helps assess liquidity because the pricing represents an appraisal of the asset's current market value. In some markets, such as the US, registration status (that is, whether or not the asset is registered with the national exchange commission) also affects an asset's liquidity. In most cases, registered securities can be traded

Figure 3.3a: US insurance industry's total cash and invested assets, by asset type, 2010–2017 (USD millions BACV)

Legend (top to bottom):
- Mortgages, Not First Lien
- Other Receivables
- Securities Lending (Reinvested Collateral)
- Preferred Stock
- Real Estate
- Derivatives
- Contract Loans
- Cash & Short-Term Investments
- Other Invested Assets (Schedule BA)
- Mortgages, First Lien
- Common Stock
- Bonds
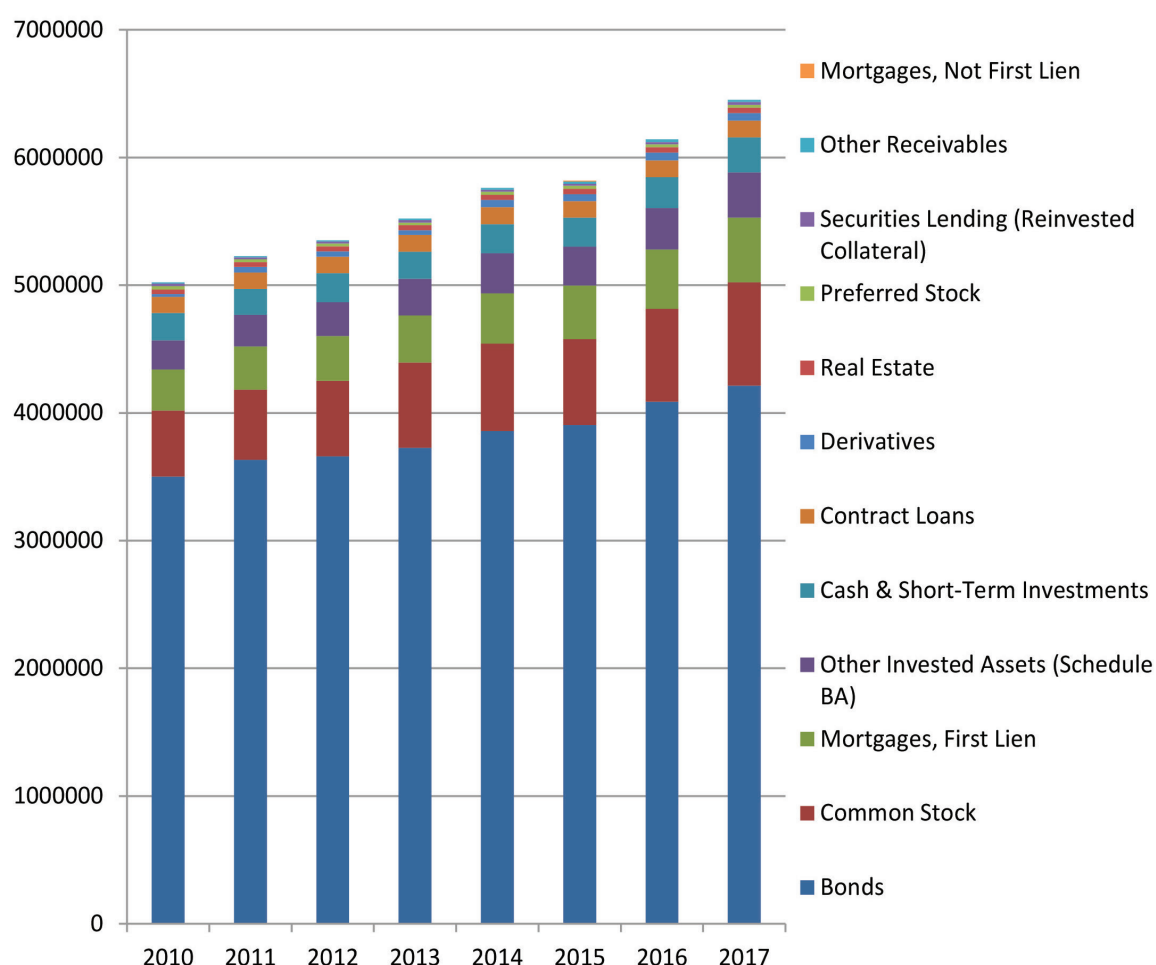
among the general public and are more liquid than those that are not registered, as the latter are subject to strict rules on how frequently the asset can trade and to whom it can be marketed.

Focusing on the US, the remainder of this analysis further considers the liquidity of asset portfolios and highlights recent trends.

3.3.2 Liquidity of Predominant US Insurer Investments

Given the size of the US insurance industry's overall investment portfolio, material changes in the mix of cash and invested assets from one year to the next are unlikely.

Notwithstanding, over the past several years, US insurers have expanded their investment strategies to include more complex, less liquid

investments due in part to the continued low interest rate environment. For the most part, however, the composition of the US insurance industry's asset portfolio has not changed significantly over time (see Figure 3.3a). The majority is invested in bonds (67% of total cash and invested assets as of year-end 2017),[42] particularly investment-grade corporate bonds. As such, the liquidity of US insurers' investment portfolios has not been an issue due in part to the size, depth and breadth of the corporate bond market. The liquidity of corporate bonds can vary over time depending on macroeconomic trends, and it is interrelated with the health of the sector in which the bonds were issued. In addition, changes in the financial markets since the financial crisis have reshaped trading, such as increasing capital requirements and placing limits on proprietary trading.

Common stocks comprised almost 12% of the US insurance industry's total cash and invested assets at the end of 2017. For the most part, these are highly liquid, particularly the stocks of larger companies that trade daily, as they are publicly traded on various stock exchanges. Note that a common stock's liquidity also depends on the size of the exchange in which the stock is traded: the larger the exchange, the more liquid the stock (because of more available trading opportunities).

In addition to corporate bonds and common stock, US insurers invested about 5% of total cash and invested assets in US government securities. Other than cash, US government securities are considered the most liquid investments as there will always be a market in which to trade them because they are backed by the US government.

3.3.3 Continued Increase in Mortgages and Schedule BA Investments for US Insurers

Smaller exposure to less liquid assets (that is, those that are more difficult to sell at desired prices and on relatively short notice) includes mortgages. Mortgages are not actively traded, so the market is illiquid by default, mostly because there is little standardisation with these types of transactions. In recent years, partly due to the reach for yield in a continued low interest rate environment, US insurers' exposure to mortgages has been rising, particularly for life insurers (see Figure 3.3c). As of year-end 2017, US insurers' investment in mortgages was 8% of total cash and invested assets (USD 464 billion in book/ adjusted carrying value, or BACV). Mortgages are commonly viewed as a long-term investment that matches the longer liabilities of life insurers.

Figure 3.3b: European Economic Area investments of insurers under Solvency II (Q4 2017–Q2 2018) (EUR millions)
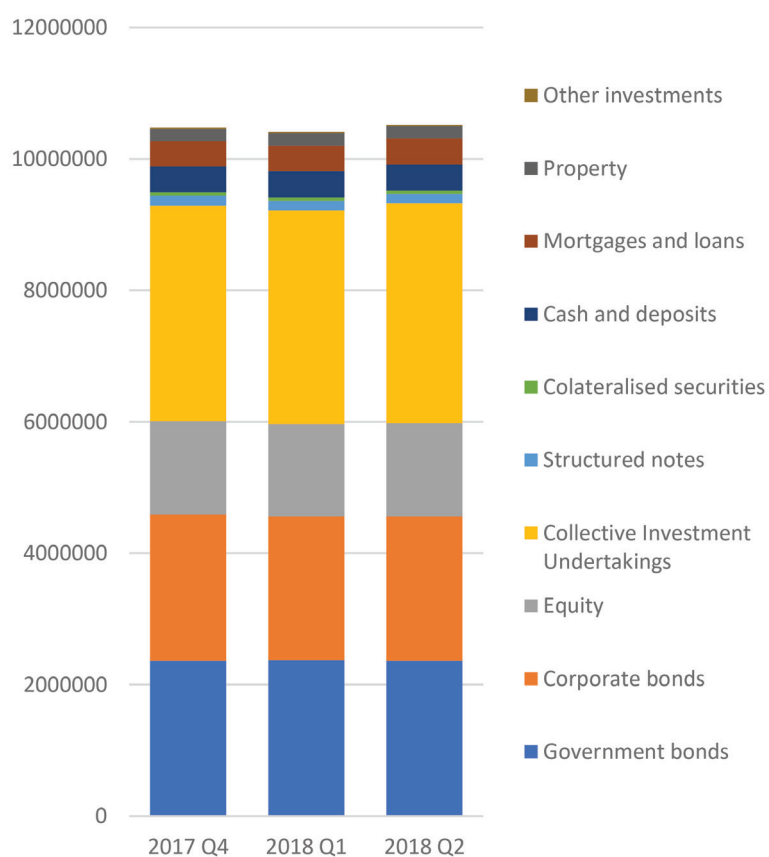
Source: EIOPA Insurance Statistics

Figure 3.3c: US insurers' exposure to mortgages (BACV USD millions)

Legend:
- Title
- Fraternal
- Health
- P/C
- Life
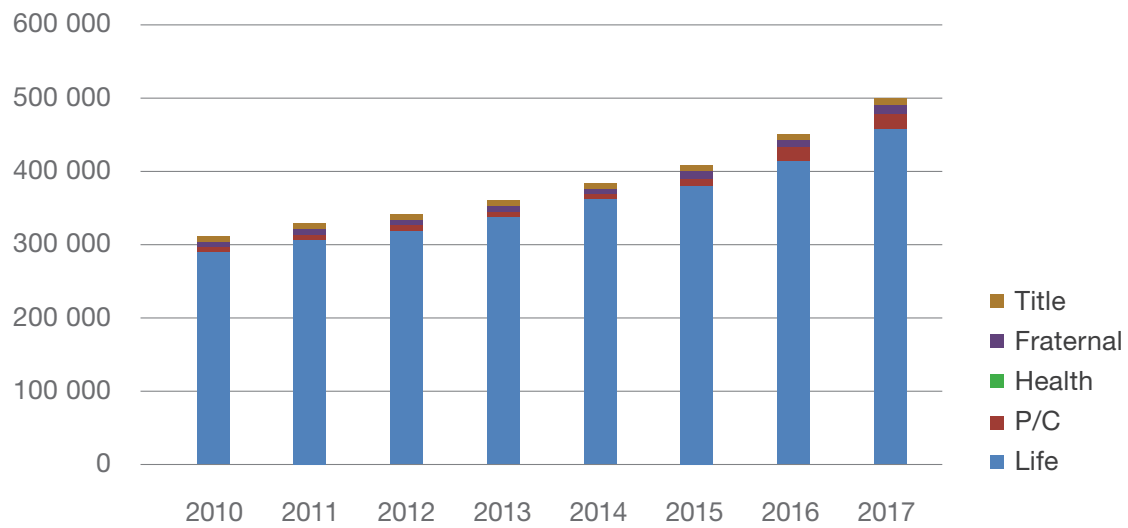
Figure 3.3d: US insurers' other long-term invested assets – major components (BACV USD billions)

Legend: Affiliated — Private Equity — Hedge Funds — Real Estate — Other
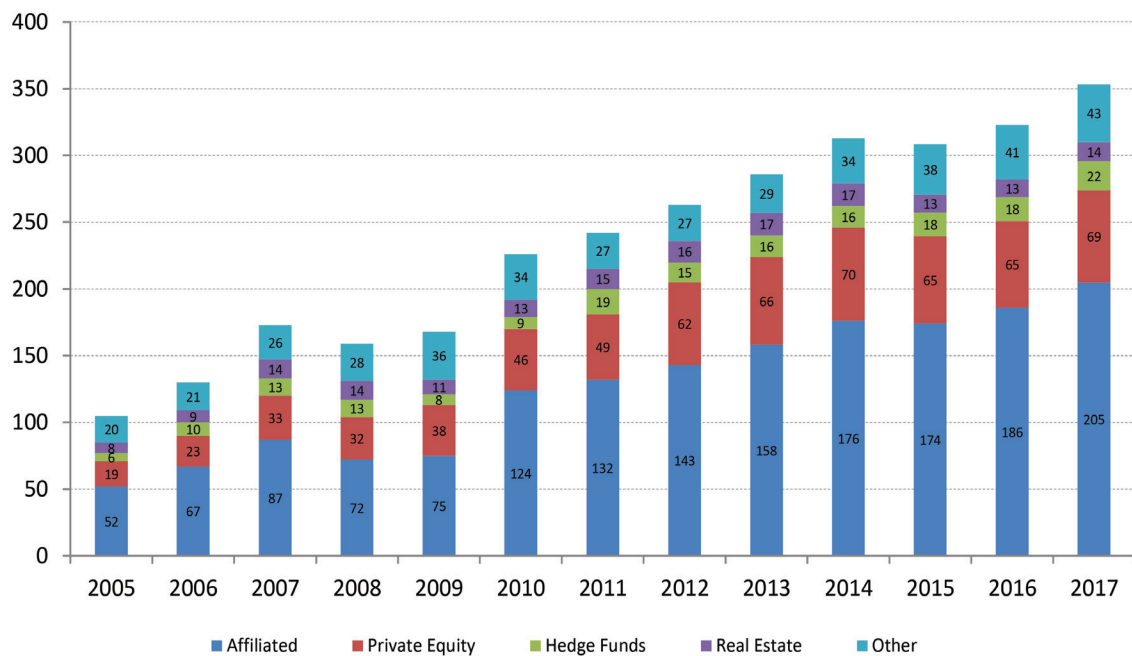
Source: European Systemic Risk Board (ESRB) 2017 Annual Report, page 21[41]

Investments in "other long-term invested assets" – which US insurers report as Schedule BA, another relatively illiquid investment – accounted for about 5.6% of total cash and invested assets (or about USD 350 billion in BACV) at year-end 2017;[43] 58% were affiliate investments (see Figure 3.3d). While unaffiliated private equity, hedge fund and real estate investments (which totalled about USD 105 billion in BACV at year-end 2017 – a 9.9% increase from the previous year) comprised a significant portion of this exposure, they represent 1.7% of US insurers' total cash and invested assets. The year-over-year increase was partly due to large insurers (those managing total assets of more than USD 10 billion) increasing exposure to unaffiliated hedge funds, and 15 small insurers (those managing total assets of less than USD 250 million) reportedly investing in hedge funds for the first time in 2017. Schedule BA assets are generally illiquid due to the high associated market risk and potential volatility. Note, however, that they are generally more liquid if they are exchange traded rather than traded over-the-counter (that is, outside an exchange). In exchange for the illiquidity, US insurers, as investors in these asset types, typically reap a higher rate of return.

Structured finance securities, including residential mortgage-backed securities, commercial mortgage-backed securities, asset-backed securities (which include bonds collateralised by credit card receivables, auto loans and student loans), collateralised debt obligations and collateralised loan obligations (CLOs) (that is, structured finance securities collateralised by bonds or bank loans), make up a small proportion of US insurers' investments. As of year-end 2017, exposure to structured finance securities totalled about USD 319 billion in BACV, or about 5% of total cash and invested assets. They represent a relatively small yet volatile exposure and are, therefore, subject to liquidity issues. Structured finance securities are generally not very liquid because of their complexity and smaller buyer base. In addition, the pricing history of these bond types does not extend as far back as the pricing history of corporate bonds, for example.

Since the financial crisis, investors have derived comfort from asset-backed securities and CLO investments as they did not experience significant losses as was the case with residential mortgage-backed securities. In recent years, US insurers have been increasing their exposure to CLOs, which was reportedly about USD 51 billion in BACV as of year-end 2017 (less than 1% of total cash and invested assets).[44] CLOs – predominantly collateralised by broadly syndicated bank loans, but in some cases middle-market loans – offer an attractive yield alternative to other, more traditional asset types, such as fixed-rate bonds, especially as interest rates are projected to rise, as CLO debt is a floating rate.

Municipal bonds comprise a relatively large portion of US insurers' bond exposure and were USD 555 billion in BACV at year-end 2017, or 9% of total cash and invested assets. Given that municipal bonds are tax exempt, property and casualty insurers typically hold the majority of this exposure. Like structured finance, trading of municipal bonds declined during the financial crisis. The liquidity of municipal bonds is affected by the economic and financial health of the states in which they were issued or the municipalities within the states.

3.3.4 Liquidity Risk for Insurers

To assess an insurer's liquidity risk, it is necessary to take into account the liquidity characteristics of both the assets and liabilities on the balance sheet. As previously stated, liquidity for assets can be defined as the ease with which market participants can transact, or the ability of markets to absorb large purchases or sales without much effect on prices. For insurance liabilities, on the other hand, there is no deep and liquid market. Liquidity for insurance liabilities can be defined as the degree to which its future cash flows are stable and predictable. The stability and predictability of cash flows is subject to risks and uncertainty, such as a policyholder lapsing or surrendering the insurance contract. As an example, the following box illustrates how the National Bank of Belgium monitors liquidity risk, taking the full balance sheet into perspective.

TO ASSESS AN INSURER'S LIQUIDITY RISK, IT IS NECESSARY TO TAKE INTO ACCOUNT THE LIQUIDITY CHARACTERISTICS OF BOTH THE ASSETS AND LIABILITIES ON THE BALANCE SHEET.

■ THE NATIONAL BANK OF BELGIUM'S APPROACH TO MONITORING LIQUIDITY RISK

In Belgium, a key indicator to measure the liquidity risk that insurers face is the amount of liquid assets relative to the amount of liquid liabilities, referred to as the liquid assets-liquid liabilities ratio. Other indicators used to monitor liquidity risk are the amount of surrenders and other payments (cash outflows) to premium volumes (cash inflow) and the proportion of investments with a potential liquidity risk (such as repos and securities lending) to the overall investments.

The liquid assets-liquid liabilities ratio is calculated in three steps.

First, what constitutes a liquid asset is defined. To do this, the assets are divided into different asset classes on the basis of their liquidity characteristics and credit quality. For instance, cash is considered to be fully liquid. For other asset classes, haircuts are applied to reflect that they are not fully liquid. These haircuts are based on similar principles applied in the Basel III Liquidity Coverage Ratio framework.

Second, the liquidity of liabilities is assessed by considering the degree to which these liabilities are subject to lapse risk. Drivers of lapse and surrender risk are the liabilities' surrender value, the size of potential surrender penalties and the existence of tax incentives related to the insurance contract.

Third, the market value of the liquid assets is divided by the surrender value of liquid liabilities to calculate the liquid assets-liquid liabilities ratio.

Figure 3.3e illustrates the distribution of the liquid assets-liquid liabilities ratio of Belgian insurers in the third quarter of 2018. Once the liquid assets-liquid liabilities ratio has been calculated, each insurer is given a high, medium or low risk score.

To date, Belgium's liquidity risk monitoring has not led to direct macroprudential measures. However, the findings that emerged from these analyses (in particular, the significant reduction in premium volumes and the growing number of surrenders related to individual life insurance contracts) gave rise to a strategic review and recommendations on the future of the individual life insurance sector in Belgium. For a small number of insurers, the results of the analyses led the National Bank of Belgium to adopt follow-up measures or to carry out on-site inspections focusing on how they manage liquidity.

Figure 3.3e: Distribution of the liquid assets-liquid liabilities ratio of Belgian insurers (Q3 2018)
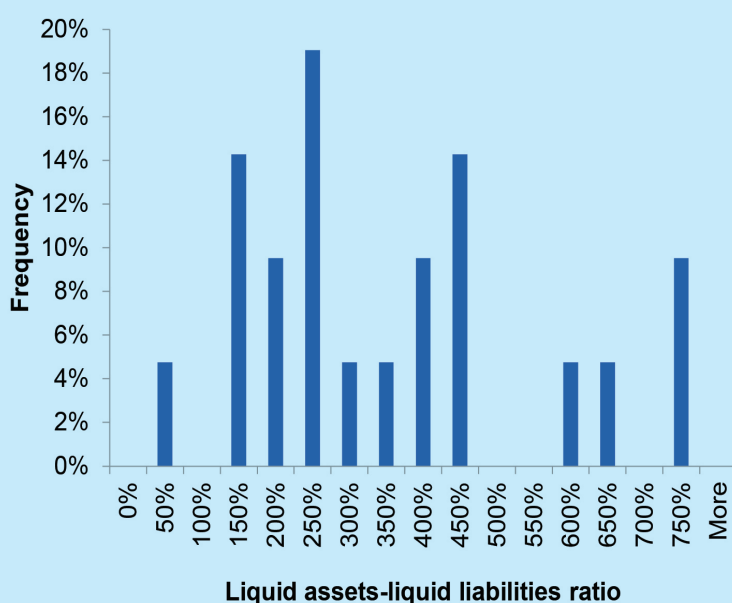
3.3.5 Conclusion

Insurers have specific measures in place to determine portfolio liquidity (as do credit rating agencies when assessing the financial strength of insurers). It is concerning if larger individual insurers, or even the insurance industry as a whole, cannot sell assets at a reasonable price. Liquidity is a prime measure of solvency, with liquidity risk most visible when an insurer's financial position is under stress.

Insurance supervisors should consider scenarios where an increase in cash and other liquid assets is needed to satisfy policyholder claims and how that could be satisfied by selling assets. Liquidity supervisory monitoring is key, as is a proper supervisory toolbox that can help address liquidity risks in a timely fashion.

3.4 MACROPRUDENTIAL SUPERVISION OF THE INSURANCE SECTOR IN VARIOUS JURISDICTIONS

The financial crisis has shown that systemic risk and the contagion channels within the whole financial system need to be properly considered. Macroprudential supervision is an approach to supervising financial institutions that tries to identify risks to the system as a whole rather than individual institutions.

Practices of individual institutions may seem rational and be able to shield an institution from shocks, but the aggregate behaviour can still produce sub-optimal results. Excessive leverage, common exposures, and cross-holdings on a broad scale were identified as the main sources of financial instability during the global financial crisis. This highlights the importance of macroprudential supervision as the global financial crisis demonstrated the inadequacy of solely relying on microprudential supervision of financial institutions.

Traditional approaches to supervision could not adequately stem the worst crisis of the global economy since the Great Depression. In particular, policymakers observed that macroeconomic stability in the form of price stability or internal/external balance stability[45] did not preclude instability in other parts of the economy, particularly the financial sector.

In reality, the market was not the great aggregator of risks that it was made out to be, since risks tended to be concentrated in comparably few institutions. For example, AIG had a substantial exposure to risk transfer through selling credit default swaps. These observations prompted

policymakers to complement microprudential supervision, which focuses on individual institutions, with macroprudential supervision, which focuses on the sector as a whole.

Initially, macroprudential surveillance focused primarily on banks. Basel II was deemed inadequate and was replaced by Basel III to strengthen bank capital and solvency. Moreover, a new toolbox was developed to curb banks' harmful practices at the macro level. Tools such as dynamic provisioning, loan to value ratios, countercyclical buffers, and liquidity coverage ratios are essential elements in banking macroprudential supervision.

Unlike banking, macroprudential supervision in insurance receives little coverage and publicity. However, the 2008 crisis showed that big insurers can fail and amplify systemic risk. Furthermore, shocks may also spread as a result of collective risk exposures or responses to shocks. When establishing a macroprudential insurance supervision framework, the specificities of the insurance sector need to be taken into account, including the type of risks that insurers are exposed to, their capital structure and their role in the economy. This section showcases several national initiatives to develop and implement a macroprudential surveillance framework for insurance.

3.4.1 Methodology and Sample

In order to illustrate possible ways to implement macroprudential frameworks dedicated to the insurance sector, a questionnaire[46] was distributed to seven jurisdictions to gather information on their current practices. The jurisdictions were Bermuda, France, Germany, Korea, Singapore, the UK and the US.[47] They were chosen to ensure that the major global insurance markets were represented and because they already have in place a macroprudential surveillance framework.

The questionnaire used the current draft of Insurance Core Principle (ICP) 24 as a basis. Twenty-six questions, split into seven sections, were asked. Each supervisor was asked to provide brief answers and the results were aggregated in order to make comparisons across jurisdictions. ICP 24 served as the reference point as it distils important issues on macroprudential surveillance. The questionnaire was not designed to assess whether the jurisdictions observe the ICP; rather, the goal was to take stock of different approaches to developing a macroprudential surveillance framework.

Section 1. Data	Macroeconomic		Microeconomic		Cross-sectoral	
Describe the types of data that your authority collects for its macroprudential framework of insurance supervision.						
Section 2. Market Analysis	Does the supervisory process include financial market analysis together with statutory filings? If yes, briefly explain the process.	Does the supervisory process require the analysis of common exposures, search for yield, exposure to derivatives or any other financial market analysis that impacts the insurance sector?	Does the supervisor develop or use market risk scenarios for stress testing that take into account macroeconomic vulnerabilities, microeconomic behaviour of individual insurers and cross-sectoral exposures?	Does the supervisor develop or use extreme but plausible scenarios in its supervisory process?	Does the supervisor rely only on statutory filings or does the supervisor perform forward-looking assessments of a quantitative and qualitative nature?	
Describe aspects of market analysis of your authority in the insurance sector and how it translates into scenarios.						
Section 3. Qualitative and Quantitative Analysis	Describe briefly the tools that you use for quantitative analysis.		Describe if you use qualitative analysis and expert judgement in the macroprudential supervisory framework. When is qualitative analysis used?		Does your authority perform horizontal analysis as described in ICP 24?	
Describe aspects of quantitative and qualitative analysis that you use in your macroprudential supervisory framework.						
Section 4. Publication of Aggregate Sectoral Data	Does your authority publish aggregate data of the insurance sector such as statistics about premium volume, profitability, solvency, etc.?		How regularly does your authority publish such data?		What kind of data is included in the report?	
Describe whether your authority publishes aggregate data of the insurance sector.						
Section 5. Financial Stability and Insurance Sector	Does your authority conduct liquidity stress tests?	Does your authority monitor short-term funding and other noninsurance forms of financing in their macroprudential framework?	Does your authority have clear processes of cooperation with the central bank, ministry of finance, department of statistics, banking supervisor, etc.?	Does your authority formulate parts or the entire financial stability framework in your country?	Does your authority work closely with foreign supervisory authorities as part of its macroprudential policy framework? If yes, how?	What are the tools of macro-prudential supervision that your au-thority uses vis-à-vis the insurance sector?
Describe how financial stability and systemic risk issues are addressed in the macroprudential surveillance framework.						
Section 6. Identification of Systemic Insurers	Does your authority designate D-SIIs?	What are the criteria for designating a D-SII?	Does your authority consider systemically important activities in its designation of D-SII?		If activities are used to designate an insurer as systemically important, name which activities have so far been relevant for the designation.	
Describe whether your authority has a process to identify systemically important insurers.						
Section 7. Supervisory Tools for Systemic Insurers	If an insurer is deemed systemically important, what macroprudential tools are used for reducing the systemic risk of the insurer?			If an insurer is deemed systemically important, does your authority coordinate with foreign supervisors to address spillovers from and to overseas?		
Describe the tools for effective macroprudential supervision of systemically important insurers.						

Content of the questionnaire

The same questionnaire was used for all jurisdictions to simplify comparisons and classify practices.

The questionnaire is divided into three main topics:

◗ Sections 1–4: The quantitative and qualitative analysis undertaken to assess the financial strength of the market as a whole.

◗ Section 5: The interaction between financial stability and macroprudential surveillance and the way macroprudential surveillance interacts with other policies.

◗ Sections 6–7: The identification of systemic insurers and the related supervisory tools that the supervisor can use in that context.

The surveyed jurisdictions

Bermuda has its own solvency framework, which is equivalent to Solvency II. The NAIC has given it the status of a qualified jurisdiction. The Bermuda Monetary Authority is responsible for macroprudential supervision and surveillance in the insurance sector.

Being part of the EU, France, Germany and the UK are under Solvency II. Each jurisdiction has its own supervisory authority: France has the Autorité de Contrôle Prudentiel et de Resolution (ACPR), Germany has the Bundesanstalt für Finanzdienstleistungsaufsicht (BaFin) and the UK has the Bank of England (BoE).

The convergence of the microprudential supervisory practices within European jurisdictions is ensured by EIOPA, which is also responsible for organising and coordinating stress test exercises together with the ESRB. The latter is responsible for overseeing macroprudential surveillance of the EU financial system and preventing and mitigating systemic risk. The ESRB therefore has a broad remit, covering banks, insurers, asset managers and other financial institutions and markets.

Korea has its own regime overseen by the Financial Services Commission and the Financial Supervisory Service, which is the integrated supervisor of banks, insurers and capital markets.

Singapore has its own regime based on the Insurance Act (1966, revised in 2002). The Monetary Authority of Singapore is the supervisor for the insurance sector.

In the US, the NAIC facilitates the US states' oversight of macroprudential surveillance by accumulating and analysing data that it receives from insurers. Passed into law in response to the financial crisis, the Dodd Frank Act created the Financial Stability Oversight Council (FSOC). The FSOC can designate non-bank financial institutions as systemic depending on the spillovers of their financial distress into the economy. Institutions designated as systemic are regulated by the Board of Governors. The board, in this regulatory role, is required to set capital requirements for and conduct stress tests of designated institutions. As of December 2018, no non-bank financial institutions were designated as systemic.

3.4.2 Assessing the Market's Financial Strength

Because the purpose of macroprudential supervision is to assess the insurance industry as a whole and its potential systemic impact, insurers have to be assessed on whether systemic risk factors affect the viability of the sector as a whole and whether the insurance sector can systemically affect financial markets or the real economy through its behaviour or activities.

Macroprudential surveillance is a data-driven exercise

Macroprudential supervision is a data-driven exercise, which builds on microprudential supervision, supported by macroeconomic data. Quantitative assessments need to be complemented by qualitative analyses.

Data needs can differ from one jurisdiction to another, depending on the features of the national economy. For example, insurers who operate in emerging markets and have exposures in different currencies should be concerned about sudden reversals of capital flows that could trigger currency depreciation. Balance of payments and exchange rate data are required to properly assess such risks. Insurers operating in these jurisdictions are exposed to economic risks beyond their control. For instance, capital flows could be reversed by decisions of foreign central banks or the liquidity of the local market could be insufficient due to institutional reasons. Thus, insurance supervisors should properly assess the systemic risks that are inherent to the economic circumstances that insurers operate in.

Another example of specific data needs could be identifying the interactions between the financial sector's different parts. If insurers are

exposed to common counterparties in a given market, the market's financial stability could be at risk if a particular counterparty fails. Other direct connections may arise through cross-holdings of securities between insurers as well as between insurers and banks, with insurers holding significant amounts of bank debt. Moreover, interconnections between insurers and reinsurers can be considered in a context of greater concentration of the reinsurance market. According to Powers and Shubik (2006),[48] for N primary insurers there are $\sqrt{N}$ optimal reinsurers in a competitive market structure. Thus, N insurers are exposed to fewer reinsurers, increasing the potential concentration risk. Reinsurers themselves can retrocede exposures and further increase the problem of concentration. With the advent of capital market risk transfer, risks are passed on to capital markets. But it is not always clear who ultimately buys these insurance risks from the capital markets. Without data on these cross-holdings of risks and connections, a false sense of security may be created by assuming that risks are spread throughout the capital market when they may actually be finding their way back to insurers.

QUALITATIVE ANALYSIS PLAYS A CRUCIAL ROLE IN UNDERSTANDING MARKET TRENDS AND BEHAVIOUR AS WELL AS IN DECIPHERING HOW INCENTIVES TRANSLATE INTO CORPORATE ACTION.

Quantitative analysis is not necessarily sufficient to give the full picture of either the sector or individual insurers. Institutional issues such as corporate governance and board fitness are also important to supervisors. In corporate finance, Jensen and Meckling (1976)[49] have shown how incentives can lead to empire building and inefficient expansion of corporate activity if there are large free cash flows. Given the current abundance of capital in the global reinsurance sector, these incentives have become more prevalent than before and can explain mergers and acquisitions activity, capital structure changes and corporate strategy. The incentives have important ramifications for the industrial organisation of the reinsurance market. From a macroprudential perspective, systemic incentives produced by corporate policy can have risk implications. Pronounced mergers and acquisitions activity could consolidate the sector such that it results in concentration risk. Qualitative analysis plays a crucial role in

understanding market trends and behaviour as well as in deciphering how incentives translate into corporate action.

Type of data collected for macroprudential purposes

Section 1 of the questionnaire covers the type of quantitative data collected and used by the authorities for macroprudential supervision purposes. Macroeconomic data include interest rates, exchange rates, changes in the output, balance of payments, capital flows, and gross domestic product. All jurisdictions in the survey have a comprehensive macroeconomic data collection process.

Macroeconomic data are usually collected from sources such as the central bank or Bloomberg. In the US, both the NAIC and the Federal Reserve contribute to macroprudential surveillance. The NAIC collects, accumulates and analyses an extensive amount of individual insurer data and pairs it with macro data, leveraging its dedicated capital markets bureau, to collectively develop an overall macroeconomic view. As the central banking institution, the Federal Reserve, on the other hand, compiles and uses primary macroeconomic data.

In addition to these data, all jurisdictions collect microeconomic data from statutory returns and use them in their macroprudential analysis, in particular premiums, losses, performance ratios, balance sheets, and asset and liability exposures. Supervisors conduct on-site examinations and external surveys to obtain a qualitative analysis.

Taking into account interconnections with other counterparties

Respondents take different approaches to collect cross-sectoral data. In Europe, Solvency II reporting allows for a comprehensive view of the common exposures of European insurers, which are required to give a detailed list of their assets and counterparties, including a look-through approach of the assets held in Undertakings for Collective Investments in Transferable Securities (UCITS) as well as a comprehensive view of the reinsurance counterparties.

Moreover, given the importance of the financial conglomerates in Europe, the European Central Bank is putting in place a dedicated reporting framework to supervise these entities; this reporting framework will replace those already in place at the national level. For example, in France data collected for microprudential supervision are used to analyse the interconnection between different sectors or the counterparty risk linked to reinsurance for the French insurers.[50] Analysing interconnections and linkages[51] between the different financial sectors in Europe is one of the ESRB's core tasks.

Singapore has a comprehensive process to collect cross-sectoral data, enabling the analysis of insurers' exposures to banks and other insurers. It also plans to use cross-sectoral data to perform network analysis of insurer exposures.

The Bermuda Monetary Authority uses cross-sectoral data for reinsurers and fronting companies that are involved in many deals in the alternative risk transfer market.[52]

Korea uses cross-sectoral data such as intra-financial exposures on assets when performing stress testing to measure potential sector-wide contagion effects. Korea plans to improve its stress testing model, which covers all financial sectors, to more comprehensively capture cross-sector spillovers.

The NAIC records reinsurance counterparties, covering both assumed and ceded business, along with corresponding premiums and reserves. In addition, it has a detailed record of insurers' investments and other entities' exposures to capital structure instruments.

Quantitative valuations are complemented by qualitative analysis. As qualitative assessment can require different types of knowledge and competencies, the ACPR has set up an internal Risks Committee to incentivise the exchange of information and foster discussions between teams in charge of microprudential supervision and those in charge of market analysis.

Quantitative and qualitative data feed market-wide analysis

In order to develop macroprudential surveillance, authorities need to assess the market developments as a whole. Section 2 of the questionnaire deals with market analysis.

Jurisdictions were asked whether they perform market analysis as a complement to traditional supervision and to briefly explain the process. All clearly stated that they perform market data analysis to complement traditional statutory filings. As reported by Bermuda, such analysis can involve observing stock prices, financial ratios such as price earnings and price to book value ratios, credit default swap spreads, and put to call ratios. Bermuda also runs a stochastic scenario generator for assets and liabilities to evaluate solvency. The generator is run for all companies and aggregate peer analysis results for the sector are published in an annual filings report.

Common exposures, search for yield and financial market dislocations are taken into account by all jurisdictions surveyed. Bermuda and the UK also rely on surveys and other reviews when microprudential data is insufficient to get a complete overview of the risks taken by the market. In particular, the Financial Policy Committee helps the BoE review such issues. The US also performs market analysis by tracking market developments locally and in other countries that could have a spillover impact. Any material changes are reported quarterly to the chief financial regulators at the NAIC national meeting.

Finally, all jurisdictions perform forward-looking assessments to varying degrees. Bermuda, Singapore, France, Korea and the UK use quantitative models and market assessments. Germany has a process called "Prognoserechnung" for all life and health insurers, including institutions for occupational retirement provision. In Europe, EIOPA produces a quarterly risk dashboard for the European insurance market. This tool, based on about 50 aggregated indicators, gives the trend and evolution of market perceptions and seven identified risks: macroeconomic risk, credit risk, market risk, liquidity and funding risk, profitability and solvency, interlinkages and imbalances, insurance underwriting risks and market perceptions. Some jurisdictions, such as Italy and France, have replicated these tools to benchmark their markets with the European average. Korea uses stress testing as a forward-looking tool. In the US, stress testing is used for forward-looking assessments. Many of the tests focus on asset risks (natural catastrophe stresses are carried out on specific geographic locations). The NAIC can develop more encompassing scenarios for specific companies deemed to need enhanced scenario testing.

Tools used in the framework of macroprudential supervision

Having assessed market developments as a whole, additional analyses may be required to identify vulnerable entities or common vulnerabilities in a given market. Section 3 of the questionnaire asked the supervisors to describe the quantitative tools that they use for macroprudential supervision, while section 2 requested further information on the use or development of market risk scenarios that take into account macroeconomic vulnerabilities.

Jurisdictions use various types of tools for quantitative analysis. Stress tests are commonly used tools that use statistical software and methods. Bermuda, Singapore and the UK explicitly responded that they use stress testing, while France and Germany responded by mentioning various statistical tools that they use. Singapore is developing a network analysis model for reinsurance in order to capture common exposures of the insurance sector.

Korea conducts trend analysis using time series econometrics in order to develop crisis scenarios. Based on this work, Korea performs multi-year stress testing exercises to assess insurers' financial health. The NAIC has developed a risk-based capital tool for individual states to use in scenario analyses.

Moreover, all jurisdictions that answered the questionnaire develop market risk scenarios. In Europe, every national supervisory authority participates in the Europe-wide stress test scenarios, using scenarios developed by EIOPA and the ESRB. Some jurisdictions may decide to develop national scenarios for dedicated exercises due to the specificities of their market. For example, for the insurance sector the BoE also uses a macroeconomic scenario that is applied to banks. The four non-European respondents, Bermuda, Korea, Singapore and the US, have developed their own models and scenarios.

Extreme but plausible scenarios are useful in the supervisory process because they test the resilience of capital. At the tails of the loss distribution, a few large deviations dominate many statistical measurements. When asked, all jurisdictions responded that they consider extreme events that are expected to have sectoral ramifications as part of their macroprudential supervisory process.

However, different definitions of extremity complicate the inter-jurisdictional comparison. The BoE considers a 25% fall in equity prices as a moderately extreme but not severe scenario. Singapore stress-tests catastrophe risk as well as cyber, pandemic and climate change scenarios. Bermuda uses Lloyd's realistic disaster scenarios for liabilities, while the stochastic scenario generator has switches for catastrophe asset risk. Korea simulates the 1997 Asian crisis as a key crisis scenario that affected its economy profoundly. On specific occasions, the US develops a more encompassing scenario, although it is within the discretion of individual state regulators to conduct specific what-if analyses.

Finally in section 3, supervisors were asked whether they compare or benchmark insurers with their peers. According to the survey, horizontal or peer analysis is an important component of macroprudential surveillance, with most surveyed jurisdictions performing such a peer analysis.

3.4.3 Financial Stability and Macroprudential Surveillance

Publishing data and analysis for a more efficient market

Supervisors were asked whether they publish aggregated data of the insurance sector using descriptive statistics such as premium volume, profitability, actuarial indicators and solvency indicators. They were also asked how often they publish such information and what type of data they publish.

All surveyed jurisdictions publish aggregate market data. European authorities report and publish their data via EIOPA. Bermuda, Korea, Singapore, the UK and the US gave detailed information on the type of reports that they produce. Most of the publications are annual or quarterly, with France publishing some of its data annually and semi-annually. The information contained in these reports is based on aggregate statistics in terms of balance sheet, premiums, losses, investments and so on.

> EXTREME BUT PLAUSIBLE SCENARIOS ARE USEFUL IN THE SUPERVISORY PROCESS BECAUSE THEY TEST THE RESILIENCE OF CAPITAL.

The US also includes industry snapshots and capital market developments. Bermuda publishes many catastrophe-related statistics because its market is concentrated in the catastrophe segment.

Addressing liquidity concerns

Section 5 of the questionnaire asked about financial stability issues in the insurance sector and how macroprudential supervision interacts with financial stability. Although the insurance sector generally showed resilience during the last financial crisis, there were activities of insurers that either bolstered or enabled excessive risk taking.

Liquidity is sometimes overlooked in the insurance sector because insurers do not perform maturity transformation by borrowing short term and lending long term as banks do. Microprudential regulation partly takes liquidity into account. For example, Solvency II imposes higher capital requirements for insurers whose portfolio is mostly composed of non- redeemable contracts and requires liquidity plans for insurers using particular measures such as volatility and matching adjustments.

Liquidity problems can stem from an insurer's funding structure or asset-liability mismatches. If the insurer is reliant on very short-term debt when debt markets are in crisis, it may not be able to roll over this debt. If the insurer is improperly managing its assets and liabilities, a large natural catastrophe, for example, may force the insurer to record heavy capital losses from liquidated investments if those investments have long durations at times of interest rate increases. Liquidity problems can also stem from hedging activities due to margin calls that have a detrimental temporary effect on liquidity.

The survey asked supervisors whether they conduct liquidity stress tests. The survey identifies short-term funding as a source of risk in the insurance sector. Although insurers are financed mostly by issuing insurance policies as a form of debt, they can also be funded by other capital instruments, excluding common equity. Gorton and Metrick (2012)[53] identified short-term funding as one of the culprits of the financial crisis. They focused on repo markets, which exchange longer-term assets for cash. During the financial crisis, repo markets dried up and many financial institutions collapsed due to a lack of short-term funding. A proliferation of short-term funding in the insurance sector may therefore cause disruptions. Supervisors are expected to have supervisory tools to manage such developments.

To assess liquidity risk, Bermuda and Singapore have in-house processes for liquidity stress tests, in addition to insurers' own risk and solvency assessments (ORSAs). Bermuda uses these assessments as a qualitative assessment tool.

By reviewing the ORSAs, supervisors can identify commonalities in the risks present in the market and compare firms' approaches to properly estimating that risk. In Bermuda the supervisory college has a crisis simulation exercise that tests whether insurance groups have sufficient liquidity. Korea considers liquidity risk when performing stress testing and also monitors short-term funding such as repos.

The US performs risk analyses on short-term funding exposures such as securities lending, repos and reverse repos. Although it does not formally conduct liquidity stress testing, the regulatory toolbox includes cash flow analysis requirements for life insurers, a reserve projection tool for property and casualty insurers, and asset/liability analysis tools for health insurers based on their total liabilities and the liquidity of their investment portfolio.

As in the US, surveyed European countries (Germany, France and the UK) do not regularly perform liquidity stress tests, either via EIOPA or on their own. That said, European supervisory authorities have available information on liquidity (especially through cash flows analysis and the structure of the insurers' asset portfolio) and the UK is in the process of establishing a report on the issue.

Overall, there are few jurisdictions that formally perform liquidity stress testing, although some jurisdictions consider short-term funding as part of their risk analysis.

Macroprudential governance and powers

Macroprudential supervision relates to the macroeconomy and is a superset of the

> IF THE INSURER IS RELIANT ON VERY SHORT-TERM DEBT WHEN DEBT MARKETS ARE IN CRISIS, IT MAY NOT BE ABLE TO ROLL OVER THIS DEBT.

microprudential supervision of individual institutions. Insurance supervisors are part of a wider nexus of supervisory authorities and financial policymakers within countries. Overall, macroprudential policy is a consistent set of policies and tools that pertain to the financial sector and the economy as a whole. Insurance supervisors are expected to cooperate closely with other supervisory authorities (domestic and foreign), the ministry of finance, the department of statistics and others.

The survey asked supervisors whether they have well-defined processes of cooperation with the central bank, other supervisory bodies and the government. It also asked supervisors how macroprudential supervision is organised in their jurisdiction. In this context, it asked whether the insurance supervisor formulates part of or the entire financial stability framework in its home country.

Large insurance groups that operate across borders pose significant challenges to supervisors because they have to take account of activities in places where they do not have the legal recourse to enforce legislative powers. Recognising the significance of cross-border insurance activity, the IAIS recently provided criteria to identify internationally active insurance groups that will fall under the remit of a supervisory framework called the Common Framework for the Supervision of Internationally Active Insurance Groups, or ComFrame for short. ComFrame provides a set of supervisory tools for these international entities. In this context, the survey asked supervisors to identify how they cooperate with foreign supervisors even if they are not group supervisors of internationally active insurance groups.

For example, countries hosting subsidiaries of large foreign insurers participate in supervisory colleges and regularly cooperate with other authorities. Or, if a country is an insurer's place of domicile, usually the supervisor of this country will act as group supervisor.

Finally, section 5 of the survey asked whether the supervisor has any macroprudential tools to address macroprudential risks. For example, if many insurers are investing heavily in risky assets, the supervisor could create disincentives to curb such investments. Disincentives could include higher capital charges for these particular assets or legally prescribed limits on how much of these assets can be held. Similar macroprudential tools can be applied to the types of insurance

contracts that can be sold or any other practice deemed to be systemically risky.

All jurisdictions have clear processes for interacting with other authorities on financial stability and the insurance sector's role in the financial system. Bermuda, Singapore and the UK have an integrated regulator for both banking and insurance that formulates the financial stability policy. In Germany, BaFin formulates part of the financial stability policy as it is independent from the central bank.

In France, the High Committee for Financial Stability is in charge of formulating the financial stability policy. At the end of 2016, the Sapin II Law extended and reinforced the powers of this committee, granting it strong powers[54] to intervene when the financial health of the insurance market or the financial system is threatened. In addition to these powers, the law makes provision for a complete resolution regime for French insurers and extends the ACPR's competence to resolve to the insurance sector.

In Korea, the Financial Services Commission and the Financial Supervisory Service is the integrated regulator of financial services and formulates part of the macroprudential policy with the central bank and the Ministry of Finance. In the US, the financial stability mandate is bestowed on the Federal Reserve. The state insurance regulators have a representative at the FSOC, which decides on financial stability issues. In addition, the NAIC has formed a financial stability task force to discuss macroprudential and financial stability matters.

Cooperation at the international level is common among all jurisdictions surveyed. Supervisory colleges and international organisations such as the IAIS or supranational authorities such as EIOPA are the avenues of cooperation. Countries that host internationally active insurance groups, such as those surveyed, have an extensive network of cooperation.

3.4.4 Identification and Supervision of Systemically Important Insurers

Systemically important insurers fall within the scope of macroprudential surveillance and supervision. If such an institution is identified, the supervisor deems that its failure could have systemic consequences either for the insurance sector as a whole or for the broader economy. Section 6 of the survey therefore asked supervisors whether they identify and designate systemically important insurers in their jurisdictions.

The survey also asked about the criteria used to recognise that systemic risk may arise from the distress or disorderly failure of individual insurers as well as from the collective exposures of insurers at a sector-wide level; whether activities that can have systemic implications are explicitly taken into account when the systemic designation is conferred; and what activities have been relevant for the designation of systemic importance.

Section 7 covers supervisory tools for systemically important insurers. Once the supervisor has identified a systemically important insurer, they need a supervisory framework for dealing with this institution. The survey asked supervisors specifically about the macroprudential tools used for systemically important insurers. These tools complement the ones implied by the final question in section 5, since non-systemically important insurers may be under the scope of macroprudential tools but not under the scope of tools made explicitly for systemically important insurers.

Lastly, the survey asked whether the supervisor has established communication channels with foreign supervisors if there are spillovers overseas in the event that an insurer fails. This is an important issue particularly for global systemically important insurers (G-SIIs). Domestic supervisors need to coordinate with foreign supervisors given the complexity of these institutions and the fungibility of capital to move cross-border.

As expected, the answers to the questions in section 7 relied on the fact that all jurisdictions, except for the US, do not designate systemically important insurers, preferring to rely on the G-SII identification by the Financial Stability Board, in conjunction with national supervisors, if they host G-SIIs. In the US, the FSOC has formal powers and a methodology to designate systemically important insurers.[55] Once an insurer falls under the systemic risk category, its supervision becomes a matter for the Federal Reserve (Board of Governors).

IF MANAGED WELL, DIGITALISATION HAS GREAT POTENTIAL FOR CONSUMERS, INSURERS AND REGULATORS. IT COULD REDUCE COSTS, INCREASE INCLUSION, AND ENHANCE RISK MANAGEMENT AND OPERATIONAL RESILIENCE, AMONG OTHER BENEFITS.

Although all other jurisdictions reported that they do not designate domestic systemically important insurers (D-SIIs), the UK and Singapore provided details on how they assign risk classes to their insurers by using factors and indicators to inform their decision. Moreover, Singapore plans to develop a methodology for identifying systemically important insurers. Until then the classification of high-impact insurers may not conform to any G-SII or D-SII criteria. Singapore provided extensive information on the macroprudential tools it uses for high-impact insurers. These tools include enhanced supervision and higher capital standards.

Most jurisdictions reported that they have criteria to place a particular insurer into a specific risk category, a process aligned with their current supervisory framework. BaFin will closely follow international discussions on the issue before it decides whether to develop a process for D-SIIs. Both the BoE and the ACPR may ask for recovery and resolution plans for non G-SIIs if they deem it necessary for specific insurers.

Lastly, all supervisors acknowledged that supervisory colleges are the forum to discuss issues of systemically important insurers, with some alluding to the IAIS' framework of G-SIIs.

3.4.5 Conclusion
The survey of practices of macroprudential supervision covered seven mature insurance jurisdictions representing North America, Europe and Asia. It was split into three topics: quantitative and qualitative analysis; interaction of macroprudential surveillance and financial stability; and identification and supervision of systemically important insurers. The results indicate significant overlap of practices among the participating jurisdictions. In quantitative and qualitative analysis, all jurisdictions collect macroeconomic and microeconomic data; however, they diverge on cross-sectoral data given the particular circumstances of each jurisdiction. Stress tests are used extensively as tools of macroprudential surveillance. Some jurisdictions develop the process in-house, such as Bermuda and Singapore, while others rely

partly on supranational authorities such as EIOPA to perform these tests. Many EU jurisdictions perform national stress tests in addition to the ones organised by EIOPA. Market analysis complements traditional statutory filings analysis and participating jurisdictions indicated that they publish aggregate statistics. Peer analysis and qualitative assessment based on market intelligence and interactions with insurers complement the supervisory process. Some jurisdictions conduct liquidity stress testing to varying degrees.

With respect to interactions of macroprudential surveillance and financial stability, there was more variation in the responses. Different practices are observed throughout the world. Parts of the financial stability framework can be formulated by authorities that are independent from the central bank, as in Germany or the US. Alternatively, the regulator could be integrated into the central bank. Respondents said that there are structures in place for cross-sectoral and cross-border cooperation. All jurisdictions mentioned supervisory colleges and work with supranational authorities and international organisations such as the IAIS as forums of enhanced cooperation.

On the identification of systemic insurers, all jurisdictions, excluding the US, mentioned that they do not have established processes for identifying systemically important insurers. Rather, many jurisdictions rely on the existing G-SII methodology to identify G-SIIs. One jurisdiction, Singapore, plans to establish a methodology for identifying D-SIIs, while other jurisdictions have put processes in place to categorise insurers into various risk categories that are subject to different supervisory intensity and prudential measures.

In the US, the FSOC and not the NAIC designates insurers as systemically important, while systemically important insurers fall under the supervisory remit of the Federal Reserve. However, the corresponding applicable legal entity insurers are still subject to state regulation in addition to the Federal Reserve's supervision. For G-SIIs, supervisors use supervisory colleges and international cooperation to manage the increased complexity of internationally active insurance groups.

This paper partially reflects the peer assessment of ICP 24, which was conducted by the IAIS in 2017. Standards 24.1–24.5 were fully or largely observed, while standards 24.6 and 24.7 were found to be largely observed or partly observed. Some jurisdictions were assessed for all standards except for 24.6 and 24.7. ICP 24 is under review in light of the IAIS holistic framework for systemic risk.[56]

In conclusion, supervisors use similar tools and processes for their macroprudential surveillance, although they tailor their approach to market circumstances.

3.5 DIGITALISATION OF THE GLOBAL INSURANCE SECTOR

Insurance is going digital. In 2018, global investment in insurance technology (InsurTech) is estimated to have reached USD 2.6 billion and continues to rise rapidly.[57] This trend makes sense for what is essentially a data industry, with drivers coming from both the supply and demand side. Supply of digital services has, for example, been boosted by recent advancements in data analytics, wearables and telematics, cloud-based services and the proliferation of mobile devices. Alongside these developments, consumer expectations are shifting to simpler, more accessible products.

If managed well, digitalisation has great potential for consumers, insurers and regulators. It could reduce costs, increase inclusion, and enhance risk management and operational resilience, among other benefits. It is not, however, without risks. Most notably:

◗ Reduced pooling of risk and increased risk monitoring raises several ethical questions and data privacy issues that regulators may not be able to answer alone.

◗ Insurers may become increasingly reliant on digital partners for success. These partners may reside outside the regulatory perimeter (for example, providers of data or algorithms, robo-advice, and cloud services). This will change the risk profile of firms and the sector.

◗ Increased connectivity and the move from tangible to intangible assets will increase the cyber threat.

The following discussion has two parts. Section 1 briefly outlines the most significant trends in InsurTech, indicating market take-up where possible. Section 2 sets out some of the risks and potential regulatory implications under three themes: consumer protection, operational resilience and cyber risk.

3.5.1 Market Trends in InsurTech

The proliferation of internet services and personal devices such as smartphones allows for increased interaction between companies and consumers. It has also led to an explosion of personal data on consumers, which can be analysed in detail by sophisticated algorithms. The everyday digitalisation of people's lives encourages companies to concentrate their service offering online. For insurers, the advent of big data, artificial intelligence (AI), telematics and other digital innovations allows for more personalised products and services that more closely match consumers' needs. Digitalisation could also enable insurers to reduce administration and claim-processing costs, reach underserved business segments, and offer on-demand, self-issuing policies using AI-driven underwriting and smart contracts implemented using blockchain technology.[58]

Access to data is key for most of these opportunities. To this end, insurers are increasingly using multichannel digital portals and mobile applications.[59] For example, insurers may link data from wearable devices or applications that monitor customers' lifestyle choices to their health insurance policies, with incentives for risk-reducing behaviour.

For consumers, InsurTech enables their insurance policies to be tailored to their exact needs.[60] According to a recent survey, 85% of policyholders would like their insurer to give them insight into how they could lower their premium, for instance by suggesting changes in behaviour.[61] Modifying or cancelling insurance contracts is also easier through mobile apps, with chatbots providing online assistance 24/7. A Morgan Stanley-BCG survey found that 50% of the consumers interviewed would be willing to switch insurers for a better user experience.[62] As the CEO of a global insurer recently noted, customers now choose an insurance product "primarily because it's easy to use, transparent in terms of price and quality, and personalised – and because it's available to them via the digital channels they want to buy it from".[63] Despite the advantages, transformation can be costly. About 90% of insurers have identified legacy software and infrastructure as barriers to digitalisation.[64] Instead of digitalising from

within, some traditional insurers are choosing to outsource, collaborating with data or tech providers.[65] Either way, average investment in digitalisation has surged, increasing fivefold from 2011 to 2015.[66] Globally, North America still leads in terms of both the total value and number of deals – accounting for USD 1.24 billion, or 46% of all deals in 2017. Europe accounts for one third of all InsurTech deals globally, amounting to USD 679 million in 2017.[67] The biggest growth in InsurTech investments can be seen in the Asia-Pacific region. The region saw a significant increase in funding, with a 169% rise in deal values to USD 358 million in 2017 – compared to 6% growth in the US.[68]

For example, the Korean government has announced that it will invest USD 9 billion to boost start-ups in financial technology (FinTech), AI and drone technology.[69] In some countries, digitalisation is expected to increase overall access to insurance. India's insurance industry, for example, is expected to grow at an annual rate of 8% from 2017 to 2025, with digitalisation boosting the currently low coverage levels.[70]

In 2017, insurers mainly invested in health and digital health (14% of such investments), the internet of things (13%), and big data and analytics (9%).[71] Among the largest insurers, the race to digitalise is on. Allianz, for example, plans to make its business model "digital by default", and has announced that it will spend more than USD 800 million annually on InsurTech.[72] AXA has announced that it will invest 200 million euros yearly in digitalisation innovations,[73] while Aviva has announced annual spending of 100 million pounds (USD 132 million).[74] The insurance sector may nevertheless lag behind the banking sector in ambition: in a 2016 global survey among 544 insurers, 32% of the respondents noted that they do not deal with FinTech at all.[75] The following box summarises some of the main trends seen to date.

FOR CONSUMERS, INSURTECH ENABLES THEIR INSURANCE POLICIES TO BE TAILORED TO THEIR EXACT NEEDS.

MACHINE LEARNING AND ARTIFICIAL INTELLIGENCE

One of the most widespread technological applications in the insurance sector is artificial intelligence (AI).[76] Practical examples of using AI include chatbots, driver performance monitoring, claims processing and fraud detection. Due to the wide range of application opportunities, about 75% of insurers plan to use AI to automate tasks to a large or very large extent in the next three years.[77]

Chatbots and AI assistants are already widely used in the sector. Some robo-advisers can help consumers select an insurance plan that provides appropriate coverage within a specific price range, accounting for factors such as consumers' risk aversion and their preferences about qualitative differences among the plans.[78] Indeed, more than a third of brands say that customers and prospective customers prefer to complete a purchase or resolve service issues without speaking to a person, if possible.[79] As a result, 85% of customer interactions are predicted to be managed without a human by 2020.[80] Robo-advisers can also respond to internal agent enquiries and provide guidance on business protocols. According to a report by the International Organization of Securities Commissions (IOSCO), global spending on wealth management initiatives will triple from USD 4 billion to USD 12 billion between 2015 and 2019 due to growth in robo-advice.[81]

Another popular AI application is customer service performance monitoring, as smoother interaction leads to higher customer engagement and thus client retention for insurers. For example, Cogito[82] uses AI to measure and improve the quality of certain key conversations, such as sales and customer-service calls, in real time. Cogito claims that its system reduces callbacks by 10%[83] and increases customer satisfaction by 28%.[84] Its clients include three of the five largest US health insurers, two of the five largest disability insurers, and some of the biggest credit card companies.[85]

Given the trend towards personalised products and services, large technology and internet entities are also starting to enter the insurance business to leverage the extensive data that they have available on consumers and their behaviours.[86] These companies may also sell data to traditional insurers rather than use it themselves.[87] For example, a start-up called Planck Re searches online for publicly available data, such as social media activities, of people seeking insurance coverage, and then performs a partial risk assessment based on that information.[88] Virtual agent technology could also have the capability to deliver more compliant sales or advice across a pool of financial advisers and to deliver a better customer experience at a lower cost.[89]

AI is also widely used in underwriting management.[90] Employees in finance and insurance spend about 50% of their time collecting and processing data, where the technical potential for automation is high.[91] For example, in underwriting, manual data entry takes about half of the entire processing time.[92] Life insurance agency Haven Life reduced its application processing time from 1–2 weeks to 20 minutes via its website's online questionnaire.[93] Another insurer eliminated about 20 million calls per year by introducing a mobile app that allows customers to make direct changes to their policies.[94]

APPLICATION OF BLOCKCHAIN TECHNOLOGY TO INSURANCE

The use of AI can be further enhanced by combining it with the advancements in blockchain. While blockchain keeps a record of a smart contract[95] updated and organised, AI can be used to assess and prioritise the information in the chain.[96] For example, a blockchain ledger can be used to record insurance placement transactions,[97] which are then analysed by AI applications. Hybrid applications of blockchain and AI are thus expected to help with the automation of insurance businesses in the future, especially if algorithms can be powered by machine learning.[98]

For example, machine learning algorithms by Shift Technology have processed over 77 million insurance claims and detected fraud with a 75% accuracy rate, reducing costs for insurers and claim wait times for customers. In Japan, a large life insurer replaced 34 employees with IBM's Watson Explorer AI system.[99] Claims can now be settled in less than 20 minutes because the customer or their broker can provide the evidence digitally, whereas previously it could have taken three days to visit the claimant and complete the process. While claims processing is expected to remain a primary function of insurers, digitalisation could reduce the number of people involved with claims processing by 70-90% in 2030 compared with 2018 levels.[100] Indeed, a 2017 survey of 998 insurers and

reinsurers identified payment infrastructure and digital identity management as the most likely blockchain applications.[101] According to one estimate, blockchain applications could enhance risk understanding and save USD 5–10 billion through faster, more efficient and more accurate placement, claims settlement and compliance checks.[102] Nonetheless, a recent study found that although 56% of insurers recognised the importance of blockchain, 57% conceded that they did not yet know how to respond to the developments.[103]

INTERNET OF THINGS AND TELEMATICS

"Digital ecosystems" are becoming increasingly significant for insurers.[104] They enable insurers to collate data from multiple devices to establish a more accurate risk premium, or to monitor risks in real time. Practical applications include wearable monitors for health insurance, driver-tracking boxes in cars, and "connected home" data sent directly to the insurer.[105] Data coming from sensors in smart machines (such as aircrafts) and buildings also offer insights into aspects of risk that underwriters might not have previously considered. To some extent, these developments may be shifting traditional insurance business to a risk prevention model.[106]

Digital ecosystems also increase the importance of partnerships with technology companies for insurers. Several major tech firms, such as Google, Amazon, Facebook and Apple in the US and Baidu, Alibaba, Xiaomi and Tencent in China, could partner with insurers to support the collection and analysis of data.[107] Insurers are also collaborating with smaller FinTechs. For example, in 2016, AIG announced that it was investing in Human Condition Safety,[108] an early-stage start-up developing advanced analytics and wearable devices to improve employee safety.[109] Technology companies could also start offering insurance to complement their offering (see section on "insurance as a service").

Another issue to consider is how the health insurer-consumer relationship will change as insurers engage consumers in wellness and

ANOTHER ISSUE TO CONSIDER IS HOW THE HEALTH INSURER-CONSUMER RELATIONSHIP WILL CHANGE AS INSURERS ENGAGE CONSUMERS IN WELLNESS AND DISEASE MANAGEMENT PROGRAMMES.

disease management programmes.[110] For example, Discovery insurance launched Vitality, an incentive-based wellness programme that has grown into a global platform with a vast digital ecosystem of services, partners and rewards. The insurer can track the health of policyholders through its Vitality platform and use the data to generate insights on its customers.[111] Munich Re has developed Digital Doctor, an app for health insurance customers. The app contains an intelligent questionnaire, based on algorithms, that asks for details about the user's symptoms to build a picture of their condition. Once the data has been analysed, a doctor can provide the customer with medical advice by phone, live video or chat messages and, if necessary, refer them to a specialist from the insurer's network.[112] RGA Reinsurance Japan is also developing tools to digitise health checks.[113]

Due to the increasing penetration of connected cars, interest in telematics is likely to grow in the coming years. In the UK, about 75% of new cars are expected to be connected cars by 2020, increasing to 100% by 2026.[114] In the US, it has been estimated that by 2020 about half of cars will be equipped with telematics to monitor performance and driving behaviour such as speeding or sudden braking.[115] For example, Tesla has reported a 40% drop in road accidents with a new AI feature deployed in its cars, compared to models without the feature.[116]

In the UK, Aviva has created a mobile application called Drive,[117] which allows the driver to compete with their friends on driving performance. Based on the driving behaviour in a 200-mile test drive, Aviva may grant up to 20% off the insurance premium. The driver only needs the app on their mobile phone; no black box is required.

USAGE-BASED INSURANCE, MICRO-INSURANCE AND PEER-TO-PEER INSURANCE

Mobile technology enables nimbler and faster insurance contract actions. Both traditional insurers and InsurTech start-up companies are entering the usage-based insurance and

micro-insurance sectors, where policies are offered on demand for a limited time or for a specific use. For example, Trov provides on-demand insurance for valuables that can be instantly switched on and off through a mobile app. Other examples include insurance tailored for half-an-hour car-sharing schemes or for people who only drive their car during specific times of the day.[118] Lloyd's of London is now underwriting insurance products for individuals who provide on-demand office spaces in an Airbnb-style business.[119]

Due to the growing interest, India's Insurance Regulatory and Development Authority adopted a regulation on micro-insurance in 2015. Brazil, India, Mexico, Pakistan, Peru, the Philippines, Taiwan, South Africa, and some other African countries have also legislated on usage-based insurance or micro-insurance.[120]

There are questions about whether peer-to-peer insurance truly constitutes an insurance service, and if so, how it should be regulated. Broadly speaking, peer-to-peer insurance allows individuals to pay into an insurance "money pool". The pool is then dedicated to paying the group's claims up to its original amount.[121] For example, the New York Department of Financial Services was the first US state to grant Lemonade, an InsurTech start-up, a licence to sell micro-insurance for homeowners and renters in a broadly peer-to-peer format.[122] In the business model, a group of Lemonade customers are pooled together to pay premiums into one pot; the company takes a flat fee from everyone in the pool; and if anything is left over after the claims have been paid, the extra money is given to charity.[123] All interactions are via a mobile app and claims can be settled within seconds.[124] Lemonade has a licence to operate as an insurer in 27 US states and has launched operations in 10 of them.

INSURANCE AS A SERVICE

With advances in digitalisation, tech developers can now build an insurance offering into mobile apps that offer other services. For example, Tesla has begun offering customers in Asia a package that includes the cost of insurance and maintenance in the purchase price of the car – InsureMyTesla.[125]

Other tech giants, such as Amazon, have indicated their interest in entering the insurance sector, with first products already available for private customers.[126] In October 2018, Amazon announced that it would start offering travel insurance policies, with its voice assistant, Alexa, acting as the broker.[127] According to a recent survey, more than 30% of UK consumers would buy some form of insurance product from "alternative providers" like Google or Amazon.[128]

AUTONOMOUS VEHICLES

While not an InsurTech innovation, autonomous vehicles are likely to have a huge impact on the insurance market. It has been estimated that the proportion of autonomous vehicles on the road could exceed 25% by 2030.[129] By 2020, the global sales of autonomous vehicles are likely to increase fivefold to 35.7 billion euros.[130] The development and uptake of autonomous vehicles is changing many insurers' approach to car insurance. According to one estimate, the UK motor insurance market could contract by 21% by 2040.[131] In the US, auto insurance premiums could decline by as much as 25% by 2035 due to the proliferation of safety systems and semi- and fully autonomous vehicles.[132]

For insurers, liability determination will be a key consideration with autonomous vehicles. For example, in the case of a semi/completely autonomous car, insurers will need to determine whether a potential accident is due to the (passive) driver or the car manufacturer.[133] Another consideration is the behaviour of cars when they can choose between different crash scenarios.[134] Once driverless cars become more commercially viable, vehicle manufacturers could also begin to offer insurance products as add-on accessories to the vehicles.[135] To date, Google, Tesla, Ford and Audi[136] have entered or are about to enter the autonomous vehicle market, with Apple exploring the idea.[137]

At the national level, the UK government has started looking into how autonomous vehicles could affect the insurance markets by issuing a public consultation on possible regulatory options.[138] In 2016, the US Department of Transportation issued the Federal Automated Vehicles Policy to guide the use of autonomous vehicles.[139] In addition, the US National Highway Traffic Safety Administration has been considering whether to grant a special permit for car manufacturers to allow a number of autonomous vehicles on the roads.[140] The manufacturers would be required to provide the driver data to the authorities in order to better assess the real-life safety of these cars on the road.[141]

CASE STUDY: FOCUS ON CHINA

Digitalisation of the insurance industry is seeing particular growth in China,[142] with the country's InsurTech market expected to be worth USD 216 billion by 2021.[143] Consumers in the country own more than 1 billion smartphones and tablets,[144] offering a rich testing ground for different InsurTech innovations. Technology companies, banks and insurers are also increasingly working together to transform financial services.

For example, Zhong An, China's sole online-only insurer, was formed through a cross-industry partnership between Ant Financial, Ping An and Tencent.[145] It has underwritten over 6 billion insurance policies and serviced over 460 million clients since it launched in 2013.[146] The company collected about USD 500 million in premiums in 2016, a 49% increase from 2015.[147] In 2017, the company's total premiums grew to almost USD 1 billion.[148] This is indicative of the rapid growth of InsurTech in China.

Zhong An uses new technology at every stage of its operations, from product development to claims processing, including analysis of big data, to identify customer needs, market trends and prices and then develop products that address those needs.[149] For example, to determine health insurance premiums, the company analyses exercise data secured through partnerships with wearable device makers.[150]

In addition, Zhong An uses AI and blockchain technologies to settle online claims and offer micro-insurance policies "on the go", with almost instant approvals.[151]

Interestingly, Zhong An is looking to digitalise insurance services across Asia. To this end, in September 2018 the company announced a deal with Sompo Japan Nipponkoa to help the Japanese insurer develop its online insurance offering.[152]

While China's biggest insurer, Ping An Group,[153] was an early investor in Zhong An, it has also digitalised its own insurance offering. In the past decade, Ping An has invested over USD 7.5 billion in FinTech, medical technology and AI.[154] Its online portal offering includes car-buying services, online medical consultations, and online wealth management services.[155] Ping An has also created a one-account model, offering both mortgage and insurance services to those who recently bought a new home through its real estate site. Ping An's motor insurance service uses image recognition to provide repair estimates for a damaged car part based on images that can be submitted on its app.[156]

Ping An's bet on digitalisation seems to be paying off: while it currently has more than 153 million financial services customers, the company's various apps – including health-care and medical platform Good Doctor,[157] real estate app Ping An Haofang, and shopping loyalty program Wanlitong – have more than 400 million users. The information gathered from the digital ecosystem is likely to be useful for Ping An's 1.4 million insurance agents.[158]

3.5.2 Regulating InsurTech

To ensure that the changing insurance market remains fair, sound and stable, digitalisation trends will require global regulators' attention. Based on recent developments, key supervisory principles for digitalising insurance could include technological neutrality, proportionality and consistency from an activity-based perspective, market integrity, and consumer protection.[159]

Multi-supervisor and multi-market participant regulatory sandboxes are an efficient way to enhance global collaboration. In August 2018, 12 financial supervisors agreed on a framework for a global financial innovation network (G-FIN) that will act as a "global sandbox" for FinTech innovations. The network aims to provide a more efficient way for innovative firms to interact with regulators globally. While firms will not gain access to other markets through the sandbox, it does provide an opportunity for trialling potential cross-border solutions. The G-FIN will also create a new framework for cooperation between financial services regulators on innovation-

related topics, sharing different experiences and approaches.[160] The G-FIN was launched in January 2019.

National sandboxes are already used in, for example, Australia, Hong Kong, the UK and Singapore. In India, the Reserve Bank is setting up both a regulatory sandbox and data science labs with employees from several different government departments to work on digitalisation issues.[161] In addition to sandboxes, these kinds of innovation hubs with employees from various regulatory and government departments could be another supervisory development in the future.

Specific regulatory considerations are explored further below under three themes: operations and management, cyber risks and consumer protection.

Operations: Concentrations and management of big data

One of the biggest risks of digitalisation relates to operations. Insurers are increasingly relying on third parties such as technology and data providers, potentially creating complex interconnections between firms in different sectors with different operating models. These operations may also be subject to varying regulatory requirements. In addition, the outsourced data and analytics may be provided by a limited number of cloud platforms, risking cloud concentration. This, in turn, may affect insurers' risk management practices.

Cloud outsourcing transfers the responsibility for managing IT infrastructure to cloud service providers, whereby the insurer becomes a user of the technology company's applications, rather than owning and operating its own IT infrastructure. In 2017, five companies provided over 60% of the world's cloud computing services.[162] While the cloud offers insurers risk transfer opportunities, the risks may become concentrated in a limited number of cloud service providers. The lack of substitutability may also limit insurers' ability to move from one cloud service provider to another. It is therefore important that both company boards and supervisors adequately understand the potential risks of cloud-based services. For example, cloud

outages could result in consumers being unable to complete transactions, incurring fees on late payments and delaying receipt by transaction counterparties.[163]

Moreover, as insurers continue to rely on sophisticated algorithms for their data needs, company leadership is expected to understand the models that they are using. It may thus be desirable to ensure appropriate levels of transparency and board oversight of the data production chain. Further scrutiny may also be required to understand insurers' outsourcing arrangements, as well as to monitor any potential over-reliance on external suppliers.[164]

For example, insurers should understand the risks in the data and technology vendor model, rather than expect the vendors to manage risk chains (black box reliance). In public blockchains, supervisors may need to focus on a range of different issues, such as the role of data miners and nodes, or security and privacy challenges. Regulatory authorities could also consider addressing some of the legislative barriers preventing the implementation of blockchain.[165]

For market supervisors, digitalisation may present regulatory blind spots and new concentrations of risk. In addition to a limited number of cloud service providers, the concentrations could involve, for instance, a single AI provider for a specific product or restricted distribution channels.

Increased fragmentation of the market and the production chain may also challenge supervisors. Regulators may need to closely monitor the nature of partnerships and interconnections between insurers and technology companies. Once technology companies start to offer insurance products, the scope of insurance regulation may need to be reconsidered.[166] The blind spots can, to some extent, be remedied by regular public-private dialogues and partnerships to better understand the changes in the markets. Regulatory sandboxes may be an effective way to do so.[167] Nonetheless, it is important to maintain proportionality in the supervisory approach to different firms and financial innovations.

IT IS THEREFORE IMPORTANT THAT BOTH COMPANY BOARDS AND SUPERVISORS ADEQUATELY UNDERSTAND THE POTENTIAL RISKS OF CLOUD-BASED SERVICES.

Cyber risks

Elevated cyber risks may be due to increased levels of available policyholder data, the move from tangible to intangible assets, and the use of increasingly connected smart items, among other reasons.[168] The risk of personal and financial data being compromised may also be heightened due to the increased reliance on web-based channels.[169] According to an IAIS survey, the main weaknesses that insurers face in cyber security include missing or incomplete overviews of the IT landscape; inadequate control processes for user privileges; and improper access to superuser accounts with privileged access levels.[170] Insurers could thus help support economic resilience by supporting measures that help combat cyber threats. Estimates of the disruptive potential of cyber-attacks are high, with one report calculating that cyber-crime cost the global economy USD 450 billion in 2016.[171]

The increased risks are also affecting insurers' business: according to some estimates, written premiums for cyber insurance grew by 35% between 2015 and 2016.[172] For example, the Indian Banks Association urged its members to buy cyber insurance after a wave of crippling cyber-attacks on lenders.[173] Insurers may also start offering insurance products that cover crypto-asset thefts or hacks. Regulators may expect insurers to be cautious when offering cover and pricing policies given the lack of long-term historical data on how damaging the attacks, hacks and virtual thefts may actually be.

From the supervisory perspective, regulation can play an important role in minimising the risks of cyber-threats. At the regional level, EIOPA included a questionnaire related to cyber-risk in the 2018 Insurance Stress Test exercise, which covers 78% of the EU market.[174] In addition, the European Commission asked European Supervisory Authorities to map existing supervisory practices on the financial sector's information and communications technology security and governance issues by March 2019 and to evaluate the resilience of the cyber testing framework by the end of 2018.[175] Globally, these issues are being considered in the Basel Committee on Banking Supervision's working group on operational resilience and the G7 Cyber Experts Group. Most recently, a Financial Stability Institute report, drafted together with the IAIS, suggests developing a supervisory framework to assess concentration risk in cloud computing.[176]

Conduct and consumer protection: Distribution of and access to insurance

Digital social life and smartphone data enable increased profiling of consumers. The data allow integration with insurance products, but also pose questions on access. Regulators may need to consider the balance between data privacy and insurers' underwriting practices.[177] For example, although 85% of policyholders in a recent survey[178] noted that they would like their insurer to give them insight into how they could lower their premium, regulators may need to ensure that the consent is explicit and that consumer data is adequately protected.

> THE INCREASED RISKS ARE ALSO AFFECTING INSURERS' BUSINESS: ACCORDING TO SOME ESTIMATES, WRITTEN PREMIUMS FOR CYBER INSURANCE GREW BY 35% BETWEEN 2015 AND 2016.

In many jurisdictions, conduct and consumer issues may require enhanced cooperation between different government departments, from supervision to prudential policy directorates. Global regulators may also consider further developing supervisory dialogue to ensure appropriate levels of consumer protection across the world.[179] In terms of access, information on social media profiles could, for example, be used to filter product offerings, inadvertently acting to restrict insurance coverage to a segment of the population.[180] Reduced risk pooling could also result in unwarranted cross-subsidisation and even reduced access to insurance. In addition, digitalisation may lead to significant changes in the size and risk profile of customers, for example, if there is an unexpected surge in a specific business or market.

Many regulators are thus closely following underwriting and pricing trends in the insurance market, to better understand how new technologies are being used for risk selection, and the transparency of associated practices. This includes challenges related to the transparency and reliability of AI-based techniques, such as using social media

and other publicly available web sources in risk assessment.[181]

To this end, the IAIS' ICP 7 on Corporate Governance states that supervisors must require an insurer's board to oversee the design and implementation of risk management and internal controls. The board's responsibilities are described further in ICP 8 (Risk Management and Internal Controls), including the establishment of internal controls that ensure compliance with applicable laws, regulations and standards, and promote fair conduct towards consumers and policyholders.[182] The IAIS' ICP 19 states that supervisors must require insurers to treat customers fairly, whether before or after the contract has been entered into. The IAIS has published an Issues Paper on Increasing Digitalisation in Insurance and its Potential Impact on Consumer Outcomes.[183] In addition, the UK Financial Conduct Authority (FCA) has investigated[184] the use of big data analytics in the insurance sector to protect customers and spur innovation, noting the concern of distribution access risks for consumers.[185]

Insurance distribution concerns are also linked to the quality and use of robo-advisers. Key concerns for supervisors include the ranking and matching of algorithms as well as the choice architecture,[186] that is, on what basis digital advisers propose certain policies at certain premiums.

Regulators could, for example, assess the following issues:[187]

◗ Explanations of the models and the data on which the models are based.

◗ Evidence regarding the appropriateness of the data used to create the model.

◗ Explanations of the outcomes that the algorithms seek; evidence that the algorithms perform in the way that they are designed.

◗ Evidence of how the creators of the robo-adviser measure whether the algorithm is succeeding and what they are doing in response.

◗ Explanations of the alternatives the robo-adviser creators considered and rejected.

It is also important to know who within the firm is ultimately responsible for the advice given, that is, who signs off the advice models.[188] Applying the senior managers' regime[189] to the InsurTech industry should be considered.

In New Zealand, for instance, the Financial Advisers Act (2008) states that only a natural person can provide financial advice.[190] However, due to the popularity of automated advice, the government has approved legislative changes that allow advice to be given by computer programmes from mid-2019 onwards.[191]

Companies wanting to offer personalised financial advice to consumers through digital tools and platforms will have to apply to the New Zealand Financial Markets Authority for an exemption.[192] The exemption is intended to be a temporary fix.[193] Other countries may need to consider appropriate legislative amendments, too. For example, a start-up in the UK that wanted to offer automated advice found that it may have to ask consumers 247 questions to comply with current regulations.[194]

3.5.3 Conclusion

The insurance sector is expected to change substantially in the coming years due to ongoing digitalisation efforts. Insurers are either updating their legacy IT systems or partnering with new FinTech start-ups to widen their offering and improve how they use data. As insurers increasingly rely on partnerships for future success, supervisors may need to consider how the changes could affect the financial ecosystem. For example, regulators could look into questions relating to access, data and risk management, and transparency of the new insurance models. Supervisors may also need to evaluate if all firms offering insurance policies, whether traditional insurers or InsurTech start-ups, are adequately and proportionally regulated. In particular, regulatory sandboxes have proved to be efficient in testing developments in digitalisation in a controlled environment.

Sandboxes provide InsurTech companies with a better understanding of how viable their business could be from a regulatory standpoint, while offering a thorough understanding for supervisors on the depth and speed of technical advancements in the market. At a global level, the IAIS will continue to monitor these trends.

■ REGULATORY TECHNOLOGY

Big data techniques are not only relevant when considering regulated companies – supervisory authorities are also presented with opportunities for greater efficiency. Regulatory technology (RegTech) could, for instance, help meet compliance requirements in a more streamlined way, using available big data to provide smart data.[195]

Digital regulatory reporting, in particular, could improve the efficiency and accuracy of data reporting and reduce the burden on both firms and the regulator.[196] The UK's FCA and the BoE, for instance, are investigating how to make their rule books machine readable.[197] If successful, supervisors could assess compliance directly in real time, without the need for firms to interpret and implement the rules independently. The automation would reduce the reporting burden on the firms and improve data accuracy and consistency for the supervisor. The benefits could be remarkable, considering the number of compliance reports global regulators receive every

year.[198] The FCA and BoE are working on the project together with the industry and are expected to publish a technical report on the first pilot project by March 2019.[199]

In addition, in September 2017 the UK's FCA, in collaboration with a group of firms, revealed that it has created a blockchain application to improve the regulatory reporting of mortgage transactions.[200] The system enables banks to generate automated delivery receipts for the FCA each time a mortgage is booked.[201]

In 2016, the Monetary Authority of Singapore launched Project Ubin to explore different potential uses of blockchain.[202] Since then, the Monetary Authority of Singapore, together with several Singapore-based banks, announced that it has software prototypes of three different models for decentralised inter-bank payment and settlements with liquidity savings mechanisms.[203] The United Arab Emirates has also launched a new distributed ledger strategy, with the aim of making Dubai a blockchain-powered government.[204]

GLOBAL REINSURANCE MARKET STATISTICS SURVEY

The IAIS gathers data on the global reinsurance sector through its annual GRMS survey of its Member jurisdictions.[205] The survey was first conducted in 2003. This iteration covers 47 reinsurers based in nine jurisdictions,[206] the same reinsurers that took part in the 2017 survey. The participating reinsurers have remained largely consistent throughout the years. The GRMS survey captures data from reinsurers with gross unaffiliated reinsurance premiums of more than USD 800 million. Data captured from the survey 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 analyses the data collected from the 2018 survey.
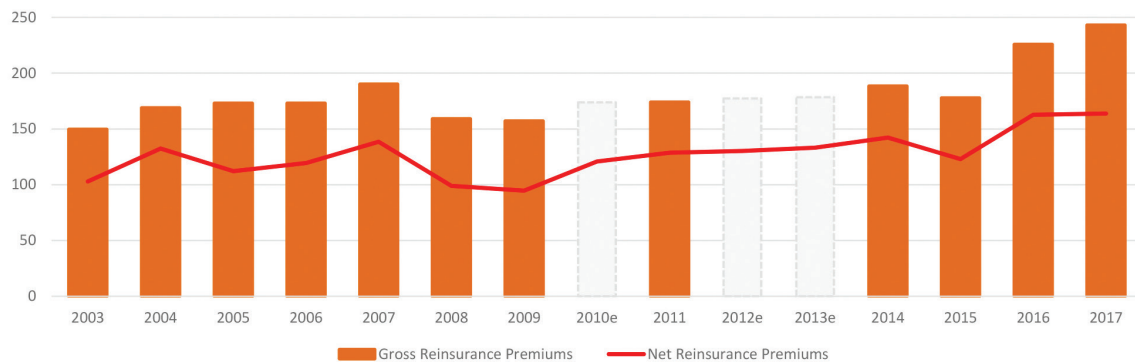
4.1   REINSURANCE PREMIUMS[207]

The global reinsurance industry experienced an 8% increase in gross premiums written between year-end 2016 and year-end 2017. Premiums in life reinsurance increased from USD 79 billion to USD 82 billion, while non-life reinsurance premiums increased by 10% to USD 161 billion. Within non-life reinsurance, property reinsurance exhibited the greatest change, increasing by almost 14% (USD 11.7 billion) during the period. Liability and financial lines of business rose by about 4% and 7.5% respectively.

As shown in Figure 4.1a, the increase in gross premiums written in 2017 was accompanied by a stable volume of net reinsurance premiums written (gross premiums written less retrocession). Overall, reporting entities retroceded 33% (USD 80 billion) of gross premiums written in 2017. The majority of the retrocession was for life risks, which accounted for 56% (USD 33 billion) of the total retrocession at the end of the period. Hence, the 26% change in retrocession from 2016 to 2017 was mainly driven by life risks.
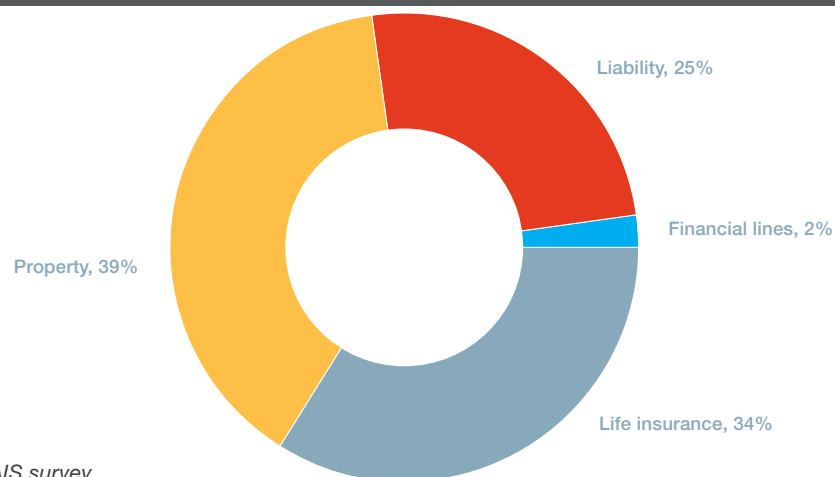
The relative share of lines of business by gross written premium has remained somewhat static, with the exception of property reinsurance, which grew faster than the other lines. In 2017, life insurance accounted for one third and non-life insurance lines of business represented two thirds. Within the non-life reinsurance lines of business, property reinsurance represented the majority of gross written premiums, accounting for 39% of total premiums. Liability coverage amounted to 25% and financial lines 2%.

Source: 2018 IAIS survey

Liability, 25%

Financial lines, 2%

Property, 39%

Life insurance, 34%

Source: 2018 IAIS survey

Source: 2018 IAIS survey

55

4.2 RISK TRANSFER BETWEEN REGIONS

Table 4.2a shows gross reinsurance premiums grouped by assuming region and ceding region. The data has been grouped by the region in which the reporting entities are domiciled. For example, USD 3,164.1 million of European insurance business in the sample is ceded to companies based in North America. Europe assumed the majority of the risks, especially those ceded by Africa, the Middle East and Latin America.

As the data in Table 4.2b shows, it is common for reinsurers to assume risk from ceding insurers located across borders. These risk transfers are driven, among other things, by the kind of insurance risks involved (for example, catastrophe risk). Geographical diversification of risk is a key element of reinsurers' risk management strategies. By ceding insurance risk across borders, jurisdictions exposed to catastrophe may benefit from a reduced concentration of insurance risk exposures within the jurisdiction's borders. This can positively contribute to the jurisdiction's financial stability.

Figure 4.2c reflects gross reinsurance premiums assumed according to the region of the ceding insurer. In 2017, North America accounted for 60% (slightly down from 60.5% in 2016) of the global reinsurance market, followed by Europe with 23% (a slight increase from 22% in 2016), and Asia and Australia with 12% (the same as in 2016). The risks assumed in Latin America and Africa remained relatively stable, cumulatively accounting for 5% (similar to 2016) of global risks.

4.3 ASSETS

The GRMS captures data on the financial instruments held by reinsurers at balance sheet value and market value. An analysis of this data shows that the total book value of invested assets held by reinsurers increased by 14% (USD 111 billion), from USD 769 billion in 2016 to USD 880 billion in 2017.

In recent years, reinsurers' asset composition (excluding cash) has exhibited marginal shifts. However, fixed-income debt securities have remained the largest asset class held by reinsurers.

In 2017, debt securities comprised 41% of total assets. The nominal value of year-over-year debt securities has increased by 8%.

Table 4.2a: Risk transfers between regions, ceding and assumed amounts, year-end 2017 (USD billions)

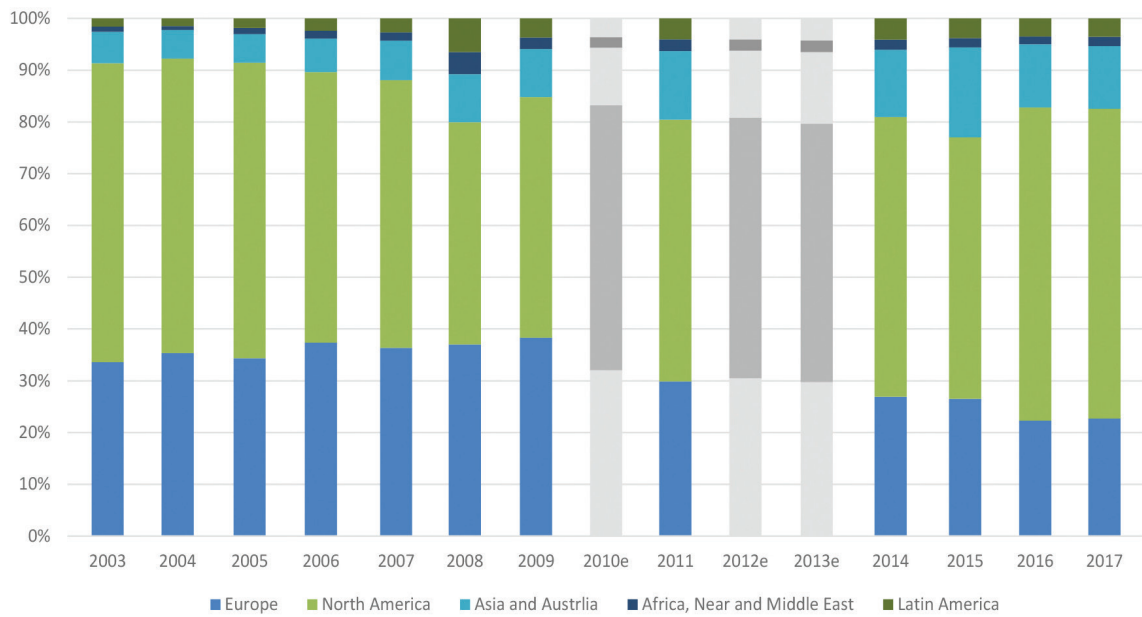| Ceding region	Assuming region			TOTAL
	North America	Europe	Asia	
Europe	3,164.1	51,441.14	866.85	55,472.09
North America	106,130.26	39,308.57	622.48	146,061.31
Asia and Australia	5,209.82	22,076.68	2,299.82	29,586.33
Africa, Near and Middle East	364.18	4,015.93	20.10	4,400.21
Latin America	1,592.66	7,065.02	32.49	8,690.17
Total	116,461.02	123,907.34	3,841.74	244,210.11

Source: 2018 IAIS survey

Table 4.2b: Risk transfers between regions and net positions, year-end 2017 (USD billions)

Risk transfer by reporting entities between regions in 2017		
Region	Gross ceded	Gross assumed
Europe	55,472	27,461
North America	146,061	40,715
Asia and Australia	29,586	5,239
Africa, Near and Middle East	4,400	479
Latin America	8,690	11,292

Source: 2018 IAIS survey

Figure 4.2c: Gross premiums assumed by region, year-end 2003–2017

Legend: Europe · North America · Asia and Austrlia · Africa, Near and Middle East · Latin America

Source: 2018 IAIS survey

Figure 4.3a: Asset composition, year-end 2003–2017 (%)

Legend: Debt Securities · Shares and Other Equity Investments · Non-negotiable Loans (including non-mortgage loans) · Mortgage Loans and Real Estate · Other
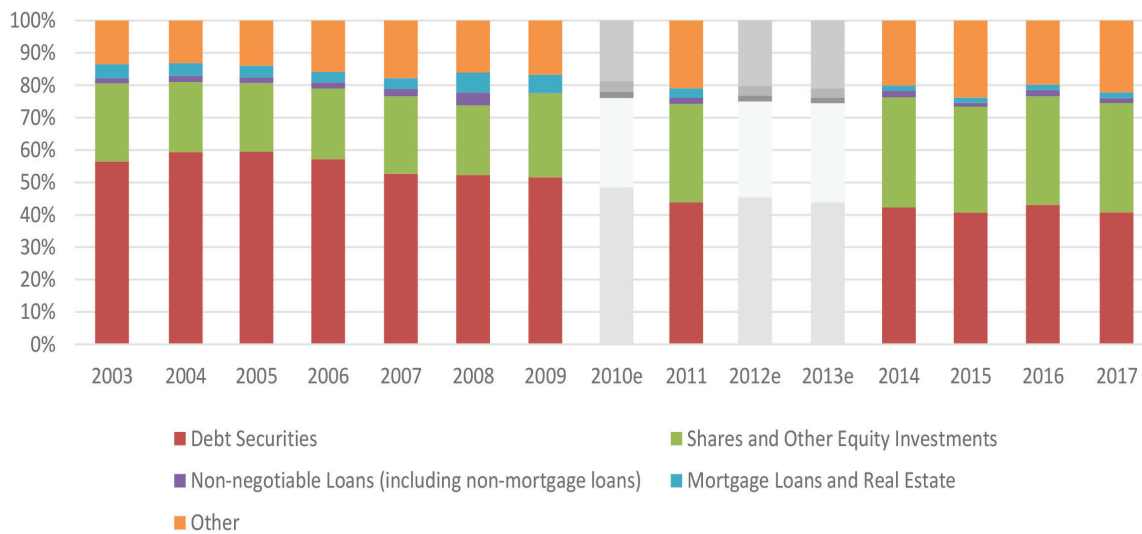
Source: 2018 IAIS survey

4.4 PROFITABILITY

The reinsurance industry's financial performance can be assessed using financial indicators such as gearing and net gearing ratios. As shown in Figure 4.4a, gearing ratios reflect the overall capital improvement of reinsurers in the year and measure reinsurer dependency on reinsurance (for direct business) and retrocession (for assumed reinsurance business) by comparing recoverables with total available capital.

In 2017, reinsurers reported a gearing ratio[208] of 36.5% and a gearing ratio net of collateral and offsetting items of 20%. As shown in Figure 4.4a, gearing ratios trended downward between 2009 and 2015. The movement was driven mainly by an increase in reinsurers' capital base. This reduced the impact of recoverables on reinsurance and retrocessions. In 2016, the ratios increased substantially, returning to a 12-year average. This finding can be related to increasing recoverable values (as the capital base also improved). In 2017, the ratios decreased to similar levels observed in 2015.

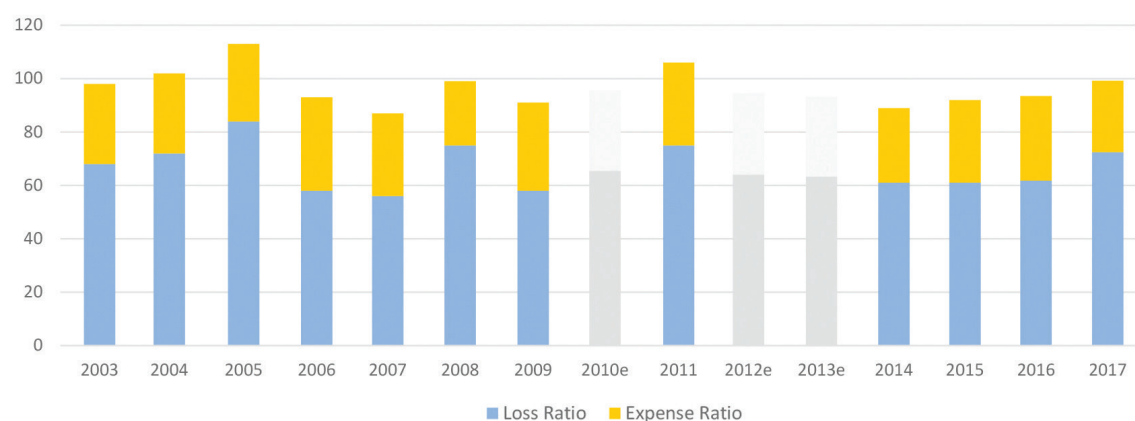Figure 4.4b shows the average combined ratio of reinsurers surveyed over a 15-year period. From 2003 to 2017, the average combined ratio was 96.4%, with 2005 reflecting the highest

Figure 4.4a: Gross and net gearing ratio, year-end 2003–2017 (%)
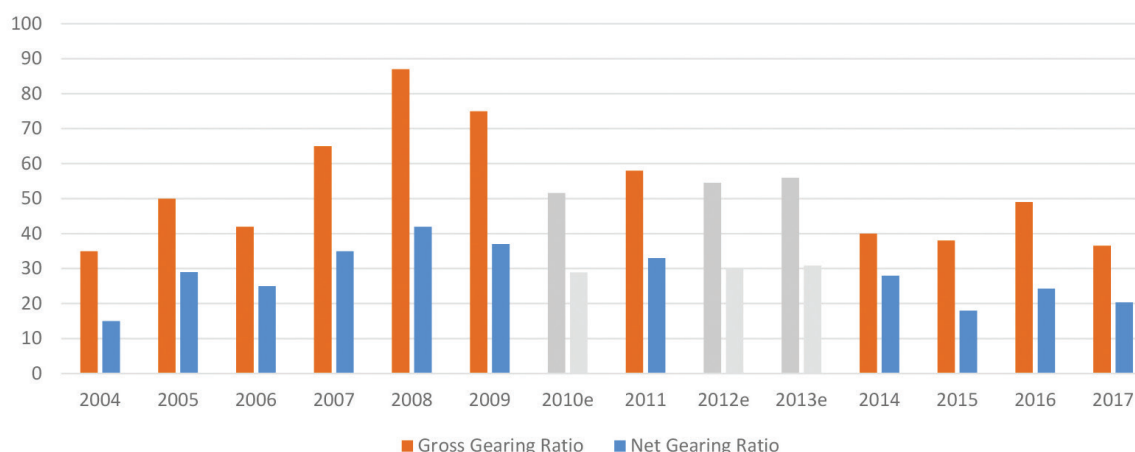
Source: 2018 IAIS survey

**Figure 4.4b:** Combined and loss ratio, year-end 2003–2017 (%)

Source: 2018 IAIS survey

ratio (113%) and 2007 the lowest (87%). The constant oscillation in the combined ratio is indicative of the volatility in profitability of the reinsurance sector. Nonetheless, the increase in the combined ratio in 2017 is to be expected due to the large losses incurred as a result of the severe natural catastrophes.

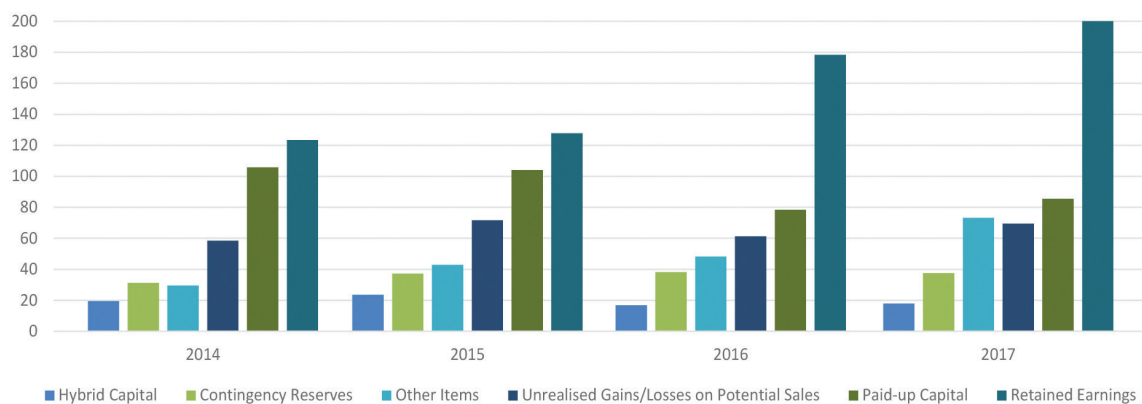The combined ratio increased from 94% in 2016 to 99% in 2017. The expense ratio (net operating expenses to net premiums earned) provides insight into reinsurers' operational performance. The loss ratio, which measures the total losses incurred as a proportion of total premiums earned, increased to 72% after a period of several years where it remained unchanged at 61%. The expense ratio, on the other hand, decreased from 32% in 2016 to 27% in 2017.

Figure 4.5a: Reinsurance capacity, year-end 2014–2017[209] (USD billions)

■ Total Regulatory Capital Required   ■ Total Available Capital
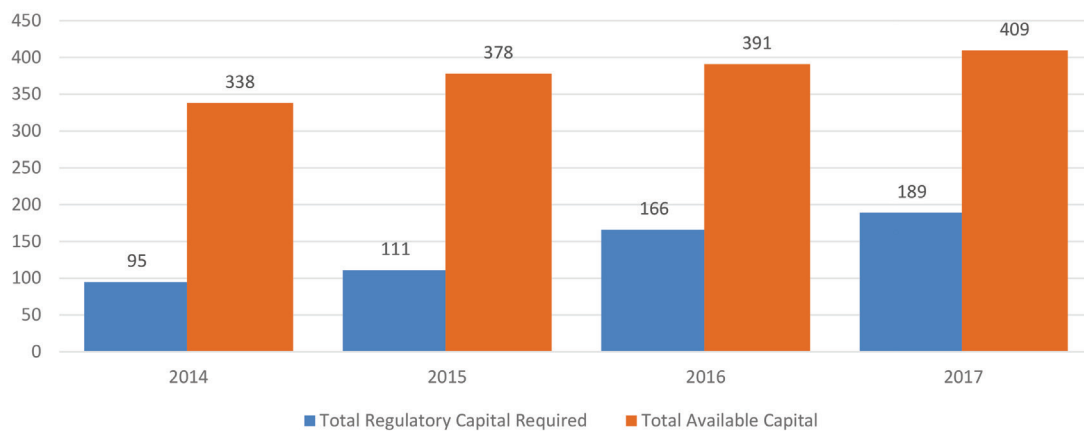
Source: 2018 IAIS survey

Figure 4.5b: Reinsurance capacity: Composition of total available capital, year-end 2014–2017 (USD billions)

■ Hybrid Capital   ■ Contingency Reserves   ■ Other Items   ■ Unrealised Gains/Losses on Potential Sales   ■ Paid-up Capital   ■ Retained Earnings
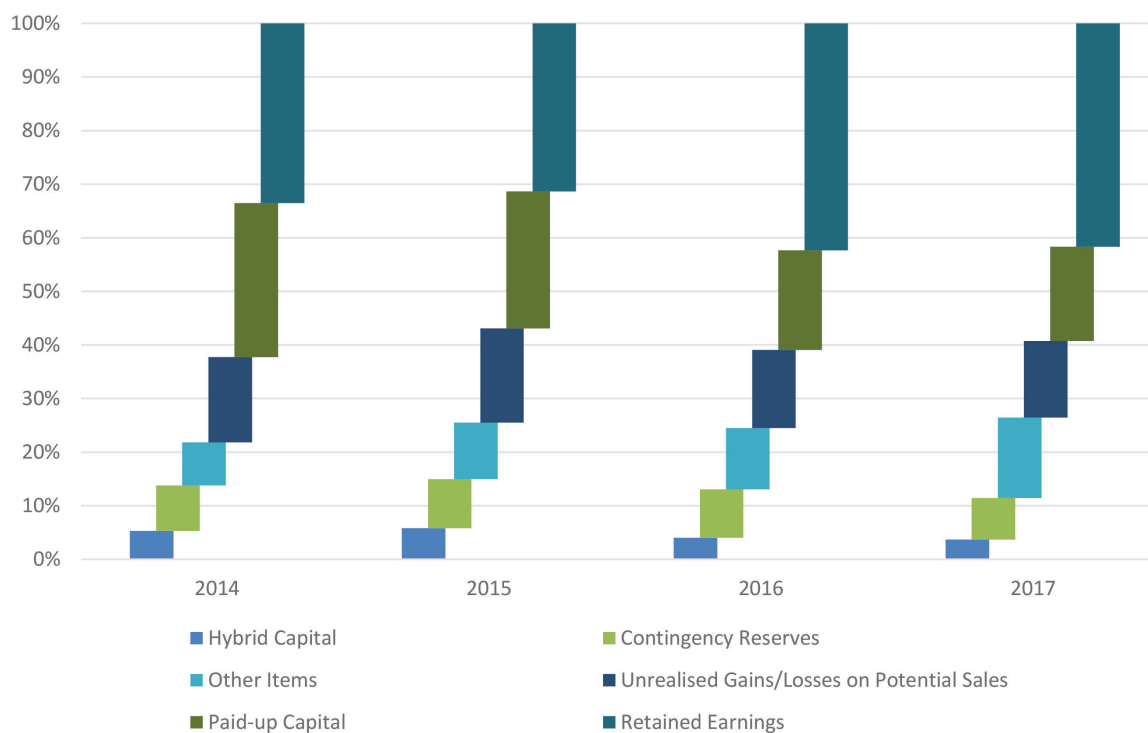
Source: 2018 IAIS survey

4.5   CAPITAL ADEQUACY

Traditional reinsurers maintained a strong capital base in 2017. Global reinsurance capital increased to USD 409 billion in 2017, an increase of almost 5%. This can mainly be explained by the inflows to maintain or increase the coverage against losses due to the extreme weather events that occurred throughout 2017. In the same period, total regulatory capital required increased by 14%, while the sector's capital base was USD 220 billion above its regulatory capital requirement.

Figures 4.5b and 4.5c show that the total available capital generally increased in 2017, with retained earnings increasing by 14%. Paid-up capital increased by 9%, while the unrealised gains/losses on potential sales increased by 13%. The "other items" category increased by 52%, while hybrid capital increased by 6.5% and contingency reserves decreased slightly by 1%.

Figure 4.5c: Reinsurance capacity: Composition of total available capital, year-end 2014–2017 (USD billions)
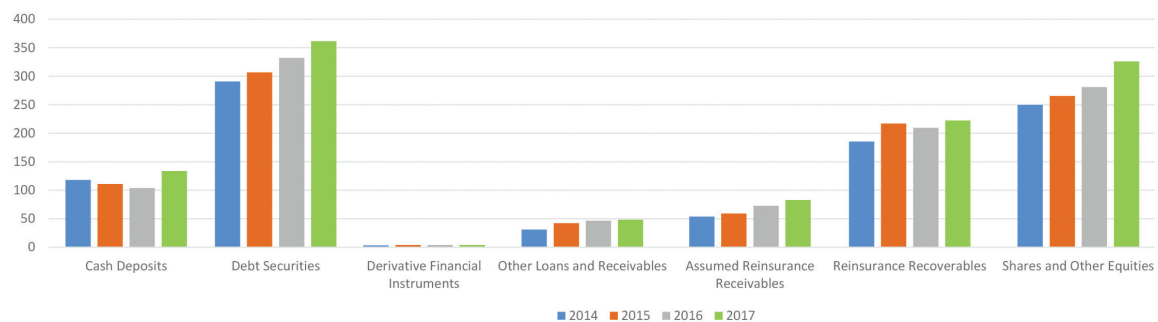

Source: 2018 IAIS survey

4.6 COUNTERPARTY LINKAGES AND EXPOSURES

In 2017, total counterparty exposure increased by 12% from USD 1,050 billion to USD 1,179 billion. Nevertheless, the general development is fairly stable. This growth was driven by an increase in debt securities (which constituted 31% of all counterparty exposures and amounted to USD 362 billion in 2017) as well as shares and other equity investments (which constituted 28% of all counterparty exposures and amounted to USD 326 billion in 2017).

Cash deposits, constituting 11% of all counterparty exposures, showed a 29% increase, while reinsurance recoverables, constituting 19% of all counterparty exposures, marginally increased by 6% from year-end 2016, peaking in the period observed (2014–2017).

Figure 4.6a: Counterparty exposure, year-end 2014–2017 (USD billions)

Source: 2018 IAIS survey

4.7 SUMMARY OF MAIN FINDINGS

Even though the reinsurance market was severely hit by the fallout from the numerous natural catastrophes in 2017, there was sufficient capacity that acted as a loss buffer. This largely explains why the combined ratio only marginally trended upwards compared with the loss levels. In addition, the survey shows how the reinsurance industry relies on retrocession as a tool to reduce and diversify risk.

Equity and fixed-income securities still remain the largest asset classes for investment in the reinsurance industry, while counterparty exposure continued to grow for the fourth year in a row. This may signal that reinsurers are looking across the financial markets for higher returns.

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1 In this document "insurer" means insurance legal entities, insurance groups and insurance-led financial conglomerates. When referring to "individual" insurers or institutions, this is to distinguish 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.

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19 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.

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23 This metric can be used as a proxy for the property and casualty market.

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28 The "technical rate" is the guaranteed rate of return for policyholders over the contract period. According to French law, insurers have to distribute at least 75% of their financial results to policyholders within eight years. This is not taken into account in calculating the technical rate.

29 The increase in costs in Germany can be primarily attributed to lapse risks, reinsurance business and costs charged for acquisition and administration. Between 2010 and 2015, gains significantly decreased due to the difference between forecasted administrative expense and realised figures.

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37 The notional amount of a derivative depends on its strike price, whereas the market value of a derivative changes based on how the market shifts. We use the notional amount instead of the market value to estimate amounts of derivatives and isolate changes in derivatives without factoring in market changes.

38 Note that this is a simplified version of the hedging problem. In practice, the insurer faces additional risks – for example, the risk of early withdrawal of annuities (not described here) might require more complex hedging strategies.

39 Note that while we have detailed information on the derivatives holdings, we cannot test the extent to which these hedges offset the liability risk because detailed data on liabilities (like minimum guaranteed rates for each policy) are not available.

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205 Subject to survey bias.

206 The jurisdictions are Japan, Luxembourg, Spain, Germany, Switzerland, France, the UK, Bermuda and the US.

207 The charts in this section use data gathered from the IAIS GRMS surveys conducted from 2003 to 2017. The 2010, 2012 and 2013 periods of the charts were estimated using historical and current reinsurance data of the large reinsurers surveyed and are denoted by an "e" and greyed out in all relevant figures.

208 The gearing ratio is the ratio between recoverables from reinsurance and retrocessions and total capital available.

209 When interpreting this figure, be mindful of the different conventions and expectations pertaining to the regulatory capital required.

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