

## **ILS Losses 2022 – Expectations, Realizations and Implications**

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The purpose of this essay is to review ILS losses during 2022. Specifically with reference to losses from Hurricane Ian and more generally in the context of the past 22 years, 2001-2022. We look, as is our wont, to two sources of information – models and market<sup>1</sup> expectations. But instead of confining our comparison to a single point of view, we look at “triangulating” towards an understanding of 2022’s losses from three different perspectives.

There is, as they say, more than one way to skin a cat, but at the end of the day each way should result in the same cat’s skin. That, or provoke some interesting discussions.

The three viewpoints in our triangulation are as follows. First, a simple comparison of expectations<sup>2</sup>, as embedded in models, with actual losses, as embedded in market prices. Second, a comparison of ILS losses with the traditional catastrophe reinsurance market’s Global estimates of loss. Then, thirdly, we unpack the market estimate of loss and expose the component expectation of frequency and severity of loss. Frequency of losses being the number of losing ILS one expects to see. Severity of loss being the complement of the bond price, for those bonds which have experienced a loss.

The three views can be reconciled, but they expose some gaps in the ILS market, resulting from the “incompleteness” of the market. In more efficient or “complete” markets, reconciliation would be easier to attain. Such markets are said to be arbitrage-free. The ILS market tends to be illiquid, perhaps because it does not have a full range of instruments available in other markets. Thus, reconciliation is more difficult or less complete. But the exercise is revealing, perhaps exposing ways in which the ILS market can be improved.

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<sup>1</sup> Reconciling ILS models and ILS market expectations is a non-trivial exercise. But rather than take the reader on that repeat journey, we have assigned some reminder tables and figures of those difficulties to an appendix. A longer and more detailed description can be found in “The ILS Loss Experience – Natural Catastrophe Issues 2001-2020”, Geneva Papers 2021

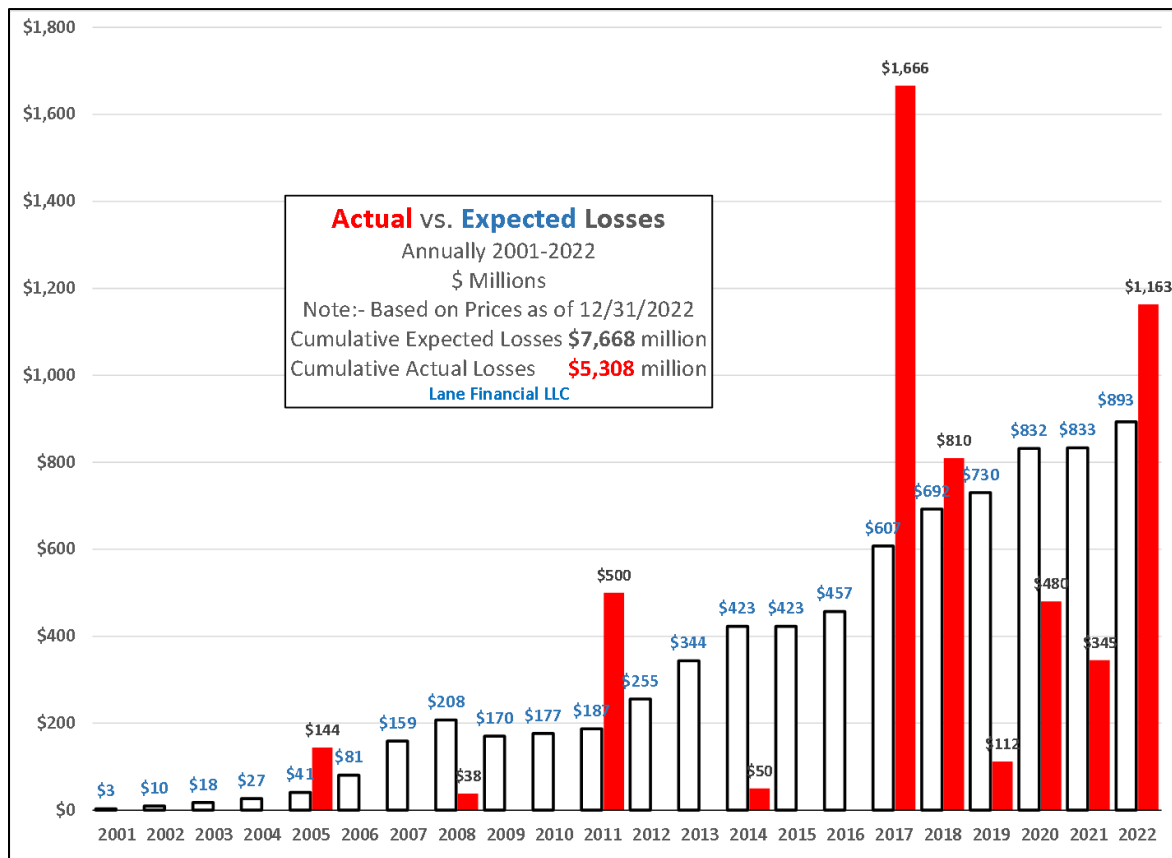
<sup>2</sup> The specific calculations of expectations are made using data from the Verisk (a.k.a. AIR Worldwide) Catastrophe Models. AIR models the vast majority of ILS and we are grateful for their data. Any errors in interpretation, however, remain the responsibility of Lane Financial LLC.

Our road map is to visit each point in the triangulation, reconcile the viewpoints and then discuss the issues and recommendations. We conclude with some of those recommendations, which if enacted will, we believe, allow the ILS market to grow and expand more dramatically.

### Expectations of Loss vs Actual Loss – 2001-2022

We begin with expected vs actual losses. In Figure 1, the expected levels of loss each year are represented by the outlined white columns. Actual losses each year are represented by the solid red columns. While we refer to them as “Actual” loss, the most recent columns, e.g., 2022, contain estimated numbers that are based on the prices that prevailed on price indication sheets on 12/31/2022.

Figure 1



As of that date, for those who went to the trouble of making the calculation, it was expected that 2022 would have had losses of \$893 million. Instead, by year end the actual losses implied by market prices were estimated to be \$1,163 million. 2022 was a relatively quiet catastrophe year for the ILS market until Hurricane Ian slammed into the Florida gulf coast on September 28<sup>th</sup>. In the period immediately after Ian, the market prices fluctuated considerably as

the market tried to assess the size of ILS insured losses<sup>3</sup>. By year end these prices had settled more and it is on these prices that estimates are made.

The 2022 estimates of loss exceeded expectations by some 30%. Looking back over the previous 22 years represented in Figure 1, losses exceeded expectations only 4 previous times – 2005 by 235%, 2011 by 167%, 2017 by 174% and 2018 by 17%. In all other years the actual loss was less than expected, with 12 of the 17 years having no ILS loss at all.

All participants in the ILS market know that losses will be lumpy, rather than the smooth exposure of losses presented by catastrophe models. Put another way, the average catastrophe year is a statistical artifact, not an exact outcome we expect to see occur very often, if ever. What Figure 1 demonstrates is just how lumpy the catastrophe market is.

Notwithstanding year to year lumpiness, we would still expect the cumulative totals of expected loss to equal or be close to accumulated actual loss over a long period of time. In the numbers contained in Figure 1, the accumulated expected losses (white columns) are \$7,668 million and the accumulated actual losses are \$5,308 million. In other words, either the models are extremely cautious, or the actual losses are underestimated. The answer, we believe and hope to show, is the latter.

There is certainly no support, in the numbers, for the criticism that the models underestimate reality. The numbers point in the other direction. Indeed, the gap to be reconciled is quite large.

## ILS Losses vs. Global Insured Catastrophe Losses

A second viewpoint in our triangulation is the size of ILS losses compared to what has happened worldwide over the same 2001-2022 period. Estimates of worldwide losses are provided to the market by Swiss Re's SIGMA publications. Swiss Re, along with others including Munich Re, Aon and Guy Carpenter, perform a very considerable service to the market in this regard and we are grateful recipients of the data. The picture of the importance of the ILS market is laid out in Figure 2.

Fig. 2 shows the size of the Global loss each year compared to the losses experienced by the ILS market. Each dot on the graph is labelled by its year of occurrence, the ILS loss and the fraction of the Global market that represents. Thus, for example, in 2022 Swiss Re's estimate of Global loss is \$125 billion.<sup>4</sup> The ILS loss, from Figure 1, is \$1,163 million, representing about 0.93% of total annual losses. The reader should comprehend that the horizontal axis of the graph is in \$ millions (to accommodate ILS dimensions). The vertical axis is in \$ billions (to accommodate Global loss dimensions).

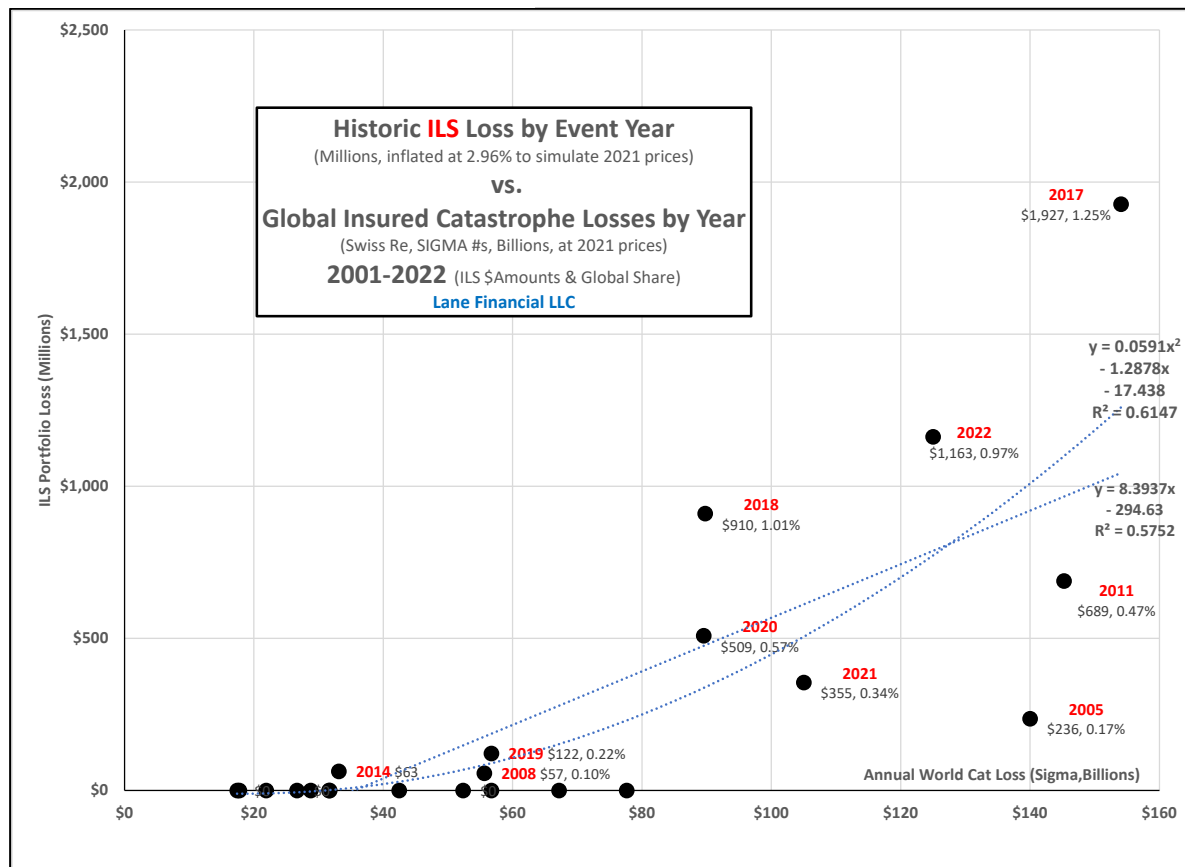
The size of the ILS market is small but clearly growing. The ILS market sometimes exaggerates its share of the Global market by comparing the capital exposed in the ILS market

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<sup>3</sup> We have already talked about these estimates in previous essays located on our website – “Ian and ILS - Two Messages from the Market”, Oct 10<sup>th</sup>, and “Volatile Valuations” Jan 10<sup>th</sup>, 2023.

<sup>4</sup> The original SIGMA estimate was \$120 billion.

Figure 2



with the capital exposed in the traditional catastrophe insurance market. But those two types of capital are different, i.e., non-leveraged vs. leveraged capital. A fairer reflection of its current importance is reflected in the loss comparison.

Digging a little deeper into the Swiss Re estimate exposes the detail that Swiss Re as of yearend 2022 assumed an estimate for Ian of between \$50 and \$65 billion, with a mean of \$57.5 billion. Now, in the ILS market there were no significant event losses prior to Hurricane Ian. So, we can deduce that the ILS estimate of loss for 2022 of \$1,163 million was all Ian. Thus, the ILS market is picking up 2.02% of the Ian loss, if SIGMA is correct in its 57.5 billion for Ian.

However, look back to 2017, which had a similar ILS year to 2022 in the sense that it was relatively quiet for ILS catastrophes until it was hit by 3 fall hurricanes – Harvey, Irma and Maria (H.I.M.). In that year, the ILS market picked up 1.25% of Global annual losses<sup>5</sup>. Also, in 2017 the market was a) smaller, \$26 billion<sup>6</sup> outstanding vs. \$32 billion in 2022, and b) was taking less risk at 2.37% EL weighted average vs. 2.75% in 2022. Adjusting the 1.25% share for

<sup>5</sup> See appended Table A3.

<sup>6</sup> Exact numbers are in appended Figure A1.

those size differences one could expect, in 2022, for the ILS market to take at least 1.42% of the Global annual loss compared to the 0.93% implied by the market.

This Global perspective, therefore, points to another possible disconnect. If the 1.42% is correct, then the annual ILS loss estimate should be \$1,778 million (\$125,000 billion X 1.42%). And, if these are all Ian losses then, at \$57.5 billion, the ILS market will be picking up 3% of Ian losses.

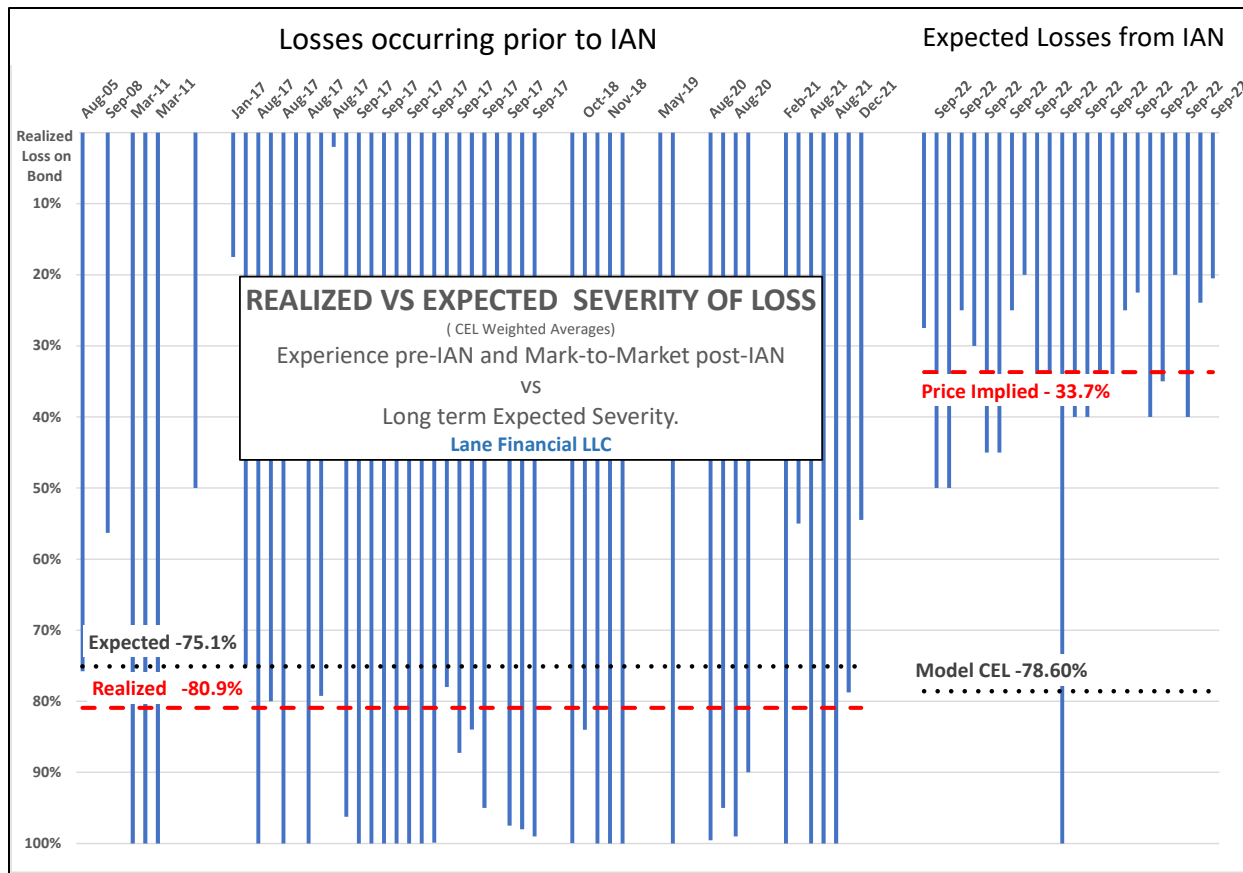
### Third viewpoint - Frequency and Severity of Loss

In the corporate bond world rating agencies keep track of the number of bonds that default, and the size of the loss given that a default has occurred. Indeed, differing emphasis on each of these is what distinguishes the Standard and Poor's from Moodys ratings.

The analog in the ILS world is frequency of loss (i.e., the number of ILS expected to have a loss and this is related to the Probability of First Dollar of Loss [PFL]) and to the expected loss conditional on there having been a loss (sometimes referred to as the Conditional Expected Loss [CEL]). Both measures combine to produce the Expected Loss [EL].

Thus, the well-known identity is  $EL = PFL * CEL$  or, equivalently,  $CEL = EL / PFL$ .

Figure 3



As an example, if the Offering Circular of an ILS gives an annual EL of 2% and a PFL of 3%, (every ILS comes with at least those two numbers) then we can predict that the CEL = 66.6% (=2%/3%). What this means is that on average, when a loss occurs on bonds with those characteristics, investors will lose 66.6% of their principal. Conversely, cedants will, on average, receive 66.6% of their limit.

We can examine how this relationship works in practice by looking at past losses and this is shown in Figure 3. The graph lays out the percentage loss of principal for all previous ILS that have had a loss. The top axis gives the date of the event (likely<sup>7</sup>) causing the loss. The vertical axis shows the loss in terms of bond price. The graph also separates the losses prior to September 2022, the month that hurricane Ian hit, and the ILS with implied losses resulting from the Ian. And, not to beat a statistical dead horse, this is the loss implied by yearend prices - 3 months after the immediately volatile period of price changes.

Figure 3 illustrates two main conclusions. First, historic loss of principal, given those bonds that had a loss, prior to Sep 2022, averaged 80.9% of Limit. This is reasonably close to the expected loss estimate of 75.1% derived from their prospectuses' modeled statistics. Second, and somewhat startlingly, the estimated losses on the deals identified at year end as having an Ian impaired loss, is 33.7% loss of principal. Using original prospectus data for EL and PFL on a weighted average basis suggests that the loss would be 78.6% of principal. See dotted and dashed lines for these figures.

There is then a large gap between where the market is pricing loss and what the frequency and severity components of the models predict. Possibly the gap will resolve itself by some of these ILS returning to par (i.e., dropped from the graph) and the remaining ILS get much worse as time goes on. Or possibly "this time is different".

We doubt it because we have seen this movie before. Notably after August and September 2017 when Hurricanes Harvey, Irma and Maria generated huge losses. After those storms and an immediate period of price volatility, yearend prices in 2017 implied a conditional loss of nearly 50%. However, over the next 18 months prices added another 20% of loss to end close to the predicted 75%<sup>8</sup>.

We are left then with this question – why are price indication sheets marking the loss of principal at 33.7% now, when we confidently expect, over time, that the loss will be closer to 78.6%? Why not immediately?

Before addressing this question, we look again at the context of 2001-2022.

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<sup>7</sup> "Likely" because "Aggregate" deals will have many loss causing events. Occurrence deals know precisely when the loss occurred.

<sup>8</sup> See appended graph Figure A3. Also, in 2017, 14 year-end bonds were identified as impaired. Only one of those returned to par. In 2022, 24 were identified as impaired. As of 3/10/2023, 3 or 4 bonds were still bouncing around the impaired cut-off price and could therefore return to par.

Putting 2022 into the full 22-year context.

Some critics of models and their analysts say they should be looking at shorter horizons, say, 10 and 5 years to examine the real value of models. This seems counter-intuitive when verifying statistical models, but it may arise from short term pain or from being a recent investor. However, it is one thing to say that the past 5 years have been horrible from a loss point of view, but that is quite different from concluding that the models are wrong.

Notwithstanding, we examine the horizon effect. Table 1 lays out the models' performance over three different horizons.

The three time periods are represented in Table 1 by three columns of data and we describe the table proceeding row by row. The first row represents the accumulated years of coverage provided by the ILS market. Thus, in the last 5 years it was 926 years compared with 2,498 years for the last 22 years. The sum of the limits, or amount of coverage, was respectively for 5 and 22 years, \$145,678 million and \$337,857 million.

Table 1

<b>Comparative ILS Performance - over time and against experience</b>				
<b>Lane Financial LLC</b>				
	Period	2001-2022	2013-2022	2018-2022
	Years	22	10	5
Coverage	Years of ILS Coverage	2,498	1,575	926
	\$s of Coverage (\$mn)	\$337,859	\$252,038	\$145,678
Frequency of Loss	Expected # of ILS with a Loss	71	52	33
	Actual Number of ILS with Loss	73	68	42
Losses	Expected % Loss on All Issues	2.27%	2.47%	2.73%
	Expected # \$ amount of ILS Loss	\$7,668	\$6,235	\$3,981
	Actual \$ amount of ILS Loss	\$5,308	\$4,626	\$2,910
Revenue (Gross)	Wtd Avg Loss-Free Income in %	6.49%	6.24%	6.22%
	\$ Loss-Free Income	\$21,916	\$15,723	\$9,058
Profit or Net Income	Expected Rate of Profit	4.22%	3.76%	3.49%
	Actual Rate of Profit	4.92%	4.40%	4.22%
	Benefit of Actual over Expected	0.70%	0.64%	0.74%
<b>HYPOTHETICAL Loss From IAN</b>				
<b>with CEL 78.6%, i.e. an additional</b>		<b>\$1,550</b>		
	Hypothetical Losses	\$6,858	\$6,176	\$4,460
	then ..Hypothetical Net Profit	4.46%	3.79%	3.16%
	Difference of Hypothetical over current EL	0.24%	0.02%	-0.33%

By combining the years of coverage with the PFL's<sup>9</sup>, we can calculate the number of deals that were expected to experience some loss. Over 22 years 71 deals were expected to print some loss, over the last 10 years the expected number was 52 and 33 for the past 5 years. In fact, what was experienced was respectively 73, 68, and 42. The long-term average is very close, while the shorter periods are more volatile. Indeed, the observation by critics that more loss deals have happened more frequently than expected is accurate.

To obtain the amount of loss that was expected over each period we record the weighted average modeled EL and multiply that by the coverage amounts to get the expected loss in dollars. In the line below that, the actual loss for each period is recorded. Clearly, in all periods, the actual recorded loss was less than the expected loss, indicating, if we have our sums correct, conservatism on the part of the models.

As a last step and cross-check, we translate this into returns<sup>10</sup> on the portfolio. In a loss free environment, we would expect to receive the premium at the stated coupon rate times the face amount of limit – the coverage. Thus, over the 22 years we would expect revenues of \$21,916 million, of which \$15,723 million and \$9,058 million were for the past 10- and 5-year periods.

Finally, we can compare the theoretical rate of profit on the coverage (i.e., what the models told us to expect) with the actual realized rate of profit. It shows, in the last line, that the market's actual performance over 22 years exceeded expectations by 70 basis points per year. If on the other hand you had entered the market just 10 years ago, the market outperformed expectations by 64 basis points per year. And if you had joined just 5 years ago on 1/1/2017 and cashed out on 12/31/2022 at secondary market levels, your actual performance would have outperformed expectations by an annual 74 basis points. You certainly would have no grounds for assuming the models had misled you. Of course, this assumes that the year-end version of ILS market prices is correct.

Remember there are two voices in your/our ear. We are listening to the model and listening to the market.

As already noted, the year-end market seems to have anomalous valuations for Ian in 2022 – see again Figure 3. Or alternatively, the market has valuations that would have to increase loss estimates if they are to be consistent with past outcomes.

Let's try a hypothetical experiment. Suppose that the CEL number for Ian, the % loss on limit, was increased from 33% of limit to 78.6% of limit, i.e., increasing \$1,163 million by an additional \$1,550 million. Or, put another way mark-to-market prices dropped by a lot over the next several months. If this were to happen, then the performance results would be as laid out in the lower *Hypothetical* panel of Table 1. Over the 22-year holding period outperformance would drop to 24 basis points per year. Over the past 10 years it would be 2 basis points per year.

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<sup>9</sup> See appended A1 for detailed PFLs.

<sup>10</sup> These are the underwriting returns and do not include the floating rate returns on collateral.



Finally, over the last 5 years the market has UNDER-performed expectations by 33 basis points per year.

Late entrants for the last 5 years will have reason to rue their unlucky timing, but seemingly will not have ammunition to say the models were wrong. But, if we are correct, they may be glad if they hypothetically got out at year-end rather than wait for prices to be lower at any later exit point.

## Summarizing

When we put all three perspectives together something is out of kilter, because a) using direct year end market prices suggests an ILS 2022 loss of \$1,163 million, b) using Global numbers suggest an ILS 2022 loss of \$1,778 million and c) using expected severity of loss on losing ILS suggest a 2022 loss of, a seemingly too high, \$2,713 million.

No doubt the real final number will be somewhere in the middle range – perhaps at the average of these three numbers \$1,885 million. If that were the case, then Figure 1 would adjust its red bar to \$1,885 million. Figure 2 would show the ILS market picking up 1.5% of Global losses (3.28% of Ian). Figure 3 would show the severity of impaired ILS at 54.3%<sup>11</sup>. Finally, Table 1 would show outperformance over the past 10 and 5 years as 35 and 24 basis points respectively.

The point is not to endorse any one of these points of view, although the best guess would probably be the average figure \$1,885 million, but to show they are different. And, when all loss uncertainty is closed, they must come together. The question arises again – why not immediately?

In an efficient market you would not have such a disconnect. Efficient markets are, as the academics say, arbitrage-free. How would the efficient market correct the disconnect? Easy. Sell the impaired ILS at the year-end price, which forces prices lower. Or, if the ILS holders will not do that, “short” the impaired ILS and buy them back a year from now. Either will accelerate the drop in price that the models tell us we are likely to experience.

But there are few instruments to implement such a short strategy. Total return swaps (often known in this context as “replicants”) can be constructed but are seldom used. Neither is there, as far as we are aware, a lending market to borrow ILS to facilitate shorting. To be sure, each has a cost to consider but that has to be weighed against potential gain, which looks considerable.

Instead of these types of solutions, common in the most efficient secondary markets in the world – the US Stock and US Treasury markets - there are calls for the market fund managers to use reinsurance to make and trade the instruments to free “trapped capital<sup>12</sup>”. We take the

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<sup>11</sup> If some of the marginally impaired ILS (those bouncing around \$80) return to par, this percentage would be bigger.

<sup>12</sup> Trapped capital is a post-maturity phenomenon when cedants hold excess precautionary funds that are ultimately releasable to the investor.

view that the opposite of trapped capital is unfairly overestimated investor profits. Arbitraging the trapped capital or inappropriate profits will release capital to cedants and investors much quicker.

## Concluding Remarks

At this point it is important to clarify our stance on the ILS market. We are not saying the market is wrong. Instead, we are saying that its structure and composition leads to inefficiencies – to incompleteness. Our analysis is based on market prices and we believe that even in an incomplete market they are the best gage of market opinion. If prices are quoted higher than some other point in the triangulation suggests, quoters may not be able to lower those quotes till they see actual transactions. Investors who might otherwise sell securities may not want to realize a loss until they must. The most justifiable time to do that is when new issues present themselves as replacements in the portfolio. So, prices move slowly, often in the second quarter when most supply is issued. Understandable but not efficient.

To make the market more efficient and thus more liquid we believe that several steps can and should be taken.

First, the market needs to be more transparent and open. This would lead to more interested investors conducting their own independent research. And, as surely as night follows day, it would lead to more innovation such as swaps, options and other derivatives. In a sense, the World Bank has already led the way on this by issuing swaps alongside their bond issues. The restriction that ILS details and the distribution of “price indication sheets” are confined to “qualified investors” may not sound like a high hurdle, but it may be for independent researchers and academics.

Second, ILS deals should ideally be listed on exchanges which have public disclosure requirements. The Cayman Islands Stock Exchange sets a good-practice standard, post issue, in this regard, but even theirs is not full disclosure. What the ILS market needs to do is emulate EDGAR, the data site for all US public securities. This site is openly available to the public. It does not seem to have inhibited the growth of the equity markets – to the contrary.

A third and final step would be to issue ILS as public securities (instead of 144A Private placements). Large and repeat issuers will have to lead the way in this regard. But the benefits to them would be access to wider pools of investor funds and liquidity and valuation of placement. The private 144A market did this for the traditional catastrophe reinsurance market some 25 years ago; public listings can stimulate the further growth of the ILS market for the next 25 years.

Who knows, in five years the ILS market could represent 5% or 10% of the traditional SIGMA sized market, instead of its present approximate 1.5% now.



## Data and Graphic Appendix

Table A1 - This contains the universe of 893 issued ILS to a condensed set of 22 annual issues with contained characteristics.

Table A2 - Each “annual” issue is run through the loss model displayed in Table A2 with two possible events with loss at the CEL level.

Figure A1 - Showing output from the expectation model – annual coverage and annual issuance.

Figure A2 - Showing the breakdown of the loss estimates shown in Figure1 broken down into a) known and closed losses, b) partial loss payments, c) market value of remaining principal when some losses have been paid, and d) pure mark-to-market loss.

Table A3 - Showing Swiss Re Global Insured Losses compared to ILS losses, on a then-contemporary and current 2021 price basis.

Figure A3 - Showing the subsequent weighted average price path of 14 ILS whose price was less than or equal to \$80 at year-end 2017 after H.I.M.

Table A4a - Showing the complete list of currently impaired securities in two parts. Part a) is the known part of the list.

Table A4b - Part b) Ditto – Showing the mark-to-market deals that are impaired.

Table A1

Characteristics of Annual ILS Nat Cat Issuance - Expected Losses etc.										
2001 - 2022; \$million										
Year	Annual Total	# of Tranches	Wghtd Avg Issue Date	Wghtd Avg Maturity Date	Premium *	Wghtd Avg PFL SSST	Wghtd Avg EL SSST	Wghtd Avg PFL WSST	Wghtd Avg EL WSST	Maturity Term Wtd Avg
2001	\$964	11	7/17/2001	12/17/2003	5.35%	1.06%	0.66%	1.06%	0.66%	2.4
2002	\$956	20	7/20/2002	4/27/2005	4.57%	1.09%	0.76%	1.09%	0.76%	2.8
2003	\$1,720	29	9/8/2003	4/25/2007	4.41%	1.11%	0.87%	1.11%	0.87%	3.6
2004	\$1,143	16	9/3/2004	11/12/2007	5.34%	1.79%	1.32%	1.79%	1.32%	3.2
2005	\$1,588	15	8/25/2005	3/2/2008	6.35%	1.94%	1.54%	1.94%	1.54%	2.5
2006	\$4,581	61	8/10/2006	2/6/2009	8.93%	2.47%	1.84%	2.77%	2.08%	2.5
2007	\$7,031	60	7/20/2007	5/29/2010	5.85%	1.90%	1.39%	2.03%	1.48%	2.9
2008	\$2,636	26	5/23/2008	3/15/2011	6.78%	2.07%	1.46%	2.26%	1.59%	2.8
2009	\$3,398	31	8/15/2009	6/1/2012	10.61%	2.46%	1.99%	2.71%	2.17%	2.8
2010	\$4,799	40	8/6/2010	8/22/2013	7.22%	2.20%	1.66%	2.40%	1.81%	3.0
2011	\$4,270	33	8/11/2011	11/26/2014	8.79%	2.75%	2.16%	2.96%	2.32%	3.3
2012	\$5,455	42	6/17/2012	9/3/2015	9.57%	2.42%	1.94%	2.62%	2.11%	3.2
2013	\$7,210	40	7/10/2013	10/20/2016	5.58%	2.13%	1.64%	2.40%	1.85%	3.3
2014	\$8,026	35	6/29/2014	1/24/2018	4.76%	2.19%	1.56%	2.41%	1.74%	3.6
2015	\$6,218	30	6/20/2015	11/26/2018	5.36%	2.99%	2.08%	3.26%	2.27%	3.4
2016	\$5,590	37	7/15/2016	3/12/2020	5.71%	3.48%	2.63%	3.86%	2.91%	3.7
2017	\$10,111	66	6/1/2017	12/10/2020	5.39%	3.48%	2.61%	3.77%	2.82%	3.5
2018	\$9,594	47	5/11/2018	12/12/2021	4.93%	2.90%	2.17%	3.08%	2.30%	3.6
2019	\$5,284	33	7/28/2019	4/14/2023	8.26%	4.16%	3.20%	4.51%	3.47%	3.7
2020	\$11,023	75	6/23/2020	8/5/2023	7.02%	3.10%	2.36%	3.38%	2.56%	3.1
2021	\$12,397	73	6/27/2021	12/17/2024	5.89%	3.12%	2.31%	3.35%	2.48%	3.5
2022**	\$8,713	63	5/24/2022	7/22/2025	7.91%	2.82%	2.22%	3.07%	2.42%	3.2
Totals	\$122,708	883								
Weighted Averages					6.54%	2.74%	2.07%	2.98%	2.24%	3.3

\* Some previous listings of this table did not convert discount issues to yield.

\*\* Through Q3 2022

Shaded area prior to introduction of WSST Statistics

Table A2

Table 4.2 Proportionate Two Step Losses		Assumptions	a) 1 Event per period b) CEL is % Loss each Event c) 2nd Loss on remaining Limit d) Only 2 loss events over term of the ILS				Amount of Loss	Probability of Loss			
ILS Term	4										
EL	<b>2.00%</b>										
Two Step	CEL										
Amount	\$100										
PFL	<b>3.00%</b>										
CEL*	<b>66.7%</b>										
							Year 1	Year 2	Year 3	Year 4	
											No Loss
											1st Loss 4th Yr
											1st Loss 3rd Yr
							1st Loss 3rd Yr; 2nd 4th Year				
							1st Loss 2nd Yr				
							1st Loss 2nd Yr; 2nd 4th year				
							1st Loss 2nd Yr; 2nd 3rd Year				
							1st loss 1st Yr				
							1st loss 1st Yr; 2nd 4th Year				
							1st loss 1st Yr:2nd 3rd Year				
							1st loss 1st Yr; 2nd 2nd Year				
			EL Yr 1	EL Yr 2	EL Yr 3	EL Yr 4	Average	1			
			Cumul EL	2.00%	3.96%	5.88%	7.76%	1.94%	Life PFL	11.47%	
			Ann ELs	2.00%	1.98%	1.96%	1.94%	1.97%	Life CEL	67.7%	
			Exp LIMIT	98.00%	96.04%	94.12%	92.24%				
			<b>NOTE</b> EL and PFL determine CEL								
			<b>*NOTE</b> This is % of LIMIT loss								

Figure A1

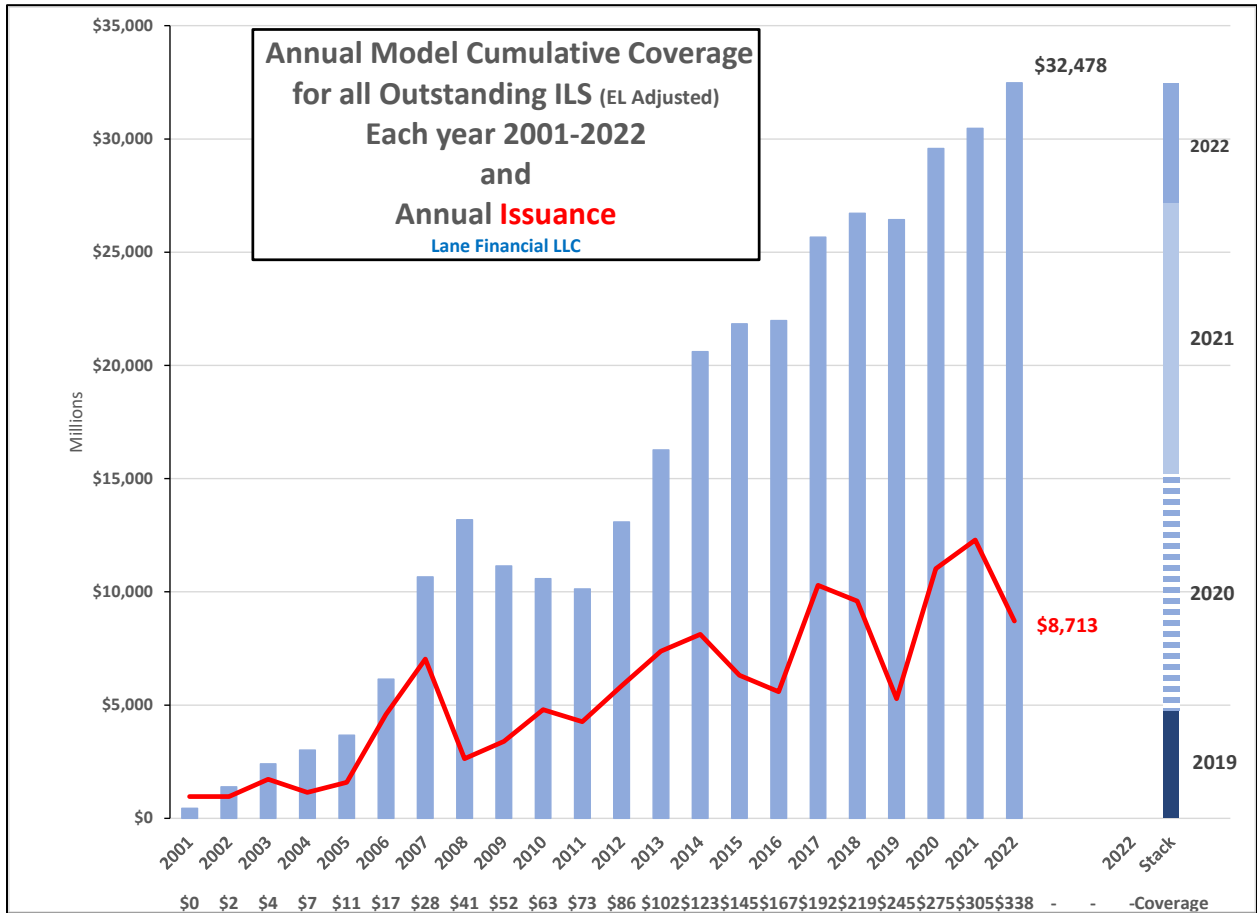


Figure A2

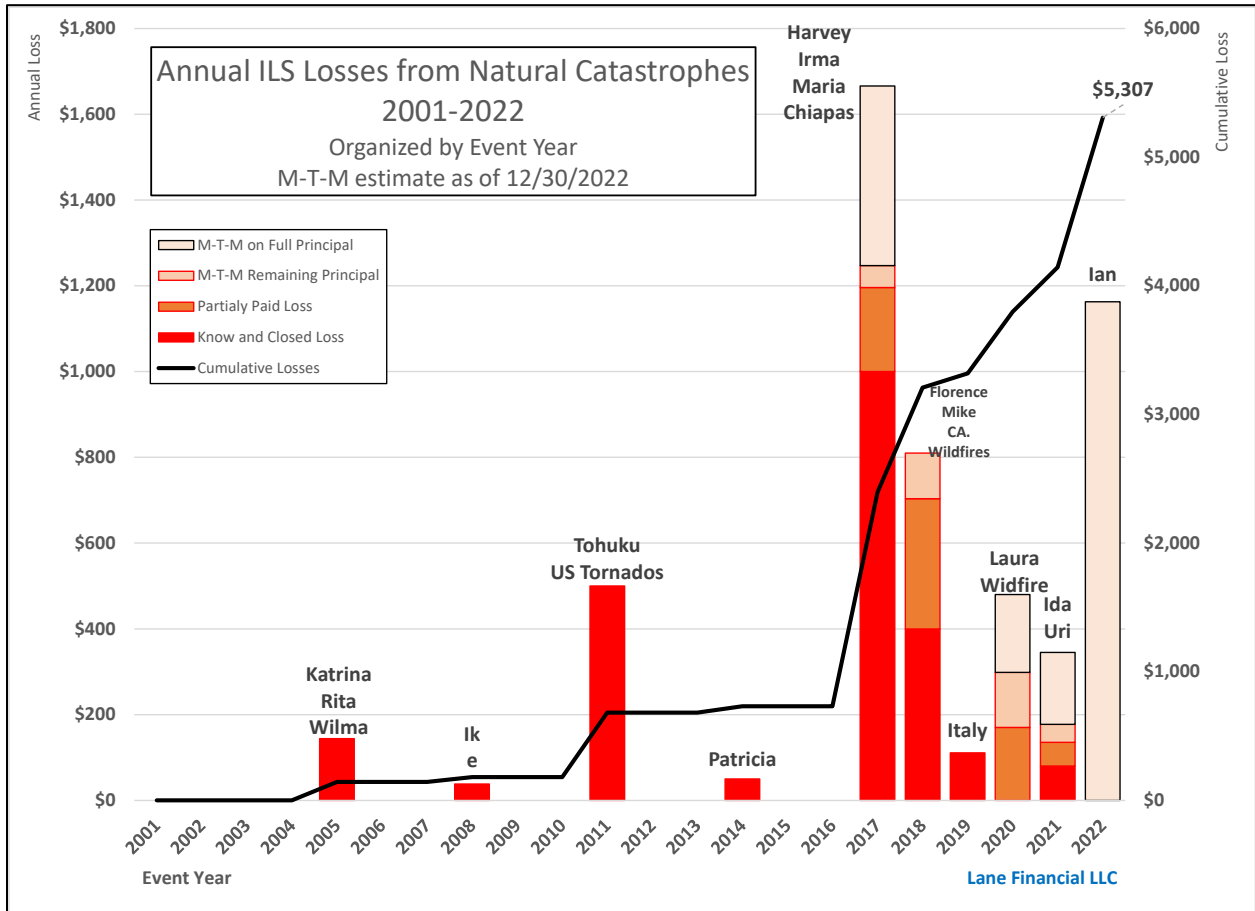




Table A3

ILS LOSSES RELATIVE TO SIGMA GLOBAL INSURED LOSSES	SIGMA	SIGMA	SIGMA	ILS \$Mn	ILS % of	ILS	ILS % of
	\$Bn	\$Bn	Implied	Actual	SIGMA	inflated	SIGMA
	Original	2021	Inflation or	Original	Original	Inflated	Inflated #s
	Report	Prices	Development	Loss	ILS Loss	at 2.96%	SIGMA #s
2001	\$10.0	\$17.4	2.80%				
2002	\$11.4	\$21.9	3.48%				
2003	\$16.2	\$26.7	2.81%				
2004	\$46.7	\$67.2	2.16%				
2005	\$78.3	\$140.0	3.70%	\$144	0.18%	\$236	0.17%
2006	\$11.8	\$17.7	2.73%				
2007	\$23.3	\$31.6	2.21%				
2008	\$44.7	\$55.6	1.70%	\$38	0.09%	\$57	0.10%
2009	\$22.4	\$28.8	2.12%				
2010	\$39.9	\$56.7	3.25%				
2011	\$110.0	\$145.2	2.81%	\$500	0.45%	\$689	0.47%
2012	\$71.3	\$77.6	0.95%				
2013	\$37.0	\$42.5	1.72%				
2014	\$27.7	\$33.1	2.56%	\$50	0.18%	\$63	0.19%
2015	\$25.0	\$31.7	4.04%				
2016	\$45.9	\$52.3	2.64%				
2017	\$133.0	\$154.0	3.74%	\$1,666	1.25%	\$1,927	1.25%
2018	\$76.0	\$89.7	5.70%	\$810	1.07%	\$910	1.01%
2019	\$53.0	\$56.7	3.42%	\$112	0.21%	\$122	0.22%
2020	\$81.0	\$89.5	10.54%	\$480	0.59%	\$509	0.57%
2021	\$111.0	\$105.0	0.00%	\$345	0.31%	\$355	0.34%
2022	\$120.0	\$120.0	0.00%	\$1,163	0.97%	\$1,163	0.97%
22 Year Totals & %Aves	\$1,196	\$1,461	2.96%	\$5,308	0.24%	\$6,033	0.24%

\* 2022 Preliminary Reports

*Italics* indicate a graphic source

Lane Financial LLC

Table 4A

History of ILS with Natural Catastrophe Losses													
Lane Financial LLC													
(Listed in Loss Event Sequence)													
Loss Issues a/o 12/30/2022 (+ Indicates Aggregate Loss)	Month of Event	Agg ILS	Issue Date	Original Maturity	Extended Maturity	Spread at issue	Actual or Estimated Loss as a % of Par	Actual or Fully Paid Loss	Partially Paid Known Losses	Market Implied Losses (bid <80)	Total Actual and Est Loss	Payments to Investors	Loss Triggering Event
<b>ILS with Natural Catastrophe Paid Loss of Principal Known and Closed</b>													
Kamp Re	Aug-05		7/28/2005	3/14/2008	12/14/2010	5.30%	76%	\$144			\$144	\$46	Katrina, Wilma
Nelson Re Class G 2008-I	Sep-08		6/6/2008	6/6/2011	6/6/2012	12.00%	56%	\$38			\$38	\$30	Ike
Muteki Ltd.	Mar-11		5/24/2008	5/24/2011		4.40%	100%	\$300			\$300		Tohoku Earthquake
Marian Re 2010-I	Mar-11	+	11/15/2010	1/8/2014		6.25%	100%	\$100			\$100		US Windstorms - Tornado Loss
Marian Re 2010-II	Mar-11	+	12/16/2010	1/8/2014		8.50%	100%	\$100			\$100		US Windstorms - Tornado Loss
MultCat Mexico 2012-1 C	Sep-14		10/5/2012	12/4/2015	3/4/2016	7.50%	50%	\$50			\$50	\$50	Patricia
Gator Re 2014-1 A	Jan-17	+	3/10/2014	1/9/2017	11/3/2017	6.50%	18%	\$35			\$35	\$165	Aggregate Loss
Residential Re 2013-2 1*	Aug-17	+	12/02/13	12/06/17	3/6/2019	20.00%	75%	\$60			\$60	\$20	Harvey, Irma, CA WF Aggregate Loss
Residential Re 2014-1 10	Aug-17	+	05/22/14	06/06/18	9/6/2020	15.00%	100%	\$80			\$80	\$20	Harvey, Irma, CA WF Aggregate Loss
Residential Re 2015-1 11	Aug-17	+	05/29/15	06/06/19	9/6/2020	6.00%	80%	\$80			\$80	\$20	Harvey, Irma, CA WF Aggregate Loss
Residential Re 2017-1 10	Aug-17	+	5/3/2017	6/6/2018		17.50%	100%	\$50			\$50	\$103	Harvey, Irma, CA WF Aggregate Loss
Atlas IX 2015-1	Aug-17	+	02/10/15	01/07/19	1/7/2021	7.00%	32%	\$48			\$48	\$15	Harvey, Irma, Maria Aggregate Loss
Loma Re 2013-1 C	Aug-17	+	12/30/13	01/08/18	1/8/2021	17.00%	77%	\$50			\$50	\$20	Harvey, Irma, Maria Aggregate Loss
Manatee Re 2016-1 C	Sep-17		3/10/2016	3/13/2019		16.25%	100%	\$20			\$20		Irma, Maria
CAR 113 Class A (Mexico)	Sep-17		8/4/2017	8/11/2020		4.50%	100%	\$150			\$150		Chiapas EQ
Citrus Re 2015-1 C	Sep-17		4/8/2015	4/9/2020		9.00%	100%	\$30			\$30		Irma
Citrus Re 2015-1 B	Sep-17		04/08/15	04/09/18	4/9/2020	6.00%	100%	\$98			\$98		Irma
Citrus Re 2016-1 D	Sep-17		02/24/16	02/25/19	2/25/2021	7.50%	78%	\$117			\$117	\$33	Irma
Citrus Re 2016-1 E	Sep-17		02/24/16	02/25/19	8/25/2019	10.50%	100%	\$100			\$100		Irma
Citrus Re 2017-2 B	Sep-17		05/11/17	03/18/20		10.75%	100%	\$35			\$35		Irma
Blue Halo 2016-1 B	Sep-17	+	06/16/16	06/21/19	6/21/2022	19.75%	87%	\$48			\$48	\$7	Matthew, Harvey, Irma, Florence
Residential Re 2018 1 11	Nov-18		05/14/18	06/06/19	6/6/2022	11.75%	100%	\$100			\$100		California Wildfires
Cal Phoenix 2018-1	Nov-18	+	08/02/18	08/13/21		7.50%	100%	200			\$200		California Wildfires
Frontline Re 2018-1 B	Nov-18		06/26/18	07/06/22		11.75%	100%	100			\$100		Michael
CAR 120	May-19		02/07/18	02/15/21		6.00%	30%	\$60			\$60	\$140	Peru EQ
Almos Re DAC A	Nov-19	+	02/06/19	02/14/22		4.50%	100%	\$51			\$51		Italy Severe Weather
Catahoola Re 2020-1 A	Aug-21		05/11/20	05/09/23		3.52%	100%	\$60			\$60		Ida
Manatee Re III 2019-1 B	Aug-21		05/30/19	06/07/22	6/8/2026	9.82%	100%	\$20			\$20		Ida
	28						79%	\$2,323			\$2,323		
<b>ILS with Natural Catastrophe Paid Loss of Principal and are still Outstanding</b>													
Casablanca Re 2017-1 C	Aug-17		06/01/17	06/04/20	6/4/2023	16.00%	96%		\$5	\$1	\$6	\$6	Harvey, Irma, CA WF Aggregate Loss
Residential Re 2016-1 10	Aug-17	+	05/11/16	06/06/20	3/6/2023	11.50%	79%		\$46	\$6	\$52	\$14	Harvey, Irma, CA WF Aggregate Loss
Espada Re 2016-1	Aug-17	+	03/01/16	06/06/20	3/6/2023	5.75%	2%		\$1	\$0	\$1	\$49	Harvey, Irma, CA WF Aggregate Loss
Citrus Re 2017-1 A	Sep-17		03/13/17	03/18/20	3/20/2023	6.00%	100%		\$113	\$12	\$125		Irma
Caelus Re V 2017-1 D	Sep-17	+	05/04/17	06/05/20	6/5/2024	9.25%	84%		\$31	\$32	\$63	\$11	Harvey, Irma, CA WF, Aggregate
Akibare Re 2016-1	Sep-18	+	03/04/16	04/07/20	4/7/2024	2.50%	100%		\$104	\$96	\$200		Jebi
Frontline Re 2018-1 A	Oct-18		6/26/2018	7/6/2026		7.00%	84%		\$200	\$10	\$210		Michael, Ian
Sanders II 2019-1 B	Aug-20	+	03/28/19	04/07/23		12.25%	100%		\$170	\$129	\$299		CA Wildfires, TS Uri, Texas Freeze
Manatee Re III 2019-1 A	Aug-21		05/30/19	06/07/22	6/8/2026	6.11%	79%		\$3	\$16	\$19		Ida
CAR 124 B	Dec-21		11/22/2019	12/2/2022	3/2/2023	5.65%	55%		\$53	\$29	\$82		Odette, Noru
	10						85%		\$725	\$328	\$1,053		

Table 4B

History of ILS with Natural Catastrophe Losses												
(Listed in Loss Event Sequence)												
Month of Event	Agg ILS	Issue Date	Original Maturity	Extended Maturity	Spread at Issue	Actual or Estimated Loss as a % of Par	Actual or Fully Paid Loss	Partially Paid Known Losses	Market Implied Losses (bid -80)	Total Actual and Est Loss	Payments to Investors	Loss Triggering Event
<b>Currently Outstanding ILS with Market Implied Natural Catastrophe Loss of Principal</b>												
Caelus Re V 2017-1 C	+	05/04/17	06/05/20	6/5/2024	6.50%	95%			\$71	\$71		Maria
Caelus Re V 2018-1 A	+	05/10/18	06/07/21	6/7/2025	3.50%	23%			\$29	\$29		Harvey, Irma, CA WF, Aggregate
Caelus Re V 2018-1 B	+	05/10/18	06/07/21	6/7/2025	4.50%	98%			\$73	\$73		Harvey, Irma, CA WF, Aggregate
Caelus Re V 2018-1 C	+	05/10/18	06/07/21	6/7/2025	7.50%	98%			\$172	\$172		Harvey, Irma, CA WF, Aggregate
Caelus Re V 2018-1 D	+	05/10/18	06/07/21	6/7/2025	10.50%	99%			\$74	\$74		Harvey, Irma, CA WF, Aggregate
Caelus Re VI 2020-2 A	+	02/27/20	07/07/23		5.50%	95%			\$71	\$71		CA WF, Aggregate
Caelus Re VI 2020-2 B	+	02/27/20	07/07/23		7.75%	99%			\$74	\$74		CA WF, Aggregate
Caelus Re VI 2020-2 C	+	02/27/20	06/07/23		12.75%	90%			\$36	\$36		CA WF, Aggregate
Sanders II 2020-1 B		03/30/20	04/07/24		12.75%	55%			\$55	\$55		TS Uri
Sanders III 2022-2 C		5/31/2022	6/7/2023		11.75%	100%			\$38	\$38		lan, WS Uri
Pelican IV Re 2021-1 A		05/06/21	05/07/24		2.25%	100%			\$75	\$75		Ida
Integrity Re 2019-1 A		5/29/2019	6/12/2023		4.75%	28%			\$14	\$14		lan
Kilimanjaro III Re 2019-1 A-1		12/12/2019	12/19/2023		15.75%	50%			\$75	\$75		lan
Kilimanjaro III Re 2019-2 A-2		12/12/2019	12/19/2024		15.75%	50%			\$75	\$75		lan
Bonanza Re 2020-1 A		2/19/2020	2/20/2024		4.75%	25%			\$50	\$50		lan
Floodsmart Re 2020-1 B		2/20/2020	2/27/2023		14.50%	30%			\$30	\$30		lan
Integrity Re II 2020-1 A		3/24/2020	4/12/2023		7.25%	45%			\$68	\$68		lan
Herbie Re 2020-2 C	+	10/29/2020	1/6/2023		16.00%	45%			\$11	\$11		lan
Bonanza Re 2020-2 A		12/21/2020	12/23/2024		4.75%	25%			\$50	\$50		lan
Floodsmart Re 2021-1 A		2/23/2021	3/1/2024		13.00%	20%			\$90	\$90		lan
Floodsmart Re 2021-1 B		2/23/2021	3/1/2024		16.75%	35%			\$44	\$44		lan
Cosaint Re 2021-1		3/26/2021	4/3/2024		9.25%	35%			\$53	\$53		lan
Pelican IV Re 2021-1 B		5/6/2021	5/7/2024		5.25%	100%			\$50	\$50		Ida
Herbie Re 2021-1 A	+	5/25/2021	6/6/2025		17.25%	40%			\$60	\$60		lan
Merna Re II 2021-2		6/24/2021	7/8/2024		5.50%	40%			\$120	\$120		lan
Claveau Re 2021-1	+	7/6/2021	7/8/2025		17.25%	35%			\$53	\$53		lan
Astro Re 2021-1		7/9/2021	7/8/2025		8.00%	35%			\$14	\$14		lan
3264 Re 2021-1	+	12/22/2021	1/8/2025		19.00%	25%			\$25	\$25		lan
Floodsmart Re 2022-1 C		2/18/2022	2/25/2025		17.75%	23%			\$6	\$6		lan
Bonanza Re 2022-1 A		3/16/2022	3/16/2025		5.75%	40%			\$54	\$54		lan
Hestia Re 2022-1		4/14/2022	4/22/2025		9.50%	35%			\$61	\$61		lan
Integrity Re 2022-1 A		5/16/2022	6/6/2025		7.00%	20%			\$15	\$15		lan
Kilimanjaro III Re 2021-2 A-2		4/13/2021	4/20/2026		11.25%	24%			\$36	\$36		lan
Matrethorn Re 2021-1 A		12/21/2021	12/8/2025		5.75%	21%			\$31	\$31		lan
Merna Re II 2022-2		6/23/2022	7/7/2025		7.50%	40%			\$80	\$80		lan
	35					44%	0.36		\$1,931	\$1,931		
Issues with actual and/or M-TM loss:	73			2.6	8.91%	62%			\$2,259	\$5,307		

Loss Payments indicated are believed accurate although specifics on loss payments - particularly interim payments - are often opaque.

\* Spread: Issued at a discount; discount amount shown.

# Interim and final payments are shown in top section, bottom section includes outstanding ILS; the latter ILS are excluded from the count in the lower section to avoid duplication.