AIR Worldwide Analysis: Exposure Data Quality





AIR Worldwide Corporation

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Introduction

In light of the enhanced hurricane activity of the last two seasons and a heightened regulatory environment established by the Sarbanes-Oxley Act of 2002, exposure data quality is once again becoming a critical issue for insurers.

Before Hurricane Andrew, few companies captured detailed exposure information for catastrophe loss analysis. At best, county-level exposure aggregates were analyzed. In most cases, Probable Maximum Losses (PMLs) were calculated using statewide premiums by line of business. As a result of record setting losses from the 1992 storm, insurers recognized the need for higher quality exposure data and made significant efforts to improve the level of detail. Capturing the five-digit zip code and exact street address for each location, along with its construction (wood frame, masonry, steel, etc.) and occupancy (single family residential, industrial, retail, apartment, etc.) became a high priority at many companies, particularly those that experienced large and unexpected losses from Hurricane Andrew.

Today, most companies capture location-level information, such as street address and construction type, for the majority of their residential properties. However, there has been far less improvement in commercial exposure data, for which insurers still do not provide catastrophe models with realistic replacement values and risk-specific construction and occupancy information.

This report presents the results of an AIR Worldwide analysis of current exposure data. The analysis reveals that the quality and completeness of data on insured properties is lacking, especially for commercial policies. In particular, property replacement value—a parameter with considerable impact on catastrophe loss estimates—is of questionable accuracy for most of the companies analyzed. In addition, the completeness and resolution of construction type, occupancy class and location information is also inadequate for detailed catastrophe loss analyses.

Methodology

For this analysis, exposure data were reviewed from companies representing more than 50 percent of the total U.S. property market. Location, construction and occupancy data were reviewed for completeness and replacement values were compared to average industry values. In addition, individual properties were selected from the company data and evaluated in detail using a standard engineering-based cost estimation approach.

Average industry values were obtained from AIR's U.S. industry exposure database, which contains information on residential and commercial insured properties and their replacement values. The database includes building-specific information—such as square footage, construction type and occupancy—for over 50 million residential and six million commercial properties. It has been developed and refined over the past 20 years and is used to develop AIR's industry loss estimates.

Replacement Value

A property's *replacement value* is the full cost to replace the building in the event of a total loss. Since catastrophe models estimate loss by applying vulnerability functions to the replacement value before applying policy terms and conditions, accurate replacement values are essential for obtaining accurate catastrophe loss estimates. If a property's replacement value is understated by 50 percent, for example, the estimated catastrophe loss will be understated by at least that much. Thus, if a policy covers only $2 million of a $10 million structure, the full $10 million replacement value must be coded in the exposure data for the model to produce an accurate loss estimate for the property.

The analysis exposed large discrepancies between insurers' replacement values and replacement values estimated using a standard engineering-based cost estimation process. A range of individual buildings across several key occupancy types, including hotels, retail establishments and business services (commonly referred to as office buildings), were analyzed in detail. These occupancies were selected because, collectively, they represent over 60 percent of commercial exposures and they are particularly vulnerable to wind and earthquake damage.

AIR construction specialists estimated replacement values for these commercial structures and compared them to the values contained in the company data. Individual properties with street address information were selected for detailed evaluation to allow each building to be identified and its structural characteristics determined. The replacement values for each building were estimated using a standard engineering-based analysis that included factors such as design, construction, square footage and occupancy. A representative sample of the analyzed properties is shown in Table 1.

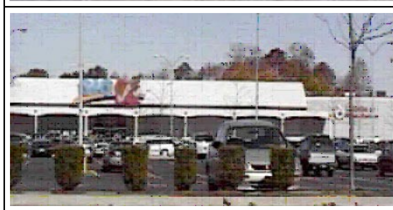
Overall, nine out of ten commercial properties analyzed had replacement values less than the amount estimated using a standard engineering-based cost estimation process.

While the underestimation of commercial replacement values was ubiquitous, the variability of data among companies was also significant, as insurers' average replacement values ranged from 20 to 80 percent of industry average values.

Further analysis revealed that coded replacement values were equal to coverage limits for many commercial policies, which suggests that many companies may simply be using the coverage limit as a proxy for the replacement value. Catastrophe loss estimates are calculated by applying a damage function to each property's full replacement value. Therefore, coverage limits can not be substituted for replacement values, as they will not provide accurate loss estimates. These inaccuracies are compounded for policies covering only a share of a property. If the coverage limit is used as a proxy for the full replacement value of the structure, the resulting loss estimate will be further understated.

To obtain accurate catastrophe loss estimates, the coverage limit should not be used as a proxy for the replacement value, particularly for polices covering only a share of the property.

Table 1: Comparison of Replacement Values for Representative Properties

	Occupancy	Con-struction	Approx. Gross Area (sq. ft.)	Replacement Value		
				Company Provided Value	AIR Estimate	Ratio
	Hotel	Wood Frame	30,000	$1,692,702	$3,509,831	48%
	Hotel	Concrete	50,000	$5,515,000	$7,637,016	72%
	Retail	Masonry	8,000	$427,883	$964,148	44%
	Retail	Masonry	100,000	$1,243,816	$8,484,046	15%
	Business Services	Wood Frame	10,000	$717,500	$1,502,498	48%
	Business Services	Steel	120,000	$10,639,315	$24,718,846	43%

Additional Exposure Information

Catastrophe models employ vulnerability functions to estimate the damage to exposed buildings and contents at the specific intensity experienced at a given location. Accurate construction, occupancy and location information are also essential for accurate catastrophe loss estimates.

Construction and Occupancy

To obtain accurate loss estimates, separate damage functions have been developed for many different construction types and occupancies. At a given wind speed, light metal structures, for example, are more than three times as vulnerable as those built using reinforced concrete. Other risk-specific structural details—such as height, the presence or absence of hurricane shutters, roof pitch and geometry, the percentage of the exterior represented by glazing, and others—will also have an effect on loss estimates. The greater the available detail, the more accurate the loss estimates will be.

Damage to buildings and their contents is also a function of occupancy class, so accurate occupancy information is also important. For a given construction type, e.g. steel frame, occupancy provides insight into the likely size and footprint of the building, and the percentage of the exterior taken up by windows. Occupancy information is also used to provide insight into the type of contents present and, hence, their damageability. Occupancy information can also be used to infer construction.

In our analysis, AIR found a large variation among companies in the completeness of construction and occupancy information. While several companies had construction and occupancy information for nearly all their commercial exposures, the majority lacked construction and/or occupancy information for more than a third of their policies. In the more extreme cases, construction and/or occupancy information was missing for more than 75 percent of commercial properties.

Over 50 percent of companies analyzed lacked construction and/or occupancy information for more than a third of their policies.

Location Information

Today's catastrophe models leverage recent advances in computing power to simulate the local intensity of various hazards at extremely high resolution. However, to take full advantage of a model's site-specific characteristics—such as distance to coast or nearest fault, elevation or soil data, and land use/land cover information—analyses must be run using street address level data, which can be translated into an exact latitude and longitude.

Hurricane Katrina provided another recent example of why address-level location information is critical for the generation of reliable loss estimates. Damage from storm surge along the Mississippi Gulf Coast was severe, yet highly localized due to natural barriers that limited the extent to which the surge traveled inland. Coastal properties whose locations were coded at the ZIP Code centroid, for example, would have been estimated to have no surge damage when the ZIP Code centroid is located outside of the surge footprint.

In the course of this analysis, AIR found that there has been significant progress in the quality of location information for commercial policies. A high percentage of commercial policies were identified by a street address. However, for many multi-location policies, only a single address was provided, typically the headquarters or billing address.

Accurate analysis of multiple-location policies requires an address for each location.

Conclusion

Since Hurricane Andrew, catastrophe models have become the industry standard tools for catastrophe risk assessment and management. While Hurricane Katrina refocused industry attention on the accuracy of modeled losses for an actual event, the real purpose of catastrophe models is to help insurers prepare for catastrophes *before they occur*.

Catastrophe losses much larger than those caused by Katrina will happen in the future. For example, AIR estimates that an intense hurricane striking a major metropolitan area could cause insured losses in excess of $150 billion. For such a scenario, even companies writing less than one percent of the properties in the affected area could experience losses in excess of $1 billion.

AIR uses its detailed database of residential and commercial properties, which is revised and updated on annual basis, to derive such industry loss estimates. This industry database can also be used to gauge individual company losses. For catastrophe models to provide companies with more detailed and accurate assessments of their catastrophe risk, the exposure data input into the model must be complete and accurate. To attain this goal, significant improvements in exposure data must again become a high priority for insurers, reinsurers and other companies exposed to catastrophe risk.

About AIR Worldwide Corporation

AIR Worldwide Corporation (AIR) is a leading risk modeling company helping clients manage the financial impact of catastrophes and weather. Utilizing the latest science and technology, AIR models natural catastrophes in more than 40 countries and the risk from terrorism in the United States. Other areas of expertise include site-specific seismic engineering analysis, catastrophe bonds, and property replacement cost valuation. A member of the ISO family of companies, AIR was founded in 1987 to provide its insurance, reinsurance, corporate and government clients a complete line of risk modeling software and consulting services that produce consistent and reliable results. Headquartered in Boston, AIR has additional offices in North America, Europe and Asia. For more information, please visit www.air-worldwide.com.