Swiss Re

sigma

No. 3/2001

Capital market innovation in the insurance industry

Published by:
Swiss Reinsurance Company
Economic Research & Consulting
P.O. Box
CH-8022 Zurich

Telephone +41 1 285 25 51
Fax +41 1 285 47 49
E-mail: sigma@swissre.com

New York Office:
55 East 52nd Street
41st floor
New York, NY 10055

Telephone +1 212 317 51 35
Fax +1 212 317 54 55

Hong Kong Office:
18 Harbour Road, Wanchai
Central Plaza, 61st floor
Hong Kong SAR

Telephone +852 25 82 56 91
Fax +852 25 11 66 03

Authors:
Dr David S. Laster
Telephone +1 212 317 5587
Fax +1 212 317 5455

Dr Mayank Raturi
Telephone +1 212 317 5673
Fax +1 212 317 5455

Editor:
Dr Kurt Karl
Telephone +1 212 317 5564
Fax +1 212 317 5455

Thomas Hess, Head of Economic Research & Consulting,
is managing editor of the *sigma* series.

The editorial deadline for this study was 23 April 2001.

sigma is also available in German, French, Italian, Spanish, Chinese and Japanese.

sigma can also be accessed via Swiss Re's Website: http://www.swissre.com

Executive summary

Capital market insurance solutions transfer insurance risk to capital markets.

Many insurance industry participants believe that capital markets have the potential to bear some types of insurance risks more efficiently than insurance markets. In recent years, insurers have begun issuing securities linked to bundles of insurance risk, most commonly catastrophe risk. This report explores the prospects for these capital market solutions by first examining the general nature of financial innovation and then assessing current market developments.

Financial innovation

Demand, supply, and taxes and regulation drive financial innovation.

Financial innovation – the act of developing new products and processes – has been robust in recent decades. One reflection of this activity is the explosive growth of derivatives trading, which has expanded 20-fold since 1986.

Three types of factors drive financial innovation: demand, supply, and taxes and regulation. Demand-driven innovation occurs in response to the desire of companies to protect themselves from market risks such as the fluctuation of exchange rates, interest rates, and energy prices. Supply-side factors that encourage financial innovation include improvements in technology and heightened competition among financial service firms. Other financial innovation occurs as a rational response to taxes and regulation, as firms seek to minimise the costs that these impose. Once the pace of financial innovation began to accelerate in the 1970s, the impetus to innovate assumed a life of its own. Major banks and insurers set up product development units that serve as engines of innovation.

Growth of capital market insurance solutions

Following Hurricane Andrew and the Northridge earthquake of the early 1990s, property catastrophe reinsurance was in short supply and premium rates more than doubled. In reaction to this rate spike, some insurers began developing a new class of financial instruments that transfer insurance risk to capital markets. Approximately USD 12.6 billion worth of these capital market insurance solutions have been issued worldwide in the past five years. Nearly two-thirds of these transactions have involved catastrophe bonds, swaps and options. Other transactions include contingent capital and life insurance securitisations. After several years of rapid growth, the pace of issuance slowed in 1999 and 2000.

Capital market insurance solutions offer issuers several advantages, including the potential to reduce counterparty risk and to diversify funding sources. Investors benefit from new opportunities to diversify their portfolios and earn high risk-adjusted returns.

This report reviews ten factors critical to the success of capital market insurance solutions: higher reinsurance prices; liquidity; transparency; resolution of regulatory, accounting, and tax ambiguities; better benchmarks; industry education; ratings agency involvement; new investors; financial sector convergence; and specialisation.

Capital market insurance solutions have the potential to expand the limits of insurability.

The issuance volume of catastrophe securitisations should grow from its current annual level of USD 1 billion to approximately USD 10 billion by 2010. Over time the set of securitised risks will become more diverse. There is vast market potential for capital market insurance solutions linked to non-catastrophe risks. If these solutions fulfil their potential, the range of risks that are deemed insurable will expand.

Introduction

The market response to capital market insurance solutions has been mixed.

For the past few years, a stream of announcements has proclaimed the impending convergence of capital and insurance markets. Conferences, trade publications, and the business press have extolled the potential of capital markets to inexpensively and efficiently bear sizeable insurance risks. Several leading investment banks, insurance brokers, and reinsurers have entered the fray, committing substantial resources to establishing units that bring capital market solutions to the insurance industry.

Other, more sceptical, market participants have adopted a 'wait-and-see' stance in the belief that the complex risks traditionally underwritten by insurers will not be easy to repackage and sell to institutional investors. They argue that experienced professional insurers and reinsurers are better positioned to manage these risks. The sceptics view announcements of convergence as hype and wonder aloud whether there really is money to be made in the brave new world of capital market insurance solutions.

The results to date have been mixed. Enthusiasts can point to several promising developments such as the issuance of catastrophe bonds, the emergence of creative deal structures, and the drafting of sound regulations. Naysayers can point to a series of failures. Soon after the Chicago Board of Trade (CBOT) introduced futures and options contracts based on the underwriting results of insurers in 1992, it halted trading due to lack of interest. Trading in Property Claims Service (PCS) options, the CBOT's next attempt at exchange-traded insurance risk securities, has dwindled to virtually nothing.

This *sigma* explores what causes financial innovation to succeed or fail...

Why do some capital market innovations win acceptance while others fail? This *sigma* attempts to shed light on this question while offering a perspective on how capital market innovation affects the insurance industry. In so doing, it draws insights from:

- economists who have examined the nature of financial innovation; and
- capital market insurance solutions that have already been brought to market

...and assesses the prospects for capital market insurance solutions.

The purpose of this report is twofold: to examine the process of financial innovation and to assess the prospects for capital market insurance solutions. The next section explores the nature and causes of financial innovation. Section three describes the benefits that capital market insurance solutions provide to issuers and investors. Section four offers an overview of how the market for these solutions is developing. Section five discusses ten factors critical to their success. The report concludes by discussing the prospects for capital market insurance solutions.

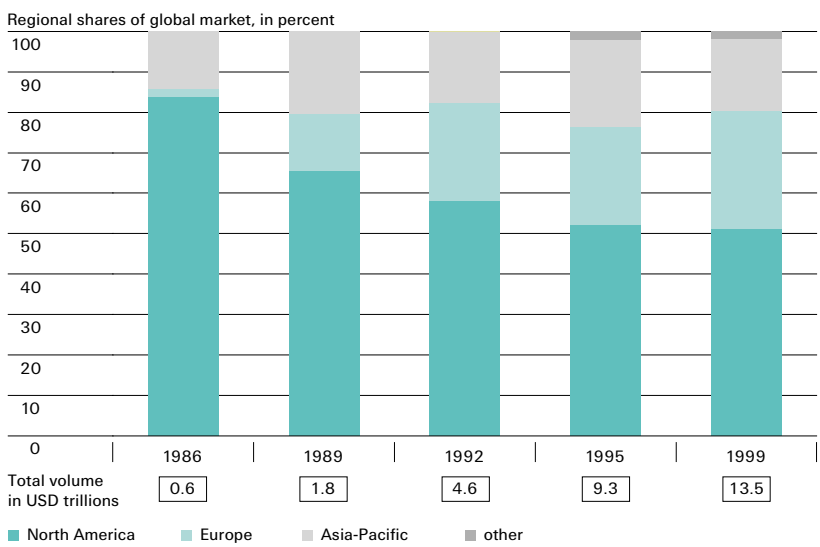
> These instruments [derivative products] allow users to unbundle risks and allocate them to the investors most willing and able to assume them. A growing number of financial and non-financial institutions have embraced derivatives as an integral part of their risk capital allocation... The profitability of derivative products has been a major factor in the significant gain in the finance industry's share of American corporate output during the past decade — a reflection of their value to non-financial industry.
>
> - Alan Greenspan[1]

Financial innovation is growing at an explosive pace.

The introduction of capital market innovations to the insurance industry reflects a broader trend toward financial innovation. One highly visible example of this innovation is the explosive growth in the trading of derivative securities. A derivative instrument, or 'derivative', is a financial contract whose value derives from the performance of an underlying asset. This underlying asset is commonly a stock, portfolio of stocks, bond, currency, or commodity. It can also be a pool of mortgages, a portfolio of credit card receivables, or an insurance contract.

Since 1986, the notional value of financial derivatives traded on organised exchanges throughout the world has grown more than 20-fold, or 27% per annum, reaching USD 13.5 trillion in 1999. Trading activity has quickly spread throughout the world (Figure 1). European and Asian exchanges, which accounted for a sixth of global trading in 1986, were responsible for nearly half by 1999.

Figure 1
Europe's share of the financial derivatives market is growing.



Note: The figures include a notional amount outstanding of exchange-traded interest rate, currency, and stock market index futures and options.

Source: Bank for International Settlements, taken from *International Capital Markets*, IMF, Sept 2000.

Derivatives are just one of many recent examples of financial innovation. Other important innovations include bank automated teller machines, captive insurers, Eurobonds, and money market funds. Financial innovations such as these occur in response to three basic forces: the demand for risk protection; the supply of risk protection; and taxes and regulation.

[1] Testimony of US Federal Reserve Bank Chairman Alan Greenspan on over-the-counter derivatives before the Committee on Agriculture, Nutrition and Forestry, United States Senate, 10 February 2000.

Demand-driven financial innovations

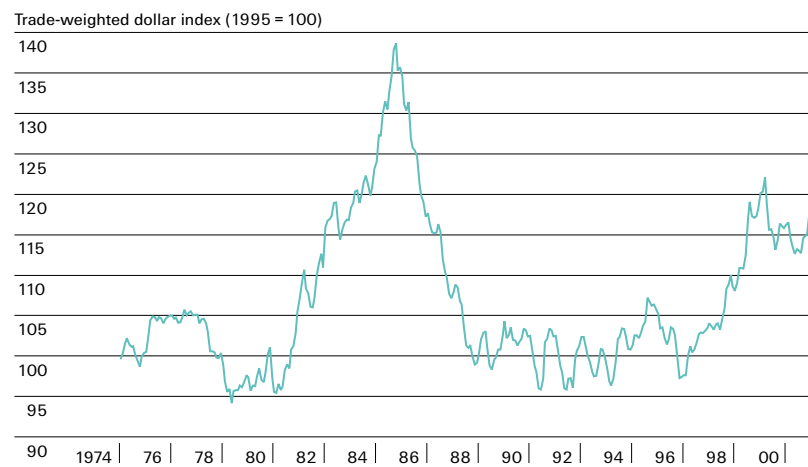
New risks increase the demand for risk protection.

Some financial innovations develop in response to demand for risk protection. When new risks arise, or existing risks grow more significant, companies seek ways to protect themselves.

In the 1970s, several asset price risks grew prominent. Interest rates, which had long been stable, rose sharply and became far more volatile than before. US savings and loans associations came under severe pressure to liquidate the mortgage loans on their books, stimulating the development of a market for mortgage-backed securities.[2] The twin oil price spikes of the 1970s stimulated demand for ways to hedge energy price risk.

In 1971, the Bretton Woods system of fixed exchange rates collapsed, exposing firms to significant currency risk. Following several years of stability, the dollar appreciated by nearly 50% from 1980-85, undermining the international competitiveness of American firms (Figure 2). European and Asian firms, though more experienced in international trade, also suffered dislocations.

Figure 2
Exchange rate volatility stimulated demand for currency futures and currency options.



Source: Federal Reserve Bank of Atlanta,
available at http://www.frbatlanta.org/econ_rd/dol_index/index.html.

Firms' desire to hedge against currency fluctuations stimulated financial innovation. In May 1972, the Chicago Mercantile Exchange began trading futures contracts for all major currencies.[3] In December 1982, the Philadelphia Stock Exchange introduced an option contract for pound sterling, followed by options for other major currencies.

[2] For a discussion of how interest rate volatility affected the insurance industry, see David Laster and Eric Thorlacius, "Asset-liability management for insurers," Swiss Re *sigma* No. 6/2000, pp. 7–11, available at http://www.swissre.com.

[3] An option is a contract that gives the holder the right, but not the obligation, to buy or sell an asset at a pre-determined price over a set time period. A call option offers the chance to buy an asset; a put option provides the opportunity to sell an asset.

Supply-driven financial innovations

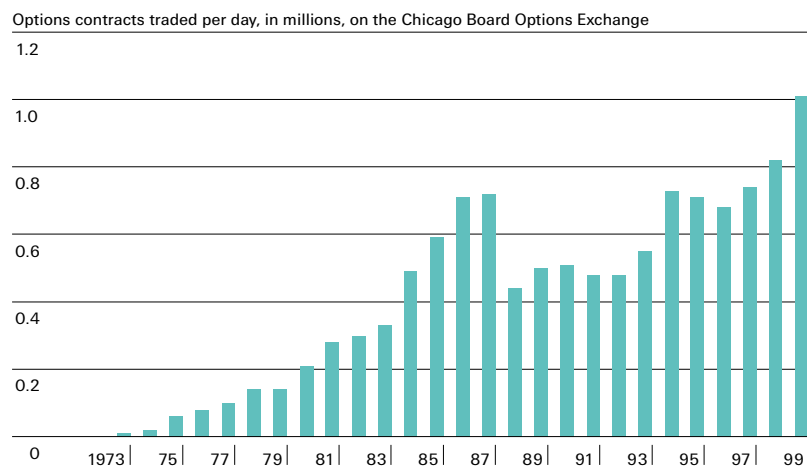
Supply-side forces reduce the costs of innovations, hastening their adoption.

Some financial innovations develop in response to forces that increase the supply of risk protection. These forces reduce the cost of financial innovations, hastening their adoption. Improvements in computer and telecommunications technology have dramatically reduced the costs of manipulating, storing, and transferring large amounts of data. Computing power that recently filled a room now sits comfortably on a desktop. Many esoteric securities that exist today are feasible only because of the low cost of information processing.

A related development is the maturation of finance as a discipline over the past few decades.[4] One landmark achievement was the creation of the Center for Research in Security Prices (CRSP; pronounced 'crisp') database in the mid-1960s. This effort provided the first complete record of returns to all New York Stock Exchange stocks from 1926 to 1960. CRSP data, and other market data sets from around the world, make it possible to test existing financial theories and develop new ones.

Another key area of development is the pricing of options. Though stock options have long existed, practitioners lacked a reliable way of valuing them until the pioneering work of Black, Scholes, and Merton. The dissemination of these models and their variants began at about the same time as the founding of the Chicago Board Options Exchange (CBOE) in 1973. Largely due to the availability of these models, daily CBOE options trading volume grew from 6500 contracts in 1973 to 326,000 contracts a decade later (Figure 3). Options trading spread to several other exchanges as well. Once the pricing of options, swaps, and futures became standardised, 'financial engineers' used these instruments as building blocks for designing new financial instruments and risk management strategies.

Figure 3
After the introduction of pricing models in the early 1970s, the options market grew rapidly.



Source: CBOE *Market Statistics,* 1999.

[4] For an informative and engaging treatment of this topic, see Peter L. Bernstein, *Capital Ideas,* Free Press, 1992.

Financial innovations also arise due to competitive pressures among financial institutions.

Aside from technological and academic progress, competition among financial service firms creates pressure to develop new financial products to stay ahead of the crowd. Once an innovation proves successful, competitors quickly duplicate it. For example, TIGRs, CATs, LIONs, and COUGARs are nearly identical types of zero-coupon bonds introduced by different investment houses in the early 1980s.[5] The desire to offer distinctive products spurs a cycle of innovation and duplication among competing firms.

Financial innovation soon develops a life of its own.

Once financial innovation becomes the norm, it develops a life of its own. Even if the forces that set financial innovation into motion cease, the process of innovation continues nonetheless, as change becomes institutionalised. In the 1970s and 1980s, leading banks and brokers established 'new products' groups to serve as engines of innovation. These firms consider research and development as much a part of their strategy as do innovative manufacturing firms. Another source of momentum is 'learning by doing'. The tenth customised financial product is far easier to develop than the first.

Box 1
Spiral of financial innovation

Robert C. Merton has characterised the evolution toward more efficient financial markets and intermediation as a 'spiral' of financial innovation:

1. In the first stage of the innovation spiral, there is a proliferation of standardised securities such as futures. These securities make possible the creation of custom-designed financial products, which make the market more complete.
2. In the second stage, volume in the new market expands as financial intermediaries trade to hedge their market exposures.
3. The increased trading volume in turn reduces transaction costs and thereby makes further implementation of new products and trading strategies possible, which leads to still more volume.
4. The success of these trading markets then encourages investment in creating additional markets, and the financial system spirals towards the theoretical limit of zero transaction costs and dynamically complete markets.

Source: Robert C. Merton, "Financial Innovation and Economic Performance," *Journal of Applied Corporate Finance,* Vol. 4, No. 4, Winter 1992.

[5] Zero-coupon bonds are securities that sell at a discount, do not pay interest, and are redeemed for their face value at maturity.

Financial innovation due to regulation and taxes

Regulation and taxes stimulate innovation.

A third major impetus for financial innovation is firms' desire to reduce their taxes and regulatory costs. The design of a security affects how it is taxed and regulated. Firms therefore seek cost-effective ways to structure their financial transactions.

Capital requirements also stimulate innovation. As highly regulated entities, financial service firms must meet capital and reserve requirements that, while serving a vital public purpose, constitute a hidden tax. Capital that firms must hold to meet regulatory requirements could earn a higher return elsewhere. Banks, insurers, and securities firms therefore devise new financial products to minimise the burden of capital requirements. There are many instances in which a tax or regulation has been the sand in the oyster producing pearls of financial innovation:

- The Federal Reserve's Regulation Q set a ceiling on rates that commercial banks and other institutions could pay on savings and other time deposits. In the late 1960s and early 1970s, inflation and interest rates rose sharply. In response, investors reduced their time deposits with banks to invest in higher yielding securities. To remain competitive, banks developed the Eurodollar and commercial paper markets. Eurodollars are deposits outside the US denominated in dollars, not subject to the interest rate ceiling imposed by Regulation Q. Commercial paper issued by banks was not treated as deposits and was therefore exempt from Regulation Q. The mortgage-backed securities market also thrived in this environment.

- A *swap* is a financial transaction in which two parties agree to exchange a series of cash flows. British firms started the market for swaps in the 1960s in response to UK foreign exchange restrictions on transfers of funds to their foreign subsidiaries.

Merton Miller argues: "The government is virtually subsidising the process of financial innovation just as it subsidises seeds and fertilisers, but with the important difference that in financial innovation the government's contribution is typically inadvertent."[6]

Example: mortgage-backed securities

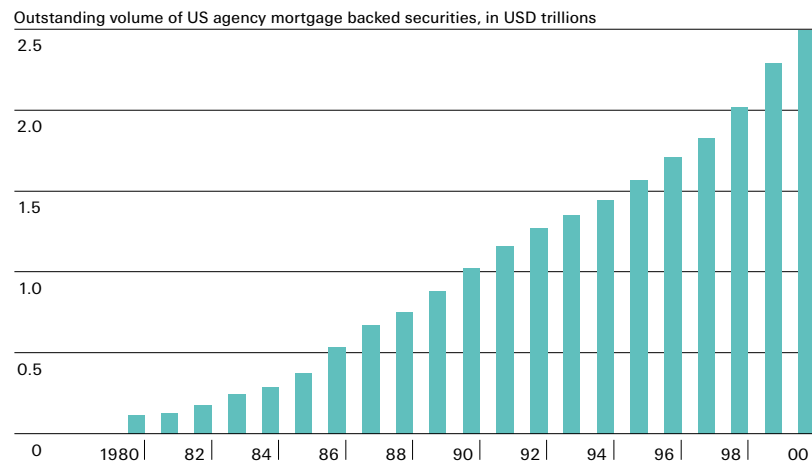
Demand and supply forces, taxes, and regulation initiated the development of mortgage-backed securities.

The way the market for mortgage backed securities developed illustrates some of the key drivers of financial innovation. In the early 1970s, government agencies such as the Federal National Mortgage Association ('Fannie Mae') and the Federal Home Loan Mortgage Corporation ('Freddie Mac') began pooling mortgages and selling them to investors as mortgage-backed securities (MBSs). Initially, many investors chose not to participate in the secondary market for mortgages because of the problem of prepayment risk. As interest rates became highly volatile, the timing of mortgage prepayments grew more erratic. Investors, uncertain about the timing of cash flows they would receive from owning MBSs, elected not to purchase the securities.

[6] Merton Miller, "Financial Innovation: The Last Twenty Years and the Next," *Journal of Financial and Quantitative Economics,* Vol. 21, No. 4, Dec. 1986.

To make MBSs more palatable to investors, a new structure called the *collateralised mortgage obligation* (CMO) emerged. CMOs mitigate prepayment risk by redirecting cash flows from underlying collateral pools to bond classes called *tranches.* This structure creates securities with different exposures to prepayment risk, providing a variety of risk/return profiles designed to suit different investors. CMOs expanded the reach of the mortgage market by creating tranches whose timing of cash flows was more or less assured. The Real Estate Mortgage Investment Conduit provision under the 1986 tax reforms allowed CMOs to be tax exempt if certain conditions were met. These developments boosted the volume of MBSs to unprecedented levels (Figure 4).

Figure 4
A tax exemption for collateralised mortgage obligations bolstered demand for mortgage-backed securities after 1986.



Source: Bond Market Association, available at http://www.bondmarkets.com/Research/mbsdat2.shtml.

The emergence of mortgage-backed securities illustrates how demand and supply of risk protection, taxes, and regulation work together to stimulate financial innovation:

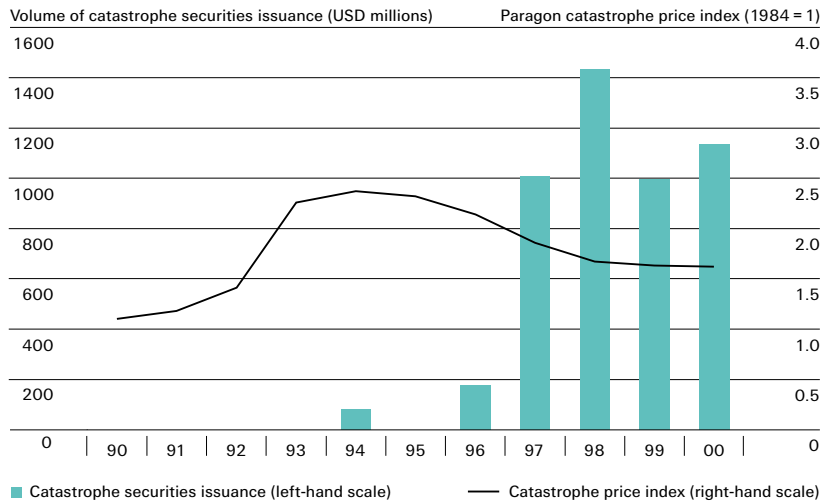
- *Demand.* The savings and loan crisis created a need for increased liquidity in the mortgage market, which in turn fostered innovation. The CMO structure was developed in response to investors' reluctance to assume prepayment risk.
- *Supply.* Computer and information technology enabled financial institutions to design CMO tranches with payment streams that investors deemed desirable.
- *Taxes and regulation.* The active role played by the US government, including the tax rules it instituted in 1986, facilitated the securitisation of mortgages.

A final lesson is that it may take several years for an innovation to win broad acceptance. Mortgage securitisation, begun in the early 1970s, did not become a major asset class until the 1980s.

Hurricane Andrew and the Northridge earthquake boosted demand for risk transfer capacity.

A series of major catastrophes can precipitate a shortage of global property catastrophe reinsurance capacity, driving up prices. For example, reinsurance was in very short supply in the wake of Hurricane Andrew and the Northridge earthquake, causing premium rates to more than double between 1991 and 1994 (Figure 5). These events set into motion industry efforts to find alternative sources of reinsurance capacity.

Figure 5
In the early 1990s, high reinsurance rates created interest in the securitisation of insurance risk.

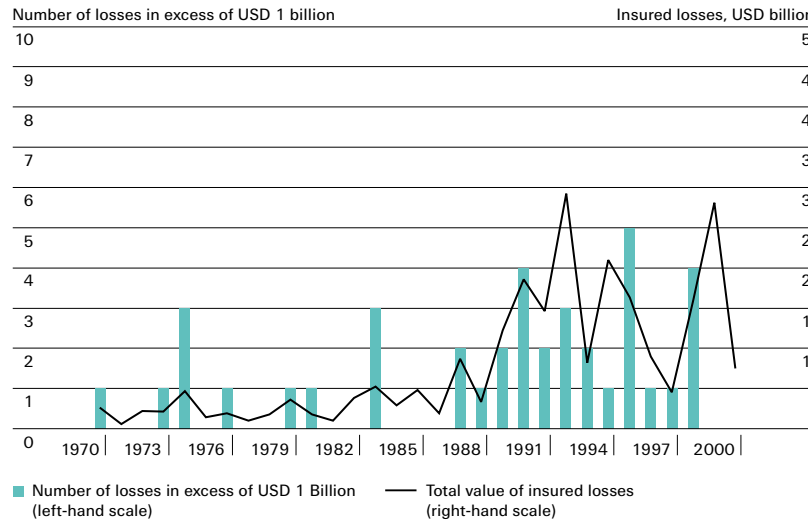


Sources: E. W. Blanch; Swiss Re Capital Markets.

Although property catastrophe reinsurance rates have declined from their 1994 levels, the need for catastrophe insurance continues to expand. Growing population densities, increasing wealth, and rising concentrations of property in endangered areas have created a clear long-term trend toward natural catastrophe losses of increasing severity*. The number of inflation-adjusted billion-dollar natural catastrophes grew from seven in the 1970s to nine in the 1980s and 32 in the 1990s (Figure 6). The reinsurance industry, moreover, regularly experiences capacity constraints for specific catastrophe exposures.

* See Swiss Re, *sigma* No. 2/2001, "Natural catastrophes and man-made disasters in 2000: fewer insured losses despite hudge floods", available at http://www.swissre.com.

Figure 6
Natural catastrophes intensified in severity in the 1990s.



Note: All values are adjusted for inflation and expressed in 2000 prices.

Source: Swiss Re Economic Research & Consulting, catastrophe *sigma* database.

Some of these exposures are of staggering magnitude. Consider:[7]

- an earthquake of magnitude 8.5 on the New Madrid Fault in the central United States can produce insured losses exceeding USD 115 billion.
- a Tokyo earthquake of similar likelihood can produce insured losses of USD 40 billion.
- a Florida hurricane with sustained wind speeds of more than 150 mph can produce insured losses exceeding USD 75 billion.

Because adequate insurance coverage for catastrophe exposures such as these is either prohibitively expensive or unavailable at any price, many catastrophe exposures are only partially insured. Thus, the uninsured losses realised in the wake of one of these catastrophes might be several times larger than the magnitudes listed above. Faced with this sobering reality, industry participants have begun developing capital market insurance solutions to help insure against property catastrophe risks.

Capital market insurance solutions provide the capacity desired.

The basic logic is compelling. Publicly traded stocks and bonds have a total market value of USD 60 trillion. Imagine that securities investors were to add securities linked to catastrophe risks to their stock and bond portfolios. A USD 250 billion event would represent less than 0.5% of the global market portfolio. Fluctuations of this magnitude are a normal daily occurrence in securities markets. Capital market insurance solutions also offer advantages for non-catastrophic lines of business, not only for issuers, but also for investors.[8]

[7] Insurance Services Office, Inc., *Financing Catastrophe Risk: Capital Market Solutions,* January 1999, p. 8; David Durbin, "Managing Natural Catastrophe Risks: The Structure and Dynamics of Reinsurance," *Geneva Papers on Risk and Insurance,* Spring 2001.

[8] For a more extensive treatment of these advantages, see Gail Belonsky, David Laster, and David Durbin, "Insurance-Linked Securities," Swiss Re New Markets, available at www.swissre.com, pp.16–22. Reprinted as Chapter 10 in Prakash Shimpi ed., *Integrating Corporate Risk Management,* Texere, 2001.

Advantages for issuers

Capital market insurance solutions offer issuers pricing benefits and opportunities to minimise credit risk.

Pricing and availability

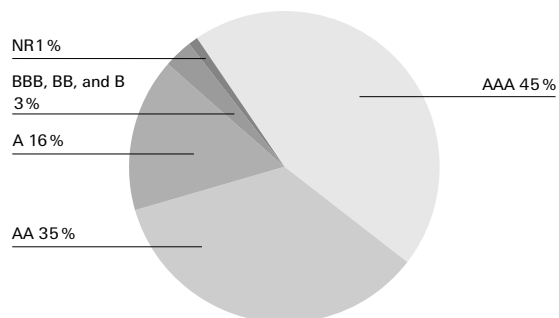
Large-scale purchasers of reinsurance often find that the coverage they seek is either unavailable or prohibitively expensive. This is because reinsurers limit their exposure to any one risk. Consequently, securitisation can sometimes cost less than traditional reinsurance or can offer capacity that is not available on the traditional reinsurance market. Moreover, securitisation provides multiyear coverage at a set price. Multiyear pricing insulates the issuer's cost structure from fluctuations in reinsurance prices.

Credit risk

Purchasers of reinsurance take counterparty risk into account when choosing their reinsurers. The times when reinsurance matters most are often the times when reinsurers are undergoing financial stress. Insurers therefore diversify their sources of reinsurance and prefer doing business with financially strong reinsurers. As evidence of this preference, reinsurers rated below AA as of 1999 wrote just one-fifth of reinsurance premiums (Figure 7).

Figure 7
The top-rated global reinsurers command a large market share.

Market share of the hundred largest reinsurers, by 1999 rating category



Source: Standard & Poor's *Global Reinsurance Highlights,* 2000 Edition.

Capital market insurance solutions can be structured to minimise credit risk. When catastrophe bonds are issued, the funds collected are invested in investment-grade securities and guaranteed by a highly rated company. The securities are held as collateral in a trust account for the benefit of the reinsured and the investors. A non-US reinsurer usually establishes the trust account as a special purpose vehicle (SPV), which transforms the risk from reinsurance risk into an investment security. Because the SPV holds capital dollar for dollar against all potential claims, the arrangement can offer greater credit quality than conventional reinsurance, albeit at greater cost.

Diversifying sources of capacity

Companies seeking to minimise the cost of financing diversify their funding sources. Even if one source of credit is slightly more expensive than another, a company might still access both just to be prepared for changing market conditions. Similarly, even if insurance securitisation is now more costly than reinsurance, it may still pay to tap the market. Doing so will allow quick and easy market access should changing conditions make securitisation the lowest-cost source of coverage.

Advantages to investors

Insurance-linked securities offer investors attractive returns and portfolio risk reduction.

High expected returns

Catastrophe bonds typically pay interest rates close to those for similarly rated esoteric structured paper. These rates tend to be higher than those for corporate debt and traditional asset-backed paper (e.g. MBSs, credit card receivables) carrying the same credit rating. In particular, a representative sample of 17 catastrophe bonds issued from 1997 to 2000 were priced at an average spread of 4.2% above the risk-free London Interbank Offered Rate (LIBOR), even though their expected losses averaged just 0.6%. These high spreads compensate investors for: the relative illiquidity of catastrophe bonds; model risk (concern that expected losses are actually higher than estimated); and the non-traditional nature of the securities.[9]

Portfolio diversification

Empirical analyses show that the occurrence of insurance-related events is uncorrelated with the returns to stocks and bonds. Thus, investing in insurance-linked securities (ILSs) reduces the overall riskiness of an investment portfolio.[10]

[9] The higher expected returns priced into non-traditional securities are also known as the 'newness premium'.

[10] According to estimates by Guy Carpenter, adding a 2% allocation of catastrophic risk to a portfolio of 60% stocks and 40% bonds reduces the standard deviation of portfolio returns by 0.25%. Similarly, Belonsky, et al, op cit., demonstrates the risk impact of adding cat bonds to a diversified portfolio.

Approximately USD 12.6 billion of capital market insurance solutions have been issued since 1996.

In recent years, firms have developed a new class of financial instruments that transfer insurance risk to the capital markets. Approximately USD 12.6 billion of these capital market insurance solutions have been issued since 1996.

Recent innovations

Catastrophe bonds

Nearly half of insurance securitisation transactions to date have involved catastrophe bonds (popularly known as cat bonds). In a typical transaction, an SPV enters into a reinsurance contract with a cedent and simultaneously issues cat bonds to investors. If no loss event occurs, investors receive a return of principal and a stream of coupon payments that compensate them for the use of their funds and their risk exposure. If, however, a pre-defined catastrophic event does occur, investors suffer a loss of interest, principal, or both. These funds are transferred to the cedent, in fulfilment of the reinsurance contract.[11]

Catastrophe swaps

Another common way to transfer catastrophe risk is through a swap transaction, in which a series of fixed, predefined payments is exchanged for a series of floating payments whose values depend on the occurrence of an insured event. The transaction can be structured as a swap or an option, but the cash flows are the same. The cedent can enter into the swap directly with counterparties or through a financial intermediary. Swaps, by design, offer benefits over catastrophe bonds. They are simpler to implement and entail fewer fixed costs. Unlike cat bonds, they do not tie up capital in an SPV. Swaps do, however, entail credit risk.

Industry loss warranties

An industry loss warranty (ILW) resembles a catastrophe swap but is structured as a reinsurance transaction. The risk transfer mechanism is a double trigger that is activated only if insurance industry losses and actual losses incurred by the purchaser of the ILW both exceed prespecified thresholds. Because of the indemnity requirement, the ILW can be treated as reinsurance rather than as a swap. The actual loss layer is set so low relative to the industry loss layer, however, that the actual loss event is very likely to occur should the industry loss event occur. As such, the ILW is priced based on the risk associated with the industry loss layer.

Contingent capital

Contingent capital instruments provide the buyer with the right to issue and sell securities at a fixed price for a fixed period of time if a predefined event occurs. These securities may be equity, debt, or some hybrid. For example, an insurance company can purchase the right to issue securities to investors at a pre-negotiated price if catastrophe-related losses exceed a certain threshold. Contingent capital differs from insurance in that it does not provide indemnification. It provides access to capital that either dilutes equity or must be repaid.

[11] For a more detailed description see Belonsky et al, op cit.

Life securitisation

In a life securitisation transaction, an insurance company sells its rights to receive mortality and expense fees or policy acquisition expenses to an SPV. The SPV finances the purchase of these rights by issuing securities to the capital markets. There is an important difference between the life securitisation deals that have occurred to date and property catastrophe securitisations. In the life deals, although some risk has been transferred, the primary motive of issuers appears to be obtaining financing for new business. Cat bond transactions, by contrast, transfer risk to the capital markets.

Bank-funded life reinsurance

Another financial product that some regard as a securitisation is bank-funded life reinsurance. This takes the form of a traditional financial reinsurance arrangement, where a reinsurer coinsures a book of life business. The reinsurer agrees to pay a percentage of all future claims on a book of life business and receives in return the same percentage of premiums and investment earnings associated with that business. The aggregate value of premiums and investment income is expected to exceed that of claims, generating profits. The reinsurer pays a ceding commission to the insurer for a share of these expected profits. The reinsurer funds the ceding commission by selling the rights to the profits to a commercial paper conduit (provided by a bank) for a higher price. Because commercial paper is short term (usually less than 270 days), the reinsurer assumes the risk that at some future time the conduit will be unable to reissue its commercial paper. If this occurs, the reinsurer must usually repurchase the remaining profits from the conduit.

Exchange-traded options

Although efforts to date to develop exchange-traded catastrophe options such as the PCS options listed on the Chicago Board of Trade have not been successful, exchange-traded instruments may eventually become a widely accepted means of transferring insurance risk to capital markets. PCS exchange-traded catastrophe call options are standardised contracts that provide the purchaser with a cash payment if an index measuring catastrophe losses exceeds a certain level, known as the *strike price*. If the catastrophe index remains below the strike price for the prespecified time period, the options expire worthless and the seller keeps the premium. If, however, the catastrophe loss index exceeds the strike price, the purchaser of the options receives – and the seller provides – cash payment equal to the difference between the catastrophe index and the strike price. An insurer purchasing a catastrophe call option is hedging against the risk that large aggregate market losses, as measured by the index, will exceed the strike price.

Although all these instruments transfer insurance risk to capital markets, some are more suitable than others in particular situations. To illustrate the differences between these instruments, Table 1 highlights the advantages and limitations of capital market insurance solutions vis-à-vis property catastrophe reinsurance, the traditional means of protecting against catastrophe losses. In particular, it compares catastrophe bonds (a debt instrument), PCS options (an exchange-traded instrument), and contingent capital with traditional property catastrophe reinsurance.

Table 1
Comparison of capital market instruments with reinsurance

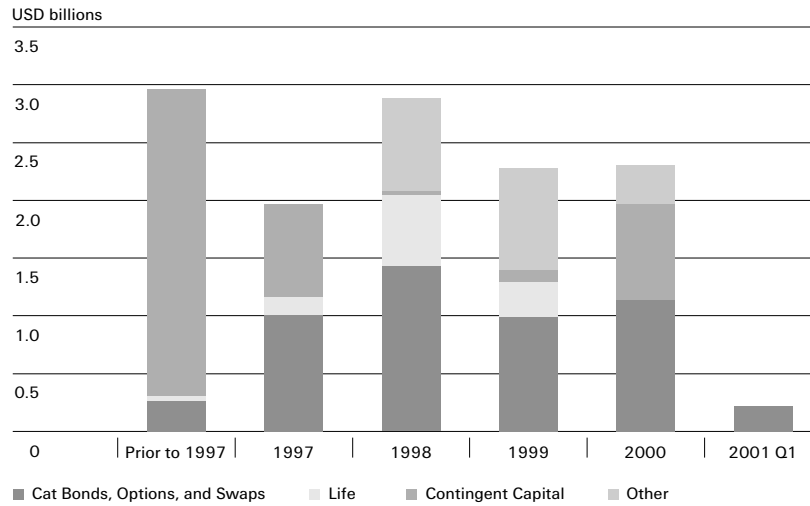
	Cat bonds/swaps	PCS options	Contingent capital	Property catastrophe reinsurance
Compensation/ financing	Compensates buyer against losses, subject to basis risk	Compensates buyer against losses, subject to basis risk	Provides financing on pre-agreed terms in case of loss event. No indemnification	Compensates reinsured against losses
Basis risk[12]	Present in deals with trigger based on index	Significant	Depends on the index/trigger used	Minimal
Credit risk	Minimal. Capital is invested in safe securities held by trustee	Minimal. Obligations guaranteed by the exchange	Minimal. Capital is invested in safe securities held by trustee	Depends on solvency of the reinsurer
Liquidity for risk taker	Currently low. Expected to improve as market develops	Currently low. Expected to improve as market develops	Low	Limited to retrocession market
Well-established underwriting accounting rules?	Yes	No	No	Yes
Well-established accounting rules for investors?	Yes	Yes	No	Yes
Standardisation	Customised	Standardised	Customised	Customised
Multiyear pricing	Available	No	Available	Availability depends on market conditions
Transaction costs relative to reinsurance	High, expected to decrease as firms gain experience	Low	High, expected to decrease as firms gain experience	N/A

Market developments

To date, more than USD 5 billion of property catastrophe risk has been securitised worldwide. The first non-exchange-traded capital market product that insured against catastrophe losses was a USD 85 million cat bond issued in 1994 by Hannover Re. Cat risk securitisation achieved an annual volume of USD 1 billion in 1997 and USD 1.4 billion in 1998 (Figure 8). This rapid growth raised the expectation among market participants that capital markets would soon develop into a significant channel for sharing catastrophe risk. Then the growth halted. What happened? A 21% decline in property catastrophe reinsurance prices from 1996 to 1998 made the pricing of securitisation deals less attractive by comparison (Figure 5).

[12] In the context of capital market insurance solutions, basis risk is the risk that the compensation that the insured receives may differ from the losses it incurs.

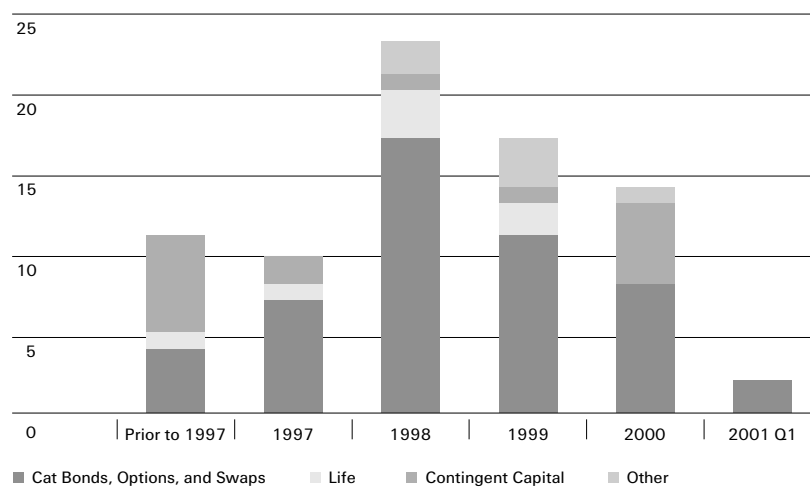
Figure 8
The issuance of catastrophe-linked securities stagnated after reinsurance rates fell in the late 1990s.



Notes: Data exclude some contingent capital transaction renewals. The category "Other" includes some of the credit-related transactions executed. Transactions were included either on the basis of their unique structures or because they were issued by (re)insurers.

Source: Swiss Re Capital Markets.

Figure 9
The number of reported transactions.

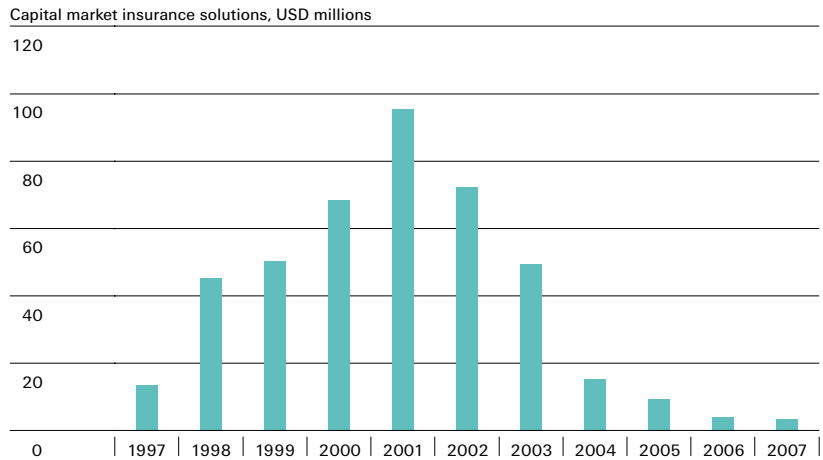


Source: Swiss Re Capital Markets.

Issuance volumes tend to overstate the true economic significance of ILSs relative to the insurance market. For example, issuing USD 100 million worth of cat bonds for which the rate on line of the embedded premium is 3% actually provides insurance protection with an economic value of just USD 3 million per year.[13] This concept can be termed the *premium equivalent* of an ILS. To calculate the premium equivalent of a capital market solution, we multiply the size of the transaction by the spread over LIBOR (comparable to the rate on line). The premium equivalent increased more than fivefold from 1997 to 2000, when it reached USD 68 million (Figure 10). Though this growth is robust, the total amount of coverage still represents less than 0.5% of worldwide catastrophe insurance premiums.

[13] This assumes that 100% of the capital is at risk. If less is at risk, the premium equivalent is correspondingly lower.

Figure 10
The premium equivalent of capital market insurance solutions is rising rapidly, but is still small.

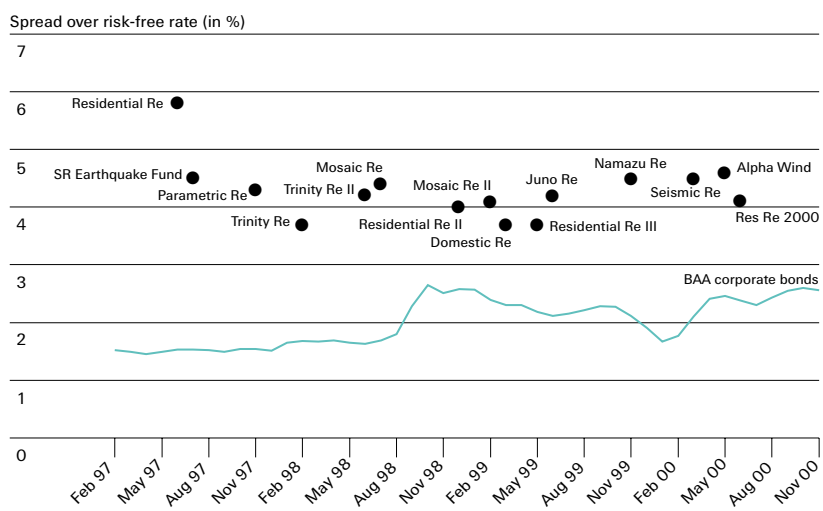


Notes: The premium equivalents for 2001 to 2007 include only deals closed by the end of 2000. These figures include only cat bonds and notes, cat swaps and options, and options to issue.

Source: Swiss Re Capital Markets.

In transactions to date, spreads initially declined and then stabilised. One indication of this trend is the pricing of four cat bonds issued by Residential Re. The first Residential Re transaction, conducted in 1997, was priced to yield an expected return (coupon minus expected loss) of approximately 500 basis points (bp) over LIBOR.[14] This spread decreased to about 350 bp for the next Residential Re deal in 1998 and remained roughly constant for 1999 and 2000 deals. Further declines in spread can be expected once liquidity improves and investors become more familiar with the securitisation process.

Figure 11
The yield spread of catastrophe bonds over government bonds is much higher than that of corporate debt and has not declined over time.



Note: For BAA corporate bonds, spreads are calculated with respect to Treasury bond yields. For cat transactions, spreads are computed with respect to LIBOR.

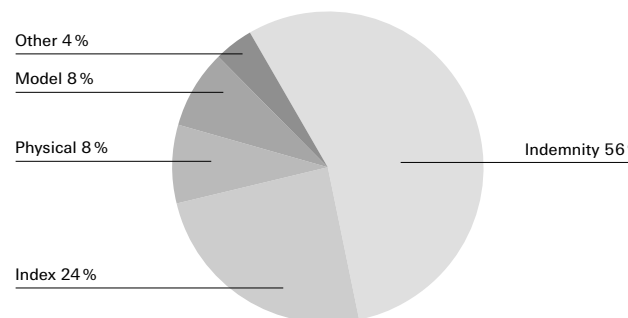
Sources: Markus Schmutz, Swiss Re Capital Markets; Standard & Poor's.

[14] A basis point is defined as 0.01%. Thus, 500 basis points equals 5%.

Most deals have triggers based on indemnity, industry losses, or physical magnitudes.

The vast majority of cat securitisations relies on one of three types of trigger – indemnity, index, or physical (Figure 12). The first type of securitisation uses settlements based on actual insurer losses. Although these deals have no basis risk, they do have the disadvantages of adverse selection (the insurer may be trying to cede precisely those risks that it knows to be most problematic), moral hazard (after reinsurance is bought, the insurer has less incentive to mitigate the risk), and lengthy development periods (the time it takes to settle claims). The second type of securitisation, of which the 1997 issuance by Swiss Re Earthquake Fund is an example, uses settlements based on industry losses reported by an independent agency, such as the Property Claims Service. A disadvantage of index-based deals such as these is that they may pose substantial basis risk to the issuer. The third type of cat securitisation uses a physical index to settle claims. One such issue, by Parametric Re Ltd., used the magnitude of earthquake activity in and around Tokyo as measured by the Japan Meteorological Agency to determine payouts.

Figure 12
Catastrophe securitisations use several distinct types of trigger.

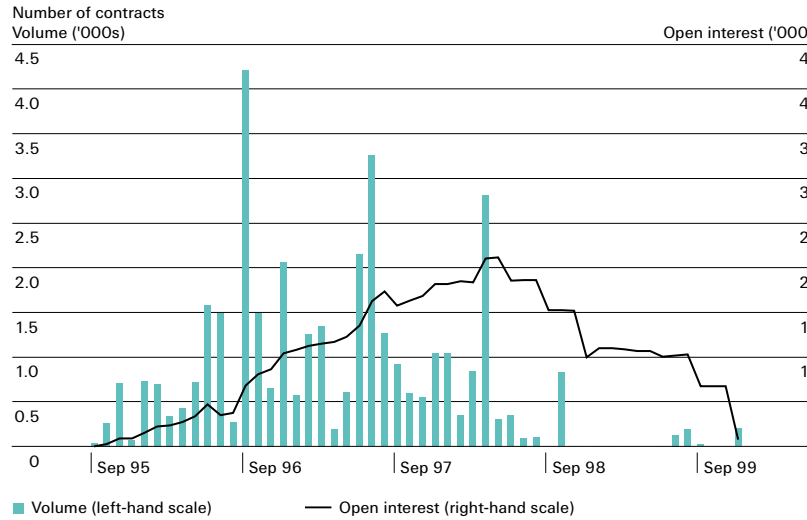


Source: Swiss Re Capital Markets.

Though most securitisations to date have been related to catastrophe events, there have been a few notable life securitisation deals as well. Hannover Re transferred its new policy acquisition costs to the capital market in 1998 and has followed with three more offerings. Other companies that have done successful life securitisations include National Provident Institution, American Skandia Life, and Alleanza/Generali. Most of these deals have been motivated by the need for funding as opposed to risk transfer.

Futures and options contracts based on the initial version of the Chicago Board of Trade (CBOT) cat index began trading in December 1992, but there was little activity in the market. Trading in these securities was halted. A second version of the index, compiled by PCS, was introduced in 1995. These securities met with limited success (see Box 2 for more details). At its peak, the total capacity created by PCS options was USD 89 million. Trading in these options has slowed to a virtual halt (Figure 13).

Figure 13
PCS options trading activity has dwindled to virtually zero due to lack of interest.



Source: Chicago Board of Trade.

Box 2
What would increase the use of cat options?

In a survey on the use of cat options, only 9 of 177 insurance company managers, or 5%, reported using catastrophe insurance options. The principal reasons the managers cited for not using the options were a perceived lack of market liquidity and the view that derivatives were risky and might lead to increased regulatory oversight. The fact that few managers actually responded to questions on insurance options indicates that there was uncertainty regarding the design and use of these derivatives. Some respondents also cited lack of qualified personnel, the need to educate management, and resistance from decision-makers as major obstacles to the use of insurance derivatives.

Factors that insurance companies' managements perceive will increase the use of catastrophe insurance options

Rank	Factor	Percentage of all respondents (N=177)
1	Clarification by regulators of the rules governing the use of catastrophe insurance options	43.2
2	More information on the specifics of catastrophe insurance options	36.9
3	More training on how to hedge using catastrophe insurance options	33.5
4	Tax deductibility of losses from trading catastrophe insurance options	25.0
5	Availability of customised index for catastrophe insurance options	24.4
6	Prevention of manipulation of the index through reported losses	22.7
7	Availability of an annual loss period	21.6
8	Access to non-insurance or foreign affiliates to trade catastrophe insurance options	3.4

Source: Raja Bouzouita and Arthur J. Young, "Catastrophe Insurance Options: Insurance Companies Management's Perception", *Journal of Insurance Regulation,* Vol. 16, No. 3, Spring 1998.

In a separate initiative, the Bermuda Commodities Exchange (BCE) was launched in 1997 to trade property catastrophe-linked option contracts. The BCE suspended operations in 1999 due to lack of activity.

These developments suggest two questions: How might capital market insurance solutions evolve in coming years? What will it take for today's spurts of capital market activity to mature into a full-fledged market?

Thirty years ago it would have been difficult, if not impossible, to envision the sophisticated markets for mortgage- and asset-backed securities that now exists. A complex dialectic between technology, finance theory, and regulatory practice has facilitated great strides in the ability of institutions and individuals to trade these assets. What might the next thirty years have in store for the trading of insurance risk?

Market evolution

Of several securities with identical cash flows, investors may prefer some to others.

Deciding how to package a given risk or group of risks is not an exact science. Risks can be packaged in many different ways, only some of which will succeed. Property catastrophe risk, for example, can be packaged as a bond, swap, future, or option. Even among securities with identical cash flows, investors feel more comfortable with some than with others. Because they invest chiefly in bonds, insurers might prefer thinking of cat risk as a bond rather than a swap. The choice of structure also has legal, regulatory, and tax consequences. Underwriters must experiment with a variety of structures to discover ones that appeal to investors as well as issuers.

Capital market insurance solutions, like any other innovation, entail substantial start-up costs. In the face of great uncertainty, pioneers must invest millions of dollars in personnel, training, and legal costs while experimenting to see what types of solutions work for clients. These costs will decline over time once successful financial products become standardised, personnel gain experience and the legal obstacles are overcome.

Markets evolve. Many innovations fail to attract investors. Those that succeed attract attention and imitation. New entrants innovate further, creating variations of successful instruments designed to better meet the needs of particular issuers or investors. The regulatory or investing climate can change suddenly, as regulators view an instrument with greater suspicion or investors lose interest in an asset class. New tax or securities laws can put an end to one security structure while giving rise to others. Just as climactic change in a rain forest favours certain plants and animals, changes in the financial environment spell the end of certain innovations while calling forth others.

Ten determinants are key to how successfully capital market insurance solutions develop.

Discussions with industry participants point to ten factors that are critical to the successful development of capital market insurance solutions.

1. Hard reinsurance market

Hardening insurance markets would facilitate greater acceptance of capital market insurance solutions.

By far the most important determinant of the success of capital market insurance solutions is whether they can offer issuers competitive pricing. Rising reinsurance rates in the early 1990s stimulated the demand for capital market insurance solutions to substitute for reinsurance. Just as these solutions began to develop in the mid-1990s, however, reinsurance premium rates declined to levels so low that capital market insurance solutions were, by and large, no longer competitively priced (Figure 5). Box 3 describes another example of how poor timing can thwart financial innovation.

A hardening of the reinsurance market would help foster greater acceptance of capital market insurance solutions. A major catastrophe or a downturn in securities prices that renders several insurers insolvent could precipitate this. The unavailability of ample, reasonably priced insurance or reinsurance has spurred innovation before, accelerating the growth of captives in the 1970s and the founding of the Bermuda market in the 1980s.

Box 3
Poor timing and the market for CPI futures

The CPI futures market provides another example of financial innovation being thwarted by poor timing. A Consumer Price Index (CPI) futures market would allow investors to hedge against rising inflation. Proposed in the US in the early 1970s when inflation was high, the CPI futures market won endorsement by Nobel laureates Paul Samuelson and Milton Friedman. By the time the Coffee, Sugar and Cocoa Exchange introduced these contracts in 1985, inflation had already moderated; the market was essentially dead by 1986. A similar market for CPI futures was introduced quite successfully in Brazil in 1986 during an inflationary period. The success ended when the Brazilian government shut it down as an anti-inflation measure.

Source: Stefano Athanasoulis, Robert Shiller, and Eric van Wincoop, "Macro Markets and Financial Security", Federal Reserve Bank of New York, *Economic Policy Review*, Vol. 5, No. 1, April 1999.

2. Liquidity

Capital market insurance solutions will gain greater acceptance once they become more liquid.

Another key attribute of insurance linked-securities (ILSs) is their liquidity. If the secondary market for these securities is active, investors can unwind their positions with a minimum of difficulty and at low cost. The absence of this liquidity makes the securities a less attractive investment vehicle. The need for liquidity is a 'chicken-and-egg' problem: for the pricing on ILSs to improve, more investors must become interested in them. Investors, however, would rather see more deal flow before devoting time and effort to analysing these securities.

Traditional reinsurance markets are far less liquid than securities markets. An active market for ILSs could make insurance risks substantially more liquid than they are today. Experimentation will include the creation of new contracts on established commodity exchanges and the development of entirely new exchanges dedicated to the efficient exchange of risks among insurers. Both approaches have been tried; each is a reasonable possibility. Just as leading securities firms have found it worthwhile to create new electronic exchanges to facilitate the efficient trading of stocks and bonds, insurers should find value in developing efficient mechanisms for sharing risks.

If the market for ILSs attains a critical mass, it will command more serious attention from institutional investors. Today, mortgage-backed securities are viewed as an asset class. Many institutional investors routinely allocate a set percentage of their portfolios to these securities based on their overall return, risk, and correlation characteristics. Once ILSs develop a track record, they too can strive to achieve the status of a regular asset class.

3. Transparency

The transparency benefits of capital market solutions must outweigh the information advantages of reinsurers.

A key advantage of capital market insurance solutions is that they permit greater transparency, thereby allowing a larger group of investors to bear a given risk than was previously feasible. This advantage is important because capital market insurance solutions compete with reinsurance, a mature, standardised means of risk transfer that is widely accepted in the marketplace and simple to execute. The reinsurance industry is global, well established, and possesses the expertise needed to underwrite a wide range of risks. For capital market insurance solutions to succeed, the benefits of transparency must outweigh the information advantage and skills that reinsurers possess.

This suggests that the lines of business that can be securitised most efficiently are those for which the risks are transparent and understandable to potential investors from outside the industry. Developing standardised ILS structures will enhance this transparency, broadening the range of potential investors. In support of these efforts, insurers must also undertake technological investments to standardise record keeping throughout the industry in order to facilitate the exchange of risks.

4. Resolution of regulatory, accounting, and tax ambiguities

Clarifying rules and regulations will improve the prospects for capital market insurance solutions.

Regulatory, legal, tax, and accounting rules heavily influence whether, and how widely, a financial innovation is adopted. As the rules and regulations governing capital market insurance solutions grow clearer, insurers will become more willing to securitise their risks. One survey found this to be a factor critical to the success of capital market insurance solutions (see Box 2).[15] Because of their newness, however, some capital market reinsurance solutions presently receive less favourable regulatory treatment than reinsurance. As tax and regulatory authorities grow familiar with these instruments, they will be better equipped to establish clear standards and regulations.

The recent trend in many countries has been to develop regulation along functional lines, in recognition of the great similarity of various financial instruments (see Box 4). It is in the interest of leading insurers to work together with supervisors to promote a better understanding of the role that capital market insurance solutions play and of what an appropriate regulatory framework might be.

[15] The survey was specific to PCS options, but the results may be generalised to other capital market insurance solutions.

Box 4
Substitutability between markets raises challenges for regulators

Because there are often several equivalent ways of executing a transaction, it can be a challenge to regulate a financial transaction and all of its equivalents. In the US, regulating all the ways of executing a transaction can require co-ordination among the Securities and Exchange Commission, the Federal Reserve, the Comptroller of Currency, and state banking, insurance, and securities regulators. This highlights the advantage of organising regulation along functional, rather than institutional, lines and the need to co-ordinate financial regulation internationally.

One illustration of equivalent transactions that achieve the same purpose is the leveraged purchase of the stocks in the Standard & Poor's 500 index (S&P 500):

Ways of taking a leveraged position in the S&P 500

- buy each stock individually on margin in the cash stock market
- invest in an S&P 500 index fund and borrow from the bank to finance the purchase
- go long with a futures contract on the S&P 500
- go long with an over-the-counter (OTC) forward contract on the S&P 500
- enter a swap to receive the total return on the S&P 500 and pay LIBOR or some other fixed interest rate
- go long on exchange traded calls and short puts on the S&P 500
- go long on OTC calls and short puts on the S&P 500
- purchase an equity-linked note whose payoff is based on the S&P 500 and finance it by a repurchase agreement
- buy on margin or purchase the capital appreciation component of a unit investment trust that holds the S&P 500
- borrow to buy a variable rate annuity contract with a return linked to the S&P 500

Source: Robert C. Merton, "Financial Innovations and the Management and Regulation of Financial Institutions," *Journal of Banking and Finance,* 1995.

5. Development of better benchmarks

Insurance industry benchmarks are crucial to the development of a liquid market.

An important step on the road to a liquid market for ILSs is the establishment of benchmarks through which industry participants can monitor the progress of a given region or line of business. The existence of well-accepted stock market indices such as the FTSE100 and the Nikkei 225 and benchmark securities like the ten-year Treasury bond greatly facilitates the development of financial derivatives. Analogous benchmarks for the insurance industry are needed to provide a solid foundation for capital market insurance solutions (Box 5). The absence of a suitable benchmark will discourage issuers or investors from trading insurance risks. For example, recent research suggests that contracts based on available regional indices in the US are not sufficiently disaggregated and would therefore cause substantial basis risk for insurers seeking to hedge their portfolios.[16] Industry indices have begun to emerge and will continue to be refined in coming years.

[16] Scott Harrington and Greg Niehaus, "Basis Risk with PCS Insurance Derivatives Contracts," *Journal of Risk and Insurance,* Vol. 66, No. 1, pp. 49-82, 1999.

Box 5
Characteristics of an effective insurance index

According to the Academy of Actuaries, the effectiveness of index-based insurance derivatives can be enhanced by the use of indices with the following characteristics:[17]

- easily comprehensible and conceptually straightforward
- highly correlated to loss process, similar factors should affect losses as well as index
- losses rapidly reflected in index
- minimal moral hazard problem
- capability to be modelled on an exposure basis or based on historical data
- no manipulation of data required to construct index
- flexibility in allowing calculation of subsidiary indices based on data underlying original index – index should be flexible in respect to factors such as geographical distribution, lines of business, demographics, inflation, and attachment point.

6. Industry education

Education initiatives will be necessary for broad acceptance of capital market insurance solutions.

For capital market insurance solutions to win broad acceptance, a critical mass of insurance industry participants must become familiar and comfortable with capital market concepts. This will require an extensive education initiative. Professional leadership by individuals, companies, and industry organisations can help make this happen.

7. Credit rating agencies

Credit agencies will play an important role in the successful development of capital market insurance solutions.

Credit rating agencies play a crucial role in the development of capital market insurance solutions. Their ratings of ILS deals offer investors an objective assessment of just how risky the securities are. More important, by distributing information to investors on how they rate these transactions rating agencies play an invaluable educational role (Box 6).

Box 6
Rating a cat transaction

When insurers deal with reinsurers, the two negotiating parties have the capability to understand and evaluate risk. In structured risk transactions such as cat securitisations, however, investors often have little experience in evaluating insurance or catastrophe losses. Hence, they rely on rating agencies such as Moody's, Standard & Poor's, and Fitch to evaluate structured finance transactions. The evaluation usually involves the following steps:

1. Structural analysis

The rating agency investigates the structure of the cat transaction, considering the legal documents that govern the operation of the special purpose vehicle (SPV) and other entities that form part of the transaction. Besides the legal structure, the rating agencies also examine:

- quality of collateral;
- bankruptcy remoteness of SPV from originator;
- market, credit, and legal risks involved with the transaction.

[17] American Academy of Actuaries Index Securitization Task Force, "Evaluating the Effectiveness of Index-Based Insurance Derivatives in Hedging Property/Casualty Insurance Transactions," 4 October 1999.

Box 6
(continued)

2. Insurance risk analysis

In this step, the rating agencies examine the validity of the model used and the assumptions made. This involves:

- evaluating the underlying catastrophe model and assumptions;
- examining the quality of data;
- stress testing the model with different scenarios and assumptions. Some rating agencies like to skew the model towards the investors, as the investors have less information than the originator;
- evaluating the quality of the insurer with respect to its claims handling, underwriting, and other abilities.

3. Evaluation of default risk

The final stage consists of comparing the probability of catastrophic losses with historical data on corporate bond defaults. For example, for Residential Re's 1997 USD 447 million cat bond offering, the reinsurance treaty stipulated that the bondholders would lose their interest, or interest and premiums, if the insured's (USAA) losses were in excess of USD 1 billion. Standard & Poor's calculated the probability of this occurring to be 1.6%, and found it comparable to the default probability of a BB rated corporate bond. Based on this information, Standard & Poor's assigned the Residential Re offering a BB rating.

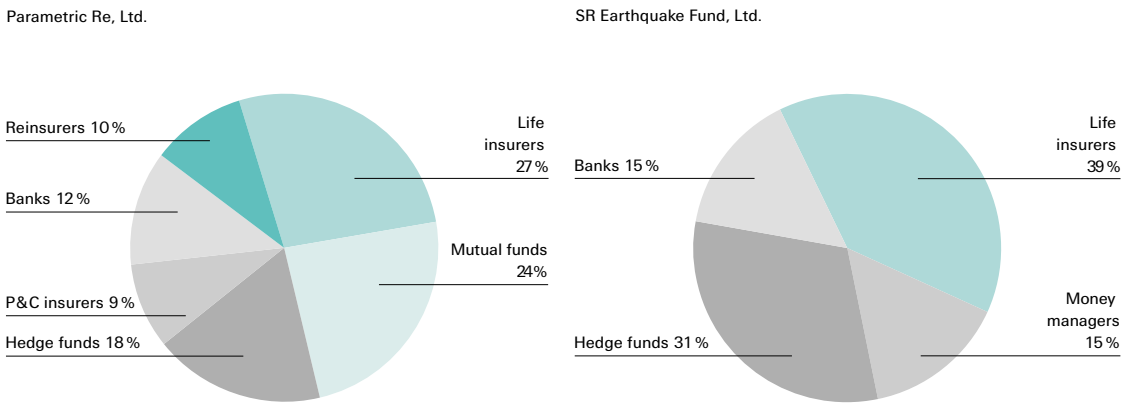
For a fuller discussion, see Allan M. Levin, Patricia E. McWeeney, and Richard Gugliada, "Standard & Poor's Introduces Criteria for Insurance Securitisation," Standard & Poor's, 22 March 1999.

8. Attracting new investors

Capital market insurance solutions must attract investors from outside the industry to gain sufficient capacity.

Capital market insurance solutions offer an alternative mechanism for risk sharing. For them to provide additional capacity to the industry, however, they must attract investors from outside the industry. Just as the success of a new consumer good depends upon its acceptance by *early adopters* (trendsetters inclined to try a new product), ILSs must also attract new investors. These early adopters include firms with institutional knowledge of insurance markets (Figure 14). Some insurers and reinsurers invest in the instruments because they offer a simple way to enter a line of business or region without building costly infrastructure. Individuals who have worked in the insurance industry as underwriters, actuaries, or security analysts have begun opening asset management boutiques investing exclusively in these instruments for clients. Hedge funds that invest in a wide range of assets have also expressed an interest in these securities. Many investors favour hedge funds whose returns are uncorrelated with the bond and stock markets. It is precisely this lack of correlation that is a major selling point of ILSs.

Figure 14
At present, insurance linked securities (ILSs) are sold to institutions, not individuals.



Source: Swiss Re Capital Markets.

Eventually, even individual investors might hold insurance risk in their portfolios. The ability of technology to facilitate risk sharing is mind-boggling. Today, an individual's personal balance sheet might contain a mortgage on a condominium as a liability and an investment in a Ginnie Mae fund[18] as an asset. The latter has interests in dozens of mortgage-backed securities, each of which has an interest in a portion of the cash flows of thousands of mortgages. Why not establish similar possibilities for insurance risk? Perhaps one day our routine purchases of motor and home insurance may be offset by income received from our holdings in various forms of securitised insurance risk.

9. Financial sector convergence

Financial markets are becoming more integrated.

Industry competition has also stimulated the development of capital market insurance solutions. With ongoing financial market deregulation in Europe and Asia, and the passage of the Gramm-Leach-Bliley Act in 1999 repealing key provisions of the Glass-Steagall Act in the US, commercial and investment banks are looking to enter profitable insurance lines of business. These new competitors will force insurers to embrace change. Lines between disciplines are blurring. For example, actuaries are being trained in finance. Risk management, once the exclusive province of insurers, is emerging as a topic of wider interest at leading business schools. Some professional risk managers are beginning to address a wide array of business risks such as interest rates, exchange rates, commodity prices, and even the weather.

[18] A Ginnie Mae fund is a mutual fund that invests in a type of mortgage-backed securities. Ginnie Mae is the nickname for Government National Mortgage Association, a government agency created in 1968 to promote home ownership by fostering a public market for home mortgages.

10. Specialisation

Specialisation will streamline specific stages of the securitisation process.

Capital market insurance solutions permit a more efficient allocation of capital and division of labour through specialisation. With the advent of the mortgage-backed securities market, a US bank typically makes a loan and then sells it to an agency such as Fannie Mae or Freddie Mac, which in turn bundles the mortgages, offers credit enhancement, and services the loans.

A similar development may be in store for ILSs. Today, primary insurers sell policies, invest the premiums, service the policies, and manage the liabilities. In coming years, an established market for ILSs would allow different industry players to assume more focused roles. Some firms might become 'virtual insurers', marketing policies by direct mail or phone and then immediately selling off the policies. Banks, for one, might find this role attractive. Other firms might be securitisers, purchasing policies from a variety of direct insurers, packaging them in ways that appeal to investors (perhaps offering credit enhancements), and then reselling them. Major reinsurers or firms with experience in securitising assets could be naturals for the role.

Another market niche involves servicing the individual policies – collecting premiums and processing claims – for which a service fee can be collected. Firms with efficient, low-cost back-office capabilities might be especially suited to the role. Finally, firms that can effectively structure and sell ILSs to clients can earn commissions or placement fees. Investment banks, insurance brokers, and reinsurers are candidates for this role. In short, those who specialise and excel at specific stages of the securitisation process stand to profit.

The exact types of capital market insurance solutions that will win acceptance and their rate of adoption remain uncertain. Despite this ambiguity, the compelling benefits that these solutions offer – reduced credit risk, added risk capacity, and an enhanced ability to shift risks to those best prepared to bear them – suggest that convergence of the capital and insurance markets will continue. This section reviews current developments regarding capital market insurance solutions and considers what the future might hold.

Current developments

Several recent developments have strengthened the market outlook for insurance securitisation.

Hardening markets

Hardening insurance markets after losses in Europe have strengthened the outlook for securitisations.

Interest in insurance securitisation has been rekindled in recent months because of rising reinsurance premium rates in most markets in 2000. These increases reflect substantial property catastrophe losses in 1999, which was the second-worst year on record. In reaction to these catastrophes, a number of insurers suffering severe losses have withdrawn from the market.

At the end of 1999, the two most severe winter storms in a decade devastated areas of Europe, including France, southern Germany, and Switzerland. Storms *Lothar* and *Martin* caused economic losses of USD 12 billion and USD 6 billion, respectively. Nearly half of these damages were insured; reinsured losses for the two storms were USD 3.8 billion and USD 1.6 billion.[19] In response to these events and the resulting hardening of the reinsurance markets in Europe, several major reinsurers issued cat bonds covering European windstorm risk at the end of 2000 and the beginning of 2001.

Regulatory, tax, and accounting issues

'Protected cell', underwriting accounting for derivatives, and the status of SPVs are key issues.

Several key issues are under active debate by regulatory, accounting, and tax authorities.

Protected cell model

In the US, the National Association of Insurance Commissioners (NAIC) adopted the Protected Cell Model Act in December 1999. The model, already adopted into law by six states, enables insurers to issue securitisations out of 'protected cells', which would be shielded from the insolvency of the insurer. The model thus enables US insurers to securitise risk in the capital markets more efficiently and economically than they could through a traditional offshore SPV. The major ambiguity that remains concerns the tax treatment of a protected cell. Because of this uncertainty, no one has yet used a protected cell to securitise insurance risk.

[19] For a more detailed account, see David N. Bresch, Martin Bisping, and Gerry Lemcke, "Storm over Europe: An underestimated risk", Swiss Re Publishing, 2000, available at www.swissre.com.

Accounting status of derivatives

Another question that regulators are addressing is how an insurer's purchase of a derivative security to hedge its underwriting risk should be treated for accounting purposes. Proponents of underwriting accounting for derivatives have asked regulators to allow underwriting accounting as long as the correlation between actual losses and the payoff of the derivative is sufficient to keep basis risk below some acceptable threshold. Opponents argue that there must be actual indemnity as represented by perfect correlation between the actual losses and the payoff of the derivative. Still others suggest that for a derivative to be deemed effective and therefore qualify for underwriting accounting, it need only exhibit some positive correlation with the underlying risk.

SPRV model in the US

The purpose of the Special Purpose Reinsurance Model Act, tentatively approved by the NAIC, is to establish a legal basis for conducting securitisation transactions using a domestic SPV as opposed to an offshore SPV, as is currently standard practice. This legislation would allow for the formation in the US of a dedicated reinsurer (SPRV) that would serve to transform insurance risk into an investment security. Advantages of an SPRV relative to an offshore SPV could include: cost savings through operating the SPRV domestically rather than abroad; avoidance of the 1% Federal premium excise tax on reinsurance premiums passing outside the US; and a wider range of potential buyers for securities issued by the SPRV, who might have restrictions on their holdings of foreign securities.

Standardisation and education

Standardisation and public leadership promote the development of new markets.

Standardisation and public leadership are valuable means by which to promote the development of a new market. The New York-based Bond Market Association has formed a committee to promote the market for debt instruments linked to a broad range of event risks including natural hazards and mortality-sensitive cash flows, which they have collectively termed *risk-linked securities.* The committee – comprised of leading banks, insurance brokers, and reinsurers – has announced two initial goals:

- standardising documentation, which will facilitate book-entry trading and settlement of risk-linked securities, thereby increasing liquidity;
- organising an annual Risk-Linked Securities Industry Conference sponsored by the underwriters of these securities to promote investor awareness.

Outlook

By 2010, annual issuance volume of cat securitisations may reach USD 10 billion, but this is just the beginning.

A major lesson of this report is that the path a financial innovation follows is seldom smooth. Many different pieces must fall into place for an innovation, however sensible, to gain broad acceptance. Financial innovations mutate. Existing transaction structures are refined and new structures arise.

Capital market insurance solutions are still evolving. Once market leaders resolve key issues such as standardisation, regulation, and education, an active secondary market for insurance risk will develop. This in turn will make capital market insurance solutions accessible and attractive to an expanding universe of issuers and investors.

To date, the predominant example of capital market insurance solutions has been catastrophe securitisations. We foresee annual cat securitisations, whose issuance volume has exceeded USD 1 billion in recent years, growing to perhaps USD 10 billion by 2010. But this is just the beginning.

There is vast market potential for capital market insurance solutions linked to non-catastrophe risks as well. The possibilities are many. One promising area is life securitisation, which offers insurers an economical way of financing policy acquisition costs. Another promising opportunity is in lower layers of coverage. Until now, securitisations have focused on low frequency/high severity risks. This area, though important, is limited in scope. Many practitioners foresee growing securitisation activity in middle frequency/middle severity covers such as motor insurance. Securitising these risks would improve capital and tax efficiency.

In our view, capital market insurance solutions will be not a substitute for traditional reinsurance, but a complement. If they deliver on their promise of improved transparency, liquidity, and efficiency for certain lines of business, they along with other ART techniques have the potential to expand the limits of insurability.

Appendix

Capital market insurance solutions deal list

Cat bonds/notes

(Re)insurer	Name of issue	Year	Size (USD mill.)	Risk type	Trigger
Hannover Re	KOVER	1994	85	Multi-line	Indemnity
St. Paul Re	Georgetown	1996	69	Multi-line	Indemnity
AIG	AIG	1996	10	Multi-line	Indemnity
Winterthur Re	Winterthur Re	1997	238	Wind	Indemnity
Reliance	SLF I	1997	10	Multi-line	Indemnity
Reliance	SLF II	1997	10	Multi-line	Indemnity
U.S.A.A.	Residential Re I	1997	477	Wind	Indemnity
Swiss Re	SR Earthquake Fund	1997	137	EQ	Industry
Tokio M&F	Parametric Re	1997	100	EQ	Physical
Centre Re	Trinity	1998	84	Wind	Indemnity
Reliance	SLF III	1998	25	Multi-line	Indemnity
Yasuda	Pacific Re	1998	80	Wind	Indemnity
U.S.A.A.	Residential Re II	1998	450	Wind	Indemnity
F&G Re	Mosaic Re I	1998	54	Multi-line	Indemnity
Centre Re	Trinity Re II	1998	57	Wind	Indemnity
USF&G Re	Mosaic Re II	1999	46	Multi-line	Indemnity
Reliance	SLF IV	1999	10	Multi-line	Indemnity
Kemper	Domestic	1999	100	EQ	Indemnity
Sorema S.A.	Halyard Re	1999	17	Multi-line	Indemnity
Oriental Land Co	Concentric	1999	100	EQ	Physical
U.S.A.A.	Residential Re III	1999	200	Wind	Indemnity
Gerling	Juno Re	1999	80	Wind	Indemnity
Gerling	Namazu Re	1999	100	EQ	Model
Am Re	Golden Eagle	1999	182	Multi-line	Model
Lehman Re	Seismic	2000	150	EQ	Industry
SCOR	Atlas Re	2000	200	Multi-line	Indemnity
Sorema S.A.	Halyard Re	2000	17	Multi-line	Indemnity
Arrow Re/State Farm	Alpha Wind	2000	90	Wind	Indemnity
USAA	Residential Re IV	2000	200	Wind	Indemnity
Vesta	NeHi	2000	50	Wind	Indemnity
AGF	Mediterranean Re	2000	129	Wind, EQ	Model
Munich Re	Prime Capital	2000	300	Wind, EQ	Physical
Swiss Re	Western Capital	2001	100	EQ	Industry
American Re	Golden Eagle II	2001	120	Wind, EQ	Model

Cat swaps/options

(Re)insurer	Year	Size (USD mill.)	Risk type	Trigger
Hannover Re (K2)	1996	100	Multi-line	Indemnity
CAT Ltd.	1997	35	Wind	Indemnity
Mitsui Marine	1998	35	EQ	Physical
AXA	1998	40	EQ	Industry
XL MidOcean	1998	100	Multi-line	Indemnity
Constitution Re	1998	10	Basis Risk – Wind	Index/Indemnity
CNA	1998	90	Wind	Industry
Société Générale	1998	50	EQ	Industry
Société Générale	1998	100	EQ	Industry
CNA	1999	50	EQ	Industry
Lehman Re	1999	111	EQ	Industry

Option to issue

(Re)insurer	Name of issue	Year	Size (USD mill.)	Risk type	Trigger
Reliance National	None	1998	40	Multi-line	Industry
AXA	None	1998	21	EQ	Industry
Allianz	Gemini Re	1998	150	Wind	Indemnity
Hannover Re (K2+)	Hannover Re	1998	50	Multi-line	Industry

Life bonds

(Re)insurer	Name of issue	Year	Size (USD mill.)	Risk type
American Skandia	ASLAC Funding Trust I	1996	42	Life/Annuity
American Skandia	ASLAC Funding Trust II	1997	158	Life/Annuity
Hannover Re	Interpolis Re	1998	57	Life/Annuity
National Provident Life	Mutual Securitisation	1998	438	Life/Annuity
American Skandia	ASLAC Funding Trust	1998	111	Life/Annuity
Hannover Re (L2)	Interpolis Re	1999	250	Life/Annuity
Hannover Re	Whiterock	1999	49	Life/Annuity

Contingent capital

(Re)insurer	Year	Size (USD mill.)	Risk type
FWUA*	1995	1500	Wind
Hawaii Hurricane	1995	500	Wind
Nationwide	1995	400	N/A
RLI*	1996	50	Multi-line
Horace Mann	1996	100	Multi-line
Arkwright	1996	100	N/A
LaSalle Re*	1997	100	Multi-line
CEA*	1997	700	EQ
Lloyds*	1998	40	Multi-line
Oriental Land Co.	1999	100	EQ
Pacific Electric	2000	120	Credit
Michelin	2000	170	GDP
US Consulting Firm	2000	250	N/A
Royal Bank of Canada	2000	200	Credit
Countrywide	2000	100	Multi-line

Other

(Re)insurer	Name of issue	Year	Size (USD mill.)	Risk type	Trigger
FHLMC	MODERN's	1998	243	Mortgage	Indemnity
Toyota	Gramercy Place	1998	566	Residual Value	Indemnity
Gerling	SECTRS	1999	500	Credit	Index
Swiss Re	ELF	1999	330	Credit	Index
Koch Energy	Kelvin	1999	50	Weather	Index
Swiss Re	ELF II	2000	330	Credit	Index

Notes: As most transactions are private placements, this list may be incomplete.
EQ = earthquake
N/A = not available
* denotes contingent capital deals that have been renewed.

Source: Swiss Re Capital Markets.

Recent *sigma* publications

No. 1/1998:	Life and health insurance in the emerging markets: assessment, reforms and perspectives
No. 2/1998:	Health Insurance in the United States: An Industry in Transition
No. 3/1998:	Natural catastrophes and major losses in 1997: Exceptionally few high losses
No. 4/1998:	World insurance in 1996: Modest growth in the insurance industry
No. 5/1998:	Upheaval in insurance markets – results still good despite increased competition
No. 6/1998:	Life and health insurance markets benefit from reforms in state pension and health systems
No. 7/1998:	Insurance industry in Central and Eastern Europe: Increasing competition – different prospects for growth
No. 8/1998:	Financial difficulties of public pension schemes: market potential for life insurers
No. 9/1998:	The global reinsurance market in the midst of consolidation
No. 1/1999:	Natural catastrophes and man-made disasters 1998: Storms, hail and ice cause billion-dollar losses
No. 2/1999:	Alternative risk transfer (ART) for corporations: a passing fashion or risk management for the 21st century?
No. 3/1999:	World insurance in 1997: Booming life business, but stagnating non-life business
No. 4/1999:	Are mutual insurers an endangered species?
No. 5/1999:	Asia's insurance markets after the storm
No. 6/1999:	Life insurance: Will the urge to merge continue?
No. 7/1999:	World insurance in 1998: Deregulation, overcapacity and financial crises curb premium growth
No. 1/2000:	Solvency of non-life insurers: Balancing security and profitability expectations
No. 2/2000:	Natural catastrophes and man-made disasters in 1999: Storms and earthquakes lead to the second-highest losses in insurance history
No. 3/2000:	Europe in focus: Non-life markets undergoing structural change
No. 4/2000:	Emerging markets: the insurance industry in the face of globalisation
No. 5/2000:	The impact of e-business on the insurance industry: Pressure to adapt – chance to reinvent
No. 6/2000:	Asset-liability management for insurers
No. 7/2000:	Trade credit insurance: globalisation and e-business are the key opportunities
No. 8/2000:	Japan's insurance markets – a sea change
No. 9/2000:	World insurance in 1999: Soaring life insurance business
No. 1/2001:	Insurance industry in Central and Eastern Europe – current trends and progress of preparations for EU membership
No. 2/2001:	Natural catastrophes and man-made disasters in 2000: fewer insured losses despite huge floods
No. 3/2001:	Capital market innovation in the insurance industry