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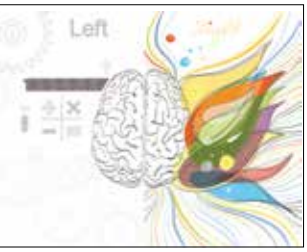

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A Bit of Perspective

NOW THAT'S IT'S SUMMER, I'm able to enjoy one of my favorite weekend activities—picnics. Something about the fresh air and sunshine makes sandwiches and fruit snacks (both of my kids are under 5) truly transcendent.

If you live in or visit the metro D.C. area, you have to check out Gravelly Point Park in Arlington, Va. With expansive green fields and a view of the Potomac River, it'd be a great spot for a picnic even if not for the headline attraction.

You see, Gravelly Point Park is situated right next to Reagan National Airport. As you dine on cold fried chicken and potato salad, massive jets are taking off from or landing on nearby runways. From this unique vantage point, you get to see planes as you've never seen them before. The roar of the engines and sheer size of these massive machines are truly breathtaking. Somehow, this new perspective makes the mechanical wizardry of flight—these gigantic machines hurtle through the air, you say?—that much more amazing.

A shift in perspective makes you think about things in new ways. Our cover story this month, "Beyond Big Data" (page 20), offers a new way to think about quantitative analysis as it pertains to business decisions. The author contemplates why companies are rushing to embrace a data-driven scheme, and how that approach often fails to deliver on promises. Actuaries are uniquely positioned to offer a different perspective on important business decisions; the wisdom-based approach espoused in this feature is a refreshing change of pace from the drumbeat of data.

A new perspective may also shine some light on a dim corner of the financial world. In "The Role for Actuaries in Settlement Annuities and Factoring" (page 38), the author explores settlement annuities, which are structured to compensate victims for injuries or wrongful death cases. The extended time frame of an annuity can make for liquidity problems for the payee, though, so a murky industry known as factoring has sprung up to offer lump-sum payments to cash-strapped annuitants. The author posits that an actuarial examination of this type of transaction can help all involved understand the long-term ramifications and drawbacks.

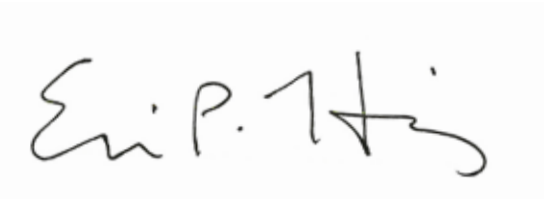
Indeed, actuaries are adept at taking a step back and looking at the big picture. Sometimes the results of such an examination are startling. "Mortality Experience of Civil War Veterans" (page 32) investigates the outcomes of soldiers who survived the Civil War via a mortality study undertaken at a historic cemetery in Brooklyn, N.Y. The study examines age at death by military rank then compares those findings to the mortality expectation of the general population. Even years after the war had concluded, the veteran population was experiencing mortality at significantly different rates than that of the population as a whole.

WIKIMEDIA

On a bit of a lighter note, our final feature this month, "Intelligent Game Design" (page 28), takes a look behind the curtain at what it takes to create an enjoyable pastime. Game designers need to juggle several competing considerations as they develop board games or video games. A lot of hard work takes place before you get to play—this feature explores that process.

Finally, we welcome our first new puzzle co-editor, Josh Feldman. He's crafted a pair of puzzles based on one of the most enduring television game shows of all time, *Family Feud* (page 66). I hope you enjoy them.

And I hope you enjoy your summer. May your days be filled with warm sunshine, cool breezes—and the revitalization of spirit and perspective that only a favorite summer spot can deliver. □



The Birth of Our Professionalism Structure

SINCE NOVEMBER, AS I HAVE HAD THE OPPORTUNITY TO TELL THE STORY of the U.S. actuarial profession and the Academy's first 50 years, it has become clear to me that no accounting can be complete without discussing the birth of formal actuarial professionalism under the auspices of the Academy. Letters from founding leaders and historical documents paint a compelling picture of the need for an organization that would represent the interests of American actuaries from all practice areas, and in particular, for that organization to be a steward of professional standards and a coordinated disciplinary process.

As we reflect on the origins of the Academy, it is also appropriate to consider the conditions that led to the creation of the two autonomous professionalism bodies that are housed within the Academy—the Actuarial Standards Board (ASB) and the Actuarial Board for Counseling and Discipline (ABCD). Taken together, these two bodies are at the core of what makes the actuarial discipline a profession, and we are well served to remind ourselves of how and why they were formed.

In its formative years of the 1970s and early 1980s, the Academy issued many stand-alone documents that provided guidance specific to a single practice area. Thus in 1973 the Academy began promulgating *Financial Reporting Recommendations and Interpretations,* which provided guidance in selecting actuarial assumptions and methods for stock life insurance company financial statements. Other sets of guidance were released to assist casualty and pension actuaries in their work.

Because these guidelines were developed by independent committees of the Academy, they lacked a consistent framework. Moreover, there was no overall mechanism for identifying the need for new standards of practice, nor for coordinating their development, review, and revision.

Recognizing the need for a centrally organized body charged with such duties, the Academy in 1982 formed the Task Force on Organizing Professional Standards of Practice. After testing the efficacy of a central standards-setting body on an interim basis, the Actuarial Standard Board was created via an amendment to the Academy's bylaws and a vote of the membership, effective July 1, 1988. To date, the ASB has promulgated 49 actuarial standards of practice that address all areas of actuarial practice in the United States, and it continues to proactively develop standards of practice that ensure the highest level of professional consistency and integrity.

The desire to maintain and enforce professional integrity was also the driving force behind the creation of the Actuarial Board for Counseling and Discipline as the investigative body for the U.S. actuarial profession. Bylaws of the Academy and the other U.S.-based actuarial organizations historically included sections that laid out how members could be disciplined for violations of that organization's standards of conduct, which were similar but had some differences. Because individuals were often members of multiple actuarial organizations, the absence of uniform standards of conduct led to replication of time and expense for the investigation of alleged violations. Further, requirements of confidentiality generally precluded sharing of investigative results among various organizations.

In an effort to make a consistent basis for the discipline process across the U.S.-based actuarial profession, the Academy again amended its bylaws and formed the Actuarial Board of Counseling and Discipline, effecting January 1, 1992. Each of the five U.S.-based actuarial organizations has delegated their counseling function and consideration of alleged Code of Professional Conduct violations to the ABCD.

A landmark discussion paper written by Jack Turnquist, William Odell, and Robert Wilcox, *Structural Framework of U.S. Actuarial Professionalism*, meditates on what it means to be a profession:

> The essential characteristic of a profession has come to be expertise in the area where professional services are performed. This typically requires setting of selective standards for admission to the profession, intellectual and practical training to acquire professional competence, and an effective means to test such competence. To ensure that professional services are delivered in a manner generally expected of professionals, it has become necessary to lay down canons of professional performance and behavior in work situations, as well as procedures for maintaining discipline.

These two bodies—the Actuarial Standards Board and the Actuarial Board for Counseling and Discipline—are the heart of our profession's understanding of contemporary, ethical, and professional actuarial practice in the United States and are fundamental to our self-governance and self-regulation. Their work continues to strengthen the actuarial profession in the Academy's 50th year and beyond. □

On Social Security Reform

To evaluate Ken Steiner's suggestion ["Look to the North for a Better Approach to Financing Social Security," May/June 2015] that the U.S. adopt a funding policy for Social Security similar to that of the Canada Pension Plan (CPP), it is helpful to understand some differences between the CPP and Social Security.

Employers and employees each contribute to the CPP 4.95 percent of pay (9.90 percent total) in the range from $3,500 to $51,100. (Dollar amounts relating to the CPP are in Canadian dollars; dollar amounts relating to Social Security are in U.S. dollars.) The benefit at age 65 is a flat 25 percent of average earnings in this same dollar range from age 18 to 65 adjusted to a current dollar basis, with an allowance for dropping up to eight low-income years.

Social Security has a steeply graduated benefit formula: 90 percent of the first $826 of average indexed monthly earnings (AIME), plus 32 percent of AIME from $826 to $4,980, plus 15 percent of AIME over $4,980. The $826 and $4,980 thresholds are "bend points"; they increase each year with the national average wage. For comparison with the CPP formula, the bend points are $9,912 and $59,760 on an annual basis. The Social Security formula is more generous than the CPP formula.

This does not mean Canadians receive lower social insurance retirement benefits, because Canada has another program, Old Age Security, that provides an additional monthly benefit at age 65 of $549.89 for those with at least 40 years of employment since age 18. This benefit is phased out for retirees whose annual income exceeds $67,668, and is entirely eliminated for those with incomes over $110,878. This benefit is funded from general revenue.

In Canada the CPP and Old Age Security together provide benefits comparable to Social Security in the U.S.. Yet Old Age Security is both means-tested and funded by general revenue, while no part of Social Security is means-tested or funded by general revenue. This explains why 9.90 percent of pay is adequate for long-term funding of the CPP, but the current 12.40 percent rate is inadequate to fund Social Security in the long term.

All this does not invalidate Steiner's article, but it clarifies that the resulting burden on employers and workers in the U.S. would exceed the burden imposed on employers and workers in Canada of providing sustainable funding for the CPP.

Other reforms have been proposed to make Social Security more like the Canadian system, including changing to a two-tiered formula with both a flat-dollar and wage-related component, means-testing of benefits, and partial funding of benefits from general revenues. Any of these reforms would help put Social Security on a sounder financial footing. In the end, we in the U.S. must decide for ourselves what kind of system is best for us.

Eric Klieber
Independence, Ohio

The Start of a Meaningful Ethics Discussion

CONTINGENCIES READERS SHOULD BE INTERESTED TO KNOW that the U.S. actuarial profession and stakeholders in our work finally have quantitative information on what actuaries see as our greatest ethical challenges, thanks to an Academy report released earlier this year, "Key Ethical Concerns Facing the Actuarial Profession: Perceptions of Members of the American Academy of Actuaries." (The complete report is available on the Academy's website.)

The results reported provide an objective starting point for all those interested in the ethical conduct of actuarial work to discuss, prioritize, and address potential challenges ranging from discrimination in the workplace to conflicts of interest. Most notably, the report finds one particular potential ethical concern stands out from the others, a result that is likely to prompt broader discussion and draw attention from both within and outside the profession.

The report is based on data collected through a survey of more than 3,300 Academy members. Members were asked to rate each of 18 statements pertaining to ethical concerns on a scale from 1 to 5, with 5 indicating the highest degree of ethical concern. Response rates were sufficient to provide valid statistical results.

The area ranked of most concern is pressure from principals/management to select inappropriate assumptions used in pricing or reserving—clearly the No. 1 issue across all demographics from the survey, including area of practice, geographical region, and length of Academy membership. Fully 44 percent of respondents identified it as a 4 or 5 on the scale of ethical concern, markedly elevating it above the second-most concern—"false or misleading representation of products or services in marketing, advertising, or sales efforts"—which garnered 31 percent. The third-highest issue is "failure to take appropriate action when another actuary misrepresents information."

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Providing all of the data collected is part of the Academy's efforts to demonstrate both that self-examination is very important to the health of the actuarial profession, and that transparency in sharing that data publicly is necessary to preserve and deserve the trust the public places in the profession. The Academy has already started using the report as a diagnostic tool to consider themes on professionalism important to the profession and the public and to provide forums to address the concerns identified. Through these efforts, the Academy can contribute to the greater good and build public trust for the profession in the United States.

Actuaries, like everyone else, have personal values, and at some points in their lives are likely to need to find a way to reconcile those values with the obligations of the profession. It's important to the collective health of the U.S. actuarial profession and to the individual actuary's own moral values to have conversations about ethics. These are conversations that the Academy is dedicated to fostering with increasing frequency and opportunity in its 50th year.

A May 2015 professionalism webinar featuring Ken Kent and Karen Terry, current and immediate past chairpersons, respectively, of the Academy's Council on Professionalism, delved into some of the top ethical issues identified in the Report, how they relate to the Precepts in the Code of Professional Conduct (Code), and how actuaries may be able to address these issues when they arise in their work.

Even with the well-known benchmarks given in the Code, and the actuarial standards of practice (ASOPs), there will always be a need for an actuary to use professional judgment. Terry noted that if an actuary selects every assumption at the low end of a range, for example, each assumption on its own may fall within the range of reasonableness, but the total may fall outside the range of reasonableness. Thus, actuaries must look at not just each assumption, but at all the assumptions as a whole, to see whether they fall within a reasonable range.

Kent and Terry reminded attendees that actuaries facing ethical dilemmas in their day-to-day work have additional valuable tools at their disposal to help them, including requests for guidance (which can be confidential) from the Actuarial Board for Counseling and Discipline, and colleagues.

The dialogue that this webinar started will continue as the Academy develops additional programs and materials based on this important survey's results. As a broader discussion of our profession's ethical perceptions unfolds—which may in some cases include dialogue with non-actuaries—the Academy's professionalism leaders look forward to the meaningful consequences that may result from this groundbreaking report. We welcome *Contingencies* readers to share their thoughts about these topics as well. □

End-of-Life Care—Beyond the Numbers

"THE QUESTION THEREFORE is not how we can afford this system's expense. It is how we can build a health care system that will actually help people achieve what's most important to them at the end of their lives."

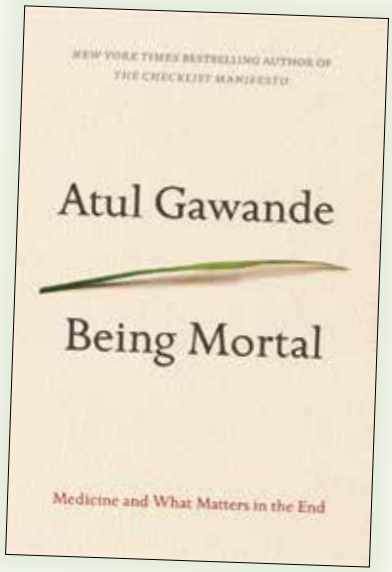
—Dr. Atul Gawande, *Being Mortal*

No one wants to contemplate his or her mortality, but it is a fact of life. It's a wholly human reaction to feel apprehensive about considering health care at the end of life, but preparing for this period is a crucial step in ensuring that the last weeks, months, and even years of life are spent the way an individual wants.

Such contemplation is especially difficult when the issue becomes a national debate, and the concept of cost seems to be weighted equal to the concept of quality of life. Indeed, while end-of-life care is undeniably a personal decision, there is a benefit to having a national discussion that includes individuals, providers, patient advocates, and, yes, even policymakers. Such a conversation can help individuals take control of their own end-of-life care choices.

In his book *Being Mortal,* Dr. Atul Gawande provides readers with a glimpse of the challenges individuals can experience as they navigate the health care system—particularly as they explore the implications of specific medical treatments, options for care settings, and how they envision the end of their lives. He explores the often surprising disconnect between doctors who struggle with the desire to do everything medically possible to extend life—even if they know the result will be the same without medical intervention—and patients who, at an extremely emotional and confusing time, have to decide between quantity and quality of time left.

As an example of the difficulties people face, Gawande shares his family's journey after his father (also a doctor) was diagnosed with a tumor inside his spinal cord, which eventually turned out to be a slow-growing cancer. Gawande



discusses the various conversations they had with his doctors about the options for surgery, how far to go with radiation and chemotherapy, and the potential outcomes with or without the disparate treatments. When he finally asked one of the specialists his father saw about the time he might have left with and without the treatment, the answer was very similar: three months at the shortest and three years at the longest. Despite the similarities in prognosis, the doctors urged additional treatment—favoring an approach that might be more likely to result in the three-year end of the spectrum. Gawande says that in the process of deliberating options, "the pressure remains all in one direction, toward doing more, because the only mistake clinicians seem to fear is doing too little." But he notes that doing too much can be a mistake, too, especially if the patient's priorities don't align with extensive medical intervention to prolong life.

So the basic question is, what are individuals' priorities at the end of life? Studies have indicated that a majority of people express similar goals for their last years of life: They want to be able to talk and communicate with friends and family, they want to be able to feed themselves (or live independently and not be a burden to others), they want to enjoy the time they have left, and finally, they want to live without pain or suffering. Sometimes these priorities conflict with medical efforts to prolong life. And that is why communication and preparation are so important.

But are individuals taking the time to think about end-of-life wishes, to talk to their family and friends about those wishes, and more important, to write them down in an advance directive? According to Pew researchers, "Despite the graying of America, a sizable minority of the populace has not thought about the kinds of medical decisions that people increasingly face as they age."

For all adults surveyed, the researchers found that 37 percent of people have given a great deal of thought to their end-of-life medical wishes, 35 percent have given some thought, and 27 percent have not given much thought if at all. When broken down by age, 33 percent of individuals age 18 to 49 have not given their medical wishes much thought, which is perhaps understandable. But it is surprising that 25 percent of those 75 and older have not. Similarly, 22 percent of those individuals over age 75 have not even written down or talked to anyone about their priorities at the end of life.

It's time to have a national dialogue about this issue, in an effort to find ways to encourage individuals to think about end-of-life care, to train and incentivize doctors to talk with their patients about their priorities, to make it easier to record preferences for end-of-life care and ensure that those records follow a

patient throughout his or her life, and to educate patients on their options on a spectrum ranging from aggressive medical intervention to a reliance on hospice/palliative care.

Several years ago, during the debate about health care reform, a provision was included in the legislation under consideration that would have reimbursed doctors for counseling patients on their end-of-life options. The counseling was voluntary, meaning no individuals were required to have these conversations with their doctors. Immediately branded "death panels," the provision was stripped from the bill that ultimately would become the Patient Protection and Affordable Care Act (ACA).

We cannot let political rhetoric preclude these conversations, and doctors should be on the front lines working with their patients to determine what they want in terms of medical interventions in those last months and years. At the same time, doctors need training on how to have these conversations.

In his book, Gawande explores the reasons most medical programs don't spend much time on geriatric needs, focusing instead on doing everything possible to extend life. As a result, these programs neglect to prepare doctors for the tough discussions: knowing how to explain to patients the whole truth of their diagnoses and treatment options and the potential quality-of-life implications of any medical decision. For example, Gawande uses the story of a patient he calls Joseph Lazaroff, a man in his 60s with an incurable cancer that had spread to his spine. Doctors could remove the tumor from his spine, but that surgery had inherent dangers and was unlikely to extend his life—and what life he would have left would be painful. All Gawande had to do was confirm that the patient understood the risks of surgery. He states, "What strikes me most is not how bad his decision was but how much we all avoided talking honestly about the choice before him. We had no difficulty explaining the specific dangers of various treatment options, but we never really touched on the reality of the disease." Doctors need training to help them broach these tough issues in a way that allows individuals to make decisions based on a more holistic approach that incorporates facts and figures with personal wants and desires.

But it may not be enough to rely on individuals having these conversations with doctors, or family, or friends; these wishes should be written down in some type of advance directive (even though some studies have shown that just having the discussions is enough, especially since written directives can be ignored, changed, and even challenged legally over time). For younger individuals, advance directives may be the best approach; however, for terminally ill patients, physician orders for life-sustaining treatments (POLST) forms are another option for facilitating this process. POLST forms were designed to ensure that patient decisions on end-of-life care are recorded in writing and followed when the time comes. These forms are completed based on a discussion between doctor and patient and can include information related to decisions on everything from life-sustaining measures to the use of antibiotics in the last phase of life.

Counseling and advance directives are essentially ways to ensure that people are thinking about, talking about, and preparing for the end of life, whether that includes doing everything possible to prolong life or choosing to work with palliative care specialists or enter

A Problem Without a Solution

The following is an excerpt from the Introduction to *Being Mortal*.

Modern scientific capability has profoundly altered the course of human life. People live longer and better than at any other time in history. But scientific advances have turned the processes of aging and dying into medical experiences, matters to be managed by health care professionals. And we in the medical world have proved alarmingly unprepared for it.

Death, of course, is not a failure. Death is normal. Death may be the enemy, but it is also the natural order of things....

You become a doctor for what you imagine to be the satisfaction of the work, and that turns out to be the satisfaction of competence. It is a deep satisfaction very much like the one that a carpenter experiences in restoring a fragile antique chest or that a science teacher experiences in bringing a fifth grader to that sudden, mind-shifting recognition of what atoms are. It comes partly from being helpful to others. But it also comes from being technically skilled and able to solve difficult, intricate problems. Your competence gives you a secure sense of identity. For a clinician, therefore, nothing is more threatening to who you think you are than a patient with a problem you cannot solve.

There's no escaping the tragedy of life, which is that we are all aging from the day we are born. One may even come to understand and accept this fact. My dead and dying patients don't haunt my dreams anymore. But that's not the same as saying one knows how to cope with what cannot be mended. I am in a profession that has succeeded because of its ability to fix. If your problem is fixable, we know just what to do. But if it's not? The fact that we have had no adequate answers to this question is troubling and has caused callousness, inhumanity, and extraordinary suffering.

This experiment of making mortality a medical experience is just decades old. It is young. And the evidence is it is failing.

hospice. The core values of hospice and palliative care include a focus on pain management, medical care, and emotional support for the patient and his or her family. It provides an alternative to patients who may not want aggressive medical treatments, so expanding access to hospice and educating individuals about what they can expect from hospice or palliative care should be part of any national discussion of end-of-life care.

In many cases, hospice is called in too late to manage those last few weeks and months, but studies have shown that broader conversations about end-of-life wishes may result in people being more likely to choose hospice. One example was a two-year study by Aetna. While the insurer did not reduce aggressive medical interventions for terminally ill policyholders, it did offer patients more hospice options. If patients had a life expectancy of less than one year, they could opt to receive hospice services while still receiving other medical treatments. The study found that patients enrolled in this program were more likely to use hospice—up to 70 percent. They didn't have to give up the more aggressive treatments, but the study found that the use of hospital services dropped significantly and policyholder satisfaction scores went up. Another study in 2010 from the Massachusetts General Hospital divided 151 patients with stage IV lung cancer into two groups—one received the typical oncology care, and the other group received oncology care and visits with a palliative care specialist. Those patients speaking with a palliative specialist stopped oncology treatment sooner, entered hospice earlier, and had less pain at the end of life. The results showed that they lived 25 percent longer as well.

Whether an individual chooses aggressive medical treatments, hospice, or any of the myriad options on the spectrum of approaches to dealing with the end of life is a personal decision. Ensuring that people have access to information about all of their options and reforming a system that typically focuses on extending life to one that focuses on improving quality at the end of life will require a national conversation. As Gawande says, "Our ultimate goal, after all, is not a good death but a good life to the very end." □

HEATHER JERBI is assistant director of public policy at the Academy.

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What Is a Profession?

WHAT DO YOU THINK OF when you hear the word "profession"? I would guess that you quickly came up with doctors, lawyers, and actuaries. I generally think of four aspects of one's work when I consider whether that person is part of a profession:

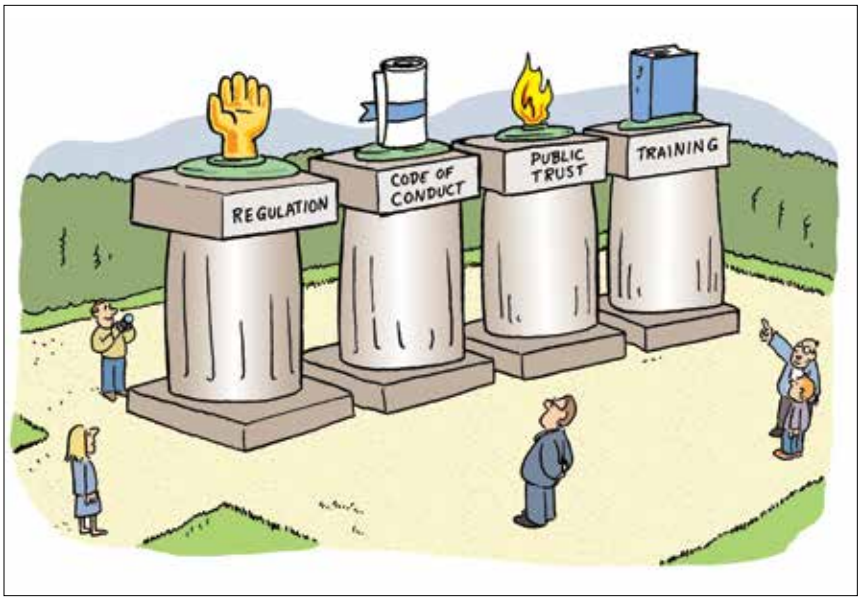
1. Specialized and rigorous training
2. Public interest and trust
3. Code of conduct
4. Regulation

In this article, I am going to focus on aspects 3 and 4 above, since most readers will be very familiar with the training and public interest facets of an actuary's work.

A Profession Has a Code of Conduct

The Code of Professional Conduct was adopted by all five U.S.-based actuarial organizations, effective Jan. 1, 2001. The Code of Professional Conduct applies to members of all of these organizations, and helps us understand what it means to be a professional. In fact, the Code itself says it best: "The Precepts of the Code identify the professional and ethical standards with which an Actuary must comply in order to fulfill the Actuary's responsibility to the public and to the actuarial profession. The Annotations provide additional explanatory, educational, and advisory material on how the Precepts are to be interpreted and applied."

Generally, when the Actuarial Board for Counseling and Discipline (ABCD) receives a complaint, it is from an actuary seeking to fulfill his or her obligations under Precept 13. Precept 13 has been explored in depth previously in this column (see, for example, John Purple's article "Owning Precept 13" in *Contingencies*, May/June 2014) and is a frequent topic in webinars and local meetings. The Academy's Council on Professionalism also has published a discussion paper on Precept 13 that is available on the Academy's website. In short, this Precept requires each of us to be conscious at all times of the professional behavior of other actuaries and to bring any potential material violations to the attention of that other actuary. And if resolution is not reached or if such a conversation does not take place, an actuary is required to disclose the potential violation to the ABCD, except where the disclosure would be contrary to law or would divulge confidential information. According to the recently released 2014 Annual Report of the ABCD, the Board dealt with such inquiries 47 times during 2014. This is where we begin to enter the self-regulating aspect of a profession mentioned above.



JOE SUTLIFF

A Profession Is Regulated

The ABCD, the Joint Discipline Council, and the discipline committees of the individual membership organizations may all play a role here. Complaints may be dismissed early in the process, if the ABCD chairpersons do not believe there is a possible material violation. The complaint may also be dismissed at other points along the way. Those that are not dismissed will generally go to a hearing, where the subject actuary, the investigator, and the full ABCD review all the evidence.

If the ABCD believes that discipline is warranted, the case will go to the subject actuary's member organization(s), which may then forward the case to the Joint Discipline Council (JDC). If a JDC panel determines that there was a material violation and the discipline is suspension of more than two years, the individual organizations' discipline committees will also be involved. (My intention here is not to go through all the details of the process but to impress upon all actuaries and other interested parties that the process is fair, has substantial cross-functional representation as well as deep subject matter expertise, and that the process does a good job of balancing the interests of the public we serve with the privacy that we owe actuaries while this process is going on.)

Former ABCD chairperson Bob Rietz stated in the ABCD's 2014 Annual Report,

"Actuaries have a well-deserved reputation for integrity and expertise, and the discipline process is one tool that helps maintain that reputation."

Professionalism and Continuing Education

While the discipline process discussed above is important as a way of dealing with the most serious violations of our Code of Professional Conduct, most members of the profession will never have to be involved in that process. Nonetheless, actuaries are demonstrating professionalism, integrity, and competence every day. Most members of the Academy will need to comply with the General Qualification Standard, which requires 30 hours per year of continuing education, including a minimum of three hours on professionalism topics. This yearly requirement demonstrates our profession's dedication to appropriate standards of practice and self-regulation.

It is relatively easy for everyone to get the three professionalism hours, given the numerous seminars and meetings offered. ABCD members alone participated in 10 presentations and several webinars last year. All around the United States, individual companies, local actuarial clubs, and all five of the U.S.-based actuarial organizations offer programs on professionalism. So while it is not difficult to get your three hours, you do have to be intentional about this—just as intentional as you are about maintaining your expertise in the more technical aspects of your work.

Informal Help—Requests for Guidance

According to the ABCD's 2014 Annual Report, at least 90 times in 2014, actuaries used the process of a Request for Guidance (RFG). Generally, in these cases, the member is asking, informally, for a member of the ABCD to help the actuary think through a particular situation. This may involve the work of another actuary, in which case the Request for Guidance sometimes escalates into a complaint. More often, these RFGs focus on the actuary's own work. He or she has been asked to do something that does not quite feel right. Or the actuary wants an opinion on whether he or she has satisfied technical requirements for qualification. Often, it seems, the actuary is looking for validation of concerns before taking them to management. In any case, these RFGs represent another way that the profession is demonstrating its support for the quality and expertise of actuarial work done in the U.S.

Who Cares About Professionalism?

By all indications, nearly everyone in the actuarial world. From the first exam where an actuary signs a candidate code of conduct to an officially retired but still practicing actuary listening in on a webinar, and in all of the courses, meetings, and daily interactions in between, actuaries are demonstrating our commitment to professionalism and showing that we deserve the trust of the public we serve. □

NANCY BEHRENS is a member of the Actuarial Board for Counseling and Discipline.

BEYOND

How to Use Wisdom and Simple Data Analysis to Make Better Decisions

By Kurt Wrobel

BIG DATA. The term has become synonymous with strategy, innovation, sophistication, and the general advancement of using more information to improve decision-making. As the story goes, Big Data[1] is the wave of the future, and business leaders need to financially support the latest innovations in capturing and using an increasing amount of data. The typical response to critics of Big Data is to simply dismiss them as people who want to rely on gut feel rather than invest the time and resources to carefully consider all the available information.

In response to the pervasive Big Data narrative, this article looks at the other side of the argument by suggesting an alternative approach that uses wisdom and simple data analysis to produce better decisions. By combining a straightforward analytically driven approach with prudent qualitative considerations, we can make better decisions with fewer resources and less risk than we can by blindly following a Big Data approach for the business questions we most often confront as actuaries.

Big Data

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Indeed, this alternative approach is very much in keeping with the core skills that we develop as actuaries. As the professionals with either direct financial accountability or significant responsibility in advising other leaders, we have real-world experience and skills to make judgments that go beyond the rote application of complex models that mechanically process large data sets.

The Big Data Industrial Complex: Why Companies Invest—and Sometimes Overinvest—in Data Infrastructure

President Dwight D. Eisenhower coined the term "military industrial complex" to describe the increase in military spending caused by several groups—all advocating for more resources—including the armed forces, lobbyists, defense companies, and congressmen. In advocating for increased spending, these groups would suggest that this funding was required to maintain a strong defense against communism. As Eisenhower suggested, the structure of the decision-making process ensured that few groups were advocating for a more restrained and rational process for allocating resources to the military.

In a similar way, the spending increase on Big Data infrastructure projects starts with the supporters highlighting the advantages of using more data and increasingly complex modeling to improve decision-making, with few people advocating for restraint in spending these additional resources. Like many initiatives that require investment, the Big Data story starts with what appears to be a compelling narrative that highlights the success stories from well-known companies. These stories then lead to the proposal for significant organizational changes to fully capitalize on the Big Data opportunity.

- **The Big Data Story**. The Big Data success stories can take many forms, but they start with an amazing insight that is drawn from an analysis of data. In the classic story, using a large data set and complex modeling, a data scientist will find historical correlation in the data that allows his or her company to better offer promotions or product recommendations on a website. The net effect is greater revenue and profits for the company using this more sophisticated data approach.

  The retailer Target's customer-segmentation strategy is a well-known case study that is often used in the Big Data literature. In one study, after the retailer had sent a promotion to a young woman suggesting that she was pregnant, the father complained vigorously to Target for sending her the promotion. Of course, the father eventually apologized once he learned that his daughter was indeed pregnant. Thus, the narrative concludes, Target's Big Data efforts had delivered correct insights based on an analytical assessment of available information—with the implication that your company can realize similar results with a Big Data approach.

  The most popularized story on data analysis, and one often used by Big Data advocates, is the book *Moneyball*, in which the front office of the Oakland A's baseball team used relatively simple data analysis to more effectively measure the true value of players relative to the traditional approaches used by baseball scouts. While the story involves a simple data approach, it's often incorrectly used by Big Data advocates as another success story, when in fact the success of the approach was largely based on simple metrics that were long known to be undervalued.

  Taken in total, these narratives appear to build a compelling story of why a company needs to build a robust Big Data capability. The implicit suggestion of this narrative is that a company cannot let important information go unanalyzed ... or allow its competitors to use this information to its advantage. The narrative will then often suggest that people who use more qualitative factors are not allowing the science of Big Data to improve their decision-making. As will be highlighted in this article, this one-sided narrative fails to distinguish when complex modeling and a large data set will be useful—for improved targeting of customers on a website, for example—from when it will not be useful (or will possibly even be detrimental) in making the best possible decisions.

- **Company name-dropping**. Following the seemingly compelling narrative, many advocates bring up the names of several successful companies, including Google and Amazon, that are deploying a Big Data approach. The implication, of course, is that if these highly successful companies are pursuing a particular approach, it must be the best path for all organizations that aspire to be successful.

- **Big Data organizational implications**. After building the narrative and providing further evidence from the success of well-known companies, the Big Data advocates step in to start the discussion about how to best restructure your organization and provide funding for a Big Data capability.

The restructuring and funding discussions will involve almost all aspects of the organization. Consultants and IT professionals will be engaged to ensure that their data can be widely dispersed throughout the organization, with proper data governance, security, and access. The human resources team will then become engaged to find "data scientists" who aim to find meaningful patterns in the data. Data analysts throughout the organization will start doing more data mining and will inevitably find special insights into the data. Senior managers will be encouraged to make data-driven decisions and listen to the recommendations of the new data scientists.

Overall, with the prospect of furthering their careers and catching the new business trend, everyone gets involved. This process then begins an organization's Big Data journey.

Big Data: The Other Side of the Argument

While the seemingly compelling narrative highlights the promise of Big Data and provides a rationale for funding these

While the *[Moneyball]* story involves a simple data approach, it's often incorrectly used by Big Data advocates as another success story, when in fact the success of the approach was largely based on simple metrics that were long known to be undervalued.

initiatives, the failures caused by a fully implemented Big Data strategy are never mentioned in the typical narrative. While the narrative highlights incremental improvements associated with simple binary buy decisions, many of the failures have been catastrophic—particularly when an organization has attempted to predict the future of a complex economic system.

- **Long Term Capital Management (LTCM)**. Started by a team of Wall Street traders known for using quantitative analysis to identify mispriced securities, this hedge fund used sophisticated techniques and a massive data set to make trading bets over the entire world. (The Nobel Prize-winning economist Myron Scholes described the approach as "vacuuming nickels others didn't see.") Ultimately, their overconfidence in the model led LTCM traders to become highly leveraged in these bets and eventually led to the failure of the firm. This wasn't a small-scale failure of an isolated hedge fund. It was an enormous failure that required the intervention of the Federal Reserve and the bailout of the firm by the combined efforts and resources of several Wall Street firms.

- **Value at Risk**. On an even larger scale, several Wall Street firms famously started relying on a single metric called "value at risk," developed through sophisticated modeling to gauge the risk profile of their underlying investment portfolio. By using this metric, some firms were further emboldened to take enormous, highly leveraged bets that contributed to the failure of Lehman Brothers and ultimately led to the financial problems of many other banks during the financial crisis of 2008.

The unwavering trust in underlying models to correctly predict the future led to a collective hubris to take ever-increasing risk. The problem was that this degree of trust wasn't tempered by any reasoned measure of humility regarding the difficulty in predicting the future of the true downside of the risks being taken ... particularly when these metrics were attempting to predict the future of complex economic systems rather than the relatively less complex models typically highlighted in the Big Data success stories.

Finding Insights: The Big Data Incentive Problem

Beyond its failure to highlight where sophisticated modeling has fallen short, the Big Data narrative also fails to account for the incentive structure that is created when individuals can further their careers by providing information that is in keeping with the Big Data approach. With a clear incentive to provide results, a data scientist with a large data set and tremendous computing power will offer insights and various correlations drawn from the available data. The problem is that there's often not an individual with equal technical expertise providing sufficient oversight who can question the wisdom of using the results from such a model.

With a clear career incentive to provide insights into data sets, data scientists have good reason to support and not question the work of others using a Big Data approach. In addition, because the data scientists are not primarily responsible for driving the success of an organization or product line, their conclusions can be offered without the burden of "owning" the final result of their prediction.

A real-life example from earlier in my career: After a large investment in data infrastructure, a senior manager emphatically said, "Insights! Insights! I want insights!" In many respects, this was not an unreasonable request. The company had made a large investment, and this senior manager wanted to see a return on this investment. However, an incentive structure had already been created that demanded "insights" without a critical review of the statistical validity of the results. Needless to say, in this particular case, insights and correlations were developed without critical oversight.

In keeping with the urge to find insights, no matter what, several techniques can be employed to artificially find results in the data that are not statistically credible. A classic example is "regression fishing." Using this technique, a researcher without a theoretical basis changes the parameters of a model to produce a desired result. In a very simple example, using 20 potential explanatory variables, the researcher could run 20 separate regressions and find a single variable among the 20 that is considered statistically significant according to a standard definition. While this result could be considered significant if the researcher developed this regression with a strong theoretical foundation (and without running 20 regressions), the true result would not be considered significant because a single significant result would be expected even if all the variables were random.

Beyond the more sophisticated approaches, data scientists could even more simply cherry-pick the data to show only the information that supports their preferred position. In all cases, data scientists could also fall victim to confirmation bias—the inherent bias people have to look for evidence that confirms their previously held views, rather than to actively look also for

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evidence that disproves their original positon.

These problems have long been discussed in the academic literature, and a few researchers have measured and attempted to account for the problem in their peer reviews. Without the pressure of a peer-review process and with almost no critics, however, the data scientists at an organization have even more freedom to find correlations that are most advantageous to the conclusion they are trying to promote. This challenge is made even more difficult by the complexity of the work. To the extent that the model and data are made more complex and the opportunities to find statistically significant results increase with more data, the ability to perform an impartial and credible external review becomes nearly impossible. As Nassim Taleb, author of *The Black Swan*, has suggested, the Big Data infrastructure allows these cherry-picking techniques to be conducted on an industrial scale.

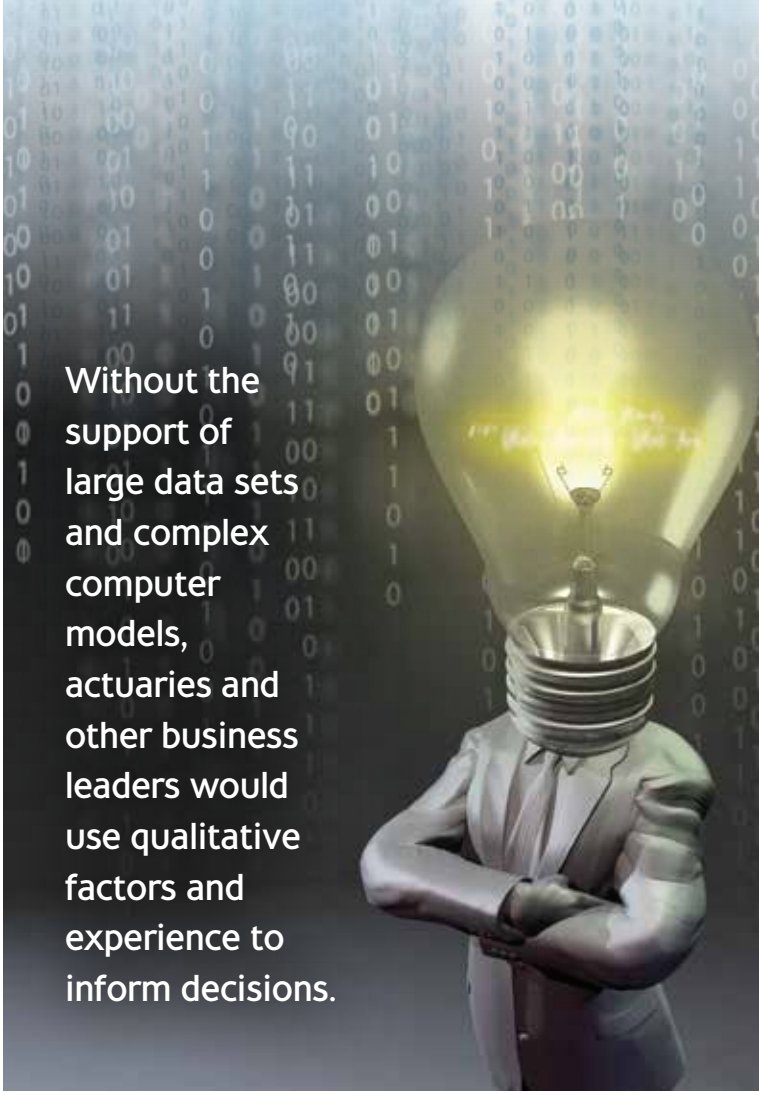
Employing a Wisdom-Focused Data Strategy

In response to the Big Data approach, I believe an alternative offers a much better way to answer important business questions involving complex economic systems. A wisdom-focused approach involves a series of steps and considerations that actuaries can employ to develop a projection. An actuary employing this approach is not necessarily intent on using complex models or an extensive data set to develop a response to a business question. Instead, the actuary looks to most effectively use all available information—including data and other quantitative tools and models—in a transparent process that leads to the best possible decision for his or her organization.

Although this technique is implicitly used by many actuaries in all our specialties, it rarely receives the recognition that comes with other techniques associated with Big Data, or with other modeling techniques, including predictive models, genetic algorithms, agent-based models, or hidden Markov models. Unfortunately, a wisdom-focused approach lacks the flashy appeal of these other techniques, because its inherent simplicity does not have the implied sophistication associated with complex computer models or large data sets.

While the Big Data approach is very much in keeping with the increasing availability of computing power and data, it is far different from the techniques used historically to drive decision-making when less data was available and when computers were less powerful. Without the support of large data sets and complex computer models, actuaries and other business leaders would use qualitative factors and experience to inform decisions. In an effort to balance our profession's interest in using more computing power and data to drive complex models, this discussion will highlight the advantages of using this wisdom-focused approach to drive projections and sound decision-making. The following list highlights many of these techniques:

Understand the underlying system and the potential value of large data sets and complex modeling. Unlike many other analysts who reflexively believe that more data and greater complexity will produce a more credible projection, an actuary using a wisdom-based approach will consider whether the underlying system is complex or simple and whether the system is changing or stable relative to its historical experience.)[2]



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In a simple example, if one were attempting to develop a mortality table, a large data set with more complex modeling could reasonably be employed to estimate its components and be useful in developing life insurance rates. In this case, the system (mortality of a specified pool of risks) and the variables contributing to mortality (age, gender, and other factors) are largely known, and dramatic changes from the historical period to the projections period (other than the continued trend of mortality improvements) are unlikely.

The celebrated Big Data success stories also have many of the above characteristics. With a large historical data set and a simple distribution of potential outcomes ("buy" or "not buy," for example), the historical correlations found in the data can be useful in predicting the buying behavior of a consumer.

These examples are in contrast to what many health actuaries confront in Affordable Care Act (ACA) filings. With no historical cost experience and a highly complex incentive system to participate in the exchange (tax penalties, complex subsidy rules, availability of transitional policies), the use of a traditional Big Data approach is much less useful. In this case, an analyst would need to first find a related data set that could be

Table 1: Comparison of Various Systems

	Stable system with little historical change and significant historical data	Changing system with little or no historical information
Simple system normally distributed	Mortality tables; Product purchases on a website (Complex models and Big Data can be more useful)	New life insurance product
Complex system with fat tails or indeterminant distribution	Health care cost projections prior to the ACA and the financial crisis	ACA rate filings (Big Data approaches much less useful)

reasonably expected to have utilization similar to an uninsured population and then use complex modeling to make a prediction of the expected cost of this population in the future. Between the problem of using data loosely related to an exchange population and estimating economic behavior under a new and complex incentive structure, the final results of this exercise will be of limited use.

As an illustration, Table 1 describes examples of different systems and the relative usefulness of employing complex models.

Consistent with the above framework, an actuary using wisdom will understand the underlying system and then apply a projection technique that is appropriate for the particular system.

Understand the incentives of those providing a projection. As discussed earlier, projections can often come with an embedded bias that needs to be reviewed when considering the potential accuracy of a model. Younger actuaries, for example, may inappropriately try to use complex models or formulas simply because they are more intellectually interesting than simple models. These actuaries are also more likely to show an interesting result rather than present a more ambiguous or uncertain result. Although these tendencies are not inherently a problem in developing a given projection within an actuarial team, these approaches need to be tempered with other factors that may be less interesting or certain but are nevertheless very important in the decision-making process. As many of us have learned, the energy and drive of younger actuaries can be a great asset, but enthusiasm needs to be tempered with a broader understanding of all the approaches that can be used to reach the best possible decision.

While young actuaries have a tendency to use more sophisticated models, as discussed earlier, data scientists often have a career incentive to show a causal relationship between different variables in a data set. In drawing these connections, the technical expert will likely be subject to little oversight in developing conclusions and will not face a clear profit-and-loss accountability at the end of the year. His or her predictions are merely suggestions of potential opportunities, without the "skin in the game" that many business leaders have.

Consider the impact of small proportional deviations in actual results from the projection rather than focus solely on the prediction itself. As one of the most important risk managers at an insurance company, an actuary knows that the outcome of a projection is more important than the projection itself. If, for example, a 2 percent variance in a projection will lead to an extremely adverse financial outcome, the risk of this projection should be considered in a much different light than a projection for a which a 2 percent variance in results would not have a material impact on the organization's overall results.

Look for multiple data sources to confirm or disprove the credibility of a prediction. Throughout my career, I have seen many people fall in love with a story or projection based on the results from a single data source. The problem is that this simple story can often be questioned by reviewing additional sources of data or consulting alternative viewpoints. As with many of our activities, an actuary using a wisdom-focused approach must consider the contrary position and look for evidence that disproves a story or projection with the same enthusiasm as finding a data source that confirms a story.

Consider the costs and benefits of using complex models and large data sets. While complex models and large data sets hold the promise for more credible projections, an actuary using a wisdom-based approach also knows that the additional complexity comes at a cost—a much greater likelihood that the results could contain a significant error driven by either the underlying data or the model's design. This problem is often further magnified when the results of the model cannot be easily checked with a simple model or intuition. Beyond the costs of Big Data approaches, the use of more data, in most cases, will have increasingly less benefit as more data is captured in proving a particular research question. As a result, this additional risk management cost and potential benefits should be considered when assessing the trade-off between using a complex model and using a more simple approach.

Understand the risk tolerance of the organization. It is often difficult for senior leaders to clearly articulate the exact risk tolerance acceptable for an organization. In these cases, an actuary must make a judgment that considers a quantitative understanding of the risk along with a qualitative understanding of the organization's risk tolerance. This judgment certainly

isn't easy, but it represents one of the most important qualitative tasks in our profession—and it is one that many other technical experts are not trained to understand.

Ensure a transparent process to discuss key assumptions, exogenous model factors, and the potential variability in predicted results. Because identifying and carefully establishing key assumptions are important to the ultimate outcome of a projection, an experienced actuary will ensure complete transparency and facilitate a wide discussion of these assumptions throughout the organization. This transparency and discussion will help ensure that a diverse range of viewpoints is considered in the process and that no insight is ignored in developing the key assumptions. These actuaries will not only consider the known model factors but will also ensure a broader discussion of other factors that are not explicitly included in the model but that could materialize in the future and affect results. As we have seen with the extension of the transitional plans into the ACA pools, these unknown factors could have a profound impact on the ultimate results.

In addition to highlighting the most important assumptions, the variability associated with a projection should be shown. Some best practices include:

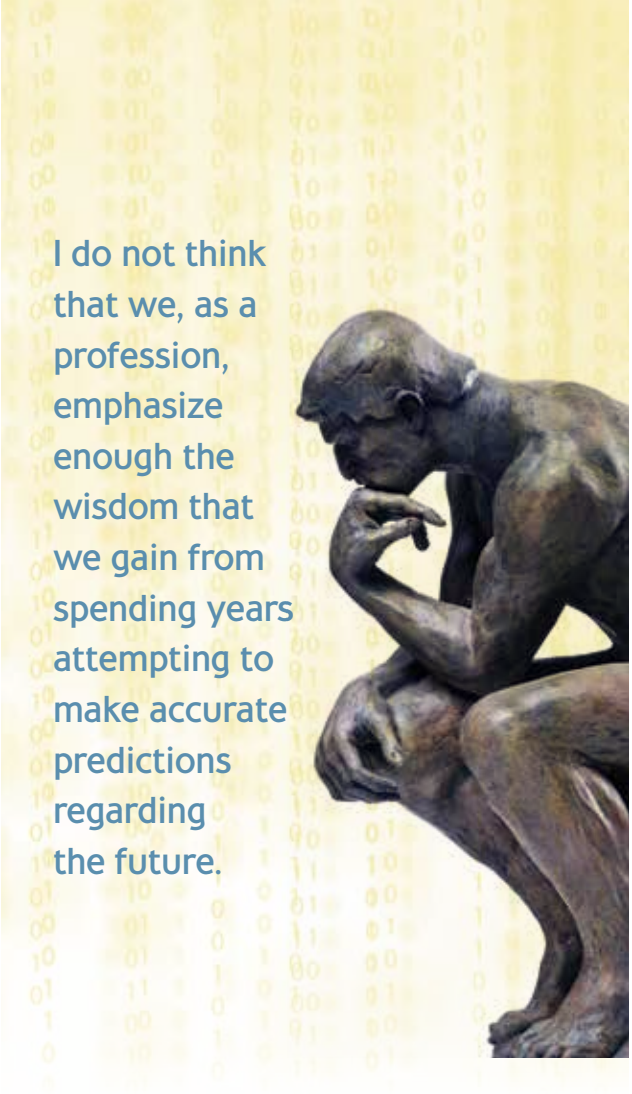
- Show the projection as a distribution of potential outcomes rather than a single point estimate. The potential variance needs to be emphasized, and the analyst should highlight the relative variance in comparison with the potential variance of other projections.
- At the beginning of the project, set appropriate expectations regarding the potential accuracy of the projection, and maintain this position throughout the entire process.

In addition to the above specific actions, an actuary employing a wisdom-based approach will approach projections with a significant amount of humility throughout the entire process. Those who have been practicing for a long time have seen their share of unforeseen adverse financial events—higher-than-expected trend, a volatile financial market—and will make allowances for adverse events in their projections throughout the estimation process, including highlighting the potential risks in making a particular decision. In many cases, these practices will not be popular, but they are a foundational trait among those practicing a wisdom-focused approach.

Conclusion

I do not think that we, as a profession, emphasize enough the wisdom that we gain from spending years attempting to make accurate predictions regarding the future. Because we are often in the hot seat to make projections and accept the financial responsibility associated with our decisions, we intuitively learn many techniques outside of the typical Big Data approach that are important in developing the best possible projections.

As many actuaries know from experience, the usefulness of models and data can vary widely; depending on the business question and the characteristics of the system being predicted, it is important to employ techniques that find the appropriate balance between the qualitative factors and the quantitative metrics. We have also learned many of the techniques necessary to manage an effective decision-making process, including how to communicate, how to focus on key assumptions, and how to set appropriate expectations.



In my own actuarial career, as I consider the inevitable trade-off between simpler models and models with greater complexity and large data sets, I am reminded of a quote from the well-known economist and philosopher Friedrich Hayek: "I prefer true but imperfect knowledge, even if it leaves much undetermined and unpredictable, to a pretense of exact knowledge that is likely to be false." □

KURT J. WROBEL, MAAA, FSA, is chief actuary at the Geisinger Health Plan in Danville, Pa.

Endnotes

1. The term "Big Data" is used here to include an analysis that is based on either a large data set or a very sophisticated modeling process (or both), with a focus on establishing historical correlation among different data elements. While a more narrow definition may include only an analysis for data sets that go beyond traditional software tools, I will be using this broader definition.

2. This model is based, in part, on the four-quadrant model introduced by Nassim Taleb, author of *The Black Swan* and other books on probability. His approach helps formalize a framework that many actuaries implicitly use on a day-to-day basis.

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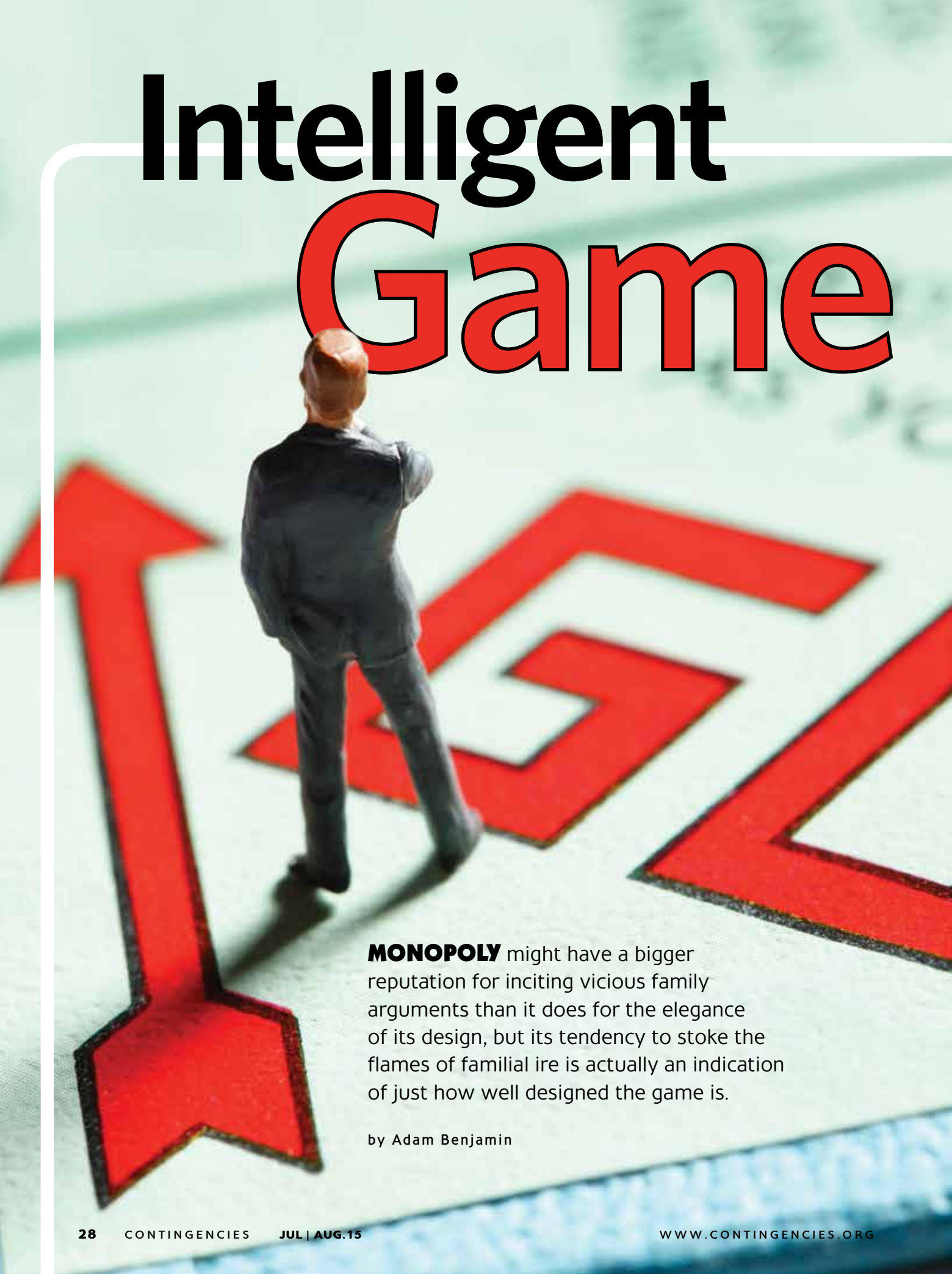
Intelligent Game



MONOPOLY might have a bigger reputation for inciting vicious family arguments than it does for the elegance of its design, but its tendency to stoke the flames of familial ire is actually an indication of just how well designed the game is.

by Adam Benjamin

Design

Much like a good movie, a great musical album, or your favorite novel, there's a lot of work that goes into games before they're ready for public acclaim. Indeed, game design is a laborious process that's as likely to end in failure as success. From concept to mechanics to playtesting and eventually marketing, there is a long list of things that need to go right before a game is ready to stock the shelves of your local game store (or, if you're really lucky, your local big-box retailer).

Despite their reputation, games are not simple vehicles for mindless entertainment. Indeed, anyone who frequents the crossword section of the newspaper will tell you: There's a lot of brainpower that goes into playing games. But don't take our word for it. Just ask Benjamin Franklin.

"The game of Chess is not merely an idle amusement," Franklin wrote in his essay "On the Morals of Chess." Rather, he asserts, "Several very valuable qualities of the mind, useful in the course of human life, are to be acquired or strengthened by it, so as to become habits, ready on all occasions."[1] In particular, he mentions foresight, circumspection, and caution as three traits that players develop through the game of chess. The ability to think ahead, to reflect on your mistakes, and to minimize your future errors—these are certainly useful skills in any context.

Nor are the benefits of playing games restricted to old classics. Modern board games teach a very important skill: play. In an interview with *The Washington Post*, Marilyn Fleetwood, a Montessori school president, mentions that "play is probably the most important skill for life. Most children learn to read, but social skills are one of those things that really have to be developed. And that's what you get with board games."[2]

Even video games can give your brain a hefty cognitive workout. Isabela Granic, Adam Lobel, and Rutger C. M. E. Engels wrote about "The Benefits of Playing Video Games" in *American Psychologist* little more than a year ago. They pointed out that video games rarely instruct players on how to solve their puzzles, instead forcing players to quickly develop and test their own solutions. Thus, "instead of learning through explicit linear instruction (e.g., by reading a manual first), many children and youth problem-solve through trial and error, recursively collecting evidence which they test through experimentation."[3]

Games offer these kinds of benefits in part because game design itself is such a rigorous and difficult process—as much art as science. Games challenge our brains the way exercise challenges our muscles, forcing them to respond, adapt, and strengthen. By looking into the process of game design, we can learn about critical thinking and balancing multiple competing priorities. We'll look at some of the greatest challenges of game design and how professional game designers approach those obstacles, and we'll examine what sorts of lessons we can draw from the game design process broadly.

Considerations of Game Design

Game design, at its heart, is an enormous yet delicate balancing act. Game designers must weigh and adjust dozens of considerations simultaneously, tweaking the game until it addresses each of those concerns as optimally as possible.

Does the game function the way the designer intends it to, or are some mechanics jamming up the action? Does the gameplay evoke the game's theme, or are thematic elements relegated to art and flavor text? Is it fun—and how does one even measure the "funness" of a game? What about replay value? Is the game as fun the fifth, sixth, tenth time you play it as it was the very first?

Game designers may bang their heads against a wall trying to answer just one of those questions. But good game designers must find answers for all of them—and many more.

The process of game design typically has one of two starting points: a thematic idea, or a mechanical concept. Starting with a theme is known as "top-down" design—contrasted with "bottom-up" design, which begins with the game's mechanics. If you decide to design a game about bounty hunters in space, you're designing top-down. But if you start with an idea for a

The ability to think ahead, to reflect on your mistakes, and to minimize your future errors—these are certainly useful skills in any context.

game that involves racing to board locations for victory points and battling with dice rolls, you're designing bottom-up.

Neither process is necessarily better; they're simply two different paths that a designer can take. And regardless of where the designer starts, there are numerous obstacles on that path, including the task of marrying the game's mechanics to its theme. From there, a designer must weigh countless considerations, including some particularly slippery concepts like marginal advantages and entropy.

Game design website Gamasutra offers a succinct yet engaging exploration of these two concepts.[4] Marginal advantage is the concept of gaining a lead ("advantage") early in the game, and maintaining that lead through small increments ("margins") throughout the game. By contrast, entropy refers to game elements that can disrupt a player's advantage, so as to keep the game engaging and competitive throughout.

A well-designed game should allow skilled players to establish and hold on to marginal advantage in most games. Players are rewarded for skill and good decision-making. An overly entropic game—one that can always be decided by a random event at the endgame—is fundamentally uninteresting, because there's no investment in the early or midgame. Conversely, a game without a certain measure of entropy can drag on long after the outcome has been decided.

Good games balance marginal advantage and entropy so that every part of the game is significant, allowing skilled players to gain the lead by making informed decisions, while also rewarding players who make smart, strategic moves—and calculated risks—after falling behind.

Then, once the game designers have walked the tightropes of theme vs. mechanics, fun vs. function, and entropy vs. marginal advantage, they still have to test the game. Playtesting and refining are crucial parts of the design process, allowing the designer to determine which aspects of the game are working properly and which still need work.

All of these considerations raise the question: How in the name of Rich Uncle Pennybags do game designers do it?

Designing Games

Before looking at what the designers themselves have to say about designing games, we should acknowledge that game design, like any creative endeavor or development process, will be different for each person. There is no "correct" way to design games, no incorrect way, no best or worst method. But by examining the different processes through which designers create their games, we may glean certain insights from the patterns and similarities that do arise.

Any discussion of game design would be incomplete without comments from Richard Garfield, designer of more than 20 games, including one of the most popular and enduring games of the past 25 years: Magic: The Gathering.

Magic: The Gathering (often shortened to "MTG" or simply "Magic"), is a collectible card game in which players construct decks to battle one another. Players take the role of planeswalkers, powerful magic-wielders who can cast sorceries or summon creatures to battle. Games are played in duels or wild multiplayer free-for-alls, as players call upon powerful spells from their library of cards to drain their opponents' life as quickly as possible.

Speaking to Opinionated Gamers, Garfield detailed his approach to balancing skill and randomness—two aspects related to marginal advantage and entropy, as mentioned earlier. "I think it [is] better to have randomness come from different choices rather than just random success or failure," Garfield says, noting that when a game is reduced to a simple chance event—such as drawing a particular card to win the game—it becomes less enjoyable.[5]

Indeed, the presence of choice is essential to good game design. Even in games that are mechanically simple, players often have the opportunity to make strategic decisions that can affect the final outcome. During a game of Yahtzee, for instance, the initial roll is entirely random, but players are given the option to roll any number of dice a second or third time, bringing an element of strategy to an otherwise very chance-based game.

I spoke to Ben Rosset, designer of Brew Crafters and Brew Crafters Travel Card Game, about his priorities during the design process. "I think the best word to describe what I look for is 'engagement.' Are the players sufficiently engaged throughout the entire game? Are they constantly tuned in to the game, or are they continually checking their phones, starting side conversations, or going to the kitchen for snacks?" As Garfield pointed out, a steady stream of meaningful decisions is one way to ensure engagement. By constantly being given choices, players are continually invited back into the game, keeping their focus on the board or cards in front of them.

And while good games let players influence the game through timely decisions, designers take great pains to ensure the gameplay is balanced. Rosset explained the process: "As the design is refined, that's when you need to take a closer look at the mathematical engine that drives the game to make sure the game is balanced and that there is no broken, unbeatable path to victory. The most challenging part of using math ... is hiding it."

The relationship between theme and mechanics is particularly important here, says Rosset. "Basically, you're trying to put ... an engaging theme and gameplay on top of the mathematical engine [so] that players don't realize they are doing math as they are playing the game." Whether it's dice rolls or card draws, the mathematical elements are much more digestible for players when they're entwined with the game's theme. "More people will engage with a game if they don't feel like they are doing math

homework, even if they are making very complex statistical or probability calculations in their head about what move they should make on their turn," Rosset says.

In order to assess whether those mechanics are working, though, a designer must put substantial time into playtesting and gathering player feedback.

Video game developer Bungie, the studio behind the Xbox classic Halo: Combat Evolved and three of its sequels, invests heavily in the collection of feedback for its games. While testing Halo 3 before release, Bungie allowed *Wired* contributor Clive Thompson a behind-the-scenes look at its playtesting process. The central element is "a testing lab for Bungie that looks more like a psychological research institute than a game studio. The room we're monitoring is wired with video cameras that [Halo 3 playtesting lead Randy] Pagulayan can swivel around to record the player's expressions or see which buttons they're pressing on the controller. Every moment of onscreen action is being digitally recorded."[6]

The process of game design is itself a sort of puzzle: Designers must balance competing goals, repeatedly adjusting their strategies in order to find victory in a fun, challenging game for players to experience.

The experiences of every playtester are recorded, aggregated, and studied for any indication of bad user experience. Are players getting stuck on a particular battle? Is the appropriate path through the level not clear enough? No detail is too small, and the development team will adjust different aspects until the game has achieved the perfect balance of being fun, challenging, and rewarding.

For Bungie, of course, the stakes are higher than they are for independent game developers. Development costs for video games rival Hollywood blockbusters, sometimes reaching more than $100 million.[7] Thus, a flop upon release means the studio will have wasted a lot more than just time developing the game.

The key to success, according to Thompson, is creating a game that draws players into a state of "flow"—a heightened state in which players respond to the game and make decisions quickly, almost instinctively. As Thompson explains, "Gamemakers have to devise a system of rules and equipment that gives players a few basic goals and then allows them to find their own ways of achieving those goals. The flow comes from constantly discovering innovative ways to solve these open-ended problems."

The best game designers are able to take that feedback and use it to simplify the game, creating an engaging experience that challenges, teaches, and ultimately entertains players.

Lessons of Game Design

Good games are able to help us refine our cognition skills even while entertaining us. And in some cases, the games can provide substantial rewards of their own.

Researchers have discovered the benefits of games thanks to the process of gamification—adding game-like elements to problems or challenges that otherwise involve dull, rote tasks. At its simplest, gamification can make everyday chores more bearable. At its best, it can help us solve complex scientific problems.

Take, for example, understanding the crystal structures of viruses. Granic, Lobel, and Engels, the researchers who studied the benefits of video games, describe an astonishing breakthrough at the University of Washington that was aided by gamification. While attempting to model the structures, researchers released a game to the public, allowing players to create genetic models of proteins. The task was gamified by scoring the results and pitting players' scores against one another.

Within three weeks, researchers were looking at new structures created and discovered by the players—with no more incentive than achieving the top score in the game. "The structure had eluded researchers for over 10 years," the authors write. "However, the nonlinear, cooperative, and creative problem-solving techniques used by these gamers seemed to be precisely the skills needed to finally solve this elusive problem."

The process of game design is itself a sort of puzzle: Designers must balance competing goals, repeatedly adjusting their strategies in order to find victory in a fun, challenging game for players to experience.

So the next time you're soaking up the emotional fallout of a family game of Monopoly, try not to curse your uncle for his sudden but inevitable betrayal. Instead, consider how invested you are in the game's outcome, and how much effort the designers must have put in to achieve that investment.

And then, using your game-enhanced cognition, plot your revenge. □

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Mortality Experience of Civil War Veterans

and Comparison With Other Wars

By Philip Lehpamer

IN 2015 THE UNITED STATES OF AMERICA CELEBRATES THE 150TH ANNIVERSARY OF THE END OF THE CIVIL WAR, which raged from April 1861 to April 1865. Considering both Union and Confederate forces, many historians have estimated that about 620,000 soldiers died during those four years. However, in 2011 Binghamton University historian J. David Hacker stated that the number of soldier deaths was approximately 750,000, or about 20 percent higher than traditionally estimated, and possibly as high as 850,000. Some historians believe that the Civil War accounted for at least as many American deaths as all other U.S. wars combined.

With respect to the longevity experience of soldiers who survived the Civil War, two different points of view developed: (1) Veterans were healthy, active men relative to the general population (because disabled and chronically sick individuals were excluded from fighting), and thus the mortality experience of veterans should be favorable compared with the overall male population, especially as time elapsed from the end of the war and wounds and diseases were healed; or (2) The experience of war would negatively affect the future longevity of veterans years after the conflict, and one should expect shorter life spans and higher mortality rates than in the general male population for some time.

Back issues from the *University of Pennsylvania Medical Bulletin* show that the health of the survivors of the Civil War was studied in the late 19th century. In that publication John S. Billings, examining census records, attempted to gauge the death rates of veterans; he found the data did not support view (1), as his calculations were showing that the expectation of life for veterans was not as great as or greater than that of other males. Yet support for view (1), at least for the Army officer

Above: The Civil War section of Green-Wood Cemetery.

Right: After the war, Union soldiers experienced mortality that differed from that of the general population.

class, might be expected from the multitude of socioeconomic studies done later in the 20th century. That is, Army officers came out of a social class that typically correlated with education and financial well-being; these two attributes for a group almost always show better mortality experience than that found in the general population or in groups that do not have these characteristics.

Green-Wood Cemetery in Brooklyn, New York, was one of America's early rural cemeteries. It was founded in 1838 and today is a National Historic Landmark. Its 478 beautifully landscaped acres and outstanding architecture serve as the final resting place of 560,000 individuals, including nearly 5,000 veterans of the Civil War. Recent work by the cemetery's historian, Jeffrey Richman, and a group of dedicated volunteers has produced biographies of many of these veterans; their work also documents years of birth and death. That data allowed the author of this paper to investigate veteran mortality experience separated by highest achieved Army rank.

This article comes to three conclusions about the mortality experience of Civil War veterans based on this data set and includes a brief comparison with other veteran studies from other wars.

The Civil War Army Veteran Population at Green-Wood Cemetery

The biographies of the soldiers at Green-Wood give their highest attained rank:

Table 1

Category	# Survived the War Years	# Died 1861–1865
Field or General Officer	300	56
Commissioned Officer	740	145
Noncommissioned Officer	716	76
Private	1,803	191
Total	3,559	468

This article examines the mortality experience of the 3,559 veterans who died after 1865. The next table separates the surviving officers further by rank.

Table 2

Highest Military Rank Attained and Number in Each Rank	Total Number
Brigadier General (54), Major General (12), General-in-Chief (1)	67
Major (90), Lieutenant Colonel (71), Colonel (72)	233
Lieutenant (443), Captain (297)	740
Corporal (310), Sergeant (406)	716
Private	1,803
Total	3,559

Having the year of birth and year of death for each soldier allows us to immediately calculate the calendar age at death, which is defined as [calendar age at death] = [calendar year of death] – [calendar year of birth]. With the calendar age at death for each of the soldiers, we can calculate the average calendar age at death for each of the ranks listed above by adding the calendar ages by rank and dividing by the total number for that rank. The average calendar age at death for each rank is given in Table 3.

Table 3

Average Calendar Age at Death for Each Rank	
Brigadier General (64.8), Major General (71.8), General-in-Chief (57)	All General Officers (65.9)
Major (61.5), Lieutenant Colonel (61.9), Colonel (63.25)	All Field Officers (62.2)
Lieutenant (59.7), Captain (62.7)	Commissioned Officers (60.9)
Corporal (59.6), Sergeant (59.0)	Noncommissioned Officers (59.3)
Private (58.0)	Private (58.0)
	Total Army (59.3)

In Table 3, we see that longevity as defined by calendar age at death is closely correlated with rank, as the higher ranks have higher average calendar ages at death. This result is not surprising; rank is to some extent a function of education and social status, and as mentioned earlier, almost all studies show that better socioeconomic conditions lead to improved longevity. Here we see evidence of that reality in the average longevity experience of deceased Civil War veterans who survived the war years.

FIRST CONCLUSION: ***The average age at death of Army veterans is correlated to the highest attained military rank, with the higher ranks having better average longevity.***

However, there is another factor that may be at work here; namely, robust health is probably necessary for individuals to make it to the top ranks. A 2014 study done of 1949, 1950, and 1951 U.S. Naval Academy and U.S. Military Academy graduates showed that the higher final ranks had longer life spans, but the pattern of mortality differentials supported the "selection" hypothesis that those with robust health had greater chances to make it to the top, in contrast to those with frail health.

In 2007, T.J. Saclarides studied the morbidity and mortality of Confederate generals and found that the mean age of death for those who survived the war was 68.0 years, a result not inconsistent with the generals buried in Green-Wood, as shown in Table 3. In another century and in another part of the world, retired Maj. Gen. Surjit Singh's study on retired Indian army personnel, published in 2005, had senior officers living to age 72, junior officers to age 67, soldiers from the engineering battalion to age 63, and infantry soldiers to age 59. The socioeconomic pattern observed in American military ranks from the late 19th and early 20th centuries is once again seen, this time in late 20th-century Indian military ranks.

Logistics of the Mortality Study in This Paper

The source of data for the mortality study is the record of year of birth and year of death for each of the Army veterans as shown by Green-Wood Cemetery. There is no reason to think that this data is biased in one direction, either to older or younger ages, and any inadvertent mistake in recording a particular soldier's information should be minimized and even offset by considering a sufficient number of veterans. Certainly, 1,803 veterans with the rank of private is a huge cohort, and we can trust this collective data with confidence. The number of soldiers who attained the rank of general, however, is relatively small at 67 and needs to be combined with the field officer ranks of major, lieutenant colonel, and colonel in order to produce a cohort of 300 individuals, which is barely adequate in terms of numbers as we trace the lives of these men for 70 years and attempt to conclude something about their mortality experience at the advanced ages.

The observation period for the mortality study is Jan. 1, 1866, through Dec. 31, 1935, a period of 70 calendar years, and we divide that period into seven periods, each of 10 calendar years: Jan. 1, 1866–Dec. 31, 1875, Jan. 1, 1876–Dec. 31, 1885, ..., Jan. 1 1926–Dec. 31, 1935. At the start of the mortality study on Jan. 1, 1866, we have 3,559 soldiers alive and separated for the purposes of the study into four categories: the field and general officers (majors, lieutenant colonels, colonels, generals) numbering some 300 individuals, the commissioned officers (lieutenants and captains) numbering 740, the noncommissioned officers (corporals and sergeants) numbering 716, and the 1,803 privates. We record the deaths of the soldiers by calendar age in each of the four categories during the first 10-year period between Jan. 1, 1866 and Dec. 31, 1875 and note those who have survived that period of time. Those "enders" become the starters for the next 10-year period, and we proceed as before, recording the deaths and noting those who survived. At the end of the full observation period, at the conclusion of the day on Dec. 31, 1935, we have finished our study, and it turns out that we have only nine "enders" remaining: one sergeant and eight privates.

Recording actual deaths as described above becomes more relevant if we are able to compare those actual deaths with some measure of expected deaths. The usual basis of expected deaths is to look at the mortality of the general population (in this instance, since all the Army soldiers were males, the

mortality experience of the male population) during the appropriate period. The United States government began producing United States Life Tables at the beginning of the 20th century that provide population mortality rates, and the Social Security actuaries in their work also went back to the year 1900 to produce mortality rates applicable to the general population separated by age and sex. For consistency in development I have used the Social Security male mortality rates for the basis of expected deaths in this paper for the last 40 years of the observation period.

Findings Compared With the General Population

Having tabulated actual and expected deaths in each period for each category allows us to calculate the ratio of actual deaths divided by expected deaths. Ratios close to 1.0 indicate that the category or group being studied has mortality experience equivalent to the overall male population. A ratio of 0.90 would show that that group's mortality experience is about 10 percent better than the overall male population, while a ratio of 1.10 would show mortality experience 10 percent worse than the overall male population. Some groups have exceptionally favorable mortality with mortality ratios around 0.50, while other groups are at the other end of the spectrum with actual/expected ratios (A/E's) around 2.0.

Table 4 shows the mortality ratios associated with the Civil War veterans buried in Green-Wood Cemetery. The basis of the expected deaths is the male mortality rates for the years 1900, 1910, 1920, and 1930 as published by the Office of the Actuary, Social Security Administration.

SECOND CONCLUSION: ***Veteran mortality was uniformly worse than the available population mortality across all ranks except for the rank of private during the time period 1916–1935.***

If we look at the total Army experience from Table 4, we see that actual deaths exceeded expected deaths in each of the four periods, and that the mortality experience improved over time; this finding supports view (2) mentioned above, that the war adversely impacted subsequent veteran mortality experience. What may be really surprising here is that for the period 1896–1905—some 30 to 40 years after the end of the Civil War—veterans were collectively experiencing a mortality ratio 20 percent worse than expected by the male population. The effects of the war, if that is a cause of this high ratio, apparently did not wear off quickly.

Moreover, looking at the private rank, we see that the A/E ratio was 35 percent above the population during the 1896–1905 period. Even the officer ranks, although uniformly better with lower A/E's than the private rank, were still worse than the population.

Given the usual socioeconomic expectation that these ranks should have better-than-average population mortality, other factors may be at work in this study. In particular, the immigrant

Table 4

Privates:	1896-1905	1906-1915	1916-1925	1926-1935
Starters	878	530	252	76
Enders	530	252	76	8
Actual Deaths	348	278	176	68
Expected Deaths	257.758	263.587	182.980	75.471
Actual/ Expected	1.350	1.055	0.962	0.901
Noncommissioned Officers:				
Starters	366	241	104	24
Enders	241	104	24	1
Actual Deaths	125	137	80	23
Expected Deaths	114.255	120.153	75.328	17.726
Actual/ Expected	1.094	1.140	1.062	1.298*
Commissioned Officers:				
Starters	372	232	91	14
Enders	232	91	14	0
Actual Deaths	140	141	77	14
Expected Deaths	132.603	126.666	65.065	12.145
Actual/ Expected	1.056	1.113	1.183	1.153*
Field & General Officers (F&GO):				
Starters	121	63	18	2
Enders	63	18	2	0
Actual Deaths	58	45	16	2
Expected Deaths	53.233	38.775	15.088	0.644
Actual/ Expected	1.090	1.161	1.060*	3.106*
Total Army				
Starters	1,737	1,066	465	116
Enders	1,066	465	116	9
Actual Deaths	671	601	349	107
Expected Deaths	557.849	549.181	338.461	105.986
Actual/ Expected	1.203	1.094	1.031	1.010

*We note that the Actual/Expected ratio is greater than 1, consistent with the other results; however, since there are not enough starters in this cohort, the resultant A/E is not fully credible. The entire study is highly credible, however, as there were 25,468 life years of exposure to the risk of death for the 1,737 soldier starters for the period Jan. 1, 1896–Dec. 31, 1935.

Civil War veterans, Green-Wood Cemetery, 1920

effect, whereby immigrant mortality in the 20th century has been shown to be an exception to the socioeconomic rule that money and/or education leads to better mortality. That is, the influx of America's immigrants into the overall general population improves overall mortality, lowering expected deaths and raising the A/E ratios. If this immigrant effect was in place in the 19th century, that would be a factor in raising the mortality ratios of Civil War veterans.

Looking at Table 4 for the years 1906–1935, there is no real mortality improvement relative to the population in any of the officer categories; however, there is a marked drop in the A/E's for the private rank, which become favorable in the last 20 years of the study. One wonders if there is something in common that could be identified among the 252 privates who survived to 1916 and who then experienced not only better mortality than the overall male population but also better mortality than their 213 remaining officers, other than calling them robust and attributing their longevity to some form of natural selection.

In 2012, a study done on Civil War POWs looked at their mortality 35 years after the war, and concluded that whether a robust or frail effect was in place depended on the age at imprisonment. That is, among the survivors to 1900, those younger than age 30 at imprisonment faced higher old-age mortality while those older than age 30 at imprisonment faced a lower older-age risk.

Findings Compared by Rank

We do not have an adequate government measure of United States population mortality in the 19th century, which prevents a calculation of A/E's by category for the years 1866–1895. But it is possible to compare the mortality experience for each of the four categories by time period. In Table 5, the number 1.00 is assigned to the mortality experience of the private rank in each of the seven periods; the mortality experience for the other categories relative to this assigned value of 1.00 is then shown. This convention is done for convenience—in essence it makes the private rank the standard by which other groups are measured, and it allows us to compare the mortality experience among the categories within each time period (although not between two periods).

The results of this convention show that the officer ranks generally have better mortality experience than the private rank during the first four decades after the Civil War, but the trend reverses, and privates experience better mortality than the officers in the final decades of the study.

Table 5

Time Period	F&GO	Comm.	Noncomm.	Privates	Male Population
1866–1875	0.61	0.75	0.80	1.00	n/a
1876–1885	0.85	0.84	0.96	1.00	n/a
1886–1895	0.97	0.96	1.04	1.00	n/a
1896–1905	0.81	0.78	0.81	1.00	0.74
1906–1915	1.10	1.05	1.08	1.00	0.95
1916–1925	1.10*	1.23	1.10	1.00	1.04
1926–1935	3.45*	1.28*	1.44*	1.00	1.11

*We note that the officer mortality is worse than the mortality of the private rank, which is consistent with the results in the later time periods; however, the number of soldiers contributing to this result in this cohort is too small to be credible. Grouping all the officers together in the period 1926–1935 from Table 4 shows actual deaths were 39 while expected deaths were 30.515, giving a mortality ratio of 1.278. The comparable number from Table 4 for privates was 0.901. Thus in this final period of the study, officer mortality in total was 27.8 percent greater than the male population, and 1.278/.901 = 1.418, or 41.8 percent greater than the mortality of the private rank.

THIRD CONCLUSION: ***The officer ranks had better mortality than the private rank in the first four decades after the Civil War, except for noncommissioned officers (sergeants and corporals) during the period 1886–1895.***

The fact that rank has a positive effect on mortality is not surprising, although its reversal in the last three decades of the study is. Moreover, conclusions 2 and 3 are different from the results of studies done on World War II veterans with respect to population mortality. There the results indicate that the prescreening selection process for entry into the military exerted a positive effect on the mortality of veterans after separation from service. In total, 85,491 white male veterans were followed for 23 years, 1947–1969, and generally the mortality rates of those

veterans were well below those of the general population within the first few years of discharge but thereafter gradually approached those of the parent population. By rank, it was found that the mortality of privates was close to expectation based on population rates, while noncommissioned officers had a 23 percent advantage and commissioned officers about a 40 percent advantage.

Looking at Table 5, we see during the early decades of the Green-Wood mortality study that the officers did have better mortality experience than the privates, similar to the WWII study, but given Table 4, it is not likely that any of these soldiers did better in mortality than the general population during that period. The preselection process that worked well in WWII to lower subsequent mortality was not evident in the Civil War. Of course, as mentioned before, if the healthy immigrant population that came to the United States after the Civil War lowered population mortality, then this contributed to higher mortality ratios for veterans; however, it is more likely that a relative lack of medical knowledge about illness at that time—along with no antibiotics to control diseases and the corresponding lack of technology such as electricity, medical equipment, and limited anesthesia that made many operations dangerous or impossible—contributed to adversely affecting the health and mortality of surviving Civil War soldiers.

The literature on World War I focuses on war deaths and casualties, with little information on the mortality of those who survived. A study of New Zealand soldiers showed that survivors of WWI had worse mortality than those males in the population who did not fight. Similar to the experience of Green-Wood Civil War veterans, prescreening selection does not appear to be as strong a factor in the final mortality results as the actual enlistment into military service.

Final Observations

The three results obtained in this study may not hold for Civil War veterans buried in other cemeteries because of the demographics of the soldiers. In particular, Green-Wood Cemetery veterans are mainly Union troops (under 2 percent fought for the Confederacy), and only a few are identified as African-American soldiers, two factors that would have affected subsequent mortality.

If the Civil War adversely affected the long-term longevity of surviving soldiers throughout the country similar to conclusion 2 of this study, then perhaps the actual length of military service during the war years for each soldier is a factor in the study. In particular, perhaps the 252 privates who survived into the last two decades of the study and then showed better mortality than the population and the officer group had limited exposure to the actual war; hence, less stress to carry forward and greater longevity. There is enough information in the Green-Wood archives to answer this and related questions concerning the impact of the Civil War on its veterans.

In August 2008, Department of Defense actuaries reported significantly higher mortality rates among active-duty retirees compared with reserve retirees, with the disparity stretching back decades. In any given year the death rate for active-duty enlisted retirees age 60 and older was 20 to 25 percent higher than for comparable reserve enlisted retirees. Active-duty officer retirees who are 60 and over have about 10 percent higher mortality than retired reserve peers. With respect to the overall population, all retired officers and retired reserve enlisted soldiers had better mortality, but for retired active-duty enlisted, mortality was about even with the overall population.

The results of this study surprised many individuals and raised several questions, ranging from the quality of medical care active-duty retirees were receiving to the adverse long-term impact of military stress on the life of a soldier; this latter being exactly the point of view expressed in the late 19th century as the deaths of Civil War soldiers began to be investigated. Why active-duty retirees have had worse mortality than their reserve counterparts in recent times may still be under investigation. But the mortality experience of Green-Wood Civil War veterans as shown in Table 4 documents a long-term adverse impact—even years after the conflict ended. Given the improvements in medical knowledge and technology, one would like to think those impacts are behind us, but apparently that is not the case. □

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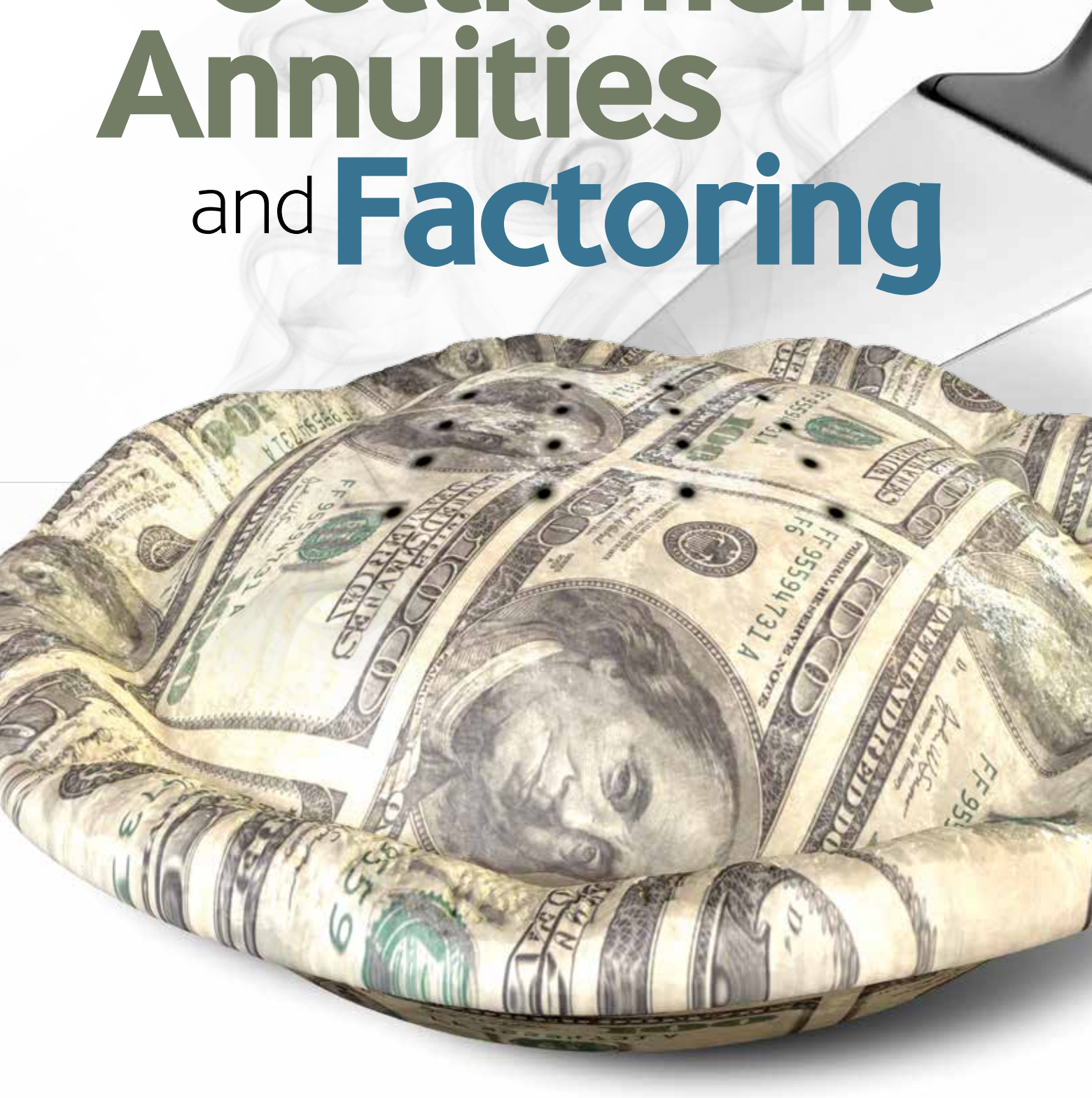
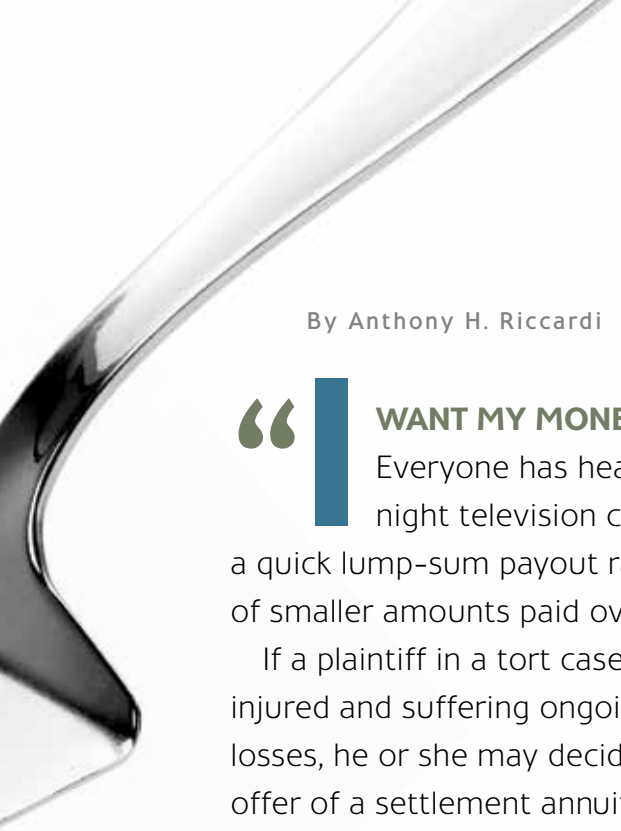
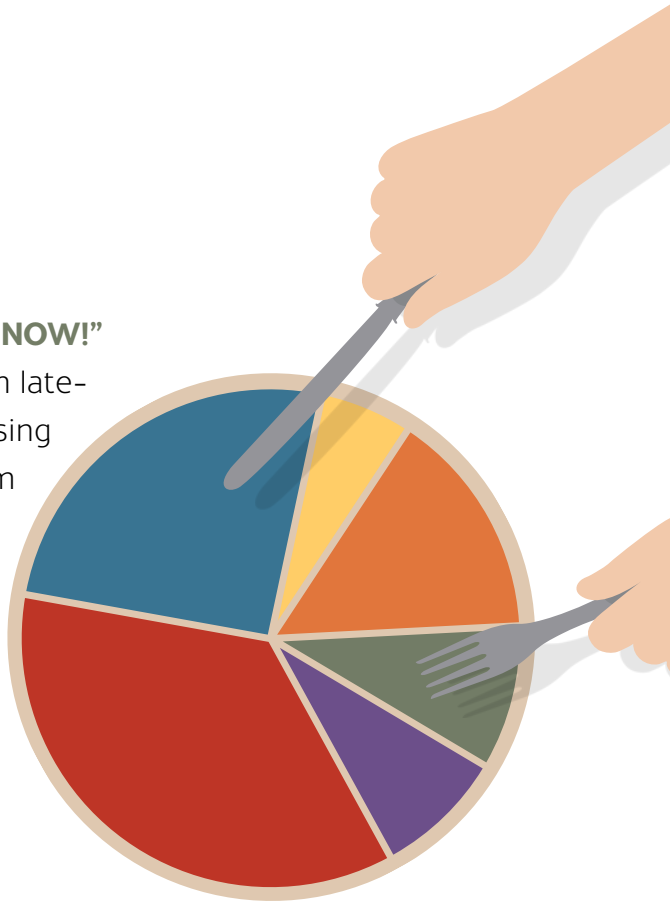
The Role for Actuaries in Settlement Annuities and Factoring



By Anthony H. Riccardi





"I WANT MY MONEY, AND I WANT IT NOW!" Everyone has heard the refrain from late-night television commercials promising a quick lump-sum payout rather than a stream of smaller amounts paid over a longer period.

If a plaintiff in a tort case is physically injured and suffering ongoing economic losses, he or she may decide to accept an offer of a settlement annuity—compensation distributed in periodic benefit payments. Indeed, a risk-averse plaintiff stands to gain distinct advantages by doing so.

Defendants see advantages from such an annuity structure as well, which is why many states are mandating that plaintiffs who prevail in personal injuries or wrongful death actions accept a structured settlement offer that includes periodic payments from a settlement annuity. However, the Internal Revenue Service treats the annuity contract as financed and owned by the defendant, which means the plaintiff irrevocably relinquishes investment liquidity.[1]

Consequently, cash-strapped payees who are locked into rigidly structured settlement annuity frameworks often seek immediate liquidity. A growing gray market known as factoring has emerged to provide immediate lump sums for settlement annuities. The nature of these factoring transactions is controversial and remains the subject of much debate—and as this market develops, actuaries can play a crucial role in providing enlightenment in order to level the playing field for individuals seeking liquidity in the factoring market.

To appreciate how and why an actuary might play a role in the settlement annuity and factoring debate, let's first provide some basic operational definitions for readers who are not acquainted with this specialized area of actuarial work.

1. "Investment liquidity" is defined as the ease of an asset's conversion to cash.

Definitions

- **Settlement Annuity**: A contractually stipulated schedule of periodic benefit payments, which are due and payable to a plaintiff/annuitant (also known as a payee), not subject to personal income tax and defendant-financed from the lump-sum proceeds of either a personal injury or wrongful death settlement or award in compliance with Internal Revenue Code §104(a)(2) and Revenue Ruling 79-220. The most common modes of a settlement annuity are:
  - **Annuity Certain**: A stream of specified benefit payments made to an annuitant, or to his estate, at periodic intervals for a predetermined number of years (or months) only; payments are not dependent on the survival of the annuitant.
  - **Life Annuity**: A stream of specified benefit payments made at periodic intervals for the duration of an annuitant's lifetime; if there is a periodic payment limitation that specifies a point when the payments must otherwise cease (notwithstanding the annuitant's survival), the benefit stream is known as a temporary life annuity.
- **Factoring**: A liquidity transaction that converts a settlement annuity contract's stipulated schedule of periodic payments into an immediate lump sum payable to a plaintiff/annuitant.

Background

The first reported case to use a settlement annuity contract was M & P Stores, Inc. v. Taylor (1958). The term "structured settlement annuity" does not appear in this case, but the jury awarded $36,000 in damages "to be paid at $150 per month for

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twenty years." It was not until 1968, however, following the Thalidomide birth defect cases that structured settlements became widely used.

The Canadian manufacturer of Thalidomide was facing bankruptcy following hundreds of catastrophic injury claims for multiple birth defects. The drug company was not insured, so both plaintiff and defense counsels undertook negotiations to implement structured settlements that would meet the needs of plaintiffs and, most important, avoid the risks associated with the company either going into a reorganization or declaring bankruptcy and liquidating assets. This settlement set the precedent, forged through a compelling necessity.

A settlement annuity is generally part of a broader structured settlement agreement, pursuant to a tort action. The settlement agreement is a release of claims of tort damages by a potential claimant in exchange for a promise by the defendant to make lump-sum and periodic payments to the plaintiff. Typically, an immediate lump-sum payment is made to the plaintiff, and periodic benefit payments are funded by the defendant's subsequent purchase of a single-payment, immediate annuity contract from a life insurance company. An illustration of a tort settlement that includes a settlement annuity follows.

Illustration

The following case facts illustrate the basis for a tort settlement negotiation that includes a settlement annuity contract offer.

Assume that a tort action has begun in which it is alleged that a risk-averse plaintiff is substantially disabled from further gainful employment and seeks recovery of his damages from a defendant that is amply insured by a property and casualty insurance carrier affiliated with a life company. Further assume that as the suit progresses toward a trial, the property and casualty carrier attorneys (representing the defendant) come to believe that a jury is very likely to find that the defendant is liable for all the plaintiff's alleged damages. Accordingly, at some point either before or during the trial, settlement negotiations might begin based on the following plaintiff case facts and defense settlement offer:

Case Facts

Plaintiff	40-year-old male, fully and permanently disabled from employment with up to 10 years of rehabilitation care needs
Lost Wages	Annual lost wages and fringes of $60,000, projected to increase at 2% per annum
Rehabilitation Expenses	$125,000 per annum, growing at 3% per annum

The defense would typically make a structured settlement offer that would include a large lump sum to compensate for the plaintiff's pain and suffering and economic losses to date. (A lump-sum contingency fee for the plaintiff's attorney is typically paid separately.) In terms of the plaintiff's future ongoing economic losses, monthly benefits from the defendant's purchase of a settlement annuity may be offered as follows:

Settlement Annuity Contract Offer

Item of Loss	Scheduled Benefits	Annuity Mode
Wages	Starting at $5,000 per month, increased at 2% annually for 25 years (300 months)	Annuity Certain
Rehabilitation	Starting at $10,416.67 per month, increased at 3% annually for 10 years (120 months)	Temporary Life Annuity

The important point here is that the settlement annuity offer is designed with a benefit package that will more than compensate the plaintiff's ongoing economic losses. The quoted standard mortality premium[2] is approximately $2.3 million for this 40-year-old male, who stands to get a potential benefit payment of $3.3 million overall. The overall potential payout figure—and not premium cost—is often emphasized in the defendant's offering presentation to the plaintiff. Although the plaintiff may reject the settlement annuity concept altogether and instead negotiate for an immediate all-cash lump sum, the author's experience suggests that choice is unlikely. Through either advisement or encouragement, reason and prudence generally prevail, and the annuity stays prominently fixed in the negotiation.

There are three principal advantages for a risk-averse plaintiff to agree to a settlement annuity offer:

- **Investment security**: Although annuity assets are part of a life company's assets and thus benefit payments are comprehensively protected and regulated by state statutes, typically a company will also transfer its settlement annuities to an "assignee" company to further protect against the risk of default during a bankruptcy proceeding;
- **Avoidance of a wasteful dissipation**: Published data on the outcomes of lump-sum settlements and verdict awards paid to injury victims indicate a general lack of good judgment on investment choices, and, even when good and safe choices are made, invested funds are often inadequately managed over the long run; and
- **Income tax exemption**: An absence of federal, state, and local taxes on the benefits paid for the plaintiff's lost wages means that his pre-injury taxable wages would be more than compensated.

There are, of course, distinct advantages for defendants in negotiating a settlement annuity as well. Acting in the interests

2. Settlement annuity quotes were supplied by Christopher E. Larned of EPS Settlements, www.epssettlements.com.

of defendants, business groups and trade associations have lobbied strongly and encouraged the adoption of legislation that created periodic payment laws. Currently, some 30 states have done so.

Although they differ, typically these laws apply at least to medical malpractice cases that result in a verdict award. The wording in these statutes generally requires purchase of a settlement annuity emphasizing either life annuity or temporary life annuity benefits, particularly in circumstances involving uncertainty about the survival of a severely injured plaintiff. These life-contingent annuity mode specifications, in effect, allow the defendant to purchase a settlement annuity at a lower premium than would otherwise be charged if there were only annuity certain benefits in the contract. This lower premium outcome is true for all settlement annuities contracts that are written with benefits that are alternatively paid in this fashion.

In the illustration above, where the quoted standard mortality premium is approximately $2.3 million, the defendant's advantage may actually go a step further because of a medical underwriting determination. If the plaintiff is severely injured, a life company's medical underwriting may significantly age-rate the premium down to a substandard risk quote. This substandard underwriting would mean that the defendant could save even more—perhaps as much as $200,000—because a large stream of temporary life benefits is included in the contract.

It is important to note that investment security and avoidance of wasteful dissipations are generally recognized advantages for annuitants of all immediate annuities. It is only settlement annuity contract benefits that are uniquely exempt from income tax.

Illiquidity—A Problem

A settlement annuity is unique because the contract must be either defendant-owned or assigned to a third party by the defendant to preserve the plaintiff's income tax exclusion on the benefit payments. This point is a non-negotiable term in the settlement negotiation because it is an Internal Revenue Code stipulation. An otherwise identical annuity contract that is purchased with the lump-sum proceeds of a settlement by the plaintiff means that the plaintiff gained constructive receipt of the tort settlement proceeds. It is only by avoiding constructive receipt that the settlement annuity benefits paid to the plaintiff are not subject to income tax.

The unfortunate consequence of this stipulation is that the plaintiff is only a payee, and he or she relinquishes all access to liquidity. This latter point often becomes a serious problem.

All else being equal, when given a choice, it is assumed that the plaintiff would opt for an unsubordinated ownership of the annuity contract for which he is the payee. Published data on investor preferences[3] indicates that for individuals faced with annuity purchase decisions, restrictions on gaining liquidity are the largest impediment to making a purchase.

3. Brown, Jeffrey R., "Life Annuities and Uncertain Lifetimes," *NBER Reporter*, spring 2004, 9-11.

Settlement annuity payees effectively have no other choice than to negotiate for immediate cash redemptions in a gray-market factoring transaction.

Although all annuities have liquidity constraints, defendant ownership of a settlement annuity is an extreme case of annuity-contract illiquidity. The consequences of a plaintiff's decision at settlement may not be fully appreciated until after the contract is issued and benefits are being paid. To the author's knowledge, no reliable data or study exists that explains the underpinnings of a liquidity choice after the contract has been issued. Whether it stems from buyer's remorse or from a benefit structure that doesn't meet their needs, a growing number of plaintiffs who have opted for a settlement annuity have come to seek liquidity of the contract's benefits.

These settlement annuity payees effectively have no other choice than to negotiate for immediate cash redemptions in a gray-market factoring transaction. As a solution, however, this redemption choice has spurred much controversy.

Factoring—A Solution

Cash-strapped payees of stipulated benefits from qualified settlement annuities can seek relief through a factoring liquidation. One important point: Because a payee cannot transfer contract ownership, a factoring company is only accepting the payee's promise to have the contract benefits redirected through a third

party (bank account, etc.), and thereupon all the contract benefits are made payable to the factoring company.

The transaction is conducted at arm's length and not collateralized by the contract-issuing life company. This means that there is default risk encumbered by the factoring company. This risk is calculated and reflected in the initial redemption offer made to the payee. Because the risk encumbrance calculation often represents a sizable discount in the redemption offer, it brings up "buyer beware" precautions for those payees inclined to seek liquidity through a factoring transaction. To that end, Internal Revenue Code Section 5891 (2001) was designed and implemented to inform and protect payees involved in factoring transactions; most states have similar reporting and advisement statutes as well.

It is beyond the scope of this article to presume and speculate on the sales pitches made to an anxious cash-strapped payee by a factoring company representative, and on the interplay of an ensuing redemption negotiation. However, in the author's experience, after an initial offer is made, a protracted and asymmetric negotiation may ensue between a factoring company's representative and the settlement annuity payee. The negotiation is asymmetric because the payee is anxious and handicapped by a lack of substantial background information on at least two crucial issues that affect the negotiation:

- The underwriting factors that determined the contract premium that was paid by the defendant; and
- An objective measure of factoring company default risk experience and transactions costs on similarly issued contracts.

There is a widely held belief that a factoring initial redemption offer will be discounted by 50 percent for the extra risk encumbrance, when compared to the redemption of a collateralized annuity contract. By applying solely this rule of thumb, an initial offer may be calculated regarding a cash redemption for the above newly issued contract illustration.

In this circumstance, the contract payee would initially be offered a redemption of approximately $1.15 million (50 percent of $2.3 million) in a lump-sum payment. This figure would then set the basis for a protracted negotiation in which the wits of the payee would be tested to determine the cash redemption for his stream of future benefits. At the end of the negotiation, if successful, the payee will have his liquidity problem solved by trading a stream of benefits for a redemption paid immediately and in cash. It is also true that, given the uneven playing field, factoring as a solution to settlement annuity illiquidity represents a controversial choice. Herein lies the basis for what is becoming a public debate on factoring.

Having an actuarial analysis of the financial consequences of a factoring transaction would be a positive development.

The Actuary's Role in Factoring

What the actuary's role comes down to here is the extent of the actuarial public policy commitment. Interpreting the underpinnings of redemptions and working to create a level playing field for factoring negotiations would go a long way toward softening the factoring controversy.

In the broader vision of this controversy, there is a certain eventuality in the settlement annuity and factoring debate that beckons an actuary. The economics are compelling. Market volume of settlement annuities is currently approximately $100 billion cumulatively and growing. No reliable data is available on factoring transactions, though there is an ongoing (and generally recognized) simultaneous expansion of factoring transactions. Factoring—and the accompanying debate and controversy—is not going away anytime soon.

While the customary role of forensic actuaries is to apply their actuarial skills to technical problems, actuaries may play an even more important role that addresses the aforementioned crucial issues affecting payees in a factoring negotiation. From any perspective, having an actuarial analysis of the financial consequences of a factoring transaction would be a positive development for contract payees and regulatory agencies seeking answers. The most important question to answer is, of course, whether payees are better off after they have redeemed their settlement annuity benefits—at date of redemption and in the long run. □

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The opinions in this feature are solely those of the author and should not be construed to be legal or tax advice.

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Corporate Overview

Canada Life Reinsurance is a division of The Canada Life Assurance Company and certain of its subsidiaries and affiliates. Founded in 1847 as Canada's first domestic life insurance company, Canada Life provides insurance and wealth management products and services in Canada and internationally, primarily in the United Kindom, Isle of Man, Ireland and Germany.

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Overview

Optimum Re Insurance Company (ORIC) is the US subsidiary of Optimum Re Inc, a member of the Optimum Group which celebrated its 45th anniversary in 2014. Located in Dallas, Texas since 1987, ORIC is active in all US states, Puerto Rico and the Caribbean. ORIC prides itself in its dedication in helping the development of insurance companies of all sizes. In addition to traditional individual reinsurance, including life and bulk accidental death and dismemberment (AD&D), with its experience and guidance in risk management and claims handling, ORIC has solidified itself as a key player in the Critical Illness and Final Expense arena. We believe that an Alliance in Growth with our partners starts with listening to our client's needs. This is what has contributed to our success and growth through the years as we continue to develop strong personalized partnerships.

History

The Company was acquired from Scor Re by the Optimum Group Inc in 1987. Its innovative marketing approach allowed for rapid but controlled growth, paving the way to the Company's successful start. In 1991, ORIC acquired the reinsurance of AGC Life Insurance Company. In 1998, 1999, 2000, 2005 and 2014 further acquisitions of blocks of reinsurance from other reinsurers were finalized. This acquisition strategy accelerated the company's growth and commitment to the market. ORIC's 2004 expansion into the larger company market and its dedication in critical illness development and leadership since 2000 are a testament of the company's growth and service strategy. ORIC continues to increase its client base while looking for further reinsurance acquisitions and new areas of growth.

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With its strong growth and attention to risk management, the capital and surplus of Optimum Re Inc. grew to over 200 million in 2014 with total assets exceeding 2 billion. Quoting Ms. Anabelle Blondeau, President and COO, "The results for 2014 were remarkable in the vast majority of the company's business sectors. I would like to highlight the particular performance of our subsidiaries in the sectors of reinsurance, asset management and property and casualty insurance." Written premium for the Optimum Group has increased 12.6%, total assets have grown 17.1% and return on equity was 14.9 %. ORIC's financial results for 2014 were also excellent with a 12% increase in assumed reinsurance premiums and a RBC ratio of 696%. Despite the continued decline in total recurrent new volume reinsured in the U.S. market, ORIC's life insurance inforce volume increased by 20% to pass the 50 Billion mark in 2014. Adding further accolades to its financial success, the Board of Directors of Optimum Group presented ORIC with the Optimum Enterprise Award during their May 2015 shareholders meeting. ORIC was chosen for its sustained revenue growth and its excellent profitability. Optimum Re has an A-(Excellent) rating from AM Best.

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- Optimum is ranked 1st as "Best Reinsurer Overall"
- Optimum is ranked 1st in "Ease of Doing Business".
- Received scores greater than 8 (out of a maximum score of 9) for Medical Underwriting Capabilities, Strong Claims Handling Ability and Strong Client Orientation.

First Class Underwriting Seminar

Our 2014 Underwriting Seminar, held in our office, was again a tremendous success. It was fully registered within just a few days. Plans are underway for our 2015 seminar tentatively set for November 1-3 in Dallas.

LIC Final Expense Seminar

For over 3 years now Optimum has partnered with LIC to host a Final Expense Workshop. The wealth of knowledge from our speakers during this event has received praise and has helped the seminar grow significantly.

Fresh Capacity for Jumbo Cases

We offer "fresh" capacity for cases with total lines exceeding the jumbo limit. In 2015, we offer over 7 Million of capacity for jumbo risks at automatic rates with a 24hour reserving process. We continue to search our international markets to offer our clients the maximum capacity available.

Continued Updates on our Underwriting Manual

While we introduced a new redesigned web-based manual in 2012, underwriting risk is an ever evolving process. We have a dedicated team that regularly monitors and updates our UW manual for our clients. The devotion to research and detail is shown through the many satisfied clients that use our manual as their UW manual.

No Minimum Amount for Facultative Submission

We offer full service facultative services with no minimum cession required.

1 Million Capacity for Select HIV Risks

Optimum Re has announced that it felt many HIV risks were insurable and it was willing to provide its clients 1 million in capacity regardless of plan applied for. Optimum was the first reinsurer to offer such capacity showing its continued emphasis on innovation.

New Hepatitis C Underwriting Guidelines

At the 2015 AHOU Optimum issued a press release announcing its new Hepatitis C rating guidelines…in many cases reducing the ratings 3-4 tables and often offering standard rates.

Critical Illness Acceleration Rider Initiative

Critical illness has been one of our specialty services for over 10 years and we continue to research the market and support major Critical illnesses initiatives. New in 2014 was an initiative to provide a simplified approach to help clients add an acceleration rider on their products. We also reinsure chronic illness riders. Please contact us for further details.

RGA Reinsurance Company

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Chesterfield, Missouri 63017-1706
PHONE: 636.736.7000 or 1.888.736.5445
WEBSITE: www.rgare.com

Overview

Reinsurance Group of America, Incorporated, is a global leader in life and health reinsurance, recognized for its expertise in risk assessment and capital management, its ability to develop innovative solutions, and its unwavering commitment to its clients. For more than 40 years, RGA has partnered with insurers to help them take advantage of opportunities, address challenges and develop solutions that will help them grow.

RGA's core products and services include reinsurance for individual life, group life and living benefits insurance, financial and annuity reinsurance, as well as facultative and electronic underwriting, risk management and product development. RGA serves clients from operations in 26 countries, covering all major markets.

Client Focus

RGA listens to its clients, analyzing their specific needs and developing tailored products, services and distribution solutions to facilitate their success in existing and new markets. RGA puts this guiding philosophy of partnership and service into practice every day, for every client, and in every market where it does business. This is just one quality that separates RGA from its competitors.

Leading studies of cedants in markets served by RGA reveal RGA's leadership and the success of its approach to client service. Most recently, RGA was named "Best Overall Life Reinsurer" in the 2015 Flaspöhler Survey™ (Direct Writers Evaluate Reinsurers/Life N.A.), marking the sixth consecutive time RGA has achieved this rating. RGA was also ranked #1 in Business Capability Index in 11 markets globally in NMG Consulting's 2014 regional and national studies of ceding companies.

The consistently high ratings RGA receives from its clients and industry experts are a testament to RGA's ability to collaborate with clients and provide them the services they need to reach their goals.

Innovation and Expertise

Another key RGA differentiator is its culture of innovation. RGA is a leader in developing innovative products and first-in-market solutions to help insurers compete and succeed.

RGA is at the forefront of the industry with its electronic underwriting offerings. AURA, an automated underwriting solution powered by RGA's underwriting expertise, is the premier knowledge-based system for life insurance underwriting and risk management, with the strongest rules engine on the market. RGA's ASAP, an AURA application, is another online underwriting innovation, providing instant decisions on routine facultative cases.

One of RGA's core strengths is its expertise at researching, analyzing and synthesizing data from its own as well as client and other external sources. With the data contained in its $2.9 trillion of life insurance in force, RGA continually gains deeper insights and fresh perspectives into emerging trends that lead to more accurate pricing and risk assessment, translating evidence-based research into tangible results that clients use in the real world.

RGA also pioneered the use of reinsurance as a financial management tool and is a specialist in measuring and quantifying insurance and investment risk, as well as evaluating the merits of using financial solutions to make better use of capital. The highly specialized fields of financial reinsurance and global acquisitions require considerable expertise, and RGA is adept at structuring and executing these complex transactions.

The RGA DNA

The foundation of all the solutions and services the company offers is the RGA DNA—a unique, powerful combination of thought leadership, innovation and exceptional dedication to its clients. From research studies to risk management and product development, RGA provides solutions that help clients improve their ability to assess risk profitably, and provides meaningful insights into the evolving challenges insurers face.

SCOR

2003-2013, A DECADE OF GROWTH

SCOR'S SUCCESS STORY TO CONTINUE WITH THE IMPLEMENTATION OF THE NEW "OPTIMAL DYNAMICS" PLAN LAUNCHED IN 2013.

"SCOR has grown to become the **fifth largest reinsurer in the world** and is firmly established in the small group of **Tier 1 global reinsurers**. The Group has become stronger throughout the past few years, with rapid organic **growth** that has been supplemented by the successful integration of four companies. This development is thanks to the staunch support of its shareholders, the exemplary loyalty of its clients and the unfailing commitment of all its teams.

Today, SCOR offers a **high level of security**, with solvency standing at the top end of the target range. Its rating, which currently stands at A+, has been upgraded twice since 2009, and S&P recently moved its outlook to positive. The Group generates a **high level of profitability**, including a record level of net earnings in 2013. With its prudent underwriting and investment policy, SCOR has managed to absorb all the major natural and technological catastrophes, as well as the financial turmoil, that have marked the past ten years.

With our new three year strategic plan "Optimal Dynamics", SCOR is devoting itself to remaining at the forefront of the global reinsurance industry, with innovative products and attentive customer service. Looking ahead, SCOR will continue its momentum, combining growth, profitability and solvency, in the interests of its clients and to the benefit of its shareholders."

Denis KESSLER
Chairman & Chief Executive Officer

Access the latest SCOR financial information on your iPad

HEALTHY PREMIUM GROWTH
3.7 billion euros 2003 → x 2.7 → 10.3 billion euros 2013

RAPID INCREASE IN SHAREHOLDERS' EQUITY
0.6 billion euros 2003 → +23% CAGR* → 5.0 billion euros 2013

STRONG APPRECIATION OF MARKET CAP
1.1 billion euros 2003 → +16% CAGR* → 5.0 billion euros 2013

SOLID BALANCE SHEET
13.9 billion euros 2003 → +9% CAGR* → 34.2 billion euros 2013

SOLVENCY STRONGLY REINFORCED
S&P rating 2003**: BBB+ → A+ Positive outlook 2013

ROBUST ROE
10.3%
Average over the past 10 years

ATTRACTIVE DIVIDEND POLICY
1.5 billion euros
Total dividends paid between 2003 and 2013

PRODUCTIVITY GAINS
Premium/employee: 3.1 million euros 2003 → +45% → 4.5 million euros 2013

* Compounded Annual Growth Rate
** As at December 2003

SCOR Global Life Americas

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Overview

SCOR Global Life Americas Reinsurance Company is a top-tier life reinsurer, providing a portfolio of mortality, financial and longevity risk management solutions to carriers in the US, Canada and Latin America. SCOR is…

- The leading US life reinsurer based on new and inforce business
- A leading innovator in the insurance space
- A risk expert and thought leader
- A client oriented risk partner with an "ease of doing business" approach

Products & Services

One of the largest suppliers of automatic and facultative reinsurance, SCOR Global Life Americas ranks number 1 in the US market based on new business and inforce volume, according to the most recent SOA survey of US Life Reinsurance Results.

We offer an array of services and competitive pricing

- Our coinsurance and YRT solutions help clients manage mortality and strengthen capital positions, enabling them to market competitive products.
- We actively work with clients to develop effective and regulatory-compliant mechanisms to manage reserve and capital strain.
- Our longevity solutions help companies control tail risk in existing longevity portfolios.
- Velogica®, our algorithm-based underwriting system for point-of-sale decisions, transforms the way companies do business in middle markets with simplified applications. Companies can also use Velogica to triage fully underwritten business.
- We provide group reinsurance capacity at competitive rates.

Underwriting Support

As a full-service reinsurer, SCOR Global Life Americas provides expert facultative underwriting services. We offer…

- A staff of highly experienced reinsurance underwriters and medical directors
- A dedicated staff of underwriting and medical researchers
- Client-focused risk assessment flexibility
- Excellent time service
- Competitive offers
- Our SCORcast series of webinars on medical/underwriting-related topics

SOLEM®, our life underwriting manual, is used by companies in US and international markets. Our underwriters and medical directors are available to provide input on developing underwriting requirements, guidelines and training programs.

The SCOR Group

SCOR Global Life Americas is part of the Life Division of the SCOR Group, the fifth largest reinsurer in the world with a unique track record of growth and commitment to partnering with clients. SCOR Global Life is a top five global life reinsurer. Its expert teams have been providing worldwide clients superior reinsurance products and services for over 40 years and its strategy is based on the development of long-term relationships with its clients throughout the world.

Financial Strength Ratings for SCOR Group

Standard & Poor's . . . .A+ (Positive Outlook)
A.M. Best . . . . . A (Stable Outlook)
Moody's. . . . . A1 (Stable Outlook)
Fitch. . . . . .A+ (Stable Outlook)
(Ratings as of April 2015)

Faster, Easier and Smarter than Ever

In the automated underwriting space, Velogica is in a class of its own. Our state-of-the-art solution correlates electronic data along with application data to underwrite life insurance applicants in real time.

Companies using this tested and proven platform are reaping the benefits.

- Increased application flow
- Underwriting decisions in less than a minute
- Lower acquisition and underwriting costs
- Consistent underwriting assessments
- Success across distribution channels

As a veteran solutions provider, SCOR Global Life Americas has already made the big investment in time and resources required to get Velogica operating at a high level. Over the course of numerous client implementations and multiple major version updates, we have learned which program elements work in the middle market and, equally important, which ones don't.

Velogica is a tested and proven platform with a record of achievement that is unmatched in the industry.

- 90% of underwriting evaluations made within one minute
- 24/7 application submission capability
- Thousands of applications processed weekly
- Entire sales process and decision typically take less than 15 minutes
- Less than 5% of simplified issue applications require human
- underwriting involvement
- Internal study validates risk assessment effectiveness

We have accumulated a wealth of experience data since implementing our first Velogica client solution 10 years ago. By thorough analysis of this data, SCOR Global Life Americas continues to provide and improve a best-in-class solution for clients.

The Academy Takes the Lead on Price Optimization

INTERNET RETAILERS HAVE GROWN LARGE with targeted sales, making special offers based on individuals' shopping histories. Airlines change prices daily to reflect demand, enabling them to fill seats that might otherwise go empty. Hotels offer rewards to returning and loyal guests to increase occupancy.

More data, better tools and techniques, and increasing computing power are allowing businesses to better understand their customers, tailoring offers, products, and prices to pursue an optimal level of profit, growth, added services, and repeat business. Can insurers employ similar techniques within the United States insurance regulatory environment?

The Academy's 2014 Annual Meeting and Public Policy Forum featured breakout sessions with experts discussing the latest policy efforts in property and casualty issues, retirement security, and health care reforms. One property and casualty track highlighted a new and evolving area of actuarial practice—price optimization.

As the panel noted, price optimization has no single definition or widely accepted actuarial methodology. It starts from actuarial risk-based estimates and considers demand elasticity—a customer's willingness to pay—and competitors' prices. The panel noted that it is somewhat analogous to airline pricing. The panel examined a variety of models and approaches to price optimization, providing a thoughtful overview of the challenges, regulatory concerns, and professionalism implications for actuaries.

Following the Annual Meeting, the Academy's Casualty Practice Council continued pursuing this new avenue, creating the Price Optimization Task Force to research emerging practice and identify public policy issues and challenges. One of the first activities of the task force was to respond to the NAIC Casualty Actuarial and Statistical Task Force (CASTF) draft white paper on price optimization. The CASTF white paper draft, issued at the NAIC Spring Meeting, garnered nearly 100 pages of commentary from a diverse group of respondents, including actuaries, consumer advocacy organizations, insurance trade associations, insurers, and regulators. Comments from the Academy's Price Optimization Task Force highlighted the numerous ways in which price optimization can be implemented, some of which are used in other countries with different regulatory environments than the U.S. Additional comments focused on the comparison of traditional pricing and price optimization techniques and the increasing complexity of how insurance products (particularly consumer-facing products such as auto insurance and homeowners insurance) are priced.

Another activity of the Price Optimization Task Force is to develop an issue brief. The task force has identified three key areas to focus on in the coming months:

- **Develop a Common Lexicon**: As noted above, no common definition exists for what constitutes price optimization or related activities. While a precise definition is not necessary, using common terminology is important to provide a better understanding of what activities are acceptable or objectionable.

Even without a common terminology, some states are taking action. Maryland, the first state to prohibit price optimization, in October 2014, defines price optimization as "varying rates based on factors other than risk of loss." In January 2015, Ohio became the second state to ban insurers from using price optimization. Stating that there is no absolute definition, Ohio described price optimization as "an insurer practice of varying premiums based upon factors that are unrelated to risk of loss in order to charge each insured the highest price that the market will bear." California issued a notice in February directing all property/casualty insurers to cease using price

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optimization and remove any effects of price optimization within six months of the notice. California defines price optimization as "any method of taking into account an individual's or class's willingness to pay a higher premium relative to other individuals or classes." Finally (as of the writing of this article), New York sent a letter in March seeking information concerning price optimization; New York's description of the practice is similar to Maryland's. Activities in other states are ongoing.

Establishing a common lexicon is vital to fostering greater understanding and cooperation in this developing field.

■ **Identify Current Market Practices**: Insurance risk classification and pricing have become increasingly complex. The analytical techniques and tools, the amount of available data, and the degree of competition all contribute to the complexity of modern insurance pricing ... and to the challenges in regulating insurance rates. A comprehensive description of traditional ratemaking and the evolution to current practices will help identify and isolate specific aspects that need to be addressed.

■ **Identify Issues to Consider**: Price optimization is in its infancy in the U.S. insurance market. Exploring the concerns and asking questions is an appropriate step to identifying the issues that have public policy implications and need solutions that benefit from an actuarial perspective.

As an emerging and controversial issue, price optimization will continue to be in the forefront of many organizations' activities—the Academy, the NAIC, consumer groups, and insurers. The 2015 Annual Meeting will again feature a property/casualty breakout session on price optimization, giving attendees an opportunity to hear directly from state regulators in states that have acted to limit price optimization behaviors by insurance companies, state regulators working with the NAIC on this issue, and property/casualty insurance experts on what price optimization entails, how it benefits (or disrupts) the property/casualty insurance market, and what, if any, actions need to be taken by insurers to protect the means by which they price insurance. □

As an emerging and controversial issue, price optimization will continue to be in the forefront of many organizations' activities.

SHAWNA ACKERMAN is vice president of the Academy's Casualty Practice Council.

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What's Your Future Worth?

By Peter Neuwirth

IF YOU'RE LOOKING FOR A DRY, LACKLUSTER, overly technical piece of reading material, this book is not for you. *What's Your Future Worth?*, ostensibly about considering salient data when making projections, is in fact a useful guide to making better decisions for everyone.

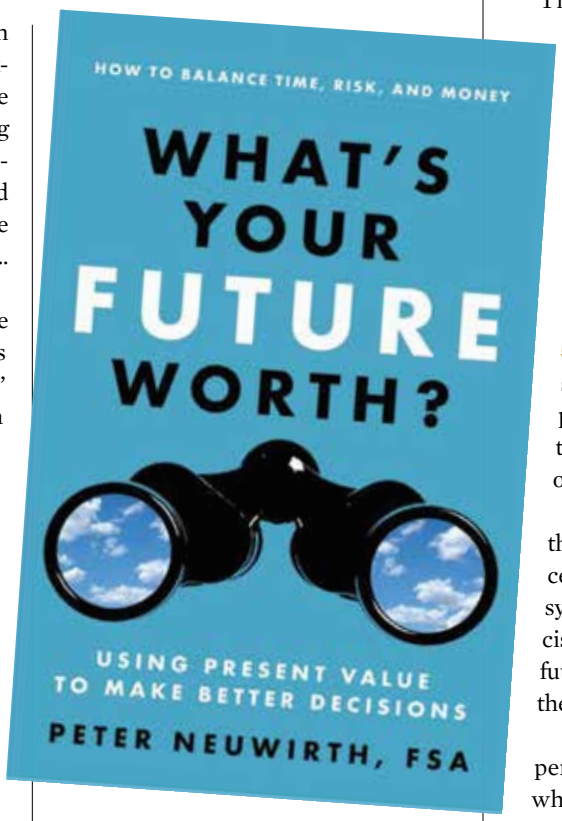
Author and actuary Peter Neuwirth weaves in many colorful stories and examples, drawing on both his personal life and his professional career. After reading this book, you will have learned something about the way actuaries think—and you'll have some tools for applying the lessons to decisions you face every day ... and you'll enjoy it along the way.

This book stands as a practical guide on how to make informed decisions about your future—how to be "right." These decisions run the gamut from everyday problems, such as "Should I replace my refrigerator?" to big life issues, such as "Should I go back to school to earn an MBA?" and explains how corporations, charities, not-for-profits, and governmental organizations can use actuarial tools for making better decisions. In addition, by delving into the techniques and concepts so elegantly, the author opens up the reader's mind to an approach far more philosophical than you would expect from a step-by-step finance self-help book.

The beauty of this book is that the author draws on an actuarial technique (Present Value) and transforms it into a useful step-by-step process with not an equation in sight. In fact, the only mathematical notion you may need to understand is compound interest, and even that is not an absolute prerequisite for the concepts to work for you.

Neuwirth identifies three common ways that people make choices:

1. Basing decisions solely on past experiences;



2. Relying on gut instinct, or "living in the moment"; and
3. Considering what is going to happen in the future, and acting based on that expectation.

He argues that none of these methods is optimal, and instead proposes a new approach.

The author writes that with Present Value, you don't have to try to figure out what is going to happen; rather you use your imagination to examine and put a value on the gamut of possible futures that could arise out of the available decisions that you make today. He says that by lining up, side by side, these possible futures, assigned with the value you put on them today, you can make better-informed decisions about which path to take.

The author outlines a five-step process:

1. Define the choices to be made.
2. Imagine as many of the futures as possible that might arise from the possible choices.
3. Evaluate the relative likelihood for all the possible futures.
4. Put a value of time—what is the value of something happening in the future worth to you today?
5. Sum up the "values" of the possible future consequences from that particular choice and compare to all the other alternatives to arrive at the optimum decision.

Neuwirth promises at the start of the book that by applying these concepts, you will be able to think more systematically and deeply about decisions you are faced with about the future. The book certainly delivers on the promise.

The author asks the reader to suspend any preconceived ideas about what the future could hold, and instead approach the decision-making process from a "humble" or "no expectations" perspective. I found this idea to be enlightening: All too often we get stuck on a one-track future. Using the techniques described in the book is truly an expansive experience that opens us up to an exciting world of possibilities.

Others will find the chapter on "time value"—weighing the "now" vs. the "later"—incredibly helpful. Neuwirth describes calculating your own "personal discount rate": How much would you discount the value of an event occurring in the future compared with it occurring

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today? While going through this exercise myself, I realized that my own personal discount rate for things with monetary values was quite low—I put a relatively high value on things that would happen in the future—whereas in my personal life I realized that I have a much higher discount rate—I tend to live much more in the moment. (My many injuries from one adventure or another will probably attest to this!)

Not only does Neuwirth consider time discounting for an individual, but he also discusses using the concept for an organization. For example, what is the personal discount rate for a corporation? The book explains that corporations should not simply rely on a standard market discounting rate, but rather they should be honest about the weight they put on certain time horizons. Shouldn't publicly traded companies have a relatively high discount rate, for example, if they focus more on short-term gains than on longer-term stability?

The book uses numerous real-world examples to illustrate the concepts. Consider the Oregon Public Employees Retirement System (OPERS). Back in the 1990s, contributing entities (cities, counties, and public utilities) were in danger of going bankrupt because of poor pension plan design decisions made decades before. Neuwirth believes such a calamity could have been avoided had OPERS followed some of the concepts in his book. The state failed to clarify exactly what choices it wanted to make in rewarding its employees; under the plan, for example, participants could often retire on 120 percent of their salary, whereas in a typical state pension plan they might receive only about 70 percent. In addition, the decision-makers suffered a failure of imagination by not considering all the possible outcomes—they did not look at all the possible investment returns on the reserves put aside to pay the benefits in the future. Finally, decision-makers did not put their own interests aside, and used their own "personal discount rates" when deciding on the pension plan design; that is, they valued higher short-term gains over longer-term stability.

The last part of the book focuses on non-monetary examples, such as leaving a legacy beyond death. Neuwirth also delves into the realms of planned giving, and offers suggestions on how charities and not-for-profits can use an understanding of Present Value to avoid costly pitfalls.

Finally, although I stated at the very beginning of this review that this book avoids fancy mathematics, I must reinforce that this book is a must-read for actuaries. A danger that actuaries face is that they can get too bogged down in the numbers, the details, and the risk of taking their results as fact. This book is a reminder for us actuaries to think about the big picture and focus on the important concepts of our work—and what our work is actually being used for in the first place. It reminds us that our work can never be used to value the future as a certainty, but rather it stands as a guide to help people make better decisions about the unknown. *What's Your Future Worth?*, in turn, is a tool to help us remember that important precept. □

ALEX WILLSON is a senior consulting actuary and CFO at Rael & Letson.

How People Choose

The following is an excerpt from the introduction to *What's Your Future Worth?*

Typically, people make decisions from one of several perspectives. First, they might make decisions based on the past, focusing on what has worked before or how the decision at hand is similar to one previously addressed. These people make their decisions based on experience. Second, they might, as Eckhart Tolle in The Power of Now suggests, focus on what they see in the "here and now," adhering to Tolle's philosophy that the future "doesn't really exist." Such people feel that they should just be in the present moment, trusting the "power of now" to guide them. Somewhat related to this group are the people who base their choices on their faith or intuition, trusting that some unseen force (or perhaps their own "intention" or "aspirations") will guide them to the right decision. These people make their decisions "from their gut."

Finally, many (perhaps most) people—including those who tend to use the first two approaches—do try to think about the future in a logical way and consider the immediate and long-term consequences of the choices they face, deciding on a course of action based on intellectual analysis and a projection of future events. However, such people usually try and figure out what they think will happen and then act accordingly. In the best of circumstances, they might consider a couple of different scenarios. But even here, the decision maker will most often come to a conclusion as to what is most likely to occur and then make their choice on that basis.

In fact, there seems to be—at least for this third group—an almost universal feeling that trying to figure out what is actually going to happen is basically the only way to think about the future. There is a better way. For reasons that we will discuss shortly, I would propose that we will never know for sure what the future holds and that we need a different attitude toward what will happen and what we should do now to prepare for it.

Better Than a Philly Cheesesteak: The Actuarial Assassin

THE FOLLOWING INTRODUCTION was delivered at the Actuaries Club of Philadelphia's (ACP) meeting on Nov. 19, 2014:

"For the first time in the history of the ACP, the person who will introduce the health session speaker will get his own introduction. Let me repeat that—the person introducing the session speaker will get an introduction.

"His name is Jon Forster, and he is a true champion. Let me explain. Jon is an ASA, MAAA, the ACP health chairperson, and he works for Independence Blue Cross in Center City Philadelphia. And on Aug. 9, 2014, Jon won the Xtreme Fight Event (XFE) amateur lightweight belt and became the first actuary in the history of the world to win a mixed martial arts title. He also fights under the best moniker: "The Actuarial Assassin." And now, here's Jon Forster, aka The Actuarial Assassin, with his XFE title belt..."

Mixed martial arts (MMA) is a full-contact sport that allows both striking and grappling techniques. Participants compete while standing, as in boxing, as well as on the mat, as in wrestling. MMA is derived from other combat sports and martial arts. It is mostly regulated in the United States at the state level and overseen by the Association of Boxing Commissions. Various organizations promote the sport by signing fighters and putting on MMA events. The best known of these organizations is the Ultimate Fighting Championship —UFC. The UFC is considered the major leagues of MMA; most fighters train to be signed by the UFC.

Jon Forster turned professional after winning an amateur title and is currently signed with the Cage Fury Fighting Championships (CFFC) promotional organization. On Feb. 28, Jon won his first professional bout by unanimous decision. Recently, I sat down with Jon and discussed his actuarial and MMA careers.

AL: What is your sports background?

JF: I wrestled for Buena High School in Buena, N.J., where I was a two-time state placewinner. I received a wrestling scholarship from Rutgers University. I wrestled for Rutgers and was ranked as high as 14th nationally. I was also a two-time team captain and am still ranked fifth in Rutgers history with 110 wins.

AL: Did you start your actuarial career after graduating from Rutgers?

JF: After college, I attacked an actuarial career. I started out with Benecard Services and was in a management-level position by the end of my second year there, eventually becoming the director of actuarial at the company. I then came to Independence Blue Cross (IBC), where I brought the Medicare Part D bid pricing internal for the 2008 and 2009 bids. Very few companies were successful in doing so, and most outsourced the bid pricing to consultants. My next assignment at IBC was a move to the AmeriHealth New Jersey team, where I was responsible for a large amount of the actuarial functions. From there I moved on to become director of actuarial and the appointed actuary for Coventry Healthcare of Delaware, overseeing all actuarial functions, including pricing, reserving, forecasting, and medical cost. A few years ago I returned to IBC.

AL: Your actuarial career was going very well. So how did you get involved with MMA … and why?

JF: As I moved up in my career, I also moved up on the scale—up to 210 pounds at one point. I knew it was time to make some serious life changes, and I started training in mixed martial arts. Several people I had wrestled with were having great success at the pro level. Two college teammates of mine, Nick Catone and Ricardo Romero, made it to the UFC. I'm always looking for ways to challenge myself, and MMA seemed like the best way to challenge myself both physically and mentally.

AL: How do people react when they find out you are both an actuary and an MMA fighter?

JF: When most people find out I'm an actuary by day and an MMA fighter by night, they state that there is a great contrast between the two. I always point out that the same traits that made me a top Division 1 wrestler in college and MMA fighter—work ethic, determination, drive, commitment, leadership, ability to learn, and ability to overcome adversity—also allowed me to be successful in my profession. I participated in a variety of sports when I was growing up and was never the strongest, most athletic, most talented, or fastest. I do, however, have the most heart, the most determination, and a pretty insane work ethic. I couldn't hit a baseball, shoot a basketball, or throw a football to save my life, but the skills above allowed me to place fifth twice in the New Jersey state wrestling tournament in high school and then to become a nationally ranked wrestler at Rutgers

AL: Give me an eyewitness account of your amateur championship fight.

JF: I was coming off three straight dominant MMA wins and was offered an opportunity to fight for the XFE lightweight amateur championship. That's right—lightweight, as in 155 pounds (55 pounds less than I weighed a few years prior). I was matched up against a very tough opponent who also had a very strong wrestling background and was 12 years younger than me. Very few people my age are actively competing at this level. I knew that I was up for a challenge and wanted to see what I could do.

Coming into the fight, I could feel

Jon Forster, right.

the energy in the arena. As I walked into the cage it was loud. I went out, touched gloves, threw some punches, and went for a takedown. My opponent countered with a crafty roll and ended up in a good position and went on to totally dominate the round, landing a lot of shots. The fight was close to being stopped, and I really could not have lost the first round any worse. I went back to my corner, and all I could think about was how hard I trained for the fight and how many people bought tickets and came out to support me.

AL: Sounds like you're describing the first few minutes of taking an actuarial exam.

JF: Right. It's a similar feeling. I knew I had better cardio than him. I also felt that I had much better skills than I had showed in the first round. I had been down countless times in wrestling matches, and I knew how to come back to win.

I went back out in the second round and threw some punches. He tried for a takedown, and I was able to counter and landed some big shots. We then got into a scramble, and I had him in a choke and ended up back on top, landing punches for the last minute of the round. When I went into my corner, my trainer told me that since the first round was so lopsided, I did not want to leave it in the hands of the judges. I went out in the third round and finished the fight via TKO in 12 seconds.

I was very happy with the outcome of the fight. Lots of hard work went into it, and I was able to display my heart and did not quit mentally. I also donate winnings of my fights to charity, so I was able to raise $1,100 for the Ashley Lauren Foundation, which helps families with children who have cancer. *(Editor's note: Under amateur rules, MMA fighters are permited to raise money through sponsorships, merchandise sales, and ticket sales.)*

AL: What are some misconceptions about MMA fighters?

JF: Let me address some of the myths and misconceptions about MMA fighters.

Myth: MMA fighters are uneducated.

Fact: It takes a great deal of discipline and dedication to compete in MMA. To be successful, you have to learn many disciplines, including wrestling, jiu-jitsu, and kickboxing. There are so many different positions and techniques to learn, and it takes quite the intellect to acquire the knowledge to process everything.

Outside of technique there's much that must be mastered, including nutrition, conditioning, and training. The discipline acquired through MMA is unparalleled. I train often with several successful business owners—doctors, lawyers, engineers, and people from many other professions. We even have a group of actuaries here who train in boxing during lunch in the IBC fitness center. There is a continuous learning process involved in becoming a mixed martial artist.

Myth: MMA is an unsafe, anything-goes sport.

Fact: Fighter safety is a key concern in mixed martial arts. Several rules are designed to ensure safety—no knees or kicks to the head to a downed opponent, elbows cannot go straight up and down, no strikes to the back of the head, no pulling hair (this is a non-issue for me), etc. In order to compete in an MMA competition you have to get cleared by the commission and pass a series of medical tests to ensure you are in top-notch health. For your first amateur or professional fight, a reputable trainer has to certify that he has been monitoring your training and believes you are qualified to compete at that level.

AL: Tell me more about your charitable donations.

JF: I have a lot of people who support me through my fighting career, so it's a way for everyone to be involved in a cause to give back. For three amateur fights (prior to my title bout) I donated my winnings to the American Cancer Society (approximately $2,400 in three fights). As I mentioned, my last amateur fight raised $1,100 for the Ashley Lauren Foundation.

Marco Perazzo, who is one of the top MMA trainers in New Jersey, has been helping me train for my fights for a few years now. His son goes to the Elwyn Seedings School for children with autism and other developmental disabilities, so he asked that I donate the money there; I was happy to do so. Winnings from my first professional bout went to Elwyn—I was able to raise $2,700 for them.

ART LUCKER, MAAA, FSA, is the secretary of the ACP and works for INS Consultants in the Society Hill section of Philadelphia.

Cryptic Puzzle | TOM TOCE

Three-Wheeler

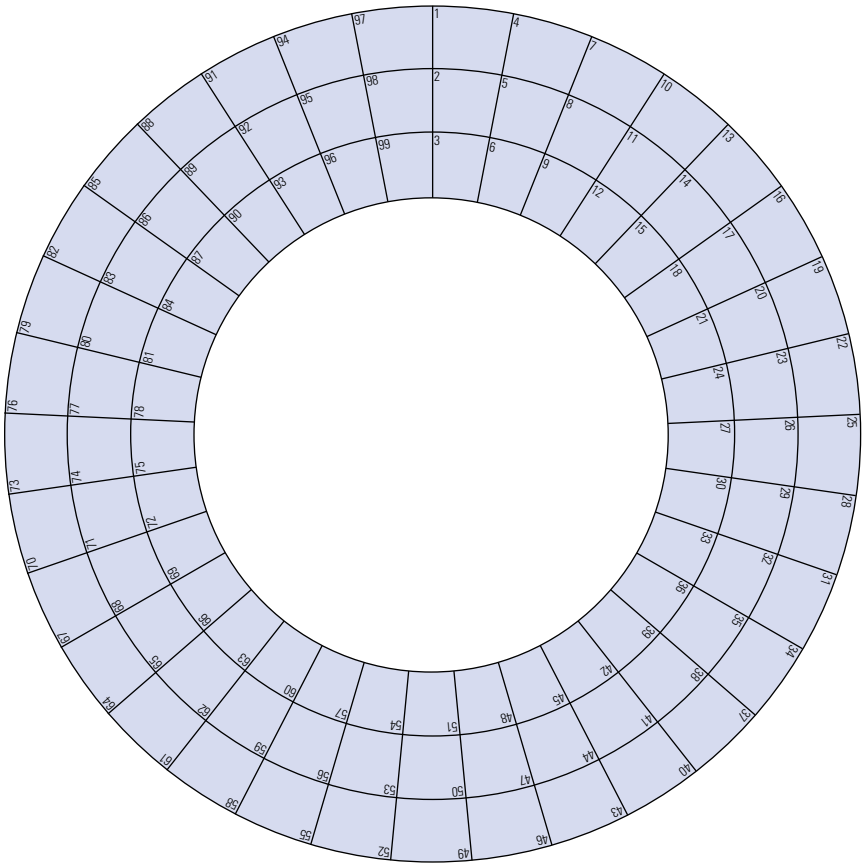
MANY SOLVERS COMMENTED that the "Two-Wheeler" puzzle from the March-April issue must have been a real challenge to construct. The truth is, it was one of the easier constructions. It's just not that hard to find letter strings, or pairs of letter strings, that contribute to words backwards and forwards.

But if you want to be dazzled by these things, fine by me. It's always been my nature to think that if one of something (for example, a piece of pie) is good, then two will probably be even better. And if two is so good, then what about—well, you get the idea.

Hence "Three-Wheeler." Both the clockwise answers and counterclockwise answers start with the outer circle letter, then the middle, then the inner circle letter. This means the clockwise words will be entered 1-2-3-4 etc., but the counterclockwise ones will read 97-98-99-94-95-96 etc. This will take a little getting used to, but it's not so bad. Clue lengths are supplied upside down in the box below. They help, but aren't crucial. Let me know if you solve the puzzle with or without the hints.

Not all 26 letters in the alphabet are used. There are eight proper nouns and one foreign word. Everything else is playable in Scrabble. Ignore punctuation, which is designed to confuse.

Thanks to Eric Klis and Bob Fink for test-solving and editorial suggestions.



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Clockwise Clues

1. Last stop—tramline derailed
2. Some town cars left, Colonel, after being driven into hotels
3. Go to bang stranger with sled
4. Señora, lousy excuse
5. Storage place where, admittedly, a prostitute stands by to do drugs
6. Play spontaneously in diminished Ionian mode, transposed
7. Baseball team of Germans? No heckling
8. Excessive soak
9. Figure Bo Diddley's first
10. Bill covering one-time term reciprocal
11. Shakespearean villain from Italy, initially, in the past!
12. Claim peripheral piece of avocation's workflow
13. River horse for Augustine's bishopric
14. Peter or Nicholas put pizza in, right, but the wrong way?
15. Strictness, after a fashion, from Stravinsky
16. Forbid an apple at the start, then a tropical fruit
17. Palpitation at hearing the sound of a time bomb
18. Rainbow seen from jouncy car
19. Worker with curious tan

Solutions may be emailed to thomas.toce@ey.com. In order to make the solver list, your solutions must be received by July 31, 2015.

Counterclockwise clues

a. Fantastic cataract in the deep, deep South
b. Arrest Nabokov, all right, and everything else gets censored
c. Hair from a rabbit or a goat or a nag, perhaps
d. Trio rocks for a very good time
e. Nothing lighter?
f. Stop which person, not any particular one?
g. Something to keep you up in City of Taj after six
h. Last-minute Starbucks order missing one teaspoon
i. Bio about Pound is one for the shire
j. Urinated with backsplash—time for New Yorkers to be most profound
k. Feudal warrior born in Japan without censure
l. Mean to visit the Louvre, for example
m. Who lost and by what means?
n. Felony caught by sonar, blurrily
o. Age ran uneasily for former president
p. Sailor crawfishing in wetlands
q. Tools scattered around toilet seat
r. In more ways than one, a notorious writer of erotica
s. Telephone everyone after the third of December
t. Coiner of term in shambles

TOM TOCE is a senior manager for actuarial services with Ernst & Young in New York and is a member of the Jeopardy Hall of Fame. Solutions may be e-mailed to him at Thomas.Toce@ey.com. In order to make the solver list, your solutions must be received by July 31, 2015.

Clockwise Clue Lengths

1. 8 5. 9 9. 3 13. 5 17. 3
2. 8 6. 3 10. 9 14. 4 18. 3
3. 8 7. 4 11. 4 15. 4 19. 3
4. 6 8. 5 12. 4 16. 6

Counterclockwise clue Lengths

a. 10 e. 5 i. 5 m. 3 q. 5
b. 3 f. 4 j. 7 n. 5 r. 3
c. 6 g. 6 k. 5 o. 6 s. 4
d. 4 h. 4 l. 5 p. 3 t. 6

Previous Issue's Puzzle—Der German lesson

	Definition	Root Word	"der" Word	First (or last letter) of Root Word
1	Michelin's output comparatively banal	tire	tireder	T (F)
2	Gray-haired pack rat	hoar	hoarder	H (F)
3	Famous Argentinian one who got away	Eva	evader	E (F)
4	Smile, hero	grin	grinder	G (F)
5	Kind of river toll	fee	feeder	E (L)
6	Stranger dam	weir	weirder	R (L)
7	Famous cellist covering	Ma	derma	M (F)
8	One who rules meadow	lea	leader	A (L)
9	Rubber cement can	bin	binder	N (L)
10	Pasty tramp	wan	wander	W (F)
11	Otherwise a group of monks	or	order	O (F)
12	Duplicate pistol	ringer	derringer	R (F)
13	Got off track, felt poorly	ailed	derailed	D (L)
14	20C art interpreter	deco	decoder	D (F)
15	Midmonth gibes	ides	derised	I (F)
16	In Spanish, the one born earlier	el	elder	E (F)
17	1940s café owner Crane	Rick	derrick	R (F)
18	Belonging to a particular female cattle driver	her	herder	H (F)
19	Horse race next door	by	derby	Y (L)
20	Average snake	mean	meander	M (F)
21	German songs aren't truthful	lie	lieder	E (L)
22	Health club he can dig	spa	spader	S (F)
23	More astute harpy	shrew	shrewder	W (L)
24	Burly folk singer figures it out	Ives	derives	I (F)
25	Silvery metal combustible	tin	tinder	T (F)
26	Hello, concealer	hi	hider	H (F)
27	Guys doctor	men	mender	M (F)
28	Gardener very early	wee	weeder	E (L)

The German lesson is: The German word "die" rhymes with "me."

Solvers

Michael and Jina Accardo; Mark Ackerman; Anthony Amadeo; Dean Apps; Glenn Bier; Jack Brauner; Lois Cappellano; John Calcagno, Molly Calcagno and James Cassidy; Chris Carlson; Laura Cremerius; Jonathan Currier; Todd Dashoff; Mick and Kris Diede; Michael Dolan; Sean Donohoe and Josh DenHartog, dba T.O.C.E (The Thousand Oaks Cryptic Enthusiasts); Dave Dougherty; Greg Dreher; Deb Edwards; Bob Fink; Laura Forbes; Phil Gollance; Rich Harder; Jason Helbraun; Pete Hepokoski; John Herder; Wade Hess; David Heyman; Catharine Hornby; Ruth Howald; Paul Ivanoskis; Ruth Johnson; Eric Klis; Paul Kolell; Douglas Kraft; Ken Kudrak; Tim Luker; Samantha McLeod; Jeanette Manning; Liam McFarlane; Jeff McLane; Jerry Miccolis; Jon Michelson; Lee Michelson; Jim Muza; David & Corinne Promislow; Alan Putney; Matt Reinert and Eric Sitzman; Jeff Reynolds; Daniel Rhodes; Craig Schmid; Bill Scott; Ryan Smith; Doug Szper; Jon Turnes; and Frank Zaret.

It's Time to Play the Feud

After finding out that I moved from the big city to a small town—Columbia, Mo., in my case—a lot of people ask me: What do you do for fun? I tell people that while I can't speak for everyone, I watch *Family Feud*.

I know I'm not the first to sing the praises of the show. Yes, the game is silly and mindless, but there's a whole lot of mathematical analysis that people do about this game show. Studies of the game have gotten so involved that the mathematical analysis of *Family Feud* has its own nickname: Feudametrics.

For those unfamiliar with the show, the concept is simple. Two families compete to win the game, and the winning family gets the honor of coming back to play again in the very next episode. If a family wins five shows in a row, they retire as champions and win a stylish, fuel-efficient, midsize domestic sedan.

While the Feud always packs an entertaining punch, it's a whole different level when a family comes back for a fifth time. Yes, getting that fifth win is a huge deal! Of course, the downside is that once a family wins their fifth game, they're never seen or heard from again (except in YouTube videos, of course).

It's both good and scary to know that a bunch of people study—and I mean seriously study—Feudametrics. (Bless their hearts, as I surely don't have the patience.) These people look at all sorts of things, such as age of the contestants, gender, whether to pass or play, optimal buzzer strategy ... the list goes on and on.

Thankfully, fearless host Steve Harvey has a true Puritan work ethic, and has produced an unfathomable number of shows during his tenure as host (pro tip: don't attempt to impersonate Steve Harvey, it won't turn out well). The number of episodes is so large that it's unclear there are numbers big enough to count them all. But thanks to this huge database of shows, serious Feudametrics fanatics have a truly credible statistical dataset to look at.

Unlike me, most actuaries are busy people. So instead of delving deep in all the Feudametrics literature, I'll summarize the key finding in one sentence:

There is no skill whatsoever in which family wins. That's right: No matter what you do, no matter what answers you give, your odds of winning or losing at *Family Feud* are always 50 percent. To me, that's what makes the show so enjoyable!

After a countless number of episodes, my two younger brothers want to see what the fuss is about, and decide to watch the show with me for the first time. And that's where this issue's puzzles come from...

1. What is the probability that my youngest brother watches someone win a car during the first episode that he watches?

2. My middle brother is a big fan of bingeing on TV shows, and can't watch just one episode at a time. To the nearest tenth of a percent, what are the odds that he sees two families win a car after watching 10 consecutive episodes?

Editor's note: Below is the inaugural puzzle by new puzzle co-editor Josh Feldman. Solutions may be emailed to cont.puzzles@gmail.com.

In order to make the solver list, your solutions must be received by July 31, 2015.

Last issue's puzzle:

In triangle ABC, a point D is selected on the side BC, such that the original triangle is divided into two triangles: ABD and ACD. Prove that the sum of radii of inscribed circles in triangles ABD and ACD is larger than the radius of the inscribed circle in triangle ABC.

Let's create a sequence of numbers as follows. Let a1 be a randomly selected 3-digit number, and let a2 be the sum of squares of digits of a1. Each new term of the sequence is the sum of squares of digits of the previous term. Prove that this sequence must contain either 1 or a 4, eventually, irrespective of the choice of the original number.

Bonus problem:

For a given triangle, let M be the median, L be the bisector, and H be the altitude drawn from the same vertex. Prove that $M \geq L \geq H$.

Solution (thanks to Bob Byrne for help with the write-up):

Let the vertices be A, B, and C with the opposite sides of length of a (BC), b, and c, respectively. r, the radius of the inscribed circle, is equal to ah (h is the altitude from vertex A) divided by the sum of a, b, and c. Let x be the length of the line drawn from A to D. r1, the radius of ABD = a1 (the length of BD) times h, all divided by a1, c, and x. r1 = a1h/(a1+c+x). Similarly r2 = a2h/(a2+b+x) where a2 is the length

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of DC. Note x < a2+b since a side of a triangle is less than the sum of the other two sides, and hence r1 is greater than a1h/(a1+c+a2+b) = a1h/(a+b+c). Similarly x < a1 + c (from triangle ABD) and hence r2 is greater than a2h/(a2+b+a1+c) = a2h/(a+b+c). Therefore r1+r2 > (a1h+a2h)/(a+b+c) = ah/(a+b+c) = r.

Note that any positive-digit number will automatically result in a sequence derived by the sums of the squares of the digits with a 1 (a steady state 1) or a 4 (a loop with 4, 16, 37, 58, 89, 145, 42, 20, 4, etc.). Any 3-digit number's sum of squares can result in a result that is at most 3 * 92 = 243. The largest 3-digit sum of squares for the numbers from 100 to 243 = 163 (12 + 92 + 92). Finally, the largest sum of squares number generated from 100 to 107 is 50 (12 +02 + 72). Thus any 3-digit number will at some point in the sequence generate a 2-digit or a single-digit number. Steady state 1 numbers are generated from 1, 7, 13, 19, 23, 28, 44, 49, 68, and 79 (and their inverses; the inverse of 1 is 10, the inverse of 68 is 86). The other 80 numbers generate the 4 loop.

Bouns: Without a loss of generality, any triangle can be drawn in the Cartesian plane with (xh,yh) the coordinates of A, (0,0) the coordinates of B, and (xc,0) the coordinates of C, and xh and yh positive. H, the altitude from A, is drawn from A to BC (or its extension; y=0 is the line), and intersects at (xh,0), which minimizes the distance from A to BC (or its extension) since the difference in the x coordinate is zero. The median intersects BC at (xc/2,0). The angle bisector, L, intersects BC at (xl,0), where xl = BC/(BC+AC) by the law of proportionality, where BC and AC represent the lengths of the line segments.

Continuing, for xc < 2*xh, the median line will intersect BC closer to (0,0) than L will, and both will intersect to the left of (xh,0). Hence the length of the base of the right triangle from (xh,0) to (xc,0) with M as its hypotenuse and H as its other side is greater than the distance for the base of the triangle from (xh,0) to (xl,0) with L as its hypotenuse and H as its other side. Hence M > L > H. When xc = 2*xh, M, L, and H all coincide and are equal in length (and the triangle is isosceles). When xc > 2*xh, both M and L will intersect to the right of (xh,0), and AC will be greater than BC. Hence, L will still intersect closer to (xh,0) than M, and thus M > L > H. So we have now proven that M ≥ L ≥ H.

Solvers

Bob Byrne, Bob Conger, Bill Feldman, Yan Friedman, Rui Guo, David Lovit, Lee Michelson, David Promislow, John Snyder, Al Spooner, Doug Szper, and Daniel Wade.

JOSH FELDMAN, a member of the Academy and an associate of the Casualty Actuarial Society, is an actuary at Shelter Insurance in Columbia, Mo.

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The Artistry of Actuarial Science

HAVE YOU EVER WONDERED why our work is called actuarial science? What does it take for an actuary to be a scientist?

But first, is what we do more a science or an art? Science is typically seen as objective, rational, unbiased, experimental, and theoretical, with art being subjective, emotional, conceptual, and creative. Science usually requires a systematic approach, while art is usually more intuitive. Indeed, in popular culture, many think of science and art as polar opposites. But I posit that both are necessary in the actuarial discipline.

Actuarial art is the application of judgment, often through what is called professionalism, in contrast with actuarial science, which involves formulas, logic, and data. Science is often validated by its process, while art is validated by its results—actuarial work is assessed on both bases.

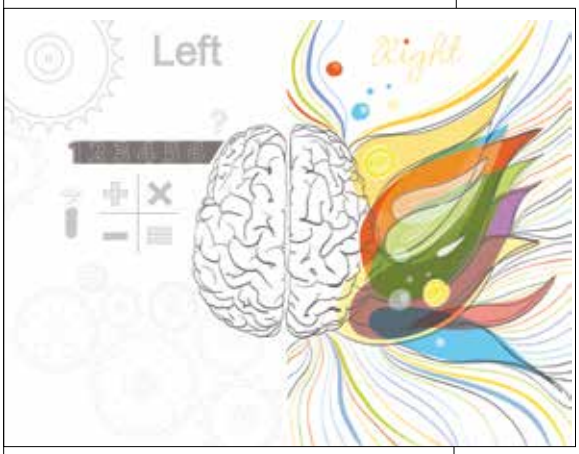
My daughter Zoe, training to be an animator, is an artist. Although she doesn't aim to solve problems, she leads viewers to enjoyment or thought, forcing them to address a revealed problem. Creative artists connect their inner expressions with the outside world, self-expression through effective communication. This is good practice for actuaries as well.

We often start our work with observation, a theory, a prejudice, or even a myth, striving through application of the scientific method to enhance our understanding and application of risk and uncertainty. But a big part of the artistic aspect of our work is the application of judgment in an evidence-based approach.

We often deal with problems for which there is no unique answer, while the quality of art is in the eye of the beholder. Similarly, many natural scientists take more time in getting the question right than in developing a solution. Often, we need the art to get to the science.

A broader artistic perception is needed—in assessing strategy and the big picture, as well as the tactical and bottom-up construction. Artists perceive, create, develop, and make, reflecting the artist's view by challenging current practice.

Scientists learn from observed data and enhanced hypotheses—moving society forward in the process. Artists take on the new, not requiring proof or necessarily following standards (though basic principles offer a place to start). Are scientists, with their skepticism and curiosity, really that different from artists?



Actuaries need to avoid an overly technical stereotype, with trust and reliability being all-important. We need to avoid unwarranted complexity and refinement, or a computer program only one person can maintain.

We regularly challenge our perception of what we do and strive through feedback loops to evolve, to be skeptical, to be curious. Although we have been trained in the risk disciplines and mastered many formulas, it may be more important to be masters at recognizing and understanding before quantifying. Our work rarely involves certainty: Even when we can accurately measure the past, conditions change to challenge its relevance to the future. Our work is to understand the uncertainty and creatively prepare for it; it might be better to focus on the "why and what" of the world, as opposed to the "how to" of a specific job.

As a large part of our job is scientific, what type of scientist are we? My son Jordan majored in political science, the art of accomplishing something (yes, politicians sometime get things done, even in our fractured times). Natural scientists help explain natural phenomena, while social scientists consider the expected actions of people in it—actuaries practice a little of both. Our estimates and product designs will likely be better when we understand the effect of the conditions and underlying behavior and utility, and anticipate possible adverse conditions. Although we can artistically extrapolate from the past, is that always best?

With today's technology at our disposal, actuaries have to go beyond calculations to add value (computers follow rules a lot better than we can, anyway). We need to challenge data quality, interpretations, and relevance to the problem being addressed—and why we do what we do. Hard scientists spend most of their time searching for the right question, while soft scientists search for unintended consequences.

Being an actuary is difficult to cubbyhole; we share characteristics of scientists and artists. I am proud to be both an actuarial scientist and an actuarial artist; judgment, creativity, skepticism, curiosity, and communication are just as important as following the scientific method—if not more so. □

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