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Some Toys Are Useful

By Frank Grossman

The advent of the new SOA Modeling Section clearly tapped into a wellspring of actuarial interest. The section's rapid growth over the past 18 months to number more than 1,200 members today has been remarkable. Some of you may have seen the short article penned by Trevor Howes that appeared in the Investment Section's newsletter *Risks & Rewards* last spring.¹ In the best spirit of reciprocity, which is to say exchanging ideas for mutual benefit, the following piece is intended as a counterpart—and possibly a counterpoint—to Trevor's thought-provoking piece about the state of current modeling practice and the way forward for actuarial modelers.

ACTUARIAL TOYS

Financial models as “toys” is a thread that runs throughout Trevor's article. On reflection, it's a very apt metaphor given the allure of models for some actuaries, and their seemingly continual need for “tinkering, adapting and improvement.” Yet our models are toy-tools of serious consequence for stakeholders who rely on model-generated projections and valuations. And the way forward for actuarial modelers is not entirely clear of obstacles, as Trevor noted.

Yet it was something Trevor wrote in his lead paragraph that really captured my attention, namely that a model is “a magical toy built on the past that explains the present and predicts the future.” Unquestionably, the majority of actuarial models embrace assumptions that have a historical basis. Yet I wonder how well our models are able to explain present circumstances, much less predict the future with any significant degree of accuracy. That might be where the magic comes in.

It may be worth taking a moment to consider the explanatory power of our actuarial models. The perennial need to “true-up” financial reporting models, to align emerging actuals with modeled expected results, is a common occurrence. Yet the familiar becomes somewhat concerning when quarter-end adjustments are both material and consistently in one direction, instead of variously alternating positive and negative adjustments. Another example is the apparent challenge of assembling a comprehensive earnings by source analysis that can be believed. Too often

the unexplained residual is the largest line item of a putative earnings analysis.

Harkening back to my apprenticeship days, I recall learning that actuaries were definitely *not* in the “predict the future” business, which was after all a mug's game (per Nassim Taleb's *Fooled by Randomness*² et passim, at least as far as financial markets are concerned). Channeling management thinker Peter Drucker, it seems to me that a good cash flow projection model can help reveal the future of today's decisions, which is not the same thing as predicting the future.³ And by today's decisions, I mean decisions regarding which financial obligations to buy and sell, in what volume and (critically) at what price. Emanuel Derman, the creator of many widely used financial models, has noted in a similar vein: “Financial models begin with current perceptions about the future and use them to move back into the present to estimate current values.”

Interestingly, the concept of models as toys also occurs in Derman's book *Models. Behaving. Badly*. In the wake of the 2008 financial crisis, he wrote:

(N)ever forget that even the best financial model can never be truly valid because, despite the fancy mathematics, a model is a toy. No wonder it often breaks down and causes havoc.⁴

Havoc indeed, bearing in mind the turmoil and significant toll of the crisis and its lasting aftermath.

THE INESCAPABLE R-WORD

Some actuarial modelers may take solace in Derman's observation that even the best financial model *often* breaks down. Not sometimes or rarely, but often. It's a subtle point worth noting, as Trevor pointed out in his article, that “model risk” in certain situations is now attracting more attention than the “modeled risk.” Yet, when focusing on model risk, it's important to resist viewing the virtual model in isolation, and thereby fail to acknowledge that it usually resides within a broader and no less complex environment.

Model risk is a variant of the operational risk located at the nexus of people, tools and processes. It obviously includes our toy-tools, but also envelops the modelers who create and use them, as well as the larger systems that they are both part of. Given the influence that actuarial modelers have over their tools and processes, perhaps “modeler risk” would be more apropos—but that's most likely drawing too fine a distinction. My point is simply that the three elements comprising model risk interact and inevitably influence each other.

Yet it's the human aspect of model risk—the decisions we make and the trade-offs we broker—and not our models per se, that is frequently underrated as a factor contributing to model break

down. Assigning the responsibility for technical work to too low a level in the echelon, for example, risks substituting the cost of inadvertent errors for the benefit of payroll savings. Deciding to skip peer review or failing to implement proper model hygiene can also influence model risk. And failing to build redundancy or margins into resource planning inevitably makes it more difficult to deal with the unexpected when (not if) it happens.

Adopting a more systematic approach to actuarial modeling seems necessary. And that means making the various assumptions, compromises and limitations of our models plain to see. Trevor made the case for taking a more holistic approach as follows:

It is simpler to rebuild a new more sophisticated model for a specific purpose or specific type of asset or liability than it is to create a fully integrated asset liability model. But a collection of small inconsistent models increases risk, drags performance and complicates ongoing system evolution.

Truly, even a little model can be a dangerous thing. Given the past record of model break down generally, greater model integrity is assuredly the way of the future.

FINANCIAL MODELERS, UNITE!

In days past—at least in Canadian actuarial circles—one heard reference made to a maxim that originated with the statistician George Box: All models are wrong, but some are useful. At first blush this may seem a subversive thought. But perhaps you'll agree, on reflection, that it's simply a matter of degree—exactly how wrong is a given model and just how useful? A more elegant expression of this basic idea is set out by Box and Norman Draper in *Empirical Model-Building and Response Surfaces*:

Remember that all models are wrong; the practical question is how wrong do they have to be to not be useful.⁵

The point being that a model, by definition, is a mere representation of reality, and the inherent simplifications that make a model usable tend at the same time to hamper its usefulness.

In January 2009, amid the global financial storm, Paul Wilmott and Derman jointly published “The Financial Modelers’ Manifesto” online, targeting both fallible models and their equally fallible modelers. As is the case with most polemics, its authors adopted heightened language to get their points across:

Whenever we make a model of something involving human beings, we are trying to force the ugly stepsister’s foot into Cinderella’s pretty glass slipper. It doesn’t fit without cutting off some essential parts. And in cutting off parts for the sake of beauty and precision, models inevitably mask the true risk rather than exposing it. The

most important question about any financial model is how wrong it is likely to be and how useful it is despite its assumptions. You must start with models and then overlay them with common sense and experience.⁶

Despite its Charles Addams-like stray bits and pieces imagery, this passage is entirely in sync with Box’s aphorism. And it goes even further to make a vital point: the need for good judgment when working with models and interpreting their outputs.

At length, the manifesto turns to the risk of self-deception, which has the potential to imperil the work of financial modelers everywhere.

The greatest danger is the age-old sin of idolatry. Financial markets are alive but a model, however beautiful, is an artifice. No matter how hard you try, you will not be able to breathe life into it. To confuse the model with the world is to embrace a future disaster driven by the belief that humans obey mathematical rules.

Considering how deeply vested some actuaries that I’ve met are in the models they have nurtured, and how personally they can take constructive feedback about their work, Wilmott and Derman’s admonition stands as fair comment.

At the conclusion of the manifesto, Wilmott and Derman present “The Modelers’ Hippocratic Oath,” which outlines essential criteria for good modeling practice. Derman subsequently republished the oath (with modest revisions), and it includes the following twin declarations.

I will not give the people who use my models false comfort about their accuracy.

I will make the (model’s) assumptions and oversights explicit to all who use them.

Good modeling practice really doesn’t get any more fundamental than managing stakeholder expectations and promoting full transparency, including the articulation of model limitations.

ROUGHLY RIGHT

Trevor’s article concludes with a cautionary statement: “We can still keep our toys if we play this right.” Taking another moment—while there is still time—to reconsider the present state of our modeling practice seems a very good idea. A couple of challenging “opportunities” spring immediately to mind.

The complexity of many insurance and pension products poses a challenge to modeling practice. Some new products harness market returns and yet include investment guarantees at the same time, drawing into question the risk appetites of both the consumer and provider of these offerings. Other products include risks that are unhedgeable using liquid market instru-

ments, thereby hampering the calibration of their models. Too frequently, the compound options and asymmetrical benefits embedded in contracts are both difficult and expensive to model well in practice—much less explain to others.

While the case for a product differentiation strategy can certainly be made, from time to time I wonder how well stakeholders grasp in whose pocket the risks of certain “novel” product features ultimately reside—and that includes model risk. Derman also offers some thoughts about the risk of excessive product complexity in *Models. Behaving. Badly*.

(T)he designers of financial products should create securities whose purpose, exposure, and risks are clear. Unnecessarily bundled complex products whose risks are obscure are often more profitable than simple ones because their value is hard to estimate. If products were transparent, good modeling would be easier.

Whether a product actually stands a reasonable chance of being profitable—or it just seems that way—relies utterly on the skills of the actuarial modeler, and how well his/her model can illustrate the future of today’s product design and pricing decisions.

A second challenge is the deep need some actuaries have to get things “right”—to specify the *right* model, to set the *right* assumptions and ultimately to deliver the *right* answer. This apparent virtue may seem second nature to many actuaries and has been a traditional strength. But it can be a potential weakness too, especially given the pressure to make optimal use of available resources (both time and money) in the contemporary workplace.

It’s pretty clear useful models are those that are fit for purpose. Bearing in mind Box’s aphorism—that all models are wrong but some are useful—the acceptable degree of model accuracy needs to be broached and confirmed with one’s stakeholders. It’s pos-

sible that being fit for purpose depends more on the reliable delivery of timely and intelligible results. The absolute accuracy of model outputs—their “rightness”—may not be the sole or even a key measure of success if your models are still running after the ledger closes.

Given the vital role of judgement when preparing actuarial estimates, the words of a certain defunct economist might be worth bearing in mind. According to John Maynard Keynes, “It is better to be roughly right than precisely wrong.” Our future success as actuarial modelers will rest on our ability to both respond to the increasing demands being made of our models, as well as bridle our innate desire for precision. Sometimes close enough is simply good enough. I’ve every confidence that the members of the new SOA Modeling Section will lead the way forward in the development and delivery of *useful* toys. ■



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ENDNOTES

- ¹ Trevor Howes, “Mind Your Modeling,” *Risk & Rewards*, 65 (March 2015): 24–25.
- ² Nassim Nicholas Taleb, *Foiled by Randomness: The Hidden Role of Change in the Markets and in Life* (New York: Texere, 2001).
- ³ Some 40 years ago, Peter Drucker observed in his book *Management: Tasks, Responsibilities, Practices* (New York: Harper & Row, 1973): “Strategic planning does not deal with future decisions. It deals with the futurity of present decisions.”
- ⁴ Emanuel Derman, *Models. Behaving. Badly.: Why Confusing Illusion With Reality Can Lead to Disaster, on Wall Street and in Life* (New York: Free Press, 2011).
- ⁵ George Box and Norman Draper, *Empirical Model-Building and Response Surfaces* (New York: Wiley, 1987).
- ⁶ <http://www.wilmott.com/blogs/paul/index.cfm/2009/1/8/Financial-Modelers-Manifesto>.