Modeling to Code

IN MARCH, I PARTICIPATED ON A PANEL on professionalism in predictive modeling at the Casualty Actuarial Society's (CAS) Ratemaking and Product Management Seminar. Since working with predictive modeling has not been an area of focus for me in my professional career, I accepted the invitation thinking it would be a good learning experience.

With two other actuaries on the panel who both were experts in the field, my role was to focus on professionalism issues, specifically which standards and principles are applicable to predictive modeling. I looked forward to the seminar discussion because the Actuarial Board for Counseling and Discipline (ABCD) has seen few requests for guidance in this area.

Since the use of predictive modeling in actuarial work has grown exponentially over the past 10 years, a number of the seminar's sessions were devoted to the topic. The multivariate analysis and generalized linear modeling, data mining, and price optimization have become standard tools in many lines of property/casualty insurance. Their use in personal lines of insurance is widespread, and they increasingly are being adapted for use in commercial lines, including workers' compensation. An article in the May/June issue of *Contingencies*, "Workers' Comp Predictive Modeling Comes of Age (And Not a Minute Too Soon)," cites a Towers Watson survey indicating that 85 percent of personal lines insurers who responded to the survey currently were using predictive modeling in pricing and underwriting. The survey also found that 70 percent of commercial lines insurers currently use or plan to use predictive modeling in the next two years. More and more companies are making use of these methodologies to improve their insurance products, risk selection, and, ultimately, their profitability.

Available Guidance
Given the widespread use of predictive modeling, what issues or concerns are there for practitioners who rely on these methodologies to price, underwrite, and market their products? While there is no specific Actuarial Standard of Practice (ASOP) that applies to predictive modeling, guidance is available. There are a number of standards and actuarial principles that deal with aspects of the predictive modeling process. Professionals doing this type of work rely on them. But because of the lack of a specific standard, some professional judgment is required to interpret the standards that do apply and ensure that you are complying with their intent.

For the most part, the standards and principles weren't written with predictive models and price optimization in mind. Instead, they focused on more traditional ratemaking approaches. But because the standards intentionally aren't prescriptive, they can be interpreted to provide guidance in situations like this when the technological advances in actuarial science move ahead of the standard development process.

Precept 3 of the Code of Professional Conduct states, "An actuary shall ensure that Actuarial Services performed by or under the direction of the Actuary satisfy applicable standards of practice." As a practitioner in the predictive modeling arena and a code-compliant professional, you need to consider which standards apply. The consensus of our seminar panel was that actuaries need to consider, among others, the following standards:

- ASOP No. 12, *Risk Classification (for all Practice Areas)*;
- ASOP No. 23, *Data Quality*;
- ASOP No. 25, *Credibility Procedures* Applicable to Accident and Health, Group Term Life, and Property/Casualty Coverages;
- ASOP No. 41, *Actuarial Communications*.

The CAS *Statement of Principles Regarding Ratemaking* and the Academy's monograph *On Risk Classification* also apply.

Practical Applications
As with most actuarial analyses, the predictive modeling process begins with the data set you intend to use. The data need to be as accurate as possible (ASOP No. 23) and credible enough to be relied upon for the intended use (ASOP No. 25). ASOP No. 23 provides guidance on the selection of data, review of the data for defects and comprehensiveness, and use of the data. Section 3.5 requires the actuary to review the data for reasonableness and consistency "whether the actuary prepared the data or received the

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data from others...." This aspect is particularly important when third-party or noninsurance data, such as credit scores or building price indices, are used as part of the modeling process. In many cases, professional judgment will be required to adjust or modify the data appropriately, and guidance is provided in Section 3.7. ASOP No. 25 similarly provides guidance to practitioners with selection of a credibility procedure and the assignment of credibility values to sets of data. Credibility, or the measure of the predictive value in a given application that the actuary attaches to a particular data set, is a critical consideration in modeling. Section 3.5 provides guidance on homogeneity of the data, another key aspect of the analysis.

ASOP No. 12 and the risk classification monograph provide guidance to actuaries when designing, reviewing, or changing risk classification systems. The standard discusses the use of statistical considerations—homogeneity, credibility, and predictive stability—that are somewhat conflicting. For example, increasing the number of classes may improve homogeneity, but at the expense of credibility. As a consequence, there's no single statistically correct risk classification system, and the use of actuarial judgment comes into play. The standard covers a number of other key areas, including the use of judgment, adverse selection, and consideration of the reasonableness of the results. The actuary must consider the consistency of the patterns of rates, values, or factors among risk classes and, in the end, ask whether they make sense.

After all the analysis is completed, the modeling processes for both internal and external audiences must be documented. Here again, guidance can be found in the standards—in this case, ASOP No. 41, *Actuarial Communications*. Although there aren't specific references to documentation for modeling, and company practices will vary, the standard makes it clear that an actuary must adequately document his or her work. For external audiences (primarily state regulators who review rate filings), the level and amount of detail required can vary depending on the line of business and the state. From discussions with several regulators, it appears that this is an area that continues to evolve (and in which some improvement may be needed).

The challenge in designing and developing a classification plan is determining an appropriate rate for each risk. With predictive modeling, insurers can look at traditional factors in new ways, add noninsurance factors, and determine the degree to which factors should be considered in developing detailed market-segmentation opportunities. Additional data segmentation and analysis can help uncover areas of mispricing as well as identify classes eligible for more competitive pricing. Use of these tools can mean additional profitability for insurers and fairer pricing for consumers. And, with appropriate consideration of the standards that cover these types of analyses, actuaries can meet their professional requirements while serving their principals and the public.　　□

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