

International Association of Insurance Supervisors



Reinsurance and Financial Stability

19 July 2012



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The IAIS was established in 1994. Its membership includes insurance regulators and supervisors from over 190 jurisdictions in some 140 countries. More than 120 organisations and individuals representing professional associations, insurance and reinsurance companies, international financial institutions, consultants and other professional are Observers. The IAIS' mission is to:

- Promote effective and globally consistent supervision of the insurance industry in order to develop and maintain fair, safe and stable insurance markets for the benefit and protection of policyholders; and to
- Contribute to global financial stability.

The IAIS provides an effective forum for standard setting and implementation activities by providing opportunities for supervisors to share their expertise, experience and understanding.

The IAIS coordinates its work with other international financial institutions and international associations of supervisors or regulators, and assists in shaping financial systems globally. In particular, the IAIS is one of the parent bodies of the Joint Forum together with the Basel Committee on Banking Supervision (BCBS) and the International Organization of Securities Commissions (IOSCO). It is also represented on the Financial Stability Board (FSB).

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1 Executive summary

1. This paper is a sequel to the IAIS policy paper *Insurance and Financial Stability*¹ (IFS) issued in November 2011. In that paper, the IAIS established that the principles of insurance, including asset-liability management (ALM), hold for primary insurers and reinsurers alike, a finding also engrained in the IAIS Insurance Core Principles (ICPs) and in supervisory practice. The current paper draws on work undertaken by the IAIS Reinsurance Transparency Group (RTG).² Over the last 10 years, the RTG has fostered greater transparency in the reinsurance sector and in doing so made early contributions to macroprudential surveillance.

2. This paper further addresses concerns that have been raised in connection with reinsurance and financial stability. These relate to (i) market concentration rates, (ii) risks arising from accumulations and high value risks, (iii) the similarities of reinsurance risk portfolios, and (iv) issues associated with alternative risk transfer (ART) which include finite reinsurance and non-reinsurance activities such as the underwriting of credit default swaps (CDS).

3. Business relationships between cedants and reinsurers establish direct links which are frequently deepened by the extension of risk and capital management services offered by reinsurers. This intra-sector connectivity is unlikely to transcend the boundaries of the insurance market and spill over into the broader financial market as long as business relationships are confined to traditional reinsurance activities.

4. The findings are in line with the IFS paper: traditional reinsurance is unlikely to cause, or amplify, systemic risk. This point holds also for the insurance of peak risks, the core business of reinsurers. The findings also apply to the bulk of non-traditional (re)insurance and particularly to ART activities. While ART comprises characteristics of financial market products and derivatives, in most cases, ART does not intermediate credit. Consequently, the failure of a reinsurer engaged in ART will not undermine a larger credit pyramid, and it is unlikely to affect other financial market participants or the real economy.

5. The case may prove to be different for non-(re)insurance activities. The financial crisis has shown that, for example, CDS/collateralised debt obligations (CDO) underwriting without appropriate provisioning carries a considerable potential for systemic risk. Supervisors must also be mindful that in recent years non-insurance entities, and in particular entities set up by investment banks, have started to offer longevity and pension services with risk transformation and risk transfer features similar to products offered by non-life and life insurers. For that reason, regulators should strengthen both cross-sector microprudential supervision and macroprudential surveillance of activities identified to have a systemically important potential.

¹ IAIS 2011b.

² In addition to a number of position papers, the RTG has published a periodic Global Reinsurance Market Report discussing market developments and specific issues related to reinsurance and financial stability.



2 The business model of reinsurance

2.1 *Reinsurance is an integral part of the insurance market*

6. Reinsurance is insurance for insurers. Just as firms and individuals buy insurance for perils they do not want to bear, primary insurers purchase reinsurance for risks they do not want to fully retain. Reinsurers absorb losses that are not retained by primary insurers, and in so doing they limit the earnings volatility of primary insurers. Reinsurers pursue the same business model as primary insurers. They contract with the primary insurer (or cedant) to reimburse any future claim the primary insurer may have against the payment of a premium today. In order to meet future claims, reinsurers apply the same insurance techniques and models for risk selection as primary insurers, and they follow the same insurance accounting principles. Just like primary insurers, reinsurers are prefunded through premium payments, and they pursue similar general approaches to asset liability management (ALM). These insurance fundamentals were discussed in the IFS paper referred to above and they are not repeated here.

7. The fact that primary insurance and reinsurance are businesses with a high degree of similarities means that supervision is also aligned. Whereas in the past it was often argued that the sophistication of the counterparties in reinsurance transactions exerted a certain degree of self-regulation which did not require supervision, today's approach treats the two businesses as essentially the same for regulatory and supervisory purposes. In the United Kingdom, for example, in 1967 the regulation of both primary insurance and reinsurance began to assess the companies' ability to meet their obligations toward policyholders and cedants. This extended also to the Lloyd's market, which is considered in its entirety and which is regulated directly by the FSA to the same standards as non-Lloyd's (re)insurers.³ Appendix A1 summarises the status of reinsurance supervision in selected jurisdictions (see pages 37-42).

8. The unified approach to supervision is also reflected in global standards. In October 2011, the IAIS ratified revisions to the Insurance Core Principles (ICPs),⁴ which provide the global framework for the supervision of the insurance sector. The principles apply equally to the supervision of insurers and reinsurers and there is no specific separation of issues in relation to reinsurance. One exception, however, is ICP 13, which recognises specific issues and covers reinsurance as well as other forms of risk transfer. It calls for the supervisor to set standards to ensure that primary insurers and reinsurers, including captives, adequately control and transparently report their risk transfer programmes.

9. The IAIS has made early strides in the macroprudential surveillance of reinsurance. For nearly 10 years now the Reinsurance Transparency Group (RTG) of the IAIS has reviewed developments in the reinsurance sector and alternative risk transfer (ART) programmes. Starting with 2003 data, the RTG began to publish a Global Reinsurance Market

³ See also Group of Thirty 2006.

⁴ IAIS 2011a.



Report (GRMR),⁵ with its frequency increasing from yearly to biannual publication in 2009. To provide a unified perspective, the IAIS is in the process of extending scope and coverage of the GRMR to include primary insurers in the new Global Insurance Market Report (GIMAR).

2.2 *The risk and capital management function of reinsurance*

10. Reinsurers have a vital interest in understanding the risks of their cedants.⁶ To allow reinsurers to accurately price and manage the risks covered by the reinsurance contract, cedants must disclose information about their underwriting portfolio. In addition to reinsurance protection reinsurers can also provide, either as part of the contract or as stand-alone fee-generating activity, risk management services, using their reservoir of risk information which extends over a wide range of hazards, business portfolios, and geographies. Other services provided by reinsurers may also include assistance and advice for product development, pricing, and claims handling.

11. The transfer of risk to the reinsurer provides capital relief for primary insurers. They may re-deploy capital to the extent that there is a reduced capital requirement to underwrite more or different risks, allowing the primary insurer to obtain economies of scale and diversification benefits. Hence, the purchase of reinsurance goes beyond risk transfer. It contributes also to the capital management of the primary insurer, underlining how risk and capital management are two sides of the same coin.

12. Although reinsurance provides a form of risk transfer, the ceding party maintains its contractual obligation to the original policyholder, whether or not the reinsurer performs as agreed under the terms of the reinsurance contract. This preserves a valuable element of risk governance. Insurers always maintain “skin in the game.” This differs from banking and shadow banking where, prior to the financial crisis, originate-to-distribute (OTD) business models had become prominent with an apparent reduced focus on risk governance and due diligence. Again, in the insurance world, the cedant remains responsible for its original contractual obligation with the original policyholder. This holds true regardless of whether or not the reinsurer passes some of its own risk to the capital market through securitisation.

13. These considerations illustrate how demand for reinsurance is the result of many factors. Globally active primary insurers with large portfolios that diversify over many lines of business and geographies typically cede a lower premium volume (ie they retain more business) than smaller primary insurers with limited portfolio diversification possibilities and geographic constraints. Also, primary insurers with large exposures to particular peak catastrophe risks (see also 3.4 Absorbing Peak Risks on page 19), such as earthquakes or tropical

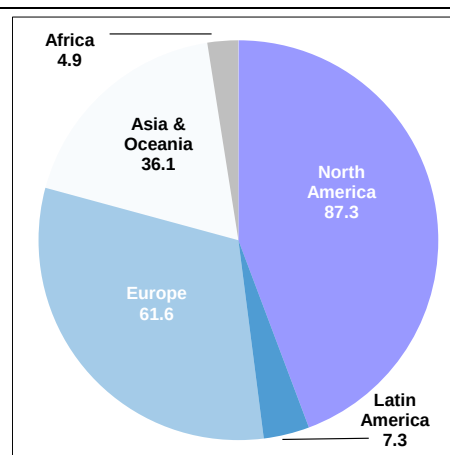
⁵ Compare various GRMR issues available on the IAIS website.

⁶ In the interest of brevity, and because primary insurers comprise the overwhelming majority of customers, the report’s focus is on the interaction between reinsurers and primary insurers. It should be borne in mind however, that the customer universe of reinsurers is broad. It may include financial and non-financial corporations and their captive insurers as well as governments.

storms, tend to purchase more reinsurance than primary insurers with lower catastrophe risk exposures.

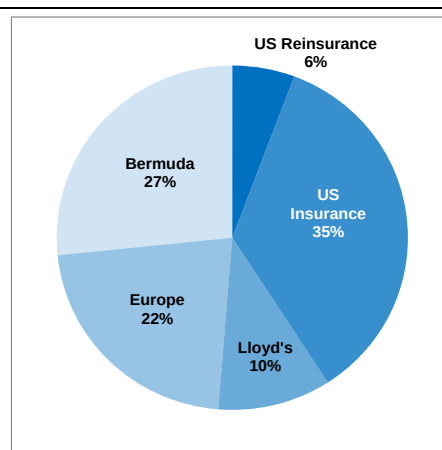
14. Reinsurers contribute to the global diversification of risks and to an efficient allocation of capital and improved risk management on the side of primary insurers. The two figures below illustrate these properties. They show the distribution of reinsurance premiums across the world (figure 1) and the distribution of payments after the three hurricanes Katrina, Rita, and Wilma (KRW) that struck the US Gulf coast in the fall of 2005 (figure 2). Without access to global reinsurance capacity the claims burden arising from this exceptional sequence of natural catastrophes would have fallen on US domestic (re)insurers and US subsidiaries of non-US parents. The access to global reinsurance and the reinsurance recoveries obtained from global and domestic reinsurance by primary insurers mitigated the financial impact these catastrophes would have had on US primary insurers and by extension also on US policyholders.

Fig. 1: The global reinsurance market (US\$ bn)



Source: Industry data

Fig. 2: Distribution of 2005 KRW hurricane payments



Source: Cummins⁷

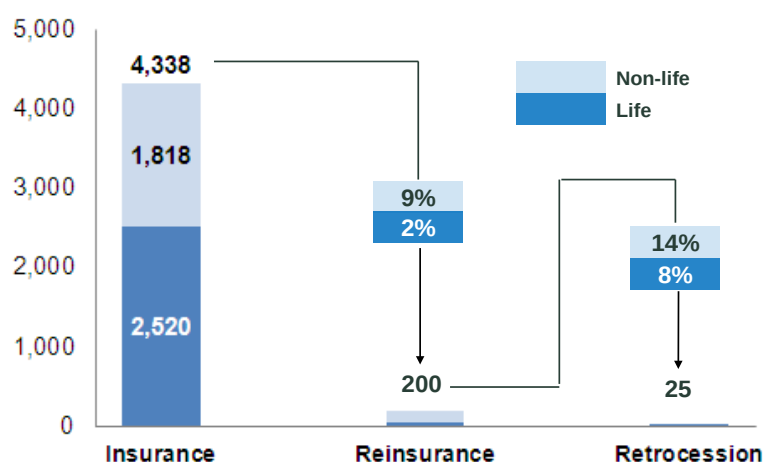
2.3 Intra-industry interconnectedness

15. The relationship between cedants and reinsurers undoubtedly introduces a certain degree of interconnectedness to the insurance industry. And this connectivity is not just limited to the interaction between primary insurers and reinsurers. To give a few examples: primary insurers may engage in reinsurance activities, just as a number of reinsurers maintain a primary insurance portfolio. And reinsurers purchase insurance from retrocessionnaires where at times the counterparties may be other reinsurers, or even primary insurers. However, the data on retrocessions provided below underscore that the degree of interconnectivity

⁷ Cummins 2008.

between reinsurers and retrocessionnaires – although larger in per cent than the share of premiums ceded from primary insurers to reinsurers – is still comparatively small.

Fig. 3: Global premium volumes in primary insurance, reinsurance, and retrocessions
(2010 US\$ bn)



Source: Industry communication to RTG

16. It is also important to note that the intra-industry connectivity in insurance is distinctly different from the interconnectedness observed in banking. First, the relationship is built on the original insurance contract, and contractual payments are strictly tied to the occurrence of an insured event. Unlike in banking, there is no overnight lending and there are no payments or cash calls on demand that could potentially trigger a reinsurance run.⁸ And there is a crucial timing difference. As was pointed out in the IFS policy paper, insurance claims triggered by large catastrophes are typically paid out over a lengthy period. After Hurricane Katrina it took six quarters for 60% of the claims to be paid; while after 10 quarters about 80% of the payments had been made.⁹ It should also be noted that expected losses are charged against provisions that are created at the time the (re)insurance contract incepts. Unless provisions were revealed inadequate, and the assets in support of the provisions illiquid, the reinsurer is expected to be in a financial position to make the contractual payments.

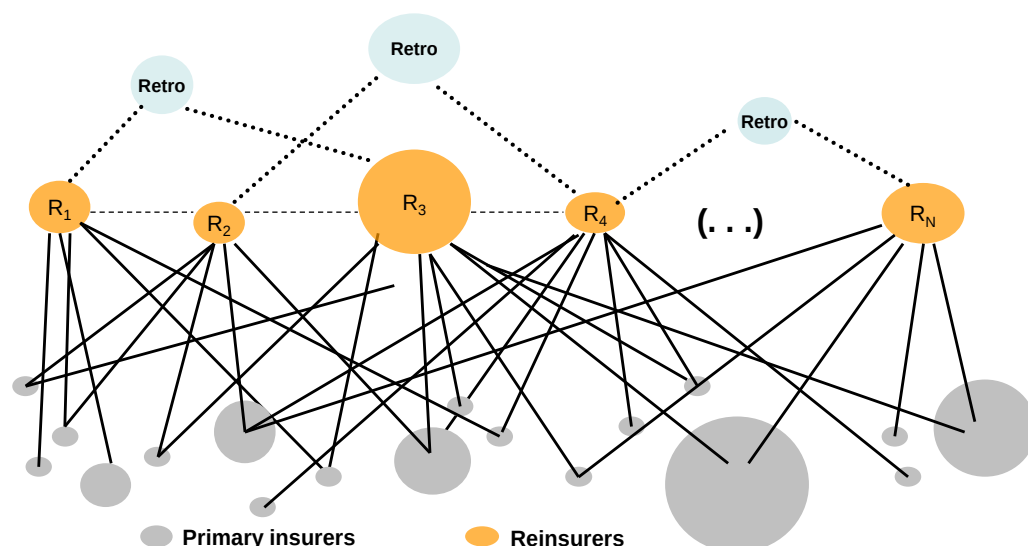
17. In general, the insurance market does not contain the feedback mechanisms that would make it fully interconnected and therefore prone to potentially systemic events akin to the systemic events observed in the interbank market and recently seen between banks and shadow banks. The dominant connections between reinsurers and primary insurers are vertical. The few existing horizontal connections between reinsurers are weak and most likely

⁸ Certain reinsurance contracts, however, are tied to financial strength ratings. A downgrade may cause collateral calls, which may be difficult to meet in stressed financial markets and pose challenges for the reinsurer's liquidity management.

⁹ IAIS 2011b, 9.

immaterial, while there are, in general, no horizontal connections between primary insurers. It is therefore fair to say that the structure of the insurance market is essentially hierarchical as depicted in figure 4 below and that the potential for systemic events to develop within such a structure is limited.

Fig. 4: Characterisation of the insurance market's hierarchical structure



Source: FINMA / IAIS

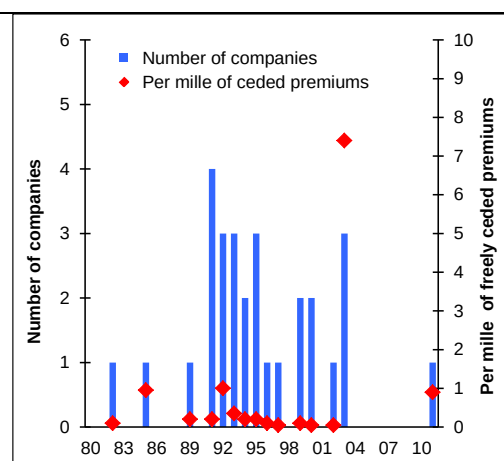
18. The hierarchical structure stifles the potential proliferation of shocks across the whole insurance sector. As the analysis below further suggests, the answer to the question whether shocks originating in the reinsurance sector spill over to the broader financial system will depend to a significant degree on the scale and complexity of reinsurers' non-traditional and non-insurance activities. As far as traditional reinsurance activities are concerned, the potential for adverse and potentially systemic intra-industry impacts is small and will likely be contained within the insurance sector.

19. These considerations are borne out by the historic record. First, the absolute number and the relative proportion of reinsurance failures are small. The known failures between 1980 and January 2011 add up to 29. In this period, three major catastrophic events occurred: hurricane Andrew, the terrorist attacks of 9/11, and hurricanes Katrina, Rita and Wilma. At the time these events occurred, each was considered to be the largest loss event in history. The cumulated loss of the 29 observed failures between 1980 and January 2011 amounts to about US\$ 1.8 bn, which represents 0.43% of the premiums ceded in that period.¹⁰ Similarly, reinsurance issues are rarely a factor behind impairments in primary insur-

¹⁰ Industry communication to the RTG, July 2011.

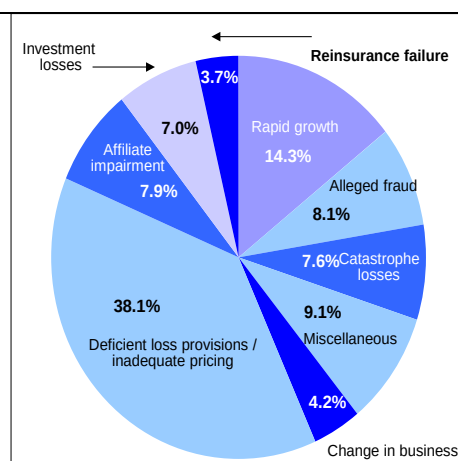
ance. Figure 6 below reports the history of financial impairments¹¹ in the US non-life insurance industry over a 40-year period. This record shows that only 3.7% of impairments in primary non-life insurers were caused by reinsurance failures. Thus, reinsurance was the smallest factor causing financial impairments in the non-life insurance sector. Among US life insurers, which typically depend less on reinsurance than non-life insurers, reinsurance failures caused only 2% of financial impairments.

Fig. 5: Reinsurance failures 1980-2011



Source: Industry communication to RTG

Fig. 6: Financial impairments of US non-life insurers 1969-2009



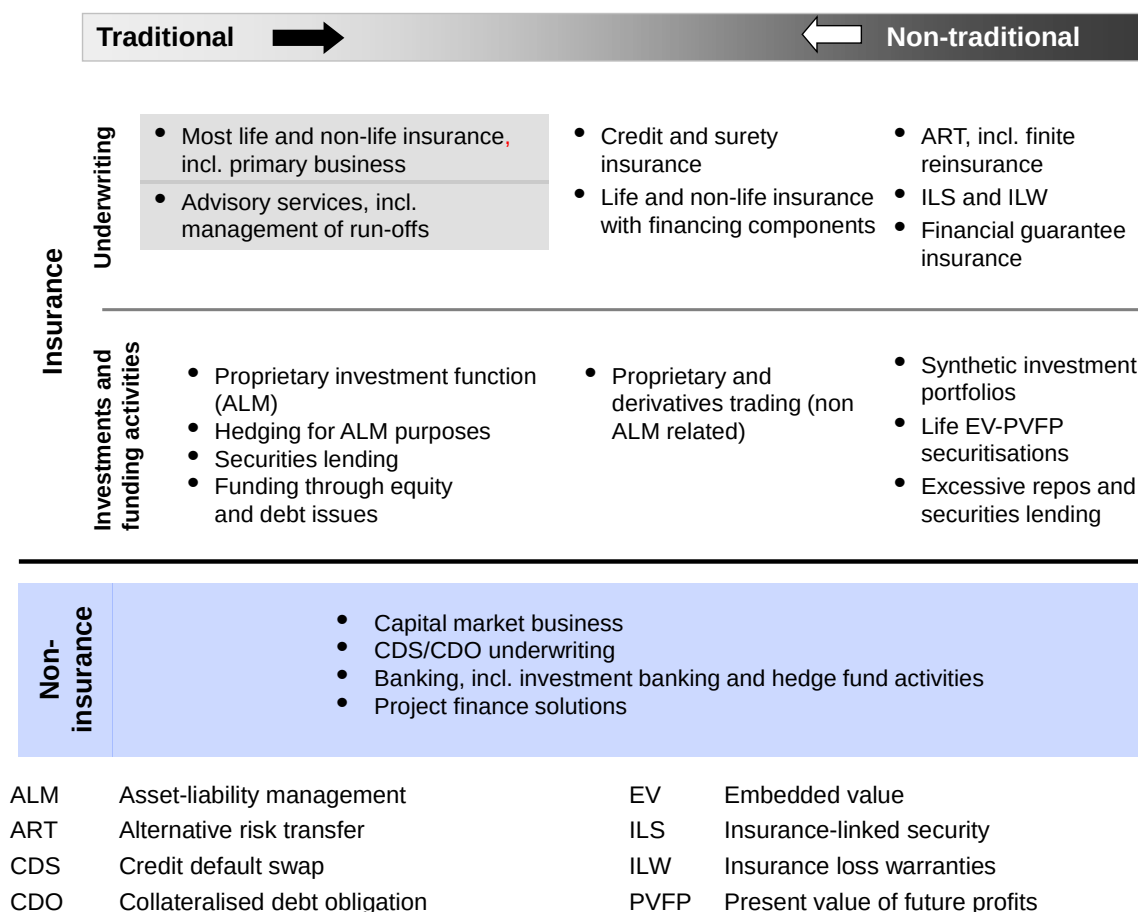
Source: A.M. Best

2.4 Activities specific to the reinsurance sector

20. While the fundamentals of the insurance business model apply to both the reinsurance and the primary insurance sectors, certain activities have emerged that are more relevant in, or are practised exclusively by, reinsurers. Before discussing the more reinsurance-specific business aspects, it is useful to recall the classification of insurance activities presented in the IFS paper.

¹¹ The data derives from A.M. Best's annual financial impairment studies. In the studies, insurers are designated "as a Financially Impaired Company as of the first official regulatory action taken by an insurance department, whereby the insurer's ability to conduct normal insurance operations is adversely affected; capital and surplus have been deemed inadequate to meet legal requirements; and/or general financial condition has triggered regulatory concern." The definition of financial impairment is also contained in A.M. Best. 2010, 3.

Fig. 7: Illustrative classification of insurance activities



Source: IAIS

21. Figure 7 (above) reproduces the matrix of insurance activities developed in IFS.¹² The key to understanding the classification is the difference between traditional and non-traditional activities as well as non-insurance activities. To paraphrase the IFS paper, the majority of life and non-life insurance business lines – such as mortality and morbidity risk in life insurance or automobile and fire risk in non-life insurance – meet the criteria for traditional insurance. They comprise the core of the (re)insurance business. Traditional insurance risks are for most parts idiosyncratic. They tend not to be correlated with each other and, more importantly, they are in general not correlated with the economic business cycle and financial market developments. These salient features set (re)insurers apart from other institutions in the financial sector.

¹² IAIS 2011b, 13.



22. However, there are activities that either deviate from, or miss entirely some of, the criteria defining traditional insurance. Such non-traditional features materially change the risk profile of the (re)insurance business. In addition to engaging in non-traditional activities a number of insurance-based groups have become engaged over time in activities with no direct connection to insurance. Conceptually, the various activities can then be allocated to two broad categories – insurance (including traditional investment and funding functions, but sometimes mixed with non-traditional features and thus called non-traditional insurance), and non-insurance.

23. It is clear that there can be no clear-cut assignments of all activities to the various fields. As stated in the IFS paper, the demarcation between traditional and non-traditional lines of business (or products) can be blurry. There are many shades of grey between traditional and non-traditional insurance activities, and different jurisdictions may allocate different activities to different classifications.

24. In the financial crisis that started in 2007 certain non-insurance activities were revealed to be systemically relevant. This was true in particular for the large volume of credit default swaps (CDS) underwritten by a non-insurance subsidiary of American International Group (AIG) that was also not subjected to insurance regulation. As was argued in the IFS paper, insurers engaged in traditional insurance activities are largely not a concern from a systemic risk perspective, while insurance groups and conglomerates that engage in non-traditional or non-insurance activities tend to be more vulnerable to financial market developments and are thus more likely to amplify, or contribute to, systemic risk.¹³ While this general statement holds also for reinsurers, there are activities more specific to the reinsurance sector that warrant special examination.

25. Of interest in this context is what academics are calling the “convergence in wholesale financial services”¹⁴ and in particular the convergence between reinsurance and investment banking. Depending on the specific nature of the convergent activities, some could be either classified as being in the non-traditional area (alternative risk transfer solutions, insurance-linked securities) or in the non-insurance segment of our classification scheme (project finance solutions, investment banking activities). Some of these activities, including CDS underwriting, are discussed in more detail in the section 3. In this context it should also be noted that in recent years non-insurance entities, and in particular entities set up by investment banks, started to offer longevity and pension services with risk transformation and risk transfer features similar to non-life insurance and life insurance products. However, in contrast to insurers who hold these risks on their balance sheets, the entities set up outside the insurance sector tend to distribute the risks to other market participants.

¹³ IAIS 2011b, 5.

¹⁴ One of the earliest contributions to a steadily growing literature was offered by Culp (2002). Culp’s thesis was expanded in Cummins (2005), and a similar line of reasoning is taken up in Cummins and Weiss (2009).



2.5 Conclusions with respect to financial stability

26. Reinsurance is an integral part of the insurance market. The technical fundamentals of the reinsurance business are the same as those of primary insurers, a fact that is also recognised in the approach to the regulation and supervision of the industry.

27. A reinsurance contract establishes a direct link between primary insurers and reinsurers. This link is often intensified through the provision of risk and capital management services by the reinsurer. It establishes an intra-industry interconnectedness, which is not observed among primary insurers.

28. Large, globally active primary insurers tend to cede less business than their smaller competitors because their size and business spread over many lines and multiple geographies allows for better risk diversification within the insurer itself. But global players still have an interest in ceding risks to reinsurers. Similarly, reinsurers cede risks either to retrocessionnaires, which in most cases are located outside the competing reinsurance system, or to the capital markets in the form of insurance-linked securities (mostly in the form of catastrophe bonds).

29. The insurance market is characterised by an essentially hierarchical structure, with weak interconnectivity along vertical lines (ie between cedants and reinsurers) and even weaker, or no connectivity at all, across primary insurers. The hierarchical structure dampens the propagation of shocks through the insurance market meaning that amplification of shocks to a systemic proportion is unlikely.

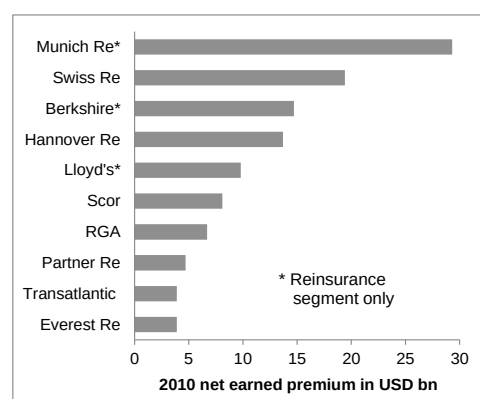
3 Reinsurance-specific business dynamics

3.1 Market size and competitive situation

30. As was pointed out in the IFS paper, the reinsurance sector is small compared to the primary insurance sector, and even smaller relative to the banking sector.¹⁵ The combined assets of the ten largest reinsurers are smaller than the assets of the top primary insurer, and by market capitalisation the whole reinsurance sector equals the two top primary insurers.

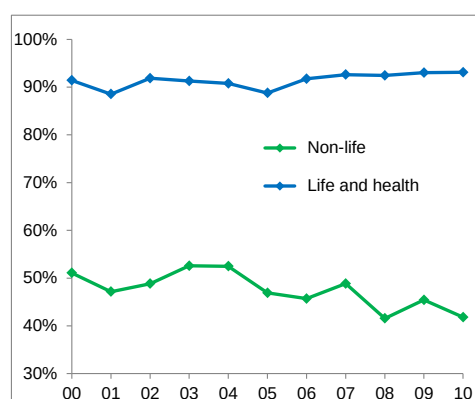
31. Although some 200 companies offer reinsurance worldwide, the market is characterised by a comparatively small number of global reinsurers. Figure 8 provides market data for the top 10 reinsurers worldwide. The net earned premiums of the five largest companies of US\$ 87 bn account for more than half of the global market. This is more than double the market concentration observed in the primary insurance market.¹⁶

Fig. 8: The top 10 global reinsurance companies



Source: Company reports

Fig. 9: Market shares over time of top 10 reinsurers



Market shares for the years 2000 to 2010

Source: Industry data

32. Figure 9 shows the development of market shares over the last 10 years. While the concentration rates in the much larger non-life insurance sector (which accounts for about 80% of total reinsurance premiums) fluctuate around the mean of 50.6%, the concentration rates in the smaller life and health insurance sector fluctuated consistently at the rather high level of 90%.

¹⁵ IAIS 2011b, 22.

¹⁶ While market dynamics and economies of scale may have fostered the emergence of large reinsurance entities, the observed concentration rates may at times have also been an unintended consequence of supervisory intervention originally designed to protect policyholders.

33. The relative stability of non-life insurance market concentration rates over time is indicative of a characteristic feature: market access is comparatively easy. After large catastrophes, which tend to reduce global capacity and lead to temporary rate increases in certain lines of business, the market has traditionally seen an inflow of start-up companies. While some start-ups have grown to become medium and large-sized companies, others either ceased operations after some time or were acquired by competitors. On balance, these dynamics kept the non-life reinsurance market comparatively competitive.

34. The dynamics are different in the life sector. Over the last decade, market concentration rates rose considerably. However, the higher market concentration has to be seen on the backdrop of a shrinking life reinsurance market, which tends to reduce the number of active competitors while increasing their relative market shares.

35. High degrees of market concentration in the reinsurance sector could *everything else being equal* raise sector interconnectedness and limit the degree of ready substitutability (at least temporarily) if a competitor were to fail. Both developments could potentially raise intra-industry systemic concerns. For that reason, the monitoring of market dynamics in the reinsurance sector would appear to be a sensible macroprudential objective.

3.2 The financial strength of reinsurers

36. Reinsurance is the main credit risk exposure to primary insurers for whom the financial strength rating, provided by rating agencies, is a contributing factor to the selection of reinsurance exposures. In addition, financial strength is vital for reinsurers and primary insurers alike when it comes to raising new capital after large catastrophe events in order to secure on-going operations. Figure 10 summarises the financial strength ratings of the top 10 reinsurers in the world. Whereas in 2002 there were three “AAA”-rated companies, there were none in early 2012. Overall, the last 10 years has seen a migration to lower ratings, with more than half of the top 10 reinsurers now rated in the “A” category.

Fig. 10: Reinsurers’ S&P rating developments (Global top 10)

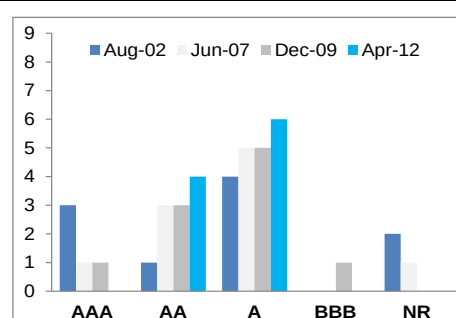
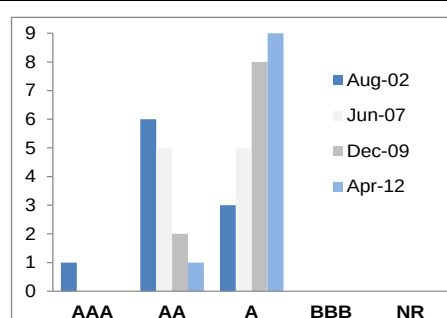


Fig. 11: Primary insurers’ S&P rating developments (Global top 10)



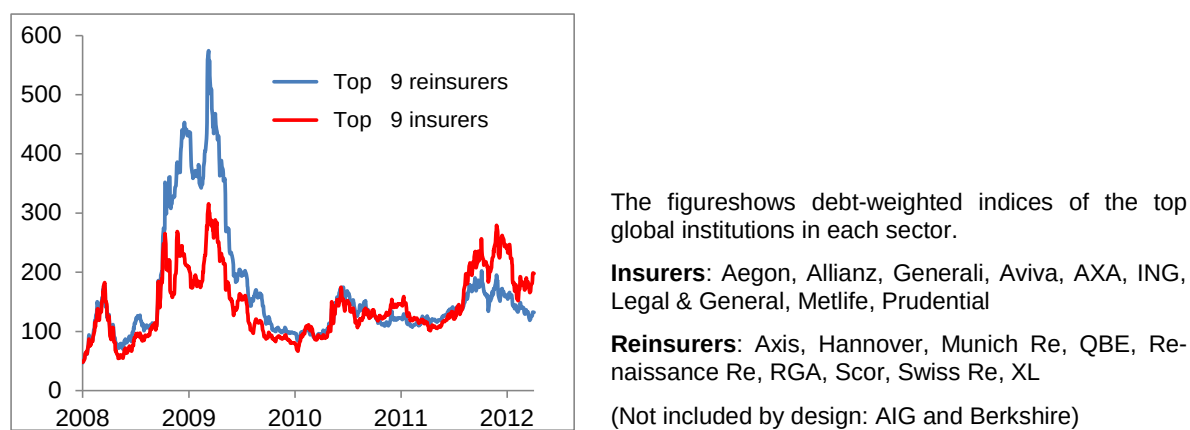
Source: S&P

37. Similar developments were observed in primary insurance (see figure 11) in the same period. By 2012, none of the top 10 primary insurers were rated in the “AAA” category, and only one continued to make the “AA” rating. However, one should recognise that in certain primary insurance lines of business financial strength appear to be less relevant than in

reinsurance. In contrast to primary insurers, for which the retail consumer business makes up an important share of total premiums, reinsurance is characterised by business-to-business transactions, which on the cedant's side are often guided by financial strength ratings.

38. In addition to the financial strength ratings provided by rating agencies (which in the aftermath of the financial crisis were critically reviewed by several panels¹⁷) we provide also a market-based view of credit risk derived from CDS data. Two caveats are in order. First, it resides in the nature of market data that they move quickly and at times react sensitively to merely perceived changes in the financial strength of individual companies. And second, markets are subject to herd behaviour and quite often indiscriminate contagion. With these caveats in mind we offer in figure 12 below CDS indices for the 9 largest global reinsurers relative to CDS indices derived for the top 9 global primary insurers.

Fig. 12: CDS spreads of reinsurers in context



Source: Bloomberg

39. While the data show that reinsurers did not totally escape the financial crisis, the picture calls for a nuanced interpretation. Responsible for the peak in CDS spreads in the first phase of the financial crisis were essentially five reinsurance groups, while the spread movements of other reinsurance groups in our sample were contained to very low amplitudes. Hence, financial market participants appear to have done a reasonable job in discriminating between strong and poor performers. Only those companies that experienced downgrades of their market-based financial strength assessment revealed to investors weak balance sheets or other problems related to their specific business models. These downgrades turned out to be comparatively short-lived. In the second phase of the financial crisis, starting with the outbreak of the sovereign debt crisis in the euro area, the group of reinsurers chosen for this sample performed markedly better than the cohort of primary insurers.

¹⁷ See for example FSB 2010.



3.3 Reinsurance markets, retrocession, and the potential of reinsurance spirals

40. In the 1980s a retrocession spiral affected the Lloyd's syndicates and London market companies offering excess of loss insurance, the so-called LMX spiral. Due to opacity, certain primary insurers and reinsurers had unknowingly reinsured their own risks. However, when the spiral unwound losses were contained within the insurance and reinsurance markets. While some companies and individual investors (the names) suffered severe losses, there was no systemic impact on the broader financial market and the real economy.

41. The LMX spiral adds a specific twist to the literature on systemic crises as it originated in a whole market comprised of many individual participants (the names). Specifically, Lloyd's syndicates and London market companies were at the heart of the LMX spiral. Direct links between various individual syndicates suggest that in a systemic perspective it would be insufficient to focus only on individual syndicates. Rather, the network of Lloyd's syndicates should be analysed in its entirety. Going forward, the challenge for macroprudential surveillance will eventually be to cast the net wide enough to also include market-wide phenomena rather than just developments within the market or emerging from individual companies deemed to be systemically relevant. (A more detailed treatment of the LMX reinsurance spiral is contained in the appendix on pages 50– 51.)

42. Since the 1980s, reinsurance regulation has been meaningfully strengthened: as of today, reinsurance is subject to regulation and supervision in all major jurisdictions (for more information about changes in reinsurance supervisory regimes see appendix A1). Requirements aiming specifically at the prevention of any future reinsurance spirals focus on two aspects. First, (re)insurers are always liable for the original contractual obligation spelled out in the underlying policy. They have “skin in the game,” which constitutes a disciplining risk governance element. Second, reinsurers must create transparency by documenting and disclosing risk origination, otherwise a retrocession exclusion clause will typically be applied.

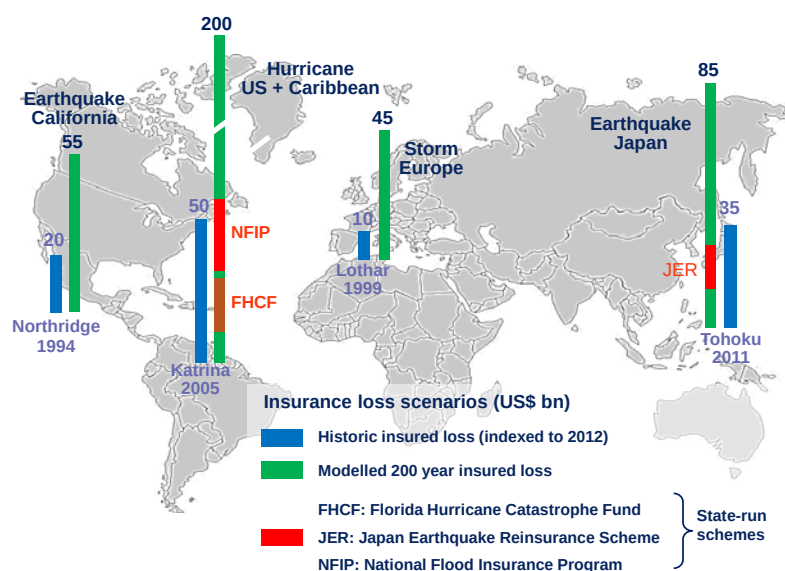
43. The question remains, however, whether reinsurance spirals are still possible. In addition to the strengthened regulation and supervision discussed in the previous paragraph, the answer is likely to be “no” also for the reason that retrocessions between competing reinsurers are negligible. Reinsurers have little incentive to assume ceded business from competitors. Their risk portfolios are similar and there are little or no diversification benefits to be gained from assuming retrocessions from competitors. If and when a reinsurer accepts retrocessions from a competitor, it is typically on special lines of business in which it is not active, thereby gaining a positive diversification benefit. Reinsurers are also interested in placing higher risk layers either in the capital market through securitisation or in the retrocession market, the latter however being placed with specialist retrocessionnaires outside the competing reinsurance market.

44. In this context it is important to recall that in 2005 and 2011 a series of large natural catastrophes occurred impacting various regions of the world. Although these catastrophes triggered retrocession layers in both years, one did not observe the formation of retrocession spirals. That was in marked contrast to the developments in the 1980s when a major claim, the loss of the Piper Alpha oil platform off the coast of Scotland, triggered not only retrocession layers, but ultimately also the LMX spiral (see appendix, pp 50-51 for a detailed analysis of the LMX spiral and its consequences for reinsurance regulation).

3.4 Absorbing peak risks

45. The reinsurance of peak risks originally assumed by primary insurers— ie risks with low probabilities of occurrence, but high severities – is the core business of reinsurers. Peak risks are typically associated with natural catastrophes (earthquakes, including tsunamis, windstorms, and floods). But peak risks exist also in the life insurance segment. They can be caused by the outbreak of pandemics, but also by unanticipated changes in longevity and mortality. Figure 13 (below) shows the insured loss potentials of natural catastrophes in four different regions of the world and over a time horizon of 200 years (so-called 1:200 year events).

Fig. 13: The four largest insured natural catastrophe losses in the world (actual and potential)



Source: Industry data

46. Loss potentials arising from peak risks are distributed unevenly around the globe. Insurers with activities limited to national or regional boundaries are exposed heavily to single loss occurrences. Global reinsurance allows for a better diversification of risks over many lines of business and – more importantly – across many geographies. It mitigates the potential impact of severe losses to primary insurers and benefits both their policyholders and shareholders. A corollary is that large primary insurers with a globally diversified portfolio tend to cede less business to reinsurers than smaller competitors with high risk accumulation potentials in specific regions.

47. These considerations highlight why reinsurance is a global activity almost by default. For example, non-US domiciled reinsurers write more than half of the reinsurance business ceded in the United States. This outcome is based on a variety of factors, including differences in the reinsurance supervisory and taxation systems of the respective jurisdictions.



48. The considerations illustrate also why global reinsurers tend to have similar risk portfolios. They all underwrite earthquakes, floods, and hurricanes. It is important to realise however that similar risk portfolios do not lead to an increased risk of aggregate industry failure. Natural catastrophe risks are idiosyncratic. They are independent of each other¹⁸ and they are not correlated with the business cycle¹⁹ or with financial market developments.

49. The latter defines a key difference between insurance and banking. Credit exposures are the dominant risks on bank balance sheets and they are tied to the business cycle. In the prologue to the current financial crisis, financial engineering and the creation of special purpose vehicles, seemingly not tied to bank balance sheets, may have created the impression that risks had been successfully sliced, diced and diversified away from financial institutions. But as the crisis revealed, the broad-based collapse of real estate prices in a large number of industrialised countries created a common shock affecting nearly all banks at the same time and with nearly fatal severity.

50. Such shocks with potentially severe consequences would be difficult to find in reinsurance. As was stated in the IFS paper,²⁰ at the end of 2010, the equity capital of global reinsurers was about US\$ 440 bn. Modelling suggests that insured losses of more than US\$ 200 bn could be absorbed without endangering the industry's viability. To put such a number in perspective, the economic loss from hurricanes Katrina, Rita and Wilma was about US\$ 125 bn and the economic losses from all large world-wide natural catastrophes that occurred in the 60 years between 1950 and 2010 amounted to US\$ 2,100 bn (in 2010 dollars).²¹ The appendix recaps the history of very large natural catastrophe years and their impact on reinsurers (see pp 43 - 45), and it reviews modelling exercises combining the simultaneous occurrence of severe natural catastrophes and severe financial distress.²²

51. Evidence that reinsurers can absorb large catastrophes without suffering significant long-term solvency impairments is given in figure 14 (next page) where developments in equity capital are used as close proxy for developments in the solvency of insurers. Reported are the mean, median and interquartile distribution of the aggregate shareholders' equity of the 10 largest global reinsurers between 2007 and 2011. While the year-on-year changes of equity capital are the result of many factors (including developments in investment yields), the data show that reinsurers weathered 2011 – a year with record-high insured catastrophe losses – well. At the end of the period both mean and median shareholders' equity positions were larger than at the beginning of the year. Also instructive is the fact that in 2008, as a result of the financial crisis, shareholders' equity of the top 10 reinsurers declined nearly 20%. Obviously, the shock originating from the larger financial system was a bigger chal-

¹⁸ In this context it is useful to lump earthquakes and tsunamis as one and the same risk affecting certain coastal zones.

¹⁹ Of course, natural catastrophes impact economic activity particularly in smaller countries. But not surprisingly, the presence of insurance tends to mitigate adverse impacts. Dahlen et.al. (forthcoming) find that countries where insurance penetration has reached a certain level tend to recover faster from natural catastrophes than countries with lower insurance penetration.

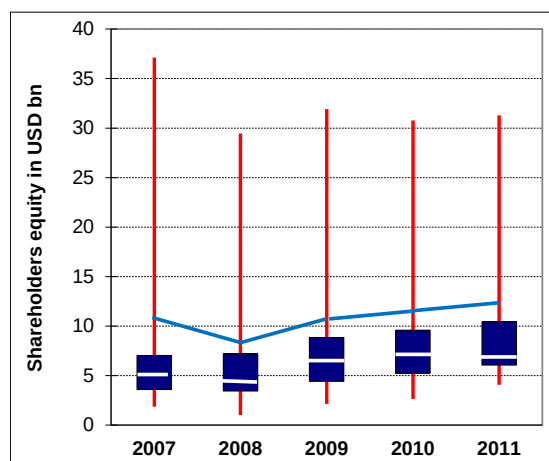
²⁰ IAIS 2011b, 30.

²¹ Industry communication to the RTG, July 2011.

²² Similar conclusions were published in a report by the Group of 30 (2006).

lenge for the reinsurance industry than the large losses associated with undertaking the business of reinsurance – the underwriting of peak risks.

Fig. 14: Development of shareholders' equity of top 10 global reinsurers



The sample of global reinsurers comprises Munich Re, Swiss Re, Hannover Re, QBE, SCOR, RGA, Partner Re, Transamerica International, Everest, and Transatlantic.

White bars denote median equity; blue lines the development over time of average equity, red whiskers the top and lowest quartiles of the distribution

Source: Company data

3.5 Absorbing a combination of extreme loss events

52. This section provides the results of extreme stress test scenarios²³ impacting primary insurers and reinsurers. The scenarios include financial market distress, severe natural catastrophes, and the failure of one large reinsurance company. In other words, they consider tail events combining the recent financial crisis and the series of extreme natural catastrophes experienced in 2010 and 2011, which impacted both the asset and liability sides of primary insurers and reinsurers.

53. The results are similar for both primary insurers and reinsurers. The impact on equity capital (which in this context serves also as proxy for solvency) of severe financial market crises far outweighs the adverse effect of large catastrophic loss events. Adding the default of one large reinsurer would make a comparatively small contribution to the total losses absorbed by primary insurers.

54. The appendix also examines the capital position of a fictitious reinsurance company under extreme loss scenarios. The findings are that the capital buffers would absorb even the combination of financial market distress and large natural catastrophes. However, the

²³ See also appendix pp 48-49 for a discussion of catastrophe simulations in stress testing.



considerations would be incomplete without reference to recent events when a large insurance conglomerate engaged in non-insurance activities.

55. Losses on the scale incurred by AIG Financial Products (FP) would indeed be much larger than the remaining buffer referred to in the extreme scenario described. In light of parental guarantees they could arguably lead to the failure of the reinsurance group under consideration. To the extent that a failed group was engaged in significantly interconnected non-insurance activities, its failure could assume systemic proportions. In the case of AIG, US authorities decided that a failure would indeed have severe cross-sectoral implications and they agreed to support the holding company so that AIG FP could honour the CDS contracts it had entered into with large global banks. This illustrates why it is of utmost importance that supervisors, both on national and international levels, must monitor changes in the business models of reinsurance entities. Moreover, such the strengthened supervision must broaden the regulatory perimeter to include in particular those non-reinsurance activities that could have potentially adverse consequences for the conglomerate and the larger financial system.



3.6 Conclusions with respect to financial stability

56. The reinsurance market is more concentrated than the primary insurance market, particularly in the life reinsurance segment. While recent years have seen a slight deterioration in the financial strength ratings for reinsurers, the ratings migration among reinsurers is less pronounced than in the primary insurance segment. These developments together lead to marginally increased interconnectedness in the insurance market and marginally higher counterparty risks for primary insurers.

57. Strengthened supervision of reinsurers in combination with new transparency and disclosure rules appear to have reduced the risk of retrocession spirals. Although in both 2005 and 2011 very large natural catastrophes triggered retrocession layers, no spirals occurred. This was in sharp contrast to the early 1980s when one particular large event triggered the LMX spiral which ultimately cost affected shareholders GB£ 8 bn.

58. Over the years, reinsurers have demonstrated a remarkable resilience in absorbing the peak risks aligned with their core business model. The global nature of reinsurance business allows for the pooling of broadly idiosyncratic and uncorrelated risks. At the end of 2011, despite an unprecedented series of large catastrophes in the Asia-Pacific region and the Western Hemisphere the top 10 global reinsurers monitored in our sample reported more equity capital than at the beginning of the year.

59. An extreme stress test suggests that large reinsurance groups are likely to absorb even a fat tail combining severe catastrophic and financial market stress. The stress analysis reported in the Appendix A5 indicates that insurers and reinsurers are likely to be impacted more by adverse financial market developments than by assuming peak risks related to their traditional business model.

60. However, the financial crisis experience suggests that reinsurance groups and conglomerates (and primary insurers) that are heavily engaged in non-insurance activities are likely to become both originators and amplifiers of systemic crises. The period prior to the current financial crisis has shown that the pace of financial innovation and the corresponding change in business models can be rapid. Supervisors should constantly monitor both innovation and changes in insurance business models, and be prepared to broaden the regulatory perimeter to include particularly those non-insurance activities that could have potentially adverse consequences for the conglomerate and the larger financial system.

4 Financial market-related activities

61. The convergence between insurance and financial markets has been a long-running topic in the literature – and perhaps less so in business practice. Intellectually, it is easy to conceptualise a wholesale financial risk management market where reinsurers and investment banks in particular provide similar services, although based on a set of different core competencies. All it requires for convergence to become functional would be an unbundling and subsequent reassembling of the value chains in reinsurance and investment banking, respectively. It is also easy to identify convergence drivers. Cummins, for example, lists (i) the emergence of enterprise risk management, (ii) the rapid growth of property values in catastrophe-prone regions, which incentivises the transfer of peak risks to the capital market, and (iii) market imperfections in response to certain regulatory, accounting and tax treatments.²⁴ Some of these incentives have indeed led to specific products and solutions, and they are the topic of this section on financial market-related activities of reinsurers.

62. If convergence between insurance and banking were to exist at a larger scale, reinsurers – or primary insurers participating in convergent activities – would indeed be a linchpin to the broader financial markets, potentially amplifying, and contributing to, systemic financial risk. However, the record is not as clear-cut as platonic models seem to suggest. The market for insurance-linked securities (ILS), for example, which is arguably a case where convergence has gone the farthest, continues to be small relative to the risk transfer to global reinsurers, and it is even smaller when compared to the global market of asset backed securities (ABS). These considerations are important when calibrating the non-traditional and non-reinsurance activities of reinsurers to similar financial activities conducted by banks and shadow banks.

63. The range of innovations that extend the traditional world of (re)insurance to products that partially or wholly incorporate financial market features is wide. Figure 15 on the next page, which is adapted from an academic survey article²⁵ summarises developments in ART. It shows the world of ART to be diversified, ranging from more traditional risk transfer schemes such as captive insurance to hybrids (including finite reinsurance) and ultimately financial market-related products. The latter extends to ILS, describing a broad category including catastrophe bonds (or cat bonds in short) and various variants of securitisation products in the life insurance sector. The last category does not include derivative products such as CDS, which were developed outside the insurance sector and are not treated as insurance products for regulatory and accounting purposes. One should also note that certain variations of ART (such as “self-insurance plans”) do not comprise insurance in the traditional meaning.

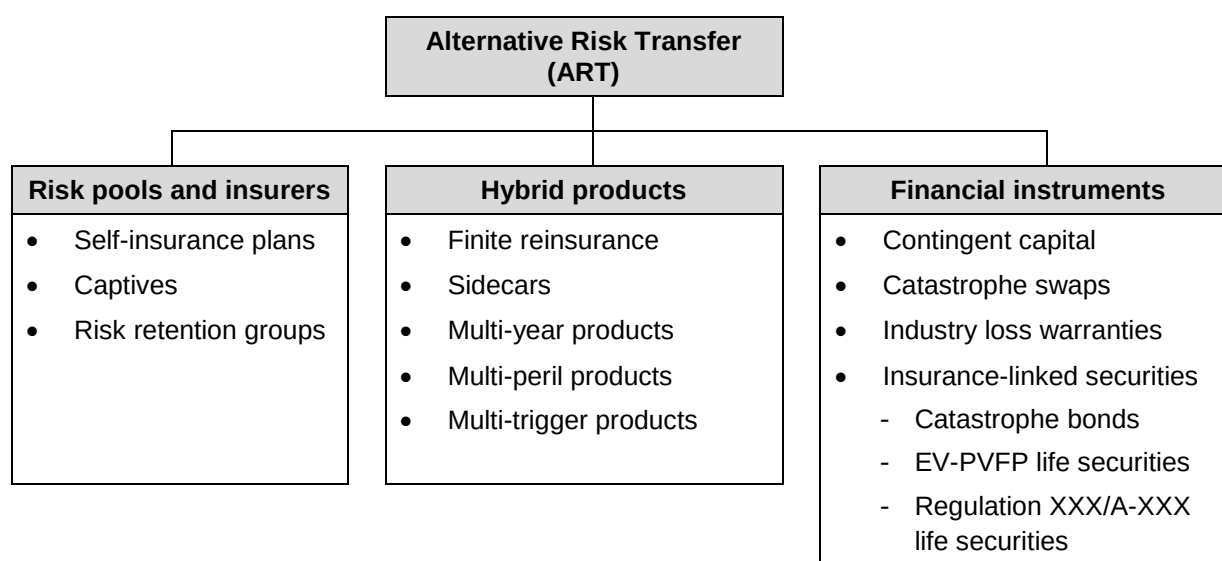
64. For brevity's sake this paper will focus on four ART developments – (i) finite or, as it is more widely called, financial reinsurance, (ii) various forms of insurance-linked securitisation, (iii) industry loss warranties (ILWs), and (iv) credit derivatives, such as CDS and collat-

²⁴ See Cummins 2005, 190.

²⁵ See Cummins and Weiss 2009, 506.

eralised debt obligations (CDOs). The latter opens the world of traditional and non-traditional reinsurance to financial market products developed outside the reinsurance industry. In the IAIS classification given in table 7 (page 12) they are defined as non-reinsurance (NRI) activities. As pointed out before, the classification of non-traditional (ILS and finite reinsurance), and non-reinsurance activities (such as CDS/CDO underwriting) will be important in ascertaining the systemic risk potential of the (re)insurance groups engaging in these activities.

Fig. 15: Innovation in the reinsurance sector



Source: Adapted from Cummins and Weiss (2009), p 506.

4.1 *Finite (or financial) reinsurance*

65. In ART, finite reinsurance²⁶ is perhaps the most widely used product. Although there is no commonly accepted definition, certain finite reinsurance transactions mitigate the fluctuation of insurance results over several years and they include the investment income on the premiums paid by the cedant when determining the price of the product.²⁷

66. The financing benefits of finite reinsurance contracts accrue often on a short-term basis without any underlying insurance transaction or risk transfer. In these cases, finite reinsurance may entail elements of credit intermediation. Deliberately abusive construction could

²⁶ The term “finite” refers to the fact that risk transfer tends to be more limited than under the also limiting terms and conditions of conventional products. However, a number of jurisdictions require the demonstration of positive risk transfer and the close monitoring for finite reinsurance to be accepted – and treated for regulatory, accounting and tax purposes – as a reinsurance contract.

²⁷ A more detailed description is given in an IAIS publication on finite reinsurance. See IAIS 2006b.



mislead stakeholders, auditors, and supervisors, and they might endanger the future ability of the primary insurer to meet its claims obligations. In order to minimise the fraudulent use of finite reinsurance, the transactions must be analysed thoroughly. Supervisors typically test for substance over form, and they require a significant amount of risk transfer in conjunction with appropriate disclosure mechanisms.

67. While the inability to honour future claims will hurt policyholders, it is important to recall that finite reinsurance transactions with risk transfer do not entail leverage and do not extend beyond the two contracting parties. For these reasons it is difficult to see how the potential demise of one particular primary insurer would create risk for the larger financial system or the real economy.

4.2 Insurance-linked securities

68. The rationale for insurance-linked securities (ILS) derives from many sources.²⁸ One of them is the need to provide capacity to insure the rapidly growing values of highly valued properties in regions exposed to hurricanes and typhoons (the US Gulf coast and parts of Asia) or to earthquakes (California and Japan, for example). Current primary and reinsurance capacity may not only be insufficient to fund the losses arising from a big catastrophic event, it would be inefficient and very expensive for insurers to permanently hold capacity for peak catastrophe risks defined as 1:250-year or 1:500-year events. It is therefore a reasonable proposition for primary insurers and reinsurers to transfer parts of the peak catastrophe risks to the vast capacity of the global capital market. In principle, primary insurers and reinsurance companies face the same requirements when accessing the capital market. However, reinsurers have turned out to play a more active role in placing insurance-linked securities than primary insurers.

69. The first ILS issued were catastrophe bonds (or cat bonds) offered in response to the capacity shortages after hurricane Andrew (1992). The majority of ILS refers to an underlying pool of insured risks that are of a low frequency and high severity, or peak risks in short. In addition to catastrophic non-life events, ILS also extend to life insurance where they cover peak risks associated with sharp increases in mortality (caused by pandemics, for example) or unanticipated changes in longevity. In recent years, ILS were also based on a high-frequency, low-severity book of automobile insurance risk, illustrating that the securitisation technique could apply to a broad range of insurance liabilities.

70. ILS transactions increased from near zero in 1997 to about US\$ 15 bn in 2007, but they have dwindled since largely due to a lack of investor appetite for life insurance transactions wrapped with guarantees provided by monoline insurers.²⁹ Cat bonds peaked also in 2007 at about US\$ 7 bn, declining in early 2008 in light of the surplus of traditional reinsurance capacity, and drying up completely in September 2008 after the collapse of Lehman

²⁸ Further insights are provided in an in-depth IAIS study on (re)insurance securitisation. See IAIS 2009.

²⁹ These data do not include "life settlement" transactions where whole life insurance policies are sold by the beneficiary or insured for an amount greater than its surrender value, but lower than the policy's face or insured value.

Brothers. It turned out that four cat bonds had been backed by poor-quality collateral that was protected by a total return swap (TRS) offered by Lehman (see also figure 16 below). The TRS failed after the collapse of Lehman.³⁰ When the rating of the four bonds covered by the TRS was subsequently downgraded, investors stepped back from the cat bond market entirely on the fear that other bonds would carry a similar credit risk exposure. The market resumed in February 2009, as issuers introduced more conservative collateralization and re-insurance markets began to tighten.

Fig. 16: Outstanding/issued cat bond volume (US\$ bn)

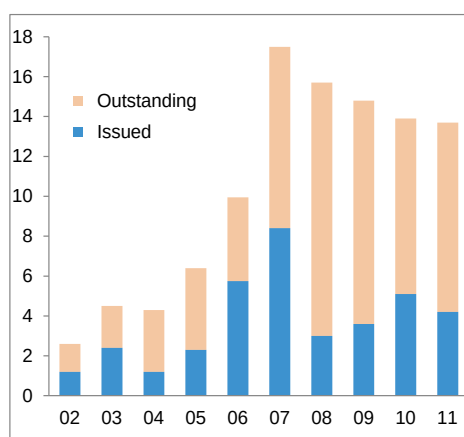
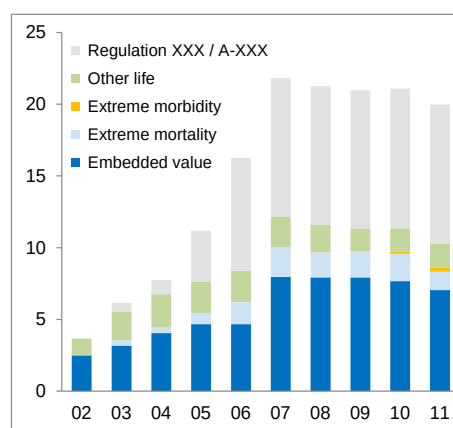


Fig. 17: Outstanding life ILS volume (US\$ bn)



Source: Swiss Re Capital Markets

71. The role of securitisation as a capital management tool is highlighted by embedded value (EV) securitisation in the life insurance sector. To acquire new business, life insurers must pay commissions to agents and brokers. The upfront payments are deferred over the duration of the life insurance policy, and the deferred acquisitions costs (DAC) are capitalised as an asset on the balance sheet. This intangible asset can be monetised through securitisation. In a similar fashion, life insurers can monetise the present value of future profits (PVFP). The gist of the transactions is that they are designed to provide financing. While they entail risk transfer (mainly mortality and lapse risks), the main rationale is to unlock the intangible value embedded in the life insurance business. To the extent that the securitised book contains interest rate sensitive products (due to interest rate guarantees, for example) investors in EV-PVFP insurance-linked-securities may face substantial interest rate risk.

72. Securitisation is also used to fund certain regulatory capital requirements. In the US, life insurers consider reserve requirements under Regulation XXX (for level-premium term life) and A-XXX (for universal life with guarantees) to be higher than what could be justified

³⁰ In a typical cat bond, issuance proceeds are invested in collateral to ensure that all interest, principal, and cat-contingent payments can be made in a timely manner. The issuers of the four bonds in question opted to hold lower-quality collateral coupled with a TRS issued by Lehman to protect against collateral deterioration.



by the economics of the business.³¹ To unlock the redundant reserves, the life insurer issues a bond through a special purpose vehicle, which is equivalent to the difference between the reserve requirement and the reserves justified by the underlying economics. In the end, investors holding the bond collateralise the redundant reserves, while the insurer can use the funds gained through the monetised redundancy to write new business.

73. As shown in figure 17 (previous page), the bulk of ILS in the life insurance sector relate to EV-PVFP and regulation XXX/A-XXX securitisations with a share of more than 80% of the outstanding volume at the end of 2011. Although the volume of life ILS also declined after 2007, the withdrawal from the market was not as pronounced as the one observed in the catastrophe bond market.

74. The outstanding volume of life and non-life insurance-linked securities pales compared to the volume of asset backed securities (ABS). At the end of March 2012, Bloomberg reported a total outstanding ABS volume of US\$ 1,916 bn. This is nearly 200-times the volume of outstanding cat bonds and nearly 100-times the volume of outstanding life insurance-related securities. At this time, it is difficult to see how the marginal ILS market could give raise to systemic concerns, but going forward its growth and potential for systemic ramifications need to be monitored carefully.

4.3 Industry loss warranties

75. Industry loss warranties (ILWs) are specific reinsurance or derivative contracts that tie any claim payments to a predefined catastrophic loss level incurred by the whole industry (the industry loss trigger) or a subset thereof rather than an individual company's aggregate losses from a catastrophic event. In some cases, ILWs include two trigger requirements. In addition to the industry loss trigger, the contract may stipulate an ultimate net loss clause, which requires the (re)insurance company buying the protection to demonstrate that it too has incurred a predetermined loss of a minimum level to trigger the requirement. Since ILWs are in most cases not collateralised, the cedant must monitor and manage the credit risk associated with the counterparty providing the protection.

76. Underwriting insurance business on an indemnity basis and hedging insurance risk with industry-triggered securities necessarily creates basis risk. In recent years, industry analysts have observed significant progress with respect to the customization of loss triggers, and they conclude that these improvements are likely to fuel further growth of the ILW market.³² From a supervisory perspective, however, increased attention needs to be paid to the management and measurement of basis and credit risks inherent in ILWs.

³¹ Regulation Triple-X determines the statutory valuation requirements for most life insurance policies. For further information on regulation XXX, compare also: NAIC Valuation of Life Insurance Policies Model Regulation, 830-1.

³² See Carpenter 2012; Willis Capital Markets & Advisory 2012.



77. One of the weakest elements in single trigger ILW products is the absence of insurable interest, which makes ILWs more akin to financial derivatives. Again, this feature suggests the need for close monitoring of future ILW market growth. Supervisors may also want to foster an appropriate collateralisation of ILWs.

78. Two additional factors are important when evaluating the potential systemic risk associated with insurance-linked securities. First, it is crucial to differentiate between the securitisation of life and non-life insurance liabilities (as in cat bonds and through the securitisation of mortality and longevity risks) and the PVFP or EV securitisation seen in the life insurance sector. In the non-life insurance sector there is a transfer of peak risks to the capital market with minimal financial market (ie interest rate) risk, whereas life insurance securitisation may entail a considerable degree of equity market, interest rate, and credit risks. The risks depend on the composition and amount of equities held in the life insurer's investment portfolio, the nature of the underlying business (ie the presence and nature of interest rate or income guarantees), and the question whether the security is credit-wrapped. That said, the small volume of EV-PVFP securities outstanding suggests that, at least for the time being, the systemic risk potential of these instruments is rather negligible.

79. Second, one must examine the potential for systemic interactions between ILS prices and the prices of other financial instruments. ILS sponsors have traditionally argued that insurance-linked securities are attractive for investors, because they show little or even no correlation with other financial assets. As a so-called "zero beta" investment, cat bonds in particular are thought to provide an attractive diversification benefit to any portfolio. While this appears true in principle, the extreme contagion experienced in 2008 during the financial crisis calls for a more nuanced view. As Cummins and Weiss report, "during normal conditions, cat bonds are close to zero-beta with respect to stock and bond total returns." However, in the period July 2007 to January 2009, cat bond returns showed higher correlations with three other total return indices, with correlations ranging from 0.19 (Barclays CMBS index) to 0.47 (Merrill-Lynch BBB corporate bond index).³³ The change in correlations underscores the by now familiar insight that what in normal times are stable and benign relationships may turn abruptly into malign and destabilising relationships during systemic crises.

4.4 Credit derivatives

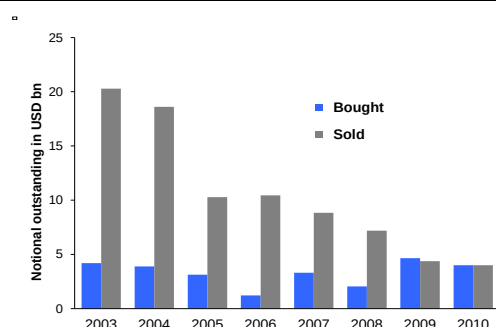
80. Finally, credit derivatives are an area where the convergence of products offered by (re)insurers and investment banks has progressed the farthest and where products and solutions offered by (re)insurers clearly extend beyond the insurance demarcation line. For simplicity's sake we shall focus only on the underwriting of credit default swaps, leaving out many other forms of credit derivatives with insurance links.

81. While a number of non-insurance subsidiaries of primary insurance and reinsurance groups began offering credit default swaps as early as 2000, the majority of the industry refrained from CDS underwriting and used them only for hedging purposes. In 2003, the RTG

³³ Cummins and Weiss 2009, 532.

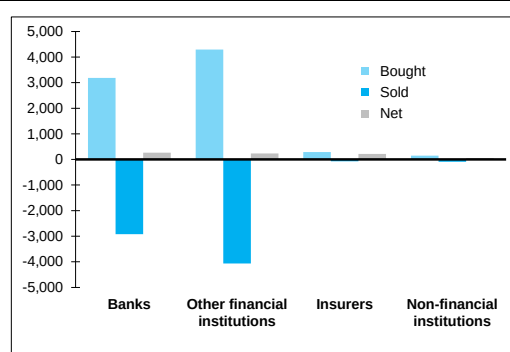
of the IAIS started tracking non-insurance CDS activities. Figure 18 (next page) reproduces global RTG data for CDS bought and sold (notional outstanding) by reinsurance firms. The data show that over the last seven years, reinsurers have continuously reduced the notional amount of CDS protection sold from a high of US\$ 20.3 bn in 2003 to a low of US\$ 4.0 bn in 2010. At the same time they increased the amount of protection bought from a low of US\$ 1.2 bn in 2006 to US\$ 4 bn in 2010. While the data show that over the years reinsurers have reduced to zero their role as CDS net protection suppliers, the moderation observed may turn out to be temporary.

Fig. 18: CDS bought and sold by reinsurers



Source: IAIS Global Reinsurance Market Report

Fig. 19: CDS bought and sold by sectors (US\$ bn)



Source: BIS OTC derivatives statistics, November 2011

82. In order to gauge the potential systemic impact of reinsurers' CDS activities, the volume of CDS protection sold should be compared to the market-wide notional amount of sold CDS contracts of US\$ 22.2 trillion outstanding in the second half of 2010.³⁴ From the grand total one can conclude that reinsurers contributed less than 0.02% to the global market's supply of CDS protection and that their potential systemic impact was negligible. The negligible role of reinsurers as net-sellers of credit default swaps is also corroborated by BIS data relevant for the whole insurance sector. At 30 June 2011, the notional value of CDS sold by insurers as a whole was US\$ 71 bn. This pales compared to the volumes offered by other financial market participants. Banks sold 40-times more and other financial institutions sold close to 60 times more than the (re)insurance sector as a whole.

³⁴ BIS 2011.



Table 1: Traditional reinsurance and capital market innovations

Products	Standardi- sation	Risk transfer	Tail risk	Market liquidity**	Liquidity risk*	Credit risk**	FM risk	Interme- diation	CM access	Classi- fication
Traditional reinsurance	Customised	Yes	D	n/a	No	D	D	Direct; brokers	No	TRI
Hybrids										
Finite reinsurance	Customised	D	Low	Low	Moderate	D	D	Direct; brokers	No	NT
Sidecars	Customised	D	D	Moderate	Moderate	D	D	Direct; brokers	Yes	NT
Financial instruments										
Cat swaps	Moderate	Yes	D	Moderate	Moderate	D	D	Direct; brokers	Yes	NT
Non-life cat bonds	Low	Yes	D	Medium	Moderate	D	D	Invest. banks	Yes	NT
Life cat bonds	Low	Yes	D	Moderate	Moderate	D	D	Invest. banks	Yes	NT
EV-PVFP securitisation	Low	D	D	Medium	Moderate	D	D	Invest. banks	Yes	NT
XXX / A-XXX securitisation	Low	D	Low	Medium	Moderate	D	D	Invest. banks	Yes	NT
Industry loss warranties	Moderate	No	D	Medium	Moderate	D	D	Direct; brokers	Yes	NT
CDS / CDOs	Moderate	D***	High	Medium	Medium	High	High	Direct; I. banks	Yes	NRI
* = For risk taker ** = For cedant *** = No risk transfer in case of speculative or so-called naked swaps n/a = Not applicable in case of traditional reinsurance CM / FM = Capital market / financial market; financial market risk refers to interest rate risk and equity market risk D = Depends on product features, underlying asset portfolio, loss triggers, and extent of collateralisation TRI / NT / NRI = Traditional reinsurance / Non-traditional reinsurance / Non-reinsurance										
Source: IAIS										

4.5 Conclusions with respect to financial stability

83. Table 1 on the previous page summarises the essential features of financial market innovations and how they compare to traditional reinsurance. With the exception of traditional and finite reinsurance, all activities link the reinsurers engaging in them to the capital market. However, liquidity risk, credit counterparty risk, and financial market risk (as the sum of interest rate and equity market risk) are moderate to high only with respect to CDS activities. These activities are considered non-reinsurance according to the IAIS classification. As also spelled out in the IFS paper, non-(re)insurance activities are more likely to amplify and contribute to systemic risk than the traditional activities of (re)insurers. This has to be borne in mind also for the development of the methodology for the identification of systemically important insurers with global reach, the so-called G-SIIs.

84. Finite reinsurance is unlikely to create systemic issues. The motive for contracting finite reinsurance appears to be predominantly financial (ie income smoothing for primary insurers) which, in the absence of any material amount of risk transfer, makes finite reinsurance a purely finance-oriented transaction. For that reason it is a prudent supervisory perspective to call for a closer monitoring of these contracts.

85. Developments of insurance-linked securities call for a differentiating view. The primary motive for the issuance of cat bonds and life insurance securities linked to longevity, mortality, and pandemic risk is the transfer of peak risks to the capital market. But the cover for the underlying insurance risks does not comprise an extension of credit. Consequently, the failure of a cat bond (ie, the indemnification of the cat bond's sponsor) does not undermine a credit pyramid. The fact that primary insurers remain accountable to the original policyholders ensures by default a high level of risk governance. Since assumed insurance liabilities are contractually not transferable, the primary insurer (ie risk originator in this case) must keep a substantial portion of the risks on its balance sheet, which again reinforces a high degree of risk governance. At this point it is difficult to see how practices associated with the originate-to-distribute business model that were seen as one root cause of the subprime credit crises could proliferate in the ILS market.

86. Investors holding EV-PVFP and regulation XXX/A-XXX securities are also participating in insurance risk. From the perspective of the issuer, however, financing (ie the unlocking of intangible assets) and regulatory motives play a more important role. These securities can display considerable financial market sensitivity, depending on the extent to which the products underlying in EV-PVFP securitisation contain interest rate guarantees. The present value of future profits also depends on economic assumptions, including the choice of the discount rate. These features make EV-PVFP life insurance securities more similar to asset-backed securities issued by banks and mortgage institutions.

87. Industry loss warranties are yet another way to mobilise the funding of reinsurers. In contrast to insurance-linked securities however, ILWs typically do not require collateralisation and there is no insurable interest. These key elements make them more akin to financial derivatives, requiring close monitoring by supervisors.



88. The underwriting of credit default swaps comprises a non-reinsurance activity. CDS may be linked to credit products (by guaranteeing subprime mortgages or collateralised debt obligations, for example). This creates, as experience has shown, a considerable degree of systemic risk for the underwriter of credit default swaps. However, data collected by the RTG indicate that in the wake of the losses caused by the financial crisis reinsurers have sharply curtailed their activities in this area. One should also note that while CDS entails many features similar to insurance contracts, their regulatory and accounting treatment has made clear that they are financial derivatives and not insurance contracts.³⁵

89. In the end, the answer to the question of whether the non-traditional and non-reinsurance activities of large reinsurance groups can amplify and contribute to systemic risk, and whether (re)insurance groups with significant activities in these areas should be determined systemically important financial institutions with global reach (G-SIFIs), must be given on empirical grounds. The IAIS is currently developing the methodology to provide this answer.

³⁵ Schwartz 2007, 167-201.



Conclusions

90. The findings of this position paper concur with the IFS paper³⁶ published last November. Primary insurance and reinsurance are fundamentally the same. Primary insurers and reinsurers conduct their businesses based on the same insurance techniques, and both sectors are subject to the same accounting and supervisory rules.

91. In line with the IFS paper, we find that traditional reinsurance – including the reinsurance of peak risks – is unlikely to contribute, or amplify, systemic risk. While reinsurance establishes intra-sector connectivity, the hierarchical structure of the insurance market dampens the propagation of shocks through the insurance market. Although reinsurers can fail, in the past, primary insurers have typically absorbed the loss of reinsurance recoverables without a significant detrimental financial impact.

92. Over the years, reinsurers have developed and propagated a range of innovations in the area of alternative risk transfer (ART). In many cases, ART simply extends the range of traditional reinsurance (eg for multi-year, multi-line and multi-trigger products). As far as these extensions are concerned, ART does not facilitate credit intermediation, and it is unlikely to raise broader systemic concerns. In a number of cases however, ART products entail little or no risk transfer and they include features that may create financial market interdependence with potential systemic implications.

93. These considerations, supported by evidence from the current financial crisis, are different with respect to non-reinsurance activities, such as CDS and CDO underwriting. These activities entail considerable systemic potential. The answer to the question, however, whether a reinsurance group engaging in such activities would be a systemically important institution, can only be given on empirical grounds. The methodology to allow such judgments is currently under development in another IAIS workstream; it was not the purpose of this paper.

94. Over the last decades, regulators have increasingly incorporated the supervision of reinsurance into the regular course of their supervisory ambit. The financial crisis has revealed transparency and disclosure gaps in many financial businesses, and it has shown the need to strengthen supervision in a number of areas across many sectors and jurisdictions.

95. The closing of transparency and disclosure gaps in (re)insurance, as well as the strengthening of microprudential supervision and macroprudential surveillance on national and global levels, are high on the agenda of IAIS Members. The intrinsically global nature of the reinsurance business in general, and the evolving nature of alternative risk transfer products as well as their affinity to the financial markets in particular, make it prudent to call for a continued monitoring of the reinsurance sector.

³⁶ IAIS 2011b.



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Appendix

A1 Survey of reinsurance regulatory regimes in selected jurisdictions

A1.1 *Review of the supervisory regime in Bermuda*

1. The supervision of (re)insurance business in Bermuda is carried out by the Bermuda Monetary Authority (BMA), Bermuda's single financial services regulator. The regulatory framework for (re)insurance is based fundamentally on the Bermuda Monetary Authority Act (1969), and amendments, and the Insurance Act (1978) and amendments.
2. Bermuda's (re)insurance sector is mostly international and focused on wholesale markets. The regulatory and supervisory framework differentiates between captive and commercial insurers and reinsurers. Bermuda's commercial reinsurers are very active in the catastrophe reinsurance segment.
3. BMA licenses and supervises both captive and commercial (re)insurers. The Insurance Act provides the BMA with a wide range of powers, including the powers to restrict activities and investments, freeze assets, remove management, prohibit payment of dividends, petition for winding up, or cancel registration. Moreover, the BMA is empowered to obtain all the information necessary for licensing (re)insurers.
4. The Insurance Act and a related Insurer Code of Conduct establish the general framework for the system of governance of (re)insurers. The BMA has a general power to assess and ensure (re)insurers' compliance with these requirements and verifies compliance in on-site reviews and off-site analysis. Importantly, the framework applies to both solo and (re)insurance group levels.
5. BMA's framework requires (re)insurers to have in place an effective system of governance which provides for sound and prudent management of the business and an effective risk management system. In relation to the risk management of (re)insurance, BMA's framework requires the risk function to be embedded in the (re)insurer's organisational structures and strategic oversight processes. (Re)insurers are required, on a solo and group basis, to carry out own risk and solvency assessments.
6. The BMA has a well-developed framework for effective and efficient information exchange, as well as disclosure and transmission, including provisions to protect confidential supervisory information from unwarranted access. This framework is applicable to information exchange in solo and group contexts. Further, the BMA was part of the first batch of supervisory authorities to become a signatory of the IAIS Multilateral Memorandum of Understanding (MMoU). Moreover, the BMA has hosted several supervisory colleges, attended by supervisors from North America, Europe, and Asia, for large (re)insurers, accompanied by numerous bilateral meetings with other relevant supervisors.
7. With respect to solvency calculations, commercial (re)insurers are required to comply with the Bermuda Solvency Capital Requirement (BSCR), introduced in 2008. BSCR is calculated to cover unexpected losses arising from existing business that correspond to the Tail VaR subject to a confidence level of 99% over a one year period. BSCR includes charges for investment, interest, liquidity, premium, reserve, credit catastrophe and operational risks, with full run-off of policyholder liabilities. BSCR is supplemented with an array of stress and scenario tests related to both peak and non-peak zone perils. (Re)insurers are required



to comprehensively inform the BMA about their catastrophe models, region-peril Exceedance Probability Curves, data quality and accumulation procedures. In addition, (re)insurers are required to file detailed information on investments, liquidity, intra-group transactions, risk concentrations and reserve development. Further, (re)insurers may apply to the BMA for approval of their own internal models for the calculation of regulatory capital. Internal models apply both to solo and group levels.

8. Bermuda's supervisory framework has been recently assessed by the IMF (2008) and by EIOPA (2011). The IMF assessment found that "insurance supervision for the commercial insurers and reinsurers has a high level of observance of the IAIS Core Principles." With specific relation to reinsurance, EIOPA concluded that, albeit with certain caveats, "Bermuda meets the criteria set out in EIOPA's methodology for equivalence assessments under Solvency II."

A1.2 Review of the supervisory regime in the EU

1. **Current reinsurance supervisory regime in the European Union:** The current supervisory regime for reinsurers in the European Union (EU) is based on the Reinsurance Directive 2005/68/EC, which was published in December 2005. It came into force because the majority of Member states believed that there was a need for a fast track solution before the long-term project Solvency II is in place.

2. The objective of the Reinsurance Directive is to establish supervision by competent authorities in their home country, on the basis that they could operate throughout the EU. It lays down a single licensing regime for reinsurers and conditions that reinsurers need to meet before a license can be granted. They comprise the establishment of technical provisions and rules on the investment of assets covering those technical provisions. It also lays down rules on required solvency margins and minimum capital requirements, as well as rules on measures to be adopted by regulators if reinsurers are in financial difficulties.

3. Member states were legally required to implement this Directive into national law by December 2007.

4. **Reinsurance supervisory regime in the past years:** Before the Reinsurance Directive came into force, no harmonized framework existed for reinsurers within the EU. For EU insurers in 2002, Solvency I represented the first stage of a fundamental review of a prudential regime. Solvency I consists of two directives: 2002/83/EC for life insurers, and 2002/13/EC for non-life insurers.

5. Member States were free to decide individually whether or not Solvency I should apply for reinsurers. Therefore, before the Reinsurance Directive came into force, pure reinsurers in Europe had been subject to a variety of different regimes which ranged from no supervision at all in some countries (such as Belgium, Greece and Ireland) to the application of



a regime substantially the same as that applied to primary insurers (Denmark, Portugal, and the UK), with a number of intermediate positions.³⁷

6. **Recent developments:** Solvency II will update the whole system of solvency requirements for the insurance industry in the EU. When it comes into force, insurance companies and reinsurance companies will be treated almost equally.

7. Solvency II is commonly regarded as the insurance regulator's equivalent to Basel II, taking account of changes in the financial market. It will examine more sophisticated approaches to solvency, rules governing assets and liabilities, asset/liability matching, and the implications of accounting and actuarial policies. The objective is to better align solvency requirements to risk and to encourage insurers to improve their measurement and monitoring of risks. Solvency II is expected to create a consistent and harmonized risk-based insurance solvency system in the EU.³⁸

8. As a first step, the Solvency II Directive was adopted by the Council of the European Union and Parliament in November 2009. EIOPA assumes that Solvency II will come into force in January 2014.³⁹

A1.3 Review of the supervisory regime in Switzerland

1. The conduct of reinsurance by Swiss domiciled re-insurance companies is subject to Swiss insurance regulations and supervision, including licensing requirements. Licenced re-insurance entities are supervised by the Swiss Financial Market Supervisory Authority (FINMA). Apart from tied assets requirements⁴⁰ and some other exceptions addressed in Art. 35 Insurance Supervisory Act (ISA) 41, identical regulations are applied to primary insurers and reinsurers. Areas of supervision include quantitative requirements such as economic risk-based solvency capital requirements, and qualitative requirements such as governance, risk management, internal control and non-insurance business, as well as other requirements such as reporting. Specific requirements include:

- The economic risk-based capital tool Swiss Solvency Test (SST) was introduced with the new Insurance Supervisory Act effective as of 1. January 2006 and entered into full application on 1. January 2011. This new concept considers risks from the asset side (market risk, credit risk etc.) as well as the liability side (re-

³⁷ Group of Thirty 2006.

³⁸ Group of Thirty 2006.

³⁹ <https://eiopa.europa.eu/activities/insurance/solvency-ii/index.html> (9 July 2012).

⁴⁰ The main reason for this is that policyholder protection is principally shaped and provided in direct business with the primary insurers. Since primary insurers constitute institutional clients of reinsurers, it is assumed that certain regulatory elements are not required.

⁴¹ Specific paragraphs in respect of direct insurance issues (e.g. tied assets, contribution to MTPL Policyholder Protection Scheme) do not apply to reinsurers.



serve risk, premium risk etc.) and measures them at the 99% Tail-Value-at-Risk. While direct insurers with a simple portfolio are allowed to use a standard model, all professional (non-captive) Swiss reinsurers and groups have to build an internal model to adequately reflect the characteristics of their respective portfolios.

- Material changes of the business plan need to be approved by the supervisor. Models, principles and assumptions used in the calculation of the technical provisions need to be disclosed to the supervisor.
- Regarding investments, reinsurers have to diversify their assets despite the fact that the concept of tied assets does not apply to them.
- Annual reporting to the supervisor includes detailed information on solvency margins, technical provisions, lines of business, type of reinsurance treaties, geographical information, gross/retrocession and on net basis, details on investment categories as well as a management report for the financial year.

2. In general, quantitative (see eg SST under (1)) and qualitative requirements, such as governance and risk management, gained much more importance (eg Swiss Qualitative Assessment). Enhanced features incorporate a higher focus on corporate governance in general, properness and fitness of board members and qualified shareholders, explicit notifications requirements of intended transactions regarding qualified shareholdings which can be prevented or subjected to conditions. In general intra-group transactions such as reinsurance, funding and guarantee contracts are to be submitted to the authority and reviewed in an intensive way.

3. FINMA currently considers establishing periodic liquidity reporting and enhanced disclosure requirements.

4. As of April 2012 two Swiss-based reinsurance groups are under the group supervisory regime.

A1.4 Review of the supervisory regime in the UK

1. The UK insurance supervisor is presently the Financial Services Authority (FSA). The current regulatory regime is substantively the same for reinsurance as for direct insurance. Reinsurance and direct insurance business can be mixed in one legal entity. Generally, the regulatory attention any (re)insurer receives is commensurate with its risk profile. However, there are some notable differences between the supervision of insurance and reinsurance as follows.

2. Some insurers, referred to as 'pure reinsurers' are restricted to writing reinsurance business. A pure reinsurer may be permitted to write both life and non-life business, whereas an insurer able to write direct business may only write one or the other. Given the international nature of reinsurance, pure reinsurers are supervised at the entity level for solvency purposes – there are no UK branch solvency requirements.



3. There is a special regime for Insurance Special Purpose Vehicles (ISPVs). These are reinsurers with limited exposure designed so that they must always be fully funded. Otherwise there is no special regime for 'captive' reinsurers.
4. Life reinsurance business attracts lower capital requirements than direct life business, because of the nature of traditional life reinsurance treaties in UK.
5. Reinsurance business is not subject to the conduct of business regulation or the compensation scheme intended to protect more vulnerable policyholders.
6. As regards the supervision of insurance, current EU directives stipulate the minimum requirements. See "Review of the reinsurance supervisory regime in the European Economic Area (EEA)" for more detail. The FSA imposed a level of regulation and solvency above that required by EU directives when at the end of 2004 FSA introduced risk-based capital adequacy standards (ICAS). Under the ICAS framework, all insurers must undertake regular assessments of the amount and quality of capital adequate for the size and nature of the business. The FSA forms its own view of the capital adequate for the insurer's risk profile and gives the insurer guidance accordingly. For all insurers the FSA pays attention to the credit risk that their outward reinsurance exposes them to, and expects insurers to mitigate their credit risk in line with their capital resources.
7. Reinsurance business has been regulated in the UK in a similar manner to insurance business since 1966. The only notable change from that position was the implementation at the end of 2006 of the EU Reinsurance Directive, which introduced ISPVs, the mixing of life and non-life reinsurance, and further reduction of capital requirements in respect to life reinsurance business.
8. The FSA will soon be replaced by two new supervisory authorities. The Prudential Regulation Authority (PRA) will inherit responsibility for the prudential regulation of insurance, and the Financial Conduct Authority (FCA) will focus on consumer protection and market regulation, creating a "twin peaks" style regulatory model in the UK. The FCA will therefore have little to do with reinsurance. The EU's Solvency II initiative will also change the regulatory landscape (see "Review of the reinsurance supervisory regime in EU" for more detail).

A1.5 Review of the supervisory regime in the USA

1. **US Reinsurance Supervision.** With respect to reinsurance supervision, the US system takes both a direct and an indirect approach. The direct approach refers to the supervision of US domiciled reinsurers, which are subject to the same level of financial solvency supervision as US domiciled primary insurers. The indirect approach to reinsurance supervision relates to regulation of the statutory credit for reinsurance that US ceding insurers are allowed to report in their financial statements. Traditionally, US credit for reinsurance regulation has focused on the financial solvency of the ceding insurer, the impact of reinsurance on its financial condition, and ultimately the financial impact to consumers of insurance products. For a number of years, in order for US ceding insurers to receive financial statement credit, reinsurance was required to be ceded to US licensed reinsurers or secured by assets held by or on behalf of the ceding insurer in the amount for which the credit was recorded.



2. **Developments in US reinsurance supervision.** Significant progress has been made toward revising the current US regulatory system regarding credit for reinsurance in an effort to facilitate cross-border reinsurance transactions and enhance competition within the US reinsurance market, while ensuring that US ceding insurers and policyholders are adequately protected against the risk of insolvency. In November 2011, the NAIC adopted revisions to its Credit for Reinsurance Model Law and corresponding Credit for Reinsurance Model Regulation. These revisions serve to reduce reinsurance collateral requirements for non-US licensed reinsurers meeting certain criteria for financial strength and business practices that are domiciled and licensed in qualified jurisdictions. Efforts will continue during 2012 to take additional steps necessary to implement the revised NAIC models within the US insurance financial solvency framework. The federal Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010 (Dodd-Frank Act) also contains provisions that potentially impact reinsurance regulation, including the Nonadmitted and Reinsurance Reform Act (NRRRA) and establishment of the Federal Insurance Office (FIO).

3. **Other recent and future developments in US financial solvency supervision.** The NAIC Solvency Modernization Initiative (SMI) is a critical self-examination to update the US insurance solvency regulation framework, and includes a review of international developments regarding insurance supervision, banking supervision, and international accounting standards and their potential use in U.S. insurance regulation. The SMI focuses on key issues such as capital requirements, governance and risk management, group supervision, statutory accounting and financial reporting, and reinsurance. In addition to the developments in reinsurance regulation, key SMI activities have recently been completed with respect to: group supervision; the Own Risk and Solvency Assessment (ORSA); supervisory colleges; review of existing corporate governance requirements; impact study for life insurance principles-based reserving; documentation of the current US Insurance Financial Solvency Framework and Core Principles; and an initial study of international solvency systems to formulate new ideas for consideration in the US.

4. In March 2012, the NAIC's SMI Task Force released a draft white paper for comment in an effort to explain the US financial regulatory framework, including how and why it works so successfully. This white paper, *The U.S. National State-Based System of Insurance Financial Regulation and the Solvency Modernization Initiative*, provides an overview of the current US Framework; an evaluation of US market competitiveness, considering the US regulatory mission; a more detailed description of financial regulation and regulatory tools used in the Framework; and an elaboration on expected SMI changes to the Framework.



A2 Catastrophe years in review

1. The loss burden due to catastrophes in 2011 was in some respect higher than ever before.⁴² Total economic losses added up to more than US\$ 370 bn. As a result, insurance companies covered more than US\$ 110 bn in insured losses. With more than 30,000 fatalities the human toll was high in 2011, but significantly lower than in 2010.

2. Reinsurance companies shared a significant part of the loss burden in 2011. Peak exposures due to prevailing catastrophe losses were the main driver for the high exposure by reinsurers. Almost 50% of the US\$ 110 bn in insured losses was covered by the reinsurance sector. Despite these unprecedented losses the reinsurance sector appears to have successfully absorbed the shock, showing resilience⁴³ and creating no risks for global financial stability.

3. The highest insured losses in 2011 occurred in Asia (US\$ 50 bn), followed by North America (US\$ 40 bn), Oceania (US\$ 20 bn) and Europe (US\$ 4 bn). Among the major events were the Brazil floods (Jan.); the New Zealand earthquakes (Feb. and June); the Japan earthquake/tsunami (Mar.); two waves of severe storms and tornadoes in the USA (Apr. and May); Hurricane Irene in the USA (Aug./Sept.); floods in Thailand (Aug. to Dec.); the in Turkey earthquake (Oct.) and the storm at Sendong in the Philippines (Dec.).

4. **Australia and New Zealand: two examples from 2011.** Australian insurance companies faced an unprecedented series of catastrophe events over a short timeframe. The reinsurers (both local and international) responded well and were timely in responding to the needs of the insurance companies. This included the reinstatement of catastrophe reinsurance covers where the original covers had been eroded due to the claims quantum and the frequency of the events. Similarly, the Australian insurance companies' exposure to the series of New Zealand earthquakes in 2010 and 2011 again met with a positive response from the reinsurers. However, it should be noted that there remains an inherent level of uncertainty in the claims quantum from these earthquake losses and there has been a steady increase in the loss reserves.⁴⁴

5. The loss events of 1992, 2001, 2005, and 2011 were unprecedented and extreme. These years marked the largest insured and reinsured loss events the markets had seen at the time of their occurrence. Insofar, the response to them illustrates the resilience of reinsurance markets in the face of extreme risk despite the lack of historical precedent that would have allowed to predict them.

⁴² The IAIS Reinsurance Transparency Group (RTG) has monitored specifically the impact of reinsured natural catastrophes. See: IAIS (2004-2011).

⁴³ Guy Carpenter 2012.

⁴⁴ For additional considerations on the modelling of extreme events see also appendices A3 and A5.



6. **The year 1992:** The main loss driver was hurricane Andrew. It led to the largest insured loss in history with property damage from the category 5 hurricane estimated at US\$ 34 bn (1999 values) of which US\$ 17 bn was insured. Prior to hurricane Andrew, the largest loss from a hurricane had resulted from hurricane Hugo in 1989, which caused US\$ 4 bn of insured loss.⁴⁵ Despite the large outflows due to the unexpectedly large losses, capital markets reacted by supplying significant amounts of new equity capital, including a wave of reinsurance start-ups.

7. **The year 2001:** The dominant events were losses caused by the terrorist attacks of 9/11, in particular the World Trade Center (WTC). With roughly US\$ 40 bn of insured damage and reinsurance losses of US\$ 20 to 24 bn⁴⁶ the loss of the WTC represented the most costly man-made catastrophe in history for the insurance industry.⁴⁷ In addition, tropical storm Allison resulted in US\$ 3.5 bn of insured losses. The pressure on insurance and reinsurance firms was compounded by the turmoil across broader financial markets brought on by the attacks of 9/11, which affected investment returns alongside insured losses.

8. **The year 2005:** Numerous large natural catastrophes, resulting in significant loss of life and large economic losses characterised the year. Natural catastrophes led to US\$ 230 bn⁴⁸ of economic losses. US\$ 92 bn⁴⁹ of combined insured losses came from hurricanes Katrina, Rita, and Wilma. The damage to property, oil rigs, and flooding caused by levee damage caused by Katrina alone resulted in more than US\$ 65 bn of damage.⁵⁰ The events of 2005 had a historically large impact on the reinsurance industry with the industry absorbing upwards of US\$ 25 bn.⁵¹ The reinsurance industry raised capital through various means including a wave of new companies. Capital raising efforts led to US\$ 11 bn of fresh capital injected into existing companies and US\$ 9 bn through start-ups.⁵² Total capital raised following the 2005 events, through all means, including insurance-linked securities and side cars, was estimated to be over US\$ 25 bn.

A3 The design of catastrophe simulation models

1. Reinsurers and insurers apply a variety of catastrophe simulation models. The catastrophe models combine stochastic simulations with computer models of how natural catastrophes behave and act upon insured exposures. They create thousands of potential combinations of variables that describe catastrophe events and estimate the impact of these

⁴⁵ Congressional Budget Office 2002.

⁴⁶ Holborn 2012.

⁴⁷ Swiss Re 2011.

⁴⁸ Swiss Re 2006.

⁴⁹ Holborn 2012.

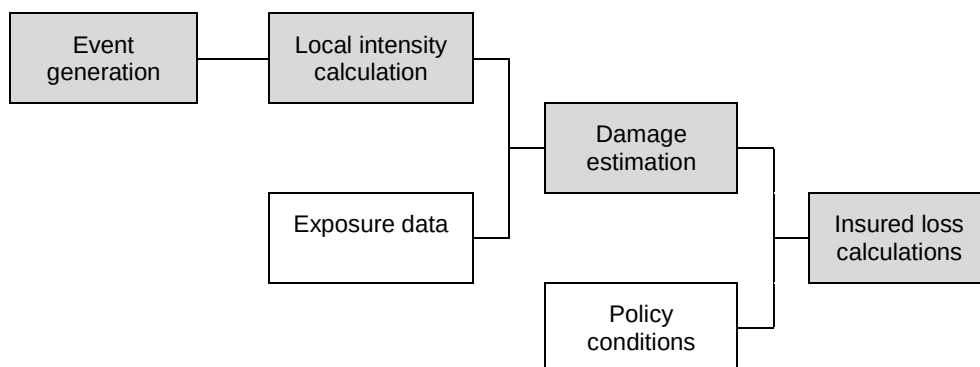
⁵⁰ Holborn 2012.

⁵¹ Holborn 2012.

⁵² Lane Financial 2006.

simulated events on insured exposures. The figure below provides an illustration of the component parts of catastrophe models.⁵³

A1: Catastrophe model components (in grey)



Source: AAA

2. **Event generation** covers, on a probabilistic basis, the location, frequency and severity of catastrophes (eg a category 3 hurricane hitting South Florida), and it is largely based upon historical data. **Local intensity calculation** refers to intensity with which the catastrophe will be experienced in the location identified, depending, for example, on local geological and topological features. **Damage estimation** covers the relation between the calculated intensity and the structural and non-structural damage caused (eg buildings and other property, individuals, etc). This is subsequently assessed in relation to the exposure of the reinsurer (exposure data). Finally, **insured loss calculations** incorporate the details of the policy conditions into the estimated economic damage.

3. Reinsurers make use of catastrophe models produced by professional model vendors (eg RMS, AIR, EQECAT) as well as catastrophe models developed in-house. In particular, the larger reinsurance companies can afford the development and application of their own in-house catastrophe models that are an important additional and independent source to assess overall catastrophe risks. Although reinsurers tend to incorporate input from more than one vendor into the catastrophe modelling practices, the sector – with the exception of the largest companies – appears to be heavily dependent on three firms providing catastrophe modelling services. Because the field of experts working for the three catastrophe modelling firms is limited, and the experts themselves are moving frequently between the three main providers, common flaws in the catastrophe models produced by these firms may have a systematic impact on a large segment of the reinsurance market.

⁵³ American Academy of Actuaries 2001.



4. Catastrophe models are also part of a wider capital modelling practice that integrates other elements of risk faced by reinsurers, including reserving risk, credit risk, market risk, and operational risk.⁵⁴

5. **Examples from Australia and New Zealand:** The local reinsurers in Australia are predominantly branches of large overseas parent reinsurers. Whilst the insurance companies rely to a large extent on vendor catastrophe models, the parent reinsurers quite often have their own in-house catastrophe modelling teams. This is primarily due to their exposure to a range of catastrophe perils around the world, both in terms of the nature of the catastrophe perils and the geographical diversity of risks exposed to these perils on an international scale.

6. The modelling for the Australian catastrophe experience could be said to be mixed, with the local reinsurers using their own catastrophe models, often sourced from their parent, whereas the primary insurance companies rely heavily on the vendor models and their reinsurance brokers' catastrophe models. There is also some patchiness in catastrophe model coverage by type of event. While cyclones and earthquakes are covered in detail, bush fires are not, and flood is somewhere in between.

7. The claims arising from the catastrophe events ranged from a series of perils including storm and associated run-off of water, cyclone and flood. The catastrophe modelling for storm and cyclone proved to be adequate, albeit Tropical Cyclone Yasi tracked between two cities and there have been questions raised as to whether catastrophe cover would have been sufficient for the size of losses if TC Yasi had impacted both cities.

8. The more recent New Zealand earthquakes have highlighted the fact that the catastrophe models do not pick up all the claims that may occur. The latest earthquake in Christchurch, New Zealand, arose from a seismic fault that was previously undetected. The 2011 earthquakes have highlighted "blind spots", one being the damage arising from the tsunami that followed the Japanese earthquake in March 2011 and another being the damage caused by aftershocks from earthquakes, which can be larger than the original earthquake.

A4 Pricing behaviour after major catastrophes

1. **Australia in 2011:** The claims arising from the series of Australian catastrophe events in 2011 aggregated to just over AUD 4.6 bn gross, with reinsurance markets covering 75% of total market claims. The New Zealand earthquake claims in the same period were in the vicinity of AUD 8.3 bn gross, with final estimates still proving to be difficult to confirm.

2. Catastrophe reinsurance is usually purchased in layers of cover and provides cover for losses incurred during the period of the reinsurance cover, which is generally limited to one year. The amount that will be paid from the catastrophe reinsurance cover is limited in the annual aggregate. It means that, if an insurer utilises part, or all, of the reinsurance cover

⁵⁴ International Association of Actuaries 2011.

in any layer this needs to be replaced. The replacement can be from either the existing reinsurer or other reinsurers if the insurer desires to have the reinsurance cover in place for the next catastrophe event. Due to this erosion of reinsurance cover caused by the size and frequency of the catastrophe events in Australia and New Zealand, the reinsurance premiums quoted for replacement covers ranged from extremely high to just above pro-rata for the quantum eroded. They also provided a good indication to both insurers and the regulators of the likely renewal reinsurance premiums for the catastrophe reinsurance programmes expiring mid-year.

3. As expected, at renewal time the catastrophe cover premium increases required by the reinsurers were substantial, reflecting the number and size of the claims paid to the insurers by the reinsurers. The rate increases ranged from 10% to 50%, depending on the size of the claims paid. In addition to the premium increases, there was a general tightening up of terms and conditions and reinsurers generally required an increase in retention by the insurer as the reinsurers were not willing to renew the lower layers of reinsurance provided in the previous year.

4. In general, reinsurers took a long-term view of reinsurance relationships held with insurers and did not require a payback of the full amount of the claims paid arising from the series of catastrophes in the following year. This is a common practice and reinforces the view that reinsurance relationships with insurers are viewed as "partnerships" and tend to be long-term arrangements, although they are contractually reviewed and renewed on an annual basis. Thus, while this renewal season saw a spike in reinsurance pricing, it was not as severe as it could have been and, should the claims be benign over the next few years, it is expected that there will be a return to the lower reinsurance premium levels experienced prior to the catastrophe event claims of 2011.

5. Increased pricing for reinsurance may act as an inducement for new capacity to come into the Australian and New Zealand markets, but of as now there have been no signs of new entrants. In fact, the reverse has been the case with one insurer and one reinsurer confirming that they will not be renewing (re)insurance covers, despite the diversity this geographical area brings to many of the global reinsurers

6. **Thailand in 2011:** The floods in Thailand, which started in July and continued for about three months, caused significant losses to the primary insurers and reinsurers who had underwritten the relevant risk in Thailand, and they also had a great impact on the reinsurance market.

7. Because of the flooding, the catastrophe models that had previously been used needed to be changed to reflect the risk of flood, which had not originally been incorporated into the models. Reinsurance premiums significantly increased in order to compensate for the newly recognised risk, or reinsurance cover to be provided by contracts has been capped. Moreover, some reinsurance companies decided to reduce their exposure to certain catastrophe risks in Thailand. Based on anecdotal evidence, there were cases in which reinstatement of reinsurance contracts was not offered. Furthermore, some reinsurers announced that they would no longer underwrite flood risk because the losses cannot be recovered even after rate increases. Reaction in the reinsurance sector also consequently imposed tight conditions on the primary insurance market. On the other hand, some reinsurance companies chose to enter the Thailand market to seek new business opportunities with high profit although such new entrants might not fully compensate for the reduced reinsur-



ance capacity. Improvements in the regulatory environment may have the potential to increase the ability to provide cover for flood risk.

8. Due to globalisation, Thailand is increasingly interconnected with other parts of the world. In cases where foreign companies investing in Thailand cannot buy flood insurance, they could become reluctant to continue to engage in business there, which could harm the economic growth of the country. The government of Thailand therefore decided to consider improving the infrastructure by establishing an insurance pool to address the issue of big disasters for retail companies and corporations. What happened in Thailand might occur in other emerging countries. Policy development might be necessary to mitigate the risk of loss due to natural disasters including floods; otherwise, reinsurance premiums would increase to compensate unexpected significant losses in other emerging countries.

A5 Stress testing for extreme insurance and financial market events

1. This section provides the results of extreme stress tests combining financial market distress, severe natural catastrophes, and the failure of one large reinsurance company. In other words, we are considering a tail event combining the recent financial crisis and the series of extreme natural catastrophes experienced in 2010 and 2011, which impacted both the asset and liability sides of primary insurers and reinsurers.

2. **The stress scenario for primary insurance companies** took as a starting point the impact of the financial crisis in 2008. Mainly as a result of the sharp reduction in financial asset prices, the shareholders equity of the six large primary insurers⁵⁵ in our sample was reduced by 29%. The identified reduction in shareholder capital is based on the most recent numbers for our above defined sample of six primary insurers and has been, under a simplifying assumption, fully attributed to the financial crisis.

3. On top of the stress caused by the loss on financial assets, we introduced in the second step the stress caused by the major natural catastrophes in 2011. These losses (adjusted for inflation) have been the largest in history. However, large natural catastrophes have only a relatively minor impact on primary insurers, because provisions and reinsurance coverage layers, including excess of loss (XL) covers, absorb all modelled losses. Based on industry calculations,⁵⁶ we assume that natural catastrophes of the magnitude observed in 2011 would impact shareholders' equity of the six large primary insurers by an additional 2%, for a total combined reduction of 31%.

4. In the third step we assumed the failure of one large reinsurance company with a market share of 20%. In addition, we considered - a very high loss-given-default ratio of 70%. Based on these assumptions, the default of the large reinsurer would lead to an additional

⁵⁵ AIG, Allianz, AXA, Generali, Metlife, and Zurich.

⁵⁶ Industry communication to RTG.

reduction in shareholders' equity of 3.8% in the cohort of the six large primary insurance companies. As result of all combined stresses – financial crisis, very large natural catastrophes, and the failure of a very large reinsurance company – the shareholders' equity of the six large primary insurance companies would be reduced by almost 35%. However, the impact can vary substantially from insurer to insurer and also over time. Especially insurers with a very high reliance on reinsurers (such as property insurers) can be exposed to an even further reduction of their shareholders equity, in particular under conditions of severe stress.⁵⁷

5. **The scenario for reinsurance companies** considered stress on both sides of the balance sheet. One element of the above scenario for the primary insurance market was the failure of a large reinsurer with a market share of 20%. The following considers extreme stress for reinsurance companies only. We base the consideration on a hypothetical reinsurer combining the average of the equity capital positions of the two largest global reinsurance companies, Munich Re and Swiss Re. This hypothetical reinsurer has available capital of € 27.5 bn.

6. Our scenario combined the tail scenarios described above – financial market distress and very large natural catastrophes. We assumed that a financial crisis reduces the reinsurer's available capital by 26% from € 27.5 bn to € 20.4 bn, similar to the 2008 losses observed in the whole industry. On top of that, we imposed severe catastrophe losses that further reduce the reinsurer's available capital to € 17 bn.

7. This result has to be compared with the regulatory capital requirement (calculated according to Solvency II), which for our hypothetical reinsurer would be € 8.8 bn, resulting in a buffer of € 8.2 bn. This amount is two and a half times larger than the catastrophe losses that the two largest reinsurers absorbed on average in 2011. As a corollary, one may observe that the capital buffers of large reinsurers should absorb even the combination of financial market distress and large natural catastrophes.

8. However, these considerations would be incomplete without reference to recent events when a large insurance conglomerate engaged in non-insurance activities. While the stress scenario described above would indeed not exhaust the capital buffer of a large reinsurer, the situation may be different if the reinsurer were to engage in the kind of financial market activities that AIG Financial Products (AIG FP) had offered. Losses on the scale incurred by AIG FP would indeed be much larger than the remaining buffer in the extreme scenario described above. They could arguably lead to the failure of the reinsurance company under consideration.

⁵⁷ The Australian Prudential Regulation Authority (APRA) reported from Australia that for some direct insurers the reinsurance assets rose to about 83% of the APRA required capital base after a series of severe natural catastrophes in 2011. Under such conditions the reduction in shareholders' equity is closer to 45%. APRA reports that the recent Australian experience was severe but not extreme, so this figure could even be higher in very adverse conditions.



A6 The LMX reinsurance spiral

9. The “LMX spiral” was a feature of the London Insurance Market in the 1980s. LMX business comprises the excess of loss reinsurance treaties reinsuring the business of London Market insurers. Excess of loss contracts provide cover up to a specified limit in excess of an amount of loss retained. There are typically several layers of excess of loss treaties.

10. The nature of the business written by the London Market, particularly by the Society of Lloyd’s, included large risks (such as oil platforms and liability cover) and risks liable to accumulate. Because of the nature of the business coming to the London Market, it was mostly reinsured within the London Market.

11. LMX on LMX business made it possible for business to be passed around the market in a complex web of transactions. An LMX insurer could pass a claim onto his reinsurers only to have it passed around and eventually come back to increase the original insurer’s claim which he then again passed on to reinsurers. This was the so-called spiral.

12. At the time LMX business comprised two features that did not help to limit potential spirals. First, there was no barrier to the reinsurance of risks in their entirety. This led to situations in which none of the originally insured risk was retained with the primary insurer. Decreased incentives for the correct underwriting and tracking of original risks were the result. Second, higher layers of LMX business were typically placed for a fixed premium. This led to arbitrage, since it enabled some (well informed) insurers to pass on all their risks in respect of large claims for a smaller aggregate premium than they had received when they accepted the risks.

13. The LMX spiral developed over several profitable years without any very large losses to illuminate its flaws. The LMX spiral caused the following problems:

- The LMX spiral had the effect of concentrating large risks, instead of spreading them.
- When the spiral unwound, most losses ended up with a few insurers who made huge losses.
- Some insurers appreciated that by passing on all their risk in respect of large claims, for less aggregate premium than they received, what they were doing was in substance arbitrage, rather than insurance.
- The complex web of LMX relationships was opaque, and the only sure way to determine which reinsurers should incur the losses contractually was to let the spiral operate. It meant that all those involved in the spiral had considerable difficulty in providing reserves on a best estimate basis, and materially so in earlier years.

14. The market took various steps to substantively end the LMX spiral:

- First, it became common for insurers to retain a proportion of the risks they reinsured. The insurers generally warranted that they retain at least a specified share of the risk after all reinsurance. This made pure arbitrage impossible. Furthermore, every insurer had to exercise greater care in writing the risks they ac-



cepted. It also meant that, to the extent a spiral would still be possible, such a spiral would be damped to insignificance much more quickly.

- Second, LMX business came to be priced differently, so that premiums were generally adjustable (at least somewhat risk sensitive).
- Third, the appetite to write retrocession business (reinsurance of reinsurance business) was generally restricted to circumstances where reinsurers could be reasonably sure that any potential for a spiral was limited.

A7 The HIH failure and the role of finite reinsurance

1. For a number of years, insurers, reinsurers and supervisors have been struggling to develop a clear definition of "finite reinsurance". Whilst most agree on the common features of finite reinsurance and its intent, a clear definition has been difficult.

2. Finite reinsurance places a "finite" limit on the quantum and type(s) of risk transferred to the reinsurer. It sets limitations on the amount by which the claims to the reinsurer will exceed the premiums. Common features of finite risk include capping of underwriting risk (ie the risk that claims will exceed premiums), inclusion of a clause describing the time value of money and an interest component, and some form of profit sharing.

3. As revealed during the inquiry into the HIH failure, financial reinsurance in that case was reported as if it were traditional reinsurance, with inappropriate deductions for reinsurance recoveries and an incorrect accounting treatment. This had the effect of distorting the insurer's balance sheet and overstating the insurer's true position.

4. The HIH Royal Commissioners report⁵⁸ provides a detailed insight into the arrangements which purported to be traditional reinsurance.

5. APRA's regulatory response was to require that this form of reinsurance arrangement be labelled as Limited Risk Transfer Arrangements and to require that any such form of risk transfer arrangement must have prior approval from APRA.

6. In considering such an approval, APRA specifies the arrangement as either a form of risk transfer or a financing arrangement, which ensures that all documentation reflects the true nature of the agreement and requires that the arrangement is accounted for correctly. As part of an insurer's/reinsurer's annual reinsurance declaration, the responsible officer must sign off that no Limited Risk Transfer arrangements that have not been approved by APRA are in place. APRA review teams examine this area when they conduct reviews of the insurers and reinsurers.

⁵⁸ HIH Royal Commission 2003.



7. This requirement is included in the Prudential Standard GPS 230 Reinsurance Management (Attachment A) and was introduced from 1 October 2006. Since this requirement has been introduced there have been very few applications for approval, and those that have been approved have been treated as financial reinsurance and accounted for appropriately. The general industry viewpoint has been that this is an area that they do not wish to participate in and traditional reinsurance has been adequate for their requirements.