Investing in hurricanes

A concise guide to reinsurance, catastrophe bonds and insurance linked funds

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1. Reinsurance

1.1 Introduction to reinsurance

A reinsurance company insures insurance companies. Insurance companies buy reinsurance for two related reasons – as an alternative to capital and to reduce the volatility of their results.

A single building, oil rig, or board of directors can be insured by multiple insurers which, in turn, each buy reinsurance from multiple reinsurers. Reinsurers themselves buy cover called retrocession. This web of contracts, enables very large claims to be absorbed by a global network of companies.

The simplified schematic below shows the traditional reinsurance hierarchy. The policies that link each entity represent a promise to pay certain losses. Rating agencies such as AM Best and S&P provide a guide to each entity's ability to pay. In recent years, collateralised insurance linked funds have been participating at every stage of the reinsurance chain.

Insurance linked funds include a wide range of structures. They can be: open ended or closed ended; onshore or offshore; focus on US peak risks or worldwide; sell out of the money options or make private equity type investments. What they have in common is the ability to provide their investors with returns with limited market risk. This lack of correlation has given them access to cheaper capital than their 'traditional' counterparts.

Reinsurance can be broadly categorised as excess of loss and proportional. When a reinsurer sells excess of loss reinsurance, the policy will protect the insurer against large losses helping to reduce the volatility of earnings. When a reinsurer sells proportional reinsurance it participates in the profits and losses of the insurer (minus some fees) in a similar way to owning equity.
The reinsurance market
Swiss Re estimates that the global insurance industry collected around $4.6 trillion in premiums in 2012. Around 57% of this was life insurance and the remainder was classed as property and casualty insurance.

According to S&P, the top 40 reinsurers wrote $185 billion of net premium in 2012. Here are the largest companies and countries of the top 40 reinsurers.

<table>
<thead>
<tr>
<th>Company</th>
<th>Net Premium USD billion</th>
<th>Country of holding company</th>
<th>Net Premium USD billion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Munich Re</td>
<td>35.8</td>
<td>Switzerland</td>
<td>32.0</td>
</tr>
<tr>
<td>Swiss Re</td>
<td>25.3</td>
<td>US</td>
<td>30.2</td>
</tr>
<tr>
<td>Hannover Re</td>
<td>16.3</td>
<td>Bermuda</td>
<td>30.2</td>
</tr>
<tr>
<td>Berkshire</td>
<td>16.1</td>
<td>Germany</td>
<td>25.9</td>
</tr>
<tr>
<td>Lloyd’s</td>
<td>11.4</td>
<td>UK</td>
<td>16.8</td>
</tr>
</tbody>
</table>

Approximately 2% of life premiums and 9% of property and casualty insurance premium was ceded to reinsurers. The insurance industry spends around $25 billion on reinsurance premiums to help absorb the cost of natural disasters. It is this part of the market that has seen the majority of interest from insurance linked funds.

Rated reinsurance
A rated reinsurer creates a diversified portfolio to minimise the probability that it will be unable to meet all of its obligations. Rating agencies review a reinsurer’s business model to determine how confident they can be that the reinsurer will be able to honour all its claims. Key parameters will include the amount of capital that the reinsurer holds and the likely volatility of losses.

An A- (or better) from the rating agency AM Best is a de facto requirement for a reinsurance company. AM Best uses a quantitative model known as BCAR in addition to qualitative factors to determine their rating. It is very difficult for a reinsurer to sell reinsurance if it is downgraded to below A-.

The range of AM Best ratings is: A++(superior), A+, A-, B++, B+, B-, C++, C+, C- D E, F (liquidation).

Other stakeholders such as regulators and boards of directors will use different calculations to come to their own view of how much capital a rated reinsurer must hold. These may impose a more or less severe constraint than the rating agencies.

Any calculation will be based on ensuring that the reinsurance company can survive an extreme stress test. But a reinsurer’s theoretical liabilities are usually much greater that its capital base so an extreme (perhaps improbable) set of events could cause the reinsurer to be unable to pay claims in full.
Fully collateralised reinsurance
Collateralised (or unrated) reinsurance is sold by reinsurers that lack credit ratings. All of the collateral that could be needed to pay claims is held in a trust account. These structures are implemented by catastrophe bonds and insurance linked funds as they can be used to transform investments into reinsurance.

For example, a fund could sell a reinsurance contract with a maximum downside of $10m for a premium of $1m. The fund will place $9m of collateral into a trust account and the insurance company will pay $1m of premium into the same trust. The most likely scenario is that there is no claim and at the end of the policy period the fund will take back its $9m along with the $1m of premium (an 11.1% return). If there is a full loss, the insurance company will be able to draw down $10m.

This financial innovation has dramatically reduced barriers to entry to the reinsurance market. A bank in Brazil or a pension fund in Canada is able to sell reinsurance policies to an insurance company in Florida or Japan without the overhead of establishing a reinsurance company.

History
1370 First recorded reinsurance contract covering a ship sailing from Genoa to Bruges.
c1688 Opening of Lloyd’s Coffee House in London which became a leading reinsurance market.
c1820 First fire reinsurance treaty in Germany.
1852 Cologne Re – the first independent reinsurance company – began writing business following the Great Fire of Hamburg in 1842.
1863 The predecessors of UBS and Credit Suisse formed Swiss Re in Zurich following a large fire in Glarus which destroyed two thirds of the town.
1880 Munich Re was established in Germany.
c1885 The first excess of loss reinsurance was sold by Cuthbert Heath at Lloyd’s.
1906 The San Francisco Earthquake demonstrated the ability of the reinsurance market to fund catastrophic losses.
1985/86 ACE and XL were established in Bermuda.
1993 Bermuda’s Class of ’93 was capitalised with over $3.5 billion following Hurricane Andrew in August 1992. New reinsurance companies included Renaissance, Partner and Tempest (now part of ACE).
2001 The Class of ’01 (AWAC, Arch, Aspen, AXIS, Endurance, Montpelier and Platinum) raised more than $8 billion following the 9/11 terrorist attacks.
2005 Following hurricanes Katrina, Rita and Wilma (and Charley, Francis Ivan and Jeanne the year before) the reinsurance industry is recapitalised with the Class of ’05. New companies including Ariel, Lancashire and Validus raised over $5 billion. In addition to this, several managers of Lloyd’s syndicates followed Catlin in capitalising Bermuda based entities and investors used sidecars on a large scale to access the reinsurance market.
2011 Record losses for the reinsurance industry following a series of loss events including floods in Thailand, tornadoes in the US and earthquakes in Japan and New Zealand. No new reinsurers were established but the inflows to insurance linked funds accelerated.
2012 Hurricane Sandy is the second largest insurance loss in history.
2014 Cat bond issuance reaches record highs partially displacing a number of large reinsurance programmes.
1.2 Excess of loss reinsurance

**Excess of loss (XoL)** reinsurance protects an insurance company against large losses that can expose its balance sheet. This is a product that has been sold by reinsurers (and retrocessionaires) for more than a century. Insurance linked securities were developed much more recently to replicate many of the key features of XoL reinsurance. Often excess of loss reinsurance and cat bonds are used in conjunction to achieve the risk management objectives of an insurance company.

An excess of loss contract can protect an insurance company from a large loss at a single location (risk excess of loss), from the accumulation of losses from a single event (catastrophe excess of loss), or the accumulation of losses during a period of time (aggregate excess of loss).

Generally, a ‘program’ of excess of loss contracts is created for a single insurance company. Each ‘layer’ is exposed to a different level of risk in a similar way to tranches of corporate debt of differing seniority. Equivalently, an insurance company can issue a series of catastrophe bonds that consists of a number of separate securities.

The most common contract type is catastrophe excess of loss (or cat xs or cat xl). This is the type of contract that has the most in common with occurrence catastrophe bonds. The structure is usually expressed in terms of $X$ over $Y$ where $Y$ is the amount of loss that is necessary to trigger the contract and $X$ is the limit – the maximum possible recovery.

For example, if AIG bought a $100m xs $200m cat xs policy, it would mean that AIG would be paid by the reinsurer if AIG’s total claims from a single event were more than $200m. The recovery would increase proportionally with the loss so that AIG would recover zero from a $100m loss, $50m from a $250m loss, and $100m from a loss of $300m and above.

Most rated cat xl is sold with one reinstatement. This means that in the case of three $300m losses, the contract would recover $100m from the first loss, another $100m from the second loss and nothing from the third loss.

This type of reinsurance is usually sold on a UNL (Ultimate Net Loss) basis. This means that the reinsurance contract responds to the insurers ultimate net loss which is the actual loss incurred by the insurance company. A minority of covers – including ILWs and CWIL – are sold using other triggers.

**Industry loss warranties (ILW)**

Industry loss warranties are similar to excess of loss reinsurance but the contracts respond to the losses of the total industry rather than the losses of a particular company. Any figure for total industry losses will be an estimate and the contract will specify which estimate to use. In the US, the loss estimates calculated by PCS are usually used. Elsewhere, it is common to use the estimates provided by Swiss Re or Munich Re.

ILWs can be structured on either an aggregate or occurrence basis and PCS produces loss estimates for homeowners, commercial and auto claims on a per state basis. This gives considerable flexibility in structure. A $10m occurrence ILW with a €5 billion xs €10 billion European wind trigger would pay a claim of up to $10m in proportion to a single loss between €10 billion and €15 billion. Equally a $10m aggregate ILW with a $10 billion xs $20 billion trigger might pay an amount based on the total annual losses in Texas, Louisiana, Mississippi and Alabama.
A key advantage of ILWs is speed of execution. It is possible to sell an ILW without knowledge of the business of the protection buyer. This means that significant transactions can be agreed in a matter of hours. This ease of execution means that the ILW market has lower barriers to entry than the UNL market. The resulting supply side pressure means that ILWs often sell for a lower price than an equivalent UNL cover.

A significant disadvantage for the protection buyer is the introduction of basis risk. This describes the mismatch between the insurance company’s losses and those of the industry as a whole. For a variety of reasons, it is possible for a catastrophe to cause a relatively small loss to the industry as a whole but a disproportionately large loss to a particular insurance company (or vice versa).

County weighted industry loss (CWIL)

CWIL is a product that is distributed by Guy Carpenter (other brokers have equivalent products). It was designed as compromise between UNL and ILW type transactions. It is easier to transact than UNL cover (and so potentially cheaper) but has less basis risk than an ILW.

The trigger mechanism uses PCS to estimate the state level losses and then uses a model to allocate the losses to counties. Because the trigger is tuned to county rather than state losses, it should correspond more closely to an insurer’s actual losses.

1.3 Proportional reinsurance

A proportional reinsurance contract cedes a percentage of the profit or loss from some or all of an insurer’s portfolio. The simplest type of contract is a quota share, in which the percentage cession is fixed.

This type of arrangement has much in common with equity. A quota share will enable an insurer to sell more insurance policies on a fixed asset base. Often, a quota share is more flexible than raising fresh capital – they are typically renegotiated every year and can grow and shrink in line with market conditions.

Each quota share will be structured in a unique way but key terms will include:

Ceding commission – a percentage of the premium that is paid by the reinsurer to the insurer to cover the cost of sourcing the business.
Profit commission – a percentage of the profit that is paid by the reinsurer to incentivise the insurer. ‘Deficit carry forward’ works in a similar way to a high water mark.
Occurrence or aggregate limit – the maximum loss that can be ceded to a reinsurer from one event or during the term of the deal.

In recent years, sidecars have enabled a broader range of entities to participate in proportional reinsurance. These use collateralised rather than rated structures.
1.4 Retrocession

Retrocession is simply the reinsurance of reinsurance companies. Structures have the same form as as ‘primary’ reinsurance. Retrocession can be rated or collateralised, excess of loss or proportional.

Reinsurers’ portfolios have a broad geographic scope as their clients are based across the globe. As a consequence, retrocession typically offers wide coverage. It is common for retrocession to cover losses from anywhere in the world from multiple lines of business. This breadth results in a high cost of capital for retrocessionaires which has, historically, led to high profit margins.

Retrocession has much in common with ‘CDO squared’ deals. Like those deals, it is important to understand the correlations of the underlying transactions before assuming that there is a benefit to diversification.

The market for retrocession is significantly smaller than primary reinsurance – it is perhaps 10% of the $25 billion property catastrophe reinsurance market. The potential for high profit margins has meant that retrocession has proved to be an attractive part of the market for alternative reinsurers.

Pillared retrocession
A significant part of the retrocession market is now sold on a pillared basis. CATCo sell a collateralised version of this product and Everest Re sell a rated version called PURPLE. This is structured so that the premium is comparable to the maximum payout from a single loss, which caps the downside from individual large losses. The payoff for this cap is that small losses are more likely and large losses are possible from multiple, medium sized events.
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