



The Forecaster

Model Behavior: Managing Your Modeling Risks



Darin Zimmerman,
FSA, MAAA
*Senior Vice President and
Chief Actuary*



Donna Claire,
FSA, MAAA, CERA, CLU,
ChFC, FLMI
*Owner,
Claire Thinking, Inc.*

The recent financial crisis demonstrated that sophisticated computer models are no substitute for sound judgment. As the life industry begins its recovery, companies and regulators alike are reconsidering the complex tools on which our business now depends and how to improve our collective skill at using them.

Darin Zimmerman, Senior Vice President and Chief Actuary, discusses the near-term future of modeling with Donna Claire, president of Claire Thinking, Inc., a consulting firm which specializes in risk management and regulatory issues.

Donna is the Chair of the Risk Management and Financial Soundness Committee of the Life Practice Council – also known as the PBA steering committee – and is currently involved in the major effort to develop a principles-based approach to reserves and capital requirements for life insurers. Previously, she had served as Vice President of the American Academy of Actuaries and as Vice President of the Society of Actuaries. She is the winner of the 2005 Jarvis Farley Award for volunteer service to the Academy.

Darin Zimmerman: A minimal essential of any regulatory regime – whether it is a rules-based or a principles-based approach (PBA) – is that your actuaries are performing in an ethical and competent manner. But there are still issues of unintentional errors – misunderstandings about the limitations of modeling. For example, many people think that the financial crisis was caused by an over-reliance on poorly understood models related to the diversification benefit among mortgage pools. Having said that, is this really the best time to be moving toward PBA, a models-based system for capital and reserves?

Donna Claire: I think it's the right time and a lot of regulators are on the same page. They want to know the risks and they want to make sure that you understand the models that you are using. PBA lets you look at the value of financial options on both the asset and the liability sides of the company. It can give you the ability to say what the risks are and what happens, say, if the stock market crashes at the same time as the bond market becomes totally illiquid.

Some models work less than perfectly. They might be accurate to 12 decimal places looking at just one aspect of the economy but miss the big picture. Ultimately it's the person – the manager or the actuary – who needs to make sure that they understand both the capabilities and the limitations of their models. The bottom line is you can't blame a model that burns you any more than you can blame a hammer that hits your finger; if you misuse the tool, it's your responsibility.

DZ: If we agree that models are the better way to go, how can the industry better manage the complexity of the models?

DC: Companies should start simple and work their way up the complexity ladder in order to fully understand the inputs and outputs of the models. Our Annuity Reserve Working Group once tested five of the major commercial modeling packages. We started with a simple single premium deferred annuity and calibrated it against investment grade bonds. To the surprise of a number of people, each of the five models, given the same

information, gave a different answer.

Next, we did exactly what a company and specifically the actuaries should do – dig down and try to understand the models and how they work. To do this, you really should look at the model as a layering tool. Make sure you understand one variable, say, interest rates, and then add something else on top of it. If you don't start simple and work your way up, you won't be sure that the model is handling all that complexity effectively.

In our test, it turned out that simple things drove the differences, such as running lapse first instead of mortality, or running the calculations as of mid-month instead of month-end. Each modeling program handles data and composes equations differently, producing incremental differences that add up when applied to large volumes of policies over time.

Companies need to be aware of this, not just for the sake of procedural controls but to effectively manage risk. Actuaries cannot give up the use of their knowledge and professional judgment and allow models to take over thinking.

An advantage today is the number of actuarial students with experience working with large complex models. They can actually check their work on side models on separate programs and compare the results to show that they make sense.

DZ: Are regulators fully aware of the challenges of a model-based environment?

DC: Actuarial regulators are getting involved in modeling issues, joining some of our task forces, looking at different modeling techniques and how to validate models. At least this group understands the problem and the need to make sure insurance companies do the right thing.

DZ: What level of redundancy is required as a prudent control?

DC: If you are introducing a new model or adding new products then some redundancy – perhaps with the use of another model or even a spreadsheet – is good. However, my goal is that a company ultimately would move to a single modeling

system with the most robust set of assumptions possible for pricing, valuation and other business uses. Modeling has to be more than just a regulatory exercise.

The New York State Insurance Department requires that reserves for a set of policies be demonstrated from first principles, i.e., from policy level data. This is not a welcomed exercise, but it is an excellent way for companies to show that they understand how their models work.

It would be easy enough to get an actuarial student to set up a spreadsheet and test some calculations on a sample of policies. That way you could make sure that your model produced the expected results.

These are very complex modeling applications with a lot of options. You need to make sure all those on/off buttons are set the way you want them. Recreating calculations on a handful of policies is a reasonable and prudent control that New York has come up with.

DZ: How far into the details can a CEO be expected to get?

DC: I don't think senior managers should concern themselves with the technical details of every lapse formula. However, the CEO should understand the modeling and all of the important assumptions being made. Executives should maintain more of a big picture focus. In particular, management should look at and understand the tail risks, those events with the potential to wipe out the surplus of a company. They need to ask themselves: What are the extreme conditions? What is the probability of getting there? What options are available to mitigate these extreme scenarios?

DZ: The financial crisis was an exceptional tail event. Is PBA more or less valuable today than it was last year?

DC: I would say more valuable because PBA (and C-3 Phase II, which is related) at least gives you a chance to anticipate market crashes as tail events. The equity generators that I use will typically generate outlier scenarios close to what actually happened. Last year's financial crisis taught us to really

pay close attention to those tail risks.

Under PBA each company must calculate its particular risks and set up appropriate reserves and capital. If you are managing your risks properly, you won't have to set up as much reserves as the guy down the street who invested heavily in real estate assets and did not cover his tail risks properly. In a PBA regime there is greater transparency; management and regulators will notice quickly if there is a need for remedies.

DZ: A book on behavioral economics titled *Predictably Irrational* addresses the irrationality embedded in economic decisions; for example, the phenomenon in which people predict the frequency of an event based on how easily they can recall a similar event. Is this a potential concern for modelers?

DC: That is one of the advantages of keeping old people like us around! When I was an actuarial student at New York Life in the late 1970s, interest rates were 15-20 percent and people were saying that rates would never go below nine percent. The chief actuary heard this talk and told the staff that interest rates were down around two and three percent right after World War II. He told them that some reserves needed to be set aside so that the company would not go insolvent in case interest rates did fall so low.

DZ: How has cash flow testing influenced the move toward PBA?

DC: Cash flow testing introduced the scenario approach, which demands greater discipline and more systematic risk analysis. Back in 1983, we came up with the seven basic interest rate scenarios now known as the New York 7 (NY7). It was computer-driven but actuarial judgment played a role. For example, you could have negative surplus under one scenario but feel that the scenario – let's say an immediate 300 basis point drop – was so extreme that it could be discounted.

Now we have better computers, better models and an awareness that even certain unreasonable things may happen. We have gone from running seven to running 1,000 interest rate scenarios. Our approach is more systematic as well; all scenarios are recognized. Even the 98-99 percent severe

loss scenario, which can be worse than the 300bp drop under NY7, are factored into the total reserve because there is a small chance that they might happen. By including all scenarios modeling has improved the reserving level as opposed to basing it on the level interest rate scenario with a pad.

DZ: Are actuaries in for a rude awakening when the reality of PBA hits? How is the assumption-setting process going to change?

DC: PBA will require that companies be more disciplined, but it is similar to what actuaries are doing already for cash flow testing. There will be more guidelines as to what assumptions are used. On mortality you will have to justify more strongly what tables or factors you use. For lapse rates, you will have to either have credible experience of your own or use industry experience. Currently a number of companies use pricing experience for determining capital adequacy, though many choose not to use it.

I don't think PBA will be a major jolt to the system for companies that are doing a good job on capital adequacy testing. But reserving decisions will be escalated; management will have to get more involved, and have an understanding of the assumptions. And the industry is doing a lot more analysis of risk, models and model validations to develop standards that will be the benchmark that companies will have to use.

These efforts could support a renaissance in the actuarial field, where our science steps forward as we look at new products and assess new approaches. We are seeing behavioral sciences used, for example, in assessing changes of lapse behavior in certain environments to develop actuarial assumptions. The bottom line is that a lot will be similar to what they are doing already but there will be a lot more science behind it.

DZ: Which risk measure do you prefer - conditional tail expectation (CTE) or value at risk (VAR)?

DC: I don't have a strong opinion.

Personally I like CTE because you are looking at certain scenarios and taking a longer-term view of your risks. Some VAR critics believe that a big flaw is the inability to anticipate extreme scenarios.

DZ: Much of the talk about complexity and stochastic models is related to interest rates, equities and the economic scenario but not so much around mortality and lapse and other types of policyholder behavior options. What's on the horizon?

DC: We have begun to discuss stochastic modeling of mortality with the regulators. When you set up your reserving, you base it on the level of your assumed mortality. However, there is always some variation in the actual experience, especially for preferred risk products where one company's selection criteria may be less stringent than those of its competitor. Under PBA there will be some standardization of risk bands. Other things can drive stochastic variation in experience, such as geographic concentration of risk for companies doing most of their business in certain areas.

Our Preferred Mortality Committee is debating a number of key questions related to stochastic modeling: Are there enough statistics for the modeling? Should we be focusing on specific causes of mortality? Will there be cures for diseases such as cancer and heart disease? On the other side we are asking: What impact will the obesity epidemic have on mortality? What if people stop exercising? The overarching question is: Are current forecasts of mortality improvement justified?

DZ: What else besides mortality will move to stochastic modeling under PBA?

DC: Premium modeling for some products, such as universal life (UL), could move to a stochastic basis someday but for now we are suggesting deterministic modeling of UL premiums. When you have a product where you don't have to pay premiums in the future, how much do you assume when you are setting up the reserves? You want to balance the complexities and sophistication of the model with the amount of knowledge you have.

One major investment bank did a study on stochastic modeling of single premium deferred annuities where they ran 100 different scenarios, but the lowest interest rate on the models was nine percent. So, it doesn't help to go stochastic if your underlying assumptions are incorrect, if your information is incomplete, or if you are just going stochastic to make it look like your model is doing more than it really is.

This interview was edited for length. To read the full interview please visit our website at www.TransamericaReinsurance.com/modelingrisk.



Visit our web site at www.TransamericaReinsurance.com

Main Marketing Office
Transamerica Square
401 North Tryon Street
Charlotte, North Carolina 28202
704.344.2700

Asia Pacific Head Office
58/F One Island East
18 Westlands Road
Island East, Hong Kong
852.2877.6222

Latin America Head Office
Transamerica Square
401 North Tryon Street
Charlotte, North Carolina 28202
704.344.2700

Europe Head Office
7 Place de la Defense
92974 Paris La Defense Cedex
France
33.1.49.67.81.60

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