Securitisation of Non-Life Insurance Working Party

GIRO 2008

Graham Fulcher (Chair)
Mohamed Afify, Cormac Bradley, Jean Bernard Crozet
David Davies, Will Forster, Susanne Frisby, Paul Fulcher, Visesh Gosrani
Shalin Haria, Cameron Heath, Gillian James, Tim James, Henry Johnson
Mohammad Khan, Angela Koller, Jun Lin, Alex Marcuson, John McCrossan
Melodie Pollet-Villard, Esmee Robinson, Emiliano Ruffini, Thomas Wallace

History of Securitisation Sub-Group

Graham Fulcher (Sub-Chair)

David Davies

Will Forster

Melodie Pollet-Villard

1. INTRODUCTION

This paper is one of a series produced by the GIRO 2008 Securitisation of Non-Life Insurance Working Party.

This particular paper explores the history of the securitisation of non-life insurance and is in two main Sections.

In the first section we set out the concepts that underlay the initial developments in this area (in the early to mid 1990's) and then examine how the non-life insurance linked securitisation has developed in the subsequent 15 years and how it may develop in future.

In the second section we take a retrospective look at two previous GIRO papers from the 1997 and 1999 conferences and review the prediction made then for the development of the non-life insurance linked securitisation market against actual developments in the last ten years.

This paper is one of a series of stand-alone but complementary papers produced by the GIRO 2008 Securitisation of Non-Life Insurance Working Party.

The other papers cover:

- a quantitative and qualitative review of the **Zero-Beta** quality often claimed for catastrophe bonds,
- a review of the important topic of **Basis Risk** within non-life insurance linked securitisations including an example spreadsheet,
- a review of the **Lessons from Sub-Prime** and wider credit crunch for non-life insurance linked securitisation and more widely for non-life insurers,
- a review of **Regulatory Regimes** (particularly capital regime) treatment of non-life insurance linked securitisation,
- a review of the securitisation possibilities for **Other Non-Life Risks and Assets** other than purely catastrophe bonds.

2. THE INITIAL MODEL FOR NON-LIFE INSURANCE LINKED SECURITISATION AND ITS DEVELOPMENT TO DATE

Initial model

The initial model for non-life insurance linked securitisation (in the early to mid 1990's) was based around the securitisation of peak natural catastrophe risk (so-called catastrophe bonds) and rested on the following two widely-quoted premises (which addressed in turn a supply and demand side argument).

- Supply Argument: That the entire capital backing the US insurance industry (including reinsurance capital) was not much greater than the probable maximum loss to the industry from either a major hurricane striking Florida or a large earthquake in California. PMLs were typically quoted as between $50-$100 billion ten years ago compared to industry capital backing of around $200 billion. Therefore such an event could imperil the solvency of the entire industry. These potential losses however only equated to the average daily fluctuation in the (at the time) total of around $20 trillion US investment in stocks, bonds and real estate; so that such a loss spread would be easily absorbed if spread across the US investment market.
- Demand Argument: Most reinsurers already considered themselves over-exposed to such peak risks as Florida hurricane and California quake and as such were reluctant to absorb any greater exposures and even if they did would charge a price high in excess of expected loss cost. By contrast for the investment community the securitisation of such exposures would be attractive as it would provide a pure investment in a zero-beta risk (as empirically catastrophe losses were believed to be uncorrelated to stock market movements) without the additional agency risks associated with a bond or equity investment in an insurance entity. As a consequence of the zero-beta argument, on a puristic Capital Asset Pricing Model (CAPM) assessment, investors should be prepared to take on the risk at close to the expected loss cost, so that it should be possible for non-life insurance linked securities to offer returns which were simultaneously competitive with traditional reinsurance and attractive to investors.

Developments

The first of these premises is even more compelling now than it was 15 years ago for a number of compounding reasons.

- Continuing population movements towards hazard exposed areas (such as the coast) and appreciation in property prices (albeit the latter partly mitigated by the recent fall in US property prices) has increased insured values. Empirical estimates are that insured values on the Florida coast for instance are doubling every ten years.
- The recalibration of catastrophe models in 2006 following the 2004 and 2005 hurricanes (and in particular the recognition of the possibility of extreme demand surge in a so-called super-cat) has increased modelled losses still further.
- The Intergovernmental Panel on Climate Change (IPCC) 2007 Fourth Assessment Report in 2007 concluded that it was likely (> 66% probability) that there was observational evidence for an increase in intense tropical cyclone activity in the North Atlantic since about 1970 (correlated with increasing sea surface temperatures) and that it was likely that tropical cyclones would become more intense in future (due to climate change) with larger peak wind speeds and more heavy precipitation.
- The reinsurance industry has become increasingly concentrated (increasing potential credit exposures) and with generally a lower level of security (at least as measured by rating agencies).

The second driver has been a dormant factor in the growth of non-life insurance linked securitisation but has come back into focus in 2007 following the sub-prime crisis/credit crunch as, non-life insurance linked securities have been viewed as a still clearly diversified class at a time when the correlation of financial risks in a extreme tail event has been starkly illustrated. Indeed, assisted by two years of low catastrophe activity in 2006 and 2007 and the resulting softening in the conventional markets, catastrophe bond spreads mainly tightened during 2007 at the same time as corporate bond spreads widened massively. However this was partly offset in late 2007 and early 2008 as some investors sold their catastrophe bonds to fund margin calls on credit business and others returned to their core holdings e.g. corporate bonds.

One point to note is that the “zero-beta” argument goes both ways and that in future years non-life insurance linked securities could see high losses at a time when other asset classes are enjoying high returns. The reaction of investors in this scenario, and the possibility that they may lose confidence in the asset class, has yet to be tested as it is believed that only one publically traded non-life insurance linked security has had losses to date (one bond being triggered by Hurricane Katrina).

Contrast to other forms of securitisation

More broadly than non-life insurance, there are three main reasons why companies use the securitisation markets:

- to reduce capital requirements – both economical and regulatory capital (the latter potentially involving regulatory arbitrage),
- to crystallise future cash-flows (including realising the value of intangible assets),
- to transfer extreme risk to the capital markets.

As explained above, non-life insurance linked securitisation has been primarily motivated by the third reason.

Banking securitisations (e.g. mortgage backed securities) have been driven by a combination of the first two reasons – by regulatory capital arbitrage (e.g. under the Basel 1 framework) and realisation of cash. Mortgage business is associated with large funding strains which securitisation can address; the recent liquidity crisis was largely triggered by the securitisation markets becoming unavailable to banks (such as Northern Rock) that relied upon them. Banking securitisation has also allowed some risk transfer, but this has been relatively limited.

Life insurance securitisations to date have been similarly been focused on more efficient capital financing and regulatory arbitrage (XXX and AXXX securitisations in the US which allow the release of redundant regulatory reserves against extreme tail risks for term life and universal life policies) and the monetisation of an intangible and regulatory inadmissible asset (embedded value securitisations in the UK and Ireland).

Actual risk transfer in life insurance securitisations has been relatively limited as the primary motivator. The exception has been the recent extreme mortality risk bonds from insurers such as AXA, Swiss Re and Scottish Re, which have effectively borrowed technology from non-life catastrophe bonds. So far, these bonds protect against increases to mortality rates: the much heralded market for transfer of longevity risk to the capital markets has yet to properly develop.

Conclusion

2007 may in retrospect be seen to be a pivotal year in the development of non-life insurance linked securitisation, with events over 2004-2007 (2004-5 hurricanes, 2005 reinsurer downgrades, 2006 catastrophe model re-calibration, 2007 IPCC report and sub-prime crisis) meaning that both the original supply and demand justifications for non-life insurance linked securitisation are re-validated.

As we will see, this was demonstrated in practice by the significant growth in non-life insurance linked securitisation issuance in 2007 despite conventional catastrophic reinsurance rates dropping between 2006 and 2007; so that the rise in catastrophe bond issuance was decoupled from conventional reinsurance market dynamics for the first time (previously the rise and growth of catastrophe bond issuance had been heavily related to conventional catastrophe rates, serving simply as a potential competitor).

Remainder of section

In this section we will consider four aspects of non-life insurance linked securitisation:

- sponsors (issuers) of securities,
- the catastrophe perils and territories securitised,
- the nature of the non-life insurance linked risks or assets securitised,
- investors in securities,

under each of three aspects:

- the initial model for non-life insurance linked securitisation (as set out above),
- developments (or deviations) that have already occurred to this initial model,
- possible future developments.

2.2. SPONSORS

Initial model

An insurer's function is to accumulate (or in financial markets' terms warehouse) risk from a very large number of insureds, which those insureds cannot bear themselves. In turn the reinsurance market developed over time to take on the peak risks carried by insurance companies, which they themselves were unable to bear (for example very large motor liability claims) and to diversify them across insurers.

One example of the role played by reinsurers was catastrophic risk where insurers were unwilling to absorb all of the low frequency, very high severity risk and passed it on to reinsurers who specialised in the assessment of catastrophic risk (and were using bespoke in-house catastrophe models before the wide-spread industry adoption of off-the-shelf modelling agencies' models) and theoretically were able to accumulate, diversify and absorb the risk across a number of insurers. However, the potential accumulations revealed by catastrophic modelling (particularly in the light of continuing economic and demographic trends leading to these accumulations growing exponentially) and the potentially industry-threatening impact of possible future events (particularly East Coast hurricanes and California earthquakes), as explained above, led the insurance and the reinsurance industry to question the ability of the reinsurance market to absorb the potential losses and so were the initial impetus to non-life insurance linked securitisation as a means of accessing a new source of capital.

Further this source of capital could provide multi-year capacity at a fixed price, in contrast to typically annually renewable reinsurance contracts which are exposed to re-pricing and re-financing risks.

The initial sponsors of non-life insurance linked securitisation were therefore insurers (looking to diversify their protection providers) or reinsurers (looking for sources of retrocessional cover). Additionally reinsurers saw a role as "transformers" – taking insurance risk on an ultimate net loss basis from insurers by providing traditional catastrophic excess of loss reinsurance and issuing a catastrophe bond to hedge their catastrophe accumulations, while managing the basis risk themselves by diversifying it over a number of insurers.

Developments to date

Another stream of sponsors in the early days of securitisation were governmental pools providing some form of catastrophic cover, normally to homeowners, such as the California Earthquake Authority (although their proposed deal was pulled from the market and reinsured conventionally by Berkshire Hathaway), the Hawaii Hurricane Relief Fund and the Joint Florida Underwriting Association. More recently there was an issuance in 2003 by the Taiwanese Residential Insurance Earthquake Pool and in 2006 by FONDEN – the Mexican government's fund for natural disasters

The first two industrial issuers of non-life insurance linked securities, effectively bypassing the reinsurance industry and accessing the capital markets directly, were both theme parks. In 1999 Disney World Tokyo bought cover against Japanese earthquake and in 2002 Vivendi bought protection for earthquake damage to Universal Studios.

Other industrial issuers were:

- the power utility Electricite de France who securitised French windstorm risk in 2003,
- the energy company Dominion Resources Inc, an energy producer that brought Hurricane protection for its Gulf of Mexico offshore drilling assets in 2006,
- the transport company East Japanese Railway Company who bought Japanese earthquake protection in 2007. Other entities to issue non-life insurance linked securities to date have been:
- event organisers: FIFA in 2003 bought terrorism cover against cancellation of the 2006 World Cup,
- captives: OCIL an insurer for the petrochemical industry bought liability cover,
- hedge funds: Nephila an offshore asset manager focused on catastrophe risk (via a mix of reinsurance, industry loss warranties (ILWs) and investing in catastrophe bonds) issued its own bond in 2007 structured as a collateralised debt obligation (CDO).

Future developments

Possible future sponsors include charities and third world governments looking to obtain pre-funding of disaster relief in catastrophe prone territories. The World Bank has been particularly active in exploring this possibility and, although currently written as conventional reinsurance, the Caribbean Catastrophe Risk Insurance Facility, set up by the bank in 2007, is structured in a way that would easily facilitate securitisation (e.g. by use of a parametric loss index). Furthermore, Swiss Re's 2008 securitisation of Guatemala and El Salvador earthquake risk using a parametric index was explicitly designed to demonstrate the feasibility of charities and governmental relief organisations using pre-event donations to buy much greater catastrophic relief than would be obtained by the same amount of post-event fund relief.

Another potential sponsor would be the airline industry post a major market loss as a way of avoiding the resulting huge increase in premiums. If legislative changes lead to rising potential marine liability exposures above the capacity of the marine insurance industry, the International Group could be another potential issuer.

2.3. CATASTROPHE PERILS AND TERRITORIES

Initial model

Under the initial model as set out above, the catastrophe perils and territories securitised were those with the highest potential exposures and those with the highest levels of capacity strain in the existing insurance industry. These would normally coincide although following a particular loss, insurance capacity could potentially dry up for some non-peak exposures.

The immediate catastrophe perils and territories securitised were US East Coast hurricanes (sometimes specifically restricted to Florida or North East US exposures) and California earthquake. The model was quickly extended to European winter storms, Japanese (particularly Tokyo) earthquake and Japanese typhoon and these five peril/territories (in roughly decreasing order) are still the most commonly securitised.

Developments to date

Over time the initial model has been extended to a number of other lesser catastrophe perils and territories. Some of the public bond issuances made have been multi-peril and territory (albeit with one peak risk); however the main additional catastrophe perils/territories securitised (and the year/sponsor when they were first securitised) are as follows:

- Europe hailstorm (Winterthur in 1997),
- New Madrid/Midwest earthquake (Kemper in 1999),
- Monaco earthquake (AGF 2000),
- Hawaii windstorm (Vesta 2000),
- Puerto Rico windstorm (Swiss Re 2001),
- Taiwan earthquake (Central Reinsurance Corporation/ Taiwan Residential Earthquake Insurance Pool 2003),
- Pacific Northwest earthquake (FM Global 2005),
- Australia typhoon/earthquake (Swiss Re 2006),
- Mexico earthquake (Mexican government 2006),
- US tornado/hail (Hartford 2006),
- Mediterranean (Turkey/Greece/Israel/Portugal/Cyprus) earthquake (Aspen 2007),
- Europe river flood (Allianz 2007),
- Central America quake (Swiss Re 2008).

Further developments have been in the cover provided for catastrophic perils, duplicating offerings in the traditional reinsurance market beyond simple per event catastrophic cover

- Sideways frequency cover (Catlin 2006) responding to higher than expected frequency of natural catastrophes (from a variety of perils) over a multi-year period
- Aggregate retrocessional catastrophe cover (Catlin 2007) responding if aggregate catastrophe losses from all events exceed an annual threshold

Future developments

Catastrophic perils/territories for future securitisation could include:

- terrorism risk,
- tsunami or volcanic risk post an event causing major insured losses,
- emerging market risk – in particular the significant natural hazard potential in many emerging markets as insurance penetration there grows, not least Russia, India and China.

2.4. RISKS OR ASSETS SECURITISED

Initial Model

As explained above the initial model of non-life insurance linked securitisation, was based around catastrophic risk (catastrophe bonds) due to the capital constraints within the insurance industry and the zero-beta argument.

Developments to date

In practice there have been a handful of other deals that have securitised other parts of the balance sheets of non-life insurers.

- OCIL – a captive insurer for the petrochemical industry securitised third party underwriting risk in 2005
- In 2005 AXA by way of securitisation obtained a form of multi-year aggregate loss ratio corridor protection for part of their French motor book. In 2007 AXA followed up with a securitisation combining motor insurance written by its subsidiaries in four other territories: Germany, Belgium, Italy and Spain
- In early 2006 Swiss Re securitised part of their Trade Credit book, obtaining multi-year aggregate cover for a diversified book of credit business. (Gerling Re issued a securitisation for their credit reinsurance subsidiary Namur Re in 1999.)
- Two securitisations of reinsurance receivables were made in 2006-2007, by Aspen Re and Hannover Re, using credit default swap/collaterised debt obligation (CDO) structuring.

Future developments

Possible future areas to be securitised include:

- other high volume, high frequency/low severity personal lines business such as Travel/A&H or Household
- long-tailed occurrence liability lines of business,
- severity affected commercial lines of business which suffer from capacity constraints in times of expansion of cover needs (e.g. Construction in the Gulf States),
- severity affected commercial lines of business which suffer from retraction of capacity and increase of insured prices above required actuarial premium for a period following a loss event (such as Aviation and Directors & Officers Liability). Both of these classes could lead themselves to some form of index cover: a number of brokers publish market loss figures for the airline industry; Stanford Law School/Cornerstone publish US securities class action indices.
- casualty reserve run-off risk,
- goodwill.

2.5. INVESTORS

Initial model

The initial concept of non-life insurance linked securitisation was for catastrophic insurance risk to be diversified away from insurers and reinsurers and spread to the mainstream investment community; so the obvious investors would have been expected to be very large institutional investors such as money managers, mutual funds, life insurers and pension funds.

Developments to date

In practice much of the initial investment in non-life insurance linked securities was by the reinsurance industry itself. This seems to have been for a number of reasons: as an alternative source of catastrophic exposure for newer insurers, as a form of arbitrage, as a way of testing and exploring the market, and for some of the larger reinsurers as a way of supporting and providing "proof of concept" to a nascent market in which they hoped to play a key role by acting as transformers (see above).

Over time, specialist hedge funds were set up to invest in non-life insurance linked securities (often alongside the establishment of sidecar catastrophic insurers), while more general hedge funds used it as a high yielding asset class.

Future development

A likely future development as non-life insurance linked securities become more and more mainstream is simply for a return to the initial concept (which was never in fact properly realised).

One interesting recent development, which may go in the opposite direction was that in April 2008 the Financial Industry Regulatory Authority (the largest non-governmental regulator for US Securities firms) issued an investor alert which "caution[ed] [retail] investors on speculating with Catastrophe Bonds and Other Event-Linked Securities" pointing out some of the risks involved for retail investors if their managing institution invested in this area.

The two main risks highlighted were: what FINRA describes as the "credit-cliff" – that a triggering event will normally cause rapid loss of all interest and capital; and "the high degree of complex modelling" which as well as adding significant modelling risk also leads FINRA to argue that institutional investors require to have a high level of resources and specialist expertise to properly understand the products. Other risks mentioned were the low liquidity and unregistered nature of most non-life insurance linked securities and the potential third party counterparty credit risk.

It is not clear how attractive the zero-beta argument is to some investors – the rise and prevalence of index-tracking funds shows that many retail investors would prefer their institutional funds invested in market tracking assets.

3. REVIEW OF PAST PREDICTIONS

This 2008 GIRO paper marks the tenth anniversary of the three previous GIRO papers produced on securitisation in 1997, 1998 and 1999. In those papers a number of predictions were made about the likely future development of non-life insurance linked securitisation and reviewing these predictions forms another perspective for assessing the history of securitisation to date.

3.1. 1997 paper

The 1997 paper made ten generic predictions about the future development of non-life insurance linked securitisation. These are repeated below followed by a retrospective assessment of how non-life insurance linked securitisation has actually developed.

1. The number of securitisation deals will continue to grow rapidly as insurers increasingly appreciate their benefits and investors grow in their understanding of and confidence in such instruments.

Chart 1 (below) clearly shows that the volume of non-life insurance linked securitisations issued has grown significantly over time with most of the growth occurring since 2005. It is clear that confidence in the structures is growing. The market was given a significant boost during 2005-6 by the shortage of traditional retrocessional capacity following the US hurricane activity of 2005. As commented above however possibly a more interesting observation is that volumes have continued to grow during 2007 as rates in traditional catastrophe reinsurance markets have softened.

Unsurprisingly, in view of the growth in volume in recent years, new sponsors are involved in a significant proportion of recent issues (56% in the year to 31/3/2006, nearly 30% in the year to 31/3/2007 and 42% in the seven months to 31/10/2007. Source: Lane Financial). In addition some companies have now repeatedly sponsored deals over an extended period: notably USAA and Swiss Re.

As the market has grown, considerable innovation has been shown by sponsors in structuring deals.

- The range of perils covered has increased significantly over time (see above for more details).
- Hybrid triggers have been developed in an attempt to reduce the basis risk of the sponsor while avoiding the potential moral hazard of indemnity coverage. These triggers are usually a combination of other trigger types, e.g. industry index and modelled loss (the ACE sponsored Calabash Ltd transaction is an example of this). Some issues (e.g. the Swiss Re sponsored Successor program) use different triggers for different perils within the same tranch. .
- Some deals have given investors considerable flexibility to tailor their exposures in terms of peril covered, attachment point and even loss trigger (the Swiss Re sponsored Successor program being an important example).
- Shelf offerings have become fairly common. With these the sponsor acquires the option to issue additional bonds over the course of the prescribed risk

period – and this increases the strategic advantage of securitisation (see below).

- Some recent deals have been structured as CDOs including, in 2007, the first publicly disclosed actively managed CDO (Nephilia/Gamut Re). This may prove to be a significant development as it allows ILS investors to gain greater leverage.
- Some SPVs have been financed by loans rather than bonds; other deals have offered both alternatives.

The nature of the investors has also changed over the last decade. In 1999 insurers and reinsurers made up 55% of the investor base. In 2007 the equivalent figure was 7% with specialist (hedge) funds and general hedge funds representing 72% (source: Swiss Re).

Not shown in the chart, which covers catastrophe bonds only, is the recent growth in other methods of transfer of insurance risk more directly to capital market investors by means of sidecars and ILWs.

- Sidecars are special purpose vehicles set up by a sponsoring entity (usually a (re)insurer) to provide additional capacity via a partially-collateralised capped quota share of a subset of the sponsor's business (usually peak catastrophe exposures). They are usually set up for a fixed term (commonly two years) and are largely funded by third-party capital wishing to access the insurance risk of the sponsor. Management and performance fees are paid to the sponsor. The capital structure of the sidecar is usually tranched to allow investors different risk-return characteristics.

  It can be seen that in some respects sidecar structures are similar to non-life insurance linked securitisation structures (i.e. the perils covered, the tranched structure, the requirement for collateral, the importance of hedge funds as a source of investment); although the debt is usually in the form of loans not securities. Following the 2005 hurricanes sidecar vehicles raised $6.5bn in 15 months compared with $2-3bn over the preceding ten-year period (source: Lane Financial). (Although the label *sidecar* is new similar mechanisms have existed for longer.) It is notable that, in contrast to the non-life insurance linked securitisation markets, sidecar activity reduced dramatically in 2007 – possibly, after adjusting for some unusual deals, by more than 80% from 2006 (source: Guy Carpenter).

- ILWs are usually double trigger reinsurance contracts. The first trigger is based on an industry loss metric. The other trigger is indemnity based but is usually set so low that it is almost certain to occur if the first trigger is breached. The contract therefore is very similar to a binary option on the industry loss index. This makes ILWs easier to underwrite and they are offered by hedge funds on a collateralised basis. Detailed statistics on the size of the industry loss warranty market are not available. However clearly there has been significant growth post the 2005 hurricanes and some estimate volumes to be of a similar order of magnitude to the catastrophe bond market.

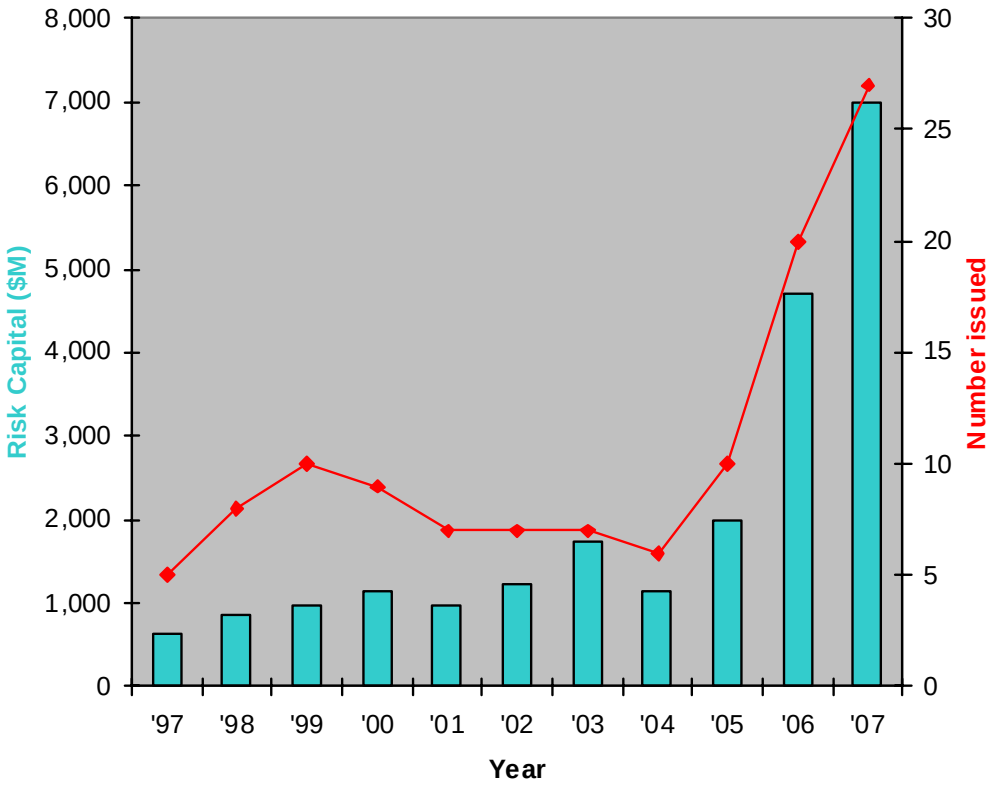


CHART 1: The Growth of Non-Life Insurance Linked Securitisation

Source: Guy Carpenter Securities (this chart includes catastrophe bonds only and not other non-life insurance linked securities).

2. Securitisation will not replace traditional reinsurance, but will be complementary. Securitisation is a particularly effective solution when there is a substantial mismatch between premium flows and claim flows. However, securitisation loses many of its advantages for relatively stable classes of business with a high frequency and low average severity of claims.

Securitisation has not replaced traditional reinsurance but has grown substantially over time. It can be seen from Chart 1 that initially the growth was slow and unsteady. As already commented volumes took off in 2006 following the 2005 hurricane activity, but then continued to grow in 2007 when rates for traditional reinsurance were softening. This may signify that many sponsors are viewing non-life insurance linked securitisation as more of a long term strategic means of accessing alternative sources of risk capital and not just as a short term tactical play.

The development of the ability to issue shelf offerings may have been key here as it gives the sponsor a way of reducing in advance exposure to future capacity crunches in the traditional reinsurance markets (by considerably reducing the lead-time and expenses of issuing additional bonds when required).

It certainly appears that non-life insurance linked securities are taking their place alongside sidecars, industry loss warranties, contingent capital and traditional reinsurance as one of a range of capital management options available to (re)insurers.

It is also true that securitisation has yet to make major advances in high-frequency, low-severity business, however the recent issues sponsored by AXA covering European motor business (see above for more details) have shown that high-frequency low average severity business can be successfully securitised and it looks likely that there will be growth in this area in future.

The claim that "*securitisation loses many of its advantages for relatively stable classes of business with a high frequency and low average severity of claims"* is open to debate. For classes of business where the capital required is relatively small compared to the expected loss cost the tax disadvantage of holding equity capital is reduced and thus the advantage of securitisation is diminished. However, the other advantages remain. It is interesting that the cover provided in the recent AXA deal (multi-year aggregate loss ratio corridor) is a cover not commonly available in traditional reinsurance markets.

Due to the lack of third party models for high-frequency low average severity business, deals are likely to have indemnity triggers (as did the AXA deal). Investors are likely to demand greater spreads to compensate for this. In addition for the long-tailed claims the sponsor is left with the risk of adverse development after the bond matures.

3. The returns offered to investors and the resulting price available to 'ceding' insurers will come down as: investors become more comfortable with the concept of securitising insurance risk, and do not require as high a premium to take on such risks; the administrative overheads of launching a securitisation deal (including the solution of legal, regulatory, tax and accounting issues) reduce with increasing familiarity and economies of scale; more deals are completed and as a result investors are more keen to be involved.

Chart 2 was produced by Lane Financial LLC. Please refer to their website for details of the chart's construction and some important caveats (e.g. relating to change in composition of the market, seasonality and post-issue changes in the expected loss).

The bars in the top chart show the average spreads (above the floating rate) on catastrophe bonds in the secondary market. The lower chart shows the expected loss on issue of the equivalent bonds (red bars), and "multiples" of yield over expected loss for the same bonds (blue line). The multiple is a reasonable indication of the price of the catastrophe cover.

Up until late 2005 the average spreads on the bonds was generally declining while the expected loss was increasing, leading to a decrease in multiple. Although part of the decline will be attributable to a general softening of catastrophe reinsurance rates over the period, it appears likely that part is also due to some of the causes predicted above. In late 2005 and 2006 (post the 2005 Hurricanes), spreads increased dramatically reflecting the changed conditions in the catastrophe reinsurance market in that period. Multiples also increased, but not as dramatically, as expected losses also increased significantly (largely reflecting the strengthening of models at that time).

Interestingly in light of the original "zero-beta" argument multiples have been at the least three times expected loss cost rather than the theoretical one-times.

Chart 3 was also produced by Lane Financial LLC. The bottom two lines in the upper part of this chart are a continuation into 2007 of the yield-spread graph discussed above (now split into all non-life insurance linked securities and catastrophe-only insurance linked securities). The spreads have reduced significantly since 2006 mirroring the reduction in rates in the traditional catastrophe reinsurance market.

What is interesting is the increase in issuance over the same period suggesting that investors still find the yields attractive despite the rate reduction. There appear to be factors supporting the demand for catastrophe bonds despite the reduction in yield spreads available. Some possible reasons are given below.

- A growth in the capital markets' confidence in and understanding of catastrophe bonds leading to greater demand. This may be self reinforcing as markets in these bonds become deeper and more liquid. Increased issuance is further reducing transaction costs and making it easier to justify the expense of researching this relatively new market. Perhaps the market has reached 'critical mass'.

- A more bullish outlook relating to the risks of catastrophe insurance in general and US hurricane cover in particular following the mild 2006 and 2007 Gulf of Mexico hurricane seasons. There may also be an increase in confidence in the results of catastrophe models – although whether this will survive the test of an actual catastrophe remains to be seen.
- A renewed focus on the search for uncorrelated yield following the recent problems in other debt markets.

Interestingly, although volumes of catastrophe bond issuance have continued to increase, sidecar capital has declined significantly over 2007. Since the investor base is similar in both cases (hedge funds are key players), this adds weight to the theory that the continued rise in catastrophe bond activity is due to one-off factors. In future we can expect to see catastrophe bond (and sidecar) volumes act in a counter-cyclical fashion, decreasing both the amplitude and period of the catastrophe reinsurance cycle.

It is less clear what equilibrium level the issuance of catastrophe bonds will oscillate around. Although the renewal of the original supply and demand-side arguments for insurance linked securitisation would imply that this equilibrium level will be at least as high as the 2007 issuance level if not higher. The large unknown (which could reduce this equilibrium level) is how the capital markets would react to a series of losses on catastrophe bonds.

Another way of looking at changes in the price of catastrophe bonds is to compare yield spreads with those of similarly rated corporate bonds and this is shown in Charts 4 and 5 (source: Guy Carpenter). Chart 4 shows the comparison from 1998 to the end of 2007; chart 5 shows the period from December 2006 to December 2007 on a bigger scale.

As Guy Carpenter Securities point out the spread over corporate bonds is volatile but has generally been around 100-200 bps reflecting in part “their potential binary nature, a novelty premium, relatively lower liquidity and perceived mechanical complexity”.

The spreads clearly increased following the 2005 hurricanes: a reflection of conditions in the catastrophe risk transfer markets in general. Relative spreads reduced dramatically over 2007 with catastrophe bond spreads decreasing as corporate bond spreads have widened. It appears that catastrophe bonds have become relatively more attractive as a source of non-correlated yield, as concerns about credit markets have grown. Existing catastrophe bond investors have certainly seen good returns as yields have declined relative to corporate bonds – an example of non-correlation. Whether some of the additional capital invested in the non-life insurance linked market survives the next major event remains to be seen.

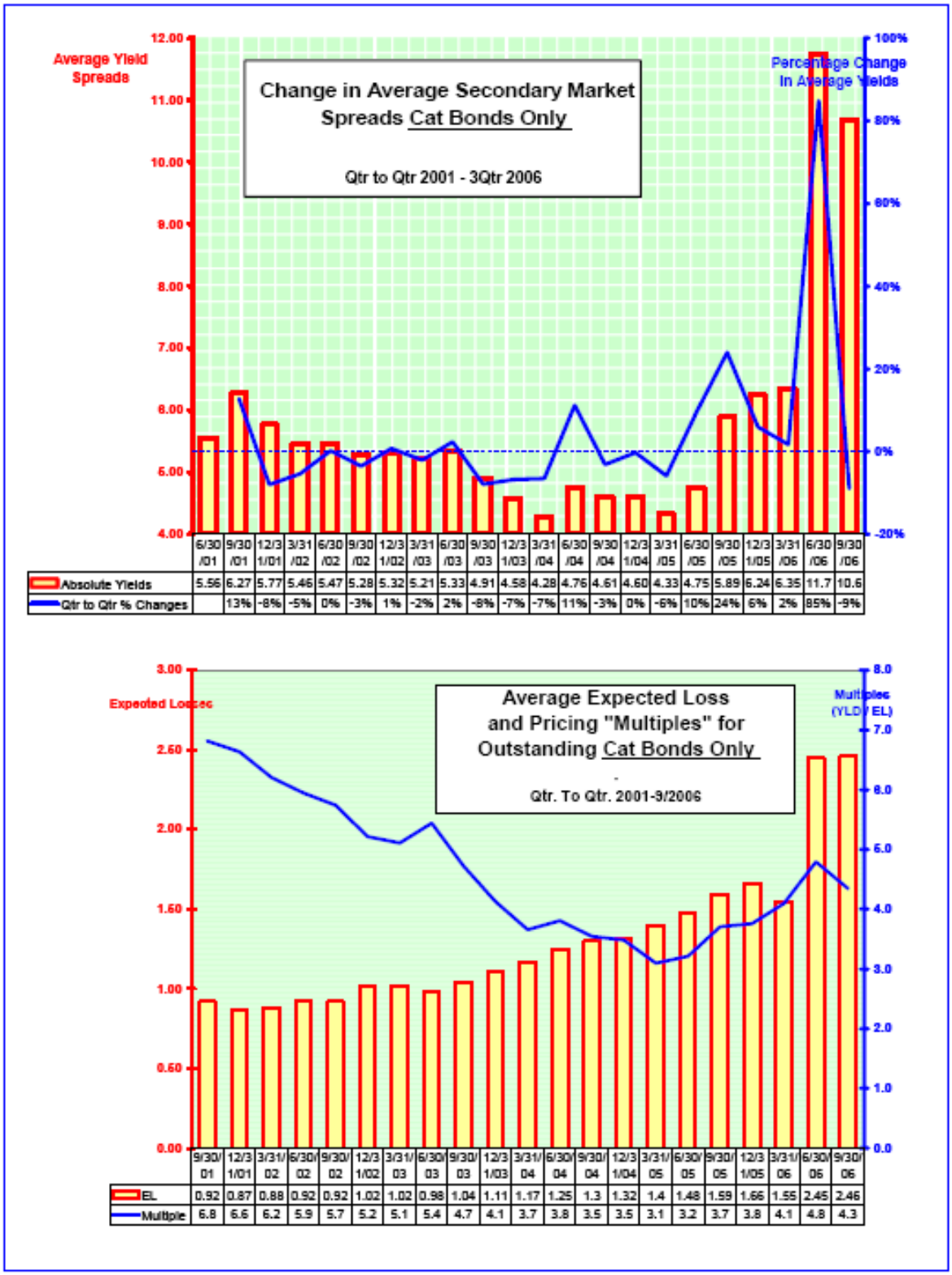
Turning to the comments relating to the expenses of issue, overheads have reduced over time as the volume of deals has increased. This has been helped by the emergence of shelf offerings and a move towards longer term deals saving on transaction costs. Increased competition amongst service providers has also helped considerably. Following the surge in issuance activity there was a corresponding surge in the number of service providers claiming catastrophe bond expertise and in 2007 a significant decrease in investment banking fees. Since this is likely to

encourage further supply of catastrophe bonds, the effect is likely to be an increase on the yield available to investors rather then a decrease as predicted, though clearly this is good news for both sponsors and investors.

It can be seen from the change in investor base over time (see comments above) that new investors are indeed becoming involved in the market and this trend is likely to continue over time acting to reduce spreads (all else equal). The accounting and capital treatment of non-life insurance linked securities is becoming increasingly favourable.

Chart 2: Catastrophe Bond Spreads

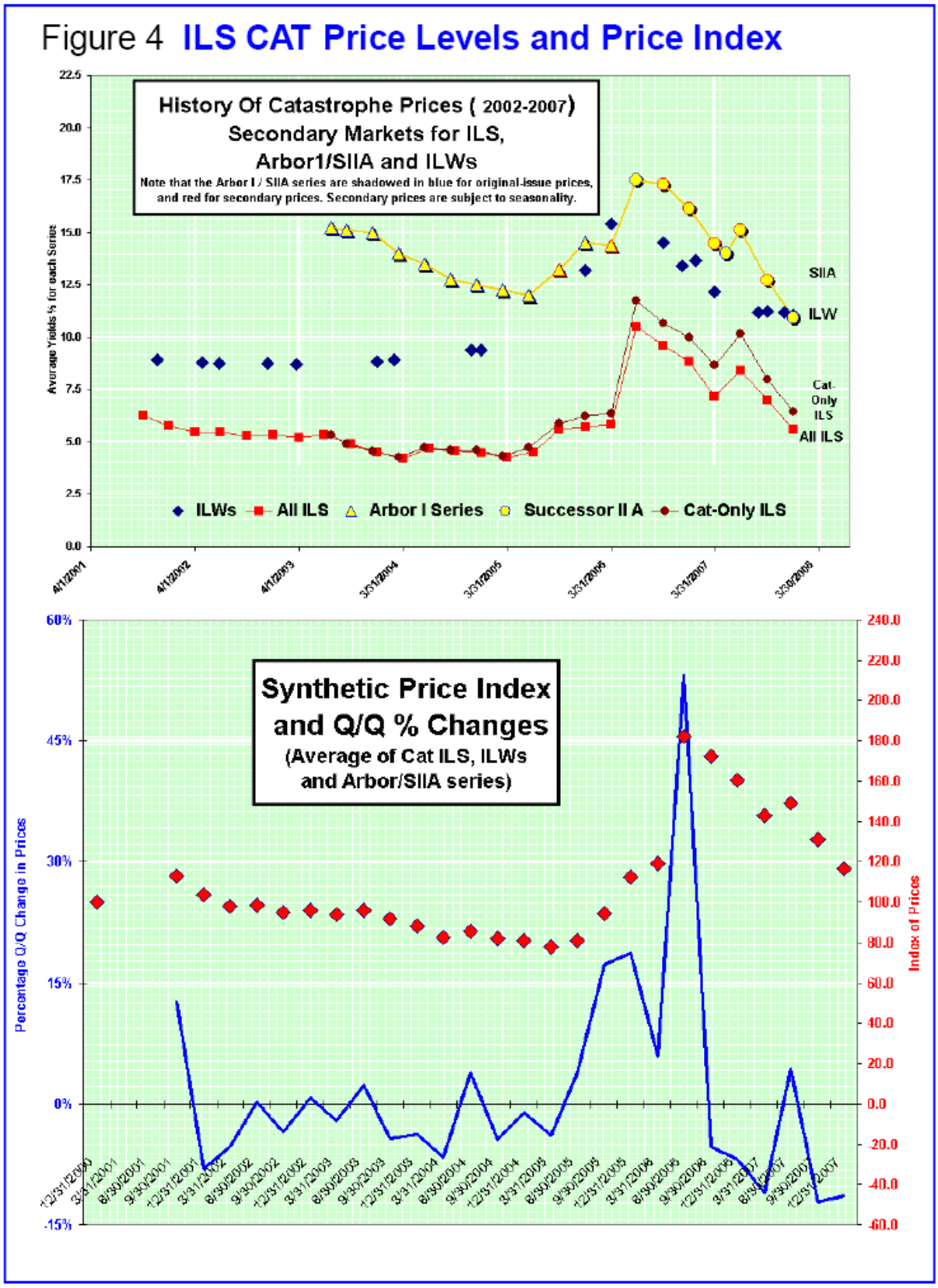
Figure 1



Source: Lane Financial.

(http://www.lanefinancialllc.com/images/stories/Publications/Over_the_Top%2C_But_Not_Off_the-Boil.pdf)

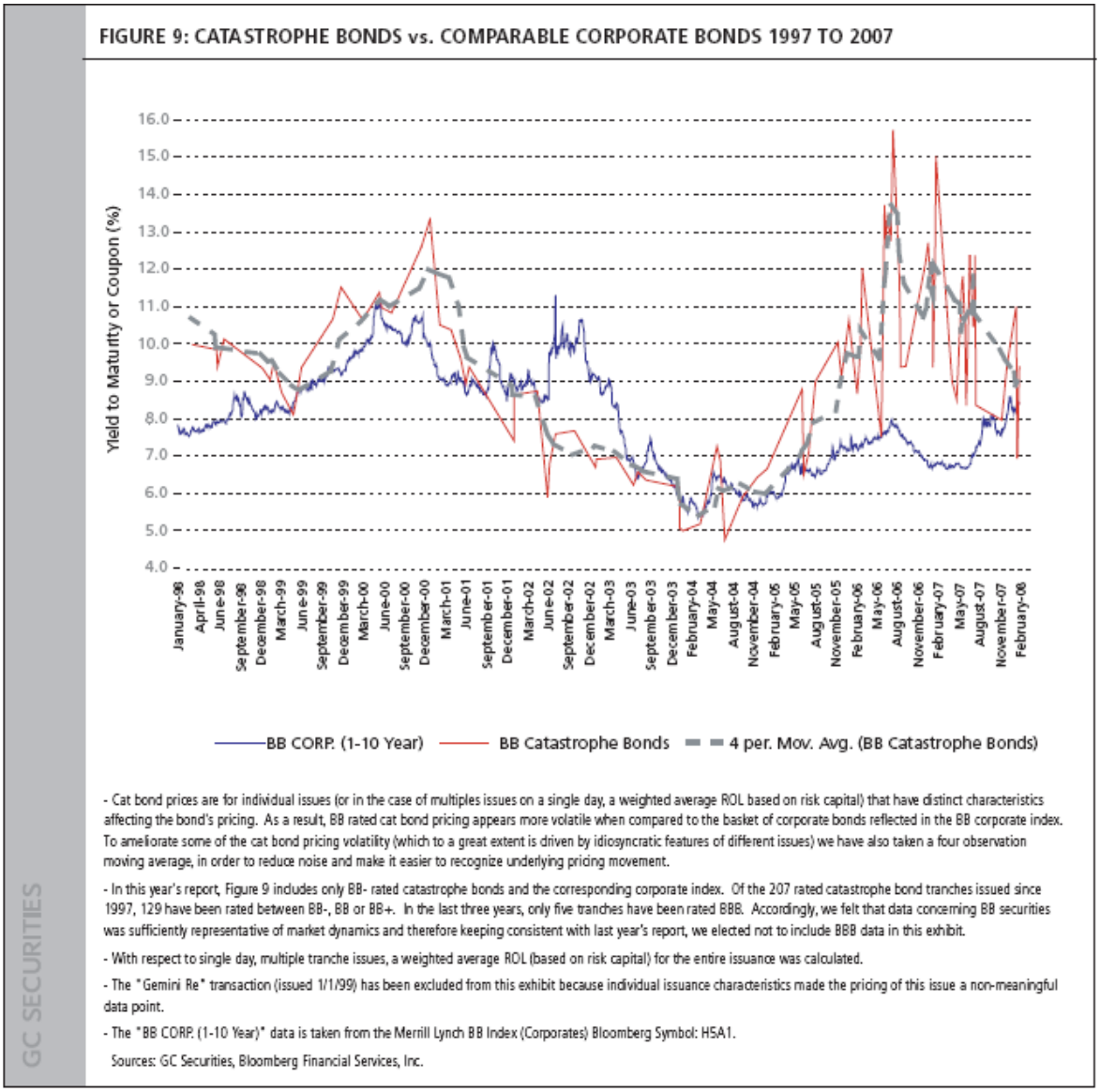
Chart 3: Catastrophe Bond Index



Source: Lane Financial.

(http://www.lanefinancialllc.com/images/stories/Publications/2008-01-15%20quarterly%20market%20performance%20report_4th%20qtr%202007.pdf)

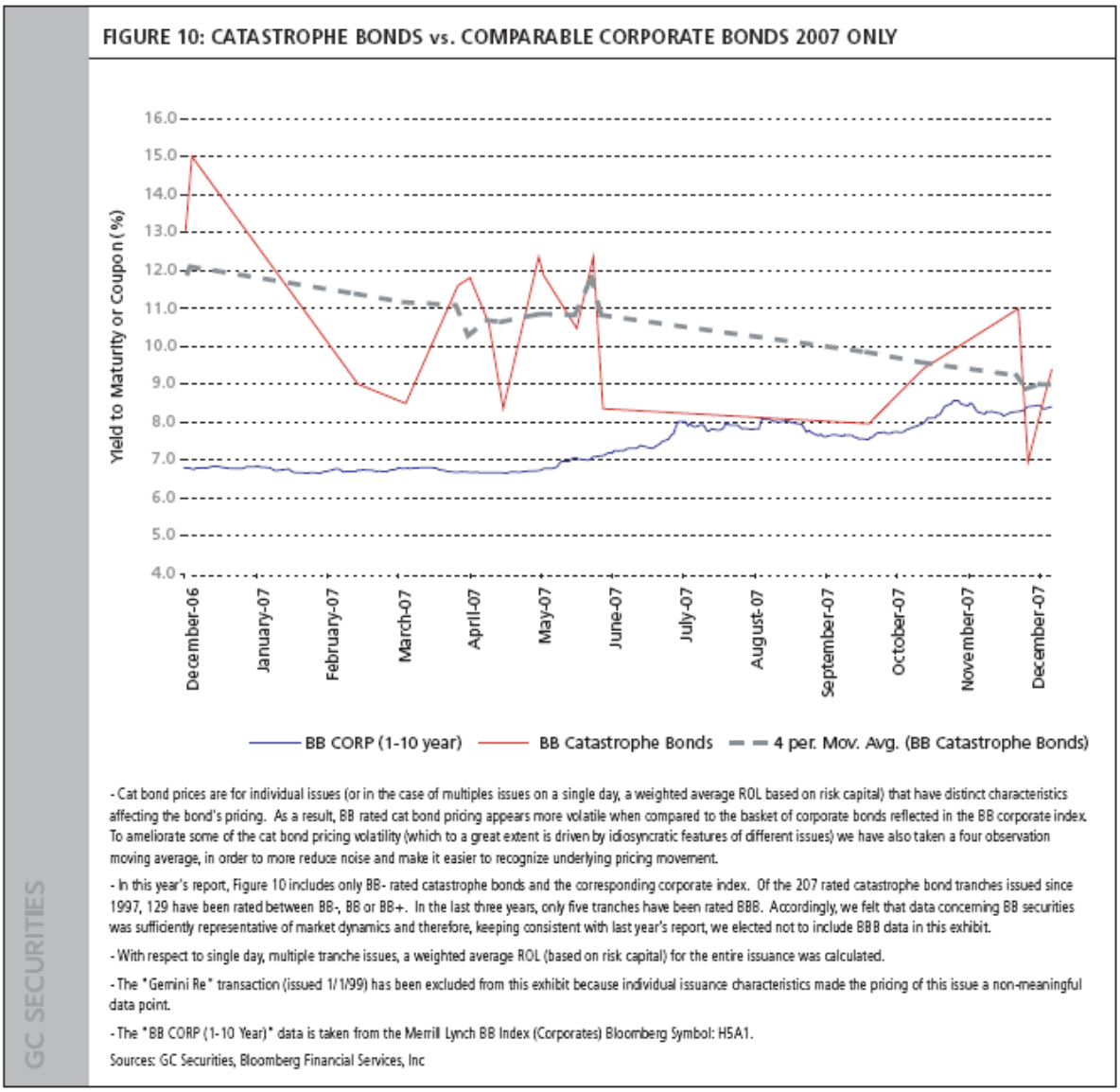
Chart 4: Catastrophe versus Corporate Bond Spreads



Source: Guy Carpenter

(http://gcportal.guycarp.com/portal/extranet/popup/insights/reportsPDF/2008/Cat%20Bond%202%2027.pdf?vid=6)

Chart 5: Catastrophe versus Corporate Bond Spreads (2007 only)



Source: Guy Carpenter.

(http://gcportal.guycarp.com/portal/extranet/popup/insights/reportsPDF/2008/Cat%20Bond%202%2027.pdf?vid=6)

The traditional reinsurance market will reform itself to compete effectively with securitisation. In particular, friction costs, for example commissions, will reduce.

There has been a shift over time towards reinsurance brokerage being complemented by a fee based approach (for success based fees or fees for provision of specific consulting services), however this has been driven by an attempt by brokers both to diversify their sources of income by moving into wider value added services (made possible in part by the consolidation among brokers increasing their resources and abilities) and to immunise themselves to some extent from the vagaries of the insurance cycle (by moving away from brokerage directly linked to reinsurance premium levels).

To the extent that there has been any pressure on more transparent disclosure of commissions/brokerage these have originated more in the direct commercial insurance industry and have been driven by regulatory pressures (e.g. the former New York Attorney General Eliot Spitzer's high-profile enquiries in 2004 into bid rigging and profit share agreements, the EU Competition Authorities investigations of the Commercial Insurance market, the Financial Service Authority's (FSA's) on-going investigations into whether to mandate disclosure of commissions in commercial insurance).

4. The distinction between traditional reinsurance, securitisation and other innovative risk financing techniques such as finite risk insurance and alternative risk transfer will become increasingly blurred.

A second set of high-profile enquiries by the former New York Attorney General Eliot Spitzer into the insurance industry in 2005, this time in conjunction with the Securities and Exchange Commission (SEC), concentrated on the alleged use of finite reinsurance to misrepresent financial statements by inflating balance sheet positions or smooth out earnings over time. This is turn led to such bodies as the US National Association of Insurance Commissioners (NAIC), the Australian Prudential Regulation Authority (APRA) and the UK FSA to tighten up significantly their requirements on the use, accounting treatment and disclosure of such arrangements.

One effect of these requirements has been a requirement to unbundle the risk transfer and purely financing parts of deals, so that the distinction has, in fact, become less blurred.

Solvency II and International Financial Reporting Standards (IFRS) will in future be key in determining the treatment of risk mitigation mechanisms such as traditional reinsurance and securitisation in insurers' and reinsurers' capital assessments and reported accounts. In broad terms they are likely to lead to a more analogous treatment of securitisation and traditional reinsurance.

5. Insurance futures and options will continue their relatively slow development due to: the lack of homogeneity of insurance risk, particularly for classes of business with a low frequency and high severity of claims; the shortage of suitable indices to act as the basis for such instruments; the lack of correspondence between the performance of these indices and of individual portfolios of risks (i.e. the inability to deal with 'basis risk'). In contrast, securitisation deals which meet the specific requirements of individual insurers will continue to develop rapidly in number and size. However, we also believe it is possible that there will eventually be a substantial market for insurance futures and options and a secondary market for securitised instruments as the need grows for such instruments to be tradable and hedgable.

In 1997 there were a number of attempts at creating trading platforms for insurance futures and options which were covered in detail in the 1998 paper, in particular:

- the Chicago Board of Trade (CBOT) traded catastrophe options based around losses compiled by the Insurance Services Office (ISO) and then subsequently and more successfully on the widely used Property Claims Service (PCS) market loss figures,
- the Bermuda Commodity Exchange (BCoE) traded catastrophe options based on a customised broker created index, the Guy Carpenter Catastrophe Index (GCCI) based on losses from a number of large insureds.

All of these attempts at creating insurance futures were unsuccessful and trading ceased only a short time after 1998.

Interestingly, 2007 and 2008 to date has seen a second wave of launches of insurance indices and related trading platforms (with some clear analogies to the previous indices) and it will be very interesting to see if these prove more successful than the first wave.

- The Chicago Climate Futures Exchange (CCFE) will trade event-linked futures (ELFs) developed by Insurance Futures Exchange Services Ltd (IFEX) with a binary ILW-style payout based around PCS market loss estimates.
- The Chicago Mercantile Exchange (CME) will list futures and options based around a customised broker created index - the Carvill Hurricane Index (CHI). Unlike the GCCI index this is a parametric index which aims to supplement the Saffir-Simpson scale as a better measure of the destructive power of a hurricane. It is a continuous index allowing for sustained wind speed and the radius of hurricane-force winds at landfall.
- The New York Mercantile Exchange Inc. (NYMEX) will list for trading and clear Property Damage Risk contracts based on the ‘Re-Ex Index’ developed by Gallagher Re, which is in turn based on PCS market loss figures.

In addition, a number of new indices are being developed with the aim of facilitating both index-based insurance linked securitisation and insurance futures and options (although without at present a dedicated exchange).

- The catastrophe modelling firm Risk Management Solutions (RMS) has developed a parametric hurricane index, WindX, based on wind speed at a network of US weather stations.
- RMS have also launched Paradex – an index for European windstorm, which combines wind speed measurements, industry exposure data and vulnerability curves to produce modelled losses.
- Swiss Re are seeking to produce a European equivalent of PCS US market loss data.

6. Securitisation deals will increasingly be issued with capital being unprotected as: investors become more comfortable with such instruments; insurers seek to launch issues which require a smaller initial commitment of capital by the investment community; insurers and investors realise that capital-protected issues are inefficient and (it could be argued) illogical.

The illogicality of catastrophe bonds being issued with only the coupon at risk and not the subscribed capital no longer occurs, to the extent that what was at the time an opinionated prediction now seems obvious with the benefit of hindsight.

7. Insurers will make increasing use of credit derivatives to hedge the credit risk which is implicit in their purchase of traditional reinsurance contracts, and will thus follow current trends in the banking industry.

In 2007 for the first time two (re)insurers made use of securitisation of reinsurance recoverables. It is unclear that many insurance companies have made use of credit derivatives to hedge their reinsurance recoverable position to date. However the significant adverse knock-on effect of the sub-prime crisis on the credit derivative market, with widening spreads and a massive increase in the cost of hedging credit risk makes any further growth in this approach very unlikely in the short to medium term.

8. Unitised investment funds which invest exclusively in instruments involved in the securitisation of insurance risk will become commonplace.

This is starting to occur. For example an interesting development is the launch in May 2007 of the “Pioneer Diversified High Income Trust”: a closed-end mutual fund allowing retail investors significant exposure to catastrophe bond investment (24% of the portfolio as at 31/1/2008).

9. Actuaries will have a significant role to play in securitisation deals, with their principal involvement being in the modelling of: the risks against which the insurer requires protection; the pattern of investment returns which may be expected by investors in such instruments; alternative reinsurance and capital/securitisation structures, including the use of stochastic asset liability modelling techniques. We believe that actuaries will also be involved in the development of new option pricing techniques to enable insurance futures and options to be priced appropriately.

Stochastic asset liability modelling has not taken on a significant role in securitisation deals. Actuaries have become more involved in these deals but this has been in ways other than those predicted. It would be fair to say that as a group, actuaries have not taken on a significant role in securitisation deals.

What has happened however is that sophisticated asset liability models have found other uses, in particular in the Individual Capital Assessment for general insurance companies. Actuaries have honed their skills in the use of these models and have therefore directed their efforts to the accurate assessment of capital and the embedding of these models into the management decisions of the companies.

3.2. 1999 paper

The 1999 paper made a number of more complex suggestions about possible future market developments:

1. That the main investors in catastrophe bonds were actually reinsurers, with wealthy private investors and hedge funds playing a secondary role and almost no involvement from long term savings capital such as pension funds, mutual funds and life insurers and a "wish list" for such investors if they were to be involved would be that: insurance risk/return should not be diluted by bundling it together with too much asset exposure; a diversified insurance portfolio should underlie the bonds; insurance professionals with an interest in the final results should manage the insurance process; the investor should enter and exit at net asset value. The paper went on to say that "the extent to which this describes a name at Lloyd's is one of the most striking conclusions to emerge from this analysis" and that some of the disadvantages of old names' participation at Lloyds would need to be avoided if insurance bonds followed this approach, in particular: insufficient disclosure/understanding of the risk in investing; the inability of names to trade their positions; the unlimited nature of the liability undertaken.

While (as we have seen above) the investor base in non-life insurance linked securities has changed very significantly since the above paragraphs were written, with much more direct capital market investment from specialist and general hedge funds, it is still true that there has been little apparent involvement of longer term savings capital.

It is worth noting that many non-life insurance linked securities already fulfil most of the items on the "wish list" described. It is not clear that all investors would necessarily want a diversified portfolio underlying the bonds, although this is likely to be attractive to many. A key requirement will be an understanding of and trust in the modelling process used to estimate the default probability. The appetite of investors for run-off reserving risk is also uncertain and it is believed that both liability deals done to date limit this risk.

The features of investment in non-life insurance linked securities are very similar to those of an old Lloyd's name and many of the problems with the old name's participation at Lloyd's would appear to have been avoided.

- The investors are professionals who are more likely to research fully and understand the risks they are bearing.
- There is a secondary market (to a degree).
- The liability is limited.
- There is no exposure to adverse development on prior year's business.

Investment in sidecars is even more similar to the annual venture of a name at Lloyd's (since they are indemnity based and the business is usually ceded via a quota share). These have the disadvantage that in most cases investments in sidecars are not tradable. In addition, in some cases, investors may be exposed to adverse development of prior claims.

To the extent that investment in non-life insurance linked securities resembles the investment of a Lloyd's name, a mutual fund focussing on such exposure could be viewed as analogous to the spread vehicles that provided much of the early corporate capital at Lloyd's in the mid 1990s.

2. That there was a business opportunity to establish a specialist rating agency to assess bonds with a larger element of risk than simple credit risk

No specialist rating agency has been established and the role of rating these bonds has been taken on by the major conventional credit rating agencies (including an insurance specialist agency). In addition the three main catastrophe modelling companies play a crucial part in the process used to arrive at a rating on the bond.

3. That brokers and investment banks may merge their functions, and that just as banks are willing to underwrite some debt issues, brokers may need to do the same for insurance risks.

To date there has been little appetite from investment banks to take some of the insurance risk from non-life insurance linked securitisation onto their own balance sheets. In contrast banks often took some of the risk of debt issuances – often by way of off-balance sheet special purpose vehicles. However this practice may alter after the large write-downs that have occurred as a result of the sub-prime crisis.

Brokers too have been reluctant to underwrite the insurance risk of securitisation. For a number of years they did however play a key role in the establishment (and sometimes equity funding) of the various "classes" of Bermuda insurance start-ups following times of conventional insurance shortage (e.g. Marsh helped establish and took a stake in: ACE following the mid 1980's US liability crisis, Mid-Ocean Re following Hurricane Andrew in 1992, Axis following the 2001 World Trade Centre attacks). Interestingly the companies and sidecar arrangements formed following the 2005 Hurricanes were mainly funded by hedge firms with more limited involvement by brokers.

4. That insurers may seek to leverage their skills by managing portfolios of other peoples' capital, via debt instruments so avoiding the frictional tax costs associated with an insurance company

Over recent years non-life insurance linked securities appear to have taken their place amongst the range of capital management options available to (re)insurers, so in a sense this is already happening. Generally though catastrophe bonds appear to have attached at levels where they are directly substituting for traditional reinsurance rather than being used as a means of further reducing the need for equity capital.

This has indeed occurred, particularly since the 2005 Hurricanes, through the growth of side-car arrangements. Investors (normally hedge funds) have via loans accessed the expertise and staff of an existing (re)insurance company, which has charged management and performance fees. This also allowed the insurers to write a larger volume of business in a hard market without the need to raise further equity capital.

REFERENCES

In preparing this paper we have made use of the following sources of information.

Lane Financial

http://www.lanefinancialllc.com

Lane Financial LLC (LFC) is a registered broker-dealer focusing on the intersection of reinsurance and finance and produce regular publications on the non-life insurance linked securitisation market, including detailed qualitative and quantitative analysis of the market and of individual deals. The LFC website is a very useful source of information on ILS related topics.

Guy Carpenter

http://www.guycarp.com/portal/extranet/insights/reports.html?vid=24

Guy Carpenter produce amongst their "Insight Reports" annual reports on the catastrophe bond market. Their annual reports on the Reinsurance market also give useful commentary on areas such as rate movements, side car and ILW activity.

Swiss Re

http://www.swissre.com

Swiss Re's SIGMA report – No 7/2006 concentrates on insurance securitisation (including life insurance).

ARTEMIS

http://www.artemis.bm/

The recently reluanched ARTEMIS website aims to be a on-line hub of information for the Alternative Risk Transfer and Weather Derivatives market, and includes in particular useful news links and a comprehensive non-life insurance linked security deal directory.

Vinod Kothari

http://www.vinodkothari.com/

Vinod Kothari's Securitisation Website is a useful introduction to the subject and source of material on the wider securitisation market (outside of just insurance linked securitisation)

Past GIRO papers

www.actuaries.org.uk

(follow links for General Insurance and then Past GIRO papers)

1997 GIRO: "The Securitisation of Insurance Risk" - Richard Bulmer et al

1998 GIRO: "Securitisation Working Party - Including Insurance Indices and the boundaries between Banking and Insurance"

- Jeff Sayers, Graham Fulcher et al

1999 GIRO "ART Alternative Risk Transfer and Insurance Derivatives"

- Stephen Walker et al