

The theory and practice of insurance

Business, Risk Management



The Theory and Practice of Insurance Sovereign Catastrophe Risk Financing
 Limitations of Traditional Insurance and the Potential of Alternative Risk
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2 Abstract In the light of increasing societal losses due to natural catastrophes, this paper focuses on the topic of how the (re)insurance industry cooperates with the public sector to protect the latter from the negative financial impact of natural disasters. In particular, it treats the question how governments commonly protect themselves and what risk transfer solutions the insurance industry can offer to governments to improve their protection against the losses of natural disasters that are not privately insured, and which ultimately would have to be borne by society, tax payers or by the government itself. In this context, the paper outlines the limitations of traditional (re)insurance and emphasizes the potential and importance of alternative risk transfer solutions for the public sector. To show how these methods are used in practice, three real life examples are introduced; one using an alternative risk transfer to the capital market in form of a catastrophe bond, the second a reinsurance solution and the last one contingent debt financing in combination with a derivative option.

3 Impact of Natural Catastrophes on Society Over the last decades, losses due to natural catastrophes have been increasing significantly. It is estimated that over 3.4 billion people worldwide are negatively affected by natural perils. 1 There are several reasons for this increase. The economic development combined with a growing and

increasingly urbanized population has resulted in a much more dense concentration of assets prone to natural disasters. In addition to that, scientific evidence suggests an increase in the frequency of climate related catastrophes, which further amplifies the impact on society. The most common disasters include earthquakes, heavy rains and floods, droughts, as well as storms, hurricanes and cyclones. ² While economic losses are huge, only a small portion of them is privately insured. In lowdeveloped countries, the insurance market covered only about 5% of direct losses incurred by natural disasters as compared to 40% for developed countries (2009 estimate). ³ ¹ ² Weathering climate change (2010): p. 1 Closing the financial gap (2011): p. 5-11 ³ Cummins/ Mahul (2009): p. 5 ⁴ With the earthquake in Japan, this upward trend was given a sad confirmation, as 2011 is estimated to be the year with the highest ever recorded natural catastrophe related losses, with economic and insured losses reaching USD 350bn and USD 103bn respectively. ⁴ How governments protect themselves and their people from the negative impact of natural catastrophes The state is often the “insurer of last resort”. This means that ultimately, all costs that are not borne by the private sector will somehow fall back on the state. For instance, governments do not only have to compensate for damages to public infrastructure but also have to bear other costs associated with administering first aid, providing emergency supplies or clearing roads etc. In addition, governments also face future cutbacks in tax revenues, slowing economy, increasing costs of social welfare, or even expenses to support private rebuilding efforts for underinsured individuals. ⁵ Governments generally devote a substantial amount of resources to protect their citizens

from the adverse effects of natural disasters. Especially in developed nations, it is quite common for governments to invest heavily in or subsidize preventive infrastructure such as dams, emergency shelters, water irrigation systems etc. Also, governments try to minimize the negative impacts of disasters by raising awareness among the population through dissemination of information, setting up contingency or evacuation plans, implementing and enforcing building codes, or by setting up danger zones where it is prohibited to construct new buildings. Such measures are mostly aimed at protecting livelihoods and at minimizing the number of casualties and damages. 6 4 Swiss Re Sigma — Preliminary estimates for 2011 Swiss Re Sigma study (2011) 6 Closing the financial gap (2011): p. 19 5 5 However, these measures rarely include provisions to pre-finance the costs of disaster relief and recovery efforts, so called ex-ante financing. “ Historically most governments have financed disaster expenses only after a catastrophic event has taken place. ” (SwissRe, 2011; 19). Ex- post financing instruments Subsequently, after disaster strikes, governments mostly have no choice but to rely on ex-post financing measures such as budget reallocation, tax adjustments, issuing sovereign debt, or requesting donor aid. Budget reallocation is one of the most common ex-post risk financing instruments used by governments. Internal funds are diverted away from initially planned spending to cover liabilities caused by the disaster. An example for this is often seen in developing nations, where proceeds from international loans are used to finance disaster relief efforts even though they were earmarked for other purposes. Mostly, this measure is used when external financing becomes too costly. 7 Tax rate adjustments also allow the government to

raise revenues for catastrophe financing. The state can postpone planned tax reduction incentives, increase taxes on a one-time basis (catastrophe taxes) or increase them permanently. Australia, for instance, has increased its tax rates permanently after the floods in 2002. Oftentimes governments choose to issue new debt in form of treasury bonds on the domestic or foreign capital markets. This solution, however, is often only viable for wealthy countries with good credit ratings or with a low debt-to-GDP ratio; otherwise fund raising costs are very high, especially after catastrophes. 7 Unless stated differently, this and the following paragraphs are based on: OECD (2005): p. 127-128 6 Donor aid is mainly targeted to assist governments of developing countries. Among some of the non-profit institutional donors are the UN, the EU, the World Bank, the International Monetary Fund (IMF), the Red Cross, and the Inter-American Development Bank (IDB). 8 We later show that donor aid also used for ex-ante financing, as donors increasingly invest in risk transfer solutions in disaster prone developing countries. Ex- ante financing instruments Governments can chose among four categories of pre-event financing instruments, which include indemnity insurance, parametric insurance, reserve funds, and contingent financing (alternative risk transfer). Insurance instruments and reserve funds Indemnity insurance is the most traditional form of insurance. This type of contract restores the insured party to the pre-loss state. After loss adjustment has taken place, the insured party will get a payout equal to the actual loss incurred or equal to the maximum amount insured. This sort of insurance is bought from companies and individuals from primary insurers, which then cede some of their peak risk to the reinsurance

industry⁹. Governments are involved with this type of insurance in as much as they might require companies and individuals by law to buy catastrophe insurance for their infrastructure. While governments might use indemnity insurance to insure specific risks such as government buildings etc., it is only of very limited use to insure the more complex costs of disaster relief and recovery efforts for developing countries. Indemnity insurance does not involve basis risk and the insured is recovered to the pre-loss state.

However, it is the most expensive form of catastrophe risk financing. ^{8 9} La Trobe/Vento (2003): p. 38; 40 EuropaRe (2012) 7 To solve the problem of moral hazard, the insurance industry has come up with the concept of parametric and index based insurance products. Parametric insurance no longer relies on the actual losses of an event to define whether there is a payout, but it predefines certain parameters according to which an event is measured (e. g. wind speed or the intensity of an earthquake). Those parameters can then also be used to define the amount of the payout. This process of estimating the losses can be further refined by using indexes of similar events. ¹⁰ Parametric and index based insurances have the advantage that they are more transparent in terms of defining when a payouts occurs. Also, if the amount of the payout is derived from the parameter or index, no loss adjustment is needed. This eliminates the threat of moral hazard and also lowers operational and transaction costs. Further, a payout can be processed much quicker. A crucial disadvantage of this type of insurance is that the client has to bear the basis risk, which is when the payout is different from the actual loss. ¹¹ Another issue is that a huge amount of historical loss data is necessary, which is time intensive and costly

to generate. 12 Catastrophe reserve fund: Governments create a so-called national calamity fund which is financed by tax revenues. Reserve funds bear the benefit that funds are immediately available after a loss experience. Further, transaction costs are minimized due to the fact that no file claiming and loss adjustment procedures are required, as compared to general insurance. Therefore, those funds can be effectively utilized to smooth budget volatilities arising after a disaster. However, “freezing” funds for contingent purposes creates opportunity costs. In addition, those funds might be diverted and wasted by corrupt government officials, which might enhance inefficiencies. 10 11 International Fund for Agricultural Development (2011): p. 19 Ibarra, H.(2009): p. 2-4 12 Weather Index-based Insurance in Agricultural Development (2011) 8 Alternative Risk Transfer The recognition of the fatality of losses associated with natural catastrophes and the inability- and unwillingness of (re)insurers to bear those risks have been a major reason for the development of Alternative Risk Transfer Solution (ART) that governments use: There are several ART instruments such as contingent debt, or Insurance-Linked Securities (ILS). 13 Contingent debt financing is a derivative alternative risk transfer solution. In return for an annual fee, it provides the option for the government to draw upon a post-event loan triggered by the realization of a risk-specific loss, and serves as a temporary funding source until other monetary resources, eventually from other insurance claims, are mobilized. 14 Terms of the loan are agreed on before the occurrence of the disaster. Among the currently most innovative contingent capital solutions is the “Cat DDO” which will be introduced in the last section. 15 The most popular form of Insurance-Linked Securities is

catastrophe bonds (CatBonds), which were first introduced in the 1990's. Instead of doing retrocession, the reinsurers can use CatBonds to transfer its risks to the capital market. 16 A Special Purpose Entity (SPE) is founded from which the bonds are issued to investors. The proceeds are put into a custodian account, which reinvests the funds into usually lower risk assets. It is a fully-funded approach of risk financing. In case a catastrophic event triggers a payout, the principal or a part of it as well as the interest are liquidated and provided to the insured party. If no disaster occurs, investors receive interests and are repaid the principal at maturity. 17 While investors might benefit from interest payments, higher prevailing market rates, they bear the potential risk of losing their total initial investment. 13 14 www.financedirectory.com (2012) OECD (2005): p. 130 15 Cummins/Mahul (2009): p. 172-173 16 ICLEI (2011): p. 40 17 Culp C. L. (2012) 9 Governments can also issue CatBonds. The Mexican government, for instance, is using a CatBond to better insure its catastrophe fund (FONDEN). 18 This structure will be introduced in the last section. Limitations of Traditional Insurance and the Potential of Parametric and Index-based products and ART Considering that governments are the "insurer of last resort", it surprises that there is only relatively little sovereign investment in ex-ante risk financing mechanisms for natural catastrophes. There are several factors, which make it difficult for governments to use indemnity insurance products to protect themselves and their people against natural disasters. Unlike most corporations, governments do not usually have reliable loss data collections, which makes it hard to estimate expected losses for future catastrophic events. 19 Further, governments often lack

institutions to carry out a thorough loss adjustment process²⁰ or risk management in general. Even if they do, it is mostly very time intensive, and therefore, not adequate if relief and recovery funding is needed quickly. However, this does not yet explain, why governments don't use parametric or index based solutions or ART more intensively. There seems to be a mutual reluctance among governments and insurers to enter contracts with each other. For the governments it is mostly the bureaucratic processes that make cooperation difficult. For insurers, on the other hand, it is hard to maintain long-term business relationships because of a high volatility in political budgets and regimes. ²¹ Another possible explanation for this is that politicians have a relatively short time horizon for making risk finance decisions. They have little incentives to spend money on "expensive" insurance premiums, as there will most likely be no payout during the time they are in power due to the low ^{18 19} OECD (2005): p. 129 Thomas (1997), p. 1 ²⁰ Country risk management: p. 8 ²¹ Cummins/Mahul (2009): p. 4 ¹⁰ frequency of catastrophic events. In addition, common voters who are not aware of the benefits of insurance will most likely deem the expenses to be careless spending rather than farsighted risk management. ²² Nevertheless, due to their above-mentioned advantages, parametric and index-based risk transfer solutions have gained much popularity in recent times. Potential of ART For the insurance industry as a whole, there are limits in terms of financial capacity. Losses of large-scale events can easily exceed the insurance industry's risk appetite. It is therefore important that governments have access to the capital markets for additional contingent capital. ART instruments satisfy exactly this need. Here, the (re)insurance industry comes

into play not as a provider of insurance but as a facilitator between the public sector and the capital markets. One of the biggest advantages of ART instruments is that their risk is not correlated with that of the market, as their value and default probability no longer depends on an underlying asset traded in the market, but on the occurrence of a natural disaster. This gives potential investors the possibility to better diversify their portfolio. ART gives the insurance industry to pass on some of their risk to the capital market and thereby freeing capital to obtain other underwriting business. This might be valuable for risks that are very low in frequency. As ART instruments also work with parametric and index-based triggers, they 22 Country Risk Management (2010): p. 1 11 offer the same advantages as the corresponding insurance instruments in that the instruments can be exercised immediately after they is triggered. For CatBonds and contingent capital, there are several distinct advantages that might benefit their use in the future. One of the advantages of CatBonds is that the issuer does not have to deal with counter party default risk after the event, as the instrument is fully funded. Further, it is one of the very few instruments that — unlike insurance - cover natural disaster risk over a multi-year period, which further smoothens budget volatility. In MultiCat-Bonds, which cover several risks at once, the client can further benefit from pooling effects. Currently, the industry is also considering an additional beneficial use of CatBonds, which is the proactive investment of the fund's proceeds in disaster risk mitigating measures. 23 Contingent capital has shown to be cheaper than other products, because the option fees are lower than the insurance premium. However, the buyer will still have to increase its debt,

once the disaster strikes. Therefore, an increase in demand for contingent capital is expected to come from rather wealthy nations with lower debt-to-GDP ratios. 24/25 Public Private Partnerships (PPP) Both the public and the private sector play an important role in making societies more resilient to peak risks. The public sector has the power to establish an adequate legal framework enabling the private insurance sector to develop and prosper. The ultimate goal is to achieve a well-established insurance market with a high private insurance penetration. The logic behind this is that the extent, to which costs fall back on governments, depends largely on how well the private insurance industry is established. Theoretically “ in countries with a functioning insurance market, there is no 23 24 ICLEI (2011): p. 41 Cummins/Mahul (2009): p. 172-173 25 OECD (2005): p. 56 12 need for the government to actively absorb natural catastrophe risks" (Swiss Re 2010: p. 13). Common measures taken by the government to regulate the insurance market can include capital and licensing requirements, providing access to international markets, ensuring legal stability or introducing compulsory insurance schemes. 26 While the public sector is in charge of the legal framework, it's the primary role of the private sector to provide governments with adequate and innovative risk transfer solutions for peak catastrophe risks, such as derivative instruments and insurance-linked securities²⁷. In addition, as the risk management experts per se, the (re)insurance industry can help government in the process of identifying, assessing and managing the key risks and lead the way toward comprehensive disaster risk management. 28 26 27 Country Risk Management (2010): p. 6 Closing the financial gap (2011): p. 4 28 Country Risk Management (2010): p. 2 13

Comprehensive Disaster Risk Management (CDRM) In recent years, there has been a trend towards more comprehensive country risk management approaches among governments. Such approaches try to look at the whole risk profile of a country, comparable to the way a private company implements an Enterprise Risk Management (ERM) system. CDRM includes the identification, assessment, mitigation of and the adaptation to risks. These risks not only include natural catastrophes, but also man made disasters (e. g. terrorism), pandemics or longevity risks etc. As mentioned in the previous sections, institutional donors have also recognized the importance of comprehensive risk management among developing nations. Instead of providing post-disaster financial support only, institutional donors are now increasingly promoting pro-active disaster risk management providing practices financial by and technical assistance for risk mitigation and the emergence of risk transfer mechanisms. This includes funding risk financing products for developing nations.

29 Real Life Examples of Public Private Partnerships In the following, we introduce three examples for Public Private Partnerships.

29 Cummins/Mahul (2009): p. 18 14 FONDEN Mexico - A combination of a public fund and CatBonds Mexico is heavily exposed to hurricanes, floods, and earthquakes. To better manage those risks financially, the Mexican government has founded the " Fondo de Desastres Naturales" (FONDEN) in 1999. In 2006, in an effort to better protect the fund, MultiCat was introduced, which is a CatBond structure that transfers some of the funds risks to the capital market. The structure was renewed three years later with an issue of the 2009 MultiCat, CatBond with a maturity of three years which is triggered by either the strength of an earthquake on the

Richter scale or by the air pressure experienced during a hurricane. MultiCat 2009 is comprised of four tranches, each with a different trigger. Its maximum payouts are USD 140mn for one earthquake tranche and USD 50mn for three hurricane tranches, each triggered in a different region of Mexico. For instance, if a storm passes either one of the three zones with an air pressure of below a certain threshold, the tranche is triggered.

15 CCRIF — A combination of public insurance pooling and private reinsurance

Historically, the Caribbean States have been prone to earthquakes and hurricanes, which, due to geographical location, both happen quite frequently. However, rarely do those events reach the intensity and devastation of 2004 Hurricane Ivan, which was unprecedented in terms of damage and economic losses. For instance, the Cayman Islands experienced losses of USD 185bn, which is roughly double its annual GDP. The event was the starting point for the Caribbean Catastrophe Risk Insurance Facility (CCRIF), a facility in which 16 CARICOM states established a fund with the assistance of the World Bank to insure its members against the adverse financial impact of earthquakes and hurricanes. The participating countries can buy insurance from the pool in the amount they desire for earthquakes or hurricanes with a frequency of once in every 15 to 20 years, with a maximum coverage of up to USD100mn for each peril. Thanks to the risk-pooling benefits, “ this structure results in a particularly efficient risk financing instrument that provides participating countries with insurance policies at approximately half the price they would pay if they approached the reinsurance industry on their own” (Cummins/Mahul 2009; 166). The mutual fund is using a modeled-loss based parametric insurance scheme.

Based on data from the United States Geological Survey (USGS) for earthquakes and from the National Oceanic and Atmospheric Administration (NOAA) for hurricanes, expected losses are estimated with a model. These loss parameters will then decide whether the policy triggers and how much will be paid out. The fund retains USD 10mn of the aggregate risk exposure of USD\$ 600mn and cedes USD 110mn to international reinsurance companies in different layers. " The top layer (USD 70mn excess USD 50mn) is financed with reinsurance as well as a USD 20mn coverage through a catastrophe swap organized by IBRD Treasury" The World Bank's Cat DDO - A combination of contingent capital and options An innovative contingent financing instrument is the Cat DDO (" Catastrophe Deferred Drawdown Option") issued by the World Bank. It ensures liquidity to IBRD (" International Bank for Reconstruction and Development") member countries after the declaration of emergency. The purpose of the Cat DDO is stated by the World Bank as follows: " To enhance/develop the capacity of borrowers to manage catastrophe risk, to provide immediate liquidity to fill the budget gap after a natural disaster and to safeguard on-going development programs". Usually, nations that are exposed to recurring natural disasters are more likely to acquire Cat DDO's. Cat DDO is characterized by a " soft" trigger, as opposed to a parametric one. This means payout is guaranteed immediately after the public has recognized the occurrence of a natural disaster. The immediate payout to cover losses allows the Cat DDO to serve as a temporary " bridge financing" (World Bank: 2011), until other funds are made available. In order to qualify for the purchase of such an option, governments will have to adapt a risk management program, which will be

supervised by the World Bank itself. Another prerequisite is the additional risk coverage that must be provided by governments, may it be in form of traditional insurance or in form of a catastrophe bond issue. The maximum loan amount is limited to either USD 500mn or 0.25% of GDP. The contract's duration is 3 years and can be renewed four times, resulting in 15 years of possible coverage. In 2010, Costa Rica drew a loan amount of USD 24m to cover earthquake losses, Guatemala USD 85m for reconstruction and Colombia USD 150m to compensate crop shortages as a consequence of heavy rainfalls.

30 Conclusion Both the impact of natural disasters and the hazards amplifying them are increasing. This results in ever-higher economic losses of which only a small part is insured privately and the rest ultimately falls back on the government. Therefore, it is important to raise awareness among governments that buying insurance or alternative risk transfer products is not just a costly thing but that, in addition to transferring risk, it can also create value in that it frees capital for other investments and smoothens budget flows. There is a variety of catastrophe risk financing instruments that, in combination, can lead to very powerful and effective catastrophe protection. Governments should rely on both ex-ante and ex-post risk financing mechanisms. There is no best solution in terms of what risk management approach to choose. All depends on the type of peril and the assessment of its impact in terms of losses and liabilities, desired coverage, availability of budget, cost efficiency as well as the benefits and drawbacks of the insurance instruments relevant to the party insured. While a trend from ex-post towards ex-ante disaster risk financing and from ad hoc risk management approaches to more holistic risk management perspectives

can be observed, there is still a lot of room for governments to improve their catastrophe risk management. 30 The World Bank (2011): p. 1-2 18

Normally, governments do not institutionalize functions such as that of the Chief Risk Officer leaving insurance companies with additional challenges such as educating government entities about the function and benefits of insurance and risk transfer. It is only after this strenuous process that actual risk transfer measures can be initiated. Public Private Partnership can fill parts of this financial and informational gap. While it's the role of the governments to optimize the regulatory environment, it is the private sector that brings in the knowledge of innovative risk transfer solutions and disaster risk mitigation. Alternative Risk Transfer solutions are a viable method to insure governments against risks that the insurance industry is not willing to bear on its own. In addition they, provide capital market participants with an additional tool to diversify their portfolio, as the returns are not correlated with the market. Despite of all the positive aspect, however, risk transfer products remain rather expensive so that developing countries with less financial resources can often not afford them. Here, institutional donors can step in to make those innovative risk transfer solutions better accessible. As we cannot do much to influence people's behavior or the contingencies of nature, our only option is to adapt to the ever-changing environment by trying to make society more resilient to those developments. This paper has shown some viable solutions to the question how at least the financial risk of natural catastrophes can be better diversified. However, in order for insurance to properly work, it cannot only be the government that takes care of it. Insurance is a matter that needs to be regarded as a responsibility by

all parts of society, starting with individuals and companies. 19 Bibliography

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