

**Today's Natural
Catastrophe Portfolio:
A Balancing Act**

Introduction

This report examines opposing factors currently affecting natural catastrophe (nat-cat) portfolios. Favourable pricing tailwinds and a change in the El Niño Southern Oscillation (ENSO) cycle are currently positioned against headwinds, including higher risk transfer costs and a return to an inflationary world. Higher retentions mean cedents bear, on average, a greater risk burden.

At Howden Tiger, we think current tailwinds seem more favoured to win this tug-of-war, on balance”



Past experience suggests the transition away from a multiyear La Niña cycle will likely, overall, be favourable from a global insured loss perspective. Our analysis in this report shows that tailwinds are more likely to outweigh market headwinds, particularly for reinsurers, who may see a material boost to profitability. However, the effects of climate change and increased volatility remain to be quantified, thereby moderating confidence levels.

HEADWINDS

- ▼ Inflationary pressures on ultimate claims
- ▼ Increases in aggregate and per-event retentions
- ▼ Uncertain effects of climate change on loss volatility

TAILWINDS

- ▲ The potential mitigation of recent and current loss trends due to shifts in the ENSO cycle from La Niña to El Niño
- ▲ The highest risk-adjusted property-catastrophe (re)insurance pricing in a generation
- ▲ Pricing keeping pace with, and sometimes even outpacing inflation, may enable carriers to exceed costs of capital



Hard market and the ENSO cycle: a 'goldilocks' combination?

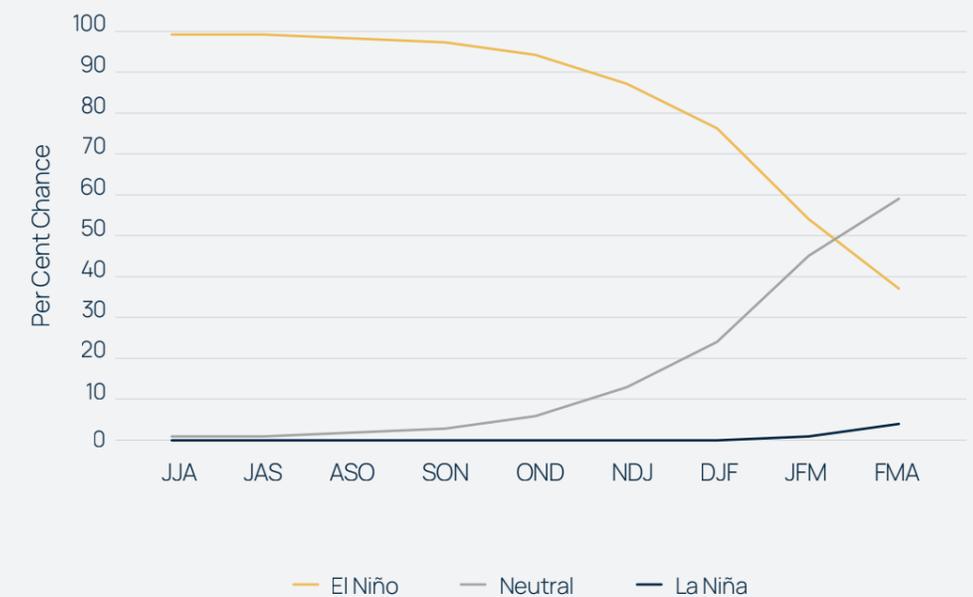
1.1 A shift to El Niño: history points to reduced hurricane frequency

El Niño Southern Oscillation (ENSO) cycles can profoundly impact the prevalence, location and strength of North Atlantic hurricanes as well as Southern Hemisphere cyclones and inland floods. During the second quarter of 2023, the cycle transitioned to El Niño, replacing the previous twenty-four months of La Niña, which ended in March.¹

El Niño episodes are usually associated with a southerly shift in the jet stream, creating cooler weather, particularly in the south-eastern United States, as well as wetter conditions on the Gulf Coast. If 2023-2024 follows a typical El Niño year, a reduced hurricane frequency impact is possible, with reduced loss activity resulting. However, as has been well reported, this season is complicated by the opposing force of significantly above average sea surface temperatures. Hurricane Idalia, along with the active 2023 Hurricane season thus far, underscores this uncertainty.

There is currently a greater than 60 per cent chance of El Niño conditions persisting in the northern hemisphere throughout the winter of 2023-24, according to official ENSO forecast probabilities (Figure 1).

Figure 1: Three-month interval NOAA ENSO probabilities: June 2023 onwards* | Source: Columbia Climate School



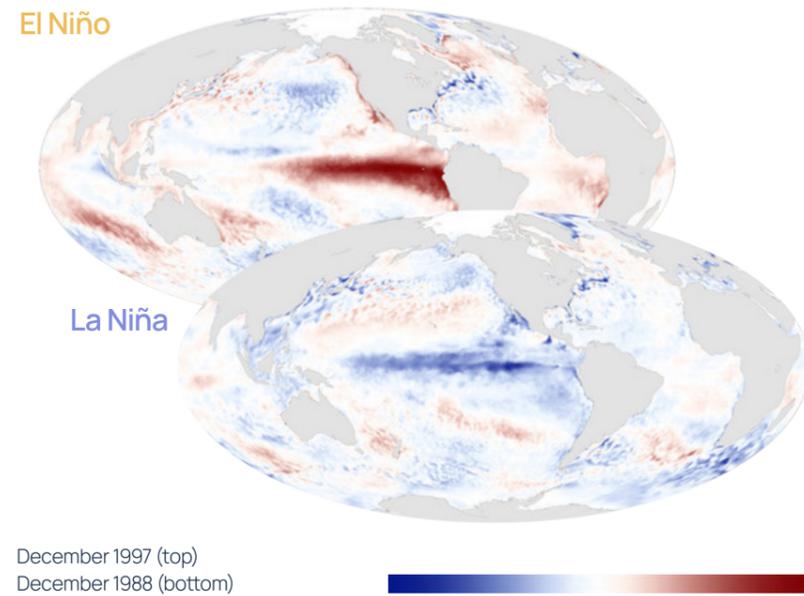
*3-months interval predictions (e.g. JJA = June, July, August)

¹ National Centers for Environmental Prediction. (13 July 2023). El Niño/Southern Oscillation (ENSO) Diagnostic Discussion. Climate Prediction Center. Retrieved 8 August 2023, from https://www.cpc.ncep.noaa.gov/products/analysis_monitoring/enso_advisory/ensodisc.shtml

Will favourable El Niño conditions have a beneficial impact on 2023 nat-cat losses?

The transition to El Niño has, in the past, generated opposing climate conditions and loss patterns to those observed in the past twenty-four months of La Niña.²

Figure 2: What is an ENSO cycle? | Source: climate.gov



²Columbia Climate School International Research Institute for Climate and Society. (16 June 2023). ENSO Forecast: June 2023 Quick Look. Retrieved 16 June 2023, from [https://iri.columbia.edu/our-expertise/climate/forecasts/enso/current/?enso_tab=enso-iri_plume]

Under La Niña conditions, ocean temperatures in the Atlantic warm as westerly winds weaken.³ This can produce stronger storms as heat intensifies evaporation, which brings more water vapour into the lower atmosphere.⁴ In the Pacific, a shift in trade winds causes upwelling off of the US West Coast, bringing colder water to the surface and pushing warmer water toward Asia.⁵ This suppresses hurricane activity in the Pacific while increasing it in the Atlantic.⁶



³National Weather Service. El Niño and La Niña. Retrieved 8 August 2023, from [https://www.weather.gov/jan/el_nino_and_la_nina]

⁴National Oceanic and Atmospheric Administration. Hurricanes. Ocean Explorer. Retrieved 8 August 2023, from [https://oceanexplorer.noaa.gov/facts/hurricanes.html].

⁵National Ocean Service. What are El Niño and La Niña? Retrieved 8 August 2023, from [https://oceanservice.noaa.gov/facts/ninonina.html]

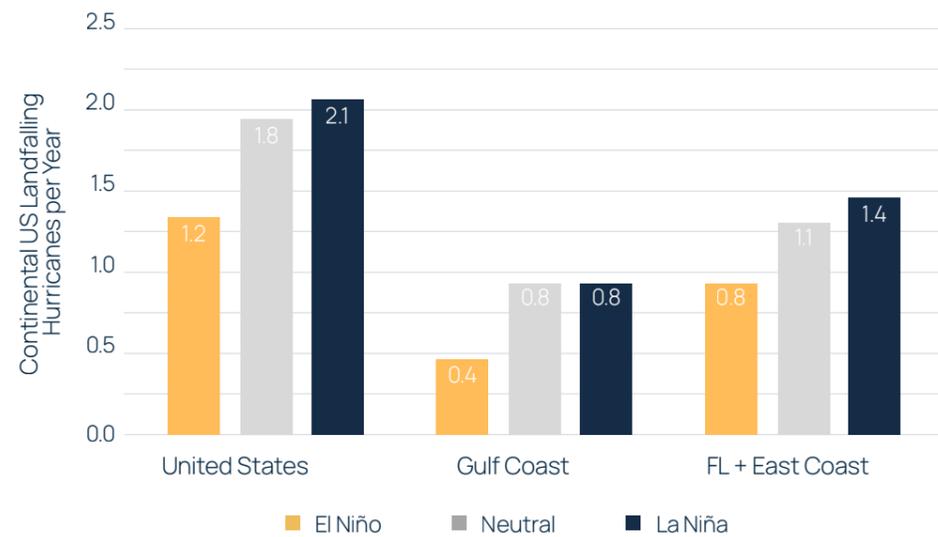
⁶National Oceanic and Atmospheric Administration. Impacts of El Niño and La Niña on hurricane season. Climate.gov. Retrieved 8 August 2023, from [https://www.climate.gov/news-features/blogs/enso/impacts-el-niño-and-la-niña-hurricane-season]

In contrast, El Niño has historically eased hurricane frequency in the Atlantic because high westerly winds disrupt storm activity.⁷ While El Niño tends to cause cooler and wetter weather in the southern US, sub-equatorial areas of Oceania and South East Asia will experience hotter and drier conditions.⁸ Similarly, El Niño shifts the risk of hurricanes to eastern Pacific basins, while curbing it in the Atlantic.⁹

Historically, between 1900 and 2017, land falling hurricanes in the continental US were 1.75 times more frequent in a La Niña season compared to an El Niño.¹⁰ This shows, statistically, that there have been fewer storms in the North Atlantic during El Niño cycles than during La Niña.¹¹

Figure 3: Mean annual continental US land falling hurricanes by ENSO Phase (1900-2017) |

Source: American Meteorological Society



⁷NASA Earth Observatory. El Niño. Retrieved 8 August 2023, from [<https://earthobservatory.nasa.gov/features/ElNino>]

⁸NOAA climate.gov

⁹NOAA climate.gov; while ENSO can be a predictor of frequency in the Atlantic basin, one should not draw a direct connection between frequency and loss. Though less likely, loss causing storms can still occur under El Niño conditions.

¹⁰American Meteorological Society. "BAMS-D-17-0184: Analysis of U.S. Billion-Dollar Weather and Climate Disasters, 1980–2016." Available at: https://journals.ametsoc.org/view/journals/bams/99/7/bams-d-17-0184.1.xml?tab_body=pdf. Accessed 5 July 2023. (Page 1362)

¹¹The definition of ENSO events used in this study is the August–October averaged Oceanic Niño Index (ONI)— the official index used by NOAA. According to the ONI index, 29 years were classified as El Niño (averaged ONI of greater than 0.5°C), 29 years were classified as La Niña (averaged ONI of greater than - 0.5°C), and the remaining 60 years were classified as ENSO neutral.

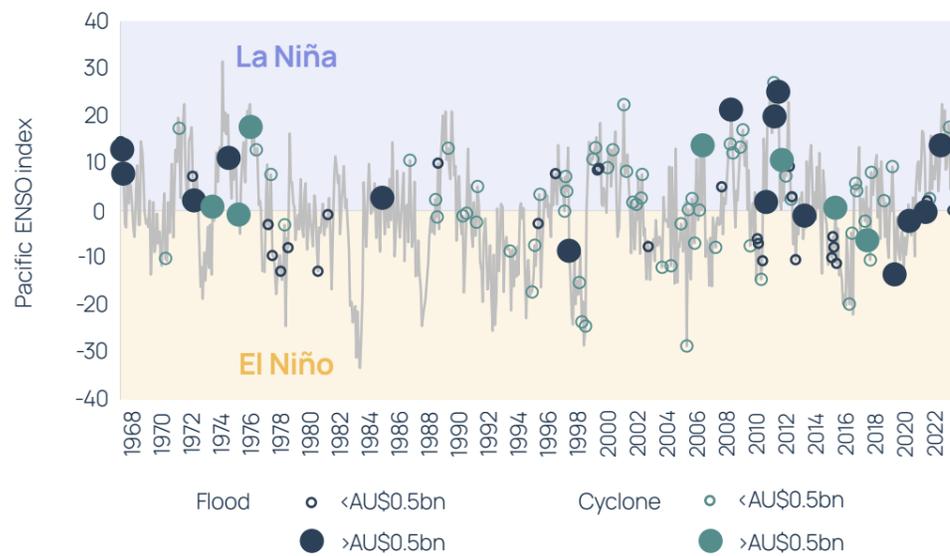


Nat-cat risks in Australia in relation to ENSO Cycles

In Australia, La Niña events are associated with greater convection in the warmer northern waters of the Indian Ocean which typically lead to higher-than-average rainfall and flooding across northern and eastern regions.¹² Fifteen of the twenty-two costliest cyclone and flooding events since 1967 have occurred during the positive phase of the Pacific Oscillation Index (La Niña cycle).

The switch to El Niño will likely alter weather patterns in the southern Pacific if the pattern of previous years repeats. Instead of flooding, Australia will tend to face an increased risk of drought, heatwaves and bushfires.

Figure 4: Pacific Oscillation Index and major Australian cyclone and flood events 1967-2022 | Source: Pacific ENSO Index (Southern Oscillation Index) and ICA Historical Catastrophe List (1967-2022)



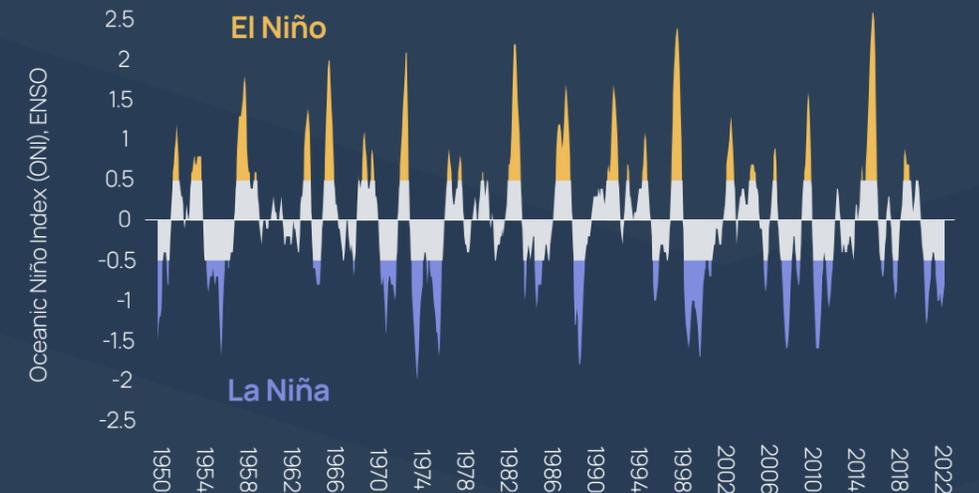
¹²<http://www.bom.gov.au/climate/enso/history/ln-2010-12/ENSO-rainfall.shtml>

Is climate change impacting ENSO cycles?

It is considered unlikely that ENSO variability will change materially over the course of the twenty-first century. However, the frequency of extreme ENSO events is projected to increase with global warming.¹³ This has particular implications for droughts and flood events.

Although historically the ENSO cycle has had a strong influence on hurricane and cyclone activity, sea surface temperatures also play a role. As with other forecasters, Colorado State University's 2023 seasonal hurricane update estimates that because ocean temperatures are expected to reach exceptional peaks, the Atlantic Basin hurricane season is now projected to be 'above average'.¹⁴

Figure 5: Oceanic Niño Indices determine ENSO cycles by measuring the three-month running average temperature of ocean waters in the central Pacific | Source: NOAA



¹³ IPCC Sixth Assessment Report

¹⁴ Colorado State University Department of Atmospheric Science. Tropical Weather and Climate Research. Retrieved 8 August 2023, from [<https://tropical.colostate.edu/forecasting.html>]

1.2 A hard market environment:

The current market environment is arguably a generational opportunity for reinsurers, with risk-adjusted rate increases across property-catastrophe lines at their highest levels since the advent of catastrophe modelling and quantitative risk-adjustments.

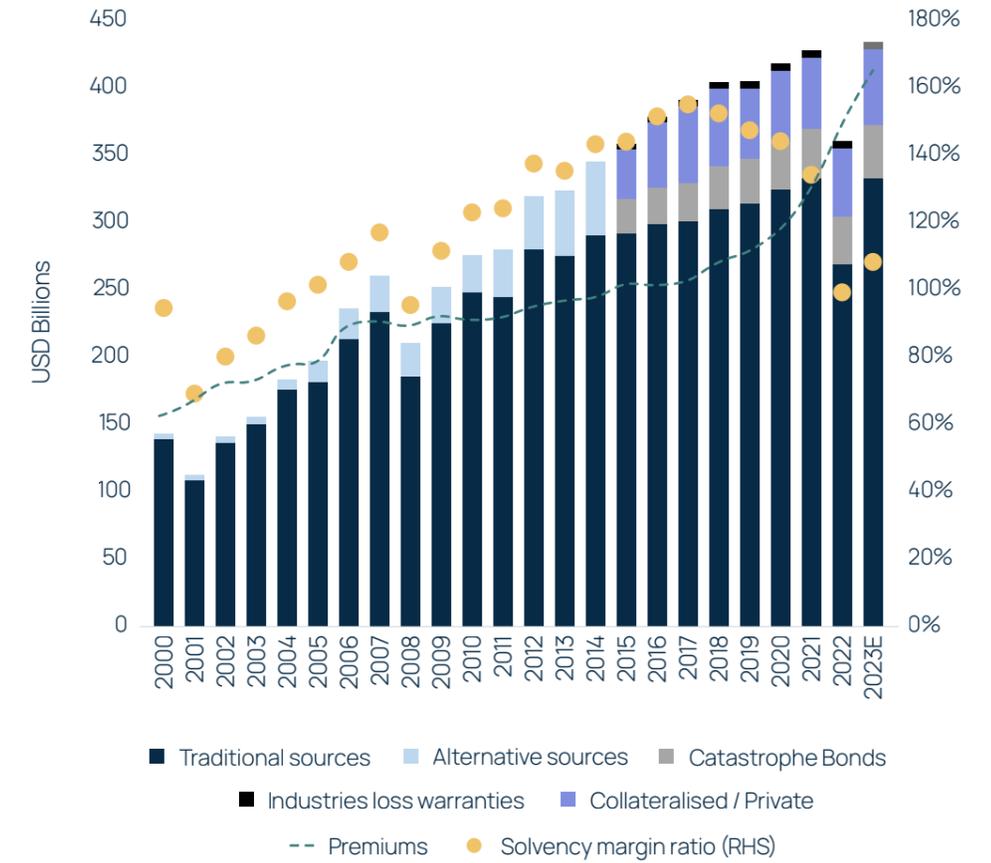
Howden Tiger data show that global property-catastrophe rates increased by over 50 per cent cumulatively over the last two years.

Figure 6: Global property catastrophe y/y rate (%) 1992-2023 |
Source: NOVA



Concurrently, reinsurance markets have seen the most pronounced capital squeeze since 2008, owing to higher interest rates and investment losses – although capital is now recovering and is estimated to reach 2021 levels by the end of 2023.

Figure 7: Global reinsurance capital 2000-2023 |
Source: Howden Tiger, S&P, Artemis



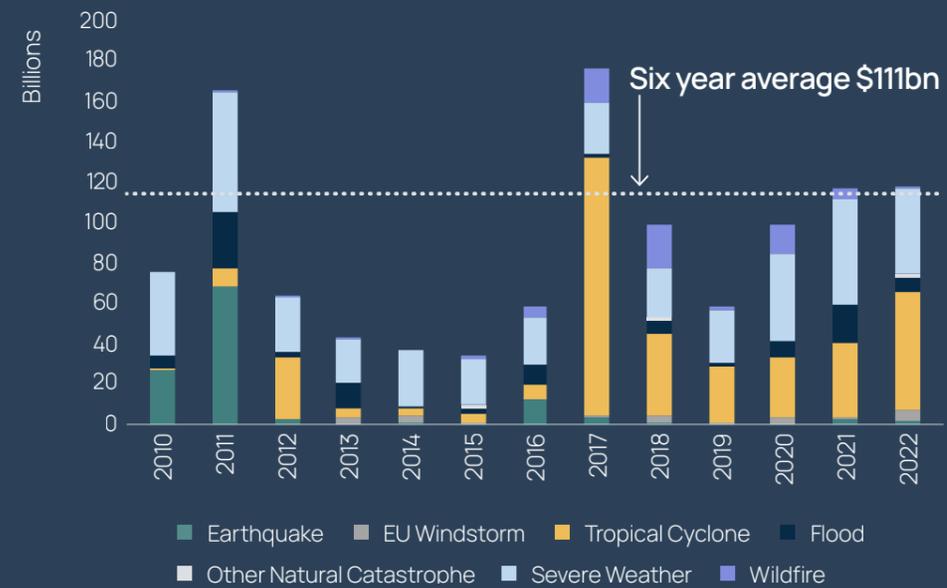


Not quite right...? Higher inflation and increased uncertainty

2.1 A return to an inflationary world

Howden's 2023 report, The Great Realignment, examined 2022's heightened nat-cat losses in depth. Loss estimates associated with Hurricane Ian are now nearing USD 60 billion bringing 2022's adjusted total to above USD 130 billion. Cumulative insured losses over the last six years have averaged USD 111 billion per annum in real terms. A larger proportion of losses have come from what were previously considered 'non-peak' perils such as wildfire, freezing and flooding. Finally, 2023's insured catastrophe losses already total over USD 50 billion, significantly above previous mid-year averages.

Figure 8: Total natural catastrophe insured losses split by peril 2010-2022 (inflation adjusted) | Source: NOVA



Why claims inflation may outpace economic inflation

Unlike generic consumer price indices, claims are exposed to a greater number of inflationary pressures. For example, nat-cat-exposed lines may face 'excess inflation' due to factors such as elevated materials costs and fraudulent activity which can amplify claims costs above widely cited consumer price indices.

In addition, exposures change over time, making it more complex to assess claims inflation and rendering it difficult to make like-for-like inflation assessments between lines of business. Further complicating this, many programmes have been restructured as overall market capacity has fallen.

Inflation varies by business mix

Longer-tail carriers are even more exposed to excess inflation. As such, carriers in 2022 took direct action to raise prices and bolster reserves and capital levels by increasing assumptions around ultimate claims severity. Within reinsurance portfolios, some firms reduced their capacity for, or exited, inflation-sensitive lines. Firms with short-tail lines still made explicit allowances for excess inflation above and beyond those generally assumed in attritional loss ratios.

Figure 9: Sample observations and responses from carriers most and least exposed to inflation risk presented in ascending order (left to right) from short-tail (least exposed) to long-tail (most exposed) | Source: Howden, Bloomberg, OECD)



2.2 Increased retentions – a drop-off in reinsurance and retrocession capacity

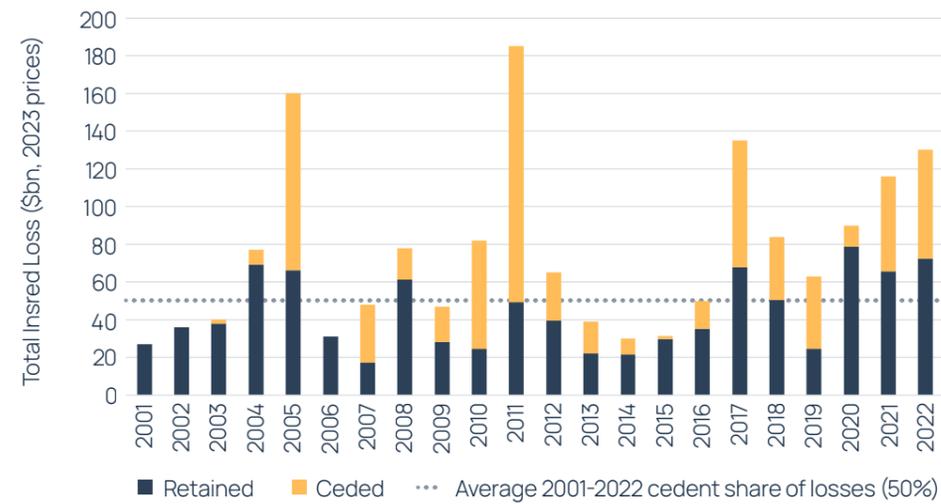
Higher 2023 nat-cat retentions

Beyond the volatility inherent from an elevated inflationary environment, underwriters today must additionally contend with increased reinsurance and retrocession costs at higher retentions.

Overall shortages in reinsurance capacity, alongside higher loss volatility, have driven higher retained losses for cedents. For nat-cat in particular, significant recent increases in per-event retentions, in addition to a drop-off in aggregate cover, mean cedents now bear a greater share of risk.

As Figure 11 highlights, cedents retained around 54 per cent of nat-cat losses over the 2001-2022 period. This historic pro-forma retention was determined using Howden Tiger's database which indicates a marked and consistent increase in retentions in the period 2017-2022.

Figure 10: Pre-2023 global insured catastrophe losses split by cedent and reinsurer share inflated to 2023 \$'s | Source: NOVA, Howden Tiger estimates



In a continuation of this trend, 2023 retention levels indicate that cedents would have absorbed 64 per cent of the same nat-cat losses on a historical basis. This 10 percentage point rise represents a significant uptick as well as a near-term normalisation of higher retentions.

Figure 11: Post-2023 global insured losses split by cedent and reinsurer share inflated to 2023 \$'s | Source: NOVA, Howden Tiger estimates



It should be noted that retention levels vary by region, market, and cedent. For example, since 2017, the Direct and Facultative (D&F) property business has avoided adverse nat-cat loss experiences seen in other US market segments. Volatility in the D&F sector was reduced by increasing original deductibles, re-underwriting portfolios and significantly improving the rating environment. This has enabled D&F to play a greater role in 'filling the gaps' left in programmes.

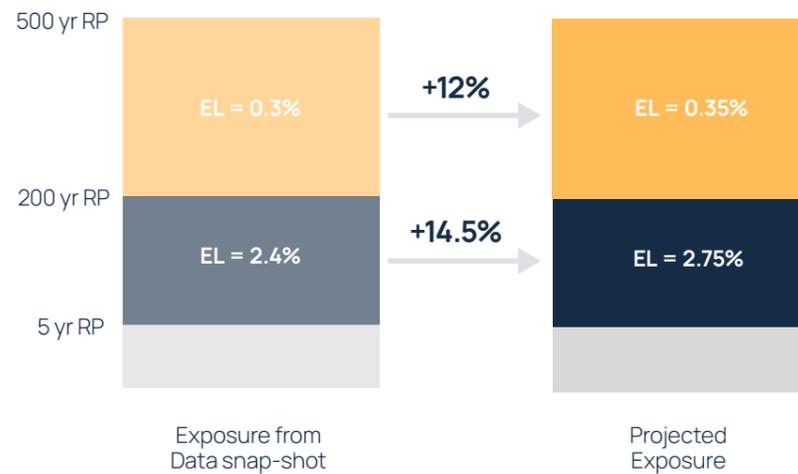
Amplified risk from double-digit inflation levels

The compounded net risk borne by cedents, in addition to heightened inflation in specific portfolios, will increase loss costs and the risk of reserve deficiency.

The compound effect. Low inflation associated with the post-financial crisis era could be comfortably offset by marginal discount rates when assessing the capital required to support a portfolio or when pricing risk transfer. Recent inflation of 5-10 per cent presents a greater challenge. For example, the inflation of 2021 and 2022 experienced in the United States, compounded, would increase the size of an initial gross loss estimate by around 15 per cent, over the period.

Reinsurance underwriters must additionally consider inflation's more acute effect on non-proportional excess-of-loss layers when assessing risk, given that it disproportionately affects exposure levels between layers relative to the number of event losses.

Figure 12: How 10 per cent exposure growth causes magnifies expected loss (EL) of a non-proportional excess-of-loss programme



2.3 Uncertain effects of climate change on loss volatility

The loss impact from climate-related events has increased from 2017-onwards after a period of relatively benign activity, with six out seven years prior (2010-2016) showing significantly below average annual expected weather-related loss activity. Much of this inter-year loss volatility is explained by climate cycles, such as the ENSO cycle as detailed in this report. Figure 14, demonstrates that the observed incidence of a La Niña event occurring in a year increased from a 55 per cent long-term average (1950-2022) to 69 per cent for the 2010-2022 period.

Figure 13: El Niño vs La Niña counts and probabilities | Source: NOAA

Metric	El Niño	La Niña
Count of events (1950-2022)	26	25
Average duration of event (months)	8.0	9.1
Number of Years with an event (1950-2022)	44	40
Probability of an event in a year (1950-2022)	60%	55%
Number of Years with an event (2010-2022)	6	9
Probability of an event in a year (2010-2022)	46%	69%
2 consecutive NH winters / SH summers	6	9
3 consecutive NH winters / SH summers	1	2

La Niña events have historically been linked to elevated frequencies of hurricanes in the North Atlantic, and it is clear that US nat-cat loss event frequency has increased in recent years (Figure 15). There is, however, no scientific consensus on the future likelihood of overall numbers of La Niña or El Niño events, but when they occur they are expected to be more extreme¹⁵.

Figure 14: 2001-2022 count of US events by peril | Source: NOVA and Howden Tiger analytics

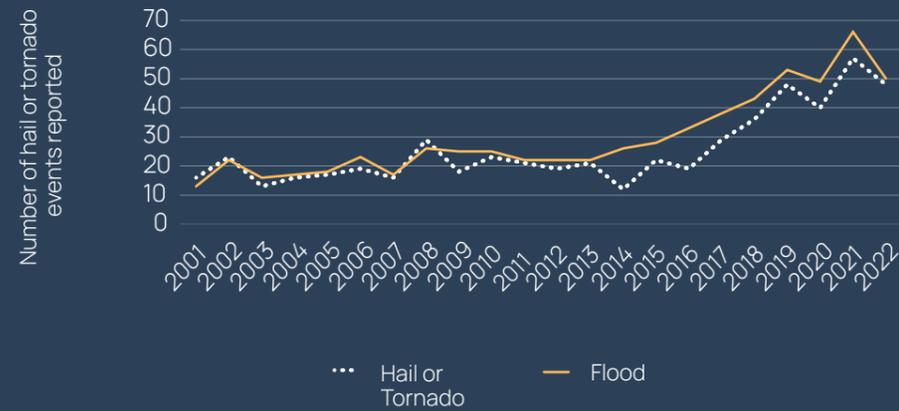
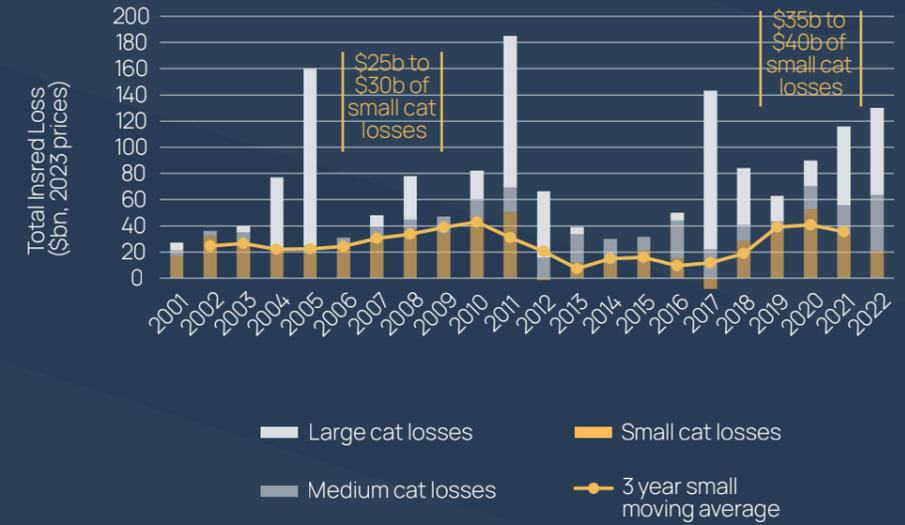


Figure 15: Greater contribution from small catastrophe losses in 2019-2021 (Source: NOVA, Howden Tiger analytics and Cresta Clix)



There is, today, a greater awareness of the risk these higher frequency nat-cat perils pose and the factors that drive pricing and catastrophe accumulation.

In addition to exposure and climate factors, under-reporting of peril events prior to 2015, given the application of a constant reporting threshold, has led to more reported events over time. Smaller losses previously may have been coded as 'attritional' and are now considered catastrophe accumulations, and recorded as such. As a result, smaller losses have contributed to a higher level of total losses in recent years (Figure 16).

This is a good reminder that there are multiple primary contributing factors to loss frequency including pricing and exposure change as well as climate change¹⁶. This said, loss frequency has been an outsized driver of underwriting volatility now for the better part of a decade.



¹⁵ IPCC Sixth Assessment report

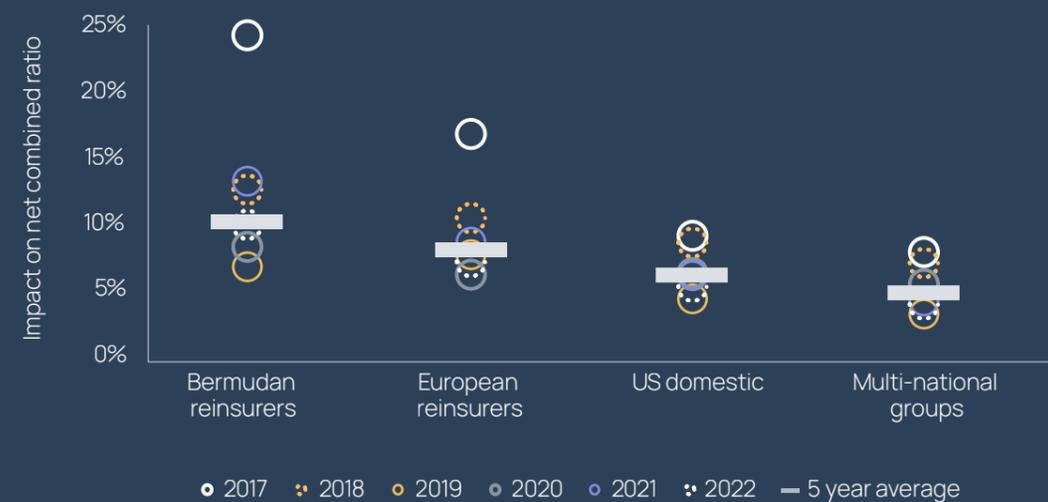
¹⁶ Howden Tiger. (2022, November). To What Extent Do Catastrophe Models Reflect Recent Nat-Cat.

Stress testing insurer profitability for headwinds and tailwinds

3.1 2022 reports of nat-cat loss ratios

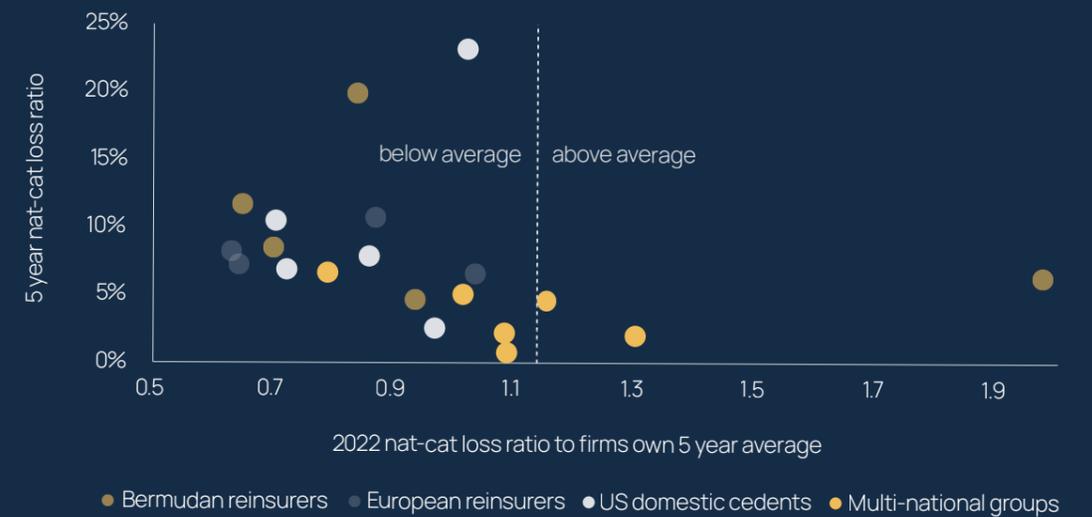
In 2022, nat-cat loss ratios for all cohorts were lower than their five-year averages. All cohorts were helped by a significant hardening rate environment and, in several cases, by diversification away from nat-cat lines.

Figure 16: P&C net nat-cat loss ratio 2017-2022 and five year average |
Source: NOVA



In 2022, several carriers reported loss ratios below their five-year average. This is, again, representative of a favourable rating environment.

Figure 17: Carriers' 2022 nat-cat loss ratio relative to the 5 year average against the five-year average cat loss ratio (Source: NOVA)



Conversely, carriers that experienced above-average nat-cat loss ratios tended to be those with proportionately lower nat-cat exposure.

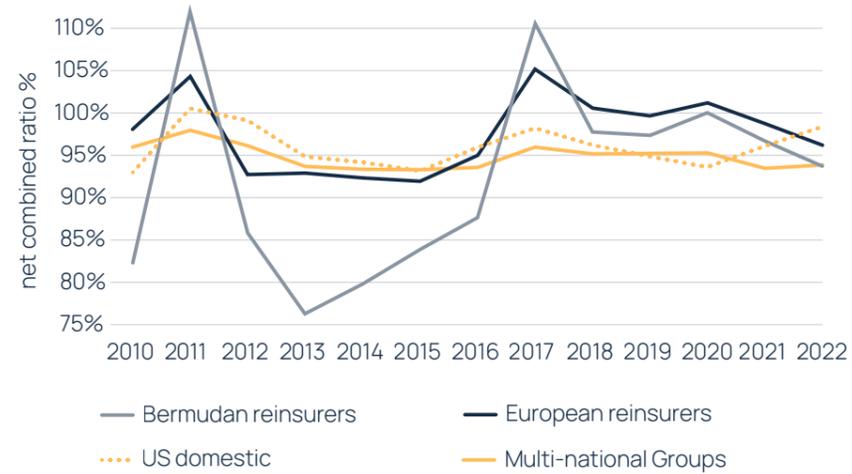
3.2 Building the stress test

In building the stress test, the impacts of headwinds are first imposed on each carrier's historical nat-cat loss ratio, thereby taking into account the amount of nat-cat business per carrier while assuming different effects for reinsurance and direct business.

Four reinsurer cohorts – European, Bermudian, US domestic and US multi-national carriers – have been created to analyse and compare underwriting performance under different scenarios.

Figure 18: P&C net combined ratio by market cohort – 2010-2022* |

Source: NOVA



Peer	10 year NCR		5 year NCR	
	Average	StdDev	Average	StdDev
European reinsurers	97.4%	4.2%	99.3%	1.7%
Bermudan reinsurers	92.4%	9.9%	97.1%	2.0%
US domestic	95.5%	1.7%	95.8%	1.6%
Multi-national Groups	94.3%	1.0%	94.6%	0.8%

*Chart Note: Despite nat-cat volatility over the past five years, all cohorts reported overall underwriting profitability across property and casualty (P&C) lines. The market has continued to harden since 2017/2018, with net combined ratios likewise steadily improving.

We add changes from adverse inflationary impacts, including increased retrocession and outward reinsurance costs, as well as restricted supply. The net effect is beneficial to reinsurance portfolios, while it negatively impacts cedent portfolios. Finally, we add favourable benefits from inwards rates and commissions for property portfolios.

The incremental change in nat-cat loss ratios is then added to net combined ratios by the carrier before re-compiling to create the entire cohort's average.

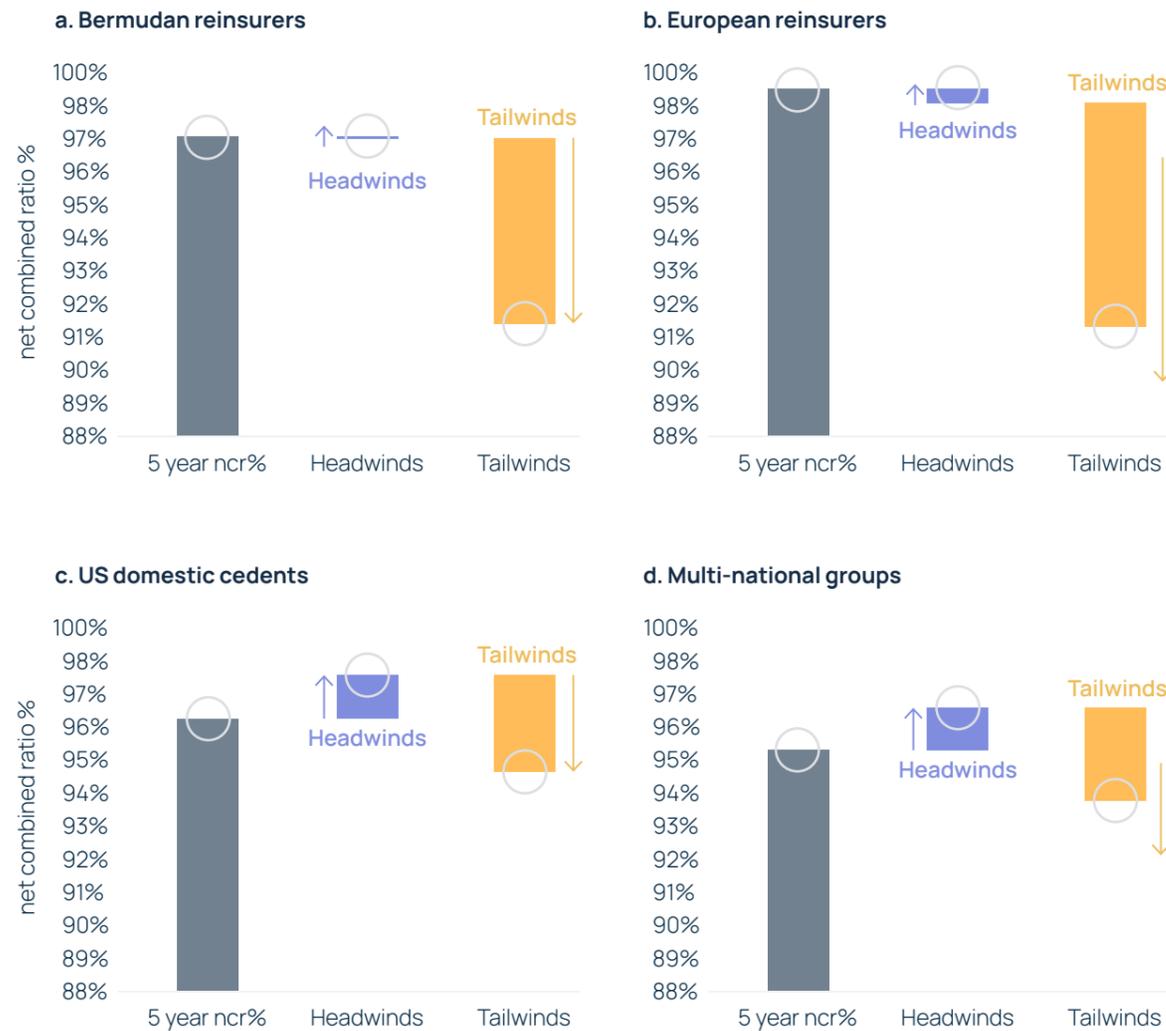
Stress tests take into account historical portfolio mix as well as each cohort's historical nat-cat underwriting performance to 'play back' results in the context of today's market environment which includes the effects of pricing and of the shift in the ENSO cycle. Current potential sources of volatility are then applied to each cohort's previous net combined ratios.



3.3 Analysis: Tailwinds likely come out on top

Stress testing for the aforementioned impacts: Our analysis shows that tailwinds net outweigh the market headwinds for all cohorts.

Figure 19a-d: Net combined ratio stress test | Source: NOVA



Tailwinds are likely to dominate meaning favourable net underwriting results

The output shows that European and Bermudian reinsurers are most favourably affected, with all four cohorts likely to benefit from the current favourable rating environment.

Reinsurers could see an improvement in 2023 net combined ratios for instance with European reinsurers' modelled NCRs at 92 per cent, 7pts below their 99 per cent five-year average.

Cedents also appear to benefit from current market conditions, with rate increases outstripping inflationary impacts and increased reinsurance pricing. This is true to a lesser extent as rate increases depend on line-of-business or regional factors such as regulatory scrutiny.

3.4 Carrier returns to exceed cost of capital?

In this environment, reinsurers seemingly have a rare chance to earn their cost of capital. A 7 per cent improvement in combined ratios, alongside higher interest rates, might see reinsurer returns on invested capital returning to mid-teens levels.

With the reinsurance cohort exhibiting an 8 per cent weighted average cost of capital, on average, over the long term, a potential return to a positive economic value added environment is possible. This has only been seen for rare periods post Global Financial Crisis (Figure 8).

Figure 20: Reinsurance economic value added: 2003-2025 |

Source: Bloomberg



At face value, therefore, the current environment appears an attractive point in the cycle for reinsurance capacity to enter the market, although capital formation has so far been slower than in previous cycles.

Volatility from inflation and increased retentions

Volatility sources have a 1 per cent to 2 per cent adverse impact on the total P&C net combined ratios of US domestic and multinational cedents.

European and Bermudian reinsurers are likely to be relatively less impacted, given that reduced inward losses offset inflationary impacts.

Favourable inwards rates and commissions expected

The greatest benefit is associated with those writing the most property reinsurance. European and Bermudian reinsurers could see a -5 to -7.5 percentage point benefit to net combined ratios.

Conversely, US domestic and multinational cedents could achieve a -2.5 to -3 percentage point benefit.

How can Howden Tiger Help?



The combination of current volatility and favourable tailwinds signal an unprecedented (a phrase used cautiously!) underwriting environment for the modern reinsurance market. Howden Tiger's analysis demonstrates that cedents now bear an increased amount of risk given the shortage in total reinsurance capacity.

Volatility source	Impact	How Howden Tiger can help
Increased retentions on nat-cat-exposed portfolios	Given reinsurance capacity shortages and reinsurance price increases, risk carriers will now bear significant increases in catastrophe retentions.	strategic advisory, risk and capital management Placement of complex reinsurance solutions that deliver value in a challenging marketplace Retention and program benchmarking
Inflationary impacts	Compounded increases in risk borne by cedents net and, from excess inflation in specific portfolios, increased the risk of reserve deficiency.	Advice around indices most relevant for specific portfolios Peer benchmarking of portfolio inflation provisions ADC / LPT solutions
Climate cycles	e.g. La Niña or El Niño cycles will impact weather patterns for many regions.	Access to forecasts of seasonal climate indices Support with climate variability model stress-testing

Howden Tiger is expert in strategic advisory, risk, and capital management with the objective of supporting client businesses in balancing nat-cat portfolio headwinds against tailwinds.

Relevant price indices (including NOVA) are utilised on behalf of clients to assess inflation risks, and peer portfolio impacts. Industry-leading, proprietary natural catastrophe models and layer simulation tools (including Tiger Eye) address nat-cat portfolio challenges, bringing new solutions to the fore. Howden Tiger provides access to key forecasts and seasonal climate indices that significantly impact portfolios. All of this is central to supporting business's individual volatility assessments.

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