



# A SECOND STORM

## CAT BONDS AND THE UNCERTAINTY OF POST-TRIGGER PRICING

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The market for insurance-linked securities (ILS) continues to grow, providing both insurers and investors with major new opportunities to share and profit from risk. ILS linked to natural catastrophes, often referred to as cat bonds, represent a large proportion of this market. Cat bonds typically provide attractive returns and are a growing component of the portfolios of many institutional investors. However, attractive returns come with risk. For these securities, the risk is the potential for investors to lose some or all of their money when a bond is “triggered” by a natural catastrophe.

While the likelihood of such an event is modeled and built into the initial rating and pricing of cat bonds, what will happen to the value of such bonds immediately after a trigger event is almost never considered. Post-trigger cat bond value is a complex phenomenon dependent on both aspects of the bond sponsor and external circumstances, such as post-catastrophe disruption and

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more general factors. Few cat bonds have been triggered in the decade since their arrival on the scene, but examining those that have been triggered exposes the potential for confusion about the true value of the bonds in the months and even years following an event. Selling too soon or too late can result in significant financial consequences. While modeling cat bond values requires a substantial effort, we expect that investors will increasingly demand such information from sponsors—particularly when the investors experience first-hand the consequences of cat bonds being triggered with no post-event price models upon which to rely.

### **Catastrophe-related ILS Today**

Today’s financial market enables types of risk-sharing undreamed of in the past. Of increasing importance to the insurance mar-

ket today are ILS, which allow the securities markets to take on risk formerly accepted only by insurance and reinsurance companies. ILS are gaining widespread acceptance, resulting in growing numbers of offerings across a range of catastrophic risks. Securities investors as a whole have much more capital to contribute to risk dispersal than even the largest reinsurance companies, providing hope that adequate financial protection against natural catastrophes may be within reach.

However, the catastrophe-related ILS market is still young and the offerings are relatively untested. We have seen only a few of the kinds of events that trigger reduced interest payments or loss of principal; when such events have occurred, the results have been unsatisfactory for most of the parties involved. Why? Because such instruments are priced and rated using catastrophe

models that predict the likelihood and severity of catastrophe, yet provide little or no insight into the financial realities of ILS *after* a trigger event. There has been a failure to address the question of what ILS are worth after a trigger event due to the relative shortage of such events. This can result in confusion, unexpected losses, and even legal battles, as investors who feel they were not given the full complement of information about post-event ILS value might seek damages from issuers of ILS. As they realize that this is a problem best analyzed with actuarial models, issuers are turning to actuaries to help them—and their investors—understand the value of ILS post-trigger events.

### A Quick Primer in ILS

Because they are complex financial instruments, and because technical terminology is not always used consistently, ILS may seem difficult to understand. However, the combinations of components of ILS are finite; looking at how they interconnect can illustrate the larger picture.

ILS represent insurance risk that has been “securitized” by pooling and repackaging it into bonds or similar instruments that can then be sold to investors. ILS represent an alternative to traditional catastrophe reinsurance in which risk is transferred to investors in the financial markets instead of to a reinsurance company. At least initially, natural-catastrophe-related ILS were primarily sponsored by reinsurance companies working with investment banks to structure the ILS offering. ILS are almost always provided through special-purpose vehicles—narrowly defined corporate entities, generally located offshore—in order to eliminate the risk of a sponsor’s being bankrupted and hence lowering the product cost for the sponsor.

There are several different alternatives to standard reinsurance, and variations on the theme of ILS continue to proliferate:

**CATASTROPHE (CAT) BONDS:** Cat bonds transfer natural-catastrophe-related insurance risk—such as the losses attributed to a winter storm in Europe or a typhoon in Japan—to investors. There are also multiperil cat bond structures and even more complex variations. If a risk event occurs and causes cumulative claims above a specific amount, the investors “forgive” (forfeit) principal to pay the claims.

**CATASTROPHE (CAT) SWAPS:** Cat swaps are transactions that take place through an entity such as the Catastrophe Risk Exchange, Inc. (CATEX), which is licensed as a reinsurance company but acts as a neutral intermediary. Through this exchange, companies can buy and sell reinsurance and swap insurance in order to diversify their catastrophe risk.

**INDUSTRY LOSS WARRANTIES:** These are agreements in which an entity purchases a security that is triggered by the magnitude of loss to the entire insurance industry from a catastrophic event rather than the loss accruing to a single company.

**SIDECARS:** Sidecars are transactions in which investors take on the risk and reward on a defined sub-portfolio of an insurance or reinsurance company’s business. The sponsor or ceding company typically requires that the investors put forth principal adequate to cover potential claims at a specified risk level. Sidecars are a way for insurance and reinsurance companies to instantly add capacity during a hard market because they are fully capitalized.

One of the most important issues in cat bonds and related instruments is the trigger event—the catastrophe of type and magnitude sufficient to require the forgiveness of investors’ principal. Rating agencies typically rate cat bonds based on how likely investors are to lose some or all of their principal, which is entirely dependent on the trigger event. There are at least four major trigger types:

**PARAMETRIC:** The trigger is a parameter of the natural event—ground acceleration in an earthquake or wind speed in a hurricane, for example. This type of trigger is usually the easiest and fastest to calculate.

**INDUSTRY-LOSS:** This trigger occurs when the total insurance industry loss from an event exceeds a predetermined monetary threshold. The industry loss is determined by a third party unaffiliated with bond investors or sponsors. Industry-loss triggers are often used in combination with indemnity triggers (defined below).

**MODELED-LOSS:** Modeled-loss triggers are based on a catastrophe model of the issuer’s exposure, which is used to calculate expected loss. When a large event occurs, the expected losses are calculated by running the model with parameters from the actual event (e.g., location, wind speed for hurricanes, ground acceleration for earthquakes). If the losses exceed a predetermined threshold, the bond is triggered.

**INDEMNITY:** This trigger is based on the issuing company’s actual insurance claims stemming from an event that exceeds a defined cost threshold. An indemnity cat bond is triggered when the insurer’s losses exceed that threshold, and it provides an additional coverage layer. Indemnity-triggered cat bonds bear close resemblance to traditional reinsurance contracts.

Alone or in combination, these four trigger types cover most of the securitized reinsurance alternatives on the market today.

### The Lack of Post-trigger Price Models

Cat bond ratings are based either on the likelihood and extent of natural occurrences or on the probability of claims amounts. They tend to miss a major element of bond value because they almost never take into account what happens *after* a trigger event. In the case of parametric triggers, this is not as important, because the payout is not connected directly to the payment of claims. In fact, bonds with parametric triggers often pay a lower interest rate because most of the basis

risk remains with the sponsor; different parametric triggers carry more or less basis risk.

For indemnity triggers, what happens after a trigger event is much more complex. There is a great deal of uncertainty following an event with the magnitude of loss typically covered by cat bonds. Internal factors delaying the estimation of catastrophe losses include the inherent fallibility of models (e.g., the failure of cat models to predict the flooding of New Orleans after Hurricane Katrina) and the nature of claims-handling processes within a company. External factors include limited access to damaged areas, evacuation of policyholders, surging demand and associated cost increases for the resources necessary to rebuild, business interruption, and backups in the legal system, all of which can cause delays in the payment of claims. The modeled loss estimate typically comes first, usually in a matter of days, followed by the claims estimate within weeks, but the final actual losses (on which indemnity triggers rely) may not be known for years.

Because the amounts to be paid and the corresponding timing are not known beforehand, investors have little idea what the bonds are actually worth after a bond has been triggered. In some cases, the trigger itself may be called into question later and even litigated because of re-estimation of industry and company loss amounts. The time value of money—the interest that accrues as the claims payout moves along—must also be taken into account when valuing the investor loss and associated bond value. The danger for investors is that they might sell at a price unfavorable to them due to imperfect information, before the final claims are paid and tallied—and the claims process can take years. Consequently, market prices may have no relationship to an analytically determined price.

Why is this? Few cat bonds have actually been triggered—no surprise, as many cat bonds pertain to 100-year (remote) events. The shortage of events leaves us with a dearth of examples from which to draw. While it is not possible to determine payout patterns with certainty, they can be modeled using actuarial techniques. When constructing such a model, actuaries evaluate factors based on

company history and company evaluations of limits exposed, loss amounts to be paid, and the timing of each. They define scenarios much as they would for a typical cat model, using history where possible and informed judgment to develop reasonable assumptions and associated margins of error where it is not. For each scenario, they then determine a payout pattern of insured losses.

Using data from the Reinsurance Association of America, we constructed illustrative payout curves for three different perils. As Figure 1 illustrates, the payout patterns vary somewhat based on the type of event, but they continue even beyond two years. At one year, only about 60% to 80% of the hurricane and wildfire claims are expected to be paid, and less than 50% of the earthquake claims. The closer the bond trigger threshold is to the ultimate loss, the higher the post-event value of an indemnity bond should be, because it takes substantially longer to pay out the claims. The uncertainty of the ultimate loss estimation also needs to be considered, as company track records of estimating ultimate loss costs vary widely. If the estimated ultimate loss decreases, the expected bond value will increase. Investors who sell cat bonds at steep discounts immediately after an event may be leaving money on the table.

## Conclusion

With the rapidly growing ILS market and with so many financial bets being placed against catastrophic events, there is little doubt that more bonds eventually will be triggered. Better understanding of post-trigger pricing dynamics can help investors determine what their ILS investments are worth and prepare risk-management procedures for triggered cat bonds. For sponsors, providing such information can boost investor confidence; this will become especially important as more bonds are triggered and investors begin to question the safety and value of ILS. Rating agencies can play a role by both encouraging greater transparency and more thoroughly assessing the risk of ILS offerings. Markets as a whole can benefit from improved information, which will enable more efficient use of capital.

We expect that as more cat bonds are triggered and more investors find themselves trying to unravel bond pricing in the wake of a catastrophe, post-trigger price analysis will become the norm. Today, there is a great opportunity for ILS stakeholders to lead the way. **M**

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**FIGURE 1: ILLUSTRATIVE PAYOUT PATTERN BY PERIL**

