

# Insurance derivatives:

## Convergence of capital markets and insurance markets

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### 1. Introduction

Natural catastrophes reached new record levels in the 90s both in terms of loss amounts and intensity, a situation which presents new challenges for insurers and reinsurers alike. The increasing volatility of the markets, the limited and diminishing number of suppliers coupled with doubts regarding the claims-paying ability of certain catastrophe (re)insurers following major natural catastrophes and resultant temporary shortages in capacity make it imperative that we look for alternative methods of risk transfer and take advantage of the near inexhaustible capacity provided by the global capital markets. Given the increasing convergence of (re)insurance and capital markets, new capital market instruments which have long been a feature of other branches of industry have been found as a way of transferring risks to the capital markets.<sup>2</sup>

### 2. Capital market instruments to cover insurance risks

For several years now the capital markets have been providing insurance companies with limited capital via so-called contingent capital programmes in the event of a natural catastrophe and a loss of equity capital. This process merely concerns the provision of capital which is repaid to the creditors or investors after expiry of the contingent capital transaction (no transfer of insurance risk, just pure financing). Insurance securitization, i.e. the securitization of insurance risks and the transfer of risks to the capital market via bonds and derivatives has only been in use as an instrument for covering insurance risks for about 4 years now. Diagram 1 shows the system of capital market instruments in insurance.

The total volume of all insurance-linked securities is currently about US\$ 13bn, of which some US\$ 7bn is accounted for under contingent capital programmes. The volume of insurance risks transferred to the capital market thus far via bonds is around US\$ 6bn. Catastrophe risks account for the lion's share of this figure with some 35 completed transactions and a transaction volume of US\$ 3.6bn.

With an estimated transaction volume of some US\$ 400m, insurance derivatives have by no means caught the public eye in the same way as insurance risk bonds. Consequently, insurance derivatives and their possible areas of use have received little coverage in the relevant literature.

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<sup>2</sup> Cf. Risk securitisation, in: Alternative Insurance Capital, November 1999, p. 8.



Depending on the structure of the different financial markets, derivative financial instruments can be divided into three main categories: Swaps; forwards and futures; options, caps, floors. In terms of trading, a distinction is made between standardized, i.e. listed derivatives on the one hand and tailor-made products on the other, which are agreed between the individual contracting parties without the need for a stock exchange (so-called over the counter products, OTC).

The low transaction costs and the great leverage effect make derivatives an ideal instrument for hedging, speculation and for achieving arbitrage profits. Also, the high degree of flexibility in the form and design of derivatives is an important factor, as the use of various underlyings shows.<sup>4</sup>

## 5. Insurance derivatives

### 5.1. Contingent capital

Derivatives which come into effect in connection with the occurrence of an insurance event were first used for contingent capital programmes.

Following the occurrence of major losses and the loss of equity capital, possibly as a result of a natural catastrophe, contingent capital programmes offer insurance companies capital support in the form of surplus notes or preference shares. Although they provide a liquidity-relieving effect, contingent capital solutions are generally unable to offer a smoothing effect of the underwriting result - as would normally be the case under other financial reinsurance concepts.<sup>56</sup>

Within this structure which incorporates an equity put or surplus note put option, the cedant (option buyer) pays a premium to acquire the right to sell surplus notes or preference shares to investors in the event of a specifically pre-defined natural catastrophe occurring and the loss of equity capital. The option can be exercised after the occurrence of a natural catastrophe. The investors purchase the shares or the surplus notes with payment of capital. In many cases reinsurers also act as investors and in this way make available additional and alternative capital.

In contrast to insurance risk bonds, investors in contingent capital programmes provide their own capital and third-party capital only *after* a loss event. This capital is repaid when the term of the transaction expires. In the case of insurance risk bonds the capital is made available by the investors *before* the loss event, the capital is managed in the collateral

<sup>4</sup> Cf. Müller, Andreas: Integriertes Risk Management – Herausforderung oder unverzichtbares Geschäftsfeld für die Rückversicherungsbranche? (Integrated risk management – Challenge or essential business area for the reinsurance industry?), in *Versicherungswirtschaft* 10/1999, pp. 686-690 and 11/1999, pp. 765-771 and Müller, Andreas and Grandi, Marcel: Wetterderivate zur Absicherung von Wetterrisiken – Spekulationsinstrument oder Bestandteil des risikopolitischen Instrumentariums in wettersensiblen Branchen (Weather derivatives for hedging weather risks – Speculation instrument or a risk-political instrument in weather-sensitive classes of business), in: *Zeitschrift für Versicherungswesen* 11/1999, pp. 674-681.

<sup>5</sup> Cf. Müller, Andreas: Neuere Konzepte in der Versicherungswirtschaft – Risk Based Capital, Financial Reinsurance und Alternativer Risikotransfer, unveröffentlichtes Manuskript am Institut für Betriebswirtschaftliche Risikoforschung und Versicherungswirtschaft (INRIVER, Lehrstuhl Prof. Dr. Elmar Helten) der Ludwig-Maximilians-Universität München, Sommersemester 1998 (New concepts in the insurance industry – Risk Based Capital, Financial Reinsurance and Alternative Risk Transfer, unpublished manuscript at the University of Munich, summer 1998), and Liebwein, Peter: Klassische und moderne Formen der Rückversicherung (Classic and modern forms of reinsurance), Karlsruhe 2000, pp. 305-362.

<sup>6</sup> Cf. ART development - Swiss Re spotlights ART development, in: *Alternative Insurance Capital*, August 1999, S. 12.

trust during the term of the transaction and serves in the event of a loss as a liability mass which is lost completely if the worst case occurs.

## 5.2. Insurance securitization via derivatives

Pure insurance derivatives, which transfer insurance risks to or via the capital markets and in contrast to insurance risk bonds do not provide prior liquidity to safeguard the maximum liability, can be designed as swaps or options. The basis of such a transaction may be a market loss index (e.g. the PCS index of the Property Claims Service in the USA) or a parametric trigger. A market loss index reflects the losses incurred in the insurance industry after a natural catastrophe. A parametric trigger links the trigger of cover to a natural catastrophe, which must comply with precisely defined and transparent criteria in terms of severity (Richter Scale for earthquakes, wind velocity for windstorm).

With its NatCatSERVICE Munich Re has a database which collects and processes data on market losses on the basis of regions and results. This database can be accessed via the Financial Information Service of Reuters. The NatCatSERVICE can be used as a market loss index for an insurance derivative transaction.

The Chicago Board of Trade (CBOT) has for several years now traded in standardized options contracts on the basis of market loss indices for 9 regions in the USA with coverage periods of up to one year. Through the options contracts market, participants can buy or sell cover against natural catastrophes in the USA (hurricanes, earthquake). The options premium here corresponds to the reinsurance premium. In addition to insurers and reinsurers, other financial institutes such as investment banks or unregulated funds can also be active in this sector. As the traded volume is still relatively low, this market cannot really be described as particularly liquid at this stage.

With an OTC insurance swap the cedant pays the investors a premium and receives indemnification in the event of a loss. The premium is the fixed-rate payment; the indemnification is the floating-rate payment. From a purely technical point of view, this construction is comparable to a standard (re)insurance contract. However, the option buyer does not need an insured interest or the occurrence of a loss event for payment from the derivative to be required. The deciding factor is merely the point when the agreed market loss index level has been exceeded or a parametric trigger comes into effect.

In the case of an OTC insurance option the cedant also acts as the option buyer, the investor as the option seller. The option seller receives an options premium in advance from the cedant (option buyer), which is comparable to an insurance premium. The option can be exercised when an agreed market loss index level is exceeded or a parametric trigger occurs. The option buyer receives the fixed nominal amount as "compensation" or "indemnification". If there may be a residual basis risk to the benefit of the option buyer<sup>7</sup>, additional windfall profits can be realized. Similarly, the basis risk can also have a detrimental effect on the option buyer if the selected market loss index does not correlate with the insurer's actual claims burden.<sup>8</sup> The option can also take the form of a second-event cover under which the option buyer receives cover at a previously fixed price if an agreed market loss index level is reached or a parametric trigger comes into play and the option is exercised.

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<sup>7</sup> This means when the loss that affects the option buyer's individual portfolio is relatively *lower* than the average market loss.

<sup>8</sup> This means when the loss that affects the option buyer's individual portfolio is relatively *higher* than the average market loss.

Unlike insurance shares, with which the investor participates not only in the underwriting risk but also in the investment and general corporate risk of a joint-stock insurance company, insurance risk bonds and derivatives give investors the opportunity of participating *exclusively* in the insurance risk and can contribute to the utilization of efficiency benefits in the area of asset management.

The legal basis of insurance derivatives are standard specimen agreements developed by the International Swap and Derivatives Association (ISDA) and in general use for financial derivatives.

As with the structuring of insurance risk bonds, reinsurers can also assume important functions with insurance derivative transactions, which can be of decisive importance for the success of the transaction:

- **Risk evaluation**

Each insurance securitization transaction by nature includes the writing of the insurance risk by a specialist risk carrier before it can be transferred to the capital market. Underwriting consists of analysis and evaluation of the underlying risk or risk portfolio. The resulting pricing is a part of the risk evaluation. The underwriting function here, as with an insurance risk bond, is best performed by the reinsurer participating in the transaction.<sup>9</sup> In its Research and Development Division, Munich Re has a team of scientists which is able to carry out the task of analysis and evaluation as part of an insurance securitization or derivative transaction.

- **Frontier and transformer**

With an insurance derivative transaction a reinsurer is needed to act as a frontier and transformer<sup>10</sup> in order to remove the underlying risk from the primary insurer's books by way of a reinsurance contract and thus to guarantee the tax deductibility of the reinsurance premium and adherence to supervisory regulations such as solvency relief. The reinsurer buys or sells a derivative, whose structure corresponds to the original reinsurance contract in terms of development of values.

- **Assumption of the basis risk**

As the risk carrier the reinsurer can charge an appropriate premium for the assumption of any residual basis risk. Understandably, this is always the case when the reinsurer acting as frontier and transformer concludes a reinsurance agreement or a derivatives contract with the cedant on a loss basis (e.g. catastrophe XL treaty) and passes the risk on to the capital market by way of a derivative based on an index<sup>11</sup> or on a parametric trigger.<sup>12</sup> In this connection it should be pointed out that investors prefer development of values on the

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<sup>9</sup> Cf. Bauer, Wolf Otto: Alternativer Risikotransfer: Finanzrückversicherung (Alternative risk transfer: Financial reinsurance), in: Zeitschrift für die gesamte Versicherungswissenschaft 1998, p. 557.

<sup>10</sup> Cf. Spiller, Richard and Mellman, Oliver: The legal pitfalls of insurance securitisation, in: Reactions, October 1999, S. 70.

<sup>11</sup> For the construction, use and effectiveness of indices with insurance derivatives cf. US actuaries evaluate index-based hedges, in: Alternative Insurance Capital, December 1999, S. 8

<sup>12</sup> Cf. Anders, Stephan: Einsatz von Katastrophen-Indizes als Schadenbasis bei der Risk Securitisation (Use of catastrophe indices as a loss basis in securitization), in: Versicherungswirtschaft 1999, S. 162.

basis of objective dimensions, i.e. a derivative on an index or parametric basis is generally preferred to a derivative on an individual loss basis.

### 5.3. Portfolio/exposure swap

Similar risks can be swapped without payment of a floating rate or options premium on the basis of an asset or portfolio swap. In this way, overexposure on the part of one party in a risk class can be ceded and swapped for another risk class not represented in the insurance portfolio. This allows a multi-dimensional diversification effect (risk class, region, ...) and thus a more efficient risk portfolio. For example, it would be possible to swap the windstorm risk USA against the windstorm risk Japan or the earthquake risk California against the windstorm risk Tokyo, given the same probability of loss and exposure of values (nominal value).

The different market reinsurance price of the swapped risks must be considered in the swap rate calculation. The situation here is comparable to a currency swap where the difference in interest of two currencies is balanced by the swap rate.

## 6. Supervisory law and accounting

The use of insurance derivatives is charting new territory both in terms of supervision and accounting on a national and international level.

In its circular letters R 7/95 and R 3/39, which specify area of application set out in Section 7, paragraph 2 of the German insurance supervision law, the German Federal Supervisory Office for the Insurance Industry listed the criteria for the exclusive use of derivative financial instruments under the realm of *investment policy*. Accordingly, derivative financial instruments include all transactions whose price is derived from an underlying trading object (shares, fixed-interest securities and currencies), reference price, reference interest rate or reference index.

As hedging transactions, derivative financial instruments (hedging against the risk of changes in price or interest rates for assets or, for example, protection of underwriting reserves against exchange rate risks with non-currency congruent cover), are admissible as transactions in preparation for acquisition and for increasing return (realization of additional return from existing securities). Accordingly, insurance derivatives in Germany are not a possible investment for primary insurance companies.

In spite of the different design of insurance derivatives and (re)insurance agreements from a fiscal, accounting and supervisory perspective, there are enough arguments in favour of equating insurance derivatives with reinsurance contracts in accordance with the principle "substance over form".<sup>13</sup> For example, the result of a swap agreement, which refers to a specific original insurance portfolio, cannot be distinguished from a (re)insurance agreement. In order to guarantee the necessary legal security within an insurance derivative transaction, an insurance company wishing to place capacity in the capital market needs a reinsurer as frontier, which assumes the risk under a reinsurance agreement and passes this risk on to the capital market by way of a derivative. The question as to what extent other investor groups are involved in insurance business requiring authorization through their writing insurance derivatives has not yet been clarified by any

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<sup>13</sup> Cf. Müller, Andreas and Seitz, Manfred: Financial Reinsurance - MAS Rules Hailed As Being In The Spirit Of International Best Practices, in: Asia Insurance Review 11/1999, pp. 31/32.

legal system. Unlike insurance risk bonds, there is no binding "legal opinion" available here. This has created an element of legal uncertainty in this area. Consequently, counterparties to insurance derivatives currently include unregulated investment funds and hedge funds and also insurance companies in "off shore" financial centres (Channel Islands, Cayman, Bermuda, ...).

In other legal systems the use of insurance derivatives (in the area of underwriting) is subject to little or no regulation. However, certain conclusions can be drawn from the discussions on this subject in the USA.

In the USA, Statutory Accounting Principle No. 31 (Derivative Instruments) stipulates that insurance derivatives which actually cover insurance risks and thus guarantee an effective hedge are covered by the regulations governing hedge accounting, i.e. paid options premiums must be shown on the balance sheet as other than invested assets or as premium income. Changes in the market value (fair value) of the derivative contract must be shown under other income in the profit and loss account.

The relevant US GAAP regulations, SFAS 60 (Accounting and Reporting by Insurance Enterprises), SFAS 113 (Accounting and Reporting for Reinsurance of Short-Duration and Long-Duration Contracts) and SFAS 133 (Accounting for Derivative Instruments and Hedging Activities) are open to interpretation as to whether insurance derivatives based on an index have to be shown in the technical or non-technical result. According to SFAS 113 and SFAS 60 all transactions which provide for indemnification against insurance risks – irrespective of their form – qualify for display in the technical account, which should also apply to insurance derivatives.

Even if there is currently a lack of clear regulations, unanimous opinion is that economic substance is the decisive factor as to whether business is treated as insurance business or financial business (substance over form). The decisive question here is to what extent the acquisition or purchase of a derivative actually involves the assumption of an insurance risk. The prerequisite for recognition as insurance business is an adequately<sup>14</sup> high correlation between the individual company's loss situation and the development of the underlying index.

In summary, it should be pointed out that the accounting of insurance derivatives is not yet fully resolved in many countries and thus presents a challenge for the users on the one hand and the parties involved in structuring on the other.

## **7. Insurance derivatives versus insurance risk bonds**

A fundamental advantage of insurance derivatives is that they are much quicker and easier to structure and realize than securitization by way of a bond issue (see diagram 2).<sup>15</sup> The transaction costs are well below those involved in a bond issue.<sup>16</sup> On the other hand a bond can cover greater volumes than a derivative.

However, insurance derivatives harbour a partner risk (counterparty risk), which manifests itself when the investors cannot meet the indemnification payment. The options or swap premium is paid in advance as with an insurance premium, the counterpayment or indem-

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<sup>14</sup> Does not include a quantification of the correlation.

<sup>15</sup> Cf. Ladbury, Adrian: Banks and insurers work hard to converge, in: *Alternative Insurance Capital*, February 1999, S. 1.

<sup>16</sup> Cf. also : More 'quake cat swaps to come, in: *Reactions*, October 1999, P. 11 and: Bermuda and ART developments, in: *Alternative Insurance Capital*, July 1999, pp. 5/6.

nification payment is made only after the occurrence of a given event. With a bond securitization on the other hand the proceeds from the bond issue are available in advance in the collateral trust as a liability mass and thus enable best solvency (top security AAA) for the risk-ceding primary insurer.

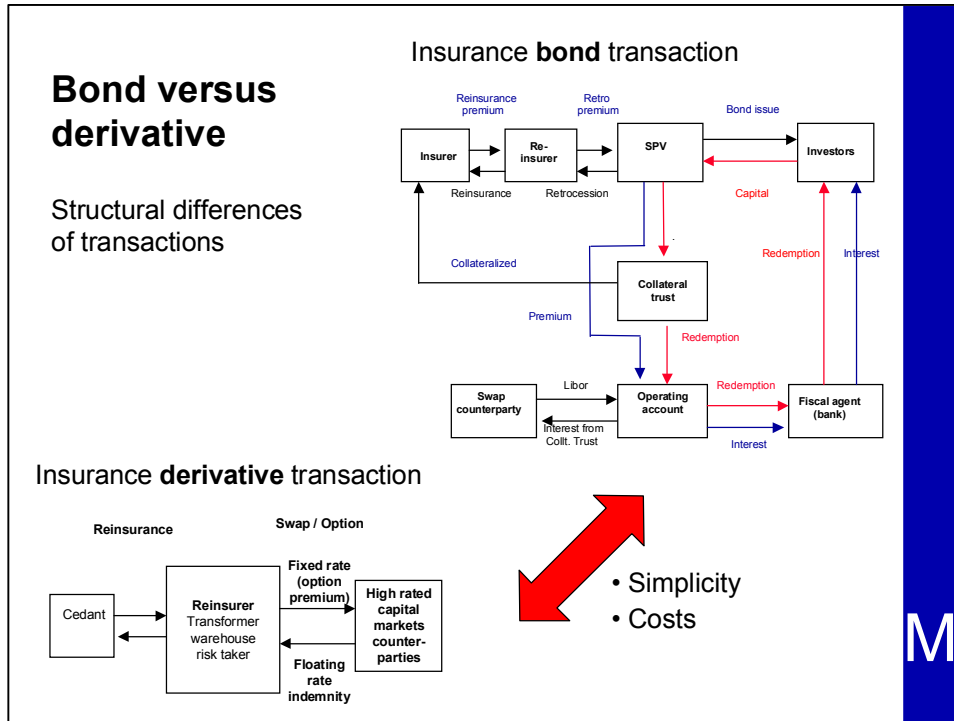


Diagram 2: Structural differences between bond and derivative transactions

## 8. Example: Insuritization - The other way round

Under classic risk management risks were divided into two categories. Certain risks, mainly typical insurance risks, were covered under (re)insurance agreements; for other risks alternative forms of risk response were sought. Capital market instruments are a new type of instrument to cover insurance risks, which in combination with traditional reinsurance concepts allow an exceptionally flexible and holistic risk management.<sup>17</sup>

The other way, namely the coverage of financial risks by way of a (re)insurance solution, can be taken by means of insuritized. Insuritization in its *broadest sense* allows *joint* coverage of classic insurance risks *and* financial risks, thus providing certain cost advantages through more efficient pricing rates.<sup>18</sup> Initial experience puts cost savings with the use of such an approach at around 10% to 20% of the overall risk costs.<sup>19</sup> Insuritization in its *narrower sense* involves coverage *exclusively* of financial risks by way of a (re)insurance agreement. In spite of this link between (re)insurance and the capital market, the structuring and application of capital market products must consider that capital markets are by nature short term. On the other hand (re)insurance markets are long-term

<sup>17</sup> Cf. Müller, Andreas: Integriertes (Integrated ... as above).

<sup>18</sup> This presupposes that the different risk classes to be combined are subject to no or only a very weak correlation. Cf. Müller, Andreas: Integriertes (Integrated ... as above).

<sup>19</sup> Cf. Ladbury, Adrian: (as above), p. 4 and Brandman, James: How to Guarantee Your Earnings, in: Reactions, April 1999, S. 26.



oriented (see diagram 3). This follows directly from the type and characteristics of the underlying risks (capital market versus insurance risks).

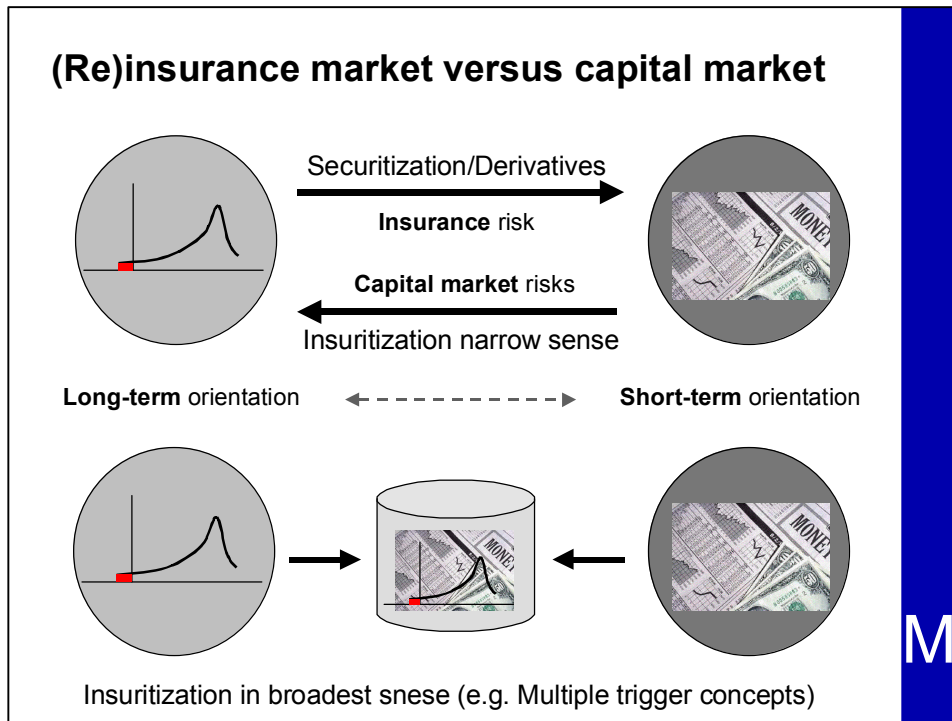


Diagram 3: Insurance market versus capital market

The interest of capital market participants to channel risks into the insurance market also poses the question of whether a price difference between the higher return expectations of the financial markets and the prices in the insurance industry should be taken advantage of. Through insuritization, differences in the capital requirements for the credit industry and the insurance industry can be used and a so-called regulatory arbitrage<sup>20</sup> pursued.

The use of a (re)insurance contract instead of a derivative financial instrument to cushion financial risks can bring advantages in terms of accounting, fiscal treatment and contract structure (e.g. realization of medium-term smoothing effects).<sup>21</sup>

## 9. Outlook

Insurance derivatives allow insurance companies to realize an alternative for placing insurance risks in the capital market which is more cost effective and quicker than insurance risk bonds. With such a derivative transaction a reinsurer can assume functions of essential importance for the success of the transaction and can also act as an advisor.

As a professional reinsurer, one of Munich Re's fundamental tasks is to act as an advisor to its clients about all products ranging from traditional reinsurance to more complex capital market solutions. Part of this fundamental task is that Munich Re supports its clients in

<sup>20</sup> Cf. Seufferle, Johannes: Arbitrage zwischen Bank- und Versicherungsprodukten (Arbitrage between banking and insurance products), in: Versicherungswirtschaft 7/1999, pp. 414-419 and 8/1999, pp. 537-539.

<sup>21</sup> Cf. Using insurance to hedge FX risk, in: Alternative Insurance Capital, June 1999, pp. 6-9 and Ladbury, Adrian: (as above), p. 5.

all types of capital market transactions as a structurer and project manager and thus not only allows its clients to obtain access to the market but continues to provide them with a wide range of services in the capital market itself.

However, the extent to which such capital market solutions can be realized currently depends on the willingness of our industry to experiment and on the development of the rates on the international reinsurance markets.

This project, examining the convergence between capital markets and the insurance sector, focused in particular on the role new financial instruments could play to better address and syndicate particular types of risk. We are pleased to present this report on the convergence of insurance and capital markets. It stems directly from an initiative of the Financial Services Governors launched at the World Economic Forum Annual Meeting 2007, when the assembled Governors agreed to carry the dialogue and work beyond Davos in line with the Forum's mission of being Committed to Improving the State of the World. Though insurance-like in behavior, weather-based insurance derivatives are fundamentally different from traditional insurance. Generally, both are avenues to transfer risk in exchange for premium payments. However, weather-based insurance derivatives anticipate high-probability, low-risk events (i.e., weather fluctuations) and cover concentrated or singular risks. Derivatives afford project owners access to the risk-sharing of financial markets, and this kind of diversification can be better than that of geographical distribution. Another good point about insurance derivatives is the settlement process is typically quicker and less onerous than it is for traditional insurance. The convergence of insurance with the capital markets has been a topic of discussion for some years now, during which time there has been strong growth, but not the explosion that might have been expected. The World Economic Forum and its partners in this project wish to advance the debate by establishing links among stakeholders and providing them with a platform for addressing key issues. Many participants in this project aspire to increase visibility, provide renewed impetus for market development and, it is hoped, place insurance risk on the agendas of a larger, more diverse group of investment markets, and resulting decline in investment income, that the insurance market began to harden. This paper explores the impact of capital markets on the insurance cycle in detail. Another interesting topic explored in this paper is how some convergence, or Alternative Risk Transfer (ART), products develop and evolve in response to the insurance cycle. Poor underwriting results in 1990s those that include new risk classes and drive the convergence of insurance and financial/commodity markets. 10. The need for extra capacity tends to increase interest in capacity enhancing ART products, including captives, finite insurance and catastrophe-related capital market solutions, or catastrophe bonds. On the other hand, during soft, excess-capacity insurance.