Catastrophe risk and the cost of real estate insurance
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Any real estate company that owns property in states exposed to hurricanes or earthquakes is well-aware of how expensive it can be to insure those properties. Florida alone accounted for $65.5 billion out of $427.8 billion of U.S. insured catastrophe losses from 1982 to 2011.¹ California’s Northridge Earthquake in 1994 resulted in $19 billion in insured losses,² and computerized models indicate that a repeat of the 1906 San Francisco earthquake could produce insured losses of as much as $95 billion.³ Those costs are factored into insurance premiums and are borne by policyholders.

Catastrophes include natural events such as earthquakes, hurricanes, tsunamis and tornadoes, as well as man-made disasters such as large-scale terrorist attacks. Insuring property in catastrophe-exposed regions always will be expensive, but real estate companies should not be passive about their insurance costs. By understanding the factors that contribute to the price of insurance, they can take steps to lower their exposure to catastrophe losses and proactively manage their insurance spend.

The elements of property insurance pricing

The elements that comprise an insurance premium are similar for all types of insurance. In general, premiums consist of “expected loss” – the amount allotted to pay claims – plus various costs incurred by the insurer and an amount allocated for the insurer’s profit. For some types of insurance, such as personal automobile insurance, a very large number of comparatively small claims over time make it relatively simple for actuaries to determine expected loss with a great deal of precision. Much the same can be said for calculating the fire loss portion of expected loss for commercial property insurance. Natural catastrophes, on the other hand, occur with far less frequency than do automobile accidents and building fires, and the losses caused by a single event can range in the tens of billions of dollars. Consequently, standard actuarial techniques, which rely on the law of large numbers, do not work as well for estimating expected loss from hurricanes and earthquakes. Insurance premiums for catastrophe-exposed properties therefore reflect various costs associated with the uncertainty of insuring these risks.

For property insurance in catastrophe-exposed regions, three elements are of particular significance: (1) the catastrophe component of expected loss; (2) the cost of reinsurance; and (3) the cost of capital set aside to absorb large catastrophe losses.

Expected loss

Calculating the catastrophe component of expected loss is far more challenging than calculating most other types of expected loss. Traditional actuarial techniques are not very effective, so the expected loss component is often calculated using complex computerized catastrophe models that mathematically simulate large catastrophes and estimate the damage to properties in their reach.

The complexity and lack of transparency of most catastrophe models has led some critics to term them “black boxes.” Although the inner workings of catastrophe models can be a mystery, it is clear that various factors affect the outputs. Many of these factors can be managed. For example, properties that are clustered in an exposed area are more likely to have a higher total expected loss than a similar portfolio of properties spread over a broader geographic area. Construction characteristics play a large role in how susceptible buildings are to damage.

²Property Casualty Insurers Association of America, www.pciaa.net
³The 1906 San Francisco Earthquake and Fire: Perspectives on a Modern Super Cat, RMS. www.rms.com
For hurricane exposed buildings, features such as roof anchors, engineered shutters and how the roof sheathing is attached can have a big influence on how much damage is expected to be sustained in a large storm. As a consequence, of the elements that most influence property insurance premiums in catastrophe-exposed regions, real estate companies have the most control over expected losses.

**Catastrophe reinsurance**
Among the costs that are factored into the price of insurance is the cost of reinsurance. When reinsurance costs rise, as they often do following a large catastrophe, the price of insurance is likely to rise as well.

Few insurance companies retain all the risk assumed under the policies they underwrite. Even the largest insurance companies find it necessary – or at least financially desirable – to transfer some portion of their risk to the reinsurance market. Reinsurance is a way for insurance companies to guarantee that worse-than-expected claims will not financially impair the company. An important role of reinsurance is to absorb property insurance losses from large natural catastrophes.

For the most part, the net cost of reinsurance – the difference between the premiums insurance companies pay for protection and the losses they recover from reinsurers over time – is quite low relative to the total premium, and year-to-year fluctuations have little or no impact on premiums paid by policyholders. However, when reinsurance costs shoot up sharply, which sometimes happens after one or more very large catastrophes, it can have a material impact on insurance premiums.

Individual real estate companies have no way to influence the cost of reinsurance and its impact on their insurance premiums. However, they can make insurance buying decisions based in part on how much reinsurance an insurer buys and, consequently, how much influence reinsurance costs can have on property insurance premiums. In general, large, globally diversified insurance companies have less need for reinsurance, and have better control over their reinsurance costs.

**Volatility and risk capital**
Another factor built into insurance pricing is the cost of the capital insurers set aside to pay claims in case losses are much worse than expected. The amount of capital insurers set aside varies by type of insurance, and is a function of the volatility of the losses for each insurance type. The more volatile the claims experience, the more capital is required. Because natural catastrophes represent one of the most volatile insurance exposures, insurers that write property insurance in catastrophe-exposed areas must hold more cash to cover potential claims than they do for property insurance in less exposed regions.

In order to get an equivalent return on the capital committed to catastrophe-exposed business, insurers must charge higher premiums. The impact on property insurance pricing will necessarily be much greater in states like Florida, Mississippi and California than, for example, in Illinois, Minnesota or Nebraska.

As is the case with reinsurance, real estate companies have little control over this cost. However, also like reinsurance, insurance buyers can make decisions that minimize the impact of this factor on their insurance premiums. Once again, it is larger, more globally diversified insurers that tend to fare better. Smaller companies with heavy concentrations of properties in catastrophe-exposed areas typically must maintain proportionately more cash reserves to provide the necessary buffer.
Catastrophe models

Computerized models that estimate the impact of natural disasters on properties play important roles in all three elements of catastrophe premiums discussed above: expected loss, reinsurance premiums and the cost of capital to absorb claims volatility. Understanding how these models work provides important insights into the property insurance pricing process. Additionally, real estate companies – especially those with large property portfolios – can benefit from cat models to assess the catastrophe exposure to their properties, to evaluate risk management options, and to better understand how to lower their insurance costs.

All the major catastrophe modeling firms have models for both hurricane and earthquake risk in the United States. Hurricane models mathematically simulate large numbers of storms of various intensities, and calculate the aggregate damage, in dollars, they would cause to properties in their paths. Key variables include concentrations of property values, how close properties are to shorelines, and construction characteristics. Similar processes are used to model earthquakes and the damage they can cause.

The computerized catastrophe modeling industry took off like a rocket in the aftermath of Hurricane Andrew in 1992. Andrew landed a direct blow to Florida's Atlantic coast below Miami, causing $15.5 billion in insured losses and more than $25 billion in total economic losses. The hit left the insurance industry dazed and panic-striken. Prior to Andrew, insurers widely agreed that a hurricane could result in insured losses of no more than $8 billion. The nearly $16 billion in insured loss from Hurricane Andrew was virtually incomprehensible, invalidating insurers' forecasting techniques and prompting an urgent reassessment of catastrophe risks.

Computerized catastrophe modeling was still in its infancy, but it held out the promise of a scientific, disciplined approach for pricing and managing catastrophe risk. One of the first catastrophe modeling firms was Applied Insurance Research, now known as AIR Worldwide, which was founded in 1987. After Hurricane Andrew, other firms followed in its footsteps. Catastrophe modelers initially focused on US hurricanes, but subsequently developed models for all types of catastrophes, including terrorism and pandemics, for regions throughout the world.

Hurricane Katrina, which caused more than $40 billion in insured losses in 2005, was the single most costly natural catastrophe in U.S. history. All the major catastrophe models badly underestimated the damage caused by the storm, leading catastrophe modeling firms to reconsider their assumptions about the amount of damage that can be caused by a hurricane. One modeling company, Risk Management Solutions (RMS), revised its models to better account for what it termed “loss amplification,” a “cascade of far more damaging consequences” that can follow in the immediate wake of a major catastrophe. Other modeling companies made similar adjustments.

Hurricane Ike in 2008 again challenged the models when the storm, which made landfall in southern Texas, combined inland with another storm system and wreaked havoc as far north as Ohio. Ike caused $12.5 billion in insured losses, making it the fourth most costly storm in U.S. history. In 2011, RMS released version 11 of its model, based in part on lessons learned from Ike. RMS 11 substantially raised certain estimates of potential hurricane losses.
Catastrophe modelers have made huge strides in understanding and accounting for a vast array of variables, but the models continue to develop. Hurricane Irene in 2011 and Superstorm Sandy in 2012, for example, were comparatively weak storms that inflicted enormous damage. Hurricane Irene raked the Caribbean and the eastern U.S. before making landfall in the New York City area as a tropical storm. Irene continued inland, causing wind damage and extensive flooding as far north as Vermont. Sandy, which resulted in an estimated $25 billion in insured losses, proved especially challenging for the models. Like Irene, Sandy had fallen below hurricane strength when it made landfall near Brigantine, New Jersey. Nonetheless, it still managed to be one of the most destructive storms in U.S. history due to its enormous size, the concentration of values in its path, and high tides that amplified its storm surge. Undoubtedly model revisions are in the works that will reflect new information gained from these events. Future events will almost certainly compel modelers to again reassess their assumptions, perhaps resulting in yet higher estimates of expected losses.

Catastrophe models take into account the growing concentration of property values in areas highly vulnerable to catastrophes such as southern Florida and southern California. A recent report from catastrophe modeling consulting firm Karen Clark & Co. estimated insured building values in the U.S. at more than $40 trillion, with increasing concentrations in areas subject to earthquakes and hurricanes. Nearly $15 trillion of insured property is in the first tier of Gulf and Atlantic coastal counties. One reason Sandy was so devastating was that the states in Sandy’s path account for 23 percent of U.S. GDP.9

Catastrophe modeling firm AIR Worldwide estimates that catastrophe losses will double every decade due to this growing residential and commercial density. Higher damage estimates from growing concentrations of property values are likely to result in higher reinsurance costs over time, and may require larger commitments of capital as buffers against worse-than-expected losses. These are costs that will be passed on to policyholders.

For real estate companies – especially those with large numbers of properties in catastrophe exposed regions – catastrophe models are useful for understanding how much is at risk in a major storm, and how altering certain variables can influence loss estimates. Catastrophe models can also arm insurance buyers with information about their exposures than can be very useful when evaluating insurance options.

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6,7“Natural Catastrophe Response.” NAIC www.naic.org

8“Natural catastrophe statistics of 2012 dominated by weather extremes in the USA.” Munich Re www.munichre.com

9Sandy’s economic hit may be softened by cleanup, rebuild and insurance payments, NBC News Business www.nbcnews.com
Conclusions

Globally, 2011 produced $107 billion in insured losses, the second highest on record according to reinsurance intermediary Aon Benfield. At an estimated $25 billion in insured losses, 2012’s Superstorm Sandy trails only Hurricane Katrina for insured losses from a U.S. hurricane. Munich Re statistics strongly imply that the number of U.S. natural catastrophes is on the rise. Higher insurance premiums for real estate in catastrophe-exposed regions is inevitable, but real estate owners can take steps to control the increases. Buildings can be made more resistant to wind and earthquakes, which may result in lower premiums. Additionally, they can carefully choose their insurance partners. Large, globally diversified companies are less reliant on reinsurance and have the benefit of a broader spread of risk. Over the long run, these factors can contribute to more stability and greater security.