



Article from

The Stepping Stone

March 2019

Issue 71

BUSINESS MANAGEMENT

Adapting Actuarial Practices in the Age of Artificial Intelligence

By April Shen and Mitchell Stephenson

The actuarial profession has been proactive in embracing the age of artificial intelligence (AI). An example of this is the application of predictive analytics for assumption-setting in industries such as health care, property and casualty, and group insurance. Another example is in life insurance, where the use of big data to accelerate underwriting has decreased the time, and automated the manner, in which consumers can purchase insurance. In other lines of business, big data is helping to better model consumer behavior for forecasting and predictive modeling purposes.

While there are many reasons the profession should embrace the capabilities and opportunities that AI presents, it is critical to consider its ethical challenges and implications. Because of their training, requirements of adherence to the Code of Professional Conduct and Actuarial Standards of Practice (ASOPs), and continuing professional development requirements, actuaries are uniquely qualified to address these challenges. They need to participate in, and lead the discussion, about how AI is used and applied, now and into the future.

THE CODE OF PROFESSIONAL CONDUCT

The Code of Professional Conduct applies to members of the five U.S.-based actuarial organizations. Its purpose is to “require Actuaries to adhere to the high standards of conduct, practice, and qualifications of the actuarial profession, thereby supporting the actuarial profession in fulfilling its responsibility to the public.”¹

The code includes sections on professional integrity, qualification standards, and courtesy and cooperation. As stated in Precept 1 of the code, “An Actuary shall act honestly, with integrity and competence, and in a manner to fulfill the profession’s responsibility to the public and to uphold the reputation of the actuarial profession.” This manner of acting will be critical as actuaries work with machines that become more sophisticated, complicated to understand and autonomous in the way that they perform calculations. In addition, Precept 3 states, “An Actuary

shall ensure that Actuarial Services performed by or under the direction of the Actuary satisfy applicable standards of practice.”

This article will relate the Actuarial Standards of Practice to three specific challenges that AI presents:

- complicated models, which are hard to understand and validate,
- communicating results, which are difficult to explain and to interpret, and
- ensuring that data is adequate and reasonable to use to draw conclusions.

THE GOVERNANCE OF MODELS

Model governance addresses complicated models that are hard to understand and validate. Over the past several decades, numerous factors have contributed to the need within the actuarial profession to ensure that adequate testing, documentation and governance occurs around the use of models.

First, the use of personal computers in the workplace means that more people have access to the code used to generate modeled results, as well as to the model itself. Therefore, it is important to have adequate controls and documentation around changes made to those models, their intended use and the limitations associated with using them.

Second, the financial crisis of 2008 resulted in a perception that models were ineffective in producing sufficiently severe outcomes.²

Finally, the use of internal models increased due to the availability of large quantities of data, faster and less expensive computing power, and progressively more sophisticated risk-based insurance regulatory capital requirements.³ These factors have made it more difficult to anticipate and interpret modeled results. This will continue to be true with the increase of AI. Therefore, actuaries must be confident that the calculations are working as intended, so they can spend their time explaining and analyzing the results, rather than worrying about whether the models are working correctly. This is especially true during live reporting periods, when there is precious little time to waste on double checking the accuracy of the models.

There are several ASOPs that place the accountability on the actuary to ensure adequate model governance activities take place around the development, testing and use of models. For example, ASOP 54, Pricing of Life Insurance and Annuity Products,⁴ states, “The actuary should use, or, if appropriate, may rely on others to use, reasonable governance and controls over the actuarial services provided as part of pricing.” The ASOP goes on to give several examples of what type of activities represent reasonable governance and controls.

Another example is the Modeling ASOP, which is still in exposure draft form. The third exposure draft of the ASOP states, “The actuary should use or, if appropriate, rely on others to use appropriate 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.”

ASOP 52, Principle-based Reserves for Life Products Under the NAIC Valuation Manual,⁵ discusses several types of model validation that the actuary should perform to get comfortable with the results of the model.

All these ASOPs are evidence that the actuaries involved in pricing, modeling and valuation activities should ensure adequate model governance activities occur. This helps prepare them to confidently present and use modeled results in the future, even as calculations get more complex and difficult to explain and to analyze.

ACTUARIAL COMMUNICATIONS

As defined in ASOP 41, Actuarial Communications,⁶ an “actuarial communication” is a “written, electronic, or oral communication issued by an actuary with respect to actuarial services.” This ASOP helps to provide actuaries with guidance on communicating complicated modeled results. It states that “the actuary should take appropriate steps to ensure that the form and content of each actuarial communication are appropriate to the particular circumstances.”

It also provides guidance around providing clarity in actuarial communications: “The actuary should take appropriate steps to ensure that each actuarial communication is clear and uses language appropriate to the particular circumstances, considering the intended users.” This guidance is meant to ensure that as actuaries report on complicated model output, they adjust the communication for the intended audience and make it as clear as possible.

The ASOP also provides guidelines around the disclosure of assumptions: “An actuarial communication should identify the party responsible for each material assumption and method.” It specifies that if no such party is identified, the actuary issuing the communication will be assumed to have taken responsibility for the assumption or method. This is especially important when it comes to complicated modeling techniques, simplifications in the model or methods of setting assumptions. By disclosing the responsible parties, the actuary needs to be able to identify all such material assumptions and methodologies, which will help in explaining the key drivers of modeled results.

Finally, there are guidelines in ASOP 41 for issuing an actuarial report, including disclosing uncertainty or risk, any potential conflict of interest and reliance on others. There may be cases in new product pricing where sensitive customer information is used. Per Precept 1 of the Code of Professional Conduct, the



actuary must ensure that the customer and the public—as well as the company—is protected legally and ethically in such cases.

Disclosing potential conflicts of interest is one way that an actuary may address inappropriate use of customer information while issuing actuarial reports. This is also addressed in Precept 9 of the code: “An Actuary shall not disclose to another party any Confidential Information unless authorized to do so by the Principal or required to do so by law.” This may help with prevention of claim fraud in an age where there are many attempts to gain customer information for use in identity theft.

Just as access to data is becoming more prevalent for use in actuarial modeling, consumers’ ability to purchase products online is growing. Although there are still some obstacles for customers to directly buy car insurance online,⁷ it’s not hard to imagine a future where consumers will be empowered to purchase virtually all forms of insurance on the internet and could potentially do so through voice technology.

Such consumer interactions will require tremendous efforts, not only in the pricing and underwriting of automated actuarial tables but also in the communication and disclosure of the terms and conditions of the insurance contract. With the possibility of more direct sales of insurance products like life insurance in the future, ASOP 41 will continue to provide actuaries with guidance for adequate disclosure and communication for the

intended audience, as well as to protect a company’s reputation and address legal concerns.

DATA QUALITY

As larger quantities of data become more available for use in actuarial models, and the modeling capabilities increase to handle more data in the calculation routines, it will become increasingly important to ensure that data is adequate and reasonable to use to draw conclusions. The old phrase “garbage in, garbage out” applies to actuarial, as well as to other, types of models. The scope of ASOP 23, Data Quality,⁸ is to provide “guidance to actuaries when selecting data, performing a review of data, using data, or relying on data supplied by others, in performing actuarial services.”

This is relevant for use of data in valuation and reporting models, as well as in pricing models. As direct marketing becomes more prevalent, and large quantities of data are used to price new products like life insurance in an automated fashion, the data used must be of adequate quality to ensure pricing accuracy. ASOP 23 provides guidance for actuaries in the selection of data, including whether it is appropriate, reasonable and sufficient. It also provides guidance on the review of data, including disclosing any reasons why it may not be necessary to review the data, in the actuary’s judgment.

One area where data quality will be critical in the future is the use of individualized data in pricing, and in the setting of, renewal rates. Specific data on drivers, for example, can be skewed if individuals other than the primary driver are behind the wheel of the insured car. Data collected from Fitbits or other activity-tracking devices may be misinterpreted if not fully understood and analyzed. For example, customers could attach the device to a pet, or a ceiling fan, giving the impression that more activity has occurred than really did.

In a 2016 study, State Farm challenged individuals to identify if car dashboard cameras captured photos of distracted drivers. The insurance company collected this data to interpret distracted driver behavior, which is the cause of one in five car accidents.⁹ Such data is useful in pricing insurance products but can be subject to misinterpretation and needs to be vetted and understood.

ASOP 23 challenges actuaries to ensure that the data used in actuarial services is not only appropriate but is also of sufficient quality with which to perform analysis. This ASOP will help in addressing such challenges in collecting, and using, individualized data in the future.

WHAT’S NEXT?

As the actuarial profession strives to compete with other fields such as data science, these professional standards can provide actuaries an advantage, as each actuary is accountable for

applying the Code of Professional Conduct and the ASOPs to his or her daily work. ASOPs like those referenced here will give actuaries relevant guidance as the capabilities of AI increase.

With the use of more sophisticated models, modeling techniques and increased automation of the modeling process, individuals practicing as model developers, testers and users will need to apply a high degree of skill and care to ensure models are working as expected and are appropriate for their intended use. There is no better place that sets the expectations of actuaries and how they should perform their work in the future than Annotation 1-1 of Precept 1 of the code: “An Actuary shall perform Actuarial Services with skill and care.” ■



April Shen, FSA, CERA, MAAA, is an actuary at Venerable Annuity, in West Chester, Pennsylvania. She can be reached at april.shen@venerableannuity.com.



Mitchell Stephenson, FSA, MAAA, is chairperson of the Leadership & Development Section Council and can be reached at mitchell.stephenson@prudential.com.

ENDNOTES

- 1 Code of Professional Conduct. Society of Actuaries. Jan. 1, 2001. <https://www.soa.org/about/governance/about-code-of-professional-conduct/>.
- 2 North American CRO Council. 2012. Model Validation Principles Applied to Risk and Capital Models in the Insurance Industry. http://cro council.org/images/CRO_Council_-_Model_Validation_Principles.pdf.
- 3 International Actuarial Association. 2010. Note on the Use of Internal Models for Risk and Capital Management Purposes by Insurers. https://www.actuaries.org/CTTEES_SOLV/Documents/Internal_Models_EN.pdf.
- 4 Actuarial Standards Board. Actuarial Standard of Practice No. 54, Pricing of Life Insurance and Annuity Products. Dec. 1, 2018. <http://www.actuarialstandardsboard.org/asops/pricing-of-life-insurance-and-annuity-products/>.
- 5 Actuarial Standards Board. Actuarial Standard of Practice No. 52, Principle-based Reserves for Life Products Under the NAIC Valuation Manual. Dec. 31, 2017. <http://www.actuarialstandardsboard.org/asops/principle-based-reserves-life-products-naic-valuation-manual/>.
- 6 Actuarial Standards Board. Actuarial Standard of Practice No. 41, Actuarial Communications. May 1, 2011. <http://www.actuarialstandardsboard.org/asops/actuarial-communications/>.
- 7 Friedman, Nicole. Want to shop for car insurance online? Prepare for a bumpy ride. *The Wall Street Journal Markets | Your Money*, Nov. 24, 2018, <https://www.wsj.com/articles/want-to-shop-for-car-insurance-online-prepare-for-a-bumpy-ride-1543035701>.
- 8 Actuarial Standards Board. Actuarial Standard of Practice No. 23, Data Quality. April 30, 2017. <http://www.actuarialstandardsboard.org/asops/data-quality/>.
- 9 State Farm Distracted Driver Detection, <https://www.kaggle.com/c/state-farm-distracted-driver-detection> (accessed Jan. 8, 2019).