

Transferring Catastrophe Risk Through Financial Markets

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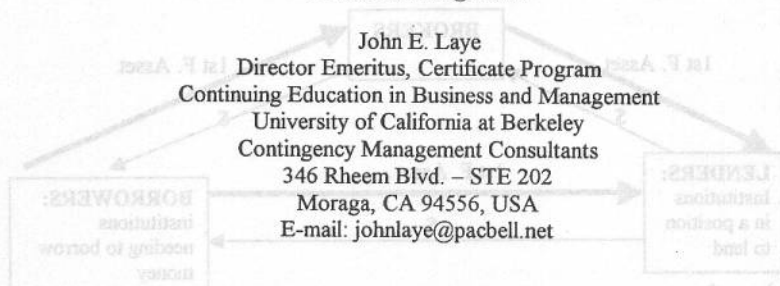
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Abstract

This article provides an overview of how insurance and reinsurance companies and institutions can use new methods to finance extraordinary or catastrophe risk in the capital markets as well as to split or swap it. These new methods are divided into two groups: those that issue new assets (secondary financial assets) by securitization, and those that use derivatives-structured products.

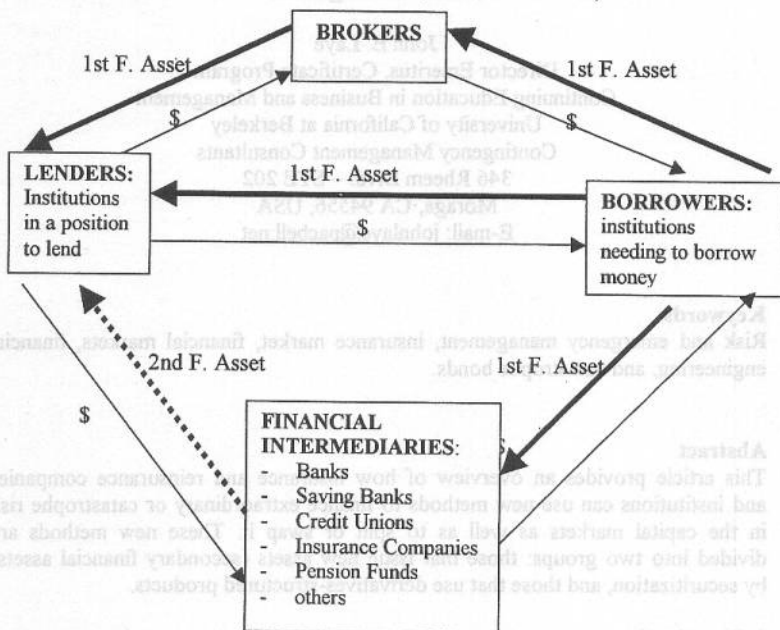
1. Introduction

In a general sense, the financial system of a country is a group of institutions coupled to methods and markets with the principal aim of conducting savings

generated by those institutions “with surpluses” into those institutions “with deficits.” In other words, the principal aim of a financial system is to channel funds from those who have excess money to those in need of it. The institutions in a position to lend money are called lenders¹ and the ones who need to borrow money are called borrowers.² The financial intermediaries buy and sell financial assets on the financial markets.

The financial intermediaries that attract funds from lenders and channel them to those in need of money are important for two reasons. First, the borrowers and lenders are different institutions. Second, desires about liquidity, risk, and profitability of financial assets are not the same for the many market participants. This circumstance allows the markets to deal with a huge range of assets that adapt to those preferences. For this and other reasons³, the financial intermediaries channel savings by the “transforming” of assets, from primary⁴ to secondary⁵ financial assets.

The G. G. Kaufman⁶ diagram below shows the interrelation between assets, intermediaries, and markets as well as the transformation process from primary (1st F. Assets) to secondary financial assets (2nd financial assets).



FINANCIAL SYSTEM TRANSFORMATION PROCESS

Source: A. CALVO, L. RODRIGUEZ SAIZ, J. A. PAREJO, AND A. CUERVO, *Manual de Sistema Financiero Español*, Ariel Economía, edición n° 12, Barcelona 1999, p. 3.

The intermediaries are those who buy primary assets for their portfolios, lend money for a long time to the borrowers (issuers of primary assets) and transform those assets, issuing others (the secondary financial assets) that sell in the markets that facilitate borrowing and lending money. By this process, the intermediaries shift money from lenders to final borrowers, transfer risks through the market, and adapt investments to investors' preferences.

Financial intermediaries can be classified as banking or non-banking intermediaries. Insurance and reinsurance institutions and companies are in the group of non-banking financial intermediaries. These institutions have a dealer activity apart from their principal activity, which is risk insurance. Insurance is a subset of the overall financial market. All these institutions accumulate very large reserves from policyholder premiums and investors in bonds, shares, investment funds, pension funds, etc. Through these investments, the insurance and reinsurance⁷ institutions channel investment money from the lenders to borrowers. At the same time, their activities transfer the risks in the financial markets.

This article provides an overview of how insurance and reinsurance companies and institutions can use new methods to finance extraordinary or catastrophe risk in the capital markets. These new methods are divided into two groups that transfer risks through the financial markets. The first group is the issue of new assets (secondary financial assets, such bonds) by securitization. The second group uses products structured as derivatives (usually options).

2. Catastrophe Risk and Insurance Problems

The market that traditionally deals with catastrophe risk is the insurance market. To begin this overview, it is useful to define "insurance." The most common definition says that "insurance is a mechanism by which people and companies can manage a particular risk by pooling and sharing the burden of any losses they incur" (REDJA, 1995). Participants in an insurance contract exchange the risk and uncertainty of a potential large loss for a relatively small and certain insurance premium. Under normal conditions, insurance companies use markets to establish efficient and equitable pooling arrangements for commonplace risks such as house fires or car accidents. However, problems can arise with other risks such as earthquakes or hurricanes that are considered to be extraordinary or catastrophe risks. They differ in several ways from the risks insurance companies normally assume.

What are commonly called "major catastrophes" are infrequent and virtually unpredictable events, but when they do occur they often cause large losses and many problems, usually concentrated in a geographic area. The risk of natural disasters has increased significantly in recent years all over the world for several reasons. On one side, there are ongoing climate and other terrestrial changes that have increased the severity and frequency not only of earthquakes and hurricanes, but also of floods, landslides, droughts, etc. In addition, there has been enormous

population growth with urban development in high-risk areas during the last decade.⁸

Some manifestations of these destructive weather-related events are hurricane Hugo in 1989 (\$4.2 billion in insured losses), winter storms in Central Europe in 1990 (\$10.2 billion), typhoon Mireille in Japan in 1991 (\$5.2 billion), hurricane Andrew in the USA in 1992 (\$14 billion), the Northridge Earthquake in the USA in 1994 (\$12 billion), hurricane Georges in the Caribbean in 1998 (\$3.4 billion), and more. Although the increased risks are reflected by increased insurance losses related to natural disasters over the last decade, experts believe recent disasters are small compared to potential future disasters (MUNICH RE GROUP, 1999, p. 44).

Insurers are trying to accommodate their business to this new situation of growth and development by expanding insurance coverage in high-risk areas. The direct consequence is that insurers have increased their exposure to catastrophic losses, and in some extraordinary events this new situation can overwhelm the financial resources of the communities and their insurers. There are many reasons why insurance markets have not financed and diversified catastrophe risk sufficiently to secure their financial viability and to protect policyholders, but we will underline two: first is the increase in the "actuarial cost"⁹ of catastrophe risk; second is the much greater potential severity of a particular disaster for the reasons we have indicated above.

An insurer facing such a situation usually looks at two options. It can reduce insurance policies in force within a high-risk area and/or increase its reinsurance to cover a greater portion of its losses. For the second option, reinsurers no longer have enough financial resources to cover the losses from a major catastrophe and must charge a relatively high price for the coverage they do offer. Consequently, many insurers face a socially unacceptable risk of insolvency or severe financial problems from catastrophes at the present time. Financial markets could be the solution to cover catastrophe losses, although there are not yet well developed for that function.

3. Catastrophe Risk and Financial Markets

Given this situation of climate and geological changes with population and building development increases, experts have expressed concern that insurance and reinsurance companies no longer have the resources to respond to the losses from a major catastrophe (LEVIN, A., MCWEENEY, P., AND GUGLIADA, R., 1999). The primary insurance and reinsurance industries in the "US only have approximately \$245 billion of capital that must service a country that has \$25 to \$30 trillion worth of property. If a \$50 billion catastrophe were to occur in the US, approximately 20% of the capital of the primary and reinsurance industries would be wiped out" (CANTER, M.S., AND COLE, J.B., 1997). Such losses would be devastating to the insurance industry.

Insurance and reinsurance companies must look for solutions to provide the capacity necessary to finance very large catastrophe risks. The following elements are only parts of a complete solution, but should be considered as ways to mitigate the threat:

- the government's tax power, and
- the \$26 trillion capital market.

In capital markets, however, a loss approaching \$50 billion is almost routine. The total estimated value of the capital markets is \$19 trillion dollars, and the average daily standard deviation is approximately \$133 billion dollars. What is needed is a mechanism through which the potential reinsurance capacity of the capital markets could be used by the insurance industry. With this orientation, insurers and financial engineers have developed ways to transfer catastrophe risk to the market and at the same time get additional capital from investors. One of the new mechanisms is securitization.

The most common definition of securitization is "the pooling of assets and the issuing of securities to finance the carrying of the pooled assets" (KRAVITT, J.H.P., 1997, p. 7). When circumstances are favorable, securitization can be one of the most efficient forms of financing, due to a combination of two emerging trends in capital markets: first, this method incorporates the growing importance of using information to create wealth; second, it exploits the increasing sophistication of computers and the ways they are used. At least one expert has said, "...a securitization, when structured correctly, may entail less risk than the financing of the entity that originated the securitized assets" (KRAVITT, J.H.P., 1997, p. 7).

When we speak of securitized insurance risk we are actually speaking of securitizing the cash flows associated with insurance risk: premiums and losses. Premiums represent a cash flow from the insured to the insurer while losses represent a cash flow from the insurer to the insured. The evolving concept of securitization appears to be developing into an innovative risk management product that insurance (and reinsurance) institutions can use to transfer their risk to capital markets.

At present, the principal forms of securitization include:

- a. catastrophe or "act of God" bonds,
- b. contingent surplus notes,
- c. exchange-traded catastrophe options,
- d. catastrophe equity puts, or
- e. catastrophe swap.

All those and other forms of securitization are financial instruments (secondary financial assets) that bridge the gap between insurer markets and capital markets by turning reinsurance contracts into securities and derivatives structures that investors understand and can therefore include in an investment portfolio. These assets or instruments¹⁰ are vehicles used to transfer risk and channel funds.

a. - Catastrophe Bonds

Catastrophe (Cat) bonds or "act of God" bonds are corporate bonds that constitute an exchange of principal for periodic coupon payments wherein the payment of the coupon and/or the return of the principal of the bond is linked to the occurrence of a specified catastrophic event. Cat bonds require that bondholders forgive or defer some or all payments of interest or principal if actual catastrophe losses exceed a specified amount. When specified catastrophic event occur, an insurer or reinsurer that issued catastrophe bonds can pay claims with the funds that would otherwise have gone to the bondholders. And, to the extent that bondholders forgive repayment of principal, the insurer or reinsurer can write down its liability for the bonds, boosting surplus and potentially staving off insolvency.

Cat bonds are also defined as "investment instruments based on a quantifiable risk that has been analyzed by one or more research firms, such as Property Claim Services (PCS) in New York City" (HODGES, S., 1997)

b. - Contingent Surplus Notes

Another form of securitization is the contingent surplus note (CSN). Contingent surplus notes are based on an insurer's right to issue CSNs in the future to investors at preset terms in exchange for cash or liquid assets. The right to issue the surplus notes may be contingent on specified events taking place, or it may be unconditional.

c. - Exchange-Traded Catastrophe Options

Traditionally, "call options" are financial instruments that give the buyer the right, but not the obligation, to buy a certain amount of a specified asset from the seller of the option for a predetermined price and for a specified period. The specified asset can range from commodities to interest rates, notional bonds, or a catastrophe index. In such transactions there are usually intermediaries, so buyers and sellers often do not know each other's identities.

Exchange-traded catastrophe options are standardized contracts that give the purchaser the right to a cash payment if a specified index of catastrophe losses for a specific period reaches a specified level--the strike price. An insurer or reinsurer that wants to use this form of securitization to hedge catastrophe risk can buy catastrophe options from investors. If catastrophe losses cause the index used in settling a catastrophe option to equal or exceed the strike price of the option, the investors must pay the insurer an amount based on the terms of the contract. Insurers, reinsurers, and investors can trade catastrophe options on the Chicago Board of Trade (CBOT) and the Bermuda Commodities Exchange.¹¹

d. - Catastrophe Equity Puts

The traditional definition of "put options" indicates that they are financial products that give the buyer the right, but not the obligation, to sell a certain amount of a specified asset to the seller for a predetermined price and for a

specified period. Catastrophe equity puts are put options that enable stock insurers to sell shares of their stock to investors at pre-negotiated prices when catastrophic losses exceed the levels specified in the options. Catastrophe equity puts thus provide insurers with access to additional equity in the wake of catastrophe losses. These instruments are also traded on the Chicago Board of Trade (CBOT) and the Bermuda Commodities Exchange.

e. - Catastrophe Swaps

An alternative structure to transfer catastrophe risk through the capital markets is a "cat swap." Swaps are contracts whereby parties agree to exchange assets or cash flows. In a catastrophe swap, an insurer agrees to make periodic payments to another party, and the other party agrees to make payments to the insurer which are based on a measure of catastrophe losses. In this financial instrument the returns are linked to the occurrence of an insured event, but there is no exchange of principal. Instead, the investor receives his or her premium up front and, depending on credit rating, may use a letter of credit to guarantee obligation. This structure enables the investor to invest the notional of the swap in a manner of his own choosing throughout the term of the swap; he or she may instead invest this money, for example, in LIBOR¹² or any other interest rate reference.

These instruments can be used in the Catastrophe Risk Exchange (Catex) in New York.¹³ Catex is a "new computerized risk exchange that will allow property casualty insurers a cyberspace marketplace to swap blocks of insurance policies and reduce their exposure from overconcentration in a geographic area or line of business" (KRETZLER, C., AND WAGNER, F., 2000, p. 137). This market permits splitting of the catastrophe risk that would be exchanged amongst another--for example, storm risks in Florida against California earthquake risks.

4. Conclusions

Our conclusion will focus on two areas: how those instruments are useful for insurers and for investors.

From the insurers' point of view, those financial instruments are not used to replace traditional reinsurance, but to supplement it. All forms of financing catastrophe risk should be used in different percentages of each form to get enough finance if needed as well as to transfer their risks to the capital markets. The process to choose the correct financial structure follows:

1. The insurers can use computer models and information about the business they have written to determine its potential catastrophe losses and how much capital the insurer would need to finance that risk on its own.
2. The insurer can then compare the cost of using its own capital with the cost of reinsurance and the cost of securitizing risk.

3. With optimization algorithms, the insurer can determine the combination of capital, reinsurance, and securitization that minimizes its overall cost of financing catastrophe risk.

From the investors' perspective, these forms of securitization permit some advantages:

- a. Investors can use catastrophe models and exposure data to determine the rates of return they could expect from selling catastrophe options to insurers. With models and data, an investor can determine the probability that the actual value for a catastrophe index will surpass the strike price for a given catastrophe option. With knowledge of that probability and information about the prices for catastrophe options, an investor can calculate the rate of return he could expect from selling catastrophe options to insurers.
- b. Catastrophe options, catastrophe bonds, and other forms of securitization also offer investors a new means of reducing portfolio risk through diversification. The results from investments securitizing catastrophe risk depend on catastrophe loss experience, while bankruptcy and default rates for most other investments generally depend on economic conditions. Therefore, the results of investments securitizing catastrophe risk do not correlate with the results of other investments. As a result, adding catastrophe bonds or catastrophe options to an investment portfolio can improve the performance of the portfolio, making it more profitable, less risky, or both.

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ENDNOTES

¹ Lenders are usually those who prefer to spend on consumer goods and capital goods MORE than their final revenues at a current interest rate of market.

² Borrowers are usually those who prefer to spend in consumer goods and capital goods LESS than their final revenues at a current interest rate of market.

³ Other reasons for the increasing importance of financial intermediaries are, for example, market globalization, market liberalization, etc.

⁴ A primary financial asset is the one that is issued by the borrowers such as shares, bonds, etc.

⁵ The secondary financial asset is the asset issued by the intermediaries such as banking account, deposits, etc.

⁶ Vid, G.G. KAUFMAN, "El Dinero, el Sistema Financiero y la Economía, Ed. IESE, Universidad de Navarra, 1978, and A. CALVO, L. RODRIGUEZ SAIZ, J. A. PAREJO, AND A. CUERVO, Manual de Sistema Financiero Español, Ariel Economía, edición nº 12, Barcelona 1999, p. 3.-

⁷ Reinsurance is the insurance of a risk taken on by another insurer.

⁸ For more information, vid, MUNICH RE GROUP, Topics 2000: Natural Catastrophes-the Current Position, Münchener Rückversicherungs-Gesellschaft, München, December 1999, pp. 70-83.

⁹ "The actuarial cost" is the estimated annual average loss from catastrophes.

¹⁰ Through September 1998, investors had committed at least \$2.7 billion to those instruments for securitizing insurance risk., see, INSURANCE SERVICE OFFICE, INC.

¹¹ See, : <<http://www.bsx.com>>

¹² As stipulated in other cat investments.

¹³ The address is : <<http://www.Catex.com>>