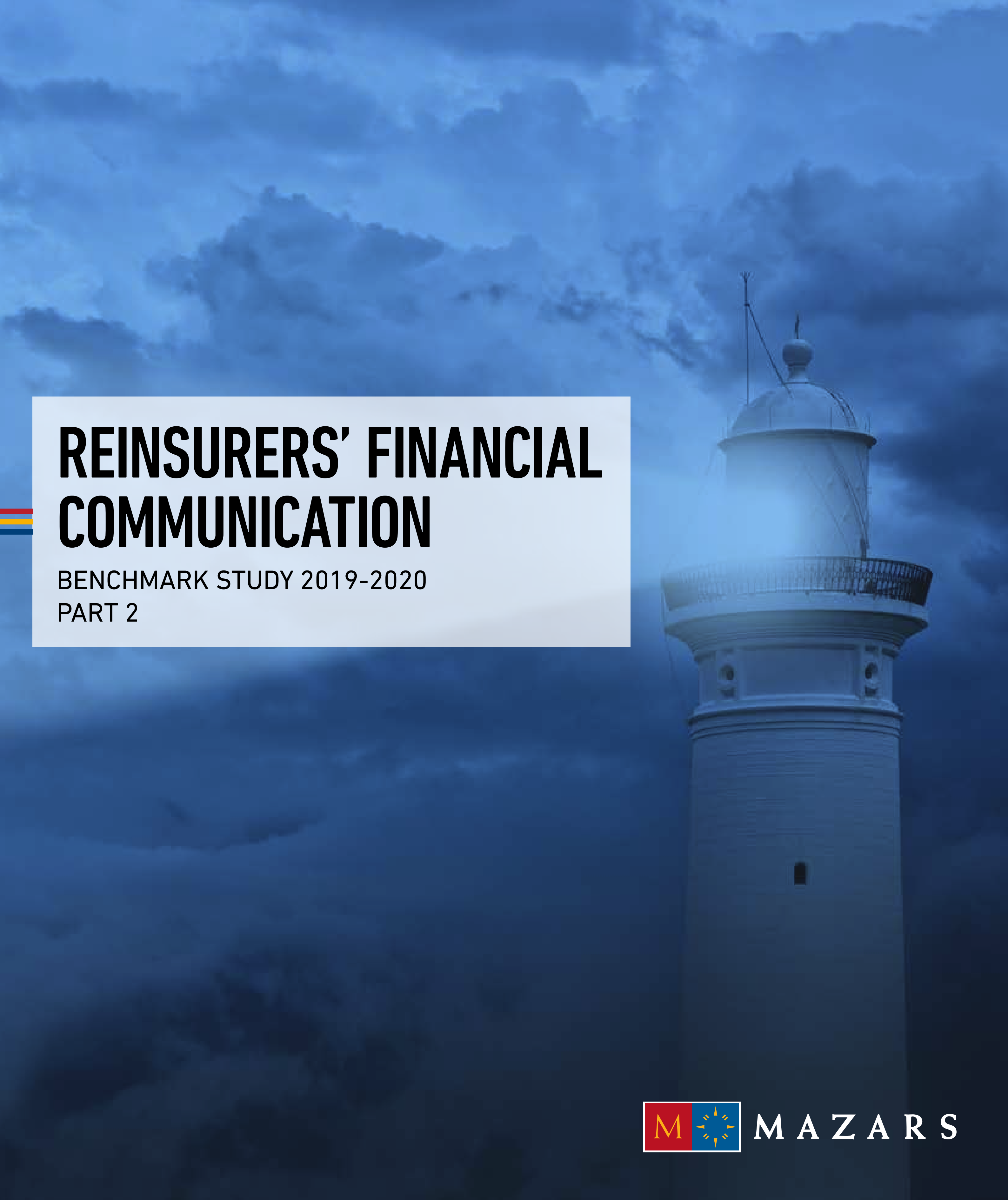
REINSURERS' FINANCIAL COMMUNICATION

BENCHMARK STUDY 2019-2020
PART 2



MAZARS

TABLE OF CONTENTS

INTRODUCTION

This is the second time we have published our two-fold benchmark study on Reinsurers' Financial Communication. Part I, published in September 2019, focuses on 2018 accounting disclosures, notably intangible assets and deferred acquisition costs. It also provides an overview of the tax environment and deferred taxes, plus an insight into the performance measurements used by the companies in our panel.

Part 2 focuses on the risk universe of selected companies based on the annual reports published for the year-end 2018. First, we address risk management disclosures and solvency II metrics. We then provide an overview of company-sponsored Insurance-Linked Securities (ILS) such as CAT/Mortality bonds.

This benchmark is published in the context of the COVID-19 crisis. This crisis will most likely have a major impact on the reinsurance market hence on the 2020 financial statements, the Solvency ratios and the modelling of pandemic risks. We will definitely address this topic in our future publications.

By analysing reinsurers' financial communication, we hope to shed light on the transparency of disclosures and provide relevant comparisons. The following page provides an executive summary of the benchmark study.

EXECUTIVE SUMMARY

Reinsurance, also known as the "insurers' insurance", plays a vital role in the global market economy. In recent years, the strengthening of capital requirements, along with the rise in significant natural catastrophe events and the demand for optimal coverage, are boosting the need for reinsurance. Based on the changing market landscape, reinsurers now propose a growing range of products that not only cover risks but also offer financial solutions, especially for life businesses. It is also common to sell specific packages to improve the capital management of ceding companies.

For the second consecutive year, Mazars' benchmark study gives the ability to compare key market performance indicators. While it proves that comparisons are possible to a large extent, we have identified areas where comparability cannot be fully achieved.

Financial communication is consistent and allows for comparisons overall

Reinsurance companies are transparent when it comes to financial disclosures with some differences when it comes to the granularity of the information provided. Disclosures made by companies using IFRS appear more comprehensive compared to US GAAP.

With Solvency II, significant standardized information is now public. All reinsurance groups in our panel show ratios significantly higher than the European Insurance and Occupational Pensions Authority (EIOPA) benchmark, which is a statement of their solid financial position. Except for one company, own funds are comprised of 85% to 100% Tier 1 funds.

As expected, the three main contributors to the solvency capital requirement (SCR) are the underwriting life & non-life risk, market risk and credit risk with a 59%, 29% and 8% average weight in the required capital before diversification.

Comparability has limits

When it comes to risk universe disclosures, interestingly, the average number of pages dedicated to this section is around 18, ranging from 3 pages up to 32 pages in some cases.

Risks are very diverse and highly correlated to the business underwritten and the geographical mix. From the 59 risks reported in our benchmark, only two risks are mentioned by all companies, namely the interest rate risk and the currency rate risk. With one exception, cyber risk is also identified by all companies as an emerging risk.

As for Insurance-Linked Securities (ILS), we note that six companies are reporting to be sponsors of CAT or Mortality bonds. However, the information disclosed in the annual reports is very heterogeneous, and comparison is not relevant.

In conclusion, this study confirms that most of the financial communication analyzed is transparent and allows for some interesting benchmarks, as illustrated in the following pages of this document. Companies in our panel show strong solvency as of 2018 year-end, despite several years of high claims activity. Notably, instances where comparisons are not possible are because of the business specifics of the selected companies. On the other hand, the risk disclosures could be harmonized for better market information. Considering the fast-changing nature of risks, and the introduction of new accounting standard IFRS 17, benchmarking financial communication should be of utmost interest to the reinsurance industry in the coming years. We hope that you enjoy reading our study.

1

The panel of reinsurers

As with Part 1 of our benchmark study, we have focused our attention on companies whose core business is reinsurance. We targeted the top 15 reinsurers in the world based on gross written premiums. From this list, we excluded one Asian and one Indian company (Korean Re and the General Insurance Corporation of India) and two holding companies (Great-West Lifeco and Transatlantic Holdings) due to comparability issues. Compared to Part 1 of our benchmark study, we excluded XL + Catlin due to its absorption by AXA, and we included China Re in the panel. We should mention that some reinsurers also have direct insurance business, like Munich Re (via ERGO Group), which were not excluded from this study as we present consolidated group figures.

From a pure information perspective, we have also included AXA and Allianz, later called "selected insurers", as we consider this information would allow a better understanding of the way reinsurers compare to regular insurers.

The benchmark study includes financial statements published in 2017 and 2018. Some figures are also disclosed for 2016. Below we present the key information in respect of their origins, the quotation market place, the share price for December 31st 2018 & 2017 and the accounting standards used for financial reporting purposes.

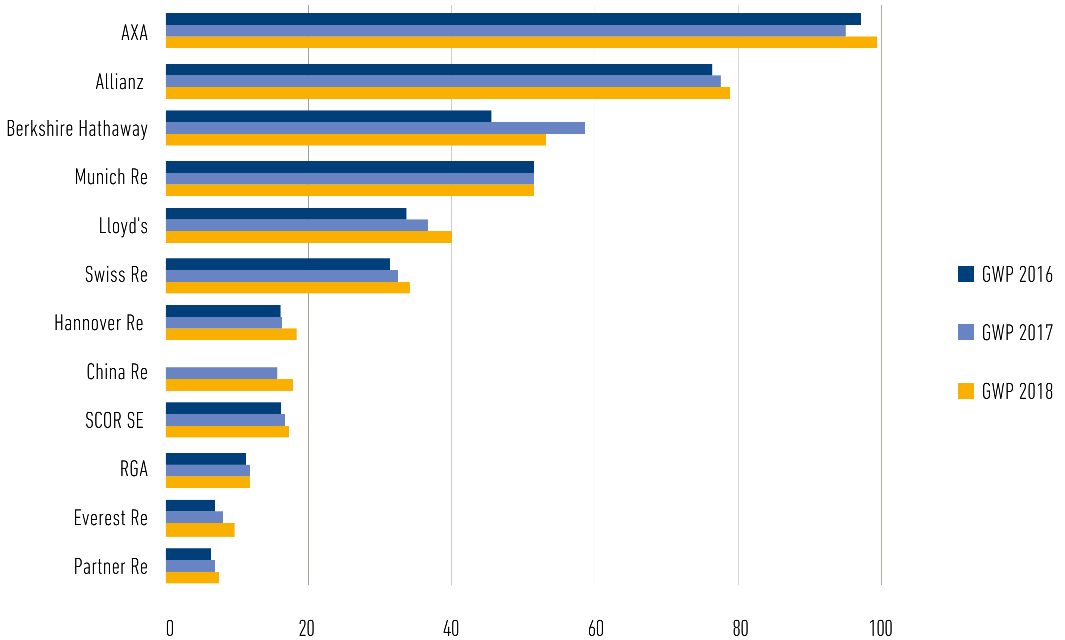
TABLE 1 - OVERVIEW AS AT 31/12/2018

	Munich Re	Hannover Re	Swiss Re	Berkshire Hathaway	RGA	Partner Re	Everest Re	Lloyd's	China Re	SCOR		AXA	Allianz
Country of origin:	Germany	Germany	Switzerland	USA	USA	USA	USA	UK	China	France		France	Deutschland
Listed company / Market	Xetra	Xetra	SIX Swiss Exchange	NYSE	NYSE	NYSE	NYSE	N/A	HKEX	Euronext		Euronext Paris	Xetra/NYSE
Accounting Standards	IFRS	IFRS	US GAAP	US GAAP	US GAAP	US GAAP	US GAAP	IFRS	IFRS	IFRS		IFRS	IFRS
Currency of the FS	EUR	EUR	USD	USD	USD	USD	USD	GBP	CNY	EUR		EUR	EUR
Share price 31/12/2018	190,55 €	117,70 €	CHF 90.12	A : $306k B : $202.08k	$140,23	$25,19	$214,90	N/A	HKD 1,6	39,40 €		18,86 €	175,14 €
Share price 31/12/2017	180,75 €	104,90 €	$93,63	A : $299.9k B : $197.57k	$155,93	$28.67	$221.26	N/A	N/A	33,55 €		24,74 €	191,50 €

To provide an overall picture of the size of the companies in our panel and to better understand the nature of business underwritten, we present below the evolution of Gross Written Premiums (GWP) between 2016 and 2018, and the split between life and non-life activities.

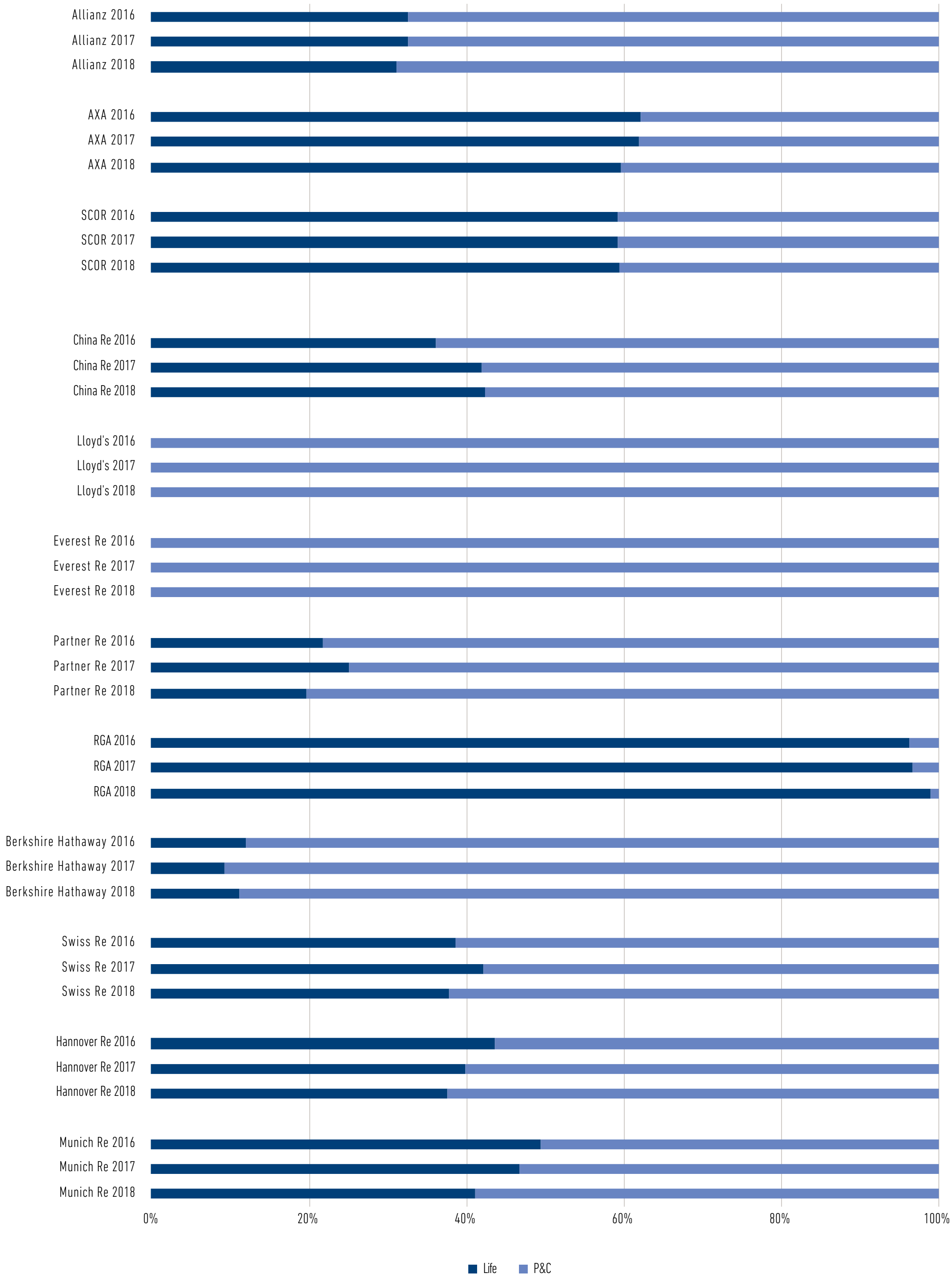
As can be seen from the analysis in Figure 1, the level of GWP remains fairly stable over the last three years. However, we note that all companies in our panel have seen their amount of GWP rise, with Berkshire Hathaway (-10% at current FX) as the only exception. The main increases come from Everest Re (+24%), Partner Re (+18%) and China Re (+18%).

FIGURE 1: EVOLUTION OF GWP BETWEEN 2016, 2017 AND 2018 (IN €BN)



Concerning the type of business underwritten, no major shifts are noted. With regard to mixed reinsurers, we see that they mainly concentrate on non-life business except for SCOR (60% life reinsurance), AXA (60% of life direct/assumed business) and RGA, which almost exclusively focuses on life products.

FIGURE 2: SPLIT OF GWP BETWEEN LIFE & P&C



A key factor when choosing a reinsurer is the rating, which is driven by the importance that ceding companies put on the financial strength of the other party. Furthermore, the credit risk of a reinsurer can also play a significant role for the ceding company in terms of the level of capital required for solvency purposes (SCR) imposed by local regulations, such as Solvency II in Europe. In brief, a higher rated reinsurer, e.g. A+, will reduce the amount of capital required due to a lower counterparty default risk compared to a B+ rated reinsurer. However, the ceding company will generally agree to pay a higher level of premium if it chooses a top- ranked reinsurer.

For this reason, the following table presents a summary of the main ratings as of 2018:

TABLE 2 - FINANCIAL STRENGTH RATES 2018

	Munich Re	Hannover Re	Swiss Re	Berkshire Hathaway	RGA	Partner Re	Everest Re	Lloyd's	China Re	SCOR	AXA	Allianz
A.M. Best	A+ (Superior)	A+ (Superior)	A+ (Superior)	A++ (Excellent)	A+ (Superior)	A (Excellent)	A+ (Superior)	A (Excellent)	A (Excellent)	A+ (Superior)		A+ (Superior)
Fitch	AA (Very strong)					A+ (Upper medium)		AA- (Very strong)		AA- (Very strong)	AA- (Very strong)	
Moody's	Aa3 (Excellent)		Aa3 (Excellent)	Aa2 (Stable)	A1 (Upper medium)	A1 (*) (Upper medium)	A1 (Upper medium)			Aa3 (Excellent)	Aa3 (Excellent)	Aa3 (Excellent)
S&P	AA- (Very Strong)	AA- (Very strong)	AA- (Very strong)	AA+ (Excellent)	AA- (Very strong)	A+ (Strong)	A+ (Strong)	A+ (Strong)	A (Upper medium)	AA- (Very strong)	AA- (Very strong)	AA (Very strong)

(*) Applies to Partner Reinsurance Company Ltd. And Partner Reinsurance Company of the U.S. Source: Annual reports 2018

As a reminder, the ratings in the 2017 annual reports were as follows:

TABLE 3 - FINANCIAL STRENGTH RATES 2017

	Munich Re	Hannover Re	Swiss Re	Berkshire Hathaway	RGA	Partner Re	Everest Re	Lloyd's	China Re	SCOR	AXA	Allianz
A.M. Best	A+ (Superior)	A+ (Superior)	A+ (Superior)	A++ (Excellent)	A+ (Superior)	A (Excellent)	A+ (Superior)	A (Excellent)	N/A	A+ (Superior)		A+ (Superior)
Fitch	AA (Very strong)					A+ (Upper medium)		AA- (Very strong)	N/A	AA- (Very strong)	AA- (Very strong)	
Moody's	Aa3 (Excellent)		Aa3 (Excellent)	Aa2 (Stable)	A1 (Upper medium)	A1 (*) (Upper medium)	A1 (Upper medium)		N/A	Aa3 (Excellent)	Aa3 (Excellent)	Aa3 (Excellent)
S&P	AA- (Very Strong)	AA- (Very strong)	AA- (Very strong)	AA+ (Excellent)	AA- (Very strong)	A+ (Strong)	A+ (Strong)	A+ (Strong)	N/A	AA- (Very strong)	AA- (Very strong)	AA (Very strong)

(*) Applies to Partner Reinsurance Company Ltd. And Partner Reinsurance Company of the U.S. Source: Annual reports 2017

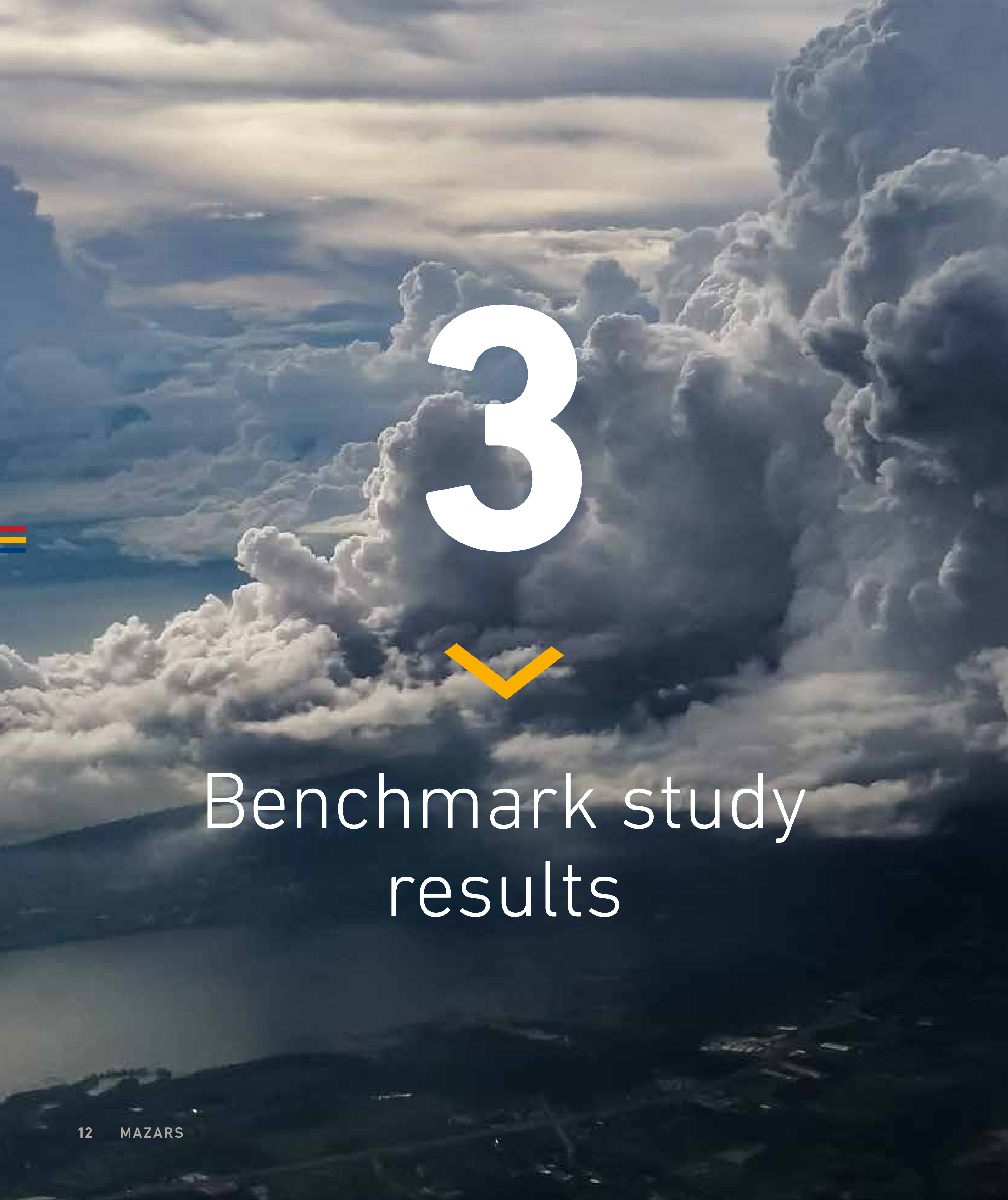
We note that ratings are quite consistent in the panel. The ratings strengthen the idea that these companies are comparable and can be studied via this benchmark study. We also note that the ratings have not evolved significantly since last year.

2

Purpose of Part 2 of our benchmark study

The purpose of Part 2 of our benchmark study is to; provide a comparative view of risk disclosures made. For this reason, we limit the study scope to the following areas:

- specific focus on the way reinsurance companies communicate on their risks
- Solvency II indicators: applicable only for companies in Europe and for European subsidiaries of non-EU based reinsurers.
- The study is limited to group/solo Solvency and Financial Condition Reports (SFCR) published in 2018 and 2019
- disclosures provided in respect of ILS issued/sponsored by reinsurance companies, given the increase of this specific market where the yields are considerably higher than traditional investments.



3

Benchmark study results

3.1. RISK UNIVERSE ANALYSIS

The insurance and reinsurance business is, by construction and by definition, based on risks and uncertainty. The companies in our panel face an ever-changing risk universe, and this risk universe is expanding as risks are developing and emerging following scientific progress and technological innovation. As such, we wanted to include in our benchmark an analysis of the disclosures made on the main risks identified in our panel's financial communications.

This section will follow the table of contents included in most of the financial communications and will revolve around four main risks categories[1]: Strategic, Underwriting, Market/Financial and Operational risks.

However, given issues such as the ongoing trade war between China and the United States, uncertainty over the impact of Brexit, volatility in the financial markets, an increase in cyber-attacks, and the implementation of the General Data Protection Regulation (GDPR) in Europe we also wanted to focus on two specific emerging risks - political and cyber risk.

As mentioned in our introduction, we estimate that the 2020 reinsurance market will be severely impacted by the COVID-19 outbreak. The main impacts will affect the technical result both on P&C and Life segments and also the financial results given the stock markets drops. Looking at our risk universe analysis, based on the 2018 annual reports, out of 12 companies in the panel, only 5 mention "pandemic risk" in their disclosures: Swiss Re, RGA, Partner Re, SCOR and AXA.

We will closely follow-up, in 2020, the disclosures made in respect of COVID-19 and will include these conclusions in our next publications.

It should be noted that most of the reinsurers' financial communications provide detailed information about their risk universe. Disclosures consist of an average of 18 pages of qualitative information, with some extreme variations such as three pages for Berkshire Hathaway, 32 pages for SCOR and 52 pages for AXA.

The table below summarizes the disclosures by the number of pages.

TABLE 4 - NUMBER OF PAGES ON RISK DESCRIPTION

	Munich Re	Hannover Re	Swiss Re	Berkshire Hathaway	RGA	Partner Re	Everest Re	Lloyd's	China Re	SCOR	AXA	Allianz
Number of pages	9	24	28	3	15	6	12	11	19	32	52	15

[1] The four risk categories were established by Mazars and may not follow the precise order presented in the annual reports

3.1.1. Strategic Risks

Strategic risks explained in reinsurers' financial communications include a focus on the core risks of inadequate decision-making and poor execution of the company's strategic objectives to also including external risks such as the global environment in which it operates. These external risks include future law and regulation changes, political risks, as well as relationships with key external parties.

The main categories of strategic risks (excluding political risks further developed below) identified in the different financial communications are presented in the following table:

TABLE 5 - STRATEGIC RISK OVERVIEW

Type of risk	Sub-category	Munich Re	Hannover Re	Swiss Re	Berkshire Hathaway	RGA	Partner Re	Everest Re	Lloyd's	China Re	SCOR	AXA	Allianz	Number of times the risks are mentionned
Strategic Risk	Legal and regulatory developments risks	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	11
	Tax reform (especially US Tax Reform)		✓			✓	✓	✓	✓					5
	Valuation of intangible assets and deferred tax assets risks					✓					✓			2
	Competitive environment risks	✓			✓	✓	✓	✓	✓		✓		✓	8
	Reputation Risk / Downgrade ratings risk	✓	✓	✓		✓	✓	✓		✓	✓	✓	✓	10
	Key people independance		✓		✓	✓		✓						4
	Risks related to capital (Solvency capital requirement)		✓				✓		✓	✓	✓			5
	Risks related to acquisitions					✓					✓			2

On average, the main strategic risks pointed out by the companies in our panel are the following:

— Legal and regulatory development risk (mentioned by all the reinsurers except for China Re)

— Reputation risk / Downgrade rating risk (mentioned by all the reinsurers in our panel except for Berkshire Hathaway and Lloyd's)

— Competitive environment risk (mentioned by 7 out of 10 companies).

3.1.2. Political Risks

The insurance and reinsurance sector is highly regulated throughout the world, and every company faces different challenges from their local regulators/authorities. For the companies in our panel, this is even more true as they are all international players who not limited by their respective borders. Thus, operations are subject to extensive laws and regulations that are administered and enforced by a wider range of different governmental and non-governmental self-regulatory authorities and associations in each of their respective jurisdictions.

The list of entities presenting specific information about their political risks is detailed below:

TABLE 6 - POLITICAL RISK OVERVIEW

Sub-category	Munich Re	Hannover Re	Swiss Re	Berkshire Hathaway	RGA	Partner Re	Everest Re	Lloyd's	China Re	SCOR	AXA	Allianz	Number of times the risks are mentionned
Political risks			✓		✓	✓		✓					4

Most of the reinsurers mentioned in the above table present very concise information about the political risks except for Partner Re.

For Partner Re, and quoting from their financial communication, the main areas of focus are the following:

"Recent government intervention and the possibility of future government intervention have created uncertainty in the insurance and reinsurance markets. Government regulators are generally concerned with the protection of policyholders to the exclusion of other interested parties, including shareholders and debt holders of reinsurers. We believe it is likely there will continue to be increased regulation of, and other forms of government participation in, our industry in the future, which could materially adversely affect our business by, among other things:

- *Providing reinsurance capacity in markets and to clients that we target or requiring our participation in industry pools and guaranty associations;*
- *Further restricting our operational or capital flexibility;*
- *Expanding the scope of coverage under existing policies;*
- *Regulating the terms of reinsurance policies;*
- *Adopting further or changing compliance requirements which may result in additional costs which may adversely impact our results of operation; or*
- *Disproportionately benefiting the companies domiciled in one country over those domiciled in another."*

3.1.3. Underwriting Risks

Insurance risks involve identifying, assessing and controlling risks the entities take through their underwriting activities, including related risks such as inflation or uncertainty in pricing and reserving.

Underwriting risk includes the risk that a policy will be written for too low a premium, provide inappropriate cover, or that the frequency or severity of insured events will be higher than expected. In other words, underwriting risk is the risk of insured losses being higher than the expectations of the entity.

The disclosures on these risks are very heterogenous and linked to the different types of portfolios underwritten. Everest Re and Lloyd's, for example, do not communicate (or barely) on risks related to the life business, whereas, RGA discloses little detail about specific P&C related risks.

But the differences are not limited to the P&C versus Life entities of our panel. The table below presents a detailed overview of the insurance and underwriting risks disclosed (either briefly or thoroughly) by the panel.

TABLE 7 - UNDERWRITING RISK OVERVIEW

Type of risk	Sub-category	Munich Re	Hannover Re	Swiss Re	Berkshire Hathaway	RGA	Partner Re	Everest Re	Lloyd's	China Re	SCOR	AXA	Allianz	Number of times the risks are mentionned
Underwriting Risk	Properties & Casualties													
	P&C long-tail Reserve deterioration			✓	✓			✓			✓		✓	5
	Property risks	✓	✓	✓	✓				✓	✓				6
	Credit and surety	✓					✓							2
	Natural and man-made catastrophes	✓		✓		✓	✓	✓	✓		✓	✓	✓	9
	Systemic crises										✓	✓		2
	Casualty risk	✓		✓	✓		✓		✓	✓				6
	Climate risks	✓	✓	✓		✓			✓					5
	Claims inflation			✓										1
	Terrorist risk					✓								1
	Biometric risk	✓											✓	2
	Life & Health													
	Long-term mortality deterioration										✓			1
	Mortality Risk	✓	✓	✓		✓			✓	✓		✓	✓	8
	Disability Risk												✓	1
	Income Protection			✓			✓							2
	Critical Illness			✓										1
	Longevity risk	✓	✓	✓		✓	✓				✓	✓	✓	8
	Morbidity Risk		✓			✓				✓	✓	✓	✓	6
	Pandemic Risk			✓		✓	✓				✓	✓		5
	Lapse Risk		✓	✓		✓				✓		✓		5
	Interdependence and accumulation risks between Areas of business		✓	✓							✓			3
	Cyclicality of the business										✓			1
	Concentration risk related to its broker										✓			1
	Expense Risk		✓											1
	Policyholder behavior risk	✓				✓	✓				✓	✓	✓	6
	Reserves risks	✓			✓				✓		✓	✓		5
	Retrocession and other risk mitigation techniques						✓				✓			2

As identified in the table above, the main risk explained by our panel in the Non-Life line of business is Natural and man-made catastrophes risk (mentioned by 7 out of 10 companies). Other main risks identified by our panel include Property (mentioned 6 times), Casualty (mentioned 6 times) and Climate (mentioned 5 times).

We also observe that some other specific risks such as Terrorist, Biometric, Systemic crises and claims inflation risks are the least detailed risks, as they are only mentioned once and by different reinsurers.

- On the life side, the main risks detailed by our panel are the following: Longevity risk (mentioned 6 times)
- Mortality risk (mentioned 6 times)

While most of the risks we identified in the financial communications of AXA and Allianz are usually mentioned by at least one other reinsurer, it should be noted that Disability risk is the only risk that is mentioned by a traditional insurer and not by any of the reinsurers in our panel.

3.1.4. Financial and Market Risks

Financial market risk is defined as the risk of a significant financial loss resulting from changes in financial market prices or rates, such as equity prices, interest rates, credit spreads, foreign exchange rates or real estate prices. Financial market risk typically originates from investment activities, underwriting activities for certain product segments, and the sensitivity of the economic value of liabilities to financial market movements. Credit risk is defined as the risk of a significant financial loss due to default or downgrade of a counterparty. Liquidity risk arises where there are insufficient funds to meet liabilities, particularly claims.

While the worldwide financial market results and economic conditions were generally favorable in 2018, there remains a variety of factors which could negatively impact economic growth and contribute to high levels of volatility in financial markets.

These factors include concerns over levels of economic growth; current market conditions, including asset valuations and volatility, that may lead to an abrupt and significant repricing in financial markets; the strengthening or weakening of foreign currencies, in particular the US Dollar against the Euro; the availability and cost of credit; the stability and solvency of certain financial institutions due to potential 'trade wars' and other governmental measures. Continuing concerns over certain sovereign debt issuers; inflation or deflation in certain markets; uncertainty regarding central bank intervention in the financial markets, adverse geopolitical events (including acts of terrorism or military conflicts); as well as recent political events in France, Germany, Italy and continuing political uncertainty in the United States. Geopolitical risks in various regions, including Russia, Ukraine, Latin America, Syria, Iraq or North Korea, have also contributed to increased economic and market uncertainty generally.

In addition, the ongoing low-interest rate environment continues to stimulate the inflow of alternative capital, which has been contributing to the current soft market.

As a result of the strong impact financial and market risks have on financial performance, they are a critical risk for almost every one of the entities in our panel. Depending on their respective exposures to specific financial and market risks, disclosures vary from one reinsurer to another. The risks presented in their financial communications are detailed below:

TABLE 8 - FINANCIAL RISK OVERVIEW

Type of risk	Sub-category	Munich Re	Hannover Re	Swiss Re	Berkshire Hathaway	RGA	Partner Re	Everest Re	Lloyd's	China Re	SCOR	AXA	Allianz	Number of times the risks are mentionned
Market Risk	Interest rate risk	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	12
	Credit spread risk		✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	10
	Commodity price risk				✓									1
	Equity Risk	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	11
	Inflation risk			✓										1
	Value of assets and liabilities	✓		✓										2
	Real Estate Risk	✓	✓	✓		✓	✓				✓		✓	7
	Currency Risk	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	12
Credit Risk	Credit risks related to cash and invested assets	✓				✓			✓		✓	✓	✓	6
	Credit risks related to derivate instruments	✓			✓							✓		3
	Credit risks related to reinsurance contracts										✓		✓	2
	Credits risks related to insurance contracts												✓	1
	Default Risk / Counterparty risk		✓	✓		✓	✓		✓	✓				6
	Migration Risk			✓										1
	Other credit risks (Highly Technical such as terrorism or nuclear)										✓			1
Liquidity risk	Liquidity Needs / Source of liquidity	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	10

An interesting fact is that Interest rate risk and currency risk are mentioned by all of the reinsurers and insurers in our panel.

Coming close is Equity risk (mentioned by 9 out of 10 reinsurers) and Credit spread risk (mentioned by 8 out of 10 reinsurers).

3.1.5. Operational Risks

We define operational risk as the risk of losses resulting from inadequate or failed internal processes, incidents caused by the actions of personnel or system malfunctions, or external events. This includes criminal acts committed by employees or third parties, insider trading, infringements of antitrust law, business interruptions, inaccurate processing of transactions, non-compliance with reporting obligations, and disagreements with business partners.

The details presented in the financial communications of our panel about operational risks are presented below:

TABLE 9 - OPERATIONAL RISK OVERVIEW														
Type of risk	Sub-category	Munich Re	Hannover Re	Swiss Re	Berkshire Hathaway	RGA	Partner Re	Everest Re	Lloyd's	China Re	SCOR	AXA	Allianz	Number of times the risks are mentionned
Operational risk	Business interruption		✓											1
	Fraud risk		✓	✓										2
	Culture risk			✓			✓							2
	Governance risk	✓		✓			✓							3
	Staff risk	✓	✓	✓	✓	✓	✓		✓		✓	✓		9
	Processes risk	✓	✓	✓		✓	✓		✓		✓	✓	✓	9
	External events risk (such as terrorist acts)	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	11

As identified in the table, the main areas of focus are the following:

- External events risk (mentioned by all the reinsurers except for China Re)
- Staff risk (mentioned by 8 out of 10 reinsurers)
- Processes risk (mentioned by 7 out of 10 companies).

3.1.6. Cyber Risks

It is estimated that an extreme cyber-attack could cost the same as hurricane Sandy. Existing reinsurance markets that support cyber are under careful watch for their growth and aggregations of exposures. Indeed, Regulatory authorities around the world have implemented or are considering a number of legislative changes or regulations concerning data protection and cybersecurity. An example is the General Data Protection Regulation (GDPR) which regulates data protection for all individuals within the EU, including foreign companies processing data held on EU residents.

All companies in our panel rely on technology in most areas of their businesses. A significant disruption or failure of their technology systems could result in safety failures, regulatory compliance failures, an inability to protect information and assets against unauthorized users, service interruptions, and other operational difficulties. Attacks perpetrated against their systems could result in loss of assets and critical information and expose them to costs and reputational damage.

As such, data security is of the utmost importance for the insurers and reinsurers in our panel, as shown below:

TABLE 10 - CYBER RISK OVERVIEW													
Sub-category	Munich Re	Hannover Re	Swiss Re	Berkshire Hathaway	RGA	Partner Re	Everest Re	Lloyd's	China Re	SCOR	AXA	Allianz	Number of times the risks are mentionned
Systems or facilities risk (such as Cyber Risks)	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	11

We can indeed point out that all the companies in our panel specifically mention cybersecurity in the risk factor sections of their financial communications (with the exception of China Re).

3.2. SOLVENCY II REPORTING

Solvency II indicators are essential in understanding the financial strength of (re)insurers and their risk management, which is why we focus on Solvency II disclosures. For the purpose of this section, we analyzed Solvency II group figures and, for non-EU companies, we have taken the solo disclosures of the subsidiary operating in Europe. The table below presents the subsidiaries and their contribution to the group premiums:

TABLE 11 - PRUDENTIAL DATA - SUBSIDIARIES CONTRIBUTION IN GROUP PREMIUMS (IN %)				
	Berkshire Hathaway	RGA	Partner Re	Everest Re
2018	0,8%	Not avail.	47,3%	3,0%
2017	0,6%	5,7%	53,8%	2,9%
2016	1,0%	7,1%	49,9%	2,6%
Evolution 2018 vs. 2017 (in bp)	0,2%	N/A	-6,4%	0,1%
Evolution 2017 vs. 2016 (in bp)	-0,4%	-1,3%	3,8%	0,3%

Our study is based on a comparison between 2018, 2017 and 2016 figures, except for RGA as the 2018 SFCR was not available at the time. For consistent analysis, we split the SII benchmark into three parts: EU group figures, EU subsidiaries of non-EU companies and two EU direct insurances companies.

We focus on five main items: firstly, we analyzed the overall disclosures made in respect of some items we considered to be key. We then looked at global SCR coverage and the breakdown of SCR per risk and, finally, the analysis of the quality of own funds.

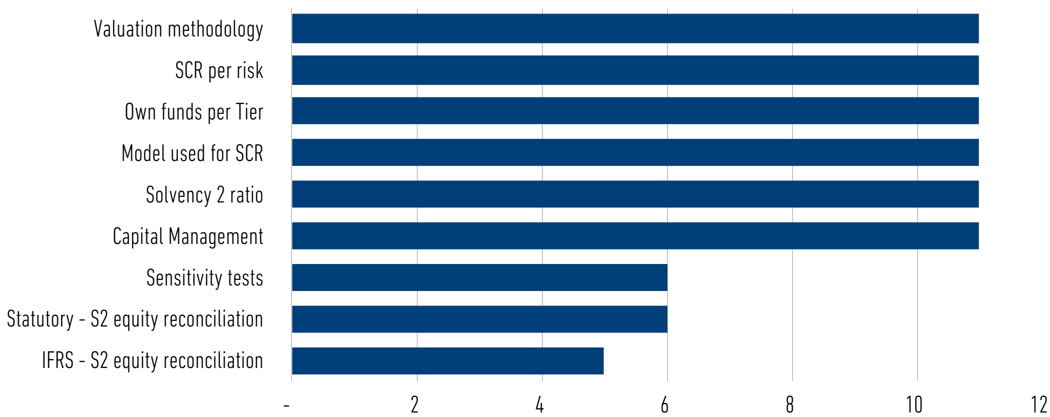
As disclosed in section "3.2.2 Solvency II ratio", based on the 2018 SFCR, European Reinsurance groups show a solid solvency ratio, above 200%. It will be interesting to see the impact of the COVID-19 outbreak over the 2019 and 2020 solvency ratio but also on the modelling of pandemic risks. It will be an area under scrutiny for our next publications.

3.2.1. Solvency II disclosures

Based on the eleven SFCRs published, we checked whether the key information was disclosed. Overall, information such as the valuation methodology, SCR per risk, own funds per Tier, capital management, the model used for SCR (standard formula or internal model) and the Solvency II ratio is disclosed by all the companies in the panel.

When it comes to the bridge from IFRS accounts to Solvency II, only five companies show the main restatements. Interestingly, six companies present the bridge from local GAAP and Solvency II.

FIGURE 3: DISCLOSURE OF SOLVENCY 2 INFORMATION (SAMPLE OF 11)



3.2.2. Solvency II ratio

Insurance and reinsurance companies communicate their solvency ratio as this has become a key indicator for their financial health and strength in covering bicentenary events. As a reminder, it is obtained by dividing the eligible own funds by the SCR. Insurers in Europe are required to maintain their Solvency Ratio, which should be at least 100%.

The table below summarizes the Solvency II ratio for each company in the panel and also the model used for the computation of SCR. For Lloyd’s, we have presented the Market Wide SCR (MWSCR) as it also includes the syndicates, which better represents the company’s risk profile. Should we only consider the Central SCR (CSCR) solvency ratio for Lloyd’s, it would stand at 215%.

TABLE 12.1 - PRUDENTIAL DATA IN 2017 - EUROPEAN REINSURANCE GROUPS					
€Bn	Munich Re	Hannover Re	Swiss Re Europe	Lloyd's MWSCR	SCOR SE
Coverage of SCR (%)	297%	267%	254%	144%	213%
SCR	14,4	4,5	0,9	19,1	4,3
Eligible Own Funds	42,6	12,1	2,3	27,5	9,2
SCR Model	Internal Model	Partial Internal Model	Internal Model	Internal Model	Internal Model

TABLE 12.2 - PRUDENTIAL DATA IN 2018 - EUROPEAN REINSURANCE GROUPS					
€Bn	Munich Re	Hannover Re	Swiss Re Europe	Lloyd's MWSCR	SCOR SE
Coverage of SCR (%)	295%	251%	315%	148%	215%
SCR	14,7	4,9	0,7	19,8	4,2
Eligible Own Funds	43,2	12,4	2,3	29,2	9,1
SCR Model	Internal Model	Partial Internal Model	Internal Model	Internal Model	Internal Model

TABLE 13.1 - PRUDENTIAL DATA IN 2017 - SUBSIDIARIES				
€Bn	Berkshire Hathaway	RGA	Partner Re	Everest Re
Coverage of SCR (%)	344%	140%	135%	195%
SCR	0,1	0,4	1,4	0,1
Eligible Own Funds	0,4	0,6	1,9	0,3
SCR Model	Standard Formula	Standard Formula	Standard Formula	Standard Formula

TABLE 13.2 - PRUDENTIAL DATA IN 2018 - SUBSIDIARIES				
€Bn	Berkshire Hathaway	RGA	Partner Re	Everest Re
Coverage of SCR (%)	369%	N/A	144%	170%
SCR	0,1	N/A	1,3	0,2
Eligible Own Funds	0,5	N/A	1,9	0,3
SCR Model	Standard Formula	N/A	Standard Formula	Standard Formula

TABLE 14.1 - PRUDENTIAL DATA 2017 - INSURANCE GROUPS		
€Bn	AXA	Allianz
Coverage of SCR (%)	205%	229%
SCR	28,2	33,3
Eligible Own Funds	57,8	76,4
SCR Model	Internal Model	Partial Internal Model

TABLE 14.2 - PRUDENTIAL DATA 2018 - INSURANCE GROUPS		
€Bn	AXA	Allianz
Coverage of SCR (%)	193%	229%
SCR	30,2	33,5
Eligible Own Funds	58,2	76,8
SCR Model	Internal Model	Partial Internal Model

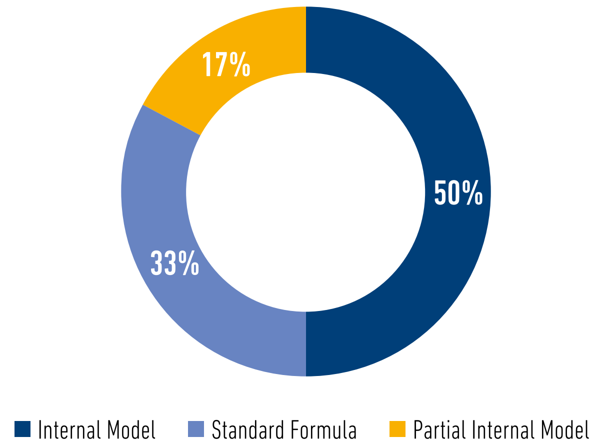
Considering the model itself, we notice that:

— European reinsurance groups use their own internal model except for Hannover Re which uses a partial internal model (operational risk is on standard formula);

— Subsidiaries of non-European groups use standard formula as they only fulfill Solvency II requirements for local reporting purposes to the regulator.

— AXA and Allianz have their own internal model. Allianz uses a partial internal model as the group SCR is emerging from entities either using a full internal model or the standard formula.

FIGURE 4: SCR COMPUTATION MODEL USED



For the European reinsurance groups, SCR in 2018 stands between 148% (Lloyd's MWSCR) and 315% (Swiss Re) with the average solvency ratio for reinsurance groups 217%, in line with the level noticed in 2017.

For subsidiaries of non-European groups, except for Berkshire Hathaway, SCR is significantly lower since there is no direct interest in having a high level of eligible own funds in the country. The average ratio of these companies stands at 163% in 2018 (vs. 153% in 2017).

AXA and Allianz present coverage ratios in 2018 of 193% (vs. 205% in 2017) and 229% (consistent with 2017) respectively.

It is also interesting to compare these solvency ratios with the figures provided by EIOPA. Based on this, we note that globally reinsurance groups are largely above the 160% solvency ratio. For the EU subsidiaries, the ratio for some companies is lower than the average 210% benchmark ratio regarding the capital management of non-EU groups.

FIGURE 5: SOLVENCY II RATIO FOR 2018 VS 2017 VS 2016

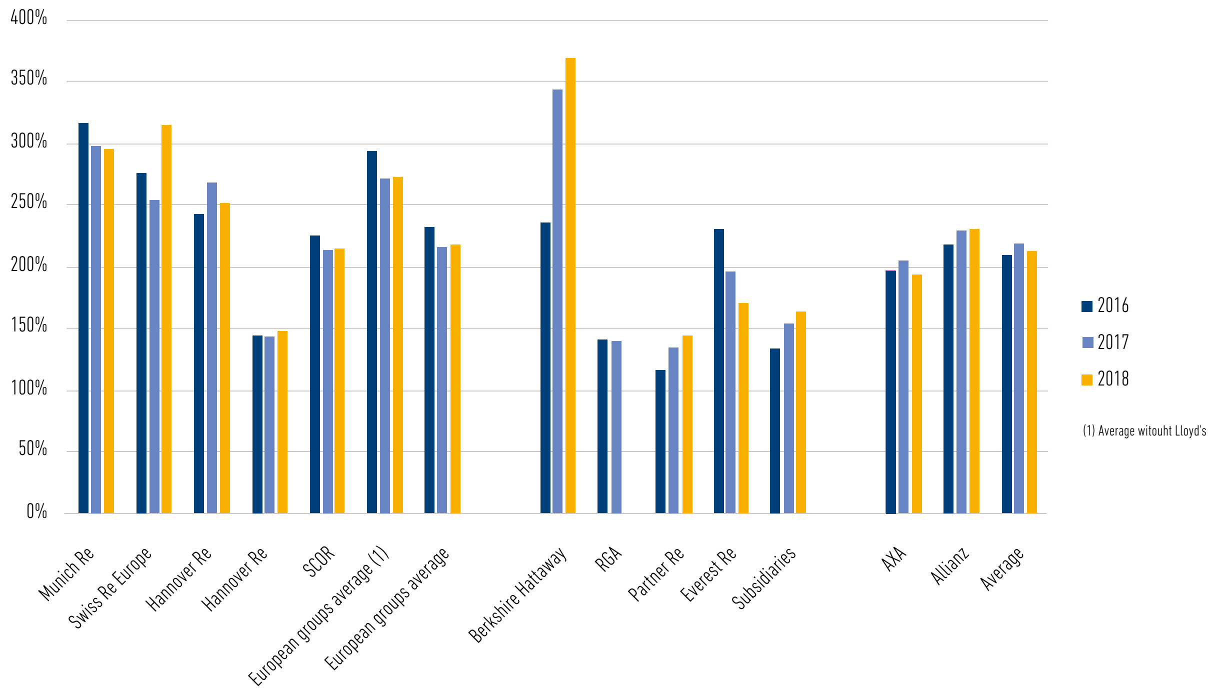
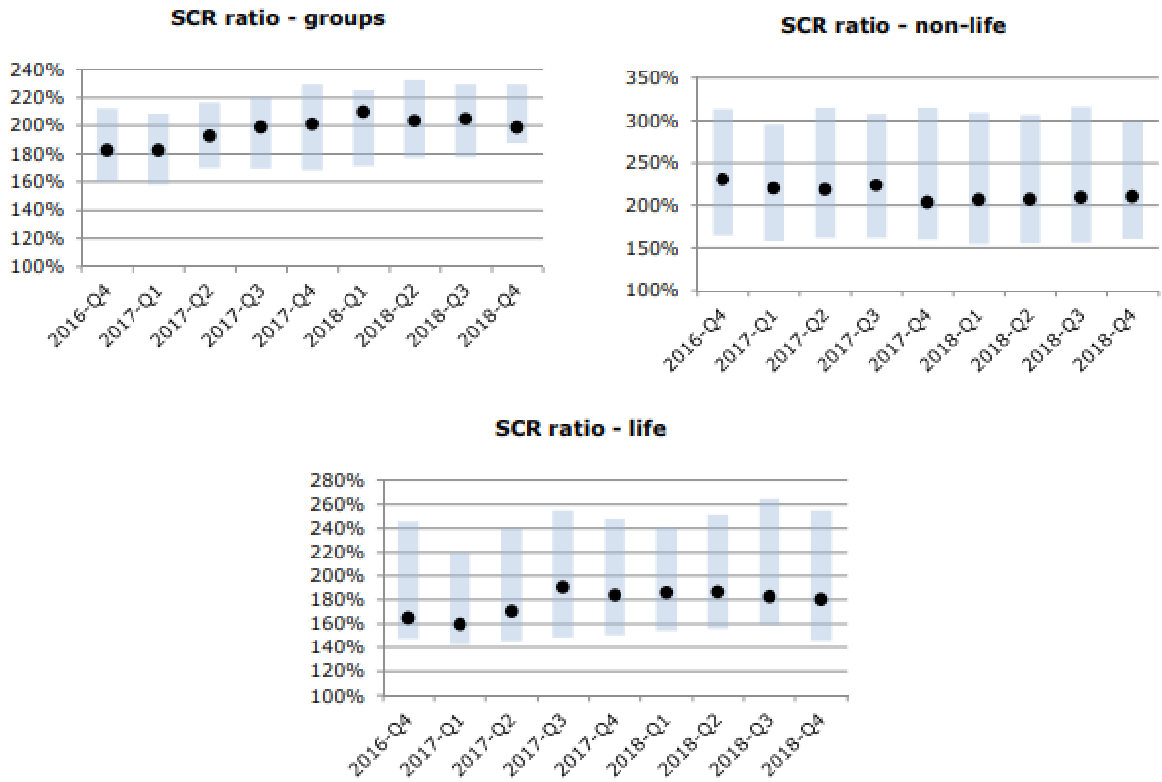


FIGURE 6: EIOPA SOLVENCY II RATIO BENCHMARK



Source: EIOPA – Risk Dashboard under Solvency II

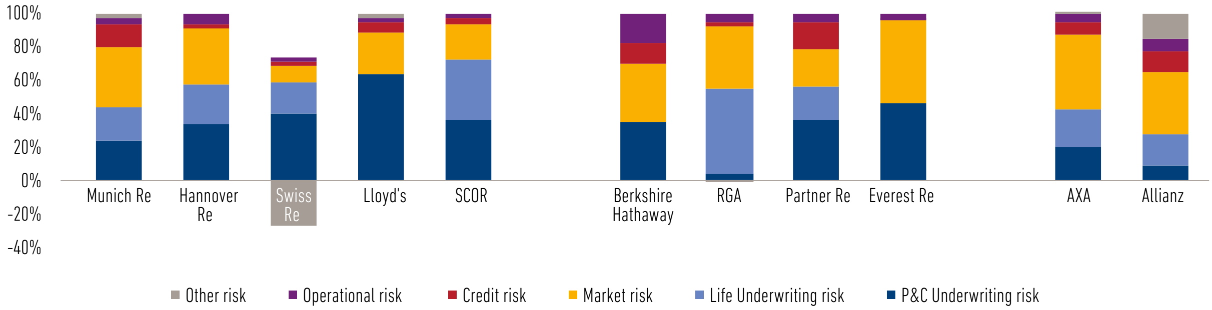
We observe that the level of SCR ratio is higher for non-life business than for life business. This assessment could explain the relatively lower level of coverage of SCR for companies more involved in life business such as RGA, SCOR and AXA, in comparison with their direct competitors.

3.2.3. SCR breakdown and analysis

We analyzed the composition of SCR for each company included in the benchmark study. On average for reinsurance groups, 96% of the required capital before diversification is composed of three risks; first, the underwriting life & non-life risk (59%), followed by market risk (29%) and credit risk (8%). For reinsurance subsidiaries, 94% of SCR is composed of the three risks already mentioned with similar contributions.

If we look at selected insurers, the contribution of underwriting, market and credit risk stands at 77% for Allianz and 94% for AXA. Figure 7.1 shows the contribution of each risk in SCR before diversification.

FIGURE 7.1: 2017 SCR BREAKDOWN BY RISK

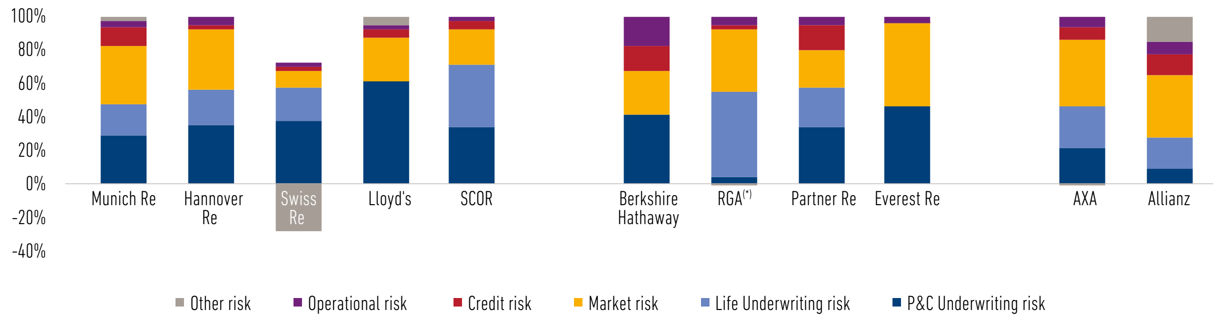


The breakdown of the 2017 SCR before/after diversification is presented in the table below:

TABLE 15.1 - 2017 SCR BREAKDOWN PER RISK

	European reinsurance groups					Non-European subsidiaries				European Insur. groups	
€Bn	Munich Re	Hannover Re	Swiss Re	Lloyd's	SCOR	Berkshire Hathaway	RGA	Partner Re	Everest Re	AXA	Allianz
P&C Underwriting risk	6,3	3,3	2,4	18,7	3,2	0,1	0,0	0,7	0,1	7,4	5,2
Life Underwriting risk	4,9	2,4	1,1	0,2	3,2	-	0,3	0,4	-	8,4	10,4
Market risk	9,2	3,3	0,6	7,3	1,9	0,1	0,2	0,5	0,1	16,4	21,4
Credit risk	3,4	0,3	0,2	1,8	0,4	0,0	0,0	0,3	0,0	2,9	6,4
Operational risk	1,2	0,6	0,1	0,8	0,3	0,0	0,0	0,1	0,0	2,1	4,4
Other risk	0,7	-	(1,6)	0,9			(0,0)	-	-	0,0	8,8
Required capital before diversification	25,8	9,8	2,7	29,7	9,0	0,2	0,6	2,0	0,2	37,2	56,6
Diversification	(9,1)	(3,6)	(1,7)	(10,6)	(4,2)	(0,0)	(0,1)	(0,6)	(0,0)	(10,9)	(17,7)
Diversification risk % of SCR	35%	36%	63%	36%	47%	20%	22%	32%	21%	29%	31%
Other SCR impact										4,7	
Deferred taxes impact	(2,3)	(1,7)	(0,1)	-	(0,4)	-	(0,0)	(0,0)	-	(2,7)	(5,6)
Total SCR	14,4	4,5	0,9	19,1	4,3	0,1	0,4	1,4	0,1	28,2	33,3
Operational risk % of SCR before diversification	5%	6%	4%	3%	3%	18%	5%	6%	4%	6%	8%
Coverage of SCR	297%	267%	254%	144%	213%	344%	140%	135%	195%	205%	229%

FIGURE 7.2: 2018 SCR BREAKDOWN BY RISK



The breakdown of the 2018 SCR before/after diversification is presented in the table below:

TABLE 15.2 - 2018 SCR BREAKDOWN PER RISK

	European reinsurance groups					Non-European subsidiaries				European Insur. groups	
€Bn	Munich Re	Hannover Re	Swiss Re	Lloyd's	SCOR	Berkshire Hathaway	RGA	Partner Re	Everest Re	AXA	Allianz
P&C Underwriting risk	7,6	3,6	2,1	18,6	3,2	0,1	0,0	0,7	0,1	7,3	5,2
Life Underwriting risk	5,3	2,2	1,1	0,2	3,4		0,3	0,5	-	8,4	10,4
Market risk	9,2	3,6	0,6	7,8	2,0	0,0	0,2	0,5	0,1	13,5	21,4
Credit risk	3,2	0,3	0,2	1,6	0,5	0,0	0,0	0,3	0,0	2,4	6,4
Operational risk	1,1	0,6	0,1	0,9	0,2	0,0	0,0	0,1	0,0	2,0	4,4
Other risk	0,7		(1,6)	1,7			(0,0)	-	-	(0,2)	8,8
Required capital before diversification	27,0	10,4	2,5	30,7	9,4	0,2	0,6	2,0	0,2	33,5	56,6
Diversification	(9,9)	(3,5)	(1,6)	(10,9)	(4,7)	(0,0)	(0,1)	(0,6)	(0,0)	(10,4)	(17,7)
Diversification risk % of SCR	37%	34%	66%	36%	50%	20%	22%	32%	18%	31%	31%
Other SCR impact										9,2	
Deferred taxes impact	(2,4)	(1,9)	(0,1)		(0,5)	-	(0,0)	(0,0)	-	(2,2)	(5,6)
Total SCR	14,7	4,9	0,7	19,8	4,2	0,1	0,4	1,3	0,2	30,2	33,5
Operational risk % of SCR before diversification	4%	5%	5%	3%	3%	18%	5%	6%	4%	6%	8%
Coverage of SCR	295%	251%	315%	148%	215%	369%	140%	144%	170%	193%	229%

Based on this analysis and the panel of eleven companies[2], we highlight the following:

- Eight companies for which the top three risks represent more than 90% of the required capital before diversification;
- Two companies for which the underwriting risk represents more than 65% of the composition of the required capital before diversification, namely SCOR (71% in 2018 and 72% in 2017) and Swiss Re (79% in 2018 and 80% in 2017);

[2] China Re does not disclose any information regarding Solvency II.

— Five companies for which market risk has the largest contribution in the required capital before diversification in 2017 and 2018, Allianz (38% in 2018 in line with 2017), AXA (40% in 2018 vs. 44% in 2017), Everest Re (49% in 2018 in line with 2017), Hannover Re (35% in 2018 vs. 33% in 2017) and Munich Re (34% in 2018 vs. 36% in 2017).

— For Swiss Re, we see a negative contribution from "other risks" explained by the internal operations restated from the group figures.

If we focus on the percentage of 2018 and 2017 diversification risk of SCR, globally the panel average stands at 38% for European reinsurance groups, 29% for subsidiaries of non-European groups and 31% for AXA (vs. 29% in 2017) and Allianz.

We note that diversification is particularly important for Swiss Re and SCOR with 63% and 47% respectively, which is mainly explained by portfolio mix and geographical diversification.

FIGURE 8.1: 2017 DIVERSIFICATION % OF SCR

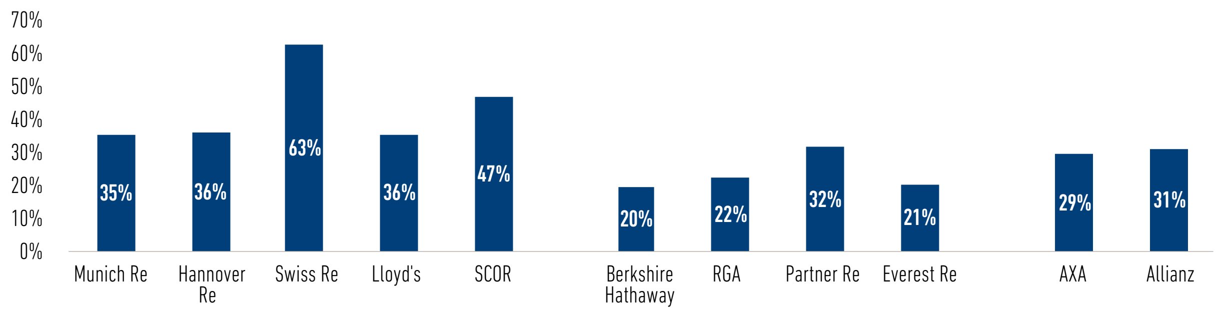
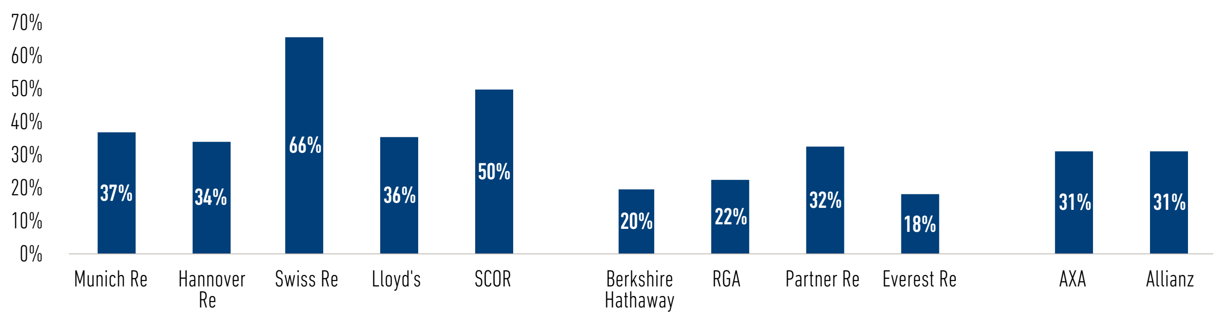


FIGURE 8.2: 2018 DIVERSIFICATION % OF SCR



In respect of the operational risk, the average contribution of SCR before diversification is:

- 6% in 2018 (vs. 7% in 2017) for the European reinsurance groups: ranging from 3% for Lloyd's in 2018 (stable compared to 2017) to 5% in 2018 (vs. 6% in 2017) for Hannover Re;
- for 2017 and 2018: 9% for the non-European groups' subsidiaries with Everest Re showing a 4% contribution and Berkshire Hathaway 18%;
- 6% and 8% respectively for AXA and Allianz in both 2017 and 2018.

FIGURE 9.1: 2017 OPERATIONAL RISK % OF SCR

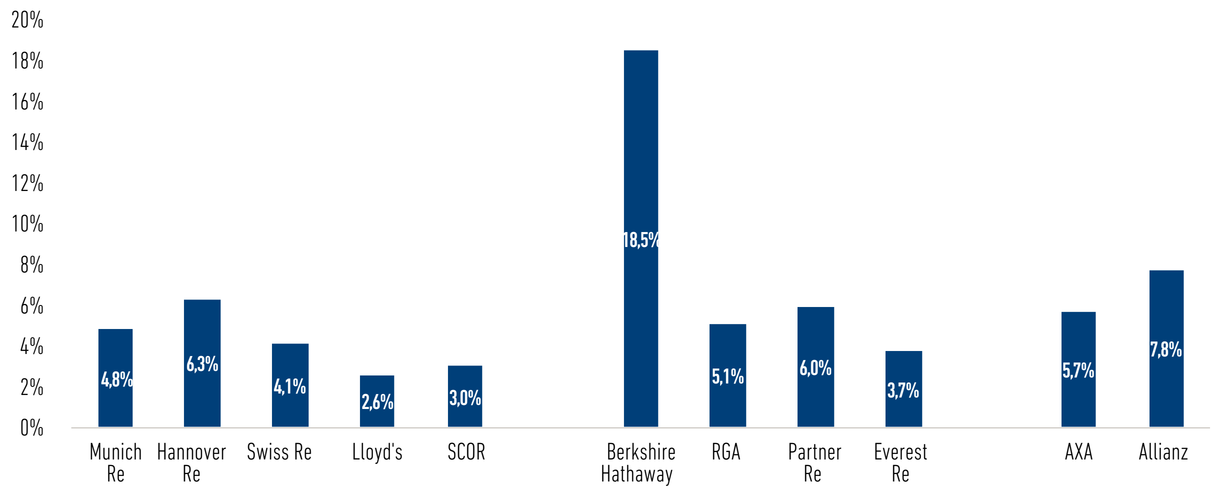
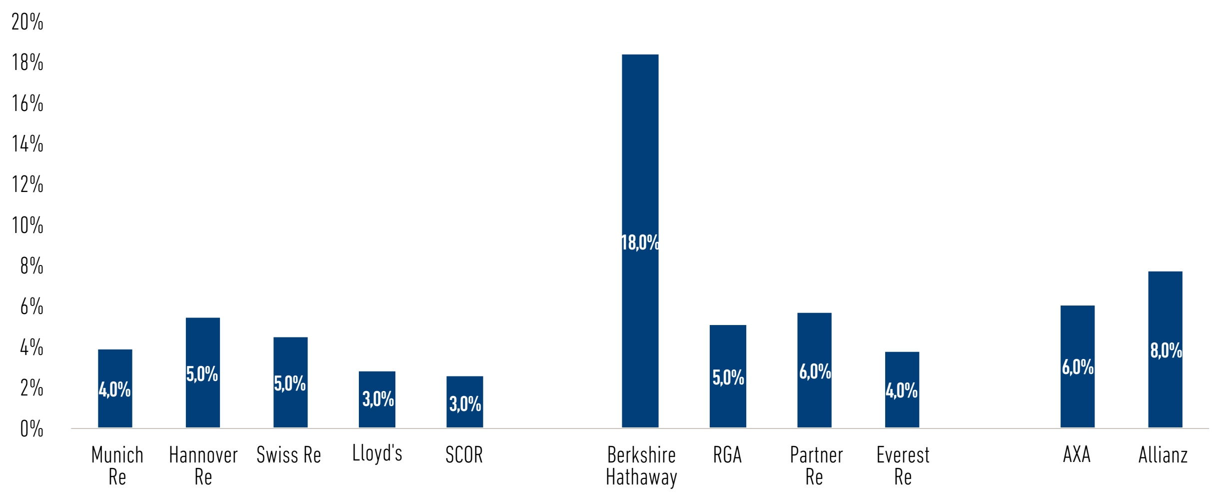


FIGURE 9.2: 2018 OPERATIONAL RISK % OF SCR



3.2.4. Own funds analysis

This information is important as rating agencies closely monitor the quality of own funds. As a reminder, SCR must have a minimum of 50% Tier 1 capital and can be funded by up to 50% with Tier 2 or a combination of Tier 2 and Tier 3 capital. The tiering of own funds for each company in the panel is presented below:

FIGURE 10.1: 2017 OWN FUNDS BREAKDOWN

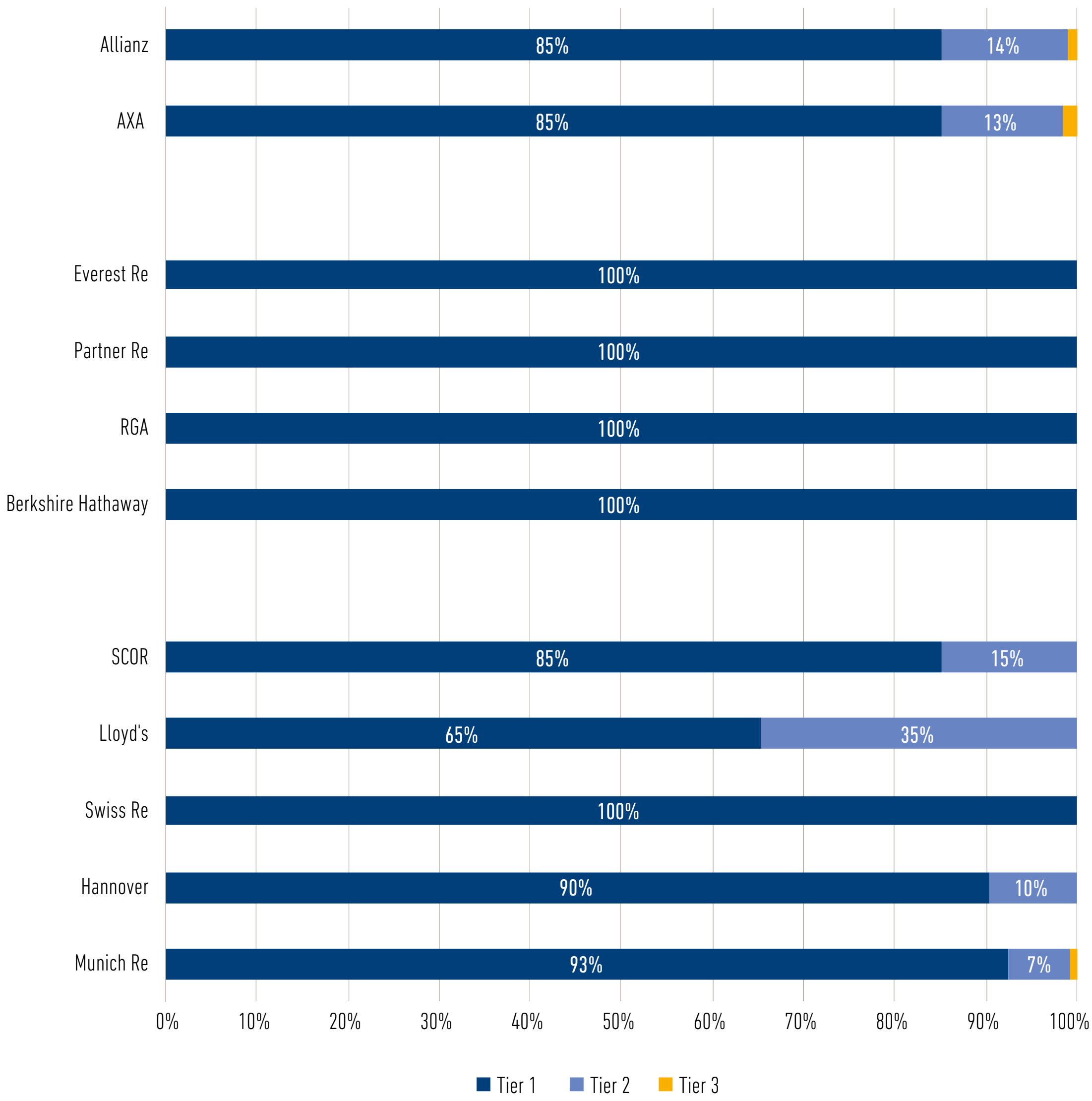
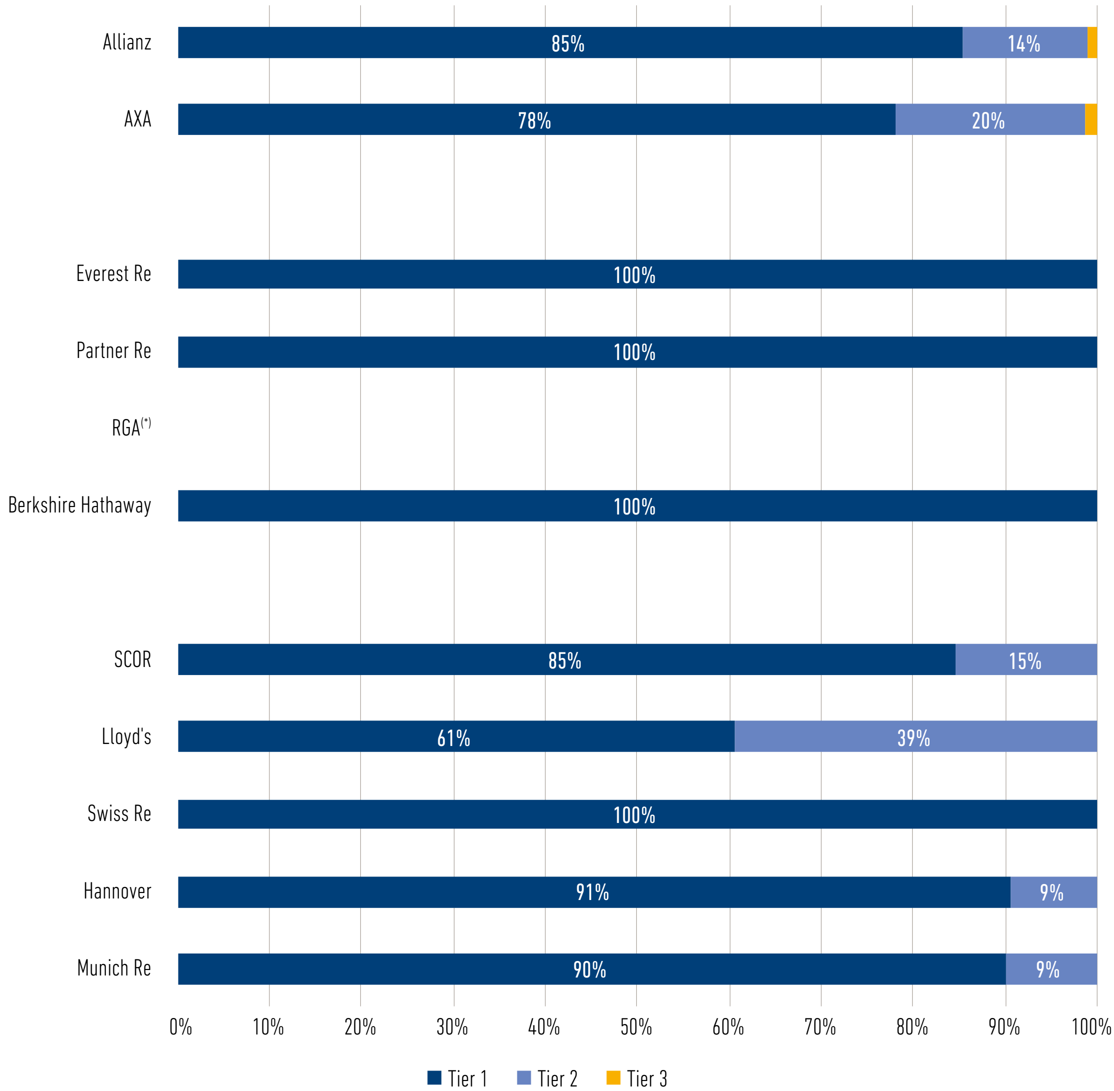


FIGURE 10.2: 2018 OWN FUNDS BREAKDOWN



(*) Not avaible for 2018.

Concerning European reinsurance groups, except for Lloyd’s, contribution of Tier 1 own funds is between 85% for SCOR to 100% for Swiss Re. For subsidiaries of non-EU groups, all companies have exclusively Tier 1 own funds.

Concerning Lloyd's, Tier 1 represents 65% of the total amount of own funds, the remaining 35% being Tier 2 and corresponds to letters of credit and guarantees provided by credit institutions which are held in trust independently for the benefit of insurance creditors.

For AXA we note a decrease of €3.8bn of TIER 1 eligible own funds (unrestricted and restricted) which stand at € 45.4bn in 2018 (78% of the eligible own funds) vs. € 49.2bn in 2017 (85% of the total eligible own funds) driven by XL unrestricted TIER 1 contribution, unfavorable economic variance, dividend payment and reimbursement of undated debt.

3.3. INSURANCE-LINKED SECURITIES (ILS)

As a reminder, insurance-linked securities are mostly financial instruments for which the value is linked to non-financial risks such as natural catastrophes, longevity or mortality. To issue an ILS, the sponsor (such as the reinsurers included in our panel) creates a special purpose vehicle (SPV) that issues the individual bond notes to capital market investors. Unlike a corporate bond, the capital contributed by investors is held by the SPV in low-risk securities and not on the sponsor's balance sheet. The coupon that is paid to investors is made up of the return on these low-risk investments and the premiums paid[3] to the SPV by the sponsor.

Quoting from Hannover Re's 2018 annual report which offers a comprehensive view on the ILS market, demand on the capital market for insurance and reinsurance risks essentially remains strong, particularly due to the diversifying nature of such investments. The worldwide volume of newly issued catastrophe bonds was again in the range of USD 11 billion in 2018, and the entire ILS market reached a volume of USD 95 billion. Investors have not lost faith in the ILS market, despite taking a hit from various loss events in recent years.

The table below provides the reader with information about the issuance of such instruments for each company in our panel.

[3] In most of the cases the sponsor is linked to the SPV via a reinsurance contract in which the premium paid matches the coupons paid by the SPV to investors

TABLE 16 - CAT / MORTALITY BONDS	Munich Re	Hannover Re	Swiss Re	Berkshire Hathaway	RGA	Partner Re	Everest Re	Lloyd's	China Re	SCOR	AXA	Allianz
Use of Cat / Mortality bonds	✓	✓	✓	×	×	✓	✓	×	×	✓	✓	×
Number of Cat / Mortality bonds issued	×	×	×	×	×	3	5	×	×	3	×	×
Total value of the Cat / Mortality bonds issued (mUSD)	×	×	462	×	×	×	2 900	×	×	750	×	×
Disclosure of accounting treatment	✓	×	×	×	×	×	×	×	×	✓	×	×
Cat / Mortality bonds under IAS 39	×	×	×	×	×	×	×	×	×	2	×	×
Cat / Mortality bonds under IFRS 4	✓	×	×	×	×	×	×	×	×	1	×	×
Type of risks covered (P&C / Life risks)	P&C	P&C	P&C & Life	×	×	Life	P&C	×	×	P&C	×	×
Underlying risks covered	Cat Nat	Property, Cat, Aviation and Marine	×	×	×	Longevity, Pandemic, Weather index	Nat Cat	×	×	Nat Cat	×	×
ILS issued in 2018	Eden Re II Ltd.	K Cession	×	×	×	×	Kilimandjaro Re 2018 Series 1 & 2	×	×	Atlas Capital UK 2018	×	×
Value of the 2018 ILS (mUSD)	300,0	600,0	×	×	×	×	525,0	×	×	300,0	×	×

According to their annual reports, we note that six reinsurers declare that they use Insurance-linked securities. However, the disclosures are not homogenous, since Everest Re and SCOR provided a full set of information on ILS, whereas Hannover Re only discloses information for those issued in 2018. Based solely on the information provided in the annual reports, Everest Re, SCOR and Partner Re disclose the number of ILS that they are sponsoring. Finally, we note that SCOR is the only reinsurer in our panel to provide information when it comes to accounting classification of each of the ILS issued.

To challenge information provided in the annual reports and to have a better view of what is made on the ILS market, we also took into account additional information provided by the website Artemis.bm. The following table presents further information on the use of this alternative reinsurance solution and the number of ILS issued.

TABLE 17 - CAT / MORTALITY BONDS	Munich Re	Hannover Re	Swiss Re	Berkshire Hathaway	RGA	Partner Re	Everest Re	Lloyd's	China Re	SCOR	AXA	Allianz
Use of Cat / Mortality bonds	✓	✓	✓	×	✓	×	✓	×	×	✓	✓	✓
Number of Cat / Mortality bonds issued	1	2	2	×	1	×	5	×	×	3	4	2

On analysis, we found the information is consistent with annual reports except for RGA and Allianz, which are reported as sponsors of ILS. In contrast, it is are not mentioned in their annual reports.

Appendix

APPENDIX 1: FX RATES USED

EUR exchange rates 2018		
in EUR	Closing 31/12/2018	Average 2018
USD	0,87	0,88
GBP	1,12	1,11
CHF	0,89	0,89
CNY	0,13	0,13

Source : the Banque de France – as of 31/12/2018

APPENDIX 2: GLOSSARY

Abbreviation	Explanation
APAC	Asia, Pacific, Asutralia namely: Australia, China, Hong Kong, India, Japan, Malaysia, New Zealand, Singapore, South Korea, Taiwan
BEAT	Base erosion anti-abuse tax
BN	Billion
BS	Balance Sheet
CSCR	Central SCR
DAC	Deferred acquisition cost
DTA	Deferred Tax Assets
EMEA	Europe, Middle East and Africa
EU	European Union
FX	Foreign Exchange
GAAP	General Accepted Accounting Principles
Geo.	Geographical
GW	Goodwill
GWP	Gross Written Premiums
IFRS	International Financial Reporting Standards
ILS	Insurance-Linked Securities
LAT	Liability Adequacy Test
LoB	Line of business
MWSCR	Market Wide SCR
NAT CAT	Natural Catastrophe
ROE	Return on Equity

Abbreviation	Explanation
SCR	Solvency Capital Requirement
SFCR	Solvency and Financial Condition Report
SII	Solvency II
SPV	Special Purpose Vehicle
TLCF	Tax losses carried forward
UPR	Unearned Premium Reserve
US	United States
US & LA	United States and Latin America
VOBA	Value of business acquired

NB : Please note that due to rounding of figures presented in some tables, the totals might not perfectly match the sum of the different lines.

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