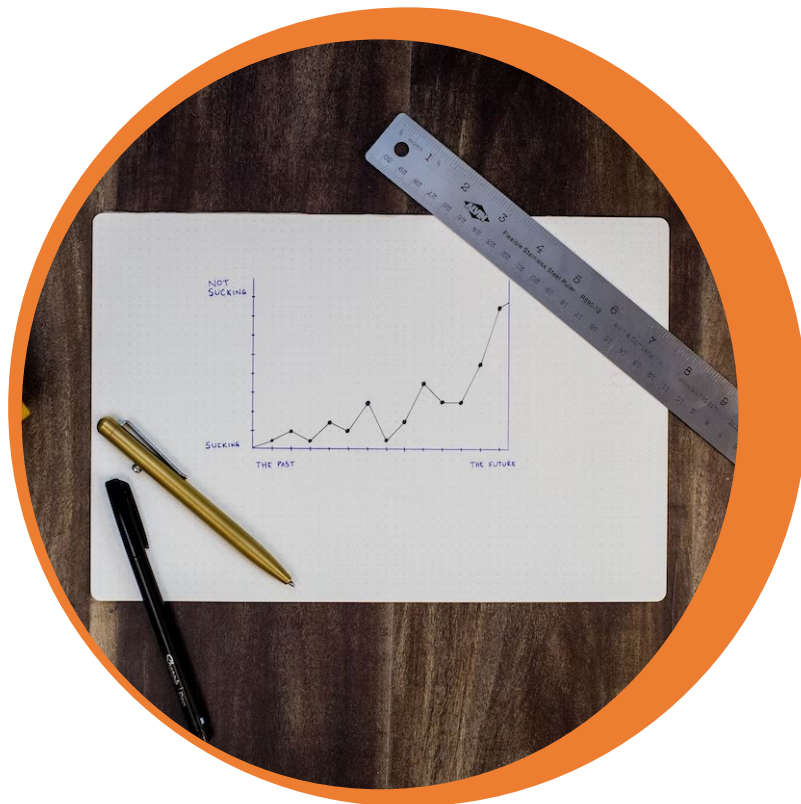


How to Find Data-driven Insights When You Have No Data, (or Just Want More)

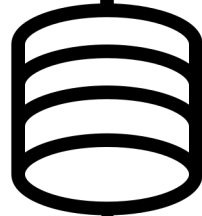
March 14, 2023

Blake Berman, Managing Director, Guy Carpenter
Jessica Leong, CEO, Octagram



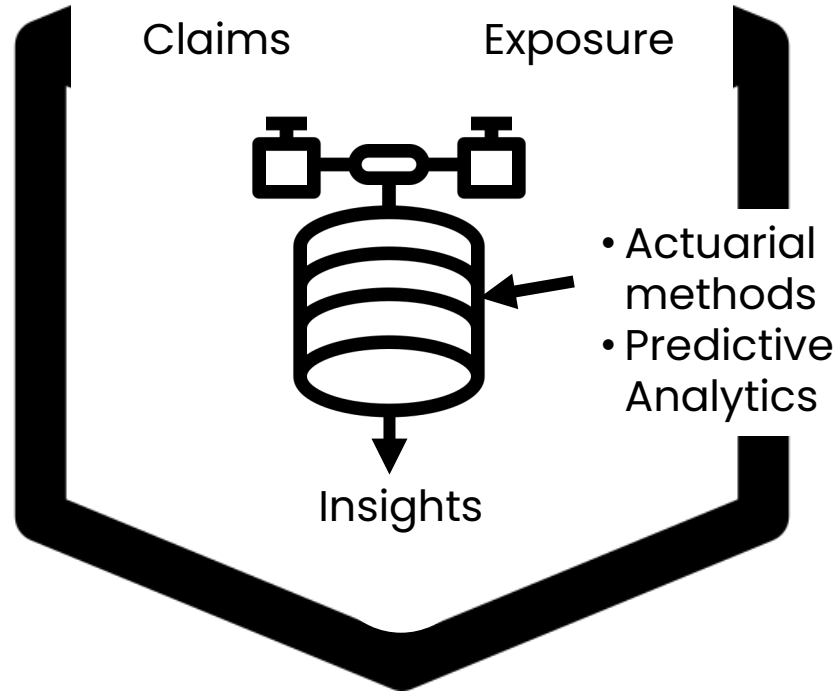
Claims

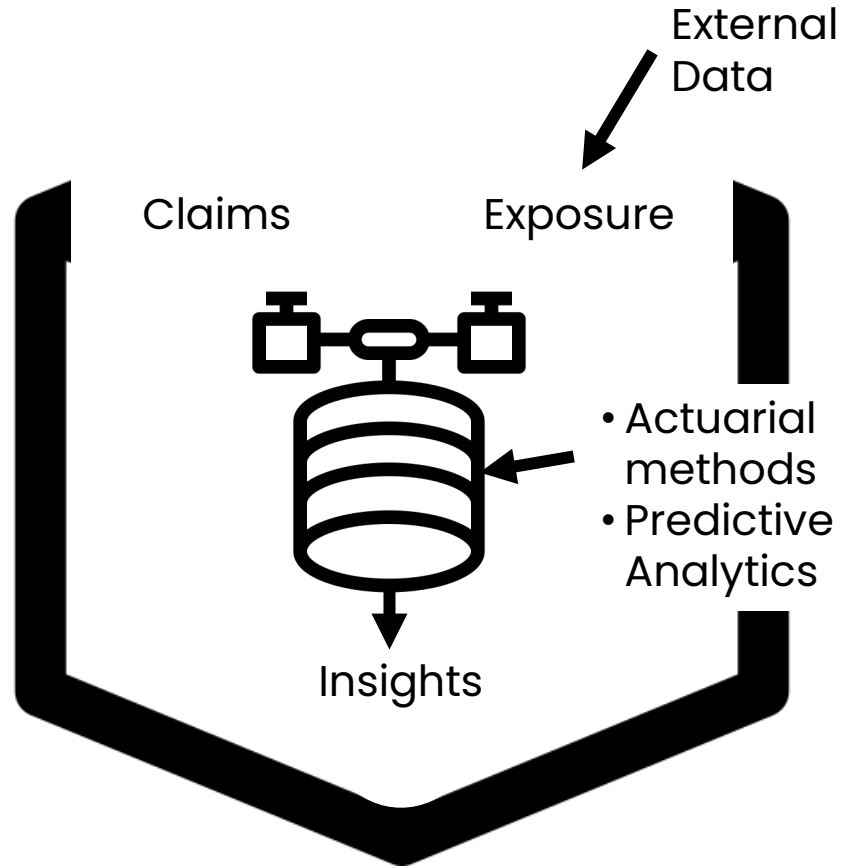
Exposure

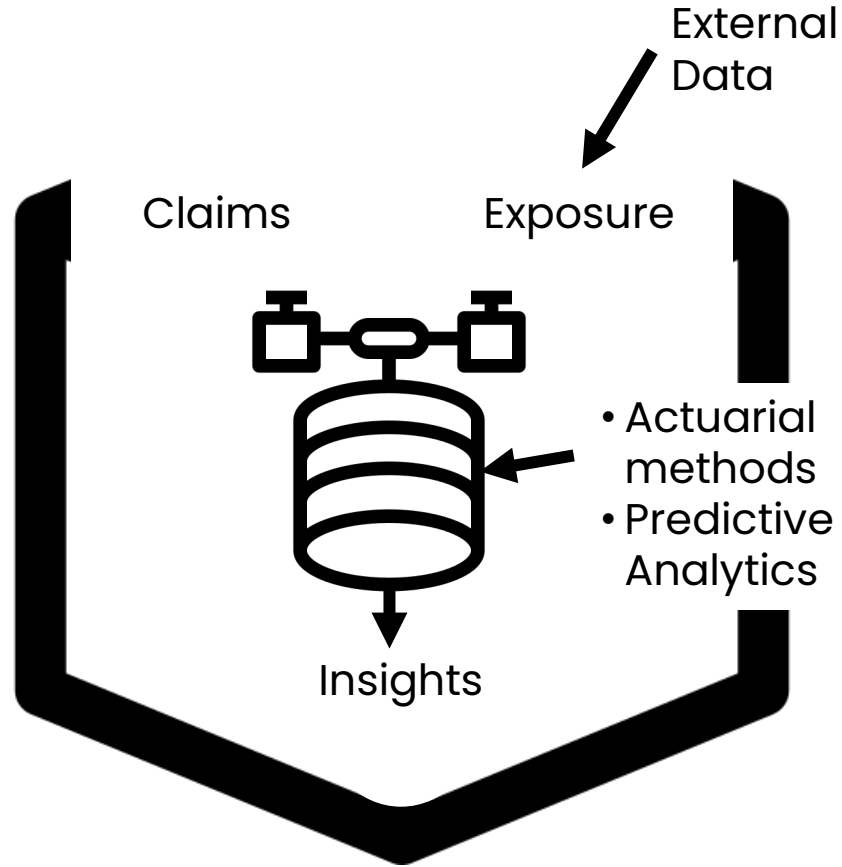


- Actuarial methods
- Predictive Analytics

Insights







Publicly
available
external
event data



Claims

External
Data



Exposure

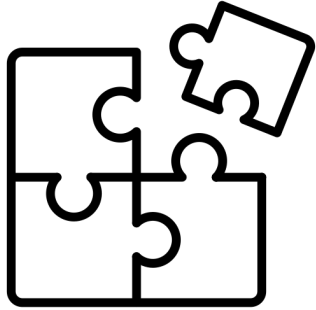


- Actuarial methods
- Predictive Analytics

Insights



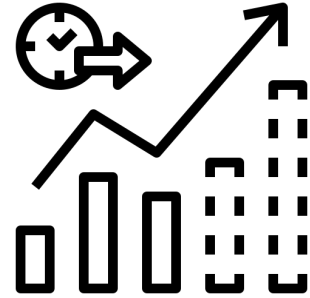
Three areas where this data is valuable



1. When you just need more data (e.g., rare events)



2. When you are expanding into business you haven't written before



3. When the future is different from the past

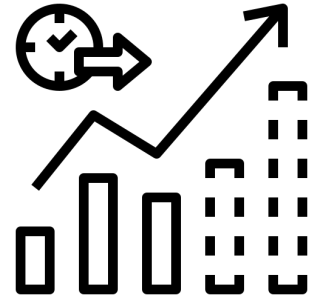
Three areas where this data is valuable



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TRANSPARENCY ♦ PARTICIPATION ♦ COLLABORATION

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Collaboration

“My Administration is committed to creating an unprecedented level of openness in Government. We will work together to ensure the public trust and establish a system of transparency, public participation, and collaboration. Openness will strengthen our democracy and promote efficiency and effectiveness in Government.”

— PRESIDENT OBAMA, 01/21/09



Open Data for All New Yorkers







Open Data is free public data published by New York City agencies and other partners. **Share your work during Open Data Week 2023** or **sign up for the NYC Open Data mailing list** to learn about training opportunities and upcoming events.



Search Open Data for things like 311, Buildings, Trees



Learn about the next decade of NYC Open Data, and read our 2022 Report

Data for when you have no data (or just want more)

| Peril | | Publicly available data sets |
|--------------------|---|--|
| Auto Accidents |  | City open data initiative |
| Fire |  | National Fire Incident Reporting System (NFIRS) |
| Crime |  | City open data initiative FBI Uniform Crime Report |
| Water damage |  | American Housing Survey |
| Hail |  | National Oceanic and Atmospheric Administration (NOAA) |
| Aviation accidents |  | The National Transportation Safety Board (NTSB) |

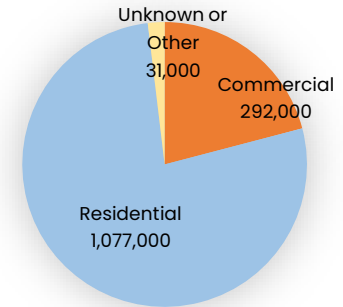
| Peril | | Publicly available data sets |
|--------------------------|---|--|
| Workers Compensation |  | Occupational Safety and Health Administration (OSHA) |
| Product Liability |  | The Consumer Product Safety Commission The Food and Drug Administration (FDA) |
| Securities Class Actions |  | Stanford Law School securities class action clearing house |
| Litigation |  | Public Access to Court Electronic Records (PACER) |
| Environmental pollution |  | The Environmental Protection Agency (EPA) |
| Medical malpractice |  | The National Practitioner Data Bank (NPDB) |

Could 1.4 million+ fire events provide you with insight?

The National Fire Incident Reporting System is a data set of fires reported by 80% of fire departments across the U.S.

Use cases:

- Understand trends in fire events
- Benchmark your own losses
- Understand fire PMLs
- Understand causes/location/spread of fires for underwriting or risk engineering
- Understand fire frequency (if paired with exposure data)



Of the 1.4 million building fire events, 292,000 (21%) are in commercial occupancies.

Data dictionary:

COPE data:

- Address
- Property Use (occupancy)
- Owner / tenant
- Number of stories
- Property value
- Contents value
- Sprinklered / non-sprinklered
- Type of sprinklers

Fire event data

- Time of fire
- Response time
- Number of buildings

Cause of Fire

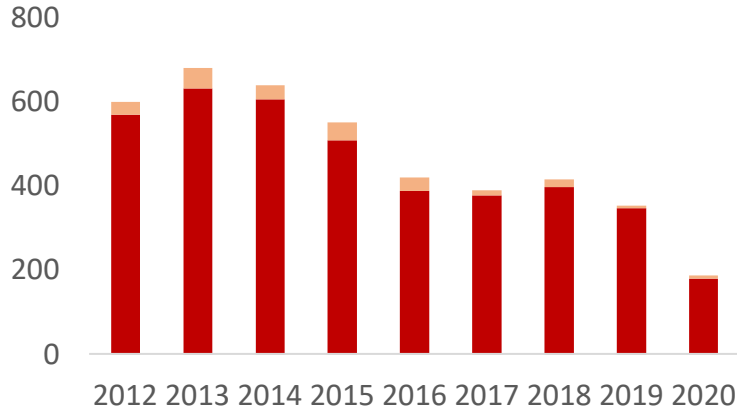
- Fire origin
- Heat source
- Item first ignited
- Type of material first ignited
- Factors contributing to ignition
- Equipment involved in ignition
- Material contributing to spread

Extent of damage

- Fire spread
- Property loss
- Contents loss
- Number of Stories with Damage: Minor / Significant / Heavy / Extreme

Some cities have decreasing fire event trends, others are dramatically increasing

Detroit FD



Number of fires in commercial properties in Detroit has more than **halved** since 2012

Detroit Reclaims Halloween, a Holiday Once Marred by Fire

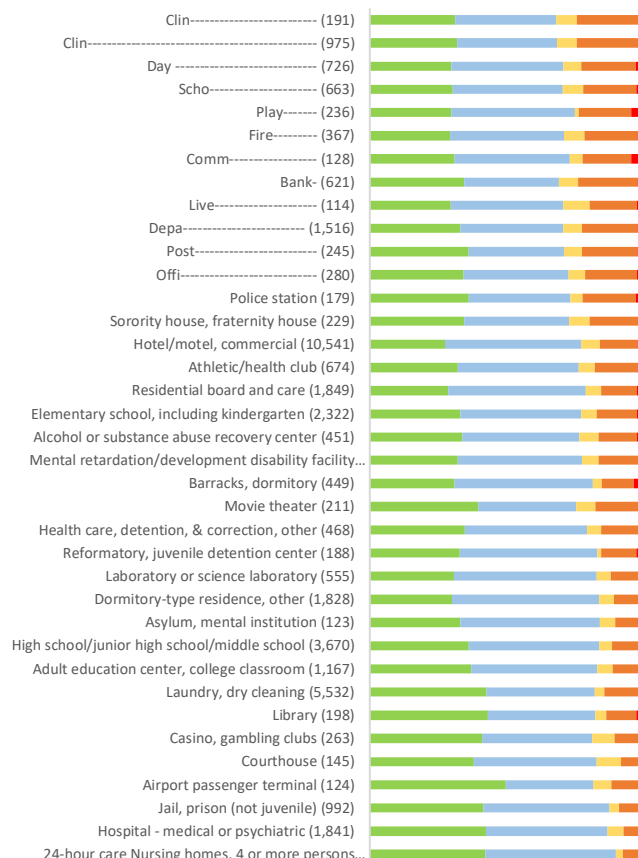
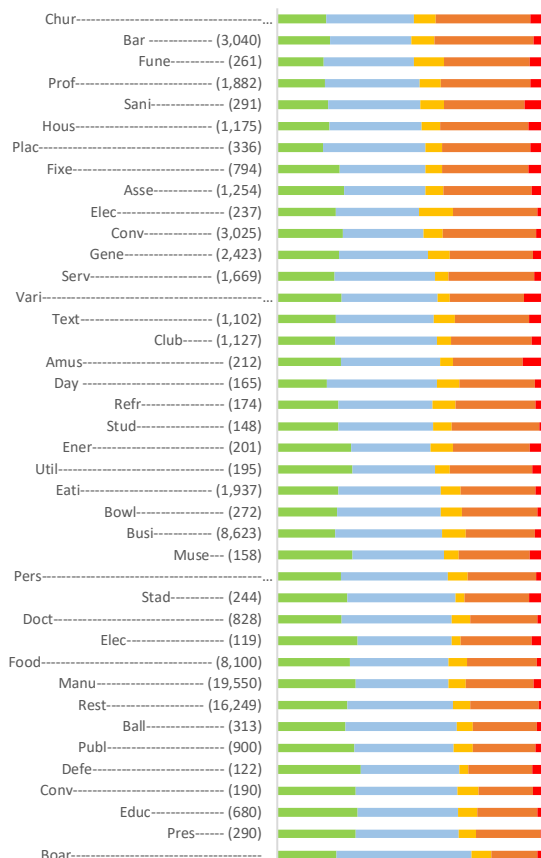
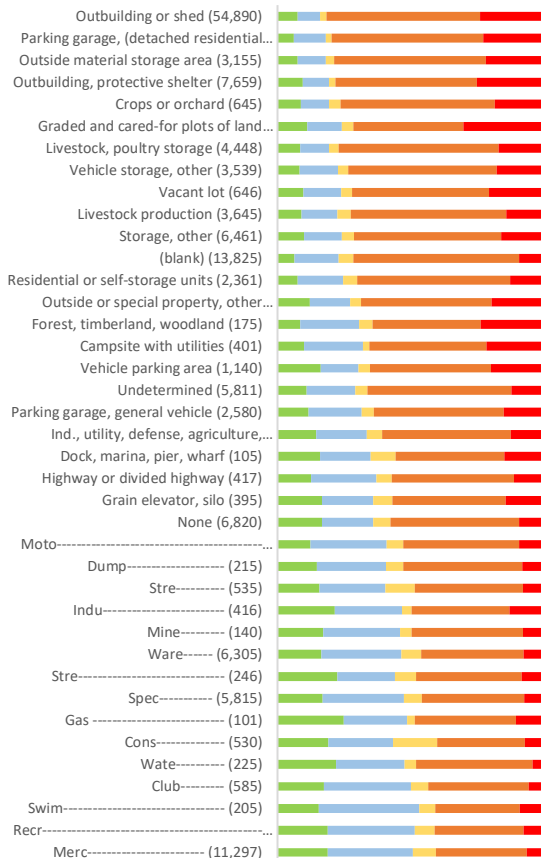
After decades of Devil's Night fear and arson, Halloween in Detroit is again a celebration, and a sign of a changing city.

– New York Times, November 2022

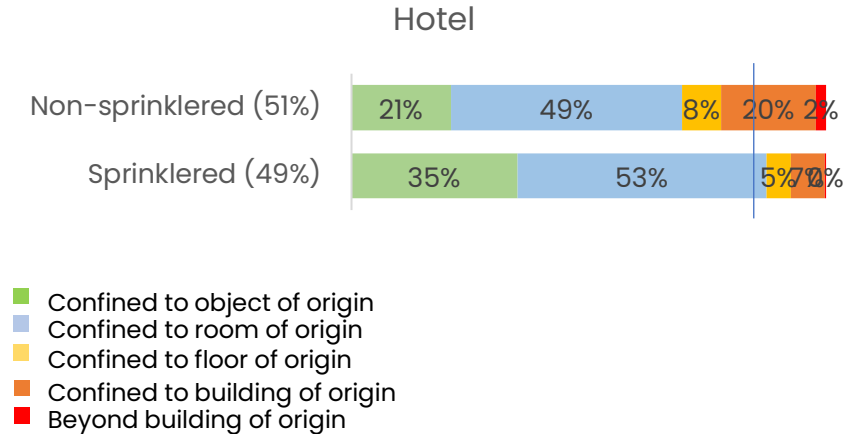
Arson finally on decline in Detroit.

– Bridge Michigan, August 2017

Commercial locations and Fire Spread



Sprinklered hotels confine a fire to the room of origin, versus non-sprinklered hotels with fires spreading beyond the floor



In looking at the interaction of class and sprinkler, you can see that:

- The 80th percentile fire spread for sprinklered hotels are **confined to the room of origin**; versus
- The 80th percentile fire spread for non-sprinklered hotels are fires that **spread beyond the room and floor of origin to the rest of the building**
- These are insights from **10,000+ hotel fires**

Could Auto Collision insights provide lift and insight?

Auto collision data is available for many U.S. cities that identifies the location, date and time of each collision, as well as some other characteristics, depending on the data source.

To help you:

- Win in the market through predictive insights for pricing and underwriting personal/commercial auto
- Manage your portfolio by staying a head of emerging trends
- Support growth into new types of business, with event insights where you have limited data

Data dictionary

- Lat / long
- Date
- Time
- Type of vehicle*
- Contributing factor *
- Number of people injured *
- Victim age *
- Victim sex *

American Housing Survey

| Topic: | Housing Problems | Subtopic: | Leaking and Mold |
|---------------|---|--------------|------------------|
| Variable Name | Description | Availability | |
| LEAKI | Flag indicating inside water leaks in last 12 months | PUF | |
| LEAKIDK | Flag indicating the inside water leak came from unknown source | PUF | |
| LEAKIOTH | Flag indicating the inside water leak came from other source | PUF | |
| LEAKIPIPE | Flag indicating the inside water leak came from pipes leaking (including pipes from other apartments) | PUF | |
| LEAKIPLUM | Flag indicating the inside water leak came from own plumbing fixtures backing up or overflowing | PUF | |
| LEAKIWATH | Flag indicating the inside water leak came from broken water heater | PUF | |
| LEAKO | Flag indicating outside water leaks in last 12 months | PUF | |

AHS Mini Codebook

2021 National Variables

Created on Sunday, February 26, 2023 at 23:20

| | | |
|-----------|---|-----|
| LEAKOBASE | Flag indicating the outside water leak came from the basement | PUF |
| LEAKOOTH | Flag indicating the outside water leak came from somewhere else | PUF |
| LEAKOROOF | Flag indicating the outside water leak came from the roof | PUF |
| LEAKOWALL | Flag indicating the outside water leak came from the walls or around closed windows or closed doors | PUF |
| MOLDBASEM | Flag indicating mold was present in basement in the last 12 months | PUF |
| MOLDBATH | Flag indicating mold was present in bathroom in the last 12 months | PUF |
| MOLDBEDRM | Flag indicating mold was present in bedroom in the last 12 months | PUF |
| MOLDKITCH | Flag indicating mold was present in kitchen in the last 12 months | PUF |
| MOLDLROOM | Flag indicating mold was present in living room in the last 12 months | PUF |
| MOLDOTHER | Flag indicating mold was present in some other room in the last 12 months | PUF |

| Topic: Housing Problems | Subtopic: Electrical Problems | |
|-------------------------|--|--------------|
| Variable Name | Description | Availability |
| FUSEBLOW | Number of times fuses blown or circuit breakers tripped in last 3 months | PUF |
| NOWIRE | Flag indicating electrical wiring concealed by walls | PUF |
| PLUGS | Flag indicating every room has working electrical plug | PUF |

AHS Mini Codebook
 2021 National Variables
 Created on Sunday, February 26, 2023 at 23:20

| Topic: Housing Problems | Subtopic: Heating Problems | |
|-------------------------|--|--------------|
| Variable Name | Description | Availability |
| COLD | Flag indicating unit was uncomfortably cold for 24 hours or more last winter | PUF |
| COLD COST | Flag indicating unit was uncomfortably cold for 24 hours or more last winter due to cost of heating | PUF |
| COLDEQ | Flag indicating unit as uncomfortably cold for 24 hours or more last winter because the main heating equipment broke down | PUF |
| COLDEQFREQ | Number of times main heating equipment broke down for 6 hours or more (provided that main heating equipment broke down and unit was uncomfortably cold for 24 hours or more last winter) | PUF |
| COLDHTCAP | Flag indicating unit was uncomfortably cold for 24 hours or more last winter due to inadequate heating capacity | PUF |
| COLDINSUL | Flag indicating unit was uncomfortably cold for 24 hours or more last winter due to inadequate insulation | PUF |
| COLDOTHER | Flag indicating unit was uncomfortably cold for 24 hours or more last winter because of some other reason | PUF |
| COLDUTIL | Flag indicating unit was uncomfortably cold for 24 hours or more last winter due to utility interruption | PUF |

| Topic: Housing Problems | Subtopic: Plumbing Problems | |
|-------------------------|---|--------------|
| Variable Name | Description | Availability |
| NOTOIL | Flag indicating if unit had any toilet breakdowns in last 3 months | PUF |
| NOTOILFREQ | Number of toilet breakdowns within last 3 months that lasted 6 hours or more | PUF |
| NOWAT | Flag indicating if unit was completely without running water in the last 3 months | PUF |
| NOWATFREQ | Number of times unit was completely without running water in the last 3 months | PUF |
| SEWBREAK | Number of sewer breakdowns within last 3 months that last 6 hours or more | PUF |

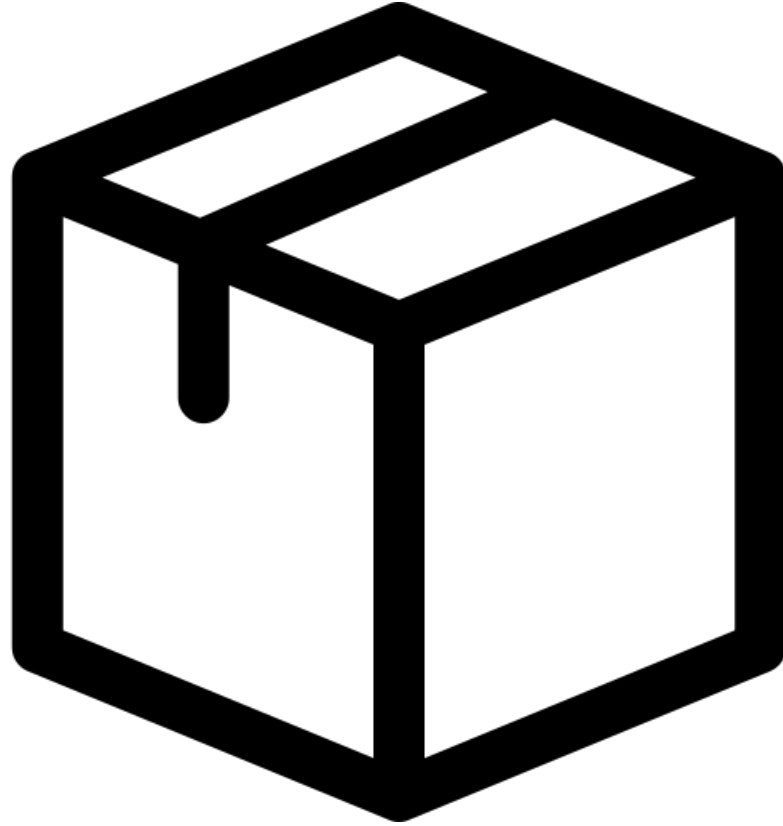
| Topic: Disaster Planning | Subtopic: Wildfire Risk | |
|--------------------------|-----------------------------------|--------------|
| Variable Name | Description | Availability |
| WFRALERT | Method of wildfire alert | PUF |
| WFRALERT_IUF | Method of wildfire alert | IUF Only |
| WFRDKMAT | Surface material of deck | PUF |
| WFRDKMAT_IUF | Surface material of deck | IUF Only |
| WFRDKSTRG | Space under deck used for storage | PUF |
| WFRDKSTRG_IUF | Space under deck used for storage | IUF Only |
| WFRGUTFRQ | Clean gutters frequency | PUF |

AHS Mini Codebook

2021 National Variables

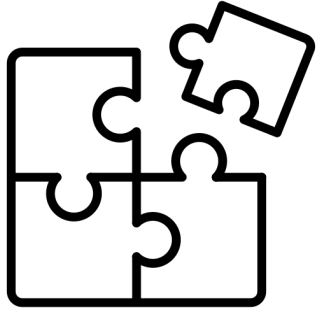
Created on Sunday, February 26, 2023 at 23:20

| | | |
|---------------|---|----------|
| WFRGUTFRQ_IUF | Clean gutters frequency | IUF Only |
| WFRROOF | Type of roof on home | PUF |
| WFRROOF_IUF | Type of roof on home | IUF Only |
| WFRSIDING | Siding or exterior wall covering | PUF |
| WFRSIDING_IUF | Siding or exterior wall covering | IUF Only |
| WFRVEGCLS | Vegetation within 5 feet of home | PUF |
| WFRVEGCLS_IUF | Vegetation within 5 feet of home | IUF Only |
| WFRWFENCE | Flag indicating wooden fence on property | PUF |
| WFRWFENCE_IUF | Flag indicating wooden items on property | IUF Only |
| WFRWPILE | Flag indicating woodpile on property | PUF |
| WFRWPILE_IUF | Flag indicating woodpile on property | IUF Only |
| WFRWSHED | Flag indicating shed on property | PUF |
| WFRWSHED_IUF | Flag indicating shed on property | IUF Only |
| WUI_2010 | 2010 Wildland-Urban Interface (WUI) area code | IUF Only |





Three areas where this data is valuable



1. When you just need more data (e.g., rare events)



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USING DATA TO DEVELOP OWN VIEW OF PROPERTY RISK

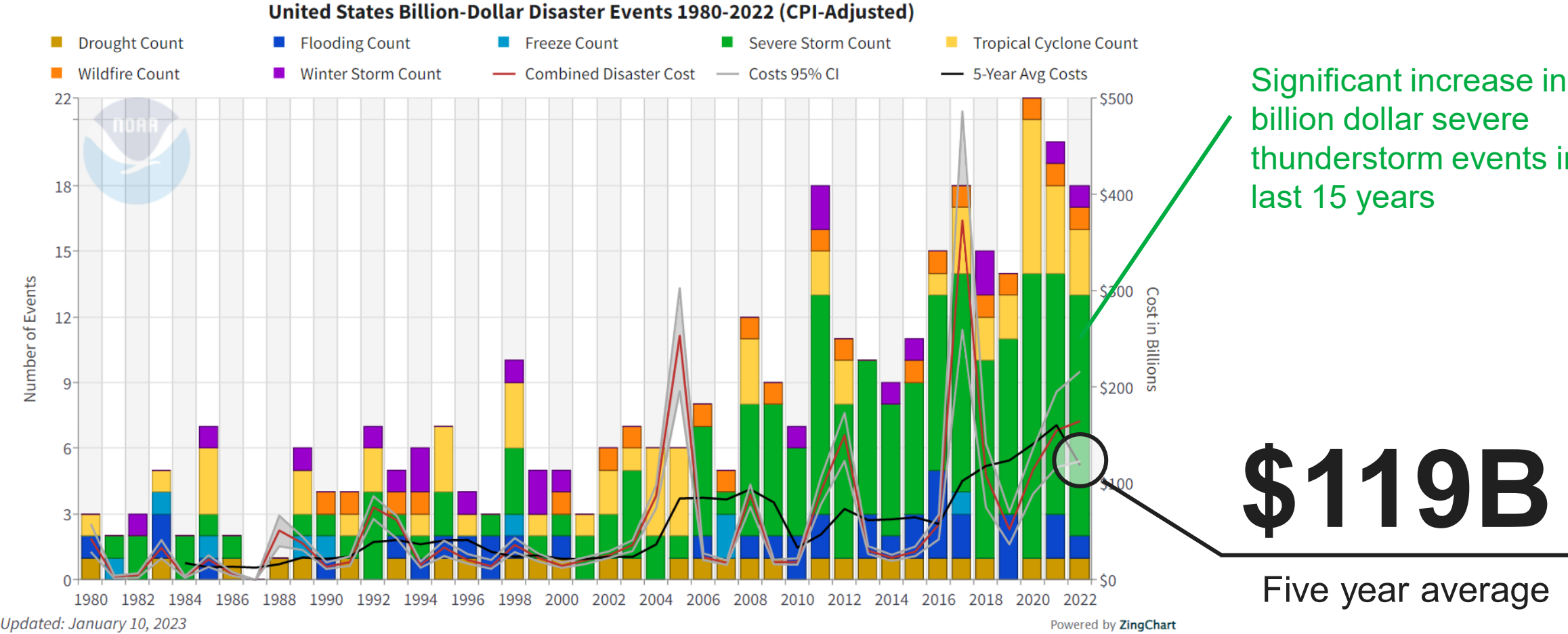
CASE STUDY: PROJECTING TRENDS IN SEVERE CONVECTIVE STORM LOSS

Jessica Leong, FCAS, Former CAS President

Blake Berman, FCAS, Managing Director, Guy Carpenter

March 15th 2023

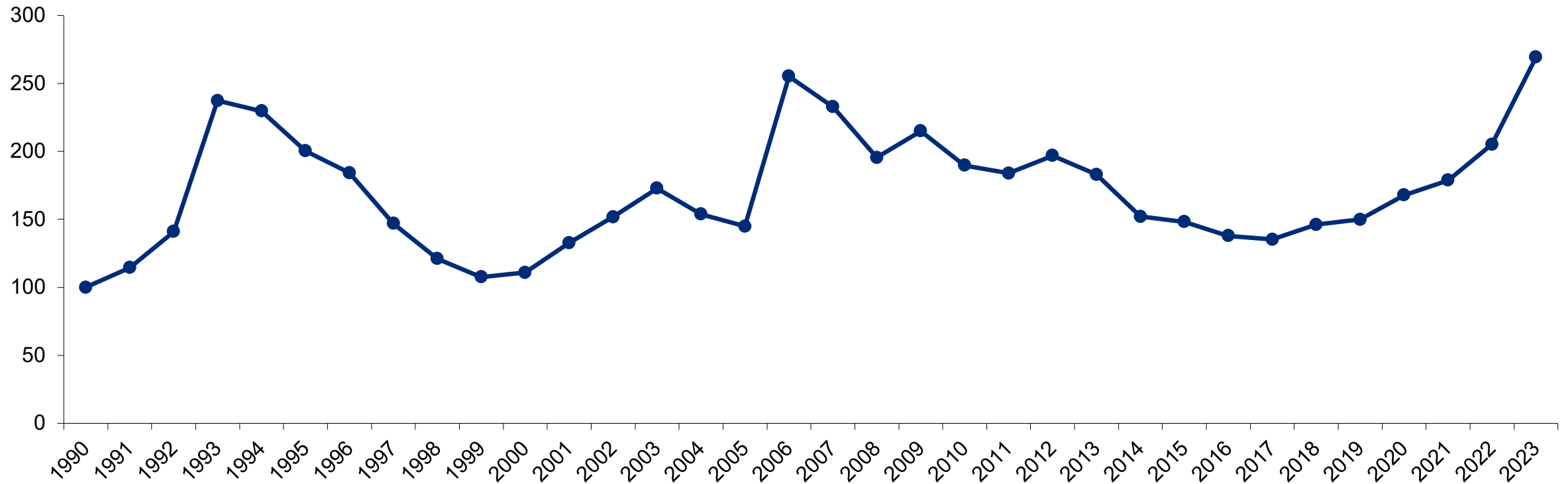
What is Driving the Increased Frequency of Billion Dollar Loss Events?



Total costs for the last five years (\$596 billion) is one-quarter of the disaster cost total of the last 43-years (1980-2022)

Reinsurers meaningfully repriced cat exposures at Jan 1 Renewal

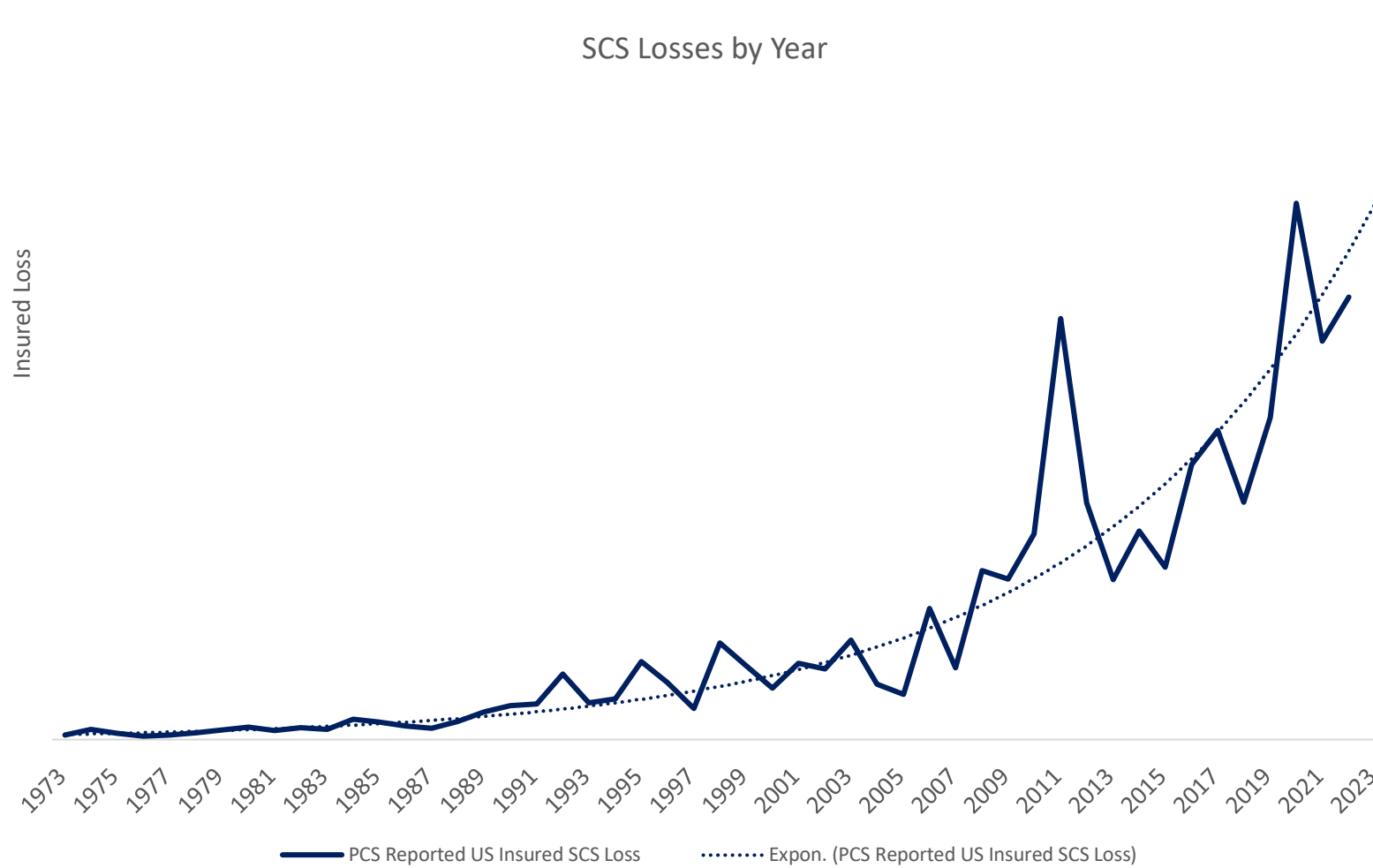
Greatest increase since 2006 brings the ROL index to record levels



US ROL Index is +31.3% for January 2023 renewals, while risk adjusted price change was +40-60%, change in ROL was tempered by broad-based increases in retentions.

Exponential Growth in Losses from SCS

Simultaneous changes in weather, exposure growth, and inflation make predicting SCS loss costs difficult



30-yr avg: \$11bn

10-yr avg: \$19bn

5-yr avg: \$24bn

2023 (Trend): \$30-35bn



Touchstone 9.0 US AAL: \$18bn

Touchstone 10.0 US AAL: \$28bn

**Historic Annual Total SCS Loss
Trend (1973-2022): 9.6%**

How can Actuarial Data Analysis help Model, Manage, and Mitigate Severe Convective Storm Exposure



Increasing evolution of natural catastrophe risk are driving carriers to **reevaluate their underwriting and risk management strategies**

Applying Actuarial techniques to Public data can help carriers better manage SCS peril

Key Considerations



Historical data lacking as **population masses have expanded**, particularly in more SCS prone regions



Evolving nature of weather patterns requires updating risk model assumptions



Shifting reinsurer appetite forces an adjustment to primary pricing and underwriting



Changing exposure due to larger homes, expanding urban centers, material and labor inflation











Regulatory dynamics create pressure, especially on personal lines admitted market against increasing rate to reflect higher loss costs



Rating Agency CAR and internal capital models will reflect significantly higher contribution from SCS Risk YoY due to higher operating leverage (NWP up, PHS down), cat vendor model updates, ITV inflation, and higher reinsurance attachment points.

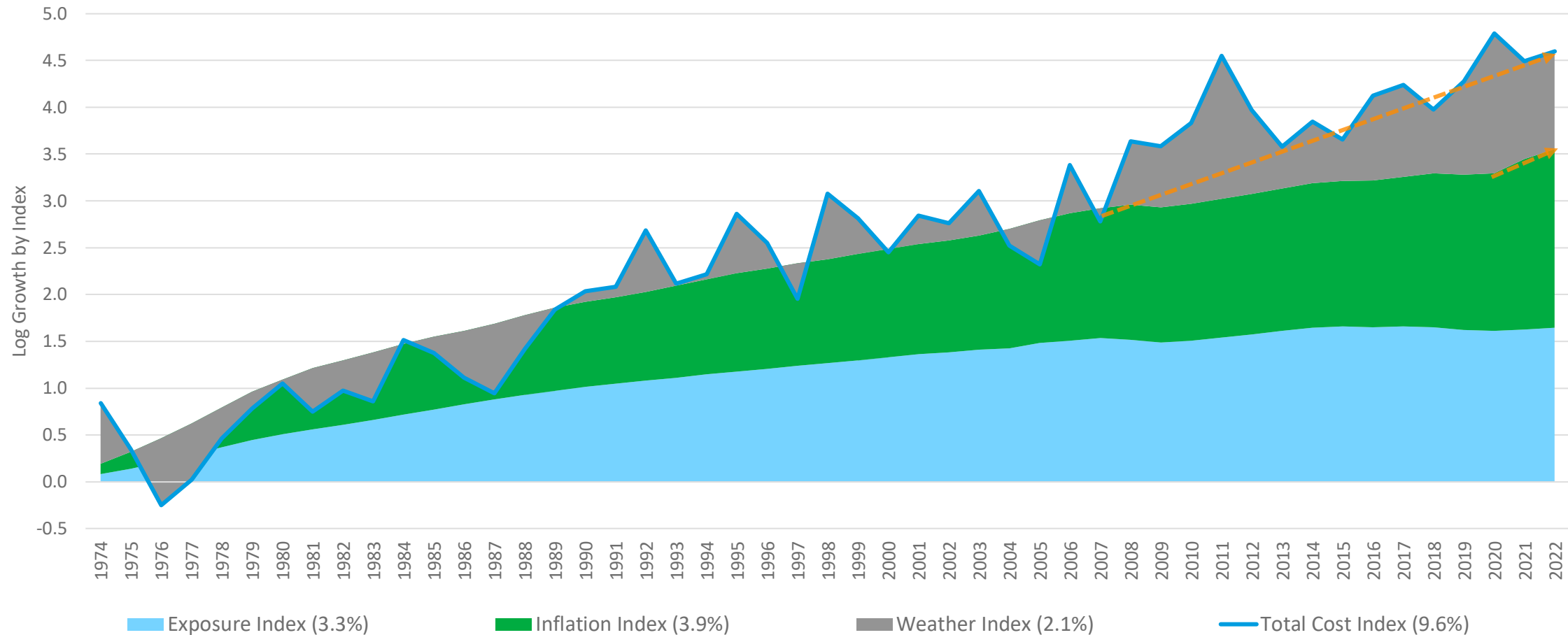
Defining a view of risk is a key step to making better decisions in pricing, underwriting, capital strategy

Informing a holistic approach requires synthesis across multiple sources

| Key Data Elements for Analysis | Data Sources |
|---|---|
|  Number and size of exposures over time | US Census Bureau, American Community Survey, Realtor Databases, IBHS, CoreLogic |
|  Trends in building material costs, labor | US Bureau of Economic Analysis, Bureau of Labor Statistics, Marshall & Swift / CoreLogic |
|  Economic and insured industry loss estimates | NOAA, Swiss Re Sigma, PCS, Reinsurance Broker Reports, Company Filings & Disclosures, Carrier Internal Loss Data, Insurance Information Institute |
|  Carrier Statutory Filings | NAIC, SERFF, S&P Financial, AM Best |
|  Weather Data | NOAA, NASA, Commercial Weather Data Vendors |
|  Capital Modeling Tools & Software | Broker Models, Consultant Platforms, Python & R Packages |
|  Government Agency Data | St. Louis FRED |
|  Catastrophe Modeling Peril and Damageability Data | Verisk/AIR, RMS, Karen Clark & Co., Oasis |

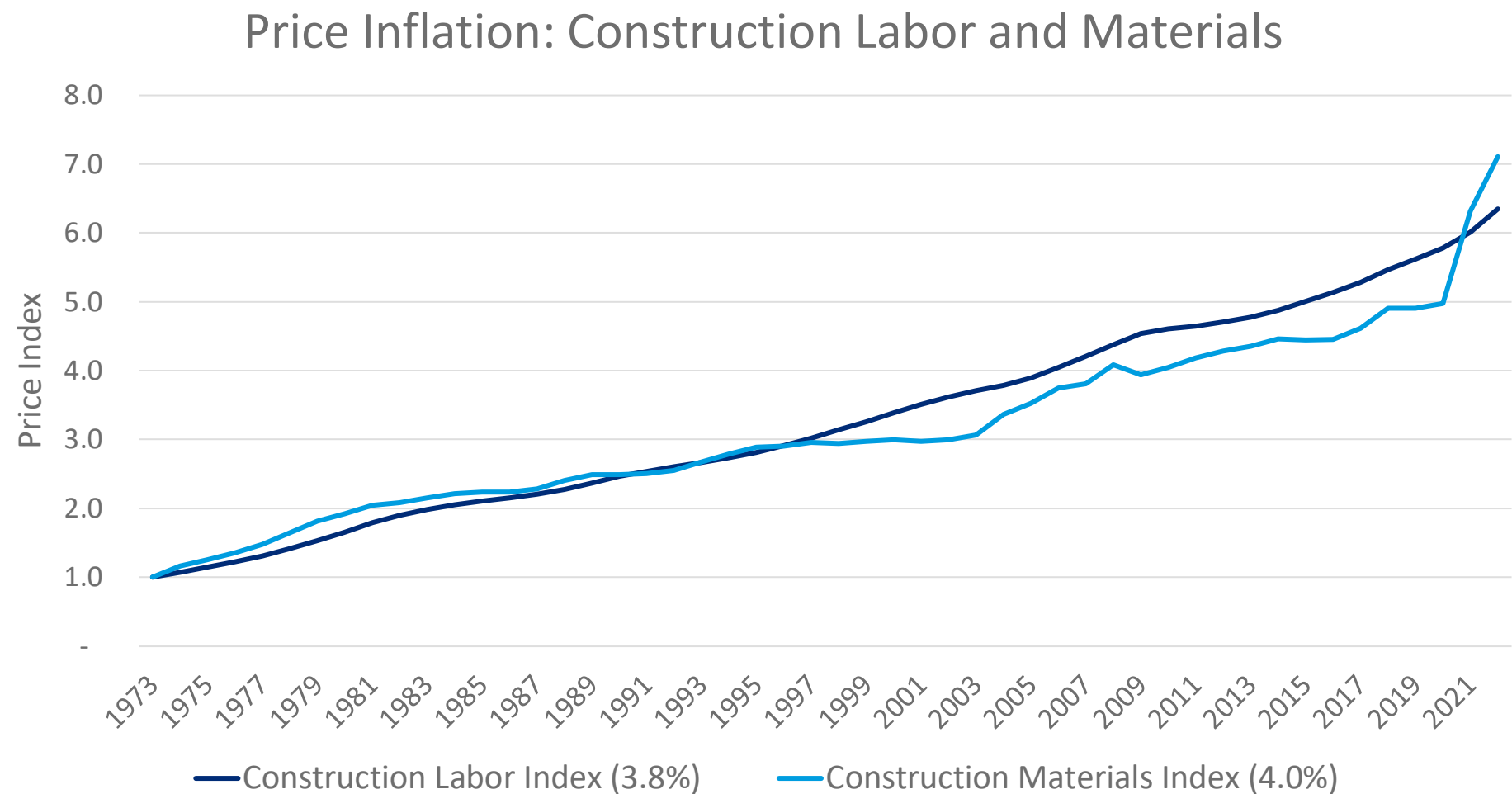
Weather has been most volatile contributor, but has driven a positive contribution to trend for last decade

Components of Rise in SCS Cost

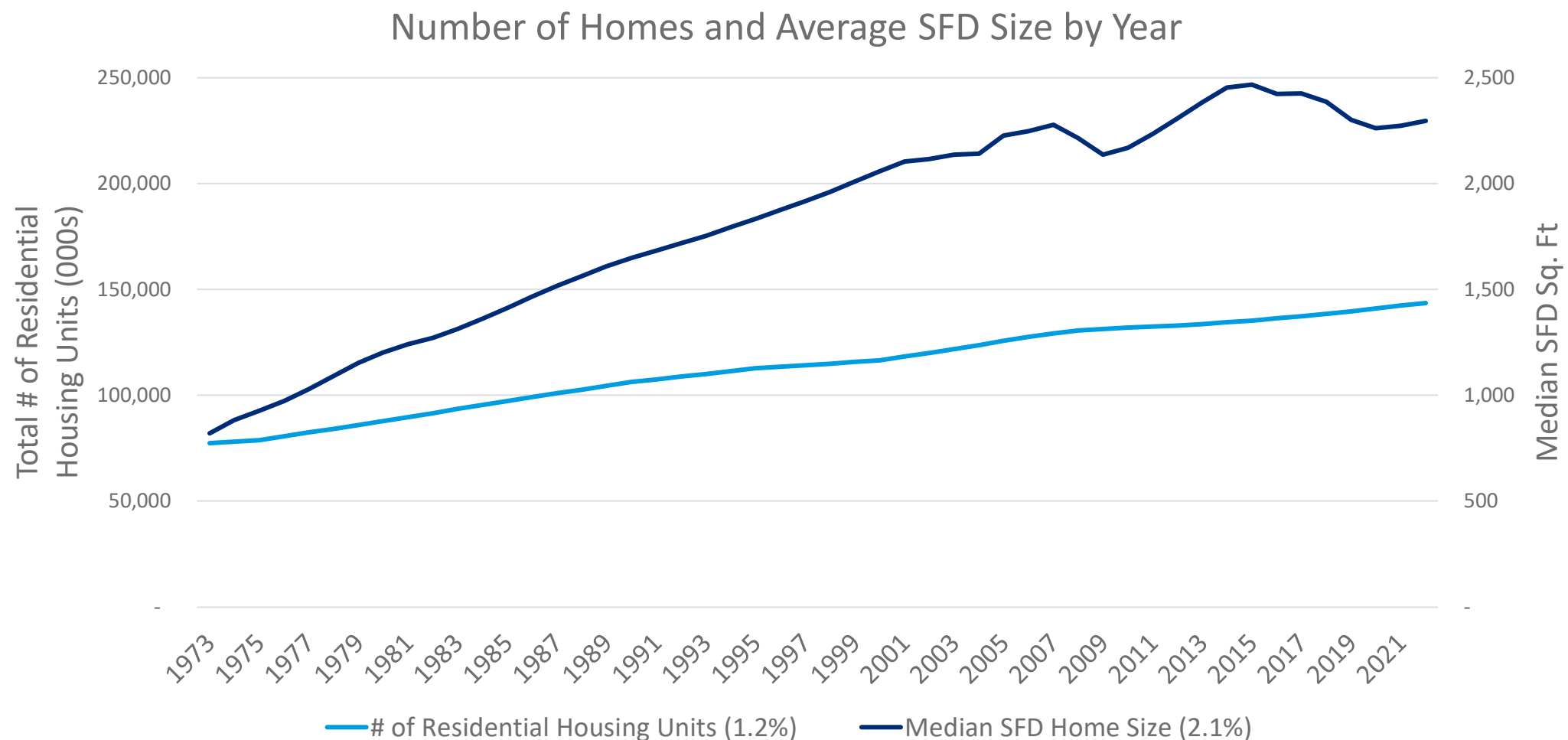


Weather trend began upward inflection around 2008, while historically stable price inflation has also accelerated post COVID

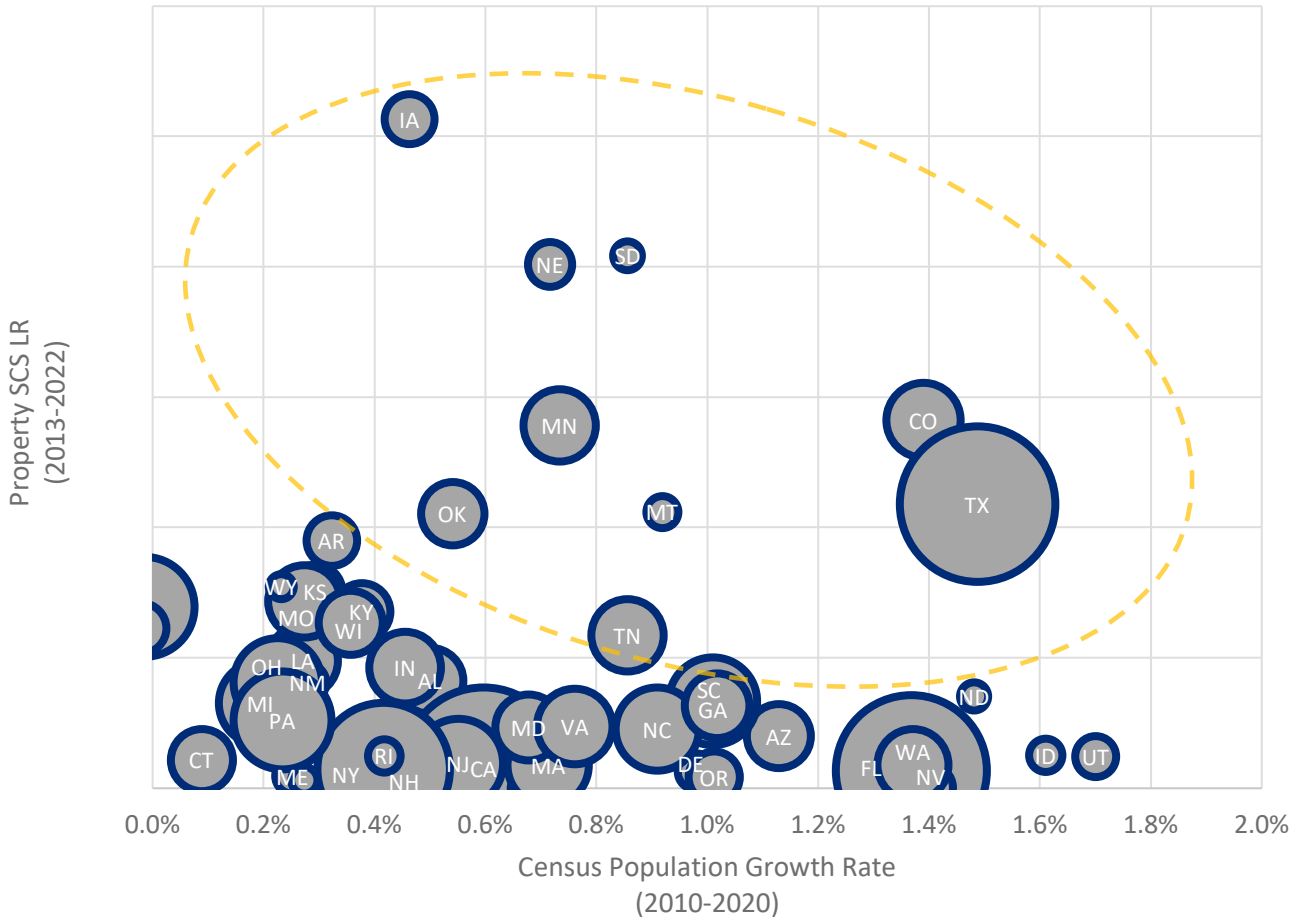
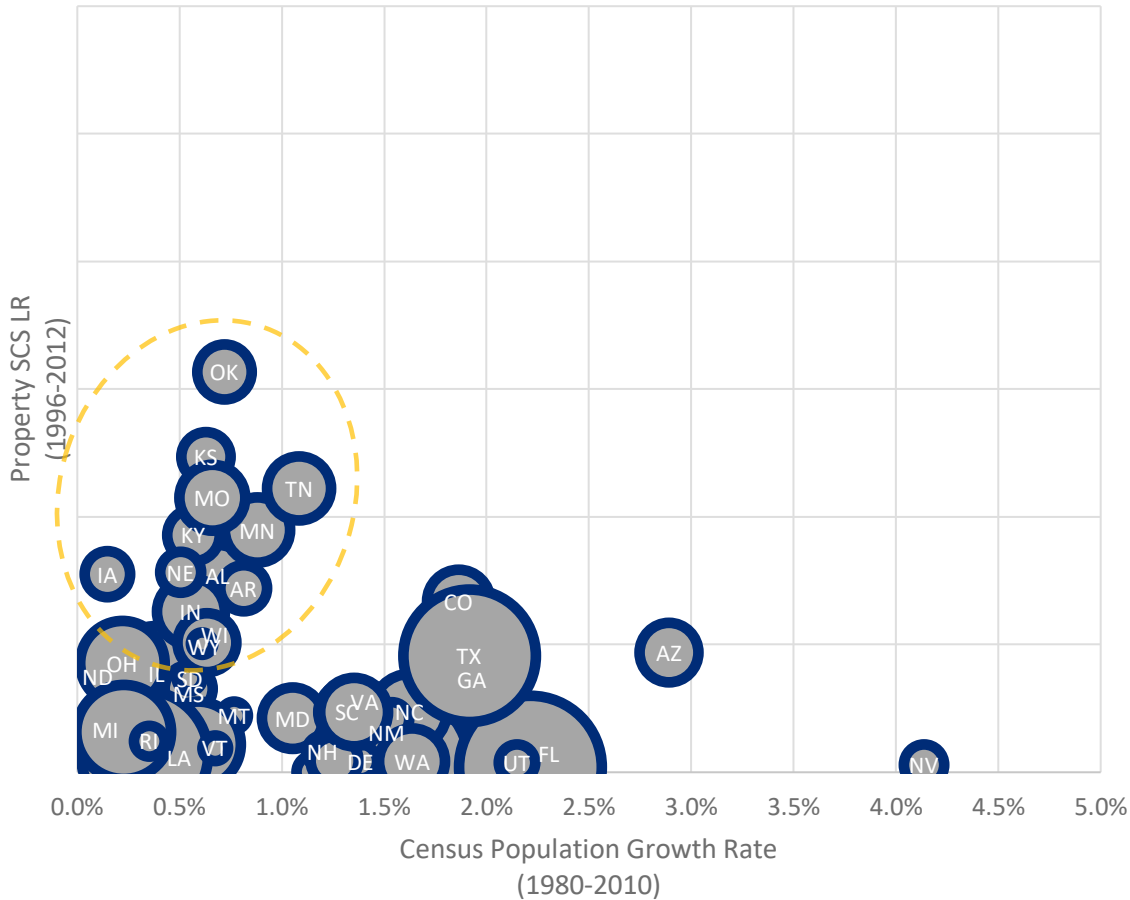
Construction Materials costs rose 54% in last 5 year, equivalent to the total increase over the prior 15 years



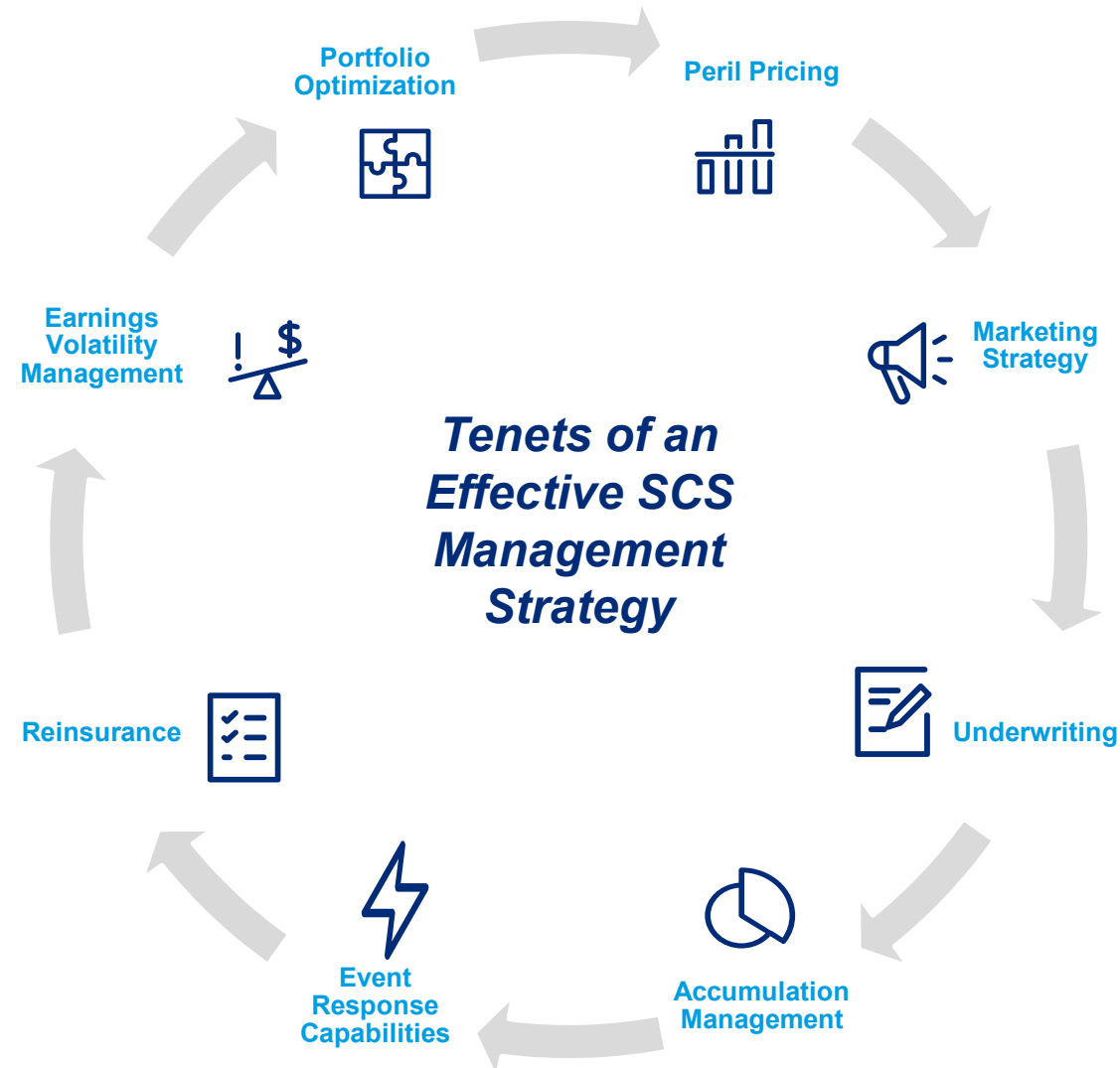
Size of Average Single Family Dwelling (SFD) has risen almost twice as far as total number of residential housing units



Prior to the last decade, highest SCS States saw lower population growth. In recent years, high growth states have seen biggest SCS losses



Evolving A Property Risk Strategy to meet Tomorrow's Challenges



Actuaries can help companies develop more informed, holistic, and prospective views of property risk



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