AP Photo/Dave Martin

The fury of Georges: *Key West, Fla., residents hold on to each other as they battle Hurricane Georges' 90 mph winds along Houseboat Row in 1998.*

Inside the Black Box

Hurricane models undergo a rigorous screening process to pass muster in Florida. Other hurricane-prone states look to Florida to set the standard.

by Martin M. Simons

Following hurricanes Andrew and Iniki in 1992, there has been virtually universal agreement that the old methods of using insurance company loss data to develop hurricane insurance rates have historically produced inadequate results. Prior to 1992, property insurance computer models had been used in some reinsurance analyses—and to a lesser extent by individual insurance companies—in their analyses relative to property insurance exposures. Ten years later, the use of computer models to produce hurricane property insurance loss costs has become more common.

In the first few years following Andrew, consumers and regulators referred to the models as "black boxes" and looked upon the modeling process with a great deal of skepticism. This view often was intensified, because much of the inner workings of the models were—and continue to be—considered "proprietary." If information was submitted to a regulator, it would become public information, and the modelers were reluctant to divulge their modeling secrets in which they often had invested millions of dollars.

There also was an understandable reluctance on the part of regulators to allow the use of these black boxes to determine the appropriate insurance loss costs and subsequent rates, especially if they were not provided specifics on how the model works. That reluctance has diminished as the models have become the targets of detailed examinations. It is quite natural that Florida, with its enormous and universal exposure to hurricanes, has taken the lead in analyzing the inner workings of hurricane insurance models that are used there.

Martin M. Simons is a public actuarial consultant based in Columbia, S.C.

Close Scrutiny

In 1995, the Florida Legislature established the Florida Commission on Hurricane Loss Projection Methodology. The commission consists of 11 statutorily defined voting members representing the government, consumers and the insurance industry. The commission includes experts in actuarial science, insurance, finance, meteorology, engineering, statistics and computer science.

The initial task before the commission was a difficult one. It had to

devise a system that allowed for an examination of the most detailed aspects of the models, while preserving their proprietary information and components. The system created by the commission to look inside these black boxes includes a level of examination that, at times, reaches so deeply into the model that individual lines of computer code are analyzed to ensure that they are performing the appropriate calculations on the appropriate data and are producing results that are reasonable in light of the scientific criteria underlying the effect being analyzed.

If hurricane models are to be used to develop loss costs in Florida, they must be found to be "acceptable" by the commission. The commission bases its acceptance on a set of standards. The standards are separated into six areas:

- General (seven standards)
- Meteorological (nine standards)
- Vulnerability, or Engineering (seven standards)
- Actuarial (17 standards)
- Computer (eight standards)
- Statistical (five standards)

In 2002, the commission is reviewing hurricane models based on these 53 standards. Reviews include an on-site examination of each of the models by a professional team appointed by the commission. The professional team includes a statistician, a meteorologist, a structural engineer, an actuary and a computer scientist. During the on-site examination, the professional team reviews all aspects of the model, including public as well as proprietary information. Calculations, assumptions, data entry, insurer inputs, program security and myriad criteria that produce the modeled loss costs are reviewed in minute detail by the professional team.

The team's computer scientist reviews the programming language to ensure that the information being reviewed is consistent with the model's operations. Statistical standards are used to determine whether the model produces statistically reasonable results as well as to provide analyses of the sensitivity and uncertainty associated with each of the model's inputs. These sensitivity and uncertainty analyses are used by the commission and by the professional team to describe how individual variables within the model interact.

Without revealing any proprietary information, the professional team reports its findings to the commission relative to each of the standards. In addition to the professional team report, each modeler submits a detailed document providing the commission with substantial information required by the commission. The commission, after analyzing the modeler submission and the professional team report, votes on each specific standard as to whether the model is acceptable.

53 Standards

For a model to be used for rate-making in Florida, it must be found acceptable under each of the 53 standards. The failure of any one of the standards disqualifies an entire model for use in Florida. A model cannot be used as support for a rate filing in Florida if it has not received acceptance by the commission. It is important to note that the acceptance of a model by the commission does not preclude the regulator from requesting additional information prior to approving or from disapproving an insurer's rate filing that uses the model's output as support for a rate revision.

Acceptance of a model by the commission is good for one year. During the year, the commission reviews each of the standards in an effort to help improve the modeling process. In addition, changes in a model that produce a change in any loss cost in Florida must be held until the next approval cycle.

The work performed by the commission is in substantial detail, providing a vast amount of information relative to each hurricane-modeling company doing business in Florida. In other states, the levels of exposure to hurricanes as well as the percentage of the state that is exposed to hurricanes reduce the necessity of creating a statutory entity similar to the one in Florida. The Florida commission's findings often are used by other states to determine whether hurricane models are acceptable for use there.

Modeling for Other States

To properly use the Florida results in other states, however, regulators in those states need to be aware of the following issues:

- the Florida meteorological standards and the review of those standards are based upon historical hurricane activity in Florida;
- the Florida vulnerability standards are based to some extent on Florida criteria that may or may not apply in other states;
- building codes and building-code enforcement may have an effect different from that in Florida; and
- If insurance company adjustments are permitted to the model, those adjustments may differ from one state to another.

The Hawaii Insurance Division has recently initiated a program for reviewing hurricane models. For a model to be found acceptable to produce loss costs in Hawaii, the model must submit informational responses to a series of interrogatories from the Insurance Division. The model also must have been reviewed and found acceptable by the Florida commission. In addition, each model is reviewed by a local meteorologist, a local structural engineer and an actuary. Models must appropriately consider the local insurance, meteorological and structural engineering criteria prior to acceptance.

The Florida commission has provided all hurricane-prone states with a solid framework from which they can review hurricane models for use in producing loss costs. State regulatory officials are able to focus their model-review processes on how the models handle state-specific differences. Florida commission meetings are open to the public and can provide a wealth of information to regulatory officials as well as the insurance industry and the modelers themselves. It is important to ensure that the models that are being used are appropriate for use in each jurisdiction in which the modeled loss costs are included in the hurricane insurance rate-making process. BR