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Reflections on Insurance-Linked Securities. What every prudent Investor should consider.

1 Introduction to ILS

Over the past few years, insurance-linked securities (ILS) have gained tremendous popularity among institutional investors as an alternative investment instrument¹. According to Swiss Re Capital Markets², the cat bond market recorded over USD 20bn outstanding by the end of 2013, breaking the previous year-end record set in 2007 by close to 20%.

In view of the fervent demand for ILS, we believe there is no better time than now for a prudent investor to reflect on the ILS market. Taking a portfolio manager's perspective, we examine six key considerations and challenge some common beliefs about ILS.

What are ILS?

The 1992 Hurricane Andrew and 1994 Northridge Earthquake created a reinsurance capital crunch, pushing the insurance industry to explore new ways to insure peak risks and raise capital. ILS emerged as a result.

ILS are fixed-income securities typically issued by an insurance company. The issuer receives investor capital to cover losses when a pre-defined event occurs. In return, the ILS investor usually receives a variable coupon payment which is a fixed margin plus a money market reference rate. If no triggering events occur, the capital usually sits in a collateral account until maturity. Such events are frequently natural catastrophes, therefore ILS becomes commonly associated with «cat bonds» although it is worth noting that there are also other ILS products in the market.

ILS are offered exclusively to institutional or qualified investors according to the relevant jurisdiction.

¹ Bloomberg (12 Dec 2013), «Insurance funds gain as pensions flock to untested risks»

² http://media.swissre.com/documents/ILS_Market_Update_2013.pdf

Figure 1a
2013 Issuance by Type of Peril
 Source: Artemis.bm

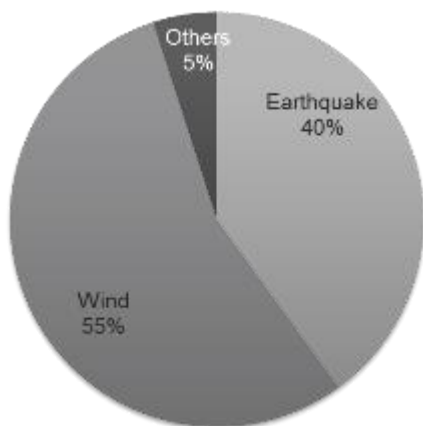
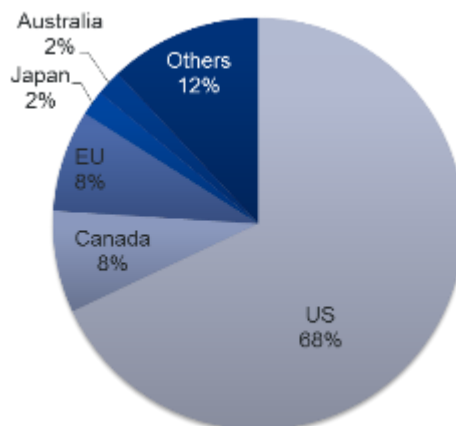


Figure 1b
2013 Issuance by Risk Region
 Source: Artemis.bm



2 Why have ILS gained popularity?

Unlike traditional asset classes such as equities and bonds, ILS are not directly subject to economic or financial factors. Instead of the issuer’s solvency, ILS default is a function of external catastrophic events. Under the logical assumption that predefined catastrophic events are rare occurrences and independent from economic well-being of an entity or country, one can easily conclude ILS to be not only a favourable portfolio diversification tool but also one that provides good returns with low frequency of loss. Further, in the current low yield environment ILS have the advantage that their variable coupon payments shield from the effects of a potential rise in interest rates.

2.1 Historical Performance of ILS

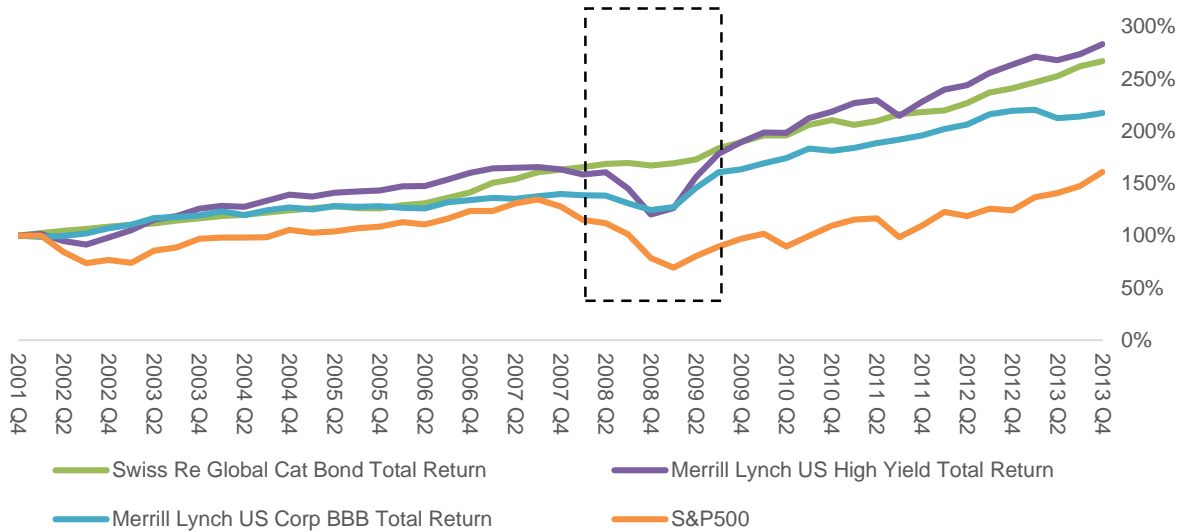
To examine the performance of cat bonds, we compare Swiss Re Global Cat Bond Total Return³ with bond indices representing investment grade⁴ and below-investment grade⁵ bonds individually as well as an equity index. See Figure 2a.

³ The Swiss Re Global Cat Bond Index tracks the performance of all property natural catastrophe bonds outstanding in the market (Source: Swiss Re Insurance Linked Securities Market Update, Jan 2014)

⁴ Represented by Merrill Lynch US Corp BBB Total Return

⁵ Represented by Merrill Lynch US High Yield Total Return

Figure 2a
Growth Comparison from 2001 to 2013



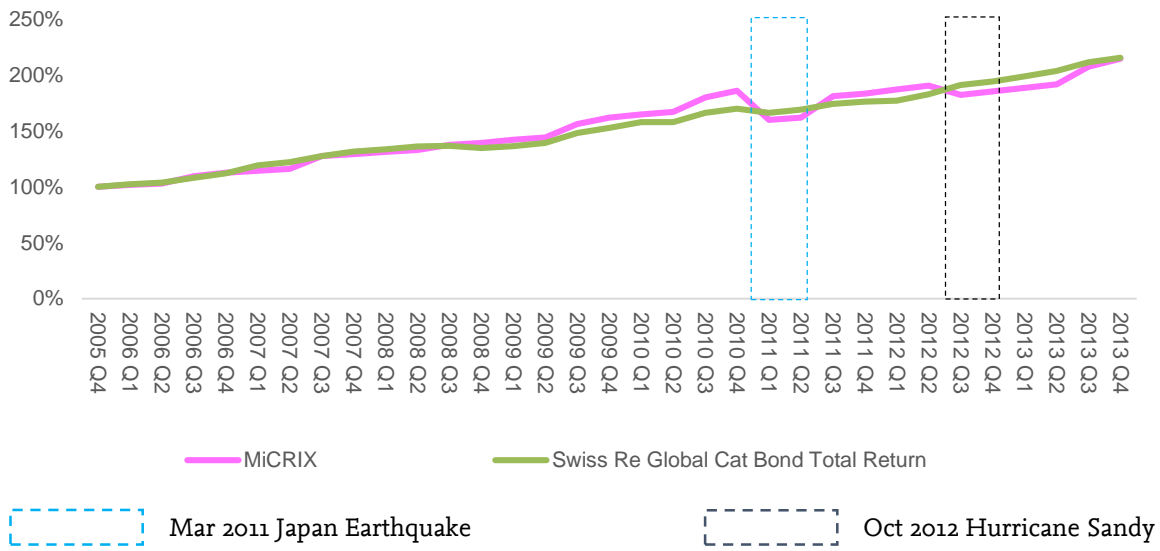
2008 Financial Crisis

From Figure 2a, Swiss Re Global Cat Bond Total Return demonstrates strong and consistent growth as compared to the other indices. However, we draw attention to the choice of benchmarks. Noting that Swiss Re Global Cat Bond Total Return fund comprises BB Cat Bonds among other single-peril cat bonds, comparing it with investment-graded bonds does not offer a fair comparison when gauging risk-return trade-offs.

On the other hand, Merrill Lynch US High Yield Total Return matches closest against Swiss Re Global Cat Bond Total Return in terms of growth. However the cat bond index's volatility is visibly lower, especially during the 2008 financial crisis and the months immediately following it.

One key observation is that the cat bond index does not reflect the impact of recent catastrophes. Again, we attribute this observation to the choice of benchmarks and examine another ILS-related benchmark. See Figure 2b.

Figure 2b
Growth Comparison from 2006 to 2013



Unlike the Swiss Re Global Cat Bond Total Return index which tracks performance of pure cat bonds, MiCRIX follows peak peril Industry Loss Warranties (ILW), covering US Quake, US Regional Wind, European Wind, Japanese Quake and Japanese Wind. ILW's are «commoditized reinsurance agreements, where the settlement of any losses under the contracts is based on the insured industry loss from a specific catastrophe event»⁶. Therefore MiCRIX offers an alternative way of gauging the returns of the catastrophic risk market. Generally growing faster than the cat bond index, MiCRIX dipped below the latter during the 2011 Japan earthquake and 2012 Hurricane Sandy.

Finally, we point out that coupon margins of ILS have decreased as a consequence of the inflow of new capital. It remains to be seen how this will affect the performance of ILS relative to other asset classes.

3 Considerations for the ILS Investor

By far, we have seen the merits and strong performance of ILS. However it may be premature to throw caution to the wind and establish ILS as an asset class that defies the typical risk-return relationship. Understanding of the ILS instrument has been built on estimates and historical performance of only slightly over a decade. To help a discerning ILS investor see beneath the surface, we offer six aspects for consideration.

⁶ Source: Mercury Capital

3.1 Treat risk statistics and reports with care

«All models are wrong but some are useful.» – George E. P. Box (statistician)

Modelling ILS

When a new ILS is issued, three key statistics are usually supplied in the offering circular – (1) attachment probability (probability of a loss to the principal), (2) exhaustion probability (probability of a complete loss) and (3) expected loss of the ILS.

These statistics are estimates provided by catastrophe modeling firms. An ILS investor may choose to rely on catastrophe modeling software available in the market to analyze risks of ILS. Nonetheless, such vendor models may not necessarily capture all risks, especially in the context of complex commercial risks. Further, additional tools might be required to help the investor account for market prices and other asset categories in order to optimize the overall portfolio.

Nobody knows the true expected loss or default probability of an ILS and therefore the true expected return of an ILS. In fact, it is difficult to ascertain not only the likelihood but also the location of a catastrophe occurrence with strong conviction. The 2011 Japanese Tohoku-Oki Earthquake of magnitude 9.0 illustrates this difficulty. Experts had predicted an earthquake of such scale but expected it to happen further south from the region actually hit⁷. Similarly, experts are not able to come to a consensus on the number of expected tropical cyclones in a certain area.

An investor must understand that catastrophe perils are subject to on-going research. New insights should impact risk evaluations. The sensitivity of model outputs with respect to parameter changes must therefore be analysed. The vulnerability of an ILS can also be seasonal, depending on the covered perils such as hurricanes, winter storms or tornados. Keeping track of the changing risk structure is a corner stone for prudent risk management and for trading decisions.

Care should be taken to educate potential investors unfamiliar with catastrophe risks. Even the concept of «expected loss» is not that as self-explanatory as it seems. We demonstrate this in section 3.5. It is as, if not more, important to highlight the limitations and inaccuracy of the stated statistics. Reports should not be quiet about model uncertainty. Investors must be clear about what is and what is not modelled by a vendor software.

3.2 Look beyond the Sharpe ratio and beware of Value at Risk

Volatility is a popular risk measure in finance. The ratio of an investment's excess return over its volatility is often employed to obtain a risk-adjusted return view and discern opportunities. The default of an ILS, however, depends on low-probability events. This means that it is very likely to observe periods as long as several years without any major losses. If however a triggering event happens, a complete loss can manifest within an instant. Such behaviour is not well described by volatility.

Another popular risk measure that does not describe the risk of an ILS portfolio well is the value at risk (VaR). VaR measures the potential loss in asset value at a given probability level. We consider a simplistic example. Suppose we are interested in two ILS for which the insurance risks are independent from each other. Assuming that the likelihood of each ILS suffering some loss is 1%, VaR at a 99% confidence level

would be zero for each bond individually. This means that if we invest in only one bond, we will have a 99% chance of absolutely no loss. However if we invest in both bonds, the chance of sustaining zero loss will be computed as 99% multiplied by 99%, i.e. lower than 99%. In other words, VaR at a 99% level is no longer

⁷ National Geographic (14 Mar 2011) «Japan Earthquake not the 'Big One'?»

zero. Following this simple statistical argument, the seemingly logical deduction is that fund allocation to only one bond is less risky than investing in both. Naturally this deduction is flawed, proving that VaR does not capture diversification benefits well.

To further illustrate the inappropriateness of VaR as a risk measure, we map out two scenarios showcasing the Markowitz frontier which graphs the risk-return profile of a portfolio of two ILS. In both scenarios, we assume the following:

ILS 1

Coupon: 3%
 Attachment Probability: 1%
 Exhaustion Probability: 0.2%

Linear distribution between attachment and exhaustion point

ILS 2

Coupon: 5%
 Attachment Probability: 1%
 Exhaustion Probability: 0.5%

Linear distribution between attachment and exhaustion point

Quick Glossary Recap

Attachment Probability:
 Probability of a loss to the principal

Exhaustion Probability:
 Probability of a complete loss

Figure 3a
Markowitz Frontier at 99.5% VaR

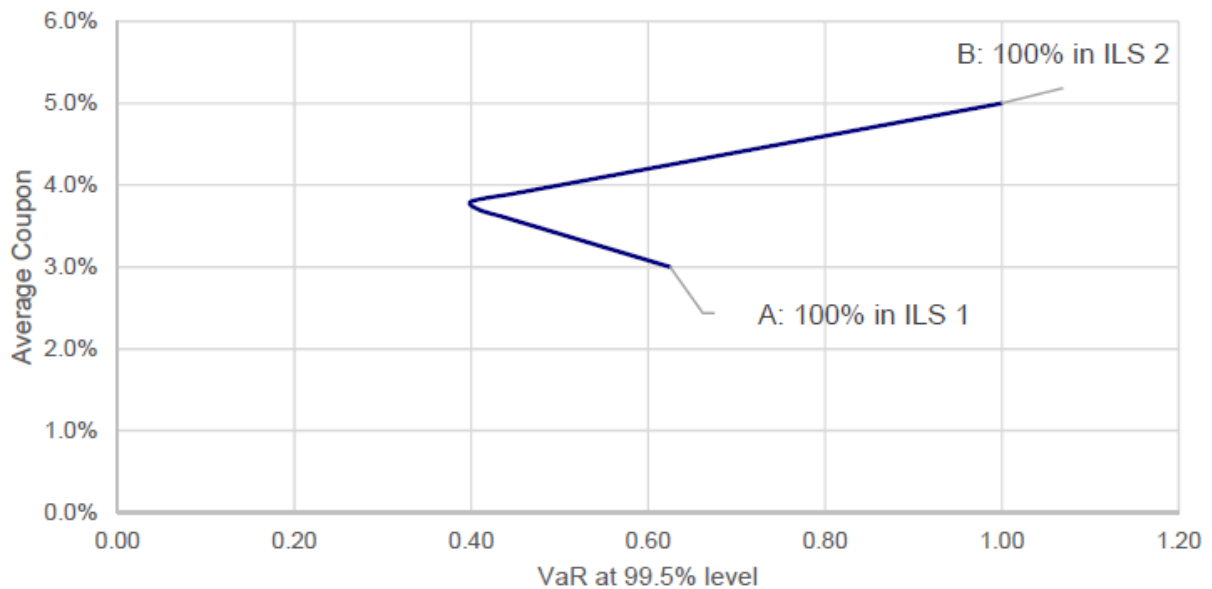
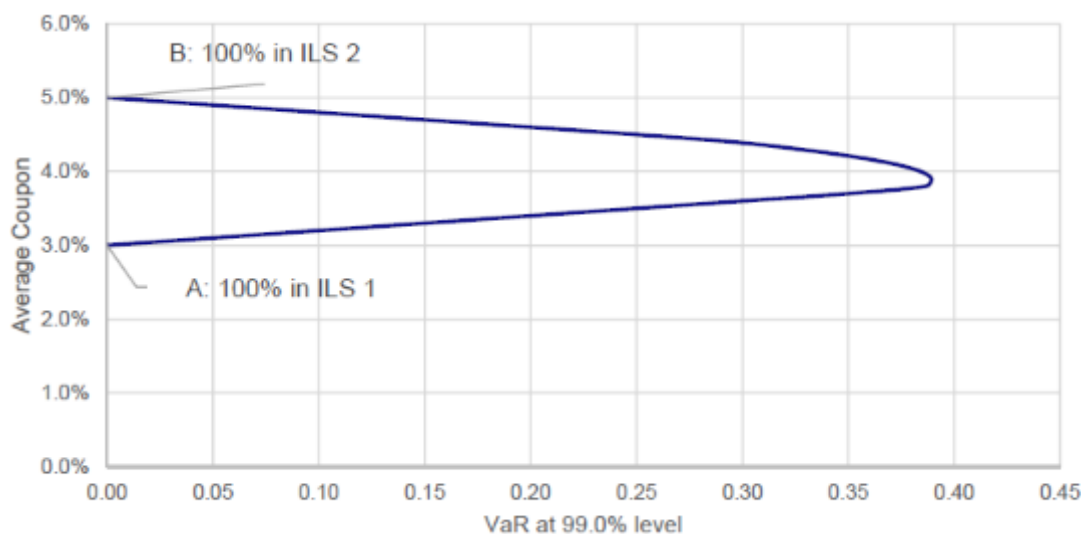


Figure 3b
Markowitz Frontier at 99.0% VaR



As seen in Figure 3a, at 99.5% confidence interval, the Markowitz frontier displays the typical shape of the efficient frontier, illustrating the diversification benefit of having two ILS in a portfolio. However at 99.0% confidence interval, as shown in Figure 3b, the frontier flips horizontally, demonstrating how investing in both ILS is less optimal than in one ILS. In other words, VaR is a highly unstable measure. Results depend heavily on the input assumptions.

3.3 Be sceptical of historical methods

The first ILS was issued in 1996 by St. Paul Re. The first catbond total return indices, Swiss Re Global Cat Bond Indices, date back to 2002. This means the ILS market has less than two decades of available data history, insufficient to be representative of the risks underlying catastrophe bonds. Therefore, one should be very sceptical towards graphs which suggest that cat bonds have a smooth sailing growth path as compared to the bumpy rides experienced by other benchmarks. In addition, risk measures such as Sharpe ratios, VaRs and other statistics should not be based on historical data alone.

3.4 Beware of the general belief that ILS are uncorrelated to market risks

ILS are commonly perceived as being uncorrelated with market risks. Indeed, catastrophes do not necessarily associate with financial markets, as demonstrated by the 2005 Hurricane Katrina and Hurricane Wilma. Stock prices did not react adversely to the hurricane season. However this observation is not consistent. In the week following the 2011 Japanese Tohoku-Oki earthquake, the Nikkei 225 index lost over 10% and around 4.5% in the same quarter. The earthquake further triggered the complete loss of the Muteki ILS.

ILS are not totally immune to financial events either. As a consequence of Lehman Brothers swap default in 2008, four ILS suffered a loss (Ajax Re, USD 84.5m Carillon Re A-1, USD 150m Newton Re 2008 A-1 and Willow 2007-1 B). In 2012, Nathan Ltd., a USD 100m extreme mortality ILS bond issued by reinsurer Munich Re, had a close shave as its issued notes were spared from being downgraded despite the downgrade of its total return swap counterparty, Deutsche Bank AG. Today, money market funds form the preferred collateral for most ILS. Nonetheless, this does not eliminate all credit risks.

Other reasons why the zero correlation assumption should constantly be challenged are:

- i. The ILS market is growing in volume and so is the number of investors.
- ii. Liquidity in the ILS market is increasing. In 2007 the Cayman Islands Stock Exchange (CSX) listed the first ILS and since 2013 the CSX has been connected to the Xetra trading platform.
- iii. The absence of a catastrophe which could otherwise cause adverse impacts in the catastrophe risk market within the short history of ILS does not necessarily mean that such events do not exist.
- iv. The correlation between a catastrophe event and financial markets might well depend on the catastrophe's cost relative to the size and strength of the affected country's economy rather than on the absolute cost of the event.
- v. As spreads compress in the ILS market, ILS fund managers may resort to use of leverage. As the history of financial crises have demonstrated time and time again, assets involving high leverage are more closely correlated with financial markets than those with little or none.

3.5 Book excess buffer reserves

Offering circulars (OC) usually provide estimates of the annual expected loss of an ILS. Yet, if a loss happens, then that loss will, very certainly, exceed the expected loss stated in the OC by a multiple.

We take MultiCat Mexico Ltd. 2012-1 Class A as an example. The annual expected loss at issuance was 4.4%. This bond has a binary loss function. This means that it would be a total loss if any qualifying event occurs. In other words, we will actually never observe the expected loss. There is either a complete loss (at a probability level of 4.4%) or no loss (at a probability level of 95.6%). So how is the expected loss to be understood and why is it useful?

Suppose we were to hold bonds with the same annual expected loss as the MultiCat Mexico bond for many years. Then the 4.4% expected loss will likely be close to the average annual loss computed over the entire investment period. Suppose further that we want to build buffer reserves in order to protect our investment against losses. A qualified actuary would insist we book reserves corresponding to 4.4% of our investment every year plus a margin. The higher the margin, the higher is the probability that accumulated reserves are sufficient to cover losses.

Since expected losses in the OC are estimates of what would be average annual losses over a long time horizon, it is wise to build buffer reserves that are at least as large as the expected loss and to do so for all ILS. It is even more so important for new investors to cushion against early losses.

3.6 Be always prepared

If a qualifying event happens, the investor has a short window period to estimate the impact on the portfolio and decide whether the ILS at risk should be traded. Knowing the portfolio and underlying exposures is key. This is especially important for ILS which require more than one triggering event. The first event might not yet cause a loss to the principal but affects the vulnerability to future events, risking a drop in market price. The Mariah Re Series 2010-1 cat bonds, for example, required at least three major tornados to trigger a loss; indeed they were hit by the high US tornado frequency in 2011. We suggest to constantly monitor exposures in order to have an idea of the current risk and be well prepared in advance. Upon the occurrence of an event, investors who have licensed a vendor model may get event loss estimates or remodelled ILS statistics, but there may be a time lag involved.

4. Conclusion

ILS require profound understanding and monitoring. If a vendor model is licensed, this software needs to be integrated in the IT structure. Choosing the most appropriate vendor model is crucial. It might still be

necessary to develop additional tools for portfolio optimization and blending the model output with supplementary analyses or inputs from multiple vendor models.

If the investor does not opt for a vendor software, then other resources must be employed for portfolio optimization. Historical hurricane tracks, for example, could be combined with ILS exposure information in order to get an idea which ILS can be hit by a common hurricane. This might lead to the development of a mathematical dependency structure embeddable into a portfolio optimizer.

Nonetheless the ILS space is exciting and may just be the most effective diversification pill which any portfolio desires. However investors must tread with caution amidst the unknowns and its short history. As Warren Buffet once said, «Never invest in a business you cannot understand.»

Contact us

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