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Financial Innovations Lab Report



*Financial Innovations for
Catastrophic Risk: Cat Bonds
and Beyond*

FINANCIAL INNOVATIONS LAB REPORT



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Financial Innovations Labs bring together researchers, policy makers, and business, financial, and professional practitioners for a series of meetings to create market-based solutions to business and public policy challenges. Using real and simulated case studies, Lab participants consider and design alternative capital structures and then apply appropriate financial technologies.

This Financial Innovations Lab Report was prepared by Glenn Yago and Patricia Reiter.



Financial Innovations for Catastrophic Risk: Cat Bonds and Beyond

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For the period covering 1970 through 2006, ten of the world's costliest catastrophe insurance losses occurred between just 2001 and 2005. And of those ten, nine occurred in the United States.

INTRODUCTION

In October 2007, the Milken Institute held a Financial Innovations Lab in New York to address ways to expand and share insurance risk in the area of catastrophe coverage. In particular, participants looked at catastrophe risk bonds, also known as cat bonds. These are securities that offer an alternative source of funding for reinsurance, which occurs when a primary insurer contracts with another insurer to diversify risk. Cat bonds return high interest rates to investors while providing insurance companies with the capital to pay out the huge losses that may arise from natural disasters like hurricanes, droughts, and earthquakes, or man-made calamities, such as terrorism. When such catastrophes occur, the consequences may be so severe, and not only to the insured, that they can drive insurance companies into insolvency.

The Lab brought together representatives from institutional investment firms, academia, the legal profession, and insurance, reinsurance, and reinsurance intermediary companies to explore innovations in capital market insurance solutions. If these kinds of instruments can achieve greater acceptance in the larger capital and investor markets, insurers should be able to offer wider and more affordable disaster coverage.

Participants tackled a variety of questions through presentations, case studies, and moderated discussions. The Lab identified five primary barriers to financing and managing catastrophic risk:

- *There is an insufficient supply of issuances.* Issuances of catastrophe bonds have increased in the past few years, but in both size and amount, they have lagged behind expectations, despite the advantages of virtually no credit risk and a potential market capacity greater than that of the traditional reinsurance market. The product's novelty—cat bonds have only been in existence since the mid-1990s—and the need to go offshore to execute the transactions were identified as barriers to increased issuance, not only of cat bonds but also of other capital market insurance solutions.
- *There is insufficient demand from mainstream investors.* Catastrophe bonds have shown generally high returns and a low correlation to other asset classes, two highly desirable characteristics for investors. But for many institutional investors, they remain unattractive due to small market volume. And the lack of risk management tools and available benchmarks serve as deterrents to increased demand.
- *Transaction fees are too high.* The issuance costs of catastrophe bonds currently run high compared to traditional reinsurance solutions. Legal expenses and regulatory requirements were blamed for higher costs.
- *Regulation hinders growth.* In the United States, the state and federal governments have a long history of regulatory involvement in the insurance industry, and have provided earthquake and flood insurance, as well. While close public-private partnerships are necessary to protect individuals and the economy from natural and man-made catastrophes, the increasing federal role in the insurance market could discourage private-sector development and dissemination of new products.
- *Large markets remain untapped.* Insurance and reinsurance companies have been responsible for more than 80 percent of new catastrophe bond issuances since the instruments were introduced. More recently, governments and companies have been among the new issuers, but again, the novelty of the product deters new entrants. For more exotic products, such as weather derivatives, this tendency is amplified.



Climate change and demographic shifts are realigning catastrophic risk exposure, yet in developing nations, insurance covers less than 2 percent of the costs of disasters.

ISSUES & PERSPECTIVE

FUNDING CHALLENGES FOR CATASTROPHIC RISK MANAGEMENT

Catastrophe bonds came onto the radar in the early 1990s, after Hurricane Andrew left affected insurers with a bill of more than \$23 billion. A number of insurers went bankrupt,¹ and alarms sounded across the industry worldwide. Florida, like most of the coastal United States, and coastal Europe and Asia, has seen a building boom, and the concentration of population and wealth in regions vulnerable to hurricanes, typhoons, floods, and earthquakes was forcing insurers and reinsurers to rethink their exposure.

Traditional risk models had been built around the idea that the industry could absorb one catastrophic event with losses of \$30 billion every decade. But advancements in catastrophe modeling were predicting much greater losses occurring at increasing frequencies.² The models proved correct, but the industry was unprepared. Figure 1 shows the twenty most costly catastrophe insurance losses from 1970 through 2006. In 1994, the Northridge earthquake in California resulted in insurance losses of \$19 billion. A 1999 typhoon struck Japan and cost insurers almost \$5 billion. The 2004 Atlantic hurricanes Ivan, Charley, Frances, and Jeanne left insurers cleaning up nearly \$20 billion in damages. Katrina, Rita, and Wilma—the fiercest of storms during the most violent hurricane season on record—slammed the Gulf Coast during the late summer and fall of 2005. Katrina alone, the most expensive natural disaster in the history of insurance losses worldwide, left the industry reeling, with \$66.3 billion in claims and expenses.³ Nor were catastrophes limited to the natural realm. The terrorist attacks of September 11 resulted in more than 3,000 deaths and created an economic toll of \$35.5 billion for the insurers who helped rebuild damaged property, businesses, and lives.

FIGURE 1		Twenty most costly catastrophe insurance losses, 1970–2006		
US\$billions (indexed to 2006)	Event	Year	Victims	Area of primary damage
66.3*	Hurricane Katrina	2005	1,326	U.S. and Gulf of Mexico
35.5	9/11 terrorist attacks	2001	3,025	U.S.
22.9	Hurricane Andrew	1992	43	U.S. and Bahamas
19.0	Northridge earthquake	1994	61	U.S.
13.6	Hurricane Ivan	2004	124	U.S. and Caribbean
12.9	Hurricane Wilma	2005	35	U.S. and Gulf of Mexico
10.4	Hurricane Rita	2005	34	U.S. and Gulf of Mexico
8.6	Hurricane Charley	2004	24	U.S. and Caribbean
8.4	Typhoon Mireille	1991	51	Japan
7.4	Hurricane Hugo	1989	71	Puerto Rico and U.S.
7.2	Winterstorm Daria	1990	95	France and U.K.
7.0	Winterstorm Lothar	1999	110	France and Switzerland
5.5	Hurricane Frances	2004	38	U.S. and Bahamas
5.5	Storms and floods	1987	22	France and U.K.
4.9	Winterstorm Vivian	1990	64	Western and Central Europe
4.9	Typhoon Bart	1999	26	Japan
4.4	Hurricane Georges	1998	600	U.S. and Caribbean
4.1	Tropical Storm Alison	2001	41	U.S.
4.1	Hurricane Jeanne	2004	3,034	U.S. and Caribbean
3.8	Typhoon Songda	2004	45	Japan and South Korea

Source: Wharton Risk Center.

*This figure includes \$20 billion paid for flood coverage by the National Flood Insurance Program (NFIP).

The accelerating pace of climate change may trigger weather systems that strike more frequently, and with greater intensity. And explosive population growth in desirable areas spells greater exposure to natural disaster. More than 50 percent of Americans are now living in coastal regions vulnerable to floods and storms—a total of 153 million people, up 33 million since 1990.⁴ Ninety percent of Americans live in regions considered “seismically active.”⁵

And the insurance safety net has frayed. Two pieces of information stand out from figure 1: For the period covering 1970 through 2006, ten of the world’s costliest catastrophe insurance losses occurred between just 2001 and 2005. And of those ten, nine occurred in the United States. Insurance companies, finding it hard to access capital to underwrite their payouts and expenses, reacted by raising premiums and deductibles, eliminating coverage, and abandoning certain markets altogether—no longer selling earthquake or flood insurance, for example, in some disaster-prone areas.⁶

For whatever reason, from affordability to other budget priorities, Americans are not keeping up with their insurance needs. Just 10 percent to 15 percent of American homeowners purchase earthquake coverage, according to a report by the insurance rating agency A.M. Best.⁷ And despite congressional intervention to fill gaps through federally regulated insurance programs, a 2006 RAND study found that only 63 percent of homeowners in coastal flood zones, and 35 percent of homeowners in river flood zones, bought federal flood insurance, often the only kind of flood insurance available to them.⁸ As of 2004, the value of insured coastal exposure totaled \$1.93 trillion in Florida and another \$1.90 billion in New York.⁹ In eighteen Eastern and Gulf Coast states, exposure to hurricanes alone totals \$6.90 trillion, or 16 percent of insurers’ total U.S. exposure.¹⁰

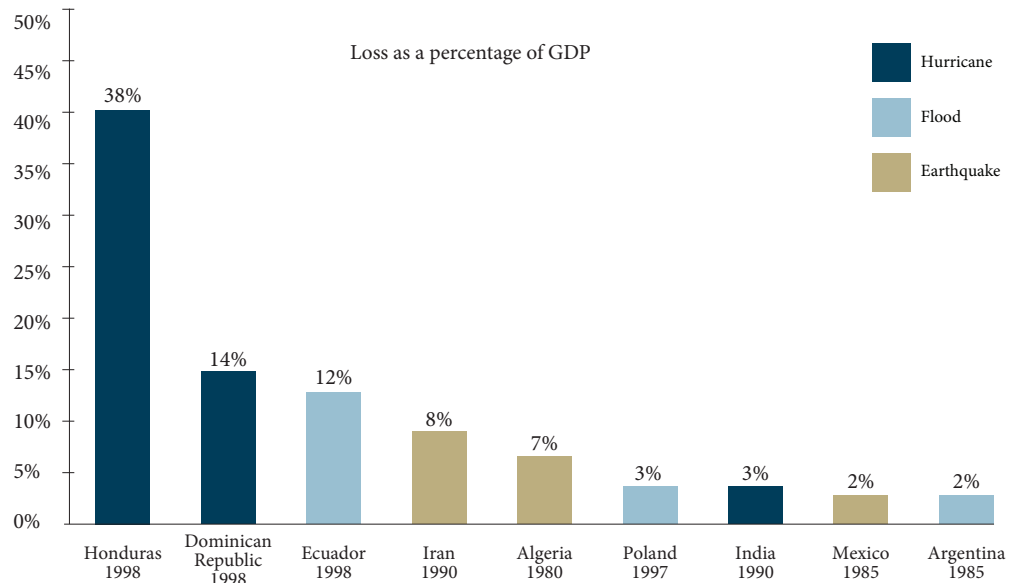
Elsewhere in the world, climate change and demographic shifts are also realigning catastrophic risk exposure. Yet when levees fail in New Orleans or freeways buckle in Los Angeles, residents often turn to private or public insurance safety nets. The tsunami slamming into Indonesia and Sri Lanka, and high-magnitude quakes in Turkey or El Salvador, hit populations and communities for the most part unprotected and uninsured. In developing nations, insurance covers less than 2 percent of the costs of disasters, while in the United States, that figure increases to 50 percent.¹¹ Figure 2 illustrates this impact on emerging economies.

Insurance has traditionally protected individuals and businesses by spreading risk among a large number of entities. But all risks are not equal. The vast majority of policies are written for well-defined markets: similar pools of clients who face similar risk exposure. Insurers work with “the law of large numbers”; the larger the group insured, the more accurate the predictions for specific kinds of loss, and how much to charge for protection. Automobile insurance is a prime example. Insurers can compute and predict the number and severity of automobile accidents and calculate with great precision the expected losses against the premiums they collect.

In eighteen Eastern and Gulf Coast states, exposure to hurricanes alone totals \$6.90 trillion.

FIGURE
2

The impact of catastrophes on emerging market economics



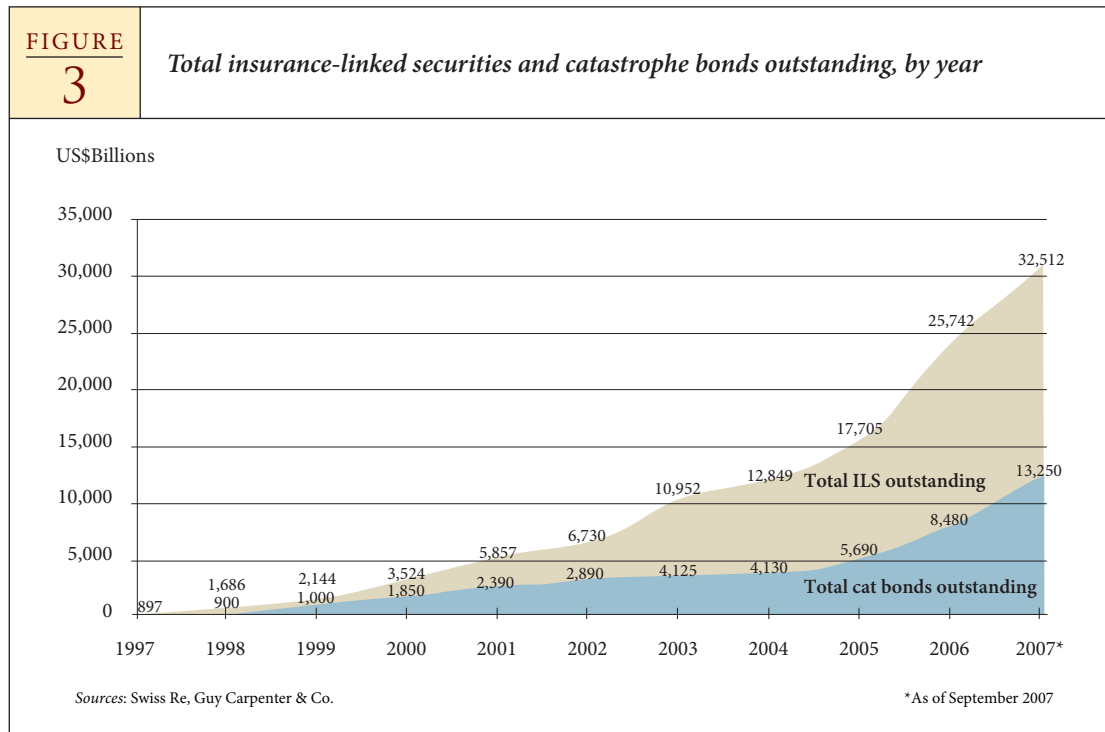
In the wake of multiple disasters, or even a single catastrophe, reinsurance capitalization is constrained, and primary insurers must pay higher premiums.

Catastrophe, on the other hand, falls into a category called “tail risk,” referring to its position on a bell-shaped probability curve and thus its very low probability of occurrence. But low-frequency events can have high impact, in terms of human and property losses. Predicting and pricing tail risk is a more daunting task than determining the premium for automobile insurance, and demands more sophisticated data, models, and analytics. In pricing tail risk, modelers calculate the losses, and the insurance pricing, for the relatively rare cataclysmic events that could wreak financial havoc for the insurer.

To minimize their risk, primary insurance providers traditionally contract with other insurers, who assume part of their original risk. This practice is known as reinsurance. Reinsurers don’t pay policyholder claims; instead, they reimburse the primary insurers for the paid claims, up to a contracted threshold. Reinsurers diversify the risk portfolios of primary insurers on a global scale and share the risk among other reinsurers, a practice called retrocession.

However, in the wake of multiple disasters, or even a single catastrophe, reinsurance capitalization is constrained due to the large obligations. Primary insurers must pay higher premiums for their reinsurance needs. This occurred in the 1990s, immediately after Hurricane Andrew and the Northridge earthquake. In addition, reinsurance covers only a small amount of catastrophe insurance exposure, another reason why primary insurers and reinsurers have sought out financial innovations in the broader capital markets, issuing cat bonds, weather derivatives, and other structured tools.

The financial markets have proved efficient in spreading risk, and it seems desirable that insurers and reinsurers would take advantage of them. Moreover, a steady stream of issuances, mainly by large insurance and reinsurance companies, is paving the way for continued use of the capital markets. By September 2007, the total volume of outstanding insurance-linked securities—both non-life (including catastrophe bonds) and life-insurance securitizations—had grown tenfold, up from \$3 billion in 2000 to \$32 billion in 2007, as shown in figure 3. Of that total, cat bonds constitute \$14 billion, up from \$2 billion in 2000.



THE FINANCIAL INNOVATIONS LAB

Financial innovation can address the funding challenges for catastrophic risk management and help identify ways in which catastrophe bonds and related risk-linked products are able to help protect individuals, communities, and companies. Soaring insurance premiums and limited reinsurance capacities following the natural disasters of the early 1990s demonstrate the need for greater protection from economic harm.

The objective of this Financial Innovations Lab was to investigate and document new ideas and structures to package and place catastrophic risks, and to discover which products and services could most increase the market absorption. The daylong Lab, held October 25, brought together representatives with expertise in the insurance, reinsurance, and reinsurance intermediary industries; bond ratings; finance; the law; and governmental regulation. A list of participants is included in Appendix I. The Lab covered such topics as regulatory and policy issues that limit the size of the catastrophic risk market; innovations in capital market insurance solutions that generate investor interest; the role of rating agencies in the growth of the market; and how to decrease transaction costs for new issuances and attract new issuers.

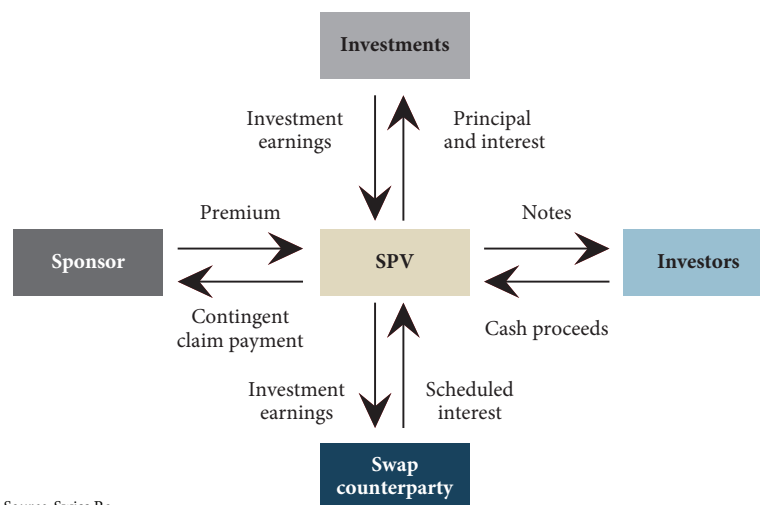
THE CATASTROPHE BOND MARKET: OVERVIEW

As an alternative source of capital for insurers, reinsurers, governments, and companies, catastrophe bonds—which pay out once a preset measure of catastrophe has been met—offer several benefits. They are fully collateralized because the proceeds of the transactions are placed in a trust fund and readily available for claims recovery and payout; under reinsurance, the process can take months or even years, and insurers face credit risk—the reinsurer may go bankrupt and be unable pay for the incurred losses. And unlike reinsurance, in which contracts are typically negotiated on an annual basis, cat bond contracts are underwritten on a multiyear basis, with three to five years being a common maturity. This guarantees both capacity and price stability.

Figure 4 illustrates the structure of a typical cat bond transaction. The issuer (also called the sponsor), such as a reinsurance or insurance company, or another organization in need of catastrophe protection, sponsors the incorporation of a special purpose vehicle (SPV) created for the sole purpose of the transaction. The SPV is typically incorporated in a jurisdiction that offers tax advantages, such as Ireland, the Cayman Islands, or Bermuda, and receives premium payments from the issuer.

FIGURE
4

Basic catastrophe bond structure



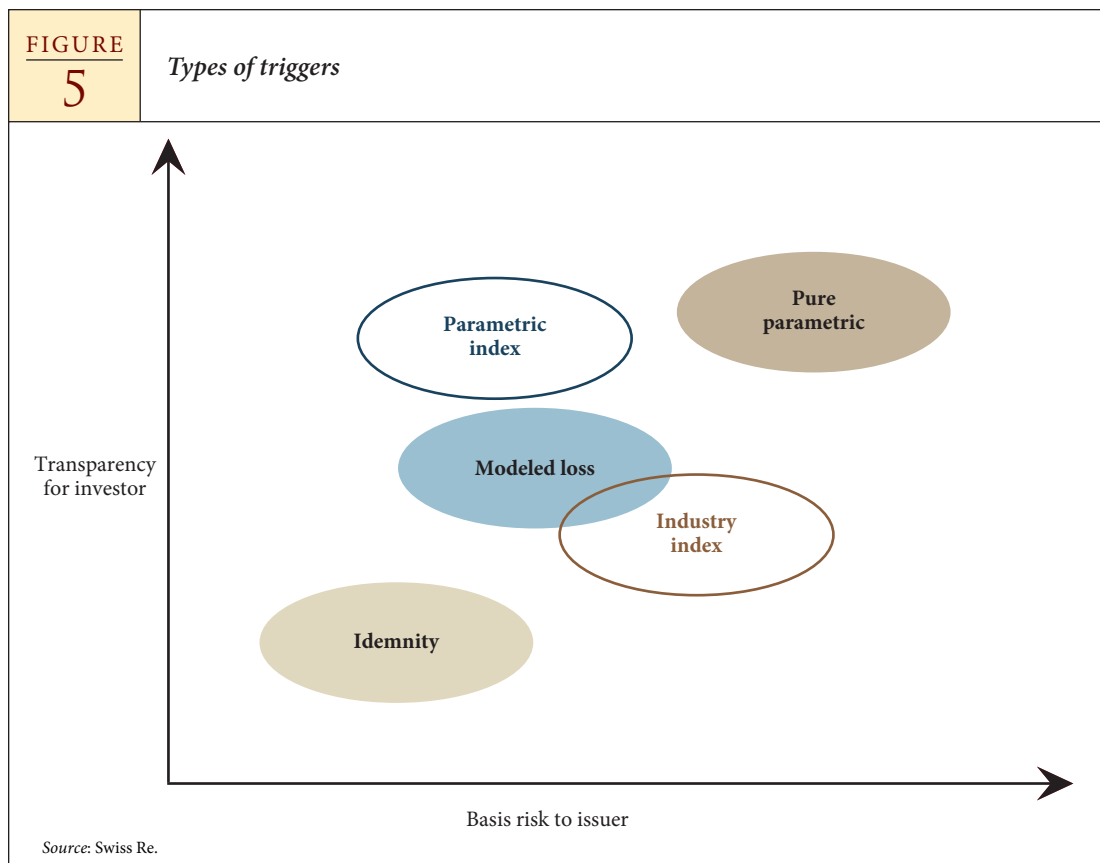
Source: Swiss Re.

The SPV is primarily responsible for issuing catastrophe bonds to fixed-income investors and using the bond-generated revenues, which are placed in a trust fund, to invest in highly rated, short-term securities. The most likely targets are short-term Treasuries or corporate bonds. In order to guarantee that the SPV's assets are always worth par (i.e., they yield a return equal to the London Inter Bank Offered Rate, or LIBOR, which is similar to the U.S. Federal Reserve rate), the actual returns from these investments are exchanged with a swap counterparty. This removes the risk of interest rate fluctuation from the investment. The returns to the investor consist of two portions: the premium paid by the sponsor and returns from the investment collected through the securities.

If the catastrophe bond isn't "triggered"—that is, if the criteria by which the issuer would receive part or all of the funds managed by the SPV have not been met—the principal is returned to the investor upon maturity, just as with any other fixed-income instrument. However, if a hurricane or earthquake strikes the contracted geographic region, part or all of the assets in the fund will be made available to the sponsor, which now has capital available to cover its liabilities.

Figure 5 shows the possible types of catastrophe bond triggers. It also highlights the trade-off between transparency for investors and basis risk—the difference between the actual and occurred losses to the sponsor—to insurers. An indemnity trigger is based on the issuer's actual losses and therefore has virtually no basis risk. It is less transparent, however, and thus less favorable to the investor because it is dependent on the insurer's practices and poses a moral hazard dilemma. Another problem of indemnity triggers, according to Eric Tell of Merrill Lynch, is the time lag between an event and the release of information on damages to investors.

At the other end of the spectrum, the pure parametric trigger is set to objective measures of an event, such as the wind speed at specific observation points. This makes it very transparent. In between the two extremes, other triggers have been used. The parametric index trigger is slightly more refined than the pure parametric trigger and provides less basis risk for the insurer. The modeled-loss trigger uses actual measures of an event fed into a model to determine loss estimates; and an industry-indexed trigger, in the United States, is typically based on Property Claim Services' or other industry-loss indexes.



The new-issue volume has grown since 1997, up from \$714 million to \$6.99 billion, as of year-end 2007, as shown in figure 6. Mild growth occurred from 1997 through 2005, but picked up sharply in both 2006 and 2007 in the post-Katrina era of catastrophic risk management. Currently, sponsors for the most part obtain coverage for multiple risks in the same transaction. U.S. wind was the largest risk securitized in 2006 and 2007. Other perils included: Californian earthquakes (approximately \$1 billion, in 2006); Japanese earthquakes (2007); central U.S. earthquakes (2006); industrial accidents (2005); and European wind (2006).

FIGURE
6 *Catastrophe bonds: New-issue volume*

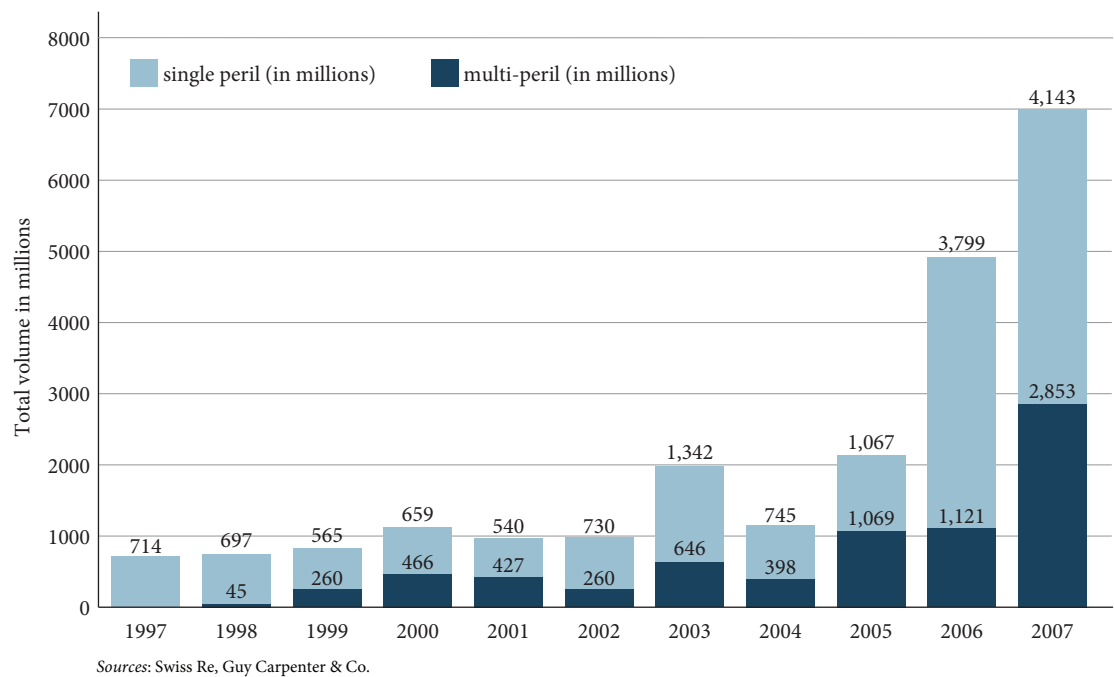
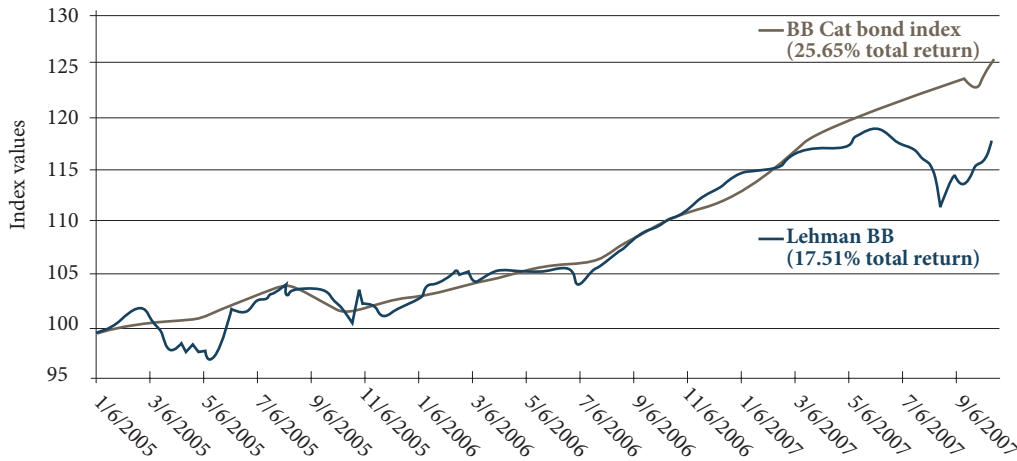


FIGURE
7

Comparative returns: Cat bonds and corporate BB bonds

BB performance from 1 January 2005–28 September 2007



Sources: Swiss Re, Lehman Brothers.

Even during the summer credit crunch of 2007, the total return on cat bonds rose, in sharp contrast with the falling corporate bond index.

Figure 7 compares the total return on BB-rated catastrophe bonds against total corporate BB returns from January 2005 through September 2007. The chart illustrates two important conclusions: First, cat bonds outperformed equally rated corporate bonds, returning 25.65 percent versus 17.51 percent. And second, even during the summer credit crunch of 2007, the total return on cat bonds rose, in sharp contrast with the falling corporate bond index. This suggests that cat bonds are only mildly, if at all, correlated with more traditional fixed-income asset classes.

FIGURE
8

The investor base is growing

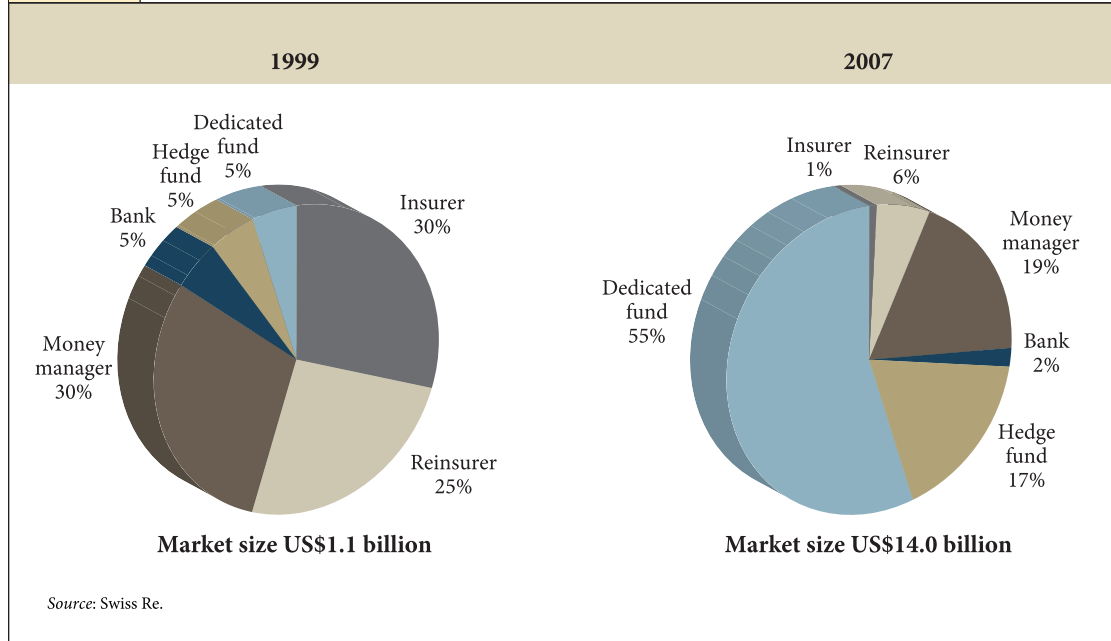
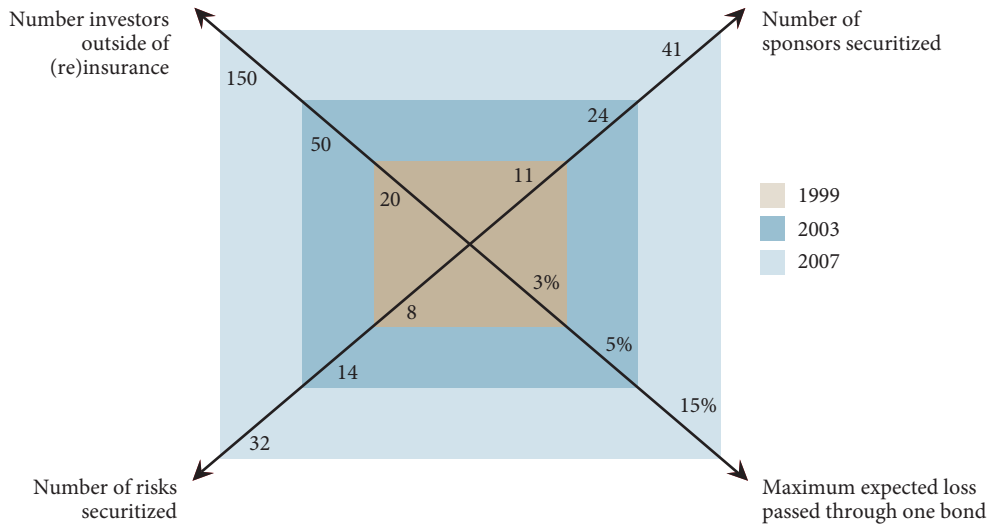


Figure 8 illustrates the evolution of investor participation in the catastrophe bond market. In the early stages of the market's development, more than 50 percent of the investors came from reinsurance and insurance companies. By 2007, they constituted a mere 7 percent of the market; investors from dedicated cat bond funds bought more than half of all issuance volume, roughly worth \$7.5 billion. The influence of hedge funds in this sphere also increased significantly, from 5 percent in 1999, to 17 percent in 2007.

FIGURE
9

The market depth and breadth are growing



Source: Swiss Re.

The catastrophic bond market has shown a significant increase in market depth and breadth since its inception. In figure 9, three discreet years—1999, 2003, and 2007—are used to track the market along four dimensions and illustrate the increasingly sophisticated use of instruments by the insurance industry.

The number of securitized risks is tracked from the center to the lower left corner: from eight in 1999 to thirty-two in 2007. From the center to the lower right corner, the line tracks the maximum expected loss passed through one bond; the maximum expected loss moves from 3 percent in 1999 to 15 percent in 2007. Moving from the center to the upper right corner, the number of sponsors tapping into the market rose from eleven to forty-one.

The line from center to upper left corner follows the number of non-insurance-industry cat bond investors. In 1999, just twenty investors came from outside the industry (most early investors were other insurers and reinsurers). That figure more than doubled, to fifty, in 2003, and had grown to 150 in 2007. This increase suggests a broadening acceptance within the wider investment community of insurance-linked securities as an asset class.

THE BROADER CATASTROPHIC RISK MARKET: OVERVIEW AND OUTLOOK

Catastrophe bonds may be the best known of the financial instruments for disaster risk mitigation, but other tools exist as well, as shown in figure 10.

- *Over-the-counter and exchange-traded derivatives.* Catastrophe derivatives take on the form of options or futures contracts. They are traded in a lively over-the-counter (OTC) market, as well as on the New York Mercantile Exchange (NYMEX), the Chicago Mercantile Exchange (CME), and others. In the over-the-counter market, for example, weather derivatives are arranged between a protection buyer and seller, typically with a financial intermediary in between. The exchange assumes the intermediary role in the case of exchange-traded derivatives. One example of an exchange-traded derivative is a futures contract on radius of wind speed and hurricane force at landfall.
- *Industry loss warranties.* ILWs are indemnity contracts that include a warranty similar to a derivatives contract, so that no recovery is due unless the industry loss, as defined by an independent third party, such as PCS, exceeds the negotiated amount. In addition, an ILW has an attached indemnity trigger; as a result, it is legally classified as reinsurance.
- *Contingent capital.* Unlike catastrophe bonds and other instruments, no transfer of risk is involved with contingent capital. This is not insurance, but an option for the insurer to exercise a contract for access to capital in the aftermath of a catastrophe.
- *Sidecars.* Sidecars are financial structures that distribute insurance risk between an investor and the sponsor, either an insurance or reinsurance company. Here the investor shares the risk and return from a slice of the insurer's book of business.

FIGURE 10		<i>Overview of instruments</i>				
	Cat bond	Derivative	Industry loss warranty	Contingent capital	Sidecar	
Purpose	Risk transfer	Risk transfer	Risk transfer	Post-event capital	Risk transfer	
Trigger	Index or indemnity	Index	Index	Index or indemnity	Indemnity	
Counterparty risk	Minimal	Depends on collateral provisions	Depends on collateral provisions	Depends on pre-funding provisions	Depends on extent of collateralization	
Deal size	Large	Medium	Medium	Large	Large	
Liquidity for investors	Relatively high	Low	Low	Low	Low	

Source: Swiss Re.

Catastrophe bonds are considered the safest of these instruments, in terms of counterparty risk, because the transactions are fully collateralized. The other instruments may not be, and depending on how comfortable the counterparties are, they may seek additional coverage.

Three instruments—cat bonds, contingent capital, and sidecars—have been exercised in transactions ranging from \$500 million to \$1 billion. Derivatives transactions have been relatively small, from \$10 million to \$50 million. A few exceptional derivatives transactions have reached \$300 million.

Catastrophe bonds are considered relatively liquid; if an investor wants to buy or sell, there is usually someone else willing to take the opposite position in the transaction. The other instruments demonstrate low liquidity, either because the transactions are specialized and tailored to specific needs or because the transactions are private placements. This is especially true in the case of contingent capital and sidecars.

Insurance-linked securities have seen a compound growth rate, in terms of outstanding issuances from 1997 through 2006, of 45 percent. According to Swiss Re Capital Markets predictions, an extrapolation of the trend over the next ten years would bring the ILS market to \$1 trillion by 2016, as can be seen in figure 11. Even if only 60 percent of the growth of the past decade is reached, the market could grow above \$300 billion, roughly ten times its current volume.

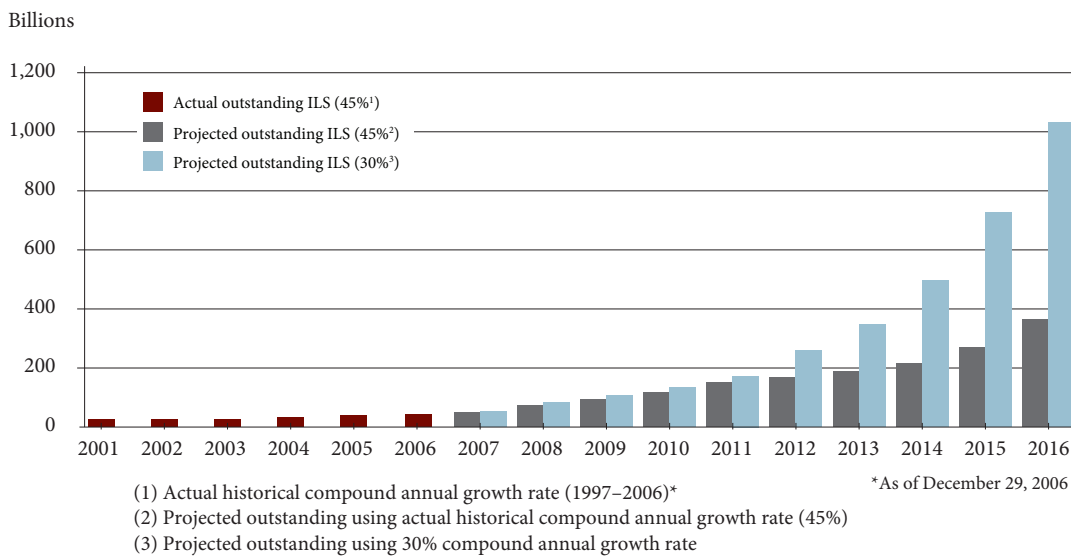
Michael Millette of Goldman Sachs predicted that the financial markets will eventually bear 30 percent to 40 percent of the total insurance risk, up from currently around 10 percent. Much of this growth will come from emerging markets, especially China, where insurance penetration has picked up.

“China doesn’t know what insurance is today. When it learns about risk financing at large, that will be a huge market.”

*Erwann Michel-Kerjan
The Wharton School
University of Pennsylvania*

FIGURE
11

Potential growth rate: A case for creation of a substantial market



Source: Swiss Re.

BARRIERS TO GROWTH IN THE CATASTROPHIC RISK MARKET

The outstanding volume of catastrophe bonds exceeds \$14 billion and has seen rapid growth, especially in 2006 and 2007. Yet industry experts suggest that those numbers lag behind expectations, considering the benefits they offer both the issuer (full collateralization and an alternative source of capital) and the investor (portfolio diversification and high returns). This Financial Innovations Lab asked two questions: Why hasn't the market for catastrophe bonds and other capital market solutions grown as expected? And what solutions could be structured to allow the markets to bear more risk? The Lab identified five barriers:

1

BARRIER

There is an insufficient supply of issuances

Even though catastrophe bonds have been issued since the mid-1990s, the novelty of insurance industry products in the capital markets still acts as a major hindrance to greater volume. By and large, insurance companies see themselves still as retainers, rather than originators, of risk. The transformation is similar to that which occurred two decades ago, when commercial banks began to act as investment houses. Even though the market has seen large transactions issued by both insurance and reinsurance companies, the latter have tapped the capital markets more aggressively. Retrocession, which is a transfer of all or part of underwritten risk from one reinsurer to another, is a limited option because reinsurers are reluctant to share company and insider information with competitors and therefore have a greater need to turn to alternative sources of capital.

In contrast, insurance companies have more options for buying protection coverage, including the reinsurance market, which caters to their needs. The availability of reinsurance, however, depends on the reinsurer's financial condition and health, which rise and fall in cycles. Reinsurance premiums peak immediately after a catastrophic event and drop once the industry has recovered. Thus, a "soft" reinsurance market offers fewer incentives for insurers to turn to the capital markets as an alternative.

However, high transaction costs, discussed at greater length under Barrier 3, make catastrophe bonds expensive for issuers. The most cited reason after high transaction costs was concern about retention of basis risk. For example, if a catastrophe bond is based on a recovery trigger other than indemnity, the recovery due under the bond may be greater or less than the insurer's actual losses. Insurance companies sell insurance products based on indemnification of their customers' actual losses. Homeowner's insurance, for instance, results in the policyholder making a recovery based on actual losses resulting from a hurricane—not on the wind speed in the neighborhood—or from the entire insurance industry loss from the event. Therefore, non-indemnified catastrophe bonds, like index-based bonds, are still something of a mismatch with the products the insurance companies themselves sell.

For potential issuers outside the insurance industry, such as governments, corporations, and other entities in need of risk-mitigation strategies, the novelty of the capital market insurance products and concerns about product complexity seem to be the main reasons the supply has been sluggish.

Legal risk for investment houses could potentially deter fund managers from taking part in the asset class. It was noted that a class of investors could file suit, alleging they were not clearly informed that a single catastrophic event could wipe out a portfolio and take away their interest return.

There is insufficient demand from mainstream investors

2

BARRIER

Their low correlation to fixed-income and other capital market asset classes, as well as high returns, have been the selling points for catastrophe bonds to investors since the introduction of the market. Figure 12 shows empirical correlations of catastrophe bonds relative to other fixed-income sectors and asset classes.

Figure 13 plots annualized returns against risk for various fixed-income asset classes, including catastrophe bonds from January 2002 through September 2007. Traditionally, low levels of risk correlate with low returns, and high levels of risk are associated with high returns, as shown in the upward sloping trend in figure 13. Over the period, however, catastrophe bonds behaved differently and granted high returns with comparatively low risk.

So why are investors not investing? Eric Silvergold of Guggenheim Partners cited insufficient supply as a major problem: There is not sufficient availability for institutional investors to make a meaningful investment in this asset class. Looking at mortgage-backed securities issuance, which totaled roughly \$6.8 trillion as of October 2007, he said, one can understand why certain fixed-income investors might have difficulty using this asset class as a component of their overall asset allocation.

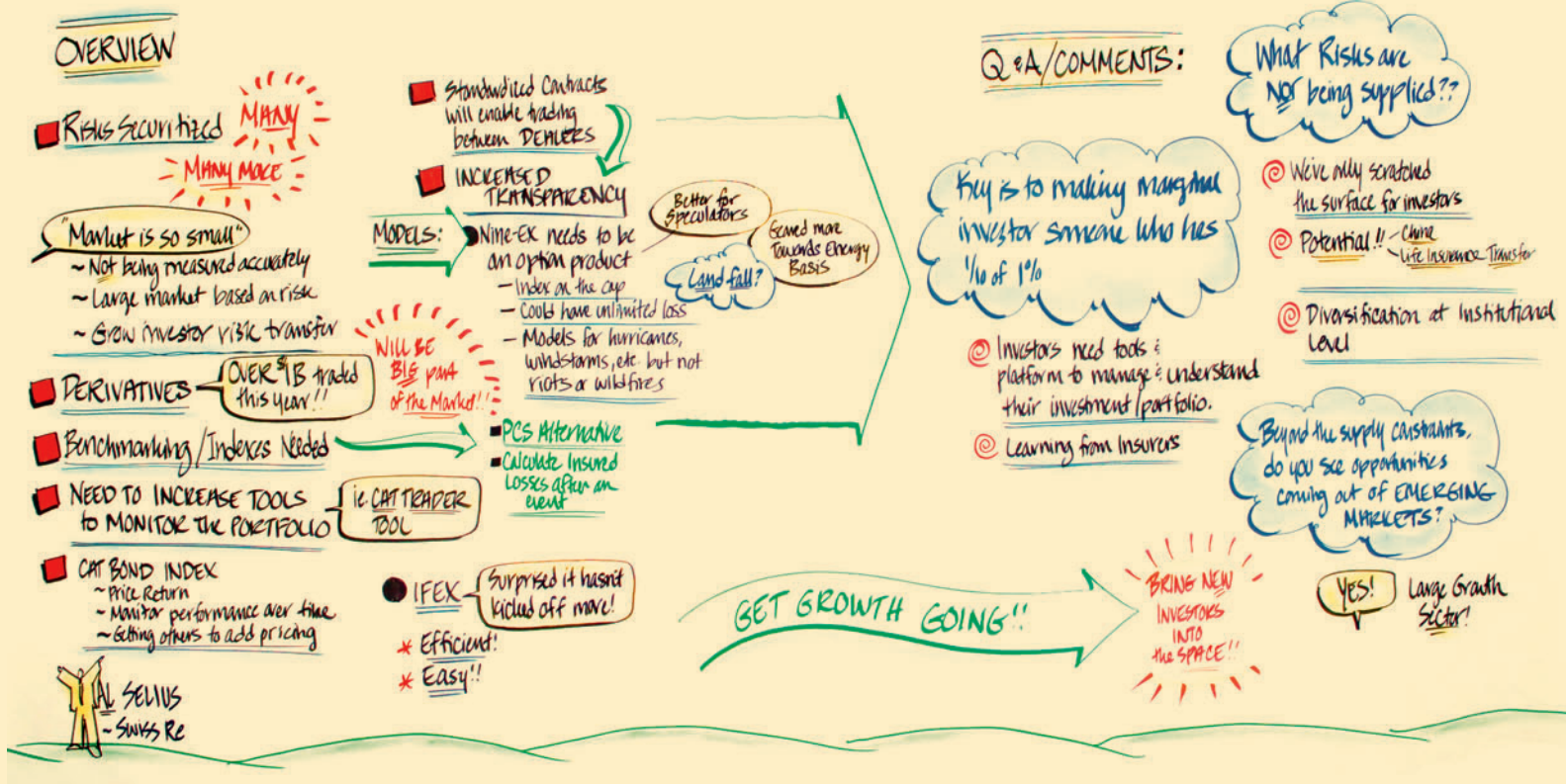
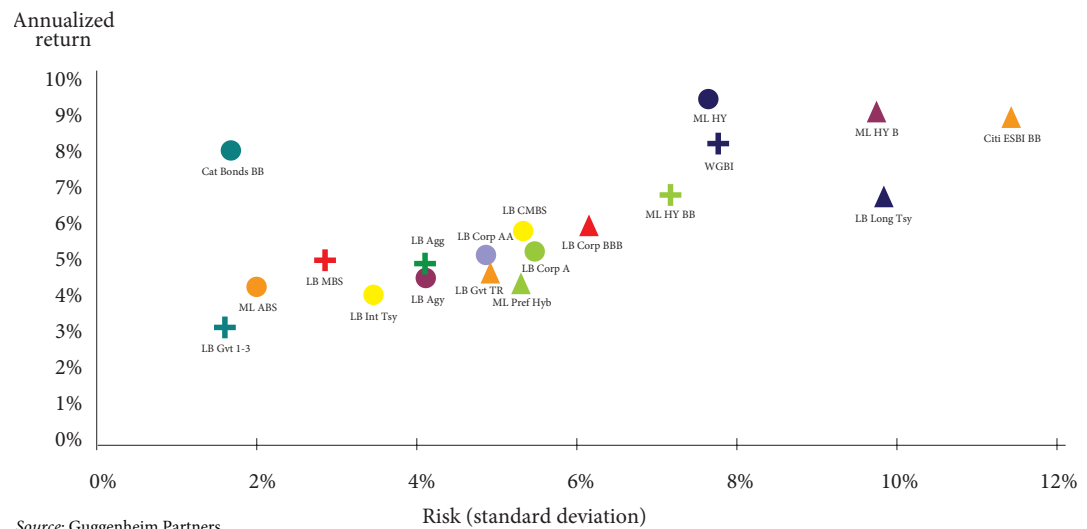


FIGURE 12 *Correlations: cat bonds, fixed-income, and other asset classes January 2002–September 2007*

	Fixed income							Other		
	LB Agg	ML ABS	Cat Bonds BB	LB Gvt	LB Corp AA	LB Corp BBB	LB CMBS	S&P 500	Gold	
Fixed income	LB Agg	1.00	0.88	0.26	0.98	0.98	0.85	0.97	-0.28	0.15
ML ABS	0.93	1.00	0.25	0.91	0.87	0.61	0.91	-0.46	0.13	
Cat Bonds BB	0.26	0.25	1.00	0.22	0.24	0.22	0.24	0.03	-0.02	
LB Gvt	0.98	0.91	0.22	1.00	0.97	0.77	0.98	-0.39	0.12	
LB Corp AA	0.98	0.87	0.24	0.97	1.00	0.87	0.98	-0.29	0.17	
LB Corp BBB	0.85	0.61	0.22	0.77	0.87	1.00	0.78	0.03	0.20	
LB CMBS	0.97	0.91	0.24	0.98	0.98	0.78	1.00	-0.34	0.17	
Other	S&P 500	-0.28	-0.46	0.03	-0.39	-0.29	0.03	-0.34	1.00	0.04
Gold	-0.15	-0.13	-0.02	0.12	0.17	0.20	0.17	0.04	1.00	

Source: Swiss Re.

FIGURE 13 *Cat bonds: historical risks and returns January 2002–September 2007*



Source: Guggenheim Partners.

Note: The risk and return data for catastrophe bonds are derived from the Swiss Re BB cat bond index.

Cat Bonds BB = Swiss Re “BB” cat bond index

ML HY B = Merrill Lynch high-yield B index

ML HY = Merrill Lynch high-yield index

LB MBS = Lehman Brothers mortgage-backed securities index

ML ABS = Merrill Lynch asset-backed securities index

WGBI = World Government Bond Index

ML HY BB = Merrill Lynch high-yield BB index

LB CMBS = Lehman Brothers commercial mortgage-backed securities index

LB Agg = Lehman Brothers aggregate bond index (includes U.S. government, corporate, and mortgage-backed securities with maturities up to thirty years)

Citi ESBI BB = Citigroup global emerging market bond BB index

LB Corp AA = Lehman Brothers corporate AA index

LB Corp BBB = Lehman Brothers corporate BBB index

LB Agy = Lehman Brothers agency bond index

LB Corp A = Lehman Brothers corporate A index

LB Gvt TR = Lehman Brothers U.S. Treasuries index

LB Gvt 1-3 = Lehman Brothers government bond index (one- to three-year maturity)

LB Long Tsy = Lehman Brothers long Treasuries index

LB Int Tsy = Lehman Brothers intermediate-term Treasury index

ML Pref Hyb = Merrill Lynch preferred hybrid index

Figure 14 shows the ten largest institutional investors, their total assets, and hypothetical allocations of 0.5 percent, 2.0 percent, or 5.0 percent of their total portfolios to non-life-insurance products. As one of the world's largest specialty fixed-income managers, PIMCO alone could take over the entire market with a relatively meager allocation of its asset base. Even if some of the large pension funds would add a few billion dollars of wind risk, that would still be a very small amount of risk participation in insurance markets for them.

Rank	Fixed-income manager/holder	Assets under management/\$billions FI assets	Hypothetical cat bond allocations/\$billions		
			0.5%	2.0%	5.0%
1	Allianz Global Investors of America	591	3.0	11.8	29.5
2	Black Rock	488	2.4	9.8	24.4
3	Legg Mason	454	2.3	9.1	22.7
4	Barclays Global Investors	320	1.6	6.4	16.0
5	Prudential Financial	290	1.4	5.8	14.4
6	AIG Global Investment Group	252	1.3	5.0	12.6
7	Goldman Sachs Group	202	1.0	4.0	10.0
8	AXA Group	192	1.0	3.8	9.6
9	Vanguard Group	181	1.0	3.8	9.6
10	Fidelity Investments	186	0.9	3.7	9.3

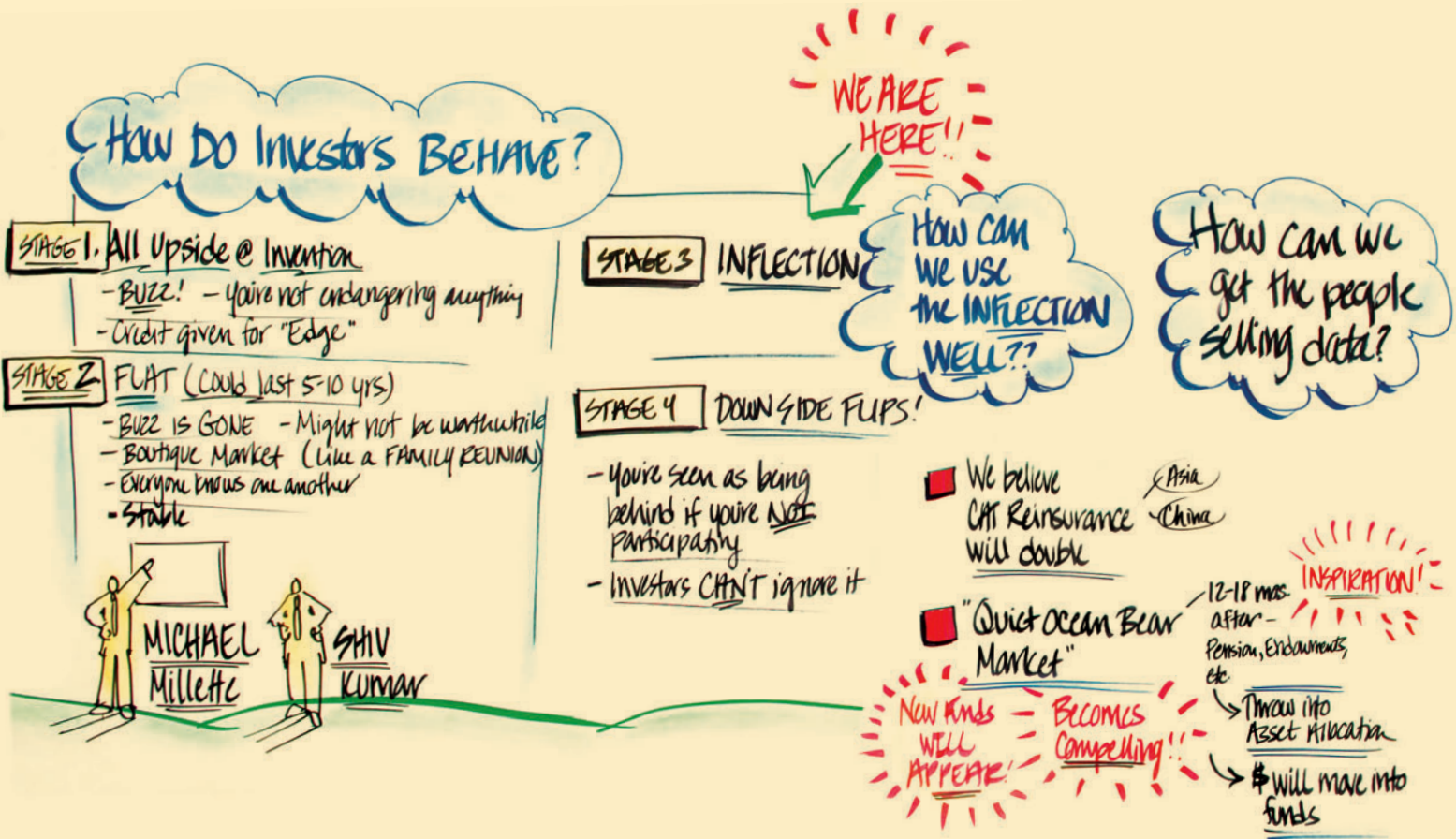
Source: Guggenheim Partners.

José Siberon of Merrill Lynch & Co. reported that investor taste varies widely, and that as more supply appears, it will be easier to know which investors want high or low investment grade, and which can take them on in derivative, bond, or loan form.

Career risk was a critical impediment to growth, noted Eric Silvergold of Guggenheim Partners. Asset and portfolio managers might choose not to invest in insurance-linked securities and other “exotic” asset classes out of fear that they would have to justify to management (which typically lacks a deep understanding of those asset classes) the triggering of a catastrophe bond. How, for example, could they report to their boards that they had lost 1 percent of their funds because a category 5 storm had hit Miami. In fact, one of the issues brought up repeatedly as a constraint for these types of transactions is reluctance among potential investors to deal with risk complexity.

“It would be difficult to explain to my management that we didn’t make a recovery on our reinsurance program because the wind speeds were two miles an hour too low.”

*Jeffrey Cooper
Allstate Insurance*



“The cat market is held to a much higher standard than people hold the credit marketplace.”

Barney Schauble
Nephila Capital

The general sentiment among Lab participants was that risk-transfer instruments in the capital markets were held to unachievable standards, higher than those in the credit market. Barney Schauble of Nephila Capital explained that even though the credit markets are sometimes distressed, no one assumes that investors will abandon high-yield debt. Yet the idea persists that investors may no longer buy catastrophe bonds if a disaster occurs.

The influence of rating agencies has increased dramatically in the insurance industry. Since institutional investors rely heavily on the assessment of new instruments by rating agencies, the latter play a vital role in the market's development. But some Lab members expressed concern that the rating agencies' evaluation of catastrophe bonds is too strict and, again, deters potential investors.

In the secondary market, the long-established “buy and hold” mentality was cited as another barrier.

Transaction fees are too high

3

BARRIER

Participants representing the insurance industry identified the high transaction costs of catastrophe bonds as a main impediment to growth of the market. Currently, costs can run about 20 percent higher than the costs of executing similar reinsurance contracts. Yet those on the capital market side suggested that the reverse might be true if insurance companies had no experience with reinsurance contracts and a history of issuing bonds.

Whether it is a matter of familiarity or not, the bottom line remains that cat bonds are expensive instruments. Structuring of the special purpose vehicles, most of which exist offshore, is costly. In addition to the extensive and complex documentation, legal fees constitute the major expenses. But U.S. tax laws discourage the creation of onshore special purpose vehicles. Henning Ludolphs of Hannover Re noted also that the lack of standardization in contracts deters small and midsize insurance companies, in particular, from branching into the capital markets.

Even though there is increasing consistency among accounting firms in the application of guidelines to determine whether a risk-transfer contract qualifies as reinsurance or a derivative contract, accounting uncertainty still contributes to the overall complexity of the deals and documentation.

Regulation hinders growth

4

BARRIER

In the aftermath of Hurricanes Katrina and Rita, reinsurance prices in Florida increased from 75 percent to 200 percent,¹³ and modeling firms revised their risk evaluations and models. These dynamics forced primary insurers to increase their premiums significantly or pull out of the market altogether. Despite this, local governments and authorities continue to advocate aggressively for low premiums, even if those prices do not reflect actual individual, property, and business risk exposures.

Lab participants spoke in favor of the need to charge fair market price for insurance premiums. Currently, however, all 50 states impose price controls on catastrophic risk insurance. It is theoretically desirable to adopt risk-based pricing so that instead of paying a subsidized insurance premium, the policyholder pays according to the full risk exposure of his or her property. But the current regulatory frameworks in many states make this unfeasible in the foreseeable future. Federal and state governments play key roles in managing catastrophic risk via post-event relief, and if history is any indication, they will continue to do so, and probably to a greater extent.¹⁴

The optimal mix of private and public involvement in the insurance markets was a topic of much discussion. Most Lab participants favored a partial or complete withdrawal of active federal or state involvement in insurance provision. The Citizens Property Insurance Corporation in Florida, set up in 2002 to provide property insurance of last resort, is now the largest provider of property insurance in the state.

Due to heavy subsidization, it provides insurance at artificially low rates. But Steve Verney from Allstate Insurance Company cautioned that the catastrophe bond market would be unable to contribute to the public response and infrastructure repair in the aftermath of a catastrophic event, and that public-private partnerships are necessary.

5

BARRIER

Large markets remain untapped

Possibilities for expansion of the catastrophic risk capital markets lie in the emerging markets. In China and other emerging Asian economies, the market for risk financing is still in its infancy. According to many Lab participants, sovereign and sub-sovereign governments, as well as non-governmental organizations and international organizations, are beginning to place risk in the capital markets and will continue to do so. Nonetheless, many governments and other public-sector entities are generally unfamiliar with the range of options for managing catastrophic risk and may not even be aware of alternative instruments. In addition, compiling the data to determine their risk profiles may prove difficult, especially for those that would have to assemble the data from scratch. This extends considerably the period up to the actual issuance of catastrophe bonds, increasing the transaction costs.

An aerial photograph of a snowy mountain landscape. The terrain is covered in snow, with a winding path or road visible. A small, dark structure is nestled in a valley. The overall scene is serene and wintry.

Innovative securitizations and financial technologies can complement the traditional insurance and reinsurance markets.

FINANCIAL INNOVATIONS FOR MANAGING CATASTROPHIC RISK

BARRIER: THERE IS AN INSUFFICIENT SUPPLY OF ISSUANCES

SOLUTION

1

Address the needs of the issuer

Lab participants across all areas of expertise agreed that addressing the needs of issuers is the first priority if the catastrophe bond market is to grow. Representatives from the capital markets noted that investors have shown great interest in the market, particularly for deals above \$500 million. Eric Tell of Merrill Lynch noted that proper incentives and legal frameworks must be created for issuers to push larger deals out to the capital markets. As discussed previously, reducing transaction costs will be a crucial remedy for creating incentives, either to enter the capital markets or allocate larger shares of risk-transfer capacity there. Creating more standardized transactions will not only lower the costs but also lessen the overall transaction time.

Participants also identified basis risk, the cost differential between actual and insured damages, as a key problem that deters primary insurers especially. A recent innovation features the use of “hybrid” triggers, in which a single transaction includes more than one trigger (a combination of modeled-loss and industry-indexed trigger, for example). The combination of triggers could help manage the sponsor’s basis risk while keeping the transaction non-indemnity based, which is typically preferred by investors. Modeling firms, in particular, have engaged in promising research to develop robust and customizable indexes and triggers.¹⁵

SOLUTION

2

Securitize low-risk events

Investment-grade ratings are essential for tapping the large institutional investor base. This could be accomplished by issuing more AAA and AA securities. Currently, the actual dollar amount of catastrophe bonds transferring in the capital markets is small, roughly \$7 billion in 2007. However, the risk transfer is large because most catastrophe bond issuances have been below investment grade and thus transfer more risk.

Figure 15 depicts a timeline of catastrophe bond issuances and their ratings. From 1997 through 2006, just six issuances out of 157 had a credit rating of AA or above. In terms of the transaction dollar amounts over the same period, of the \$13.95 billion issued, \$12 billion were given ratings of below investment grade. This trend reverses for more traditional asset-backed securities classes, such as the commercial real estate securitization market. Albert Selius of Swiss Re Capital Markets estimated that \$600 billion in bonds were issued in 2006, and of this, just \$20 billion were below investment grade. These opposing trends highlight one of the basic distinctions between traditional asset-backed and insurance-linked securities. The latter are primarily risk-transfer instruments, whereas asset-backed securities are financing tools for the banks to move triple-A assets off their balance sheets.

FIGURE
15

Catastrophe bond issuances and their ratings, 1997–2006

Ratings	B	BB	BBB	A	AA	AAA
Volume of issuances (\$millions)	1,700	10,300	1,600	210	135	105
Number of deals	26	105	17	3	1	5

Source: Merrill Lynch.

As discussed in much of the literature on catastrophe bonds,¹⁶ investors seem to favor parametric triggers over indemnity triggers. This is primarily because parametric triggers offer a greater degree of transparency. However, Michael Millette of Goldman Sachs challenged the assumption, noting that not only sophisticated sidecar investors, but “real red-blooded capital markets investors” are willing to take on indemnity-trigger issuances. In fact, he said, most new investors were buying indemnity triggers. In 2007, 43 percent of all cat bond issuances had indemnity triggers attached.¹⁷ That figure is perhaps skewed by one large transaction: Merna Re, created in July 2007 by State Farm to cover Canadian and U.S. tornado, hurricane, hail, wildfire, and earthquake risk. This catastrophe bond was the biggest placement in the history of the market. The transaction consisted of three tranches (slices), each of which was rated investment-grade. The indemnity trigger came as a surprise to many industry experts, but the transaction was structured in both loan and bond format toward attaining the higher rating, and not primarily for capital relief.

Eric Tell of Merrill Lynch, who was involved in the Merna Re transaction, said that it is certainly possible to sell indemnity triggers to investors, especially if the issuer has a transparent book of business (the amount of insurance on its books), and is well regarded for its management and underwriting practices. As stated earlier, however, the time lapse until news about an event reaches an investor must be shortened.

SOLUTION

3

Diversify risk securitizations

An important driver of growth is the securitization of *new* risks, many Lab participants agreed. As of year-end 2007, U.S. wind was the most widely securitized risk (32 percent of the total), followed by California earthquakes (22 percent). The vast majority of catastrophe bonds are issued on U.S. risks, and participants argued for a greater range of perils and geographic distribution of those risks, which would allow for increased investor portfolio diversification. Insurance and reinsurance companies would benefit because it would help them achieve a balanced retained risk portfolio.

According to a report by Guy Carpenter & Co., the supply for catastrophe bonds in 2006 was extremely weighted toward U.S. wind peril, but investors were eager to acquire diversification (as well as non-peak exposure).¹⁸ In 2007, according to the report, the concentration eased and the market saw an unprecedented number of deals on new risks: a catastrophe bond on U.S. river flood risk completed by Germany-based Allianz S.E.; northeastern U.S. hurricane risk executed by Allstate Insurance Company, Travelers, and Chubb; and earthquake risk in Greece, Turkey, Israel, Cyprus, and Portugal, by Swiss Re. The current trend is toward multiple risks in a single transaction, as seen with the Merna Re transaction.

Gerald Ouderkirk of Goldman Sachs reported that new entrants into the catastrophe bond market are large hedge funds with vast credit derivative books, asset-backed-securities books, and mortgage-backed-securities books. He added that the most frequent request coming from hedge fund managers seeking to diversify their portfolios was for new risks.

BARRIER: THERE IS INSUFFICIENT DEMAND
FROM MAINSTREAM INVESTORS

SOLUTION

4

Legitimize catastrophe bonds as an asset class

Lab participants agreed that catastrophe bonds and other non-life insurance-linked securities products must be established and legitimized as an asset class in order to grow the market substantially. Eric Silvergold of Guggenheim Partners discussed the need to educate investors about the products. Michael Millette of Goldman Sachs agreed but said it was even more important to speak to asset allocators, who are the primary decision makers at investment houses. The general sentiment was that the supply of transactions must increase drastically and soon, in order to be fully acknowledged as an asset class among investors.

SOLUTION

5

Improve risk management tools, develop appropriate benchmarks, and issue more collateralized debt obligations

According to Goldman Sachs figures, fixed-income investors and pension fund holdings of catastrophe bonds remain small, in the single-digit percentage range. Thus, efforts to foster growth of the market and establish it as an asset class should consider how fixed-income investors and pension funds perceive the asset class, and how they can benefit by allocating a larger share of their portfolio to capital market risk management solutions. Toward this end, possible solutions include:

- *Improve risk management tools.* Fixed-income and pension funds, in particular, may lack dedicated research teams for the catastrophe risk market. They can improve their access to risk monitoring tools for their catastrophe portfolios. The risk modeling firms AIR Worldwide, Risk Management Solutions (RMS), and EQUecat have recently developed competing risk management tools for investment professionals holding such portfolios.
- *Develop appropriate benchmarks.* In the derivative market, the most popular benchmark is the PCS index, published by Property Claims Service. This index is widely used by U.S. insurers and reinsurers, and addresses a variety of risks, including earthquakes, hurricanes, and wildfires. However, in Asia and much of the world, comparable benchmarks do not exist. Efforts are under way in Europe to create a similar index, built and maintained (as is PCS) by an independent source.

In 2007, Swiss Re developed indexes that track price returns and total rates of return for all dollar-denominated catastrophe bonds. Morton Lane, of Lane Financial LLC, reported on similar efforts by his firm, which came out with a returns index that differs from Swiss Re's in the source of pricing information and weighting methodology. These efforts are expected to increase market transparency and should make the asset class more accessible to various types of investors.

- *Issue more collateralized debt obligations.* The first collateralized debt obligation (CDO) structure including catastrophe bonds, Gamut Re, was launched in May 2007 and is the first actively managed CDO of catastrophic risk instruments. In general, CDOs are constructed from a portfolio of fixed-income assets, sliced, and sold to investors in tranches. Figure 16 provides an overview of the structure and key data of the Gamut Re issuance. Its portfolio includes traditional insurance contracts, industry loss warranties, and catastrophe bonds. Three of its five tranches were rated by S&P and Moody's (one received an Aa3/A- rating) and were broadly distributed to twenty-three investors. In general, CDOs target investor preference by offering specific risk-return profiles; the emergence of more CDO structures is expected to foster greater interest in the catastrophic risk capital markets by tailoring those structures toward investors' needs.

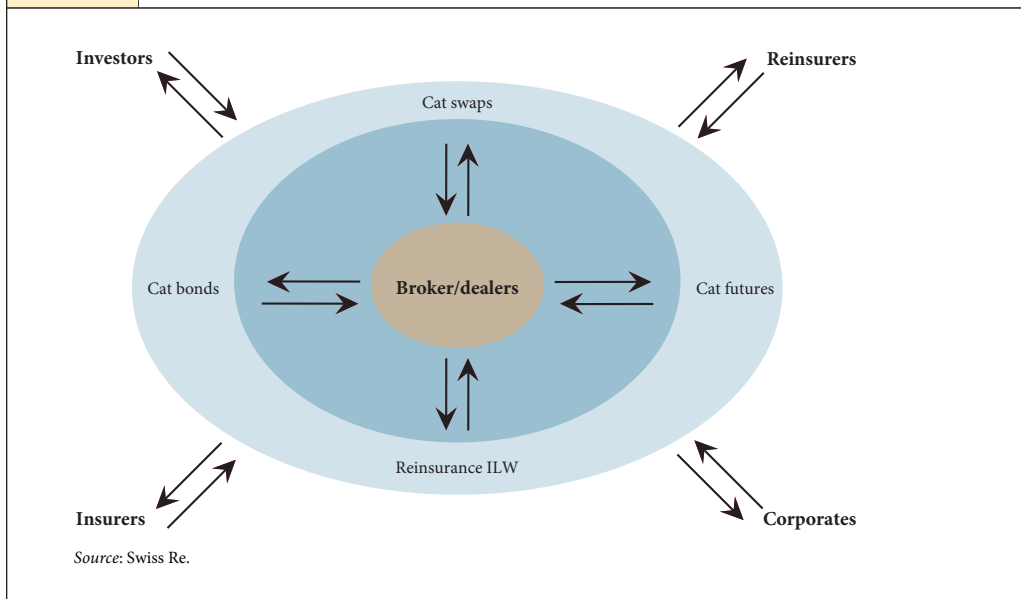
FIGURE 16 *Gamut Re cat bond: Overview*

<p>May 2007: launch of the first actively managed catastrophe risk CDO</p> <ul style="list-style-type: none"> — Five tranches (sets) of notes — Three tranches rated by S&P and Moody's — Risk period runs to 12/31/2009 <ul style="list-style-type: none"> ▪ Portfolio can include traditional reinsurance contracts, industry loss warranties, and catastrophe bonds (all fully collateralized) ▪ Actively managed to maximize ongoing income using relative value approach ▪ Defined risk parameters, as agreed between agencies and investors ▪ Broad distribution via Goldman Sachs and Swiss Re to 23 institutional investors ▪ Ongoing monthly reporting to investors 	Gamut Re \$310 million	
	Class A: \$60 million Aa3/A- L+140	20%
	Class B: \$120 million Baa3/BBB- L+300	40%
	Class C: \$60 million Ba3/BB- L+700	20%
	Class D: \$25 million	8%
	Class E: \$45 million	15%

Source: Nephila Capital.

Figure 17 illustrates how some catastrophic risk instruments—catastrophe bonds, catastrophe swaps, catastrophe futures, and reinsurance industry loss warrants—could be traded. Reinsurers, insurers, investors, and corporations should have access to a variety of instruments to hedge risk or invest in the insurance sector. Brokers and dealers would act as middlemen by trading and utilizing arbitrage opportunities between the different capital market instruments.

FIGURE 17 *The future of the broader capital risk market*



SOLUTION

6

Increase liquidity and transparency in the secondary market

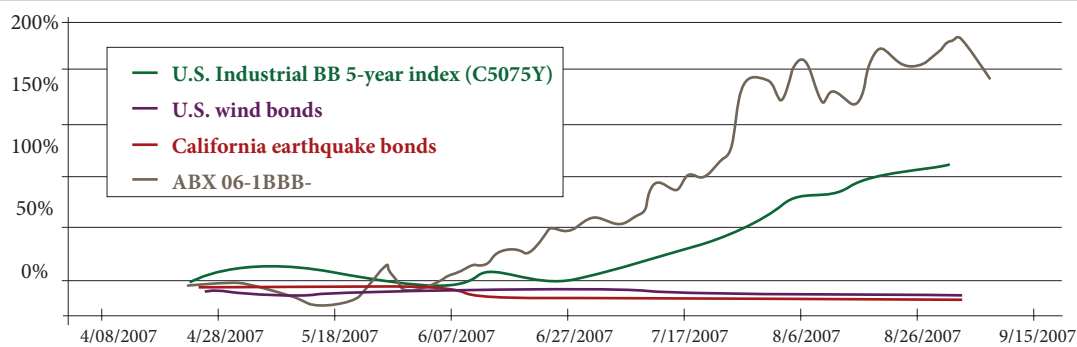
Lab participants agreed that there is an excess demand for catastrophe bonds. Striking evidence of this can be seen in figure 18, which illustrates the changes in relative percentage spread from April 2007 through August 2007, during the recent subprime credit crunch. Three instruments are examined: the ABX BBB- Index, which tracks subprime mortgages; the U.S. Industrial BB 5-year index, which provides data on BB corporate bonds; and the spreads for two classes of catastrophe bonds (U.S. wind and California earthquakes).

For the subprime index, the spread change went from zero to over 200 percent in two months; the spread change of the corporate BB index moved to 100 percent. But catastrophe bonds showed none of these patterns and remained flat.

Figure 18 demonstrates the strong demand in the market, even in midst of the summer 2007 credit crunch. Still, what can be done to improve liquidity in the market? The key component is to issue larger transactions. The ability to buy into a large trade provides investors the ability to more easily release their holdings of cat risk instruments. Eric Tell of Merrill Lynch confirmed that the size of the State Farm Merna Re transaction, \$1.2 billion, contributed to the success of the deal and attracted many first-time investors.

FIGURE

18

Relative spread change: cat bonds, subprime, and corporate bonds

Source: Swiss Re.

SOLUTION 7	<i>Promote increased participation from rating agencies</i>
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Rodrigo Araya of Moody’s Investors Service explained that rating agencies have a twofold responsibility. They develop, publish, and disseminate company information and transaction risk characteristics to investors. And they show companies how those securitizations and risk transfers affect their ratings. In general, rating agency considerations become more important for higher-rated transactions. But sophisticated investors, such as hedge funds that possess risk-modeling capacity and are familiar with insurance-linked securities, do not solely rely on ratings in their investment decisions.

Historically, catastrophe bonds were executed with a single rating. But in order to access the more traditional fixed-income investors like pension funds, two or three ratings are crucial. Figure 19 assesses the importance of rating decisions for various investors and their approximate dollar amount of assets under management.

FIGURE 19	<i>Rating decisions and investors</i>
--	--

Equity tranche	B area mezzanine tranche	BB area	BBB area	A/AA area
– Hedge funds	– Hedge funds – Asset managers	– Hedge funds – Asset managers – Bank proprietary trading desks	– Hedge funds – Asset managers – Bank proprietary trading desks – Insurance companies	– Asset managers – Pension money – Bank proprietary trading desks – High-grade funds – Insurance companies
\$2.5 trillion AUM	\$5.5 trillion AUM	\$10 trillion AUM	\$20 trillion AUM	\$50 trillion AUM

Source: Merrill Lynch. Note: AUM=Assets under management.

Some Lab participants suggested that agencies should standardize their rating systems. “Rating agency alignment will expand the investor universe,” said Eric Tell of Merrill Lynch. Furthermore, a steady ratings migration path, similar to the continuity of corporate credit ratings, would make investors more comfortable with catastrophe bonds; they wouldn’t go to sleep with an A rating and awaken to find it has become a BB.

One participant suggested that rating agencies should look at the historical performance of cat bonds and incorporate that into their ratings. In fact, only one catastrophe bond, the \$190 million indemnity bond Kamp Re, issued by Swiss Re, has been triggered in the history of the market, in late 2007. The default resulted in the loss of the investors’ principal. This is established practice for other asset classes, such as corporate bonds.

BARRIER: TRANSACTION FEES ARE TOO HIGH

SOLUTION

8

Standardize transactions, and lower legal fees

Lab participants representing the insurance industry identified the high transaction costs of catastrophe bonds—roughly 20 percent higher than the transaction costs of reinsurance contracts—as impediments to market growth. Yet those on the capital markets side suggested that the reverse might be true if insurance companies had no experience with reinsurance contracts and, instead, a history of issuing bonds. Whether it is a matter of familiarity or not, cat bonds remain expensive instruments.¹⁹ The structuring and documentation of the transactions, high legal costs, and the establishment of offshore SPVs were identified as the main drivers of cost. A number of remedies were identified:

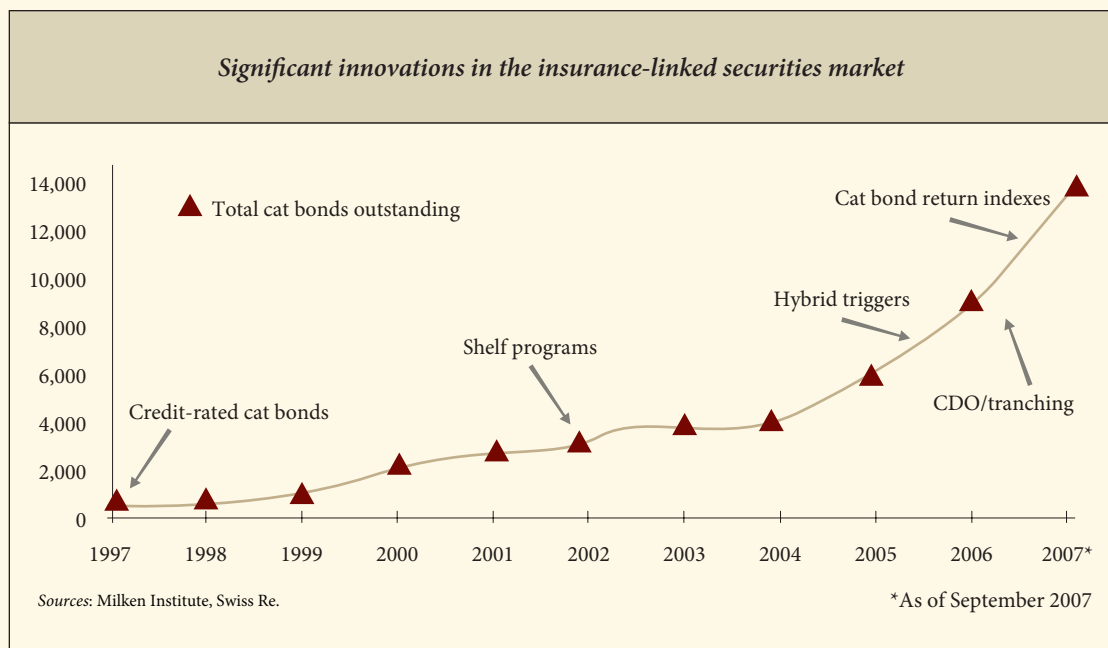
- *Increase the use of shelf programs:* Swiss Re was the first reinsurer to launch shelf offerings for catastrophe bonds, with its Pioneer program in 2002.²⁰ In a shelf offering, a sponsor may issue multiple cat bond transactions over a specified time, as needed, but is required to submit the full transaction documentation only with the initial offering. The major advantage of a shelf program is that once the structure is created and a single registration is submitted, the issuer can return with multiple issuances, using the same documentation and special purpose vehicle, reducing the overall issuance costs substantially. A shelf program also allows for a fast turnaround, allowing an issuer to utilize favorable market conditions, and reverse inquiries from investors are more readily served. The programs have gained some acceptance among issuers: in 2006, out of twenty catastrophe bond issuances, seven came from a shelf offering.²¹ Jeff Cooper reported that Allstate Insurance Company's first issuance of a \$250 million catastrophe bond in 2007 was off a \$2 billion shelf.
- *Establish International Swaps and Derivatives Association industry loss warranty (ILW) documents:* The International Swaps and Derivatives Association (ISDA) is a trade organization for the OTC derivatives market and has created standardized documents, allowing investors to take positions more easily in derivatives trades. Representatives from Swiss Re and Goldman Sachs discussed their negotiations with the ISDA toward establishing ISDA industry loss warranty documents, which would allow hedge funds and other participants in the secondary market to trade those financial instruments more smoothly. The availability of standardized documents and contracts for investors and cat risk brokers is expected to increase the transparency and liquidity in the secondary market.
- *Standardize the issuance structuring and documentation:* Structuring and documentation constitute the majority of the legal costs of issuing catastrophe bonds.²² However, as deal structures have become more homogenous, the cost of document preparation has been dropping. In this regard, the choice of trigger type plays a role in determining legal costs, since transactions with indemnity triggers demand more elaborate documentation than, for example, those with parametric triggers. John Schwolsky of Dewey & LeBoeuf LLP cautioned that small tweaks in transaction structure often result in unintended cost increases.

- *Establish the special purpose vehicle (SPV) onshore:* The principal domiciles for SPVs issuing cat bonds are Ireland, the Cayman Islands, the Bahamas, and other jurisdictions offering tax advantages. Schwolsky explained that onshore SPVs would likely be subject to taxation on the premiums they collect from the issuers, as well as the investment income on bond proceeds. Furthermore, there is some uncertainty as to whether catastrophe bonds should be treated as debt or equity. This creates an additional problem for onshore SPVs, since deductions may only be taken on interest payments, and not dividends. The Bond Market Association, the bond industry's international trade association, has submitted proposals to Congress to permit tax-efficient onshore SPVs.

MILESTONES IN THE MARKET FOR INSURANCE-LINKED SECURITIES

The insurance-linked securities market has seen a surge of significant innovations. The figure below provides a summary of the milestones against the increase in total outstanding cat bonds. In 2007, for example, the first comprehensive return index for catastrophe bonds was released and made accessible to investors. Equally important recent developments have been the application of collateralized debt obligation (CDO) technology to catastrophe portfolios and sales of tranching securities to investors.

Other innovations include the application of hybrid triggers, which have gained popularity since 2006, and shelf programs, which first came to market in 2002. However, probably the single most important step for market growth came when rating agencies began to rate catastrophe bonds, making it easier to place them with investors.



BARRIER: REGULATION HINDERS GROWTH

SOLUTION

9

Address regulation that promotes growth

The Homeowners' Defense Act (HR 3355), which passed the House of Representatives in November 2007 and, as of March 2008, is likely to pass the Senate, is the latest attempt to establish a public-private partnership for catastrophe insurance. The proposed bill would make it easier for states to create disaster insurance programs by creating a federal loan fund as a financial backstop for those programs. States then could more easily issue bonds (including, but not necessarily, catastrophe bonds) and create a consortium supported by federal charter.

Although there was general agreement that public-private partnerships are necessary and good, opinion split on the current bill and its consequences for the private insurance market. Opponents claimed that the bill would allow states to set create unrealistic disaster insurance programs selling under-priced policies. The bill would also increase pressure for federal bailouts because the bonds issued would appear to have federal guarantees attached.

The Lab discussed possible future legislation to foster public-private partnerships by granting tax benefits to insurers and reinsurers for holding catastrophe reserves. Under the current tax code and accounting principles, insurance companies have no incentive to set up catastrophe reserves because any reserves (and the interest income from them) would be taxed as corporate income. Even from an economic theory standpoint, reserves for future claims could be regarded as business expenses and therefore should be treated with tax exemptions, which is the case in many European countries.²³

Another policy recommendation was the establishment of a federal charter for insurance companies. The industry most likely would prefer to have to answer to a single federal regulator, instead of complying with fifty sets of state regulations. New building codes, such as those recently passed in California, could also lessen community risk exposure. However, the political will to actually enforce these changes is often weak.

In 2005, the Mexican government became the first federal sponsor to issue a catastrophe bond, Cat Mex, in the market's history. The bond protects Mexico by providing for loss payments in the aftermath of an earthquake. The United States could benefit from setting up similar transactions. A next step in this direction will be to determine the legislative obstacles for issuing catastrophe bonds.²⁴

Under the current tax code and accounting principles, insurance companies have no incentive to set up catastrophe reserves.

BARRIER: LARGE MARKETS REMAIN UNTAPPED

SOLUTION

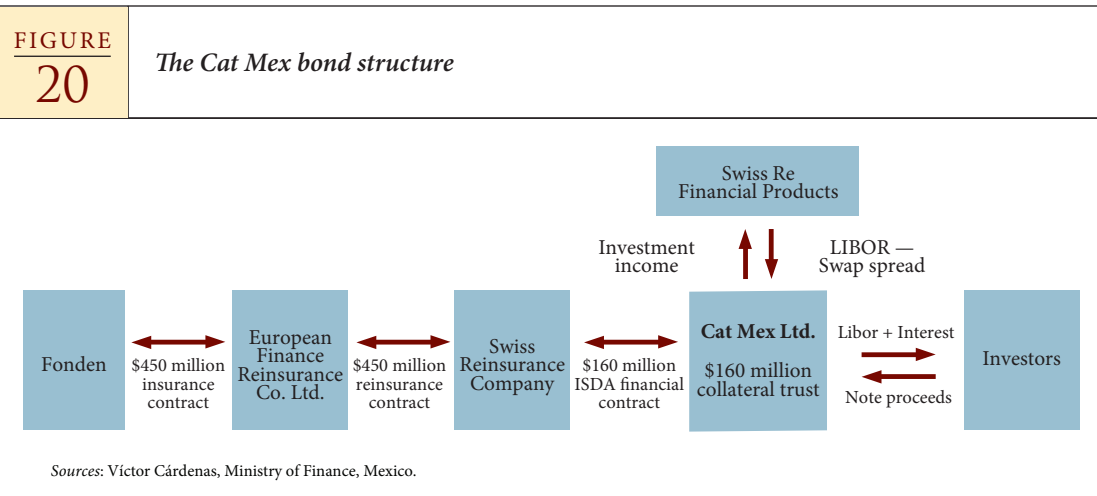
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Expand to emerging markets and attract new issuers

As stated earlier, emerging markets, as well as nongovernmental organizations, offer immense potential for expanding the market. The Fédération Internationale de Football Association (FIFA), for example, protected itself against cancellation of the 2006 Soccer World Cup final match in Germany due to terrorism or other catastrophic event, covering the investment for up to US\$262 million.

The World Bank has extended the scale of its own risk management projects, most notably through the Caribbean Catastrophe Risk Insurance Facility (CCRIF), a structure created as the world's first regional disaster facility. Similar to the Cat Mex transaction, CCRIF would provide immediate liquidity in the aftermath of a natural catastrophe. Established with the help of donor money, it uses traditional reinsurance tools, as well as capital market solutions to transfer the risk. According to the World Bank, the CCRIF would decrease the insurance premiums of each participating Caribbean country by around 40 percent due to regional pooling and its innovative deal structure.

Stuart Miller of the risk-modeling agency Applied Insurance Research Worldwide Corp. (AIR) led a session on public-private partnerships. Describing his firm's experience working with both public and private issuers, he pointed out the following distinctions: The project life cycle of a private-sector issuance may be only a few months, while public-sector transactions tend to be much lengthier. AIR was involved with the Cat Mex transaction and began dialogues with the Mexican government in 2004. However, the actual bond issuance took another two years to complete. Figure 20 provides an overview of the risk transfer structure of the Cat Mex deal. Private-sector clients typically have a clearer understanding of the transaction parameters they need for the coverage they seek, such as the type of trigger. Governments and other public-sector entities need a great deal of education on the range of potential catastrophic risk management options.



Note: Fonden is a fund for natural disaster created by the Mexican government to enhance the country's financial ability to deal with natural catastrophes. For a full history and overview of the transaction, see: <http://treasury.worldbank.org/web/pdf/VictorCardenas.pdf>.

Data collection is another factor that prolongs public-sector issuances because governments typically do not have sophisticated knowledge about their degree of exposure to certain risks or their risk profiles in general. In contrast, private-sector clients approach a transaction with a comprehensive risk management strategy. In the case of the Cat Mex transaction, more than two thousand municipalities were covered in the exposure, which substantially prolonged the data collection, as well as the modeling.

CONCLUSION

The industry professionals and academics who shared their expertise at the Milken Institute's Financial Innovations Lab provided innovative suggestions for increasing the size of the catastrophic risk capital market. Their proposals covered a broad spectrum of topics: how to address investor concerns by developing benchmark indexes, better risk management tools, and increased liquidity and transparency in the secondary market. They proposed solutions to issuer concerns, such as new ways to tackle basis risk and reduce transaction costs through standardizing issuances structures. Possibilities for future legislation include tax benefits for setting up catastrophe reserves. They predicted remarkable growth opportunities in expanding the market to emerging economies.

A key conclusion of the Lab was that closer public-private partnerships will play an instrumental role in protecting states and countries from natural or man-made disasters. In the United States, the federal and state governments have not tapped the financial markets to provide additional insurance capacity by leveraging their balance sheets. The landmark capital market transaction completed by the Mexican government serves as an example to be replicated by other countries. Current trends in U.S. insurance regulation and an increased popularity of state catastrophe funds—such as the Florida Hurricane Catastrophe Fund, which subsidizes the reinsurance industry and can pass its potentially infinite deficit to all policyholders in the state—raise a red flag. They limit the private sector's capacity for insurance provision and place the financial burden on taxpayers, instead of utilizing market-based solutions.

Lab participants also concluded that innovative securitizations and financial technologies can provide additional capital and protection, complementing traditional insurance and reinsurance markets. The application of these innovations and tools should accelerate the development of financial safeguards and protection from large-scale catastrophes for individuals, businesses, communities, and the economy as a whole.

APPENDIX I

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APPENDIX II

Literature Review

TITLE /AUTHOR(S)	PURPOSE	RESULTS	FINANCIAL INNOVATION(S)
Capital Market Instruments for Catastrophe Risk Financing Bruggeman (2007)	This study surveys capital market solutions to catastrophic risk management by product type and provides a short discussion on the costs and benefits of each.	A mix of capital market instruments is necessary to manage catastrophic risk effectively. This mix in turn is highly dependent on an insurer's/sponsor's profile.	Insurance-linked securities (cat bonds); contingent capital (contingent debt facilities, contingent surplus notes, catastrophe equity put options, and put protected equity); organized exchange-traded catastrophe derivatives (Chicago Board of Trade, catastrophe risk exchanges, BCE); OTC derivatives (pure) catastrophe swap; weather derivatives).
Insurance Derivatives: A New Asset Class for the Capital Markets and a New Hedging Tool for the Insurance Industry Canter, Coles, and Sandor (1997)	Introduction and review of insurance derivatives.	Property Claim Services (PCS) options are effective hedging mechanisms and risk management tools, and offer efficiency and price discovery for insurance pricing in the capital markets. Cat bonds and PCS options will expand the reinsurance capacity. Capital markets and the insurance industry are converging.	Catastrophe bonds and PCS catastrophe options.
Catastrophe Bonds at Swiss Re Chacko, Hecht, Dessain, and Sjöman (2006)	Harvard Business School case study that illustrates the first-time issuance of catastrophe bonds by Swiss Re in 2002.		Catastrophe bonds.
Bank Leu's Prima Cat Bond Fund Chacko, Hecht, Dessain, Sjöman, and Plotkin (2004)	Harvard Business School case study that illustrates how Bank Leu created the Prima Cat Bond Fund, making investment in cat bonds possible for retail investors.		Catastrophe bonds (more specifically, how to make a catastrophe bond fund available to a variety of investors through a public offering).
Sovereign Cat Bonds and Infrastructure Project Financing Croson and Richer (2003)	The paper explores the application of sovereign cat bonds for funding infrastructure projects in emerging markets.	Sovereign governments should be interested in cat bonds for infrastructure projects because they reduce the variance of capital requirements of individual projects and increase the predictability of required project financing.	Catastrophe bonds for sovereign and sub-sovereign entities, contingent capital.
The Basis Risk of Catastrophe-Loss Index Securities Cummins, Lalonde, and Phillips (2000)	The paper analyzes the basis risk of catastrophic-loss index derivatives and their hedging effectiveness for 255 insurers writing 93 percent of the insured residential property values in Florida, by simulating county losses.	The main finding is that insurers in the three largest Florida market-share quartiles achieve almost equally good outcomes by using the intrastate index contracts, compared to contracts they settle on their own losses. Hedging with statewide contracts is only effective for two types of insurers: big insurers and small insurers, which are highly diversified throughout the state.	Catastrophic-loss index derivatives.

APPENDIX II

Literature Review (continued)

TITLE /AUTHOR(S)	PURPOSE	RESULTS	FINANCIAL INNOVATION(S)
Financial Innovation in the Management of Catastrophe Risk Doherty (1997)	Discusses generic strategies available for cat risk management available to an insurer: asset hedge (e.g., reinsurance policy, cat options); liability hedge (e.g., cat bonds); post-loss equity recapitalization (e.g., post-loss equity financing and put options); and leverage management.	Indemnity contracts may not be the most cost-efficient means for cat risk management because of moral hazard. If newer instruments, such as cat bonds and cat options, are to succeed, they need to provide a way to resolve such incentive conflicts.	Catastrophe bonds, Chicago Board of Trade options and Bermuda Exchange options (both based on industry index), Catastrophe equity puts, reverse convertible debt (RCD); conversion of debt into equity).
Extreme Events, Global Warming, and Insurance-Linked Securities: How to Trigger the “Tipping Point”? Michel-Kerjan and Frederic (2007)	The report explores the new era for catastrophic risk management, as large-scale disasters have occurred at an accelerated rhythm in the past five years, and discusses the development of capital market solutions that complement traditional insurance and reinsurance.	The authors propose three complementary ways to increase interest in capital market insurance instruments: first, increase investor interest through tranching; second, address the basis risk challenge through index-based derivatives; and third, develop new products based on equity volatility dispersion.	Insurance-linked securities, derivatives, catastrophe bonds, sidecars, and hedging vehicles.
The Financing of Catastrophe Risk Froot (ed., 1999)	The compilation of articles provides an overview of capital market activities for catastrophic risk and discusses the role of the capital markets with respect to the insurance markets.	The articles discuss various financial market-based solutions, provide suggestions for the United States based on evidence from other countries, and discuss the federal role in catastrophic risk management. The issues, results, and discussions are current, even though this volume was published in 1999.	Catastrophe bonds, risk pools, guaranty funds, derivatives (OTC and exchange trades), catastrophe reinsurance contracts, catastrophe risk exchanges (CATEX), futures and options traded on the Chicago Board of Trade (CBOT), contingent surplus notes, contingent line of credit, hedging instruments, catastrophe indexes, catastrophe swaps.
USAA: Catastrophe Risk Financing Froot and Seasholes (1997)	Harvard Business School case that follows and illustrates the first large-scale catastrophe bond issuance.		Catastrophe bonds.
The Catastrophe Bond Market at Year-End 2006: Ripples Into Waves Guy Carpenter & Company LLC and MMC Securities Corp. (2006)	Annual review of the catastrophe bond market: market dynamics, transaction size, covered peril, trigger types, bond tenor, sponsor types, sponsor experience, bond rating and pricing trends.	2006 was a record year for catastrophe bonds, in terms of number of issuances, total risk capital issued, total risk capital outstanding, number of perils securitized, and diversity of trigger types and offering structures.	Catastrophe bonds, sidecars.
Calibrating CAT Bonds for Mexican Earthquakes Haerdle and Cabrera (2007)	This paper examines the calibration of a real parametric catastrophe bond issued by the Mexican government and derives a price of a hypothetical model-index loss catastrophe bond for earthquakes.	(1) A combination of reinsurance and catastrophe bonds is available to the Mexican Government at lower cost than reinsurance only (under certain model assumptions). (2) The derived zero coupon catastrophe bond price increases in the threshold level (“trigger”) but decreases as the expiration date of the bond nears.	Catastrophe bonds; optimal mix of catastrophe bonds and reinsurance.

TITLE /AUTHOR(S)	PURPOSE	RESULTS	FINANCIAL INNOVATION(S)
<p>Insuring Public Finances Against Natural Disasters: A Survey of Options and Recent Initiatives Hofman and Brukoff (2006)</p>	<p>This article surveys insurance modalities for public finance in developing and emerging markets. Discusses the effects of climate change on the catastrophe insurance industry.</p>	<p>The development of natural disaster insurance markets depends on the volatility of reinsurance pricing, investor demand, and the effects of climate change. It is desirable to move from ad hoc post-event relief toward provisioning based on commercial insurance.</p>	<p>Risk pooling, commercial insurance, reinsurance, weather derivatives, catastrophe bonds.</p>
<p>Financing Catastrophe Risk: Capital Market Solutions ISO (1999)</p>	<p>The paper discusses capital market instruments for financing catastrophic risk. It also identifies changes in regulation, accounting practices, and taxation that could facilitate securitization.</p>	<p>The paper suggests changing solvency regulations, accounting practices, and tax laws in order to make securitization and insurance derivatives more attractive.</p>	<p>Catastrophe bonds, contingent surplus notes, organized exchange-traded catastrophe options, catastrophe equity puts.</p>
<p>The Theory of Catastrophe Risk Financing: A Look at the Instruments that Might Transform the Insurance Industry Mutenga and Staikouras (2007)</p>	<p>This study reviews risk financing techniques, such as conventional approaches (risk retention and reinsurance) and capital market solutions.</p>	<p>Conventional risk management approaches have proved largely sufficient so far but are insufficient to cover the simultaneous occurrence of extreme events. The synthesis of new risk financing techniques allows insurers to generate a greater level of capital and coverage.</p>	<p>Catastrophe bonds, catastrophe swaps, insurance futures, catastrophe options, contingent equity (such as a put option).</p>
<p>Capital Market Innovation in the Insurance Industry Swiss Re (2001)</p>	<p>The report explores the prospects of financial innovation for capital market solutions for the insurance industry, with a focus on catastrophic risk.</p>	<p>Reviews various risk mitigation instruments and develops ten factors that are crucial for the market's development.</p>	<p>Catastrophe bonds, catastrophe swaps, industry loss warranties, contingent capital, life securitization, bank-funded life reinsurance, exchange-trade options.</p>
<p>Securitizations - New Opportunities for Insurers and Investors Swiss Re (2006)</p>	<p>The report discusses recent developments and provides a market overview of the insurance-linked securities market.</p>	<p>The report predicts that the volume of outstanding ILS is expected to grow from \$23 billion to \$150-\$350 billion by 2016. The majority of the growth will come from life securitization, and less so from catastrophe bonds. Further, fixed-income investors are increasingly interested in ILS securities.</p>	<p>Catastrophe bonds.</p>
<p>Natural catastrophes and man-made disasters in 2006 Swiss Re (2007)</p>	<p>Overview and data on natural and man-made catastrophes worldwide in 2006.</p>	<p>About one-third of the total losses due to natural and man-made catastrophes were covered by insurance.</p>	<p>None.</p>
<p>Managing Large-Scale Risks in a New Era of Catastrophes Wharton Risk Management Center (2007)</p>	<p>The report discusses private-public partnerships for insuring natural disasters in the United States.</p>		<p>Alternative risk transfer (ART) instruments: industry loss warrants (ILWs), catastrophe bonds, sidecars.</p>

APPENDIX III

Glossary of Terms

Source: Insurance Information Institute and Milken Institute.

ASSET-BACKED SECURITIES: Bonds that represent pools of loans of similar types, duration and interest rates. Almost any loan with regular repayments of principal and interest can be securitized, from auto loans and equipment leases to credit card receivables and mortgages.

BASIS RISK: The difference between two different measures of losses. For example, an insurer's actual losses in an event (indemnification loss) may be larger or smaller than its market share of the industry loss from that event (the expected Property Claim Services loss).

BOOK OF BUSINESS: Total amount of insurance on an insurer's books at a particular point in time.

CATASTROPHE BONDS (CAT BONDS): Risk-based securities that pay high interest rates and provide insurance companies with a form of reinsurance to pay losses from a catastrophe such as those caused by a major hurricane. They allow insurance risk to be sold to institutional investors in the form of bonds, thus spreading the risk.

CATASTROPHE REINSURANCE: Reinsurance for catastrophic losses. The insurance industry is able to absorb the multibillion-dollar losses caused by natural and man-made disasters, such as hurricanes, earthquakes, and terrorist attacks, because losses are spread among thousands of companies, including catastrophe reinsurers that operate on a global basis. Insurers' ability and willingness to sell insurance fluctuates with the availability and cost of catastrophe reinsurance. After major disasters, such as Hurricane Andrew and the World Trade Center terrorist attack, the availability of catastrophe reinsurance becomes extremely limited. Claims deplete reinsurers' capital, and as a result, companies are more selective in the type and amount of risks they assume. In addition, with available supply limited, prices for reinsurance rise. This contributes to an overall increase in prices for property insurance.

COLLATERALIZED DEBT OBLIGATION (CDO): First issued in the 1980s, CDOs are constructed from a portfolio of fixed-income assets. A CDO is a corporate entity formed to hold fixed-income assets as collateral and sell tranches (pieced) securities of the cash flows to investors.

DERIVATIVES: Contracts that derive their value from an underlying financial asset, such as publicly traded securities and foreign currencies. Often used as a hedge against changes in value.

FUTURES: Agreement to buy a security for a set price at a certain date. Futures contracts usually involve commodities, indexes, or financial futures.

INDEMNIFY: To provide financial compensation for losses.

INDUSTRY LOSS WARRANTY (ILW): A type of reinsurance resembling a derivative contract. The risk transfer is based on industry losses from a specified event rather than on the losses of the protection buyer. In order to get reinsurance accounting for the purchase, many insurers will include a nominal indemnity retention in the contract, with the warranty that there will be no indemnity recovery unless an agreed industry loss estimate, provided by a third party, has been exceeded.

INSURANCE-LINKED SECURITY (ILS): Bonds or notes issued to third-party investors directly or indirectly by an insurance or reinsurance company or a pooling entity as a means of raising money to cover risks.

LAW OF LARGE NUMBERS: The theory of probability on which the business of insurance is based. Simply put, the larger the group of units (such as sport-utility vehicles) insured, the more accurate the predictions of loss will be.

LIQUIDITY: The ability and speed with which a security can be converted into cash.

MORAL HAZARD: The possibility that a person may act dishonestly in an insurance transaction.

MORTGAGE-BACKED SECURITIES: Investment grade securities backed by a pool of mortgages. The issuer uses the cash flow from mortgages to meet interest payments on the bonds.

OVER-THE-COUNTER (OTC) SECURITY: A security that is not listed or traded on an exchange, such as the New York Stock Exchange. Business in over-the-counter securities is conducted through dealers using electronic networks.

PRIMARY MARKET: The market for new-issue securities. Proceeds go directly to the issuer.

RATING AGENCIES: Six major credit agencies determine insurers' financial strength and viability to meet claims obligations. They are: A.M. Best Co.; Duff & Phelps Inc.; Fitch Inc.; Moody's Investors Services; Standard & Poor's; and Weiss Ratings Inc. Factors considered include company earnings, capital adequacy, operating leverage, liquidity, investment performance, reinsurance programs, and management ability, integrity, and experience. A high financial rating is not the same as a high consumer satisfaction rating.

REINSURANCE: Insurance bought by insurers. A reinsurer assumes part of the risk and part of the premium originally taken by the insurer (the primary company). Reinsurance effectively increases an insurer's capital and therefore its capacity to sell more coverage. The business is global, and some of the largest reinsurers are based abroad. Reinsurers have their own reinsurers, called retrocessionaires. Reinsurers don't pay policyholder claims. Instead, they reimburse insurers for claims paid.

RETENTION: The amount of risk retained by an insurance company that is not reinsured.

RETROCESSION: The reinsurance bought by reinsurers to protect their financial stability.

RISK MANAGEMENT: Management of the varied risks to which a business or association might be subject. It includes analyzing all exposures to gauge the likelihood of loss and choosing options to better manage or minimize loss. These options typically include reducing and eliminating the risk with safety measures, buying insurance, and self-insurance.

SIDECAR: Risk mitigations instruments that allow investors to take on risk and return of a book of business written by an insurer.

SECONDARY MARKET: Market for previously issued and outstanding securities.

SOFT MARKET: An environment where insurance is plentiful and sold at a lower cost (also known as a buyers' market).

TRANSPARENCY: A term used to explain the way information on financial matters, such as financial reports and actions of companies or markets, are communicated so that they are easily accessible and understood.

UNDERWRITING: Examining, accepting, or rejecting insurance risks and classifying the ones that are accepted in order to charge appropriate premiums for them.

WEATHER DERIVATIVE: An insurance or securities product used as a hedge by energy-related businesses and others whose sales tend to fluctuate, depending on the weather.

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