Catastrophe Risk Mitigation: A Survey of Methods

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INTRODUCTION

Until the late 1980's, insurers typically handled catastrophe risk through the purchase of a cat reinsurance treaty. Despite its low retention, cat losses were not expected to pierce this layer. In fact, from 1980 through 1988, aggregate industry cat losses averaged only $1.5 billion annually with a standard deviation of $0.7 billion. However, these statistics deteriorated immensely in the following years, due to Hurricanes Andrew, Hugo, and Iniki, the Loma Prieta and Northridge Earthquakes, and years of poor winter weather. Average annual cat losses in these years increased seven-fold to $9.8 billion. Even more shocking was the volatility around this average, with the standard deviation increasing to $7.4 billion[1].

Following Hurricane Andrew in 1992, the cat reinsurance market hardened, due to "payback" for the hurricane, insolvencies, and a general reluctance to write reinsurance at any price. Out of this capacity shortage emerged a host of products aimed at tapping new sources of capital to help insurers and reinsurers mitigate their cat risk. The capital markets with trillions of dollars invested in stocks, bonds, and real estate, seemed the likely candidates to lead this charge. In fact, the Chicago Board of Trade (CBOT) developed and began trading options and futures contracts based on ISO property losses in late 1992. Since that time, the following products have also emerged:

1. The Catastrophe Risk Exchange (CATEX)
2. PCS Cat Options
3. Contingent surplus notes / Act of God Bonds / Cat Equity Puts
4. Special purpose reinsurers

In this paper, I will analyze these "non-traditional" methods of reducing and/or transferring cat risk; "traditional" reinsurance mechanisms will also be examined. None of the reinsurance concepts are new. However, they may not have been viewed in light of cat mitigation in the past. With the property reinsurance market the softest in five years, it is essential to consider these traditional products whenever we evaluate any of the alternatives.

[1] These statistics are based on Property Claim Services (PCS) loss estimates. It should be recognized that I performed these calculations based on cats greater than $5 Million. Now, PCS only records cats greater than $25 Million.

TRADITIONAL

I. PER OCCURRENCE CAT EXCESS OF LOSS TREATY

Perhaps the most common form of reinsurance for handling cat risk is the per occurrence excess of loss cat treaty. These treaties typically apply after all other reinsurance, protecting the insurer's net line. They are usually split into five to seven layers, each with a retention, limit, and co-participation. Division into layers is done for several reasons. First, it allows reinsurers flexibility to participate on the layers of their choice. Some prefer the higher premiums associated with the lower layers. Other would rather sacrifice premium for the lower probability of loss in the upper layers.

Second, per program capacity is usually several times greater than per layer capacity.

Example
A reinsurer offers a maximum layer limit of $1 million and a maximum program limit of $5 million. An insurer looks to place a cat treaty of $100 million x $50 million, split into five equal layers of $20 million. Considering its maximum limits, the reinsurer can offer $1 million limits on each layer for a total of $5 million. If the program was not split into layers, the reinsurer could only offer $1 million in total limits (The program would be viewed as one layer).

Third, it allows the insurer more flexibility in establishing co-participation percentages by layer. This is similar to the first point above. An insurer may have different preferences for risk at various layers. Through the use of co-participation, this variability of risk appetite can be more easily satisfied.

In the years prior to Hurricane Andrew, cat treaty retentions were set at relatively low levels, such as $15 million - $25 million. When reinsurers realized the destruction that could be caused by cats, the markets tightened. Cat treaty retentions moved upwards toward $100M, rates increased, and cat capacity was difficult to obtain. Today, rates are softening, but not to the levels seen before Andrew.

From a reinsurer's standpoint, cat treaties are viewed as pure risk reinsurance. Neither the insurer nor the reinsurer expect to use the treaty, except possibly the first layer. Even then, only under remote circumstances. As such, the reinsurer should expect no payback for losses, if losses do occur.

A typical cat treaty covers one occurrence above the retention. If the contract contains an automatic reinstatement clause, the insurer must immediately pay a premium to reinstate the limit when the retention is breached. This provides coverage for a second occurrence in the reinsured layer. For this reason, they are usually viewed favorably by insurers. However, if the first cat occurs towards the end of the treaty period, reinstatement premium is a cost with little potential benefit. Reinstatement premiums can be proportional to the amount of limit used, the time remaining in the treaty period, or a combination of both.

II. QUOTA SHARE REINSURANCE

Quota share is one of the oldest forms of reinsurance and simplest to understand. Deals are transacted between the insurer and reinsurer directly or through a broker. In its purest form, the

insurer agrees to cede X% of all premiums and losses to the reinsurer. The reinsurer will pay the cedant a ceding commission, which is loosely equal to the expense of writing and servicing the risk directly. The financial impacts of a simple quota share treaty can be seen in Appendix 1. If the direct expense ratio equals the ceding commission, the direct, ceded and net financial ratios will mirror each other.

Although it is possible to get an earnings enhancement with a quota share, it is an inefficient means to that end. However, it is an effective way to reduce the probable maximum loss [2] in a region, state, or country. A quota share treaty may be structured to function as a cat treaty. Suppose a company has the following underwriting expectations:

1997 direct accident year loss + ALAE ratio = 60%
1997 direct calendar year earned premium = $500 million
1997 direct expense ratio = 35%
1997 direct North Atlantic PML = $400 million
The 60% loss ratio only covers budgeted cat and non-cat losses.

Since the goal is to reduce the North Atlantic PML, a 25% quota share treaty for the North Atlantic only, having a 35% ceding commission and a 125% occurrence limit is purchased. In addition, there will be a loss corridor from 50% to 70% where the cedant is responsible for 100% of the losses. Since we expect to be within the corridor and, therefore, share underwriting results with the reinsurer below it, the treaty will mainly function as cat protection against a large event. To determine the amount of cat protection available, it is best to translate these treaty terms into those commonly found in a cat treaty.

We are expecting a 60% loss ratio for the accident year, which is in the middle of the corridor. The 10 points over this plan to the top of the corridor may be viewed as retention on the PML. For our plan this will be a $50 million retention on the $400 million PML. Above the $50 million, we can start ceding 25% of the PML. This is similar to co-participation, which is present in most cat treaties. In this case, we will have a 75% co-participation on the $350 million remaining loss. In cat treaty terminology, this is 25% part of 350 million x 50 million. The ceded portion of the PML would be 25% of $350 million or $87.5 million. As you can see, the net PML is reduced to $312.5 million.

Besides the PML protection, one other less obvious aspect of this treaty compared to a cat treaty is the relatively low price. In this example, we expect to pay a 15% margin or $18.75 million and receive an occurrence limit of $156.25 million. This is a 12% rate on line, which would be an attractive rate for a cat treaty with similar limits. In addition, there is usually room to cede at least part of a second occurrence with no associated reinstatement costs. On the other hand, there is usually an aggregate limit less than two times the occurrence limit.

A summary of some of the advantages of a quota share to an insurer is as follows:

[2] The probable maximum loss (hereafter referred to as "PML") is the maximum loss that will occur under normal circumstances. One example could be a large Homeowners fire loss, where the sprinkler system works to specifications. The home may be partially salvageable. This is in contrast to the maximum possible loss, which is the absolute worst loss that could occur.

1. PML reduction
2. Allows an insurer to grow in areas where cat risk is not fully known. Under this scenario, the insurer could purchase a quota share treaty the first year and reduce it in subsequent years as more is learned about the true risk in the area.
3. Immediate Statutory surplus relief equal to the amount of the ceding commission; minimal GAAP equity relief
4. Protection against non-cat losses

On the other hand, some of the disadvantages are as follows:

1. May be ceding a portion of our narrow direct Underwriting profit margin in a good year
2. If an insurer becomes too dependent on reinsurance, it will become costly when prices harden
3. Potentially, a false crutch for unmanaged, excessive growth
4. Should expect to pay back reinsurer in the long run
5. Credit risk of the reinsurer, especially during the most critical time -- following a large event
6. Giving away a small cash flow benefit

III. AGGREGATE EXCESS OF LOSS TREATY (XOL)

In the early 1990's, the NAIC and FASB began revising and implementing new regulations regarding reinsurance risk transfer. To qualify as reinsurance, a treaty must transfer underwriting and timing risk to the reinsurer; otherwise, no credit on losses can be taken and the transaction must be accounted for as a deposit. With these new regulations, finite risk reinsurance initially shrunk in popularity, but is growing again. It provides a good middle ground for insurers seeking a balance between reinsurance and straight financing

Aggregate excess of loss covers have been around for many years. One of the primary functions of a typical treaty is stabilizing current year earnings, while transferring a small amount of risk. If the company's goal is to achieve their accident year plan, it would purchase an aggregate XOL treaty that attached at the plan loss ratio or dipped down into the plan. Some insurers choose to accept a small amount of volatility in their plan and set the retention a few points above plan. In either case, the reinsurer provides a limit above the retention, which acts as a buffer against adverse results. Finite deals of this type are often characterized by one or more of the following features:

- Additional premiums based on a multiple of ceded losses
- Multi-year structure
- Sublimits
- Co-participation
- Funds Withheld accounting, limiting the actual cash flow to the margin paid

Essentially, the treaty provides acceleration of future investment income into the current period. In other words, we give up part of an uncertain future to lock in a benefit today. Although the reinsurer may incur losses soon after the treaty period begins, the reinsurer will not begin paying losses until direct paid losses exceed the insurer's retention. Therefore, the reinsurer often sacrifices current period accounting results for an economic gain.

Appendix 2 shows an example of the accounting and cash flow of an accident year aggregate excess of loss treaty attaching four points above plan. In this example, the incurred loss ratio

ends up seven points above plan. All losses are incurred in the 1997 calendar year and there is no adverse or favorable development. Direct losses are paid equally over a ten year period. The investment income given up is roughly equal to the "Funds Withheld Investment Credit". These investment income amounts are cumulative. As you can see, the volatility of the accident year loss ratio is mitigated. The 85% direct loss ratio is reduced to 80.5% on a net basis. The reinsurer, on the other hand, suffers a 1997 loss ratio in excess of 200%.

One investment income benefit is not shown here. By ceding premium to the reinsurer, the insurer can release the surplus supporting this premium and use it for general business purposes. These opportunities may provide greater returns than the narrowly defined investments of surplus as stated by statutory guidelines.

Cat risk is one of the major threats to the reinsurer's economic gain under an aggregate XOL. Under expected circumstances the reinsurer will pay nothing for ceded losses since the plan will be achieved. If there is adverse development due to poor Worker's Compensation or other long-tailed lines, the reinsurer will book an incurred loss, but the payments to the insurer will not begin for several years. When a cat occurs, the reinsurer becomes more exposed to timing risk. Cats are usually substantially paid within a few months of occurrence. This can significantly shorten the duration of the liability stream, leading not only to an accounting gain for the insurer, but also possibly an economic gain.

From the insurer's perspective, an aggregate XOL treaty is a good way to accomplish the dual result of locking in current period profits while securitizing cat risk. Because of the timing risk cats present to the reinsurer, these treaties often have a sublimit capping the amount of cat losses subject to the treaty. However, for a large, diversified book the reinsurer would be more willing to set the sublimit fairly high.

The following shows some of the advantages and disadvantages of an aggregate excess of loss treaty:

Advantages

1. Current period income stability
2. Cat protection
3. Surplus protection
4. Favorable stock analyst response, possibly leading to "buy" recommendations
5. Structure passes reinsurance accounting guidelines on a conceptual basis
6. Should be favorable to rating agencies

Disadvantages

1. Giving up future investment income for present underwriting income
2. Cat losses are paid quickly on the direct side, but may not be reimbursed on a paid basis for many years (i. e. no cash flow benefit)
3. Specific features dictated by the market may cause failure of risk transfer tests
4. Credit risk, compounded by the long reserve tail
5. Could have large income and surplus hits if commuted early
6. Accident year help only; no coverage for prior years' reserve strengthening
7. Difficult to administer

IV. THE CATASTROPHE RISK EXCHANGE (CATEX)

CATEX became operational on October 1, 1996. It is a facility where insurers, reinsurers, and brokers can buy, sell, and trade insured risks. Subscribers to the exchange anonymously post potential deals on a highly secure CATEX E-mail system. Other parties do not have access to the system. CATEX is completely neutral to the deal. However, they help facilitate deals through providing standardized contracts and even arranging collateral if necessary.

Charter: CATEX is a for profit entity, licensed as a neutral reinsurance intermediary by the New York Insurance Department. The Department has the right to oversee and examine them in accordance with regulations.

Potential Members: Any insurer, reinsurer, or broker licensed or approved in New York. Unlicensed companies can also trade on the Exchange through a licensed intermediary.

Idea: CATEX was originally conceived as a facility for diversifying one's book of business. For example, a company heavily concentrated in Florida Hurricane could trade some of this exposure through CATEX to another insurer for Vermont Freeze. There are thousands of other possibilities. Recognizing that some of these exposures are not equivalent, the New York Insurance Department allows cash as part of the deal.

Interest in the original Exchange was not great, delaying the opening of it by over a year. In 1996, however, the New York Insurance Department approved cash only transactions (effectively reinsurance) on CATEX making the Exchange a lot more popular. Some well known companies are now part of the Exchange, including Travelers/Aetna, USF & G, Gerling Global, Employers Re, Everest Re, Lloyds of London. In addition, many of the major reinsurance brokers and all the Lloyds syndicates are members.

The Trade - An Example:

- Company A posts $10 million of insured values subject to Florida hurricane it wants to trade away
- Company A remains anonymous
- Company B has a large exposure to Kobi earthquake
- Florida Hurricane is 15 times riskier than Kobi earthquake
- Company B decides it is interested in beginning a negotiation at which point both parties mutually agree to reveal their identities
- After reviewing their book, B decides it can take on this Florida exposure, but insists on a co-participation and $1 million cash
- A will agree to a 25% co-part., but no cash; in addition, they insist on a riskiness relativity of 10
- B finds this acceptable and the deal is completed
- CATEX runs a computer program to randomly generate $10 million of insured values in Florida and $100 million of insured values in Kobi from the two books of business; this will minimize the risk of adverse selection

Accounting: transactions are recorded according to Statutory reinsurance accounting procedures. An imputed premium is agreed upon by the two parties, which will be the ceded and assumed

premium for both parties. Losses are reduced for recoveries in the same manner as reinsurance. If hurricane losses are $40,000 and earthquake losses are $10,000, the accounting would look like the following for the two companies:

	Company A	Company B
Earned Premium - HO	($100,000)	$100,000
Earned Premium - EQ	100,000	(100,000)
Incurred Loss & LAE - HO	10,000	30,000
Incurred Loss & LAE - EQ	10,000	0
Commissions	16,500	16,500

Premium: An imputed premium of $100,000 was agreed upon by the two parties. Company A cedes $100,000 of hurricane premium and assumes an equal amount of earthquake premium.

Losses: Net losses are shown above. Company A incurs $40,000 of direct hurricane losses. They have a 25% co-participation, so they retain $10,000 and cede $30,000. Company B incurs $10,000 of direct earthquake losses. They have no co-participation, so they cede the entire $10,000 to A.

Commissions: In swap deals, CATEX charges $150 per $1 million in insured values traded, to each party. In the transaction above, there are $110 million of insured values, so the commission expense is $16,500 for each party. For cash deals, 75 basis points of the cash premium is charged. This is comparable to a reinsurer's brokerage fee.

Loss Occurrence: Following a cat occurrence, as defined by PCS or AM Best, CATEX will determine if the loss pierces the layer. If it does, both parties will be notified. Like reinsurance, the ceding company determines proximate cause, pays and settles all losses. The cat remains open for 18 months following occurrence. Once the cat is paid, proof of payment is presented to the assuming company, which will then reimburse the cedant.

Advantages

1. Geographical diversification of the portfolio
2. Diversification of perils
3. Greater diversification leads to greater spread of risk, creating capacity
4. Alternative sources of reinsurance
5. Benefits flow through underwriting income
6. State of the art P/C provided with internet capabilities
7. May be able to package trades into an asset-backed security to tap financial markets
8. PML reduction

Disadvantages

1. Under swaps, risk is not transferred; it is traded for an equal amount of risk
2. Need a dedicated phone line to realize full capability of internet
3. Although the ceding company determines the loss, disputes are bound to occur; how will they be settled?
4. Need more participation from major insurers to create liquidity

V. PROPERTY CLAIMS SERVICES (PCS) CATASTROPHE OPTIONS

PCS Cat Options grew out of ISO Cat Futures, which were first offered in December, 1992. PCS Cat Options were originally conceived as a way to tap into the trillions of dollars available in the financial markets. The standardized contracts are traded on the Chicago Board of Trade (CBOT), which guarantees their financial integrity. There has never been a default on the exchange. There are nine PCS industry loss indices tracked: National, Eastern, Northeastern, Southeastern, Midwestern, Western, Florida, Texas, and California.

On each index, two different sized contracts are traded. The small cap contract tracks industry cat losses between $0 and $20 billion. These are appropriate for hedging against high frequency cats, such as hail and tornadoes. The other contract is for high severity losses, those ranging from $20 billion to $50 billion. A company purchases PCS Cat Options as a hedge against direct cat losses.

Accounting period: the indices track cats occurring either in an accident quarter or accident year. These were developed to get at the seasonal nature of cats. Since hurricanes usually only occur in the third calendar quarter, a Florida accident quarter contract could be purchased. For California, on the other hand, only accident year contracts are offered, since earthquakes are not seasonal. In addition to length of contract, the parties to the contract must decide on a development period, which runs either six-months or twelve-months after the end of the coverage period.

Index valuation: the index value equals the industry cat losses during the loss period divided by $100 million. Quotes are in the following format: ###.# and each point is worth $200. Reported losses within the contract period and developed through the development period enter the index.

How can a company use options? One obvious function is for buying a layer of reinsurance. This is accomplished by buying an Option Call Spread. A Call is purchased because the buyer wants to lock in a price for losses in the event that the loss index increases. An Option Call Spread is done by buying a Call Option at the retention and simultaneously selling a Call Option at the (limit + retention). These points on the index are referred to as strike prices.

Example - Perfect Hedge
We want to hedge against California Earthquake. We have a 1% market share and would have an equivalent share of all losses. We have a cat treaty starting at $50 million, but would like to purchase protection below it, between $30 million and $50 million. We must answer the following questions:

- What are the industry strike prices?
- How many options should we purchase to be perfectly hedged?
- How much should we pay?

Let's answer each question. To determine the strike prices, we must calculate the industry limits corresponding to the layer we desire to purchase. Since we are 1% of the industry, these amounts are as follows:

Retention = $30 million / 1% = $3 billion; Strike price = $3 billion / $100 million = 30
Limit + Retention = $50 million / 1% = $5 billion; Strike price = $5 billion / $100 million = 50

This shows that we must purchase 30/50 call options, to provide coverage for industry losses between $3 billion and $5 billion. Each contract will provide a $4,000 (20 points x $200 / point) vertical strip of protection in this layer, but how many of these strips will we need? We want $20 million in overall protection and each option provides $4,000. Therefore we will need to purchase 5,000 30/50 call options to be perfectly protected in the layer.

What will this cost? The premium is a negotiated item. Since insurers and reinsurers are the primary participants, the pricing has thus far followed reinsurance rates. As supply of capital from financial markets increases, prices may decline from these levels.

For the Option Call Spread we just purchased there are three possible loss outcomes:

1. The index ends up < 30 - the spread expires worthless and the purchaser only loses the premium paid for it.
2. The index ends up > 50 - the purchaser realizes a gain of 20 points on each contract. The total gain will be 20 points x $200 per point x 5,000 contracts = $20 million, less the premium paid.
3. The index ends up between 30 and 50, say at 40. The total gain will be (40 - 30) points x $200 per point x 5,000 contracts = $10 million, less the premium paid.

Unlike typical option contracts, PCS cat options can only be exercised at expiration. Example one above expires worthless, while two and three are "in the money". This is one possible structure of a PCS Option. There are many others.

The greatest risk facing insurers buying Option Call Spreads is basis risk. An imperfect hedge can result if:

- The company experiences a large cat loss, but the industry does not
- The industry experiences a large cat loss, but the company does not

In these cases the recovery from the contracts will be less than and greater than the needed recovery, respectively.

Anyone opening an account is eligible to buy and sell options. To date, however, there has not been much trading activity in Cat Options. Most of the participants have been members of the insurance industry. One encouraging statistic is over 3,000 contracts were traded on September 5, 1996, providing $6.6 million in limits. On the other hand, this amount equaled the prior quarter's total activity. Lack of appeal is due in part to the fact that results flow through investment income, not underwriting income, as is the case with nearly all of the capital markets solutions. From an economic perspective, Cat Options offer the same benefits as reinsurance. Rather than go through advantages and disadvantages of Options, it is instructive to compare and contrast them to reinsurance:

Cat Options	Reinsurance
Standardized contracts	Customized contracts
Reimbursed for incurred losses	Reimbursed for paid losses
6 to 12 month tail	Indefinite tail
No implied payback	May have implied payback
Basis risk	Perfect hedge
No credit risk	Credit risk
Limited Market	Large, international market
Flows through investment income	Flows through underwriting income
Large potential capital supply	Limited capital supply
No coverage disputes	Disputes/Arbitration part of the business
Anyone can become a "reinsurer"	May need approval for accounting advantages
Real risk transfer	Real risk transfer
Industry loss trigger	Company loss trigger

VI. CONTINGENT SURPLUS NOTES / "ACT OF GOD" BONDS / CAT EQUITY PUTS

Although these products come in many forms, they have one overriding purpose: to protect the company's surplus in the event of a catastrophe. Usually investment banks or brokers arrange their placement. Each of the products will be discussed followed by their common advantages and disadvantages.

A. Contingent Surplus Notes

The most well-known deal (and only one as of 8/96) was done by Nationwide. In early 1996, Nationwide determined that they needed a pool of funds to draw upon in case surplus was threatened. The product acquired the name "Contingent" because surplus notes were not issued immediately. There was the possibility of issuing them sometime in the future. Cat risk was the most important risk Nationwide was guarding their surplus against, but not the only one. There is no direct link between occurrence of a catastrophe and issuance of the Notes.

The deal works as follows:

- Nationwide Mutual establishes Nationwide Trust subsidiary
- The Trust sells corporate bonds to investors worth $400 million; coupons = Treasury + 240 basis points
- With the proceeds, the Trust purchases US Treasuries, that act as collateral for the bonds

At this juncture, Nationwide conducts business as usual. At some point in time, they could exercise their option to issue surplus notes. The transactions would be:

- Nationwide Mutual issues surplus notes to Nationwide Trust
- The Treasuries are sold to purchase the surplus notes
- The surplus notes replace the Treasuries as collateral on the corporate bonds
- Investors are still owed full principal; coupon rate remains unchanged

The costs to Nationwide are two-fold. First, they are paying a 240 basis point premium over the Treasuries they have purchased as collateral. Second, if they draw upon the capital by liquidating the Treasuries and interest rates have risen, they face a loss on the face value of the

Treasuries. Investors face the credit risk of replacing (risk-free) Treasuries with Nationwide surplus notes.

As a final point, all principal and interest payments to note holders require approval from the domiciliary commissioner before they are paid. This is a way that the commissioner will be sure that certain obligations are taken care of before the notes are paid. These obligations may include payments to policyholders after a large event.

B. "Act of God" Bonds

Unlike Contingent Surplus Notes, there is a direct relationship between occurrence of a cat and repayment of the bond. These deals are a little more common and typically work like this:

- Alpha Insurance Company issues five-year bonds to investors at a coupon rate above treasuries
- The coupons are guaranteed for a fixed amount of time, say three years
- If no cats occur, Alpha pays investors five annual coupons as well as the principal at the end of five years
- If a cat occurs and losses reach the coverage trigger a number of things could occur, depending on the wording of the deal:

    1. Reduced coupon payments following the guarantee period
    2. Reduced principal payments
    3. Risk of loss to principal and interest

As would be expected, the more the investor puts at risk, the greater the return over the Treasury rate. In deals where principal is guaranteed, a portion of the proceeds is invested in Treasuries that will mature to the face value of the bonds. In another actual deal where coupons and part of the principal were put at risk, the investor received 1,000 basis points over Treasuries.

C. Cat Equity Puts (CatEPuts)

A unique sort of cat financing product was developed by AON, a well-known insurance and reinsurance intermediary. The first deal involved Centre Re of New York and RLI Corporation of Illinois in the latter half of 1996. RLI had suffered major losses from the Northridge Earthquake in January of 1994 and sought traditional and non-traditional solutions in case a similar event happened in the future. They ended up with the following deal:

- Centre Re sells a Put option to RLI for three years
- The option allows RLI to put $50 million of non-voting RLI preferred stock to Centre Re in the event of a California earthquake
- RLI pays Centre Re $1 million per year for the Put option, for a total of $3 million

Note the specific coverage trigger, unlike Contingent Surplus Notes. This limit sits on top of all existing cat coverage. Relating the cost to reinsurance produces an annual rate on line of $1 million / $50 million = 2%. However, this is too simplistic a view. With reinsurance, the reinsurer provides capital in the event of a loss and the deal is done. This is an exchange of uncertainty for certainty. With CatEPuts, the "reinsurer" provides capital and could obtain an equity stake in the insurer in return. This is an exchange of uncertainty for equity. The equity is in the form of convertible preferred stock. Half of the stock is convertible to common stock

three years after the event and the other half in four years. Unlike the preferred stock, common stock has voting rights.

Under GAAP accounting, CatEPuts are considered a part of surplus, not a liability like debt would be.

There are two contractual features worth noting. First, RLI has three to four years to buy back the shares at market rates and avoid giving up the equity stake in the company. It was acknowledged that Centre Re does not want to become a shareholder in RLI. Second, If the loss were so large as to cause surplus to fall below a threshold, the deal would be null and void.

AON is working on similar deals ranging in size from $100 million to $500 million.

The following lists show the advantages and disadvantages for the three products:

Advantages

1. Surplus protection
2. Lack of correlation with stock and bond markets
3. No basis risk - you get what you pay for
4. Possibly tap into alternate sources of capital within the insurance industry, namely life insurers and pension funds
5. Surplus notes are accounted for as equity, but are treated like debt for tax purpose, since their interest is tax deductible
6. Easier to construct multi-year deals than reinsurance
7. A. M. Best has promoted CatEPuts as "...an effective way to secure extra cat coverage"
8. Could be effective second event products
9. No reinstatement costs

Disadvantages

1. Liquidity risk, as evidenced by the failed USAA deal in the summer of 1996
2. Education - investors know about asset risks, but how many understand cat risk? Adverse selection may result
3. Cat risk may not be something an investor wants to have in his/her portfolio, especially with a limited upside in exchange for possible loss of principal and interest
4. These products are virtually junk bonds, subordinated to policyholder, stockholder, and debt-holder obligations
5. Credit risk
6. Results do not flow through underwriting income

VII. SPECIAL PURPOSE REINSURERS / SECURITIZATION

Special purpose reinsurers are established to provide reinsurance to one client. Often they are formed in places like Bermuda to take advantage of favorable regulation and to keep the transaction off the parent company's books. One deal completed towards the end of 1996 was done by Goldman Sachs for St. Paul Reinsurance. The deal works as follows:

- St. Paul Re establishes George Town Re
- George Town Re issues two types of securities to investors:

    1. Notes maturing in ten years - $44.5 million
    2. Preference shares maturing in three years - $24 million

- George Town Re becomes a quota share retrocessionaire for St. Paul Re under a ten-year reinsurance treaty
- George Town Re invests $23.2 million of the Notes in zero-coupon bonds to provide collateral for the Note principal maturing in ten years
- The rest of the proceeds ($45.3 million) will be used as collateral for reinsuring St. Paul Re

Please see Appendix 3 for a graphical portrayal of this transaction.

One of the unique features of this deal is the multiple tranche structure. The Notes are highly rated by S & P and Moody's, while the Preference Shares are unrated. The Notes provide a highly securitized principal because they are collateralized. However, interest payments are contingent on the reinsurance results. The Preference Shares, on the other hand, have no associated collateral. Therefore, not only is the interest at risk, so is the principal.

To mitigate the investment risk transferred to investors, the business reinsured is a diversified portfolio of low-frequency, high-severity reinsurance business. There are also sublimits on the different classes of business assumed by George Town Re, similar to finite risk reinsurance.

The initial transaction between the insurer and the special purpose reinsurer is considered reinsurance, assuming the risk transfer tests (FAS 113, Chapter 22) are passed. However, the deal between the reinsurer or trust fund and the bondholders shall not be construed as insurance or reinsurance. This portion is fully subject to investment laws.

Advantages

1. Keeps financing transactions off parent's books
2. Varying levels of risk offered by multiple tranches may attract a wider audience of investors
3. Company specific trigger, not industry
4. No basis risk
5. Less regulation with offshore reinsurer
6. Increased reinsurance capacity for St. Paul Re
7. Locks in pricing for a number of years
8. Benefits flow through underwriting income

Disadvantages

1. Both securities offer a large amount of risk; the reward is not specified
2. Liquidity risk
3. Credit risk to investors
4. Structure is untested thus far, since there have been no major catastrophes
5. Not much feedback from regulators

VIII. MISCELLANEOUS

In addition to the items listed above, a few other forms of securitization should be mentioned:

1. Bermuda Cat Reinsurers - these reinsurers arose in the wake of Hurricane Andrew as another source of cat reinsurance capacity. Many were formed through investment banks, such as J. P. Morgan and GE Capital. These markets offered no cat capacity as of 1989. However, they currently provide 36% of the total cat capacity in the reinsurance markets. Much of this was reallocated away from the London and domestic reinsurance markets. Some characteristics of these reinsurers are:

- Write property reinsurance only
- Use many of the industry cat models to evaluate risk
- Generally reinsure limits up to their capital and surplus level; this results in Premium: Surplus levels less than 50%

2. Lines of Credit - credit lines are one of the oldest capital sources. An insurer or reinsurer, based on its credit rating, pays a bank a percentage of the credit line to allow it to draw upon under a variety of circumstances.

Insurers could use lines of credit as a bridge loan following a catastrophe. Since cats present a tremendous timing risk to insurers, cash flow may not be available when a cat hits. However, it may be known that earnings throughout the year will be sufficient to pay for the cat. If the insurer had purchased a line of credit, it could draw down the funds necessary to pay for the cat. The cost to the insurer will be the initial fee and the interest accrued when paying back the line of credit. Since some of the companies will be able to pay this back in under a year, the latter cost should be minimal.

CONCLUSION

This paper has surveyed some of the core products on the market today geared to mitigate cat risk. There are numerous other products that retain some of the major features of one or more of the items listed above, but are tailored for individual customers. Reinsurance and alternative products share the characteristic that each contract is unique.

Reinsurance continues to be the primary means of handling cat risk. However, the new products are showing up more and more in the insurance periodicals as companies use them for deals. I believe education is the key to unlocking some of the capital routinely being invested in the financial markets. Not many people outside of the insurance industry truly understand insurance, let alone insurance contracts. This problem is exacerbated when we start talking about specifics, such as catastrophes, paid versus incurred losses, and reinsurance. Like anything new, there will be a learning curve. Once more people begin looking into these new forms of "reinsurance" and understanding them, I believe they will become more common, leading to greater liquidity and competitive pricing.

APPENDIX 1

Accounting for a Quota Share Treaty

Assumptions

Direct Premium = $1000	Direct PML = $200
Direct L/R = 60%	Quota Share = 25%
Direct E/R = 35%	Ceding Commission = 35%

	Direct	Ceded	Net
Premium	1000	250	750
Losses	600	150	450
PML	200	50	150
Expenses	350	87.5	262.5
U/W Margin	50	12.5	37.5
L/R	60%	60%	60%
Combined Ratio	95%	95%	95%

This transaction shows a year-end $12.5 decrease in Statutory and GAAP earnings, due to ceding profitable business. At intermediate points during the year, GAAP earnings will be better.

There is immediate Statutory surplus relief in a quota share transaction. This stems from the fact that we cede an unearned premium reserve (liability) and an equal amount of cash (asset). However, we also receive a ceding commission (cash), so Statutory surplus is increased by this amount. This benefit goes away under GAAP, since we are ceding DAE (asset) equal to the ceding commission.

APPENDIX 2

AGGREGATE EXCESS OF LOSS EXAMPLE - ACCOUNTING AND CASHFLOW

Subject Premium	5,600,000,000	
Plan Loss Ratio	74%	
Retention	78%	4,368,000,000
Aggregate Limit	500,000,000	
Leverage Factor	2.25	

Direct	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Earned Premium	5,600,000,000									
Incurred Loss Ratio	85%									
Incurred Losses	4,760,000,000									
Paid Losses	476,000,000	476,000,000	476,000,000	476,000,000	476,000,000	476,000,000	476,000,000	476,000,000	476,000,000	476,000,000
Cume Paid Losses	476,000,000	952,000,000	1,428,000,000	1,904,000,000	2,380,000,000	2,856,000,000	3,332,000,000	3,808,000,000	4,284,000,000	4,760,000,000
Cashflow	5,124,000,000	(476,000,000)	(476,000,000)	(476,000,000)	(476,000,000)	(476,000,000)	(476,000,000)	(476,000,000)	(476,000,000)	(476,000,000)
Ceded										
Earned Premium	174,222,222									
Incurred Losses	392,000,000									
Paid Losses	-	-	-	-	-	-	-	-	-	392,000,000
Margin	10,000,000									
Funds Withheld Inv. Credit	0	12,316,667	25,557,083	39,790,531	55,091,488	71,540,016	89,222,184	108,230,514	128,664,470	150,630,971
Funds Withheld	164,222,222	176,538,889	189,779,306	204,012,753	219,313,710	235,762,238	253,444,406	272,452,737	292,886,692	(77,146,806)
Cashflow	10,000,000	-	-	-	-	-	-	-	-	(77,146,806)
Net										
Earned Premium	5,425,777,778									
Incurred Losses	4,368,000,000									
Incurred Loss Ratio	80.5%									
Paid Losses	476,000,000	476,000,000	476,000,000	476,000,000	476,000,000	476,000,000	476,000,000	476,000,000	476,000,000	84,000,000
Cume Paid Losses	476,000,000	952,000,000	1,428,000,000	1,904,000,000	2,380,000,000	2,856,000,000	3,332,000,000	3,808,000,000	4,284,000,000	4,368,000,000
Cashflow	5,114,000,000	(476,000,000)	(476,000,000)	(476,000,000)	(476,000,000)	(476,000,000)	(476,000,000)	(476,000,000)	(476,000,000)	(398,853,194)

APPENDIX 3

SPECIAL PURPOSE REINSURER