ASOP 38: "Using Models Outside the Actuary's Area of Expertise (P&C)"

The current standard and revisions on the horizon

Professionalism Session, December 4th, 2014 CAGNY Meeting

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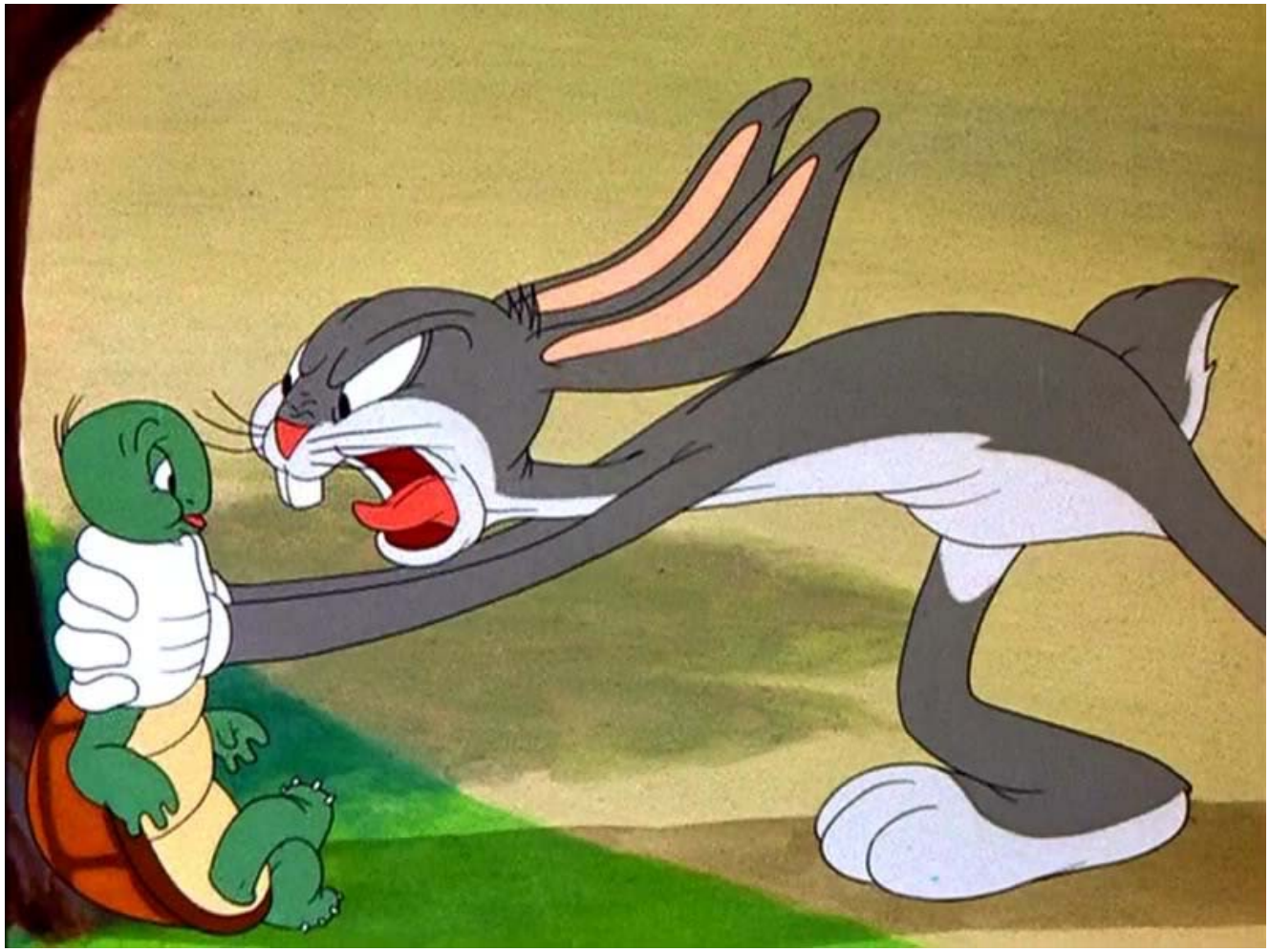
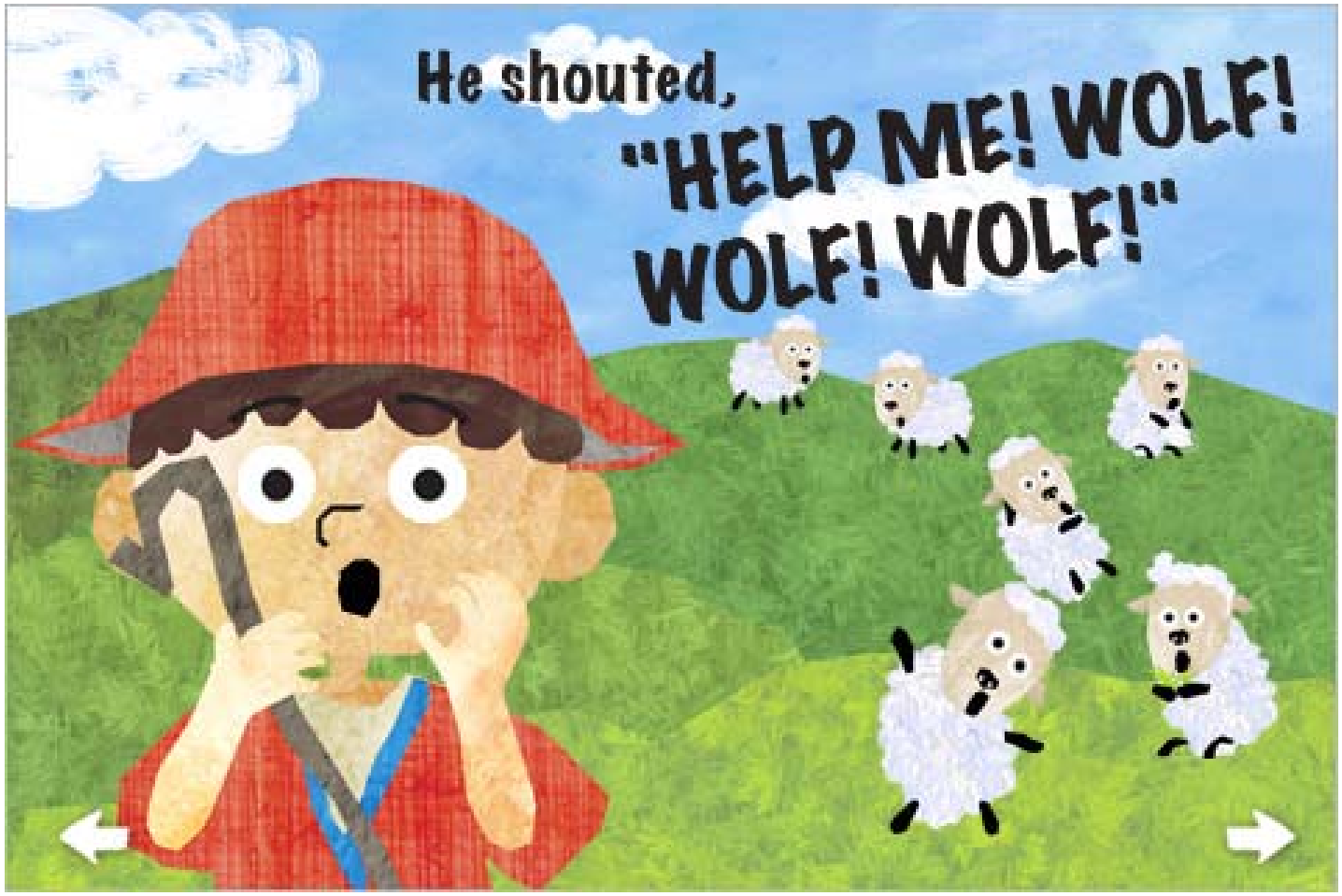
Agenda

- Actuarial Standards Board
- Current ASOP 38
- Proposed changes to ASOP 38
- New ASOP for Modeling
- Questions?

The Tortoise and the Hare



The Boy Who Cried Wolf



The Ant and the Grasshopper

The Actuarial Standards Board

"The Actuarial Standards Board (ASB) establishes and improves standards of actuarial practice. These Actuarial Standards of Practice (ASOPs) identify what the actuary should consider, document, and disclose when performing an actuarial assignment. The ASB's goal is to set standards for appropriate practice for the U.S."

"When creating or revising an ASOP the ASB:

- Reviews and evaluates current and emerging practices;
- Determines appropriate guidance;
- Publishes an exposure draft to obtain input from actuaries and other interested parties;
- Considers all comments received and publishes a final standard or another exposure draft."

The Actuarial Standards Board

In addition to the ASOP process, the ASB is also tasked with:

- Code of Professional Conduct
- Qualification Standards
- Discipline

Note that the ASB is not just a Property and Casualty organization. It serves:

- Pension
- Life
- Health
- General (crosses various areas)
- ERM
- and Property and Casualty practice areas.

ASOP 38: Some background

In the mid 90's, the AAA requested an ASOP concerning "the use of complex models".

Concern stemmed from growing popularity of catastrophe models for E(cat costs).

- What's the "duty of care" owed in understanding and relying on these models?
- What guidelines should an actuary follow when working with such complex models?

Note that this ASOP only applies to models outside the actuary's area of expertise and only for Property and Casualty.

The first draft considered models in all areas of actuarial practice, but it was scaled down for better focus.

ASOP 38: Some definitions

For context, ASOP 38 begins by defining:

Expert: "One who is qualified by knowledge, skill, experience, training, or education to render an opinion concerning the matter at hand" and

Model: "An information structure, such as a set of mathematical equations, logic, or algorithms, that is used to represent the behavior of specified phenomena".

A projected loss ratio model would fit the definition – adjusting historical data to represent next year's possible loss ratio behavior (but it's likely within the actuary's expertise). A cat model fits the definition as well and is the impetus behind the ASOP.

Can we rely on models outside our P&C area of expertise?

Yes, but with recommended practices and documentation.

From ASOP 38:

- Determine appropriate reliance on experts
- Have a basic understanding of the model (user input, model output)
- Evaluate whether the model is appropriate for the intended application
- Determine that appropriate validation has occurred (sensitivity testing), and
- Determine the appropriate use of the model

ASOP 38 requires documentation regardless of the existence or lack of a regulatory or legal requirement to do so, and refer to ASOP 41, “Actuarial Communications” when various disclosures may be necessary.

Questions to ask that address ASOP 38

You've been asked to determine expected cat losses for a prospective property QS. You have the newest version of the popular and commercially available EAR model, and an eager young cat modeler by your side. What does the ASOP 38 guidance suggest you think about?

- Has EAR been created by experts in the cat modeling field?
- Has EAR been reviewed or opined on by other experts in the cat modeling field?
- Are there standards that apply to EAR (or to the testing and validation of EAR)? Has EAR met such standards?
- Do you understand the basic components of EAR? What are the required inputs? How does the model use them? And what is the corresponding output?
- Are there limitations to EAR or adjustments required to complete your work?
- Did you sensitivity test the inputs to see if the resulting outputs moved in the direction / scale you expected?
- Is your assigned task something EAR is designed to accomplish?
- Did you document your work, including areas where you are deviating from the ASOP?

With that our modeling careers go on (until late 2012…)

MULTI-DISCIPLINARY TASK FORCE #1:

- Tasked with developing an ASOP to address modeling applications in all practice areas
- Developed by the Modeling Task Force of the General Committee of the ASB
- Result is Exposure Draft "Modeling"
- Comment Deadline: September 30, 2013

MULTIDISCIPLINARY TASK FORCE #2:

- Tasked with replacing current ASOP 38 with one that **covers all practice areas** yet maintains its current influence in the P&C community
- Developed by the Catastrophe Modeling Task Force of the General Committee of the ASB
- Result is Exposure Draft "Catastrophe Modeling (For all Practice Areas)
- Comment Deadline: December 30, 2013

Proposed Revisions to ASOP 38

- While the growing popularity of cat models in the late 90's provided the impetus behind the original ASOP 38, the ASOP itself does not specifically mention cat models.
- The Revision is now called "Catastrophe Modeling (for all Practice Areas)" and the Purpose and Scope change from "using models outside the actuary's area of expertise" to "selecting or using catastrophe models" in all practice areas.
  - Narrower scope by just focusing on catastrophe models
  - Broader scope by applying it to all practice areas, not just P&C
  - Better clarified scope by applying only to "selecting and using" and NOT "only designing, building, modifying, or developing a catastrophe model (or a portion of a catastrophe model)"

Proposed Revisions to ASOP 38

New Definitions are used to enhance or better clarify elements of the ASOP:

- Catastrophe Model – "A representation of relationships among events based on statistical, financial, economic, or mathematical concepts and equations used to explain a system, to study the effects of different components, and to derive estimates based upon the future occurrences of large-scale, low-frequency, high-severity events such as hurricanes, earthquakes, tornados, terrorist acts, and pandemics."
- Data (part of "User Input")
- Assumptions (part of "User Input")
- Parameters (part of "User Input")
- Principal (person who sets the project's objective)
- Project's Objective (aka "intended application" or "intended purpose")
- Expert (unchanged from original ASOP 38)

Some wording differences between Revised and Current 38

In performing actuarial services, an actuary may find it appropriate to **select and use** catastrophe models.

When **selecting or using** such a model, the actuary should:

- Determine the appropriate level of reliance on experts;
- Have a basic understanding of the **catastrophe** model;
- Evaluate whether the **catastrophe** model is appropriate for the **project's objective**;
- Determine that appropriate validation has occurred; and
- Determine the appropriate use of the **catastrophe** model and its results.

The actuary's level of effort in understanding and evaluating a model should be consistent with the **project's objective** and the model output's materiality to the results of the actuarial analysis.

Considerations, comments and next steps

- In general the ASB prefers ASOPs to apply across all practice areas (where it makes sense).
- Insurance departments and regulators like ASOP 38, particularly in the context of “black box” catastrophe loads found in rate filings.
- Revised ASOP 38 sought to not only preserve this strength but also to enhance it by making the ASOP strictly about selecting and using cat models.

Considerations, comments and next steps

- Over the course of the 3 month “exposure” period, the ASB received 18 comments.
- The Exposure Draft is open to general comments but also poses specific questions to the reader. The questions pertain to whether a concept or definition is clear enough, and whether or not it is appropriate.
- Very few comments were submitted by the non P&C areas, even though the ASOP would now apply to them.

Proposed Modeling ASOP

The proposed Modeling ASOP starts out with a very broad Purpose and Scope in Section 1; it applies to all practice areas when the actuary is "modeling", defined as:

- Selecting
- Designing
- Building
- Modifying
- Developing
- Or Using a model.

Recall that Revised ASOP 38 *only* applies to Selecting and Using; its Scope specifically excludes those other activities.

The exposure draft immediately recognizes the broad scope by saying the actuary may use his or her judgment when applying the ASOP in cases where there is minimal reliance on models or there is an immaterial financial effect.

Proposed Modeling ASOP: Definitions

The proposed Modeling ASOP presents 19 definitions in Section 2, including:

- Granularity (extent of assumption variations)
- Margin (adjustment for uncertainty)
- Model
- Neutral (fair and unbiased)
- Model Risk (risk of adverse consequences to output due to flawed model, inappropriate inputs or misapplication of model)

The definition of "model" in this proposed ASOP takes the revised 38 definition a step further. Since this ASOP applies to actuaries who may be developing or building models, the definition includes a model's parts – specifications that describe inputs and their relationships, implementation, and a realization (or "scenario" or "run") that produces output.

Analysis of Issues and Recommended Practices

- "Full application of this guidance is appropriate *when users rely heavily on the results* and *the model has a material financial effect*." (Section 3.1.1)
- If the model was developed by others, understand its basic workings, major sensitivities and dependencies, key strengths and limitations. (akin to current 38)

- Ensure that the model (and its structure) are meeting its *intended purpose.*
  - Will the model be able to identify volatility around the mean?
  - Will grouping inputs produce reasonable results?
  - Should you consider a particular level of input granularity?
  - Do you want deterministic results or stochastic, or both?
  - Are your assumptions and parameters reasonable, consistent, current, documented and appropriate for the intended purpose?
  - With that, are potential model limitations appropriately documented?

Mitigating Model Risk

In Section 3.3, “the actuary should attempt to mitigate model risk using validation, checking, analysis, governance and controls as appropriate to the intended purpose.”

•Validation, Checking, and Analysis

- Verify Model Integrity by checking formulas, reconciling output to actual data, and “examining the potential for model risk and then undertaking reasonable and appropriate steps to mitigate or eliminate it.”
- Analyze your output and determine if results seem reasonable and run sensitivity tests on assumptions
- Peer Review

•Employ appropriate Governance and Controls “to minimize model risk”.

Documentation and Communication Guidance

Present your Results

- Should explain your model in a report
- How are the user's needs being addressed by the model?
- Does the model fulfill the intended purpose?
- Limitations? Uncertainty in model results?
- Should consider reconciling to a prior report, if available
- Should consider describing your judgment: Does you judge the model to be fair/unbiased? (Neutral?)

Document and Communicate

- Do you understand the intended purpose for your model?
- Did you meet that purpose? Fail to meet it?
- Did you deviate from the standard? Is there anything else you're not telling me?

Must / Should: A word (or two) from ASOP 1

"The words "must" and "should" are used to provide guidance in the ASOPs. "Must" as used in the ASOPs means that the ASB does not anticipate that the actuary will have any reasonable alternative but to follow a particular course of action. In contrast, the word "should" indicates what is normally the appropriate practice for an actuary to follow when rendering actuarial services.

Failure to follow a course of action denoted by either the term "must" or "should" constitutes a deviation from the guidance of the ASOP. In either event, the actuary is directed to ASOP No. 41, Actuarial Communications.

The terms "must" and "should" are generally followed by a verb or phrase denoting action(s), such as "disclose," "document," "consider," or "take into account." For example, the phrase "should consider" is often used to suggest potential courses of action. If, after consideration, in the actuary's professional judgment an action is not appropriate, the action is not required and failure to take this action is not a deviation from the guidance in the standard."

Considerations, comments and next steps

- Impetus behind Modeling ASOP is more and more modeling work done across all areas of practice, with some modeling results showing up in financial statements.
  - Life side shift from formula reserves to considering more “home grown” estimates
  - Risk Based Capital requirements based on economic capital modeling
- Over the course of the 3 month “exposure” period, the ASB received 46 comments, some representing entire companies.
- Similar to Revised 38, the Exposure Draft is open to general comments but also poses specific questions to the reader. The specific questions pertain to whether the ASOP provides appropriate guidance and flexibility.
- Comments hit on scope, definitions, intent, strength / “teeth”
- Second attempt to make one big modeling ASOP

Some comments that represent the 46 received

- "Sections 1.2, 3.1.1 and 3.1.2 are similar in suggesting that full guidance of the ASOP may not be appropriate, practical or necessary. There is good guidance in the proposed ASOP but it is weakened by the continued suggestion that the guidance may be disregarded if following it would be inconvenient."

- The proposed standard appears very strong in that it applies to virtually every application we work with – spreadsheets, triangles, even simple math in the context of a model. On the other hand, the standard is very weak in that it does not require us to do much other than "Consider Model Risk." In fact, we would submit the entire ASOP on Modeling could be summed up by the phrase "Consider Model Risk" when performing actuarial services.

- "Model Risk: This is not necessarily generated only by models that are flawed or inappropriately applied. It can also result from models that are appropriately designed and used, but simply don't have enough granularity to capture every possible circumstance. The actuary should consider this when making decisions about the appropriate level on granularity for a model."

Questions?

Appendix

ACTUARIAL STANDARDS BOARD

Actuarial Standard of Practice No. 38

Using Models Outside the Actuary's Area of Expertise (Property and Casualty)

Developed by the
Task Force on Complex Models of the
Casualty Committee of the
Actuarial Standards Board

Adopted by the
Actuarial Standards Board
June 2000
Updated for Deviation Language Effective May 1, 2011

(Doc. No. 155)

ASOP No. 38—June 2000

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TO: Members of Actuarial Organizations Governed by the Standards of Practice of the Actuarial Standards Board and Other Persons Interested in the Use of Models Outside the Actuary's Area of Expertise in Property and Casualty Insurance

FROM: Actuarial Standards Board (ASB)

SUBJ: Actuarial Standard of Practice (ASOP) No. 38.

This booklet contains the final version of ASOP No. 38, *Using Models Outside the Actuary's Area of Expertise (Property and Casualty).*

Background

The Casualty Practice Council of the American Academy of Actuaries requested that the ASB consider drafting an actuarial standard of practice concerning the use of complex models. In submitting to the ASB its proposal for a new ASOP, the council expressed concern over the use of catastrophe models when estimating catastrophe costs. Catastrophe models are developed by groups of scientists, engineers, and actuaries working together to simulate catastrophic events. While most actuaries conceptually agree that catastrophe models may provide more realistic measures of catastrophic risk than those provided by analyzing the latest twenty to fifty years of catastrophe losses, most actuaries are not experts in many of the underpinnings of these models.

Of course, catastrophe models are not the only models with which actuaries work. Actuaries also may utilize interest rate models, investment return models, credit scoring models, asbestos and pollution models, and dynamic financial analysis models, to name a few. The standard would not apply to models that incorporate specialized knowledge within the actuary's own area of expertise, since working with these components is part of the normal actuarial effort and is covered by other ASOPs.

In order to feel comfortable with relying on models that incorporate specialized knowledge outside the actuary's area of expertise, actuaries seek guidance in defining their *duty of care* in understanding and relying upon these models. This was another reason for the development of the standard, and why the ASB created the Task Force on Complex Models, under its Casualty Committee, to initiate the project.

The task force intended that the standard should define the guidelines that an actuary should follow when working with models outside of the actuary's own area of expertise. In providing such guidance, the standard makes it clear that an actuary may rely upon a model evaluation by another actuary who has performed his or her evaluation in accordance with this standard, and

that the standard is not intended to discourage the use of new methodologies in advancement of the profession.

First Exposure Draft

The first draft of a proposed standard, titled *The Use of Models with Nonactuarial Components*, was exposed for review in a document dated May 1998. As originally proposed in this first exposure draft, the standard would have applied to models in all areas of actuarial practice. In response to the fifty-two comment letters and forty-two comment postcards received, the scope of the standard was narrowed to apply only to property and casualty practice. In addition, the standard was refocused to apply to models that incorporate specialized knowledge outside the actuary's own area of expertise. Each actuary must determine what this boundary means to him or her. The title of the standard was changed accordingly. The significant issues and questions contained in the comment letters on the first exposure draft as well as the task force's responses to them are summarized in appendix 2 of the second exposure draft titled *Using Models Outside the Actuary's Area of Expertise (Property and Casualty)* dated September 1999.

Second Exposure Draft

The second draft of the standard was exposed for review in a document dated September 1999, with a comment deadline of March 1, 2000. Ten comment letters were received. The task force considered the issues and questions raised in these letters and made some editorial changes to the text, but no substantive changes were necessary. For a summary of the issues contained in these ten comment letters and the task force's responses, please see appendix 2.

The Task Force on Complex Models and the Casualty Committee thank everyone who took the time to contribute comments and suggestions on both exposure drafts.

The Casualty Committee would like to thank Godfrey Perrott and Kurt Reichle for their assistance in the initial drafting of this standard.

The ASB voted in June 2000 to adopt this standard.

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ACTUARIAL STANDARD OF PRACTICE NO. 38

USING MODELS OUTSIDE THE ACTUARY'S AREA OF EXPERTISE (PROPERTY AND CASUALTY)

STANDARD OF PRACTICE

Section 1. Purpose, Scope, Cross References, and Effective Date

1.1 Purpose—The purpose of this standard is to provide guidance to the actuary in using models that incorporate specialized knowledge outside of the actuary's own area of expertise when developing an actuarial work product. This guidance addresses the actuary's obligation to review the model and make appropriate disclosures.

1.2 Scope—This standard applies to actuaries who use models that incorporate specialized knowledge outside of the actuary's own area of expertise when performing professional services in connection with property and casualty insurance coverages (including risk financing systems, such as self-insurance and securitization products, that provide similar coverages). This standard applies to the use of all models whether or not they are proprietary in nature.

If the actuary departs from the guidance set forth in this standard in order to comply with applicable law (statutes, regulations, and other legally binding authority), or for any other reason the actuary deems appropriate, the actuary should refer to section 4.

1.3 Cross References—When this standard refers to the provisions of other documents, the reference includes the referenced documents as they may be amended or restated in the future, and any successor to them, by whatever name called. If any amended or restated document differs materially from the originally referenced document, the actuary should consider the guidance in this standard to the extent it is applicable and appropriate.

1.4 Effective Date—This standard will be effective for work performed on or after December 15, 2000.

Section 2. Definitions

The terms below are defined for use in this actuarial standard of practice.

2.1 Expert—One who is qualified by knowledge, skill, experience, training, or education to render an opinion concerning the matter at hand.

2.2 Model—An information structure, such as a set of mathematical equations, logic, or algorithms, that is used to represent the behavior of specified phenomena.

Section 3. Analysis of Issues and Recommended Practices

3.1 Introduction—In performing actuarial work, an actuary may find it appropriate to use models that incorporate specialized knowledge outside of the actuary's own area of expertise. When using such a model, the actuary should do all of the following:

a. determine appropriate reliance on experts;

b. have a basic understanding of the model;

c. evaluate whether the model is appropriate for the intended application;

d. determine that appropriate validation has occurred; and

e. determine the appropriate use of the model.

The actuary's level of effort in understanding and evaluating a model should be consistent with the intended use of the model and its materiality to the results of the actuarial analysis.

3.2 Appropriate Reliance on Experts—An actuary may rely on experts concerning those aspects of a model that are outside of the actuary's own area of expertise. The experts relied upon may either be the experts who provided the model or other experts. In determining the appropriate level of reliance, the actuary should consider the following:

a. whether the individual or individuals upon whom the actuary is relying are experts in the applicable field;

b. the extent to which the model has been reviewed or opined on by experts in the applicable field, including any known significant differences of opinion among experts concerning aspects of the model that could be material to the actuary's use of the model; and

c. whether there are standards that apply to the model or to the testing or validation of the model, and whether the model has been certified as having met such standards.

3.3 Understanding of the Model—The actuary should be reasonably familiar with the basic components of the model and understand both the user input and the model output, as discussed below.

3.3.1 Model Components—The actuary should be reasonably familiar with the basic components of the model and have a basic understanding of how such components interrelate within the model. In addition, the actuary should identify which fields of expertise were used in developing or updating the model, and should make a reasonable effort to determine if the model is based on generally accepted practices within the applicable fields of expertise. The actuary should also be reasonably familiar with how the model was tested or validated and the level of independent expert review and testing.

3.3.2 User Input—Certain user input may be required to produce model output for the specific application. The actuary should understand the user input that is required to produce the model output. This understanding includes the level of detail required in the user input to produce results that are consistent with the intended use of the model.

3.3.3 Model Output—The actuary should determine that the model output is consistent with the actuary's intended use of the model.

3.4 Appropriateness of the Model for the Intended Application—The actuary should evaluate whether the model is appropriate for the particular actuarial analysis, and consider limitations of the model, modifications to the model, and the assumptions needed in order to apply the model output.

Some additional considerations include the following:

a. Applicability of Historical Data—To the extent historical data are used in the development of the model or the establishment of model parameters, the actuary should consider the adequacy of the historical data in representing the range of reasonably expected outcomes consistent with current knowledge about the phenomena being analyzed.

b. Developments in Relevant Fields—The actuary should make a reasonable effort to be aware of significant developments in relevant fields of expertise. The

actuary should evaluate whether such developments are likely to materially affect the current actuarial analysis.

3.5 Appropriate Validation—The actuary should evaluate the user input and the reasonableness of the model output, as discussed below.

3.5.1 User Input—With respect to the quality and availability of the user input data to be used in the model, the actuary should refer to ASOP No. 23, *Data Quality*.

3.5.2 Model Output—In view of the intended use of the model, the actuary should examine the model output for reasonableness, considering factors such as the following:

a. the results derived from alternate models or methods, where available and appropriate;

b. how historical observations, if applicable, compare to results produced by the model;

c. the consistency and reasonableness of relationships among various output results; and

d. the sensitivity of the model output to variations in the user input and model assumptions.

3.6 Appropriate Use of the Model—Having completed the analysis described in sections 3.2–3.5 above, the actuary should use his or her professional judgment to determine whether it is appropriate to use the model results, subject to any appropriate adjustments. The actuary should disclose any such adjustments in accordance with section 4.3.

3.7 Reliance on Model Evaluation by Another Actuary—The actuary may rely on another actuary who has, for a particular model, conducted some or all of the evaluations and processes described in this standard. However, the relying actuary should be satisfied that the other actuary's evaluation was performed in accordance with this standard and is appropriate for the intended application. The actuary should document the extent of such reliance in accordance with section 4.1.

Section 4. Communications and Disclosures

4.1 Documentation—This standard requires documentation whether or not a legal or regulatory requirement exists. The actuary should maintain appropriate documentation on the evaluation of the model and the use of the model output in the analysis. Documentation should demonstrate how the actuary has met the requirements of sections 3.2–3.7 above.

4.2 Proprietary Information—If the model has proprietary aspects or contains proprietary information, the actuary should document the steps taken to comply with this standard in light of the proprietary aspects or information.

4.3 Disclosures—In communicating the results of actuarial work using a model that incorporates specialized knowledge outside of the actuary's own area of expertise, the actuary should disclose the model(s) used and any adjustments made to the model results as described in section 3.6.

In addition, the actuary should include the following, as applicable, in an actuarial communication:

a. the disclosure in ASOP No. 41, *Actuarial Communications*, section 4.2, if any material assumption or method was prescribed by applicable law (statutes, regulations, and other legally binding authority);

b. the disclosure in ASOP No. 41, section 4.3, if the actuary states reliance on other sources and thereby disclaims responsibility for any material assumption or method selected by a party other than the actuary; and

c. the disclosure in ASOP No. 41, section 4.4, if, in the actuary's professional judgment, the actuary has otherwise deviated materially from the guidance of this ASOP.

ASOP No. 38—June 2000

Appendix 1

Background and Current Practices

Note: This appendix is provided for informational purposes, but is not part of the standard of practice.

Background

Actuaries have always used models. Most of the models used by actuaries are developed using expertise that is common to actuaries, and their use by actuaries is addressed by existing standards of practice and statements of principles.

However, actuaries have also used models that contain components that are outside the actuary's own area of expertise. For example, certain catastrophe models, interest rate models, dynamic financial analysis models, credit scoring models, and pollution models contain components that are outside the expertise of many of the actuaries who use them. Although in retrospect the use of models may have posed the need for a specific standard of practice, it was not until recently, as actuaries grappled with the financial issues surrounding various natural catastrophes, that the need for such a standard was recognized and acted on by the Actuarial Standards Board.

Specifically, Hurricane Andrew in 1992 and the Northridge Earthquake in 1994 led actuaries involved in evaluating hurricane and earthquake exposures to recognize the severe inadequacy of the traditional, empirical actuarial methods used for ratemaking for these exposures. In recognition of the need to replace these methods, many actuaries began using stochastic computer simulation models for their actuarial analysis of hurricane and earthquake exposure. Computer simulation models had been commonly used for some time by actuaries and others for the purpose of evaluating probable maximum loss but had not been widely used for ratemaking.

Computer simulation models are now widely used by actuaries for calculating expected losses due to hurricane and earthquake perils. The accuracy of these models is heavily dependent on the accuracy of meteorological, seismological, or engineering assumptions, areas clearly outside the expertise of most actuaries.

Because models sometimes contain components that incorporate specialized knowledge outside the actuary's own area of expertise, this raises the question as to what is required of an actuary before he or she makes use of model output in his or her actuarial analysis. This standard addresses such requirements. Although the development of this standard originated with the problem of providing accurate actuarial analysis of hurricane and earthquake exposure, the standard applies to *any model*

that incorporates specialized knowledge outside the actuary's own area of expertise used in connection with property and casualty insurance coverages.

Current Practices

The use of output from models is an evolving area of actuarial theory and practice. To date, current practices have been governed by the former *Guides and Interpretative Opinions as to Professional Conduct*, and their successor documents, the Code of Professional Conduct and the *Qualification Standards for Prescribed Statements of Actuarial Opinion*. Practices have varied according to individual interpretations of the *Guides* and the Code.

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Appendix 2

Comments on the Second Exposure Draft and Task Force Responses

The second exposure draft of this actuarial standard of practice (ASOP) was exposed for review in September 1999, with a comment deadline of March 1, 2000. Ten letters of comment were received on the second exposure draft. Summarized below are the significant issues and questions contained in the comment letters, printed in roman type. The task force's responses appear in **boldface**.

General Observations

Two basic concerns were raised as general observations. One commentator believed the phrase "outside an actuary's area of expertise" was not clear enough to define when the standard applies and when it doesn't. An actuary has some training in econometric techniques but may not be familiar with state of the art methods and protocols. Are econometric models outside the actuary's area of expertise or not? Does the standard apply?

The task force believes this example clearly shows the need for this standard. Actuaries performing professional services must determine if they are qualified to practice in that area. As such, they are making a determination of their area of expertise and if using models should then determine if this standard applies. Since the situation will differ for every individual actuary, the task force believes the ASOP can not be made more specific and no changes were made.

The other commentator making a general observation questioned if the ASOP applies when "commercial models" such as @Risk, BestFit, and Evolver are used. The commentator asked "is it not enough to know that these are commercially available products...and have general acceptance as tools...without contacting the vendor to ask questions about the fields of expertise used to develop these models?"

This standard applies when using any model outside the actuary's area of expertise. The extent of the effort applied will be dependent on the individual circumstances and application of each model. The task force does not believe an unreasonable effort is required on the part of the actuary to apply this standard to the use of "commercial models." In fact, the task force believes that in most cases, the actuary is probably already complying with the standard with perhaps the exception of the documentation requirement.

ASOP No. 38—June 2000

Section 1. Purpose, Scope, Cross References, and Effective Date

Section 1.2, Scope—Some commentators questioned the application of the standard to health companies and some forms of health coverages. They implied the standard should define property and casualty. **The ASOP does not apply to companies but rather to actuaries "performing professional services in connection with property and casualty insurance coverages." The task force does not believe a definition of property and casualty is possible since it is not static and will tend to change over time. Actuaries will have to determine if the work they are doing is "in connection with property and casualty insurance coverages."**

One commentator questioned the intent of the phrase "if a conflict exists between this standard and applicable law." If a regulator requires something that is not either a regulation or a law, does this fall under section 4.5, Deviation from Standard [clause] or is it exempt because of the conflict clause? **The task force believes this depends on the individual circumstances of the situation and made no changes to the text.**

Section 3. Analysis of Issues and Recommended Practices

Section 3.1, Introduction—One commentator believed the use of the word "basic" in section 3.1(b) sets too high of a standard and suggested replacing it with "general." **The task force discussed this issue and determined that the requirement to have a basic understanding of the model is appropriate. No change was made.**

Section 3.2, Appropriate Reliance on Experts—Some commentators were concerned with this section. One believed it was confusing and did not provide the actuary with sufficient guidance, others believed it was unreasonable to expect the actuary to know "the extent to which significant differences of opinion exist among experts...." **The task force reviewed the suggested changes from these commentators and made two changes to this section. A sentence was added to clarify that "experts relied upon may either be the experts who provided the model or other experts." Secondly, the reference to "differences of opinion among experts" was deleted as a separate item and included with section 3.2 (b), "the extent to which the model has been reviewed or opined on by experts in the applicable field."**

Section 3.3, Understanding of the Model—Some commentators believed the requirement in section 3.3.1, Model Components, stating "The actuary should be aware of the extent to which the model is based on contested or new theory" is unnecessary. They believed is was duplicative since the actuary is required in section 3.2(b) to consider "whether the model has been reviewed or opined on by expert...." and consider "the extent to which significant differences of opinion

exist." **The task force agrees that the language in section 3.2 provides sufficient guidance and deleted the sentence**

from section 3.3.1 that read, "The actuary should be aware of the extent to which the model is based on contested or new theory."

Section 3.4, Appropriateness of the Model for the Intended Application—In section 3.4(b), a few commentators believed it was unreasonable to expect the actuary to "[make a reasonable effort to] be aware of significant developments in relevant fields of expertise." **The task force disagrees with this concern and made no changes to the text.**

Section 3.5, Appropriate Validation—Section 3.5.2, Model Output, provides a list of items to consider when checking the model output for reasonableness. One commentator believed the list was not necessary as it implies that the actuary must perform all checks on the list. **The task force believes the list of examples provides valuable guidance with regard to the intent of the statement. The task force modified the introductory language to clarify that the list of examples is illustrative. The actuary, however, is not relieved from the duty to check for reasonableness.**

In section 3.5.2(d), one commentator expressed concern that considering "the sensitivity of the model output to variations in the assumptions" was too broad of a requirement. **The task force revised the section to narrow the scope of the sensitivity consideration to "variations in the user input and model assumptions."**

Section 4. Communications and Disclosures

Section 4.1, Documentation—One commentator was confused by the intent of the documentation requirement. **The task force clarified that the "documentation should demonstrate how the actuary met the requirements of sections 3.2–3.7."**

Section 4.2, Proprietary Information—One commentator offered alternative language for this section to clarify the intent. **The task force shortened the wording without changing the intent or meaning of the section.**

Section 4.3, Disclosure—**To clarify the disclosure requirement, wording was added to this section specifying that the actuary should disclose the model(s) used and any adjustments made to the model results as described in section 3.6.**

ACTUARIAL STANDARDS BOARD

● **EXPOSURE DRAFT** ●

Proposed Revision of
Actuarial Standard
of Practice
No. 38

Catastrophe Modeling
(for All Practice Areas)

Comment Deadline:
December 30, 2013

Developed by the
Catastrophe Modeling Task Force of the
General Committee of the
Actuarial Standards Board

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September 2013

TO: Members of Actuarial Organizations Governed by the Standards of Practice of the Actuarial Standards Board and Other Persons Interested in Catastrophe Modeling (for All Practice Areas)

FROM: Actuarial Standards Board (ASB)

SUBJ: Proposed Revision of Actuarial Standard of Practice (ASOP) No. 38

This document contains the exposure draft of a proposed actuarial standard of practice, *Catastrophe Modeling (for All Practice Areas)*, intended to replace the current ASOP No. 38, *Using Models Outside the Actuary's Area of Expertise (Property and Casualty)*. Please review this exposure draft and give the ASB the benefit of your comments and suggestions. Each written response and each response sent by e-mail to the address below will be acknowledged, and all responses will receive appropriate consideration by the drafting committee in preparing the final document for approval by the ASB.

The ASB accepts comments by either electronic or conventional mail. The preferred form is e-mail, as it eases the task of grouping comments by section. However, please feel free to use either form. If you wish to use e-mail, please send a message to **comments@actuary.org**. You may include your comments either in the body of the message or as an attachment prepared in any commonly used word processing format. **Please do not password protect any attachments.** Include the phrase "ASB COMMENTS" in the subject line of your message. Please note: Any message not containing this exact phrase in the subject line will be deleted by our system's spam filter. Comments will be posted in the order that they are received. **Comments received after the deadline will not be posted.**

If you wish to use conventional mail, please send comments to the following address:

Catastrophe Modeling (for All Practice Areas)
Actuarial Standards Board
1850 M Street, NW, Third Floor
Washington, DC 20036

The ASB posts all signed comments received to its website to encourage transparency and dialogue. Anonymous comments will not be considered by the ASB nor posted to the website. The comments will not be edited, amended, or truncated in any way. Comments will be posted in the order that they are received. Comments will be removed when final action on a proposed standard is taken. The ASB website is a public website, and all comments will be available to the general public. The ASB disclaims any responsibility for the content of the comments, which are solely the responsibility of those who submit them.

Deadline for receipt of responses in the ASB office: December 30, 2013

Background

The ASB first began work on a standard for modeling in the late 1990s. Motivated primarily to address the role catastrophe modeling of earthquakes and hurricanes played in casualty ratemaking, this work was focused on the use of specialized models where the actuary would have to rely on a model that was developed by professionals other than actuaries. As a result of this work, the ASB approved ASOP No. 38, *Using Models Outside the Actuary's Area of Expertise*, in June of 2000 with the scope of the standard limited to the Property/Casualty area of practice. Currently, this is the only ASOP that specifically addresses modeling.

Recently, the number and importance of modeling applications in actuarial science has increased, with the results of actuarial models often entering financial statements directly. Recognizing this trend, the ASB asked the Life Committee in 2010 to begin work on an ASOP focused on modeling. The Life Committee formed a task force to address this issue and, in February of 2012, a discussion draft titled *Modeling in Life Insurance and Annuities* was released. Nineteen comment letters were received.

Based upon this feedback and numerous other discussions on the topic of modeling, in December of 2012 the ASB created two multidisciplinary task forces under the direction of the General Committee: i) a general Modeling Task Force, charged with developing an ASOP to address modeling applications in all practice areas, and ii) a Task Force to consider expanding ASOP 38 to all practice areas while focusing exclusively on using catastrophe models.

An exposure draft titled *Modeling* was released in June 2013 with a scope that provides guidance to actuaries when selecting, designing, building, modifying, developing, or using models when performing professional services. The comment deadline was September 30, 2013.

The exposure draft that follows this transmittal memorandum is the work of the ASOP No. 38 Modeling Task Force, whose membership has experience in life insurance, health insurance, property/casualty insurance, and enterprise risk management. The task force would especially like to point out that much of this document is drawn from the work of prior ASOP No. 38 Task Forces and thank prior task force members for their work.

At the direction of the ASB, this standard was developed to apply to all practice areas and all forms of catastrophe models, both natural catastrophes such as hurricanes, earthquakes, and tornados, and other catastrophes such as terrorist acts and pandemics.

Request for Comments

The task force would appreciate comments on all areas of this proposed ASOP revision and would like to draw the readers' attention to the following questions in particular:

1. The definition in section 2.2 includes natural perils such as hurricanes, earthquakes, and tornados as well as other perils such as terrorist acts and pandemics. Is the inclusion of these other perils sufficiently clear and appropriate?

2. The proposed revision applies only to the selection or use of models that are built specifically to address catastrophes. It does not apply to models that have, as part of their output, extreme events such as hyper-inflation or a stock market collapse. Is the scope of the ASOP and definition of catastrophe model sufficiently clear?

3. The proposed ASOP does not apply when the actuary is only designing, building, modifying, or developing a catastrophe model (or a portion of a catastrophe model). Is this sufficiently clear and appropriate?

4. The proposed ASOP now applies to all practice areas. Is that clear and appropriate?

5. The proposed ASOP is intended to maintain the same level and quality of guidance as the current ASOP No. 38 in regards to property/casualty actuarial work involving the use of catastrophe models. Does the proposed ASOP meet that intent?

6. Is the proposed standard sufficiently flexible to allow for new developments in practice?

Catastrophe Modeling Task Force

Shawna S. Ackerman, Chairperson
David A. Brentlinger
Bradley J. Davis
Martin M. Simons

General Committee

Michael S. Abroe, Chairperson
Maria M. Sarli, Vice-Chairperson
Albert J. Beer
Paul Braithwaite
Raymond Brouillette
Charles Cook
Mary Simmons
Martin M. Simons
Barbara Snyder
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Actuarial Standards Board

Robert G. Meilander, Chairperson
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Patrick J. Grannan
Stephen G. Kellison
Thomas D. Levy
Patricia E. Matson
James J. Murphy
James F. Verlautz

The ASB establishes and improves standards of actuarial practice. These ASOPs identify what the actuary should consider, document, and disclose when performing an actuarial assignment. The ASB's goal is to set standards for appropriate practice for the U.S.

EXPOSURE DRAFT—September 2013

PROPOSED REVISION OF ACTUARIAL STANDARD OF PRACTICE NO. 38

CATASTROPHE MODELING (FOR ALL PRACTICE AREAS)

STANDARD OF PRACTICE

Section 1. Purpose, Scope, Cross References, and Effective Date

1.1 Purpose—This actuarial standard of practice (ASOP) provides guidance to actuaries selecting or using **catastrophe models** when performing professional services.

1.2 Scope—This ASOP applies to actuaries in all practice areas performing professional services when selecting or using **catastrophe models**. This standard applies to the selection or use of **catastrophe models**, whether or not they are proprietary in nature.

This standard does not apply to models of operational or economic risks that deal with instances of extreme events such as hyper-inflation or a stock market collapse. This standard also does not apply when the actuary is only designing, building, modifying, or developing a catastrophe model (or a portion of a catastrophe model).

ASOP No. XX, *Modeling* (currently an exposure draft), applies to the actuary when designing, building, modifying, or developing catastrophe models as well as when selecting or using catastrophe models.

If the actuary departs from the guidance set forth in this ASOP in order to comply with applicable law (statutes, regulations, and other legally binding authority), or for any other reason, the actuary should refer to section 4.

1.3 Cross References—When this ASOP refers to the provisions of other documents, the reference includes the referenced documents as they may be amended or restated in the future, and any successor to them, by whatever name called. If any amended or restated document differs materially from the originally referenced document, the actuary should consider the guidance in this ASOP to the extent it is applicable and appropriate.

1.4 Effective Date—This ASOP will be effective for work performed on or after four months after adoption by the Actuarial Standards Board.

Section 2. Definitions

The terms below are defined for use in this actuarial standard of practice.

2.1 Assumptions—A type of input to a **catastrophe model** that represents expectations or possibilities based on professional judgment.

2.2 Catastrophe Model—A representation of relationships among events based on statistical, financial, economic, or mathematical concepts and equations used to explain a system, to study the effects of different components, and to derive estimates based upon the future occurrences of large-scale, low-frequency, high-severity events such as hurricanes, earthquakes, tornados, terrorist acts, and pandemics.

2.3 Data—A type of input to a **catastrophe model** that represents facts or information usually collected from records, experience, or observation.

2.4 Expert—One who is qualified by knowledge, skill, experience, training, or education to render an opinion concerning the matter at hand.

2.5 Parameters—Mathematical, financial, economic, or statistical input to **catastrophe models**. Examples include expected values and the coefficients of variables in mathematical distributions or regression formulae. As input to a **catastrophe model**, **parameters** are sometimes considered **assumptions** and are sometimes considered **data**, but are named separately in this standard.

2.6 Principal—A client or employer of the actuary.

2.7 Project's Objective—The specific goal or question the actuary is addressing when selecting or using a **catastrophe model** to meet the needs of the **principal**.

Section 3. Analysis of Issues and Recommended Practices

3.1 Introduction—In performing actuarial services, an actuary may find it appropriate to select and use **catastrophe models**. When selecting or using such a model, the actuary should:

a. determine the appropriate level of reliance on **experts**;

b. have a basic understanding of the **catastrophe model**;

c. evaluate whether the **catastrophe model** is appropriate for the **project's objective**;

d. determine that appropriate validation has occurred; and

e. determine the appropriate use of the **catastrophe model** and its results.

The actuary's level of effort in understanding and evaluating a model should be consistent with the **project's objective** and the model output's materiality to the results of the actuarial analysis.

3.2 Appropriate Reliance on Experts—An actuary may rely on **experts** in the fields of knowledge used in the development of the **catastrophe model**. In determining the appropriate level of reliance, the actuary should consider the following:

a. whether the individual or individuals upon whom the actuary is relying are **experts** in the applicable field;

b. the extent to which the **catastrophe model** has been reviewed or opined on by **experts** in the applicable field, including any known significant differences of opinion among **experts** concerning aspects of the model that could be material to the actuary's use of the model; and

c. whether there are industry or regulatory standards that apply to the **catastrophe model** or to the testing or validation of the model, and whether the model has been certified as having met such standards.

3.3 Understanding of the Catastrophe Model—The actuary should be familiar with the basic components of the model and understand both the user input and the model output, as discussed below.

3.3.1 Model Components—The actuary should be familiar with the basic components of the model and have a basic understanding of how such components interrelate within the model. In addition, the actuary should identify which fields of expertise were used in developing or updating the model and should make a reasonable effort to determine if the model is based on generally accepted practices within the applicable fields of expertise. The actuary should also be familiar with how the model was tested or validated and the level of independent **expert** review and testing.

3.3.2 User Input—Certain user input may be required to produce model output for the specific application. User input can include **assumptions**, **data**, or **parameters**. If the model requires user input, the actuary should evaluate the reasonableness of

the user input and should have a reasonable understanding of the relationship between the model's input and output. The actuary should take reasonable steps to confirm that the precision and accuracy of the user input are consistent with the **project's objective**. With respect to the quality and availability of the user input to be used in the model, the actuary should refer to ASOP No. 23, *Data Quality*.

3.3.3 Model Output—The actuary should determine that the model output is consistent with the **project's objective**.

3.4 Appropriateness of the Catastrophe Model for the Project's Objective—The actuary should evaluate whether the model is appropriate for the **project's objective**. When using the model output, the actuary should also consider limitations of the model, modifications to the model output, and the **assumptions** needed.

Some additional considerations include the following:

a. Applicability of Historical Data—To the extent historical **data** are used in the development of the model or the establishment of model **parameters**, the actuary should consider the adequacy of the historical **data** in representing the range of reasonably expected outcomes consistent with current knowledge about the phenomena being analyzed.

b. Developments in Relevant Fields—The actuary should make a reasonable effort to be aware of significant developments in relevant fields of expertise. The actuary should evaluate whether such developments are likely to materially affect the current actuarial analysis.

3.5 Appropriate Validation—The actuary should evaluate the reasonableness of the model output, considering the input and the **project's objective**, taking into account factors such as the following:

a. how historical observations, if applicable, compare to results produced by the model;

b. the consistency and reasonableness of relationships among various output results; and

c. the sensitivity of the model output to variations in the user input.

3.6 Appropriate Use of the Catastrophe Model and Its Results—The actuary should use professional judgment to determine whether it is appropriate to use the model results to develop the actuarial work product. The actuary should also use professional judgment to determine whether any adjustments to the model output are needed to meet the **project's**

objective. The actuary should disclose any such adjustments in accordance with section 4.1.

3.7 Reliance on Another Actuary—The actuary may rely on another actuary who has selected or used the **catastrophe model**. However, the relying actuary should be satisfied that the other actuary's use of the **catastrophe model** was performed in accordance with this ASOP and is appropriate for the **project's objective**. The actuary should document the extent of such reliance in accordance with section 4.1.

Section 4. Communications and Disclosures

4.1 Actuarial Communications—When issuing actuarial communications incorporating catastrophe modeling within the scope of this ASOP, the actuary should disclose the following, as appropriate:

a. the model used and the **project's objective**;

b. a description of the user input that was incorporated into the model, as discussed in section 3.3.2;

c. a description of adjustments made to the model results, as discussed in section 3.6.; and

d. the extent of any reliance placed upon the work of another actuary, as discussed in section 3.7.

4.2 Documentation—This standard requires documentation whether or not a legal or regulatory requirement exists. The actuary should maintain appropriate documentation of the evaluation of the **catastrophe model** and the use of the model output in the analysis. The documentation should demonstrate how the actuary has met the requirements of sections 3.1–3.7 above.

4.3 Proprietary Information—If the **catastrophe model** has proprietary aspects or contains proprietary information, the actuary should document the steps taken to comply with this standard in light of the proprietary aspects or information.

4.4 Deviation from Guidance in the Standard—If the actuary departs from the guidance set forth in this standard, the actuary should include the following where applicable:

a. the disclosure in ASOP No. 41, section 4.2, if any material assumption or method was prescribed by applicable law (statutes, regulations, and other legally binding authority);

b. the disclosure in ASOP No. 41, section 4.3, if the actuary states reliance on other sources and thereby disclaims responsibility for any material assumption or method selected by a party other than the actuary; and

c. the disclosure in ASOP No. 41, section 4.4, if, in the actuary's professional judgment, the actuary has otherwise deviated materially from the guidance of this ASOP.

EXPOSURE DRAFT—September 2013

Appendix

Background and Current Practices

Note: This appendix is provided for informational purposes but is not part of the standard of practice.

Background

Hurricane Andrew in 1992 and the Northridge Earthquake in 1994 led actuaries involved in evaluating hurricane and earthquake exposures to recognize the severe inadequacy of the traditional, empirical actuarial methods used for ratemaking for these exposures. Recognizing the need to replace these methods, many actuaries began using stochastic computer simulation models for their actuarial analysis of hurricane and earthquake exposure. Computer simulation models had been commonly used for some time by actuaries and others for the purpose of evaluating probable maximum loss but had not been widely used for ratemaking.

Over time, the output from catastrophe models became commonly used by property/casualty actuaries in developing rates for catastrophic perils as well as many other risk management purposes.

Current Practices

Catastrophe models are now widely used by actuaries in all practice areas for risk management analyses and calculating expected losses due to hurricane, earthquake, and terrorist acts. More recently, catastrophe models have also been developed to simulate wild fires, tornados, tsunamis, and pandemics.

In addition, due to changes in regulations and financial reporting requirements, the number and importance of modeling applications in actuarial science has increased, with the results of actuarial models often entering financial statements directly.

Lastly, due to the evolution of enterprise risk management (ERM) practices and regulations, there has been increased use of catastrophe modeling as part of insurer stress testing and risk management across all practice areas. This trend is likely to continue to evolve.

ACTUARIAL STANDARDS BOARD

● EXPOSURE DRAFT ●

Modeling

Comment Deadline:
September 30, 2013

Developed by the
Modeling Task Force of the
General Committee of the
Actuarial Standards Board

Approved for Exposure by the
Actuarial Standards Board
June 2013

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EXPOSURE DRAFT—June 2013

June 2013

TO: Members of Actuarial Organizations Governed by the Standards of Practice of the Actuarial Standards Board and Other Persons Interested in Modeling

FROM: Actuarial Standards Board (ASB)

SUBJ: Proposed Actuarial Standard of Practice (ASOP)

This document contains the exposure draft of a proposed actuarial standard of practice, *Modeling*. Please review this exposure draft and give the ASB the benefit of your comments and suggestions. Each written response and each response sent by e-mail to the address below will be acknowledged, and all responses will receive appropriate consideration by the drafting committee in preparing the final document for approval by the ASB.

The ASB accepts comments by either electronic or conventional mail. The preferred form is e-mail, as it eases the task of grouping comments by section. However, please feel free to use either form. If you wish to use e-mail, please send a message to **comments@actuary.org**. You may include your comments either in the body of the message or as an attachment prepared in any commonly used word processing format. **Please do not password protect any attachments.** Include the phrase "ASB COMMENTS" in the subject line of your message. Please note: Any message not containing this exact phrase in the subject line will be deleted by our system's spam filter. Comments will be posted in the order that they are received. **Comments received after the deadline will not be posted.**

If you wish to use conventional mail, please send comments to the following address:

Modeling
Actuarial Standards Board
1850 M Street, NW, Third Floor
Washington, DC 20036

The ASB posts all signed comments received to its website to encourage transparency and dialogue. Unsigned or anonymous comments will not be considered by the ASB nor posted to the website. The comments will not be edited, amended, or truncated in any way. Comments will be posted in the order that they are received. Comments will be removed when final action on a proposed standard is taken. The ASB website is a public website and all comments will be available to the general public. The ASB disclaims any responsibility for the content of the comments, which are solely the responsibility of those who submit them.

Deadline for receipt of responses in the ASB office: **September 30, 2013**

Background

The ASB first began work on a standard for modeling in the late 1990s. Motivated primarily to address the role catastrophe modeling of earthquakes and hurricanes played in property ratemaking, this work was focused on the use of specialized models where the actuaries would have to rely on a model that was developed by professionals other than actuaries. As a result of this work, ASOP No. 38, *Using Models Outside the Actuary's Area of Expertise*, was approved by the ASB in June of 2000 with the scope of the standard limited to the Property/Casualty area of practice. Currently, this is the only ASOP that specifically addresses modeling.

Recently, the number and importance of modeling applications in actuarial science has increased, with the results of actuarial models often entering financial statements directly. Recognizing this trend, the ASB asked the Life Committee in 2010 to begin work on an ASOP focused on modeling. The Life Committee formed a task force to address this issue and, in February of 2012, a discussion draft titled *Modeling in Life Insurance and Annuities* was released and 19 comment letters were received.

Based upon this feedback and numerous other discussions on the topic of modeling, in December of 2012 the ASB created two multi-disciplinary task forces under the direction of the General Committee: i) a general Modeling Task Force, charged with developing an ASOP to address modeling applications in all practice areas, and ii) a Task Force to consider expanding ASOP No. 38 to all practice areas while still maintaining the significant influence that ASOP No. 38 currently commands among property/casualty actuaries and regulators.

This exposure draft is the work of that general Modeling Task Force, whose membership has experience in life insurance, health insurance, property/casualty insurance, enterprise risk management, and pension/benefits. They would especially like to point out that much of this document is drawn from the work of the Life Committee's task force that produced the discussion draft *Modeling in Life Insurance and Annuities* and thank its members—Dale S. Hagstrom, David A. Brentlinger, Timothy C. Cardinal, Julie H. Fried, Jack L. Gibson, Ronald J. Harasym, and John O. Nigh—for their work.

Actuaries generally agree that almost all actuarial work involves modeling of some type and, at the direction of the ASB, this standard was developed to apply to all practice areas and all forms of models. However, in light of this very broad scope, the proposed ASOP recognizes the fact that situations occur where some of its guidance is not appropriate to the intended application of the model or the project's objective, perhaps because the guidance is not practical or feasible for the actuary to follow. In this case, the actuary is permitted to use professional judgment in determining where it is appropriate to deviate from the guidance included in the proposed standard and is required to disclose those deviations only if they are material.

Work is currently being done by another task force on the revision of ASOP No. 38. Any potential changes in ASOP No. 38 are expected to be in conformance with this proposed ASOP but will provide more detail with regard to a narrower scope while maintaining the vast majority of guidance that now applies only to property/casualty work. The ASB tentatively plans to release an exposure draft of that revision later in 2013.

Request for Comments

The task force would appreciate comments on all areas of this proposed ASOP and would like to draw the readers' attention to the following questions in particular:

1. Does the proposed standard provide sufficient guidance to actuaries working with models?

2. Is the proposed standard sufficiently flexible to allow for new developments?

3. The draft ASOP starts with a wide scope, but allows the actuary to use professional judgment to identify those instances (such as those involving minimal reliance by the user, or resulting in a non-material financial effect) where some guidance described in this ASOP is not appropriate or practical. Is this clear and appropriate?

4. In those instances where some guidance described in this ASOP is not appropriate or practical and the deviations from guidance are "not material," the actuary does not need to disclose these deviations. Is this clear and appropriate?

5. Appropriate documentation simplifies later use and development of current models as well as allowing easier review by principals and other actuaries. Section 3 contains guidance with regard to documentation. Is this guidance clear and appropriate?

6. Does the use of bold font to identify defined terms improve the readability and clarity of the standard? If not, what suggestions do you have to improve the recognition of defined terms in the standard?

The ASB voted in June 2013 to approve this exposure draft.

Modeling Task Force

Dale S. Hagstrom, Chairperson
Maryellen J. Coggins
Julie H. Fried
Kenneth R. Kasner
Aaron R. Weindling

General Committee

Michael S. Abroe, Chairperson
Maria M. Sarli, Vice-Chairperson
Albert J. Beer
Paul Braithwaite
Raymond Brouillette
Charles Cook
Mary Simmons
Martin M. Simons
Barbara Snyder
Thomas D. Snook
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Actuarial Standards Board

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The ASB establishes and improves standards of actuarial practice. These ASOPs identify what the actuary should consider, document, and disclose when performing an actuarial assignment. The ASB's goal is to set standards for appropriate practice for the U.S.

EXPOSURE DRAFT—June 2013

MODELING

Section 1. Purpose, Scope, Cross References, and Effective Date

1.1 Purpose—This actuarial standard of practice (ASOP) provides guidance to actuaries selecting, designing, building, modifying, developing, or using **models** when performing professional services.

1.2 Scope—This ASOP applies to actuaries selecting, designing, building, modifying, developing or using **models** when performing professional services. This ASOP applies to all forms of **models** in all practice areas.

Given the wide use of **models** in actuarial practice, there may be less significant instances, such as those involving minimal reliance by the user, or resulting in a minimal financial effect, where some guidance described in this ASOP is not appropriate or practical, as discussed in section 3.1. For example, the **specifications**, development, documentation, and controls for **models** used in less critical situations may not need to be as rigorous as stated in this ASOP because the ASOP's guidance might not be practical or appropriate for the **intended application** of the **model** or the **project's objective**.

If the actuary departs from the guidance set forth in this ASOP in order to comply with applicable law (statutes, regulations, and other legally binding authority), or for any other reason, the actuary should refer to section 4.

1.3 Cross References—When this ASOP refers to the provisions of other documents, the reference includes the referenced documents as they may be amended or restated in the future, and any successor to them, by whatever name called. If any amended or restated document differs materially from the originally referenced document, the actuary should consider the guidance in this ASOP to the extent it is applicable and appropriate.

1.4 Effective Date—This ASOP is effective for work performed on or after four months after adoption by the Actuarial Standards Board.

Section 2. Definitions

The terms below are defined for use in this actuarial standard of practice.

2.1 Assumptions—A type of **input** to a **model** that represents expectations or possibilities based on professional judgment.

2.2 Data—A type of **input** to a **model** that represents facts or information usually collected from records, experience, or observation.

2.3 Granularity—The extent to which a **model** contains separate components such as cells, or **assumptions** that vary by cell or time intervals. **Models** with a higher degree of **granularity** (more cells or assumption variations) may provide more **model** precision or flexibility, but may also require greater effort and expense to design, maintain, assemble and run.

2.4 Implementation—An executable form of the **model**. Examples of **implementation** may include, but not be limited to, a computer program, database, spreadsheet or any combination thereof.

2.5 Input—**Assumptions**, **data**, or **parameters** used in a **model**.

2.6 Intended Application—The designer's planned uses for the **model**.

2.7 Intended Purpose—The **intended application** or the **project's objective** or both, depending on the actuary's role. The **intended application** applies if the actuary's role includes designing, building, or developing the **model**. The **project's objective** applies if the actuary's role includes selecting or using the **model** in an actual project.

2.8 Margin—An adjustment for uncertainty, such as that caused by a lack of full credibility of the **data**.

2.9 Model—A representation of relationships among entities or events using statistical, financial, economic, or mathematical concepts and equations. **Models** are used to help explain a system, to study the effects of different components, and to derive estimates and guide decisions. A model consists of (1) a **specification** that describes the **input** and the relationships among them, (2) an **implementation** that is achieved through a set of mathematical formulas and algorithms, and (3) a **realization** that produces a set of outputs.

2.10 Modeling—Selecting, designing, building, modifying, developing, or using **models**.

2.11 Model Risk—The risk of adverse consequences to output and decisions as a result of a flawed **model**, inappropriate **inputs**, or misapplication of the **model**.

2.12 Neutral—A description of **model inputs** or methodologies that are intended to anticipate expected future experience without any adjustment for uncertainty or for asymmetric alternative outcomes.

2.13 Organization—The entity that is being modeled in whole or in part. Examples include public or private companies, benefit plans, government entities, and associations, whether for profit or not for profit.

2.14 Parameter—Mathematical, financial, economic, or statistical **input** to **models** that, when

varied, results in different **realizations**. Examples include expected values, and the coefficients of variables in mathematical distributions or regression formulae. As **input** to a **model**, **parameters** are sometimes considered **assumptions** and are sometimes considered **data**, but are named separately in this standard.

2.15 Principal—A client or employer of the actuary.

2.16 Project's Objective—The specific goal or question the actuary is addressing when selecting or using a **model** to meet the needs of the **principal**.

2.17 Realization—**Model** results that are derived from a given set of **inputs**. This concept is also sometimes referred to as a "scenario" or a "run."

2.18 Reproducible—A property of a **model** that implies that each time the **model** is run with the same **inputs**, the **realization** will be identical.

2.19 Specification—A description of a **model** that identifies the **inputs** and their interactions with each other, the formulas and algorithms to be used, and the outputs to be produced.

Section 3. Analysis of Issues and Recommended Practices

3.1 Application of ASOP Guidance—The guidance in this ASOP applies to actuarial practice regarding all **models** in all practice areas.

3.1.1 Model Reliance and Financial Importance—Full application of this guidance is appropriate when intended **model** users rely heavily on the results and the **model** has a material financial effect.

In **modeling** situations where the results are either not heavily relied upon or do not have material financial effect, full application of the guidance in this ASOP may not be necessary. For example, efforts such as those concerning **specifications**, development, documentation, and controls may not need to be as rigorous as stated in this ASOP. The resources committed and controls the actuary applies to a **model** should relate to the degree of reliance on **model** results and the financial importance of decisions based upon these **model** results.

In deciding the extent to which the guidance in this ASOP applies, the actuary should use professional judgment, considering the extent of reliance by the intended user and the materiality of the financial effect. This consideration should be made within the context of the use of the **model** results and the requirements of the **principal**.

3.1.2 Models Developed by Others—If the actuary uses a **model** designed or built by someone else, such as a vendor or colleague, there may be limited ability to

understand the underlying workings of the **model** and, therefore, full application of the guidance in this ASOP may not be necessary. Nonetheless, the actuary should make a reasonable and appropriate attempt, given the **project's objective**, to understand the following:

a. the basic workings of the **model**;

b. major sensitivities and dependencies within the **model**; and

c. key strengths and limitations of the **model**.

3.1.3 Responsibility of the Actuary—If, in the actuary's professional judgment, circumstances are such that applying some or all of the guidance in this ASOP is not appropriate, the actuary should be prepared to identify such circumstances and justify limiting the full application of the guidance in this ASOP. In those instances where the deviation from guidance is material, the actuary should disclose that deviation from guidance as addressed in section 4.2.

3.2 Model Meeting the Intended Purpose—The actuary should select, design, build, modify, develop, or use a **model** that meets the **intended purpose**.

3.2.1 Designing, Building, or Developing the Model for the Intended Application—The actuary should confirm that the capability of the **model** is consistent with the **intended application** when the actuary designs, builds, or develops the **model**. In this evaluation, the actuary should consider items such as the **granularity** of **inputs**, the causal relationships recognized, the **model**'s ability to perform stochastic analyses or stress testing, and the **model**'s ability to identify possible volatility around expected values.

3.2.2 Selecting or Using the Model for the Project's Objective—The actuary should select or use the **model** to meet the **project's objective**. The selection or use of the **model**, including the judgments, efforts to improve the **model inputs** and formulas, documentation, controls, validation, checking, and presentation of results, should be consistent with the **project's objective**.

3.2.3 Modifying the Model—When modifying a **model** to change the **intended application** or to improve the **model's** ability to meet its **intended application**, the actuary should be guided by section 3.2.1. When modifying a **model** to improve the **model inputs**, formulas, and outputs to meet the **project's objective**, the actuary should be guided by section 3.2.2.

3.2.4 Understanding the Model—The actuary's responsibilities may include expressing an opinion, using or communicating results, or preparing documentation. In these instances, the actuary should do the following:

a. understand important aspects of the **model** being used, including but not limited to, basic operations, important relationships, major sensitivities, strengths and potential weaknesses;

b. understand whether, and the extent to which, the **model** can fulfill its **intended purpose**, given limited information, time constraints, and other practical considerations;

c. consider documenting how the **model** meets the **intended purpose**; and

d. consider documenting potential limitations.

3.2.5 Model Structure—The actuary should consider how the structure of the **model** meets its **intended purpose**. For example, where applicable and where appropriate for the **model's intended purpose**, the actuary should consider the following:

a. which provisions and risks specific to a contract or plan are material and appropriate to reflect in the **model**;

b. whether grouping **model inputs** will produce reasonable results;

c. whether the use of the **model** requires a particular level of **granularity**;

d. whether documenting the rationale for grouping **data** would be appropriate;

e. whether deterministic or stochastic results, or both, are needed; and

f. whether the projection of future results might be materially influenced by the existence of choices and options available to the **organization** and its members (that is, company management and policyholders, or plan sponsors and plan participants) and counterparties (such as debtors whose bonds are assets of the **organization**).

3.2.6 Inputs to the Model—The actuary should refer to ASOP No. 23, *Data Quality*, in determining the sources for deriving **assumptions**, **data**, and **parameters** for the **model**.

3.2.7 Assumptions and Parameters—The actuary should use **assumptions** and **parameters** that are appropriate in light of the **intended purpose**.

a. Experience Used—The actuary should consider experience that is based on appropriate available **data**, given time or budget constraints, in light of the **model's intended purpose**. The actuary should consider the

following:

1. using **assumptions** based on actual experience, to the extent it is available, relevant and credible;

2. if actual experience is not available and relevant, or is not sufficiently credible, using other relevant and credible experience, such as industry experience that is properly modified to reflect the circumstances being modeled;

3. if relevant and credible experience is not available, using professional judgment in modifying available sources of information; and

4. whether it would be appropriate to include a **margin** for an assumption or **parameter** where experience **data** are not fully credible and where the assumption or **parameter** is significant.

b. Range of Assumptions and Parameters—The actuary should consider whether the range of **assumptions** and **parameters** used and the number of **realizations** analyzed reflect a range of conditions consistent with the **intended purpose**.

c. Consistency—The actuary should use **assumptions** for the **model** that are consistent with one another. For example, where appropriate, the actuary should consider using **assumptions** consistent with the underlying economic scenario assumed in the **model**. However, if inconsistency among **assumptions** is required by legal constraints, by the **principal**, or as the result of a deliberate redundancy such as added conservatism, the actuary should disclose the inconsistency and the reasons for it in accordance with section 4.1.

d. Monitoring of Assumptions—Where practical, the actuary should consider monitoring that the **assumptions** are still appropriate for use in the current **realization** of the **model**. For example, **models** used in financial reporting offer frequent opportunities to compare **assumptions** to emerging experience in the aggregate.

e. Documentation—The actuary should document the **assumptions**, **data**, and **parameters** used in the **model**.

3.3 Mitigation of Model Risk—The actuary should attempt to mitigate **model** risk using validation, checking, analysis, governance and controls as appropriate to the **intended purpose**.

3.3.1 Validation, Checking, and Analysis—The nature and degree of validation, checking, and analysis selected by the actuary should be consistent with the complexity of the **model** and the **intended purpose**.

a. Model Integrity—For each **realization** (or a set of **realizations**) that is to be relied upon by the intended user, the actuary should validate that the **model** properly represents the situation under study. Validation of the **model** could include, but is not limited to the following:

1. a reconciliation of relevant output values to actual **data**, addressing and documenting the differences appearing in the reconciliation, if material.

2. checking formulas, logic, and table references. The degree of checking that is appropriate will depend on the **intended application**; the **project's objective** for which the **model** is being used; the context and nature of the **model**; the operating environment and controls; and whether there have been any changes to the **model** or the **model** environment.

3. where applicable, testing the **model** projection results against historical **data** to verify that modeled results bear a reasonable relationship to actual results over a given time period; and

4. examining the potential for **model risk** and then undertaking reasonable and appropriate steps to mitigate or eliminate it.

b. Analyzing the Output—The actuary should take appropriate steps to evaluate whether the **model** results are reasonable. Depending on the **project's objective**, the actuary should consider the following:

1. performing analytical tests on **model** results to assess the reasonableness of the projection (for example, testing for the appropriate application of **assumptions**);

2. reconciling the results of a **realization** to prior **realizations**, given any changes in **assumptions**, **parameters**, **data**, formulas, or other aspects of the **model** since the prior **realizations**. If such reconciliation can be developed and would be appropriate to the **project's objective**, the reconciliation should be documented in the actuary's files; and

3. running sensitivity tests on key **assumptions** to test that the **model** has been used correctly and that changes in the results are consistent with the changes in those **assumptions**.

c. Peer Review—The actuary should consider a peer review, where practical, of both **model** construction and the reasonableness of **model** results, given the **intended purpose**.

3.3.2 Appropriate Governance and Controls—The actuary should use appropriate **model** governance and controls to minimize **model risk**, to maintain the integrity of the **model** and to avoid the introduction or use of unintentional or untested changes. For example, if the **model** is deterministic, **implementations** and **realizations** used in reports should be **reproducible**. For stochastic simulations in **models** that are not deterministic, the actuary should consider if similar **inputs** will produce similar outputs. The actuary may want to confirm that different simulations or random number generator seeds produce similar distributions of results.

3.4 Presentation of Results—As indicated in section 3.7.1, the actuary should communicate the results in compliance with ASOP No. 41, *Actuarial Communications*. The actuary should present results of a **realization** of the **model**, explaining methodology, key **assumptions**, possible limitations, and any changes made subsequent to a prior **realization**.

3.4.1 Explanation of Model in Actuarial Report—If an actuarial report includes information derived from **models**, the actuary should consider including explanations of the following:

a. the **intended application** of the **models** and how the users' needs are addressed by those **models**;

b. the extent to which the **models** fulfill their **intended purpose**, given limited information, time constraints, and other practical considerations;

c. any material limitations of the **models** that have been used and the implications of those limitations; and

d. uncertainty in **model** results.

3.4.2 Reconciliation—The actuary should consider including in the actuarial report reconciliation to a prior actuarial report. Such reconciliation, if any, should include an explanation of **assumptions** or methods that have changed from the prior **realization**.

3.4.3 Description of Judgment—The actuary should consider including a description of the judgment applied in the selection of **model inputs** and methodology in relation to a **neutral** position. Terminology may include language such as "conservative," "most likely," or "optimistic," along with a description of the

relationship to the **neutral** position by appropriate quantitative, qualitative, or directional language.

When using the term "**neutral**" or other terms made meaningful by reference to "**neutral**," the actuary should consider whether an additional description is appropriate to avoid ambiguity. For example, several sets of **inputs** or methodologies may align with different characteristics of expected future experience. **Inputs** that align with the mean, median or mode of a random variable could each be described as **neutral**. In other cases, an **input** or methodology could be **neutral** with respect to one aspect of future experience but not with respect to another.

3.4.4 Terms from Applicable Law—If applicable law (statutes, regulations, and other legally binding authority) specifies that an estimate described as a "best estimate" or other similar term should be derived using methods, **assumptions**, or judgments that are not **neutral**, section 3.4.3 does not apply. In this instance, the actuary should refer to section 4.2(a) and should explain in the report the basis used for the derivation.

3.5 Reliance on Data or Other Information Supplied by Others—When relying on **data** or other information supplied by others, the actuary should refer to ASOP Nos. 23 and 41, for guidance. When relying on projections or supporting analysis supplied by others, the actuary should refer to ASOP No. 23, deeming such projections or supporting analysis as **data** covered by that standard. Similarly, the actuary should refer to ASOP No. 41 (including sections 4.2 and 4.3) with respect to the disclosure of responsibility for **data**, **assumptions**, and methods.

3.6 Documentation—Where appropriate to the **intended purpose**, the actuary should retain documentation or other file material. The actuary should also prepare and retain documentation to demonstrate compliance with the disclosure requirements of section 4 of this ASOP.

All documentation required by this ASOP should include a statement of the purpose of the documentation and sufficient detail to enable another actuary qualified in the same practice area to understand the matters involved and assess the judgments made.

3.7 Relation to Other ASOPs—The actuary should refer to other relevant ASOPs, including the following.

3.7.1 ASOP Nos. 23 and 41—Important guidance appropriate to various aspects of **modeling**, such as **inputs** and disclosures, is included in ASOP Nos. 23 and 41.

3.7.2 Other ASOPs—Other ASOPs provide specific **modeling** requirements, including guidance on setting **assumptions** and **parameters**. The actuary selecting, designing, building, modifying, developing, or using **models** should satisfy not

only the requirements of this ASOP, but also any specific **modeling** requirements from an applicable ASOP. If such specific **modeling** guidance from an applicable ASOP is inconsistent with the guidance of this ASOP, the guidance of such other ASOP supersedes the guidance of this ASOP.

Section 4. Communications and Disclosures

4.1 Actuarial Communications—When issuing actuarial communications incorporating **modeling** within the scope of this ASOP, the actuary should disclose the following, as appropriate:

4.1.1 The Intended Purpose of the Model—What the actuary understands to be the **intended application** of the **model** and the **project's objective**, as discussed in section 3.2.4.

4.1.2 Failure to Meet Intended Purpose—Any reasons that prevent the **model** from meeting its **intended purpose**, as discussed in section 3.2.4.

4.1.3 Inconsistent Assumptions—Any inconsistency in **assumptions** and the reasons therefore, whether in situations covered by section 4.2 or as the result of a deliberate redundancy such as added conservatism, as discussed in section 3.2.7(c).

4.2 Deviation from Guidance in the Standard—When issuing actuarial communications incorporating **modeling**, the actuary should refer to ASOP No. 41 and should include the following where applicable:

a. the disclosure in ASOP No. 41, section 4.2, if any material assumption or method was prescribed by applicable law (statutes, regulations, and other legally binding authority);

b. the disclosure in ASOP No. 41, section 4.3, if the actuary states reliance on other sources and thereby disclaims responsibility for any material assumption or method selected by a party other than the actuary; and

c. the disclosure in ASOP No. 41, section 4.4, if, in the actuary's professional judgment, the actuary has otherwise deviated materially from the guidance of this ASOP.

Appendix

Note: This appendix is provided for informational purposes but is not part of the standard of practice.

Background

Models have always played a fundamental role in actuarial work with every discipline relying on a very broad range of modeling applications, ranging from simple spreadsheets to complex capital models. Recently, the number and importance of modeling applications in actuarial science have continued to increase, with the results of actuarial models often entering financial statements directly.

The ASB first began work on a standard for modeling in the late 1990s. Motivated primarily to address the role catastrophe modeling of earthquakes and hurricanes played in property ratemaking, this work was focused on the use of specialized models where the actuaries would have to rely on a model that was developed by professionals other than actuaries. As a result of this work, ASOP No. 38, *Using Models Outside the Actuary's Area of Expertise*, was approved by the ASB in June of 2000 with the scope of the standard limited to the property/casualty area of practice. Currently, this is the only ASOP that specifically addresses modeling.

In light of these developments, and the fact that many ASOPs currently reference "models" or "modeling" in their guidance, the ASB felt it was appropriate to develop a general *Modeling* ASOP which addresses all areas of practice.

Current Practices

Actuaries often develop and use models when analyzing uncertain outcomes. In these instances, even a model that is prudently developed and carefully used does not eliminate inherent uncertainty and variability and actual experience may differ, sometimes significantly, from the estimates derived from the model results. These differences, by themselves, do not indicate a flawed model or noncompliance with standards.

ACTUARIAL STANDARDS BOARD

Actuarial Standard
of Practice
No. 1

Introductory Actuarial Standard of Practice

Developed by the
General Committee of the
Actuarial Standards Board

Adopted by the
Actuarial Standards Board
March 2013

Doc. No. 170

Note: *Nonguaranteed Charges or Benefits for Life Insurance Policies or Annuity Contracts,* which was formerly known as ASOP No. 1, has been renumbered as ASOP No. 2 effective on March 21, 2013. *Recommendations for Actuarial Communications Related to Statements of Financial Accounting Standards Nos. 87 and 88,* which was formerly labeled ASOP No. 2, was repealed on March 14, 2011 and does not apply to actuarial communications issued after that date.

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March 2013

TO: Members of Actuarial Organizations Governed by the Standards of Practice of the Actuarial Standards Board and Other Persons Interested in the Introductory Actuarial Standard of Practice

FROM: Actuarial Standards Board (ASB)

SUBJ: Actuarial Standard of Practice No. 1

This document contains the final version of a revision of the Introduction to ASOPs, now titled ASOP No. 1, *Introductory Actuarial Standard of Practice*.

Background

This Introductory ASOP is a revision of the *Introduction to the Actuarial Standards of Practice*. The Introduction was adopted in 2004 to replace a Preface to the standards that was adopted in 1989. The Introduction was intended to offer actuaries guidance on the ASB's operations, the content and format of standards, and the ASB's intent with respect to certain terms that appear frequently in the text of the standards themselves.

The Introduction was updated in October 2008 to make clear that the ASB, in promulgating ASOPs, seeks to define an appropriate level of practice (rather than simply codifying current practices), to remove references to "prescribed statements of actuarial opinion" in light of revisions made to the *Qualification Standards for Actuaries Issuing Statements of Actuarial Opinion in the United States* and to conform the provisions on deviations from the ASOPs to the deviation provisions of ASOP No. 41, *Actuarial Communications*, in accordance with the ASB's project to standardize the "deviation" provisions in all ASOPs. The ASB received a number of comments on the Introduction at the time of this 2008 revision and concluded that further review would be appropriate. The revision is a result of that review.

In addition, to reinforce that the Introductory ASOP contains guidance, it has been numbered as ASOP No. 1. The previous ASOP No. 1, *Nonguaranteed Charges or Benefits for Life Insurance Policies and Annuity Contracts*, has been renumbered as ASOP No. 2. The previous ASOP No. 2, *Recommendations for Actuarial Communications Related to Statements of Financial Accounting Standards Nos. 87 and 88*, was repealed in March 2011. The sole reference to ASOP No. 1, which appears in ASOP No. 24, *Compliance with the NAIC Life Insurance Illustrations Model Regulation*, has been updated to reflect this change.

Exposure Draft

The exposure draft of this ASOP was approved for exposure in December 2011 with a comment deadline of May 31, 2012. Thirteen comment letters were received and considered in making clarifications that were reflected in this final ASOP. For a summary of the issues contained in

these comment letters, please see appendix 2. In general, the suggestions helped improve the clarity of the standard but did not result in substantive changes to the standard.

Key Changes

Many comments were received with respect to the terms "must," "should," and "should consider." Some commentators objected to the concept that failure to comply with a "should" statement constitutes a deviation from the guidance in the ASOP and hence triggers disclosures. These commentators indicated that failure to follow a "should" statement had not previously been understood to be a deviation requiring disclosure, so that ASOPs were in effect being retroactively changed. Other commentators indicated the distinction between the two terms "must" and "should" was not clear.

To assist in reviewing these and other comments, the General Committee analyzed the use of the terms "should," "should consider," and "must" in the various ASOPs. The General Committee concluded that the use of these terms in this ASOP No. 1 would not retroactively change the intended meaning of the terms as used in the various ASOPs, and so the Introductory ASOP reaffirms that a failure to follow a "should" statement constitutes a deviation from the guidance.

In order to better contrast and clarify the meaning of "must" vs. "should," the definitions have been combined into a single "must/should" discussion that defines each term and highlights the distinction between the terms.

The General Committee concluded that a definition of "should consider" is not needed. The terms "must" and "should" are generally followed by an action (for example, "disclose" or "document"). When the term "should consider" is used, the action required to be performed (or to be disclosed as a deviation if not performed) is to consider something. Thus, there is no need to separately define "should consider." The revised ASOP makes clear that if the actuary considers something the ASOP indicates he or she should consider, but determines that the item being considered is inappropriate or impractical, the actuary has complied with the guidance and there is no deviation to be disclosed.

The final version of this Introductory ASOP contains several other clarifications but none are considered substantial. Notable changes are the addition of a definition of "deviation" and clarifying changes to the definitions of a number of other items, largely as a result of comments received.

The ASB thanks everyone who took the time to contribute comments and suggestions on the exposure draft.

The ASB voted in March 2013 to adopt this standard.

The ASB establishes and improves standards of actuarial practice. These ASOPs identify what the actuary should consider, document, and disclose when performing an actuarial assignment. The ASB's goal is to set standards for appropriate practice for the U.S.

ASOP No. 1—March 2013

INTRODUCTORY ACTUARIAL STANDARD OF PRACTICE

Section 1. Overview

The Actuarial Standards Board (ASB) promulgates actuarial standards of practice (ASOPs) for use by actuaries when rendering actuarial services in the United States. The ASB is vested by the U.S.-based actuarial organizations[1] with the responsibility for promulgating ASOPs for actuaries rendering actuarial services in the United States. Each of these organizations requires its members, through its *Code of Professional Conduct*[2] (Code), to satisfy applicable ASOPs when rendering actuarial services in the United States.

This Introductory ASOP sets forth principles that have been broadly applicable to the work of the ASB since its inception, and carries the same weight and authority as other ASOPs. Any Actuarial Compliance Guidelines promulgated or republished by the ASB that have not been repealed or superseded carry the same weight as ASOPs.

The ASB establishes and improves standards of actuarial practice. These ASOPs identify what the actuary should consider, document, and disclose when performing an actuarial assignment. The ASB's goal is to set standards for appropriate practice for the U.S. The ASB promulgates ASOPs through a notice and comment process described in the *ASB Procedures Manual*. The ASB has exclusive authority in the United States to determine whether an ASOP is needed in a particular actuarial practice area, to promulgate ASOPs, and to amend or repeal ASOPs. The ASB is the final authority for determining the content of ASOPs.

ASOPs are binding on members of the U.S.-based actuarial organizations when rendering actuarial services in the U.S. While these ASOPs are binding, they are not the only considerations that affect an actuary's work. Other considerations may include legal and regulatory requirements, professional requirements promulgated by employers or actuarial organizations, evolving actuarial practice, and the actuary's own professional judgment informed by the nature of the engagement. The ASOPs provide a basic framework that is intended to accommodate these additional considerations.

This introductory standard is effective for all actuarial services performed on or after June 1, 2013.

[1] The American Academy of Actuaries (Academy), the American Society of Pension Professionals and Actuaries, the Casualty Actuarial Society, the Conference of Consulting Actuaries, and the Society of Actuaries.
[2] These organizations adopted the *Code of Professional Conduct* effective January 1, 2001.

Section 2. Definitions, Discussions, and Related Guidance

Each ASOP includes a list of definitions of certain terms used within it. With the exception of this Introductory ASOP, those terms are defined only for use in that particular ASOP, and the definitions can and do differ among ASOPs, reflecting different uses of language in various segments of the profession. Definitions and discussions included in this Introductory ASOP are intended to apply to all other ASOPs if the term is used in such ASOPs, unless the ASOP includes a specific definition of the term.

ASOPs frequently use terms that, while not defined within them, are integral to an informed reading of the ASOPs. Where terms are not defined or discussed within the ASOPs, the actuary is expected to interpret a term in a straight-forward manner, consistent with the common usage of the term. If an actuary has any questions about the meaning of a specific term, the actuary should consult the Actuarial Board for Counseling and Discipline (ABCD) for guidance.

Following are some common terms used in the ASOPs:

2.1 Terms of Construction

a. *Must/Should*—The words "must" and "should" are used to provide guidance in the ASOPs. "Must" as used in the ASOPs means that the ASB does not anticipate that the actuary will have any reasonable alternative but to follow a particular course of action. In contrast, the word "should" indicates what is normally the appropriate practice for an actuary to follow when rendering actuarial services. Situations may arise where the actuary applies professional judgment and concludes that complying with this practice would be inappropriate, given the nature and purpose of the assignment and the principal's needs, or that under the circumstances it would not be reasonable or practical to follow the practice.

Failure to follow a course of action denoted by either the term "must" or "should" constitutes a deviation from the guidance of the ASOP. In either event, the actuary is directed to ASOP No. 41, *Actuarial Communications*.

The terms "must" and "should" are generally followed by a verb or phrase denoting action(s), such as "disclose," "document," "consider," or "take into account." For example, the phrase "should consider" is often used to suggest potential courses of action. If, after consideration, in the actuary's professional judgment an action is not appropriate, the action is not required and failure to take this action is not a deviation from the guidance in the standard.

b. *May*—"May" as used in the ASOPs means that the course of action described is one that would be considered reasonable and appropriate in many circumstances. "May" in ASOPs is often used when providing examples (for example, factors the actuary may consider; methods that may be appropriate). It is not intended to indicate that a course of action is reasonable and appropriate in all circumstances, nor to imply that alternative courses of action are impermissible.

2.2 *Actuarial Services*—Professional services provided to a principal by an individual acting in the capacity of an actuary. Such services include the rendering of advice, recommendations, findings or opinions based on actuarial considerations.

2.3 *Actuarial Soundness*—The phrase "actuarial soundness" has different meanings in different contexts and might be dictated or imposed by an outside entity. In rendering actuarial services, if the actuary identifies the process or result as "actuarially sound," the actuary should define the meaning of "actuarially sound" in that context.

2.4 *Deviation*—The act of departing from the guidance of an ASOP.

2.5 *Known*—ASOPs frequently refer to circumstances, factors, practices of the principal, or other items that are known to the actuary. In many cases, the actuary must rely upon the principal and others acting on the principal's behalf to supply relevant information. Unless an ASOP clearly indicates otherwise, "known" means that the actuary had actual knowledge of the item in question at the time the actuary rendered actuarial services.

2.6 *Materiality*—"Materiality" is a consideration in many aspects of the actuary's work. An item or a combination of related items is material if its omission or misstatement could influence a decision of an intended user. When evaluating materiality, the actuary should consider the purposes of the actuary's work and how the actuary anticipates it will be used by intended users. The actuary should evaluate materiality of the various aspects of the task using professional judgment and any applicable law (statutes, regulations, and other legally binding authority), standard, or guideline. In some circumstances, materiality will be determined by an external user, such as an auditor, based on information not known to the actuary. The guidance in ASOPs need not be applied to immaterial items.

2.7 *Practical or Practicable*—ASOPs frequently call upon actuaries to undertake certain inquiries, perform certain analytical tests, or make disclosures if it is "practical" or "practicable" to do so. These terms are intended to suggest that all possible steps need not always be taken to complete an assignment. A professional assignment frequently requires the actuary to adopt a course of action that is likely to yield an appropriate result without being unnecessarily time-consuming, elaborate, or costly relative to the principal's needs. Thus, it is appropriate for the actuary, exercising professional judgment, to decide that the circumstances surrounding a particular assignment are such that it would not be necessary to undertake a particular task. (Note: ASOPs commonly use "practical" and "practicable" interchangeably.)

2.8 *Principal*—A client or employer of the actuary.

2.9 *Professional Judgment*—Actuaries bring to their assignments not only highly specialized training, but also the broader knowledge and understanding that come from experience. For example, the ASOPs frequently call upon actuaries to apply both training and

experience to their professional assignments, recognizing that reasonable differences may arise when actuaries project the effect of uncertain events.

2.10 *Reasonable*—In many instances, the ASOPs call for the actuary to take "reasonable" steps, make "reasonable" inquiries, select "reasonable" assumptions or methods, or otherwise exercise professional judgment to produce a "reasonable" result when rendering actuarial services. The intent is to call upon the actuary to exercise the level of care and diligence that, in the actuary's professional judgment, is necessary to complete the assignment in an appropriate manner.

Because actuarial practice commonly involves the estimation of uncertain events, there will often be a range of reasonable methods and assumptions, and two actuaries could follow a particular ASOP, both using reasonable methods and assumptions, and reach different but reasonable results.

2.11 *Reliance*—Actuaries frequently rely upon others for information and professional judgments that are pertinent to an assignment. Similarly, actuaries often rely upon others to perform some component of an actuarial analysis. Accordingly, some ASOPs permit the actuary to rely in good faith upon such individuals, subject to appropriate disclosure of such reliance, if required by applicable ASOPs (for example, ASOP Nos. 23, *Data Quality,* and 41).

2.12 *Significance/Significant*—Significance can have different meanings. A result may be deemed to be statistically significant if it is determined that the probability that the result was produced by random chance is small. An event may be described as significant if the likelihood of its occurrence is more than remote. In addition, a result may be significant because it is of consequence. Other uses may be encountered in actuarial practice. The actuary should exercise care in interpreting or using these words.

Section 3. Purpose and Format of Actuarial Standards of Practice

3.1 The Purpose of ASOPs—ASOPs identify what should be considered, done, documented, and disclosed when rendering actuarial services.

3.1.1 The ASB promulgates standards for appropriate actuarial practice. In the course of developing or revising an ASOP, the ASB seeks the input of the actuarial profession and other interested parties. This process of exposure is intended to seek input on the effect that the proposed ASOP would have on the level of practice.

3.1.2 The ASOPs are not intended to shift the burden of proof or the burden of production during litigation, and deviation from one or more provisions of an ASOP should not, in and of itself, be presumed to be malpractice. ASOPs are intended for use by actuaries who are qualified to make use of them by virtue of having the necessary education and experience to understand and apply them (see Precept 2, Qualification Standards, of the Code). Other individuals should

consider obtaining the advice of a qualified actuary before making use of, or otherwise relying upon, ASOPs.

3.1.3 The ASOPs are intended to provide guidance for dealing with commonly encountered situations. Actuaries in professional practice may also have to handle new or non-routine situations not anticipated by the ASOPs. In all situations, the actuary should exercise professional judgment in rendering actuarial services.

3.1.4 The ASOPs are principles-based and do not attempt to dictate every step and decision in an actuarial assignment. Generally, ASOPs are not narrowly prescriptive and neither dictate a single approach nor mandate a particular outcome. Rather, ASOPs provide the actuary with an analytical framework for exercising professional judgment, and identify factors that the actuary typically should consider when rendering a particular type of actuarial service. The ASOPs allow for the actuary to use professional judgment when selecting methods and assumptions, conducting an analysis, and reaching a conclusion, and recognize that actuaries can reasonably reach different conclusions when faced with the same facts.

3.1.5 There are situations where applicable law (statutes, regulations, and other legally binding authority) may require the actuary to deviate from the guidance of an ASOP. Where requirements of law conflict with the guidance of an ASOP, the requirements of law shall govern. The ASOPs provide guidance on this and other situations where the actuary deviates from the guidance of an ASOP (see section 4.5).

3.1.6 Unlike the ASOPs, which are binding upon actuaries, other actuarial literature provides information that an actuary may choose, but is not required, to consider when rendering actuarial services. For example, practice notes published by the Academy describe various methods actuaries may use, but do not establish standards of practice and are not binding upon actuaries. Similarly, research papers, learned treatises, study notes, actuarial textbooks, journal articles, and presentations at actuarial meetings can be informative, keeping the actuary abreast of developments as actuarial science evolves, but do not establish binding requirements upon the actuary.

3.1.7 Each ASOP has a specified effective date. Prior to that date, exposure drafts of the ASOP, and the ASOP itself from the date of its publication to its effective date, form part of the literature of the actuarial profession; actuaries may look to them at their discretion for advisory guidance. An ASOP is not binding until the effective date of the ASOP. Unless specified otherwise, in the case of a revision to an existing ASOP, the existing ASOP is binding until the effective date of the revised ASOP.

3.2 The Format of ASOPs—Each ASOP document includes (1) a transmittal memorandum, (2) the ASOP itself, and (3) one or more supporting appendices.[3] The transmittal memorandum and the appendices are not part of the ASOP and are nonbinding, but may be useful to the actuary in interpreting the standard.

Section 4. Compliance with ASOPs

4.1 ASOPs are binding upon actuaries. Failure to comply with an applicable ASOP results in a breach of the Code. Such breaches subject the actuary to the profession's counseling and discipline processes.

4.2 Actuaries should take a good faith approach in complying with ASOPs, exercising good judgment and professional integrity. It is not appropriate for users of ASOPs to make a strained interpretation of the provisions of an ASOP.

4.3 Actuaries should comply with those ASOPs that are applicable to the task at hand. However, not all ASOPs will apply. An ASOP should not be interpreted as having applicability beyond its stated scope and purpose. Actuaries are responsible for determining which ASOPs apply to the task at hand. If no ASOPs specific to the task are applicable, the actuary may, but is not required to, consider the guidance in related ASOPs. Most, but not all, ASOPs are task-specific, dealing with particular kinds of actuarial services. A few ASOPs, however, deal more broadly with particular aspects of many types of actuarial services (such as ASOP Nos. 23 and 41, and this Introductory ASOP).

4.4 When an actuary believes that multiple ASOPs have conflicting provisions when applied to a specific situation and none provide explicit guidance concerning which governs, the actuary should apply professional judgment and may wish to contact the ABCD for confidential guidance on appropriate practice.

4.5 The ASOPs make specific provision for those situations where the actuary is required to or deems it appropriate to deviate from one or more provisions of an ASOP. It is not a breach of an ASOP to deviate from one or more of its provisions if the actuary does so in the manner described in the ASOP, including making the disclosures related to the deviation as required in such ASOP and in ASOP No. 41.

[3] With respect to how the ASOP document is organized, the current ASOP format differs from that of some earlier ASOPs, but all ASOP documents contain similar content, as described in the appendix 1 to this *Introductory ASOP*.

Appendix 1

Background and Additional Information

Note: This appendix is provided for informational purposes, but is not part of the standard of practice and is nonbinding.

Clarification of Language

As the ASB revises ASOPs, it strives to improve clarity and consistency in language. For example, the 2010 update to ASOP No. 41, *Actuarial Communications*, included changes in definitions to be more consistent with those found in the *Code of Professional Conduct* (Code) and in the recently revised Qualification Standards, and also incorporated language to help create consistency in the treatment of deviation language within all ASOPs. Similarly, in this Introductory ASOP, a number of definitions and discussions of terms used in many of the ASOPs have been added and, where the terms added also appear in the Code, they have been made consistent. In addition, an effort has been made to replace undefined terms or phrases with phrases that include terms that are defined, discussed, or used in the Code.

Role and Scope of ASOPs

The Introductory ASOP has been revised to clarify the role and scope of ASOPs. While ASOPs are binding on actuaries rendering actuarial services in the U.S., the Introductory ASOP now more directly acknowledges that actuaries are subject to a range of requirements and considerations that may affect how they do their work. These include legal and regulatory requirements, their employer's peer review or other quality assurance processes and policies, continuing education requirements, the Code, and the actuary's own professional and ethical standards. Because the ASOPs are not overly prescriptive and allow for disclosed deviations, the ASOP framework is designed to accommodate the actuary's judgment in providing high-quality actuarial services and acting with integrity. The Academy's Council on Professionalism publishes advisory Applicability Guidelines to assist actuaries in identifying the ASOPs that may be relevant.

Development of ASOPs

Proposals for developing new ASOPs and revising existing ones come from a variety of sources, such as individual actuaries, actuarial firms, professional committees, the ABCD, the ASB committees, and the ASB itself. If it accepts a proposal, the ASB assigns it to the appropriate committee or task force to begin the project.

The process of developing a new ASOP or revising an existing ASOP usually begins with the identification of practices that the ASB believes are appropriate to the proper performance of a

particular type of actuarial service. After reviewing the current range of practices, the ASB determines whether it is appropriate under the circumstances to develop a new or revise an existing ASOP to reflect emerging issues in actuarial practice, recent advancements in actuarial science, or for other reasons.

Organization of ASOPs

The ASB strives to organize all ASOPs in a similar fashion to the extent feasible. The ASOP document includes a transmittal memorandum, the ASOP itself, and appendices. The transmittal memorandum provides brief background information and a description of the key issues related to the development or revision of the ASOP. The appendices (1) provide additional background and historical issues, (2) describe current or alternative practices, and (3) summarize the major issues raised in the exposure process and their disposition by the drafting committee. Additional appendices may also contain supporting documents, bibliographies, or illustrative examples.

Each ASOP contains four sections. Except for this Introductory ASOP, the sections are organized as follows:

- The first section summarizes the scope, cross references, and effective date of the ASOP.
- The second section defines or discusses certain terms used within the ASOP.
- The third section provides an analysis of issues and recommended practices.
- The fourth section addresses communications and disclosures.

The scope identifies the intended application of the ASOP to the work of the actuary. In some instances, the actuary serves as an advisor to a principal and does not actually make decisions or take actions on the principal's behalf. In those instances, the ASOP may indicate in its scope to what extent the ASOP addresses the actuary's role in advising the principal. However, the ASOPs are not intended to make the actuary responsible if the principal acts contrary to the actuary's advice.

The Analysis of Issues and Recommended Practices section is organized into major topics or issues, or major tasks involved in rendering actuarial services within the ASOP's scope. Emphasis is placed on providing the actuary with an appropriate analytical framework for completing an assignment that is within the scope of the ASOP.

Communications or disclosures pertinent to the subject of the ASOP and applicable limitations are identified in the Communications and Disclosures section and in ASOP No. 41. Where appropriate, reference may be made to applicable provisions of the Code. This section also includes a description of what an actuary should do when, in the actuary's professional judgment, a deviation from the guidance in the ASOP is deemed to be appropriate.

Appendix 2

Comments on the Exposure Draft and Responses

The exposure draft of the Introductory ASOP was issued in December 2011 with a comment deadline of May 31, 2012. Thirteen comment letters were received, some of which were submitted on behalf of multiple commentators, such as by firms or committees. For purposes of this appendix, the term "commentator" may refer to more than one person associated with a particular comment letter. The General Committee of the Actuarial Standards Board carefully considered all comments received, and the ASB reviewed (and modified, where appropriate) the changes proposed by the General Committee.

Summarized below are the significant issues and questions contained in the comment letters and the responses.

The term "reviewers" in appendix 2 includes the General Committee and the ASB. Also, unless otherwise noted, the section numbers and titles used in appendix 2 refer to those in the exposure draft.

GENERAL COMMENTS	
Comment	A number of commentators indicated that the Introductory ASOP needs a number (for example, ASOP No. 0 or ASOP No. 1) so that actuaries understand that it is an ASOP that contains guidance.
Response	The reviewers agree and numbered the Introductory ASOP as ASOP No. 1. The previous ASOP No. 1, *Nonguaranteed Charges or Benefits for Life Insurance Policies and Annuity Contracts*, has been renumbered as No. 2, since ASOP No. 2, *Recommendations for Actuarial Communications Related to Statements of Financial Accounting Standards Nos. 87 and 88*, was repealed in March 2011.
Comment	One commentator suggested moving the general deviation language from ASOP No. 41, *Actuarial Communications*, to the Introductory ASOP, and having ASOP No. 41 deal only with deviations related to communication of results.
Response	The reviewers believe ASOP No. 41 is an appropriate vehicle for guidance on communicating deviation from any ASOP, because ASOP No. 41 applies to actuaries issuing actuarial communications within any practice area. As a result, no change was made.

SECTION 1: OVERVIEW	
Comment	Some commentators believed that the sentence "Each of these organizations requires its members, through its *Code of Professional Conduct*[4] (Code), to observe ASOPs when rendering actuarial services in the United States," contradicts the Code because it is incomplete (i.e. the sentence doesn't mention that actuaries must also under the Code satisfy standards of practice in a non-U.S. jurisdiction where they render services).
Response	The reviewers disagree and made no change. The reviewers believe the statement is accurate as written, and is not inaccurate merely because it does not also describe Code requirements that relate to actuarial standards of practice that exist in other jurisdictions in which the actuary may render actuarial services.
Comment	One commentator suggested revising the sentence "Each of these organizations requires its members, through its Code[5], to observe ASOPs when rendering actuarial services in the United States," to match the wording in the Code by replacing "observe" with "satisfy applicable."
Response	The reviewers made the suggested change but note that the Code uses both terms in the discussion of this topic.
Comment	One commentator indicated that the sentence "The ASOPs provide a basic framework that will typically accommodate these additional considerations." should be revised to read "The ASOPs provide a basic framework that should accommodate these additional considerations."
Response	The reviewers agree and made the following change: "The ASOPs provide a basic framework that is intended to accommodate these additional considerations."
SECTION 2: DEFINITIONS, DISCUSSIONS, AND RELATED GUIDANCE	
Comment	One commentator suggested that the definition of Deviation ("The act of departing from the guidance of an ASOP.") in ASOP No. 41 also be included here.
Response	The reviewers agree and added the definition.
Section 2.1, Terms of Construction	
Comment	One commentator asked whether the Committee meant "under ordinary circumstances" rather than "under the circumstances" in "*Must*—"Must" as used in the ASOPs means that, under the circumstances, the actuary has no reasonable alternative but to follow a particular course of action."
Response	The reviewers disagree that "under ordinary circumstances" was intended, but note that changes made to the section should eliminate potential confusion.

[4] These organizations adopted the *Code of Professional Conduct* effective January 1, 2001.
[5] These organizations adopted the *Code of Professional Conduct* effective January 1, 2001.

Comment	Many comments were received with respect to the terms "must," "should," and "should consider," as follows: • Commentators indicated that, because failure to follow a "must" or a "should" statement both constitute a deviation requiring disclosure, the distinction between the two terms was not clear. • Commentators objected to the concept that failure to comply with a "should" statement constitutes a deviation that must be disclosed under ASOP No. 41. These commentators indicated that failure to follow a "should" statement had not previously been understood to be a deviation requiring disclosure, so that ASOPs were in effect being retroactively changed, and actuaries should be afforded an opportunity to comment on the use of the word should in the various ASOPs in that light. • A commentator questioned whether a definition of "should consider" was needed. • A commentator requested that the ASOP specifically indicate that it does not create a duty to document actions considered but not taken and the reasons therefor.
Response	To assist in reviewing the comments, the reviewers analyzed the use of the terms "should," "should consider," and "must" in the various ASOPs, and reached the following conclusions: • In order to better contrast the meaning of "must" versus "should," the definitions have been combined into a single "Must/Should" discussion that defines each term and highlights the distinction between the terms. • The Introductory ASOP reaffirms that a failure to follow a "should" statement constitutes a deviation. • The reviewers agree that a definition of "should consider" is not needed. The terms "must" and "should" are generally followed by an action (for example, "disclose" or "document"). When the term "should consider" is used, the action to be performed (or to be disclosed as a deviation if not performed) is to consider something. Thus, there is no need to separately define "should consider." The revised ASOP makes clear that if the actuary considers something the ASOP indicates he or she should consider, but determines that the item being considered is inappropriate or impractical, the actuary has complied with the guidance and there is no deviation to be disclosed. • Because the ASOP does not indicate that actions considered but not taken (and the reasons therefor) must be disclosed, the reviewers do not believe it is necessary for the ASOP to indicate that they need not be disclosed. Thus, no changes have been made in response to this comment.

Comment	A commentator requested that a statement "Failure to follow the course of action which follows 'may' does not constitute a deviation" be added.
Response	Because the ASOP does not suggest that failure to follow the course of action that follows "may" constitutes a deviation, the reviewers do not believe it is necessary for the ASOP to indicate that it would not be a deviation. Therefore, no change was made in response to this comment.
Section 2.2, Actuarial Services	
Comment	A commentator indicated that "actuarial services" is defined in ASOP No. 41 and questioned whether the definition should be in two ASOPs. In addition, a commentator suggested a small change in the definition in the Introductory ASOP to match the definition in the Code (i.e., change "on" to "upon" in "Such services include the rendering of advice, recommendations, findings or opinions based on actuarial considerations."). Other commentators suggested adding "but are not limited to" after "Such services include" in the sentence above.
Response	Because the term actuarial services is applicable to all ASOPs and used in nearly all of them, the reviewers decided that including the definition in the Introductory ASOP is appropriate. The reviewers also made the indicated change (i.e. "on" to "upon") to match the definition in the Code (which also appears in ASOP No. 41). The reviewers decided not to add "but are not limited to" to the definition. The revised definition matches the definition in the Code. In addition, the reviewers believe the list of services in the definition to be illustrative rather than comprehensive.
Section 2.3, Actuarial Soundness	
Comment	A commentator suggested that a statement be added indicating that "actuarial soundness" is not an actuarial concept, but is a concept imposed by outside entities. In addition, another commentator requested that the ASOP indicate that the term "actuarial soundness" only needs to be defined once in an actuarial communication. A third commentator indicated that in property and casualty ratemaking the term "actuarial soundness" is well defined by the Casualty Actuarial Society's ratemaking principles, and should not need to be defined in an actuarial communication.
Response	The reviewers agree that the concept of actuarial soundness might be imposed by an outside entity and added a statement to that effect. However, the reviewers do not believe it is necessary to explicitly state that actuarial soundness need not be defined multiple times in a single actuarial communication, and no change has been made in this regard. With respect to the third comment, no change was made. The reviewers note that ASOP No. 41 already provides that an actuarial communication can direct the reader to information provided in other documents and thus an actuary can direct the reader to the "actuarial soundness" definition intended.

Section 2.4, Known	
Comment	One commentator indicated that the third sentence in this discussion, which reads "The actuary cannot reasonably be expected to act based on information that was not provided" could be interpreted to excuse an actuary from making reasonable inquiries to try to obtain information.
Response	The reviewers do not believe the sentence added anything to the discussion and deleted the sentence. This should avoid the potential misinterpretation.
Section 2.5, Materiality	
Comment	There were a number of comments on this section: • A commentator suggested that the ASOP not define material since "materiality" standards are normally imposed by others, and where they aren't there isn't a difference between significance and materiality. The commentator suggested using the materiality definition to define significant instead. • A commentator indicated that the statement "The provisions of ASOPs need not be applied to immaterial items" was somewhat circular, because an actuary would need to apply the ASOP to determine that an item is immaterial and that the ASOP allows it to be disregarded. • A commentator indicated that information should be required to be disclosed to allow others to make an assessment of the reasonability of the decision to exclude items as immaterial.
Response	The reviewers note that the words "material" and "materiality" are used in a number of ASOPs and, therefore, retaining the discussion is appropriate. The reviewers disagree with the other two comments.
Section 2.6, Practical or Practicable	
Comment	One commentator wanted to add the statement "No ASOP requires the actuary to perform a task that in the actuary's professional judgment is impractical based on the needs of and contractual relationship with the principal." Another commentator wanted the terms "practical" and "reasonable" and the difference between them clarified further.
Response	The reviewers consider the proposed statement overly broad and note that deviation from the guidance in an ASOP is permitted when appropriate, with disclosure in accordance with ASOP No. 41. Therefore, no changes were made in response to the first comment. In general, the reviewers believe that the term "practical" applies to a process while "reasonable" applies to a result, and changes were made in the discussion of "reasonable" to make that clear.

Section 2.8, Professional Judgment	
Comment	A commentator suggested that the phrase "recognizing that reasonable differences may arise when actuaries project the effect of uncertain events" in this discussion also belonged in the discussion of reasonable.
Response	The reviewers agree and added the sentence "Because actuarial practice commonly involves the estimation of uncertain events, there will often be a range of reasonable methods and assumptions, and two actuaries could follow a particular ASOP, both using reasonable methods and assumptions, and reach different but reasonable results" to the discussion of reasonable.
Section 2.9, Reasonable	
Comment	A commentator felt that the discussion should focus on "the act of reasoning or reaching conclusions based on supported evidence, logical argument and actuarial judgment," which the commentator believes would better parallel the usage in other ASOPs. Another commentator suggested avoiding the use of the stem "reason" or "reasonable" in the discussion.
Response	The reviewers do not agree. As mentioned above, the reviewers believe that the discussion of reasonable should focus on producing a reasonable result, and the discussion was modified to accomplish this by adding to the discussion "to produce a 'reasonable' result when rendering actuarial services."
Section 2.11, Significance/Significant	
Comment	There were several comments on this discussion, primarily indicating that there was not a clear distinction between the terms material and significant.
Response	The reviewers note that there are several different common uses of the word significant, and different usages are used in different ASOPs. Section 2.11 was intended as a discussion of the various ways in which the term is used, rather than a definition. The discussion was expanded to include an additional common usage ("An event may be described as significant if the likelihood of its occurrence is more than remote."). With the changes to the wording for both "materiality" and "significance/significant," the reviewers believe there is a clearer distinction between the two terms.

SECTION 3. PURPOSE AND FORMAT OF ACTUARIAL STANDARDS OF PRACTICE	
Comment	A commentator indicated that the placement of this section within the body of the Introductory ASOP is inconsistent with the Introductory ASOP itself being an ASOP, because there is nothing in this section that an actuary must understand or do. The commentator suggested moving this section to the appendix or another document.
Response	The reviewers note that the Introductory ASOP is unique and can have a different structure from the other ASOPs. The reviewers decided to leave this within the body of the Introductory ASOP to ensure it received appropriate visibility.
Section 3.1.2	
Comment	A commentator believed the term "production in litigation" should have been "results in litigation" in the sentence "ASOPs are not intended to shift the burden of proof or production in litigation, and failure to satisfy one or more provisions of an ASOP should not, in and of itself, be presumed to be malpractice."
Response	The reviewers changed the wording to clarify that a deviation from a standard should not result in the presumption of malpractice.
Comment	A commentator believed that the sentence "Other individuals should consider obtaining the advice of a qualified actuary before making use of, or otherwise relying upon, ASOPs" should be replaced with "ASOPs should not be used or relied upon by those who are not actuaries."
Response	The reviewers disagree and made no change.
Section 3.1.4	
Comment	A commentator wanted to add "generally" before "not narrowly prescriptive," and "typically" before "neither dictate" in the following sentence "The ASOPs are not narrowly prescriptive and neither dictate a single approach nor mandate a particular outcome." Another commentator noted that some sections of ASOPs are prescriptive.
Response	The reviewers agree that adding "generally" to the sentence is appropriate and made the change but do not believe the addition of "typically" would enhance the understanding.

Comment	A commentator suggested that the sentence "For example, because actuarial practice commonly involves the measurement of uncertain events, there will often be a range of reasonable assumptions, and two actuaries could follow a particular ASOP, both using reasonable methods and assumptions, and reach different but reasonable results" be moved into the discussion of reasonable.
Response	The reviewers agree and moved the sentence (with minor wording changes).
Section 3.1.5	
Comment	A commentator thought that this point (that an actuary may deviate from an ASOP to comply with applicable statutes, regulations or other binding authority) was better explained in other ASOPs and that the language should be modified.
Response	The reviewers believe the language is clear and consistent with the Code, and therefore made no change.
Section 3.1.6	
Comment	A commentator suggested that the word "might" be changed to "may" in the sentence "Unlike the ASOPs, which are binding upon actuaries, other actuarial literature provides information that an actuary might choose, but is not required, to consider when rendering actuarial services."
Response	The reviewers agree and made the change.
Section 3.1.7	
Comment	A commentator suggested this section be revised to indicate that early adoption of the revised Introductory ASOP is permitted.
Response	The reviewers believe that there is nothing in this revised Introductory ASOP that would result in noncompliance with the current Introduction to the ASOPs. Therefore, no change was made.
SECTION 4: COMPLIANCE WITH ASOPS	
Section 4.1	
Comment	A commentator found this confusing, saying that you can deviate from an ASOP if you disclose the deviation, so failure to comply with an ASOP is not a breach of the Code. Another commentator suggested adding information to further clarify that deviations, with appropriate disclosures, are permitted.
Response	The reviewers note that the deviation from the guidance in an ASOP and disclosing the deviation is not a failure to comply with the ASOP, as discussed in section 4.5. Accordingly, no substantive changes were made in response to these comments, although the second sentence in this section was simplified.
Comment	Some commentators believe this section belongs in the appendix, not the body of the ASOP, because it doesn't tell the actuary to do anything.
Response	Failure to comply with the ASOPs results in a breach of the Code. The reviewers believe this is an important point that belongs in the body of the Introductory ASOP. Therefore, no change was made.

Comment	A commentator suggested adding "may" before "subject the actuary" in the sentence "Such breaches subject the actuary to the profession's counseling and discipline processes."
Response	The reviewers note that a breach subjects the actuary to ABCD processes, even though it may not result in ABCD action. Therefore, no changes were made.
Section 4.2	
Comment	A commentator believes that the sentence "It is not appropriate for users of ASOPs to make a strained interpretation of the provisions of an ASOP " is not needed because the point is covered by the first sentence, and also indicated that an undefined term like "strained" should not be used.
Response	The reviewers believe the second sentence differs from the first and decided against deleting it.
Section 4.3	
Comment	A commentator suggested that the word "relevant" be replaced with "applicable" in the sentence "Actuaries should comply with those ASOPs that are relevant to the task at hand; not all ASOPs will apply." because the Code doesn't use the word "relevant," it uses "applicable."
Response	The reviewers agree with replacing "relevant" with "applicable" and made that change.
Comment	A commentator suggested that the following sentence be deleted: "An ASOP should not be interpreted as having applicability beyond its stated scope and purpose" because the commentator believes it discourages an actuary from looking at ASOPs applicable to similar issues when there is no ASOP directly applicable, which the commentator believes to be a good practice that should not be discouraged.
Response	The reviewers believe that clearly defined applicability is important and does not discourage other uses. Therefore, the sentence was not deleted.
Comment	A commentator questioned whether the actuary has unfettered discretion to come to a conclusion about which ASOPs apply, even though the ASOPs may seem to suggest otherwise, and whether the actuary's determination was open to challenge.
Response	The reviewers do not agree that the section suggests that the actuary has unfettered discretion and, therefore, made no change.
APPENDIX 1: BACKGROUND AND ADDITIONAL INFORMATION	
Role and Scope of ASOPs	
Comment	A commentator objected to the use of the phrase "to better define" in the first sentence.
Response	The reviewers agree and replaced the phrase "to better define" with "to clarify" in the first sentence.

Comment	A commentator indicated that the sentence below belongs in the body of the ASOP, not in appendix 1, because the commentator believes it is requiring the actuary to do something. "Because the ASOPs are not overly prescriptive, and allow for disclosed deviations, the ASOP framework is designed to accommodate the actuary's providing high quality actuarial services and acting with integrity, taking all appropriate considerations into account."
Response	The reviewers do not believe this sentence adds any guidance and, therefore, made no change.