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Predictive Modeling

by Barry Senensky

Recently I attended the 4th annual conference on predictive modeling for property and casualty insurers. There were approximately 300 casualty actuaries in attendance. Many, to my surprise, were experienced predictive modelers, eagerly looking for new ideas to enhance and expand their capabilities. From being used by almost no one six years ago, I learned, predictive modeling is now being used for pricing by many property and casualty companies.

Yet in the life insurance industry, almost no one uses it. Why?

Further discussions with my P&C colleagues revealed that there had been a critical catalyst, only a few years ago. The catalyst was an innovative P&C firm, who discovered that an individual's credit score was highly predictive of their likelihood for filing an automobile claim.

They discovered this by experimenting with predictive modeling.

Incorporating credit scores into their underwriting and pricing of automobile insurance immediately, measurably, and visibly increased this firm's profitability. They had an instant, significant advantage over their competitors. Of course, their advantage did not last long. Other P&C insurers leapt to incorporate predictive modeling in their pricing—eager to re-level the playing field.

After the conference I began to wonder why life insurers—specifically life insurance actuaries—have yet to take to predictive modeling with the same vigor as their P&C counterparts. I thought back to when I had begun my own predictive modeling company ...

In 2001, along with another actuary, Jonathan Polon, I started Claim Analytics, a company dedicated to bringing modern predictive modeling to the life insurance industry.

To us, the time seemed ripe. Predictive modeling had been successfully used for years, in an ever-widening range of industries. The ability of modern computing to crunch massive amounts of data had radically changed analytical methodology. The traditional methods of statistics, constrained by the fact that they were developed in the days when all computations had to be done by hand, were beginning to look limited—maybe even dated.

What exactly is predictive modeling? Where better to find a definition than Google, which itself is powered by predictive models:

*"Predictive modeling is a process used in predictive analytics to create a statistical model of future behavior. Predictive analytics is the area of data mining concerned with **forecasting probabilities and trends**. A predictive model is made up of a number of predictors, variable factors that are likely to influence future behavior of results. In marketing, for example, a customer's gender, age and purchase history might predict the likelihood of a future sale.*

To create a predictive model, data is collected for the relevant predictors, a statistical model is formulated, predictions are made, and the model is validated. The model may employ a simple linear equation or a complex neural network or genetic algorithm."

Jonathan, an actuary who had followed a non-traditional career path, had worked in the credit

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card industry building predictive models. I had many years experience working in the life insurance industry doing a range of traditional actuarial work. We thought we had an ideal fit for a new company, building predictive models. We would take the life insurance industry by storm.

That was seven years ago. We now have clients throughout North America. Our flagship product, a predictive model that “scores” disability claims on the likelihood of recovery in a given timeframe, has produced terrific results. We have built predictive models for pricing, reserving, and fraud detection, all of which have been received extremely favorably by our clients.

Yet, while we are very pleased by our progress, we wonder why predictive modeling hasn’t “rocked” the industry. Why isn’t every life insurance company using predictive modeling?

Predictive models are everywhere! Financial

institutions use them to determine your credit score when you want a loan; the post office uses them to decipher your handwriting; meteorologists use them to predict weather; retailers use them to decide what to put on their shelves; marketers use them to improve their products; concessionaires use them to figure out how many hot dogs they need for the “big game.” They are even used by sports teams to pick player personnel.

Is it just chance that the P&C actuaries found predictive modeling first? Is it inevitable that life insurance actuaries will soon starting using it? Or is there something fundamentally different in the two businesses that makes predictive modeling a fit for P&C insurance, but not for life?

On reflection I came up with a greater understanding of how life actuaries operate. And why they have been reluctant to adopt predictive modeling.

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Actuaries are trained in mathematical techniques developed by mathematicians and statisticians. Predictive modeling, which was born in the realm of computer science, is not part of an actuary's natural toolkit.

Take the example of a mortality study. Life actuaries will use the tools and techniques they learned studying for actuarial exams. They are unlikely to use a new predictive modeling technique such as "Boosted Trees," even though the new technique may produce a better result.

Predictive modeling, by contrast, was developed by computer scientists, schooled in the methods of if/then/loop analysis and massive data-crunching. The methods of analysis they have developed, rather than using elegant complex mathematical shorthand to reveal trends, are, in concept, more primitive. These methods look at every bit of data, using the brute-force power of modern computing.

The insight yielded by predictive modeling are impressive and daily more respected. Yet the method is foreign to the classically-trained actuary.

Still—this was at one point true of the P&C industry. But then came the catalyst, the one innovative firm that used predictive modeling. The visibly profit-generating discovery they came up with made all the difference.


It put me in mind of the early 1980s, when some bright spark came up with the idea of offering lower life insurance rates to non-smokers than smokers. The benefits were

immediate. Life insurance actuaries adjusted their approach almost overnight.

So what will the future bring?

It is only a matter of time before life actuaries make predictive modeling tools (generalized linear models, neural networks, genetic algorithms, classification and regression trees, etc.) best practice for pricing, underwriting, experience studies, underwriting and many other applications. These new tools are just too powerful to stay on the shelf forever. Life insurance will come around to predictive modeling, as have other industries dealing with statistics and prediction.

Will there be the one sudden catalyst, as there was for P&C Insurance? Or will there be a steady increase over time—more like a snowball effect—as life actuaries gradually discover the advantages of predictive modeling?

I don't know. But I am confident that the change will come. And my advice to ambitious actuaries is, find out as much as you can about predictive modeling. You might find it comes in handy—over time, or immediately. 

Claim Analytics and the SOA are co-sponsors of a seminar on predictive modeling that will be held Nov. 10-11, 2008 at the Crowne Plaza Chicago O'Hare, Chicago, Ill. This two-day introductory course offers life actuaries a practical, working understanding of predictive modeling tools. Beginning with a discussion of data considerations, the course next provides a review of leading techniques—Neural Networks, General Linear Models, CART, and others. Visit www.soa.org for more information.