

First of all, we would like to thank the members of the Modeling Task Force for their work on the Modeling Exposure Draft. We appreciate the hard work required in drafting a single, coherent ASOP for a broad and difficult topic area. We believe that this ASOP will be filling an already strong and still growing need for guidance and objective requirements for all actuaries working with models. Below, we first respond to the questions posed by the task force and then comment on terminology that requires further clarification.

Task Force Questions:

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

- In general: we believe that the draft ASOP could be enhanced to provide better guidance. The current draft of the ASOP seems overly “Principle Based” with insufficient specific guidance or requirements.
- The draft ASOP removes too much of the accountability from the actuary through use of phrases like “as appropriate” and “actuary should consider”.
- We recommend that the draft ASOP be clarified to include guidance for actuaries responsible for *evaluating* but not otherwise *using* models.
- Sections 1.1 & 1.2: The scope of the draft ASOP originally appears ambiguous, stated in such a way as to apply beyond actuarial services. Eventually, Section 3.1 limits the scope to actuarial science. However, an up-front limitation seems preferable, as in ASOP 38. In ASOP 38, the scope has the specific limitation “with respect to developing an actuarial work product” after “professional services” in the introductory section.
- The draft ASOP is less strict than the current version of ASOP 38, which causes concern if ASOP 38 were ever replaced by the guidance in this standard or revised to be more similar to this standard.
- We recommend adding more instruction regarding consideration of or comparison to available alternative models and reconciling any differences in modeled results.
- We recommend revising the draft ASOP to address the potential for over-specification (over-fit) of a model, including adding a definition of over-specification (over-fit).
- We recommend revising the draft ASOP to include more specific guidance on testing/validation of model output and determining its reasonability/reliability, including but not limited to:
 - i. Use of hold-out samples,
 - ii. Gini tests,
 - iii. Lift curves,
 - iv. Confidence Intervals, and
 - v. Other measures of predictive power, reliability, or goodness of fit.

Specific tests may depend on practice area, but we recommend that the draft ASOP be revised to reference at least the most common examples and note that others may be applied as applicable.
- Section 3.3.1(a): We recommend adding explicit reference to code review or the checking of subroutines or steps in a run.
- Section 3.3.2: It does not appear that the draft ASOP requires that the actuary test that results are reproducible or that similar seeds produce similar outputs. Thus, this

requirement seems theoretical. We recommend that the draft ASOP be revised to clearly require that the actuary confirm that the results are reproducible or that similar seeds produce similar outputs.

- At points the language in the draft ASOP, e.g. “realization”, is uncommon or unused by Property and Casualty actuaries; this is perhaps a holdover from the Life Committee Draft. We suggest a review by the Property and Casualty members of the Task Force focused on using language that is common or standard across actuarial areas of practice.
2. *Is the proposed standard sufficiently flexible to allow for new developments?*
- The ASOP may be too flexible generally, as noted in our responses to Questions 1, 3, 4, and 5.
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?*
- In general: we believe that the draft ASOP should be revised to contain guidance that is more clear and appropriate. Specifically, the allowance for professional judgment without a disclosure requirement is too extensive in the current draft.
 - Section 1.2/3.1.1: There is ambiguity in the use of the terms “minimal reliance” and “minimal financial effect”.
 - i. It is unclear what is meant by “intended model users” in Section 3.1.1.
 - ii. Does minimal reliance by the user necessarily imply minimal reliance by the principal, client, or regulator?
 - iii. Does minimal financial effect in the opinion of the user necessarily imply minimal financial effect in the opinion of the principal, client, or regulator?
 - iv. It is unclear what is meant by “minimal financial effect”. For example, consider a segmentation analysis where smoothing the tail ends of a curve has a serious financial impact for a few policyholders but a minimal financial effect for the program overall. Is this an instance where full application, including the disclosure requirements, of the ASOP is not required?
 - Section 3.3.1(c): Stating both “consider” and “where practical” seems redundant and to encourage omitting a peer review.
 - Section 3.1.2: The actuary is required to make a “reasonable and appropriate attempt” to satisfy a, b, and c – but is it fair or reasonable for an actuary to proceed with using a model where they have (attempted but) failed to satisfy a, b, and c? This is concerning, especially since model vendors may not be inclined to volunteer limitations of their models.
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?*
- In general: this appears to at times be inappropriate. We believe that Section 4 should have stricter disclosure requirements and more clarity regarding documentation

requirements. Specifically, the actuary should be required to always disclose deviations where the draft ASOP currently states disclosure not to be necessary.

- Section 4.1.2: The current draft ASOP states that “the actuary should disclose the following, as appropriate: ...failure to meet intended purpose”; a model’s failure to meet its intended purpose should always be disclosed. We recommend that disclosure should be “when applicable” rather than “as appropriate”.
- Section 3.1.3: We recommend always disclosing deviation from the guidance of the ASOP. As an example of the ambiguity when disclosure is only sometimes recommended, consider how the actuary is to know if a deviation is material if they only have a basic understanding of the model, as allowed by Section 3.1.2.

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?*

- In general: we believe that the clarity and appropriateness could be improved. The draft ASOP requires more clarification on documentation and validation, such as specifying that a description of the validation tests performed and a summary of their results are to be included in the documentation.
- Section 3.2 provides too many exemptions from the requirements of the standard for the actuary (“consider documenting” as opposed to “document”).
- Section 3.4: Rather than explaining the changes subsequent to “a prior realization (scenario)”, explaining the changes subsequent to “last presented realization (scenario)” is more appropriate. The distinction here comes from the likelihood of there being multiple scenarios run between presentations to the principal, client, or regulator.
- Section 3.4.1(d): This section would be improved by including specific reference to both general and specific sources of uncertainty.

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?*

- Bold type is fine. Hyperlinks, as suggested by another commenter, are also acceptable. Variable fonts, as recommended by another commenter, are very distracting and unacceptable.

Undefined and Defined Terms Requiring Clarification:

1. Undefined terms that are ambiguous or confusing:
 - a. Over-Specification: Add definition, including “over-fit” as an alternate term.
 - b. Stress Testing: Add definition.
 - c. Practice Area: As used in Section 3.6, how specific is a practice area? Is a regulatory actuary reviewing a filing in the same practice area as a company actuary who prepared a filing? Is it possible to make this a defined term?

2. Defined terms that are ambiguous or confusing:
- a. Model: Revise definition to add scientific to the types of concepts and equations. “A representation of relationships among entities or events using statistical, financial, economic, mathematical, or scientific concepts and equations.”
 - i. Section 3.2.5: Composite models may present risks/limitations that do not exist in the component models. For example, doing a single univariate analysis may be fine while doing multiple analyses will give you false indications. Is this possibility addressed? The ASOP needs to clarify the definition of “Model” to include the entire process.
 - ii. Section 3.2.5: Is subsequent interpolation/extrapolation considered part of the modeling and therefore subject to this standard? What about subjective adjustments? Again, the ASOP needs to clarify the definition of “Model” to include the entire process.
 - b. Parameter: Revise the definition to add “scientific” to the types of inputs.
 - c. Margin: We find this to be ambiguous terminology, due to possible confusion with “margin of error”. One is a specific buffer, while the other is a measure of uncertainty.
 - d. Neutral: This is ambiguous terminology.
 - e. Realization: This term should be replaced with the more generic and widely-used term “scenario”; the use of “realization” is especially uncommon in the Property & Casualty practice area.
 - f. Implementation: This is ambiguous terminology. It appears to be an abstraction in the definition of “Model”, but appears concrete in its own definition.
 - g. Granularity: It should be noted explicitly that models with more granularity may provide more model precision or flexibility, or less if the model has been over-specified or over-fit.

Thank you for your consideration of our comments,

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