

PARAMETRIC INSURANCE COVER FOR NATURAL CATASTROPHE RISKS

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Abstract

With economic losses of over USD 370 bn caused by 325 catastrophic events, 2011 ranks as the worst ever year in terms of costs to society due to natural catastrophes and man-made disasters. In the same time, 2011 is the second most expensive year in the history for the insurance industry, with insured losses from catastrophic events amounting to USD 116 bn. Both the high level of damages and insured losses, as well as the unprecedented gap between the two values, made insurers and reinsurers worldwide to understand that some risks had so far been underestimated and they have to be better integrated in the catastrophes modelling. On the other hand, governments have to protect themselves against the financial impact of natural catastrophes and new forms of cooperation between the public and private sectors can help countries finance disaster risks. Viewed in a country's wider risk management context, the purchase of parametric insurance cover, which transfers natural catastrophe risk to the private sector using an index-based trigger, is a necessary shift towards a pre-emptive risk management strategy. This kind of approach can be pursued by central governments or at the level of provincial or municipal governments, and a number of case studies included in the publication "Closing the financial gap" by Swiss Re (2011) illustrates how new forms of parametric insurance can help countries finance disaster risks.

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J.E.L. Classification:

Introduction

We witness during the last three decades to a significant increase in the economic costs of natural disasters. Thus, if in the 80's these costs (adjusted for inflation) have raised to an annual average of 25 billion USD, in the 90's they jumped to 95 billion USD and in the first decade of the current millennium the amount of damages increased to an annual average of 130 billion USD.

The main factors contributing to this growth are significant economic development, population growth, concentration of assets in areas exposed to catastrophic risks and accelerated climate changes of the last two decades.

Damage size varies of course from country to country depending on the nature and intensity of catastrophic events, but everywhere it is found that most of the damage still remains uninsured. On average, over the last 20 years, only between 20% and 40% of the damage was insured. Level of insurance coverage depends on the insurance market development. In this respect the calculation of insurance penetration in national economies (the ratio between gross written premiums and GDP) shows, in the non-life insurance sector, a persistence of a significant gap between developed countries, where this indicator stands at 8.6%, and developing countries with only 2.9%.

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1. Pre-disaster instruments

When it comes to major disasters, government intervention meant to restore the normal economic and social situation becomes unavoidable. Traditionally governments intervene after the fact, by means of budget spending, increase of taxes, loans or foreign aid request. On the background of the increasing impact of natural disasters it has grown the awareness of the idea that a more efficient portfolio of management tools for catastrophic risks should include both post and pre-disaster instruments.

In the category of pre-disaster instruments we may include:

- Building up financial reserves
- Provision of funds for major disasters (contingent financing)
- Traditional insurance (indemnity insurance)
- Reinsurance
- Alternative instruments of risk management used by insurance companies
- Parametric insurance for catastrophic risk transfer from state or local authorities to reinsurance market.

The advantages of pre-disaster instruments are obvious in terms of reducing the financial burden of the government after the occurrence of major disasters. They must be also integrated into a comprehensive risk management strategy at the country level. Such a strategy should be based on the modelling of the following aspects:

- the nationwide mapping of the exposure to catastrophic risks
- preventive measures of short, medium and long range
- the size of risk absorption on various levels: insurance market, municipalities, regions, country
- the availability of financial resources at the time of the disaster and its impact on the budget and economic growth
- the benefits of the public sector from the partnership with the private insurance sector in absorbing the more complex consequences of natural disasters.

In the private insurance sector there are to be found for quite a while a number of alternative to traditional insurance instruments offered as a result of innovative processes in the financial markets.

Examples of products that fall into what we call parametric insurance are:

-Derivatives. The hedging operations with derivatives are built on parameters and indices that reflect climatic variations such as temperature, frost, rain. These products can be found primarily on some commodity or mercantile exchanges, in a standardized form, such as on the Chicago Mercantile Exchange, which was the first to offer such products. A particular disadvantage of these products is that they can let hedgers with some residual risk, but this disadvantage can be overcome by a proper structuring of the climate derivatives on the OTC market. The insured resorting to this set of financial products is represented by manufacturing companies and users of equipment of air conditioning or refrigeration technology, agricultural producers, and others.

-Insurance-linked securities. These capital market instruments are used to transfer a wide range of risks, from natural disaster risks (the insurance of major disasters by means of catastrophe bonds, since 1997) to the risks associated with life insurance. The beneficiaries of these products are insurance companies that have implemented them as an alternative to reinsurance.

For the public sector, solutions are resulting from the public-private partnership with the insurance and reinsurance markets, but these can be structured to address the hedging needs both at a macro-level (governments) and at a micro level as well (local administrative authorities).

Catastrophic risk management is analyzed differently depending on the degree of development of the country. While in developed countries, due to the existence of mature insurance and reinsurance markets, there is no urgency for governments to absorb natural disaster risks in the sphere of their concerns, in emerging and less developed countries governments are obliged to play a more active role in managing these risks. Two are the possible directions of action:

1. Facilitation of risk redistribution on the private insurance and reinsurance markets. This can be achieved by government strategies and actions such as hydrotechnical works to prevent floods, judicious organization of fire services, imposing of appropriate standards in civil and industrial construction, strategies for preventing terrorist activities, etc.

2. Buying private insurance by state or local authorities. This initiative started in 2007 and already counts several types of agreements that have as a common denominator the parametric type of insurance.

The parametric insurance does not require loss adjusters to tally damage after a catastrophe occurs, a process that can take months or even years and which can delay a payout. The speed of payout is one of the significant advantages of this type of transaction: a parametric trigger is transparent, both for the insured and for investors, and it means that loss events can be handled faster and more efficiently than with other kinds of insurance-based solutions.

Governments act as buyers of innovative insurance or reinsurance products to protect themselves against the financial impact of natural catastrophes. Such partnerships do not just exist in theory, but real solutions are already available and can be replicated and adapted to the risk exposure in other countries and regions of the world.

2. Case studies

Swiss Re is one of the worldwide biggest reinsurers and in the same time one of the best positioned in structuring parametric insurance schemes. The various case studies included in the Swiss Re publication “Closing the financial gap” (2011) illustrate how new forms of cooperation between the public and private sectors can help countries to finance disaster risks.

It also shows that the applicability of such insurance schemes is not limited to emerging economies alone. They are equally valuable to communities in exposed regions of the developed world.

The following are short excerpts from the presentation in the “Closing the financial gap” of some parametric insurance schemes put together by Swiss Re in recent years.

1. Caribbean Catastrophe Risk Insurance Facility

Faced with limited economic capacity and high levels of indebtedness, Caribbean governments found their resilience tested to the breaking point when Hurricane Ivan swept across the region in early September 2004. Ivan was the tenth most intense Atlantic hurricane ever recorded, killing over 100 people and causing billions of dollars in losses. The Caribbean Development Bank (CDB) estimated the damage in the Caribbean Sea region at more than USD 3 billion. In the wake of Ivan, heads of government from the Caribbean Community (CARICOM) held an emergency meeting to discuss the need for catastrophe risk insurance as a priority issue in the region.

CARICOM subsequently approached the World Bank for assistance. This marked the beginning of what would become the Caribbean Catastrophe Risk Insurance Facility (CCRIF).

At the start of the 2007 Atlantic hurricane season, the Caribbean community formally launched the new facility with 16 participating governments. It was the world’s first regional fund utilising parametric insurance, giving Caribbean governments the unique opportunity to

purchase earthquake and hurricane catastrophe coverage at the most attractive pricing. Caribbean governments could now purchase coverage which would be triggered by a hurricane or earthquake with a probability of occurring once in 15 or 20 years, respectively. The maximum coverage available was set at USD 100 million for each peril.

It is a cost-effective way for an individual government to pre-finance liquidity needs and start with recovery efforts immediately after a catastrophic event.

CCRIF works in a similar manner as a mutual insurance company. It retains some of the risk transferred by the participating countries and transfers the remainder of the risk to reinsurance markets and provides participating countries with insurance policies at approximately half the price they could obtain if they approached the reinsurance industry on their own. Each country receives funds from the pool in direct proportion to the amount it has paid in over the long term.

United States Geological Survey (USGS) earthquake location data is used as input for the models which estimate earthquake losses. For hurricanes, National Oceanic and Atmospheric Administration (NOAA) storm data is used as the input for the hurricane model in order to estimate the damage.

In its first year of operation, the CCRIF made two payouts after a magnitude 7.4 earthquake shook the eastern Caribbean in November 2007. When a massive 7.0-magnitude earthquake hit Haiti in January 2010, the CCRIF's parametric earthquake insurance policy paid its full limit of just under USD 8 million, providing the nation rapid access to insurance proceeds after the quake.

2. Central America Natural Disaster Insurance Facility

Straddling the Pacific Rim of Fire and the Caribbean Plate, Central America sits on a hotbed of seismic activity, and waves from both the Pacific Ocean and the Caribbean Sea wash its shores. Earthquakes, hurricanes and floods are all recurring threats. The devastating effect that a confluence of such events can have was evidenced by the active hurricane season of 2005. The impact of Hurricane Stan, a relatively weak storm, was so severe because it coincided with torrential rains brought on by a non-tropical weather system. Stan caused flash floods and mudslides that killed over 1 500 people and led to USD 4 billion in damage. Coffee growers in Guatemala, El Salvador, Nicaragua, Honduras and Costa Rica were particularly hard hit, losing a substantial part of their crop.

To strengthen disaster preparedness in the region, the Inter-American Development Bank (IDB) partnered with Swiss Re in 2010 to develop an insurance mechanism for countries in Central America and the Dominican Republic. The new Central America Natural Disaster Insurance Facility provides participating governments with quick access to insurance proceeds following a disaster.

A key innovation of the facility is its use of an index that approximates the population nominally affected by a disaster. The Central America Natural Disaster Insurance Facility works in a similar way as the CCRIF. But it offers additional coverage for hurricane-induced landslides and reflects a more customised approach suited for nations of all sizes. This is why it can be easily expanded to include additional countries, large and small, and could be broadened beyond natural catastrophes to cover other insurable risks. Among them are weather-related risks that impact the agricultural sector or pandemic and epidemic risks that destabilise health care budgets.

3. MultiCat Mexico

In terms of lives lost, the Mexico City earthquake of 1986, which measured 8.1 on the Richter scale, was the worst disaster to hit Mexico in recent decades, resulting in over 9 500 fatalities. But in economic terms, Hurricane Wilma, which hit in October 2005, was the most devastating. Wilma caused total damages of over USD 22 billion. But only USD 13.8 billion of that was insured.

As early as the 1990s, the Mexican government identified disaster risk reduction as a national priority. The result of these efforts was MultiCat Mexico 2009 arranged by the World Bank in collaboration with Swiss Re. MultiCat uses risk-linked securities, so-called catastrophe bonds, to transfer earthquake and hurricane risks to capital markets. It is based on a parametric approach linked to pre-defined triggers: Quake magnitude (earthquake), barometric pressure (hurricane). Policy coverage USD 290 million. The MultiCat Mexico transaction comprises four tranches, each relating to a different peril or geographic area.

4. Alabama State Insurance Fund

The city of Mobile and its surrounding districts have one of the highest values of insured coastal properties in the nation today, worth a total of USD 92.5 billion. Public institutions in the district are protected through Alabama's State Insurance Fund (SIF), which provides insurance for state properties, colleges, universities and public schools. By 2008, the SIF covered potential damages of more than USD 41 billion across the State. Although much of the potential damage is covered by insurance, municipal and state governments – and ultimately taxpayers – are left shouldering the burden of paying for emergency relief and uninsured losses.

Alabama decided to opt for a new approach. In 2010, it became the first state nationwide to purchase parametric insurance cover, which transfers natural catastrophe risk to the private sector using an index-based trigger. Under the terms of the agreement, the SIF will receive financial compensation from reinsurer Swiss Re in the event that a Category 3 hurricane passes through a designated area of exposed coast. The payments can be used by Alabama's authorities for any purpose, including emergency response costs, replacing lost tax revenue and funding of increased insurance expenses.

5. Malawi weather insurance

Without enough rain, Malawi faces disaster. Over the last two decades, severe drought crippled the country no less than four times, most recently in 2005. The devastation it caused reached catastrophic dimensions for Malawian farmers and for society at large. But drought not only causes widespread crop failure, threatening food supplies and incomes. The risk of drought is also a major factor in keeping productivity low because even in good years farmers are leery of using inputs such as improved seeds and fertilizers for fear of losing their investment.

To help maize producers overcome the hurdle of uncertainty and boost agricultural output, the government of Malawi decided to promote index-based weather insurance as a way to tackle drought risk.

Its resolve translated into action in 2008 when it became the first sovereign entity in Africa to introduce such an instrument. Together with the World Bank, the government created a weather derivative that offers maize farmers a means to better cope with the financial impact of drought. Swiss Re entered into this transaction as counterparty to the World Bank. Under the provisions of this arrangement, Swiss Re commits to pay out up to USD 5 million to the World Bank which in turn pays the money to the Malawi government if the country's farmers suffer from a drought-related shortfall in maize production.

The transaction's key innovation lies in its use of an index linking rainfall with maize production. The Malawi Maize Index (MMI) applies a model to calculate the value of projected losses if precipitation falls below a certain level, mirroring the high correlation between maize yields and rainfall. If maize production drops 10% below the historical average, Malawi will receive a payout up to USD 5 million. This approach guarantees timely disbursements of funds and keeps administrative costs to a minimum, as there is no need for a case-by-case damage assessment.

6. Chinese agriculture risk insurance

Over the past decade alone, droughts, floods, typhoons, pests and diseases destroyed about 10 percent of annual crops, with some regions recording losses of over 80%.

The government decided to take action to boost agricultural output. In 2004 it launched the Three-Dimensional Rural Issues policy to give greater prominence to agriculture, rural development and farmers. As part of this plan, it identified agricultural insurance as a key financial instrument to stabilise farmers' incomes and improve their resilience to financial hardship from poor harvests.

In a country where the insurance market represents less than 1% of agricultural GDP, establishing an agricultural insurance industry is a daunting challenge. But since 2007, the China Insurance Regulatory Commission (CIRC) has taken bold first steps to make this happen, working with the central and provincial governments to extend insurance to farmers across the land.

With the CIRC's support in 2008, the Beijing Municipal Government entered into a ground-breaking partnership with Swiss Re to purchase reinsurance cover for its agricultural insurance scheme. This agreement provides tailor-made reinsurance protection for livestock, crops and fruits against perils such as livestock diseases, flood, hail, wind and rainstorms. It covers about 400 000 farming households.

The immediate beneficiaries of the transaction are the insurance companies under the government-subsidised agricultural insurance scheme in Beijing. It specifies that the Beijing Municipal Government will pool all the agricultural insurance business within Beijing. Under the terms of the contract, the insurance companies will be responsible for any losses below 160% of the annual premium. Swiss Re and the state-owned reinsurer China Re will take up any losses between 160 and 300%, while those losses over 300% will be covered by the Beijing Municipal Government's Agricultural Catastrophe Risks Reserve. In the event of catastrophe loss, Swiss Re as the lead reinsurer will settle with the individual insurance companies.

This public-private partnership is the first of its kind in China. It marks a departure from post-disaster financing and a shift towards a pre-emptive risk management strategy.

7. Vietnam agriculture insurance

With an annual production of 39 million tonnes on over 7 million hectares of land, Vietnam supplies a fifth of global trade in rice and is the world's second largest exporter. When crops fail, rice farmers across Vietnam lose an essential source of income. As a consequence, they are often unable to repay their loans or make much needed investments for the next growing season.

To actively manage loan default ratios and exhibit more confidence offering loans to rice farmers in the future, Agribank and its insurance company Agribank Insurance Joint Stock Company (ABIC) decided to enter into an innovative insurance scheme that mitigates the impact of poor harvests.

Under the deal established in November 2010, ABIC will insure Agribank against the inability of its rice-farming clients to make loan repayments due to low crop yields. ABIC will transfer the risk via reinsurance to Swiss Re and Vina Re, Vietnam's national reinsurer.

The transaction is the first of its kind in Southeast Asia. It defines payouts according to an independent area-yield index that draws on data from Vietnam's Bureau of Statistics. The insurance product disburses funds if, after a natural catastrophe or disease, the rice yield in a certain geographic area falls below the expected output of an average yield.

To date, the new insurance programme will cover loans to rice farmers in up to ten provinces of Vietnam, with the potential to extend the scheme to the entire country. The advantages of this type of index-based product over conventional forms of insurance are its transparency, lower administration costs and faster payouts.

Conclusions

As a first priority, governments should ensure a functioning insurance market. This will help to absorb a big part of disaster losses suffered by individuals and businesses.

Then, pre-event financing solutions that build up reserves, contingent finance as well as sovereign insurance solutions can alleviate the remaining financial burden on governments. Post-disaster financing through budgetary means, debt financing or donor aid should only come into play to cover residual losses once all other risk transfer solutions have been exhausted.

By building up financial reserves or using insurance solutions, governments can reduce their financial burden after a disaster occurs. These measures also lower the volatility on the government budget and help improve planning certainty for the public sector. But disaster financing instruments should never be seen in isolation. Rather, they must be viewed in a country's wider risk management context.

Viewed in such a context, the purchase of parametric insurance cover, which transfers natural catastrophe risk to the private sector using an index-based trigger, is a necessary shift towards a pre-emptive risk management strategy.

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