NAMIC® THOUGHT LEADERSHIP | GuyCarpenter

# SCENARIO TESTING OUR MUTUAL FUTURE

YEAR TWO

## NATIONAL ASSOCIATION OF MUTUAL INSURANCE COMPANIES

The National Association of Mutual Insurance Companies consists of more than 1,500 member companies, including seven of the top 10 property/casualty insurers in the United States. The association supports local and regional mutual insurance companies on main streets across America as well as many of the country's largest national insurers.

NAMIC member companies write $357 billion in annual premiums and represent 69 percent of homeowners, 56 percent of automobile, and 31 percent of the business insurance markets.

Through its advocacy programs NAMIC promotes public policy solutions that benefit member companies and the policyholders they serve and fosters greater understanding and recognition of the unique alignment of interests between management and policyholders of mutual companies.

## GUY CARPENTER

Guy Carpenter & Company, LLC is a leading global risk and reinsurance specialist with more than 3,500 professionals in over 60 offices around the world. Guy Carpenter delivers a powerful combination of broking expertise, trusted strategic advisory services and industry-leading analytics to help clients adapt to emerging opportunities and achieve profitable growth. Guy Carpenter is a business of Marsh McLennan (NYSE: MMC), the world's leading professional services firm in the areas of risk, strategy and people. The company's more than 85,000 colleagues advise clients in over 130 countries. With annual revenue of over $20 billion, Marsh McLennan helps clients navigate an increasingly dynamic and complex environment through four market-leading businesses including Marsh, Mercer and Oliver Wyman. For more information, visit www.guycarp.com and follow Guy Carpenter on LinkedIn and Twitter @GuyCarpenter.

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*The National Association of Mutual Insurance Companies consists of more than 1,500 member companies, including seven of the top 10 property/casualty insurers in the United States. NAMIC member companies write $357 billion in annual premiums and represent 69 percent of homeowners, 56 percent of automobile, and 31 percent of the business insurance markets.*

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## FOREWARD

Guy Carpenter and the National Association of Mutual Insurance Companies (NAMIC) are pleased to present the results from our second year of high-level scenario testing for the U.S. property/casualty (P&C) industry. The goal of the NAMIC and Guy Carpenter scenario testing initiative is to arm mutual industry leaders with three views of performance: 1) benchmarking of prospective risk and return profile for their businesses and their peers; 2) quantifying sources of variability in operating performance to support enterprise risk management decisions; and 3) forecasting how five potential adverse operating scenarios could affect absolute and relative performance, including risk of ruin. Gaining a deeper understanding of all three of these dimensions to risk helps better equip mutual leaders to plan for long-term strength and stability.

The market environment in 2022 was defined by uncertainty, with growing geopolitical, climate, and macroeconomic headwinds presenting a wide range of risks for business leaders to navigate. Favorable asset-market conditions over the past decade have provided a tailwind to many mutual insurers and helped offset underwriting losses. Recent actions by the U.S. Federal Reserve in response to rising core inflation have reversed these trends, and mutuals must come to terms with a new reality where capital is more important and ever-rising asset valuations can't be relied on to drive surplus growth.

Against this backdrop, the pressure on mutual insurers to articulate the impact of systemic risk scenarios in their financial planning continues to grow, driven by both internal and external stakeholders. Understanding how different risk exposures aggregate to affect financial results is a key mandate for the leaders of today's mutual industry, as the focus has shifted from return *on* capital to return *of* capital. Managing across sources of risk to minimize the chance of ruin while simultaneously maximizing policyholder value is the inherent challenge for any mutual insurer. The increasing complexity of our world today requires mutual insurers to leverage new tools to help guide decision-making. We hope you will find the scenario testing analysis one of your valuable resources for helping with planning and enterprise risk management.

In this paper, we outline our methodology and share results from the analysis. This research is expected to provide a realistic assessment of the potential impact of adverse scenarios on profitability and solvency on the industry and company level for every active U.S. P&C statutory entity.[1]

The 2022 scenario tests described in the pages that follow focus on five potential adverse environments that could be expected to have systemic ripple effects across the entire P&C industry. Year-end data from 2021 was used for the analysis that was performed in 2022 and published in 2023. Each year, NAMIC and Guy Carpenter plan to re-evaluate the market landscape to ensure that the scenarios presented reflect relevant and insightful risks that matter to the mutual industry. As always, we welcome any feedback from you, our valued reader, on ways we could further enhance this scenario-testing analysis in the future.

NAMIC and Guy Carpenter look forward to reader feedback and encourage readers to reach out to the authors with any questions or comments that might help improve the next edition of this report.

[1] The research presented here is one tool for companies to independently consider in assessing their own operations. Companies should evaluate their risks carefully based on self-assessments and information from a number of resources. Neither NAMIC nor Guy Carpenter shall be liable for any company or individual relying on the information contained in this paper.

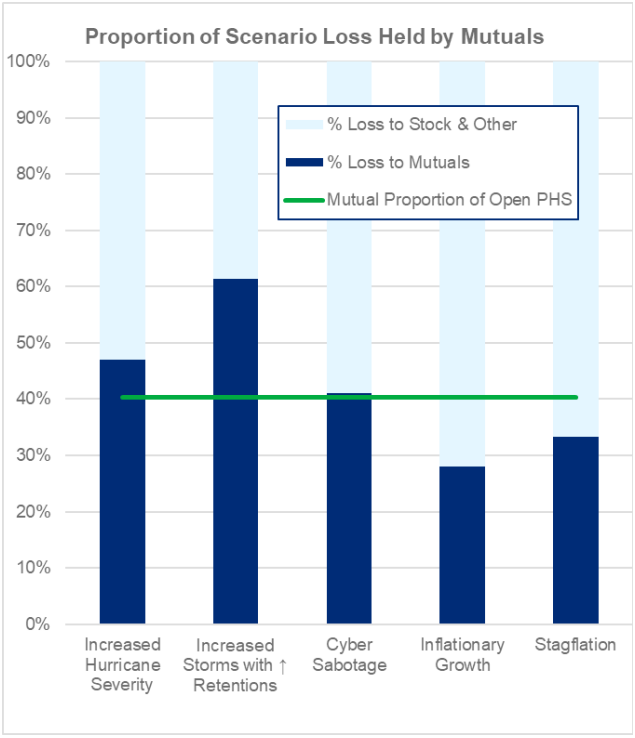
## EXECUTIVE SUMMARY

Going into 2022, mutual companies comprised 40.3% of the total capital of the U.S. property/casualty insurance industry. We expected that percentage to decline slightly to 39.8% by the end of 2022 due to stock companies outpacing mutuals in a "baseline" year of performance.[2] The higher expected return on capital for stock companies relative to mutuals is driven by higher operating leverage, lower projected expense ratios, and greater focus on higher-margin lines of business. However, this higher expected return on a surplus in an average year hides the potential for downside risk many stock companies assume to achieve those higher returns.

**Table 1. Loss Impact by Scenario 2022 Modeled Year**

| Scenario | Loss to Industry ($B) | Loss to Mutuals ($B) |
|---|---|---|
| Hurricane | 0.6 | 0.2 |
| SCS Increase Retention | 5.3 | 3.2 |
| Cyber Sabotage | 30.2 | 12.4 |
| Inflation | 138.9 | 38.5 |
| Stagflation | 190.4 | 63.2 |

**Figure 1. Loss Percentage by Structure for 2022 Modeled Year**




[2] This projection does not take into account policyholder or shareholder dividends paid during the year. Nor are capital raises or returns reflected in these figures. Total capital is measured on a statutory accounting basis, contemplating domestic statutory property/casualty filers only.

Overall, the mutual industry policyholder surplus (PHS) was expected to grow by 5.3%, with 4.9% of that growth from asset performance and 0.4% from operating performance for the year in our base case. In an adverse operating environment, including any of the scenarios we have selected, the proportion of expected losses absorbed by stock companies versus mutuals can differ materially. We see that mutuals in general are exposed to disproportionately large losses from weather scenarios, which reflect elevated incidents of severe hurricanes and convective storms, resulting in USD 0.2 billion and USD 3.2 billion in net expected annual mutual industry losses, respectively.

Cyber losses emanating from an industrywide systemic event would be borne proportionally across mutuals and other property/casualty insurers. The two scenarios tested that have the greatest impact on industry surplus are both economic in nature. In inflation and stagflation environments, mutuals are expected to outperform their stock company peers materially, only taking on 27.7% of total losses in the inflation scenario and 33.2% for stagflation.

Stagflation is defined by the World Economic Forum as a period when slow economic growth and joblessness coincide with rising inflation.

Notably from these results we see the mutual industry as a whole defensively positioned for long-term viability through a variety of challenging economic environments.

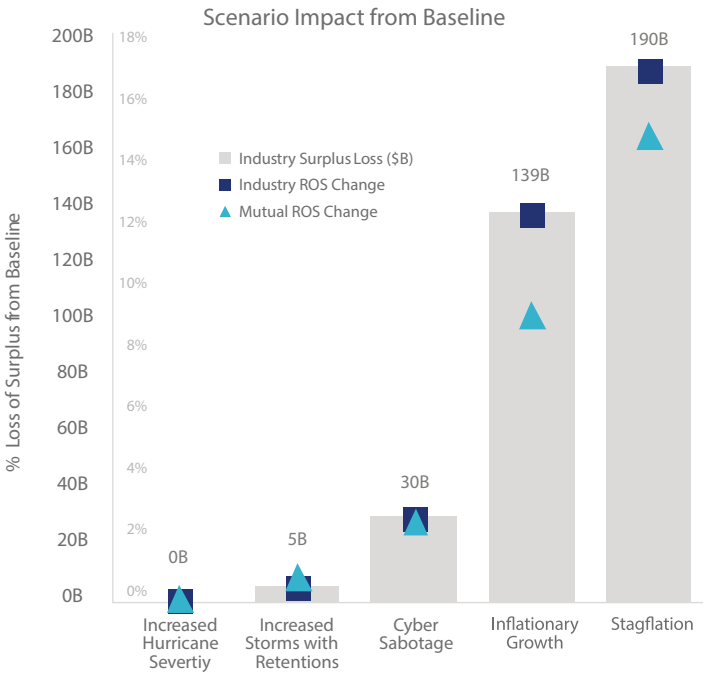
A notable advantage mutuals enjoy over stock peers is their focus on long-term surplus growth measured using statutory accounting principles (SAP), rather than quarter-to-quarter earnings on a generally accepted accounting principles (GAAP) basis.

We see the mutual industry defensively positioned for long-term viability through a variety of challenging economic environments.

In a rising interest rate environment like what we've experienced in 2022, statutory accounting helps to smooth volatility, since bonds that are held to maturity are valued at their amortized cost as opposed to their market value. In accordance with this convention, results presented here are all on a statutory accounting basis. In rising rate environments, mutuals must carefully monitor their liquidity so that assets held to maturity don't need to be sold at a loss to finance operating deficits. After a strong year of performance for the industry in 2021, the U.S. mutual industry is well capitalized and positioned to survive even extreme scenarios. Our comment in the first year of the analysis was: "The most important takeaway from this research is that as of today, the U.S. property/casualty industry is strongly capitalized, with a large majority of insurance companies well positioned to survive even severe stress." This observation continues to hold today, even as new risks continue to emerge. Prior year's baseline projection showed that one in every four companies was expected to lose surplus in the baseline scenario; now, just under one in six companies is expected to be unprofitable in the 2022 base case.

Mutual writers held consistent in their projected performance from 2022 versus 2021, with only 1% increase in mutuals projected to operate at a loss in 2022 versus 2021, versus 2% fewer for the industry at large. In three out of five of the scenarios tested, 92% of companies or more lose less than 10% of surplus. While no company wants to experience a year of near-double-digit loss, this magnitude of loss is expected to represent an earnings event, not a capital event, for all but the most highly leveraged carriers.

**Figure 2. Scenario Impact for 2022 Modeled Year**




The elevated inflation scenario, which projects years of inflation significantly above trend, results in 29% of mutuals losing at least 10% of surplus, but only 12% of companies are expected to experience surplus loss greater than 25%. While inflation does not threaten the operating capital for most mutuals, it does result in almost seven out of 10 mutuals depleting surplus as reserve picks are strengthened in response to higher loss trends. Stock companies are more vulnerable to the inflation scenario, resulting in the ratio of companies losing 10% of surplus across the industry to 38% overall. While 12% of mutuals are expected to lose more than a quarter of their surplus in an inflation scenario, the industry overall could expect to see 16% of companies lose at least 25% of surplus. This further emphasizes the overall strong positioning of the mutual industry to handle large disruptions caused by an inflationary environment.

Stagflation is the most severe scenario modeled for the industry, driving 12% of all companies and 9% of mutuals specifically to a surplus loss in excess of one-quarter of their capital. Stagflation, which combines three years of increased loss trends with economic contraction, could cause 84% of mutuals to report a decline in surplus, a number greater than the industry overall loss rate of 78%. This increased likelihood of surplus loss is a reflection of a structurally lower return on surplus (ROS) and higher allocation to equity assets for mutual companies.

Interestingly, even in a stagflationary environment where most mutuals are expected to lose surplus, we see that fewer mutuals would be put at risk of inviability or insolvency than would stock companies. At the 10% loss of surplus threshold, 41% of all companies could expect to lose at least one-tenth of their total surplus, compared to only 38% of mutuals. Of all companies, 12% are projected to lose at least a quarter of surplus in this scenario, compared to only 9% for mutuals. Overall, the mutual cohort's defensive stance provides less expected return in the baseline year but positions companies to handle the outsized stress of a stagflation or inflation scenario with more robustness than the overall industry. As we live in a world of growing uncertainty, the results of these scenarios bodes well for the mutual industry's ability to persevere despite the range of looming challenges that underwriters face in the years ahead.

The mutual cohort's defensive stance provides less expected return in the baseline year but positions companies to handle the outsized stress of a stagflation or inflation scenario with more robustness than the industry.

**Table 2. Proportion of All Companies Experiencing Loss of Surplus by Scenario**

| ROS | Prior Baseline | Baseline | Hurricane | SCS | Cyber | Inflation | Stagflation |
|---|---|---|---|---|---|---|---|
| < 0% | 27% | 25% | 25% | 27% | 37% | 68% | 78% |
| < -10% | 8% | 8% | 8% | 9% | 13% | 38% | 41% |
| < -25% | 2% | 3% | 3% | 4% | 4% | 16% | 12% |

**Table 3. Proportion of Mutuals Experiencing Loss of Surplus by Scenario**

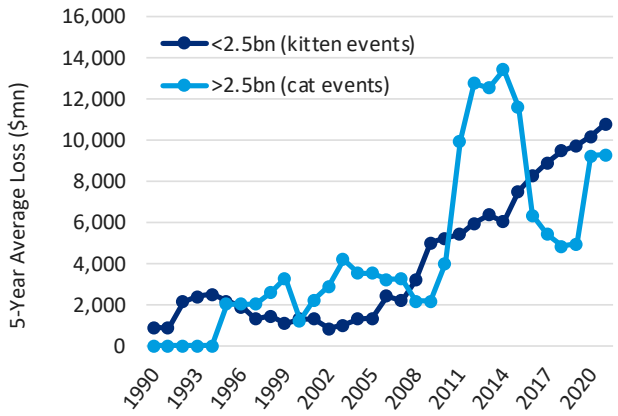
| ROS | Prior Baseline | Baseline | Hurricane | SCS | Cyber | Inflation | Stagflation |
|---|---|---|---|---|---|---|---|
| < 0% | 24% | 25% | 25% | 27% | 36% | 68% | 84% |
| < -10% | 5% | 5% | 5% | 6% | 8% | 29% | 38% |
| < -25% | 1% | 2% | 2% | 2% | 3% | 12% | 9% |

## UPDATE OF SCENARIOS

### SEVERE CONVECTIVE STORM AND REINSURANCE HARDENING

In collaboration with NAMIC member company feedback, we have selected five new scenarios for year 2 of the analysis. Some of these scenarios are the result of the natural evolution of the first year's scenarios. In year 1, we studied the increased severe convective storm (SCS) scenario given recent trends in observed meteorological data, specifically the occurrence of weather patterns ripe for hail storms. This resulted in essentially updating the mean losses for SCS and not a significant impact to the industry overall.

**Figure 3. Comparison of Small- and Large-Storm Events Over Time**




One reason for the muted net impact from the SCS scenario was because property catastrophe reinsurance covered the increase in large losses coming from this scenario. Likewise, last year's reinsurance hardening scenario reflected a 15% increase in ceded premium for reinsurance pricing while keeping coverage consistent.

Since a hardening reinsurance market is the natural consequence of reinsurers continually covering increased SCS losses, we decided to combine these scenarios in year 2. The new SCS with increased retentions scenario reflects the combination of the two prior scenarios. To highlight the recent convective storm severity, the average of the last three years of SCS storms from 2019 through 2021 was in fact greater than our expected 38% increase to average annual loss (AAL) in year 1 of the analysis, coming in at a 59% increase in AAL. Thus, the average of the last three years was selected for the parameterization of this new scenario, applied across the U.S. using the same changing exposure as the first year.

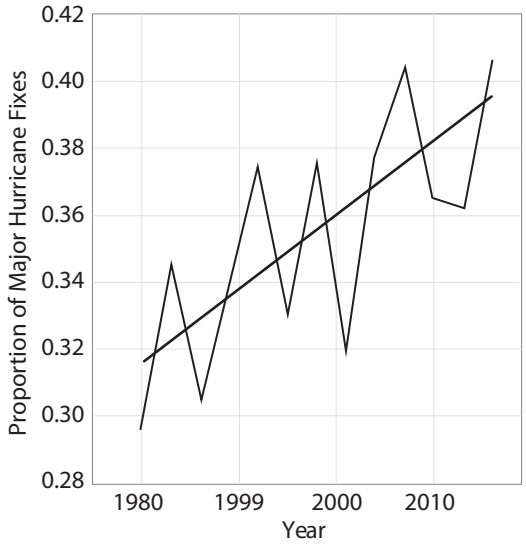
Furthermore, in reflection of strategic moves observed in the industry to manage reinsurance costs in the face of a rising market, a 20% increase in retention levels was applied to all property catastrophe reinsurance for each company, thereby keeping the ceded premium amounts consistent with 2021 levels. Year 1 severe convective storm resulted in USD 1 billion of loss, and the reinsurance hardening market resulted in a USD 3 billion loss of surplus for the mutual industry. Year 2 combined severe convective storms and increased retentions and is expected to result in USD 3.2 billion of surplus loss for mutuals.

## INCREASED HURRICANE SEVERITY

Hurricane severity is a new scenario entrant this year. Since hurricanes followed by severe convective storms are the two primary large loss drivers for insurers, incorporating the hurricane scenario is an important addition to year 2 of the analysis.

The Saffir-Simpson Hurricane Wind Scale categorizes hurricanes into five levels, from least severe at 1 to most severe at 5, based on the maximum sustained wind speed. Recent trends indicate an increased severity from the hurricanes observed. Between 1979 and 2017, the proportion of global major hurricanes, defined as category 3 or higher, to all hurricanes increased by 25%, or about 6% per decade. Wind speeds are exponentially linked to damage levels from hurricanes, thus a moderate increase in the average wind speed is expected to result in a multiplicative impact to the amount of damage created. The hurricane scenario considers potential damage resulting from more of the hurricanes developing into category 3 storms while maintaining prior overall frequency expectations regionally.

**Figure 4. Trend of Proposition of Major Hurricanes Over Time**

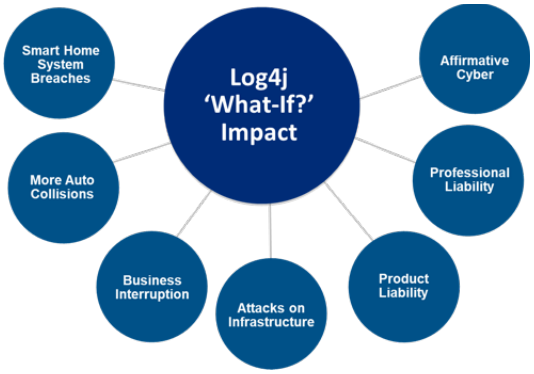



## CYBER SABOTAGE

Cyber continues to be a major threat to underwriting performance for insurance companies. This new source of loss potential has many unknown elements, including long-term frequency and severity parameters for proper pricing, how cyber incidents may affect losses in other lines of business, and an untested policy language in the judicial system.

Year 1 and 2 scenarios study the impact of silent cyber, which accommodates potential losses coming through on a non-cyber policy but that originally were caused by cyber involvement. In year 1, analysis focused on the potential loss impact from cyber criminals looking for ransom payments and willingness to hold data hostage or destroy data. This exercise resulted in the largest losses on the commercial multi-peril, financial, and general liability lines of business.

**Figure 5. Cyber Sabotage Loss Sources**




With the changing geopolitical climate and the Russia-Ukraine war, concern is rising on the potential physical damage and widespread disruption inflicted by bad actors. Rather than ransom payments, this scenario looks at the potential for economic losses resulting from individual hackers or state-sponsored entities that are determined to cause maximum harm and physical damage.

Examples of these loss sources include: malfunctioning smart home devices, such as thermostats or electrical appliances, resulting in homeowner losses; compromised control of connected vehicles, resulting in auto collision and bodily injury claims; or unsafe drinking water due to changing chemical levels in electronically controlled water-treatment facilities, resulting in large product liability claims.

All of these scenarios are hypothetical, but they reflect the types of losses the U.S. property/casualty industry could experience in the face of large-scale cyber sabotage. Year 1 cyber scenario resulted in USD 2 billion loss of surplus for the mutual industry, while year 2 cyber scenario is expected to result in a USD 12.4 billion loss in surplus for mutuals. Both cyber scenarios are based on real-world vulnerabilities discovered.

## INFLATION

In year 1, we reviewed an inflationary environment that reflected an increase of claims costs indexed from a 1-in-100-year adverse economic inflation condition, as defined by Moody's® economic scenario generator. This results in a loss of surplus to the mutual industry of USD 23 billion in year 1 scenario. We applied inflation effects based on consumer price index (CPI) for property lines of business and medical consumer price index (MCPI) for casualty lines of business. Given the increased concern over inflation coming from almost every source of the U.S. economy since last year's analysis, this scenario is most consistent with that of the prior year.

Methodology to apply newly inflated prices to payment patterns and current losses through the year remains consistent. Under the model, premium growth of 8% above plan reflects the extended time frame of increased prices. Loss and reserve volatility are increased to reflect greater cost uncertainty by indexing to inflation prices. Given the observed inflationary spike in 2022 and the relatively narrow range of volatility provided in the Q4 2021 economic scenario generator used, the increase in inflation was pegged to the 1-in-250-year return period for year 2 of the analysis. This increase in inflation above the mean inflation for the year is applied to the full distribution of inflation rates in the stochastic capital model, thus keeping the full range and distribution of inflation rates but shifting that distribution to the right, based on the indicated increase dictated by the 1-in-250-year CPI or MCPI. The loss to mutuals in year 2 of the inflation scenario grew to USD 38.5 billion.

## STAGFLATION

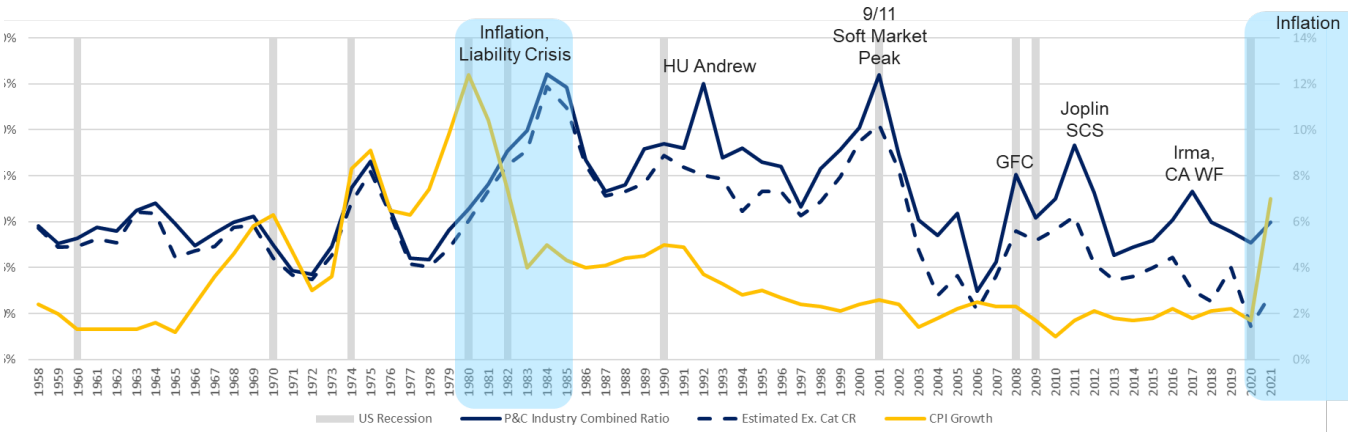
In late 2020 and early 2021, entering the second year of the COVID-19 pandemic, inflation and recession were great concerns for many, including NAMIC members. After an initial panic in spring 2020, financial markets rebounded sharply in late 2020 and 2021 due to historic expansionary fiscal and monetary policy. In 2021, a dangerous mix of recessionary concerns and stimulus-hangover-induced inflation emerged globally, pushing down valuations of stocks and bonds simultaneously.

As governments and central banks have rushed to reel in stimulus, forces like deglobalization, reduced labor-force participation, and supply-chain disruptions have served to make core inflation persistently high, even in the face of slowing growth. It is with these concerns in mind that the recession scenario was replaced with a stagflation scenario, measuring how companies may fare within the context of historically challenging times.

The 1-in-100-year return period of increased inflation is selected for application over the next three years to loss payments and payment patterns, with the three-year delta applied to all future unpaid losses in the payment pattern. Within the economic contraction, equities experience a 16.8% loss in total return for the year, which is the average of the worst 10 years in the last 100 years of return from the Dow Jones Industrial Average, consistent with the equity drop applied in the recession scenario in the year 1 scenarios.

Bonds experience an accelerated year-end yield to reflect the five-year rate within the first year, based on bond ratings. Premium in the stagflation scenario reacts to both the contraction from the economic slowdown and the inflation growth. Economic contraction matches the recession scenario from year 1 analysis, with 8% growth layered above that contraction.

**Figure 6. Relationship Between CPI and Ex Cat Combined Ratio**




Volatility for losses and reserves are increased to reflect greater cost uncertainty by indexing to inflation prices. The new stagflation essentially layers the prior year's inflation and recession scenarios atop each other, with additional nuances made to best reflect the operating environment Guy Carpenter's subject matter experts expect to see. Prior year's impact for mutuals was USD 23 billion for inflation and USD 59 billion for recession, while the outcome for the stagflation scenario results in a USD 63.2 billion impact.

## METHODOLOGY AND GOALS

The scenario tests began by examining each U.S. property/casualty company's 2021 annual statement filed with the National Association of Insurance Commissioners (NAIC). Using Guy Carpenter's proprietary standardized capital modeling framework, BenchmaRQ™, Guy Carpenter conducted a simulation of future operating results based on underlying risk distributions, including capital market outcomes, insurance market cycles, attritional and large losses, catastrophic events, and reserve development. These scenarios take into account each company's financial history, Guy Carpenter's insurance risk benchmarks, economic projections from Moody's Analytics™, and market-share-based catastrophe modeling run through AIR™. The output from BenchmaRQ™ provides valuable insights on a company's performance across a range of potential scenarios for what the future may hold. Comparing performance across the loss curve with expected results informs a deeper understanding of a company's loss sensitivities and exposure to different types of scenarios.

Additional context is provided by comparing a company to its peers or market competitors. In the sections of this report covering each scenario, we document our rationale and assumptions adopted for modeling the stress-test scenarios.

### GOALS OF THE SCENARIO TESTS

Systemic shock scenarios are unpredictable and challenging to forecast by nature, so it is helpful to reference multiple sources when deciding which scenarios to incorporate into the model.

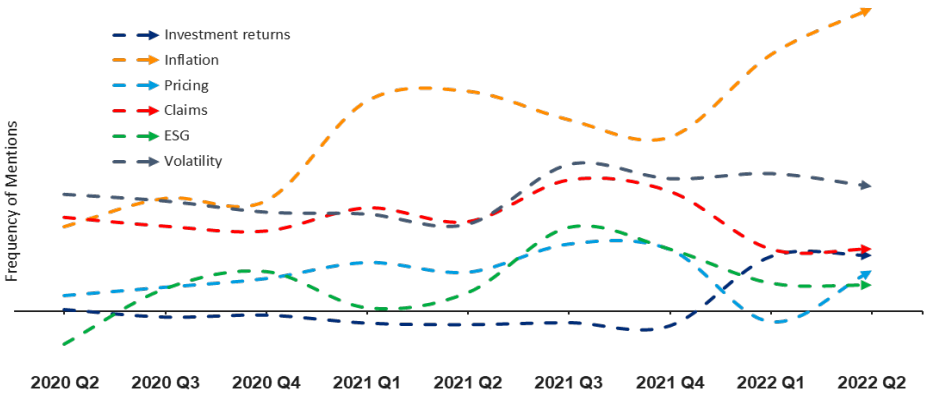
AM Best monitors the solvency and risk profile of most of the U.S. and global insurance market and has made scenario testing a point of emphasis in its ratings evaluations. AM Best has put the task of selecting and defining relevant scenarios onto the management teams of each company, with the goal of reflecting probable and impactful potential exposures and aligning action plans around exposure outside the company's risk appetite.

Regulators in 14 states[3] have begun asking companies to provide enhanced disclosures around climate exposure through the revised NAIC Climate Risk Disclosure Survey. And the NAIC's Climate and Resiliency (EX) Task Force Solvency Workstream has been reviewing approaches to scenario analysis and has several items out for referral to other NAIC groups. Regulators are considering whether/how to revise the ways they may review scenarios as well as their existing risk assessment and solvency tools. Additionally, in some cases, boards of directors are reaching out to management for information on risk mitigation strategies across specific areas of interest. Public stock companies must disclose key risks and emerging threats they are monitoring, and equity analysts are expected to ask questions on facets of the market that may present risk to future performance.

Inflation concern is an increasingly frequent topic raised in investor analyst calls and public communications. Disclosures collected from 35 U.S. regional and national publicly traded property/casualty companies are shown below. Inflation remained a major issue through the end of 2021 and into 2022. In the beginning of 2022, investment returns started to gain traction, whereas they were not mentioned much before then. Concerns around volatility and claims have started to taper off.

Based on the above data trends and NAMIC member feedback, we selected five scenarios, which are described in their respective sections in this report. As the road ahead remains uncertain for insurers, Guy Carpenter plans to continue to develop relevant and impactful scenario tests and provide detailed company-level results of the tests to NAMIC member companies.

**Figure 7. Frequency of Topics Raised**




## COMPANY SEGMENTATION

Aggregate peer comparisons may provide some direction for further investigative action – what decisions could be considered to manage downside risk in catastrophic events or volatile asset markets? These comparisons may help illuminate possible areas of outsized risk exposure and may help to provide possible direction on where to focus for additional review.

Assessing one's own risk quantitatively under various scenarios provides data to support dialogue with company stakeholders, regulators, and rating agencies. Companies were segmented by four profile characteristics: size, region, line of business focus, and company structure.

[3] States requiring NAIC Climate Survey: California, Delaware, Maine, Maryland, Massachusetts, Minnesota, New Jersey, New Mexico, New York, Oregon, Pennsylvania, Rhode Island, Vermont, and Washington.

Regional- and line-of-business-focus segmentation followed the SNL Financial segment methodology and naming conventions. Guy Carpenter performed the full stochastic capital model for baseline and scenarios on 1,009 combined and unaffiliated entities. The cluster analysis removed companies that were return-on-surplus outliers or had premium levels below USD 5 million, leaving 709 companies for the cluster analysis.

## SIZE

Companies[4] were segmented by size of direct written premium as of 2021, as provided by NAMIC. Table 4 shows a breakdown of companies modeled by count and net premium written (NPW).

## REGION

Companies with a geographic focus were put into a regional group or the national group if they wrote a sufficient amount nationally across various regions. The S&P Capital IQ definitions and mapping for geographic focus were used.

**Table 4. Company Count and Sum of Net Premium Written by Size as of Year-End 2021**

| Size | Company Count | NPW ($M) |
|---|---|---|
| < $20M | 470 | 6,599 |
| $20 - $100M | 228 | 13,017 |
| $100 - $500M | 170 | 37,585 |
| $500 - $2B | 91 | 84,037 |
| > $2B | 50 | 636,037 |
| **Total** | **1,009** | **777,336** |

State-level premiums were aggregated into four regions as defined by the U.S. Census Bureau. If a company had 50% or more premium in one region, then the company was mapped to that region. Otherwise, if the company's premium was distributed across multiple regions such that no region made up at least 50% of the premium, the company was mapped as a national writer. Companies that wrote less than USD 1 million or had premium values not available were not assigned to a region (S&P Capital IQ).

There is a balanced company count by region, with the most companies assigned to the Southern region. Unsurprisingly, national companies made up the majority of NPW.

**Figure 8. Regional Definition by State**

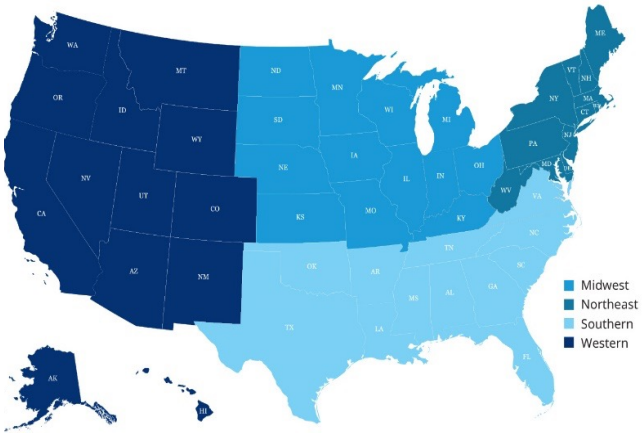



**Table 5. Company Count and Sum of Net Premium Written by Region as of Year-End 2021**

| Regions | Company Count | NPW ($M) |
|---|---|---|
| National | 219 | 636,885 |
| Midwest | 147 | 30,637 |
| Northeast | 139 | 17,478 |
| Southern | 253 | 61,442 |
| Western | 93 | 29,644 |
| No Region Assigned | 158 | 1,250 |
| **Total** | **1,009** | **777,336** |

[4] "Company" in this report is defined based on S&P company groupings of legal entities, consistent with NAMIC's approach used in other market reports.

## COMPANY STRUCTURE

The mutual segment comprises the following categories of company structures: combined and unaffiliated entity mutual companies; exchanges, including reciprocal exchanges; risk retention groups (RRGs); captives; cooperatives; and nonprofits. The stock segment comprises publicly and privately traded stock companies. Other segmentation type includes limited liability corporations, U.S. branches of alien insurers, insurance pools or trusts, syndicates, and other entities. Company count and NPW distribution by ownership type are shown; count and premium breakdown between mutuals and stock companies is relatively balanced.

**Table 6. Company Count and Sum of Net Premium Written by Structure as of Year-End 2021**

| Structure | Company Count | NPW ($M) |
|---|---|---|
| Mutual | 497 | 296,404 |
| Other | 34 | 3,816 |
| Stock | 478 | 477,116 |
| **Total** | **1,009** | **777,336** |

## LINE OF BUSINESS

Companies were segmented into line of business focus. Generally, the company was mapped to the line of business with the most premium. All companies with less than USD 1 million in net premiums were not assigned to a line of business focus.

Then, companies that had reinsurance assumed from non-affiliates that totaled more than 64% of their premium written from direct business and reinsurance assumed from non-affiliates were mapped to the reinsurance line of business. Remaining companies were assigned to the line of business that held the greatest proportion of NPW (S&P Capital IQ). Personal lines has the highest company count, as well as the largest proportion of NPW.

Please note that throughout this paper rounding may affect totals.

**Table 7. Company Count and Sum of Net Premium Written by Line as of Year-End 2021**

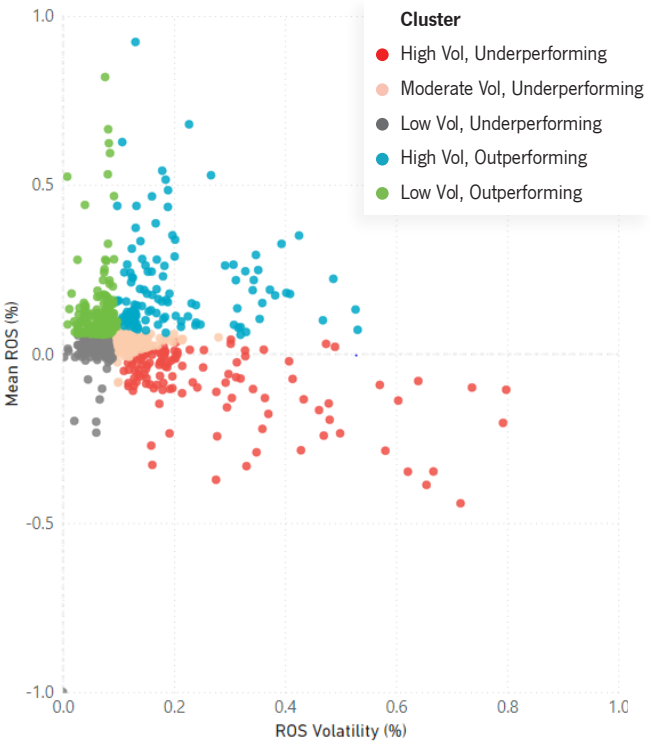
| Line of Business | Company Count | NPW ($M) |
|---|---|---|
| Accident & Health | 8 | 1,712 |
| Commercial Financial | 35 | 4,930 |
| Commercial General Liability | 72 | 21,311 |
| Commercial Lines | 92 | 157,909 |
| Commercial Medical Malpractice | 109 | 6,169 |
| Commercial Property | 185 | 81,436 |
| Commercial Workers' Compensation | 81 | 18,083 |
| Large Reinsurance | 9 | 48,998 |
| Personal Lines | 257 | 435,599 |
| Personal Property | 0 | 0 |
| Reinsurance | 12 | 369 |
| No line to assign | 149 | 821 |
| **Total** | **1,009** | **777,336** |

## CLUSTERING RESULTS

In pursuit of further insights into how companies perform against their peers, companies were grouped into similar return and volatility profiles. Company performance is defined by company's expected modeled return on surplus for the 2022 modeled year and the volatility around those return on surplus results.

We performed a k-means clustering statistical analysis on the company's modeled results. Clustering of data points aims to group companies with similarly performing peers while maximizing the difference between groups and minimizing the distance within a group. The result of the clustering is companies grouped by performance cohort, which goes from the highest performing group in light green in the top left (low volatility, outperforming) to the lowest performing group in red in the bottom right (high volatility, underperforming). The three middle groups take up various positions on the tradeoff between volatility and return: dark blue in the top right (high volatility, outperforming), peach in the center (moderate volatility, underperforming), and gray in the bottom left (low volatility, underperforming). Figure 9 shows the clustering of company modeled results; each dot represents an individual company's risk and return profile based on the Baseline 2022 BenchmaRQ™ analysis.

**Figure 9. Baseline Cluster Results**



## ANALYTICAL DEEP DIVE: APPROACH TO CLUSTERING

Clustering helps identify objective insights into how the companies are best grouped into cohorts based on the performance characteristics of mean return on surplus and variance of return on surplus. The non-hierarchical Euclidian distance was used to assign and calculate centroids based on normalized return on surplus and volatility data sets. The result placed every entity with the closest centroid, recalculated in an interative manner until no companies switched clusters. This analysis was performed on all statutory property/casualty filers, excluding those that presented as outliers: those that had a return on surplus above 100% or below a loss of surplus of 100%, as well as those companies with less than USD 5 million in net premium written (NPW).

Ultimately, the number of clusters selected was five, due to the locally optimized results, as supported by the Calinski and Harabasz test (CH Test) at k=5. Results from the various scenarios were then applied to the baseline centroid data points to remap companies to cluster cohorts. The target central point for the cluster remained constant, thereby holding consistent the performance boundaries that define each cluster. By holding the performance characteristics constant, insight into how companies move between the clusters helps to form understanding of how a company would handle a scenario compared to its baseline peers.

# MODEL RESULTS

To help facilitate understanding of stress-scenario impacts, we first needed to consider how each company is projected to perform in an expected operating environment, which we call the baseline model. This baseline view is helpful in contextualizing how performance prospects have changed over the years for the property/casualty market.

## BASELINE MODEL

For the industry in aggregate, the expected return on surplus for 2022 was 6.6%, with an overall volatility of 8.2%. This is an improvement in expected return from the 2021 baseline model, which simulated a 5.4% return and a volatility of 8.0%. The industry delivered a 16.6% pre-dividend return in 2021, due in part to strong asset performance. The improvements in expected return in the 2022 model compared with 2021 reflected some increased rate levels and an expectation for lower asset-market volatility, as pandemic disruptions are resolved or habituated. The authors project an average industry underwriting combined ratio in 2022 of 97.5%, in line with the 2021 industry results and better than the 98.3% that was projected for 2021.

In the following section, researchers break down the 2022 baseline model results for the different segments and offer high-level observations on trends by type of carrier.

## OVERVIEW OF SEGMENT RESULTS: SIZE

The largest companies in the industry had lower expected operating volatility than smaller companies due to their greater product and regional diversification. Very large companies also were more likely to have an expected return on surplus of 5% or greater. The smallest companies, those with premiums less than USD 20 million, were most likely to have flat or negative expected return, as their smaller size often drives higher expense ratios and challenges competing with the scale advantage of larger rivals.

## OVERVIEW OF SEGMENT RESULTS: BY REGION

Midwest companies tend to have lower expected operating volatility, while a larger share of West Coast and Northeast writers had very high expected volatility in their performance. Midwest companies also had the highest expected underwriting return among all regional segments, though few were expected to deliver returns on surplus greater than 12%-15%. Among regional segments, national carriers had the largest share of companies expected to deliver returns on surplus of 10% or more, while writers in the South and on the West Coast were most likely to deliver an expected loss in surplus.

## OVERVIEW OF SEGMENT RESULTS: BY COMPANY STRUCTURE

Mutual companies were much less likely to have a high surplus volatility than stock companies; fewer than 5% of mutuals studied showed a surplus volatility of greater than 20%, while more than 20% of stock companies and 35% of insurers with other company structures have an expected surplus volatility over 20%.

Because mutuals are managed with policyholders in mind, it is intuitive that the vast majority of mutuals were projected to deliver a return of surplus between break even and 10%-12% gain.

One driver of this is the higher operating leverage that stock companies and captives can tolerate, due to their ability to more easily raise capital. Because mutuals are managed with policyholders in mind, it is intuitive that the vast majority of mutuals were projected to deliver a return on surplus between breaking even and a 10%-12% gain.

Operating with a very high expected return on surplus could be counter to the mission of most mutual insurers. By contrast, more than 35% of stock companies operate with an expected return of more than 10%, which was driven by the need to deliver a return on investment to their shareholders. While relatively few stock and mutual companies were operating with more than a small expected loss, nearly 20% of companies with Other structure types operated at an expected loss of 5% or more. These entities included limited liability corporations, U.S. branches of alien insurers, insurance pools or trusts and syndicates, and often operated as components of a larger organization or designated risk management vehicles. In many cases they are not designed to deliver an economic profit but are mechanisms to manage risk.

## SCENARIO 1 – INCREASED HURRICANE SEVERITY

Since mutuals start with a higher catastrophe average expected loss, it seems that mutuals are more conservative in their catastrophe reinsurance structures, defensively positioned to withstand a large range of unexpected tail events.

### KEY FINDINGS

While insurers look to manage their exposure to catastrophic natural perils, the tail risk for hurricanes continues to grow. Hurricane damage exponentially increases in relation to wind speed[5], therefore the growing scientific consensus that the proportion of strongest storms is increasing has major ramifications for the insurance industry.

The 1-in-250-year hurricane probable maximum loss (PML) amount increases by 18.7% in the hurricane scenario compared to the baseline, which corresponds to a PML increase from 7.5% to 8.9% of surplus exposed.

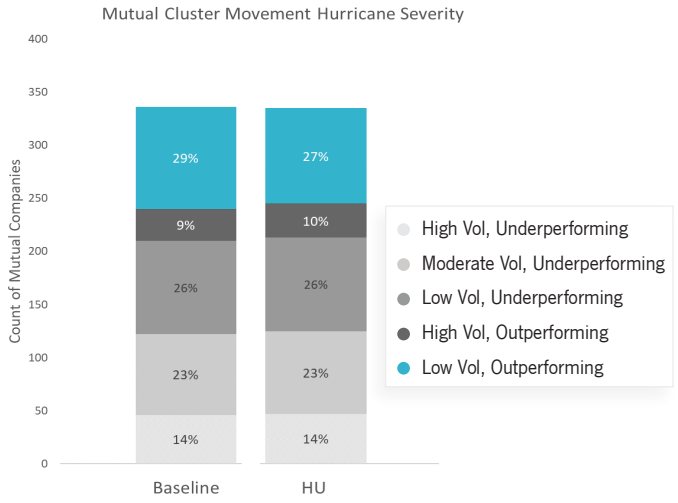
**Table 8. Hurricane 99.6th Percentile PML by Region**

| Geographic Focus | PML 1:250 HU | | | |
|---|---|---|---|---|
| | Baseline | Hurricane | % Change | $B Change |
| National | 6.5% | 7.8% | 1.3% | 11.0 |
| Midwestern Quadrant | 3.4% | 4.1% | 0.7% | 0.2 |
| Northeastern Quadrant | 24.9% | 26.9% | 2.0% | 0.5 |
| Southern Quadrant | 15.4% | 18.0% | 2.6% | 1.8 |
| Western Quadrant | 4.3% | 4.6% | 0.3% | 0.1 |
| **Total** | **7.5%** | **8.9%** | **1.4%** | **13.6** |

This scenario predicts a loss to the industry of USD 0.4 billion, with that amount increased in the tail years, resulting in a USD 13.6 billion loss in a 1-in-250-hurricane year. Gross hurricane losses from a 1-in-250-year event increase by USD 18.6 billion for the industry and USD 7.2 billion for mutuals alone. Mutual companies experience a greater portion of this loss, resulting in a total loss of surplus of 9.3% for mutual companies and 8.6% loss of surplus for stock companies, at a 1-in-250 scenario. This is the least severe scenario considered; however, it is an important scenario to consider, given its strong likelihood to occur, and it reflects a gradual shift in the industry experiences for many years to come.

Florida has the highest hurricane landfall frequency of all states and makes up almost 40% of all landfalls. Thus, insurers that write property in the Southeast – and Florida specifically – have the greatest vulnerability to this scenario.

**Figure 10. Hurricane Cluster Movement**




[5] (1) Nordhaus, William D., The Economics of Hurricanes in the United States, National Bureau of Economic Research (December 2006) and (2) R.A. Pielke Jr. and colleagues, Normalized Hurricane Damage in the United States: 1900-2005, Natural Hazard Review (2008)

Texas has the second most hurricane landfalls on record of all states. In 2017, Hurricane Harvey made landfall in Texas and became one of the most devastating hurricanes in recorded history, causing an estimated USD 125 billion in damage, which is 1.5 times the Southern surplus amount. We see that Southern companies have a 2.6% point increase in the 1-in-250 PML amount. Companies under USD 100 million in premium are most impacted by this scenario, resulting in an increased loss from a 1-in-250-year event between 2.9% and 3.4% on average. Stock and mutuals are expected to be equally impacted by increasing hurricane severities; we see an increase of 1:250 losses to be 1.4% for both, compared to 4.9% increase for other carrier types.

**Table 9. Hurricane 99.6th Percentile PML by Line for 2022 Modeled Year**

| Line of Business Focus | PML 1:250 HU | | | |
|---|---|---|---|---|
| | Baseline | Hurricane | % Change | $B Change |
| A&H Lines | 4.6% | 4.3% | -0.3% | 0.0 |
| Commercial Financial Lines | 0.3% | 0.3% | 0.1% | 0.0 |
| Commercial GL | 11.3% | 14.0% | 2.7% | 0.4 |
| Commercial | 10.1% | 12.1% | 2.0% | 3.0 |
| Commercial Med Mal | 0.3% | 0.3% | 0.0% | 0.0 |
| Commercial Property | 11.6% | 13.4% | 1.8% | 1.6 |
| Commercial WC | 2.3% | 2.9% | 0.6% | 0.1 |
| Large Reinsurance | 7.5% | 8.4% | 0.9% | 0.2 |
| Personal Lines | 6.3% | 7.5% | 1.2% | 8.2 |
| Reinsurance | 1.2% | 1.3% | 0.1% | 0.0 |
| **Total** | **7.5%** | **8.9%** | **1.4%** | **13.6** |

**Table 10. Hurricane 99.6 Percentile PML by Structure for 2022 Modeled Year**

| Company Type | PML 1:250 HU | | | |
|---|---|---|---|---|
| | Baseline | Hurricane | % Change | $B Change |
| Stock | 7.1% | 8.5% | 1.4% | 8.2% |
| Other | 40.4% | 45.3% | 4.9% | 0.0 |
| Mutual | 8.0% | 9.3% | 1.4% | 5.4 |
| **Total** | **7.5%** | **8.9%** | **1.4%** | **13.6** |

Since mutuals start with a higher catastrophe average expected loss, mutuals may be more conservative in their catastrophe reinsurance structures, defensively positioned to withstand a large range of unexpected tail events. Regarding companies selected by primary lines of business, unsurprisingly, personal lines are most affected by loss amount, losing an additional USD 8.2 billion, followed by commercial lines. Commercial lines PML increased by 2.0% to reach 12.1% surplus exposure in a 1-in-250-year hurricane, while commercial general liability and commercial property lines rose by 2.7% and 1.8% to end with 14.0% and 13.4% surplus exposure in a large hurricane event.

We see companies managing the catastrophe exposure by diversifying portfolios to minimize large aggregate weather risks. Companies that are concerned with their exposure to hurricane losses should look to understand the concentration risk they experience accumulation of catastrophe risks, and set risk tolerance. Guy Carpenter and NAMIC have coordinated to provide quarterly calls – available to all NAMIC members – highlighting advancements in understanding the relationship between weather and climate and the insurance industry.

**Table 11. Hurricane 99.6th Percentile PML by Size for 2022 Modeled Year**

| Carrier Size | PML 1:250 HU | | | |
|---|---|---|---|---|
| | Baseline | Hurricane | % Change | $B Change |
| < $20M | 16.9% | 19.8% | 2.9% | 0.1 |
| $20 - $100M | 20.6% | 24.0% | 3.4% | 0.3 |
| $100 - $500M | 13.3% | 14.7% | 1.5% | 0.5 |
| $500M - $2B | 13.1% | 15.1% | 1.9% | 1.5 |
| > $2B | 6.6% | 7.9% | 1.3% | 11.3 |
| **Total** | **7.5%** | **8.9%** | **1.4%** | **13.6** |

## ASSUMPTIONS

The purpose of this effort is to implement a capital scenario test from the potential effects of changing climate on industry hurricane risk. This scenario is hypothetical and not based on any real events that happened in 2022 or prior years. It is designed as a stress scenario distinct from the expected performance in 2022.

To achieve this goal, the proportion of very intense tropical cyclone (TCs) (categories 4 and 5: >130 mph – hereafter referred to as severe hurricanes) landfalls relative to all hurricane landfalls is adjusted based on climate change projections in the peer-reviewed literature.

We leave the probability of landfall, annual frequency of landfall, and spatial distribution of landfalls approximately consistent because of the lack of scientific consensus on how climate change is expected to affect these metrics. Using Knutson et al. (2020)[6], we selected an increase of 15% for severe hurricane landfalls and a slight decrease of all other landfalling storms to keep the annual frequency of total hurricane landfalls approximately constant. These modifications are consistent with the recent findings of the Intergovernmental Panel on Climate Change's (IPCC) 6th Assessment Report (2021)[7].

To arrive at the 15% increase, we leveraged Jewson's (2021)[8] more detailed projections for North Atlantic hurricanes, which were derived from Knutson et al. (2020). Using a representative concentration pathway or RCP4.5 warming scenario, we selected the projected change (compared to a 1990-2020 baseline) in the 75th percentile of the available climate model projections for 2040. The 75th percentile is selected to reflect the fact that higher-resolution climate models (e.g. Bhatia et al. 2018; Emanuel 2013; Knutson et al. 2015)[9] show larger changes in severe hurricanes compared to the lower resolution climate models.

[6] T. Knutson, S.J. Camargo, J.C.L. Chan, K. Emanuel, C. Ho, J. Kossin, M. Mohapatra, M. Satoh, M. Sugi, K. Walsh, & L. Wu, (2020), Tropical Cyclones and Climate Change Assessment: Part II: Projected Response to Anthropogenic Warming, Bulletin of the American Meteorological Society, 101(3), E303-E322.

[7] [V. Masson-Delmotte, P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M.I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T.K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou (eds.)]. IPCC, 2021: Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press. In Press.

[8] Jewson, S. (2021). Conversion of the Knutson et al. Tropical Cyclone Climate Change Projections to Risk Model Baselines, Journal of Applied Meteorology and Climatology, 60(11), 1517-1530.

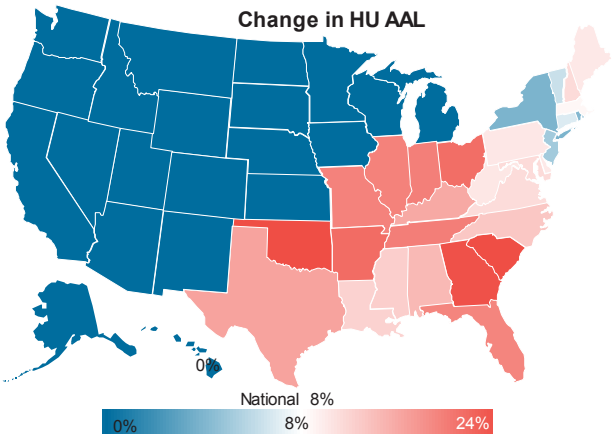
[9] 1) K. Bhatia, G. Vecchi, H. Murakami, S. Underwood, and J. Kossin, 2018: Projected response of tropical cyclone intensity and intensification in a global climate model. J. Climate, 31, 8281–8303. 2) K.A. Emanuel, 2013: Downscaling CMIP5 climate models shows increased tropical cyclone activity over the 21st century. Proc. Natl. Acad. Sci. USA, 110, 12 219-12 224. 3) T. Knutson, J.J. Sirutis, M. Zhao, R. E. Tuleya, M. Bender, G. A. Vecchi, G. Villarini, and D. Chavas, 2015: Global projections of intense tropical cyclone activity for the late twenty-first century from dynamical downscaling of CMIP5/RCP4.5 scenarios. J. Climate, 28, 7203–7224.

Thus, we have higher confidence in these more advanced models.

For a RCP4.5 warming scenario, 2040 represents an additional ~0.75 degrees Celsius of global warming compared to a 1990-2020 baseline.

With this justification, catastrophe model output is adjusted such that severe hurricane landfall frequency is increased by 15%, with a corresponding decrease in the frequency of category 1-3 hurricanes, leaving net landfall frequency unchanged. Regional frequency in the model is also preserved, given unclear guidance on regional evolution under climate change. The adjustment is implemented using an optimization process under the constraints discussed above.

**Figure 11. Map of Changes to Hurricane Annual Losses**




The approach is designed for evaluation of AAL, AEP and OEP, but could potentially lose accuracy for more complex terms and structures. It should also be emphasized that the selected projection for increased severe hurricanes, while suitably conservative and consistent with the IPCC and academic literature, represents a single possible scenario among many. The projection is highly uncertain, and it is likely the magnitude of projected changes will evolve as new research emerges.

There are a few documented caveats with our resampling approach for TCs, which could introduce biases in the loss projections. For example, locations that get hit by more cat 4 and 5s in the historical dataset will likely have more unique strong TC landfalls to resample. Thus, areas like the Northeast, which have no cat 5 storms in the historical dataset, will likely have less opportunities to be affected by strong TCs in our projected loss total. Also, our loss numbers do not account for the expectation that the average storm surge- and rainfall-related flooding for the same intensity storm are expected to be worse in the future due to climate change. Therefore, projected losses could be much higher in the future due to more flood-related damage that we are not accounting for. Finally, the future TC intensity distribution remains bounded by the same maximum intensity that is observed in the present day scenario. In reality, climate change research would suggest the top possible intensities should increase as well and the whole intensity distribution could shift to higher values in the future. We are unable to account for this possibility because we cannot create new events. The nonlinear relationship of damage and wind at higher wind speeds suggests any increase in projected storm intensity at landfall would potentially contribute to significantly higher losses.

## SCENARIO 2 – SEVERE CONVECTIVE STORM WITH INCREASED RETENTIONS

### KEY FINDINGS

Increased severe convective storm losses with an accompanying increase in retention levels for primary insurers results in a USD 5.3 billion loss to the industry. This scenario results in the overall industry exposure to 1-in-100-year storms increasing by more than 50%. Mutual companies are significantly more vulnerable to this scenario, with an additional loss of surplus of 2.4% in a 1-in-100 year, compared to a 0.9% loss of surplus for stock companies.

Companies that select a lower attachment point for their catastrophe reinsurance may expect to feel the most pain from this scenario, as they are expected to take on additional catastrophe exposure when reinsurers adjust their pricing to cover convective storms. This scenario, like the hurricane scenario, is a study in the tail risk, so the authors view the impact at the 1-in-100-year level for companies with severe convective storm exposure.

**Figure 12. SCS with Increased Retentions Cluster Movement for 2022 Modeled Year**

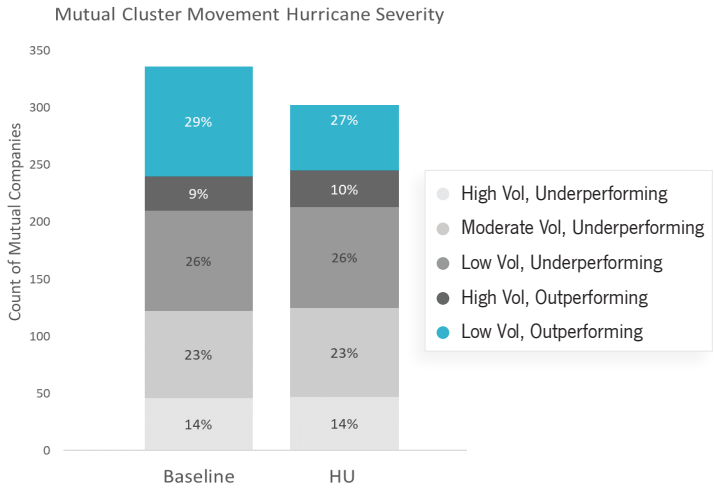



**Table 12. SCS 99th Percentile PML by Structure for 2022 Modeled Year**

| Company Type | PML 1:100 SCS | | | |
|---|---|---|---|---|
| | Baseline | SCS & Increased Retention | % Change | $B Change |
| Stock | 1.7% | 2.7% | 0.9% | 5.5 |
| Other | 7.1% | 9.9% | 2.8% | 0.0 |
| Mutual | 4.1% | 6.5% | 2.4% | 9.6 |
| **Total** | **2.7%** | **4.2%** | **1.5%** | **15.1** |

When we aggregate company results for those companies with catastrophe exposure into the NAMIC company segmentations, certain trends appear. Midwestern companies experience the largest increase in losses, ending with 12.2% of PHS. Southern companies are not far behind in increases, with a 3.4 percentage points increase resulting in 9.3% of surplus loss in a 1-in-100-year event. As losses increase from SCS activity and climates ripe for strong tornados and large hail events push east, companies can no longer rely on heuristics or rule of thumb of historical regional exposure to manage their aggregate SCS exposure. SCS loss changes are also driven by factors beyond changing weather patterns.

**Table 13. SCS 99th Percentile PML by Region for 2022 Modeled Year**

| Geographic Focus | PML 1:100 SCS | | | |
|---|---|---|---|---|
| | Baseline | SCS & Increased Retention | % Change | $B Change |
| National | 2.2% | 3.4% | 1.2% | 10.4 |
| Midwestern Quadrant | 7.4% | 12.2% | 4.8% | 1.6 |
| Northeastern Quadrant | 4.0% | 6.4% | 2.4% | 0.5 |
| Southern Quadrant | 5.9% | 9.3% | 3.4% | 2.3 |
| Western Quadrant | 2.4% | 3.4% | 1.1% | 0.3 |
| **Total** | **2.7%** | **4.2%** | **1.5%** | **15.1** |

**Table 14. SCS 99th Percentile PML by Line for 2022 Modeled Year**

| Line of Business Focus | PML 1:100 SCS | | | |
|---|---|---|---|---|
| | Baseline | SCS & Increased Retention | % Change | $B Change |
| A&H Lines | 1.4% | 2.0% | 0.7% | 0.0 |
| Commercial Financial Lines | 0.0% | 0.0% | 0.0% | 0.0 |
| Commercial GL | 1.6% | 2.5% | 0.9% | 0.1 |
| Commercial | 2.4% | 3.8% | 1.4% | 2.2 |
| Commercial Med Mal | 0.1% | 0.2% | 0.1% | 0.0 |
| Commercial Property | 3.7% | 5.8% | 2.1% | 1.8 |
| Commercial WC | 0.6% | 1.0% | 0.3% | 0.0 |
| Large Reinsurance | 1.7% | 2.6% | 0.9% | 0.2 |
| Personal Lines | 2.7% | 4.3% | 1.6% | 10.7 |
| Reinsurance | 0.6% | 0.9% | 0.3% | 0.0 |
| **Total** | **2.7%** | **4.2%** | **1.5%** | **15.1** |

One primary driver of increased SCS losses is population growth: the geographic footprint of cities, suburban, and exurban areas are all expanding, which increases the chance that a SCS will cause additional damage, due to population growth and housing expansion alone. Secondary perils are becoming an additional significant source of loss. In addition to SCS, secondary perils include wildfires/bushfires, flood or winter storms. Companies that write between USD 20 million and 100 million in premiums experience the largest increase in loss at 3.8 percentage points for a 1-in-100 catastrophe year, while companies with USD 100 million to 2 billion still see an increase of over 3 percentage points. Larger companies that write more than USD 2 billion in premium have the least exposed PHS, only increasing by 1.3% to end at 3.6% of surplus lost in a 1-in-100-year event.

Company results by ownership further emphasize the greater vulnerability mutual companies have from increased SCS loss amounts and increased property catastrophe retentions. Mutual companies' 1-in-100-year loss size increases by 2.4 percentage points, while stock companies see an increase of only 0.9 percentage points.

When we look at performance from a clustering perspective, two out of 10 mutual companies maintain the top performing category. Companies that stay in the top-rated cluster either do not have catastrophe exposure, or have a regional focus of National, Northeastern, or Western to minimize the impact of concentrated storms.

The increased loss amounts from SCS is a growing concern for insurers. More volatile weather patterns potentially could translate to greater frequency and severity of losses for insurers to manage in the future. Positive performance for property writers with respect to increasing frequency and severity of weather losses will come from achieving enough rate for each risk to compensate for increased losses.

Insurers that are concerned with their exposure to the SCS scenario can consider how they monitor their aggregate exposure to the largest weather peril. Mitigating this exposure through risk-tolerance limits may consider the extent of policies written in a particularly concentrated region or careful selection of reinsurance structures begin to future-proof companies in a changing world.

**Table 15. SCS 99th Percentile PML by Size for 2022 Modeled Year**

| Carrier Size | PML 1:100 SCS | | | |
|---|---|---|---|---|
| | Baseline | SCS & Increased Retention | % Change | $B Change |
| < $20M | 3.9% | 6.2% | 2.3% | 0.1 |
| $20 - $100M | 6.6% | 10.4% | 3.8% | 0.3 |
| $100 - $500M | 5.3% | 8.3% | 3.0% | 1.1 |
| $500M - $2B | 5.2% | 8.3% | 3.1% | 2.4 |
| > $2B | 2.3% | 3.6% | 1.3% | 11.3 |
| **Total** | **2.7%** | **4.2%** | **1.5%** | **15.1** |

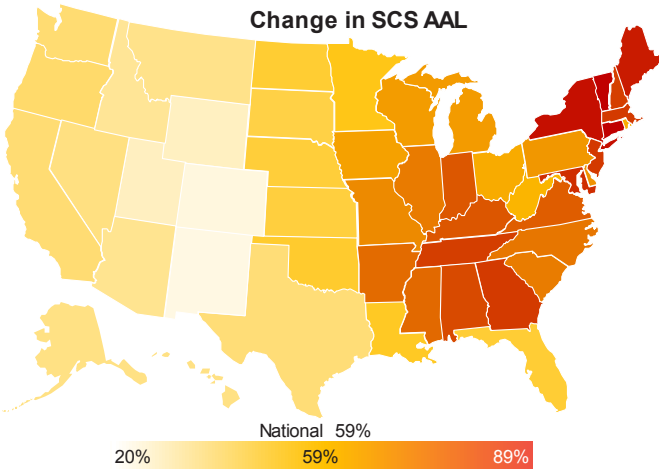
## ASSUMPTIONS

In the summer of 2022, AIR released an updated version of its Severe Convective Storm Model. This event loss database (ELD) was not available at the time of us running our analysis, so it was not used for the model run. However, the knowledge of such an adjustment from AIR led to the formulation of this scenario with the concern that recent years' experience and model trends will likely result in higher SCS exposure for companies and resulting increased price adjustments for reinsurers. Updated to include claims and hazard data through 2018 for most regions of the country, there is an expectation of increasing model losses in the revised results.

It is important to note that in observations, actual SCS activity has not increased. Thus, changes in losses thus far are largely due to exposure changes. Proxies for storm environment suggest more conducive storm environments, but it remains to be seen whether this will translate into more strong tornados and hail events in the future. Therefore, our SCS scenario is quite speculative, and there is less scientific backing supporting it compared to the TC scenario.

What could cause this scenario? Over the past several years, the U.S. has experienced a shift in the severity and variety of severe weather events. As urban centers grow denser, suburban zones spread farther from city centers, and people continue to build along the coast, the exposure to financial loss from catastrophic weather events increases. Increasing fluctuations in weather events cause some years to be more extreme than the historical experience. This scenario leverages academic engagements with leading experts in meteorology to project forward regional trends in both large hailstorms and strong tornados and measures what effect these trends could mean for insurers.

**Figure 13. Map of Change to Severe Convective Storm Annual Losses**




The catastrophe models in use today draw on historical data and may not be accurately capturing the trends of recent years. For example, the SCS models in use for the last several years utilize historical weather data that had not been updated since the early 2010s. Meanwhile, the past decade has been the most active in history for insured SCS losses. It is possible that the recent rise in losses is a temporary phenomenon, and there could be a return to the long-term averages soon. However, there is sufficient evidence in recent years of emerging trends to be considered. In this scenario, the "what if?" is modeled on what would happen if trends of more frequent and severe convective storm events continued over the coming year.

Recent academic data from Northern Illinois University[10,11] provide insights into evolving trends in tornado and hail environments – related to days where tornado and hail activity are known to have occurred. The change in environments is one measure of changing physical SCS risk. These trends are expressed on a decadal basis and normalized to the state level.

As a scenario test, these trends have been integrated into the SCS model output. The observed average for 2019 through 2021 of SCS losses has been applied to these trends to match the nationwide increase of average aggregate loss increase of 59%. This overlay results in a minimum increase of 20%; specifically, Colorado and New Mexico have relatively smaller increases. The largest increases in AAL are in the Northeast, with the maximum increase of 89%. The change is sharper for portions of the Midwest and the I-95 corridor, where the population concentrations are quite high. This scenario is hypothetical and not based on any real events that happened in 2022 or prior years. It is designed as a stress scenario distinct from the expected performance in 2022.

[10] Gensini, V. A., and H. E. Brooks, 2018: Spatial trends in United States tornado activity. npj Climate and Atmos. Science., 1, 1–5. DOI: 10.1038/s41612-018-0048-2

[11] Gensini, A. M. Haberlie, and W. S. Ashley, 2022: Convection-permitting simulations of historical and possible future climate over the contiguous United States. Clim. Dyn., DOI: 10.1007/s00382-022-06306-0

## SCENARIO 3 – CYBER SABOTAGE

### KEY FINDINGS

The cyber scenario results in USD 30.2 billion in loss of surplus to the industry overall, or 2.9% loss of surplus for the mutual industry, in line with the stock loss of surplus. Drivers of performance in this scenario are net written premium leverage and property lines of business. While 29% of mutual companies are in the highest performing cluster in the baseline scenario, only 16% remain in that cluster after a cyber sabotage event with most companies being pushed to the middle cluster, with still-low volatility but underperforming returns. This is not a surprise since almost half of the industry returns for the year are expected to be wiped out from this event.

While the prospect of a major-scale cyber scenario looms large, the extent of the impact to the insurance industry and which lines of business are most vulnerable are still an unknown at this point. The cyber team considered the damage potential for each line of business, particularly regarding the interconnected world utilizing the internet of things and the digitization of the economy.

While the model does not capture the use of exclusions and limitations utilized in policy language, this is one of the first defense options insurers may consider employing to protect themselves from this new systemic risk source. We see that a company's regional focus has little predictive value in determining its losses from a cyber attack. As company size increases, losses also increase from the cyber scenario, topping out at a 3.0 percentage-point decrease for carriers that write more than USD 2 billion in premium and 2.7 percentage points for the second largest carrier group.

**Figure 14. Cyber Sabotage Cluster Movement for 2022 Modeled Year**

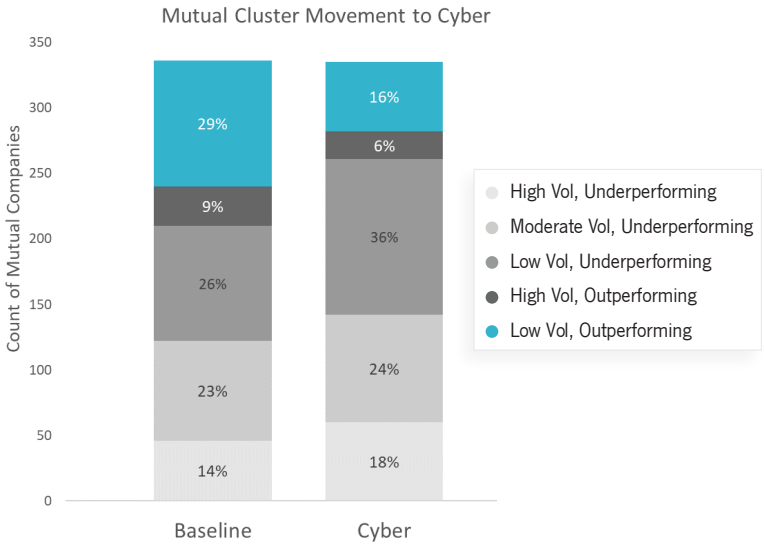



**Table 16. Return on Surplus Change for Cyber by Region for 2022 Modeled Year**

| Geographic Focus | Return On Surplus | | | |
|---|---|---|---|---|
| | Baseline | Cyber Sabotage | % Change | $B Change |
| National | 7.0% | 4.1% | -2.9% | -24.9 |
| Midwestern Quadrant | 5.2% | 2.1% | -3.1% | -1.1 |
| Northeastern Quadrant | 4.8% | 2.3% | -2.5% | -0.7 |
| Southern Quadrant | 6.4% | 3.4% | -2.9% | -2.4 |
| Western Quadrant | 3.8% | 1.3% | -2.4% | -1.1 |
| **Total** | **6.6%** | **3.8%** | **-2.9%** | **-30.2** |

**Table 17. Return on Surplus Change for Cyber by Structure for 2022 Modeled Year**

| Company Type | Return On Surplus | | | |
|---|---|---|---|---|
| | Baseline | Cyber Sabotage | % Change | $B Change |
| Stock | 7.7% | 4.8% | -2.9% | -17.7 |
| Other | 1.0% | 0.7% | -0.3% | 0.0 |
| Mutual | 5.3% | 2.4% | -2.9% | -12.4 |
| **Total** | **6.6%** | **3.8%** | **-2.9%** | **-30.2** |

Commercial and personal lines experience the bulk of surplus loss resulting from cyber sabotage. While large reinsurers experience the biggest drop of surplus by 5.9 percentage points in total, this makes up a smaller portion of the industry overall, only USD 1.8 billion of the USD 30.2 billion total loss. Companies focused on commercial general liability experienced the second largest drop of surplus, with returns for the year being more than halved. While commercial- and personal-lines-focused carriers have their returns almost halved, losing USD 5.9 billion and USD 19.0 billion in surplus respectively.

We encourage insurance companies to monitor their exposure to cyber losses through policy language and ensure there are no coverage gaps in reinsurance, since reinsurers have been pushing to exclude cyber losses.

**Table 18. Return on Surplus Change for Cyber by Line for 2022 Modeled Year**

| Line of Business Focus | Return on Surplus | | | |
|---|---|---|---|---|
| | Baseline | Cyber Sabotage | % Change | $B Change |
| A&H Lines | 2.0% | 1.1% | -0.8% | 0.0 |
| Commercial Financial Lines | 18.8% | 18.9% | 0.0% | 0.0 |
| Commercial GL | 9.7% | 4.4% | -5.4% | -1.0 |
| Commercial | 8.6% | 4.8% | -3.8% | -5.9 |
| Commercial Med Mal | 1.3% | 1.2% | -0.2% | 0.0 |
| Commercial Property | 7.5% | 4.9% | -2.6% | -2.3 |
| Commercial WC | 2.9% | 2.4% | -0.5% | -0.2 |
| Large Reinsurance | 0.7% | -5.1% | -5.9% | -1.8 |
| Personal Lines | 6.4% | 3.6% | -2.8% | -19.0 |
| Reinsurance | 2.2% | 1.4% | -0.8% | 0.0 |
| **Total** | **6.6%** | **3.8%** | **-2.9%** | **-30.2** |

**Table 19. Return on Surplus Change for Cyber by Size for 2022 Modeled Year**

| Carrier Size | Return On Surplus | | | |
|---|---|---|---|---|
| | Baseline | Cyber | % Change | $B Change |
| < $20M | 0.4% | -1.7% | -2.2% | -0.2 |
| $20 - $100M | 3.9% | 1.7% | -2.1% | -0.4 |
| $100 - $500M | 5.7% | 3.7% | -2.0% | -1.1 |
| $500M - $2B | 5.9% | 3.2% | -2.7% | -2.9 |
| > $2B | 6.9% | 4.0% | -3.0% | -25.5 |
| **Total** | **6.6%** | **3.8%** | **-2.9%** | **-30.2** |

## ASSUMPTIONS

With an ever more interconnected world, including the proliferation of connected consumer and commercial products, the potential losses from a cyber attack continue to grow. We created a scenario that explores potential for damage if a cyber criminal had the goal of inflicting significant economic harm.

This is the type of event that could result from geopolitical turmoil, such as the Russia-Ukraine war, where retaliatory operatives interfere, with the goal of causing damage and disruption. For an insurance company, this could result in homeowner, auto, or product liability claims coming from losses connected with smart-home devices, compromised control of connected vehicles, or unsafe drinking water due to changing chemical levels in a water treatment facility.

Additionally, inventory spoilage from a compromised online management system could cause significant losses for a number of different businesses. This scenario is based on a real-world vulnerability in code found in late 2021 called Log4j, which resulted in the ability to have uncredentialed access to larger systems from this small bolt-on error-logging code. This code was discovered by a "white hat," or an ethical hacker who uses computer science and hacking skills to identify vulnerabilities in software or networks and communicates those vulnerabilities to the proper sources, so that they may be fixed before malicious hackers can exploit these vulnerabilities.

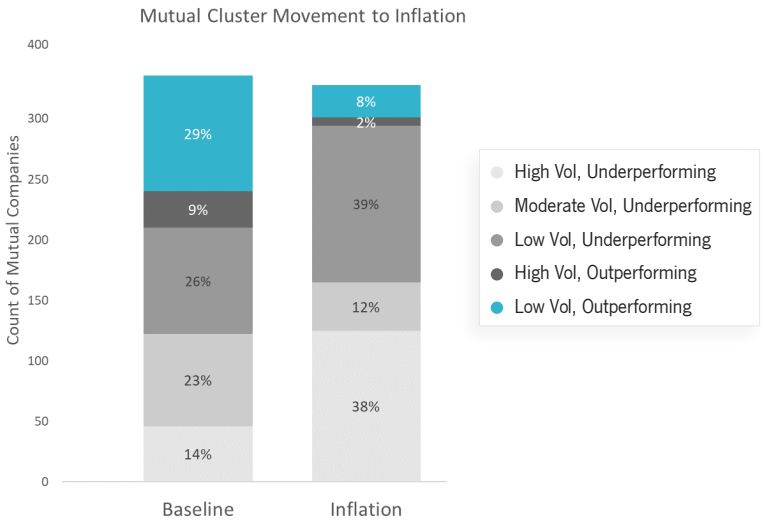
The scenario test we conducted reflects the risk of silent, or unintended, cyber only. The affirmative cyber coverage market is still relatively limited. Costs incurred in the form of business interruption, data replacement, ransom payments, and other casualty costs could have a significant impact on insurers that could be reflected in increased loss ratios. Exposure was based on various Schedule P lines of business, particularly focusing on personal lines and commercial multi-peril. This scenario is hypothetical and not based on any real events that happened in 2022 or prior years. It is designed as a stress scenario distinct from the expected performance in 2022.

## SCENARIO 4 – INFLATION

### KEY FINDINGS

Inflation remains a top concern for insurers, and for good reason – the inflation scenario resulted in USD 138.9 billion in surplus loss. Small adjustments in inflation rates become amplified through a company's payment patterns and the time lag between receiving premium and closing out of liabilities. Longer-tail lines of business are particularly vulnerable to inflation spikes, as are highly leveraged companies. This scenario resulted in a 9.2% drop in surplus for mutual companies and a 16.0% loss of surplus for stock companies. While companies experience the benefit of increased interest rates when buying new bonds, current fixed-income market holdings will drop in realized market value if liquidation before maturity is required. In general, we find mutual companies to have lower vulnerability to the inflation scenario in part due to lower levels of leverage.

**Figure 15. Inflation Cluster Movement for 2022 Modeled Year**




Specifically, reserve leverage is a primary driver of performance in the inflation scenario. Longer-tail lines of business with more reserves on the books experience a greater inflation shock when restating reserves. Written premium leverage and line of business also were predictive of performance in this scenario.

**Table 20. Return on Surplus Change for Inflation by Structure for 2022 Modeled Year**

| Company Type | Return On Surplus | | | |
|---|---|---|---|---|
| | Baseline | Inflation | % Change | $B Change |
| Stock | 7.7% | -8.3% | -16.0% | -98.3 |
| Other | 1.0% | -13.5% | -14.5% | -2.2 |
| Mutual | 5.3% | -3.9% | -9.2% | -38.5 |
| **Total** | **6.6%** | **-6.6%** | **-13.2%** | **-138.9** |

Regionally, national companies are most exposed to the inflation scenario. Companies that are spread out geographically can accommodate additional leverage in their written premium since they are less exposed to correlated losses covering a large portion of their book. They are not protected against inflationary pressures in the same way, thus this leveraging of surplus to write additional diversified risks results in the largest drop in surplus compared to any other regionally focused company. Companies regionally focused in the Southern quadrant are particularly exposed to natural perils, which may limit their leverage undertaken to stay within required risk metrics. They perform best in the inflation scenario, only expected to drop 7.3% of the surplus from baseline performance.

**Table 21. Return on Surplus Change for Inflation by Region for 2022 Modeled Year**

| Geographic Focus | Return On Surplus | | | |
|---|---|---|---|---|
| | Baseline | Inflation | % Change | $B Change |
| National | 7.0% | -7.1% | -14.1% | -121.2 |
| Midwestern Quadrant | 5.2% | -5.3% | -10.5% | -3.9 |
| Northeastern Quadrant | 4.8% | -7.2% | -12.0% | -3.2 |
| Southern Quadrant | 6.4% | -0.9% | -7.3% | -5.5 |
| Western Quadrant | 3.8% | -7.3% | -11.1% | -4.9 |
| **Total** | **6.6%** | **-6.6%** | **-13.2%** | **-138.9** |

Commercial lines similarly suffer in the inflation scenario, due in part to their longer-tail lines of business. The commercial segment is expected to drop 27.3% of its expected surplus return, outpaced by the smaller commercial general-liability-focused company group, which is expected to drop 30.3% of surplus. Interestingly, large reinsurers are the most responsive to the inflation scenario, dropping a whopping 44.8% of expected surplus growth. Further investigation is needed into why this line is so sensitive to inflation spikes.

**Table 22. Return on Surplus Change for Inflation by Line for 2022 Modeled Year**

| Line of Business Focus | Return on Surplus | | | |
|---|---|---|---|---|
| | Baseline | Inflation | % Change | $B Change |
| A&H Lines | 2.0% | -13.0% | -15.0% | -0.2 |
| Commercial Financial Lines | 18.8% | 16.8 | -2.0% | -0.3 |
| Commercial GL | 9.7% | -20.5% | -30.3% | -5.9 |
| Commercial | 8.6% | -18.8% | -27.3% | -42.7 |
| Commercial Med Mal | 1.3% | -21.2% | -22.5% | -3.7 |
| Commercial Property | 7.5% | -6.9% | -14.4% | -12.6 |
| Commercial WC | 2.9% | -10.6 | -13.5% | -4.6 |
| Large Reinsurance | 0.7% | -44.0% | -44.8 | -13.5 |
| Personal Lines | 6.4% | -1.6% | -8.0% | -55.1 |
| Reinsurance | 2.2% | -11.1% | -13.3% | -0.1 |
| **Total** | **6.6%** | **-6.6%** | **-13.2%** | **-138.9** |

Personal lines – with its fast payment patterns – demonstrates the greatest strength in the inflation scenario, showing only 8.0% loss from baseline in personal lines focus.

Companies that write less than USD 20 million in premium have a notably larger response to the inflation scenario. These are the carriers that have the least amount of exposure to catastrophes, with only one in three small underwriters having any exposure to hurricanes or severe convective storms. All other regions experience a drop in surplus between 11.7% and 13.6%.

The inflation scenario results in pushing most mutuals and stocks to the underperforming clusters. While three in 10 mutuals are in the highest performing cluster in the baseline, that number drops to only one in 12 under the inflation scenario.

**Table 23. Return on Surplus Change for Inflation by Size for 2022 Modeled Year**

| Carrier Size | Return On Surplus | | | |
|---|---|---|---|---|
| | Baseline | Inflation | % Change | $B Change |
| < $20M | 0.4% | -17.6% | -18.0% | -2.0 |
| $20 - $100M | 3.9% | -9.7% | -13.6% | -2.8 |
| $100 - $500M | 5.7% | -6.0% | –11.7% | -6.7 |
| $500M - $2B | 5.9% | -7.3% | -13.3% | -13.8 |
| > $2B | 6.9% | -6.3% | -13.3% | -113.6 |
| Total | 6.6% | -6.6% | -13.2% | -138.9 |

**Table 24. 1 in 250 Increase in Inflation Rates for 2022 Modeled Year**

| Increase by Year | General CPI | Medical CPI | WC CPI |
|---|---|---|---|
| 1 | 2.4 | 4.3 | 2.2 |
| 2 | 6.0 | 10.1 | 5.0 |
| 3 | 10.5 | 17.3 | 8.4 |
| 4 | 15.5 | 25.2 | 12.1 |
| 5 | 21.3 | 34.0 | 16.0 |

## ASSUMPTIONS

This scenario examines if the Federal Reserve fails to get inflation under control and the U.S. experiences sustained inflationary pressures. Higher labor and material expenses drive up replacement costs for property claims, while medical and social inflation drive higher severity for casualty and liability losses. In this hypothetical scenario, while the Federal Reserve keeps the low end of the curve close to 0%, interest rates begin to rise at the long end of the curve, as investors demand more return to invest in longer dated bonds. Social inflation drives up liability settlements, while labor and material costs drive higher than expected severity trends across property lines.

For the inflation scenario, researchers calibrated the underwriting stress based on two commonly used measures of inflation – the CPI and MCPI, the latter of which focuses specifically on a basket of healthcare expenditures. The inflation scenario was defined as the 1-in-250-year return period over a five-year horizon within the Moody's Economic Scenario Generator. A 99.6$^{th}$ percentile excess inflation rate over five years was applied to future loss payments on both reserves and current accident year exposures. For property, commercial multi-peril, specialty and marine lines, general CPI will be used. MCPI was applied for all other lines. Workers' compensation CPI is applied to the workers' compensation line of business. Interest rate changes are more drawn out, so this scenario is expected to materialize slowly with potential leading indicators to help companies manage its effects over multiple calendar periods. This scenario is hypothetical and not based on any real events that happened in 2022 or prior years. It is designed as a stress scenario distinct from the expected performance in 2022.

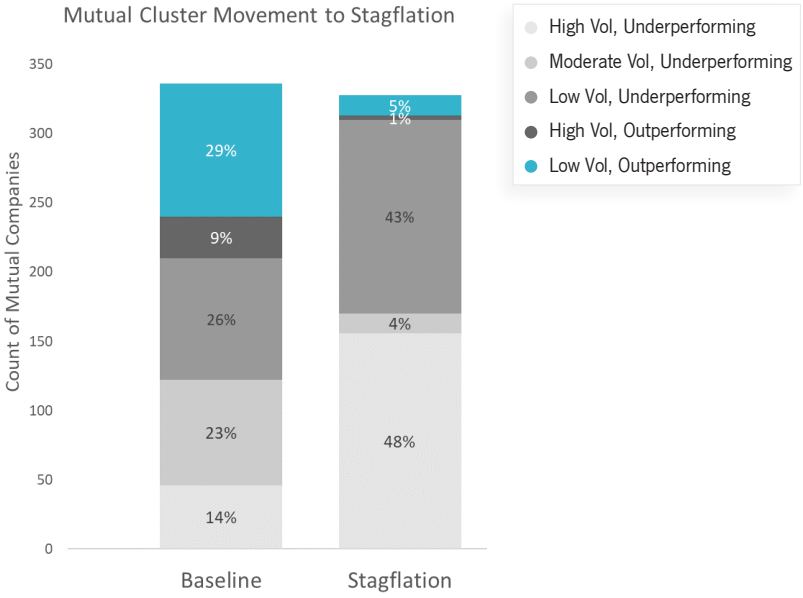
## SCENARIO 5 – STAGFLATION

### KEY FINDINGS

While interest rates are a concern, how to manage rising rates is an open question. If the Federal Reserve were to take an overly aggressive response to inflation and be hawkish in its reaction, a stagflation scenario is predicted.

This is the most severe scenario tested, resulting in USD 190.4 billion of lost surplus to the industry overall. Rising interest rates mixed with an economic downturn hurt both sides of an insurance company's balance sheet: investments drop and losses increase. Companies with greater equity allocations and increased reserve leverage are primed for significant losses from this scenario. The stagflation scenario results in pushing most mutuals and stocks to the underperforming clusters. While three in 10 mutuals are in the highest performing cluster in the baseline, that number drops to only one in 20 under the stagflation scenario.

**Figure 16. Stagflation Cluster Movement for 2022 Modeled Year**




Mutual companies outperform stock companies by 5.6 percentage points in the stagflation scenario, resulting in USD 23.8 billion in saved capital. While stock companies can expect their return on surplus to drop from 7.7% to -12.8%, a 20.5 percentage point reduction, mutuals only drop by 14.9 percentage points, from 5.3% return on surplus to -9.6%. With mutual companies holding less leverage and enterprise-level risk focused on alleviating risk from policyholders versus undertaking equity volatility, it leaves them less vulnerable to a stagflation environment. Specifically, 2.1% of mutuals' surplus is exposed to average annual catastrophe (hurricane and SCS) loss every year, compared to only 1.2% for stock companies.

National companies can expect to lose the most surplus in a stagflation scenario, resulting in a year-end return of surplus of -12.3%, while Southern quadrant companies only lose 11.8%, the best performance of any regional group, ending with -5.5% return on surplus.

**Table 25. Return on Surplus Change for Stagflation by Structure for 2022 Modeled Year**

| Company Type | Return On Surplus | | | |
|---|---|---|---|---|
| | Baseline | Stagflation | % Change | $B Change |
| Stock | 7.7% | -12.8% | -20.5% | -125.6 |
| Other | 1.0% | -9.2% | -10.2% | -1.5 |
| Mutual | 5.3% | -9.6% | -14.9% | -63.2 |
| **Total** | **6.6%** | **-11.5%** | **-18.1%** | **-190.4** |

Commercial lines are more sensitive than personal lines to the stagflation scenario. On the commercial side, general liability has the largest drop of surplus, dropping by 23.2 percentage points. Personal lines are expected to drop 17.6% of surplus growth in aggregate.

**Table 26. Return on Surplus Change for Stagflation by Region for 2022 Modeled Year**

| Company Type | Return On Surplus | | | |
|---|---|---|---|---|
| | Baseline | Stagflation | % Change | $B Change |
| National | 7.0% | -12.3% | -19.2% | -165.5 |
| Midwestern Quadrant | 5.2% | -8.4% | -13.5% | -5.0 |
| Northeastern Quadrant | 4.8% | -11.7% | -16.4% | -4.4 |
| Southern Quadrant | 6.4% | -5.5% | -11.8% | -9.7 |
| Western Quadrant | 3.8% | -8.7% | -12.5% | -5.5 |
| **Total** | **6.6%** | **-11.5%** | **-18.1%** | **-190.4** |

Large reinsurance-focused companies are the carriers most impacted, resulting in losing more than one-quarter of their surplus in the stagflation scenario. By size, we see a clear trend that the larger the company, the greater potential for loss in the stagflation scenario. The smallest companies writing less than USD 20 million have a loss of surplus change in line with the USD 500-million- to 2-billion-size companies.

**Table 27. Return on Surplus Change for Stagflation by Line for 2022 Modeled Year**

| Line of Business Focus | Return On Surplus | | | |
|---|---|---|---|---|
| | Baseline | Stagflation | % Change | $B Change |
| A&H Lines | 2.0% | -11.1% | -13.1% | -0.2 |
| Commercial Financial Lines | 18.8% | 13.4% | -5.5% | -0.8 |
| Commercial GL | 9.7% | -13.4% | -23.2% | -4.5 |
| Commercial | 8.6% | -12.2% | -20.7% | -32.4 |
| Commercial Med Mal | 1.3% | -19.9% | -21.2% | -3.5 |
| Commercial Property | 7.5% | -9.7% | -17.1% | -15.0 |
| Commercial WC | 2.9% | -9.4% | -12.2% | -4.6 |
| Large Reinsurance | 0.7% | -27.4% | -28.2% | -8.5 |
| Personal Lines | 6.4% | -11.2% | -17.6% | -120.7 |
| Reinsurance | 2.2% | -6.5% | -8.8% | 0.0 |
| **Total** | **6.6%** | **-11.5%** | **-18.1%** | **-190.4** |

## ASSUMPTIONS

The stagflation scenario reflects the insurance performance and financial market conditions expected if the Federal Reserve were to be too aggressive in getting inflation under control, pushing the U.S. economy into a recession. This scenario reflects an increase in inflation at 1-in-100-year rates for the next three years, applied to all payments in the calendar year and future payments. The CPI is applied to all personal lines, and MCPI is applied to casualty lines.

**Table 28. Return on Surplus Change for Inflation by Size for 2022 Modeled Year**

| Carrier Size | PML 1:Return On Surplus SCS | | | |
|---|---|---|---|---|
| | Baseline | Inflation | % Change | $B Change |
| < $20M | 0.4% | -13.9% | -14.4% | -1.6 |
| $20 - $100M | 3.9% | -8.8% | -12.7% | -2.6 |
| $100 - $500M | 5.7% | -7.2% | -12.9% | -7.4 |
| $500M - $2B | 5.9% | -8.4% | -14.4% | -15.4 |
| > $2B | 6.9% | -12.1% | -19.1% | -163.4 |
| **Total** | **6.6%** | **-11.5%** | **-18.1%** | **-190.4** |

The drop in real GDP causes a premium contraction, with an 8.0% growth layered above this premium contraction on all lines of business. This end results in some lines growing, such as homeowners at 8.0%, and other lines shrinking, such as workers' compensation at -12.0%. Loss ratios are not impacted from the stagflation scenario. However, since fixed costs stay the same, lines that experience a larger drop in premium will experience the pain of higher fixed costs eating away profit margins. The financial markets are also impacted in this scenario: all bonds have a one-level downgrade, thus increasing their chances of default slightly. Additionally, equities drop in total return for the year by 16.8%, which is the average of the 10 worst years for the Dow Jones Industrial Average in the last 100 years. This scenario is hypothetical and not based on any real events that happened in 2022 or prior years. It is designed as a stress scenario distinct from the expected performance in 2022.

**Table 29. 1 in 100 Inflation Increase for 2022 Modeled Year**

| Increase by Year | General CPI | Medical CPI | WC CPI |
|---|---|---|---|
| 1 | 2.4 | 4.3 | 2.2 |
| 2 | 6.0 | 10.1 | 5.0 |
| 3 | 10.5 | 17.3 | 8.4 |
| 4 | 15.5 | 25.2 | 12.1 |
| 5 | 21.3 | 34.0 | 16.0 |

## CONCLUSION

We often consider history to be the best metric to predict future performance. However, history is limited by the number of years in practice or relevant recent years. Stochastic modeling of historical performance allows for additional variability between the historical data points, layering on our understanding of risk distributions for various uncertainties.

For example, catastrophe loss information from catastrophe data vendors includes a much wider range of potential scenarios than what has recently been experienced. Purely using historical data in our capital modeling results in the availability heuristic bias, as well as our belief that what happened recently is most likely to happen again, while underweighting the risk of a yet-known adverse experience to happen.

Here, we have outlined the results from a capital model considering the interconnected risks an insurance company must hold and manage to achieve success and serve their various stakeholders. In this Guy Carpenter/NAMIC initiative, we have worked to share with mutuals what our best approximations for future results may be, as presented in the baseline scenario, which is projecting forward our observations of individual companies' financial statement results, including their current asset allocation and net written premium growth patterns.

We expand this predicted baseline view with five additional viewpoints, each layering on the dimension of a new and unexpected operating environment. These preset operating environments are adding consistently to each company for parity in comparison, the impact of which changes based on a company's exposure to the elements being stressed, such as increased pricing in loss settlement for the inflation scenario or additional hurricane losses in the hurricane scenario. Given that these scenarios reflect an unexpected alternative world view, we do not opine on the likelihood for a company to enter into such an operating environment nor do we certify that each scenario has a comparable return-period likelihood.

In selecting and parameterizing these scenarios, we have utilized subject matter experts across Guy Carpenter to capture comprehensively the financial impacts a changing world would have for each scenario. It is this selection of a carefully parameterized scenario that was our focus and not the exact return period of such an unexpected event, which may result in a false sense of accuracy.

This research and report have been created to arm companies with additional information and understanding of how various risk metrics could impact financial results. A solid comprehension of one's own financial performance within capital modeling and scenario testing framework can be beneficial in preparing for and communicating with company stakeholders and regulators. Proper stewardship of an insurance company involves considering what the models are currently not yet representing or capturing in their risk world. An insurance company's board of directors, chief risk officer, AM Best, and state regulators may be all interested in hearing about how a company undertakes the question of planning for and anticipating the future.

The Scenario Testing Our Mutual Future report shows NAMIC members how the compass of each peer group reacts to realistic scenarios and how those changes compare to the compass of other peer groups. Guy Carpenter is pleased to offer insights on your own individual company and those of de-identified and aggregated peers. The modeled results are not the "answer" but rather a starting point to understand the sensitivity of capital and earnings under duress and the result of events on each organization relative to its peers. The authors encourage readers to review your standalone company results to understand the impact of stress events on each organization's compass and inform its view of capital.

To request your company's individual results, please reach out to a Guy Carpenter representative.

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