

Risk Management

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JOINT RISK
MANAGEMENT
SECTION



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Risk Management

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Chairperson's Corner

By Tom Weist

Predictive Analytics continues to gain popularity in every aspect of our industry. Go to any actuarial conference and there will be numerous sessions on this topic. At the recent ERM Symposium in New Orleans, I was part of a panel discussion “From Quantification to Decision Making.” Our moderator checked the schedule once it was finalized and to our disappointment we were up against a predictive modeling session. As you are probably aware, these are highly attended sessions and tough competition for opposing presenters. Fortunately, it was an “Introduction to Predictive Modeling” session. Given our breakout room was full, I can only assume there were enough attendees that already knew the basics. What a relief.

Later in the conference, there was a second session on predictive modeling. This was entitled “Risk Management Perspective in Predictive Modeling.” The session description read “This session will explore the risk management perspective on predictive modeling and will answer questions like: What questions should a risk manager ask? How should the model be validated initially? How should the model be validated on an on-going basis? What data considerations should be taken into account?”

These are all very important considerations when developing and implementing a model. However, in my opinion, this is not the greatest risk facing our industry. The number one risk that I see is complacency. Open any insurance journal, newsletter or briefing and you will most likely see the word InsureTech. There are a few companies that understand this evolution and are partnering with tech firms in Silicon Valley or elsewhere. However, there are many more companies or segments of business within companies that seem to be in denial that change is at our doorstep.

In various discussions over the years, I have heard everything from “those models don’t work for my line of business” to “we already use all of the most important information for pricing or underwriting.” Some folks throw IT under the bus with statements such as “IT has a backlog” or “we are getting a new system

in the near future that has to delay implementation.” There are also other roadblocks thrown up that relate to the submission or quoting process. Something similar to “our competitors don’t do that, so we won’t be able to write any business if we do.” To all of the naysayers, I point to a recent quote from Brian Dupperault at the InsurTech Connect Conference, “The natural clinging to what you have inhibits real change.”

It is this reluctance to adopt new technology or data analytics that is the real risk. Our underwriting expenses are too high and our distribution of products is not as efficient as it should be. If we do not innovate, someone else will. There will be new entrants in this industry that will beat us at our own game through technology. According to CB Insights, insurance tech startups raised \$1.7B across 173 deals in 2016. That’s a lot of capital looking to disrupt our industry.

I was excited to see sessions about Predictive Analytics on the ERM Symposium agenda. There are many risks associated with building and implementing these models, or lack thereof as the case may be. These were a great addition to the already outstanding program. I hope to see all of you there next year.

As far as the other activities for the JRMS, we are updating EBSCO with new ERM literature. This should be completed by the time you read this. We negotiated a 50% discount on individual yearly subscription to the U.K. based media site www.InsuranceERM.com using the code SOA2017. We continue to host networking events at SOA, CAS and CIA meetings. These are a great way for our members to gather and discuss important risk management issues. (i.e., complacency around predictive analytics perhaps) Please keep an eye out for the JRMS signage and communications. Come meet your fellow risk managers and bring someone new along. There will be a variety of webcasts in the second half of the year to provide more CE opportunities. We plan to organize an additional networking event in 2017 (Boston, scheduled for October) like we did in Hong Kong (February), Toronto (May), Quebec City (June), and Austin (June). And finally, we continue with our research agenda. This is the most critical piece of our mission.

Enjoy this edition of the JRMS newsletter. ■



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Editor's Note

By Baoyan Liu (Cheryl)

“No nation was ever ruined by trade, even seemingly the most disadvantageous.” Benjamin Franklin quoted this in 1774. Almost 250 years later, with the G20 pledge, Paris climate agreement, and more to name, some can argue that we may see a return to protectionism on U.S. policy. For decades, the U.S. has provided leadership to the global economy; a neomercantilism approach runs the great risk of impacting both the U.S. and worldwide economy. And what does it mean for us? I think of risk management—closely monitor the actual policy steps to minimize the potential sell-offs.

By the time you read this newsletter, we will be more than half way into 2017. In this issue, we'd like to share with readers articles from various aspects of risk management.

“Is Credibility Still Credible?” by Mark Griffin might remind most of our readers of their study on Statistics 101 and the later course C Credibility. With the advent of Principles Based analysis, IFRS, Solvency II, and Embedded Value, Credibility Theory is gaining increasing spot light. Together with tightened requirements on assumption governance in financial reporting, it is timely to ask if Credibility Theory is still “fit for purpose,” and to explore if computing power now enables a better approach.

In the past several issues, we have published articles on the risk culture topic. In this issue, we'd like to share with readers “Culture War: Embedding Corporate Risk-Intelligence” by Damon Levine. In this article, the author discusses how any strategy for building a robust risk culture must reflect an organization's unique overall corporate culture, capabilities, resources, and risk profile. Risk practitioners are often equipped with a large number of tools and are backed by the necessary ones, but few companies have truly embedded a risk-reward view in the company culture. By citing several research papers, the author

discusses the root causes and how to arm the risk managers with risk management weapons, to have a fighting chance in the quest for robust risk culture.

“Insurance Regulation: The 1-Year 99.5% VaR Fallacy” discusses the insurance regulation in Europe. Since 2016, the European insurance regulation, consumer protection, and strategic choices are based on one key benchmark: a 1/200 annual probability of bankruptcy. Is the insurance regulation in Europe based on science and on appropriate risk measurement? The author explains why this is wrong from four disciplines: Physics, Mathematics, Economic, and Epistemology.

As the flagship risk event, ERM Symposium took place April 20–21, in New Orleans. The symposium chairperson Mark Griffin provides a recap of the event for our readers. While the keynote and concurrent sessions offered current hot topics discussion, two new types of sessions were introduced to allow attendees to tailor their experience to a larger degree: off-the-record discussion forum and RED (risk education) talks.

Last, we have an update on the recent JRMS research projects. Producing relevant research for its members is a priority of the Joint Risk Management Section Council. The section and the Joint Risk Management Research Committee have recently released a new study on parameter uncertainty. In addition, another recently posted risk management study “Mitigating Extreme Risks through Securitization” introduces readers to insurance-linked securities (ILSs) emphasizing catastrophe bonds (CAT) and industry loss warranties (ILWs). Reports can be found on the SOA website. And as usual, we provide a list of recent articles and papers that may be of interest to our members. These pieces can provide further information on a broad range of topics.

I would like to give a special thank you to Robert He, David Schraub and Kathryn Baker for helping me pull together this August newsletter. And enjoy reading! ■



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Is Credibility Still Credible?

By Mark Griffin

With the advent of Principle Based analysis, many life actuaries who have not actively used Credibility Theory are beginning to dust off their notes. In fact, the scope of Actuarial Standard of Practice 25 on Credibility has recently been extended from P&C to include life insurance and pensions. In addition to Principles Based analysis; IFRS, Solvency II, and Embedded Value are cited as reasons the scope was extended. At the same time, insurance companies are seeking a consistent, transparent, documented approach to assumption governance as part of a “Control Environment” for financial reporting. Therefore, it is timely to ask if Credibility Theory, first developed more than 100 years ago, is still “fit for purpose,” and to explore if computing power now enables a better approach.

Fundamentally, situations where we actuaries have applied Credibility Theory are no different than the hypothesis test question we all encountered in Statistics 101; “if x of our y coin flips are heads, should we continue to assume that the coin is fair?” Or put another way, when do we have enough data to change or confirm our assumption?

Consider the following situation where a hypothesis test approach could be used in place of Credibility Theory. You are the valuation actuary for a small but growing pension risk transfer business within an insurance company. The mortality experience of your block in the past year has been higher than the industry table you have been using. The natural question is, should you continue to use the industry table in light of the results? This example will translate directly to any mortality application. The same approach can be applied to any non-capital markets assumption.

Let us consider the null hypothesis to be that the industry table represents the true rates of mortality for our block. We will therefore test whether the mortality the block has experienced is plausibly a result of random fluctuation within our block’s “sample.”

We can test our hypothesis by calculating the degree of random fluctuation we should expect for our block. The expected level



of random fluctuation will be a function of the size of the population, the period of time over which fluctuation is measured, and the assumed mortality rates. If the actual deviation from the expected is sufficiently high, we can reject the null hypothesis that the variation is random.

The standard deviation of the number of deaths in the past year is simply the square root of the sum of q_x times $(1-q_x)$ for all lives. In this situation we use the q_x from the industry table, as the null hypothesis is that these rates are the correct rates. Because we are evaluating the level of random variation, the Central Limit Theorem allows us to use the normal distribution to evaluate statistical significance without loss of generality.

The normal distribution tells us there is roughly a 5 percent probability that random fluctuation alone will give a result beyond plus or minus two standard deviations. In our example, we choose two standard deviations as our decision threshold at which to reject the null hypothesis and select a new assumption. With a threshold of two standard deviations, in just one time out of forty will we inappropriately move to a more aggressive assumption? Similarly, we will move to a more conservative assumption improperly one time in forty.

The block we are studying has just less than 4,200 exposures in the past year, with expected deaths of 168. The standard deviation of the number of deaths over the past year was 12.4 deaths. Actual deaths were 186, 16 higher than expected, representing 1.3 standard deviations. In this situation, there is some evidence that the block’s experience is not representative of the industry,

Table 1
Credibility Analysis of Mortality Experience

Exposure	(1) Expected Deaths	(2) Standard Deviation	(3) Actual Variation	(3) ÷ (2)	Statistical Significance?
Current Year	168.1	12.4	15.9	1.3	No
Past 5 Years	881.3	28.4	61.7	2.2	Yes
5 Years					
Males	584.3	23.2	39.7	1.7	No
Females	297.0	16.4	22.0	1.3	No
Low \$	532.9	21.9	32.1	1.5	No
High \$	348.4	18.0	30.0	1.7	No
Younger 1/2	136.7	11.6	12.3	1.1	No
Older 1/2	744.4	25.9	49.6	1.9	No
Oldest 1/4	549.8	22.0	45.2	2.1	Yes

but this result is not statistically conclusive given our decision threshold of two standard deviations.

If we look at the past five years of data, exposures were 21,400, with expected deaths of 881.3. The standard deviation was 28.4 deaths. Actual deaths were 943, 61.7 higher than expected, representing 2.2 standard deviations. (Note that when the exposure base is stable, the standard deviation of n years of data is approximately the square root of n times the annual standard deviation). In this case, actual deaths are higher than expected by more than two standard deviations. Therefore, we should reject the null hypothesis and conclude that the industry table is not representative of the block’s mortality experience.

The same techniques can be used to search for definitive sources of mortality variation. In our case, testing by gender or by amount of benefit does not give a conclusive result. However, testing by age band does give a conclusive result. The youngest half of our exposures are adverse by slightly more than one standard deviation, while the older half is adverse by 1.9 standard deviations. In fact, the oldest quadrant, which includes 550 expected deaths, is adverse by 2.1 standard deviations. This provides strong evidence that the industry table’s rates are not only too low to represent our block, but also that the “tilt” of the rates we should use for our block are different than the industry table’s “tilt.”

Table 1 summarizes the analysis.

When one encounters an adverse statistically significant result, it may be tempting to do one of two things:

1. Look at a progressively longer period of data until the result seems more reasonable.
2. Set the decision threshold higher, (for example three standard deviations) to minimize the probability of drawing a false conclusion.

The downside of each action is:

- Ignoring statistically significant trends.
- Increasing the severity of the “reckoning” when incorrect assumptions are eventually updated.
- Violating the consistency and objectivity of the approach, whether it is the formal assumption governance process or not.

Therefore, it is important to look at shorter data periods for statistical significance first. If there is no statistical significance, then one should look to longer data.

The goal is to draw an accurate conclusion as quickly as possible. By expressing the decision threshold in terms of standard deviation, the conclusion is based on the degree of variation, the level of exposure and the underlying probabilities. The threshold may be reached over any period of time.

Let’s address the same question using Credibility Theory. While there are different versions of Credibility Theory, the Limited Fluctuation Method is commonly used. Many actuaries will turn

to a matrix of claims levels shown in the seminal 1962 paper “An Introduction to Credibility Theory” by L. H. Longley-Cook.

The paper shows a table of the number of claims required in order that a data set be deemed fully credible. One dimension of the table is the probability (P), which is similar to the decision threshold in the hypothesis test example. The other dimension is the “maximum departure from expected” (k).

The paper gives no explanation of how to select values for P or k, or how to incorporate the values into subsequent conclusions or analysis. The paper merely explains that the choice of P and k are arbitrary. Traditionally, the actuary has chosen values for P and k (presumably arbitrarily) and compared the required number of claims in the table to their volume of experience to determine if they have enough data to validate using their own experience as the assumption.

The VM20 manual directs that P should be 95 percent or higher, and k should be less than 5 percent. Once, again there is no guidance on how the choice should be made. In the Longley-Cook table, the value corresponding to both of those limits is 1,537 claims. The value for P=99% and k=2.5% is 10,623 claims, almost seven times higher, which shows how sensitive the application can be to these parameters. In the VM20 application, the credibility level is used to determine prescribed margins and how quickly company experience must be graded into the applicable industry table.

Returning to our example, if we chose the lowest value cited in the VM20 range, 1,537 claims, we would need almost 10 years of data to draw any conclusion, regardless of how good or bad our block’s experience was relative to the industry table. As a consequence, Credibility Theory would direct us to stay with the industry table and revisit the analysis in another five years.

We should ask the following questions with respect to Credibility Theory:

1. Does it make sense that credibility analysis is not based on the degree of variation between the two sets of data being compared? In the coin toss example, if 20 of the first 20 outcomes are identical, we know the coin is biased.
2. Shouldn’t the analysis incorporate the probabilities involved in some way? Going back to the coin toss example (one last time), if the null hypothesis were that heads would come up one time in 10, then 20 tails out of 20 flips would not disprove the null hypothesis. In terms of mortality analysis, rules of thumb that apply at younger ages should not be expected to be useful at older ages.
3. How can credibility theory be applied to other assumptions?

The hypothesis test approach has the following advantages relative to Credibility Theory:

1. The math is straightforward. It is easy to identify statistically significant results.
2. The methodology generalizes to other assumptions. A company could apply the same technique and decision threshold to all of its experience relative to its non-capital market assumptions, giving a cohesive, consistent, transparent approach company-wide. The decision threshold could be agreed on as part of a company’s risk appetite setting process.
3. The hypothesis test is transparent and is easily understood by many outside the actuarial profession.

In our era of computing power, the hypothesis test is clearly a more accurate approach to assumption governance and should be used in place of credibility theory going forward.

Actuaries who have worked with predictive analytics will relate to the examples of testing the significance of gender, amount of pensions and age. Predictive analytics relies on hypothesis testing and incorporates the same probability measure to determine statistically significant relationships within the data. In fact, the “machine learning” version of predictive analytics can be thought of as a hypothesis test where the “machine” develops the hypothesis.

Use of the hypothesis test approach also lays the groundwork for the following best practices:

1. In our example, we are only interested in the assumed rate of mortality. Insurance company stakeholders are very interested in the financial results which are driven by assumptions such as mortality, withdrawals and premium payments. In our example, by simply multiplying the q_x times $(1 - q_x)$ calculation by the net amount at risk, we can calculate the expected dollar variation in net claims. In the same way, we can measure the expected variation in the impact of withdrawals, or premium payments, by multiplying by the financial severity of the event. It is the author’s experience that calculating these metrics and proactively communicating across the actuarial, finance and risk functions helps to build a common understanding of the expected level of variation, and of the process for resetting assumptions. This understanding is critical in the financial close process, as it clearly delineates between plausible variation and areas where more focus is warranted.
2. Many insurance company’s assumptions governance process now includes an annual review of all major assumptions by

an assumptions committee. While this is a better process than waiting for an assumption's owner to identify the need to change their assumption, it is still difficult for the committee to be objective about an assumption they have previously approved, perhaps multiple times. In any case, if expected variation is calculated for all major assumptions (as per the first best practice above) the assumptions committee's work can be transformed to focusing on only the assumptions where the results are outside a specific range (for example one standard deviation). There is no need to spend significant time on other assumptions. Such a consistent escalation protocol should also resonate with management, auditors, rating agencies, regulators, etc.

3. The hypothesis test approach can be used for experience studies, as shown at a high level in our PRT example for gender, amount and age.

Credibility Theory was presumably developed as a short cut to hypothesis testing and was well suited to the days of very limited computing power. In today's environment, computing power allows us to apply hypothesis testing directly, precisely and consistently across a wide range of assumptions. The hypothesis test is a simple but powerful tool and its adoption will enable actuaries to navigate numerous evolving analytical and process requirements. ■



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Insurance Regulation: The 1-Year 99.5% VaR Fallacy

By Sylvestre Frezal

Since 2016, the European insurance regulation, consumer protection, and strategic choices are based on one key benchmark: a 1/200 annual probability of bankruptcy. This probability is based on measuring, risk by risk, what would be the worst crisis in a 200-year return period in order to determine how tightly woven the safety net should be.

200 years ago, Europe was just ending the Napoleonic Wars. Since that time, we invented the automobile and apartment blocks have been built. Storms have become more intense, financial decisions are now digitized, legal systems have changed, and health care has evolved. We now have electricity, and the transport of goods is global. Furthermore, how could it be possible to calculate the worst crisis over a 200-year period when businesses, which merged and migrated their information systems at the end of the 1990s, only manage 15 years of archived data? How is this possible, now that contracts and the behavior of insured persons change daily due to the digital revolution?

European regulators have decided to do the opposite of Google, whose research director, Peter Norvig, said: “We don’t have better algorithms. We just have more data.” Since they did not have the data, they took refuge under models, aided by armies of actuaries, academics, and consultants, egged on by professional federations, public authorities, and many firms. The variations are without end, but the principle is simple: with 10 observations, the statistical distribution that fits best is deduced, and we end up with the 1/200 quantile. And in good faith, the actors defend the relevance of their methods, explaining that the quantile that results is scientifically proven, that “it’s not perfect, but it’s better than nothing.” In short, they claim that insurance regulation in Europe is based on science and on appropriate risk measurement. Let us turn to four disciplines to explain why this is wrong.

PHYSICS FIRST

In electronics, mechanics, and in any signal-processing field, physicists use filters. These techniques work because high and

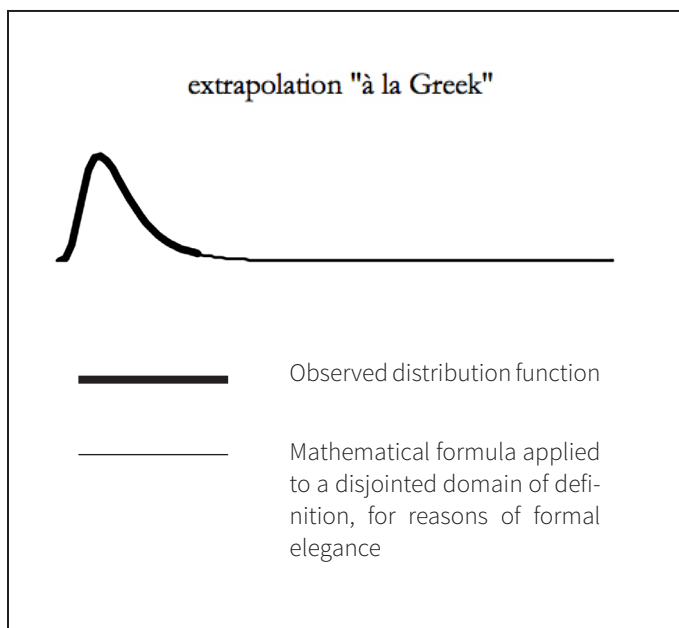
low frequencies are orthogonal.¹ This is the basis for the Fourier series. If that were not the case, we could not listen to AM broadcasts which use a technology where the signal receiver must precisely distinguish between high frequency waves (carriers) and low frequencies (the signal).

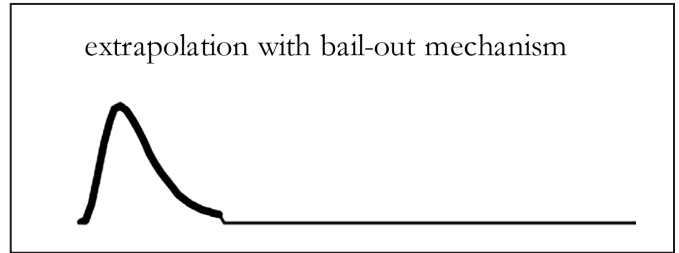
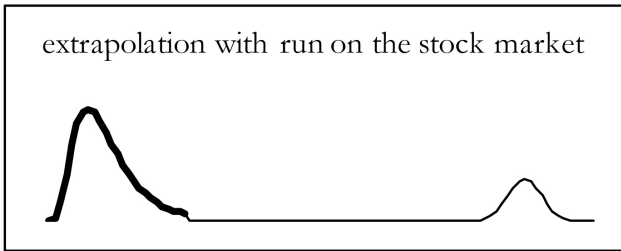
Thus, the dispersion provided by some dozen observations, which tells us something about the high frequency characteristics of a phenomenon, tells us nothing about its low frequency properties—i.e., events in the 200-year return period that regulators want to address.

NOW MATHEMATICS

But most actuaries like math and went into insurance in order to flee physics. In this field, they don’t think in terms of signal processing, but rather in terms of a distribution function, which they simply extend. A function, however, is determined by two characteristics: its output *and its domain of definition*.

In this case, we observe and extrapolate the function based on a limited domain, that of slight variations from expectation. There is no mathematical basis for assuming that with a different domain, that of distant variations from expectation, the mathematical formula would be the same.² With two distinct domains of definition, we are anyway dealing with two different mathematical functions. If we extrapolate the distribution function beyond the observations made for the sake of the mathematical formula unity, we end up reasoning like the Greeks: when they discovered geometric shapes, they in turn saw the heavens as nested celestial spheres. The elegance of a mathematical outline is not science.





ECONOMICS NEXT

Of course, we could test different probability extrapolations. But how could we justify any of these? Without empirical observation, we would have to rely on a causal relationship. For example, take the case of a stock market crash. What can we extrapolate from our dataset? Should we use a standard normal distribution? Or use the more cautious Pareto distribution? And why not say that if we hit a certain threshold, for example a drop of 50 percent over a year, a run on the stock market will then ensue and there will be a minimum drop of 80 percent? In this case, the proper distribution function would show, in the low frequencies, a bump around 80 percent. But we could also assume that in the case of a major drop, trading would be suspended and monetary policy would inject funds into the economy to prop it up; in this case, the correct distribution function would be equal to zero after the observation domain. Such causal discussions, because of their multiplicity, swiftly upends any pretensions of being able to mathematically extrapolate from observed phenomena.

EPISTEMOLOGY LAST

And, just as with mathematical extrapolations, causal arguments cannot substitute for data. In fact, given the return period under consideration, nothing is falsifiable: neither the argument nor the results. Math is no substitute for facts, and the calculation of an annual 1/200 quantile, in this ever-shifting world, cannot be scientific.

Therefore, European insurance regulation is currently based on calculations derived from a motley mass of conventions, sedimented practices, and short-sighted negotiations—not in any way from scientific measures. At best, they tell us something

about the ripples in the water, but nothing about the tsunamis that regulations are supposed to tackle. They give us an illusion of comfort, wherein risks have been quantified and decisions are made based on scientific considerations. They are, as Wolfgang Pauli said, “not even false.” They are worse, comfortably nestling us in blissful ignorance of the unknown. Instead of steering with our eyes glued to an off-kilter altimeter, we should take a look outside the cockpit. Let’s be qualitatively vigilant towards and accountable for risks, and let’s incorporate a more holistic view of the issues at stake.

Actuarial and financial researchers are greatly liable in this context. They built their credibility on effective volatility management technologies, but they will lose it if they continue to consider that these tools actually make it possible to manage danger. The task now is to quantify and make margins of error explicit, rather than to force a square peg into a round hole by using these technologies for things beyond which it is relevant. Only in this way, without putting the cart before the horse, can a science slowly bloom to later produce its technological fruit. ■



Sylvestre Frezal is PARI chair co-holder (Programme sur l’Appréhension des Risques et des Incertitudes), affiliate of LFA (Laboratoire de Finance-Assurance), CREST-Excess (Paris, France). He can be reached at sylvestre.frezal@ensae.fr.

ENDNOTES

- 1 This is the basis for the Fourier series.
- 2 A function can be defined piecewise.

Culture War: Embedding Corporate Risk-Intelligence

By Damon Levine

The Ghana native worked his way up from a back-office accounting role at UBS to their vaunted Delta One derivatives trading desk. When Kweku Adoboli caused a \$2.3 billion trading loss he was promptly labeled by the Swiss banking giant as a “rogue trader.” However, in a September 2011 article, *The New York Times* maintained that “at UBS, it’s the culture that’s rogue.”¹

Many examples of more benign risk culture deficiencies show honest efforts at implementing a true risk management framework. In some cases, approaches use concepts from COSO, ISO, or other respected frameworks. Risk practitioners have a large number of tools at their disposal and are increasingly backed by the necessary and often mentioned “tone at the top.” Unfortunately, even in this seemingly ideal atmosphere, it is apparent that few companies have truly embedded a risk-reward view in its DNA.

The root causes are often some combination of a) lack of understanding of risk management’s goals, b) fear of intellectual honesty, c) misaligned incentives, d) failure to operationalize risk appetite and limits, and e) neglect of risk analysis in key business decisions. An organization with a strong risk culture avoids each of these pitfalls.

A PATH OF LESS RESISTANCE

In their best-selling book *Switch*,² Chip and Dan Heath delve into the emotional and behavioral tendencies that commonly make significant changes difficult to achieve. Those who focus on corporate risk culture understand that implementing the desired behaviors represents a challenging change management situation.

The Heaths initially explain three *surprises about change*. They are:

1. What looks like a people problem is often a situation problem.
2. What looks like laziness may actually be a specific type of mental exhaustion.

3. What looks like resistance to change is often a lack of clarity.

CHANGE THE SITUATION, NOT MINDS

The New York Times best seller *Influencer*,³ supports item 1, above, indicating that people’s behavior can be altered through a change in environment. The authors describe a common situation in American restaurants in the late 1940s. When many of the soldiers returned home they often replaced women who had been serving as restaurant cooks during World War II. Many women viewed their new roles as waitresses as a step down and would often shout their orders at the cooks. The veterans were not at all pleased to be taking orders from these women and fights were commonplace. Both customers and employees were leaving restaurants in large numbers.

A University of Chicago professor named William Foote Whyte was asked to help with the problem. He simply changed the situation by introducing a metal spindle to which the servers would skewer their orders in written form. Training consisted of 10 minutes of instruction to the cooks and servers. Both groups preferred the new process and felt they were being treated better as a result. The minor tweak to the environment solved a problem that would have seemed almost insurmountable if one attempted to address the social views, notions, and intellects of the cooks and servers!

If a risk manager is attempting to improve identification of risks relating to achieving the financial plan or budget, it is not imperative that subject matter experts are persuaded of the value of such an endeavor. We may simply change the environment by adding a short section to the official “plan package” submitted to the finance department. It can be a page that asks for risks, challenges or factors that could lead to missing the plan or beating it. For each of those risks, the associated mitigations should be detailed. This tends to identify the higher likelihood and internal challenges most susceptible to early action or risk controls.

The above enables other concepts including: a) review of actual earnings versus plan and a comparison between root causes of the actual results and the before-the-fact list of risks to plan, b) quantitative modeling of the impact to next year’s earnings for the risks to plan, assessment of associated mitigations, and a prioritized list for management or the board, and c) compensation tied to the quality, accuracy, or completeness of either of the previous ideas.

Another challenge in establishing risk culture is an employee’s reluctance to suggest that a risk or mitigation under a superior’s purview is problematic. This issue is often quickly solved by changing the environment; a risk manager might a) lead facilitated workshops with participants being decision makers from a

cross section of business lines or functional areas (without their “bosses”), or b) use anonymous surveys or voting.

THE ELEPHANT AND THE RIDER

The second surprise about change refers to exhaustion due to a struggle between two commonly opposed mental “factions.” The Heaths describe two independent systems which are at work in our minds: the emotional side and the rational side. It is the emotional side which is instinctive, focused on short-term gratification, and feels pleasure and pain. The rational side is the more reflective and conscious aspect which deliberates and analyzes.

Social psychologist Jonathan Haidt likens the emotional side to an Elephant and the rational side as the Rider.⁴ When there is a disagreement between the (much) larger Elephant and the Rider about which direction to go, the Elephant is going to win.

When a change management initiative causes the Elephant and Rider to disagree, the task at hand may seem arduous and stress-inducing. Asking people to change habits and provide new analysis or data for some eventual return requires cooperation from the Elephant. Our Rider may see the wisdom of the endeavor but this is exactly the type of situation that the Elephant will resist. It requires self-control and deliberate execution on the part of the Rider to control the Elephant intent on resistance. The critical point is that there is a limited supply of this self-control and it gets used up faster when the Elephant and Rider are at odds!

The agent of change should aim to harmonize the two potentially opposed forces. We must appeal to both the Elephant and the Rider.

The Heaths go on to say “if you reach the Riders of your team but not the Elephants, team members will have understanding without motivation. If you reach their Elephants but not their riders, they’ll have passion without direction. In both cases the flaws can be paralyzing.”⁵

1% LOW-FAT MILK HAS PERKS!

Two health researchers from West Virginia University were exploring ways to persuade people to follow a healthier diet. Past research suggested that vague instructions such as “eat healthier” did not typically lead to meaningful changes in behavior. The researchers often found themselves returning to the fact that milk was Americans’ single largest source of saturated fat.

Rather than offering vague nutritional guidance they went for a simple message: switch to 1% milk. The marketing campaign was called “1% Low-Fat Milk Has Perks!”

The results showed a significant and persistent increase in the consumption of 1% milk. It was not that people were necessarily resistant to eating healthier; they simply needed concrete guidance. These events support the Heath’s message that what looks like resistance may just be lack of clarity.

As a way to improve identification of risks to strategic execution and associated mitigations one may use a simple and fast survey to query business leaders on:

1. Critical business goals;
2. The necessary projects or sub-goals needed to achieve the goals in (1); and
3. Challenges, risks and factors that influence the execution of the projects and sub-goals in (2).

The above can be done anonymously if desired and the resulting information will point to key drivers of value and enable practical and intuitive steps toward risk appetite compliance and strategic risk management.

Clarity pairs well with brevity. Risk management expectations are best digested in small pieces. Consider a few one page company-wide communications. Keep things crystal-clear and streamlined.

BIG PROBLEMS SUCCUMB TO SMALL CHANGES

The post war restaurant problem described earlier is a striking example of how a minor change can solve a significant problem. Risk managers often cite ignorance or misunderstanding of risk management goals as a key problem. Anyone who has tried to implement a new risk process with someone who thinks of risk management as an extension of audit or feels the main goal is total elimination of risk will agree that education must play a part of the solution.

The problem is that leaders across a company’s various business lines, functional areas, and geographies are not likely to ensure that their employees complete the training or retain its key messages.

One Fortune 500 company’s risk management function requested a very small budget for a prize and then created a slide deck which was followed by a risk management quiz. The result was high participation rates, retained knowledge, and quick response times. The approved budget was just enough to cover the motivational prize of an iPad!

In some organizations, risk functions are asked to provide risk-based assessments of potential acquisition targets. Those involved in pitching the target company and forecasting of sales, expense synergies, profits, etc. can easily become emotionally

tied to the outcome. As the deal gets closer to final there is a tendency for them to view the deal through rose-colored glasses and a bidding war may result. Those in the line of business pushing for the deal may look very unfavorably on anyone suggesting potential downsides or that sales or synergy forecasts at optimistic at best.

In the above situation, a potential remedy is the designation of a “devil’s advocate” among the group of internal experts. This person’s role is to list key risks associated with the valuation, integration, and any other factors which may negatively affect the short- and long-term outcome of the proposed acquisition. The role can be made anonymous with the information provided directly to the risk management function.

Risk management departments are frequently striving for the Three Lines of Defense model. The main challenge to its implementation is that the frontline managers, subject matter experts and risk owners are the linchpin of the whole concept. In the case of risk identification and mitigation assessment, as part of an inventory or risk control self-assessment, it can be difficult to get quality updates of this information on a timely basis. This is a situation in which an investment in software and a one hour training session can solve the issue. Designate risk owners and describe the information to be determined, fields to be entered, and how to do it. Automatically generated email reminders should prod those who are late (and CC their superiors when needed!) and risk owners should have to proactively state when there is no change from last quarter’s risk or mitigation assessment. It is important that the software also tracks changes, provides time stamps and lists the name of the person making the change.

Of course, money is often a driver of change. Some organizations attempt to measure the state or maturity of their risk culture and then link compensation to improvements in the various metrics. One might count the number of risks reported and updated in a timely and complete manner or track results of each operating division’s scores on a risk management understanding assessment.

Finally, ego and competitiveness can work to your advantage. In *Influencer*, a story is told in which the agent of change proudly says, “We publish lots of graphs, charts, and tables. But none has been more influential than [*the race*] ... we harness the natural competitive instincts of people by preparing a racetrack with the names of each country or even the faces of the [line of business] leaders on each runner.”⁷ When such a hypothetical race is shown to management and the board, line leaders ensure they are not embarrassed by their peers!

FINAL THOUGHTS

Any strategy for building a robust risk culture must reflect an organization’s unique overall corporate culture, capabilities, resources, and risk profile. That being said, there are certain areas that must commonly be addressed to achieve success.

A McKinsey & Company whitepaper⁸ describes four foundational elements for strong risk culture:

1. **Transparency:** ensure clear understanding and open communication of risk profile, risk appetite, and risk limits.
2. **Acknowledgment:** avoid overconfidence, challenge peer assumptions, be open to discussions about downsides, and learn from mistakes.
3. **Responsibility:** encourage proactive and timely response to risk manifestation or warning signs.
4. **Respect:** align incentives across individuals, departments, LOBs, and the enterprise to avoid attempts at “gaming” or “beating the system.”

Armed with the weapons described in this article, a risk manager will have a fighting chance in the quest for robust risk culture. As risk management continues to gain acceptance as a value creator for organizations making decisions under uncertainty, the battle may well be easier for future culture warriors. ■



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ENDNOTES

- 1 <http://www.nytimes.com/2011/09/24/business/global/at-ubs-its-the-culture-thats-rogue.html>
- 2 Heath, Chip and Dan Heath. 2010. *Switch*. New York: Broadway Books.
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- 4 Haidt, Jonathan. 2006. *The Happiness Hypothesis: Finding Modern Truth in Ancient Wisdom*. New York: Basic Books.
- 5 See *supra* note 2 at p. 8.
- 6 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5175990/>
- 7 See *supra* note 3 at p. 234.
- 8 <http://www.mckinsey.com/business-functions/risk/our-insights/taking-control-of-organizational-risk-culture>



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Joint Risk Management Research Update

The Joint Risk Management Section and the Joint Risk Management Research Committee have recently released a new study on parameter uncertainty. Authored by a Hartman Analytics team of Brian Hartman, Robert Richardson, and Rylan Bateman, the paper provides structures to incorporate parameter uncertainty in quantifying risk and illustrates the application through case studies. A preview of the report further outlines the case studies:

In all fields of insurance and risk management, understanding the uncertainty associated with model estimates is essential to properly quantifying risk. In this report we examine and describe parameter uncertainty, providing simple structures to incorporate parameter uncertainty in a wide range of problems. We begin in section 1 with a review of the current literature. We look at work from many areas of actuarial science and draw connections to statistics and other applied fields with similar concerns. We continue in section 2 with a mortality and life insurance case study wherein we show a simple way to add parameter uncertainty to both mortality rates and mortality improvement. We compare the impact of parameter uncertainty on the present value of a simple life annuity. Next, in section 3, we estimate diabetes progression using an OLS regression. We show how to incorporate spike and slab priors to automatically perform model selection while fitting the model. We discuss how to choose good hyperparameters for the prior distributions and compare the impact of different choices on the model selection process. Finally, in section 4 we use Poisson regression to analyze claim counts from a set of auto insurance data from California. In this context, we compare different prior assumptions and show the value of including parameter uncertainty.

In addition, another recently posted risk management study “Mitigating Extreme Risks through Securitization” introduces readers to insurance-linked securities (ILSs) emphasizing catastrophe bonds (CAT) and industry loss warranties (ILWs). Sponsored by the Society of Actuaries Research Expanding Boundaries Pool, the report also discusses the pricing of ILSs and the issues in utilizing them as hedging tools. Authored by Jose Blanchet, Henry Lam, Qihe Tang, and Zhongyi Yuan, the report develops a general pricing theory for CAT bonds and establishes a framework for quantifying basis risk of hedging using ILWs relying on Extreme Value Theory to model and measure the catastrophe risks involved.

Both projects can be found on the SOA website under risk management research.

Other Joint Risk Management Section Managed research projects nearing completion include:

Country Risk Officer: This project will propose a framework for a country risk officer (CRO) and discusses the roles and responsibilities of a CRO. Sim Segal has been engaged to perform the research.

1. ERM Stakeholder Buy-in: Kailan Shang will identify the factors, processes and practices that lead to both poor and strong levels of enterprise risk management stakeholder acceptance.
2. 2016 ERM Emerging Risk Survey: The tenth survey in the series, Max Rudolph asks risk managers for their thoughts on emerging risks and identifies the trends across time. Look for the survey to be emailed to Joint Risk Management Section members by the end of the year.
3. 2017 ERM Call For Papers: The monograph will contain the accepted research papers.

The following projects are in the early or middle states:

1. Application of Enterprise Risk Management on National Long-Term Care Needs: This study continues to be defined and explores the impact at a national level of the application of enterprise risk management on Canadian long-term care needs.
2. Negative Interest Rates and the Insurance Industry: This study examines the potential impact of a sustained negative interest rate environment on the insurance industry.

The CAS has recently published two new research papers in the Spring 2017 issue of *E-Forum*:

“An Adaptation of the Classical CAPM to Insurance: The Weighted Insurance Pricing Model”
Edward Furman, Ph.D., and Ričardas Zitikas, MSc, Ph.D.

In this the paper, the authors present and discuss an insurance version of the classical Capital Asset Pricing Model that offers economic pricing and risk capital allocation rules for a large class of risks, including those that are nonsymmetric and heavy tailed. A number of illustrative examples are given, and convenient computational formulas suggested.

“Compendium of Credit Risk Resources”
Jean-Philippe Boucher, Mathieu Boudreault and Jean-François Forest-Desaulniers

This compendium summarizes the various aspects of credit risk that are important to insurance companies in general, namely

corporate credit risk (single and multi-name), typical credit-sensitive

securities, credit risk for individuals (including mortgage insurance), municipal credit risk, sovereign credit risk, counterparty risk, and regulatory and enterprise risk management. The document also includes considerations for property and casualty insurers and about their practices. Finally, the authors also list and link to important resources for practitioners and graduate students.

As this article illustrates, producing relevant research for its members is a priority of the Joint Risk Management Section

Council and council members are interested in hearing from you. If you have an idea for a research project that would benefit Joint Risk Management Section members or would like to help with section research efforts, please contact Louise Francis, research lead for the section, at louise_francis@msn.com or Ronora Stryker, SOA research actuary, at rstryker@soa.org. ■

ENDNOTES

- 1 <http://www.casact.org/pubs/forum/17spforum/>



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The Global Risks Report 2017 12th Edition

World Economic Forum

http://www3.weforum.org/docs/GRR17_Report_web.pdf

Navigating Through Uncertainty

KPMG

<https://assets.kpmg.com/content/dam/kpmg/xx/pdf/2017/02/navigating-through-uncertainty-feb-2017.PDF>

Leading Practices in Model Management

CRO Forum

https://www.thecroforum.org/wp-content/uploads/2017/03/CROF_WGMR_Final-Paper-Published.pdf

Allianz Risk Barometer — Top Business Risks 2017

Allianz

https://www.agcs.allianz.com/assets/PDFs/Reports/Allianz_Risk_Barometer_2017_EN.pdf

Mitigating Extreme Risks Through Securitization

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<https://www.soa.org/Files/Research/Projects/2017-03-mitigating-risks-through-securitization.pdf>

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<https://www.soa.org/Files/Research/Projects/cybersecurity-insurance-report.pdf>

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http://www.swissre.com/media/news_releases/nr20170613_sonar.html

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2017 ERM Symposium Recap

By Mark Griffin

This year's ERM Symposium took place April 20–21, in New Orleans. 184 attended the conference, with many staying for the weekend to enjoy the host city.

Among the highlights were a keynote presentation by Kevin Slavin of Playful Systems at MIT's Media Lab. Kevin's message was that algorithms are becoming more common in the world around us and more powerful. However, as they become more inscrutable, they can become more fragile. Using the evolution of competitive chess as an example, he advocates a "human-in-the-loop" approach. This makes algorithms more effective and less fragile. The room full of human risk managers approved unanimously.



Mark Mennemeyer presents the JRMS prize to Ben Goodman.



The Program Committee socializing.



Steve Craighead receiving the JRMS Research Prize from Alietia Caughron.



JC McKenzie (L) and John Manistre (R) sharing the Actuarial Foundation Prize.



CRO Panel from L-R: Robert Rupp, Joe Celentano, Allesta Quane, and Mark Griffin.

Attendees also took in a lunch address by Steven Boyer: Co-founder of BitSights, a Cyber risk rating company and a CRO Panel including Allessa Quane of AIG, Robert Rupp of the Hartford and Joe Celentano of Pacific Life.

The symposium was designed to allow attendees to tailor their experience to a larger degree than typical conferences. With that in mind, two new types of sessions were introduced:

1. Forum. Mimicking the same session at the Valuation Actuary Symposium, this session allowed participants to engage in an off-the-record discussion of common issues with a handful of other risk managers. The session provided participants with a broadened perspective and a unique networking opportunity.

2. RED talks. Stolen shamelessly from the TED Talk format, RED (Risk Education) talk sessions gave the presenter of a paper or piece of research 20 minutes to describe it. The shorter sessions allowed attendees to get exposure to more topics. Some of the talks were repeated in the agenda. Similar to TED Talks, the audience could follow-up off line. ■



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