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If More Precision Is Always The Answer, Have We Forgotten The Question?

By Dave Snell

/// *It is the mark of an instructed mind to rest satisfied with that degree of precision which the nature of the subject limits, and not to seek exactness where only an approximation of the truth is possible.* —Aristotle, 384-322 BC

The theme of this issue is precision. We are not discussing it in the usual sense of how do we get even more precise; but in a contrary one of whether we are already too focused on more details and more decimal places. Actuaries can be too oriented towards precision—sometimes when it does not make sense. The advent of inexpensive computers has made it easier to do thousands of stochastic runs, to carry intermediate results to many decimal places, and to exhaustively analyze myriad criteria.

Yet the models seem, if anything, even more fragile than previous, simpler ones. When people don't do what is logical, or expected, the self-correction mechanisms in some models can cause precipitous market falls; and natural disasters, such as the Japanese tsunami, result in unnaturally dire consequences when we focus on the minutiae of failsafe mechanisms and ignore common (less common?) sense.

Alberto Abalo, our chairperson, starts us off with a quote from Shakespeare (“That which we call a Rose, by any other Name ...”) and a common sense question about our section name “*What’s in a Name?*” Is it still an accurate reflection of who we are? Some members would like us to change the F&F section name to better reflect the sophisticated, advanced analytics we do. In fact, at a recent meeting with several SOA Board members, one proposal was to form a new SOA section that would embrace predictive modeling, ‘Big Data’, and other topics that we have been using and writing about (right here in our newsletter) for almost five years now—a few of them had no idea there was already a section, Forecasting & Futurism, that was doing this! Have we all become so enamored with the trees (especially those involving the



Bayesian branching and hidden Markov models) that we have become blind to the forests (other than random forests and similar machine learning techniques)? Alberto raises some important points. If we ignore the opportunity to rebrand and explicitly put some sort of advanced analytics into our name, we may lose membership of those who want to be a part of this initiative; but if we abandon our Futurism appellation, we risk turning off (and away) those who came to us to learn about Delphi studies, behavioral economics, and other “softer” sciences that help us to step off the analytics treadmill, smell the roses, and see the bigger picture.

Geof Hileman helps us see the bigger picture with his poignant article “*Roughly Right.*” Geof suggests five key practices that we all should keep in mind. I’ll mention

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only one of them here: “be aware that precision implies confidence.” I once worked on a valuation project for a client who insisted upon calculating and saving the seriatim valuation of millions of policies on a quarter-by-quarter basis for the next 80 years; and all the calculations were done to four decimal places. When I suggested projecting for less years, keeping less decimals, or perhaps using annual calculations to save both computing time and storage space, the suggestion was soundly rejected because the present value calculated would differ (in total) by thousands of dollars. None of the input assumptions held up after even one quarter, let alone 320 quarters, but that didn’t matter because the focus was on precision, not value. Sometimes we start looking at trees and then become obsessed with the tiny twigs on the ends of the branches. We lose the ability to see, and therefore to explain the overall picture, and consequently we find ourselves displaced by the “communicators”—those quants who can speak in terms the client understands. I loved Geof’s first sentence supporting his insistence on simple corroborating models: “As fascinating as you may find neural networks, genetic algorithms, or negative binomial regressions, you were hired because your client (using this term loosely) would rather not know about these things.”

Next, we have another contribution from Charles Brass, our Futurist from Down Under (Australia). Charles wrote the article *“The Past Is No More Certain Than The Future—Decision Making In The Face Of Unavoidable Uncertainty.”* He reminds us how two independent juries (one for the criminal case; one for the civil case) each came to unanimous but opposite decisions about the murders allegedly committed by O.J. Simpson. He also points out the responsibility we have as futurists: “Futurists acknowledge the power that past performance might bring to the future, but they also explicitly recognize the possibility of ‘wild cards’ which might change the picture completely.” Remember that portion of our section name?

Which brings us to the question *“How Do YOU Forecast?”* wherein Doug Norris describes our F&F fourth annual contest. This time, instead of an iPad, we are offering a \$500 credit in the Apple store. Informally, we are calling it an “iPrize.” We know you want it. Here it is. Doug explains the rules, the scoring criteria, and oh yeah, the purpose of the contest. It’s basically, to advance the actuarial profession. Wouldn’t you want to be known as the winner of an SOA contest to advance the profession? Learn how to enter in Doug’s contest announcement.

Learning is a major focus for us; and Jeff Heaton has contributed an article about how machines can learn. *“An Introduction To Deep Learning”* delves into how Google and other leaders in the machine learning area teach a neural network much faster than the former, multiple-hidden-layer approach. IBM’s Watson uses Deep Learning (among an ensemble of other learning techniques), and Jeff explains the simultaneous supervised and unsupervised nature of this training that makes this methodology “deep.” He also explains the neat “bag of words” algorithm that helps us deal with unstructured data. It is a simple concept that works well with unknown text from a book, or from a large text-oriented database like Wikipedia.

Unstructured data is often synonymous with Big Data; and the term is used and misused a lot. Richard Xu and his colleague, Dihui Lai, dispel some of the confusion about Big Data in their article *“Big Data In Life Insurance—Does It Exist? If So, How Should We Handle It?”* They address some of the ways to deal with the mounting challenges of capacity and speed as data scales up rapidly in size. Hadoop was once just the name of a toy elephant; but there is nothing toy-like about how it has been employed to handle very large datasets. Five exabytes supposedly represents all the words ever spoken by human beings; but according to IBM, the new SKA telescope initiative will generate over an exabyte of data every day.¹ How will we cope with big data? Read Richard and Dihui’s article for some hints.

Hints, hunches, opinions, and collaborative ideas are the mainstay of progressive think tanks; and the SOA Delphi Study on Long-Term Care Financing Solutions had a lot of them. Ben Wolzenski and Ron Hagelman carry on a simulated dialog in their article *“A Conversation About The Delphi Study On Long-Term Care Financing Solutions”* to explain the six Principles generated by the Delphi study participants as well as the legislative background applying to this growing concern for our aging population.

Compared to some of the more conventional actuarial forecasting techniques, Delphi studies seem a little vague at times. The answers are often not numbers. Often they are free form text, which has to be analyzed to understand the nuances of meaning.

Like the real world, the answers to a Delphi study questionnaire are sometimes a bit “fuzzy.” I’m actually an advocate of fuzzy set theory and fuzzy logic (some colleagues suggest that I might be fuzzy more than I intend to be). Fuzzy set theory appears to be a superset of the set theory we learned in school. In fact, the former set theory is now referred to as “crisp” set theory. A cool aspect of fuzzy logic is that it tends to work better (than crisp logic) with problems involving incomplete or imprecise data. Since precision is our theme this issue, we have two articles on fuzzy logic.

In my article, *“Warm And Fuzzy ... And Real!”* I take a nonconventional approach to explaining fuzzy logic. I use only one greek character, μ (mu), which represents membership in a given fuzzy set; and I avoid almost all the fancy mathematical distribution descriptions and set theory symbols. My purpose is to try to convey the basic ideas unobscured by these artifacts of too many graduate courses in statistics. Fuzzy logic is something that we learn as children. It is not that difficult! OK, I can take basic terms only so far, and the planned Part 2 article next issue will have to bring back the Greeks; but here is a chance to warm up to the concept without as much angst.

Jeff Heaton extends the angst-free fuzzy zone by teaching how you can use fuzzy logic without even having to do any calculations yourself. In his article *“Fuzzy Logic In R,”* Jeff shows that everything you need for your fuzzy-logic-in-a-can experiments is included in the programming language R, supplemented by a “sets” package. You can get started just by giving the R command: `install.packages("sets")`

Jeff shows how building a fuzzy logic application can be almost as simple as combining some LEGO blocks. He told me that he is planning a Part 2 as well. It will be a similar programming tutorial using the fuzzy add-on features of Python instead of R. Between the two languages, you can program the vast majority of data science applications.

That’s a summary of the articles in this issue. However, let’s return to the issue of the F&F section name; and the rose metaphor from Albert.

The study of “meaning-making,” signs, signification and communication is called Semiotics. One of the most famous fictional books employing semiotics is Umberto Eco’s *Il nome della rosa (The Name Of The Rose)*. All of this symbolism is appealing to me; and we’d like to sponsor another contest, which I am calling The Name Of The Rose contest. The winner will be the person who submits the best suggested name for our section (to be submitted to any council member by Aug. 15, 2014, and judged by our section council), and gives a compelling argument why this is a better fit than our current F&F. In case of a tie, the winner will be randomly chosen from the top entries. If no names are deemed by the council to be better than the current one, the council reserves the right to reject all entries.

The prize will be a dozen roses for your significant other. It’s not an iPrize; but it is likely to make you look really good in his or her eyes.

Finally, since our stated theme this issue is precision, I'd like to leave you with one more quote:

“so far as the laws of mathematics refer to reality, they are not certain. And so far as they are certain, they do not refer to reality ... mathematical precision does not correspond to reality.” (Albert Einstein, 1921).²

Enjoy the issue! ▼



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ENDNOTES

- ¹ <http://highscalability.com/blog/2012/9/11/how-big-is-a-petabyte-exabyte-zettabyte-or-a-yottabyte.html>
- ² **Computational Intelligence: Synergies of Fuzzy Logic, Neural Networks and Evolutionary Computing**, By Nazmul Siddique, Hojjat Adeli, p.20, John Wiley & Sons, Ltd., 2013