

Innovation in Disaster Risk Financing for Developing Countries: Public and Private Contributions

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Executive Summary

Over the past 20 years, natural disaster losses have been steadily climbing; beyond their human toll, economic losses have exceeded US\$100 and even US\$200 billion in the recent years¹. Although high-income countries have greater losses in monetary terms, low- and middle-income countries are more adversely impacted as a percentage of GDP. Fatalities also disproportionately impact developing countries – drought in Africa alone accounts for almost one million of the 3.3 million deaths from natural hazards since 1970².

The Hyogo Framework for Action 2005-2015 identifies the need to promote the development of financial risk transfer mechanisms, including insurance, as a priority action for building the resilience of nations and communities to recover after disasters. While this recommendation is only one among many, the need for innovative disaster risk financing and insurance solutions is particularly relevant for the developing countries. The 2010 United Nations Climate Change Conference also called for enhanced action on risk transfer and insurance in the Cancun Adaptation Framework. Risk transfer, possibly through the creation of a climate risk insurance facility, is promoted to address climate change impacts associated with severe weather events.

Innovation in disaster risk financing and insurance is occurring at all scopes: risk transfer for governments and sovereign entities, private non-life catastrophe insurance markets for homeowners, agricultural insurance for farmers and herders, and disaster microinsurance for low-income populations. Furthermore, innovation is happening on a variety of fronts in the field of disaster risk financing and insurance – product development, disaster risk assessment and sharing, and delivery channels to name a few – that interact to produce new solutions. These innovations, through public-private partnerships, can foster the development of risk market infrastructure in developing countries, which are essential to ensure the emergence of cost-effective disaster risk financing and insurance solutions from sovereign entities to households.

This report aims to advance the dialogue on creative, forward-looking solutions for developing countries by presenting recent innovations on disaster risk financing and insurance developed by the private markets as well as the international donor community, from the macro (government) level down to the micro (household) level. It discusses how these innovations can be adapted and implemented in developing countries to better protect efficiently those countries against the financial consequences of natural disasters.

Section 1 provides an introduction to the economic and fiscal impacts of natural disasters on developing countries. Weak to nonexistent non-life catastrophe insurance penetration in most developing countries, particularly low-income countries, means that almost none of these losses are shouldered by private insurers. Governments are usually relied upon to bear these costs; historically, governments of developing countries have depended on humanitarian assistance and financial aid to

¹ 2005 and 2008 both saw natural disaster losses exceeding US\$200 billion (Swiss Re 2009).

² World Bank 2010.

respond to disasters. Over the past 15 years, however, there has been a shift in focus by the international community from ex-post financing to the promotion of ex-ante disaster risk financing strategies and mechanisms.

Section 2 examines examples of innovation in the private insurance and capital markets that may have applications in sovereign disaster risk financing for developing countries. The first interactions of the insurance and capital markets have triggered numerous innovations that may hold significant promise for sovereign disaster risk financing for developing countries. Transactions sponsored by USAA and Swiss Re illustrate such innovations; both have been first-movers in developing creative, adaptive strategies for issuing insurance-linked securities (ILS) in the capital markets.

USAA removes concentrations of risk from its portfolio by issuing staggered three-year catastrophe (cat) bonds that provide it with overlapping coverages. Swiss Re came up with a “cafeteria” approach to ILS issuance: it provides a standard set of cat bonds in the form of a menu of offerings that is shown to the market on a regular basis. This standardized approach obviates the need to go through the lengthy and expensive process of setting up a new special purpose vehicle (SPV) and different legal document each time a bond is offered.

These examples are considered in conjunction with two recent examples of transactions between developing countries and private markets. The World Bank was party to Mexico’s 2009 cat bond issuance, “MultiCat Mexico;” it used the opportunity to set up a facility through which other developing states could issue their own bonds. The Caribbean Catastrophe Risk Insurance Facility (CCRIF) is another innovative initiative advanced by the World Bank. This entity was set up in 2007 to provide catastrophic coverage for the island states of the Caribbean.

These four examples suggest the development of a multi-year cafeteria approach to transferring developing country risk to the private markets, possibly using a bond-issuance platform such as that developed through MultiCat Mexico. The tranching of the risk portfolios of International Financial Institutions (IFIs) into collateralized debt obligations is a longer-term vision suggested by these examples.

Section 3 examines how innovations coming out of mature property catastrophe risk insurance (PCRI) markets could serve in low- and middle-income countries. Private insurance markets in developing countries tend to be less developed, with low penetration rates. Deepening these markets can increase the financial resilience of households, agricultural sector participants, and businesses while reducing the contingent liability of the government to natural disasters. Examples from the London insurance market support this discussion, providing examples of creative thinking to improve the operational efficiency of domestic insurance markets: the Lloyd’s of London “Coverholder” model shows how companies can leverage existing local infrastructure for product distribution; the London Market Data Community (LMDC) demonstrates how firms can share the cost of risk analysis for common exposures, reducing the cost of underwriting support for all participants.

Open source risk modeling initiatives, such as the Global Earthquake Model (GEM), can also contribute to lowering barriers to entry for selling non-life catastrophe insurance in developing countries. These

examples of reducing the costs of distribution and risk analysis demonstrate how the development of public goods can facilitate growth of domestic non-life catastrophe insurance markets.

Section 4 considers how innovation is taking seed in creative disaster microinsurance programs in low- and middle-income countries. A diverse group of disaster micro-insurance programs are testing new solutions to the challenges of providing disaster insurance to low-income populations. Although these programs having varying success rates, they provide insight into how disaster microinsurance programs can meet the needs of their target populations.

Examples from both privately- and publicly-driven programs demonstrate noteworthy innovations. The Horn of Africa Risk Transfer for Adaptation (HARITA) Program offers a holistic approach to risk management for vulnerable populations. The Kilimo Salama pilot illustrates how adoption of mobile technology is lowering distribution costs and facilitating scale-up. The Jakarta Flood Pilot demonstrates how strides are being made to provide affordable microinsurance to the elusive risk of flood. Finally, an El Niño insurance program adopts innovative forecast index insurance to provide payouts in advance of disaster – usable for disaster mitigation and prevention.

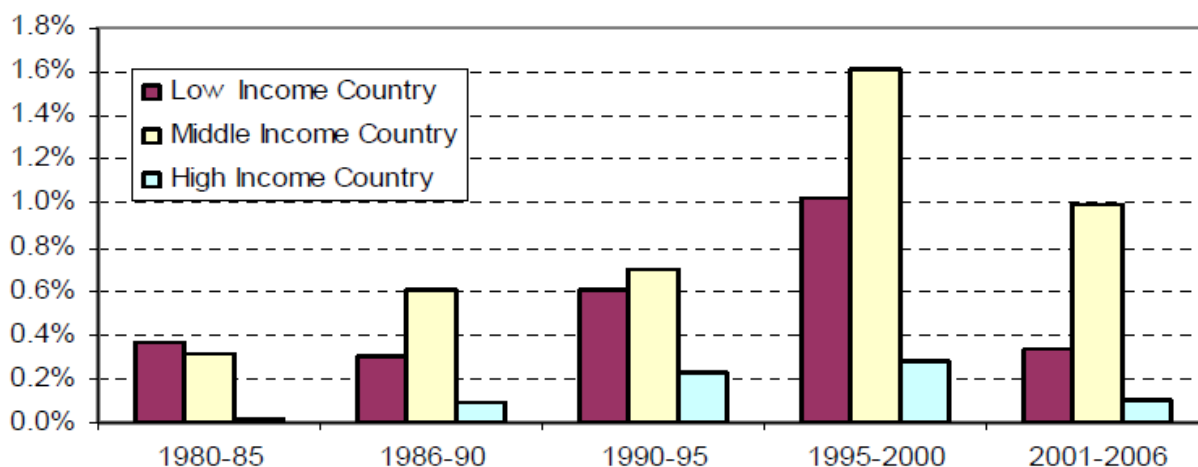
Section 5 wraps up the report with brief concluding remarks. It calls for the establishment of an International Platform for Disaster Risk Financing and Insurance, financed by both the public and private sectors. Its mandate would be to offer technical assistance and public goods and services to the developing countries that want to develop disaster risk financing and insurance solutions as part of their overall disaster risk management agenda.

Section 1: Introduction to Disaster Risk Financing in Developing Countries

Over the past 40 years, natural disaster losses have been rising around the world. Global inflation-adjusted cumulative natural disaster damage for 1970 to 2008 is US\$2.3 trillion, with the vast majority of damages coming after 1990³. This upward trend, illustrated in Figure 1 in Appendix A, is attributed primarily to increasing exposure: during these years there was significant growth in population and assets located in high-risk zones. Losses are expected to continue trending upward due to a variety of factors, including growing urbanization, environmental degradation, and climate change.

Although, in absolute terms, damages in developed countries far exceed those in developing countries, damages from natural disasters as a proportion of GDP are much greater in developing countries. Figure 2 below shows average annual economic losses from natural disasters compared to GDP. In low-income countries, this loss is approximately 0.6 percent of GDP. In middle-income countries it is somewhat higher, approaching 1 percent of GDP. In contrast, high-income countries suffer an average annual economic loss less than 0.2 percent of their GDP. This evidence shows that damages are especially high in middle-income countries, whose regulatory systems (e.g., zoning laws and building codes) often cannot keep pace with rapidly expanding asset bases at risk.

Figure 2: Average Annual Direct Losses from Natural Disasters Compared to GDP



Source: Cummins and Mahul 2009.

³ World Bank 2010.

Fiscal Impacts of Natural Disasters on Governments

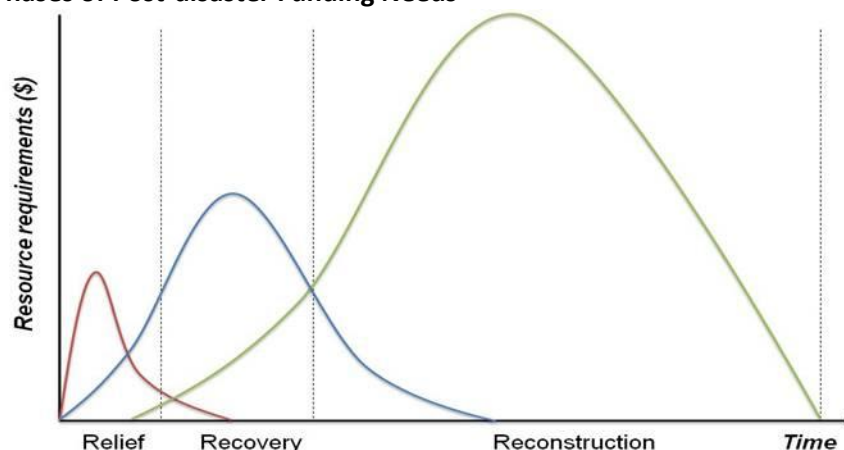
Natural disasters tend to disrupt government budgets in developing countries much more than in high income countries. When a disaster occurs, the government is expected to provide emergency relief to victims, return critical infrastructure to working condition, and begin planning for recovery and rebuilding, usually while providing uninterrupted “business-as-usual” services outside of the impacted area.

In high-income countries, governments are typically financially equipped (with reserves and quick budget reallocation) to cover their legal and social post-disaster responsibilities. Private insurers also tend to cover a large proportion of the losses. In developing countries, however, governments often rely on humanitarian assistance and financial aid to respond to disasters. Furthermore, weak non-life insurance penetration in most developing countries, particularly low-income countries, means that private insurers shoulder little to none of the losses.

The majority of the government’s funding needs are not incurred until it enters later recovery and reconstruction phases, as illustrated by Figure 3 below. Thus, the government is allowed time to mobilize ex-post funding sources (sources obtained following a natural disaster). Ex-post sources include budget reallocation, tax increase, domestic credit, external credit, and donor assistance.⁴

Even if the government is expecting ex-post funding, it still needs immediate access to liquidity for initial relief and early recovery. Although immediate liquidity needs are not nearly as important as costs incurred later for reconstruction, they are critical to avoid funding gaps and to mitigate budget disruption caused by the event. Likewise, continually mobilizing ex-post resources for small, recurrent events is cumbersome. Governments of countries prone to these types of disasters (e.g., minor floods) could benefit from preplanned financing mechanisms to efficiently cover losses.

Figure 3: Main Phases of Post-disaster Funding Needs



Source: Source: Ghesquiere and Mahul (2010)

⁴ Although not discussed in depth in this paper, it is noted that all ex-post financing sources have limitations. Donor assistance, for example, is unreliable because it varies with conditions such as media coverage and the type of disaster. Furthermore, it may be in the form of pre-established aid that has been reallocated from other programs.

Increasing Options

Over the past 15 years, in parallel with the international community's shifting focus from ex-post disaster aid to ex-ante disaster risk reduction, increasing attention has been paid to developing creative solutions to meeting governments' immediate liquidity needs following a disaster and mitigating the impact of natural disasters on the government's budget. Ex-ante disaster risk financing instruments used by developing countries include reserves or calamity funds, budget contingencies, contingent debt facilities, and risk transfer mechanisms (i.e., (re)insurance and ILS such as cat bonds). Some of these tools, such as calamity funds, have been used for many years.

Only recently, however, have innovations in risk financing instruments for developing countries made tools traditionally only available in western insurance and capital markets obtainable by developing countries.

Managing What You Measure

A benefit of advance planning by the government for disaster losses is that it forces the government to assess its financial exposure to natural disasters. And when vulnerability to disasters is translated into dollar signs, the significant return on investment from disaster risk reduction activities is made clear. Financial assessment sensitizes key decision makers, such as the Minister of Finance, to the importance of ex-ante disaster risk management.⁵

By clarifying the economic benefits of disaster risk reduction, disaster risk financing complements and promotes other disaster risk reduction actions; well-designed disaster risk financing strategies are regarded as an essential component of a broader disaster risk management strategy. Indeed, engagement in discussions on sovereign risk transfer typically comes after the country has made significant progress on its broader disaster risk management agenda as outlined in Note 1 of Appendix B.

Disaster risk financing does not work in isolation: it enables governments to manage *residual* disaster risks, those that remain after financially viable and attainable mitigation and prevention measures have already been implemented. It does nothing, however, to physically shield populations and assets from natural hazards. Figure 4 (see Appendix A) illustrates the role of disaster risk financing in a comprehensive disaster risk management framework.

A number of recent innovative disaster risk financing tools have forged even more explicit links between disaster risk financing and disaster risk management. These instruments make access to financing contingent upon engagement in disaster risk management activities. The World Bank, for example, established a contingent credit facility in 2008 with an eligibility requirement of implementation of

⁵ Ghesquiere and Mahul 2010.

national disaster risk management strategy; the Inter-American Development Bank (IADB) has since followed suit with a similar facility (see Box 1 below).

The adoption of parametric coverage (payouts that are based on an independent proxy for losses, such as wind speed) is also credited with increasing the interest of investors and reinsurers in obtaining developing country risk. Investors and insurers prefer parametric triggers because they eliminate the potential for adverse selection or moral hazard and allow for objective and transparent triggers. Insureds, however, prefer indemnity-based insurance, which is based on the idea that the issuer of the insurance will compensate the insured for its actual loss (dependent upon the level of coverage purchased). For the insured, indemnity-based insurance eliminates basis risk, or the difference between losses indicated by index measurements and the losses actually incurred by the insured.

Box 1: Contingent Credit Facilities Available through International Financial Institutions

The World Bank Development Policy Loan with Catastrophe Deferred Drawdown Option (DPL with Cat DDO) is available to International Bank for Reconstruction and Development (IBRD) eligible member countries. Eligibility for the DPL with Cat DDO is contingent upon the implementation of a national disaster risk management program that is monitored by the World Bank. Financial terms are those regularly applied to IBRD loans. Drawdown of funds is contingent upon the occurrence of a natural disaster that results in the declaration of a state of emergency by a Head of State. DPLs with Cat DDO can range up to US\$500 million or 0.25 percent of the country's GDP (whichever is less). The DPL with Cat DDO is available for up to 15 years; funds drawn down upon by the borrower that are repaid before the closing date are eligible for subsequent borrowing.

The IADB's Contingent Credit Facility for Natural Disaster Emergencies is a US\$600 million Facility that provides contingent loans ranging up to US\$100 million or 1 percent of a country's gross domestic product, whichever is less. Countries are required to have an adequate integrated disaster risk management program to be eligible. Drawdown of funds is contingent upon the occurrence of a natural disaster of a type and intensity determined by Facility guidelines. All IADB member countries are eligible to receive this loan. Financial terms are those regularly applied to IADB operations.

Not Just for the Government: Financial Protection at all Scopes

It is important to keep in mind that a government that is financially prepared to manage the impact of natural disasters on its budget is not synonymous with a *country* that is financially protected against natural disasters.

The introductory paragraphs above distinguish between the economic impacts of natural disasters on a country's economy and the fiscal impacts of natural disasters on the government's budget. While the two are certainly related, factors such as penetration of property catastrophe insurance and agricultural insurance considerably affect the magnitude of an event's impact on the economy as well as the

distribution of the losses within society. Even where they are somewhat developed, however, commercial property catastrophe insurance and agricultural insurance markets tend to exclude low-income populations. These populations also tend to be the most vulnerable to natural disaster shocks, which perpetuate a cycle of poverty. In a number of developing countries, NGOs, governments, international institutions, and others have launched disaster microinsurance programs for low-income populations.

A thematic illustration of the “pillars” of disaster risk financing and insurance that a country can use to bolster its financial resilience to natural disasters is provided by Figure 5 in Appendix A. The four pillars are distinguishable by the direct beneficiary of the risk financing or insurance tool; sovereign disaster risk financing tools primarily benefit the government, property catastrophe insurance and agricultural insurance primarily benefit non-poor households, farmers, and enterprises, and disaster microinsurance primarily benefit low-income households, farmers, and enterprises.

Also notable is that these four pillars of financial protection are increasingly being cited as key tools for climate change adaptation in developing countries. Box 2 below highlights recent initiatives promoting disaster risk financing in climate change adaptation.

Box 2: Disaster Risk Financing in a Changing Climate

As climate change adaptation has taken center stage in the development agenda, risk financing and insurance tools have been nominated by many to play a supporting role in increasing financial resilience to climate change. The role of disaster risk financing in the broader climate change adaptation framework is unsurprising, as weather extremes form a subset of the climate change adaptation challenge and are anticipated to increase in intensity and in frequency.

Numerous international initiatives focus on the role of disaster risk financing in climate change adaptation. A primary focus of these initiatives is reducing, pooling, and sharing climate-related disaster risk, particularly through risk financing mechanisms for transferring private and public sector risks from local and national levels to a global scale (Mechler et al 2010). The Munich Climate Insurance Initiative, for example, was initiated by Munich Re in 2005 in response to the growing realization that insurance solutions can play a role in adaptation to climate change (MCII, 2010).

Specific private insurance reactions to climate change are elusive given that the industry is very short term and evidence-based. Following Hurricane Katrina in 2005, however, risk modeling agencies revised their North Atlantic Risk models, offering estimates of loss based on both Standard Sea Surface Temperatures [SSST] and Warm Sea Surface Temperatures [WSST]. In the 150 Cat ILS involving US Wind risk issued since, the average estimated expected loss is 14 percent higher in WSST circumstances. Investors have responded accordingly.

The effort to integrate risk transfer and other risk financing mechanisms into climate change adaptation will continue to grow and to evolve. The Cancun Adaptation Framework that resulted from the 2010 United Nations Climate Change Conference invites Parties to the Document to enhance action on climate change adaptation through nine action areas. One of these action areas is enhancing climate related disaster risk reduction strategies, taking into the account the Hyogo Framework for Action 2005-2015. This action area specifically promotes risk assessment and management as well as risk sharing and transfer mechanisms such as insurance at local, national, subregional, and regional levels. Furthermore, it suggests the possible development of a climate risk insurance facility to address impacts associated with severe weather events (United Nations 2010).

Section 2: Sovereign Disaster Risk Financing: Lessons from Private Market Innovations

Financial markets can be relied upon to discriminate between good ideas and bad – as they relate to the circumstance of the moment. But some ideas, inconvenient to one set of circumstances, are enduring and may be brought back in other contexts. Winston Churchill encapsulates the spirit of this review: “The further backward you look; the further forward you can see.”

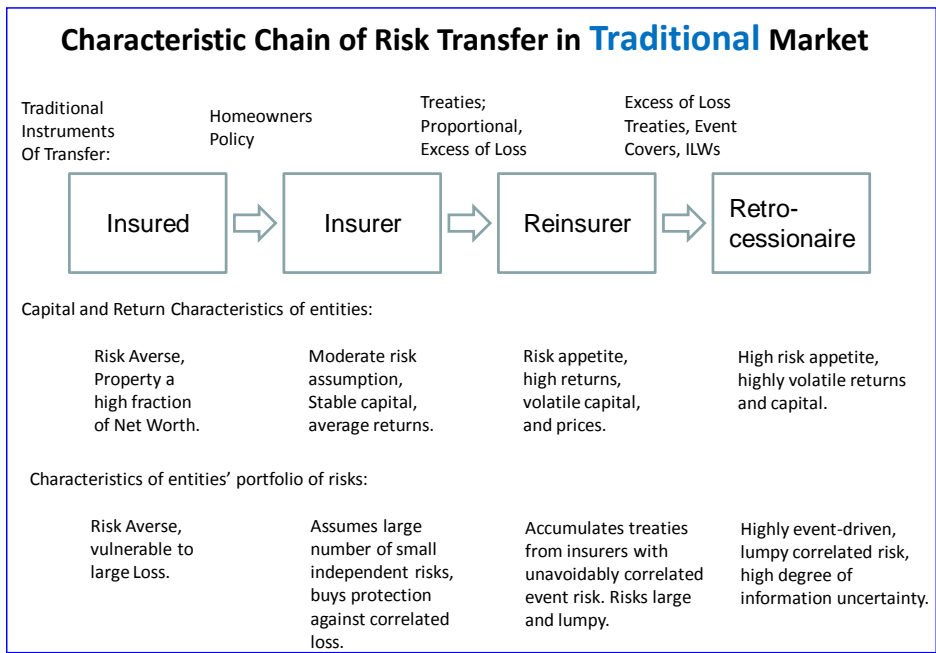
As discussed below, the catalogue of insurance innovations from the last two decades can yield new ideas for sovereign risk transfer for developing countries.

Hurricane Andrew: A Catalyst for Innovation

In 1992, the insurance world was shocked by the economic losses caused by Hurricane Andrew. It caused some US\$26 billion in contemporary dollar loss, causing devastation across the Bahamas and the US states of Florida and Louisiana. Were it to repeat today it would cause some US\$57 billion of insured loss (see Figure 6 in Appendix A). Hurricane Andrew ranks as the third biggest single event of the century when adjusted for exposure and inflation.

Andrew caused a devastating wave of loss claims to roll through the chain of risk transfer, exhausting or depleting capital at each stage for all who had assumed part of the risk⁶. Figure 7 below illustrates this risk transfer chain, which can be called the “traditional” risk transfer chain. (See Note 2 Appendix B for details.)

Figure 7: Characteristic Chain of Risk Transfer in Traditional Market



Source: Lane Financial LLC.

The capital depleted by Hurricane Andrew had to be replaced in this chain for the insurance market to function going forward. It was that need for capital replacement that resulted in the interaction of the

⁶ For example, an insurer who provided a large number of homeowners policies for Florida residents, the reinsurer who provided this insurer reinsurance on these policies, and any retrocessionaires who had in turn taken a piece of the reinsurer’s Florida exposure.

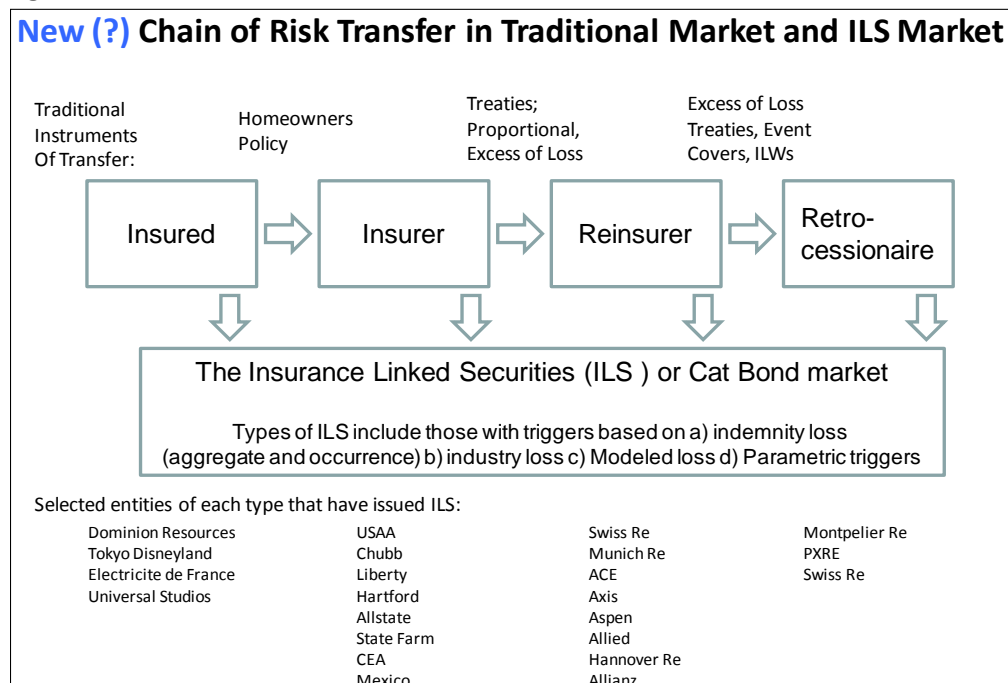
capital markets and the global reinsurance and insurance markets, sparking a number of innovations in the last two decades.

The Revised Risk Transfer Chain

The chain of risk transfer became revised post-Andrew as in Figure 8 below. Instead of simply transferring risk up through a chain of different insurance entities, but essentially keeping it within the insurance market, the major innovation was to transfer risk directly to the capital markets. The ILS box in Figure 8 below represents the capital market (see Note 3 of Appendix B for detailed information on the revised risk transfer chain).

ILS are essentially a form of collateralized risk transfer where the insured (such as USAA illustrated below) enters into an agreement equivalent to an insurance or reinsurance policy with a special purpose vehicle (SPV) which then transfers the risk onto investors through bond issuance. ILS are only the main instrument of transfer in the revised risk transfer chain. There are others currently in use and there have been several others that have been tried – see Note 3 of Appendix B for details on the structure of ILS and descriptions of some other risk transfer instruments.

Figure 8: New Chain of Risk Transfer in Traditional and ILS Market



Source: Lane Financial LLC.

A noticeable feature of the revised chain is that the movement to the capital markets can take place by any of the types of players in the traditional chain. The fact that insureds such as Electricité de France and Tokyo Disneyland have issued directly to the capital markets shows that a fully developed chain of risk transfer is not a prerequisite for transfer into the capital markets, although the chain undoubtedly facilitates such transactions.

Of particular note as far as this paper is concerned are state or governmental entities that have used the market. These include most noticeably Mexico, the US states of North Carolina and Massachusetts and the California Earthquake Authority. The fact that these entities find the coverage obtained useful is encouraging for developing country aspirations.

Two Case Studies that May Provide a Roadmap

In order for developing countries to benefit from catastrophe risk transfer markets, they must circumvent the issue of under-developed private insurance markets; they lack a traditional chain of risk transfer. One option is to emulate private market innovations by using ILS as the revised chain does. Indeed, as Figure 8 shows some governments already have done so.

Although these types of transaction tend to be expensive, there is good news for developing countries interested in risk transfer to the capital markets; 2010 showed strong growth in the issuance of insurance linked-securities for property catastrophe risk, and market practitioners report new inflows of capital on the investment side with demand expected to outstrip supply of risk. This could lead to favorable pricing conditions for potential sovereign catastrophe bond sponsors.

Developing countries looking to capitalize on these good market conditions can learn from case studies of innovative practices from two of the biggest and most persistent ILS users, USAA and Swiss Re.

Overlapping Coverage – The Residential Re Program of USAA

The insurance company United Services Automobile Association (USAA) sells homeowner, auto, and life policies to a target market of persons who have served in the US Armed Forces. Many are retirees living in the southern coastal states of the United States. Thus, USAA has exposure to catastrophes, such as hurricanes, affecting these coastal states. Historically, USAA diluted these exposure concentrations by buying reinsurance along the traditional market chain.

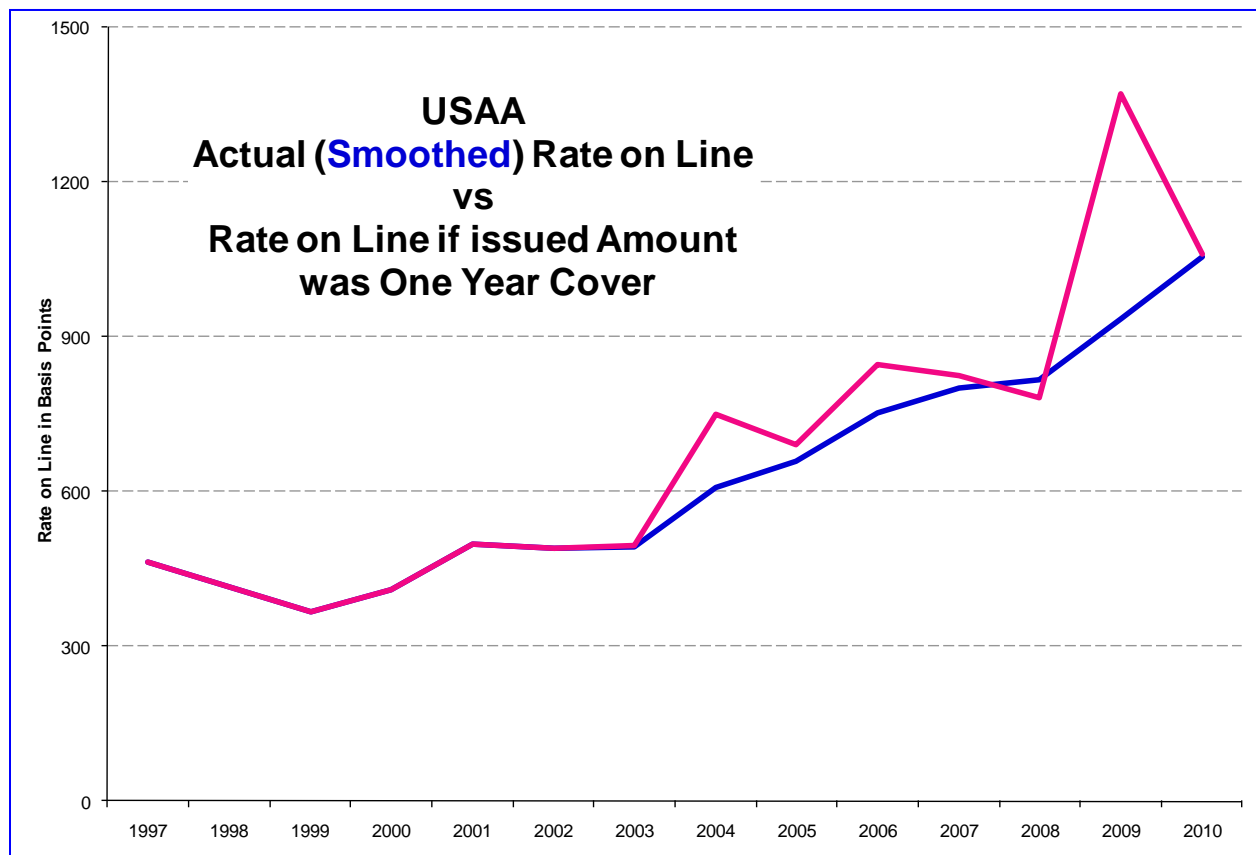
Beginning in 1996 (and every year since), USAA has also bought protection from the capital markets. To date, it has issued some US\$4.5 billion of ILS through a special purpose vehicle under the name Residential Re. Since 2001, all its issues have had three-year maturities. Furthermore, each year the coverage includes the coverages that were purchased in ILS issued one and two years before; thus the coverages accumulate. At any one point in the last few years, the three overlapping issues outstanding at the beginning of each wind season have accumulated to some US\$1 billion of wind protection.

By now, USAA is a familiar issuer in the market and investors compete for the bonds, as does the traditional market. This competition redounds to the benefit of USAA in the form of lower cost.

Another benefit to overlapping coverages is stabilizing or smoothing costs. Figure 9 below shows that had the same coverage been bought in the traditional (annual) market, protection costs would have been quite volatile (red line) compared with the actual smoothed costs achieved (blue line).⁷

USAA's innovation shows a very professional approach to the business of removing concentrations from its original book of business. However, it is not the product of an overnight wunderkind. This strategy has evolved over time – creatively and adaptively. This case study underscores the point that a well-designed program is one that responds to circumstance and that developing countries need not be afraid to experiment.

Figure 9: USAA Actual Rated on Line vs Rate on Line if Issued Amount was One Year Cover



Source: Lane Financial LLC.

The Cafeteria Approach – The Successor Program of Swiss Re

The point about creativity and adaptation is well illustrated in this second case study from Swiss Re. Swiss Re issued experimental bonds to the market even before the path-breaking USAA bonds in 1996. It

⁷ The rising trend should not be confused with rising cost *per se* but with changing protection behaviors.

has been a consistent ILS user and innovator since; some of Swiss Re's ILS deals that are well known to the international community are CatMex and MultiCat Mexico. The purpose here, however, is to highlight the "Successor" program because it is an example that could be emulated by International Financial Institutions (IFIs) or developing country governments.

Around the same time as USAA was adopting overlapping three-year issuance, Swiss Re came up with another innovation that is referred to here as a "cafeteria" approach to risk transfer. This approach evolved through programs variously listed as Pioneer, Arbor, and now Successor.

The essential idea of the cafeteria approach is to provide a standard set of ILS issuance in the form of a menu of offerings. The menu is standardized and is shown to the market on a fairly regular basis. Since the offerings are standardized, there is no need to go through the lengthy and expensive process of setting up a new SPV and different legal document each time a bond is offered. The standard issue can be done repetitively and in any size.

The cafeteria approach achieves both standardization and economies of scale. What is striking about the Successor *et al* series is that the average size of issue is quite small. Some issues are as small as US\$3 million. Swiss Re has achieved economies of scale and standardization with Successor. But there is another benefit: regularity of issue. The presence of a standard menu – a cafeteria of offerings – has led to reverse enquiry business. Thus, investors come to Swiss Re when they have capital to assume risk instead of waiting for Swiss Re to show an offering. Since they know the menu all they need to negotiate is the price on the particular item of interest. See Box 3 below for more detail on the Successor series.

A regular menu of offerings is creative and adaptive. It suggests a model for developing countries.

Box 3: Swiss Re Cafeteria Style Risk Offerings

Extraordinary Variety of Offerings – as self cedant – cafeteria style offering

Successor Coverages	Succ I Class A	Succ I Class B	Succ II Class A	Succ II Class B	Succ II Class C	Succ II Class D	Succ II Class E	Succ III Class A	Succ III Class B	Succ IV Class A	Succ IV Class B	Succ V Class A	Succ V Class B
Successor Hurr Ind Class A													
Successor Hurr Ind Class B													
Successor Hurr Ind Class C													
Successor Hurr Ind Class D	X							X		X	X		
Successor Hurr Ind Class E		X							X				
Successor Hurr Ind Class F													
Successor Hurr Mod Class A			X										
Successor Hurr Mod Class B				X									
Successor Hurr Mod Class C					X								
Successor Hurr Mod Class D						X							
Successor Hurr Mod Class E							X						
Successor CalQuake Industry A	X	X	X	X	X	X	X						
Successor CalQuake Industry B													
Successor CalQuake Industry C													
Successor CalQuake Para Cl A												X	
Successor CalQuake Para Cl B													X
Successor CalQuake Para Cl C													
Successor JapQuake Cl A	X	X	X	X	X	X	X	X	X			X	
Successor JapQuake Cl B													X
Successor JapQuake Cl C													
Successor EuroWnd Cl A			X	X						X	X	X	
Successor EuroWnd Cl B	X				X			X	X		X		X
Successor EuroWnd Cl C		X				X	X						

Source: Lane Financial LLC.

The rows of this menu show the single risks of interest to Swiss Re. They are Atlantic hurricane, California earthquake, Japan earthquake, and European wind. But notice that the rows show different classes in each risk. These correspond to different risk layers. Also notice that there are, for example, two sets of Atlantic hurricane risk. One is denominated as industry loss. The other is denominated as modeled loss. Investors who don't like the industry loss numbers could choose to invest in ILS based on modeled loss numbers.

The emphasis in this menu is on multi-peril covers. The columns of the menu show the combinations of single peril risks that are part of each multi-peril offering. While not all combinations are covered, this set of offerings is still rich.

Figure 10 in Appendix A graphs the coverage that Swiss Re has gleaned from the use of this regular program. For North Atlantic hurricane alone the coverage was once as high as US\$600 million and currently stands at US\$300 million. This does not include the coverage that comes from other component parts of the risk covered in the multi-peril bonds.

Innovations in Developing Countries: MultiCat and the Caribbean Catastrophe Risk Insurance Facility

The World Bank has facilitated two major initiatives⁸ that touch on the capital markets and the transfer of catastrophic risk. The first of these is the MultiCat Program. This program was initiated with the 2009

⁸ These programs do not include the myriad of loan programs, contingent and otherwise, that form part of its conventional and continuing approaches to financing catastrophe risk both ex-ante and ex-post.

Mexican ILS issuance, known as MultiCat Mexico, which covered both earthquake risk in the principal urban areas of Mexico and hurricane risk of the exposed parts of its Atlantic and Pacific coasts.

In 2006, Mexico had issued an ILS titled CatMex. For Mexico's second issuance, the World Bank became party to the transaction and saw an opportunity to set up a facility through which other developing states could issue their own bonds. In setting up MultiCat they mimicked the "program" form utilized in ILS markets. The MultiCat Program could indeed save expense if and when other countries use the facility⁹.

Similar remarks about adaptability apply to the Caribbean Catastrophe Risk Insurance Facility (CCRIF).¹⁰ This entity was set up in 2007 to provide catastrophic coverage for the island states of the Caribbean. Donor countries were encouraged to provide capital to establish the CCRIF and thereby instill some discipline to the ex-ante relief program. The coverage was for relief funds that could be paid out immediately after a catastrophe, but were not intended to provide a substitute for long-term relief. Caribbean states choosing to participate had to pay a participation fee, which formed part of the capital of the CCRIF, together with an annual premium.

To date, the CCRIF has paid out seven claims totaling about US\$32 million, two for earthquake (a surprise) and five for wind losses. Famously, the CCRIF was one of the first payers of monies (in the amount of US\$7.7 million) immediately after the 2010 Haiti earthquake.

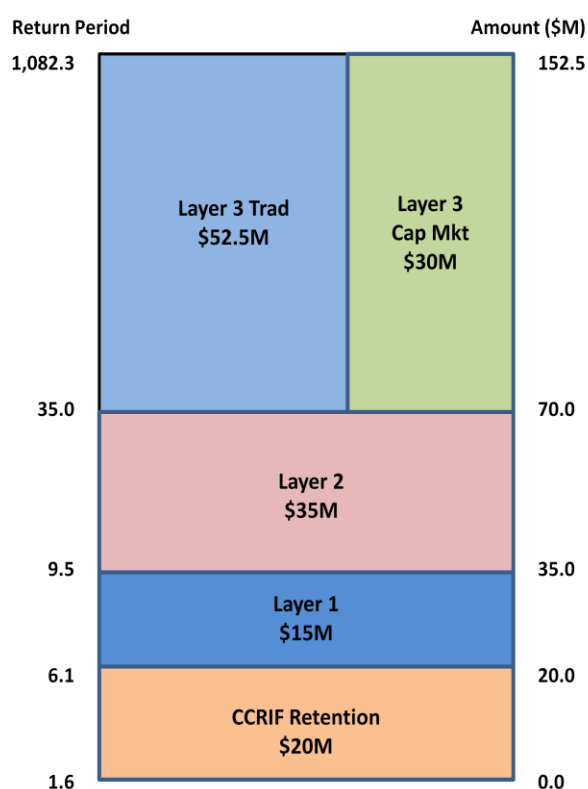
The CCRIF 2010 Annual Report shows the coverage provided in several levels of exposure (Figure 11 below). Essentially, the CCRIF would provide for the first loss up to US\$20 million. The next layer is provided for by traditional reinsurance from the private market in two layers for a total of US\$50 million of loss. Above that, the traditional market reinsurers and the World Bank absorb the risk proportionately for an additional US\$82.5 million. The World Bank share of the top layer is 36 percent. The World Bank has assumed risk in this layer by doing an excess-of-loss contract in swap form.

What the block diagram does not show is the donors' role in CCRIF. Donors established a special fund to help establish the CCRIF in its early years in the approximate amount of US\$67 million. This fund is helping to defray expenses and claims for running the fund while CCRIF builds up its own capital. The initial period of support is five years but can be extended. In its first years, the donor fund has reimbursed the CCRIF for its operating expenses, its reinsurance premiums, and its claims. In short, the donors are in the first loss position.

⁹ It should be noted that once established, such programs are not always used multiple times or by additional sponsors as anticipated; they often have to be changed because the program failed to fully anticipate new events or wrinkles in underwriting. Lloyds of London set up a similar facility (Thunderbird Re) for its syndicates in 2006. It still has not been used.

¹⁰ CCRIF has also provided an important demonstration effect. In February 2011, the Inter-American Development Bank and Swiss Re announced a \$100 million risk transfer platform for the Dominican Republic providing \$50 million protection for damage from hurricanes and a similar amount for earthquakes. The risk may in the future be transferred to either the reinsurance or capital markets.

Figure 11: Layers of Coverage of the CCRIF



Source: CCRIF Annual Report 2010.

Visions for the Future of Disaster Risk Financing in Developing Countries

There follows a multi stage set of proposals that can serve as a guide to possible ways to proceed to develop future programs. The proposals lean heavily on the experience laid out by the private market above.

The Small Scale – A Caribbean Cafeteria?

The CCRIF is a readymade vehicle for small experimentation. Such experiments should be made toward the furtherance of the initiative and not at the expense of current participants. The CCRIF currently buys reinsurance from the private market and the World Bank. It has not tapped the capital markets for cover by issuing ILS. But if it takes a leaf out of USAA's book, it will try to tap both the traditional market and the capital market.

What would be necessary to tap these markets? First, a risk analysis must be given to investors. Once updated, this assessment is already available. Next, CCRIF would need a vehicle for issuing the ILS. But this vehicle is also available through the MultiCat Program. The question, therefore, is in what form CCRIF should issue the ILS.

Consider a cafeteria approach *a la* Swiss Re's Successor program, as illustrated in Table 1 below. Here, the Caribbean is divided into four sections and earthquake and wind risks are separated. There is no particular justification for this division – it is simply by way of illustration. In practice, the division of wind, quake, and different intra-Caribbean zones would be driven by the interplay of risk analysis and demand. This task is beyond the scope of this paper. The purpose here is to illustrate how innovations of the past can be applied in the future.

Table 1: Caribbean Cafeteria Example

Caribbean Cafeteria		CCRIF I	CCRIF II	CCRIF III	CCRIF IV	CCRIF V	CCRIF VI	CCRIF VII
Wind								
North Caribbean Island Zones - Wind		x				x	x	
South Caribbean Island Zones - Wind			x			x		x
East Caribbean Island Zones - Wind				x		x		
West Caribbean Island Zones - Wind					x	x		
Quake								
North Caribbean Zone - Quake						x	x	
South Caribbean Zone - Quake						x		x
Term - Three Years, adjusted as to risk after annual reassessments of risk								

Source: Lane Financial LLC.

In Table 1's menu of items, four wind risk ILS are suggested together with three multi-peril ILS. As with Swiss Re's Successor menu, the rows represent the individual single perils and the columns represent the deals. The column labeled CCRIF V is a multi-peril deal that incorporates all the risks presently in CCRIF. Properly structured, this menu could be a substitute for the risk layers currently underwritten by the private reinsurance market¹¹. Issuing this ILS would provide a price competitor to the traditional market in the same way that USAA does with its Residential Re series. Also mimicking USAA, a three-year term of exposure is suggested so that reinsurance costs are smoothed over time.

Swiss Re's Successor model initially communicated its pricing to the market on a quarterly basis. Since inception, pricing has been less regular, and it is not suggested that the CCRIF price its offering quarterly. Rather CCRIF could choose some other regular frequency, such as semi-annual or annual, to allow capital market investors to adjust to the idea of a regular and dependable supply of risk from the Caribbean that they can incorporate into their portfolio plans.

Notice that a regular auction of risk does not imply that CCRIF has to offer all risks all the time. Successor does not. CCRIF can indicate that it no longer needs, say, East Island Zone risk by setting prices low or not quoting on that particular zone. Reverse enquiry can also inform CCRIF where demand is.

¹¹ The Annual Report shows four reinsurers as participants on the risk including Munich Re and Swiss Re.

The cafeteria menu is merely one idea for CCRIF. Another involves the layer of risk that the World Bank has underwritten as co-insurer to the senior layer. As indicated above, the World Bank has assumed risk in this layer by doing an excess-of-loss contract in swap form. In theory, the CCRIF could have issued an ILS that duplicates the layer by itself, but it would have incurred attendant ILS issue costs. By entering a swap with the World Bank, the CCRIF has avoided ILS issuing cost, but has also lost the advantage of name exposure to the market.

The World Bank could also hedge its own risk by assuming the costs of issuance and using the MultiCat Facility to issue MultiCat CCRIF. MultiCat CCRIF would be an ILS for Caribbean risks. This issuance could be advantageous for the World Bank, as it would establish the World Bank as an intermediary between developing country risk and private market risk in a way that is cost effective for the CCRIF.

The ideas of CCRIF issuing a cafeteria menu of bonds and of IFIs such as the World Bank intermediating to the capital markets are both precedent setting. They translate easily to the idea of a larger platform.

A Larger Frame – Global Cafeteria Coverage

It is easy to extend the idea of a regular menu of risk offerings from the Caribbean to the world at large. Table 2 shows a simple example of offerings, similar to that illustrated for the Caribbean. Again, merely for illustration purposes some known zones of risk exposure are listed.

To a degree, IFIs already understand the worldwide distribution of risks and have begun monitoring existing disaster relief¹². Figure 12 in Appendix A from a recent World Bank review of its disaster lending portfolio shows the number and amount of disaster lending operations. Closer examination of the report reveals the concentrations of risk faced by the World Bank (see Figure 13 in Appendix A).

Of course, what IFIs are most interested in for their ex-ante risk financing programs is getting relief to affected countries. Thus, IFIs need mechanisms similar to the CCRIF. They need risk analysis in acceptable measurable form, such as the parametric measures used for the CCRIF, before they can proceed.

¹² See for example “Natural Disaster Hotspots: A Global Risk Analysis,” or “World Bank Disaster Lending Operations Portfolio FY 2006 – FY 2010.”

Table 2: Global Cafeteria Example

IBRD Global Cafeteria		IBRD I	IBRD II	IBRD III	IBRD IV	IBRD V	IBRD VI	IBRD VII
Wind								
Caribbean Islands		x				x	x	
Pacific Islands			x			x		
Bangladesh				x		x		
Flood						x		
Africa					x			x
Quake								
Caribbean						x	x	
Turkey						x		x
Pakistan								
Asia							x	x
Drought						x		
Term - Three Years, adjusted as to risk after annual reassessments of risk								
Single peril bonds IBRD I thru IV all binary								

Source: Lane Financial LLC.

In establishing any kind of platform to interface with private markets, the first requirement is to establish the risk measure and analysis. Earthquake in many zones can be measured by fairly precise geophysical metrics (as has already been done for MultiCat Mexico). Wind speeds can be measured at specific locations. Rainfall, temperature, and snow are all more or less obtainable for most regions of the world so that drought and flood conditions can be measured. More difficult to assess are the damages resulting from excessive rain, temperature, wind, or quake. These losses, after all, are what need to be replaced after a disaster. Risk modeling agencies are the experts in doing this assessment.

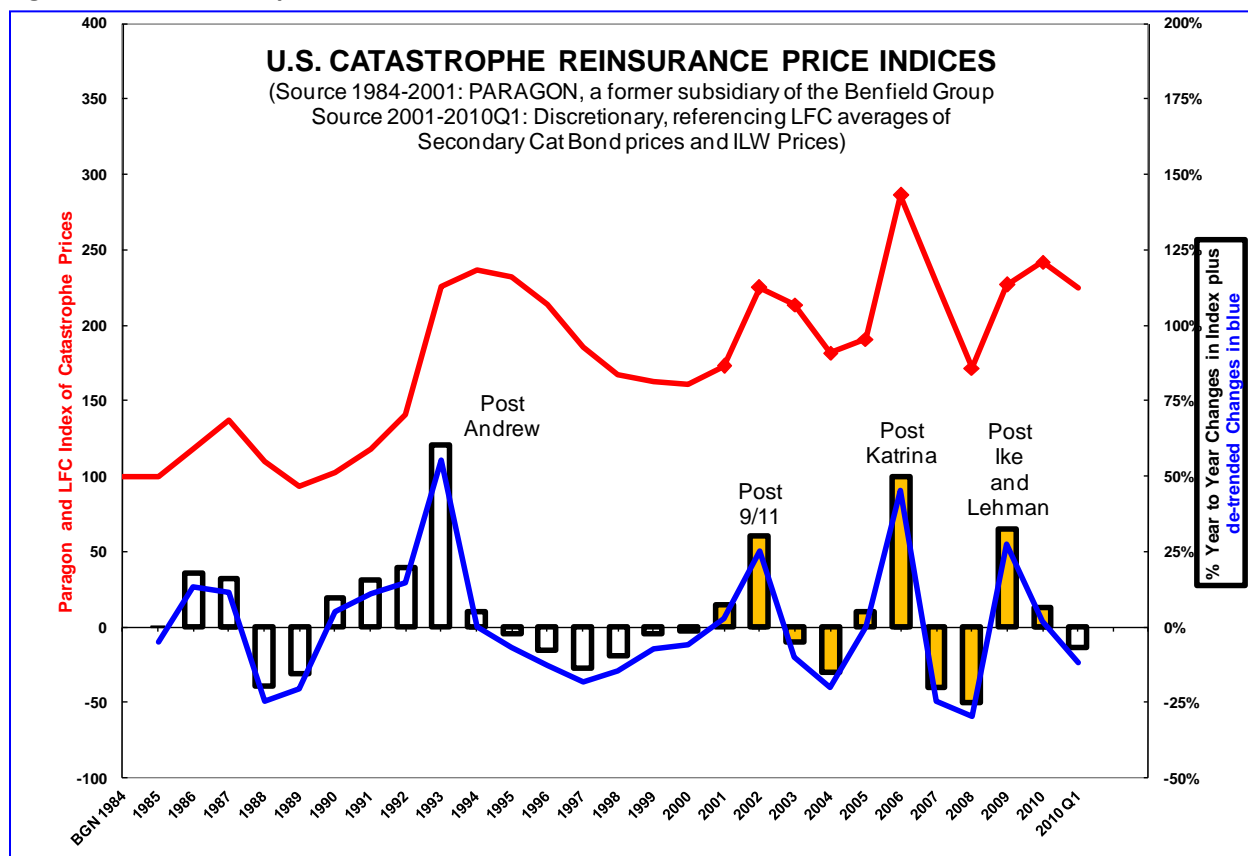
Commissioning more risk analyses will therefore be important for communicating the IFI and/or issuing countries' risk to potential risk takers. As demonstrated above, if the risk assessments are available, then the actual mechanisms of transferring ex-ante risk, whether through a cafeteria approach (possibly web-based) or a specific ILS, is straightforward.

Pricing

While the forgoing ideas may be appealing and will advance the cause of ex-ante disaster financing, they are not without some downsides. Two are worth stating here. The first is that accessing the private markets brings with it the reality that the markets themselves are volatile. Thus, as major disasters occur in the existing world of reinsured risks, private markets exhaust their capital and need to replenish to continue doing business in the future. One way in which they do that is to raise premiums. The same risk will cost more to transfer after a major disaster than it did before, even if the risk was not directly

affected by the disaster. Figure 14 below illustrates the volatility of major developed world risk cost over the past two decades. Accessing the private markets will bring some part of that volatility to developing world risks.

Figure 14: US Catastrophe Reinsurance Price Indices 1984-Q1 2010



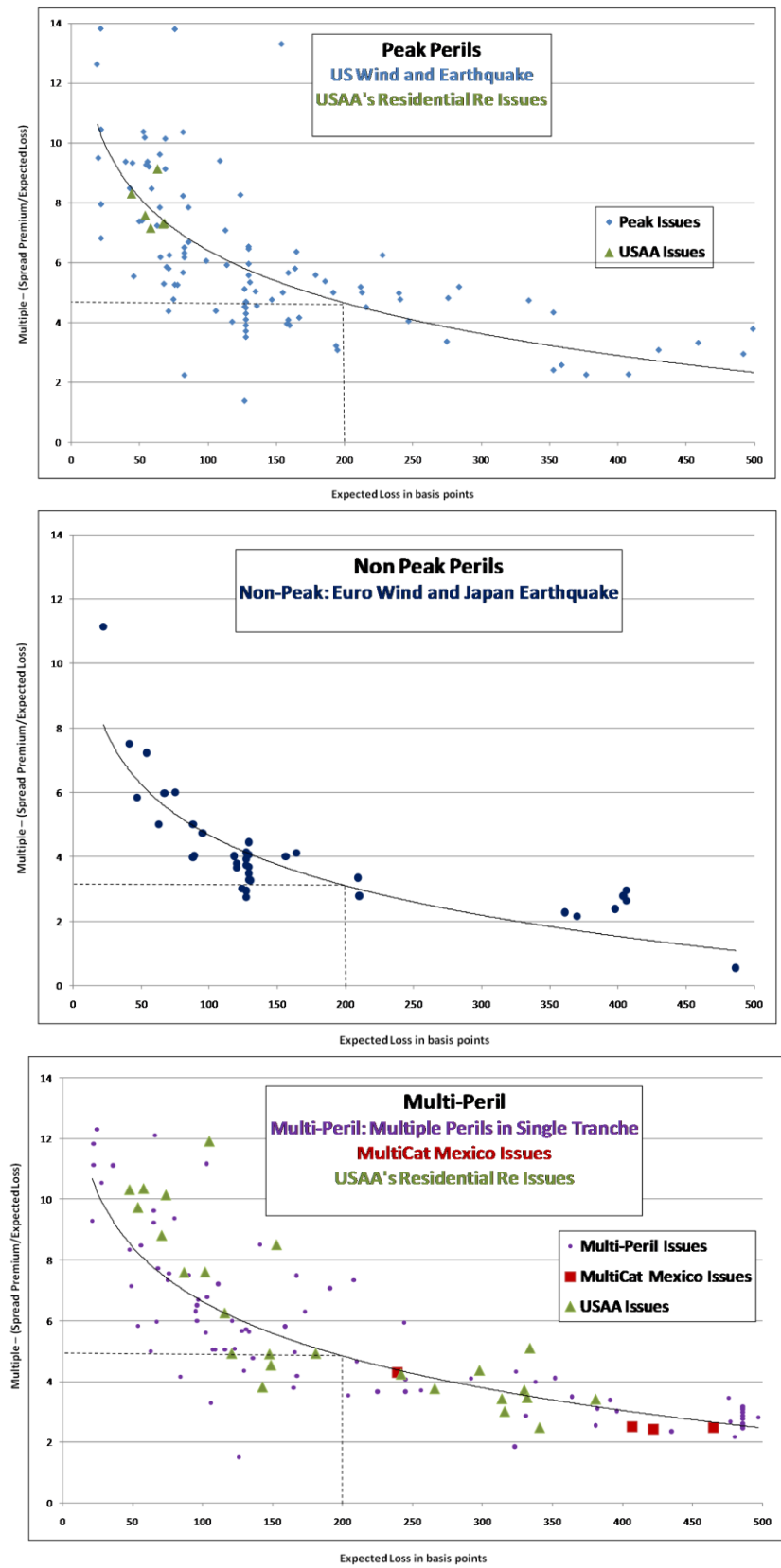
Source: Lane Financial LLC.

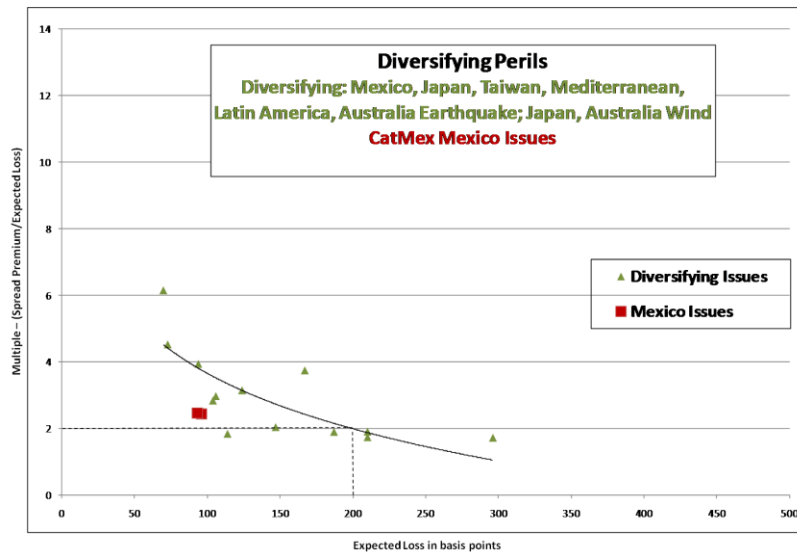
A second caution is that the existing reinsurance markets are devoted to protecting against extreme events. They are not typically vehicles for protecting against frequent events. The most practical response to those situations is mitigation, not ex-ante insurance. This does not mean that in the aggregate there will not always be some disaster. If there are five hundred independent one-in-fifty year event risks that are identified worldwide, then one can expect ten such disasters a year to occur somewhere in the world. It is just that the reinsurance markets will focus on pricing the one-in-fifty year events individually and will collectively handle the aggregate in their portfolio.

Notwithstanding these two cautions, there is some good news about pricing: Investors are hungry for new diversifying risks and will pay for them. The evidence is in the history of issued ILS. Consider the graphs in Figure 15 below.¹³

¹³ In these graphs, expected loss is limited to 500 basis points and multiple to 14 times the expected loss.

Figure 15: Multiple versus Expected Loss for Cat Bond Issuance 1997-2010





Source: Authors, from Lane Financial LLC.

About 350 tranches of ILS have been issued since the market began in 1997. They have been issued when prices are relatively high and when they are low, but taking all periods together a relative view of pricing can be gained by comparing the premiums paid at issue with the expected loss at issue. Dividing premium by expected loss gives a “multiple” that the issuer is paying for protection. The graphs show that the issuer is always paying more than the expected loss, sometimes a great deal more. Coverage for infrequent events can be from ten to 20 times expected loss, although the cost will depend on the exact type of peril being covered.

Cummins and Mahul (2009) divide the historical list of ILS into four types. These are: Peak risks (US wind and US earthquake); Non-Peak (Europe wind and Japan earthquake); Diversifying (Mexico, Australia); and Multi-Peril (bonds that can be exhausted or attached by more than one peril). The four graphs above show the multiples for each class. The comparison is instructive: a bond issued for a peak peril and an expected loss of 200 basis points would require a premium close to 4.5 times the risk, or 900 basis points. A bond that contained multiple perils would be similarly or even more highly priced. However, non-peak bonds for the same level of risk, 200 basis points, command a multiple of three times the risk, or 600 basis points. Diversifying risk ILS could be issued at a multiple of two times the risk, or 400 basis points. The dotted lines on each graph pick out these comparison points. Since most ILS that would appear from developing countries would likely be diversifying, their pricing can be expected to be at the low end of ILS experience. Note also that the MultiCat Mexico and USAA issues discussed in this paper are separately identified on the graphs and follow the same pattern.

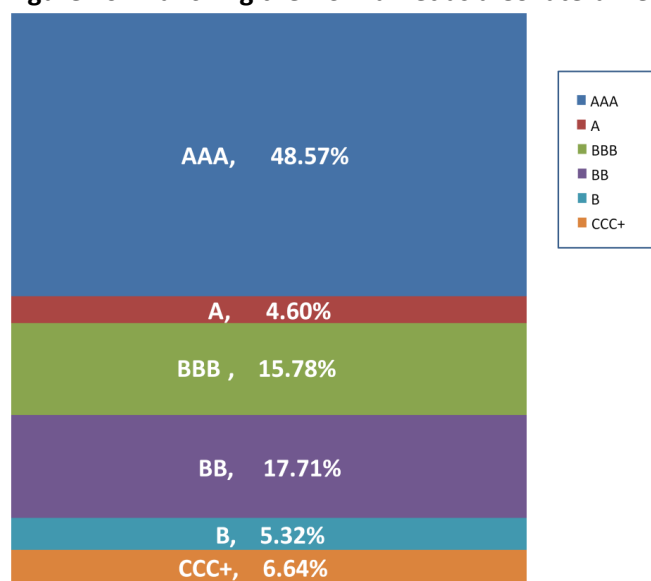
Longer Term Visions

In the case that IFIs pursue some or all of the above in the next few years, then there are other experiments they might wish to explore.

One such experiment recognizes that the cafeteria approach is essentially static. The offerings are fairly similar year-to-year in order to build up investor acceptance and loyalty. Over time, IFIs issuing for developing country catastrophe risk might find the cafeteria approach cumbersome and not sufficiently adaptable. IFIs may accrue shifting portfolios of risks; therefore, a more dynamic approach may be preferred. In this approach, an IFI would assemble and manage risks on its own portfolio, but hedge using a CDO-like structure. The collective risks form a portfolio that can be tranching and hedged by tranche rather than by single risk.

The existing portfolio of ILS in the private market provides an illustration. Suppose an aggregator bought all the ILS currently outstanding. The risk profile assumed would then be like that shown in **Figure 16** below. The aggregator could hedge by issuing tranches of bonds for the portfolio of the bonds overall (which may shift) rather than for a fixed portfolio. Now suppose that the aggregator was an IFI and that the bond acquired were from developing country governments rather than high-income country insurers. The IFI's risk portfolio would represent the amount of insured loss those governments expected to get after an event. As intermediary to the private markets, the IFI would be able to manage the risk and to bear the cost; individual governments may lack this ability.

Figure 16: Tranching the ILS Market as a Collateralized Debt Obligation (approximate as of 6/30/2010)



Source: Lane Financial LLC.

Section 3: Innovations in Domestic Property Catastrophe Insurance Markets

Sustainable private domestic markets for insurance have an important role to play in disaster risk management. Not only do private markets directly reduce the strain on the fiscal budget following a

disaster, they can also be instrumental in preventing losses in the first instance by encouraging individuals and businesses to apply loss mitigation measures. High-income countries provide multiple examples of effective PCRI markets; examples that developing countries can draw on to strengthen their own domestic markets.

A healthy domestic insurance market can be a conduit into the international reinsurance market, allowing countries to tap into a pool of over US\$400 billion of capital¹⁴ to aid recovery in the aftermath of a disaster. Chile provides an example of such a partnership; following the devastating February 2010 earthquake, domestic carriers passed on 95 percent of the insured losses to the international reinsurance market. Figure 17 in Appendix A demonstrates this point in more detail. It displays the fraction of insured losses coming from the reinsurance market over the last ten years, which is around 35 percent.

Insurance markets also indirectly influence total economic exposure (insured and uninsured). A functioning domestic insurance market can encourage risk-averse behavior in a population, as information about risk is embedded in prices. Where higher premiums indicate higher risk, insureds have a strong incentive to invest in risk mitigation or to avoid investing in assets located in zones vulnerable to natural hazards.

The burden of average annual economic loss relative to GDP is higher for middle- and low-income countries, as illustrated in Figure 2. Yet these countries benefit less from private insurance markets than their high-income counterparts, as markets tend to be less developed, often with low penetration rates. Individuals within high-income economies choose to spend a huge amount on insurance of all kinds. According to AON average net premium paid in the US is over 3.25 percent of GDP¹⁵.

Another way to view the importance of these markets is to look at how much of the natural catastrophe's economic losses are reclaimed from insurers – how much those economies benefit from ex-ante solutions. Figure 18 below illustrates these phenomena for the US. For all the major US catastrophes of the past 25 years, a large part of the economic loss from each catastrophe is reclaimed as insured loss.

Not only is impact of the catastrophic loss relative to GDP smaller in the US, it is made even smaller because part of the losses is recovered from insurers¹⁶. Figure 18 shows that insured recoveries for major catastrophes relative to GDP in the US are around 0.1 percent¹⁷. This is a significant portion of average annual economic losses – Figure 2 shows that average annual economic losses are in the order

¹⁴ Source Aon Benfield Reinsurance Market Outlook 2010

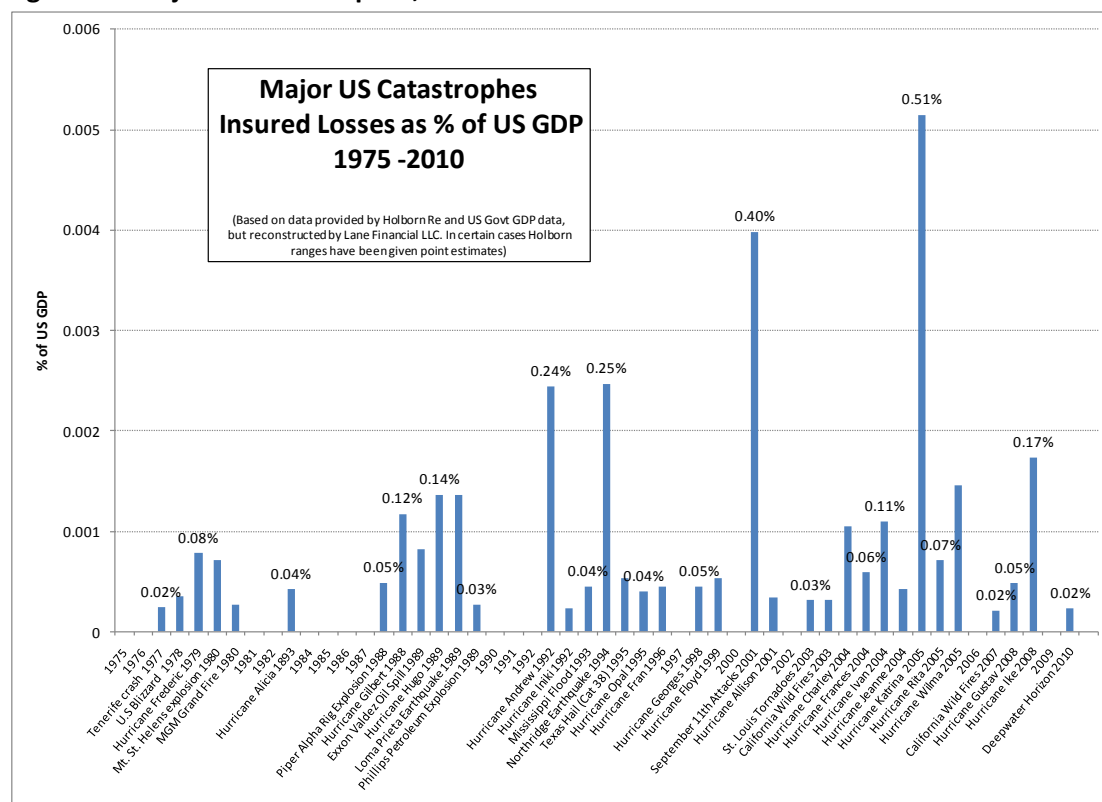
¹⁵ Reinsurance Market Outlook, AON, January 2011. The 3.5% is premium for all coverages, life, etc., not just catastrophes.

¹⁶ The exact amount of economic loss for these US catastrophes is not well recorded. A good rule of thumb might be that the economic loss is twice the insured loss. The uninsured component is born by those affected, individuals and governments, exactly as in low income countries where no risk transfer market exists. Also the uninsured often receive ex-post relief from governments, again similar to developing countries.

¹⁷ We use visual inspection to avoid too much false precision in these numbers. For example this comparison uses different time periods and different measures (annual average vs. catastrophic events) to draw the conclusions.

of 0.2 percent of GDP for high-income countries. In the US, the populace has made ex-ante provisions for recovering from disaster by buying insurance.

Figure 18: Major US Catastrophes, Insured Losses as % of US GDP 1975-2010



Source: Lane Financial LLC.

Lessons in Cost Efficiency

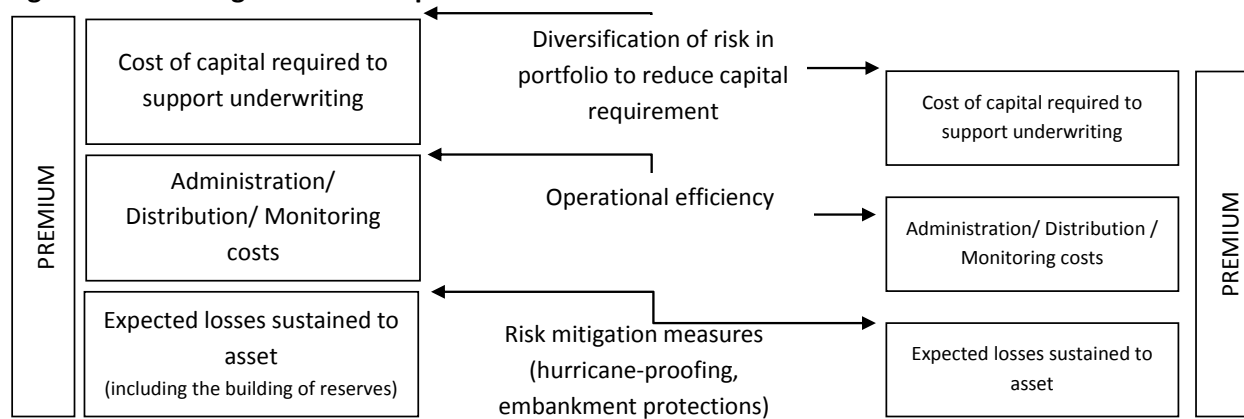
One challenge in the development of viable domestic insurance markets in developing countries is ensuring that the cost of risk transfer is not prohibitive. To understand how to strip costs down as far as possible, it is necessary to look at the different components that premiums must cover; expected losses to the covered asset plus the expense of distributing, administering and monitoring policies (see Figure 19 below). Additionally, the cost of holding capital to support underwriting must be considered.

There are several ways to reduce the cost of capital required for the insurer to hold in order to take on risk. One way presented in Figure 19 is the diversification of risk accepted, which reduces the amount (and therefore total cost) of capital that the insurer must hold.

Risk mitigation measures provide an option to reduce the expected losses component of premiums; these come under the banner of 'disaster prevention,' however, which is beyond the scope of this discussion.

Additionally, there are tried and tested models of operational efficiency within developed private insurance markets that may be transferable to the developing world. Two examples from the London market are presented below: delegation of underwriting authority and sharing of resources.

Figure 19: Reducing the Cost Components of an Insurance Premium



Source: Authors.

Cutting Distribution Costs: Delegating Authority

The success of the Coverholder model at Lloyd's of London illustrates how non-standard approaches to product distribution can reduce expenses. A Coverholder is an entity external to the Lloyd's market that writes local business on behalf of the market; underwriting authority is effectively delegated to Coverholders. These arrangements give the Lloyd's market access to domestic insurance markets that would otherwise not have been commercially viable. Agreements are drawn up between the market and each Coverholder, clearly delimiting how the Coverholder may accept business on behalf of the market. Through these agreements, the Coverholder is able to offer competitive access to a broad range of insurance products available at Lloyd's.

The Coverholder model enables Lloyd's to leverage existing local infrastructure for product distribution. Delegated authority business currently accounts for almost a third of premium income at Lloyd's.

The existence of appropriate local infrastructure and local expertise in underwriting are prerequisites for the success of the Coverholder model, which narrows the list of developing countries in which it could be directly applied. The concept of using a flexible risk transfer chain with satellite entities able to tap into developed market capacity, however, could have broad applicability. Furthermore, the existing local infrastructure used as the basis of distribution need not necessarily be in use for insurance: where distribution channels are in place for products targeting the same demographic (credit, for example), there may be opportunities to leverage these.

Reducing the Cost of Risk Analysis

Collaboration

Although competition for business between insurers is fierce, market practitioners are not averse to collaboration with competing firms where mutual benefit may be gained. The London Market Data Community offers an example.

As many insurers/reinsurers may participate in risk sharing on the same underlying pool of assets, operational efficiencies can be gained by sharing the cost of risk analysis for portfolio exposure management. The 15 or so insurers/reinsurers that participate in the London Market Data Community split the cost of analyst resources on common exposures by sharing the outsourcing to a third party.

In this way, reinsurers and insurers are able to collaborate without ceding competitive advantage, as their individual in-house expertise on risk analysis can still be applied post-receipt of the shared, outsourced data results. Although in the context of the market as a whole, sharing analyst resources remains small, the London Market Data Community has attracted some of the largest companies operating out of London (e.g., Amlin, Beazley, Brit, Catlin, Hiscox, and Kiln), and participation has more than doubled since the inception of the scheme in 2007.

Open Source

Open source initiatives for catastrophe risk models are a further step toward reducing the cost of risk analysis in both the traditional and alternative risk transfer arenas. Ultimately, risk analyses form the basis of pricing models to support underwriting. Access to pricing tools underpinned by free open source risk data can cut the cost of underwriting for insurers operating in both high-income and developing countries.

By sharing expertise and data, insurance and reinsurance companies participating in open source initiatives ultimately benefit from a common resource beyond the scope of potential individual achievement. Furthermore, the intellectual property associated with any resulting tools will be collectively owned (in part) by the reinsurance and insurance industries, leading to cost savings in the long-term.

The Global Earthquake Model (GEM) is one such initiative that is well underway. The innovative elements of the project are that the resulting global earthquake model will have a flexible interface to expand the potential user base, will be open source, and is being constructed by a community of stakeholders across the globe and the private and public sectors.

Several private players, including Munich Re, Zurich Financial Services Group, and broker Willis, founded the initiative. It has attracted broad participation from both the private and public sectors, with support from 18 participating countries and numerous public sector organizations, including the World Bank.

Many more open source initiatives are currently underway in risk modeling, including a drive by the IFIs to enhance awareness of risk through “Open Source.” In this initiative, the experience of various agencies will be collected and made publically available. The objective is to collect risk assessment worldwide so that, for example, earthquake risk in Turkey, drought risk in Africa, flood risk in Bangladesh and bird flu risk in Asia are all assessed and disseminated.

The data produced by open source initiatives could be a catalyst for the development of property catastrophe insurance markets in developing countries, where historical records for loss experience are typically sparse and insurers need to look to other sources of data to inform pricing.

Section 4: Innovations in Disaster Microinsurance for the Most Vulnerable

Disaster microinsurance is ripe for the study of innovation. Driven by both the public and private sectors and tested in diverse contexts (with even more diverse outcomes), the field of disaster microinsurance is constantly changing. New understandings and solutions are notable on many fronts: product development, distribution channels, client education, etc. These developments are important for establishing disaster microinsurance a substantive tool for protecting poor people against natural disasters; while there is great optimism about disaster microinsurance, its growth until now has been limited.

Disaster Microinsurance Programs with Potential

Recent or ongoing disaster microinsurance programs test innovative solutions for meeting the needs of their target populations. Lessons from these innovations can be applied for the improvement of disaster micro-insurance services for low-income populations. Also note that new innovative pilots are under development; for example, in late March, 2011, a consortium of partners announced the formation of Microinsurance Catastrophe Risk Organization (MiCRO), a disaster microinsurance facility for Haiti’s micro-entrepreneurs that will test a new approach to minimizing basis risk in its parametric coverage¹⁸.

A Holistic Approach to Reduced Vulnerability

The Horn of Africa Risk Transfer for Adaptation (HARITA) Program offers a holistic approach to risk management. The program integrates risk transfer (i.e., insurance), risk reduction (i.e., improved agricultural practices and conservation activities), prudent risk-taking (i.e., credit), and risk reserves (i.e.,

¹⁸ MiCRO’s founding partners are Swiss Re, Caribbean Risk Managers Limited, Guy Carpenter Micro Risk Solutions, Mercy Corps Development Agency, and Fonkoze Microfinance Institution.

savings). HARITA is being piloted in Tigray, the northernmost state of Ethiopia, and involves a large number of partners from both within Ethiopia and the international community.¹⁹ HARITA targets highly vulnerable rural families, many of whom are enrolled in Ethiopia's Productive Safety Net Program (PSNP)²⁰.

HARITA aims to provide a package of disaster risk reduction and management services that is designed to address the core interests of its clients. To understand clients' needs and wants, program organizers engage farmers as central participants in the design of the risk reduction package. For example, farmers suggested one of the central innovations of the program: enabling the poorest farmers to pay in-kind for coverage with their labor. This suggestion resulted in PSNP participants being able to pay for insurance through disaster risk reduction activities in their village that reduce their own vulnerability to future extreme events.²¹

A key innovation of this program is providing comprehensive disaster risk reduction, risk transfer, savings, and credit to targeted food-insecure populations. By integrating insurance with a food security program, farmers' immediate concerns begin to be addressed. This relief allows them to consider longer-term issues that insurance is designed to cover²². In the long-term, this integrated approach could help increase the resilience of vulnerable rural populations to climate change.

Effective & Efficient Distribution through Mobile Technology

Kilimo Salama, or "safe agriculture" in Swahili, is a weather index-based insurance program for Kenyan farmers that embraces mobile phone technology. Mobile phones are used for selling, tracking, and distributing payouts.

Kilimo Salama was launched in 2009 through partnership between the Syngenta Foundation for Sustainable Agriculture, African insurance company UAP, and mobile provider Safaricom. The program's insurance policies protect a farmer's investment in inputs (seeds, fertilizers, and chemicals). Policies are paid for up-front when inputs are purchased and last for one growing season. The premium for the insurance policy (10 percent of the cost of the purchased input) is shared 50 percent by the farmer and 50 percent by the agribusiness; this private sector partnership is another innovative feature of the program.²³

¹⁹ Major Partners: Relief Society of Tigray, Dedebit and Credit Savings Institution, Nyala Insurance Company, the Ethiopian Productive Safety Net Program, the Government of Ethiopian National Meteorological Agency, Swiss Re, Mekele University, Oxfam America, and Columbia International Research Institute for Climate and Society.

²⁰ PSNP is a government safety-net program that serves eight million chronically food-insecure Ethiopian households.

²¹ Risk reduction activities include: Tree, grass, and bush planting; creation of stone terraces for soil and water conservation; soil fertility management through composting; and spate irrigation.

²² Linnerooth-Bayer and Suarez 2010.

²³ In 2010, its second year of operation, participating companies included MEA Limited (fertilizer) and Syngenta Chemicals East Africa Limited, and Seed Co. According to Kilimo Salama, a number of other agribusinesses have indicated their interest in participating in the scheme.

Kilimo Salama was the first agricultural microinsurance program to use agricultural supply dealers to distribute the insurance policies. In 2010, almost 40 agro-dealers in five regions in Kenya distributed the policies.²⁴ Participating agro-dealers pay an approximately US\$60 deposit on a mobile phone equipped with an application that registers the policy and sends an immediate confirmation to the purchasing farmer.

To register a policy, the agro-dealer references a provided sheet of “Quick Response” codes that identify the product type, size, and insurance type. When the agro-dealer scans the relevant codes with the mobile phone’s camera, a request is made through the program server via the General Packet Radio Service (GPRS) network. When the policy is registered, the farmer receives a SMS confirming the purchase; the agro-dealer also provides the farmer with a paper receipt where purchase details can be recorded.²⁵ The agro-dealer collects premiums and transfers them in bundles via SMS to the insurance company.

Throughout the growing season, insured farmers (approximately 11,000 in 2010) receive location and crop-specific text messages with farming advice. For example, farmers growing maize in a region that has experienced significant rains will receive a text suggesting that they spray against aflatoxins. In case of a payout, all phone numbers linked to a weather station receive a confirmation of their payout via SMS, and the payout is made directly via MPesa, a mobile money transfer service available throughout Kenya. In September 2010, the program paid out for the first time: Over 100 farmers in the Embu Region of Kenya received payouts ranging up to US\$30.

In November 2010, the International Finance Corporation’s (IFC) Global Index Insurance Facility (GIIF)²⁶ conferred a grant of US\$2.4 million to Kilimo Salama to scale up the program. While costs such as strengthening Kenya’s weather station infrastructure will pose challenges to the scaling up of the program, its innovative use of mobile technology means that transaction costs of distribution will remain minimal.

The First Flood Microinsurance

In 2009, Indonesian insurance company Asuransi Wahana Tata, Munich Re, and German aid agency Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ)²⁷ launched the first-ever flood microinsurance pilot in Jakarta. The program aimed to provide affordable, easy-to-understand, and non-bureaucratic insurance coverage for a risk known to be very difficult to assess.

The insurance product was a simple protection card, similar in size to a telephone card, which carried insurance coverage. Residents of the pilot area could purchase an unlimited number of insurance cards; each card cost slightly less than US\$5 and guaranteed a one-off payment of approximately US\$24.50 if

²⁴ There are an estimated 8400 agricultural supply stockists in Kenya.

²⁵ Farmer can also access his policy data by sending a SMS to the insurance company.

²⁶ IFC’s GIIF program was established in 2009 to assist the development of index-based insurance for natural disasters and weather risks in developing countries.

²⁷ On January 1, 2011 GTZ was merged with two other German development services to form the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ).

the waters rose to or above 950 centimeters at the Manggarai Water Gate in Jakarta during the rainy season. Cards could be purchased during the dry season and were valid for one year. In case of a triggering flood, policyholders could redeem their insurance cards for payment within an approximated five days of the event. Payouts could be used to cover asset losses and livelihood expenses such as medical expenses and food.

Although lauded for its simple design and availability of flexible coverage, the flood insurance product had limited outreach. In its first month, approximately 50 policies were sold, and sales did not increase significantly in the following months. One issue cited by community members in the months following the product launch was that they did not feel that flood water level at the Manggarai Water Gate accurately reflected their own losses (i.e., basis risk). They also felt that the trigger level (950 cm) was set too high and demanded insurance for more frequent events. For this and a number of more practical reasons (i.e., an urban drainage project that attenuated flooding problems in the area), the pilot was discontinued in 2010.

This case raises interesting questions about design and development of index-based insurance products. The project appeared well positioned to provide a valuable coverage for Jakarta residents – it addressed a compelling infliction on the community, involved community members in its design, and adopted a straightforward product design – and yet demand was weak. What can other disaster microinsurance programs learn from this project? How can programs balance the demand for coverage that pays out frequently with insurability constraints? How can educational messages on insurance be effectively conveyed to the population? Is it feasible for insurance to be part of the response to recurrent urban flooding?

Payment in Advance of Disaster

El Niño is an unusual warming of the tropical Pacific Ocean responsible for bringing catastrophic rainfall and flooding (among other weather patterns) along the northern coast of Peru. In the coastal region of Piura, a project is using highly predictive sea surface temperature values associated with this event to design innovative insurance coverage for the damages and disruption that El Niño inflicts on Piura's economy.

GlobalAgRisk Inc., in conjunction with numerous other stakeholders, is leading the effort to create an index based on sea surface temperatures in the Pacific; this index is unique because it can signal a severe El Niño event months in advance of its impact on land. It enables an insurance product that disburses a payout based on a seasonal prediction, so that policyholders receive payment months in advance of catastrophic weather. This payment can be used for risk mitigation and adaptation strategies to reduce losses and disruptions from the forecasted event.²⁸ The policyholder chooses the amount to insure; the maximum amount available is capped at an estimation of the policyholder's largest plausible flood losses.

²⁸ See GlobalAgRisk Press Release 2009.

This product is the first forecast index insurance to receive regulatory approval. It is currently being targeted at risk aggregators, such as rural lenders, primarily to increase access to credit in rural areas of Peru.²⁹ The development team has received funding to develop and pilot alternative applications of the El Niño index insurance, such as other business sectors and households. The development of El Niño index insurance has sparked consideration of other applications of forecast index insurance and its linkage to ex-ante risk reduction.

Section 5: Concluding Remarks

The last two decades have seen a flurry of risk transfer innovations, driven by the private sector but also by the international community at large. The result is a broader set of options for disaster risk financing and insurance at all scopes in developing countries.

The first interactions of the insurance and capital markets have triggered a number of innovations that hold significant promise for cost-efficient access to international capital markets for governments. Examples from the ILS market show that an established domestic insurance market may not be a prerequisite for risk transfer by sovereign entities in developing countries. Successful transactions such as the Residential Re and Successor series give hope that creative structuring can make products attractive to investors and bring down the cost of transfer.

The traditional risk transfer market has also found ways to continue evolving, with innovations in distribution and operational efficiency that could deepen non-life catastrophe insurance markets in developing countries. Could current open source initiatives form the base of pricing tools used in domestic PCRI markets in the developing world? Could Western market operators adapt the Coverholder model of distribution to find a commercially viable path into developing PCRI markets?

Finally, partnerships between the private sector and public entities have been testing creative disaster microinsurance solutions for low-income populations. While not all of these have proved successful, the continued application of innovative ideas to the problem of disaster insurance for low-income populations will no doubt yield many effective, sustainable solutions in the future.

While only a few recent cases of innovation have been discussed in this paper, other examples of creative disaster risk financing efforts are readily available. Lessons from the successes and failures of these can be dissected, sorted, and reconfigured in new combinations and contexts. There remains, however, a considerable amount of work to be done to increase the financial resilience of developing countries in an era of increasing catastrophes. Creativity, collaboration, and constant questioning of decisions will be central to identifying new solutions.

²⁹ Linnerooth-Bayer and Suarez 2010.

This report has shown that innovations in product design, risk assessment, intermediation, and delivery mechanism can help overcome the challenges faced for the development of cost-effective disaster risk financing and insurance solutions in developing countries. Most of these innovations have a public good component and contribute to improving risk market infrastructure. The establishment of an International Platform for Disaster Risk Financing and Insurance, financed by both the public and private sectors, could further promote and spread such innovations. Its mandate would be to offer technical assistance and public goods and services to the developing countries that want to develop disaster risk financing and insurance solutions as part of their overall disaster risk management agenda.

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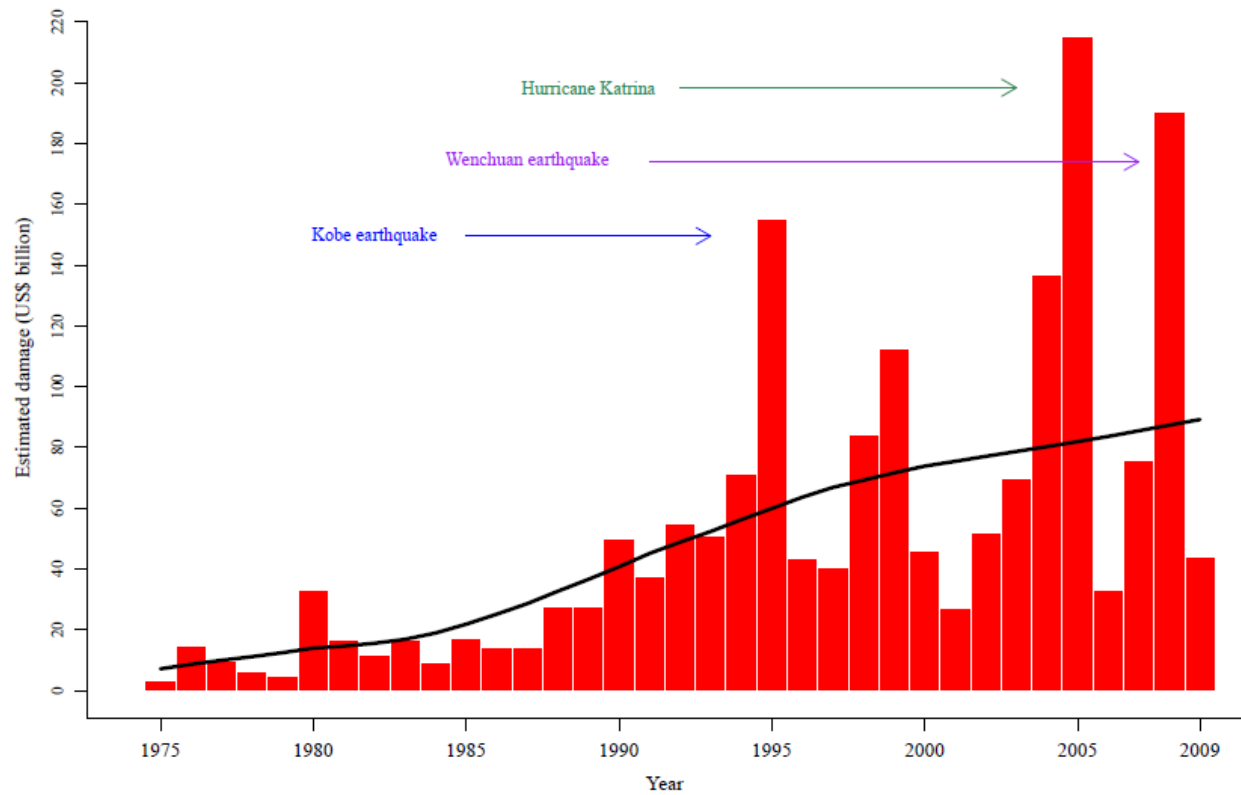
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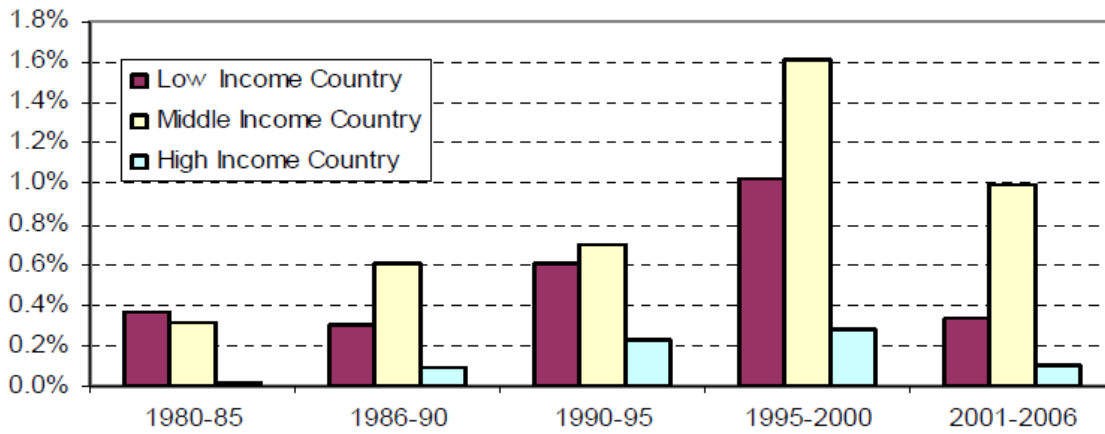
Appendix A: Figures from the Main Text

Figure 1: Estimated damage (US\$ billion) caused by reported natural disasters 1975-2009



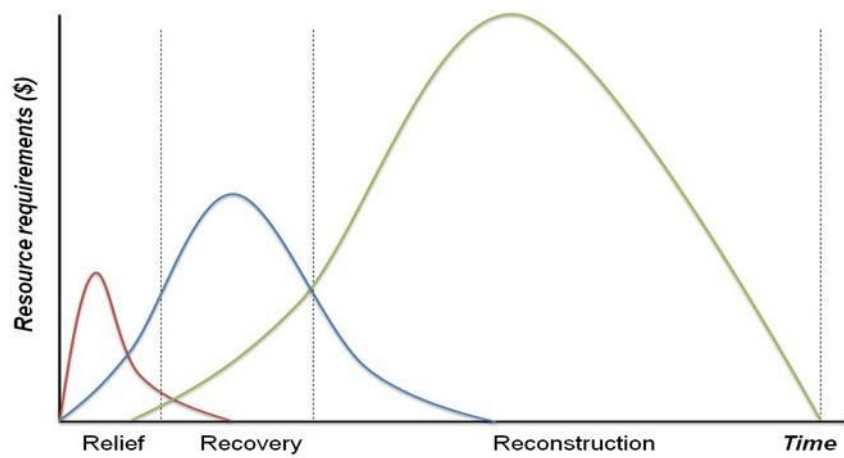
Source: EM-DAT: The OFDA/CRED International Disaster Database.

Figure 2: Average Annual Direct Losses from Natural Disasters Compared to GDP



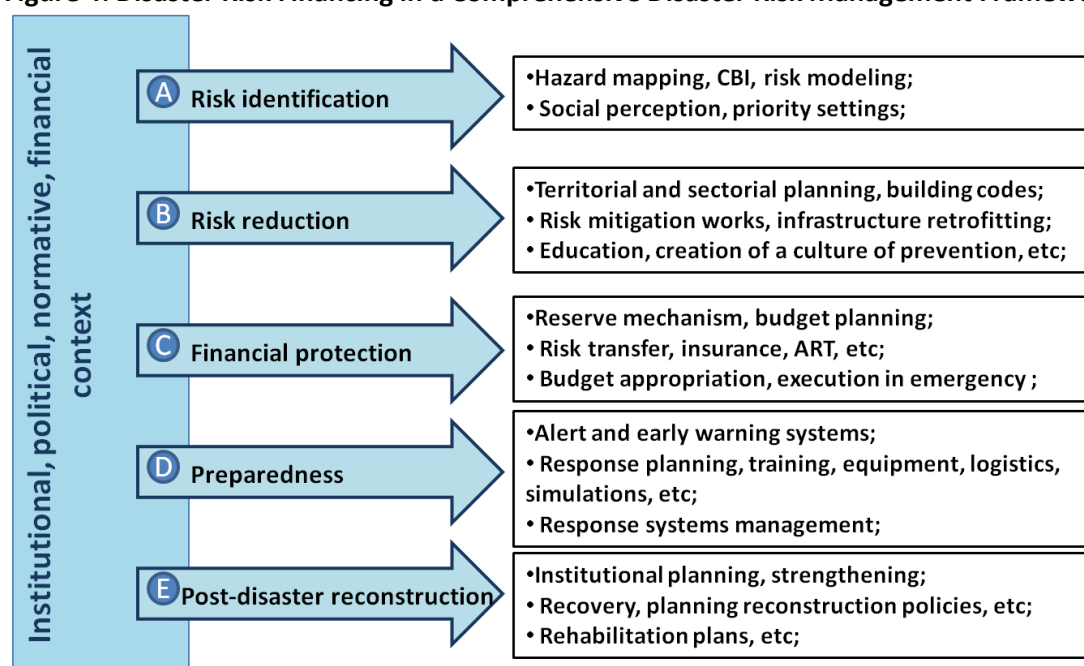
Source: Cummins and Mahul (2009).

Figure 3: Main Phases of Post-disaster Funding Needs



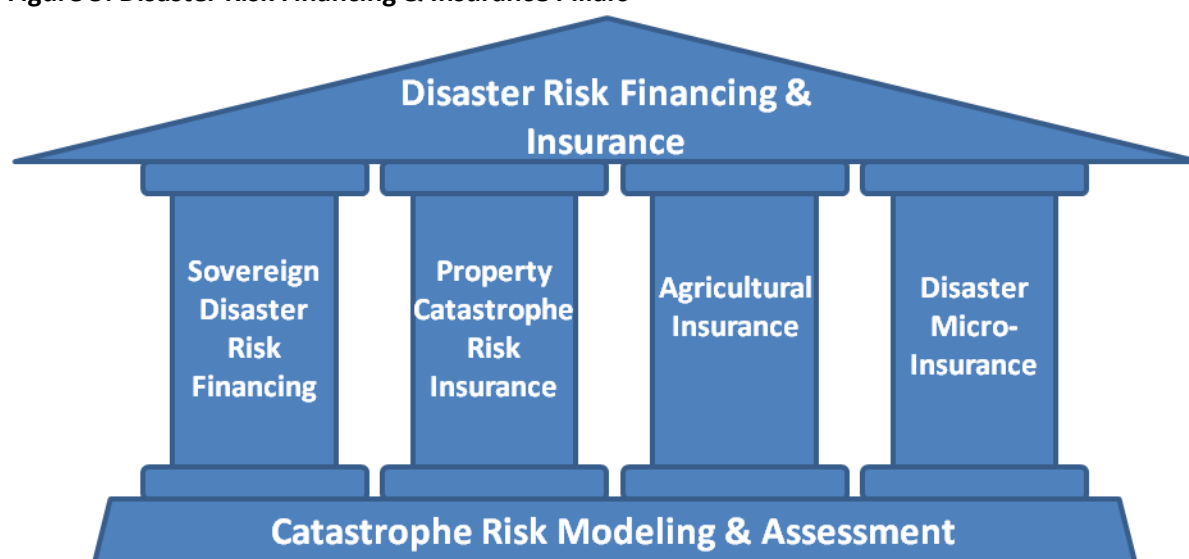
Source: Ghesquiere and Mahul 2010.

Figure 4: Disaster Risk Financing in a Comprehensive Disaster Risk Management Framework



Source: GFDRR Staff.

Figure 5: Disaster Risk Financing & Insurance Pillars



Source: GFDRR Staff.

Figure 6: Ten Largest US Catastrophes - "Exposure" and Inflation Adjusted 1900-2009 compared with Ten Largest Recent (1980-2009) Inflation Adjusted US Catastrophes

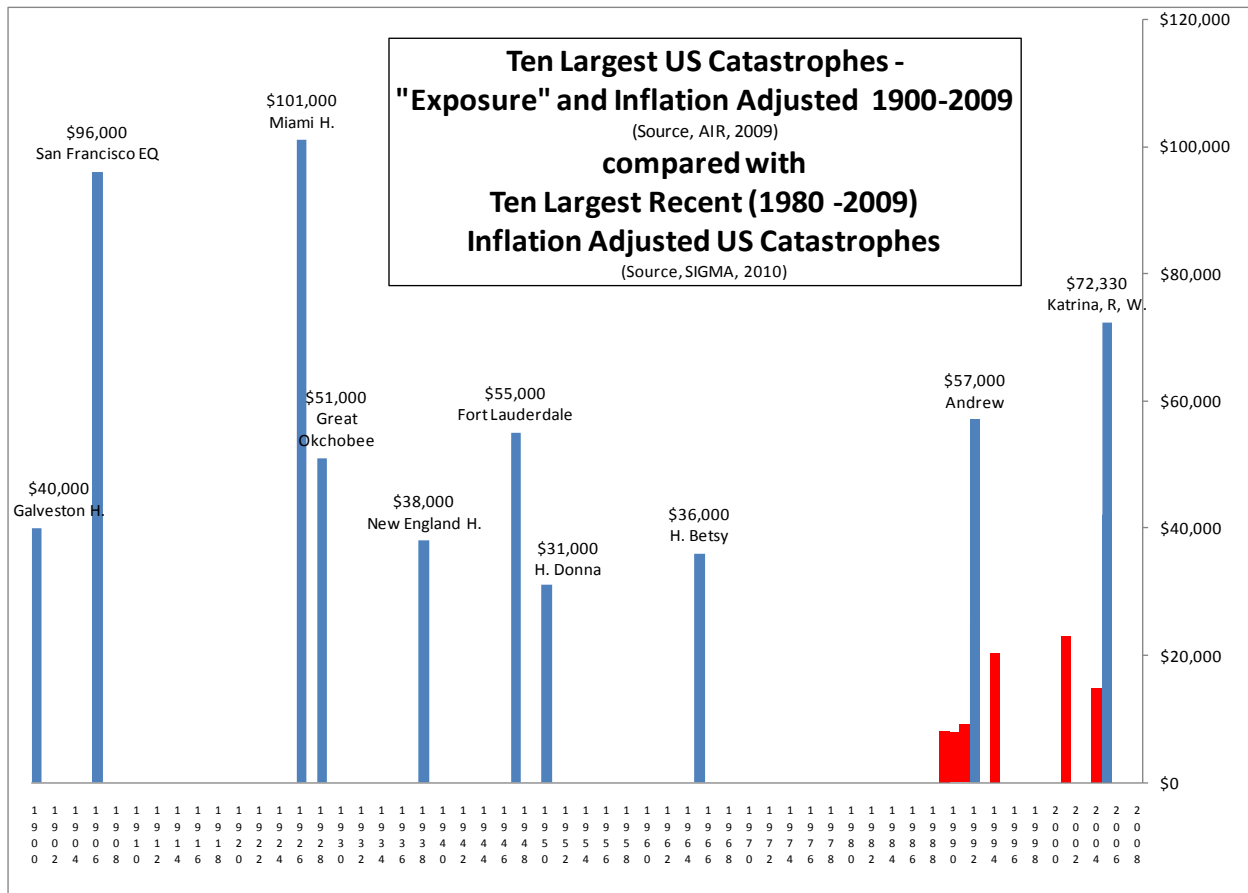
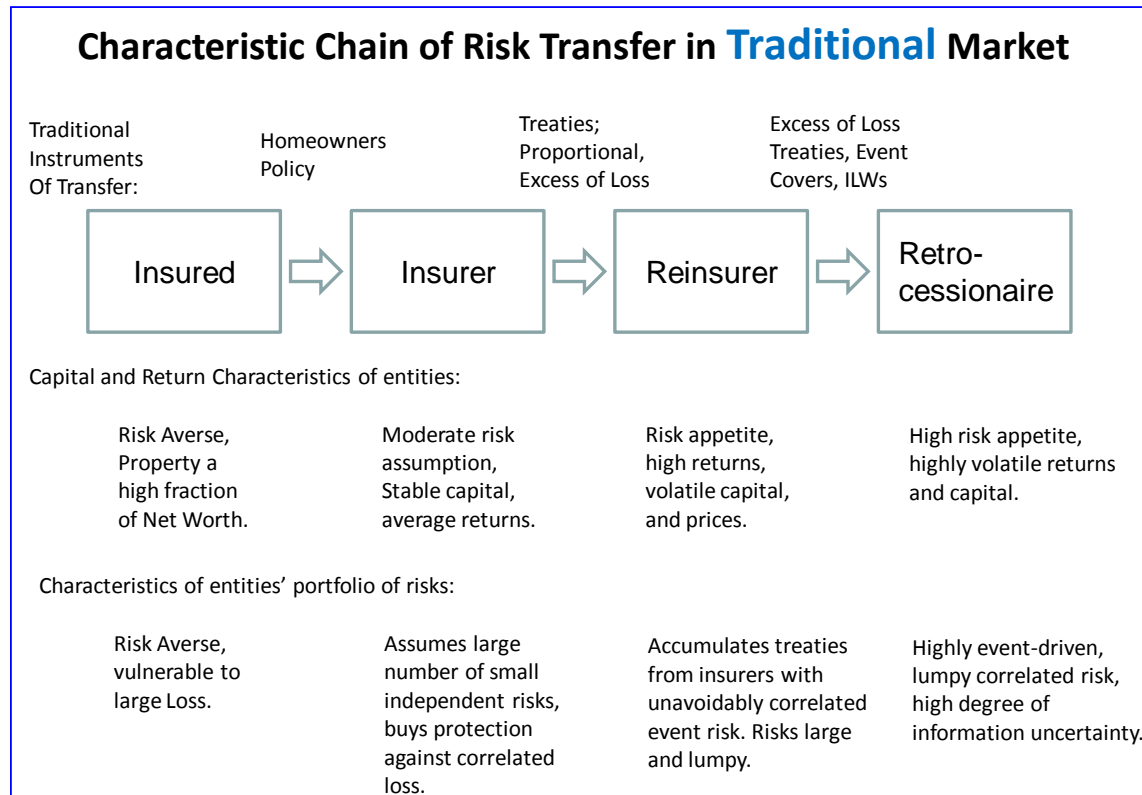
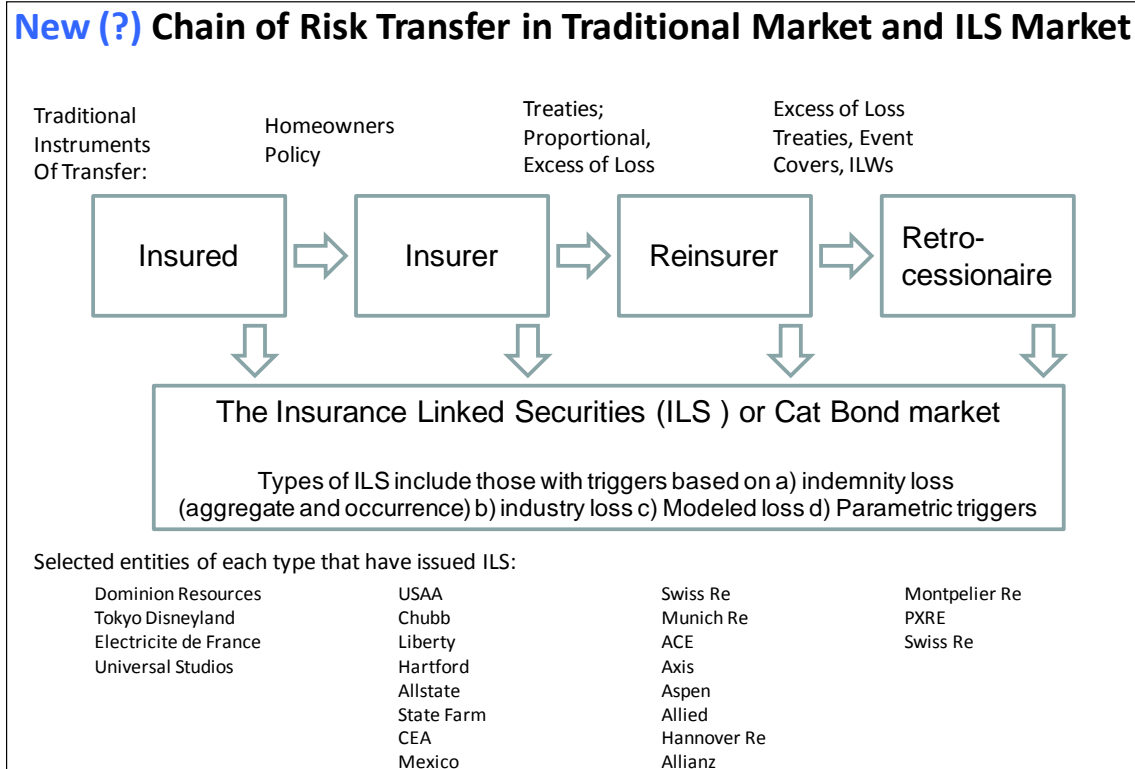


Figure 7: Characteristic Chain of Risk Transfer in Traditional Market



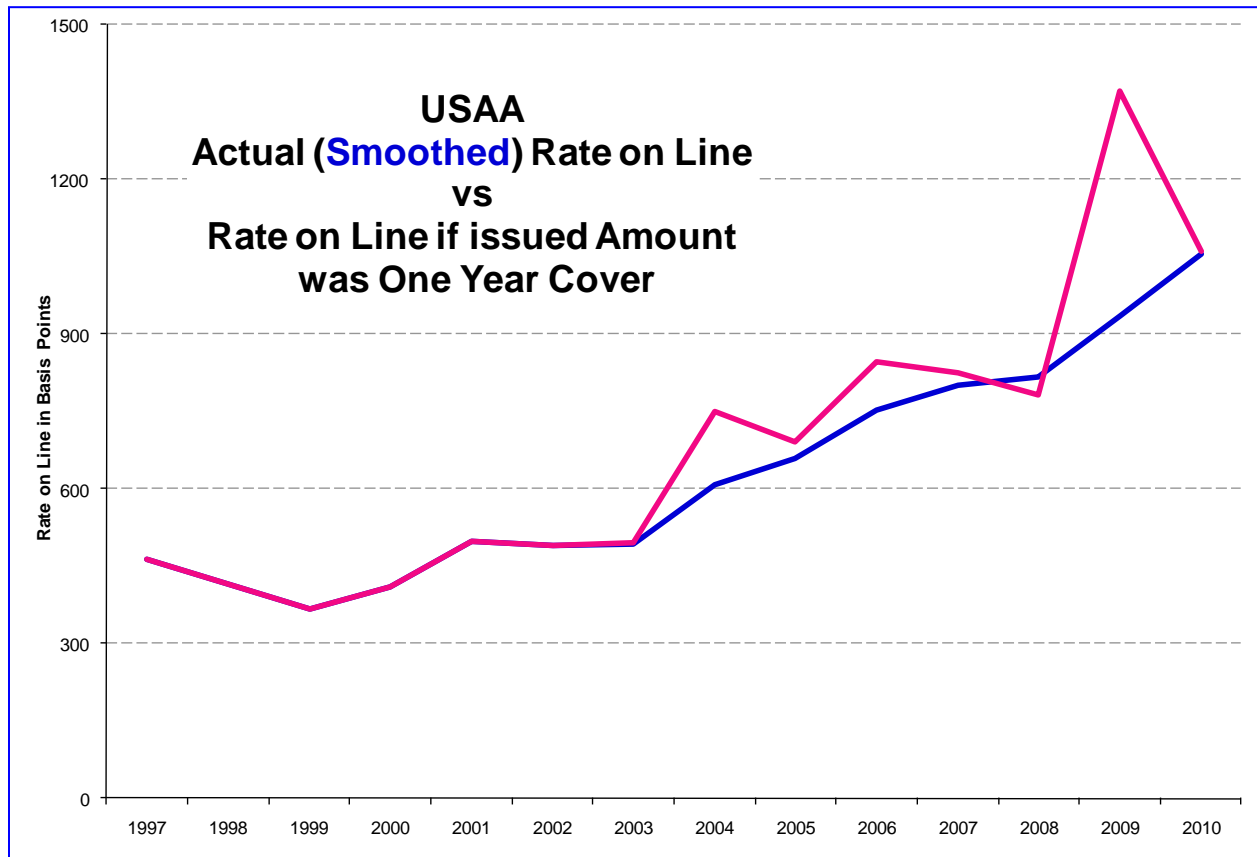
Source: Lane Financial LLC.

Figure 8: New Chain of Risk Transfer in Traditional and ILS Market



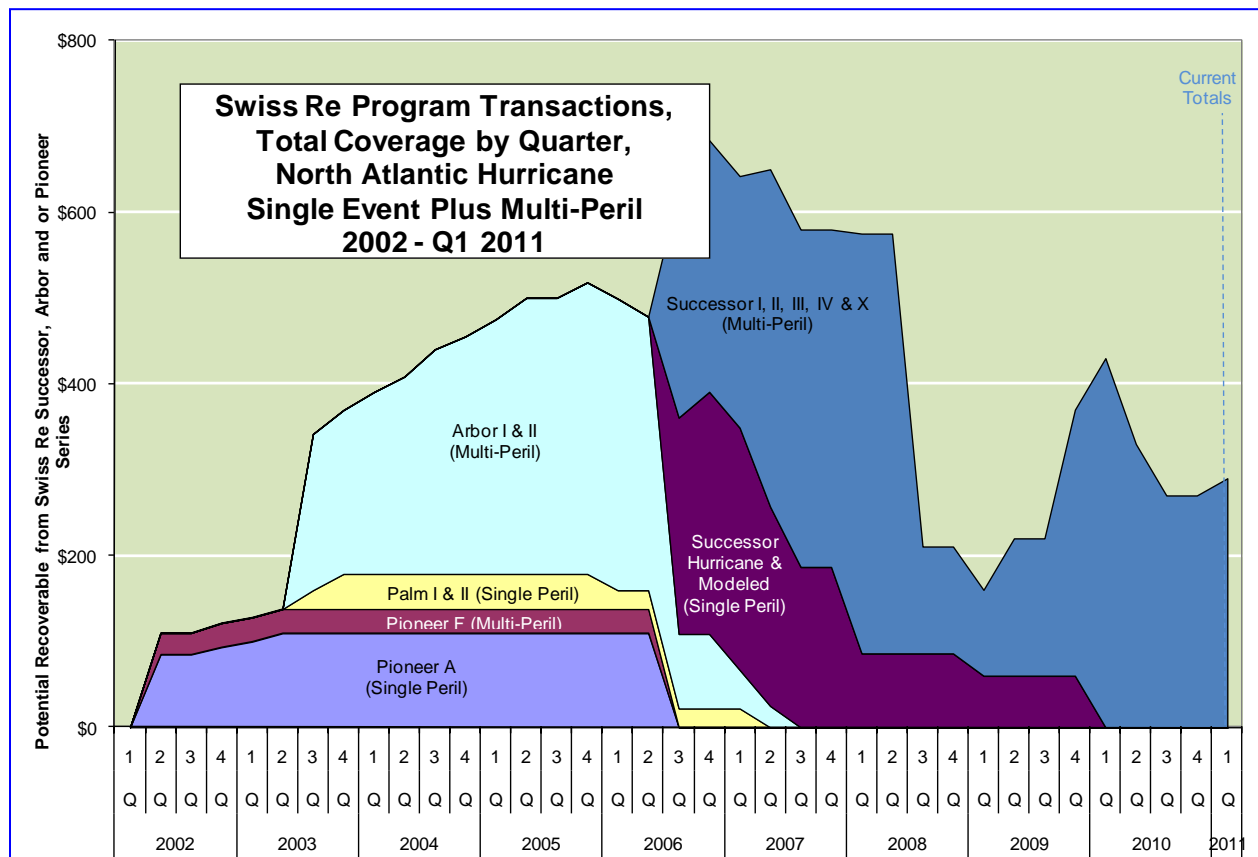
Source: Lane Financial LLC.

Figure 9: USAA Actual Rated on Line vs Rate on Line if Issued Amount was One Year Cover



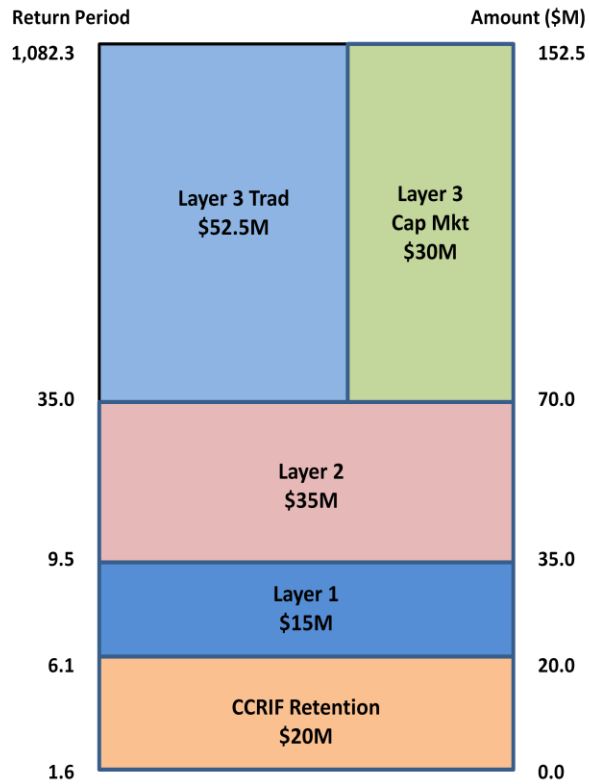
Source: Lane Financial LLC.

Figure 10: Swiss Re “Cafeteria” Style Program Transactions 2002-Q1 2011



Source: Lane Financial LLC.

Figure 11: Layers of Coverage of the CCRIF



Source: CCRIF Annual Report, 2010.

Table 1: Caribbean Cafeteria Example

Caribbean Cafeteria	CCRIF I	CCRIF II	CCRIF III	CCRIF IV	CCRIF V	CCRIF VI	CCRIF VII
Wind							
North Caribbean Island Zones - Wind	x				x	x	
South Caribbean Island Zones - Wind		x			x		x
East Caribbean Island Zones - Wind			x		x		
West Caribbean Island Zones -Wind				x	x		
Quake							
North Caribbean Zone - Quake					x	x	
South Caribbean Zone - Quake					x		x
Term - Three Years, adjusted as to risk after annual reassessments of risk							

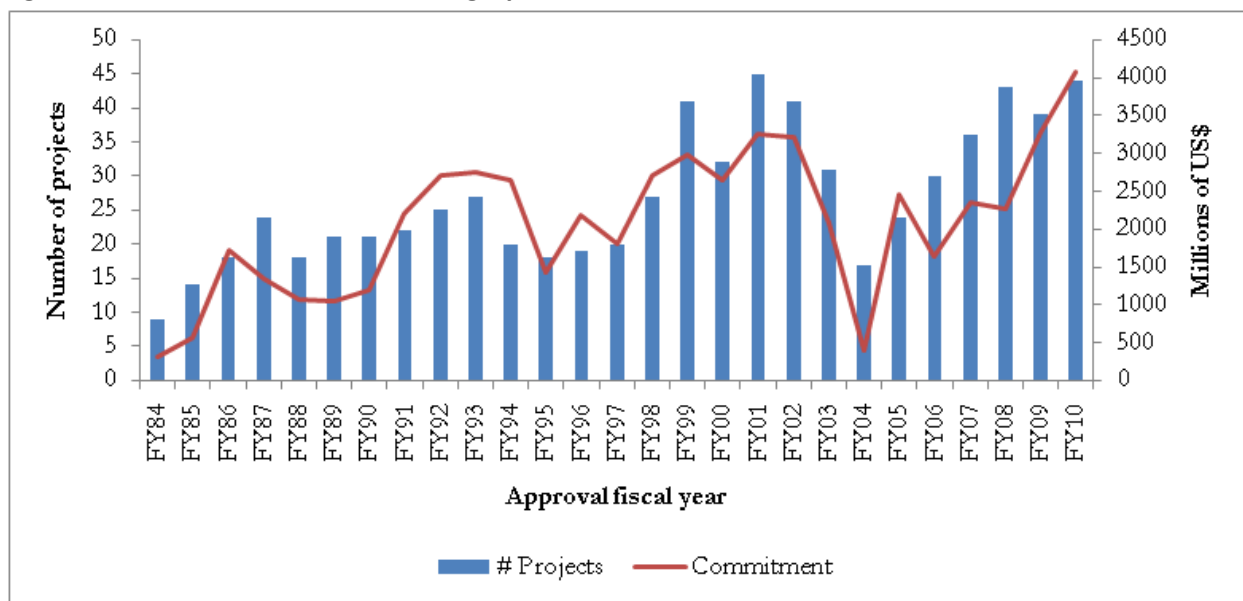
Source: Lane Financial LLC.

Table 2: Global Cafeteria Example

IBRD Global Cafeteria	IBRD I	IBRD II	IBRD III	IBRD IV	IBRD V	IBRD VI	IBRD VII
Wind							
Caribbean Islands	x				x	x	
Pacific Islands		x			x		
Bangladesh			x		x		
Flood							
Africa				x	x		x
Quake							
Caribbean					x	x	
Turkey					x		x
Pakistan							
Asia						x	x
Drought					x		
Term - Three Years, adjusted as to risk after annual reassessments of risk							
Single peril bonds IBRD I thru IV all binary							

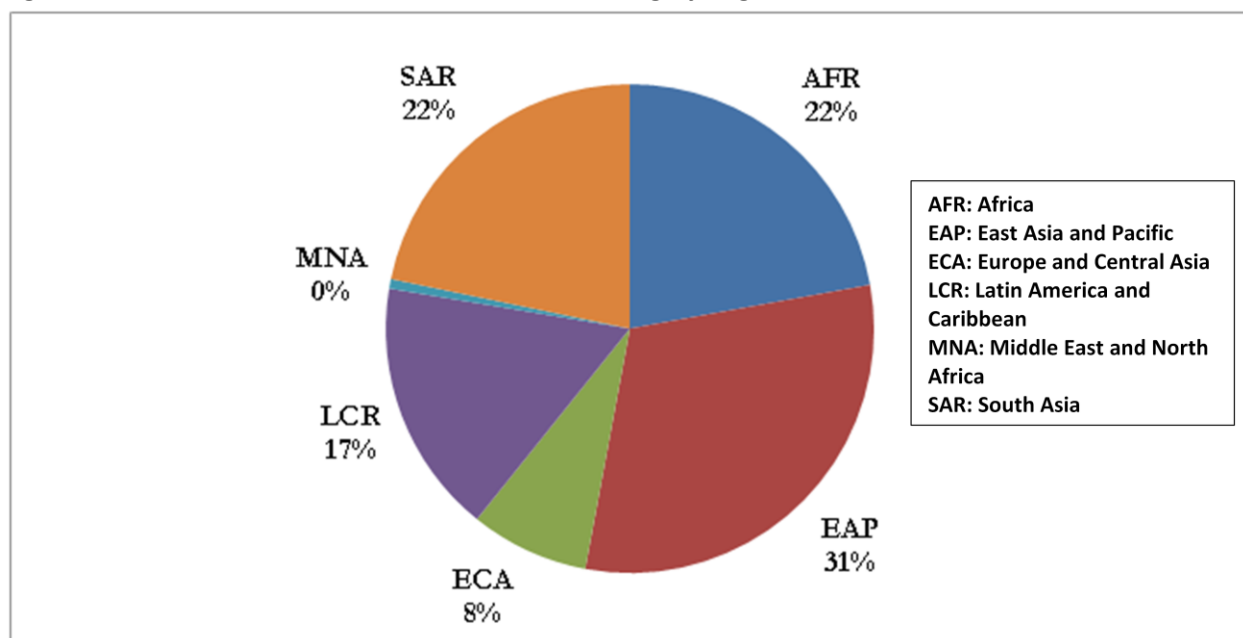
Source: Lane Financial LLC.

Figure 12: World Bank Disaster Lending Operations FY84-FY10



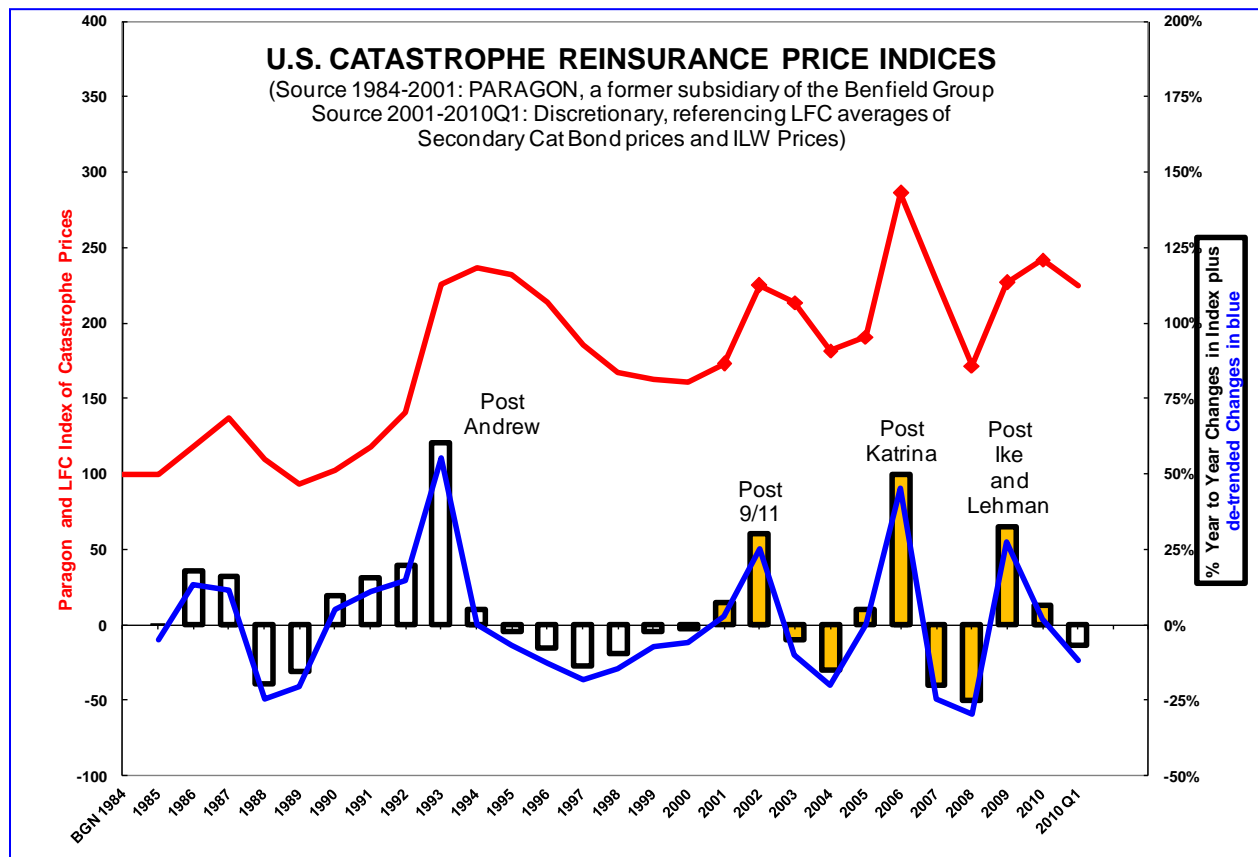
Source: World Bank Disaster lending Operations Portfolio FY 2006-FY 2010, GFDRR

Figure 13: Distribution of World Bank Disaster Lending by Region FY06-FY10



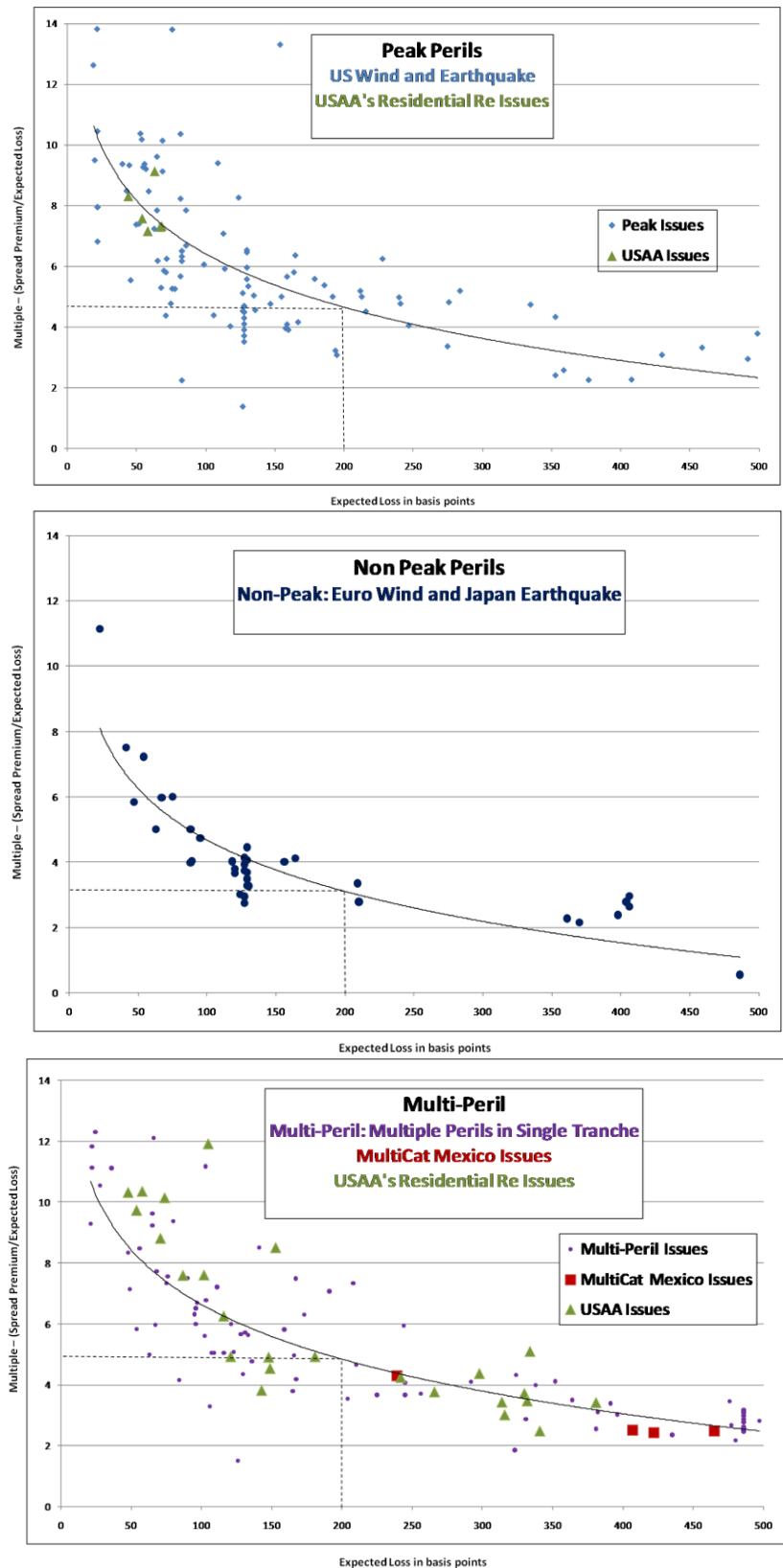
Source: World Bank Disaster lending Operations Portfolio FY 2006-FY 2010, GFDRR

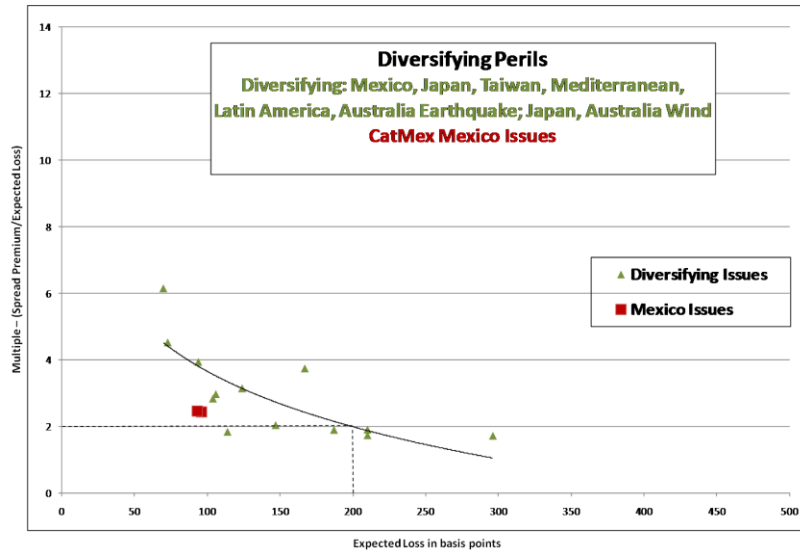
Figure 14: US Catastrophe Reinsurance Price Indices 1984-Q1 2010



Source: Lane Financial LLC.

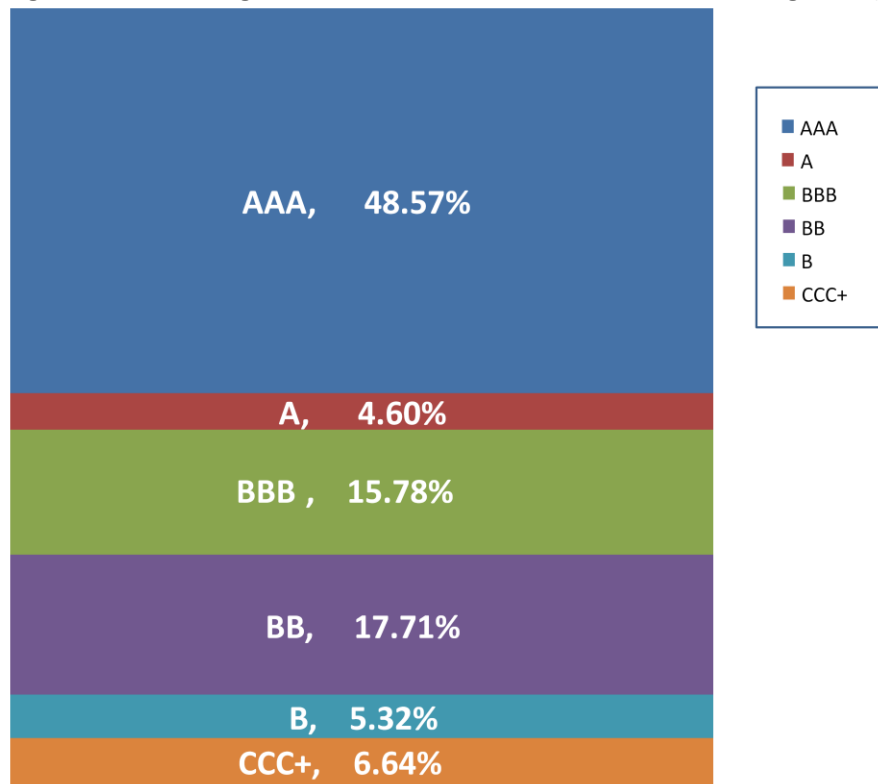
Figure 15: Multiple versus Expected Loss for Cat Bond Issuance 1997-2010





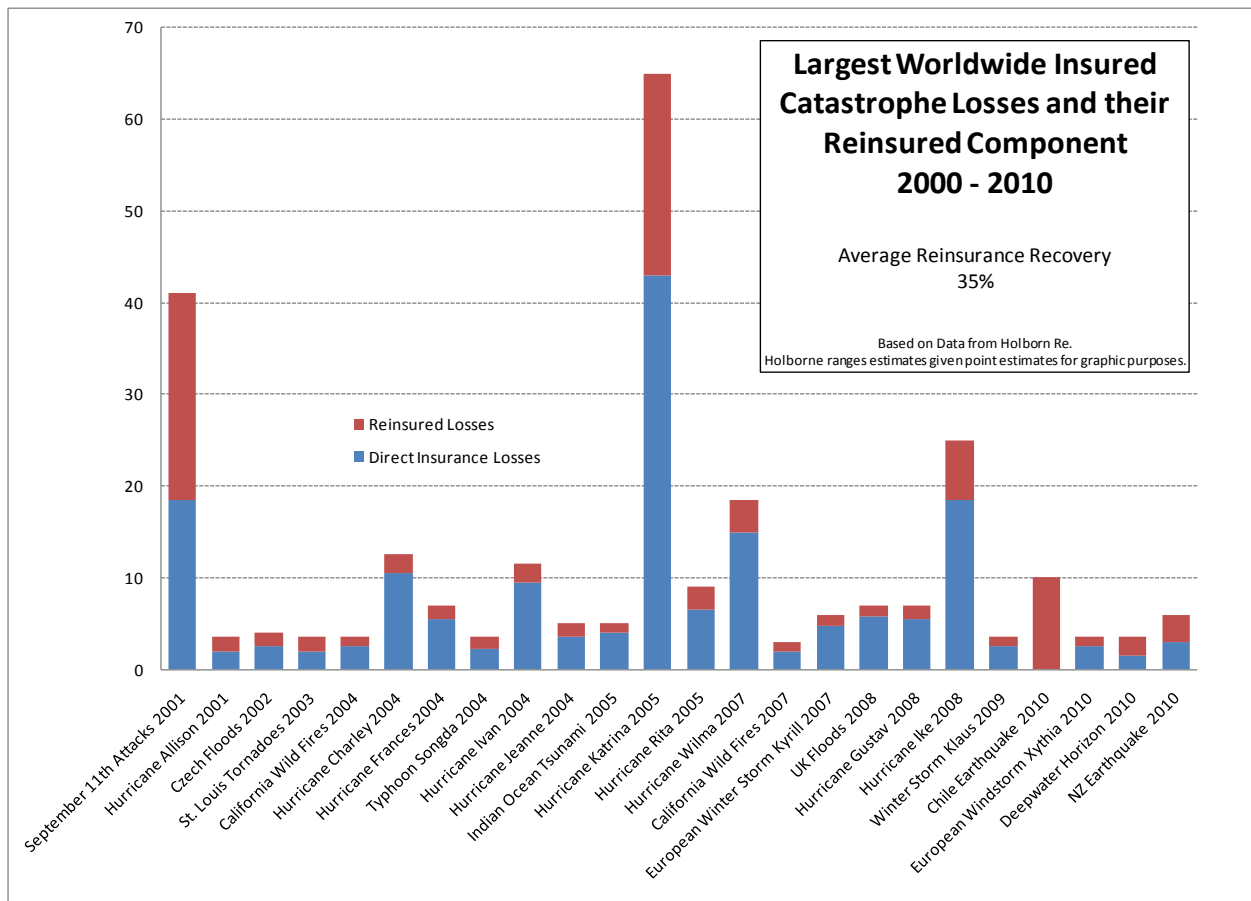
Source: Authors, from Lane Financial LLC.

Figure 16: Tranching the ILS Market as a Collateralized Debt Obligation (approximate as of 6/30/2010)



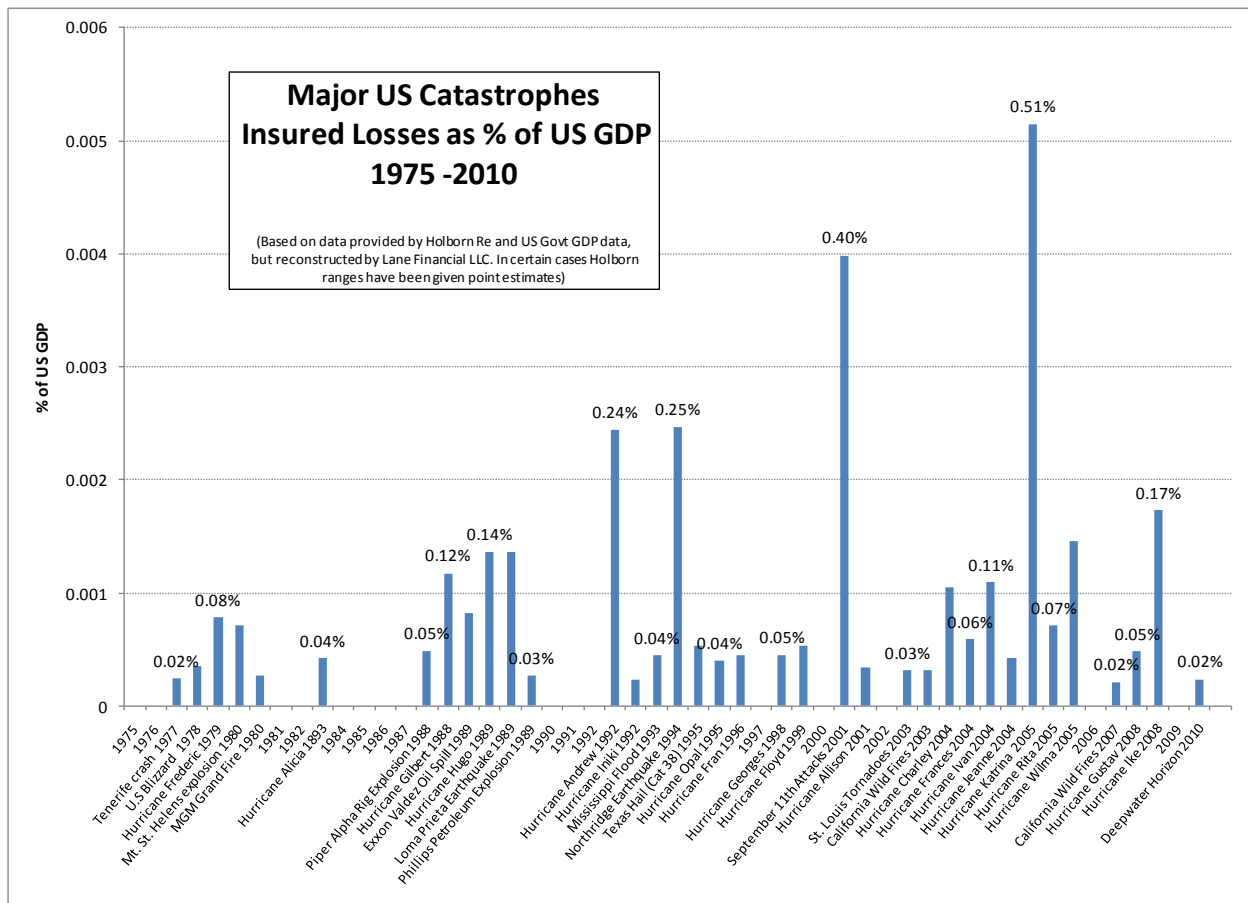
Source: Lane Financial LLC.

Figure 17: Largest Worldwide Insured Catastrophe Losses and their Reinsured Component 2000-2010



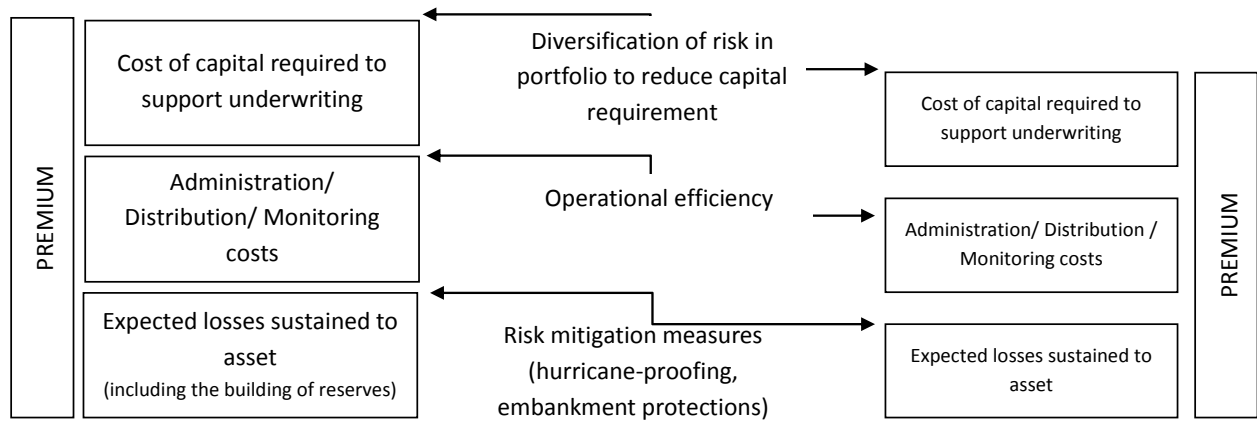
Source: Lane Financial LLC.

Figure 18: Major US Catastrophes, Insured Losses as % of US GDP 1975-2010



Source: Lane Financial LLC.

Figure 19: Reducing the Cost Components of an Insurance Premium



Source: Authors.

Appendix B: Additional Notes

Note 1: Developing Disaster Risk Financing Strategies for Governments

Governments develop disaster risk financing strategies based on their countries' unique needs. Purchasing a weather derivative, for example, is less appropriate for a country with an industrially based economy primarily vulnerable to earthquakes. Similarly, sponsoring a catastrophe bond is irrelevant to a country that has not had its vulnerability to natural hazards modeled by a catastrophe risk assessment firm. A number of factors determine the government's use of disaster risk financing instruments; one strong indicator of experience with disaster risk financing is the country's income level. Its geographic spread and economic base also impact what disaster risk financing strategies a country will choose.

The correlation between income level and capacity in ex-ante disaster risk financing is unsurprising, as disaster risk financing is highly technical. Furthermore, low-income countries almost always lack robust data on past events, which makes it difficult to correctly price their risk. This uncertainty also contributes to their inability to access international markets; historically, low-income countries have required assistance from the international community to interact with the private market. Ethiopia and Malawi, for example, have accessed weather derivatives through the intermediation of the World Food Programme and the World Bank, respectively, and the financial support of donors. Middle-income countries, in comparison, have more technical capacity. It is more likely that these governments will interact directly with the international reinsurance and/or capital markets³⁰; these governments may also opt to use intermediation services provided by international financial institutions to purchase coverage on the international market (e.g., MultiCat Mexico discussed in Section 2).

For both low- and middle-income countries, disaster risk financing strategies tend to be (and are encouraged to be) developed starting with bottom risk layers and adding protection against more severe but less probable events as the government's risk financing capacity develops. The international community supports this risk layering approach for events of varying reoccurrence and severity³¹. Governments can also reduce their contingent liability to natural disasters through the promotion of property catastrophe risk insurance and agricultural insurance markets. Developing these insurance markets provides individuals, businesses, and farmers/herders with reliable financial protection against natural disasters and extreme weather³².

Figure B1.1 below illustrates a proposed normative approach for the government to the phases of establishing a disaster risk financing strategy. Note that Figure B1.1 is a simplified representation –

³⁰ For example, the state-owned Vietnam Bank for Agriculture and Rural Development, or Agribank, purchased reinsurance from Swiss Re for its area yield-based index insurance product.

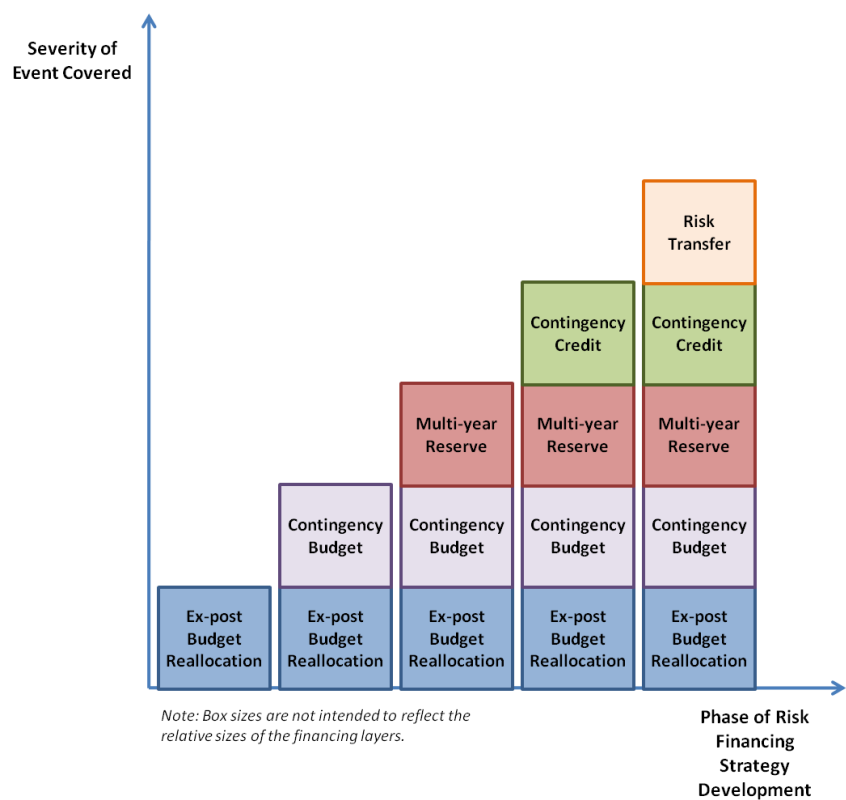
³¹ Ghesquiere and Mahul 2010; Inter-American Development Bank 2010.

³² Furthermore, there are several studies that provide solid econometric support for the premise that economies that experience more growth do so in part because they have access to efficient and effective insurance products (Kunreuther and Michel-Kerjan, 2008).

countries may spend variable amounts of time in each phase or may employ strategies that use certain tools while omitting others.

As Figure B1.1 shows, countries that have not engaged in ex-ante disaster risk financing typically use ex-post budget reallocations to cover recurrent losses; in the aftermath of more severe events, they will request international aid, take out emergency loans, or utilize other ex-post financing sources. Usually, when transitioning to an ex-ante disaster risk financing strategy, the government begins by developing a contingency budget for unforeseen events. Ideally, this contingency budget is dedicated to natural disasters, although often it is available for a variety of unexpected events. Contingency budgets normally represent around three percent of the government’s total budget.

Figure B1.1: Country Disaster Risk Financing Strategy Development



Source: Authors.

It is important to note that when the government decides to engage in developing an ex-ante disaster risk financing strategy, assessing its financial exposure to natural disasters is critical for effective financial protection. An economic and fiscal risk assessment based on all available data on past natural disasters will inform the government of the cost of events of varying frequency and severity, the potential for post-disaster funding gaps, and the most suitable disaster risk financing options. Fiscal and economic impact studies can be challenging and require extensive data analysis and modeling; the international community can assist countries in conducting these assessments.

Yearly contingency budgets can be exhausted at any point in the fiscal year. Establishing a multi-year reserve for natural disasters, therefore, can help the government ensure the year-round availability of funds. Establishing and maintaining a multi-year reserve can be politically challenging, but having a dedicated fund for natural disasters ensures the availability of more significant resources to cover more severe events.

As the government's experience with risk financing increases, it may find it desirable to seek protection through contingent credit and/or risk transfer for less frequent but more severe events. Contingent credit and risk transfer are especially attractive for middle-income countries with rapidly expanding asset bases at risk. Contingent credit is most appropriate for mezzanine risk layers, while risk transfer is most appropriate for top risk layers (infrequent but catastrophic events). See Notes 2 and 3 of this Appendix B for an in-depth examination of risk transfer.

Note 2: An Introduction to Traditional Risk Transfer

The chain of risk transfer in the traditional insurance markets in the developed world, which have arguably been around for 350 years starting with the institution of Lloyds of London, is depicted in Figure 7 in Appendix A. In the storied beginnings of Lloyds, ship-owners wished to defray the risks of their ships not returning by sharing their risk with others. They compensated the sharers for taking part of their risk, thus beginning the insurance market. The important point to take away from this concept is that the ship-owners had a concentration of risk in one vessel. A sunken ship would destroy a large fraction of their wealth, putting them out of business and worse, sending them to debtor's prison or the workhouse.

It is that same risk of ruin that motivates today's asset holders in the developed world or high-income countries. Homeowners traditionally have a large fraction of their net worth tied up in their residences. Businesses have a large fraction of their equity tied up in their plant and equipment. A fire or theft could devastate their prospects and those of their families or their stakeholders. Thus, individuals and businesses (called insureds) buy insurance protection. They buy their policies from insurance companies.

The insurance companies themselves write multiple policies because they know that not every policyholder will suffer fire or loss at the same time. The premiums from all will pay for the losses of the few and provide a return on capital. The capital has been committed in case they are exposed to greater than usual levels of loss. All is well and good as long as the policies are diverse, spatially and in size and type. However, if amongst the portfolio of policies there is a concentration of risk, the insured is back with the same dilemma as the sixteenth century shipowner – a loss in that concentration that can sink him. Concentrations can be from size - one business policy is vastly bigger than the other policies. Concentrations can be from geography - too many policies in Florida that one hurricane can trigger all at the same time. Concentrations can also be from type - too much product liability all subject to the same lawsuits. In all cases the traditional market has evolved to handle the concentrations, not by avoiding

the business altogether but by accepting it and then passing it along to another sharing party. The insurance company itself buys insurance from another company. Insurers who specialize in insuring insurance companies are known as reinsurance companies.

So, as Figure 7 in Appendix A shows, risk is transferred along the chain to reinsurers. There is another stage as well where reinsurers themselves become too concentrated and they buy protection from retrocessionaires. This traditional chain provokes a number of observations. The first is that there are agents who move the risk along the chain. These are insurance and reinsurance brokers³³.

A characteristic of this chain is that there are several ways the risks can be transferred. In the case of a size concentration from, say, a large plant, part of the risk of that specific plant can be transferred. This is known as a facultative placement. Alternatively, a treaty can be arranged to take a fraction of the whole, or considerable part of, a book of business. If the treaty is such that the assumer of the risk gets a similar fraction of the premium, this is known as a quota-share treaty. The most important of these forms is a non-proportional treaty form called excess of loss³⁴. Excess of loss transfers work by isolating the group of risks to be transferred then associating a specific negotiated price to that group of risks that is unrelated to the underlying policy premiums. It is this association of risk and independently negotiated price that has allowed the traditional risk chain to be opened up to the capital markets.

All transfer along the traditional chain takes place under the principal of indemnity. Indemnity is the idea that the losses that are assumed as one moves along the chain must match exactly the losses from the original underlying policies. Thus the totality of losses from the underlying policy is exactly equal to all the component parts from each participant. No one can make a profit by collecting twice, or be out of pocket because the claim does not match the loss. Insurers who buy protection, by transferring the risk to another in the traditional market using indemnity contracts, are said to have no basis risk.

An important observation regarding traditional risk transfer is that the capital characteristics of insurers, reinsurers and retrocessionaires are quite different. While the objective is to disburse concentrations of risk, it becomes more and more difficult to do as one moves along the chain. Many insurers will want to transfer the same peak risk. Thus, each step becomes inherently more concentrated. It requires more capital to accept the higher risks and is more expensive. An insurance company might accept three times as much premium as it has capital; a reinsurer might only accept premium to a level of thirty percent of its capital (Premium is the proxy the industry uses to say how much risk it is taking on). Higher risk return characteristics prevail as the risk moves left to right in the diagram (Figure 7 in Appendix A) along the traditional chain.

To illustrate the idea of losses along the chain consider Figure B2.1 below, which shows the insured losses from hurricanes Katrina, Rita and Wilma and other events in 2005. In total original insureds lost

³³ The three biggest brokers are Marsh and McLennan, AON and Willis, but as in every industry there are many smaller specialist brokers as well, such as Holborn whose data we use in part of this report. Brokers typically get compensated in relation to the size of the premium paid to move the risk along the chain.

³⁴ Excess of loss forms are analogous to call spreads in finance.

US\$83 billion. Who paid? As the diagram illustrates, insurance companies paid US\$40 billion, a further US\$43 billion had been transferred to reinsurers³⁵. They paid US\$38 billion and a further US\$5 billion was paid by retrocessionaires³⁶. The point to note is that the chain works and is best illustrated in loss situations such as Katrina.

Figure B2.1: Hurricane Katrina



Source: Lane Financial LLC.

In countries in the developing world the risk transfer chain is non-existent or weak. Often there is no underlying private market for insureds. Thus the first part of the chain is absent. This is truer of low-income countries than middle-income countries. Necessary ingredients for a true risk transfer market are savings and credit markets at the policyholder level. Traditional risk transfer chains will not exist anytime soon in some countries. But as we describe below the traditional chain has been revised and catastrophes still cause devastation whether or not there is a savings market. Can those revisions be utilized to provoke ex-ante risk protection (i.e. insurance) markets in a new way? Can governments or multilateral agencies become the surrogates for the absent individual insureds?

Note 3: The Revised Risk Transfer Chain

Figure 8 in Appendix A shows the revised risk transfer chain following the inception of the ILS market and the first overlap between the capital markets and the insurance and reinsurance markets as discussed in Section 2 within the main body of the paper.

It shows that instead of simply transferring risk up through a chain of different insurance entities, but essentially keeping it within the insurance market, the major innovation was to transfer risk directly to the capital markets. The insurance-linked securities box represents the capital market in Figure 8 Appendix A. Insurance-linked securities are only the main instrument of transfer. There are others

³⁵ Losses to policyholders were all in the US, however their ultimate cost was born in the US, Switzerland, Bermuda, London – to shareholders anywhere in the world who bore US risk.

³⁶ These were contemporary estimates; late claims may have changed these numbers somewhat.

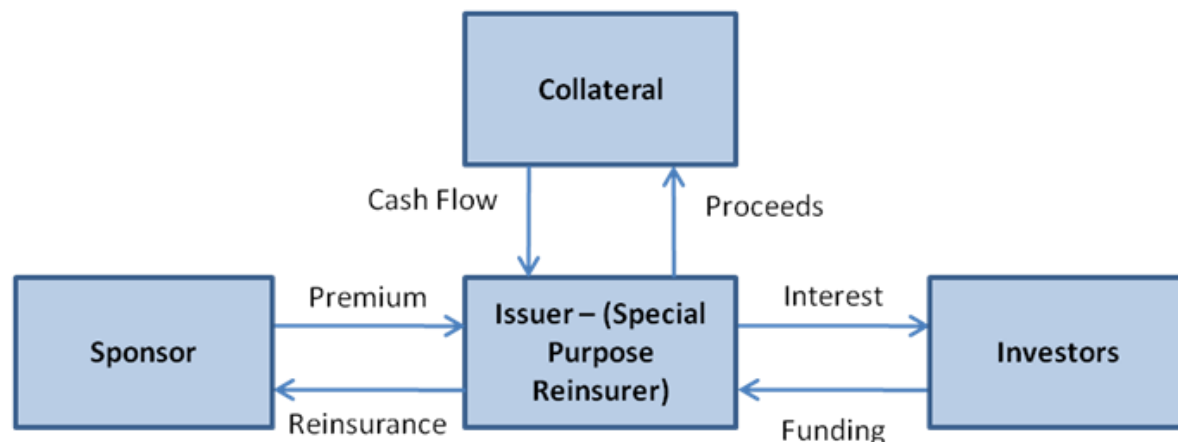
currently in use and there have been several others that have been tried. Some of these are described in Note 4 below.

Note 4: Forms of Alternative Risk Transfer

Insurance-Linked Securities - Structure

Figure B4.1 below represents the essential structure of an ILS. A special purpose vehicle (SPV) is established, usually in an offshore location³⁷. The SPV has very little capital but can enter into contracts to accept risk from a transferring entity. The risk is then made good by simultaneously issuing bonds to raise capital to secure the risk. The amount of the bond is set equal to the limit on the risk and the premium accruing from the risk transferee is passed through to the bondholder in the form of a coupon on the note. The bond proceeds are held in trust until needed to cover the risk, or if the covered risk does not occur the proceeds are returned to the bondholder at maturity. In its original concept the bond proceeds were invested in treasury securities and the interest was passed back to the investor in addition to the premium. The structure of the bond was a floating rate note where the floating rate was a treasury rate and the fixed spread was the premium.

Figure B4.1: Typical structure of an Insurance-Linked Security Transaction



Insurance-Linked Securities - Development

Technically, an ILS was introduced to the market in the summer of 1992, prior to hurricane Andrew and the Chicago Board of Trade options. AIG, the promoter of the concept, got cold feet and withdrew it from the market before sale could be consummated. The proposed bond was for a three-year term and covered wind and earthquake risk in the USA. Had AIG issued the bond, it would have gotten recoveries for both hurricane Andrew and the 1994 Northridge earthquake.

³⁷ The SPV may or may not be an insurer. That will depend on the risk being transferred.

In fact, the next ILS (also known popularly as Cat Bonds) was issued two years later in a small experimental size of US\$10 million. This experiment was repeated several times over the next few years. It was not until 1996 that the first significantly sized (US\$500 million) ILS was issued, by USAA. USAA has issued every year since and represents the gold standard of good practice in utilizing the ILS market.

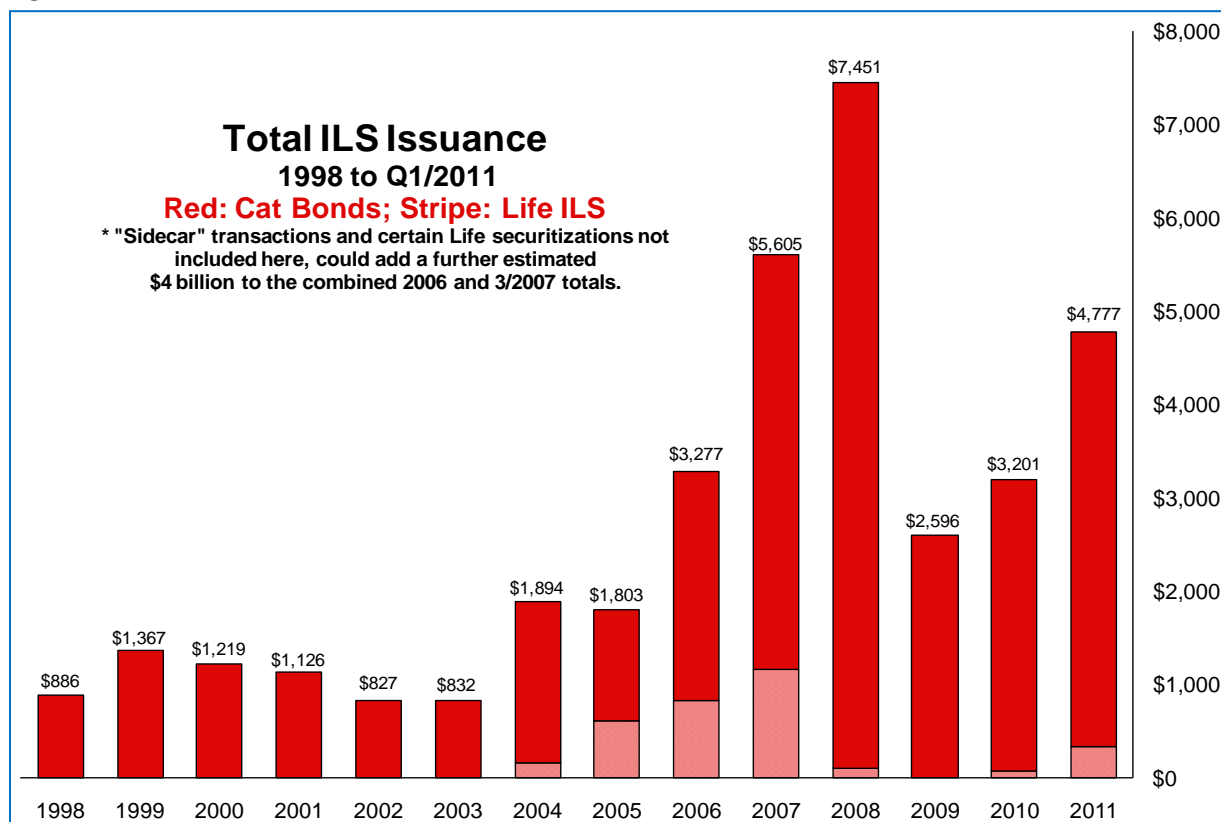
Shortly after the acceptance of ILS as legitimate investment vehicles, investors asked for a better floating rate, and collateral was invested to give LIBOR returns. Most ILS were issued at LIBOR plus a fixed spread with the LIBOR portion protected through a swap arrangement. As the market was violently reminded with Lehman Brothers' default, however, LIBOR investments contain credit risk. Four bonds that had Lehman as a swap counterparty lost money. As a result, post-Lehman, bonds are issued with government guaranteed investment of collateral at Treasury plus the spread.

ILS issued by the SPV are typically registered as private placements for sale in the US, falling under US SEC regulation 144A. Advertising the sale of such instruments to the general public is prohibited. Their sale is restricted to institutional buyers, who by definition are supposed to be sophisticated. One side effect of this restrictive policy is that price sheets on various available bonds are not readily accessible to public. The early promise of the exchange-traded instruments, in terms of price transparency, suffered a setback as the world went to ILS. This situation has eased as more European investors and issuers have entered the fray. In Europe, private placement restrictions are not as onerous and prices become known much more easily.

Other features of ILS are that most of the exposure coverage is a) on an occurrence basis, and b) covers remote risk. Recall that in transferring risk along a chain, within insurance markets or to the capital markets, the most compelling reason is to get rid of concentrations of risk that could impair capital. The effect of such concentration can be seen when a catastrophic event occurs. An earthquake can affect many policies in one geographic area all at the same time to devastating effect. Risk that is event driven is known as occurrence based risk. Ninety percent of all ILS are occurrence based. The remaining ten percent are a combination of aggregate and contingent covers. The risks that are covered are typically risks that occur with an assessed frequency between once in one hundred years and once in fifty years. Obviously, there are risks greater than and less than that, but it is rare to encounter an ILS with an assessed frequency of less than one in twenty years.

ILS now come in all shapes and sizes with different loss measures, loss denominations, and maturities; they cover a variety of exposures beyond catastrophe. Among the exposures covered by some ILS are weather, wind, quake, third party liability, mortality, longevity, credit, autos and health care. The market is still relatively small by some standards, annual issuance being shown in Figure B3.2. Since inception, almost US\$40 billion of ILS have been issued, about 90 percent of which has been for catastrophe coverage. Clearly the other lines of coverage are still experimental. Of all the forms discussed herein ILS is by far and away the most successful. Compared with the US\$40 billion of ILS issued, exchange traded experiments barely aggregate to US\$1 billion and Industry Loss Warrantees (ILWs) may account for US\$20 billion of coverage over the same period.

Figure B4.2: Total ILS Issuance



Source: Lane Financial LLC.

ILS also come in both indemnity and non-indemnity form. Recall that indemnity is the idea that the issuer of the protection will compensate the protected for exactly their loss (within the underlying insurance market). But how do capital market buyers know about the underlying risks? Are selectively bad risks being transferred rather than the purely concentrated risks? How does one know, especially if you are a capital market investor rather than an underwriter? There is a feeling that indemnity coverage allows an “information asymmetry” and potentially “adverse selection” between protectors and protected that makes pricing difficult. Instead, capital market investors want a “loss measure” that is more neutral (information-wise) between buyer and seller. They will provide lots of non-indemnity cover with the right loss measure (and price). About 75 percent of all ILS are non-indemnity based.

Insurance-Linked Securities - Loss Denomination and Measurement

Leaving the world of traditional indemnity cover to serve the desires of investors provokes the question, what is the non-indemnity loss measure that will still be desirable as protection for the buyer? Since the buyer will be purchasing cover that will not replace losses exactly but only approximately there will be basis risk. Clearly the measure of loss must be chosen so as to minimize basis risk but still make the issue attractive to protection buyers.

There is no single measure that satisfies both buyer and seller. The ILS market is replete with experimental loss measures; innovations abound. The index-like measures that have been tried are loss indices based on:

1. Sigma³⁸ Reports
2. Munich Re Nat Cat Service reports
3. PCS³⁹ industry numbers
4. Weighted PCS numbers
5. PERILS⁴⁰
6. Wind Speeds
7. The Richter Scale
8. Paradex⁴¹
9. AIR modeled loss (now Verisk)
10. Computer replications of cedent's book of business

This list is partial and probably does disservice to many innovations that have appeared in ILS. The cat-in-a-box trigger is also worth a mention. Payments under the cat-in-a-box structure are triggered when a storm of the requisite strength traverses a latitude-and-longitude determined box. These triggers were principally applied in the Gulf of Mexico following the devastation that hurricanes Katrina, Rita and Wilma did to the drilling industry but have since dwindled in popularity.

The point is that the experiments continue; specific indices are clearly not the determinants of overall success. Although it's not about one-or-another specific index in the ILS market, the ILS market will not grow without some indices.

In the case of developing countries, where loss measures are even harder to get than in the US or in Europe, it is clear that loss measures will have to be creatively designed to capture the loss. Governments that will be asked to pay the premium for protection will need to be convinced that their premium outlay will pay off in the event of a disaster. At the same time, the loss measures must be credible to investors who are providing protection capital. ILS history shows that absence of an obvious single measure is no deterrent to progress – the capital markets are creative and adaptive.

Exchange Traded Instruments

The first experiment following hurricane Andrew was the introduction of catastrophe options at the Chicago Board of Trade. This bold experiment captured lots of imagination. Essentially the traded options were spreads denominated on observable loss-like measures such as loss ratios and/or industry

³⁸ Sigma is a Swiss Re publication that reports annually on worldwide losses.

³⁹ Property Claims Service is an industry entity that measures event losses for the (US) industry as a whole.

⁴⁰ PERILS is an index designed by a consortium of European insurers who are trying to replicate an improved version of PCS for European losses.

⁴¹ An index designed by RMS for measuring wind speed losses.

catastrophe losses, rather than individual losses. The exchange experiment lasted some five years and was copied or mimicked in New York, Bermuda, London and Chicago a second time. None of these exchanges has (robustly) succeeded, but two are still in existence with active open interest. It is not clear what inhibits their success but perhaps the futures exchange format of high turnover, continuous auctions is too liquid for the slow moving business of insurance. The economics of each is different. In addition, in the case of the Chicago Board of Trade's first attempt, the market also died after a prolonged soft market (low premiums) at the end of the 1990s. This caused prospective investors to lose interest: returns were better elsewhere. Importantly, however, the exchange experiments allowed the common man (who had a commodities account) to participate in a way that has seldom been possible since. It also set a standard for price transparency that has not been equaled since. It did not, however, raise capital or allow significant transfer of risk and by that standard exchanges have been a failure.

During the repeated exchange traded attempts there was genuine experimentation as to loss measure. Consider that at the exchanges, contracts were introduced which were based on the following list of loss measures:

1. Loss ratios
2. PCS Industry Loss (by region and proportionate to loss)
3. Guy Carpenter (customizable) loss ratios
4. PCS loss estimates (by region and event)
5. Hurricane Index formula (based on storm intensity)

These are just some of the experiments that have taken place on exchanges.

Industry Loss Warrantees (ILWs)

A form of risk transfer that stands mid-way between transparent exchange catastrophe options and private placement ILS are Industry Loss Warrantees (ILWs). These instruments in early format usually contained two triggers, an indemnity trigger and a non-indemnity trigger. Both triggers had to be hit in order to collect from the coverage. However, the non-indemnity cover was usually dominant. In other words, if the non-indemnity trigger was hit then almost certainly the other trigger (one's own losses) would be hit. The non-indemnity trigger was usually denominated on an industry event basis. Thus a trigger could be an earthquake in California that caused insured industry losses exceeding \$10 billion as reported by some independent agency. The fact that there was also a trigger that required some small amount of loss to the buyer from the same event meant that accountants viewed the ILW as an indemnity cover and it could be recorded in the premium account of the insurer. Because of this feature ILWs were originally traded within the insurance community. That was certainly true during the 1990s.

Two other distinctive features about the original ILWs were that they a) were binary in character, and b) often contain reinstatement provisions. The binary nature meant that a buyer of ILW protection would be paid off to the full extent of the limit if an event happened. There were no partial payments. The reinstatement feature meant that if one had a claim because of an inuring event, one was obliged to buy

a second cover to protect against a second event of the same character during the on-risk period. Effectively, the second premium was a way of reducing the first event claim payout.

Figure B4.3: ILW Pricing

Representative ILW Price Sheet

First Event Covers

October 31, 2010

Trigger Point	US T&P Perils	US T&P Wind	Florida Wind	US T&P Quake	California Quake	Virginia to Main Wind	New Madrid Quake
\$5 Billion	N/A	N/A	N/A	19.00%	16.50%	13.00%	4.75%
\$10 Billion	N/A	N/A	40.00%	13.25%	11.75%	9.00%	3.25%
\$12.5 Billion	48.00%	45.00%	33.00%	11.75%	10.00%	7.50%	3.00%
\$15 Billion	43.00%	40.00%	29.00%	10.00%	8.50%	6.50%	2.75%
\$20 Billion	37.00%	34.00%	25.00%	7.75%	6.75%	5.50%	2.50%
\$25 Billion	31.50%	28.00%	21.00%	6.50%	5.75%	4.50%	2.25%
\$30 Billion	27.50%	23.50%	17.00%	5.00%	4.75%	4.00%	2.00%
\$40 Billion	23.00%	18.00%	15.00%	4.25%	3.75%	3.50%	1.90%
\$50 Billion	18.00%	13.50%	12.50%	3.75%	3.25%	3.00%	1.80%
\$60 Billion	15.00%	11.50%	10.00%	3.50%	3.00%		
\$70 Billion	11.00%	9.75%	7.50%	3.00%	2.75%		
\$80 Billion	9.50%	8.50%	6.50%	2.00%			
\$90 Billion	8.00%	7.00%	5.50%				

Gulf (TX-AL) Wind
18.25%
12.75%
11.50%
9.00%
6.75%
5.75%
4.75%
3.50%
2.50%

Trigger Point	Japan Quake	Japan Typhoon	Japan Perils	Europe Perils	Japan Perils
\$3 Billion	15.00%	11.00%	22.00%	31.50%	N/A
\$5 Billion	10.00%	8.50%	16.00%	21.75%	28.50%
\$7.5 Billion	8.50%	7.00%	13.00%	16.75%	24.00%
\$10 Billion	7.15%	3.75%	9.25%	12.50%	18.00%
\$12.5 Billion	6.50%	3.25%	7.25%	10.00%	14.00%
\$15 Billion	5.50%	3.00%	6.50%	8.25%	11.00%
\$20 Billion	4.50%				
\$25 Billion	4.00%				
\$30 Billion	3.50%				

Second Event Covers

Trigger Point	US T&P Perils	Europe Perils	Europe & Japan Perils
\$3 Billion	N/A	12.25%	N/A
\$5 Billion	N/A	7.00%	11.00%
\$7.5 Billion	N/A	5.25%	8.00%
\$10 Billion	15.00%	3.50%	5.25%
\$15 Billion	11.00%		
\$20 Billion	7.00%		

Today, ILWs come in many forms depending on the nature of buyer and seller. All retain the binary character, but not all require a second indemnity trigger and not all require reinstatements. The simplest version is traded on an exchange⁴², others are traded over the counter and are arranged between brokers. As the character has changed, so has the name. Some now refer to ILWS that are pure binary options as swaps. It is really a designation of form rather than substance. Figure B4.3 above contains an example of a pricing sheet for ILWs. It seems to imply lots of variety of covers, but in truth all prices are negotiated and none is initiated without interest. The price sheet is merely one broker's (informed) view of where such instruments would trade if there was interest. In soft markets interest in ILWs tends to be muted; indeed, one can think of ILWs as hard market instruments where even their essentially "blunt instrument" protection is valuable.

Other transfer forms

⁴² The International Futures Exchange (IFEX) in London, part of the Chicago Climate Exchange.

Ninety percent or more of the risk that is transferred to the capital markets is done in the forms of exchange-traded instruments - ILS and ILWs. There are, however, other forms. Sidecars are a form that is analogous to quota-share or proportional coverage arrangements along the traditional chain. ILS are analogous to excess-of-loss coverages. Then there is collateralized reinsurance. In this the risk is negotiated one-on-one as it might be to a traditional provider, but because the assuming entity is not a reinsurer he may use a front or a specialized reinsurance vehicle to write the cover but capitalize that particular exposure with dedicated collateral. That collateral is specific to the risk, rather than generalized within the reinsurance vehicle. And as we have mentioned there are many versions of swaps. There are contingent covers, second and third event covers as well as a variety of programs that allow serial issuance. In all, the market is open to any ideas that provide the risk transfer and at appropriate cost.

Glossary

Adverse Selection	Adverse selection occurs when potential insurance purchasers know more about their risks than the insurer does, leading to participation by high-risk individuals and nonparticipation by low-risk individuals. Insurers react by either charging higher premiums or not insuring at all, as in the case of floods.
Attachment	The level of actual loss or index value at which an excess of loss policy will begin to pay out.
Attachment Probability	The probability that an insurance-linked security will reach the attachment point.
Average Expected Loss	Expected loss per year when averaged over a very long period (for example, 1,000 years). Computationally, AEL is the summation of products of event losses and event occurrence probabilities for all stochastic events in a loss model.
Alternative Risk Transfer	Refers to any non-traditional form of insurance risk transfer. Catastrophe bonds are a form of ART.
Basis Risk	The risk, with index insurance, that the index measurements will not match individual losses. Some households that experience loss will not be covered, for example, and some households that experience no loss will receive indemnity payments. As the geographical area covered by the index increases, basis risk will increase as well.
Capacity	The maximum amount of insurance or reinsurance that the insurer, reinsurer, or insurance market will accept.
Captive Insurance	The arrangement whereby a subsidiary company provides insurance or reinsurance for its parent.
Catastrophe	A severe, usually sudden, disaster that results in heavy losses.
Catastrophe Bond	High-yielding, insurance-linked security providing for payment of interest and/or principal to be suspended or cancelled in the event of a specified catastrophe such as an earthquake.
Catastrophe Model	A computerized model generating a set of simulated events to calculate losses arising from a catastrophe
Claim	An insurer's application for indemnity payment after a covered loss has occurred.
Cedent	The party transferring risk to an insurance company.
Combined Ratio	Represents the total of acquisition and administrative expenses and claims and insurance benefits incurred divided by premiums earned.
Direct Loss	Recovery cost of the damaged assets.
Diversification	Refers to the variety of assets within a portfolio in terms of its geographical or sectoral spread, or in terms of its credit quality. In general, risk is reduced as portfolio diversification increases.
Expected Loss	The expected amount of loss to an insurance-linked security expressed as a probability.

Exposure	The amount (sum insured), exposed to the insured peril(s) at any one time.
Facultative Reinsurance	The reinsurance of individual risk at the option of the reinsurer and the ceding company, whether under a treaty or by negotiation.
Hard Reinsurance Market	The supply of reinsurance coverage is restricted and prices rise.
Hazard	A physical or moral feature that increases the potential for a loss arising from an insured peril or that may influence the degree of damage.
Indemnity	The amount payable by the insurer to the insured, in the form of cash, repair, replacement, or reinstatement, in the event of an insured loss. This amount is measured by the extent of the insured's pecuniary loss. It is set at a figure equal to but not more than the actual value of the subject matter insured just before the loss, subject to the adequacy of the sum insured..
Indirect Losses	Economic consequences of the damaged assets (e.g., foregone revenue).
Insurance	A financial mechanism that aims to reduce the uncertainty of loss by pooling a large number of uncertainties so that the burden of loss is distributed. Generally, each policyholder pays a contribution to a fund, in the form of a premium, commensurate with the risk he introduces. The insurer uses these funds to pay the losses (indemnities) suffered by any of the insured.
Insurance Captive	An insurance company that is owned and controlled by its insureds.
Insurance Policy	A formal document (including all clauses, riders, and endorsements) that expresses the terms, exceptions, and conditions of the contract of insurance between the insurer and the insured. It is not the contract itself but evidence of the contract.
Layer	The term used to define a range of potential loss that is covered by insurance. For example, an insurance contract may pay indemnities only for losses within a specified range of magnitude.
Limit	Maximum indemnity payout specified in the insurance policy.
Loss on line	Annual expected loss as a percentage of the policy limit.
Moral Hazard	In insurance, moral hazard refers to the problems generated when the insured's behavior can influence the extent of damage that qualifies for insurance payouts. Examples of moral hazard are carelessness, fraudulent claims, and irresponsibility.
Parametric Insurance	Parametric insurance makes indemnity payments based not on an assessment of the policyholder's individual loss, but rather on measures of a parametric index that is assumed to proxy actual losses.
Premium	The monetary sum payable by the insured to the insurers for the period (or term) of insurance granted by the policy. Premium = premium rate x amount of insurance Also, the cost of an option contract—paid by the buyer to the seller.

Premium Rate	The price per unit of insurance. Normally expressed as a percentage of the sum insured.
Price multiple	Ratio of the rate on line to the loss on line.
Probable Maximum Loss (PML)	The largest loss believed to be possible for a certain type of event in a defined return period, such as 1 in 100 years, or 1 in 250 years.
Rate on line	Insurance premium as a percentage of the policy limit
Reinsurance	When the total exposure of a risk or group of risks presents the potential for losses beyond the limit that is prudent for an insurance company to carry, the insurance company may purchase reinsurance (that is, insurance of the insurance). Reinsurance has many advantages, including 1) leveling the results of the insurance company over a period of time; 2) limiting the exposure of individual risks and restricting losses paid out by the insurance company; 3) possibly increasing an insurance company's solvency margin (percent of capital and reserves to net premium income), hence the company's financial strength; and 4) enabling the reinsurer to participate in the profits of the insurance company, but also to contribute to the losses, the net result being a more stable loss ratio over the period of insurance.
Risk Financing	The process of managing risk and the consequences of residual risk through products such as insurance contracts, CAT bonds, reinsurance, or options.
Risk Layering	The process of separating risk into tiers that allow for more efficient financing and management of risks.
Risk Pooling	The aggregation of individual risks for the purpose of managing the consequences of independent risks. Risk pooling is based on the law of large numbers. In insurance terms, the law of large numbers demonstrates that pooling large numbers of roughly homogenous, independent exposure units can yield a mean average consistent with actual outcomes. Thus, pooling risks allows an accurate prediction of future losses and helps determine premium rates.
Risk Retention	The process whereby a party retains the financial responsibility for loss in the event of a shock.
Risk Transfer	The process of shifting the burden of financial loss or responsibility for risk financing to another party, through insurance, reinsurance, legislation, or other means.
Soft Reinsurance Market	The reinsurance coverage supply is plentiful and prices decline.
Systemic Risk	Risk that impact the entire financial system, rather than individual sectors. Exposure to systemic risk cannot be avoided through diversification.
Total Economic Losses	Sum of direct losses and indirect losses.
Total Return Swap	Contract used by investors to exchange (swap) a fixed payment for a certain portion of an insurance company's (the swap counterparty) losses.