Date: September 30, 2013
To: The Actuarial Standards Board ERM Task Force
From: Anthony T. Salis, M.S.
Subject: Comments on the Exposure Draft on Modeling

First, I thank the board for their work and efforts in putting this document together and presenting it for comments. I appreciate the work that has been put into this ASOP and I hope that my comments do not detract from the quality of the committee's efforts in putting together this draft.

I think that the board should give careful consideration to the comments proposed by Tobias E. Bradley. I agree with his comments and I have expounded further on many of his comments. My remarks are what follow. I will give response to the ASB's request for comments, then comment by paragraph, and finally a couple overall comments.

Request for Comments

1. No – however, with suggested changes I believe that the committee will be able to clarify the guidance to be sufficient for actuaries working with models.
2. Generally, yes, but I did suggest some ways that it could be even more flexible.
3. Yes
4. Yes
5. I believe the appropriate guidance for documentation is included in this ASOP, however I believe that consolidating all these places for documentation into 3.6 will make the guidance clear.
6. Yes, the bold font is very helpful and I believe it is sufficient to make clear what is being referenced.

2.3 – Granularity: I have a very difficult time understanding this definition, especially the use of the term "cell", which is not well defined. From a data sense, I would understand a cell as being a unique set of values given by a specified set of predictors, but one could also see a data cell as a unique value that a variable can take. In this sense, the granularity of a variable would be the number of unique values that it takes.

I am also not sure how there can be granularity with assumptions. Is this talking about the degree to which there are separate assumptions for each cell of data? How does one have granular assumptions?

2.4 – Implementation: I suggest that just because I have a model that is an executable form does not imply that one has implemented a model. In my experience, a model is considered

implemented when it is actually being used for a business purpose, not necessarily just in a state that is ready to be used, as the definition would suggest.

2.5 – Input: I have always known model inputs to be the original values that generate the desired values (or model output). Then if the model input changes, there will be a different model output. Usually I would think of data and parameters as inputs, but not assumptions. This is because assumptions generally refer to the structure of the model and thus changing the assumptions would change the whole model and not just the output.

2.7 -- Intended Purpose: I would add "reviewing" to the actuary's role in the second sentence because it is an important part of the model's project. (See overall comments at the end.)

2.9 – Model: I suggest that perhaps the use of "statistical, financial, economic, or mathematical concepts and equations" is limiting the scope of the definition too much. It does not allow for developments in the modeling arena for new ways "to help explain a system". I would agree with Bradley's suggested definition for a model:

> *A representation of relationships among entities using systematic logic, algorithm, and/or mathematical equations. Models are used for a variety of different reasons some of which are: (1) to help explain a system, (2) to study the effects of components, (3) and to derive estimates and guide decisions. In general, a model consists of (1) a specification that describes the input and the relationships among them, (2) an implementation that is achieved through, logic, a set of mathematical formulas and/or algorithms, and (3) a set of outcomes.*

2.10 – Modeling: Add "reviewing" to the list, just as in 2.7.

2.11 – Model Risk: I agree with Bradley's suggested definition due to the limiting nature of this definition: "The risk of adverse consequences and/or decisions as a result of the model not reasonably representing the situation (reality) under study."

2.13 – Neutral: This term does not seem to be clearly defined and does not appear to be consistently used in the ASOP. Its use in 3.4.3 is very confusing. Since "neutral" can refer to so many things, I had a difficult time trying to match the definition with the usage. I would suggest a different term and/or a clearer definition for the word.

2.19 – Specification: I would suggest revising this definition to: "A description of a model that identifies (1) the inputs, and (2) and the formulas, algorithms, or logic to be used to generate the outputs from the given inputs." This keeps the definition broad enough to be flexible, yet specific enough to completely describe what is being named.

3.2 – Model Meeting the Intended Purpose: Please add "review" whenever the list of modeling actions is used as in 2.7 and 2.10.

3.2.3 – Modifying the Model: It would be appropriate to title this "Modifying or Reviewing the Model".

3.2.5 .b: What does grouping mean? I could understand grouping data in different ways, such as binning, but I do not understand grouping parameters or—using the given definition—grouping assumptions. I thought maybe this could also refer to a dimensionality problem (see "Other Concerns").

3.2.5.d: I would suggest moving all sections like this to the section on documentation (3.6), so that it is clear what should be considered or what is necessary in terms of documentation.

3.2.7.e – Documentation: Please see my comment on 3.2.5.d.

3.3 – Mitigation of Model Risk: I would suggest that using multiple models is also an acceptable mitigation method that should be noted.

Other Concerns

Dimensionality: This ASOP does not appear to address the issue of dimensionality. I thought that 2.3 may have been addressing this issue but it is not clearly defined. Generally a large number of covariates in comparison to the number of observations should be avoided. I would suggest mentioning this danger for consideration in 3.2.5 saying: "whether the complexity of the model specification will produce reasonable and reliable results".

Review: I agree with Bradley in that reviewing models is an important part of an actuary's work. Therefore I have included the comments for its inclusion in 2.7, 2.10, 3.2. As a reviewer, it is important that an actuary keep this ASOP in mind to make sure he does not violate this ASOP in any changes, or fails to catch something that is in violation of this ASOP.