Swiss Re

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The benefit of global diversification: how reinsurers create value and manage risk

Executive summary

Reinsurance is insurance for insurers.

Reinsurance is one of the main risk and capital management tools available to primary insurance companies. However, it is not well known outside the insurance sector. This paper explains the essentials of reinsurance in terms understandable to a broad audience. It describes the principles of life and non-life reinsurance, why insurers benefit from buying reinsurance cover, and how reinsurers deal with risk. It focuses on the benefits to society that reinsurers provide through their ability to diversify across risks and geographies, and concludes with an overview of the general framework needed for reinsurance to function efficiently.

Reinsurance supports the financial resilience of society.

Reinsurance provides insurance to insurers. Insurers buy reinsurance for risks they cannot or do not wish to retain fully themselves. Reinsurers help the insurance industry provide protection for a wide range of risks, including the largest and most complex risks covered by the insurance system. Insurers also benefit from the capital relief that reinsurance provides and from reinsurers' product development skills and risk expertise. In sum, reinsurance makes insurance more secure and less expensive. This ultimately benefits policyholders, who can access risk protection at a lower cost, thus supporting the financial resilience of society

Reinsurers promise to pay on future claims, and manage their risks and capital accordingly.

As with insurance, reinsurance is a promise to pay possible future claims in return for receipt of a premium today. The payment goes to insurance companies to pass on to their customers. Reinsurers apply sophisticated risk management processes to ensure that this promise can be honoured. These processes – including risk monitoring and modelling – guarantee that the capital base and the risks assumed are aligned.

Reinsurers generally have a high credit rating and rarely fail.

Reinsurers generally have a highly-rated capital base: the majority of reinsurers are rated at least single 'A+' by Standard & Poor's, and there have only ever been a few reinsurer bankruptcies. Even when a reinsurer fails, it is an orderly process in which a very high proportion of outstanding obligations are still met. An additional aspect is that ceding insurers pool their risks with several reinsurers, lowering the impact that a single reinsurer's insolvency could have on their own survival.

Reinsurance is a global business that relies on diversification of risks across products and geographies.

Reinsurance is a global business deploying capital across geographic boundaries and lines of business. For reinsurance to work effectively, a reliable legal system that is secure and honours contracts robustly is required. So too is a balanced regulatory framework giving reinsurers market access, allowing free movement of risk and capital, and capital requirement rules that recognise reinsurers' broad diversification across lines of business and geographies, and also their superior risk management capabilities. International diversification allows re/insurers to provide the same amount of security with less capital, making re/insurance more affordable and more widely used, and it should be retained in resolution planning.

What are the essentials of reinsurance?

What is reinsurance?

Insurance for insurers.

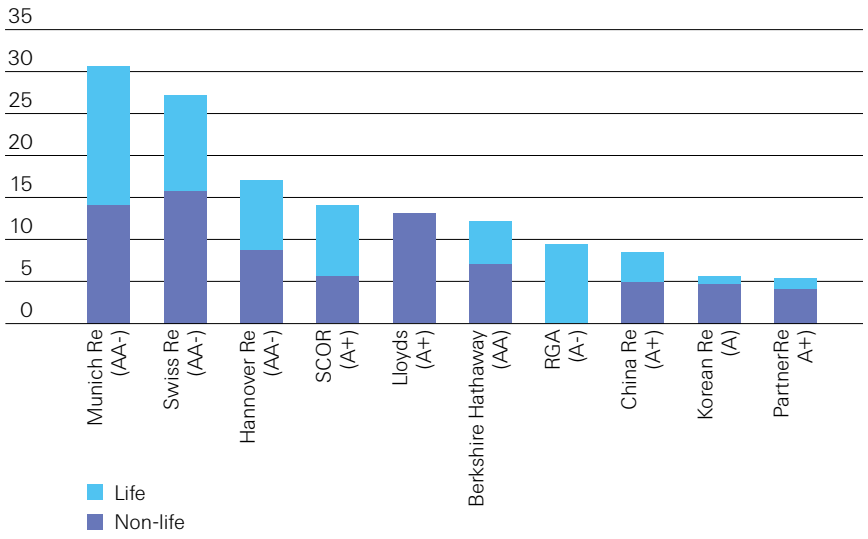
Reinsurance is insurance for insurers. When a reinsurance contract is signed, the reinsurer agrees to indemnify the insurer against all or part of a loss the insurer may incur under policies it has issued to its clients. For this indemnity cover, the insurer, also known as the cedent, pays a premium (or "cedes" premium) to the reinsurer, and discloses to the reinsurer information needed to assess, price and manage the risks covered by the reinsurance contract.

Who offers reinsurance?

In 2015, global reinsurance premiums were around USD 220 billion.

Today there are about 200 companies offering reinsurance, most of which are specialised reinsurers. A number of large primary insurance companies also write reinsurance business, either through their in-house reinsurance departments or through reinsurance subsidiaries. In 2015, global premiums (cessions) were about USD 220 billion. Of those, USD 167 billion were non-life cessions, which is equivalent to 10.8% of the premiums written by primary non-life insurers globally. The corresponding premium figure for life reinsurance was roughly USD 53 billion, or 2.2% of total primary market premiums. Less life business is ceded to reinsurers than non-life because in life, typically only mortality and disability risks are reinsured. A large proportion of savings business is retained by primary life insurers. Overall, the world's 10 largest reinsurers take around 65% of total premiums ceded.

Figure 1:
The world's biggest reinsurers, premiums written (USD billion), 2015



Munich Re: P&C reinsurance segment excludes Risk Solutions; Life includes reinsurance written by Munich Health. Swiss Re: gross assumed premiums of P&C Reinsurance and L&H Reinsurance. Hannover Re: excludes reinsurance with Talanx companies, and primary insurance; SCOR: excludes primary commercial lines business. Berkshire Hathaway: reinsurance assumed premiums for P&C and L&H, respectively. RGA, China Re, PartnerRe: excludes primary insurance premiums. Lloyd's is not a company but a market consisting of 84 syndicates (as of 2015)

Source: Standard & Poor's, Swiss Re Economic Research & Consulting.

The largest reinsurers have a very strong financial strength rating.

The capital strength of reinsurers is generally above investment grade. Of the top 10 reinsurance groups, eight have an S&P financial strength rating of at least "A+", which means "strong capacity to meet financial commitments, but somewhat susceptible to adverse economic conditions and changes in circumstances". Three of the top 10, including Swiss Re, have a "very strong financial security" (AA-) with respect to their ability to pay their obligations in accordance with their reinsurance contract terms. The reinsurance industry has a stable and sound capital base. There have been very few large failures in the sector. The latest two significant events were run-offs rather than bankruptcies. Gerling Re (now Global Re) decided to discontinue writing new non-life reinsurance business in 2002 and to put its existing portfolio into run-off. Gerling Re's run-off strategy included several commutations but also portfolio sales, most recently in 2016. At the time, Gerling Re was the sixth largest reinsurer. The second event started in 2008 when Scottish Re commenced run-off. Its total liabilities declined from USD 11.9 billion at the end of 2007 to USD 2.8 billion by the end of 2015. Both companies' run-off and commutations did not bring down another re/insurer, nor did they create any shortage in reinsurance capacity.

Who buys reinsurance?

The majority of reinsurance clients are primary insurers.

Most reinsurance clients are primary insurers, from all classes of insurance. However, reinsurers also deal with other professional counterparties such as reinsurance intermediaries, corporations and their captive insurers, and banks. Buyers of reinsurance assess the professional expertise of reinsurance providers as a counterparty risk, and only those reinsurers very likely to meet all their obligations can expect to be chosen as reinsurance provider.

The business models of insurers define their reinsurance needs.

The volume of business an insurer cedes depends on its business model, its capital strength and risk appetite, and prevailing market conditions. In particular:

- Insurers whose portfolios are heavily exposed to catastrophic events – such as windstorms, earthquake or floods – have a strong need for reinsurance cover.
- Small local players need more reinsurance coverage than larger international insurers. Larger players can diversify their insurance risks over a wider range of products, larger geographic area and a bigger client base.
- Multi-line insurers need relatively less reinsurance cover that others. Insurers writing many different lines of business tend to have a better-balanced portfolio than specialised insurers, which operate in just a few business lines or sell risk coverage to a target customer group.
- Commercial line portfolios with a small number of risks with large exposures (such as aviation or utility industries) need more reinsurance than personal lines portfolios with a large number of small and homogenous risks (eg, motor insurance). Life insurers with a greater proportion of contracts containing a mortality or disability risk element tend to cede more than life insurers with a high level of savings premiums.
- Insurers expanding into new products or entering new geographical regions often use reinsurance to benefit from reinsurers' risk assessment and financing expertise. This is particularly important in life reinsurance.
- Insurers exiting markets or lines of business in a run-off transaction often transfer closed books of business where liabilities continue to exist to reinsurers. The reinsurer then manages the portfolio of policies, paying out all claims over time until no liabilities remain.
- Regulatory and rating agency considerations also influence demand for reinsurance, because reinsurance can be a source of capital relief and be used to improve balance sheet strength.

The reinsurance industry in numbers

Figure 2:
Largest reinsurance markets by region, 2015

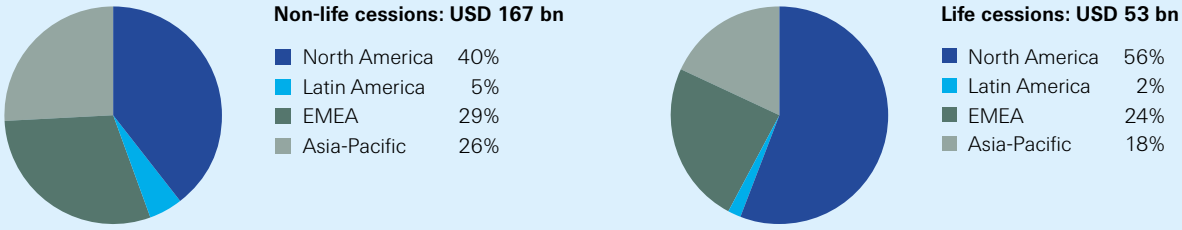
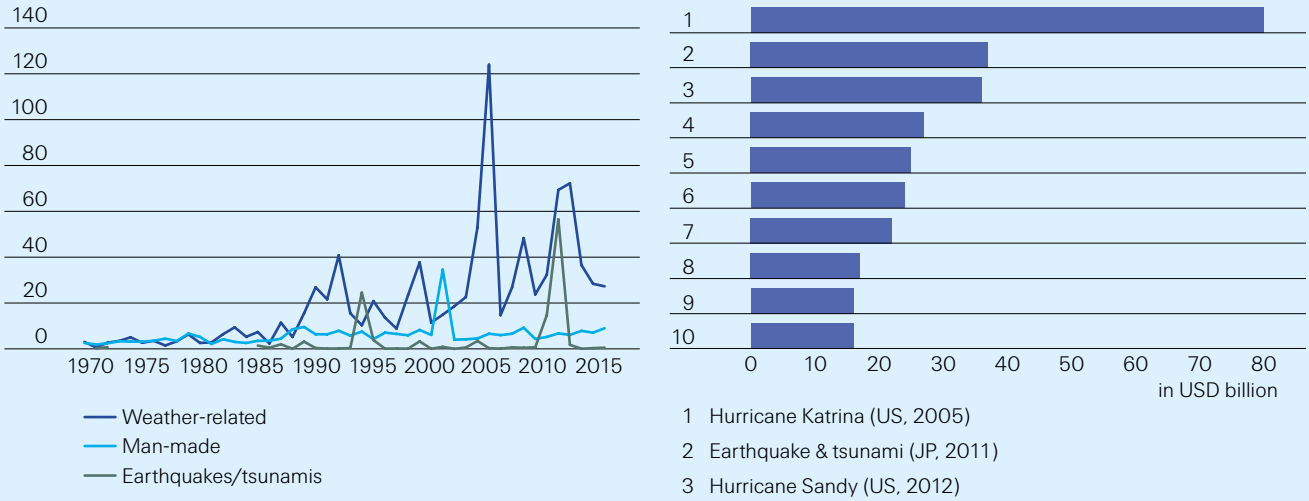


Figure 3:
Insured losses from natural catastrophes and man-made disasters (left) and top 10 loss events (right), in USD billion



1 Hurricane Katrina (US, 2005)
2 Earthquake & tsunami (JP, 2011)
3 Hurricane Sandy (US, 2012)
4 Hurricane Andrew (US, 1992)
5 9/11 terrorist attacks (US, 2001)
6 Northridge earthquake (US, 1994)
7 Hurricane Ike (US, 2008)
8 Earthquake (NZ, 2011)
9 Hurricane Ivan (US, 2004)
10 Heavy monsoon rains (TH, 2011)

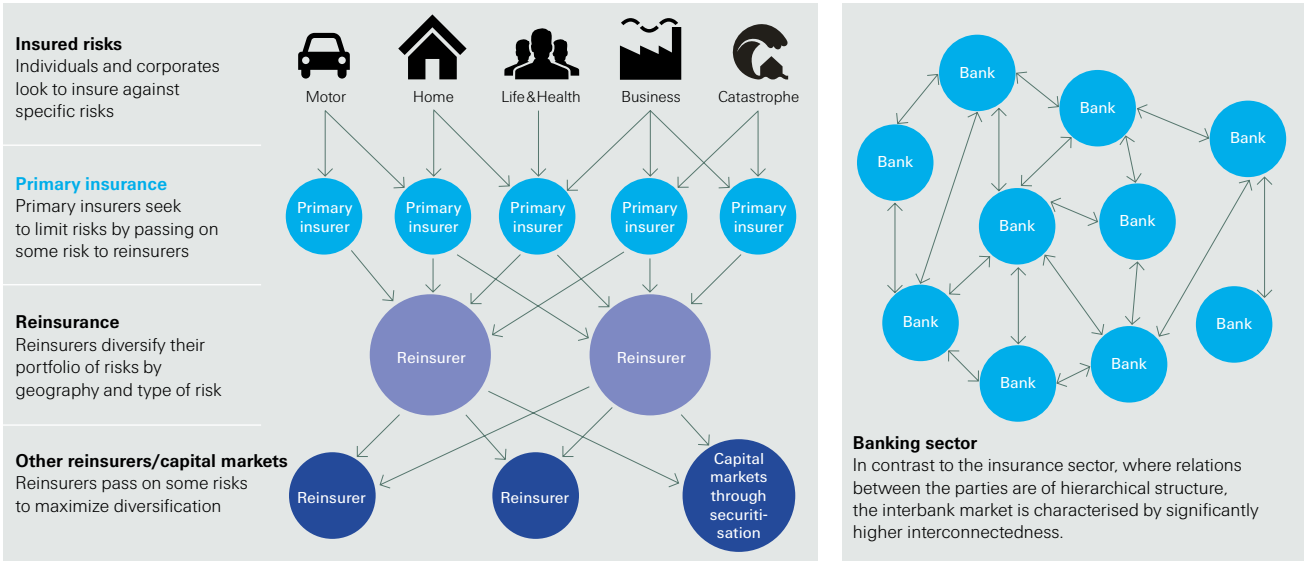
Note: EMEA = Europe, Middle East and Africa; JP = Japan; NZ = New Zealand; TH = Thailand; US = United States.
Source: Swiss Re Economic Research & Consulting.

How is risk transferred in re/insurance?

Individuals and corporates transfer some of their risks to primary insurers, who then pass on portfolios of similar risks or large single risks to reinsurers.

Figure 4 illustrates how risk is transferred in re/insurance. The transfer starts with individuals/households and corporates looking for protection against specific risks. Each party transfers a portion of the risk by paying a premium to a primary insurer. In return the primary insurer safeguards the individuals and corporates against losses from the insured risks. Primary insurers diversify the assumed risks by geography, lines of business and time, all to reduce claims volatility. In addition, they seek to limit risk accumulation by passing on portfolios of similar risks or large single risks to numerous reinsurers. By transferring risks to reinsurers, primary insurers benefit from lower claims volatility, protection against extreme events and lower severity of claims, from freed up capital that can be used otherwise, and from guidance on best-practice underwriting and other knowledge transfer. Reinsurers, meanwhile, assume the risks from primary insurers and diversify their portfolio of risks by geography and type of risk. As part of the risk management process, a reinsurer may pass on some of these risks to other reinsurers (retrocession) or to the capital markets (via securitization).

Figure 4:
Risk transfer in insurance and reinsurance



Source: *The essential guide to reinsurance*, Swiss Re, 2013. Bank chart from *Assessing the potential of systemic risks in the insurance sector*, Finma, 2010.

The parties in the insurance sector are interconnected in a hierarchical way.

The relations in re/insurance are hierarchical, with each level absorbing risks. In contrast, in the banking sector, banks are interconnected with each other (see right panel of Figure 4) and the credit risk is leveraged on a small capital base, so contagion of risk is possible. The business model of banks depends on leveraging their deposit base to expand credit availability. But no bank can hold sufficient reserves for its on-demand obligations, because this is not profitable. In insurance the capital is not "on-demand": it can only be drawn on after an insured event, such as a death in the family or a property loss after a fire.

Reinsurance is not systemically risky.

This risk transfer mechanisms in re/insurance allow easy measurement and control of the cession rate of any primary insurer to every single reinsurer. It is comparably small, and the retrocession rates are even smaller. Swiss Re and Munich Re have recently proven that neither causes institutional concentration risk for any primary insurance group, nor do they pose geographical concentration risk. In sum, reinsurers do not present systemic risk for the insurance sector.

The benefits of reinsurance

Reinsurers are shock absorbers for the global economy.

The number and severity of major disasters, including natural catastrophes and man-made events, is increasing. These events highlight the importance of reinsurance as a shock absorber for the global economy. Reinsurers also support innovation by mitigating potential losses from risks inherent in, for example, major new construction projects or breakthrough new technologies. And, with their long-term investments in equities, bonds and other asset classes, reinsurers provide capital to companies, giving the latter and the economy the means to grow and prosper.[2]

The main benefits or reinsurance are stabilisation of underwriting results, financial flexibility and expertise.

Reinsurance has important benefits for primary insurers. It provides:

- reduced volatility of underwriting results;
- capital relief and flexible financing; and
- access to reinsurers' expertise and services.

These benefits apply in both non-life and life insurance. However, due to the different focus, the importance of the benefits varies for the two sectors.

Non-life: less volatile underwriting results, and more capacity

Stabilisation of underwriting results is a dominant driver for non-life insurers to buy reinsurance.

One of the main reasons non-life insurers buy reinsurance is to protect their capital base against large deviations from expected losses. This is most important in the event of major catastrophes. Were it not for reinsurance, huge disasters such as Hurricane Katrina or an unprecedented event like the 9/11 terrorist attacks may have led to a wave of insolvencies amongst insurers. Having reinsurance means an insurer can shield its capital base against such peak exposures: reinsurance-provided capital mitigates the effects of disasters which may be too severe, or simply uneconomic, for an insurer to absorb independently.

The beneficial effect of reinsurance was especially pronounced in 2005, a year with a large number of catastrophe events.

The beneficial effect of reinsurance was especially notable in 2005, a year with a particularly large number of catastrophes. For instance, hurricanes Katrina, Rita and Wilma had a significant impact on US non-life insurers. According to Swiss Re's *sigma* team, around 12% of all direct insurers in the US received payments from reinsurers that were equal to or exceeded 100% of their shareholders' equity in that year. And about 23% received payments from reinsurers that accounted for more than one third of their equity capital. In other words, reinsurance reduces the likelihood of insurers facing grave consequences as a result of capital depletion.

Reinsurance helps insurers benefit from economies of scale.

Another benefit of reinsurance is that it allows non-life insurers to accept more business with the same amount of capital. By buying reinsurance cover, insurers transfer risks to the reinsurers and consequently do not need to allocate capital for those risks. The ability to assume more risks, at the same level of capital, means that primary insurers can spread their overheads (eg, the cost of distribution, administration and claims handling) over a broader base of business and thereby benefit from economies of scale.

Reinsurers also support insurers with their expertise in risk control.

Reinsurers play an important role in assessing and underwriting risks, and in contract wording. In the past, reinsurers have been instrumental in ensuring the continued availability of insurance capacity in times of market stress. The growth and evolution of the Bermuda reinsurance market as a response to the US liability crisis of the mid-1980s, during which insurance premiums rose by up to 300% and coverage became increasingly difficult to obtain, is a prime example.

Reinsurers also use their experience to help insurers improve claims handling.

Reinsurers also help insurers handle claims more efficiently, using their international and long-term experience. The involvement of reinsurers in claims handling can substantially contribute to mitigating and adjusting claims efficiently, to the benefit of insurers and policyholders.

[2] *The essential guide to reinsurance*, Swiss Re, 2013

Life: accumulation control, expertise & business financing

Reinsurers offer long-term security for primary life insurers.

Life insurers buy reinsurance to minimise the potentially negative impact of large risks: for example, life insurers often want to limit their exposure to high sums assured for individual risks, or avoid an accumulation of mortality risks like in the case of group cover schemes that provide protection as part of employee benefit packages. Such reinsurance contracts are common in Europe and Japan, and help stabilise insurers' earnings. Furthermore, long-term reinsurance agreements protect insurers against claims variation (eg, of mortality claims) over time.

A reinsurers' expertise in underwriting and claims management are another mains reasons to buy life reinsurance.

Life reinsurance arrangements are also frequently entered into to gain access to reinsurers' expertise in underwriting and claims management, as well as pricing and product development. Reinsurers typically operate on a global basis and have a deep understanding of markets and their products, and data from a wide range of the insured populations. This allows reinsurers to assist primary insurers with superior underwriting tools, training for insurers' underwriters and other capabilities. The same applies to managing claims: guidelines on claims assessment and training are important benefits for insurers and, ultimately, for policyholders also. Reinsurers' broad expertise also helps insurers develop and price new products. This allows for innovation, while at the same time helping primary insurers minimise possible risks arising from novel products. In markets where insurers focus primarily on savings and investment business (eg, the UK and the US), life reinsurance allows primary insurers to transfer a sometimes significant proportion of the mortality and disability risk component of their policies, allowing them to focus more on their investment activities.

Reinsurance also helps ease capital strains.

As in non-life, the transfer of risk and the ability to benefit from reinsurers' expertise allows life insurers to reduce their capital requirements and to use the freed-up capital on other projects, for instance expanding into new business lines or geographies. Life insurance business places considerable demands on capital. Initial statutory reserves, solvency capital and commission can amount to several times the first year's premium, particularly in the case of protection business. Reinsurance can help to ease this capital strain.

Table 1:
What are the benefits of reinsurance for clients?

Function	What reinsurers do	Benefits for clients
Risk transfer	Stabilise financial results by smoothing the impact of unexpected major losses and peak risks.	Companies become a more attractive investment proposition and benefit from reduced cost of capital.
Risk finance	Offer reinsurance as a cost effective substitute for equity or debt, allowing clients to take advantage of global diversification.	Companies become a more attractive investment proposition and benefit from reduced cost of capital.
Information	Support clients in pricing and managing risk, developing new products and expanding their geographical footprint.	Accelerate profitable growth.

Source: *The essential guide to reinsurance,* Swiss Re, 2013.

Making insurance more stable and affordable, benefiting society

Reinsurance allows efficient risk and capital management.

Ultimately, reinsurance allows primary insurers to manage their risks and capital more efficiently, making insurance more secure and less expensive (see Table 2). At the same time, it broadens the range of products and coverage primary insurers can offer. Reinsurance helps insurers protect their balance sheets against unexpected losses and to better understand risks, leading to more accurate risk assessment and pricing. As a consequence, insurers' earnings are less volatile, reducing significantly the likelihood of a loss event depleting capital. Supervisors and rating agencies acknowledge the stabilizing effect of reinsurance on the insurance sector at large. They give primary insurers credit for the use of reinsurance when they calculate an insurer's capital requirements.

Table 2:
What are the benefits of reinsurance for society?

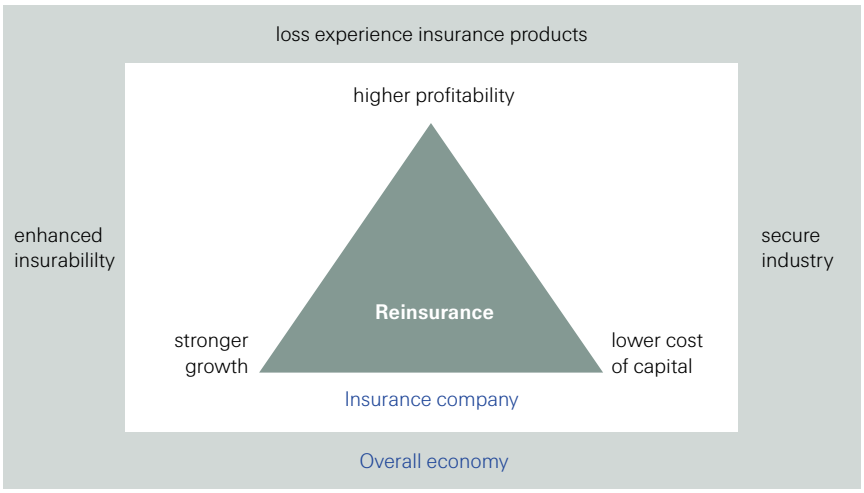
Function	What reinsurers do	Benefits for society
Risk transfer	Diversify risk on a global basis.	Makes insurance more broadly available and affordable; enables economic growth.
Risk finance/ capital market function	Invest premium income according to expected payout.	Provides long-term capital to the economy on a continuous basis.
Information	Put a price tag on risks.	Incentivises risk-adequate behaviour.

Source: *The essential guide to reinsurance,* Swiss Re, 2013.

Reinsurance facilitates economic growth and social welfare.

Reinsurance enables insurers to take advantage of economies of scale by using available capital more efficiently. With reinsurance, insurers can offer their clients the same level of risk protection at a better price. In addition, without reinsurance, many large and complex risks would not be insurable. The ultimate benefits of reinsurance are not confined to primary insurers or policyholders. By enabling innovation and ensuring that risk is held in the most efficient way among different players in the economy, reinsurance is a central facilitator of economic growth and improved social welfare.

Figure 5:
Micro and macro dimensions of reinsurance



Source: Swiss Re Economic Research & Consulting.

How reinsurers manage risk

The concept of risk management

It is crucial for the insurer that a chosen reinsurance partner is financially secure.

When insurers cede part of their business to reinsurers, they reduce their underwriting risk. In exchange they assume counterparty credit risk, which is the risk that the reinsurer cannot honour its financial obligations. For an insurer, therefore, it is crucial that its reinsurers are financially secure.

Risk management is the core competence of any reinsurer.

Reinsurers implement sophisticated risk management processes so that they are able to honour their financial obligations. The overarching goal of risk management is to guarantee the long-term survival of the reinsurance company. The role of risk management is to identify, monitor and model the risks and their interdependencies, and to ensure that the risks taken onto the book are in line with what the reinsurer can bear. For this, close cooperation among a firm's underwriting, asset management and capital management units is key.

Figure 6:
Risk management is interactive

Source: Swiss Re Economic Research & Consulting.

Risk modelling: the basis of risk management

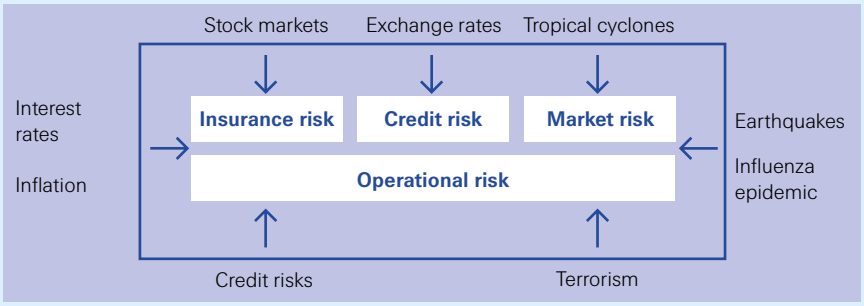
Risk modelling uses different forms of quantitative and qualitative analyses.

In risk modelling, different forms of quantitative and qualitative analyses are applied. Figure 7 provides a list of risks affecting reinsurers. Based on the analysis of these risks, a sufficiently representative subset is chosen and mapped using stochastic models, which take into account possible interdependencies among the various sources of risk. Finally, these models are used to quantify the impact of the risk factors on the reinsurer's balance sheet.

Assessment of exposure to non-modelled risks is also required.

Quantitative modelling needs to be complemented with the analysis of risks less suited to formal modelling. These include socio-political risks, regulatory risks and importantly, operational risks. The latter is the risk of loss resulting from inadequate or failed internal processes, people and systems, or from external events such as fires and power failures. Internal guidelines and appropriate management processes are used to minimise operational risks.

Figure 7:
Which risks affect a reinsurer?



Source: Swiss Re Economic Research & Consulting.

Underwriting

Underwriting is the first step to determine whether a reinsurer can bear the risk being proposed.

Underwriting[3] is the process of examining, classifying and pricing risk, for example a book of motor business, or a single risk submitted by a primary insurer for reinsurance. Underwriting is also finalising the contract for those risks which are accepted.[4] The main tasks of the underwriting process are to ensure that:

- risks are assessed properly, and terms and conditions are adequate;
- the limits of assigned capacity are respected;
- there are controls for accumulation of and peak risks; and
- pricing and wording are appropriate.

Information is key to assessing risks correctly.

Risk assessment and terms and conditions

Risk assessment starts with evaluating data provided by the ceding insurer, and determining whether additional information about the characteristics of the insured object(s) or person(s) is required. In non-life reinsurance, this includes information about the location, the value and the exposure of the object(s) or person(s) in question. For example, the exposure of individual buildings to flooding is assessed using flood zone maps which show high water levels, the speed of flow and other information. In life reinsurance, risk assessment considers information that helps determine the risk of an individual to death or illness (eg, age, gender, smoker status, and medical and lifestyle factors).

Terms and conditions are essential to making risks insurable.

Only risks which meet the general conditions of insurability (see Principles of insurability below) can be re/insured. Terms and conditions under which the risks are insured have an important function in making risks insurable, as they limit the cover provided in such a way that the principles of insurability are met.

To be insurable, risks must be quantifiable, independent and random, and priced appropriately.

Principles of insurability

Re/insurance can only operate within the limits of insurability. There is no strict formula for insurability, rather a set of basic criteria which a risk must fulfil to be re/insurable. These criteria can be classified as follows:

- Assessability: it must be possible to quantify the probability that the insured event will occur, as well as its severity, in order to calculate the potential exposure and the premium necessary to cover it. In addition, it must be possible to allocate the loss to a particular insurance period.
- Randomness: the time at which an insured event occurs must not be predictable, and the occurrence itself must be independent of the will of the insured.
- Economic efficiency: primary insurers and reinsurers must be able to charge premiums commensurate with the accepted risk.

Reinsurers' capacity limits determine how much risk can be accepted.

Capacity allocation, accumulation control and peak risks

Reinsurers only accept risks that are in line with the capacity limits they have set. Capacity is the maximum amount of coverage that can be offered by a reinsurer over a given period. In the case of risks with low accumulation potential, such as a portfolio of different fire policies, underwriters are generally able to commit a defined amount of capacity for a certain line of product and client/country. Risks demanding more capacity are typically escalated for special approval by senior underwriters or risk committees.

[3] For ease of reading, non-life terminology is used. In some instances, terms (eg, underwriting), do not have exactly the same meaning in life insurance. The underlying ideas are, however, the same.

[4] In the following text, for the sake of simplicity the term "risk" is used to denote both risk portfolios and single risks.

Outstanding risks must be identified.

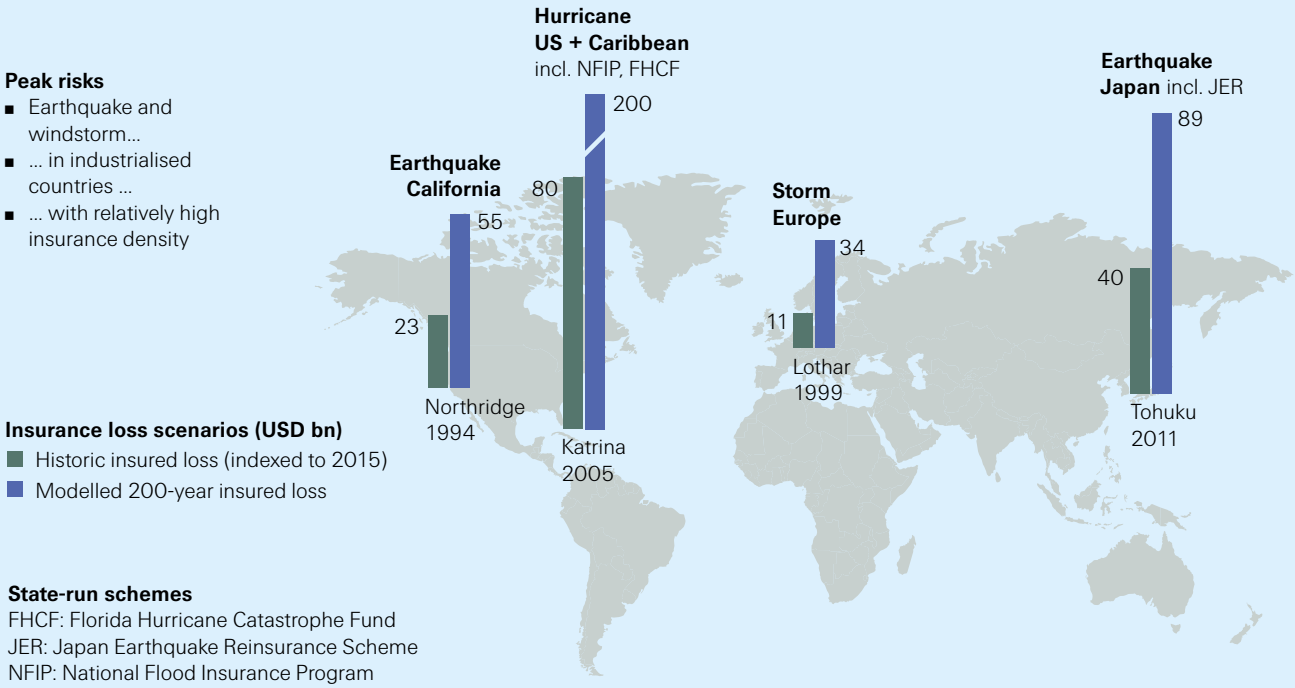
Some risks – especially in the field of natural perils – have greater accumulation potential. Accumulation arises from dependencies between individual risks. This can be concentration of risks (eg, houses or cars) hit by the same loss event like an earthquake, or a concentration of shares in the same large risk (eg, a pharmaceutical firm) through different reinsurance treaties, making the reinsurer more exposed to a single loss occurrence. To be managed successfully, the risks need to be identified in the underwriting process. Capacity allocation is an important means to contain exposure to accumulation risk: in a top-down process, capacity for a specific natural peril is allocated to specific markets (profit centres) and accumulation zones. Underwriting guidelines and clearing systems, which show the total of cover provided for a single risk within the whole company, are further means to contain exposure to accumulation and peak risks.

Loss potentials for natural catastrophes are rising.

Natural catastrophe loss potentials

Global exposure to natural catastrophe risk is rising due to (1) increasing concentration of insured values in catastrophe-prone areas, such as China's eastern coastal region; (2) changing weather patterns related to climate change; and (3) the growing complexity and interconnectedness of globally integrated economies and corporate value chains. This development is mirrored in the size of loss potentials for the insurance industry. Figure 8 displays select peak-risk insured loss scenarios, comparing projected 200-year losses with historic insured losses.

Figure 8:
Select insured natcat loss potentials compared to loss history



Source: Swiss Re Cat Perils.

The appropriate price for risks is based on claims experience and exposure.

Pricing and wording

The price agreed for a reinsurer to take on a risk must be sufficient to cover the expected cost of acquiring the business, administering it and paying claims. The price needs to also provide the reinsurer with an appropriate return on the capital. To arrive at a price, underwriters employ experience- and exposure-based models. Experience-based models use historical claims applied to the current situation. For such models to work, reliable and sufficient loss data are needed, for instance in the case of fire risks, a long history of recorded incidents; and in the case of mortality risks, pricing that is based on mortality tables and experience studies. When such data series are missing, for example in the case of natural perils which occur infrequently, the correct price must be determined by using exposure-based modelling. These models use scientific information and expert opinion. Claims experience is only used to check and calibrate the model.

When the reinsurer and insurer agree on the wording, the risk is accepted in the reinsurer's portfolio.

When the primary insurer accepts the price and the terms and conditions offered by the reinsurer, a contract is drawn up between the two parties. This document, called a wording, describes the rights and duties of the contracted parties, as well as the terms and conditions. When agreement is reached, the risk is accepted into the reinsurer's portfolio.

Reinsurers make earthquakes more insurable through modelling and information sharing.

Insuring earthquake risks

Major earthquakes are high severity, low frequency risks. They occur relatively rarely but when they do happen, they can cause major damage. To be able to provide cover for such catastrophe risks, sophisticated modelling capability is required. Reinsurers have played a major role in making earthquakes insurable: in the 1970s, after the earthquakes of Managua and Guatemala, a group of reinsurers and insurers founded CRESTA (Catastrophe Risk Evaluating and Standardising Target Accumulations). This organisation has since set standards on how to format and report the information in natural peril insurance policies. The availability of more accurate and detailed risk exposure data together with improved technical capabilities has allowed exposure-based earthquake modelling capabilities to advance, and consequently enabled re/insurers to provide more earthquake cover.

Asset management

Asset management invests the premiums while taking into account guidelines and limits.

Reinsurers invest the premiums they receive for providing reinsurance cover in the capital markets. This is the task of a firm's asset management unit. It is part of the risk management process as it delivers portfolio data to risk managers and, as with underwriting, it must respect limits and guidelines on where to invest. This is to ensure that assets are allocated in a way that matches the characteristics of the corresponding liabilities.

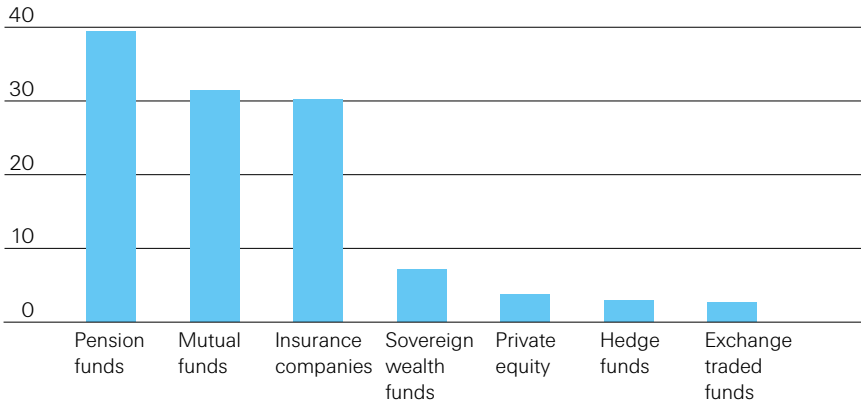
ALM offers systematic guidance on how risks interact.

The coordinated management of both sides of the balance sheet is known as asset and liability management (ALM). In the ALM process, information on liabilities must first be obtained. In doing so, quantifying currency exposure and payout patterns – the assets needed to match the duration of the liabilities – is very important. As a next step, the financial risk factors which affect liabilities need to be identified, namely changes in interest and exchange rates, equity or real estate prices, inflation and credit risks. Once these factors are identified, assets that match the characteristics of the liabilities are chosen.

The re/insurance industry is among the largest investors worldwide.

Re/insurers held USD 30 trillion in assets under management in 2014.[5] The industry is among the largest investors worldwide. Combined with pensions funds, re/insurers account for more than 50% of the total, global institutional asset base. The industry plays a crucial role in providing the real economy with long-term capital and thus in supporting growth.

Figure 9:
Assets under management (in USD trillion, 2014)



Source: CityUK, Investment Company Institute, Sovereign Wealth Fund Institute, Bain Global Private Equity Report 2015,Hedge Fund Research Inc, Deutsche Bank, Swiss Re Economic Research & Consulting.

Capital management

Capital acts as a buffer against unexpected losses.

A reinsurer's capital must be appropriate for its specific risk profile and appetite. Capital is needed for those adverse situations when payments exceed premiums and investment income, or when shocks from inadequate reserving or asset impairments, such as the stock market slump during the global financial crisis, need to be absorbed. Capital thus acts as a buffer against unexpected losses.

Capital must be sufficient to cover the risks assumed.

In the risk management process, capital management has the important task of aligning capital and risks assumed through insurance and investment activities. If risk monitoring reveals a gap between risk assumed and what can be borne by the existing capital base, either the necessary capital must be increased, or the underwriting and investment risks have to be reduced. The latter can be achieved by transferring risks outside the company using retrocession or securitisation.

Reinsurers sometimes balance their risk portfolio by transferring some risks to other reinsurers or to the capital markets.

Balancing retained and transferred risks

Reinsurers may wish to transfer some of the risks they have absorbed outside their company. For this, they can use either traditional retrocession agreements or capital market techniques such as securitisation:

- Retrocession is the transfer of ceded premiums to other reinsurers or insurers. It provides reinsurers with a means of spreading their risks more broadly. Counterparty assessment is crucial to ensure that the mitigation of underwriting risk is not offset by the assumed credit risk.
- An alternative to retrocession is securitisation through which peak risks are transferred to the capital market in the form of insurance-linked securities (ILS). In the case of reinsurance, securitisation has been used for natural catastrophe exposures like hurricanes, windstorms and earthquakes, and also for extreme mortality risks such as lethal epidemics.

[5] For sources see Figure 9.

Diversification and risk management

The demand for diversification

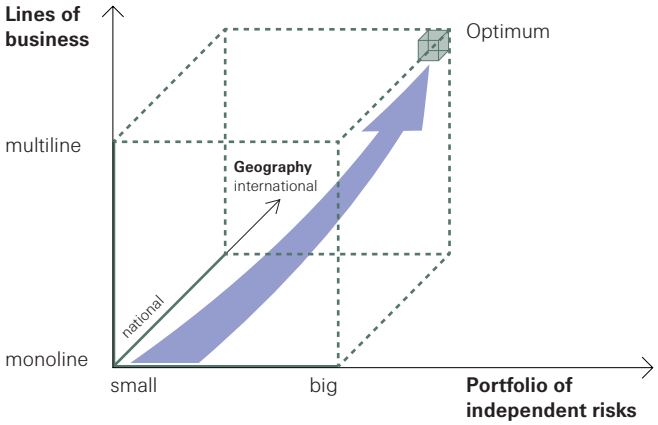
Risk can be reduced by pooling offsetting risks, which is called diversification.

Households and businesses have different options to reduce or even avoid risk. They can attempt to avoid situations that involve risk, increase prevention efforts to reduce the probability and severity of negative outcomes, or pool offsetting risks.[6] The pooling of risks – or diversification – is often described as "never put all your eggs in one basket".[7] To reduce the likelihood of extreme losses, households and businesses are incentivized to pool their own risks with those of others. Insurance companies enable this pooling. By spreading single risks among a larger number of households and businesses, insurance companies are better able to reduce the volatility of losses that households and businesses face. Single households and businesses cannot diversify their risks alone. Insurance therefore creates value for the society and contributes to the social goal of risk sharing.

International diversification is crucial for the insurability of certain risks.

National insurers can diversify their risks by writing multiple lines of business in their country. International insurers have the additional option of diversifying risks across borders, which helps reduce the risk of accumulated losses. For example, an earthquake can damage a large number of homes in one country, or a pandemic can affect entire life insurance portfolios. With globally active insurers and reinsurers, risk pooling is available on a global scale, enabling the writing of previously uninsurable risks, such as peak risks like earthquakes in California.

Figure 10:
Dimensions of diversification



Source: Swiss Re Economic Research & Consulting.

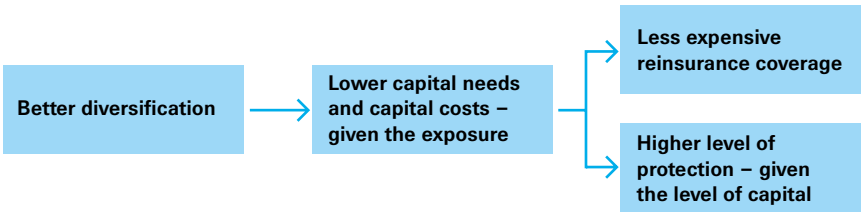
[6] J.M. Perloff, *Microeconomics*, Pearson International, 2009.
[7] P. Zweifel and R. Eisen, *Insurance Economics*, Springer, 2011.

Diversification enables the efficient management of risks

A well-diversified portfolio is the cornerstone of the long-term success of a reinsurer.

Diversification plays a crucial role in the reinsurance business model. A well-established risk management process will result in a reinsurer's portfolio where underwriting and investment risks are aligned with the capital available. This ensures the long-term survival of a reinsurer. To survive the competitive market, a reinsurer must be secure but also manage that security efficiently, which is accomplished by diversifying risks. Reinsurers achieve a high degree of diversification by operating internationally across a wide range of many lines of business, and by assuming a large number of independent risks (see Figure 11). Diversification across time is also important. Risk management, which applies the previously mentioned processes of assigning capacity and setting up guidelines, also plays a role in this respect.

Figure 11:
Diversification leads to lower price of reinsurance and a higher level of protection.



Source: Swiss Re Economic Research & Consulting.

The law of large numbers

The core of the insurance business is to assess, mitigate, and transfer risk through the law of large numbers.

The core of the re/insurance business model is to assess, mitigate and transfer risk. Diversification plays a major role in doing so. The basic principle behind diversification is the "law of large numbers". This statistical principle states that the more independent risks are added to a re/insurer's portfolio, the less volatile its results become. For example, in a pool of insured vehicles, the actual number of accidents each year gets closer to the expected number if the size of the pool increases. In terms of capital, lower volatility translates into lower capital needs/costs for the same level of protection. Better diversified re/insurers can therefore offer cover at a lower price and – given the level of capital – provide a higher level of protection.

Low diversification increases the risk of insolvencies

Empirical evidence shows that risk concentration has been a strong contributor to re/insurance insolvencies.

A reinsurer's insolvency is a rare event and there is a lack of empirical evidence for the major drivers behind insolvencies. Nevertheless, the insolvency Gerling Re in 2002 as referenced earlier shows how risk concentration can contribute to insolvency or impairment. Already in trouble after an acquisition, a high loss due to the 9/11 terrorist attacks and claims for asbestos-related and environmental damage in the US led to one of the largest run-offs in the history of reinsurance. And in the primary insurance market, Hurricane Andrew in 1992 led to the insolvency of 11 non-life insurers. No large multinational insurer was among them, even though they were exposed to the same natural catastrophe. Their better geographical diversification helped them to weather the losses.

Diversification reduces the amount of capital needed to remain solvent.

Diversification reduces capital required – an illustrative example

Diversification allows re/insurers to hold less capital to cover the same risks with the same certainty. To illustrate the diversification benefit, a motor insurer with two branches is considered. For simplicity, each branch writes only 10 policies and each claim is assumed to cost USD 1000. Further, claims are assumed to be uncorrelated with each other (ie, the likelihood that one occurs is independent of the occurrence of others, which is a realistic assumption in motor insurance).

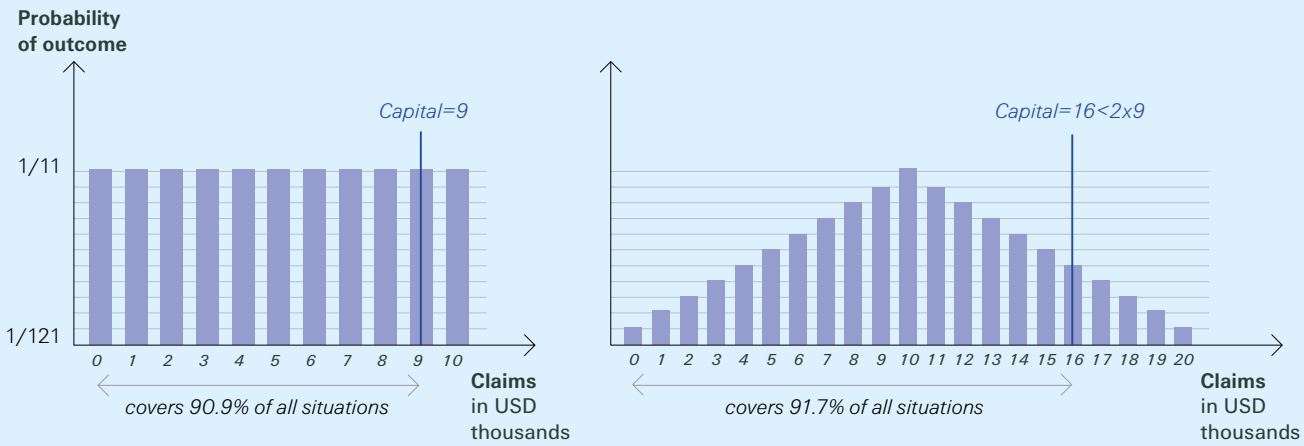
Two scenarios are considered: with and without diversification.

Two scenarios are considered. Under the first, each branch operates independently. They do not pool their risks and the required capital to cover the assumed risks is determined for each branch. Under the second scenario, the branches pool their risks and the capital required is determined at the group level.

The required capital to cover the same risks decreases significantly with diversification.

Each branch can expect zero to 10 claims (ie, 11 outcomes are possible). Since the risks are uncorrelated, each outcome occurs with the same probability of 1/11. The expected claims are the same in both scenarios, but the risk pooling reduces the likelihood of experiencing extreme outcomes, good and bad (see Figure 12). The capital required to cover the same risks with the same certainty (eg, 90%) is lower with diversification. In the undiversified case (left panel of Figure 12), holding USD 9000 allows the branch to pay the claims in 10 of the 11 possible situations (90.9%). Hence, the insurer needs USD 18 000 in total. In contrast, holding USD 16 000 for the diversified risks guarantees that the group can pay the claims in 111 out of 121 possible outcomes (91.7%). Therefore, the diversification reduces the required capital to cover the same risks by USD 2000 or by 11%. This simple example illustrates how diversification affects an insurer's capital need and shows how capital costs can be reduced. The reduced costs constitute the value from diversification and – in reality – can be a multiple of the value shown in this example.

Figure 12:
Required capital with and without diversification



Source: Swiss Re Economic Research & Consulting.

The importance of international diversification

Global diversification allows reinsurers to absorb major losses

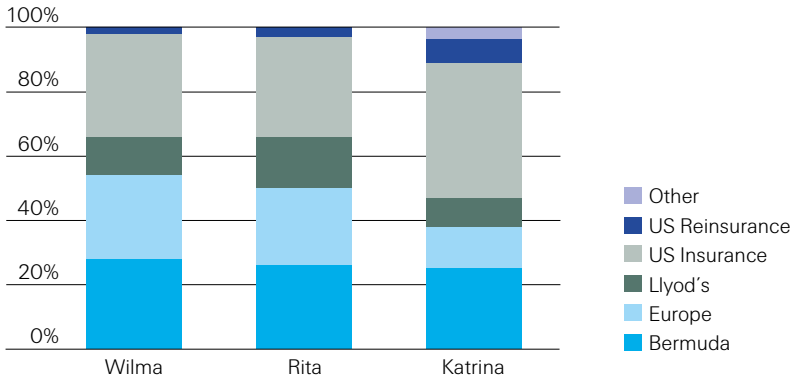
Reinsurers are able to spread risk globally, which allows them to assume large and complex risks.

Reinsurance is a global industry. This allows reinsurers to assume very large and complex risks because they are able to spread the risk across many countries and regions. Reinsurers' high degree of international diversification is a major source for the stabilisation of domestic insurance markets and helps to avoid potential disruptions due to catastrophes.

Without reinsurance, some domestic insurers may be unable to meet claims resulting from a major catastrophe.

The role of international diversification has gained in importance as the number and severity of natural catastrophes and man-made disasters increases. Global re/insurers made more than 60% of payments related to the destruction of the World Trade Center in 2001 and hurricanes Katrina, Rita and Wilma in 2005, respectively (see Figure 13). Without reinsurance, some domestic direct insurers may have experienced difficulties in meeting the claims. In anticipation of such losses, capital limitations may have forced insurers to restrict the scope of coverage, or to write less business. Reinsurance, therefore, helps to make insurance more broadly available and adds credibility to the promise to pay.[8]

Figure 13:
Regional distribution of 2005 hurricane payments: Wilma, Rita and Katrina.



Source: J. David Cummins, "The Bermuda Insurance Market: An Economic Analysis", 2008

Swiss Re's benefit from international diversification

The elimination of international diversification would destroy economic value for reinsurers.

Without international diversification, the reinsurance business model would be much less efficient than it is today. To illustrate the economic value of international diversification, the required capital to cover the same risks with the same certainty is compared between a fully internationally diversified situation and a non-diversified situation. The higher need for capital in the geographically undiversified situation leads to higher capital costs, constituting the lost benefit if international diversification would be abolished.

Ignoring Swiss Re's international diversification would more than double the capital costs for the group.

For Swiss Re, the benefit is calculated as the difference between today's capital cost for the group as a whole (ie, under the Swiss Solvency Test) and the capital costs without intra-group retrocession (ie, without international diversification). In the latter case, each entity and branch is without protection from the group and must hold enough capital to bear its own – less diversified – risks. Without international diversification, Swiss Re's annual capital costs would increase by approximately USD 2.5 billion.

Abolishing international diversification would have unintended consequences.

If international diversification is not preserved, for example in resolution, substantial economic value would be destroyed, having unintended consequences. Reinsurers would be required to hold more capital driving up premiums by 8.2%.[9]

[8] *The essential guide to reinsurance,* Swiss Re, 2013.
[9] The quantification uses well-established methodologies, but is not audited by a third party.

Required framework for reinsurance to work

Reinsurance has evolved as a means of coping with the growing number and increasingly complex nature of risks.

Over the last 150 years, reinsurance has evolved as a means of coping with a growing number and increasingly complex nature of risks. Reinsurance can play its role only if certain basic conditions are met, such as freedom of contract and legal security, the ability to provide reinsurance services internationally, and capital requirements that are commensurate to risk exposure.

Freedom of contract, and contract certainty

Legislation must not be retroactive.

Reinsurance is based on contracts that determine which risks are covered. Freedom of contract is an essential element for an efficient reinsurance market. Claims manifest in the future, and it is therefore important for reinsurers that the originally agreed contracts remain legally valid, and that changes in law are not applied retroactively. If contract certainty is not given, the principles of insurability may no longer be met. This may mean that cover for certain risks can no longer be offered. There was such a situation in the mid-1980s, when the US environmental superfund legislation introduced retroactive joint and several liability. This led to the withdrawal of a number of insurers and reinsurers from US liability business. Contract certainty is also essential for smooth resolution should a reinsurer become insolvent.
The certainty provides for the most accurate estimate of liabilities, facilitating their pricing should the reinsured prefer a commutation agreement, which provides a payment to return the risk and liability to the reinsured.

Allow international risk transfer and free capital flow

Market access and free flow of capital are key for global diversification.

Reinsurers need to be active globally to be able to balance their portfolio. Without international diversification, they would not be able to absorb peak risks, as they could no longer benefit from the law of large numbers. A prerequisite for global scope is the ability of reinsurers to operate on a cross-border basis (freedom to provide services) in order to gain access to as many markets as possible. For international diversification to work, reinsurers also need the ability to use their worldwide premium income to pay local claims. Restrictions on the free flow of capital for reinsurers – as seen in several places in the form of deposit requirements – restricts reinsurers' ability to move capital to cover major events. Consequently, covers become more expensive. Preserving diversification is crucial for fair resolutions. It allows all countries to get a proportionate share of the reinsurer's assets and to benefit from the greater availability of protection that diversified reinsurers can provide to society.

Capital requirements that reflect a reinsurer's individual risk profile

Capital requirements for reinsurers have been the same as those of primary insurers, or more liberal.

Capital requirements for reinsurers have been either the same as those of primary insurers or more liberal, taking into account that reinsurers deal with professional counterparties and not with individual consumers. For reinsurance to preserve its benefits, it is important that regulation takes into account its characteristics, including its broad diversification across lines of business and geographies and its superior risk management capabilities. In general, regulatory capital requirements should cause as little market distortion as possible. In this context, initiatives that promote transparency and acknowledge reinsurers' risk models are preferable to capital requirements that do not.

What lies ahead?

The goal is a regulatory framework that preserves confidence in the financial robustness of the industry.

The ever-changing risk landscape and regulators' and shareholders' demands for increasing transparency will require reinsurers to explain their operations in ever greater detail. In this context, the reinsurance industry needs to address concerns expressed about its own stability. The objective is to achieve a regulatory framework that preserves the confidence in the financial robustness of the industry while taking into account its unique characteristics.

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