Thank you for the opportunity to comment. The Actuarial Opinion Working Group has held several discussions on the topic of predictive models used in reserving. We provide our thoughts below, along with a list of potential questions.

First, some background: Traditional actuarial methods use paid losses and case reserves to estimate IBNR, or “incurred but not reported” reserves. IBNR reserves come in two types: 1) development on open claims (due to the inadequacy of case reserves), also called IBNER, or “incurred but not enough reported,” and 2) reserves for unreported claims, also called pure IBNR or IBNYR (“incurred but not yet reported”).

It is our understanding that the type of model that sparked the referral from FAWG is a case reserving model that uses predictive analytics to establish ultimate case reserves for each open claim based on the specifics of the claim. In theory, when this type of model is used, there is no need for IBNR type 1 as described above, since the model is supposed to establish accurate ultimate case reserves. (There is still a need to establish IBNR type 2, or pure IBNR reserves, via a separate process, since the model establishes reserves for open claims only.)

Regulatory actuaries have not traditionally been involved in an examination of how case reserves are established; rather, actuaries generally focus on the establishment of IBNR reserves via traditional actuarial methods. In fact, on a recent call of the Actuarial Opinion Working Group, no participants had ever performed an in-depth review of such a case reserving model. This was also true on the exam that led to the referral from FAWG: traditional diagnostics such as average claim size and loss ratios suggested that the company’s carried reserves were inadequate, rendering unnecessary an in-depth review of the case reserve model.

That said, the use of predictive analytics in insurance is growing, and regulators are now faced with reviewing a variety of complex models. As a starting point, the Actuarial Opinion Working Group drafted a list of questions that could be used when reviewing any type of predictive model – reserving or otherwise. We feel that it is more important for regulators to evaluate management’s understanding and use of the model, than a deeply technical understanding of the model mechanism itself. Questions that are specific to the model type – case reserving, capital, catastrophe, etc. – could be added to this list as the situation warrants. The Actuarial Opinion Working Group would require outside assistance, either within or outside the regulatory community, to write specific questions that pertain to a case reserving model since, as noted above, none of us have ever reviewed such a model.

1. *What is the intended purpose of the model?*
2. *Who is the intended user of the model?*
3. *Briefly describe the model.*
   1. *Identify the type of model (GLM, neural network, etc.).*
   2. *Identify the inputs.*
   3. *Identify the output(s).*
4. *Who developed the model?* 
   1. *Was the model developed internally or by an external vendor?*
   2. *Briefly describe the modelers’ qualifications.*
5. *Describe the sources of the data used to build the model.*
   1. *For insurance data, describe:* 
      1. *Whether the data is internal, based on industry data, or both*
      2. *The experience years included*
      3. *The companies included, if the data is internal*
   2. *For non-insurance data, identify the source, indicate who owns that data, and describe how insureds can obtain their records and correct any errors.*
6. *Describe any checks performed to verify the reasonableness of the input data.*
7. *How was the model validated?* 
   1. *Was the model tested on hold-out data?*
   2. *Was sensitivity testing performed?*
   3. *How were the formulas, code, etc. checked for accuracy?*
   4. *How did the modelers assess the reasonability of the model output?*
   5. *Submit the most recent validation report, if available.*
8. *Submit the most recent model documentation.*
9. *Describe model governance. Is there a set of procedures and an organizational structure designed to reduce the risk that the model output is not reliably calculated or not utilized as intended?*
10. *Is this a new model or an update to an existing model?*
    1. *If this is a new model, how does its output compare to the previous model or methodology? If there is a significant difference, please provide a discussion of why the company places more confidence in the new model than the previous methodology.*
    2. *How did the actuarial department adjust its data and methods to account for the changes in the model (or the introduction of the new model)?*
    3. *How does management use and understand the model?*

We would like to highlight the central importance of questions 1, 2, and 9, regarding the intended purpose, intended users, and governance of the model. Even though the exam in question involved a sophisticated predictive model, the prime driver of the company’s downfall, as in so many other insolvencies, was management decisions. Management placed outsized reliance on a new and sophisticated model and did not temper their confidence, even in the face of diagnostics that clearly suggested to regulators and consulting actuaries that the new model was producing inadequate reserves.

As a potential alternative or a complement to the questions above, we would suggest that FAWG consider the model questions that are being developed by the Big Data and AI (H) Working Group. These questions are getting a broad review and improvement suggestions from various stakeholders and will have the benefit of being consistent and standardized for use by the various regulator groups.

We welcome your feedback on the questions we provided and on our suggested path forward.