BEFORE THE STATE OF SOUTH CAROLINA

DEPARTMENT OF INSURANCE

IN THE MATTER OF:	)	
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THE USE OF INSURANCE CATASTROPHE MODELS IN PROPERTY INSURANCE RATEMAKING IN SOUTH CAROLINA	)	Order Number 2013-05
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	)	

This matter comes before me pursuant to Section 38-75-1140 of the South Carolina Code Annotated.[1] Section 38-75-1140 recognizes the use of natural hazard catastrophe models in insurance ratemaking. Specifically, it provides that the director or his designee may cause to be made an evaluation of any natural hazard catastrophe model used in property insurance rate filings in this State.[2] Accordingly, the South Carolina Department of Insurance (Department) engaged a panel of experts to review the hurricane catastrophe models (hurricane or catastrophe models) in use in South Carolina to determine their appropriateness for insurance ratemaking. The expert panel consisted of a structural engineer, Masoud Zadeh[3]; a meteorologist, Jenni Evans[4]; and an actuary, Martin M. Simons[5] (Expert Panel). Each member of the Expert Panel has significant experience reviewing natural hazard catastrophe models and is a member of the Professional Team engaged to advise the State of Florida's Commission on Hurricane Loss Projection Methodology (Florida Commission). Four modeling organizations submitted models for evaluation: AIR Worldwide; Applied Research Associates (ARA); EQECAT; and Risk Management Solutions (RMS).[6] The Expert Panel's preliminary report was received by the Department on or about July 1, 2013 and its final report on or about October 7, 2013.

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[1] *See* S. C. Code Ann. § 38-75-1140 (2002).
[2] S.C. Code Ann. §38-75-1140(A) (2002).
[3] Martin M. Simons, et al., *Evaluation of Hurricane Catastrophe Models Used in South Carolina,* Appendix pp. 84-94 (October 4, 2013).
[4] *Id* at 69-83.
[5] *Id* at 60-68.
[6] Additionally, the South Carolina Wind and Hail Underwriting Association was asked to provide information to facilitate the review of the models.

A public hearing was held on October 9, 2013 at the South Carolina Bar Conference Center. The purpose of this public hearing was to receive comments about the final report and findings and recommendations of the Expert Panel engaged by the Department to review the use of insurance catastrophe models in South Carolina. Additionally, the Department held the record open to receive public comments and other input through October 31, 2013.[7]

Having made an independent review of the Expert Panel's report, the record and hearing transcript and other input and comments, I hereby find and conclude as follows.

FINDINGS OF FACT

Based upon the information presented at the public hearing and the recommendations of the Expert Panel, I find:

1. South Carolina law permits the use of catastrophe modeling in property insurance rate filings. Catastrophe modeling (cat modeling) is a risk management tool used by insurers, reinsurers, businesses and regulators to assess the potential losses caused by a catastrophic event such as a hurricane, earthquake or other natural disaster. Catastrophe models are available for a variety of hazards, including the following natural hazards: hurricane, earthquake, fire following earthquake, severe thunderstorms and tornados, and winter storm.

2. Catastrophe models estimate the average losses that will be incurred due to a particular catastrophic event or set of catastrophic events over either the near-term or long-term. It is important to note that hurricane modeling is not predicting the number of hurricanes, for example, that will occur in a given year (as is the case with the National Hurricane Center's annual forecasts). Instead, cat modeling assesses the potential losses that a portfolio of properties could sustain due to a catastrophic event or series of catastrophic events.

3. Hurricane models are utilized in property insurance ratemaking because they are generally accepted as the best available tool to estimate the prospective costs of risk transfer from natural disasters. The models combine historical disaster information with current

[7] *See Public Hearing Transcript on Hurricane Catastrophes in Ratemaking in South Carolina*, p.37, (October 9, 2013).

demographic, building, scientific and financial data to determine the potential cost of catastrophes for a specified geographic area. The skills of many experts including meteorologists, seismologists, geologists, structural engineers, mathematicians, actuaries, and others are used in the development and analysis of the catastrophe models.

4. A catastrophe model inputs the data for a specific insurer on the given insurer's exposure to catastrophic risk. This data includes the location of the properties insured, the physical characteristics of the insured structures, and the insurance coverage applicable to these properties. These catastrophe models help to ensure that an insurer is resilient enough to withstand a major disaster affecting its insured properties.

5. As a part of the review of property insurance rate filings, the Department reviews each insurer's use of all catastrophe models. One of the current prerequisites for deeming a hurricane catastrophe model acceptable for producing loss costs in South Carolina is that the hurricane model was approved by the Florida Commission.

6. The Department hired an Expert Panel to evaluate hurricane models as provided by South Carolina law.[8] The purpose of the Expert Panel review was to ensure that hurricane models produce results that are accurate and reliable for loss cost estimates in South Carolina.

7. The Expert Panel reviewed the hurricane models for South Carolina for the following four modelers: AIR Worldwide; Applied Research Associates (ARA); EQECAT; and Risk Management Solutions (RMS). The Expert Panel made the following general findings[9]:
    - Each of the reviewed models included the production of one or more output reports or analysis logs which provided a great deal of information about the adjustments and inputs to the catastrophe models.
    - The output report is necessary for identifying important assumptions and provisions inherent in any rate filing.

[8] *See* S.C. Code Ann. §38-75-1140 (2002).
[9] *See* Martin M. Simons, *et al.*, *Evaluation of Hurricane Catastrophe Models Used in South Carolina* pp.44-46 (October 4, 2013).

- Catastrophe models that include tropical storm depressions in their stochastic storm sets should not be approved for use in South Carolina.

- All catastrophe models used in Florida and approved by the Florida Commission are long term models.

- The catastrophe models reviewed tend not to address the effects of the South Carolina building code.[10] This is important for structures built after the implementation of the 2006 Building Code[11] implemented July 1, 2009. Going forward, adjustments need to be made to the catastrophe models or by the insurers through the use of secondary structural modifiers to account for the 2006 Building Code.

8. Each of the catastrophe models provide a reasonable reflection of South Carolina hurricane history and provide a reasonable distribution of hurricane intensities at landfall for South Carolina.[12]

9. Based upon its review of the catastrophe models, the Expert Panel made the following conclusions and recommendations to the Department:

   a) The Department should not accept historical claim data for hurricanes as the sole basis for estimating expected hurricane loss costs in the development of rates that are not excessive, inadequate or unfairly discriminatory.[13]

   b) Catastrophe models that include tropical storms and tropical depressions in their stochastic storm sets should not be approved for use in South Carolina. Such inclusion of tropical storms and depressions could result in a double counting of the effects of those storms; once in the modeled "hurricane" losses and once again

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[10] *See* Martin M. Simons, *et al.*, *Evaluation of Hurricane Catastrophe Models Used in South Carolina*, pp. 18, 24, and 31 (October 4, 2013).
[11] The reference to 2006 Building Code in this section means the 2006 International Building Code as well as the 2006 International Residential Code adopted by South Carolina on November 28, 2007 and implemented on July 1, 2009.
[12] *Id.* at 7, 10.
[13] *Id.* at 44.

in the rate development for "other than hurricane" portion of the ratemaking process.[14]

c) The Department should not permit the use of any of the following model variations: "short-term," "near-term," "medium-term," "warm phase," or "warm water." This is consistent with the practices of the Florida Commission. Partial support for this recommendation is given in the comments related to EQECAT's Meteorology Module: "if shorter segments (or other subsets) of the historical record are used, the (resulting) loss costs will be even more sensitive to changes in an individual event." This sensitivity works against the goal of having models produce stable results over time.[15]

d) With each rate filing for hurricane rates, the Department should obtain a model-specific output report, which should contain sufficient detail to determine whether the modeler or the filing insurer has made adjustments or assumptions outside of the workings of the model (which may or may not be reasonable), including, but not limited to, storm surge, demand surge, and exclusion of (or modifications to) any records from the filer's exposure data set. The modeler or the filing insurer should provide details to the regulator as to how to locate the desired information in the output report. Filings that omit these reports should not be approved by the Department.[16]

e) Catastrophe models may include a certain percentage increase in the loss costs to allow for items such as storm surge losses that are considered as wind losses in the actual claims data. These adjustments are outside of the review by the Expert Panel and are not generally permitted by the Florida Commission. While an argument may be made that some storm surge losses were coded as wind losses, there is also an argument that some wind losses may have been coded as storm surge losses. If there is an amount to be added to all South Carolina hurricane insurance rates, that amount should be determined by the regulator with input

[14] *Id.* at 44.
[15] *Id.* at 45.
[16] *Id.* at 7, 22, 28, 43-44.

from those that are affected, including the catastrophe modeler, but not by the catastrophe modeler alone.[17]

f) The Expert Panel understands that there is no mechanism in place currently to address future catastrophe model revisions for South Carolina. It is recommended that the Department develop a procedure to address future catastrophe model revisions (recommendations provided).[18]

g) <u>As to the AIR model:</u>

   a. AIR Atlantic Tropical Cyclone Models v12.0.1 and v14.0.1 may be used for application to South Carolina property insurance rate filings.[19]

   b. It is recommended that the Department require filing companies to provide detailed justification for their rates when using the AIR model with regard to regional and temporal variations in vulnerability due to variations in building codes and regional wind speed, specifically pre- and post implementation of the 2006 Building Code. The Expert Panel judges this to be an acceptable approach, though not their preferred approach, as it puts the onus upon each individual filer to recognize such differences (and upon the regulator to verify that they are reflected).[20]

   c. It is recommended that the Department require filing companies using the AIR model to declare whether storm surge losses are included in the loss costs used for ratemaking and provide the extent and justification of such inclusion. AIR states "We encourage the SCDOI to ask for the log to gain an insight into the storm surge assumption included in the rate making analysis," a recommendation with which the Expert Panel agrees.[21]

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[17] *Id. at 44.*
[18] *Id.* at 44.
[19] *Id.* at 17-22.
[20] *Id.*
[21] *Id.* at 23-28.

h) As to the ARA model:

a. HurLoss 6.0 should be permissible for use in filings in South Carolina. However, the Expert Panel has determined that there are three issues that need to be addressed regarding this catastrophe model prior to its use:

1. Treatment of tropical cyclones that do not reach hurricane strength,
2. Treatment of unknown masonry residential structures (i.e., masonry residential structures that are not identified as either unreinforced or reinforced), and
3. Treatment of the 2006 International Building Code.[22]

In summary, if ARA HurLoss 6.0 is used for rate filings, the filing company should provide resolutions and justification with regard to the above issues. ARA has agreed to resolve the above issues in a subsequent model version. Once implemented, the Expert Panel suggests that the Department review the above listed improvements.

i) As to the EQECAT Model:

a. It is recommended that EQECAT WORLDCATenterprise Versions 3.13 and 3.16 and EQECAT Risk Quantification and Engineering (RQE) v14 may be used for rate filings in South Carolina.[23]

b. If the WORLDCATenterprise models (Versions 3.16 and 3.13) are used for rate filings in South Carolina, documentation should be required in the rate filing to specify the view of risk (to ensure there is no variation from the long-term historical view of hurricane risk) and to document and justify the differences in hurricane models between the Florida specific models and the South Carolina models.[24]

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[22] *Id* at 29-35.
[23] *Id.*
[24] *Id.*

c. It is recommended that if and when RQE v14 is used for rate filings in South Carolina, there are some differences at the zip code level that should be satisfactorily detailed and explained.[25]

d. While the entire hurricane database was used in developing the catastrophe model, the landfall frequencies for the stochastic hurricane set are lower for weaker storms and more frequent for more intense hurricanes, including Cat 5 systems. These frequency variations are acceptable, but should be examined with each new catastrophe model submitted to the Department.[26]

e. In order to reflect differences in structural vulnerability due to regional (i.e. wind regions vary within South Carolina) and temporal variations (i.e. construction codes are revised over time, causing vulnerabilities to change), it is necessary for filing companies using RQE v14 to use Secondary Structural Modifiers to reflect such variations (whether previous models have this functionality is unclear from the report). The Expert Panel judges this to be an acceptable approach, though not their preferred approach, as it puts the onus upon each individual filer to recognize such differences (and upon the regulator to verify that they are reflected).[27]

j) <u>As to the RMS model</u>:

a. It is recommended that RiskLink 11.0 SP2c be used for South Carolina rate filings. Any differences from Florida in hurricane catastrophe modeling properties in South Carolina should be documented and justified in such rate filings.[28]

b. In order to reflect differences in structural vulnerability due to temporal variations (i.e., – construction codes are revised over time, causing

[25] *Id.*
[26] *Id.*
[27] *Id* at 36-43.
[28] *Id.*

vulnerabilities to change), it is necessary for filing companies using models from RMS to use Secondary Modifiers to reflect such variations. The Expert Panel judges this to be an acceptable approach, though not their preferred approach, as it puts the onus upon each individual filer to recognize such differences (and upon the regulator to verify that they are reflected).

10. The Department does not accept historical claim data for hurricanes as the sole basis for rates. Insurers rarely make filings excluding catastrophe modeled results, but those that do (due to size or other limitations) generally base their rates on competitors that use catastrophe modeled results in their rates. Further, rates are compared to those of their competitors for reasonability by Department staff.[29]

11. Catastrophe modeled output including tropical storms and tropical depressions in their stochastic storm sets are not generally used in South Carolina rate filings. Where it has been used, Department staff ensures that there is no double-counting of tropical storm/depression losses in the "other than hurricane" and the modeled hurricane losses.[30]

12. The Department does not permit the use of any of the following model variations: "short-term," "near-term," "medium-term," "warm phase," or "warm water." Only the long-term variation of catastrophe models is permitted.

13. With each rate filing, the Department should obtain a catastrophe model-specific output report, which should contain sufficient detail to determine whether the catastrophe modeler or the filing insurer has made adjustments or assumptions outside of the workings of the catastrophe model (which may or may not be reasonable), including, but not limited to, storm surge, demand surge, and exclusion of (or modifications to) any records from the filer's exposure data set. The catastrophe modeler or the filing insurer should provide details to the regulator as to how to locate the desired information in the output report.[31]

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[29] *See Public Hearing Transcript on Hurricane Catastrophes in Ratemaking in South Carolina, pp 84-85,* (October 9, 2013).
[30] *Id.* at 85-86.
[31] *Id.* at 86-87.

14. The Department does not permit insurers to incorporate a certain percentage increase in the loss costs to allow for items such as storm surge losses that are considered as wind losses in the actual claims data. The Department does not permit carriers to incorporate storm surge when the underlying policies for which rates are being estimated do not cover such losses (which is almost always). The Department's Interrogatories currently instruct carriers to omit such losses.[32]

15. There is no mechanism currently in place to address future model revisions for South Carolina. It is recommended that the Department develop a procedure to address future model revisions, incorporating the recommendations provided by the panel. No state-specific hurricane catastrophe model is recommended at this time.[33]

CONCLUSIONS OF LAW

1. The law governing the making of insurance rates in South Carolina is well-defined. For property insurance rates, Section 38-73-330 provides, generally as follows:

> ...(2) Rates may not be excessive, inadequate, or unfairly discriminatory. Due consideration must be given for installation and maintenance of nationally recognized hazard reducing systems.
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> (3) Due consideration must be given to past and prospective loss experience within and outside this State, to the conflagration and catastrophe hazards, to a reasonable margin for underwriting profit and contingencies, to dividends, savings, or unabsorbed premium deposits allowed or returned by insurers to their policyholders, members, or subscribers, to past and prospective expenses, both countrywide and those specially applicable to this State, and to all other relevant factors within and outside this State, and in the case of fire insurance rates consideration must be given to the experience of the fire insurance business during a period of not less than the most recent five-year period for which the experience is available....[34]

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[32] *Id.* at 88-89.
[33] *Id.* at 89-90.
[34] *See* S.C. Code Ann. Section 38-73-330 (2002).

2. Additionally, § 38-73-430 sets forth the general guidelines for casualty rates and provides:

> Rates must be made in accordance with the following provisions:
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> (1) Due consideration must be given to past and prospective loss experience within and outside this State, to catastrophe hazards, if any, to a reasonable margin for underwriting profit and contingencies, to dividends, savings, or unabsorbed premium deposits allowed or returned by insurers to their policyholders, members, or subscribers, to past and prospective expenses, both countrywide and those specially applicable to this State, and to all other relevant factors within and outside of this State.
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> (2) The systems of expense provisions included in the rates for use by any insurer or group of insurers may differ from those of other insurers or groups of insurers to reflect the requirements of the operating methods of the insurer or group with respect to any kind of insurance or with respect to any subdivision or combination thereof for which subdivision or combination separate expense provisions are applicable.
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> (3) Risks may be grouped by classifications for the establishment of rates and minimum premiums, and classification rates may be modified to produce rates for individual risks in accordance with rating plans which establish standards for measuring any variations in hazards or expense provisions, or both, that can be demonstrated to have a probable effect upon losses or expenses.
>
> (4) Rates may not be excessive, inadequate, or unfairly discriminatory.
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> (5) Due consideration must be given to assessments for purposes such as the guaranty fund, wind and hail joint underwriting association, and similar mechanisms.
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> Except to the extent necessary to meet the provisions of item (4) of this section, uniformity among insurers in any matters within the scope of this section is neither required nor prohibited.

3. South Carolina will not develop a state-specific hurricane catastrophe model at this time. Notwithstanding, the Department will develop a procedure to address future hurricane catastrophe model revisions and their appropriateness for property insurance ratemaking. Hurricane catastrophe models will be reviewed periodically by the Department.

4. For hurricane catastrophe models not subject to this review, the Department may continue to rely on the reports and approvals of the Florida Commission.[35] The Florida Commission is currently considered the standard for the review of hurricane catastrophe models used for producing property insurance loss costs. Organizations, agencies, and regulators around the country, including South Carolina, rely on the work performed by the Florida Commission. Biennially, the Florida Commission adopts standards that catastrophe modelers must meet in the following year in order to be accepted.

5. Subject to full compliance with the recommendations included in the report and those made by Department staff, the Department accepts the Expert Panel's finding as appropriate for use in South Carolina rate filings, the following models:

    a. AIR Atlantic Tropical Cyclone Model v12.0.1 and v.14.0.1;[36]

    b. ARA Hurloss 6.0;

    c. EQECAT WORLDCATenterprise Version 3.13 and Version 3.16 and RQE v14;

        i. The Department suspended the use of EQECAT's model as of the hearing date due to the Department's concerns about the modeler's redactions of information from the report.

        ii. Subsequent to the hearing, but prior to the issuance of this order, EQECAT communicated with Department personnel and supplied the requested information, thus receiving approval.

    And

    d. RMS RiskLink 11.0 SP2c.

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[35] *See S.C. Code Ann. §38-73-1140(E) (2002)(*In conducting his evaluation of a model, the director or his designee may rely on the report of an official of another state who has made such an evaluation pursuant to the laws of that state.)

[36] *See* Martin M. Simons, *et al., Evaluation of Hurricane Catastrophe Models Used in South Carolina,* p.17 (October 4, 2013).

6. Each of the hurricane catastrophe models reviewed by the Expert Panel reasonably estimate the hurricane-related risk throughout South Carolina based upon the historical hurricane records for the state.[37]

ORDER

IT IS THEREFORE ORDERED THAT the Department develop a procedure for the periodic examination and evaluation of hurricane catastrophe models used in property insurance rate filings.

IT IS ORDERED THAT the modelers referenced in this order shall meet with Department personnel within 45 days of the date of this order to review, address or follow up on any model specific issues identified in the report submitted by the Expert Panel.

IT IS ORDERED THAT within 90 days of the date of this order, the Department issue a bulletin to the South Carolina property and casualty insurance industry which implements the recommendations set forth in this order. This bulletin will list all hurricane catastrophe models that will be approved for use in subsequent property insurance rate filings for South Carolina and any additional information or support required of insurers when using these models for the development o property insurance rates.

IT IS FURTHER ORDERED THAT any company or entity using hurricane catastrophe models to develop a provision in their rates must include with its rate filing the data the Department considers appropriate to support its rate filing consistent with the procedures outlined by this Department in its bulletins, actuarial exhibits and other documentation. This should include a comparison of the actual historical experience with the expected annual losses from the applicable catastrophe model; information on the catastrophe model, including, for example, the number of simulated storms by intensity, and the types of storms (including their meteorological characteristics or description) or events modeled; a description of the company-supplied inputs to the model; company adjustments to the model or to the model output, including optional

[37] See Martin M. Simons, *et al.*, *Evaluation of Hurricane Catastrophe Models Used in South Carolina* (October 4, 2013); also *See Public Hearing Transcript on Hurricane Catastrophes in Ratemaking in South Carolina, pp125-126* (October 9, 2013).

modeling features selected (e.g., demand surge); and a description of how the modeled results were integrated with the actual historical experience so as to avoid the double counting or understatement of expected future losses.

Submitted this 12th day of December, 2013.