SOCIETY OF ACTUARIES

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Letter From The President

BROADER ROLES FOR ACTUARIES

BY MIKE MCLAUGHLIN

WITH THIS BEING my first column of the New Year, I thought it would be a good time to take a look at opportunities for the members of our profession.

Actuarial skills and methods have been underutilized in the business world, and there are many new areas in which we can use our knowledge. In the last issue, I discussed the changes taking place in the traditional markets we serve. These changes are making it even more important to look at new areas of growth—or opportunity—for actuaries. In this article, I'll give examples of the kinds of work opportunities that are out there, and then I'll cover the kinds of skills we need to be successful in new areas.

AN ACTUARIAL CONTRACT

Let me give you an example of a complicated contract in which a price is needed:

These contracts are sold individually, but they number in the thousands. Sales are made over the Internet, or face-to-face with the customer in an office. Either way, the contracts carry a high acquisition cost made up of sales commission, new business/administration department expenses, and costs of third parties.

The acquisition cost is recovered out of recurring monthly charges. The contracts are profitable, so we don't want to report a loss at issue—instead, we'll hold an intangible asset, which amortizes over time. The contract typically runs several years, so we have to consider the time value of money. The contract may end prematurely before running its full term, due to mortality or lapsation, so we have to consider multiple decrements. The customer may voluntarily terminate the contract, in which case we assess a surrender charge.

Several different plans are offered, with longer or shorter terms. Optional extras can be added to the plan, such as insurance, at extra cost. Additional family members may be included. If multiple features are added, we would give a volume discount. Many contracts include price guarantees for a period of time, after which repricing may occur. And of course the price is subject to competitive pressures!

The monthly fee recoups acquisition costs, and pays administrative expenses, taxes and the cost of capital, over time. Interest rates are unpredictable, so hedging may be necessary. Sound complicated? Sound like an actuary would be needed to price and reserve for such a contract? Absolutely! But this is not an insurance contract. This is a typical cell phone contract. It carries many of the same complexities that affect insurance contracts—if not more! Telecommunication and technology companies that serve customers directly, such as cable TV companies and Internet service providers, all need actuarial skills, knowledge that our profession already has. Technology companies are also notoriously capital intensive—could actuaries play a role in forecasting, modeling and capital management there?

In a few countries—Australia and Mexico come to mind—actuaries are already working in technology companies. One colleague of mine served a major telecommunications company in Australia, working on new product development, pricing, analyzing churn patterns, understanding multi-product customer behavior, bundled offer pricing, customer profitability studies, comparative distribution channel economics, cost allocation and business cases for major expenditures. Why don't actuaries do this in North America!?

CUSTOMER VALUE STUDIES

Picking up from the technology example above, many industries serve customers directly, with long-term relationships—insurers, banks, telecommunications, utilities, even the government. Customers sign on, sign off, need services, pay recurring fees, and behave in complex ways, some rational and some not. In serving these customers, most businesses use some level of analytics, and the techniques used can be rudimentary, compared to actuarial methods.

Actuaries use embedded value (EV) methods (or derivatives of EV methods) to determine company value. In this simplified example of

an actuarial appraisal approach (see Chart 1), enterprise value is shown as the horizontal dotted line. It is composed of capital and surplus, plus the value of customers. In this model, the value of customers has been allocated to individual customers, based on the profitability of the contracts they own, or are likely to purchase. Customers paying a higher price, or with low-risk characteristics, will contribute relatively more value. Individual customers are then ranked in descending profitability order, and plotted horizontally.

Customers who contribute larger profits cause the curve to increase rapidly at first. Customers who contribute little profit cause the curve to increase more slowly, and then level out. Customers who contribute to losses, those toward the right-hand side of the curve, actually destroy enterprise value. This kind of analysis points the way to better underwriting, more accurate pricing or increased fees for services to the least valuable customers. The banking industry uses similar methods, for example, to assess high charges for bounced checks, such that fees are directed at customers who would otherwise diminish profitability. This is a good example of how actuarial techniques could be used to better serve these industries and their customers.

A MORTALITY STUDY—AT A GAS UTILITY

Some years back, I worked on a project for a major gas utility. They had installed thousands of pieces of equipment underground—pipes, joints, valves, switches, meters and more. They were seeking a rate adjustment, and needed to calculate the average lifetime of the various pieces of equipment. Depreciation costs were a major component of the utility rate.

The company had written records of every piece of equipment installed, going back to 1902. The records were legible and accurate. The records showed a code for each type of equipment, the date installed, and the date removed from service, if it had been removed. My team performed a classic mortality study. The date of installation was the "date of birth" and the date removed from service was "death."

The data was very well behaved, and the results were smooth and credible. The lx function curve was typical of mortality curves—relatively rapid decline early on, with relatively high defect rates initially. Then in the middle years the curve leveled out. Finally, in later years, the curve became steep again, as mortality rates rose to high levels. We determined the average lifetime of one of the main pipe sizes as 54 years.

The alternative approach to determination of average lifetime was an engineering method. Labeled the "rust pit depth" method, the method involved excavating a hole in the ground, measuring the depth of rust pits on the pipe or valve in question, and extrapolating as to how long before it would need to be replaced.

In this particular actuarial study, the client company did not like the results, because it had estimated the average lifetime as 33 years. Our results meant lower depreciation costs than estimated, hence less justification for an increase in utility rates! But our results were highly credible. This is a classic application of actuarial methods, and it seems to me this would have wide application in manufacturing or certain other industries.

Mike McLaughlin

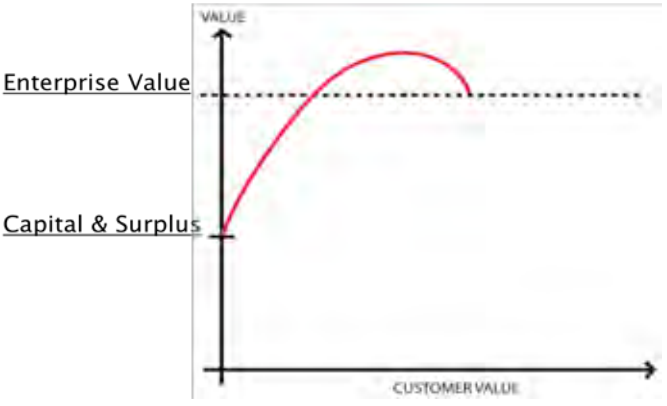
PREDICTIVE MODELING

Actuarial training includes statistical methods, and almost all actuaries are very capable of multiple regression analysis. This tool identifies correlations between the variables affecting an outcome. Now more commonly called predictive modeling, there are many applications in insurance.

For example, P&C actuaries use predictive modeling for underwriting purposes, to better match the actuarially sound rate with corresponding acceptable risk parameters on both commercial and personal risks. For example, classification ratemaking in auto insurance has extended not only to causal risk parameters such as the driving record of the insured, but also to perceived non-causal relationships, such as the insured's credit score. In this case, predictive modeling has signaled significant correlations with an insured's credit score and an insured's propensity to be in an accident.

In addition, P&C actuaries are also using predictive modeling tools to aid in claim settlement purposes. By looking at prior claim history and considering many factors,

Chart 1



certain claims can be classified as being more or less complex, more or less likely to be fraudulent, or more or less uncertain as far as ultimate settlement is concerned. Using these tools, claims can be more appropriately managed. Some claims may be assigned to an expedited process, while the relatively few, more difficult claims would be assigned for detailed review. As such, predictive modeling not only enhances the effectiveness of committing the appropriate resources to the claim adjudication process, but also enhances the traditional actuarial role in loss reserving accuracy.

Similar techniques are now being applied in life insurance. Of course, life insurance has much lower claim frequency than, say, auto or homeowner's insurance! But there are many underwriting risks that are amenable to predictive modeling techniques. Predictive modeling is also used for marketing and customer retention purposes.

As an example, an engagement team compared traditional underwriting risk classification to a predictive modeling technique. The predictive modeling approach used company-provided basic demographic information (name, address, no social security number, no medical information) for several thousand customers. This first step was to amass as much data as was available on these individuals. The engagement team then matched the basic identifying information as provided to external data sources. The sources were publicly available for a very small fee, when purchased in quantity. The sources included public records on property ownership, driving record, credit history and purchasing patterns. Lifestyle patterns were identified from small-area (e.g., zip code) characteristics. Income, investments, net worth, employer, occupation and level of education could all be derived from the external sources. Any such match of external data, of course, contains inaccuracies or incomplete data points. However, the number of actual and derived data points number in the several-hundreds. With that much data, reliable trends could be found.

In the second step the engagement team ran the analysis and classified customers into 10 groups, or deciles, of increasing risk. The customers were also classified into 10 groups in accordance with full medical underwriting, in which the client company had access to medical history, family history, medical (or paramedical) examination, build, body fluids, telephone interview and treadmill tests.

The similarity of the classification was remarkable. Most contracts were classified in the same decile. Very few were classified more than one decile differently. The disparity in cost was equally remarkable! After initial setup, the cost of additional analysis was marginal. The predictive modeling technique allowed simplified underwriting at low cost and high speed, with few data inputs, to be applied to the top six deciles. Full individual medical underwriting was used where the models indicated lowest four-decile ranking.

ENTERPRISE RISK MANAGEMENT

♫ Actuaries and ERM, ♫ actuaries and ERM, ♫ go together like a horse and carriage. Well, maybe I'm not a songwriter, and it definitely doesn't rhyme, but it's true. Actuaries have managed risks for years, including risks such as mortality, morbidity, property/casualty and changing interest rates. Our risk management resume is pretty impressive. In the midst of the greatest financial crisis in decades, few insurance companies have failed thanks to conservative regulation and generally good risk management.

Actuarial risk management over the years has quantified risk, mitigated it and exploited it by charging a premium over the cost of the risk and expenses. As actuaries we estimate and hold capital in proportion to the risk exposure, gradually reducing capital over time as we are released from risk. Now, with ERM, we're looking at a wider range of risks, and looking at risks in totality. ERM is a logical extension of time-tested actuarial methods. It's a great opportunity to extend the reach of our profession outside the traditional areas of pensions and insurance.

WHERE ELSE CAN WE USE OUR SKILLS?

There are many other areas in which we can use our actuarial skills. Actuaries have expertise in expense analysis. We might make great sports statistics analysts. Airline ticket pricing structure is very complex—could actuaries optimize the process? Where did operations research go?

I know of a few pioneering actuaries who have broken through the fences and are grazing in fresh pastures. This magazine has featured several pioneers in our profession, such as Laura Bennett, FSA, who is CEO and founder of Embrace Pet Insurance. Rudy Karsan, FSA, developed software to help companies retain valued employees. Another actuary, David Braun, FSA, manages $14 billion of funds for insurers.

Our profession does not yet have much practical experience outside of insurance and pensions. But with more knowledge and experience in different industries, we could apply our existing technical skills much more broadly. I'm convinced that there are huge opportunities here. What opportunities do you see for our profession? I invite you to share your ideas at *membercomms@soa.org*.

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