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Using Capital Markets to Develop Private Catastrophe Insurance

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The global catastrophe insurance market exhibits inherent cyclical risks. Disaster-prone countries can improve their protection against catastrophic risk and premium volatility by using capital markets to boost the capacity of the private sector to absorb and spread the risks—both domestically and internationally. This Note proposes two mechanisms for more efficient management of catastrophic risk: pooled insurance coverage supported by liquidity and credit enhancement facilities, and hazard-indexed bonds to securitize risk. Support from multilateral development institutions can play a catalytic role in the development of these mechanisms while still preserving actuarially fair premiums. Some small countries may require multilateral support (a credit enhancement) to gain access to capital markets. Or perhaps all that is needed is for the government and local industry to recognize that the new mechanisms can both increase cover and stabilize premiums. Such an assessment requires scarce financial modeling skills—something multilaterals can help organize and finance.

Catastrophic events are unique among insurance risks: while traditionally insurable risks occur with predictable frequency and relatively low losses, catastrophes occur infrequently but with high losses. Three mechanisms have been developed in recent years to better manage these risks by tapping capital markets. In the United States public authorities in earthquake-prone California and in hurricane-prone states such as Florida and Hawaii collaborate with the private sector to address insurers' fears of large losses (and thus potential market flight). These public-private efforts combine catastrophe coverage under special-purpose pooled funds with outside capital (such as long-term loans and bonds that securitize insurance risks), increasing the availability of insurance. The pooling arrangement achieves efficiencies of scale while giving all parties the confidence that contractual obligations will be met. This approach is also used in Europe.

Also in the United States an options market based on insured loss indexes has been set up at the Chicago options exchange. These options allow insurers to hedge some of their catastrophic risk in the capital market. In Japan, Europe, and the United States markets for "cat bonds" offer another alternative for transferring risks. In these markets investors buy high-yield bonds that are backed by premiums on the underlying insurance portfolio, but also contain provisions that trigger loss of interest and principal if a major catastrophe occurs during the life of the bond. Investors are attracted to these bonds because of their lack of risk correlation with global financial markets.

Some of these risk management methods could be adapted for use in developing countries.

High and volatile premiums

In catastrophe-prone developing countries the domestic insurance industry generally reinsures

BOX 1 PRICES FOR CATASTROPHE REINSURANCE

Reinsurance prices are quoted as "rates on line." Assume, for example, that a primary insurance company wishes to purchase reinsurance for catastrophic losses between US$15 million and US$25 million. If losses in a catastrophe are less than US$15 million, the company retains all the loss. This ceiling is referred to as the retention level. If the loss is more than US$15 million, the reinsurer pays the excess up to the US$25 million—the excess-of-loss level. If the reinsurer charges US$1.5 million for this US$10 million of coverage, the rate on line—the price expressed as a percentage of the coverage—is 15 percent.

Rates on line vary by type of risk. A primary insurance company doing business in an area at low risk of catastrophes will pay the lowest rates on line. Rates also vary by retention level. The rate on line for US$10 million in coverage above a retention level of US$15 million would be much higher than that for US$10 million above a US$100 million retention level. The reason is that there is a higher probability that losses will exceed US$15 million than that they will exceed US$100 million. A typical average for rates on line is 13 percent. The rates for hurricane-prone countries are high relative to worldwide catastrophe rates. But retention levels for small, disaster-prone countries are much lower on average than for U.S. insurers.

its local portfolio through international insurance or reinsurance companies that can better bear the risk of catastrophic losses through global diversification. While this reinsurance transfers the risk abroad, it may not provide the kind of coverage that could ensure economic recovery and fiscal stability in the wake of a natural catastrophe. Excessive risk transfer might also imply low capital among local insurers.

Insurance for natural disasters is generally available for even small developing countries. But following an unusual series of major losses, domestically or globally, insurance could become scarcer and pricier. Thus relying on reinsurance from foreign companies affects the price of disaster insurance (box 1). Prices have been dropping since 1995. But they could rocket if a major catastrophe occurs and catastrophe reinsurance markets tighten. In 1990 the rate for home insurance in parts of the Caribbean was 0.4 percent. After Hurricane Andrew hit Florida in 1992 prices more than tripled, reaching 1.3 percent in 1994, then declined to 0.8 percent in 1997. By contrast, Hurricane Mitch, which devastated parts of the Caribbean and Central America in 1998, had little effect on insurance prices because much of the property it damaged was uninsured. Thus the price of insurance tripled for property owners in the Caribbean at a time when there had been no change in their underlying risk. Instead, the price fluctuations reflected changes in the supply of catastrophe reinsurance following a disaster elsewhere.

Transferring risks abroad also means that because the domestic insurers retain little of the underwriting risk, they face low incentives to monitor compliance with structural codes or to promote measures to mitigate losses or improve industry efficiency that in the long run might lower the cost of insurance. When all but very low levels of risk are reinsured abroad, the reinsurance coverage is generally expensive because of the high likelihood that it will be triggered. Contracting reinsurance at much higher levels of loss would lower the premiums because of the lower probability that losses would reach those levels. Thus a key cost issue is finding the right balance over time between retaining risk locally and transferring it abroad.

Transferring catastrophic risks to the capital market

A simple numerical example shows how capital markets can replace or supplement insurance and reduce costs. Assume that a primary insurance company calculates the probability of a loss of more than US$15 million but less than US$25 million at 10 percent. If the primary insurer purchases reinsurance at this rate, it will break even over time. Adding administrative and operating costs, the reinsurer might charge a premium of 12.5 percent (10 percent + 2.5 percent).

Alternatively, the primary insurer could issue a US$10 million bond to investors, then put the US$10 million in U.S. treasury notes paying, say, 5 percent. The investors' principal of US$10 million would be put at risk as part of the contract. If a catastrophe with losses exceeding US$25 million occurs, the investors might lose all their principal. For putting their principal at risk, the investors would demand at least a 15 percent return—5 percent as risk-free interest and 10 percent for the "pure" risk of losing their principal (akin to a default risk). Net of the investment in treasury notes, the insurer's total financing cost would approach 10 percent, compared with the 12.5 percent with traditional reinsurance.

In yet another option the insurer could arrange a standby credit of US$10 million with a 2 per-

cent commitment charge and an interest rate of 12 percent that kicks in if the loan is needed. If a catastrophe occurs, and assuming a ten-year repayment period for principal (yielding a combined principal plus interest "insurance" cost of 18 percent), the expected financing cost would be 3.6 percent (0.1 [18 percent] + 0.9 [2 percent]), much lower than with direct reinsurance.

These capital market schemes to replace or supplement insurance have many possible variations. These range from full risk transfer with no financing (where the full principal is at risk, just as in reinsurance) to zero risk transfer with full financing (full repayment of principal).

Applying new insurance technologies

Two compatible financial structures could be used to address the challenges of catastrophe insurance in disaster-prone countries, separately or as a joint mechanism.

Pooled coverage supported by liquidity and credit enhancement facilities

A mechanism in which liquidity and credit enhancement facilities support insurance coverage against catastrophic risks could function as follows:

- The domestic insurance industry would transfer catastrophic coverage (through premium cessions) to a central fund regulated by the government and operated by the insurance industry. The risks covered would not be reflected on the balance sheets of local insurers but would instead be liabilities of the pooled fund. The international insurance industry could then reinsure catastrophic coverage under the fund up to a specified loss limit.
- Multilateral development institutions might provide contingent credit at the next highest loss level, supporting the liquidity of the fund in the event of immediate large losses in the initial years of operation. The credit would eventually be repaid and secured through future premium collections by the fund. The extended repayment period would provide optimal risk spreading over time. This layer of cover would also serve as a partial buffer against fluctuations in international reinsurance pricing, since the loan terms would remain unchanged.
- Once such arrangements prove financially viable, local financial markets or international commercial lenders could offer liquidity support facilities. Development of these instruments would be catalyzed by the credit provided by multilateral development institutions.

While this mechanism would finance rather than transfer risk, if structured with proper terms and appropriate levels of excess-of-loss coverage, it could provide more cost-effective coverage and longer-term price stability than traditional reinsurance.

Hazard-indexed catastrophe bonds

Weather-indexed catastrophe bonds, based on payouts linked to measurable weather events (as reflected in weather indexes or parametric measures), have the advantage of being relatively easy to implement once a reliable weather measurement mechanism is identified. They bypass the traditional insurance "loss adjustment," which requires site-by-site evaluation of losses before indemnity is provided. The payout is simply based on the weather index reaching a certain range. Payouts for the Tokyo Marine Insurance cat bond, for example, are based on specified Richter measures of earthquake intensity and damages within a specified radius around Tokyo.

The main risk with hazard-indexed instruments is basis risk—the risk that the basis for triggering the loss payment (such as a high windspeed, excessive rainfall, or earthquake intensity) is not directly linked to actual loss (such as damage to a specific house or building). A loss payment may be made (with the bondholder losing interest or principal) even though the insured experiences no loss. Or the insured may experience a loss but receive no indemnity because the index is not triggered (as a result of a lower-than-threshold windspeed).

Most catastrophe bonds—such as those issued in Europe and the United States—are triggered by

reported losses and indemnification claims in the industry rather than weather indexes. But investor appetite for such bonds issued in developing countries might be low because of lack of direct knowledge of the local insurance industry. Bonds based on easily verifiable weather indexes should be more attractive. Adding to their attractiveness are the opportunities they would offer international investors for portfolio diversification, since natural disasters have little or no correlation with global financial market trends.

What would the financial structure of a scheme based on hazard-indexed bonds look like?

- Catastrophe bonds could cover public infrastructure or provide financing to a private pooled fund, as described in the previous section. The bonds would pay higher-than-average yields but would also carry a risk of a significant drop in the coupon rate or a loss of principal in the event of a catastrophe that leads to loss payments.
- A multilateral institution or affiliate could guarantee the contractual payments of bond coupons and any principal due investors. In a fully private arrangement the bond payments would need to be fully secured by the premiums collected in the common fund.
- The basis for triggering loss payments could be information from weather station tracking equipment with satellite links to global recording centers or from weather monitoring systems of the U.S. National Weather Service, which tracks high-altitude hurricane activity in the Pacific and Atlantic regions. Earthquake risk could likewise be measured.

Before hazard-indexed bonds are introduced, historical data on hazard events and associated losses would need to be compiled and analyzed to ensure a sufficiently strong correlation between index-triggered payments and actual losses. These data are essential for structuring and pricing such insurance contracts.

A joint mechanism

While a hazard-indexed bond could be developed on its own, it could also be combined with the catastrophe insurance pool, serving as one of the upper layers of coverage. Such risk transfer mechanisms—involving capital market investors under multiperiod contracts—can further reduce the potential volatility of insurance and reinsurance prices. They would also enable the government to insure public property at reasonable prices. And they would enable the local insurance industry to extend coverage to such hard-to-insure sectors as small farmers, public infrastructure, and low-income communities.

A catalytic role for development institutions

Financial support from multilateral development institutions to create an insurance pool and hazard-indexed bonds, separately or together, would meet several objectives. The support would help reduce potential market failures due to historical premium volatility that result in lapses in coverage. It would also help overcome suboptimal coverage resulting from the scale diseconomies in small countries' insurance markets, and the lack of incentives for measures to mitigate catastrophic losses. And because capital market–based arrangements could increase the insured asset base in developing economies while promoting reliability in economic compensation following natural disasters, the support could encourage participation by the international reinsurance industry.

Such initiatives go hand in hand with the needed restructuring of local insurance industries. Thus the involvement of multilateral institutions could help strengthen the domestic insurance industry and improve hazard mitigation. Where regional rather than national arrangements are optimal, multilateral institutions could facilitate intercountry policy dialogue.

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