

# After the storms Harvey, Irma and Maria: lessons learned

## Disclaimer

The communication of information in this document is not intended for distribution to, or use by, any person or entity in any jurisdiction or country where such distribution or use would be contrary to local law or regulation. In particular, the contents and / or subject matter do not constitute an offer of information, products or services to US persons or in the United States, or in any other jurisdictions where such an offer may be unlawful.

Furthermore, the attached communication does not represent a prospectus or invitation in connection with any solicitation of capital. Nor does it constitute an offer to sell securities or insurance, a solicitation of an offer to buy securities or insurance, or a distribution of securities in the United States or to a US person, or any other jurisdiction where it is contrary to local law. Such persons should inform themselves about and observe any applicable legal requirement.

This report has been produced by Lloyd's for general information purposes only. While care has been taken in gathering the data and preparing the report, Lloyd's does not make any representations or warranties as to its accuracy or completeness and expressly excludes to the maximum extent permitted by law all those that might otherwise be implied.

No responsibility or liability is accepted by the Society of Lloyd's, the Council, or any Committee or board constituted by the Society of Lloyd's or the Council or any of their respective members, officers, or advisors for any loss or damage of any nature occasioned to any person as a result of acting or refraining from acting as a result of, or in reliance on, any statement, fact, figure or expression of opinion or belief contained in this report.

The views expressed in the report are Lloyd's own. This report does not constitute advice of any kind.

© Lloyd's 2018 All rights reserved

## About Lloyd's

Lloyd's is the world's specialist insurance and reinsurance market. Under our globally trusted name, we act as the market's custodian. Backed by diverse global capital and excellent financial ratings, Lloyd's works with a global network to grow the insured world –building resilience of local communities and strengthening global economic growth.

With expertise earned over centuries, Lloyd's is the foundation of the insurance industry and the future of it. Led by expert underwriters and brokers who cover more than 200 territories, the Lloyd's market develops the essential, complex and critical insurance needed to underwrite human progress.

## Key contacts

[Albert Küller](#)

Research Manager, Class of Business

[Albert.Kuller@lloyds.com](mailto:Albert.Kuller@lloyds.com)

[Eleanor Gibson](#)

Manager, Class of Business

[Eleanor.Gibson@lloyds.com](mailto:Eleanor.Gibson@lloyds.com)

Contents

Executive summary 4

A tale of three hurricanes 9

Harvey 12

Irma 17

Maria 23

Conclusions and next steps 25

## Executive summary

### Overview

This report focuses on the insurance of hurricane-related risks. The 2017 hurricane season, aside from the record-breaking losses, generated losses of large magnitude in a number of different classes of insurance and from different types of loss events. For example, much of the damage from hurricane Harvey arose from flooding as opposed to direct wind damage; during Irma, yacht insurance losses mainly arose from small and mid-size yacht claims where hurricane contingency plans did not mitigate losses as far as hoped.

This study considers these losses – the expected and the unexpected - as well as some of the lessons learned from Harvey, Irma and Maria (HIM) and the 2017 hurricane season in general.

### Harvey: key findings

- Insured industry losses for Harvey are likely to represent a relatively small proportion of total economic losses, with a suggested range of \$25 to \$35 billion<sup>1</sup> with Lloyd's net losses being \$1.6 billion in 2017 financial results<sup>2</sup>.
- The main reason for the relatively high difference between economic and insured losses is that flooding is not typically covered as standard in normal homeowners' and renters' insurance policies. Also, catastrophe models performed less well for flood peril than for wind peril in estimating the impact from the hurricane.
- Cargo losses from Harvey are likely to be less than those caused by Superstorm Sandy and transit-related losses seem relatively limited too. This is partly because lessons were learned from Sandy and partly because damage from Harvey was typically caused by rainfall/flooding as opposed to storm surge or wind peril, which potentially causes more damage.
- Greater private sector participation in flood insurance market could potentially lead to higher resilience and increased insurance penetration, as well as create new business opportunities for insurers. However, this requires a more equitable balance between public and private markets (or private/public partnerships) and continued improvement of flood risk maps and modelling.
- Better flood maps are required. Research has shown that NFIP flood maps are sometimes out of date and occasionally politicised. This has made it hard to price flood risk and has done little to discourage planners from populating areas prone to flooding.
- Exposure managers could benefit from considering risk aggregation, not only in a single class of insurance but across multiple lines of business. They could also consider how risk aggregations can be exacerbated by policy extensions (such as business interruption) and by the rising number of non-modelled risk aggregations (such as yacht insurance and cargo).

---

<sup>1</sup> <https://www.rms.com/newsroom/press-releases/press-detail/2017-09-09/rms-estimates-hurricane-harvey-insured-losses-from-wind-storm-surge-and-inland-flood-damage-will-be-between-usd-25-and-35-billion>

<sup>2</sup> Lloyd's 2017 Annual Results, Analyst Presentation, 21 March 2018

## Irma: key findings

- Irma caused significant losses, with economic losses of \$60-95 billion, insured industry losses of \$35-55 billion<sup>3</sup> and Lloyd's net losses of \$2.1 billion in 2017 financial results<sup>4</sup>. Despite the large industry losses and the widespread destruction of property, the event footprint and Lloyd's losses were well within loss tolerance ranges for individual Lloyd's syndicates.
- Although hurricane Irma set a number of records as one of the strongest on record, it is arguably one of the better modelled and understood types of hurricanes.
- When underwriters are considering portfolio/exposure management and their catastrophe underwriting strategy, it is potentially important they consider different types of perils (even if they are weather-related) when building and maintaining a catastrophe book of business.
- Yacht underwriters could consider the variable catastrophe exposure inherent in the yacht class of business.
- Insurers could create contingency plans that suit different types of catastrophes better and could reassess what is considered a safe harbour. It could also be beneficial to consider catastrophe response in the yacht class of insurance.
- As regards, coverage expansion, prudent insurers may benefit from back-testing their assumptions around these costs when recalibrating pricing and exposure models in the light of recent loss experience from Irma.

## Maria: key findings

- Maria caused economic losses of \$30-60 billion, insured industry losses of \$15-30 billion<sup>5</sup> and Lloyd's net losses of \$1.1 billion in 2017 financial results<sup>6</sup>. However, challenges in assessing damage in sometimes remote Caribbean locations and a lack of loss adjusters mean that more uncertainty remains around the ultimate value of insurance sector losses.
- With a lack of loss adjusters on the mainland, getting adjusters to the Caribbean has proved challenging and this has slowed down recovery in some cases. Furthermore, some regions are remote and getting contractors on the ground to do loss assessments and carry out repairs has also been difficult, something made more difficult given significant damage to infrastructure (power and roads).

---

<sup>3</sup> <https://www.rms.com/newsroom/press-releases/press-detail/2017-09-20/rms-estimates-hurricane-irma-insured-losses-from-wind-storm-surge-and-inland-flood-damage-will-be-between-usd-35-and-55-billion>

<sup>4</sup> Lloyd's 2017 Annual Results, Analyst Presentation, 21 March 2018

<sup>5</sup> <https://www.rms.com/newsroom/press-releases/press-detail/2017-09-20/rms-estimates-hurricane-irma-insured-losses-from-wind-storm-surge-and-inland-flood-damage-will-be-between-usd-35-and-55-billion>

<sup>6</sup> Lloyd's 2017 Annual Results, Analyst Presentation, 21 March 2018

- Insurers have responded to this challenge. To facilitate claims payments, a number of insurers are using satellite imaging to assess damage in remote areas and areas hard to access because of the scale of destruction. In addition to this, insurers are increasingly looking to integrate social media reports (e.g. Twitter, Facebook, etc.) to augment their loss data and get up-to-date records of what is happening on the ground.
- Maria demonstrated that portfolio management should not only consider geographical diversification but also the diversification - or concentration - in the underlying type of business.
- Maria (and the other hurricanes) highlighted the requirement for a disaster/catastrophe committee which assembles as quickly as possible (perhaps as events unfold) to assess the impact on the insurer itself and its counterparties (reinsurers and other insurers), as well as to co-ordinate the recovery efforts.

## **Conclusion: lessons learned**

Overall, the 2017 hurricane season provided a number of important reminders, including:

- Each hurricane is unique. As demonstrated by Harvey, flood peril may be a significant driver of losses alongside wind and storm surge. At a time when climate change is leading to sea temperature rises this will increase this risk going forward. Non-modelled in-transit cargo risks have the potential to cause significant losses during hurricanes. While some lessons have been learned and implemented following Superstorm Sandy, (re)insurers could potentially benefit from more knowledge about cargo risk and supply chain aggregations. Implementing more sophisticated cargo aggregation management tools could potentially increase understanding of the correlation between cargo risk and other classes of insurance (and different policy terms and conditions) that are subject to natural catastrophe risks.
- Yacht hurricane contingency plans may not have been as effective as expected. Refining pre-catastrophe action plans and post-catastrophe repair and salvage operations for mid-sized and small yachts may help mitigate losses and aid recovery in future hurricane seasons. Better modelling of yacht risk may also increase insurers' understanding of risk aggregations and inform reinsurance purchasing arrangements.
- Claims inflation and loss adjustment expenses are significant issues that affect (re)insurers' claims costs. Simply having an agreement with a claims adjustment firm may not guarantee that it will be able to fulfil adjustment services in the period after a natural catastrophe (if numerous claims adjusters decide to change employers or can't access remote locations) and this can delay recovery and increase claims costs. Working with adjustment firms and contractors with track records of good service standards during past natural catastrophes may potentially mitigate some of this risk. In particular, in Florida, underwriters should take into account the impact of the loss adjustment expense cap in the Florida Hurricane Catastrophe Fund when considering pricing models for property catastrophe excess of loss for affected cedants. The simple fact of three hurricanes making landfall clearly had an impact on additional costs associated with claims, and this is a factor to consider further in underwriting and risk selection going forwards.

- Business interruption extensions, contingent business interruption and other coverage extensions were similarly affected by the additional stresses on resources caused by the cluster of storms. Again, underwriters may potentially benefit from placing such coverages under additional scrutiny in the light of the 2017 loss experience.
- The insurance cycle may be flattening, and capital availability remains strong after the hurricane season. Insurers with a clear catastrophe underwriting strategy, sophisticated modelling and capital management strategies directed in a central portfolio or risk management function may potentially be well placed to operate in this competitive marketplace.
- The 2017 hurricane losses were not extraordinary and the Lloyd's market has once again proven its resilience to wind peril and its ability to quickly settle valid claims to help communities recover. This remains the essential role of insurance.

# A tale of three hurricanes





## A tale of three hurricanes

Last year (2017) was the costliest year for US natural catastrophes on record<sup>7</sup>, due in large part to the very active North Atlantic hurricane season, which produced the likes of Harvey, Irma, and Maria (HIM).

Hurricane Harvey originated from a westward travelling tropical wave that emerged from Africa over the eastern Atlantic on 12 August. The weather system had weakened in its path through the Caribbean Sea and meteorologists expressed surprise at how quickly the hurricane re-intensified when it passed through the Gulf of Mexico<sup>8</sup>.

When Harvey made landfall between Port Aransas and Port O'Connor on 25 August, it was the first category 4 hurricane on the Saffir-Simpson wind scale to make landfall in the US since hurricane Charley in 2004<sup>9</sup>. After making landfall, Harvey slowed significantly and weakened to a tropical storm on 26 August while dumping enormous amounts of rain over Texas, which led to significant flooding. Areas of the Houston metropolitan area received up to 1.5 metres of rainfall over this period, making Harvey the wettest tropical cyclone on record in the US<sup>10</sup>. The hurricane, which then returned to the Gulf of Mexico before making landfall again in Louisiana, delivered more than 102 trillion litres of rainwater over a six-day period and is considered the second costliest US hurricane on record (behind Katrina)<sup>11</sup>.

Irma, a Cape Verde-type hurricane, formed as a tropical wave on 30 August. As it travelled westward, it intensified to a category 4 hurricane on 4 September and strengthened to category 5 on 5 September as it moved towards the north-eastern Caribbean islands<sup>12</sup>. Over the following days, it blasted through the area hitting Antigua, Barbuda St. Martin, Anguilla, St. Kitts and Nevis, the US Virgin Islands, the British Virgin Islands and Cuba, causing significant destruction and disruption.

On 10 September, Irma hit Florida Keys as a category 4 hurricane before moving through western parts of Florida, with the strongest winds recorded near Naples. As Irma settled down and moved towards Atlanta, it set a number of records including: the first time two category 4 Atlantic hurricanes had hit the US in the same hurricane season; the most powerful hurricane to ever hit the Leeward Islands; and the longest time a tropical cyclone has maintained winds that strong (298 kilometres per hour for 37 hours)<sup>13</sup>.

Hurricane Maria, the last major hurricane of the season, formed on 16 September and intensified quickly to a category 5 hurricane over 17-18 September. Between 18 and 20 September, Maria swept through several Caribbean islands including the Windward Islands, Puerto Rico and the US Virgin Islands. Maria hit Puerto Rico as a category 4 hurricane, the harshest storm to hit Puerto Rico for 85 years, causing significant damage to infrastructure and a power outage across the entire island<sup>14</sup>. Maria hit North Carolina on 26 September before weakening and heading back out to sea.

In total the 2017 hurricane season produced 17 named storms, including 10 hurricanes and the first two hurricanes to hit mainland US in 12 years (in a single season). This represented the seventh most active hurricane season on record and the most active year since 2005<sup>15</sup>. In fact,

<sup>7</sup> <https://uk.reuters.com/article/us-global-insurance-aon/2017-second-costliest-year-on-record-for-natural-disaster-insured-losses-aon-idUKKBN1FD22Y>

<sup>8</sup> <https://qz.com/1062450/hurricane-harvey-developed-so-fast-it-took-national-forecasters-by-surprise/>

<sup>9</sup> <https://edition.cnn.com/2017/05/15/us/2017-atlantic-hurricane-season-fast-facts/index.html>

<sup>10</sup> IBID.

<sup>11</sup> <http://edition.cnn.com/2017/08/27/us/harvey-impact-by-the-numbers-trnd/index.html>

<sup>12</sup> <https://edition.cnn.com/2017/05/15/us/2017-atlantic-hurricane-season-fast-facts/index.html>

<sup>13</sup> <https://qz.com/1074185/hurricane-irma-all-the-meteorological-records-the-storm-has-broken-so-far/>

<sup>14</sup> <https://edition.cnn.com/2017/05/15/us/2017-atlantic-hurricane-season-fast-facts/index.html>

<sup>15</sup> <http://www.noaa.gov/media-release/extremely-active-2017-atlantic-hurricane-season-finally-ends>

Harvey, Irma and Maria represent three out of the five costliest hurricanes in US history with a combined estimated economic cost of \$265 billion<sup>16</sup>.

---

<sup>16</sup> <https://coast.noaa.gov/states/fast-facts/hurricane-costs.html>



# Harvey

---

US landfall date: 25 August 2017

---

Main areas impacted: Texas, Louisiana

---

Max Saffir-Simpson Scale: 4

---

Rainfall: 102 trillion litres of water

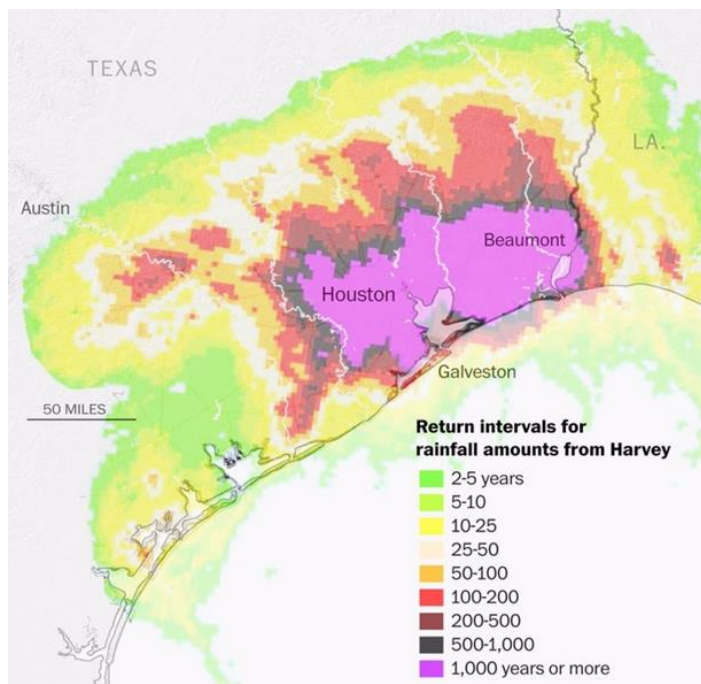
---

Economic cost: \$70 – 190 billion

## Harvey highlights flood underinsurance

According to some studies, the rainfall from hurricane Harvey in some specific areas had very high return intervals, and estimates of economic damage for the event run from \$70 billion<sup>17</sup> to as high as \$190 billion, which would make it the most costly weather disaster in US history<sup>18</sup>. RMS estimates that the median estimate of the economic inland flood loss from Harvey is \$75 billion, which represents the majority of their median estimate for total economic losses of \$80 billion<sup>19</sup>.

Picture 1: Return intervals for rainfall amounts from hurricane Harvey



Source: Cooperative Institute for Meteorological Satellite Studies

Insured industry losses for Harvey are likely to represent a relatively small proportion of total economic losses, with a suggested range of \$25 to \$35 billion<sup>20</sup> with Lloyd's net losses being \$1.6 billion in 2017 financial results<sup>21</sup>.

The main reason for the relatively high difference between economic and insured losses is that flooding is not typically covered as standard in normal homeowners' and renters' insurance policies. While flood cover is offered by the Federal Emergency Management Agency (FEMA) through their National Flood Insurance Program (NFIP), uptake of cover is typically low, despite the requirements from mortgage lenders for coverage within certain designated flood risk areas. It has been suggested that only 12%<sup>22</sup> of American homeowners carry flood insurance

<sup>17</sup> <http://www.rms.com/newsroom/press-releases/press-detail/2017-08-30/rms-models-economic-losses-from-major-hurricane-harvey-and-associated-flooding>

<sup>18</sup> <https://www.accuweather.com/en/weather-news/accuweather-predicts-hurricane-harvey-to-be-the-most-costly-natural-disaster-in-us-history/70002597>

<sup>19</sup> <http://forms2.rms.com/rs/729-DJX-565/images/NAHU2017-SeasonReview.pdf>

<sup>20</sup> <https://www.rms.com/newsroom/press-releases/press-detail/2017-09-09/rms-estimates-hurricane-harvey-insured-losses-from-wind-storm-surge-and-inland-flood-damage-will-be-between-usd-25-and-35-billion>

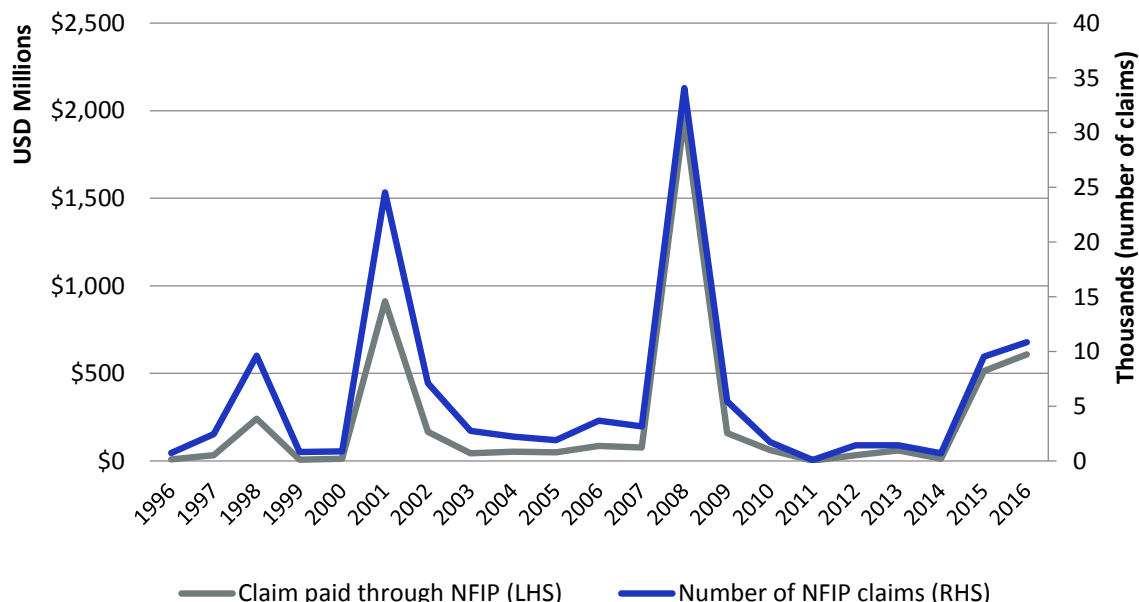
<sup>21</sup> Lloyd's 2017 Annual Results, Analyst Presentation, 21 March 2018

<sup>22</sup> <https://www.iii.org/fact-statistic/facts-statistics-flood-insurance>



and that as many as 80% of Houston homeowners lacked appropriate cover<sup>23</sup>. However, as the below chart demonstrates, Texas is prone to flooding and the NFIP pays out an average of circa \$250 million in claims in the state each year.

Chart 1: NFIP claims in Texas



Source: FEMA

Despite the low uptake of NFIP policies, more than half of the program is written in Texas, Florida and Louisiana.

### Reasons for the flood insurance gap

The low uptake of flood cover may be explained by several factors. For example, the program was about \$25 billion in debt before hurricane Harvey struck. This has meant the NFIP has been increasingly reliant on funds from US Congress, and has recently had to raise premiums. Homeowners perhaps decided against insurance on cost grounds (even if they knew the limits to conventional homeowners' and renters' insurance in the first place)<sup>24</sup>, while the limits on coverage and eligibility may also have put people off unless required for mortgage purposes. Although NFIP policies are generally considered to be priced below the actuarial rate (e.g. the cost does not reflect the full risk)<sup>25</sup>, affordability is still an issue and NFIP could be contributing to reducing rather than increasing resilience in communities over time (e.g. homeowners are not deterred from building in flood-prone areas).

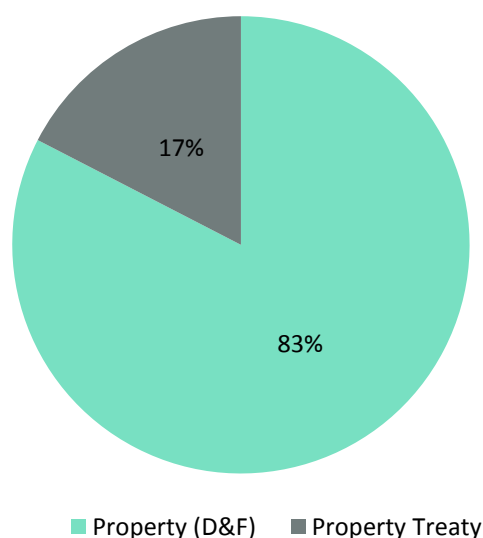
All this explains not only why economic losses are relatively high compared to the insured losses, but also the proportion of the insured losses and in the classes of business in which they fall, and why they may be different to those from more traditional hurricane losses. Insured Harvey losses, excluding the NFIP, fell predominantly in commercial insurance books, which often offer policies that include flood cover.

<sup>23</sup> [http://www.huffingtonpost.co.uk/entry/flood-insurance-could-save-homeowners-from-financial-ruin-so-why-dont-we-all-have-it\\_us\\_59aeb9ae4b0b5e531010f2e](http://www.huffingtonpost.co.uk/entry/flood-insurance-could-save-homeowners-from-financial-ruin-so-why-dont-we-all-have-it_us_59aeb9ae4b0b5e531010f2e)

<sup>24</sup> <https://www.nytimes.com/2017/04/07/business/flood-insurance-financial-tips.html>

<sup>25</sup> The Perverse Effects of Subsidized Weather insurance, Stanford Law Review, March 2016

Chart 2 : Harvey property losses



Source: Lloyd's data as at 22 February 2018

With so much of Harvey's impact falling outside the private homeowners' insurance market which the typical Lloyd's property catastrophe contract covers, the losses in property treaty are relatively low. Therefore, in the Lloyd's market, property (direct and facultative) insurance losses for Harvey make up more than 70% (83% of total property losses) of total losses followed by property treaty, energy and marine losses<sup>26</sup>.

Research has shown that NFIP flood maps are sometimes out of date and occasionally even politicised<sup>27</sup>. This has made it hard to price the risk and has encouraged individuals to populate areas prone to flooding. Rather than focus on resilience, people tend to underestimate the risk of highly adverse outcomes and thus ignore insurance<sup>28</sup>.

### The role of private insurers

Private insurers could play a larger role in the pricing of risk, and building resilience and insurance penetration, but providing broad coverage will remain difficult in competition with the NFIP. Insurers looking to provide cover for flood peril need to consider improving the accuracy of flood maps, and encouraging individuals and societies to invest in risk mitigation measures. They could help people identify risk by pricing the risk appropriately<sup>29</sup>. Lloyd's is working with the authorities in the US to increase private markets' participation in insuring flood peril. As well as developing a better-functioning flood insurance market, this could help build resilience and improve risk mitigation – by highlighting the risk of building in certain areas, for example.

Better use of models would help this process. There are at least four commercial inland flood models available for the US market, as well as models for non-property classes (such as cargo)<sup>30</sup>. Flood modelling has improved in recent years and using it will help (re)insurers understand their potential exposure to flood risk inland and in coastal areas, and help in the process of setting appropriate terms and conditions. However, for less well modelled risks and

<sup>26</sup> Lloyd's data as at 22 February 2018

<sup>27</sup> <https://riskcenter.wharton.upenn.edu/flood-insurance/>

<sup>28</sup> The Perverse Effects of Subsidized Weather insurance, Stanford Law Review, March 2016

<sup>29</sup> A Methodological Approach for Pricing Flood Insurance and Evaluating Loss Reduction Measures, Wharton University, 2012

<sup>30</sup> <https://www.insurancebusinessmag.com/us/news/catastrophe/lloyds-insurer-to-host-comparison-of-us-flood-models-83165.aspx>

perils - for example, flooding caused by extreme rain - it could be prudent for insurers to ensure that the uncertainty is included in their view of risk in their capital model when covering such exposures (and as mentioned, further model development and improved flood maps will also help improve the view of this risk).

### **Cargo losses less than those caused by Superstorm Sandy**

Cargo losses from Harvey are likely more contained than those caused by Superstorm Sandy, and transit-related losses seem relatively limited given the damage was predominantly caused by rainfall rather than storm surge and preparedness was generally better (*see below*).

However, static (in the course of transit) goods further inland may have seen more adverse outcomes and inland locations may have been less prepared for this. Damage is more widespread to goods susceptible to rain, wind and flood water contamination such as vehicles in open lots and pharmaceuticals where contamination can likely result in total loss, especially in inland locations where preparedness for this level of rainfall maybe lower<sup>31</sup>.

Lessons learned from Sandy may have helped. For example, before Harvey, cargo may not have been unstacked and thus did not suffer flood damage to the same extent (unstacking cargo would help reduce wind damage but could potentially increase damage from storm surge and flooding). It is estimated Houston port has a peak exposure of \$7.6 billion, but cargo underwriters could potentially benefit from understanding how their exposure fluctuates throughout the year.<sup>32</sup> (A previous Lloyd's report available [here](#) elaborates further on this concept.) Exposure managers could potentially benefit from considering aggregation risk, not only in single classes of insurance but across multiple lines of business.

---

<sup>31</sup> <http://www.rms.com/blog/2017/09/01/hurricane-harvey-impact-on-marine-cargo/>

<sup>32</sup> Ibid.



---

# Irma

---

First landfall date: 6 September 2017

---

Main areas impacted: Caribbean, Florida

---

Max Saffir-Simpson Scale: 5

---

Top sustained wind speed: 298 kmh

---

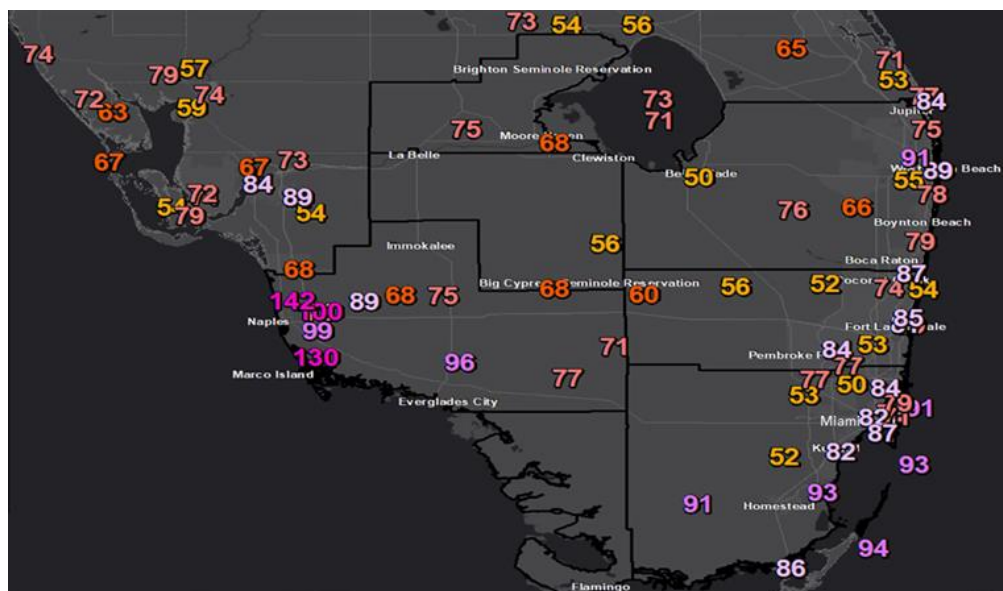
Insured cost: \$35 – 55 billion



## Irma

Although hurricane Irma set a number of records as one of the strongest on record, is arguably one of the better modelled and understood types of hurricanes. Irma caused widespread damage, especially over the north eastern Caribbean and in the Florida Keys, before sweeping over Florida with some of the strongest winds measured on the west coast (see picture below).

Picture 2: Irma's observed top Florida wind gusts (mph)



Source: US National Weather Service, Miami, 11 September 2017

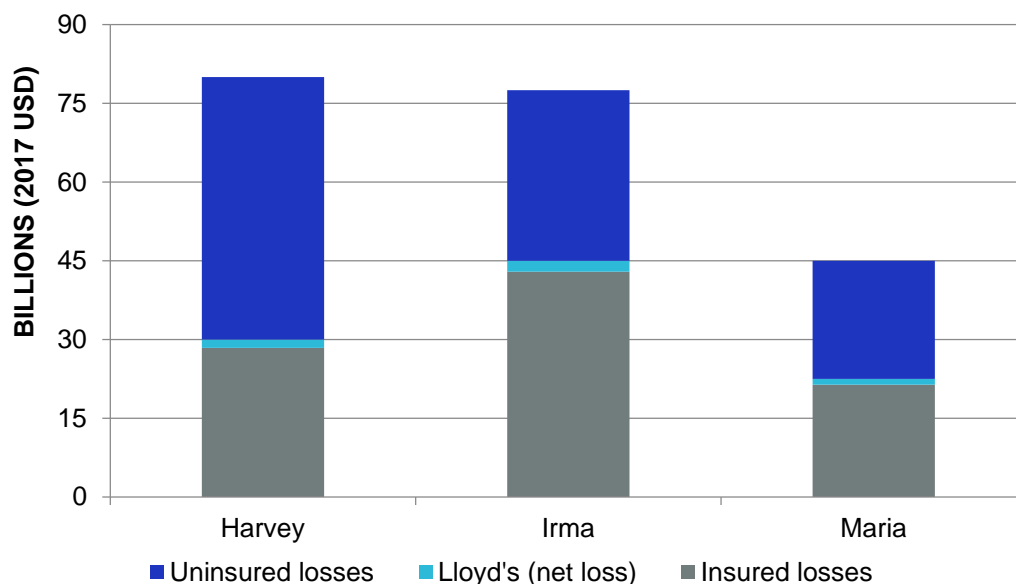
Irma also caused significant losses, with economic losses of \$60-95 billion, insured industry losses of \$35-55 billion<sup>33</sup> and Lloyd's net losses of \$2.1 billion in 2017 financial results<sup>34</sup>. Despite the large industry losses and the widespread destruction of property, the event footprint and Lloyd's losses were well within loss tolerance ranges for individual Lloyd's syndicates – but naturally, each hurricane footprint is unique. Typically Lloyd's syndicates have suggested that a loss such as Irma would be considered around a one-in-five to one-in-10 year loss in their modelling frameworks<sup>35</sup>. While there was a degree of variance around this number, hurricane Irma was considered a rather typical US windstorm with few unusual characteristics.

<sup>33</sup> <https://www.rms.com/newsroom/press-releases/press-detail/2017-09-20/rms-estimates-hurricane-irma-insured-losses-from-wind-storm-surge-and-inland-flood-damage-will-be-between-usd-35-and-55-billion>

<sup>34</sup> Lloyd's 2017 Annual Results, Analyst Presentation, 21 March 2018

<sup>35</sup> Interviews with individual Lloyd's managing agents, February & March 2018

Chart 3: Economic losses, insured losses and Lloyd's net

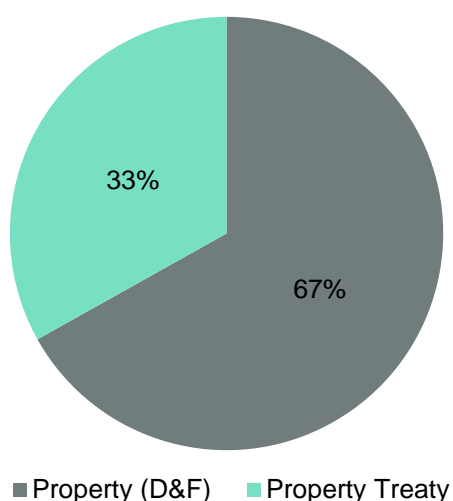


Source: Lloyd's 2017 Annual Results, Analyst Presentation, 21 March 2018, RMS (midpoint of estimate range).

Where Harvey is estimated to have the largest total economic losses, Irma's estimated insurance industry losses are significantly larger than those expected from Harvey (the Harvey estimate includes NFIP-related losses). This can be explained by the lower penetration of cover for the flood peril relating to hurricane Harvey.

Lloyd's incurred losses as a percentage of industry losses were around 5% for each hurricane, reflecting the diverse spread of exposure of Lloyd's in US and Caribbean markets. Thus, Irma as a more conventional hurricane saw a more conventional spread of losses across different lines of business. For example, compared to Harvey, a significantly larger proportion of the property losses incurred from Irma were from treaty reinsurance.

Chart 4: Irma property losses



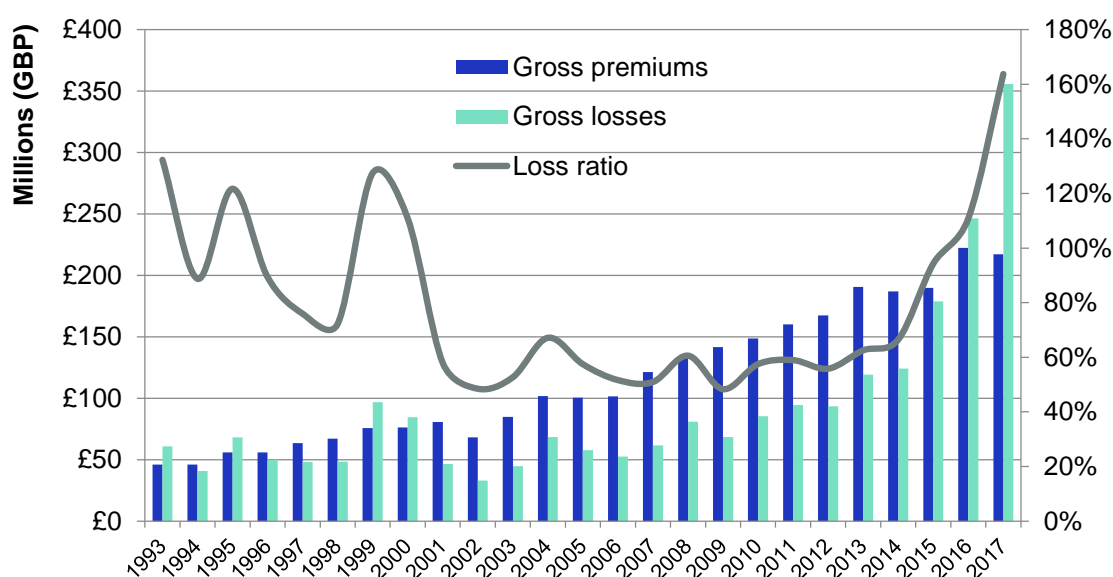
Source: Lloyd's data as at 22 February 2018

It well known that different types of catastrophes can have different properties and cause losses of varying magnitude on insured lines of business (e.g. certain areas in Texas are prone to flooding from precipitation). However, when underwriters are considering portfolio/exposure management and their catastrophe underwriting strategies, it may be important they consider different types of perils (even if they both are weather-related) when constructing and maintaining a catastrophe book of business. Considering the uncertainty around accuracy of flood peril in hurricane catastrophe models may also be beneficial.

### Yacht losses

The third most significant loss from hurricane Irma was in the yacht book of business. The yacht class does exhibit a degree of volatility, as yachts can be concentrated in a single area when a catastrophe strikes.

Chart 5: Yacht losses over time



Source: Lloyd's data returns, premiums and losses (data contains forecasts).

Yacht lines of insurance have seen significant growth in premiums over the past 25 years. In the last 10 years, loss ratios have been growing steadily, suggesting that the market for this class of business had softened materially in the period leading up to the 2017 hurricane season. Irma taught insurers a few lessons in respect of yacht catastrophe exposure.

### Lessons learned in yacht insurance

Super/mega yachts are generally crewed and can move out of danger, but smaller yachts do not always have this option. As catastrophe exposure varies across different segments of the yacht insurance market, it could be beneficial to consider this in the underwriting process. Furthermore, losses so far seem not to be attributed to non-compliance with hurricane contingency plans. For example, Irma hit Miami with higher than anticipated storm surges, which meant yachts suffered damage after mooring failures in supposedly safe marinas. Yachts that were moved onshore in advance of the storm also suffered damage<sup>36</sup>. To reduce these types of losses, it might be beneficial to design contingency plans (as part of insurance

<sup>36</sup> <http://www.kennedyslaw.com/article/five-lessons-that-2017s-hurricane-season-has-taught-the-yacht-claims-market/>

terms and conditions) that suit different types of catastrophes better and reassess what is considered a safe harbour. Post Irma, it was difficult to mobilise an appropriate repair and salvage effort due to lack of skilled tradespeople and the difficulty in accessing certain areas of the Caribbean<sup>37</sup>. It could also be beneficial, therefore, to consider catastrophe response in the yacht class of insurance as the lack of repair facilities has in some cases been shown to increase costs to such an extent that some economically repairable property had to be deemed a total loss.

### **Claims inflation post Irma**

Claims inflation (including demand surge and increased costs from assignment of benefits in Florida) and loss adjustment expense increases are regularly seen after large catastrophes where a shortage of materials and professionals available to assess losses drive up the cost of the claims. As demand surges, loss adjusters employed by a specific firm may be tempted to move employers to increase their salary. Independent adjusters might increase their rates when demand significantly outstrips supply. There is some evidence of all these happening in the aftermath of hurricane Irma.

Prudent insurers may potentially benefit from back-testing their assumptions around these costs when recalibrating pricing and exposure models in the light of recent loss experience. Furthermore, it has been suggested that long-standing relationships with contractors with a track record of retaining staff during previous catastrophes means this could be an additional underwriting consideration when choosing cedants with who to do business, as they may be better at meeting agreed service levels during major catastrophes<sup>38</sup>.

In Florida, there is an additional consideration when writing property catastrophe excess of loss business. Cedants who also buy protection from the Florida Hurricane Catastrophe Fund (FHCF) will typically have included in their ultimate net losses for their private market cover any loss adjustment expense (LAE) not covered by the FHCF policies. In addition, the FHCF only allows 5% for LAE. With LAE anecdotally running at double digits after Irma, this clearly has an additional impact for both the cedants and their reinsurers.

Also, there has been evidence of an increasing number of different types of business interruption extensions impacting losses in the wake of the 2017 hurricane season.

### **Expansion of coverage**

Market conditions in recent years have seen numerous areas of coverage expansion and the area of business interruption/consequential loss insurance has been no exception. Different types of extensions have been developed, ranging from the likes of runway blockage to the replacement of beach fronts damaged following weather events.

However, to what extent an underwriter can reasonably and accurately come up with the likely frequency and severity of a beachfront being washed away at any point along the world's coastal regions, and how this impacts the overall riskiness of a portfolio, could prove beneficial for the prudent underwriter to consider. Underwriters could benefit from offering a clear rationale behind the pricing methodology set for any extensions they consider sufficiently material to warrant discrete terms, based around either the nature of the extension or the limit provided. Furthermore, it could be beneficial to make sure exposures for any extensions are captured, particularly if they are additional and not inclusive to the main item limit. Where appropriate, consideration should potentially be made of the impact these may have on the selected line sizes written<sup>39</sup>. It may also prove beneficial to consider how deductibles

---

<sup>37</sup> Ibid.

<sup>38</sup> Interviews with individual Lloyd's managing agents, February & March 2018

<sup>39</sup> Interviews with individual Lloyd's managing agents, February & March 2018

(especially for sub-limited extensions) are responding. It could be useful for underwriters to clearly define whether deductible percentages should be counted against the value of the damaged property or total insured values.



# Maria

---

First landfall date: 18 September 2017

---

Main areas impacted: Caribbean

---

Second hurricane to make landfall in  
Leeward Islands in two weeks

---

Max Saffir-Simpson Scale: 5

---

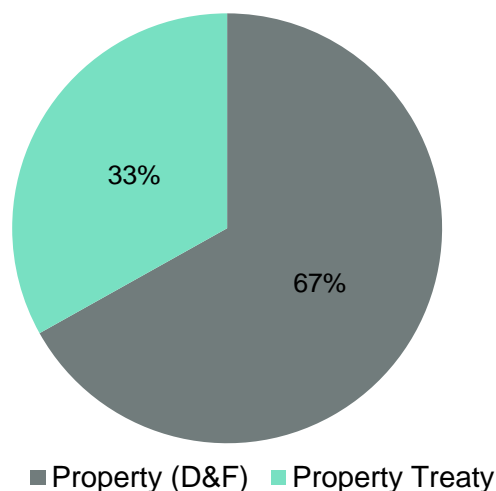
Insured cost: \$15 – 30 Billion

## Maria

After Irma, Maria was the second hurricane to hit the Caribbean islands in relatively short succession. A number of small islands were hit hard, but a significant amount of insured losses are stemming from the US territory of Puerto Rico. Losses to Caribbean islands shortly after a major hurricane in mainland US are causing a number of challenges for insurers.

With a lack of loss adjusters on the mainland, getting adjusters to the Caribbean has proved challenging and this has in some cases slowed down recovery. Furthermore, some regions are remote and getting contractors on the ground to do loss assessments and carry out repairs has also been difficult. At the time of writing, seven months after the hurricane, power is not fully restored on Puerto Rico as well as on a number of other islands. To facilitate claims payments, some insurers are using satellite imaging to assess damage in remote areas and areas hard to access because of the scale of destruction. This can potentially prove beneficial, as rapid claims settlement can reduce recovery time. In addition to this, insurers are increasingly looking to integrate social media reports (e.g. Twitter, Facebook, etc.) to augment their loss data and get up-to-date records of what is happening on the ground. Often in major areas, data (imaging and descriptions) provided by local people in situ can help provide a fuller picture of the destruction and help validate other data sources<sup>40</sup>. Maria also highlighted the lack of resilience in certain Caribbean locations (as did the other hurricanes in certain other territories). Lloyd's and the Centre for Global Disaster Protection recently released a paper discussing finance for innovative resilience which can be found [here](#).

Chart 6: Maria property losses



Source: Lloyd's data as at 22 February 2018

Coincidentally, the split between property D&F and property treaty is similar to that of hurricane Irma. However, given the potential remote location of some of the claims, these proportions may change over time. Within the property D&F claims are a higher proportion of facultative claims, including larger hotel chains in the Caribbean. This is different from the make-up of the Irma claims, in which binders are playing a more significant part because the structure of catastrophe (re)insurance is different in Florida compared with the Caribbean. Reported Lloyd's

<sup>40</sup> Ibid.

losses from Maria are circa £1.1 billion<sup>41</sup>, currently lower than that of the other hurricanes. The different make-up and size of the losses demonstrates the value of expert portfolio management in putting together a well-balanced book of business, and shows that just diversifying between the US mainland and the Caribbean may not yield the desired level of risk diversification. As demonstrated by the 2017 hurricane season, multiple hurricanes have the potential to strike large parts of the Caribbean and the US mainland in a single season which means the geographical spread of risk in this area may not yield desired diversification benefits (*see below*).

### **Lessons learned**

The events of 2017 demonstrate that portfolio management should not only consider geographical diversification, but also the diversification - or concentration - in the underlying type of business. For example, insurers may see the losses arising from yacht and cargo accounts in 2017, and reconsider their views on the diversification benefits and catastrophe loads required when adding such business to a more obviously catastrophe-prone account<sup>42</sup>.

In terms of catastrophe response, these events have highlighted the requirement for a disaster/catastrophe committee which assembles as quickly as possible (perhaps as events unfold) to assess the impact on the insurer itself and its counterparties (reinsurers and other insurers), as well as to co-ordinate recovery efforts. Ensuring rapid claims settlement could reduce overall losses, and help insureds restore their lives and businesses with the minimum level of disruption. This includes efficient claims operations and access to local contractors (e.g. claims adjusters, etc.) as appropriate<sup>43</sup>. Managing counterparties, their financial stability and receivables (e.g. reinsurance recoveries) could also have a central role to play in a catastrophe committee.

Ultimately, each natural catastrophe is unique and as the 2017 hurricane season showed, even what some may consider the relatively well-modelled peril of US wind can result in events which cause very different insurance and economic losses. Despite the magnitude of losses being within expectations, it may prove beneficial for insurers to use the data from the 2017 hurricanes to validate current modelling frameworks and focus on some of the potential outliers (e.g. increase understanding of flood peril). Also, as mentioned, there is always room to improve catastrophe response. Settling valid claims as quickly as possible will help affected individuals rebuild their lives and communities, and improve the reputation of the valuable services the insurance sector provides.

---

<sup>41</sup> Lloyd's 2017 Annual Results, Analyst Presentation, 21 March 2018

<sup>42</sup> Interviews with individual Lloyd's managing agents, February & March 2018

<sup>43</sup> Association of British Insurers, Responding to major floods



---

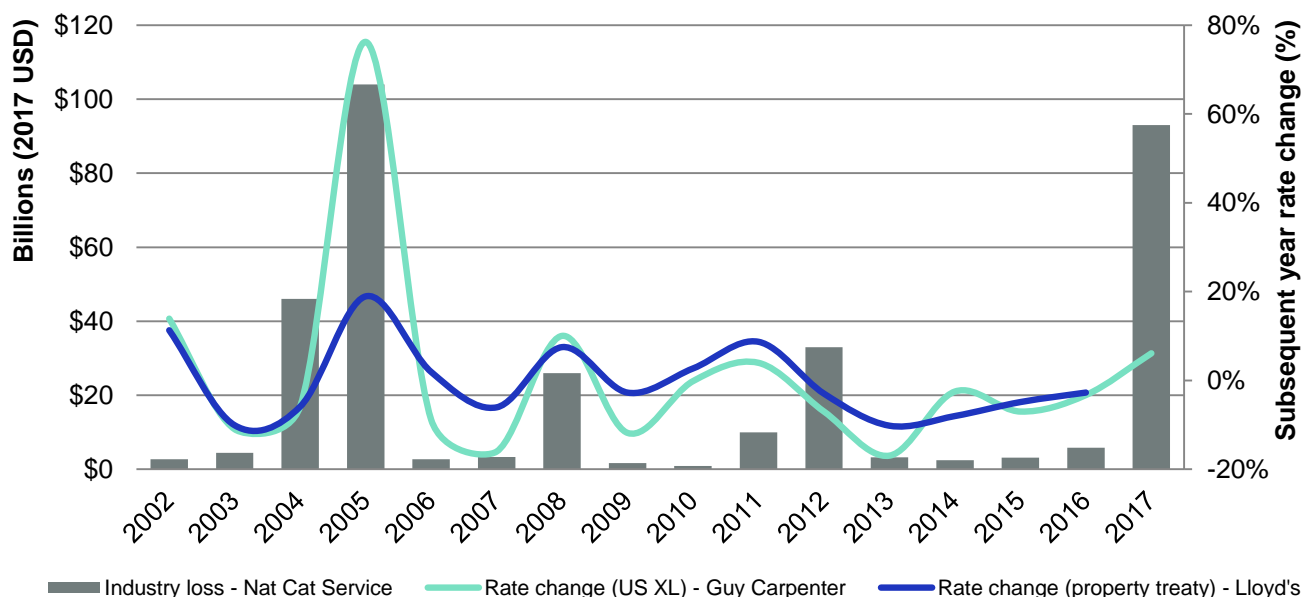
# Summary and next steps

## Conclusion and next steps

Historically, after a major catastrophe, (re)insurance prices would rise as the affected markets sought payback for the losses they had incurred. However, the chart below suggests this payback has reduced over time. Part of this can likely be attributed to better analytics and more advanced modelling of wind peril, meaning there is potentially less uncertainty around its technical price. This is supported by the fact hurricane Irma was a relatively well-modelled event; while anecdotal evidence suggests that the change in pricing has been larger for loss-hit Caribbean and Texan accounts<sup>44</sup>.

The other factor likely to dampen the insurance cycle is the current economic conditions, which have led to an increase in available reinsurance and retrocession (reinsurance of reinsurance) capital. This relative abundance of capital means it was relatively easy for (re)insurers to raise new capital in the wake of the hurricane season, and that there is generally more (re)insurance capacity available, which could potentially serve to dampen rate changes in the renewal season.

**Chart 7: Insurance industry wind peril losses and subsequent year catastrophe excess of loss rate change**



Source: Lloyd's Statistics (risk adjusted rate change, 2017), Guy Carpenter (2018 data point is global XL), Munich Re Nat Cat Service.

Regardless, early indications suggest an uptick in excess of loss reinsurance pricing of just more than 5% (with large variance across regions and accounts)<sup>45</sup>. However, ultimately, the 2017 hurricane season provides further evidence that pricing in the (re)insurance market, particularly as observed in property catastrophe excess of loss, is less likely to swing between hard and soft markets in the future than it has done previously. However, there are of course limits in making comparisons to past market conditions and the impact of the series of hurricanes in 2017. For example, in 2005, Katrina made up the majority of losses whereas in the 2017 hurricane season losses are more evenly spread across Harvey, Irma and Maria and impacted different (re)insurers quite differently.

<sup>44</sup> Interviews with individual Lloyd's managing agents, February & March 2018

<sup>45</sup> Guy Carpenter data

In this new reality, strong portfolio management, a sensible catastrophe underwriting philosophy and strategy, and sophisticated modelling frameworks are increasingly important if insurers are to remain competitive in catastrophe-affected classes of insurance. Reinsurance and retrocessional arrangements, including the efficient use of non-traditional sources of capital (such as catastrophe bonds and insurance-linked warranties/parametric (re)insurance arrangements, sidecars and other SPV structures), are also important. Insurers that master the majority of these elements, and that offer a first-rate post-loss and claims service could potentially find themselves with an advantage in an increasingly sophisticated and competitive market-place. Currently, a large number of insurers are bringing some of these strands together (investment, capital, underwriting and risk management) in analytics and portfolio management and/or chief risk officer departments. Lloyd's has previously written about catastrophe excess of loss underwriting strategy [here](#).

Overall, the 2017 hurricane season provided a number of important reminders, including:

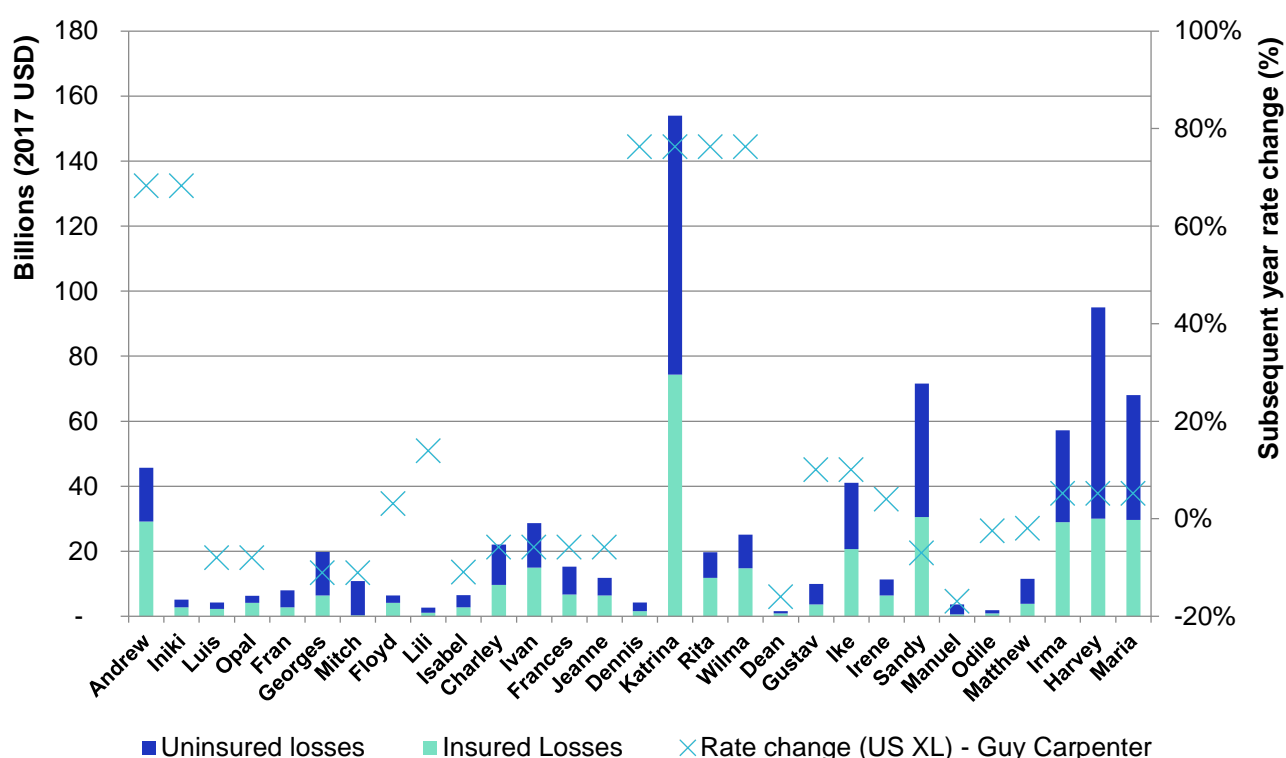
- Each hurricane is unique. As demonstrated by Harvey, flood peril may be a significant driver of losses alongside wind and storm surge. At a time when climate change contributes to sea level rises, this risk will increase. More private sector participation in flood insurance market can potentially lead to higher resilience, increased insurance penetration and new business opportunities for insurers. However, this requires a more equitable balance between public and private markets (or private/public partnerships) and continued improvement of flood risk.
- Non-modelled in-transit cargo risks have the potential to suffer significant losses from hurricanes. Where some lessons have been learned and implemented following Superstorm Sandy, (re)insurers could potentially stand to benefit from an increased understanding of cargo risk and supply chain aggregations. Implementing more sophisticated cargo aggregation management tools could potentially increase understanding of the correlation between cargo risk and other classes of insurance (and different policy terms and conditions) that are subject to natural catastrophe risks.
- Yacht hurricane contingency plans may not have been as efficient as expected. Refining pre-catastrophe action plans, and post-catastrophe repair and salvage operations for mid-sized and small yachts, may help mitigate losses and aid recovery in future hurricane seasons. Better modelling of yacht risk may also increase insurers' understanding of risk aggregations and aid reinsurance purchasing arrangements.
- Claims inflation and loss-adjustment expenses are significant issues that affect (re)insurers' claims costs. Simply having an agreement with a claims adjustment firm may not guarantee it will be able to fulfil adjustment services in the period after a natural catastrophe (if numerous claims adjusters decide to change employers or simply can't access remote locations), and this can delay recovery and increase claims cost. Working with adjustment firms and contractors with track records of good service standards during past natural catastrophes may potentially mitigate some of this risk. In particular, in Florida, underwriters should take into account the impact of the LAE cap in the FHCF when considering pricing models for property catastrophe excess of loss for affected cedants. The simple fact of three hurricanes making landfall clearly had an impact on additional costs associated with claims and this is a factor to consider further in pricing and risk selection going forwards.
- Business interruption, contingent business interruption and other coverage extensions were similarly affected by the additional stresses on resources caused by the cluster of storms.



Again, underwriters may potentially benefit from placing such coverages under additional scrutiny in the light of their 2017 loss experience.

- The insurance cycle may be flattening and capital availability remains strong after the hurricane season. Insurers with a clear catastrophe underwriting strategy, sophisticated modelling and capital management strategies directed in a central portfolio or risk management function may potentially be well placed to operate in a competitive marketplace.
- Ultimately, natural catastrophes are expected to happen on a periodic basis. The 2017 hurricane season may seem severe but in reality it was not a statistical outlier. The below chart shows losses and subsequent year rate change for selected named windstorms in 2017 US dollars. The facts show that 2017 saw a more active hurricane season compared to the average over this period of time; in fact, many underwriters may not have experienced a year with notable US wind losses in their careers. It does also show us that the losses were not extraordinary and that the Lloyd's market once again has proven its resilience to the wind peril and its very strong position to quickly settle valid claims to help communities recover, which remains the essence of insurance.

**Chart 8: Industry losses and subsequent year catastrophe excess of loss rate change for selected windstorms**



Source: Lloyds, Guy Carpenter (2018 data point is global catastrophe XL), Munich Re Nat Cat Service

### Looking ahead to the 2018 hurricane season

What lies ahead for this year's hurricane season? Forecasting hurricane activity in the Atlantic basin is notoriously difficult - most forecasts failed to accurately predict the intensity of the 2017 hurricane season<sup>46</sup>.

Given the large number of factors influencing the formation of hurricanes, it is hard to accurately predict the number of major hurricanes in a single year, let alone predict whether a hurricane will actually make landfall once it has formed. That said, forecasters point towards slightly above average activity in the 2018 hurricane season that runs from 1 June to 30 November. Ultimately, given the tenuous link between these forecasts and insured losses, they have limited application in underwriting. Overleaf is a summary of major forecasts for the upcoming hurricane season.

---

<sup>46</sup> RMS – Review of 2017 Hurricane Season, March 2018

### Appendix: Early views on 2018 North Atlantic hurricane season (June 1<sup>st</sup> to 30<sup>th</sup> November 2018)

| Source                              | Date       | Named storms | Hurricanes | Major hurricanes | Landfall events                             | Overall comments   |
|-------------------------------------|------------|--------------|------------|------------------|---|--|
| <b>Long term averages 1950-2016</b> | -          | 11.6         | 6.2        | 2.5              | -   | -  |
| <b>TSR - Early</b>                  | 7/12/2017  | 15           | 7          | 3                | No Comment                                  | Slightly above average seasonal activity anticipated   |
| <b>AON TSR- April</b>               | 05/04/2018 | 12           | 6          | 2                | No Comment                                  | Predicting lower than normal activity in 2018 season   |
| <b>CSU - Early</b>                  | 26/12/2017 |              |            |                  | No Comment                                  | Above active season early estimation pending April Statement   |
| <b>CSU - April</b>                  | 05/04/2018 | 14           | 7          | 3                | 63% chance compared to 52% historic average | Anticipation of a slightly above average probability for major hurricanes making landfall along the continental US coastline and in the Caribbean. 39% chance of major hurricane hitting US East Coast including Florida against long term 20 <sup>th</sup> Century average of 31%. US Gulf Coast Florida to Texas view 2018 at 38% probability compared to 30% historical average |
| <b>NOAA - May</b>                   | 24/5/2018  | 10-16        | 5-9        | 1-4              | No Comment                                  | 75-percent chance that the 2018 Atlantic hurricane season will be near- or above-normal  |
| <b>Accu Weather</b>                 | 02/04/2018 | 12-15        | 6-8        | 3-5              | 3-4   | Normal to slightly above normal seasonal activity anticipated  |
| <b>Weatherbell Analytics</b>        | 14/3/2018  | 11-15        | 5-7        | 1-3              | No Comment                                  | Overall season likely to be closer to normal activity levels anticipated   |

Sources (as at 24 May 2018):

<http://www.noaa.gov/media-release/forecasters-predict-near-or-above-normal-2018-atlantic-hurricane-season>

<http://www.tropicalstormrisk.com/>

<https://www.accuweather.com/en/weather-news/2018-atlantic-hurricane-outlook-4-us-impacts-predicted-amid-another-active-season/70004533>

<https://www.weatherbell.com/hurricane-prelim>

<https://www.nhc.noaa.gov/data/tcr/index.php?season=2018&basin=atl>

<https://www.mypalmbeachpost.com/weather/hurricanes/this-forecast-predicts-active-2018-hurricane-season/DYfGAgUmeH6aljmhg1UyAl/>