

# A CAT bond primer for investors and insurers

by Fredrik Engman



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*Insurance Linked Securities (hereafter ILS) are often referred to as a new way for companies and insurers to finance and/or transfer risk. It is deemed not only as a way to insure notoriously difficult to place or costly risks, but also as a potential opportunity for the capital market to add profitability to their investment portfolios and at the same decrease risks.*

*The purpose of this paper is to give an introduction to how a specific ILS, the CAT bond, is normally structured. Thereafter, we shall study the CAT bond from an insurer perspective and continue with how the bond could be of use to investors. Lastly we shall propose some issues that could be significant for the future development of the CAT bond market.*

## Alternative Risk Transfer

Whether the name ‘Alternative Risk Transfer’ is the correct term to use or not is open to question. Why should risk transfer, by means of a CAT bond for example, be viewed as something apart, or alternative. Why is it not simply regarded as traditional risk transfer, as insurance and reinsurance, and spoken about as such?

Something is alternative if it exists “outside traditional or established institutions or systems... [or reflects and espouses] values that are different from those of the establishment or mainstream”<sup>1</sup>. As CAT bonds surely are neither mainstream, nor traditional they could well fit a description of being an alternative form of traditional risk transfer. The term

might therefore, in a linguistic sense, be used in a correct manner. A difference would manifest itself, should we read out the acronym ART as *Alternative to Risk Transfer* as this transforms the meaning into an allusion of choice between two mutually exclusives. CAT bonds do not necessitate such a choice to be made. Its goal is not any different from that of traditional insurance and must be seen as a complementary tool. In fact, both have the exact same *raison d’être*, namely to procure

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tools for hedging risks. More so, their history is similar or possibly the same as traditional insurance. Bearing this in mind, even if the terms ART and CAT bonds are rather new to the insurance industry, one should not be misled to believe that the concept behind them is equally novel.

A historical example – “bottomry”, the oldest known form of risk transfer – shows striking similarities to ART of today. Bottomry was used by the ancient Greeks to provide cover for the risk of losing a ship at sea. Basically it involved a contract stipulating that the ship owner was allowed a loan in order to fit out the ship and pay crew for a voyage proposed. Should then the unfortunate event occur, that the ship was lost at sea by perils mentioned in the contract, the loan would default. If the ship reached its intended destination, the principal amount should be redeemed together with an agreed interest amount. Bottomry differed from a normal loan by the fact that in a loan, the money is at the risk of the borrower and must be paid at all events. In bottomry, the money was on the contrary at the risk of the lender during the voyage. We shall find that in effect, risk was transferred to the lender in a similar way with bottomry, as is the case with contemporary forms such as CAT bonds.

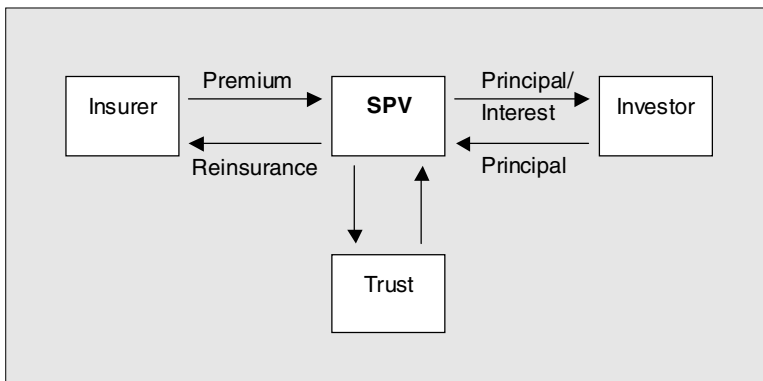
Even if CAT bonds are not new, they have not had a growth rate similar to other financial innovations. The volume in the derivatives market have for example increased 20 fold since the mid 1980’s and in 1999 was estimated at an annual USD 13,5 billion. It is estimated that the issuance volume for catastrophe securitizations, today have reached an annual level of about USD 1 billion, an amount that compared to insurance volumes must be considered quite low<sup>2</sup>. There are, however, a number of basic benefits that speak in favour for securitization into CAT bonds, and these shall now be explored.

## CAT bonds

### CAT bond structure

The normal CAT bond structure involves four parties. First, the entity that have initiated the risk transfer. Second, the capital market which will assume the risk. Third, the SPV (Special Purpose Vehicle) established for the sole purpose to act as an administrator and risk intermediary by which risk is securitized from regular reinsurance into a bond. Forth, a trust owning the SPV and investing the principal amount from the bond into risk free assets. Figure 1 gives a graphic presentation of the structure.

Figure 1. A normal CAT bond structure



The investor purchases a bond from the SPV (a licensed reinsurance company typically established off-shore and owned by a charitable trust) who simultaneously enter into a reinsurance agreement with the insurer. The principal amount is invested through a trust in risk free securities. The proceeds on these investments together with the reinsurance premium paid by the insurer, make up the periodic interest payment of LIBOR + risk premium payable to the bondholder. The SPV eliminate credit risk, that traditional insurance experience, since the money is fully paid up in advance and readily available should a loss occur. If a defined loss event would happen (see below) triggering the bond to default, the principal will not be repaid to the investor and the insurer will be indemnified according to the reinsurance contract with the SPV. Here we see the striking resemblance with the CAT bonds ancient form bottomry. Should the parties so prefer it is of course possible to have some of the principal protected, or to make the investor loose out on interest in case of default.

There is also the issue on how to decide which event should be used to simultaneously trigger a bond default and make the reinsurance contract “in the money”. Basically there are three alternatives. The first alternative is to use an index to decide how much the incurred loss from an event is. This method, which is good from a standardization perspective, suffers from a major downside in the form of basis risk. This is the risk that your losses differ from the amounts established by an index. The second option would be to more traditionally look at the specific book of business and decide indemnification upon actual losses to that portfolio. This is more laborious than the first and it would in most cases take much longer time. Thirdly one can use complex parametric modeling to estimate the cost of say an earthquake. There are some companies that specialize in this kind of computer-

simulated estimates (e.g. Applied Insurance Research). These models combine actuarial data, vulnerability relationships, historic climatological data, and meteorological models to generate scientific probabilities and loss estimates. What triggering event should be used must be analyzed carefully and need to be made on a case-by-case basis.

### **An insurers perspective**

Considering some risks, low in frequency but large in their possible pecuniary magnitude (e.g. catastrophic risks), it is suggested that ILS such as CAT bonds would provide a more efficient mean of risk transfer than do traditional insurance methods. The basic reasoning behind this, from an insurance perspective, is the matter of capacity.

Thankfully catastrophic events do not frequently occur but when they do, the consequences can be immense. Since 1970 the world has seen 40 catastrophes with an insured loss above USD 1,1 billion. The largest ever being Hurricane Andrew which hit the United States coast on August 23, 1992 with an estimated cost of USD 19,6 billion. Other examples include the second largest event, Northridge Earthquake, USA 1994 with insured losses of USD 16,3 billion; the third largest, Thyphoon Mireille, Japan 1991 where total insured losses reached USD 7,1 billion; and the European Winterstorm Lothar that commenced on Christmas day 1999 and caused losses of some USD 6 billion<sup>3</sup>.

Even if these events are rare in occurrence, when they occur they become a significant restraint to many insurance companies balance sheets. Over time and with a continued growing world economy, the monetary value of insured events has risen steadily<sup>4</sup>. Should, as an example, the earthquake that struck Tokyo in 1923 have happened today, estimates say that costs could reach a staggering USD 1,400 billion. Should a highly unlikely mega-catastrophe occur it would therefore be

a huge blow to the total insurance capital estimated to some USD 250 billion and significantly reduce their future capacity in underwriting risks<sup>5</sup>. Compare this capacity with the substantially larger U.S. Capital market, with an estimated capital of USD 26 trillion.

One negative aspect of using CAT bonds is the fact that they have been estimated to be more expensive than traditional reinsurance<sup>6</sup>. As long as the reinsurance markets can offer lower prices for cover, the ILS market will have difficulties in taking off. Even if the current hardening markets have seen reinsurance prices climbing dramatically, the aftermaths of the events on September 11 have not decreased capacity to such an extent as was first believed<sup>7</sup>.

### **An investor's perspective**

From the investors perspective there are some potential benefits to investing in a CAT bond compared to ordinary bonds.

Firstly, CAT bonds may be considered as zero-beta securities as they are generally uncorrelated with the economy<sup>8</sup>. In principle, an asset should be added to a given portfolio in the cases where the Sharpe ratio (i.e. Investment return – Risk free rate/Standard deviation) of the asset is greater than or equal to the correlation coefficient of the asset, multiplied by the Sharpe ratio of the portfolio. In the case of a zero-beta asset, such as a CAT bond, the right-hand side of the equation reduces to zero the effect being that should you decide to include such an asset into your portfolio you are certain to increase portfolio return<sup>9</sup>.

Secondly, the rates offered for CAT bonds are significantly higher than normal bonds even for bonds with similar credit rating. In April 1997 USAA, a Texas insurer issued a CAT bond divided into different layers depending upon how much of the principal was protected. One of the layers rated BB by a rating institute, and paid 575 basis points over LIBOR, whereas the average BB corporate

bond paid only 200 basis point over LIBOR<sup>10</sup>. A sample of 17 CAT bonds from 1997 to 2000 gave an average spread of 4,2%<sup>11</sup> over LIBOR, even though the expected loss averaged 0,6%. Much of this can probably be explained by the fact that these are new products and that investors demand some compensation for their felt unfamiliarity. This can also be seen in the spread for CAT bonds declining somewhat over the years<sup>12</sup>. Getting CAT bonds rated by the major rating institutes also will make the comparison between alternatives more easy for investors to do, possibly making the excess rates offered by CAT bonds more palatable and appreciated.

This combination of high spreads and investment that are uncorrelated with traditional financial markets should be interesting for investment managers. However, before making CAT bonds a viable investment the issue of pricing must be solved or agreed upon. Methods exist for calculating risks associated with earthquakes e.g. simulations as performed by Applied Insurance Research. These must be accepted and understood by the investor collective to work. Initially this will demand much involvement to understand how prices are established in the market and this will of course incur large costs. Another issue concerns the question on how to decide losses and design trigger events. As described earlier these are both associated with choices made when structuring the deal and it will be paramount for investors to understand how these design choices affect prices.

### **Future developments**

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In a generally bearish global market, investors must be open to new opportunities that will increase the return on their investment portfolio. Even if CAT bonds are still unfamiliar territory to many investment managers, their qualities such as higher rates of return in combination with them being uncor-

related to the market, is promising.

As investors grow more accustomed to a maturing CAT bond market, the need for information will decline together with increased cost savings associated with standardization of contracts and methods for analyzing them. Even though the offered spread will decrease concurrently, the fact that CAT bonds are uncorrelated to other investments will give portfolio managers good reasons for including them to their investment portfolio as long as the return offered is above the risk-free rate. This process will, contrary to other uncorrelated products such as gold, be made easier as the CAT bond is a normal bond structure and likely to be more familiar to the average fixed income investor than investing in gold through the mercantile exchange.

Decreased cost (increased standardization of structures) and uncertainty (unfamiliarity with how to analyze and by what method) must be regarded as key factors to overcome in order to achieve stable growth. Issuing a CAT bond of course entails costs, but so do normal bond issues. Structuring the bond demand careful consideration and professional risk management advice. The legal reinsurance entity, the SPV, need administration over the bond period. One alternative to setting up a new SPV would be by using an existing Captive Reinsurance Company or a Protected Cell Company, which most blue-chip companies already employ for self-insurance purposes. This would decrease cost and possibly make companies more readily active to try and learn, as this would be done in a familiar risk management milieu.

Once a product has become familiar to investors and insurers it will demand less information (as the products and methods have been structured and standardized), and costs will go down. Given the fact that capital markets have superiorly transparent pricing, CAT bonds will offer more stable costs over time than traditional insurance.

In conclusion from the above, it is proposed that the driving force behind the development of CAT bonds will be the capital markets and not the demand for capacity from the insurance market. With time, when the products have become more standardized and methods for analyzing them more established, the difference between a CAT bond and a regular corporate bond will have diminished. In achieving this, rating institutes play a vital role as they would make comparisons of risk and return easier for investors. Having an external risk rating would decrease the uncertainty felt and instill a perception of quality into CAT bonds.

Here the investment managers will get a real opportunity to increase portfolio return together with lowered portfolio risk. However, when markets mature the spread is likely to decrease so that when markets are fully efficient they will be priced equal to similarly risky corporate bonds. Even so, there will still be an incentive for investment managers to include CAT bonds into their portfolio, as they are uncorrelated with traditional markets.

We have proposed that it is the capital market that will be the most important catalyst in the development of the CAT bond market for reasons just mentioned. This is not to say that they will be the only ones benefiting from this development. So will insurance companies and other entities looking for ways to effectively diversify their current risk portfolio and to transfer some of its risks to other parties. In a matured market where standardized products and methods through increased transparency and liquidity work to give a more efficient pricing and lowered cost, products such as CAT bonds that transfer risk to the capital market will have a significant advantage. Compared to traditional insurance solutions this will possibly lead to higher capacity at lower cost.

When then will markets have matured?

When will it be normal practice for investors to include CAT bonds in their investment portfolios? It is of course a difficult question to give a simple answer to. There are today branches within many of the leading investment banks that specialize in ART who work to securitize low frequency, high impact catastrophe risks. Evolution is rarely linear, more so an iterative process where time plays a vital role. In the end, the benefits of CAT bonds cannot be disregarded as it presents a possibility to add significant value to the business of both investors and insurers.

### Notes

<sup>1</sup> (<http://www.dictionary.com/search?q=alternative>)

<sup>2</sup> Sigma, No. 3/2001, *Capital Market Innovation in the Insurance Industry*, 2001.

<sup>3</sup> Sigma, No. 2/2001, *Natural Catastrophes and man-made disasters in 2000: Fewer insured losses despite huge floods*, 2001.

<sup>4</sup> Valery, *Fear of Trembling*, the Economist, April 1995.

<sup>5</sup> Cummins and Doherty, *Can insurers pay for the big one?* 1997.

<sup>6</sup> Penalva-Zuasti, *The Theory of Financial Insurance with an Application to Earthquakes and Catastrophe Bonds*, 1997.

<sup>7</sup> [www.artemis.bm](http://www.artemis.bm), *Catastrophe Bonds losing luster*, 2002.

<sup>8</sup> Lintzenberger et. al. *Assessing Catastrophe Reinsurance linked Securities as a New Asset Class*, Journal of Portfolio Management, 1996

<sup>9</sup> Cole, Sandor, *Opportunities for hedging and trading with catastrophe insurance futures and options*. The Handbook of Derivatives and Synthetics: Innovations, Technologies and Strategies in the Global Markets, 1994.

<sup>10</sup> CNA Re White Papers, *The Foundation and Evolution of the Catastrophe Market*, 2002.

<sup>11</sup> Sigma, No. 3/2001, *Capital Market Innovation in the Insurance Industry*, 2001.

<sup>12</sup> Best's Review, *How Much Is That Cat Bond?*, 1999.