TRADING Risk
ILS INVESTOR GUIDE

H2 2018

IRMA'S SECOND-ROUND IMPACT

ILS managers juggle rising claims

TRADING Risk

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DRAWING ON RESERVES

Even though this year's forecasts are calling for a benign hurricane season, the fallout from 2017's active year is continuing to buffet ILS investors this year.

As claims from last year's catastrophes have developed in the first half of the year, the spotlight has been firmly on Florida and Irma-related claims as the driver of increased losses. We explore what is driving this dynamic and how much it has affected the ILS market overleaf.

While loss creep may be disappointing for some, it is perhaps unavoidable to some extent.

Reserving for catastrophe losses is a tricky exercise – ILS managers and reinsurers have to look ahead to get a sense of how claims may develop in the future at a time when their own counterparties may still be unsure of how losses will shake out.

Managers neither want to be too conservative by locking up capital unnecessarily, nor too optimistic for fear of passing on losses to new investors if their valuations prove inaccurate.

So loss creep is in itself not necessarily a bad sign – the key question should be how managers are handling it and whether their increased losses are in line with peers, or a portender that they were being too bullish in the first round of reserving.

In most cases, side-pocketing practices used in the ILS industry will have confined the impact of this year's loss creep to the original set of investors exposed to these risks.

But all investors should be drawing on the data when they are assessing the industry and individual managers.

Indeed, though the year of Harvey-Irma-Maria will take its place in insurance history, 2018 should also stick in investors' memories as the year when clarity emerged on these losses.

Fiona Robertson, Managing Editor, *Trading Risk*

INSIDE

Lingering Irma claims weigh on 2018 returns

Loss creep – the reinsurance market jargon for a trend of rising claims from a major event – is not an elegant term, but it does vividly capture the lurking problems that may come back to haunt risk-takers.

Towards the end of 2017, there was a sense that overall insured losses from the year's long list of disasters might come in lower than initially feared.

Even though Puerto Rico was still struggling to rebuild after Hurricane Maria, large claims from the tourism and industrial sectors were not emerging at forecast levels. In Florida, insurers were moving quickly to close claims after Hurricane Irma led to largely minor damages.

However, some analysts were fretting that a $20bn or more gap between company-level loss reports and estimated industry-wide claims portended an inevitable rise in losses.

Fast-forward a year and some of those fears appear to have been warranted as lingering tailwinds from 2017 have worsened losses.

But the effect of loss creep has been unevenly distributed. Among Bermudian reinsurers, Everest Re had to add to its reserves, while RenaissanceRe was able to free up value.

On the ILS market, there is much less public visibility on loss creep – not helped by the fact

2017's long list of cat losses

Catastrophe	Insured loss ($bn)
Hurricane Maria	32.0
Hurricane Irma	30.0
Hurricane Harvey	30.0
Tubbs Fire	7.7
Atlas Fire	2.7
Colorado storm	2.5
Late March storms, US	2
Thomas fire	1.8
Early March storms, US	1.6
Minnesota hailstorm	1.5
Feb storms, US	1.4
Cyclone Debbie, Australia	1.3
Earthquake, Mexico	1.2
June storms, US	1.1
Typhoon Hato, China	1.1
Total	**117.9**

Source: Swiss Re Sigma 1/2018, Swiss Re Institute and Cat Perils. $1bn+ losses listed only that ILS managers often do not split out reserve development when reporting overall monthly returns.

One of the only public funds – Markel Catco – reported an outsized loss in April that is not a good proxy for industry-wide loss creep.

> "The most significant creep is likely to have been taken by managers with heavy reinsurance exposure to Florida carriers"

Markel Catco's London-listed Reinsurance Opportunities fund wrote off 19.5 percent of net asset value in April, taking its 2017 portfolio loss to 41.4 percent, from a year-end forecast of 27.6 percent.

Meanwhile, Siglo Capital Advisors partner Michael Knecht estimates that on average, ILS managers have written a further 0.5-1.0 percentage points off 2017 performance due to loss creep in the first half of 2018.

Upper-quartile performers have managed to keep their 2017 performance stable or worse by only 0.3 points, while those in the lower quartile have wiped more than 100 additional basis points off last year's return.

The most significant creep is likely to have been taken by managers with heavy reinsurance exposure to Florida carriers.

Retro-heavy managers, which may have already taken extensive losses last year, are believed to have been more insulated from claims creep thanks to conservative reserving practices among their reinsurer clients.

So why did Hurricane Irma become the focus of loss creep in 2018?

Irma creep no surprise in litigious Florida

It is no surprise that a Florida hurricane has thrown up problem claims that are taking longer to settle – the state has a history of high levels of claims litigation that exacerbate losses.

But other more routine factors, including shortages of labour and materials, have also played into the mix.

The costs of managing claims – or loss adjustment expenses (LAE) in industry terminology – have leapt well above historical precedents.

LAE made up about 20 percent or even as much as 40 percent of total Irma losses for some carriers, compared to historical levels of 8-10 percent.

High LAEs are being picked up by private market reinsurers. The state-backed reinsurance scheme caps the amount of LAE it will reimburse at 5 percent of total claims, but there is no limit on these costs under traditional private market reinsurance.

In the Q2 reporting season, the listed Florida-headquartered insurers reported Irma claims that on average were 31 percent ahead of initial estimates released in Q3 last year – with a huge range from 20 to 100 percent.

The fact that Hurricane Irma has contributed the bulk of this year's loss creep means the rising tally has had a disproportionate impact on reinsurers and ILS managers, given how well protected Florida insurers are. This does not necessarily mean that reinsurers or ILS managers with large Florida books will all have taken loss creep – some may have anticipated that insurers were being too optimistic about claims.

They may also have been influenced by risk models that – atypically – initially over-estimated the impact of Irma and Maria.

This runs counter to a trend over the past 15 years for models to significantly underestimate losses, according to analysis from broking firm JLT Re (see graph).

The loss breakdown

Even with rising Irma claims, reinsurers have a manageable share of total losses, as their insurer clients, whose covers are generally designed to respond to huge one-off disasters, ended up bearing the brunt of Harvey and wildfire claims.

JLT Re estimates that reinsurers picked up just under a third of a total $90bn of losses from the three major hurricanes and Californian wildfires last year. Insurers shouldered just over half the total and ILS managers picked up above 10 percent of claims, it estimated.

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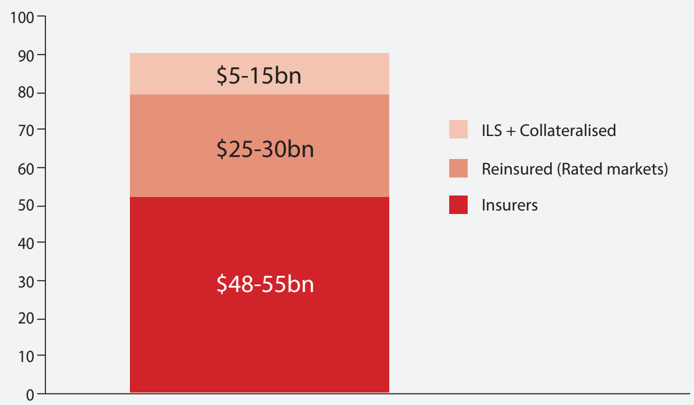
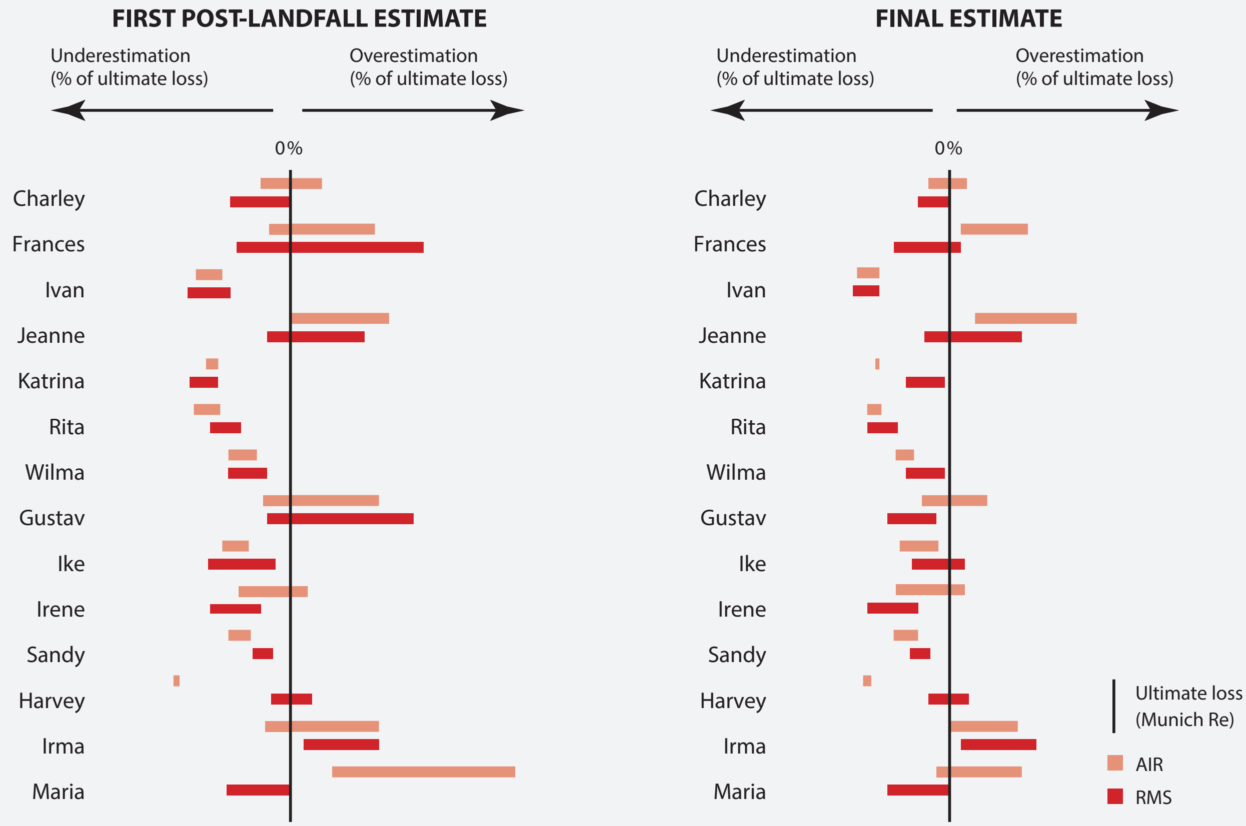
Insurers shoulder bulk of 2017 cats

Estimated industry loss distribution, JLT Re



Source: JLT Re. Covers Hurricanes Harvey, Irma, Maria and California wildfires, excludes NFIP losses

Highball modelled estimates for 2017 storms buck trend: JLT



For Harvey, AIR's estimates (both 'first post-landfall' and 'final') do not include National Flood Insurance Program (NFIP) losses whilst RMS's and Munich Re's figures do.
Source: JLT Re, AIR, RMS, Munich Re

These figures are broadly in line with previous analysis from *Trading Risk* that put likely ILS losses in the range of just under $14bn. Another broking firm, Aon, estimates ILS losses reached $15bn, mostly in retro, aggregate and lower-layer reinsurance covers, with a further $5bn of collateral trapped as of the second half of 2017.

> "Even though losses have been creeping up, the overall breakdown of ILS losses remains broadly in line with previous estimates"

Even though losses have been creeping up, the overall breakdown of ILS losses by segment is similar, as higher-risk strategies take the brunt.

Trading Risk had tracked cat bond claims of nearly $700mn as of mid-year. While losses have been rising under three notable series of deals covering insurers USAA, Nationwide Mutual and Heritage, this remains within the market's overall markdown level as of early 2018 as other deals may have recovered.

Retro segment losses will have shifted up in line with Markel Catco's deterioration – the manager had paid out $1.3bn in the 18 months to 30 June, including a portion of losses connected to 2016 events.

While the ILS share of total losses is still modest, this shows the growth in the market's participation among higher-risk reinsurance, retro and primary business.

Back in 2005, consultancy firm Towers Perrin estimated that capital market providers would pick up only 1-3 percent of claims from Hurricane Katrina, with primary insurers taking 47-53 percent of the total as some looked set to exhaust their covers.

Figures from loss-tracking agency PCS are another closely watched benchmark in the ILS market, as they drive recoveries on industry loss warranty (ILW) hedges. While data on the bilateral market is hard to come by, sources have estimated as much as $2bn of ILW payouts were made in relation to last year's losses.

Second-event ILW covers attaching at $5bn and $10bn were paid out quickly following the catastrophes.

Some US wind-only aggregates are also believed to have triggered, although the majority of US all-perils aggregate contracts were placed at higher trigger levels of $50bn-$70bn that are not yet in the money.

Florida-specific $15bn contracts were also close to triggering based on the PCS updates midway through 2017, sources said.

By mid-June, PCS figures put the cost of Harvey, Irma and Maria at nearly $63bn, which was up by 13 percent from its initial estimates.

However, its second-round Irma estimate actually came in lower than its initial figure for the storm, so the uplift from its revised figure for this event to the mid-year figures was higher at 30 percent.

Based on analysis of PCS reports for a group of major recent hurricanes over the past 15 years, the agency's final number has settled on average a third above its first estimate, with average creep of 9 percent from its second report to the final estimate, according to data provided by sources.

PCS has declined to comment on its private data.

Where to from here?

As investors see 2017 losses continue to shake out, loss creep is compounding the disappointment from rate increases that failed to meet expectations.

Siglo's Knecht says there is a risk that for some investors, the reality is now dawning that the increased yield promised in 2018 may not come to pass at the magnitude expected.

"There's potentially going to be disappointed people at year-end," he says, pointing to the fact that half-year returns for the the Eurekahedge ILS Advisers Index is trailing H1 average gains by 100 basis points.

Data from Mercer suggests that ILS returns are clustering together more closely in the post-loss period, after an initial wide dispersion as the hurricanes hit in the latter part of 2017.

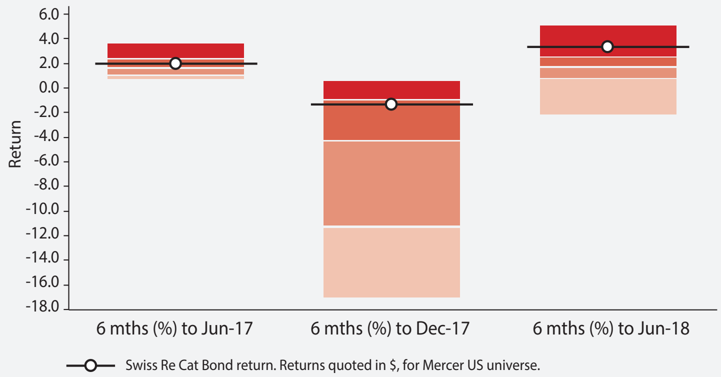
Over the first half of 2018, the firm's ILS peer group made a 1.7 percent median gain – slightly ahead of the 1.6 percent return in the same period in 2017.

ILS market segment loss projections

	Loss ($bn)	Est. total size ($bn)	Assumptions
Indemnity retro	5-7	11	Assuming 49-63% loss based on Markel Catco's return (NAV loss on top of lost premium)
Collateralised reinsurance	5.3	35	Taking 15% loss as average based on 10-20% October losses reported by some funds tracked by ILS Advisers index
Industry loss warranties	1.4-2	6	Based on 12% Micrix index loss in 2017, multiplied by two to account for higher US/ aggregate exposure; upper estimate sources
Sidecars	0.8	8	Based on average loss from Stone Ridge/Pioneer sidecar investments
Cat bonds	0.7	25	Mid-2018 estimates from sources
Total	**13.6-14.5**	**85**	

Source: *Trading Risk*

Divergence in ILS fortunes persists post-HIM



Source: Mercer

Lower-quartile performers maintained a positive performance with half-year gains of 0.7 percent – but the 95th percentile fell to a 2.3 percent loss.

This compared to gains of 1.1 percent and 0.8 percent for the lower quartile and bottom 5 percent in the first half of 2017.

However, on the rate outlook, Mercer principal Robert Howie is more optimistic that this year at least reversed the downward trend that had been prevailing in ILS.

> "It's been a learning opportunity for the industry in how best to think about these issues"

"What we've seen is slight disappointment in terms of premium increases – but the ILS industry is very inward-looking," he adds.

Set against other asset classes such as equities, where investors are concerned about valuations looking full, ILS returns are still attractive, Howie says.

He expects discussions in 2019 to focus on the best structures to treat investors fairly in the context of loss development.

Howie suggests it may become more commonplace to see ILS managers using side pockets or raising separate funds at each renewal cycle, letting each capital draw-down run-off over time rather than using rolling funds with regular dealing opportunities.

"It's been a learning opportunity for the industry in how best to think about these issues."

For more on year-to-date ILS returns, see page 8.

Top ILS managers boost assets by 7% in H1

ILS capital inflows showed no signs of abating in the first half of 2018 despite the deteriorating losses from last year's catastrophes, with Bermudian manager Nephila leading growth in assets under management.

The industry's top 10 managers grew their assets by 7.2 percent over the first half of the year to reach $68.7bn at 1 July, according to figures from *Trading Risk*'s latest biannual survey of ILS managers.

Nephila added $1.2bn in the half-year, with Fermat, Elementum, Leadenhall and Securis posting $500mn increases. Outside the top 10 group, Scor Investment Partners rose by a similar margin.

The top 10 leaderboard remained largely steady, with Stone Ridge Asset Management moving up one place to fourth position.

The top 10 continue to dominate the sector, making up 84 percent of the $81.9bn of ILS assets overseen by specialist managers tracked by *Trading Risk*. Reinsurer-backed firms control a further $16.1bn.

But in the past year smaller managers and reinsurer-backed firms have expanded their share of assets, suggesting the spoils of post-Harvey, Irma and Maria growth have been spread around.

These figures do not include funds of funds, but as some large ILS portfolios – including those managed by Stone Ridge – are heavily focused on investing in sidecars, there will be some overlapping assets included in the total $98bn pool of specialist and reinsurer-backed ILS funds tracked by *Trading Risk*.

2018 returns lag in H1

ILS returns have had a slow start to 2018, as last year's disaster activity continued to weigh on performance.

A benchmark of industry performance, the Eurekahedge ILS Advisers Index, showed a 0.56 percent gain over the first half of the year, well below the 1.65 percent return in the same period of 2017.

A generally benign period for loss activity has provided some respite after the index fell 5.6 percent in 2017. However, amid spring storms in the US and rising claims from last year's Hurricane Irma, the index posted two consecutive negative months in March and April.

The index, which tracks the performance of a group of 34 ILS funds, was dragged down in April following a significant loss taken by retro writer Markel Catco's fund.

But with a patchy distribution of losses, some managers have lifted H1 performance compared to 2017.

ILS returns, Jan-Jun by month

	Jan	Feb	Mar	Apr	May	Jun	FY/YTD
2017	0.36	0.32	0.21	0.15	0.19	0.4	**-5.6**
2018	0.54	0.08	-0.24	-0.28	0.18	0.3	**0.56**

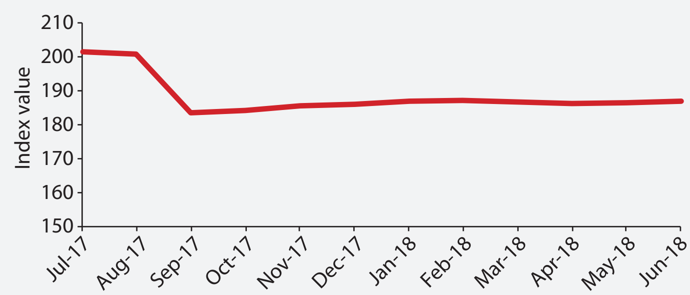
Source: Eurekahedge ILS Advisers index
* Based on 70.59% of funds which have reported June 2018 returns as at 25 July 2018

Top 10 ILS fund managers

	ILS AuM ($bn)				
	Jul-18	Jan-18	Jul-17	Jan-17	Jul-16
Nephila Capital	12.2	11.0	10.5	10.2	10
Credit Suisse Asset Management	9.0	8.8	8.6	7.5	7
LGT Insurance-Linked Partners	7.9	7.9	7.0	6.5	5.8
Stone Ridge Asset Management*	7.0	6.1	5.7	5.1	4.8
Securis Investment Partners	6.7	6.2	4.6	4.1	3.7
Markel Catco*	6.5	6.1	4.5	4.3	3.7
Fermat Capital Management	6.2	5.7	5.4	5.2	4.8
Leadenhall Capital Partners	5.2	4.7	4.2	3.5	2.9
Aeolus	4.0+	4.0+	3.2	~3.0	2.5+
Elementum Advisors	4.0	3.4-3.7	2.8-3.1	2.7-3.0	2.6-2.9
Total	**68.7**	**64.1**	**56.7**	**52.3**	**48.0**
% change from prior half	**7.18%**	**13.1%**	**8.4%**	**9.0%**	**7.7%**

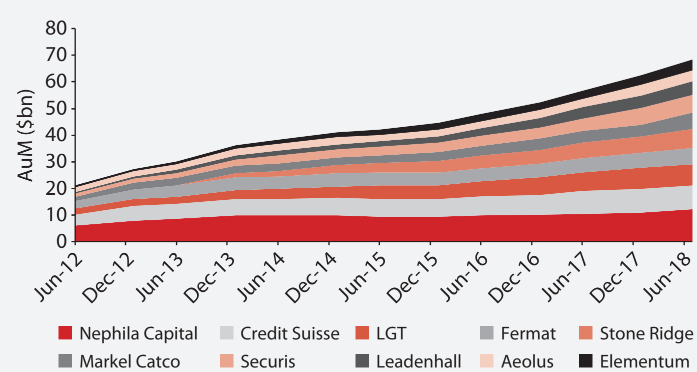
*Latest Stone Ridge AuM based on most recent disclosure as of 30 Apr. Markel Catco figs include trapped capital as of 30 June 2018. Source: *Trading Risk*

ILS funds make small gains post-HIM



Source: Eurekahedge ILS Advisers index

Top 10 ILS managers' AuM



Source: *Trading Risk*

LUCA ALBERTINI

The ILS asset class can evolve to fit fixed-income appetites, says Leadenhall Capital Partners CEO Luca Albertini

Q: What prompted Leadenhall's launch of a new remote-risk ILS strategy this year?

Historically, ILS has competed as an asset class targeting near double-digit returns to fit in with an investor's traditional alternative allocation bucket, alongside other hedge fund strategies. It took time for ILS to find a space in this bucket, but now it's important to offer something to lower-risk, lower-return investors.

In order to make remote risk layers palatable to investors, we need to change the definition of the ILS asset class from "alternative" to that of a quasi fixed-income product.

> "We need to change the definition of the ILS asset class from 'alternative' to that of a quasi fixed-income product"

At the remote-risk layers, there's less volatility. And for ILS risk with an expected loss of 2 percent or below, you can still earn more yield than from BB credit instruments.

Q: How much room is there for ILS markets to grow by taking these low-risk layers of business?

This is where the vast majority of the reinsurance market's limit is derived. I tell investors to think of it as a martini glass – the reinsurance tower spreads out at the top. It's not necessarily capital efficient for rated reinsurers to take this low rate-on-line business, so there's scope for the ILS market to grow here. Also protection buyers may like the benefit of collateral protection in the wake of a very large event.

Previously, more of Leadenhall's business had been skewed towards the mid-layers of risk. Rebalancing our portfolio will make us more valuable to protection buyers who want to deal with reinsurers across all layers of their programme.

I think we're providing something that investors will appreciate, and we are diversifying our portfolio and provide our protection buyers with broader support at the same time.

Q: Are you seeing a notable shift in demand towards more risk-remote products from investors?

While we've done work to find the investors who want lower-risk layers, the reality is that most investors will still want more yield than this can offer – so we will mix remote risk into our overall portfolios as well.

You can grow this portion of business with people who have a 2-3 percent return target or with people who want to leverage these risks. If you still want spicy returns, there's space for remote risk – with a bit of leverage, the returns could be 2-3 times as high.

In our case, we have been offering leveraged remote portfolios in a managed account form to high-quality investors.

Q: What lessons do you think the ILS market can take from the deterioration to last year's losses that has occurred in 2018?

There are several things that are important here – ultimately it's down to investor education.

We always made it clear to our investors that the loss numbers we were giving were the best estimates at the time.

There's ample historical evidence that catastrophes can have unexpected development tails – for example, the New Zealand earthquake loss of 2011 is still deteriorating. Earthquakes are expected to be more tricky, but even wind losses can develop unexpectedly.

We acknowledge it is important to update investors frequently, but we didn't want to rush out meaningless numbers. The first thing we did after Harvey was to close our funds to new investors for a couple of months, to allow us to create side pockets when we had some more information.

One thing we emphasised was actively seeking information from every possible source – we were making calls to counterparties, brokers, other underwriters, anything that could help us to form a view on the loss before loss notices were released. Even at the end of November, it was still a long time before we got loss notices from some counterparties.

One thing I would like the industry to consider in the future is to find better ways for listed companies to have better input into valuations.

Listed companies are very careful in the information they can give out ahead of official financial reporting. Informal discussions can help, but some listed companies have recently surprised many with their reserving creep, and surprises are always harder to manage than frequent open dialogue.

This may be something to discuss with the legal departments of listed companies.

Q: What was your firm's experience with loss creep?

The side pocket is taking the sting out of it. It has insulated the loss to the right set of investors.

I'm told our losses started creeping earlier than others, but others then caught up to us. I think that's because we put so much emphasis on calling people and bugging our counterparties to give us information.

We also don't have any Puerto Rican primary reinsurance business, which helped limit our exposure to Maria development.

Florida has created a bit of volatility, but only within certain layers. Then reflecting the industry experience, some of the retro and aggregate layers were full losses – so there was a limit to loss development.

Q: You've previously said that 2017 wasn't "the great test" for the ILS market. What kind of test was it?

It wasn't the great test, but it did prove some points about the ILS asset class on a number of fronts. There haven't been any court cases related to cat bond payouts and most investors have reloaded their losses.

It has proven the role of the pension consultants in education of investors and that this role matters.

What we have not yet seen is a big event just before a key renewal – it's one of the few events that remains to be seen.

But I would argue that the conversations we as ILS markets would have in that event would play out in a similar way to those with rated balance sheets.

Q: Did the dynamics of the 2018 renewals hold any surprises for you?

It was a surprise that rates didn't rise as far as the market had anticipated after last year's losses.

Some reinsured parties chose to take up cheaper new offers of capacity, reducing allocations to loss-affected partners who were demanding a reasonable premium increase due to the claims experience.

But we were giving investors messages which were not that far from what actually happened.

We didn't allow people to expect the 40-50 percent increases which some anticipated.

I question whether some capital was being raised on unrealistic rate expectations – and whether that capital might exit next year. Hope not: it would not be good for anyone.

Q: How would you advise ILS investors to react to the 2017-2018 experience?

When you have a loss, it's valuable to look at what went well and what didn't go well and to take corrective actions on your portfolio.

My opinion is that there's nothing in what happened that is contrary to expectations for those types of events. 2017 was not a year of surprises.

It also reminds you that the only way to invest in ILS is to be a long-term investor. Being a short-term investor in an asset class with this kind of tail risk is more akin to betting.

Some investors have rebalanced their risk appetite across the risk spectrum in light of their experience. This is a healthy approach as many of our investors have a bespoke risk and return appetite which fits the rest of their portfolio, and would not be available to take a beta risk and return profile.

Q: How are you planning to react as a manager to the post-2017 opportunities?

Ten years after our launch, it's incredible to be in the position of being able to make choices about our growth in the knowledge that we had more capital being offered than we could accept.

We are looking at the sustainability and quality of prospective investors – we don't have to take mandates on a first-come, first-served basis, as we don't need to accept hefty fee discounts for new large tickets.

> "2017 was not a year of surprises. My opinion is that there's nothing in what happened that is contrary to expectations for those types of events"

We plan how much we can grow our business by looking at the additional business opportunities we think we will have in the next 12 months – then we consider how much of that will be absorbed by natural growth and then we allocate new capacity to our marketing team.

Around 85 percent of our investor base is made up of pension funds and another 6 percent is from family offices. They are the more long-term sustainable investor base.

On the underwriting side, in 2018 we have focused on deploying our capital with markets that have performed in line with, or better than, expectations and that have behaved before and after a loss as true partners.

Reframing ILS: the ESG angle

The ILS market was founded to help provide insurance capital in the wake of Hurricane Andrew, but, despite its worthy origins, the case for ILS as an ESG investment is not one that has historically received a lot of attention.

"Funds could be saying 'we think that our portfolio is providing a social good, and here is how', but we haven't seen many ILS managers yet articulating that," Alex Bernhardt, US head of responsible investment at Mercer Investments, told *Trading Risk*.

This is because managers haven't been under pressure to make this case, as many firms are over-subscribed, according to Nick Silver, co-founder of the Climate Bonds Initiative.

In recent years, however, a growing focus on managing climate-change risks, as well as the growing breadth of the ILS market, means that investors are increasingly considering the argument for ILS as an ESG investment, as well as a diversifier.

What is an ESG investment?

Responsible investment is an approach to investing that aims to incorporate environmental, social and governance (ESG) factors into investment decisions, to better manage risk and generate sustainable, long-term returns, according to the Principles for Responsible Investment association.

The ILS shock absorber

While ILS investments don't prevent natural catastrophes, their role as a 'shock absorber' means they are key to the process of managing climate change – presenting it as an ESG-friendly asset class, said Henrik Sjöholm, director of communications and responsible investment at Entropics.

"If we discuss climate change, we must discuss both aspects of it – that is, to prevent further change and to mitigate the effects of what has happened that we are facing," he told *Trading Risk*.

One of the areas where the effects of climate

ESG initiatives

Reinsurance initiative	Year	Info
World Bank Latin American Cat Bond	2018	The $1.36bn Latin American earthquake cat bond was issued in February this year and will provide cover to Chile, Colombia, Mexico and Peru using a parametric per-occurrence trigger.
Nephila Climate (NCx)	2018	The specialty division Nephila Climate (NCx) was launched in January this year and is dedicated to weather risk transfer and climate resilience.
World Bank Pandemic Cat Bond	2017	The $320mn pandemic cat bond was launched last year as part of a broader insurance facility. The bond will trigger if pandemic-related deaths in any of the covered developing nations reach a certain trigger.
CCRIF	2007	CCRIF IS a multi-country catastrophe risk pool which insures 18 Caribbean governments (as well as one central American government) and is also backed by the World Bank.

Source: *Trading Risk*

change are beginning to be felt most severely is in the developing world, an area where ILS and reinsurance initiatives are increasingly being used to make a difference.

Over the past couple of years, the World Bank has worked with ILS funds, reinsurers and a number of developing nations to create risk transfer deals to capital markets.

> "Last year, the CCRIF paid out nearly $50mn to countries impacted by Hurricanes Irma and Maria within 14 days of the storms hitting"

For example, multiple South American countries purchased earthquake cover from the cat bond market this year.

Longstanding insurance schemes such as the Caribbean Catastrophe Risk Insurance Facility (CCRIF) have provided a pattern for new regional insurance bodies such as the African Risk Capacity (ARC), which launched to provide drought insurance initially.

Last year, the CCRIF paid out nearly $50mn to countries impacted by Hurricanes Irma and Maria within 14 days of the storms hitting.

Helping developing nations build resilience against natural disaster is now a strategic priority for the World Bank, it said in February this year when the South American cat bonds were completed.

"When there are people just one disaster away from poverty, managing risk is a development priority," said Jorge Familiar, World Bank vice president for Latin America and the Caribbean.

Insurance can protect government budgets, and is an important complement to emergency funds, credit lines and other funding sources in the wake of a natural disaster, the World Bank said.

Boosting sustainable infrastructure

It is not just developing nations that are turning to the ILS world for protection and advice in the face of climate change; large asset owners are increasingly realising the threat which climate risk poses to their investments.

For example, coal investments may lose value following changes in public perception, Nick Silver said, or timber assets may be at risk because of climate volatility.

"Climate change is seen as a big existential threat to humans and the economy and that also translates directly into individual investments," he said.

Funds concerned about their investments are increasingly looking to the ILS world for help in protecting their assets, said Barney Schauble, *(pictured)*, managing principal at Nephila Advisors.

"There is a far more serious discussion about this now than there was three years ago. Funds are saying 'we know that you know scientists and others who think about quantifying what is going on in the world and we want to get a better handle on what is changing'".

In response to these fears, there are increasingly more examples of modellers and insurance experts doing analysis for sovereigns and cities to identify areas of concern.

"Our view is that this could be a very big opportunity for the insurance and (re)insurance and ILS sectors as people want to quantify and understand risk, which is our native expertise," Schauble continued.

Another thing the (re)insurance sector could do to better leverage the power of its expertise would be to give more long-term pricing signals to offer developers a better idea of a building project's long-term riskiness.

"You can be involved by being paid for risk and be instrumental in providing the signal in terms of where investments make sense and where they don't," Schauble said.

In some instance, the provision of coverage has actually encouraged the building of low-carbon energy suppliers such as wind turbines, he added.

"We've been involved in some new products where we, in conjunction with our partners, have put together a product which protects against

continued on page 14

Climate change: opportunity or threat?

As climate change is set to add to the volatility of catastrophe risk that ILS investors are taking, many raise the issue of how to make sure the industry is being appropriately compensated for taking on these risks in the future.

But the short-term lifespan of most ILS investments means that investors don't need to worry about premiums not matching up with the long-term risk being taken on, Sjöholm from Entropics explained.

"A typical cat bond has a lifespan of three to five years, so this will not be immediately affected by large changes within that time span. Pricing will obviously reflect current knowledge, the risk to investors is very limited as the pricing is reviewed very frequently, so if I was an investor I wouldn't be concerned about that," Sjöholm said.

A broader question that may be difficult to answer is whether increased climate volatility could create new opportunity to expand the ILS market – or threaten demand.

While Schauble and others have argued that the worsening impacts of climate change could create more opportunity for ILS, Bernhardt suggested that the effects of climate change could actually lead to a smaller insurance market.

"If losses increase, it will result in premium increases which eventually will result in lower demand. It could result in un-insurability of risk in some areas, which would be a big loss for commercial insurers," he added.

variable wind for a new wind farm for the first 10 years of its life. This enables more wind farms to be constructed."

This is also an area which traditional reinsurer Swiss Re is exploring. Last year it announced that its Global Partnerships division was looking into designing a "resilience bond".

> "Better monitoring of the impact of climate change is one way the sector could better appeal to ESG investors, according to the New Zealand Super Fund"

The idea would be to find ways of monetising avoided losses, which would reduce the risk and subsequently reduce insurance premiums over time – potentially giving cat bond sponsors credit for investing in projects such as flood defence, for example.

"The key question is whether the saving in the future can be leveraged today to partially finance risk reduction measures," Ivo Menzinger, a leader of the Europe, the Middle East and Africa region said at the time.

Reporting limitations

One area where ILS structures differ from other ESG investment is the area of governance and oversight, where Schauble said the role of managers as insurance counterparties may limit their influence.

"The classical version of ESG is that you as an owner/investor should be making your views known on what you think is important in respect to the company because you are an owner.

"Obviously if you are investing in cat bonds or a reinsurance contract or some other risk transfer instrument you may not have the same voice, or the same ability to say to an issuer of a catastrophe bond tell me about what is in your investment portfolio, or I don't like the way that your board is structured," he said.

However, there are things ILS managers can do to responsibly filter the risks they are taking on, Sjöholm said.

"We try to look at the purpose of the insurance. Looking at listed cat bonds, if you look at the construction, starting at the sponsor. We look at the sponsor, the domicile of SPV and the instruments where the collateral would be invested."

For example, at one stage, it avoided investing in a Turkish cat bond because of political unrest in the region, he said. Reputational risk is a serious issue for investors, he added.

While a spokesperson from the New Zealand Super Fund told *Trading Risk* that they did not currently consider ILS to be an ESG investment, they did say that the fund looked into the compliance of its ILS investments as part of a broader ESG strategy.

"We seek to actively identify and manage ESG factors across the whole Fund, including in our ILS investments. In particular, we focus on issues relating to the origination of the policies, regulatory compliance, and privacy of customer data."

Better monitoring of the impact of climate change is one way the sector could better appeal to ESG investors, the fund added.

"As an investor with a long-term investment horizon, we are always looking to understand how investment managers are monitoring and assessing the potential impact of climate change on natural catastrophe investments."

The argument for ILS as an ESG investment may have not received much attention to date. However, the asset class has a lot to offer in a world that is increasingly feeling the effects of climate change.

While the argument for provision of insurance capacity as a social good hasn't received much attention, this could be set to change as the world reacts to worsening frequency and severity of catastrophes.

Post-2017 rate adjustments slow at mid-year renewals

ILS managers and reinsurers obtained modest rate increases on renewing business in the mid-year season, but the pace of the uplift slowed back from earlier in 2018.

For many in the market this came as a disappointment, as hopes had been pinned on change after Hurricane Irma inflicted significant losses on reinsurers last year.

Key themes at mid-year renewal

- Ebbing pressure for higher rates after capital levels replenished
- Florida insurers seize on strong supply to minimise rate pressure
- ILS firms seek to lift market share and compete on wider range of business
- Lurking concerns over the potential for Irma loss development

One reinsurance CEO said the renewals showed the "rule book" had been "ripped up" in that there was no longer any major post-loss movement in pricing for property cat reinsurance.

But others were more positive about the outcome. RenaissanceRe CEO Kevin O'Donnell told analysts that this was the best market the firm had seen in years. "Frankly, I'm confused by the general sense of malaise…it feels like the wind is at our backs again," he said on a conference call.

The Florida renewal on 1 June is a key period for the ILS market, which captures a large market share of the state's business.

ILS managers and cat bond investors captured 21 percent of premiums ceded by 10 of the state's largest insurers in 2017, according to data compiled by *Trading Risk*.

As ILS managers had quickly reloaded their asset bases following last year's losses, there were strong levels of capital supply heading into the renewal, which ultimately helped to suppress rate increases.

Mid-year reinsurance rate momentum stalls

Territory	Catastrophe loss free % change	Catastrophe loss hit % change
Australia	0% to -1%	0% to +5%
UK	0% to -2.5%	N/A
US Florida	0% to -7.5%	0% to +7.5%
US Nationwide	0% to -5%	+5% to +10%
Non-marine retro	0% to +10%	0% to +10%

Source: Willis Re

Broking firm JLT Re estimated that Florida catastrophe rates edged up by 1.2 percent at the 1 June renewal – marking the first increase in seven years.

This year's Florida increases compared to overall reductions in the 2.5-5 percent range last year.

The broker's Florida property cat rate-on-line index shows that rates remain 40 percent below 2012 levels, before rates began sharply tumbling.

However, the index remains 13 percent above the previous cyclical low of 1999/2000.

Loss-affected contracts – the lowest layers of Florida reinsurance programmes – were the main focus of hopes for rate increases. Sources told *Trading Risk* they were seeing increases of 5-7.5 percent on loss-affected business in the run-up to 1 June.

JLT Re North America executive vice president Brian O'Neill said rate increases on loss-affected layers were muted, while some loss-free layers were even down modestly.

But with a wide range of outcomes, some reinsurance buyers paid rate increases in the mid-to-high single digits to renew loss-affected covers.

ILS players target new territory

During the renewal, ILS players continued to expand into areas historically dominated by traditional reinsurers, for example by offering reinstatable limit, JLT Re said.

Its peer, Willis Re, echoed this point, adding that ILS managers also offered larger line sizes to favoured counterparties.

Willis Re described reinsurance market conditions as a "disciplined soft market" in the mid-year renewals.

It said this was evidenced by the fact buyers had to change up their panels of reinsurers if they wanted to push pricing down as far as possible, as previous partners walked away.

The broker did not give an overall view of Florida pricing but said rates on loss-affected catastrophe business were flat to up 7.5 percent, with loss-free business flat to down 7.5 percent.

Loss-hit US nationwide business was up more strongly, by 5-10 percent on average.

> "Frankly, I'm confused by the general sense of malaise…it feels like the wind is at our backs again"

Meanwhile on the retrocession market, reinsurers buying new cover led demand up modestly from a small mid-year base. But this did not prevent rate increases from slowing to single digits, sources said.

Willis Re estimated that cat bond and industry loss warranty rates were largely flat year on year, amid a subdued year for ILW trading.

In the earlier part of the run-up to hurricane season, the cat bond market closed a handful of Florida deals at competitive rates.

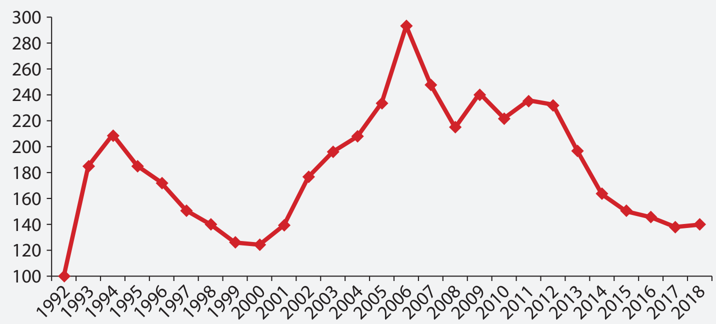
"[Cat bond] pricing benchmarks are not going to make it easy on the traditional market to extract rate increases," one ILS executive noted.

Florida-based carriers Safepoint, American Integrity and UPC Insurance all raised fresh cat bond cover, including some lower-risk layers with insurance coupons of around 3.5-4.25 percent – at the lower end of what has been previously recorded on the ILS market for US wind bonds with Florida exposure.

Ultimately, the result of the renewals has left traditional reinsurers under intense pressure to revise their operating models to improve returns, with various carriers considering significant job cuts and withdrawals from underwriting in certain segments, Willis Re highlighted.

"This year is the straw that's broken the camel's back," James Vickers, Willis Re international chairman, told *Trading Risk*.

JLT Re Florida property cat RoL index



Source: JLT Re

For more on the cat bond market, see pages 19-20.

New perils will benefit ILS market

While recent developments have broadened the catastrophe bond market and led to record issuance, significant opportunity exists to further innovate, reduce peak peril concentration and subsequently grow the market beyond these record levels.

When alternative capital was in the nascent stage of development, the majority of catastrophe bonds issued covered only a single peril on an occurrence basis with a tightly worded peril definition.

However, over the last 20 years a number of factors have contributed to significantly broaden catastrophe bond coverage. Improvements in vendor models, data availability and overall market sophistication have all contributed to growth. As a result, the market has securitised new perils, covered new territories, issued bonds with multiple covered perils and significantly broadened peril definitions. Additionally, the sponsor base has expanded to include new categories, such as government entities.

These developments have benefited both sponsors and investors alike, leading to record catastrophe bond issuance of $10.7bn in 2017. This year has the potential to eclipse this record.

While the overall market breadth has increased significantly, including sponsors, perils, geography and structures, the peak peril concentration has not decreased. In fact, the contribution to modelled expected loss from US hurricane has increased from 45 percent to 56 percent over the last 10 years.

Despite the expansion of perils and geography, the ILS market has become less diversified. This is important to note as this peak peril concentration is one of the larger market constraints. Investors are limited by their overall capital, but a number of investors are also limited by their peak peril exposure. As such, diversifying exposures are beneficial to the overall market, as they provide investors a broader base of premium to offset their peak exposure.

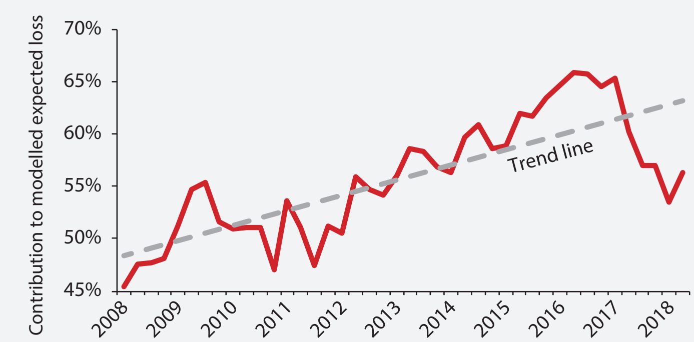
Author:
Paul Schultz,
CEO, Aon Securities

There are a number of opportunities to broaden the market, increase diversification and ultimately continue growing the overall ILS space. For example, some diversifying perils and regions have become less prominent in the ILS market. Over the last 10 years, Europe's modelled contribution to expected loss on risk has decreased from 23 percent to 3 percent.

In addition to expanding these existing perils, there is also significant opportunity to develop and issue new perils. Based on the recent issuances of catastrophe bonds covering US inland flood and US wildfire, the market has shown an appetite to evaluate and write new risks. Consequently, this is an opportune time to develop new perils, such as cyber and terrorism, which the market has contemplated for years. Cyber, in particular, represents a significant opportunity as the risk is expected to double by 2020.

While expanding existing non-peak perils and developing new perils both present challenges, the overall market will benefit significantly from this added diversification. All market participants should dedicate the time and resources to evaluating and developing these perils.

US wind exposure grows



US hurricane contribution to modelled expected loss
Source: Aon Securities

New peril introduction

Peril	Deal	Date
Hurricane	Residential Reinsurance I	June 1997
Earthquake	SR Earthquake Fund, Ltd.	October 1997
Severe thunder storm	Mosaic Re Ltd.	July 1998
Europe windstorm	Mediterranean Re p.l.c.	November 2000
Mortality	Vita Capital	December 2003
UK flood	Blue Wings Ltd.	April 2007
Medical benefits	Vitality Re Limited	December 2010
Mortgage insurance	Bellemeade Re Ltd.	July 2015
Pandemic	IBRD CAR	July 2017
US inland flood	FloodSmart Re Ltd.	July 2018
Wildfire	Cal Phoenix Re Ltd.	August 2018

Source: Aon Securities

Fire and flood firsts among 2018 surge of cat bonds

The cat bond market has delivered on forecasts for a bumper year in 2018, with strong levels of new issuance after last year's loss activity.

But pricing quickly settled back to levels seen before the 2017 hurricanes even as claims escalated, with slight increases on loss-impacted renewals.

Lane Financial's rate-on-line index for the ILS market, based on secondary market pricing indications, showed that after tumbling 9.5 percent in the first quarter and flat-lining in the second, the market had fallen back from its post-Irma spike.

During the second quarter heading into hurricane season, the insurance spreads on new deals settled on average 7 percent below the initial targets set by sponsors during the marketing process, according to data tracked by *Trading Risk*.

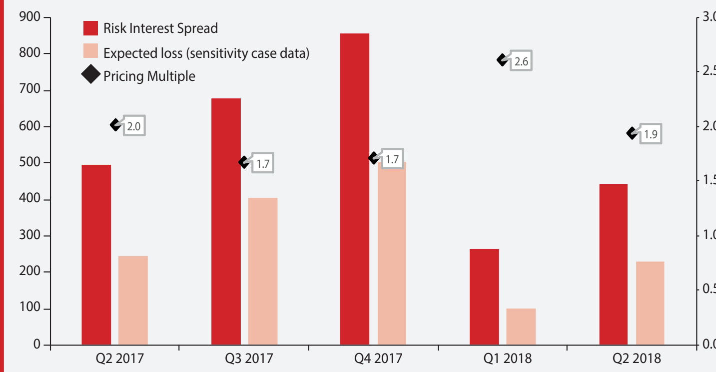
The average spread of second-quarter deals came to 441 basis points (bps), offering investors a 1.9x multiple of their expected loss level. This compared with a 2.0x multiple and average spreads of 496 bps for cat bonds closed in Q2 2017.

Total 2018 returns from the cat bond market, as measured by Swiss Re indices, had reached 3.22 percent by the end of June, driven by coupon income and putting the total return index nearly back in line with pre-Irma levels.

In terms of volume, the $10bn of issuances predicted in January looks likely to be exceeded, as cat bond issuance climbed to $9.6bn at the start of August.

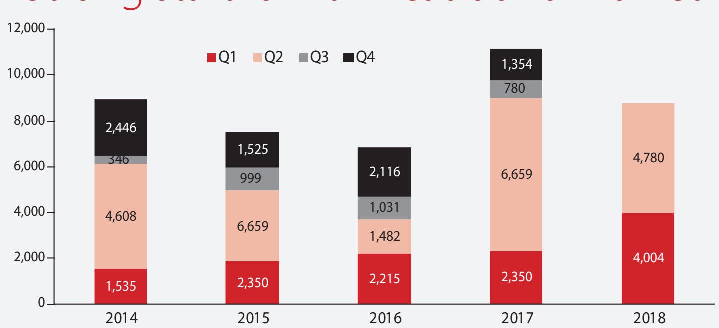
This total included just over $620mn of non-catastrophe risks, such as mortgage ILS deals, which are likely to have been distributed outside the usual ILS markets.

Weighted average spread, expected loss and pricing multiple



Source: *Trading Risk*

Strong start for 2017 cat bond market



Source: *Trading Risk*

The cat bond market escaped the brunt of 2017 losses, but claims from several major sponsors – nationwide US insurers USAA and Nationwide Mutual, as well as Florida-headquartered Heritage – deteriorated in the first half.

This was due to rising aggregate losses in the cases of the first two insurers, and Irma losses from Heritage.

Meanwhile, new sponsors drew a variety of landmark deals to the ILS market.

Utilities company Pacific Gas and Electric (PG&E), which has been blamed for the multiple wildfires across California last October, launched the first wildfire liability bond Cal Phoenix Re, making it one of a handful of corporates to use the cat bond market.

Another landmark deal for 2018 was the ILS market's first indemnity flood bond, the $500mn FloodSmart Re. This will protect the US government's National Flood Insurance Program (NFIP).

More than 35 investors participated on the landmark deal, said GC Securities, which structured the deal and acted as joint bookrunner.

However, most issuances in the second quarter were from returning sponsors. Among the notable deals, Travelers closed its Long Point Re III cat bond at $500mn, becoming the insurer's largest ILS issuance since 2009.

Looking forward, there are only half a dozen bonds due to mature in the second half of the year, worth $1.1bn in total.

MATTHEW SWANN

The Hiscox Re Insurance Linked Strategies principal on the questions investors should ask on loss creep

Q: What have you observed in the way of ILS industry loss creep in 2018 – how did you manage reserving risk?

At Hiscox, our approach to reserving risk is to expect loss creep and to manage it as best we can. This means accepting certain realities. The loss has happened and indemnification will take place over many months, if not years.

ILS managers should be proactive in their reporting, rather than waiting for loss advice from insurance carriers that do not conform to common reporting standards. In addition to this, catastrophe models are not designed to predict single-event loss outcomes for individual carriers. Therefore, it's not reasonable to rely solely on a model for valuation.

To arrive at an initial range of estimates our valuation process relies on modelling, market share analysis and carrier loss advice. We require two things of these estimates at the outset.

First, completeness – namely ensuring we have assessed every carrier who might be exposed.

Second, consistency – all carriers must be assessed on the same industry loss assumptions, regardless of their own initial loss estimates. From this point, we are able to refine a fair valuation framework proactively as more information comes to light.

While it's impossible to predict ultimate losses with complete accuracy, we believe investors should be asking two questions: 1) Has a complete and consistent valuation framework been applied following large loss events? 2) Could some of the loss creep seen across the industry reasonably have been avoided?

Q: Were there any surprises for you in the way the market reacted to 2017 losses this year?

Pricing in 2018 has played out consistently with the prevailing view that both 'size and surprise' are required to cause real disruption. Perhaps the sting in the tail is that the surprise element (loss creep, mostly) may only now be manifesting itself.

In aggregate, pricing fell within our expected range, albeit towards the lower end. However, there were some noteworthy details.

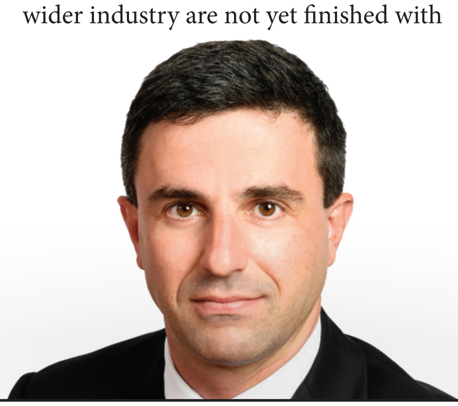
First, the downward trend between January and July has resulted in pricing levels close to 2017 at present.

Second, the retro market has faced challenges securing meaningful price increases. It has also demonstrated that it can recapitalise and deploy extremely efficiently.

Outside the retro space, barriers to entry are higher, with access determined by long-established relationships and trading lines.

Q: Do you anticipate any knock-on impact to market rates in 2019 as a result of lower returns in 2018?

It's clear that the ILS asset class and the wider industry are not yet finished with 2017. In the absence of loss activity, if ILS investors see lower returns in 2018 (due to a combination of 2017 loss creep, trapped capital and muted price increases), we may see a change in appetite for 2019.



However, we have also seen how efficiently the market can recapitalise on the expectation of rate increases.

Outside pure supply-demand dynamics, it remains to be seen to what extent any 'lessons learned' from the 2017 losses will manifest themselves in pricing corrections.

We maintain that, under most circumstances, selecting and pricing risk correctly is more valuable than attempting to time the market.

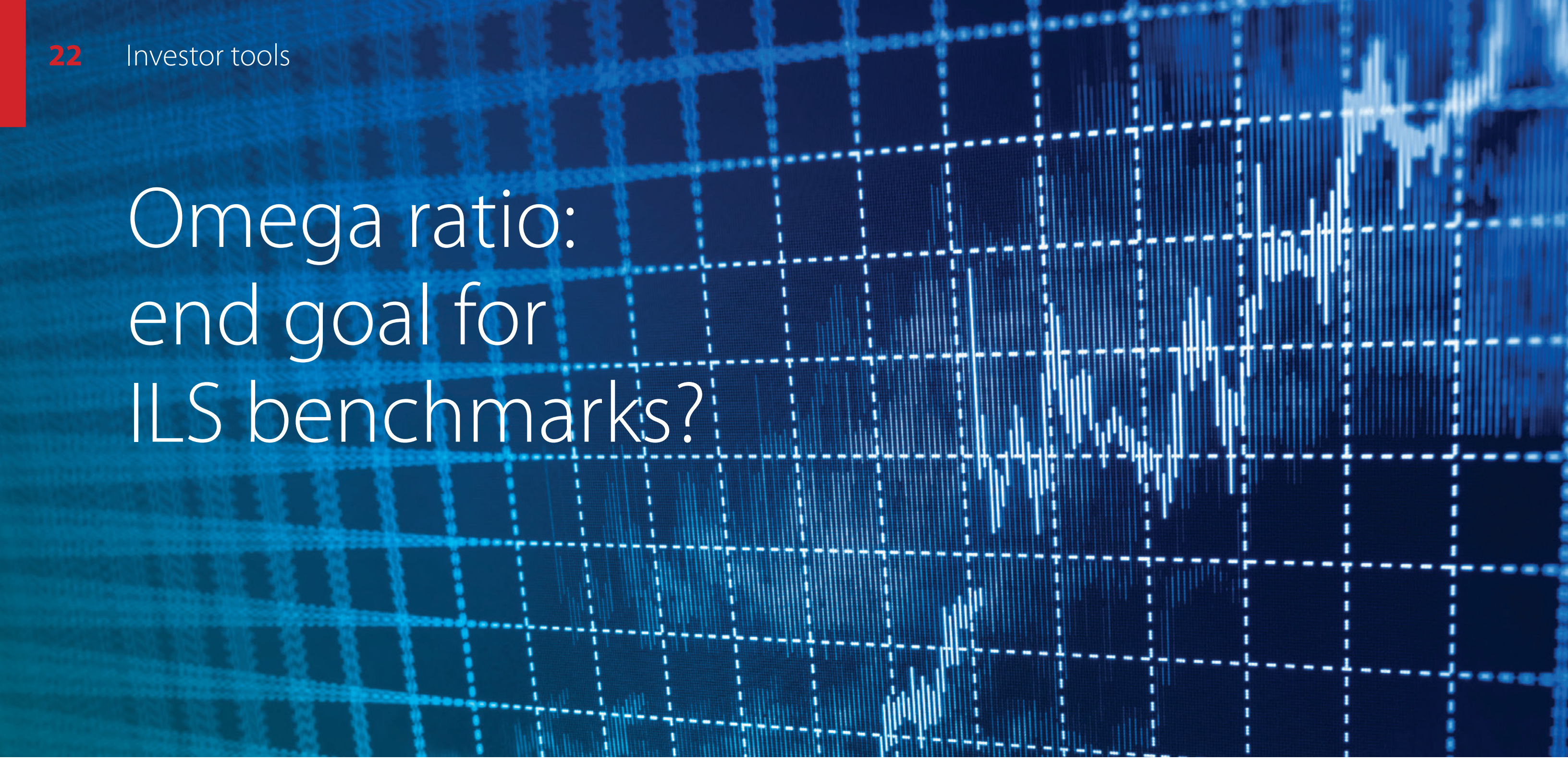
Q: How do you anticipate climate change could impact demand for ILS covers?

To see climate change as a slow shift in baseline conditions with an imperceptible impact from year to year is to ignore the threat to our industry.

Even a slow shift in baseline conditions can give rise to greatly amplified effects in the tail, i.e. where the reinsurance industry trades.

The industry is well equipped to address these technical challenges, but needs to be more pro-active in doing so. We believe that a forward-looking view should highlight the need for protection buyers to prepare for climate change now as well as over the longer term, and that this will most likely manifest itself as an increase in demand.

Properly priced for, these risks are well suited to the ILS market and will likely drive continued growth in the future.



Omega ratio: end goal for ILS benchmarks?

The nature of disaster risk means that benchmarking ILS returns is a probabilistic perfect storm for investors. But does the omega ratio offer a better alternative to more well-known measurement tools?

As catastrophe insurance involves the risk of rare but hugely costly losses, investors will be well aware of the notable "fat tail" to be expected from a distribution curve of ILS returns.

Hence, measures of performance such as the Sharpe ratio – which is designed for asset classes with normal distribution patterns of returns – may be considered mis-shapen for ILS purposes.

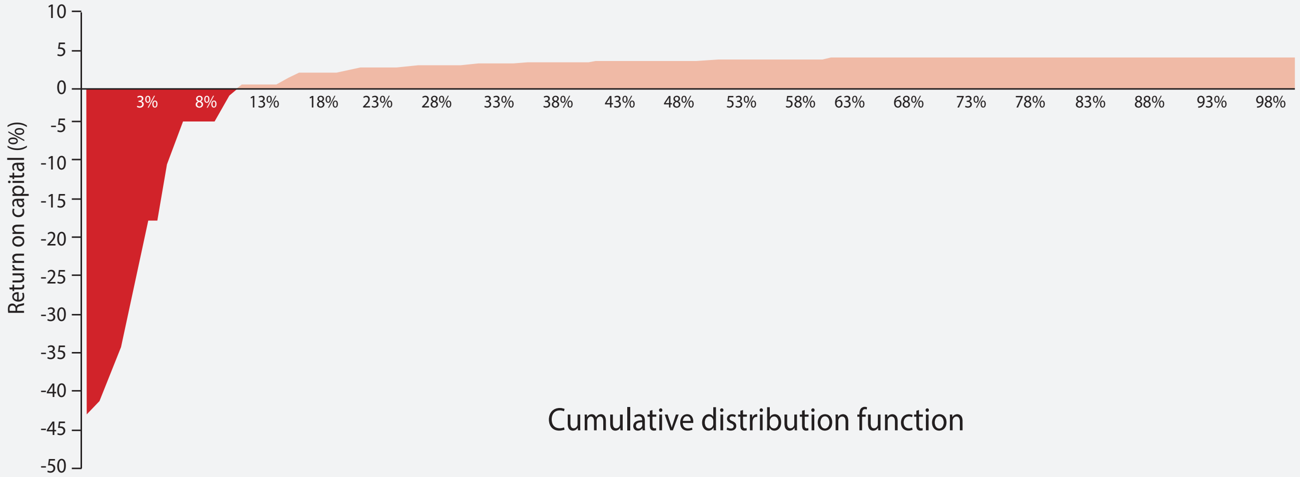
The omega ratio was devised in 2002 precisely to serve as an alternative risk-return performance measure for asset classes whose returns have skewed distribution curves. It shows how often an outperformance may be expected against underperformance and does not penalise volatility on the upside, as the Sharpe ratio does.

In an ILS context, calculating the omega ratio involves taking modelled forecast returns using the 10,000-year catalogue of events from third-party providers such as AIR Worldwide or RMS.

Pillar Capital CEO Stephen Velotti says that one of the main advantages of using the omega ratio in an ILS context is that many managers build portfolios and buy hedges to manage exposure at certain set areas on the distribution curve, such as the often-studied 1-in-100-year probable maximum loss.

"But that's one single point on the distribution curve," he says. "With the omega ratio, you can't hide

Cat Bond Omega: positive outcomes 2x loss outcome



Source: Lane Financial / Pillar Capital. Market-weighted average cat bond portfolio as of Feb 2018 behind that one point and you can't buy yourself out of the problem."

However, investors may also want to consider the flipside of the fact that the omega ratio does not penalise outperformance.

It also does not overweight the risk of a large but rare loss occurrence – so whether the omega ratio is an appropriate tool for investors depends on their level of concern about facing near-full losses to their ILS portfolio.

Meanwhile, Velotti notes that investors using the omega ratio as a tool should bear in mind that using out-of-the-box modelling may understate certain risks that are less well-modelled.

Moreover, if you have used zero as the threshold for calculating the omega ratio, but are studying a low-yielding asset class – such as US Treasury bills – the portfolio might have a high omega score, but absolute returns could fall below an investor's target yield.

However, alternative minimum targets can be used to calculate the omega score to overcome this issue.

> "With the omega ratio, you can't hide"

Investors may also need to consider whether an ILS manager has included investment earnings on collateral in their return datasets when setting an appropriate minimum acceptable return (MAR).

If they have included investment returns, then the MAR should be at least set to risk-free rates.

Omega ratios calculated for ILS portfolios at each end of the risk-return spectrum show that investors may need to be aware of whether they are reaping enough reward for the risks they are taking, according to analysis of funds that Pillar has compiled.

Studies that Pillar Capital undertook in association with ILS analytical firm Lane Financial show that the market-weighted cat bond portfolio has an omega ratio of around 2.03, indicating the magnitude of positive projected returns was around twice as large as the scale of possible losses, when zero is set as the threshold.

This compares to a ratio of around 3.5 for the S&P500, showing that the diversification benefits of a cat bond portfolio come at a cost of lower overall returns.

But this is just one public data point from the industry, and many reinsurance portfolios will have higher omega ratios, showing that ILS diversification can still reap additional rewards for investors.

Read the interview with the NZ Superannuation Fund head of external investments and partnerships, page 24.

Calculating omega

The omega ratio depicts the probability and scale of returns coming in above a defined threshold level, against the probability and scale of returns falling below this threshold (or losses if zero is used as the threshold).

Therefore, the ratio provides a measure of how often a portfolio will deliver gains relative to the downside risk of falling below target, across a full distribution set of outcomes. It shows both the count and scale of possible returns above and below an investor's minimum accepted return threshold.

The higher the omega value, the greater the probability that a given return will be met or exceeded. But there is no objective threshold for a good omega score – it is a relative metric and has to be assessed against a peer group to determine favourable results.

Select pension funds invested in ILS, stakes of $250mn+

Pension fund	ILS allocation ($mn)	Total funds ($bn)	% ILS allocation	Managers employed	Date of initial allocation
PGGM	4,776	245	1.95%	Fermat, LGT, Nephila, Elementum, AlphaCat, New Ocean, Munich Re	2006
RBS	1,400*	64	2.20%	Nephila, Leadenhall; *total also includes unspecified stake in insurance litigation fund	2012
Pensionskassernes Administration (PKA)	1,370	39	3.51%	Twelve Capital, Nephila, Markel Catco	
Pennsylvania Public School Employees	650	49	1.33%	Nephila, Aeolus, RenaissanceRe	2011
AP2	640	40	1.60%	Fermat, Elementum, Credit Suisse	2012
New Zealand Super Fund	235*	26	1.76%	Elementum, Leadenhall; *also includes life settlements with Apollo	2010
MLC	392	78	0.50%	AlphaCat Managers	2007
Coca-Cola Pension	~379	7.6	~5%	Securis and another	
AP3	325	40	0.81%	In-house and external allocations	
Teacher Retirement System of Texas	300	145	0.21%		2013
MassPRIM	250	69.4	0.36%	Aeolus, Catco	2017
Ontario Teachers' Pension Plan	236+	138	0.17%	Da Vinci Re and in-house vehicles; Catalina and Kyobo stakes not included in ILS assets	2005
IBM UK	229	9	2.54%	Nephila	2014
Maryland State Retirement and Pension	200	46	0.44%	Nephila	2014

Source: *Trading Risk*; some information as of 2017 reports

DEL HART

The head of external investments and partnerships says the NZ Superannuation Fund weathered losses from the 2017 catastrophes

Q: How long have you been investing in ILS?
Our first insurance-related investment was via a swap executed with Credit Suisse in 2009. Since then, our focus has turned to accessing the opportunity directly (not through derivative exposure) via our fund managers.

This includes two natural catastrophe mandates managed by Elementum (appointed in 2010) and Leadenhall (appointed in 2013) and three US life settlements mandates managed by Apollo.

Q: Have your ILS investments performed in line with your expectations?
We classify our ILS investments into two separate opportunity definitions: life settlements and natural catastrophe reinsurance.

The latter includes both catastrophe bonds and participation in privately negotiated reinsurance contracts via an externally managed investment mandate. The opportunities have performed in line with expectations, both in terms of returns since inception as well as observed volatility.

The defining feature of the NZ Superannuation Fund's portfolio design and allocation model is use of a reference portfolio—a simple, passive, low-cost mix of global equities and fixed income—which we are fully invested in, in the absence of compelling investment opportunities.

From a mix of the growth and income assets that comprise the reference portfolio, we create a "proxy" that shares similar characteristics with our ILS opportunities, and serves as a benchmark that we closely monitor when assessing performance.

Q: What was the biggest challenge for you in dealing with the ILS sector?
ILS investments brought potential reputational and other responsible investment-related risks and challenges to the NZ Superannuation Fund. Understanding these deeply, and ensuring that the strategies agreed with managers mitigated these risks to the greatest extent, has been central to our implementations.

For example, as an investment fund wholly owned by the Crown, we are especially sensitive to assuming New Zealand catastrophe risks. Doing so has the potential to affect the Crown's balance sheet twice: first from the direct impact, and then from any insurance-related losses.

In more recent years, as the NZ Superannuation Fund has implemented a Climate Change Investment Strategy, we are especially focused on understanding the climate change-related risks posed by ILS investments.

Q: What advice would you give to investors considering their first allocation to ILS?
To state the obvious, portfolio design matters and careful thought should be given to establishing the desired diversification benefit, and to determining the structure of the exposure to various perils and desired risk levels.

Q: Were there any surprises in the results from the 2017 losses?
None really. Having been invested in catastrophe investments for several years, we were aware of and expecting a year with the loss profile seen in 2017.

Q: Did you lift your ILS allocation this year?
In a limited fashion. At the start of this year, we looked to take advantage of better pricing for equivalent risks if market conditions proved amenable. As is well known, pricing has not responded materially or in a structured manner to the 2017 events.

The NZ$35.37bn ($25.3bn) NZ Superannuation Fund allocates 1.7 percent of its portfolio to ILS, including life settlements. Its natural catastrophe mandates were awarded to Elementum Advisors (NZ$75mn) and Leadenhall Capital Partners (NZ$203mn).

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ILS market: 10 years on from 2008

The collapse of Lehman Brothers in September 2008 was a critical moment for the fledgling ILS market.

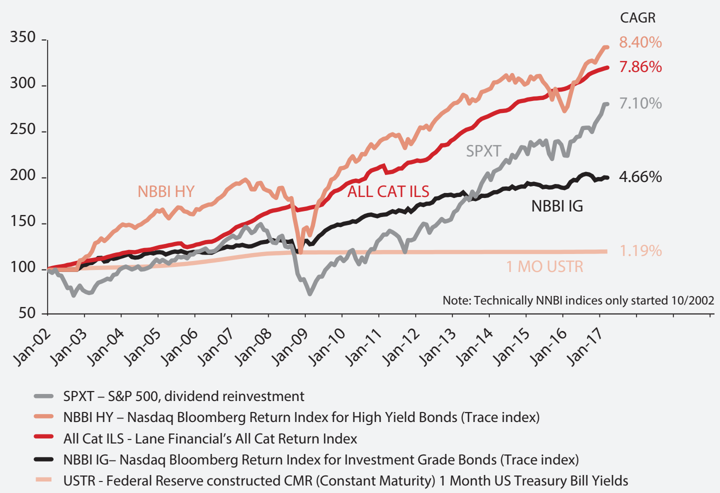
The bank was managing the collateral for four cat bonds: Ajax Re, Willow Re, Newton Re 2008-1 and the Carillon US wind cat bond.

Investors faced losing capital while insurers were left unsure of their cover in the middle of a hurricane season, due to uncertainty surrounding the collateral investments.

Lehman's bankruptcy led to a halt on cat bond issuances for the rest of that year until collateral arrangements for future cat bonds were determined. Once this issue was resolved – with a move away from total return swaps relying on bank credit – cat bond issuance resumed in 2009.

> "The ILS sector was one of the best-performing sectors during that time period and it was a real proof of the … minimal correlation to the broader financial markets, at a time when a lot of asset classes proved to be correlated"

ILS outperforms on Sharpe ratio since crisis



2002-3/2017, Initial Indices equal 100. Source: Lane Financial

After this temporary hiccup, the 2008 crisis actually laid the grounds for the ILS market to begin booming several years later.

The financial crisis showed that simply diversifying by asset mix or via general hedge fund strategies did not provide enough protection against a broad downturn, according to Secquaero Advisors CEO Dirk Lohmann (pictured right).

However, the cat bond and broader ILS market proved its diversifying nature, as values and liquidity remained generally robust.

"What the financial crisis did was give a proof of concept that this asset class was in its performance not correlated to macro-economic market risk," said Lohman.

That has been one of the key selling points of the sector for investors, even when yields have been under pressure, he continued.

Ali Al Ali, co-head of the insurance structured finance business at Goldman Sachs, agreed that the financial crisis was an important milestone in the ILS market's development.

"The ILS sector was one of the best-performing sectors during that time period and it was a real proof of the lack of (or minimal) correlation to the broader financial markets, at a time when a lot of asset classes proved to be correlated."

Indeed, the ILS asset class has achieved a "hands-

The Lehman impact

At the time of the 2008 crisis, around 4 percent of the $13.5bn catastrophe bond market comprised transactions featuring Lehman Brothers as total return swap provider.

The bank was effectively guaranteeing the performance of underlying collateral, asset-backed securities that plunged in value.

Asset losses stemming from these transactions have reached about $190mn, according to GC Securities global head of ILS origination Cory Anger.

This means that Lehman losses have contributed roughly 17 percent of overall cat bond losses for the period to 30 June last year. However, once the impact of recent catastrophe payouts is fully developed, the Lehman impact is likely to drop to reflect only 10 percent of cumulative cat bond losses, Anger added.

down return victory" over the past 15 years when compared with risk-adjusted returns from US corporate bonds and stocks, according to analysis from Lane Financial.

Compound annual returns over the period came to 8.40 percent for high-yield debt, 7.86 percent for ILS, 7.1 percent for the S&P 500, 4.66 percent for investment grade bonds and 1.19 percent for the US Treasury securities.

Taking the US Treasury returns as a risk-free rate, returns from the ILS sector have shown a Sharpe ratio of 2.76 – compared to less than 1 for the other asset classes.

Ultimately, the experience of the crisis also altered the market's investor base, said GC Securities global head of ILS origination Cory Anger (pictured far right).

"The exchange of hedge fund and other opportunistic types of capital markets investors …towards larger, deeper and more stable investors…with lower costs of capital was a pivotal result of the 2008 crisis," she said, giving pension funds, endowments, family offices and sovereign wealth funds as an example of the incoming investors.

Structuring ILS

Following the Lehman collapse, discussion focused on acceptable types of underlying investments with investors and ceding companies agreeing a more conservative approach was necessary.

ILS issuers have moved towards two of the safest collateral solutions around – US Treasury money market funds and, more recently, notes issued by the World Bank's International Bank for Reconstruction and Development (IBRD).

The latter allows investors to earn (London Inter-bank Offered Rate) Libor-based returns, but overall investors have shown no signs of interest in returning to higher asset-risk strategies, said Anger.

While the property cat bond market quickly rebounded from 2008, the life securitisation market took much longer to recover, as its exposures were correspondingly larger.

The market for reserve financing (regulation XXX) bonds backed by monoline insurance wrappers "imploded", in Lohmann's words.

"The life securitisation died with the financial crisis. And it didn't come back to life again until 2011 until we did a transaction."

Lohman said any residual investment risk in ILS structures was now minimal.

For example, some cat bond sponsors pay a year's premium upfront but others pay in instalments. "You could have a small window where the premium wasn't paid," said Lohman, although he noted termination events cover these possibilities.

Anger said that other examples of the minimal investment risk include the possibility of Treasury money market funds earning negative interest rates or 'breaking the buck' if expenses or valuations lead to principal write-downs.

"The current structures minimise exposure to credit/investment risk and deliver as pure insurance risk to investors as possible," added Al Ali.

Institutional Investor FORUMS

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European Investment Roundtable

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We are excited to announce a collaboration between Trading Risk and Institutional Investor, bringing investors interested in the insurance-linked strategies (ILS) sector a new event geared especially to them. A morning session dedicated to the ILS market will kick off Institutional Investor's 17th Annual European Investment Roundtable, hosted in Copenhagen on 26 September 2018 at the Marriott Hotel. Hear from several ILS industry leaders as we discuss new opportunities in the wake of 2017's disaster losses, followed by structured networking sessions that will enable you to debate the merits of ILS portfolios with your peers.

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SPEAKERS

Paul Schultz - Aon Securities CEO
Tom Libassi - ILS Capital Management Managing Partner
Niklaus Hilti - Credit Suisse head of ILS
Dirk Lohmann - Secquaero CEO
Vincent Prabis - Scor Investment Partners head of ILS

California wildfires flag modelling test

Last year's wildfires in California broke two records: the Thomas blaze became the largest, scorching 281,893 acres; while the Tubbs, Atlas and 2017 Mendocino Lake events incurred record insured losses that topped $11bn.

The Thomas loss has already been eclipsed by the size of this year's Mendocino fire, with the 2018 Carr Fire also among the most destructive.

The historic events pushed wildfire risks firmly into the spotlight, demonstrating not only how damaging the peril can be but how complex it is to model.

Wildfire models are less widely adopted compared to hurricane models, but insurers are quickly realising that historical loss experience alone is an inadequate predictor of wildfire risk.

For example, insurers had been surprised when the Tubbs fire jumped a six-lane highway – previously thought to be a fire break – reducing Santa Rosa's Coffey Park neighbourhood to ashes.

The fire was also unexpectedly fast-moving and intense.

While the 2003 Cedar and Old fires rendered a 30-40 percent damage ratio, the Tubbs fire resulted in a 100 percent damage ratio, says senior scientist at AIR Worldwide Tammy Viggato.

California's 2017 blazes provided the first real test of the models and showed a need for improvement.

"Hopefully the lessons learnt from last year's events will be incorporated in the new releases to create better loss estimates, though the model has to be nimble enough to take into account the ever-changing nature underlying physical characteristics…," said Bhaskar Chattaraj, head of modelling at TigerRisk Partners.

The challenges

However, wildfire is intrinsically difficult to model because its main components – winds, availability of fuel and suppression – are highly variable.

The Thomas wildfire last year was spread by the Santa Ana winds, a large-scale wind pattern originating far inland and pushing fires toward the Pacific Ocean. Localised wind patterns, however, can produce nearly binary damages to neighbourhoods: a house could escape simply because the fire turned a corner because of a local wind pattern, says Viggato.

The fuel is equally difficult to determine.

In 2017, California had one of its wettest winters on record. This led to a growth in vegetation.

A dry summer meant that this became tinder, says TigerRisk Partners modeller Anna Neely.

"The challenge that modellers face is that the underlying fuel is always changing."

Californian wildfire losses

Californian wildfires	Year	Location	Area burnt (acres)	Insured loss ($bn)
Thomas	Dec-17	Southern California	281,893	1-2.5
Tubbs, Atlas and Mendocino	Oct-17	Northern California	36,807	11
Witch–Guejito–Poomacha	Oct-07	San Diego County, California	247,400	1.6
Cedar	Oct-03	California	273,246	1.1
Old Fire	Oct-Nov-03	San Bernardino County, California	92,281	1
Tunnel (Oakland)	Oct-91	Oakland, California	1,520	1.7

Source: Impact Forecasting for all insured losses except Thomas (RMS); Cal Fire figs on area burnt

Vegetation mapping has been static until now. However, remote-sensing tools are now able to provide a better idea of the vegetation in remote areas and how much water it holds, says Joaquin Ramirez, principal at wildfire modellers Technosylva.

Suppression of wildfire is also unpredictable.

"Human decision goes into how and where to set up fire[fighting] lines and how to implement suppression," says Neely.

For example, firefighters may look at what a homeowner has done to mitigate wildfire risk – such as cleaning gutters of debris – in order to make a decision as to whether the house is possible to save.

Models need to capture the rapid expansion of the wild urban interface – areas where communities have been built next to natural vegetation, despite the high risk of wildfire.

Urban interfaces have hosted a 41 percent increase in new homes from 1990 to 2010, becoming the fastest-growing areas of development in the US, according to a Proceedings of the National Academy of Sciences journal article from last year.

Opportunities for cover

Insurers have responded to increased risk from wildfire, for example by offering private fire protection for high-net-worth homeowners, according to Meyer Shields, analyst at Keefe, Bruyette & Woods.

Insurers themselves are considering more cover for the aggregate risk from wildfire, Meyer adds.

They are not alone. Power provider PG&E in California turned to the ILS market for wildfire protection this year.

RMS plans to release a fire model next year, while in August AIR Worldwide released its updated US wildfire model which will help better predict losses.

But until wildfire can be more reliably modelled, communities will have to develop resilience to the peril while insurers get to grips with the true costs of future worst-case scenarios.


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Aditya Dutt, President, Renaissance Re
Michael Hamer, Partner & Senior Analyst, Albourne Partners
Aaron Koch, Director, ILS Group (P&C Division) Milliman
Richard Lowther, Partner & COO, Hiscox Re Insurance Linked Strategies Ltd
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What would it cost: California wildfire

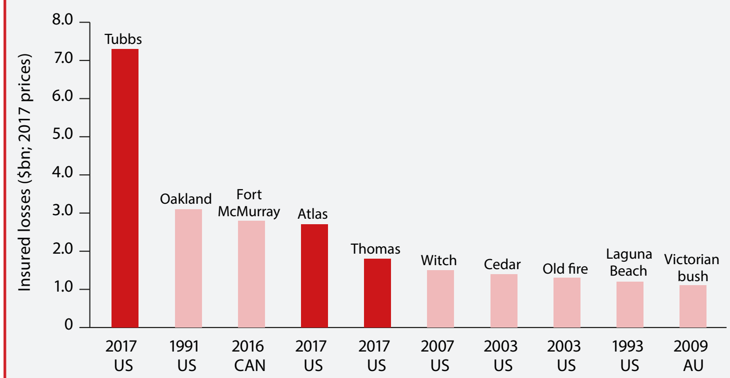
California is on course for another record-breaking wildfire year with the Mendocino Complex blaze demonstrating clearly the danger the peril poses to the state.

Last year's wildfires in California racked up estimated insured losses of $12bn-$13.5bn in October and December alone.

AM Best has warned the state's population growth in remote areas combined with drier conditions and rising temperatures could mean the current prevalence of wildfire is the "new normal".

Trading Risk asked AIR Worldwide to estimate insured industry losses for two potential wildfire scenarios aligning with the 1-in-100 year and 1-in-250 year return periods.

Top 10 insured losses from worldwide wildfires



Source: Swiss Re Institute

1-in-100 year

The ignition point of the 1-in-100 year event is just outside Ford City, approximately 25 miles north of Los Padres National Forest, in southern California.

It is followed by a second ignition point slightly north of Santa Barbara, 50 miles south of the first ignition point, 17 hours later. This fire causes damage across a much greater area, burning over 97,000 acres of the 98,000-acre total for this outbreak.

The 1-in-100 year event results in a total loss to properties in California that could be insured but are not necessarily insured to the tune of $10.3bn. The fire has a 1 percent exceedance probability.

Some $9.4bn of the event's losses come from residential lines of business, while $0.8bn come from commercial and auto lines of business.

> "AM Best has warned California's population growth in remote areas combined with drier conditions and rising temperatures could mean the current prevalence of wildfire is the 'new normal'"

The majority of these losses are within Santa Barbara County, which accounts for $10.1bn of the losses; the remaining losses occur in Ventura County.

After accounting for the take-up of insurance policies covering wildfire in this region, the insured loss estimate for this event is $9.5bn, a little over 90 percent of the insurable total.

To put this in context, the insurable loss in California from the Tubbs wildfire in today's dollars would be approximately $5.3bn, said AIR, although actual insured loss estimates came in above $7bn.

1-in-250 year

The 1-in-250 year event, which has an exceedance probability of 0.4 percent, has a single ignition point 25 miles north of San Diego, resulting in the burning of over 41,000 acres.

While the burn-area for this event is much smaller than the 1-in-100 event, the insurable losses are based not only on the extent of the fire, but also the intensity of the fire, as well as the total replacement value contained within the event footprint.

Some $13.7bn of these losses come from residential lines of business, while $1.7bn come from commercial and auto lines of business. All of the losses for this event are contained within San Diego County.

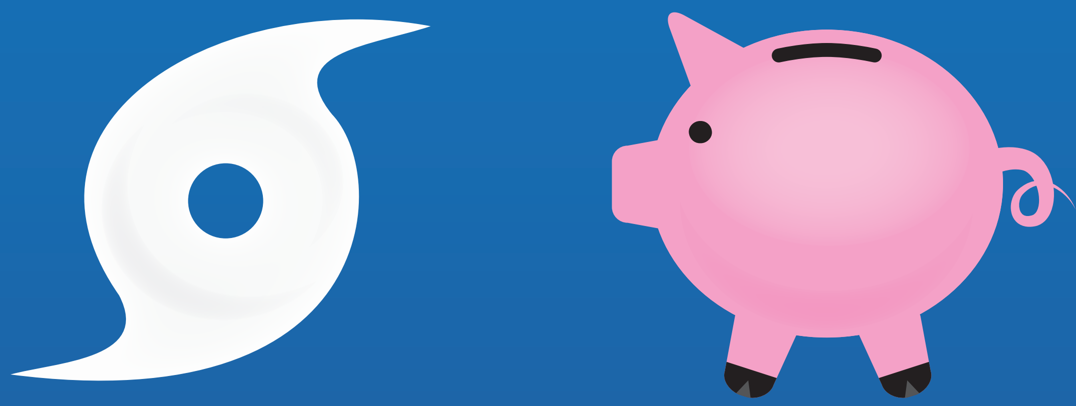
After accounting for the take-up of insurance policies covering wildfire in this region, the insured loss estimate for this event is $14.3bn, again a little over 90 percent of the insurable total.

"Whilst neither of the featured events directly impact downtown Los Angeles, it is worth noting that there is the potential for meaningful loss amounts to occur in this area given the population density," says AIR Worldwide senior risk consultant Harry White.

Eight of the 10 largest loss-causing California events in AIR's catalogue, as measured by insurable loss, directly impacted Los Angeles County.

AIR defines any fires that occur within a 150-mile diameter as well as within seven days of each other as a single event, or cluster.

ILS market primer: from disaster frontline to pension portfolio



What is the insurance-linked securities (ILS) market? As the name suggests, it consists of financial instruments that provide insurance cover.

But don't conflate this industry with a standard burglary or fire insurance product. If you're investing in the ILS market, your risk antennae instead need to be tuned to the kind of natural disaster that might take over CNN screens – US hurricanes or Japanese earthquakes, for example.

The ILS market first emerged in the mid-1990s but it wasn't until after the 2008 financial crisis that it began to take off.

This surge was driven by its major selling point as a source of diversifying, or non-correlating risk

Why ILS?

- Diversification from financial market risks
- Catastrophe models provide a framework for analysing risk and quantifying exposures
- Purer access to insurance risks – avoiding investment exposure on the balance sheets of major (re)insurers
- Cushions against inflation risks, as premiums include a floating rate component on cash pledged against insurance liabilities
- Short-term liabilities (largely one- to three-year contracts, some tradeable)

ILS primer: Market timeline

1996 – George Town Re, widely cited as the market's first cat bond, is launched by St Paul Re, followed a year later by the first Residential Re deal from USAA and a Swiss Re deal

1997 – Nephila Capital, which is now the industry's largest asset manager, is founded

2005 – The hurricane season of Katrina, Rita and Wilma sets off a spike in reinsurance rates and a spate of new start-ups

2008 – Lehman Brothers collapses – it had managed collateral for four cat bonds that defaulted – cat bond structures shift to invest collateral largely in Treasury money market funds

2011 – The cat bond market records three full defaults in one year due to the Tohoku earthquake in Japan and US tornado claims

2017 – Hurricanes Harvey, Irma and Maria along with US wildfires make 2017 the ILS market's biggest loss year to date

– acts of God that won't be triggered by financial market turmoil.

The ILS market has largely made its home within the reinsurance sector – a wholesale industry that provides insurance to insurers to help them bear claims when disasters produce a spike in losses.

The ILS sector is sometimes labelled the "alternative" reinsurance market, and contrasted with the so-called "traditional" reinsurance market, which refers to rated balance sheet companies such as Swiss Re or Munich Re, to cite two of the longest-standing industry brands.

That's because the emergence of ILS market asset managers has given investors an alternative entry route into reinsurance risk, instead of just buying equity.

However, since its early days, any simplistic distinction between the two segments has eroded as the ILS segment has broadened and melded into the wider reinsurance markets.

For one, many traditional reinsurers have set up asset management platforms to compete with ILS managers, while a number of ILS managers have set up or are closely tied to rated reinsurance vehicles, giving them more freedom to take on a broader range of underwriting risks.

In recent years, the ILS market has expanded into segments such as marine and energy and aviation reinsurance, as well as into catastrophe-exposed property insurance, a step down the business chain. And for a select group of managers, life (re)insurance risk is a major part of their business.

Despite its blurring boundaries, ILS still offers investors a distinct route into taking reinsurance risk while skirting the equities market.

Perils: US risks dominate

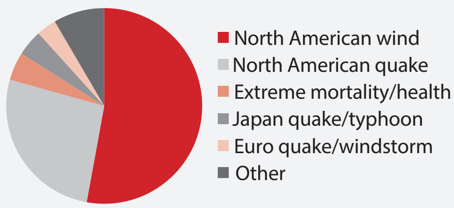
The ILS market portfolio is heavily skewed towards the US, led by tropical storm/hurricane risks. Other major perils are US earthquake and Japanese earthquake, with small elements of European wind or Australian catastrophe.

That's because these are historically the most lucrative products for reinsurers. Florida, in particular, is their peak zone of exposure, meaning more capital must be held against these potential liabilities, attracting higher rates in turn.

They are also the most well-studied risks, with third-party statistical models available to help quantify hurricane exposures.

This combination of higher rates and strong data laid the foundation for ILS managers to target catastrophe risks in their early days, since for their pension fund capital providers, hurricane risk was a minor source of diversifying income to their own

2017 cat bonds by peril



Limit of peril volume by contribution to expected loss
Source: *Trading Risk*

peak peril of equity market risk.

As ILS managers grabbed more market share in the property catastrophe market, the ensuing competition eroded much of the premium previously attached to hurricane risk.

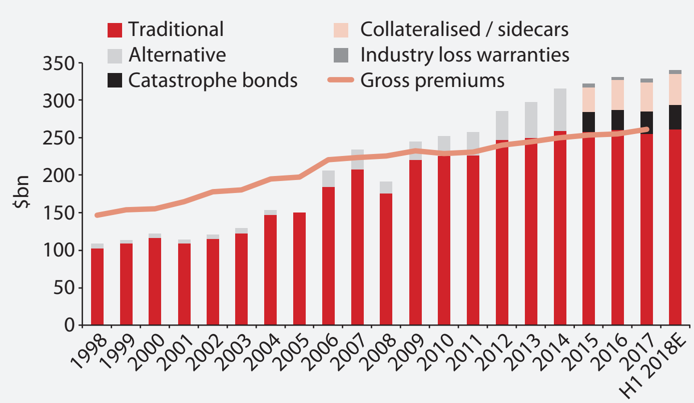
However, it remains the market's peak exposure with a corresponding price advantage compared to the types of catastrophe business that diversify a reinsurer's portfolio.

Continental European catastrophe margins are often said to be little better than break-even, which is one of the reasons why ILS market participation in this sector is relatively limited – cash collateralising limit for such margins would be highly inefficient.

Outside the catastrophe bond market, however, ILS managers are likely to be exposed to a wide range of catastrophe risks beyond the specific perils discussed here.

"All natural peril" catastrophe risks may involve exposures that are unmodelled or less well-modelled – such as wildfires or floods.

Dedicated reinsurance sector capital and gross written premium



Source: JLT Re

Sizing up the market

Estimates vary, but ILS now makes up almost 20 percent of an overall $427bn reinsurance capital base, according to year-end 2017 figures from Guy Carpenter and AM Best.

But what exactly does the ILS market's $82bn-$89bn of capacity represent? There are several distinct segments within this total.

The catastrophe bond market attracts a wide range of investors looking for liquidity, although it typically presents a lower risk, lower return opportunity within the ILS world.

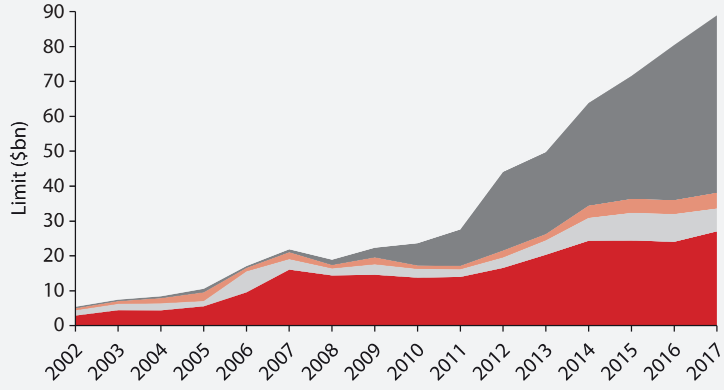
The niche industry loss warranty market is also relatively commoditised and easier to access, with a variety of risk-return options.

In contrast, the collateralised reinsurance segment is more specialised and difficult to access, but also provides a range of risk-return targets.

What is a cat bond?

A catastrophe bond transaction involves a sponsoring insurer paying investors a premium for reinsurance cover against defined catastrophe losses. If a cat bond triggers, investors' capital is used to reimburse a sponsor's losses. There is no requirement for insurers to later repay such sums to investors. However, if no qualifying event occurs, then investors recoup their capital at the end of the transaction (typically three to four years).

Alternative capital deployment



Source: Aon Securities Inc

Catastrophe bonds
The most liquid section of the ILS market. Reinsurance in tradeable form, typically providing slightly narrower terms of cover for specified perils.

Collateralised re
Effectively just traditional reinsurance contracts, providing indemnity cover for a buyer's losses, across a broad range of perils. ILS managers pledge cash collateral to back their liabilities, hence the name.

Industry loss warranty
Contracts that trigger not on a buyer's actual losses, but on the insurance industry's overall loss from specified disasters, e.g. a $5bn Florida hurricane.

Sidecar
Vehicles run by reinsurers in parallel to their balance sheets. Typically involve a reinsurer ceding a share of a set portfolio of risks to investors (via "quota share" reinsurance). Some are "market-facing", akin to a fund, where a reinsurer writes a specific portfolio for the vehicle.

Finally, other small niches such as retro business can provide higher-octane strategies, while sidecars offer the chance to leverage off rated balance sheets and may introduce a range of diversifying risks.

Weighing up returns

So far during its short history the ILS market has delivered strong returns for investors, although margins have softened significantly in recent years.

Before last year, its most difficult years had been 2011 and 2005, as a result of the Tohoku earthquake in Japan and Hurricane Katrina, respectively. These were both testing, but by no means worst-case, catastrophe scenarios for the largely Florida-exposed market. Even 2017, with its trio of hurricanes, could have been much worse had Irma taken a less favourable track over Florida.

There are a couple of benchmarks of returns that are often cited within the industry, although neither is without its limitations. The Eurekahedge ILS Advisers tracks the performance of 34 ILS funds all equally weighted, which cover a wide range of strategies from high risk-return retro vehicles down to low-risk cat bond-only funds. Its worst year to date was 2017, when it lost 5.57 percent.

Meanwhile, the Swiss Re Cat Bond Total Return index – which solely tracks performance of the cat bond segment – returned 0.57 percent last year.

ILS returns, 2006-2018

Annualised return (%)	5.15
Sharpe ratio (X)	0.98
2017 return (%)	-5.6
Return since 2006 inception (%)	86.48

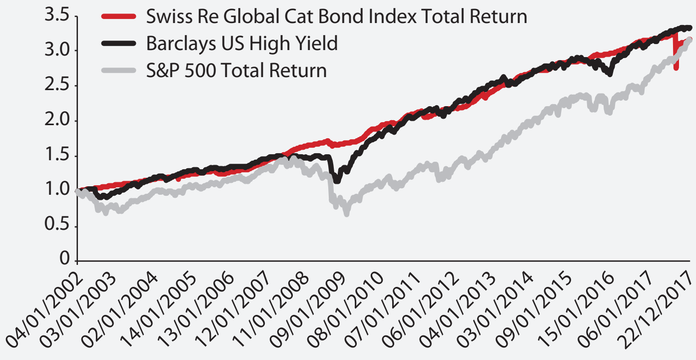
Source: Eurekahedge ILS Advisers index, data as of 31 May

Quantifying risks

Cat bond investors are typically given the "expected loss" of a deal to measure their risk levels, a figure that expresses the likelihood of capital loss in any given year. For example, a 1 percent expected loss means investors could lose that amount of their principal in any year – or looked at another way, is roughly similar to the prospect that a 1-in-100-year disaster would wipe out all their capital.

Cat bond spreads are often cited as a multiple of the deal's expected loss, which is an easy way of referencing the margin of premium earned in relation to potential losses. Typically, cat bonds in the 1-2 percent expected loss range now offer investors around a 2x multiple (or spreads of 2-4 percent), depending on the risk profile.

Cat bond performance 2002-17: HIM losses tip ILS below high-yield



DISCLAIMER: Swiss Re Cat Bond Index Total Return ("Index"), calculated by Swiss Re Capital Markets ("SRCM"), is a market value-weighted basket of natural catastrophe bonds tracked by SRCM, calculated on a weekly basis; past performance is no guarantee of future results. For full disclaimer details please see Bloomberg.

Investor list

Manager by type	Total AuM in ILS $mn (estimated)	AuM within UCITS funds if applicable	AuM within '40 Act funds if applicable	Notes	ILS strategies	Established in ILS	Base
Specialist ILS manager							
Nephila Capital	12,200			Independent ILS manager, part-owned by KKR and Man Group	Various multi-instrument funds and single-investor mandates, also invests in weather	1998	Bermuda
Credit Suisse Asset Management	9,000			AuM as of April 2018	Various funds with different risk levels	2003	Switzerland
LGT Insurance-Linked Partners	7,900	600		Former Clariden Leu ILS team moved to Swiss alternatives manager in 2012. Team of 50 (20 portfolio managers).	Various funds and bespoke mandates	2005	Switzerland
Stone Ridge Asset Management	6,980		6,980	US mutual fund manager. Net assets of end April 2018	Invests principally in cat bonds and sidecars	2013	US
Securis Investment Partners	6,716	64		Independent ILS manager; Northill Capital owns majority stake	Life, non-life and mixed strategy funds	2005	UK
Markel Catco	6,500			Owned by (re)insurer Markel. Runs a public listed fund and private funds; AUM includes lost capital as of 30 June	Retrocession specialist	2011	Bermuda
Fermat Capital Management	6,200	1,700		Independent ILS manager	Cat bond focus	2001	US
Leadenhall Capital Partners	5,200	240		Majority-owned by (re)insurer MS Amlin after buy-up in late 2014	Non-life and mortality funds, life/non-life mandates	2008	UK
Elementum Advisors	4,040			Independent ILS manager; team investing since 1995 and managing ILS funds since 2002 under prior entities	Multi-instrument funds	2009	US
Aeolus Capital Management	4000+			Began as private reinsurer; transformed into fund manager in 2011. Now majority-owned by Elliott Management	Retro and collateralised re	2006	Bermuda
AlphaCat Managers	3,491			Subsidiary of (re)insurer Validus, now part of AIG. AuM from 1 July	$1,800mn lower-risk ILS fund, $1183mn higher-risk fund, $89mn BetaCat fund, $406mn direct mandates, $13mn sidecars. $165mn Validus capital.	2008	Bermuda
Schroders (Secquaero Advisors)*end May AuM	3,077	1,260		Schroders owns 50.1% of Secquaero which advises it on ILS management	Five funds: two cat bond; three multi-instrument of which two include life risk. 4 segregated mandates	2008	Switzerland
Renaissance Underwriting Managers	2,757			Reinsurer subsidiary.	DaVinci rated sidecar $1.23bn; Medici cat bond fund $410mn; Upsilon funds $917mn; $200mn Fibonacci; all external capital. Langhorne life reinsurer assets not tracked here.	1993	Bermuda
Twelve Capital	1,664	530		Independent ILS manager. Spun out from Horizon21; team in ILS since 2007	Cat bond and multi-instrument ILS funds (insurance debt fund not tracked)	2010	Switzerland
Pioneer Investments	1,650			Offers one ILS vehicle (Pioneer ILS Interval fund $810mn); also invests multi-strategy fund assets in ILS	Invests principally in cat bonds and sidecars	2007	US
Hiscox Insurance-Linked Strategies	1,600			Reinsurer subsidiary. Hiscox capital $55mn	Two co-mingled diversified funds; single-investor funds; one insurance sidecar	2014	Bermuda
Scor Investment Partners	1,445			Asset management affiliate of reinsurer established 2011	Multi-instrument	2011	France
Axa Investment Managers	1,214	187		Affiliate of insurer; invests third-party funds only	Various funds and mandates, new UCITS fund added 2017	2007	France
Mt Logan (Everest Re sidecar)	1,134			(Re)insurer subsidiary, includes some Everest Re capital	Quota share of Everest Re book		
Axis Ventures	1,045			(Re)insurer subsidiary; also oversees $600mn Harrington Re casualty vehicle not tracked here	$1.0bn for property cat support of $1.9bn total. Largely private sidecars.	2014	Bermuda
Pillar Capital Management	~900			Reinsurer Transatlantic owns 50%; previously known as Juniperus	Collateralised re focus, runs two funds and mandates	2008	Bermuda
Tokio Marine Asset Management	750-775			Insurer's asset management arm	Largely ILS, some collateralised covers		Japan
Cartesian Re	>750			Independent ILS manager backed by private equity firm Cartesian Capital	Focus on index strategies via ILWs, cat bonds & other ILS. Investment vehicles include: open-ended funds in Cayman Is and Delaware, Luxembourg SICAV, Bermuda-listed shares of segregated account and managed accounts	2009	Bermuda
Hudson Structured Capital Management	742			Independent manager led by Michael Millette; backing from Blackstone	Reinsurance AuM listed; transport fund not included. Flagship strategy invests across catastrophe, life/health, casualty, other risks and various instruments. New funds for 2018 include catastrophe-based opportunities fund and $75mn InsurTech venture fund	2016	US/Bermuda
Coriolis Capital	700	25		Independent ILS manager. Team operating since 1999; est. after MBO from Societe Generale	Multi-instrument including weather	2003	UK
Aspen Capital Markets	650			(Re)insurer subsidiary	Runs managed accounts, commingled funds and sidecars including Peregrine		
Arch Underwriters	600			(Re)insurer subsidiary. Underwrites for rated $1.13bn casualty-focused Watford Re, not tracked here	Largely private quota shares	2014	Bermuda
Kinesis Capital Management	500			Subsidiary of (re)insurer Lancashire, established mid-2013	Kinesis Re I vehicle writes multi-class reinsurance and retro. Wrote $340mn limit	2013	Bermuda
TransRe Capital Markets	500			(Re)insurer subsidiary	Runs Pangaea Re and other sidecars		
PG3	450			Family office taking some third-party capital	Invests in QS sidecars, ILWs and ILS across wide range of reinsurance - nat-cat, non-nat-cat, life and health, legacy		Switzerland
New Ocean Capital Management	450			Affiliate of (re)insurer XL (now part of Axa XL); minority backers include Stone Point and Mitsui & Co	Three funds: Diversified (QS of XL Re property cat book); Market Value (super remote risk); Focus (directly written short-tail reinsurance). Also individual accounts	2014	Bermuda
Plenum Investments	380	355		Independent asset manager	Cat bond focus, long only strategies	2010	Switzerland
Oppenheimer Funds	366		332	Mutual fund manager; runs ILS vehicle and invests via multi-strategy funds	OFI Global Cat Bond Strategy open to external investors	1997	US
ILS Capital Management	350			Independent ILS manager backed by Don Kramer	Specialty focus	2014	Bermuda

Manager by type	Total AuM in ILS $mn (estimated)	AuM within UCITS funds if applicable	AuM within '40 Act funds if applicable	Notes	ILS strategies	Established in ILS	Base
Blue Capital Management	350			Subsidiary of (re)insurer Sompo International; runs one public fund; private funds and private sidecars.	Moving to more of a quota share focus	2012	Bermuda
Eskatos Capital Management	260			Azimut Group subsidiaries Eskatos and Katarsis Capital Advisors manage and advise the ILS fund respectively	One fund: Eskatos AZ Multistrategy ILS fund; small longevity exposure	2008	Luxembourg
Lutece	250			BTG Pactual Asset Management bought in July 2018 after January 2018 launch by former reinsurance broker Erik Manning and ex Ariel CFO Angus Ayliffe	Initially a focus on retrocession	2018	Bermuda
Lombard Odier	200	155		Swiss private bank launched ILS fund in 2016	Cat bond funds	2016	Switzerland
PartnerRe	195			(Re)insurer subsidiary. Lorenz sidecar $195mn; additional $230mn collateralised quota share not tracked here. Sold down cat bond portfolio after strategic shift to focus on quota share only			US
Leine Investments	150			(Re)insurer Hannover Re has seeded the fund with up to $150mn	Cat bonds and collateralised re		
Sumitomo Mitsui Asset Management (Tokyo)	95			Advised by insurer Mitsui Sumitomo Insurance	Diversified, low-risk portfolio with JPY currency hedge	2014	Japan
Tenax Capital	58			Independent asset manager launched Ucits ILS fund in May 2017 with EUR50mn capital	Cat bond funds	2017	London
Eastpoint Asset Management	50			Backed by Japanese manager Asuka Asset Management	Cat bond focus	2012	Bermuda
Tangency Capital	50			Independent ILS manager launched by trio of reinsurance execs	Quota share retrocession portfolio	2018	Germany/ London
Mercury Capital	45			Independent manager with seed funding from Lloyd's insurer Ark	ILW tracker fund	2013	Bermuda
Entropics Asset Management	25			Newly operational independent ILS fund; still raising capital	ILS	2015	Sweden
IBI ILS Partners	Not disclosed			Joint venture between Roman Muraviev & asset manager IBI Investment House		2017	Israel
Solidum Partners	not disclosed			Independent ILS manager	Cat bond and multi-instrument funds	2004	Switzerland
Total	**87,198**						

Note: this total will include some double-counting of assets as several ILS vehicles are heavily focussed on quota share partnerships with reinsurers and are arguably akin to fund of funds vehicles. Other reinsurers also take third-party capital via sidecars but if no clear fund management framework in place, these are not included here.

ILS Fund of funds

Manager by type	Total AuM in ILS $mn (estimated)	AuM within UCITS funds if applicable	AuM within '40 Act funds if applicable	Notes	ILS strategies	Established in ILS	Base
K2 Advisors	915			Hedge fund of funds manager; $11.6bn AUM	Invests with multiple ILS funds; buys cat bonds directly	2003	US
City National Rochdale	345	45		$45mn held in the firm's Select Strategies ILS fund, which allocates to Iris Re. Another $300mn allocated to other ILS managers		2017	US
GT ILS fund	230			Texas based advisory firm offering ILS fund of funds solution	Securis and others		US
ILS Advisers	178			Index tracker fund tracking ILS Advisers index	Fund of funds	2014	Bermuda
Altair Reinsurance Fund	78			Operated by wealth advisor First Republic Securities	Feeds into Hudson Structured ILS funds	2018	US
AIM Capital	20			Finnish fund of funds manager	AIM Insurance Strategies fund	2011	Finland
Hatteras Reinsurance Fund				Newly registered fund; sub-adviser not yet named		2018	US
Total	**1,766**						

Multi-strategy investors (directly active in ILS; but not offering external strategies)

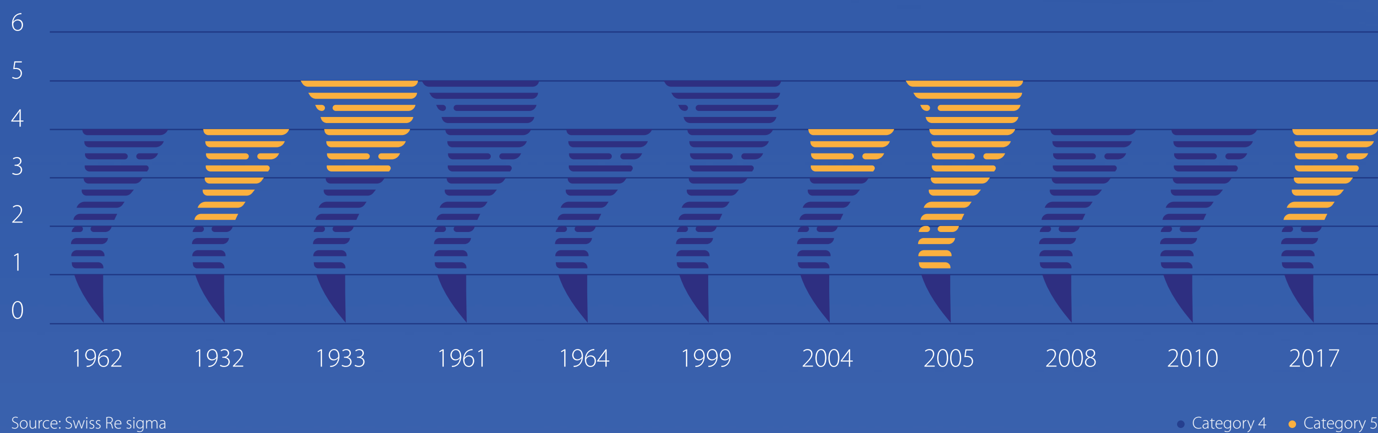
Manager by type	Total AuM in ILS $mn (estimated)	AuM within UCITS funds if applicable	AuM within '40 Act funds if applicable	Notes	ILS strategies	Established in ILS	Base
Aberdeen Asset Management	41			7% of £427.5mn Diversified Growth fund at end Q1 18; reinvested $33mn in Catco post-loss			
AP3	325			Swedish pension fund	$319mn (2.7bn kronor) "other" assets as of year-end 2015		Sweden
Baillie Gifford	500			Scotland-based asset manager; one multi-asset fund invests in ILS - much less active in ILS through 2015 than 2014	Buys ILS directly. Also holds stake in listed ILS funds Catco/DCG Iris		
BlueMountain Capital	100			$21bn alternatives asset manager; employed Al Selius to manage ILS portfolio		2017	US
BNP Paribas	not disclosed			Internal ILS cat bond fund			
Challenger	not disclosed				ILS and Life		Australia
DE Shaw	not disclosed			Has $40bn+ total AUM; ILS holdings not disclosed	Writes collateralised re/retro	2007	US
New Holland Capital	not disclosed			Hedge fund of funds manager for Dutch fund manager, APG			US
Ontario Teachers Pension Plan	300+			Invests via third party ILS managers and through internal team	Stakes in DaVinci Re, Catalina	2005	Canada
Quantedge	360			Hedge fund with $1,800mn overall AuM	Invests in cat bonds, collateralised re, sidecars, ILWs, cat bonds	2013	US
Swiss Re	335			(Re)insurer's internal ILS portfolio, invests in cat bonds, ILWs and swaps	Third-party sidecar assets not tracked here		
Munich Re	not disclosed			Internal ILS fund of up to $1bn	Sidecar assets not tracked here	2006	Germany
Tiaa-cref	not disclosed			Manages $800bn overall AuM	Buys cat bonds directly		US
Total	**1,961**						

Source: *Trading Risk*

Hurricane season 2017

Harvey, Irma and Maria made 2017 one of the most expensive hurricane seasons on record for insured losses, but how did it stack up in terms of storm activity? It was one of five years in the past century to have seen four or more major hurricanes, including one Category 5, Swiss Re noted in its Sigma report on catastrophe losses.

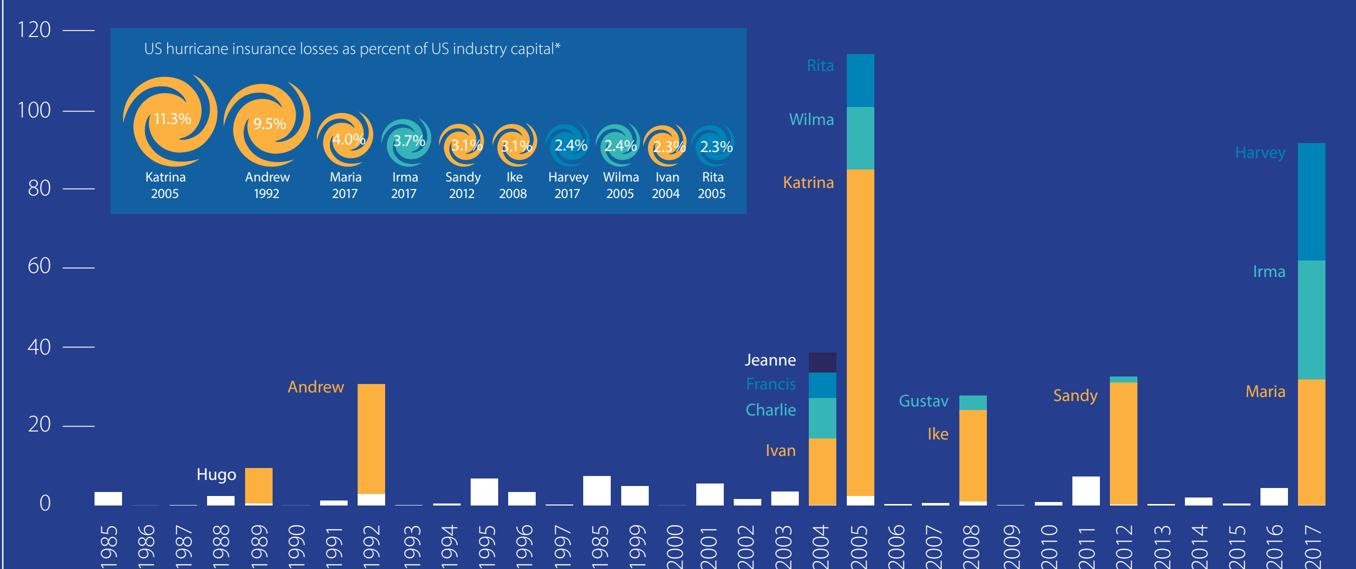
Years with at least four hurricanes in the North Atlantic attaining the highest categories 4 and 5



Source: Swiss Re sigma

By another intensity metric, the season's accumulated cyclone energy (ACE) at 226 was about 2.5 times ahead of the season average value of 90, making it one of the top 10 ACE years in the past century.

Insurance losses from hurricanes in USD billion (in 2017 prices)



*Note: the insurance loss figures in this figure do not include payouts from the National Flood Insurance Program (NFIP) in the US.

Source: Swiss Re sigma

GLOSSARY OF TERMS

KEY PHRASE	DEFINITION
Aggregate exceedance probability (AEP)	Probability of total annual losses of a particular amount or greater
Alternative risk transfer	Transferring risk through methods other than traditional insurance or reinsurance, for example utilising capital markets capacity through the issuance of insurance-linked securities
Attachment point	The point at which excess insurance or reinsurance protection becomes operative; the retention under an excess reinsurance contract
Attachment probability	Likelihood of losses exceeding the attachment point over the course of a one-year term
Administrator	Assumes all operating and reporting protocols for a special purpose insurer/entity
Basis risk	Risk that losses in a non-indemnity trigger differ from indemnity losses
Capacity	The largest amount accepted on a given risk or, sometimes, the maximum volume of business a company is prepared to accept
Catastrophe bond	Securities that transfer catastrophe risks from sponsors to investors
Cedant	Party to an insurance or reinsurance contract that passes financial obligation for potential losses to another party
Collateralised reinsurance	Reinsurance contract that is fully collateralised to the limit
Earned premium	The portion of premium (paid and receivable) that has been allocated to the (re)insurance company's loss experience, expenses and revenue
Excess of loss	System whereby a (re)insured pays the amount of each claim for each risk up to a limit determined in advance, while the (re)insurer pays the amount of the claim above that limit up to a specified sum
Exhaustion probability	Likelihood of losses exceeding the exhaustion point, causing a full loss on a reinsurance layer
Expected loss	The expected loss is the modelled loss within the layer divided by the layer size
Extension period	Time period after the scheduled maturity used to calculate losses for events which took place during the risk period
Extension spread	Spread paid during the extension period (typically a reduced rate from the initial risk spread)
Gross premiums	Premium before subtracting direct costs
Indemnity trigger	Type of trigger that most closely resembles the traditional market ultimate net loss cover, and offers ceding insurers (a.k.a. sponsors) the ability to recover based on actual losses
Industry loss index trigger	Type of trigger where payouts are determined by a third party estimate of industry losses
Industry loss warranty (ILW)	Form of reinsurance or derivative contract that covers losses arising from the entire insurance industry rather than a company's own losses from a specified event
Incurred losses	The total amount of paid claims and loss reserves associated with events from a particular time period
Insurance-linked security (ILS)	Financial instruments whose value is affected by an insured loss event
Limit	The maximum amount of (re)insurance coverage available under a contract

KEY PHRASE	DEFINITION
Loss ratio	Incurred losses divided by earned premiums (earned premiums include reinstatement premiums)
Modelled loss trigger	Type of trigger where payouts are determined by inputting event parameters into a predetermined and fixed catastrophe model to calculate losses
Net premiums	Premium less direct costs
Quota share	Reinsurance where the cedant transfers a given percentage of every risk within a defined category of business
Occurrence exceedance probability (OEP)	Probability that any single event within a defined period will be of a particular loss size or greater
Parametric trigger	Type of trigger where recoveries are triggered by a formula that uses measured or calculated parameters of an actual catastrophe event (e.g. wind speed, magnitude of an earthquake)
Peril	A specific risk or cause of loss covered by an insurance policy
Probable maximum loss (PML)	The anticipated maximum loss expected on a policy
Profit commission	A provision that provides the cedant a share of the profit from business ceded
Proportional reinsurance	System whereby the reinsurer shares losses in the same proportion as it shares premium and limit
Rate on line	Reinsurance premium divided by reinsurance limit
Reinsurance	A transaction whereby the reinsurer, for a consideration, agrees to indemnify the ceding insurer against all or part of the loss which the insurer may sustain under a policy or policies that it has issued
Reinsurer	Company that provides financial protection to an insurance company
Reset	Adjusting a layer of a multi-year catastrophe bond to maintain a bond's probability of loss at the level defined at issuance
Retention	The net amount of risk the ceding company keeps for its own account
Retrocession	A transaction whereby a reinsurer cedes to another reinsurer all or part of the reinsurance it has previously assumed
Risk period	Time period for which a reinsurance agreement covers events taking place
Sidecar	A structure to allow investors to share in the profits and losses of an insurance or reinsurance book of business
Special purpose insurer/entity (SPI/SPE)	A company created by (but not owned by) a (re)insurer for the purpose of raising capital for a specified programme
Treaty	An agreement between a cedant and a reinsurer stating the types or classes of businesses that the reinsurer will accept from the cedant
Underwriting profit	Earned premium minus incurred losses and incurred commissions (earned premiums include reinstatement premiums)
Variable reset	Adjusting a layer of a multi-year catastrophe bond up or down within a pre-defined range of probability of loss, with a corresponding update in risk spread
Vendor models	Software that estimates expected loss and probability of occurrence for specified exposure sets and predefined peril scenarios. The three largest vendors by market share are AIR Worldwide, Risk Management Services and Eqecat
Written premiums	Premium registered on the books of an insurer or a reinsurer at the time a policy is issued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