

# Evaluating Catastrophe Indices

By Bruce B. Thomas

Critical to the success of any market is the amount and quality of information that supports it. Unfortunately, the growth in the market for securitized catastrophe risk has been stunted by the dearth of high quality, detailed data describing the insurance industry's exposure and loss experience.

While most insurance companies now have the data processing capabilities to record this information in sufficient detail, months may elapse before they know their ultimate losses due to lags in claim reporting and settlement. Moreover, detailed information about insured properties and losses is confidential, and there is no single entity that collects this information for all companies throughout the United States.

## **Needing a Standard**

While investors could underwrite a specific insurer's catastrophe loss potential, there are a variety of reasons why this is usually impractical. Performing this analysis requires a high level of expertise, is time consuming and costly, and it also places investors in direct competition with reinsurers who are better equipped to perform this function.

Most investors would prefer to invest in securities where the settlement value is determined by industry-wide losses. This helps eliminate the adverse impact of any particular company's unusual loss experience and acts as a safeguard against potential moral hazard since it minimizes insurers' ability to affect settlement values and eliminates much of their informational advantage over investors.

Contracts based on industry loss experience are attractive to insurers because they alleviate the need for releasing confidential information about their exposures, loss histories, growth plans, distribution systems, and underwriting and claim payment practices. For most insurers, the effort and cost of issuing securities tied to individual company loss experience is too costly to represent a feasible alternative to traditional reinsurance.

Fortunately, catastrophe indices have been developed that can serve as a standard by which to describe and evaluate catastrophe risk. A properly constructed index can serve as a reliable representation of overall industry loss experience, providing news and information, but also serving as a basis for effecting transfer of catastrophe risk. By standardizing catastrophe risk, an index makes rapid exchange of information possible and creates a platform on which to base standardized financial instruments. Buyers and sellers can focus their energies on price, credit, and settlement terms rather than on all of the unique characteristics of a particular insurance company.

In the last few years, a great deal of effort has gone into the development and production of catastrophe indices, each with its own unique methodology for estimating industry losses (See Figure 1.). These methods run the spectrum from computer simulation to gathering exposure and loss information from millions of transaction level insurance records.

Figure 1. Catastrophe Index Comparison

<b>Features</b>	<b>PCS</b>	<b>RMS</b>	<b>GCCI</b>
<b>Geographic Detail</b>	State	ZIP code	ZIP code
<b>Insured Property</b>	All major lines	All major lines	Homeowners
<b>Perils</b>	All significant Perils	Earthquakes and Hurricanes	Hurricanes, hailstorms, tornadoes, thunderstorms, winter storms, and freezing conditions
<b>Index Value</b>	Dollars of loss	Dollars of loss	Paid loss-to-insured value ratio
<b>Source of Estimate</b>	Phone survey of insurers, computer model, and ground survey	Computer model	39 companies' insurance and paid loss records
<b>Sample Size</b>	23% <sup>1</sup>	Not applicable	25%
<b>Supplemental Information Provided</b>	None	None	Premiums, deductibles, amounts of insurance, claim counts, paid losses, construction types
<b>Published</b>	3 to 5 days after event, Updates as necessary	7 days after event, Final value after 28 days	Quarterly

Now that there are a variety of indices to choose from, how should firms decide which Index is best suited to their particular needs? What criteria should be used to evaluate these estimates (See Figure 2)?

### Assessment Criteria

Insurers and investors want to know if they can rely on an estimate of insured loss. Is the estimate likely to be accurate? If the index is based on actual loss experience, they want to know if the sample is large enough to constitute an unbiased estimate of industry loss experience. If the methodology involves computer simulation, they want to understand all of the assumptions used in the computer model.

Investors are particularly concerned if they feel that an index can be manipulated. For indices based on reported losses, it is important to determine if paid losses are used since the discretionary nature of incurred loss numbers can make them both volatile and subject to potential manipulation. Another issue that should be considered is the extent to which individual company loss experience may affect the overall estimate. An index that uses an unweighted average of many companies' loss experience will substantially eliminate the possibility that any one company will unduly affect the overall estimate.

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<sup>1</sup> Kenneth A. Froot & Markus F. Mullarkey, Mid Ocean Limited – Trading Catastrophe Index Options, Harvard Business School Publication N9-298-073, Boston, 1997, p.14.

Figure 2. *The Makings of a Good Index*

<b>Characteristic</b>	<b>Evaluation Criteria</b>
Reliable	Uses large sample Based on actual exposure and loss Non-manipulable
Useful	Timely Meaningful informational content High correlation to insurer loss experience Measurable basis risk
Verifiable	Transparent computation Based on objective and predefined methodology

However, to be most useful, an index must also produce timely information. Timeliness is, to a large degree, a function of how the information will be used and whether similar information already exists.

Insurers need quick estimates of loss to mobilize claim personnel and to code losses as catastrophic. Later, this designation helps identify reinsurance recoveries and facilitate actuarial analysis, since catastrophe losses can be isolated when setting reserves and making pricing decisions. A ballpark estimate also helps investors and hedgers determine how they may want to adjust their financial positions. If, on the other hand, a catastrophe index will be used as a reference basis for a financial contract or for catastrophe modeling purposes, one may prefer a very accurate estimate based on a wealth of detailed exposure and loss information.

An important consideration for an insurer is the degree to which its loss experience is correlated to the index. If an insurer's loss experience does not track the index as expected, i.e. has too much basis risk, a hedge becomes ineffective and the insurer either pays for more protection than is desirable or retains too much risk. Without enough information to measure and minimize basis risk, the cost and uncertainty of using index-linked contracts make them unattractive.

Finally, parties to an insurance securitization want independent verification of index values. Having a written description of the index methodology is a good starting point, but for an index to be widely accepted, insurers and investors require access to the detailed insurance data supporting the index calculations. Ultimately, a knowledgeable professional should be able to read the index methodology and recalculate the index.

In summary, a good catastrophe index is much like the rules governing a sporting event. In order to receive enthusiastic support from a wide audience, the rules must be specified in advance, play must be observable, and people must have confidence that the rules determine the final scores.

With these considerations in mind, it is worth taking a look at how some of the current catastrophe indices score.

### **PCS**

The Property Claim Services (PCS) Index estimates the insurance industry's total personal and commercial property catastrophe losses for states and regions and is the reference basis for the Chicago Board of Trade's catastrophe options contracts. The PCS methodology can be considered a hybrid approach since it relies on a telephone survey of insurers, the opinions of PCS staff members, and the use of a proprietary model of loss experience. The advantage of this approach is that PCS can provide a quick estimate of insured loss.

However, many potential users do not feel this methodology is objective or transparent enough to form a sound basis for transacting catastrophe risk. There are too many layers of judgement involved and not enough supporting information for many hedgers to feel very comfortable with these estimates. For hedgers, a separate but more significant problem is that since PCS does not report separate estimates by line of insured property, peril, or for geographic areas within states, most insurers' loss experience is not likely to be very highly correlated with this Index.

### **RMS**

Risk Management Solutions, a provider of catastrophe modeling software, produces the RMS CAT Index. First published last July, this Index estimates the insured damage from hurricanes and earthquakes by entering key event parameters into its catastrophe modeling software. RMS' hurricane model, for example, projects losses based on landfall location, direction, forward velocity, central pressure, and the radius to the maximum wind speed.

In addition to the speed with which estimates can be generated, using a model of loss experience has the benefit of allowing users to quickly and flexibly aggregate and disaggregate the model's estimated losses by peril, line of insured business, and geographic area. Although RMS' catastrophe model is modified and updated over time, the model is essentially frozen in advance of a particular Index series, which helps eliminate potential manipulation.

Unfortunately, most risk management professionals do not believe that a model can predict losses with precision. Thus, the RMS CAT Index may be more useful to investors interested in quick estimates of potential damage than to hedgers desiring a precise measurement of actual loss.

### **GCCI**

The Guy Carpenter Catastrophe Index (GCCI) measures the insured damage to homeowner properties caused by atmospheric perils for over 9,600 individual ZIP codes in the United States. The GCCI was first published in August 1997 by IndexCo, LLC and is the reference basis for option contracts traded on the Bermuda Commodities Exchange. Since the GCCI uses a predefined and objective methodology based on more than 40 million insurance and paid loss records annually, users will be satisfied that the GCCI is both reliable and verifiable.

The detailed geography covered, combined with the fact that it is peril and line specific, make the GCCI highly correlated to the loss experience of insurers writing homeowners policies. Given the

wealth of insurance and loss information that accompanies it, the GCCI will be very useful for fine-tuning catastrophe models and for investors and hedgers who want to reduce potential basis risk in index-linked securities. Unfortunately, the GCCI is only produced on a quarterly basis and is not as timely as many users would like.

### **Final Measure**

Although no one index will accomplish every objective, each of these indices provides valuable insight into how catastrophes affect the insurance industry, and insurance executives should welcome and support these efforts. Whether they provide a quick estimate of damage, just days after an event, or detail actual paid losses, catastrophe indices provide information that is critically important to understanding and managing catastrophe risk.

Developing a standard by which catastrophe risk can be described and evaluated is an essential first step in creating a large and vibrant market for catastrophe risk. By standardizing risk, catastrophe indices can help insurers and investors flexibly and efficiently diversify their exposures by buying, selling, and swapping index-based contracts. Capital can be allocated more efficiently, setting the stage for greater pricing stability and profitability.

### ***Author's Note:***

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