

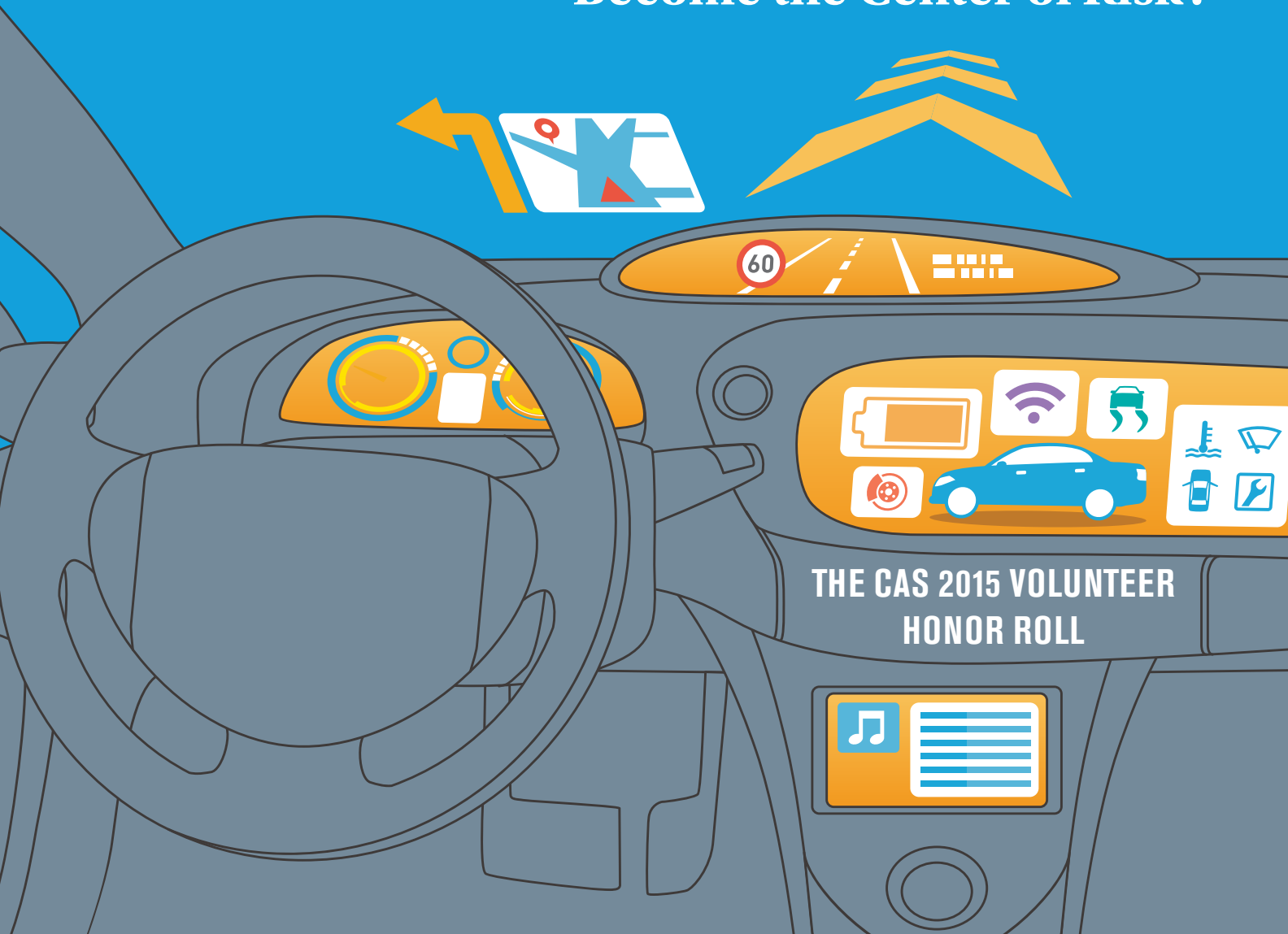
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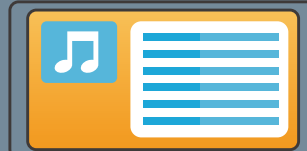
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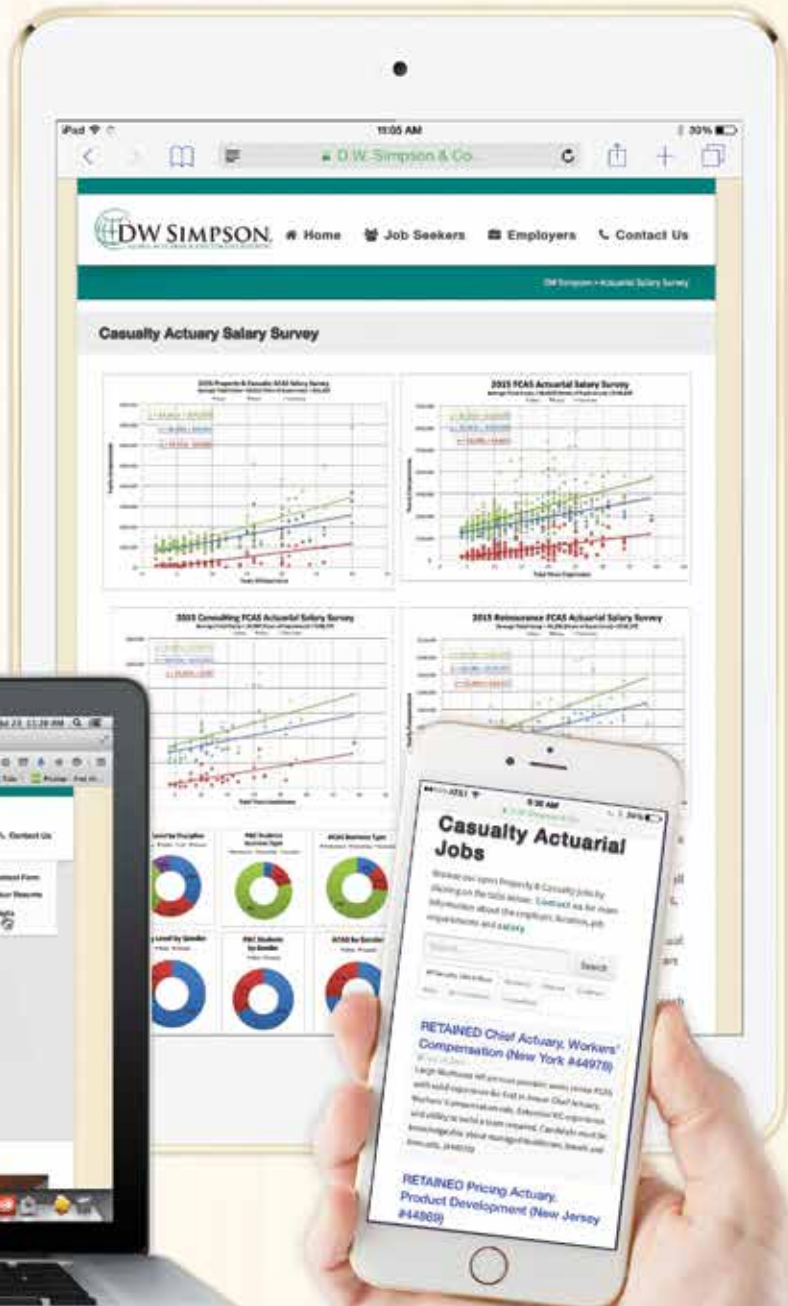
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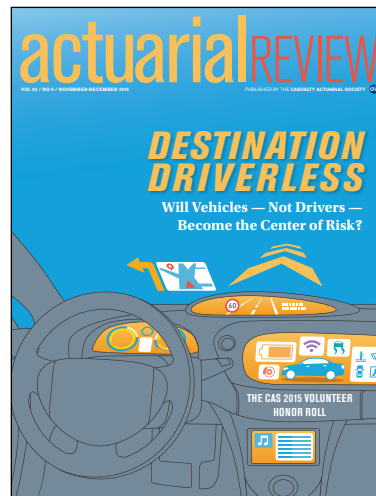
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Destination Driverless

BY ANNMARIE GEDDES BARIBEAU

Will vehicles — not drivers — become the center of risk?

In Celebration of Volunteers: The CAS 2015 Volunteer Honor Roll

Here's to you, volunteers! The CAS
couldn't have done it without you!

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editor'sNOTE By GROVER EDIE

CAS Strong

Several elements come together to make an organization durable: the desire to serve, to grow in knowledge and to pursue new endeavors. This issue of *AR* highlights just some of the components that are the backbone of the CAS.

Once a year, *Actuarial Review* lists all of the members who help keep our Society strong and viable. Our thanks go out to all of you listed in this year's Volunteer Honor Roll. Thanks also to those who have supported these volunteers and the organizations that have provided the time and funding.

There is still time to make sure you are in compliance with the continuing education requirements for 2015. Gordon Hay's article on page 14 can provide some insight as well as an interesting view from a member of the Continuing Education Compliance Committee. I admit, I was surprised (and a little disappointed) to find out that some members are not using TRACE to track their continuing education (<https://www.actuary.org/trace>). I have been using it for years, and find it is easy and convenient. If you need some resources, see the "Get Ahead" column by David Zornek.

Living near Detroit, I find our feature article, "Destination Driverless," especially interesting. I recently had a lengthy discussion about the driverless vehicles with a retired GM engineer. He brought the technological aspects to the conversation, while I provided the insurance and legal implications. He mentioned that the Michigan Department of Transportation and University of Michigan researchers have designed an "Mcity," a facility for testing and evaluating automated vehicles and systems. (See more about it at <http://www.mtc.umich.edu/test-facility>.) While the subject is much broader than insurance alone, it will have a significant impact on what we do in the future.

Members joining the Actuarial Innovation Ambassadors might be tempted to go out and buy a copy of *The Creators' Code*, the subject of our "On The Shelf" column. It's also good reading for anyone wanting to learn about the thought processes of successful innovators.

And that's our issue of *AR*. It's been put together by volunteers and its contents reflect the strengths of the CAS. Enjoy! ●

Actuarial Review always welcomes story ideas from our readers. Please specify which department you intend for your item: Member News, Solve This, Professional Insight, Actuarial Expertise, etc.

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Expanding Our Envable Culture

At a recent presentation to the board of another actuarial organization, I reported on the CAS's impressive growth over the past few years. I was asked how we plan to maintain our culture as our membership continues on a very healthy growth path. I was also asked if we would expect that there would be a time when the engagement among CAS members, which is so enviable, will become lost in a large professional society as we advance. It is a difficult scenario to ponder, but I am optimistic, based on a couple of promising observations.

I was very encouraged when I first learned of how our members reacted to solicitations for the CAS to merge with another actuarial organization and to personal entreaties to the members to join another actuarial organization. The commitment and intense loyalty to our organization and its culture were powerful.

My second observation is of the profound dedication of those members actively engaged at CAS meetings and in CAS volunteer opportunities, as well as the sheer longevity and depth of CAS volunteer involvement. This dedication is truly inspiring.

The CAS volunteer culture is not only highly valued by our members and stakeholders, but it's also recognized within the profession and among industry leaders. Among the international actuarial community, CAS leaders are often sought after for connections and formal relationships. Also, among other professionals within the P&C industry, such as underwriters and claim managers, the reputation of the CAS and our members is very strong. These observa-

tions are both consistent and durable, mostly as a result of the excellent experience that those outside our profession have had in working with CAS members. This recognition is also a key to the strength of our culture.

Masters and Experts beyond Actuarial Science

I continue to be amazed at the depth and diversity of the professional and academic achievements of CAS members. Masters and doctorate degrees, and designations such as CERA, CFA, CPCU, ARM, ARe and CPA abound among CAS members. These abilities and educational achievements are testaments to the professional excellence of

CAS members frequently expand their horizons well beyond the ranks of practicing actuaries to pursue careers as insurance executives, regulators, financial executives, strategy consultants, journalists, data scientists, product managers and entrepreneurs.

our CAS members wherever they choose to apply their knowledge and expertise. Furthermore, when meeting with the leaders of other actuarial organizations and industry groups as a CAS leader, I am struck by their high level of interest in developing a collaborative relationship with the CAS in significant areas of mutual interest and benefit.

We also have many members who have used their CAS actuarial education and experience as a springboard for other pursuits and careers. Unlike many professions where the predominant goal is to have a career as a practitioner, CAS members frequently expand their hori-

zons well beyond the ranks of practicing actuaries to pursue careers as insurance executives, regulators, financial executives, strategy consultants, journalists, data scientists, product managers and entrepreneurs.

These achievements of so many CAS members are certainly noteworthy and provide a source of pride about the CAS. More importantly, the CAS culture that emerges from this sense of community is definitely noticed by outside observers. In fact, our three appointed CAS board members are particularly enthusiastic about promoting opportunities for the CAS to become more accessible and to be better connected to other experts in the insurance industry.

Adaptation, Assimilation and Evolution

Once of the differentiating attributes of CAS professional education has been to continuously improve our educational programs, our qualifying exams and our skillset as actuaries. The recent report on travel time to FCAS has indicated that we can achieve these improvements without lengthening the time it takes for actuaries to become fully qualified. However, travel time is only one dimension of professional qualification. We need to better understand and, if possible, rectify the extraordinary time

President's Message, page 8



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President's Message

from page 6

period that it takes a significant number of CAS members to complete the FCAS requirements. Moreover, we should find ways to help ACAS members who desire to reach FCAS, but despite numerous exam attempts, are challenged to do so. In many cases, long-term ACAS members are quite successful in their careers.

The description of the actuary as an insurance mathematician or statistician who has practical business acumen, like an MBA, seems to fall far short of how many of us see ourselves and our profession. I have seen several of my CAS colleagues adapt their actuarial skills to many challenges and opportunities that they face in business. Their skills in finding practical and insightful solutions generally surpass those of mathematicians, statisticians and MBAs. They have developed the keen ability to adapt their education in mathematics, statistics and business to apply complex insurance problems. They also become masters at assimilating knowledge and understanding concepts from law, behavioral psychology, economics, finance, accounting, marketing, computer science, enterprise risk management and data science. Some of my colleagues have also been able to assimilate knowledge from such diverse fields as medical science, environmental science, meteorology, seismology, geology and agricultural economics in order to analyze the potential costs associated with specific risk issues. CAS education, along with the practical experience of our CAS colleagues, appears to encourage the development of these adaptive and assimilation skills and to foster a community of technical problem solvers

who have evolved into quick learners who can connect dots quite effectively across highly technical fields.

Communication — Our Nemesis, Our Challenge

The collective talents of CAS members are quite impressive. However, despite having such talents, it can be quite frustrating when some of those in general management and executive positions view actuaries as lacking in the ability to communicate the most useful or relevant insights from their work. Perhaps some actuaries suffer from too much of an inward focus and consequently are perceived as missing the big picture. It has also long been a perception that actuaries are not good communicators and that communication skills seem to persistently evade us and are difficult to assimilate into our culture. While there certainly are actuaries with excellent communication skills who have excellent career paths, the unfair perception of actuaries remains.

Good communicators are generally seen as being quite confident. However, such confidence can sometimes be mistaken for competence, particularly when the actuarial evidence is not so clear. Certainly, our confidence is perceived based on our ability to communicate our advice and conclusions both effectively and persuasively. While our professional credentials do create a level of trust, poor communication skills can erode the recognition of that trust. Being able to tell our story, particularly in a way that will be understood by those with different backgrounds and talents, is a critical talent that actuarial leaders around the world have recognized as an important skill for the long-term continued success of our profession.

The need and value for actuaries to have good communication skills is recognized globally. We are faced, however, with the emergence of a digitally connected global society, something particularly appealing to actuaries attracted to the wealth of digital data to analyze. Consequently, the challenge for the profession is to ensure that actuaries acquire good communication skills in a world where short and brief electronic communication reigns.

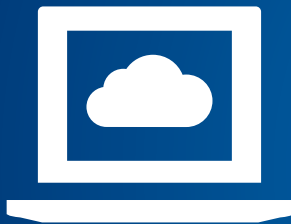
A Very Bright Future Ahead

As the CAS continues to grow in numbers, in areas of specialization and geographically, we need to continue to encourage that passion for maintaining an intense sense of community. I believe that we can do it by continuing to energize our plethora of volunteer opportunities, in-person meetings and seminars, regional and special interest events, webcasts, innovation challenges, leadership development, continuing education offerings and social media involvements. I trust we will accomplish our mission as a professional institution, particularly as a collaborator with other actuarial associations and other professional organizations. It is important that all of us to stay connected to our CAS colleagues and stay engaged in being the best we can be. I certainly plan to continue to be an active CAS volunteer where my talents are needed.

In my previous President's Message in *AR*, I wrote about charting a new course for the CAS and our profession. Details about that new course will be announced soon. Your patience in waiting to learn about these plans is appreciated. I believe that you will be impressed and enthusiastic about these plans. ●

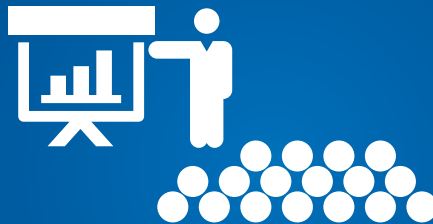


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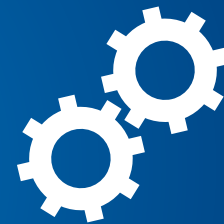
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Price Optimization and the Descending Confusion

Dear Editor:

Clever titles aside, the only confusion that is descending on the price optimization debate is the confusion over the definition of price optimization sewn by the industry (“Price Optimization and the Descending Confusion,” *AR*, September/October 2015). In fact, the supposed different definitions boil down to adding price elasticity of demand to the usual ratemaking model. No matter how defined, price optimization always uses non-risk-based factors to move prices away from the risk-based prices, always producing rates that are excessive, inadequate, unfairly discriminatory or all of these.

The major thrust of the industry arguments made in the article is that we should not *throw the baby* (described as “good” movements away from cost-based prices) *out with the bathwater* (“bad” movements). The problem is that any move away from cost-based rates produces illegal prices.

The author says that actuaries found that some “individual risk characteristics such as age, occupation and education are reasonable for determining risk.” I disagree. The use of education and occupation is highly questionable since these classes are surrogates for the prohibited classes of income and race. The impact on the poor of these and other anti-poor classes is devastating as Consumer Federation of America’s extensive research on the unaffordability of state-required auto insurance shows.

We can debate all sorts of things about the proper pricing methodologies for insurance products. But we shouldn’t be led into phony debates about defini-

tions while the industry moves to use “innovations” that undermine everything actuarial theory stands for.

— J. Robert Hunter, FCAS, MAAA
 Director of Insurance of the Consumer Federation of America and former Federal Insurance Administrator and Texas Insurance Commissioner

AR Editor in Chief Grover Edie replies:

We politely disagree with Mr. Hunter’s characterization of the article. We believe it offers an objective view of this hot-button issue. The *Actuarial Review* stands by the story.

Dear Editor:

I was very pleased to see the good article about “Price Optimization and the Descending Confusion”. Congratulations to author Annmarie Geddes Baribeau!

Price optimization is the main subject of my paper, “Prices and Commissions Based on the Theory of Games,” published in the June 1966 issue of *The Journal of Risk and Insurance*. The first contest calculates the optimum price by maximizing the margin expectation. This is done in a way that excludes overhead, profit and sales commission (these items are secured by the second contest, which ends up with a calculated sales attempt quota).

The first contest takes account of competition, control, price elasticity, etc. The emerging optimum prices can be surprisingly low because of the way they are worked. They are really based on a study of human behavior. In my opinion, price optimization is in the public interest. Furthermore, it is very helpful to have formal methodology, which clarifies the mind and dispels that “descending confusion.”

Another item of some interest: The 1966 paper used some work by a relative

unknown, John Forbes Nash Jr. Much later, Nash was the subject of *A Beautiful Mind* and the Oscar-winning movie of the same name. Tragically, he was killed in a taxi accident in May 2015. The 1966 paper is available through Wiley.

—John M. Bragg, ACAS ●

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Correction

Steven Sullivan’s article, “The Mad World of Political Risk Insurance” (*AR*, September/October 2015), contains an error. In a quote from Lila Rymer of Beazly, NYC, the sentence originally read as follows: “At Beazley, aside from sanctioned countries, we rarely stop considering new deals blanket-close in a country.”

The quote should read: “At Beazley, aside from sanctioned countries, we rarely stop considering new deals in a country.” ●

IN MEMORIAM

Frederic J. Hunt (FCAS 1959)
 1923-2014

COMINGS AND GOINGS

Deborah Stone, FCAS, MAAA, has been elected chair to the American Mensa Board of Directors. Stone has been a member of Mensa, the largest and oldest high IQ society in the world, for more than 31 years and has previously served as regional vice chair for the organization. Stone is owner of Stone Business & Risk Consulting LLC. She worked at the State of New Hampshire Insurance Department as director of financial regulation. Stone also serves on the executive committee of Mensa International.

Paul B. LeSturgeon, FCAS, MAAA, has joined Cincinnati Financial Corporation as managing director, head of reinsurance analytics for the company's reinsurance-assumed initiative, Cincinnati Re. In this role, LeSturgeon will drive the reinsurance-assumed actuarial and catastrophe modeling analytics. He has previously held positions at ACE Group and Towers Watson.

Kim Garland, FCAS, has joined State Auto Financial Corporation as senior vice president, standard lines. Garland will be responsible for all personal lines business, including farm and ranch, as well as small commercial business. Garland was most recently chief product officer of AIG's consumer division. He previously helped lead the restructuring of United Guaranty, AIG's mortgage insurance company, as its COO and later CEO.

PartnerRe Ltd. has appointed **Charles Goldie, FCAS**, CEO of PartnerRe Global. Most recently serving as deputy CEO of PartnerRe Global, Goldie joined the company in 2002 as head of the U.S. Specialty Lines portfolio and in

2009 was named head of risk management and reserving. Prior to joining PartnerRe, Goldie worked for Gerling Global Reinsurance Corporation of America as head of casualty underwriting and for Milliman as a consulting actuary.

CAS Past President **W. James (Jim) MacGinnitie, FCAS, MAAA, (1979-1980)** will serve as its first senior property-casualty fellow for the American Academy of Actuaries. MacGinnitie will communicate to the public and to public policymakers the organization's work on casualty actuarial issues. MacGinnitie retired in 1999 after serving as senior vice president and chief financial officer of CNA Financial.

Bret Parmenter, FCAS, MAAA, has rejoined Pinnacle Actuarial Resources Inc. as a consulting actuary in the Chicago office. Parmenter has over ten years of experience in the property-casualty practice area and has considerable experience with both primary commercial insurance and reinsurance. He has extensive experience with stochastic models along with various capital allocation procedures and portfolio and large account profitability analyses.

The Canadian Institute of Actuaries appointed **Craig A. Allen, FCAS, FCIA**, chair of the CIA Actuarial Evidence Committee, which represents the 85 actuaries in Canada who provide expert testimony in personal injury litigation and marital breakdown proceedings. Allen is the first FCAS to lead the committee in its 35-year history. He is senior consultant for Commonwealth Research Group in Brookline, Massachusetts. ●

EMAIL "COMINGS AND GOINGS"
ITEMS TO AR@CASACT.ORG.

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Seminar on Reinsurance
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Casualty Loss Reserve Seminar
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Leong, Wang and Chen Win 2014 *Variance* Prize

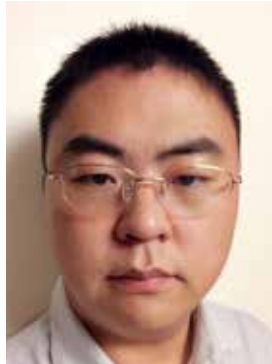
BY DONNA ROYSTON, CAS PUBLICATIONS PRODUCTION COORDINATOR

The *Variance* Prize for papers published in *Variance* volume 8 has been awarded to Jessica Leong, Shaun Wang and Han Chen, for their paper “Back-Testing the ODP Bootstrap of the Paid Chain-Ladder Model with Actual Historical Claims Data.”

The winning paper presents a back-test of a popular technique to obtain reserve distributions. By using the data from several hundred U.S. companies, spanning three decades, the authors show that the modeled distributions emerging from this technique can underestimate reserve risk. The paper examines the causes of this problem, and suggests two methods to address it by accounting for systemic risk.

The *Variance* Prize honors original thinking and research in property/casualty actuarial science and is awarded to the author or authors of the best paper published in each volume year. To be eligible, a paper must show original research and the solution of advanced insurance problems.

The judges noted that “the contribution of this paper is the focus on reserve risk and the importance of the systemic risk component, which component cannot be discerned using a static point-in-time reserve triangle.” The paper was also recognized for the significance and relevance of its subject matter.



Han Chen



Jessica Leong



Shaun Wang

Jessica Leong, FCAS, FIAA, is a predictive analytics execution lead at Zurich Insurance. In this role, she works with the business, ensuring effective execution on predictive analytics projects. Prior to working in predictive analytics, Leong has had roles in capital modeling and reserving. Most recently, Leong was the lead casualty specialty actuary at Guy Carpenter. She was also a consultant at Milliman in New York and Towers Watson in London. Leong is a Fellow of the Institute of Actuaries of Australia and a current board member of the Casualty Actuarial Society.

Shaun Wang, FCAS, CERA, is chairman of Risk Lighthouse LLC. Previously, he was deputy secretary general and head of research at the Geneva Association (2013-2015) and pricing actuary and research director at SCOR Reinsurance (1997-2004). He was professor of actuarial science at Georgia State University’s Robinson College of Busi-

ness (2004-2013), assistant professor at the University of Waterloo (1994-1997) and Concordia University (1993-1994). Dr. Wang holds a BS degree in mathematics from Peking University and a Ph.D. in statistics from the University of Waterloo.

Han Chen, FSA, ACAS, is lead analyst at Tokio Marine Technologies, where he is responsible for property and casualty reinsurance pricing/reserving tool development and emerging risk study. Prior to joining Tokio Marine Technologies, he led a research team in conducting P&C industry cycle-related analysis and other nontraditional actuarial research for Risk Lighthouse. Chen has a bachelor’s degree in mathematics from Fudan University in China and master’s degrees in actuarial science and mathematical risk management from Georgia State University.

The winning paper is published in *Variance* volume 8, number 2. ●

COLLABORATIVE

At the Casualty Actuarial Society, we believe that collaboration is the key to success. We are proud to foster a community of risk professionals collaborating towards a common goal — solving today's risk-oriented challenges. Learn more about how we are working together — and partnering with others — to create solutions for the property and casualty insurance industry at casact.org/collaboration.



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Report: Continuing Education Compliance in 2014

BY GORDON HAY, MEMBER OF THE CONTINUING EDUCATION COMPLIANCE COMMITTEE

Each year the CAS Continuing Education Compliance Committee (CECC) gets together via conference call and email to organize and prepare for our primary task: reviewing a sample of CAS members' compliance with continuing education requirements. On behalf of the committee, I offer this report to the *Actuarial Review* readers, especially those who enjoy statistics.

In accordance with CAS policies, the CECC reviewed 82 members' documentation of their 2014 continuing education (CE) credits. This was a one-percent sample of the membership, plus documentation from every member of the CAS Board of Directors and Executive Committee. With rare exceptions, the CECC found that the selected members who attested that they "Have complied" actually had done so.

Based on a subsample of 45, about 89 percent of the "Have Complied" attestations were under the U.S. Qualification Standard, four percent were under the Canadian Institute of Actuaries' (CIA) CPD requirements and seven percent under the CAS Alternative Provisions. Other national standards were not represented in the subsample.

CAS members providing actuarial services in the U.S. are subject to the U.S. Qualification Standard, and CIA members who provide actuarial services in Canada are subject to the CIA Continuing Professional Development requirements. See Section B of the CAS CE Policy, March 23, 2015, for a list of Recognized National Organizations.

The original CAS CE policy included

Alternative Compliance Provisions, which were discontinued in the March 2015 revision. Members who have used the Alternative Provisions will need to determine the most relevant Recognized National Standard for themselves. If providing actuarial services in more than one jurisdiction, members should take care to meet the relevant qualification standards in each jurisdiction that applies.

With respect to the U.S. Qualification Standard, very few members showed any difficulty documenting compliance with the three credit hours minimum for professionalism topics, six credit hours minimum for organized activities, and 30 credit hours overall minimum. Likewise, few had any difficulty capping general business skills activities at the three credit hour maximum.

The online CAS member profiles show "Did Not Comply" for 474 members who either did not attest or attested that they "Did Not Comply." Of these, 109 appear to be neither retired nor working in academia, but have job titles in the CAS Online Directory that appear to involve providing actuarial services.

Some members attested that they are "Not Providing Actuarial Services." The CECC found 29 of these to be neither retired nor working in academia, but have job titles in the CAS Online Directory that appear to involve providing actuarial services. The CECC is following up individually with these and also with members who "Did Not Comply." Updated member profile information may be all that's required.

The CECC can refer noncompliant

members to the CAS Executive Committee. Providing actuarial services without being qualified to do so would violate the Code of Professional Conduct and could entail consequences that include counseling or discipline. No loopholes exist.

How Did Members Comply in 2014?

By compiling data from anonymous PDF files, I looked at how a sample of 45 members documented their 2014 CE credits. Actuaries tend to put everything into Excel, and their CE documentation is no exception. Most submissions were some variety of spreadsheet. Some members used the American Academy of Actuaries (AAA) TRACE program, submitted hand-written notes or provided the output of their employer's internal CE database. In general, the database outputs are the hardest to read. They often seem to be a raw dump with little effort made to format them for reviewers' ease. It was common for the CECC to suggest improvements in members' documentation.

The sample average CE credits documented for 2014 was 78.7. Excluding five outliers, the average for the remaining 40 was 57.3 credit hours. As you can see from Table 1, four members documented more than 100 CE credits, but at the other extreme, eight documented between 30 and 32. So, members varied widely in the number of CE credits documented. The members are assigned to "Documented Credit" groups to highlight the extremes. In particular, many members documented compliance with the minimum but

Table 1: 2014 CE Credits Documented

Docu-mented Credits	Number of Members	Average Credits
30-32	8	30.7
32.1-40	12	35.4
40.1-100	16	57.5
>100	4	175.6
Subtotal	40	57.3
5 Outliers*	5	249.3
Total	45	78.7

* 4 CAS Exam-takers and one other who documented just 12 credits in 2014 under the CAS Alternative Provisions.

probably did not document all their qualifying continuing education, so it is not possible to measure the time actually devoted to continuing education.

Judgmentally, I identified seven sources of CE credit or activity types:

- (1) Webinars — Affordable, plentiful and generally structured to be “Organized” under the U.S. Qualification Standard.
- (2) Multi-session meetings — Sponsored by the CAS and other professional bodies, these provide a lot of “Organized” CE credit but generally require travel.
- (3) Committee work and public speaking — This may include time that qualifies as continuing education.
- (4) Traditional educational institutions (i.e., universities) — Study or work with this type of organization is often an overlooked source for CE activity that should not be omitted.
- (5) Educational meetings internal to the actuary’s organization — Caveat: These are not “Organized” under the AAA definition *unless* there are participants from outside the organization.

Table 2: Reliance on Activity Types

	5 Outliers	30-32	32.1-40	40.1-100	>100	Total	Excl. 5 Outliers
Webinars	20%	88%	67%	63%	50%	62%	68%
Actuarial Meetings	40%	88%	92%	94%	75%	84%	90%
Committees & Talks	0%	0%	17%	56%	100%	33%	38%
University-Sponsored	0%	0%	0%	19%	0%	7%	8%
Employer Meetings	20%	75%	50%	63%	25%	53%	58%
Other Meetings	0%	38%	25%	63%	75%	42%	48%
Self-Study	100%	50%	75%	56%	100%	69%	65%

(6) Other Meetings — These can be sponsored by nonactuarial trade associations and various service vendors.

(7) Self-study — This can include educational reading, preparation for presentations and reviewing ASOPs.

Table 2 reveals the proportion of members that used at least some of each Activity Type. Members varied widely.

Actuarial meetings were used for documented CE credits by 84 percent (or 90 percent when the five outliers are excluded). Self-study and webinars were used by 60-70 percent, and employer-sponsored meetings were used by 50-60 percent. Only three out of 45 relied on university-sponsored activities. Those documenting a lot of CE credit relied most heavily on committee work, presentations given, “Other Meetings” and self-study. In contrast, those with 30-32 documented CE credits relied least on committees/speeches and self-study.

Fifty-eight percent of the 40 members documented educational meetings internal to their organizations. This is in-

teresting because it implies that 42 percent claimed no such CE credit. Some internal educational meetings might be hard to document without disclosing proprietary information.

Table 3 shows the average CE credit by activity type.

For obvious reasons, self-study CE credit volume was greatest among exam takers and among the four members who documented more than 100 CE hours. Those who documented 30-100 CE hours probably did more self-study than they chose to document.

Webinars, though widely used, contributed an average of about five CE credits. Across the Documented Credits groups, except for the five outliers, actuarial meetings came closest to a uniform contribution to members’ documentation. The documented averages of 15-24 credit hours came from meetings sponsored by the CAS, CAS Affiliates, the CIA, the AAA and similar actuarial organizations. The SOA was not represented in the sample.

Four members out of 40 (excluding

the five outliers) documented over 100 credit hours, and their totals reflect decisions to claim much more CE credit than others for self-study, internal educational company meetings and committee work. Committee work and self-study may be subjective sources of CE credit. Fifteen of the 40 (excluding the five outliers) claimed a total of 223 CE credits for committee work and presentations delivered, but two members claimed almost half of those credits. Twenty-six of the 40 claimed a total of 692 CE credits for self-study, but one member documented almost as much self-study credit as the other 25 combined. It's likely that many of us have chosen not to include all of our self-study and committee work that could be considered CE in our documentation.

Indeed, a strategy for some was to submit only a short, defensible list of "Organized" activities. It is not surprising there is so much diversity in the way members documented CE, given the broad and diverse work our members engage in.

Good Faith Determinations

Judging "relevant" continuing education is up to the member, who needs to be able to support those decisions under applicable criteria. Continuing educa-

Table 3: Average CE Credits by Activity Type

	5 Outliers	30-32	32.1-40	40.1-100	>100	Total	Excl. 5 Outliers
Webinars	1.8	4.4	5.2	6.6	3.3	5.0	5.4
Actuarial Meetings	5.5	15.1	24.4	17.1	16.8	17.3	18.8
Committees & Talks	-	-	2.3	7.2	23.6	5.3	5.9
University-Sponsored	-	-	0.8	1.9	-	0.9	1.0
Employer Meetings	3.5	4.3	10.3	9.3	18.3	8.8	9.5
Other Meetings	-	1.8	6.2	10.0	12.9	6.7	7.5
Self-Study	238.6	5.1	13.3	5.5	100.7	41.9	17.3
Total	249.3	30.7	62.5	57.5	175.6	85.9	65.5

tion is supposed to be new learning that will aid you in your current practice or prepare you for potential future practice. Remember what the U.S. Qualification Standard states:

Continuing education is "relevant" if: (1) it broadens or deepens an actuary's understanding of one or more aspects of the work an actuary does; (2) the material expands an actuary's knowledge of practice in related disciplines that bear directly on an actuary's work; or (3) it facilitates

an actuary's entry into a new area of practice. Ultimately, it is an actuary's responsibility to make a reasonable, good-faith determination of what continuing education opportunities will enhance an actuary's ability to practice in a desired field. ●

Gordon K. Hay, FCAS, is the senior casualty actuarial examiner for the Nebraska Department of Insurance.

D.W. Simpson Makes CAS Trust Donation

The Trustees for the CAS Trust are pleased to announce that D.W. Simpson Global Actuarial Recruitment donated \$10,000 to the Trust in 2015. This brings the total contribution by D.W. Simpson to the Trust to \$190,000 over the past several years. The CAS sincerely thanks D.W. Simpson and its employees for its continued support of the CAS mission to advance actuarial science. ●



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Call for Volunteers: Actuarial Innovation Ambassadors

BY KEVIN BINGHAM AND AARON HALPERT, CAS INNOVATION COUNCIL CO-CHAIRS

The CAS Innovation Council is looking for innovators who have demonstrated the ability to apply actuarial skills and experiences to address complex business issues creatively.

The CAS has a proud reputation of developing innovative solutions for the insurance industry for over 100 years. Beginning with the formation of product pricing for workers compensation in the early 1900s, to fostering innovative research and applications in economic capital modeling, catastrophe management and predictive analytics, CAS members have been at the forefront of applying actuarial techniques in new and creative ways.

Help celebrate our innovative culture by volunteering as an Actuarial Innovation Ambassador.

Actuarial Innovator Ambassadors serve the CAS membership by present-

ing webinars through the Innovation Council's profile series. These webinars educate CAS members on how innovation is used to expand the actuarial footprint in traditional and emerging practice areas. Following their webinar presentations, Actuarial Innovator Ambassadors are encouraged to share their stories in other ways, such as through articles in the *Actuarial Review* or the CAS Roundtable blog.

Our Work So Far

Actuarial Innovator Ambassadors who have presented to date include:

- Serhat Guven, who shared how innovation is used to expand the actuarial footprint in the emerging predictive analytics practice areas.
- Jason Harger, who shared how the principles of innovation are applied in catastrophe management.
- Melissa Salton, who shared how the

principles of innovation are applied in the development of an ERM framework for U.S. P&C insurers.

- Mike Schmitz, who discussed how the principles of innovation are applied in credit risk analysis.

We are also excited to let you know that John Welch, FCAS, president and CEO of XL Reinsurance America, will be presenting an innovation profile series webinar on the CEO's perspective on innovation in December.

If you'd like to join this group showcasing how actuarial skills are applied in innovative ways, please email us at kbingham@deloitte.com and ahalpert@amhadvisory.com. ●

Kevin Michael Bingham, ACAS, is a principal for Deloitte Consulting, LLP in Hartford, Connecticut. Aaron M. Halpert, ACAS, is a principal with AMH Advisory LLC in New York.



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CAS STAFF SPOTLIGHT

Meet Cheri Widowski, CAS Research Manager

Welcome to the CAS Staff Spotlight, a column featuring members of the CAS staff. For this spotlight, we are proud to introduce you to Cheri Widowski.

- **What do you do at the CAS?**

I'm the research manager so, big picture, I help the various research committees get their research projects completed. And we have a lot of research committees. I also manage the CAS library and DARE, the CAS literature database.

- **What do you enjoy most about your job?**

Although it doesn't happen a lot, I love when I get to use my library skills on the job, whether it's doing some research for a co-worker or helping someone learn how to maneuver around DARE.

- **Hometown:**

Cleveland, Ohio

- **College and degree:**

John Carroll University, bachelor's in history and psychology; Syracuse University, master's in library and information science

- **First job out of college:**

I juggled a few jobs right out of college — working in a book store, my dad's video store and a library. I pretty much never had a day off for about two years. After that, I guess my first official 9-5 job was as an indexer for a research database. And my first job out of grad school is my current one.

- **Describe yourself in three words:**

Smart, sarcastic, organized

- **Favorite weekend activity:**

I really like to do as little as possible on the weekends and just enjoy my time off, but it's a rare week-



Cheri Widowski

end when I haven't seen a movie or watched some sort of sporting event.

- **Favorite travel destination:**

Anywhere there's a beach.

- **One interesting or fun fact about you:**

I used to write for a *Survivor* website, where I did episode recaps and player profiles. ●

2015 Annual Report of CAS Discipline Committee to the Board of Directors

The CAS Rules of Procedure for Disciplinary Actions (as amended May 3, 2009, by the Board of Directors) requires an annual report by the Discipline Committee to the Board of Directors and to the membership. This report shall include a description of its activities, including commentary on the types of cases pending, resolved and dismissed. The annual report is subject to the confidentiality requirements.

2015 Activity. There was no activity during 2015.

There are no cases pending before the committee.

This notice will be published in the November/December 2015 issue of *Actuarial Review*.

— Tom Myers, Chairperson of the 2015 Discipline Committee, October 6, 2015 ●

The background is a vibrant red with a radial gradient, emanating from the top center. It is decorated with numerous small, multi-colored confetti pieces (yellow, blue, green, purple, pink) and thin, wavy streamers in the same color palette, scattered throughout the frame.

In Celebration of Volunteers:

**THE CAS 2015
VOLUNTEER
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We are an association of people, professionals and friends.

Since the founding of the Causality Actuarial Society in 1914, volunteers have been the main life force sustaining the Society through its various dimensions of growth — in the examination process and in the variety of continuing education activities, as well as in supporting the sheer growth in membership. An effort of this scale generates a continuous need for volunteers, with generally one in three CAS members volunteering each year. These positions include the entire range of CAS activities: the examination committees and exam proctors, research and development activities, liaison representatives, and various program committees and speakers, who serve as faculty for these programs. We recognize that none of these activities can take place without the active participation of the many CAS volunteers and for this the CAS thanks you.

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Albert Zhou
Ao Zhou
Christina Tiejian Zhou
Jun Zhou
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CAS 2015 Employer Honor Roll

The CAS is grateful for the support of employers who encourage their actuaries to volunteer their time and effort to the CAS. Here are two “snapshots” of these employers.

Top Ten Employers with the Largest Number of Fellows Volunteering

Liberty Mutual Insurance
The Travelers Companies, Inc.
Milliman, Inc.
Towers Watson
The Hartford
Zurich
CNA Insurance Companies
AIG
Allstate Insurance Company
PricewaterhouseCoopers

Large Employers with at Least 50% of Fellows Volunteering

Towers Watson
Milliman, Inc.
The Hartford
CNA Insurance Companies
Allstate Insurance Company
Munich Re America, Inc.
PricewaterhouseCoopers
United Services Automobile Association
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Deloitte Consulting, LLP
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XL Catlin
Sentry Insurance
Willis Re, Inc.
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DESTINATION DRIVERLESS

Will Vehicles — Not Drivers — Become the Center of Risk?

By ANNMARIE GEDDES BARIBEAU

Last August marked the first injury-causing Google car accident. This 16th crash, amid the more than two million miles the cars have traveled, shared one important factor with the others — they were all caused by human error.

A shift in fault from drivers to vehicles is just one factor that could forever change the traditional automobile insurance industry. Other considerations, such as the potential risk of new technologies and the exchange of lower claim frequency for higher claim costs, are also likely to torque the industry's future.

Automated vehicles are no longer the fodder of science fiction. Some technology companies and car manufacturers anticipate they will be commercially available within the next five years.

These cars will have limits, said

John J. Leonard, a roboticist and associate head of research for the Massachusetts Institute of Technology's (MIT) mechanical engineering department. "If vehicles do become truly autonomous," he said, "they would likely require two to three decades."

It's not too early for insurers to study the potential risks and advantages of robotic vehicles, said Michael Stienstra, chair of the Casualty Actuarial Society's Automated Vehicles Task Force and vice president of the actuarial department at ACE Private Risk Services.

The task force's goal is to demonstrate the value casualty actuaries can add to the public conversation about these technological marvels. To quantify their influence on auto insurers and their customers, actuaries need to begin examining the ambitious claims being made by technology and vehicle manufacturing companies and to anticipate future risks and advantages.

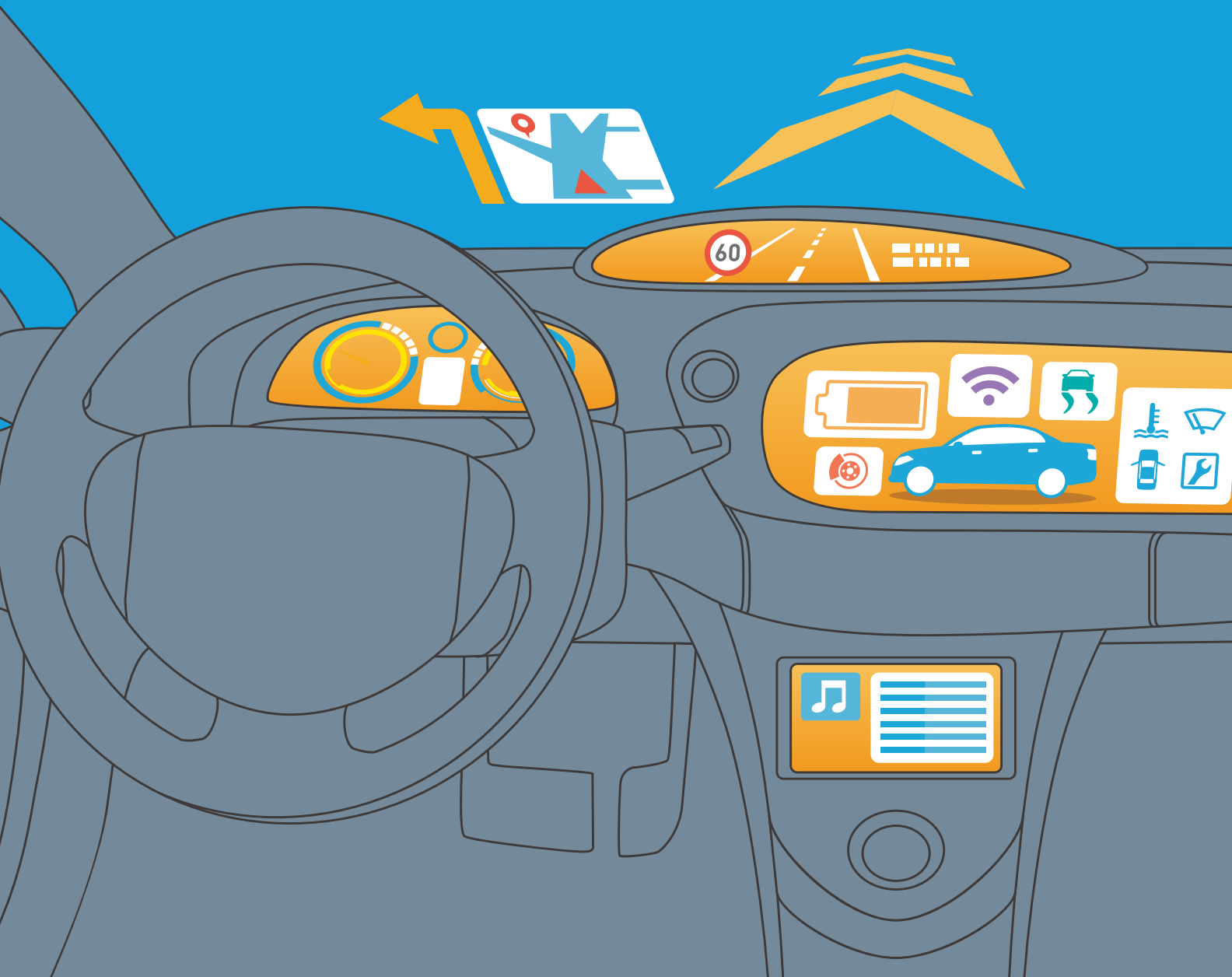
Which is the bigger risk?

A. Vehicles.

B. Drivers.

C. Both.

D. Not enough data.



To Err is Human

The most important expectation of driverless cars is that they will be safer because they will reduce the potential for human error.

Headlines and predictions affirm this assumption. Auto insurance premiums could drop as much as 60 percent in 15 years as self-driving cars hit the roads, Donald Light, head of the North American property and casualty practice for the research firm Celent, recently told *Bloomberg Business News*.

But will driverless cars be safer? “We still don’t know yet,” said Leonard, a self-proclaimed technology optimist. “We need a lot more data to know if we can meet or exceed human performance.”

There is limited information available to anticipate the potential of driver-

less cars to reduce accidents. One commonly used statistic is that 93 percent of vehicular accidents is caused by human error. The logic is that the more driverless cars operate, the less opportunity there will be for mere mortals to make accident-causing decisions.

The statistic, which comes from the 2008 National Highway Transportation Safety Administration’s (NHTSA) “National Motor Vehicle Crash Causation Survey,” was even offered by many witnesses who testified about driverless cars before the U.S. Senate and House in 2013.

When the task force took a look under the hood of the NHTSA study, however, it found that the 93 percent statistic is problematic for several reasons.

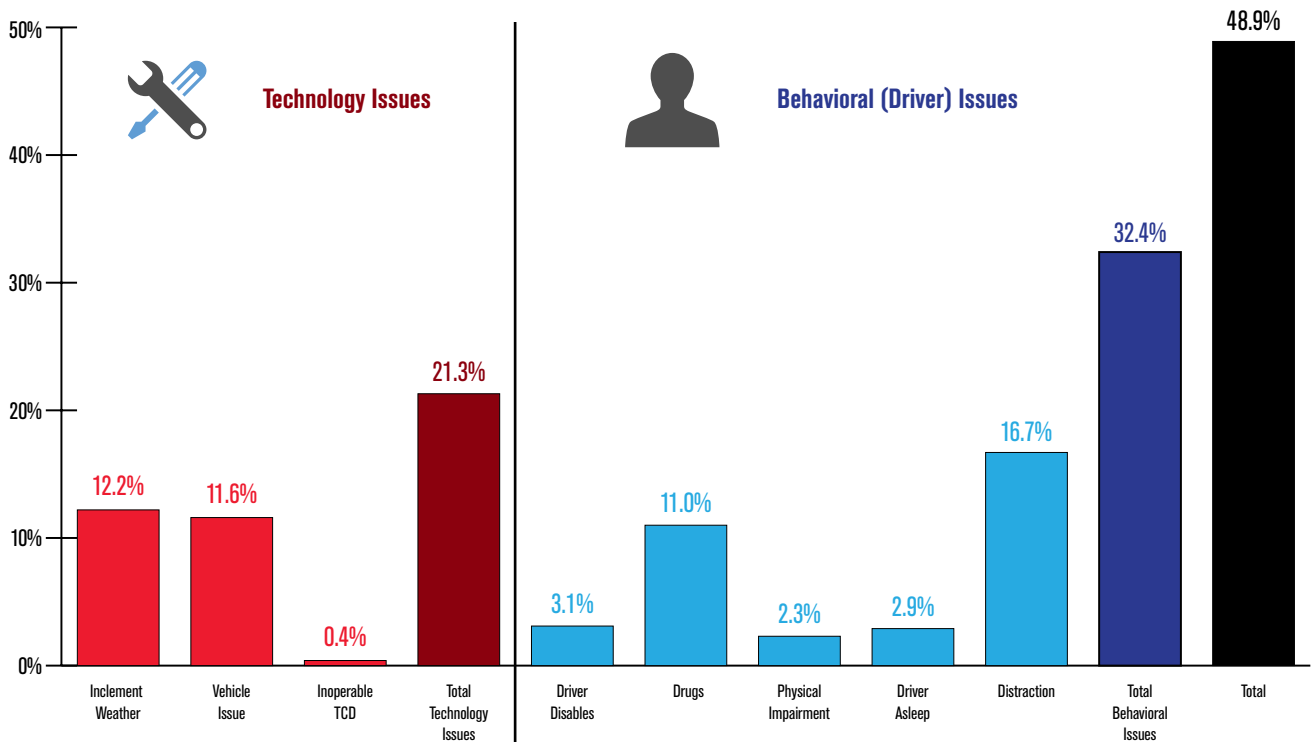
According to the CAS Task Force report, “Restating the National Highway

Transportation Safety Administration’s National Motor Vehicle Crash Causation Survey for Automated Vehicles,” the NHTSA study is based on old data — 6,950 auto accidents from 2005 to 2007. It was also never intended for considering the safety of driverless cars.

The data, however, was useful in helping the task force identify circumstances where the technology behind automated cars could be limited. As a result, the task force report reaches significant conclusions that deserve attention from policy makers, insurance companies and the general public.

According to the task force report, if automated technology could not overcome weather, vehicle errors and inoperable traffic control devices, it could only address 78 percent — not 93 percent — of accidents. That’s a differ-

Chart A: Percentage of observable accidents in a sample of 6,950 accidents from 2005 - 2007



Source: NHTSA.

ence of 830,000 accidents or \$45 billion annually, according to the task force report, which was issued in 2014.

The Control Factor

Tonight Show Host Jimmy Fallon joked earlier this year that driverless cars will allow people to eat, talk on the phone and even apply makeup while driving — activities they are already doing today!

Despite the technological prowess of self-operating cars, there remain many instances where drivers will need or desire to take control of the car. These circumstances fall under two basic categories. Either the technology requires driver intervention or human action makes them inoperable.

“Part of automated vehicles’ value comes from their predictability,” the task force report said. “However, the more involved the driver is, the less predictable the driving becomes.”

The task force study found that 49 percent of the accidents in the NHTSA report had at least one limiting factor that could disable the technology or reduce its effectiveness (see Chart A).

The bar chart represents technological and human behavior-related hurdles that might have to be overcome. None of the risks negates the technology’s potential, but instead, they indicate the relative importance of each risk, provided the assumptions are true. The behavioral issues identified indicate the importance of the driver’s relationship to the technology. Improper technology use can offset its potential safety benefits so it is important that the technology is both safe and used correctly to realize its maximum benefit.

Technology-related disabling factors were present in 21 percent of

The most important expectation of driverless cars is that they will be safer because they will reduce the potential for human error.

NHTSA study accidents, according to the task force report. Such instances included weather, non-working traffic control devices (which interpret the environment to prevent the accident) and vehicle condition/error (which was used as a proxy in the task force report for vehicle failures).

Meanwhile, the report indicates that another 30 percent of the NHTSA accidents involved technology-undermining human activity. These actions include operating a vehicle under the influence of drugs and alcohol, sleeping, distraction or physical impairment such as a heart attack or low blood sugar.

Becoming More Human

While artificial intelligence-guided vehicles offer great promise, they still are being tested under generally ideal driving conditions. These futuristic wonders generate a great deal of media attention, but the fact remains that they have a long way to go before being able to handle the multiplicity of real-world traffic situations that drivers are able to handle today.

“People,” said Leonard, “do not like to talk about the technology not being

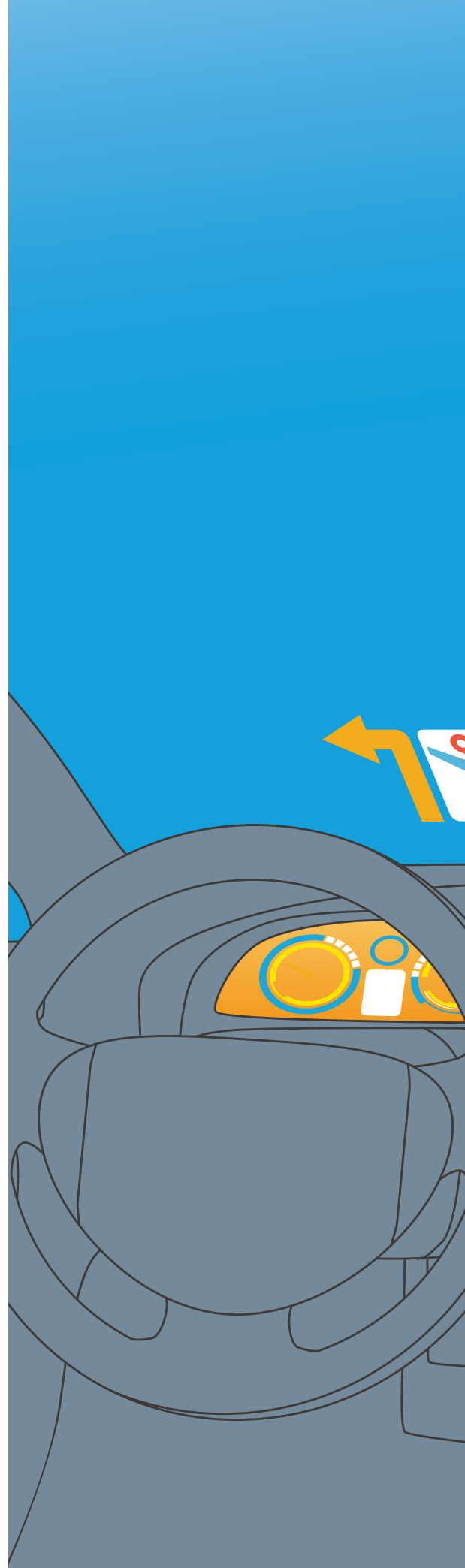
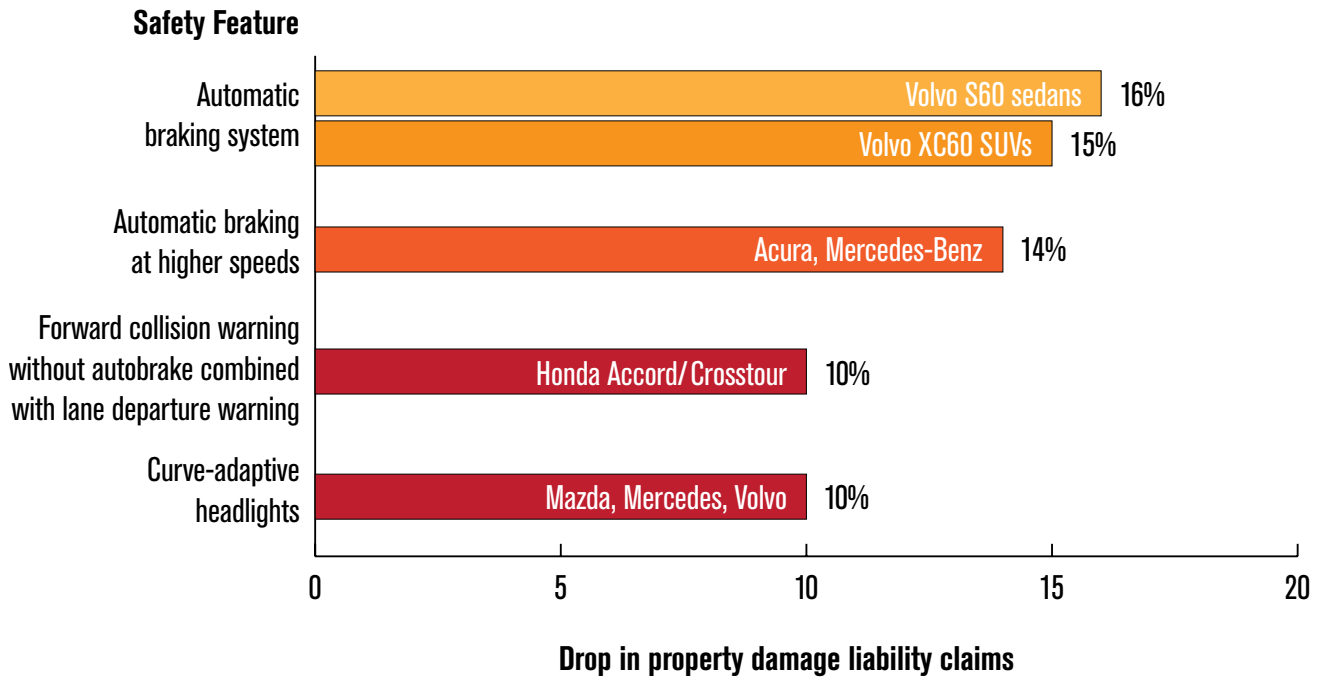


Chart B: Safety Features Reduce Crashes



Source: HLDI.

perfect in many ways. As we deploy the system, we will be building the statistical evidence that they are safer.”

The irony is that for robotic vehicles to be safer than people-driven vehicles, they need to acquire more human-like decision-making capabilities. “The question of how people pay attention when monitoring a highly autonomous driving system remains a research question because humans are often not good at taking the ‘handoff’ from an autonomous system in a difficult driving situation,” he said.

Automated cars will need to better reflect human judgment in several ways. The driverless car currently “lacks the courage” that humans have to handle currently difficult scenarios such as making left turns across high-speed traffic at junctions without traffic lights, Leonard said.

To improve judgment, artificial

intelligence software adjusts itself through parameters, he explained. There are several parameters to perfect so that driverless cars can detect and correctly respond to other vehicles, people and cyclists. “Another research challenge is responding to gestures from police officers or crossing guards directing traffic,” he said.

Driverless cars also use more conservative judgment than humans because they are programmed to operate according to safe driving practices, such as following traffic rules. “It’s possible that an autonomous vehicle that strictly obeys speed limits might frustrate human drivers who would typically drive faster than the speed limit,” he said.

And there are specific technologies that still require expansion and fine-tuning. Driverless cars depend on Global Positioning Systems (GPS) via the Internet, but for the cars to work

anywhere, the entire world would need to be precisely mapped and constantly updated. Current GPS technology, such as the Google Maps app, is a boon to drivers, but human judgment is still necessary.

Insurer Adjustments

While some experts anticipate that driverless cars will reduce overall insurance premiums by preventing accidents, Robert Hartwig, president of the Insurance Information Institute, does not believe they will have a significant impact due to concurrent premium-raising trends. “I think the tale of the death of the auto insurance industry has been greatly exaggerated,” he said.

“The auto insurance industry will continue to grow,” Hartwig said. “As the number of vehicles continues to increase, the number of drivers continues to increase and the average value

of the vehicles on the road continues to increase.”

Driverless cars will likely reduce overall premiums in the long term, he believes, but some of these reductions are already taking place due to safety features being introduced in conventional vehicles.

New safety features being introduced in cars are not only showing reductions in crashes, but they are also the building blocks of driverless car technology, said Russ Radar, senior communications director for Highway Loss Data Institute (HLDI).

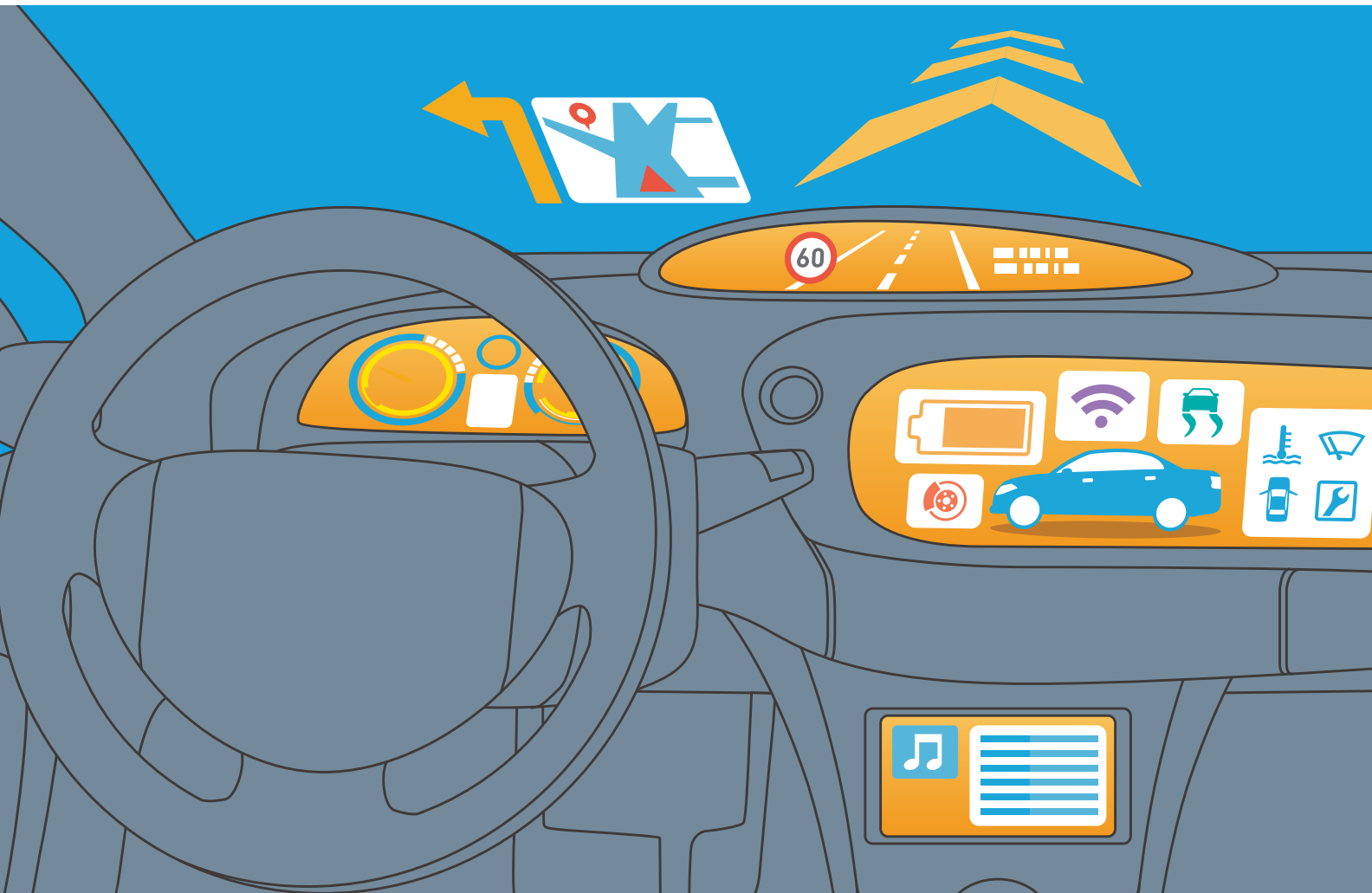
Electronic stability control, for example, has been shown to reduce fatal single-vehicle crash risk by 49 percent and fatal multiple-vehicle crash risk by 20 percent for cars and SUVs. Other

features are also making cars safer (see Chart B).

According to HLDI, if all passenger vehicles were equipped with forward collision warning, lane departure warning, blind spot detection and adaptive headlights, and all of them worked as intended, about one in three fatal crashes and one in five injury crashes could be prevented or mitigated.

Among the newest features, forward collision warning and automatic braking systems are proving beneficial for vehicles now on the road. HLDI has found that insurance claims for injuries in front-to-rear crashes dropped by as much as 35 percent for some vehicles equipped with automatic braking. And there are more safety features coming soon.

The irony is that for robotic vehicles to be safer than people-driven vehicles, they need to acquire more human-like decision-making capabilities.



Even though safety features are preventing accidents overall, insurers are not offering discounts on particular ones, said Roosevelt Mosley, a principal with Pinnacle Actuarial Resources. The reason is practical because it would take agents too much time to determine the existence of features for each insured car, he added.

Transition Trials

Mosley sees several challenges to the insurance industry during the transition period from driverless cars becoming available for purchase to when 200 million vehicles will be replaced with driverless cars.

“What happens when 25 percent of the vehicles are driverless and 75 percent are not?” he asks. “As the percentage of driverless cars begins to increase there will be unique risk issues for non-driverless cars,” he added.

To offer coverage for driverless cars, Mosley said, “Insurers will need to adapt while continuing to offer insurance for traditional manually operated vehicles that are operating in a very different environment.”

Driverless cars will rely on Internet connectivity, raising real concerns about cyberattacks or thieves remotely taking control of the cars.

Hartwig believes that the transition period will span until the 2040s because the automobile manufacturing cycle takes five to six years and cars are being better built. “Fifty percent of all vehicles purchased 11 years ago are still on the road, so vehicles are lasting longer,” he said. “People will not rush out and buy a fully autonomous vehicle if they have a fully functioning traditional vehicle.”

Anticipating the effect of driverless cars on insurers and their customers remains challenging because there is little available autonomous vehicle data. “To create a pricing model of the most

predictive 20 to 40 variables, actuaries have to start with a dataset that includes hundreds to thousands of variables,” Stienstra said.

Therefore, actuaries will not only have to wait to observe the technology’s impact in their data, they may also have to create new models to accurately capture the new variables’ impacts.

More Considerations

There are other driverless car-related factors that can affect overall premiums during the transition period as well. During the gradual transition from conventional to driverless, Mosley said, there should be a decline in accident frequency that will reduce overall premium.

At the same time, claim severity is expected to rise for decades from the expense of repairing driverless cars until the technology costs decline and driverless vehicles become more common, Mosley said. Priced at about \$320,000, Google’s Prius, if available today, would clearly cost more to repair than a traditional car.

It could take decades until technology costs decline enough to make up for

the cost of claim severity, Mosley said. “But the common thinking is, at some point, the reduction in claims will more than offset severity costs.”

Google is quick to point out that human drivers, not technology, are at fault when its cars experience accidents, but laws, regulations and court decisions ultimately will guide such determinations.

How much will auto accident claims be shifted to product liability? Looking at current modern safety technology, such as electronic stability control, provides some indication, said Richard L. Fox, vice president and chief actuary for the West Bend Mutual Insurance Company. “We are already relying on more systems to take control in certain circumstances where the machine can respond faster and better than people,” he added.

While he sees the potential for liability to shift from auto insurance to product liability, the evidence, based on safety features so far, show that the impact will likely be minimal.

In fact, he believes that car manufacturers could become so confident in the safety of automated cars that they might compete directly against car insurance companies by offering free or

discounted insurance as a selling point — whether the fault lies with the vehicle or the driver. “We have already seen manufacturers start to dabble in auto insurance,” he said. BMW, for example, sells auto insurance to owners through its agency.

Driverless cars could also significantly reduce the substantial costs of third-party damage, which would mean substantial premium reduction, Fox said.

There are also the new risks to consider, Stienstra said. For example, it was thought in 2000 that the GPS would reduce accidents from drivers getting lost. When GPS became available via cell phone, however, new and unforeseen risks did emerge, he added. Other car features that rely on technology, such as the gas-saving hybrid vehicles, can automatically shut off on impact, disabling the car in traffic.

Determining future risks means looking at today’s hazards and using some scenario imagination. Driverless cars will rely on Internet connectivity, raising real concerns about cyberattacks or thieves remotely taking control of the cars. “Cyber risk is a huge potential

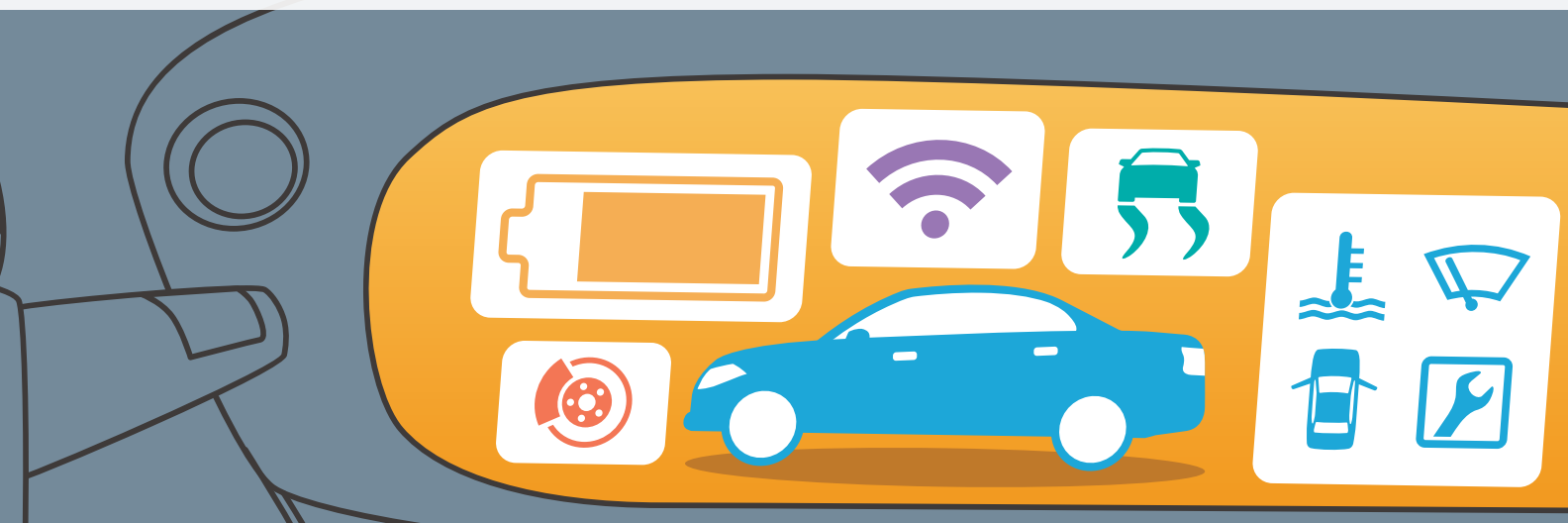
concern,” Mosley said.

For example, when security researchers hacked a Jeep via the Internet, taking over dashboard functions, steering, transmission and brakes, Chrysler recalled 1.4 million cars within days, according to wiredmagazine.com. The automaker sent customers USB drives with software updates to correct the problem.

The Road to Destination Driverless

The autonomous vehicle is quickly approaching its spectacular advent. Paved with technological innovation, the road to destination driverless offers exciting possibilities and the potential of new risks. By offering their unique perspectives and insights, actuaries — the seers of the insurance industry — can also help manufacturers, developers and public policy makers better prepare for the future. ●

Annmari Geddes Baribeau has been covering actuarial topics for more than 25 years. Her blog can be found at annmariecommunicatesinsurance.com.



ON THE SHELF BY LAURIE MCCLELLAN

Lessons in Innovation

***The Creator's Code: The Six Essential Skills of Extraordinary Entrepreneurs* By Amy Wilkinson, Simon & Schuster, 2015, 240 pp, \$20.37.**

Where do great ideas come from? Amy Wilkinson opens *The Creator's Code* with a story about Kevin Plank, who dreamed of playing college football. Although no Division I schools recruited him, Plank won a walk-on slot as a fullback at the University of Maryland. Smaller and less athletically gifted than his teammates, he searched for anything that could give him a competitive edge — and he found one, in sweat.

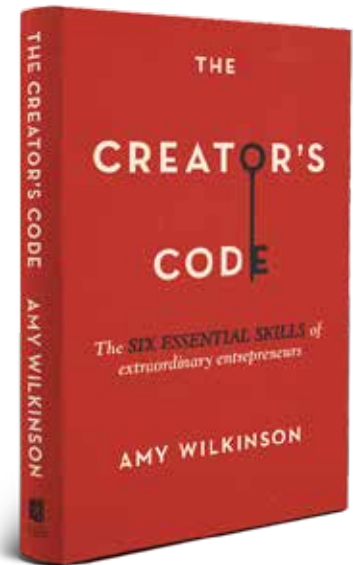
Plank perspired. A lot. One day, he put his sweat-soaked t-shirt on a scale after practice and found that it added three pounds to his weight — three pounds he couldn't afford. So, after visiting a local fabric store and a tailor, Plank dressed himself in a t-shirt that weighed only seven ounces when wet. The shirt became the core product of Under Armour, the company that Plank went on to found.

Wilkinson, a lecturer at the Stanford Graduate School of Business, took a methodical approach to stories like Kevin

Plank's, spending five years searching for the keys to entrepreneurial success. She began by interviewing more than 200 entrepreneurs who started companies that each generate more than \$100 million in annual revenue.

Using the grounded theory method of quantitative analysis, Wilkinson had the interviews transcribed, and she analyzed and coded the transcripts for common themes. She also scrutinized some 5,000 other pieces of data, including academic studies. In the end, she boiled down all her research into advice short enough to fit on a single index card: a set of six key skills that all the entrepreneurs relied on. At 200 pages long, *The Creator's Code* is a concise guide to using the six skills, as well as a behind-the-scenes tour of the founding of some of the most innovative companies of the last decade, including Airbnb, Tesla Motors and Chipotle.

Wilkinson stresses that these fundamental skills are just as handy for people working inside companies as they are for people starting new ones. "You could



be in a large corporation," she says, "you could be in government, and you can still create new ideas, new initiatives, new projects."

"If you want to use a sports analogy," Wilkinson says, "I went out and interviewed the equivalent of Olympic athletes, people who were just exceptional performers. And I tried to really study, in detail, what they did, and what they had in common. Probably few of us are going to play at the Olympic level ... but they're still skills that we all want to develop, to be more effective." According to Wilkinson, entrepreneurs "don't need an MBA, millions of dollars, perfect timing or permission." What they do need is to learn how to be creative.

That creativity starts with finding a "gap," Wilkinson's term for a problem that requires a solution. She defines

Wilkinson stresses that these fundamental skills are just as handy for people working inside companies as they are for people starting new ones.

three kinds of thinkers who come up with fresh solutions: sunbirds, architects and integrators.

Sunbirds “transport solutions that work in one area and apply them to another, often with a twist.” One member of the Sunbird tribe is Pierre Omidyar, the software engineer who created eBay with the insight that traditional yard sales could take place online. Wilkinson also interviewed Dean Kamen, inventor of the Segway, who borrowed a concept from the design of helicopter blades to build a better heart stent. Kamen’s secret, he says, is finding “someone who has solved the problem in another field ... and then [I] just tweak it a little bit.”

Sara Blakely, who invented Spanx body shapers because she wanted the smooth look of pantyhose underneath her clothes, but without the telltale seams on the feet, is a perfect example of an Architect. Wilkinson describes Architects as “problem finders [who] identify friction points, bottlenecks and complications.” For architects, defining a problem is half the job. They then craft a new solution from the ground up.

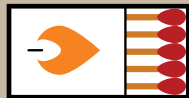
Integrators combine both approaches. The idea for Chipotle came about when Steve Ells, a graduate of the Culinary Institute of America, began to wonder why he couldn’t get a quick meal that was also delicious, combin-

It’s important for creators to learn how to “fail wisely.”

ing the convenience of fast food with the taste of quality ingredients. Other examples of combining opposites to come up with a new concept include products like the luxury SUV, shabby

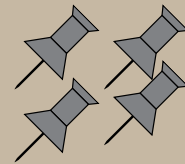
Thinking Creatively

One key to coming up with new ideas is the ability to see pieces of information independently. Wilkinson describes an experiment called “The Candle Problem,” in which researchers hand the participants a candle, a box of matches and a box of thumb-tacks. The goal is to attach the candle to the wall using only those items. Participants discover the right answer only about 25% of the time.



Hint: When the researchers change the experiment by underlining certain words in the directions, the solution rate doubles to about 50 percent. The new directions read, “There is a candle, a box of tacks, and a book of matches.”

Solution: Remove the tacks from the box. Use the tacks to attach the box to the wall, so that it forms a shelf. Set the candle on the shelf.



chic decorating and travel packages that offer “rugged comfort,” a category that blends adventure with soft beds.

To Wilkinson, the key to finding a gap is being curious. “You really want to ask a huge number of questions,” she explains. “And keep asking questions. Because the curiosity factor — when you’re 20, and 30, and 40, and 70, it keeps you fresh in the economy.”

Identifying a problem and coming up with a novel solution is just the beginning. At some point, says Wilkinson, it’s important for creators to learn how

to “fail wisely.” The key to doing this, she says, is placing small bets. “Creators test ideas in low-risk experiments,” Wilkinson explains, “and by taking small risks, they avoid catastrophic mistakes.”

Sara Blakely, the Spanx founder, learned this lesson as a child. Every night at the dinner table, she remembers her father asking, “What have you failed at today?” The purpose was not to celebrate failure, but to replace a perfectionist outlook with a view of work as an inherently trial-and-error process, much like arranging the furniture in a new house.

When it comes to failing, Wilkinson practices what she preaches. “One of the ways to try to step back from [perfectionism] and to fail wisely, is to adopt a failure ratio,” she says. “As an author, I try to do this. I set my own ratio that says, ‘Okay, if there are 10 things, I’m not going to get 10 out of 10 right. I’m going to get three out of ten wrong, I’ll fail 30% of the time.’ You’re testing in order to be learning.”

Besides failing wisely, Wilkinson found that creators often fail together — the concept behind another of the six skills, “network minds.” According to

Everybody thinks that in order to create and scale an idea, you have to be in your 20s.

It's really far from the truth.

her research, bringing together teams of people and collaborating are indispensable to starting successful enterprises. Some “flash teams” of experts, like those who create a Hollywood movie or construct a skyscraper, might come together for only one project before breaking apart. Another way to bring together different perspectives on a problem is to set up a prize competition. (Historical fun fact: What do fire extinguishers, canned goods and margarine all have in common? They were created during prize competitions, according to Wilkinson).

“If you want to solve problems you haven’t solved before,” says Wilkinson, “you have to bring other brain power to help you. This is the complexity of information, the vast quantity of it now. No single person can digest or figure that stuff out. You have to network minds, and you have to be able to work collaboratively.”

To Wilkinson, one of the most surprising things about writing the book has been finding out who’s interested in the six skills. “The surprise to me,” she says, “is that there’s a big education audience for it.” She notes that two trends in education today — a drive for perfect test scores and a focus on testing

the individual — run counter to the skills that build new enterprises.

“Right now, if people are collaborating in school, we call that cheating,” she says. “And yet, the entrepreneurial economy is very collaborative, people winning together.” She also notes that “[we want] perfection, we want people to get a four-point grade average ... then we launch people into an economy in which getting it wrong some of the time is certainly what’s going to happen ... and probably what you want to have happen, as long as people are learning through it.”

Wilkinson was also struck by some of the data her research turned up. “I had thought this was a next generation skill set, meaning people under the age of 40 ... would be the best creators. But I found there was no age criteria. I don’t believe it’s a demographic, I think it’s a psycho-graphic, meaning, are you open-minded? It’s a mindset and a skill set that carries people forward at any age.”

In reality, Wilkinson says, “The data right now is also showing that baby boomers are creating companies at much faster rates than their millennial children are ... millennials are, in fact, risk averse. You hear about Mark Zuckerberg, the 20-something-year-old in Silicon Valley who wears a hoodie. Created Facebook. And then everybody thinks that in order to create and scale an idea, you have to be in your 20s. It’s really far from the truth.”

Based on her research, Wilkinson believes the workplace is changing for everyone, entrepreneur and employee

“If people are collaborating in school, we call that cheating ... and yet, the entrepreneurial economy is very collaborative, people winning together.”

alike. “I believe we are all becoming increasingly responsible for our own careers,” she says. “If we move into a non-credentialed economy, it does not really matter if you’re going to Ivy League schools. What really matters is that you can create and scale ideas.”

While she set out to create career advice for others, the project has changed the way that Wilkinson sees her own career. “I feel like this research,” she says, “has sort of bolstered my own confidence in the fact that I can find my own pathway.” It’s also changed the way she views the frustrations and inconveniences of everyday life, from sitting in traffic jams to waiting in long lines.

“I used to be like, oh, that’s a problem, that’s so irritating,” she says. “Now, whenever I get that kind of a reaction, I immediately flip it around and think, ‘Okay, where’s the opportunity here?’ Because wherever there’s a pain point ... that’s a huge opportunity to solve it, to make it better.”

Sometimes, it turns out, an idea that passes the entrepreneurial sniff test is as close as the sweaty t-shirt on your back. ●

History Likely Not Enough to Price Ever-Shifting Cyberrisk

BY JIM LYNCH

Insurance against cyberrisk is one of the fastest growing lines of business, but actuaries setting rates should look beyond historical trends, a panel of experts said at the Casualty Actuarial Society Seminar on Reinsurance in Philadelphia held in June 2015.

Three panelists — Dr. Raveem Ismail, a specialty treaty underwriter at Ariel Re; Jason Crabtree, chief executive officer at Rationem, a developer of risk management support systems; and Chuck Thayer, a senior vice president at Willis Re — told actuaries that the fast-changing nature of cyberrisk makes it difficult to price using the traditional actuarial model of projecting losses from the past into the future.

There's no doubt that the line of business is growing, said Thayer. Willis counted more than \$2 billion in writings through February, and there continues to be strong potential for growth, he said.

However, even the name “cyber-risk” can be a bit misleading, Thayer observed, since the risk isn't usually caused by computers. In most ways, “it is essentially a human risk.” Thayer likened the situation to making a side bet on a contest, one between the company and the attacking hackers. One of the parties — the insured — you know well. The other side, however, resembles “a cage match where anyone can enter the ring.”

Panelists said recent hacks that tapped millions of customer records at retailers Target and Home Depot, health insurer Anthem and others are just one small piece of the total cyberrisk. The threat grows more complex, said Dr.

Ismail, when hacks can cause physical damage, even terrorism. “The term ‘cyber’ no longer means what it once did.”

Dr. Ismail is dedicated to underwriting, analyzing and modeling specialty risks such as war, terrorism and cyber. He characterized current cyberrisk in three ways:

- **The hazard evolves rapidly and contextually.** All businesses face cyberrisk, but malware is often uniquely targeted: “It’s as if new storms are invented every day, and the storms are very specific to your organization,” Dr. Ismail said.
- **The exposure cannot be diversified away by geography or by class of business.** Hidden accumulations exist. For example, a German factory and an Australian bank could be linked via use of the same service provider.
- **The exposure profile changes rapidly, unlike standard lines of business.** For example, fire risk, he noted, can be mitigated by building fire escapes and following building codes, actions typically present at the construction of a building and only requiring routine maintenance afterwards. With cyberrisk, the exposure can change very quickly and drastically, by simply hiring a new IT resource or by switching to a new third-party tech provider. Therefore, a standard way an insured enumerates its exposure — often by filling out an application — may not be effective in this case, and previous loss experience may not have any relevance to predicting the future.



The insured may not even understand all the permutations of the risk; a self-audit or questionnaire could potentially leave too many gaps, and the depth, frequency and complexity of proper appraisal could be expensive.

Crabtree said most cyber protections are meant to stop hackers who are trying to penetrate the weakest system. Often, though, hackers target a particular company. That is harder to defend against. It would be a mistake to try to create a failsafe, “silver bullet” solution against targeted attacks, Crabtree warned. “Security is an emergent property of a complex system,” he said.

Panelists spoke of insuring risks instead through a combination of risk management techniques, which would include regularly monitoring insureds, and actuarial pricing. Although for now, a lack of data and understanding can make pricing a challenge.

“The environment is constantly changing,” Thayer said. ●

James P. Lynch, FCAS, is chief actuary and director of research and information services for the Insurance Information Institute in New York.

GET AHEAD BY DAVID ZORNEK, CANDIDATE REPRESENTATIVE TO THE CAS CANDIDATE LIAISON COMMITTEE

Upping Your Game: Resources to Advance Your Technical Skills

The news may be late, but I'm here to report that Big Data has officially arrived. It's changing the way business as a whole works, and that includes actuarial science. Excel has been replaced by SAS, R, or (pick your favorite programming language) as the latest and greatest analytical tool. Predictive analytics is the go-to technique for big and small data alike. The business atmosphere has changed more rapidly than changes to the CAS syllabus can be made. Although steps are being taken to bring the syllabus into the modern age ("The Next Evolution of Basic Education," *Future Fellows*, June 2014), many of us will have finished taking exams by the time these changes are complete.

The following are various resources that are available for learning on your own.

CAS Interactive Online Courses (www.casact.org/education/interactive)

The CAS currently provides an inexpensive predictive modeling course (\$75 for members; \$95 for non-members). The CAS course has the virtue of being directly applicable to actuarial work and includes use of GLMs in both loss and retention modeling. Entry-level candidates are not the target audience of this course, but the course description clearly lays out the prior knowledge advised before beginning. Be sure to check out the section on upcoming courses. In addition to the predictive

modeling course, the CAS has several others planned for the future. As an added bonus, CAS courses provide 1 CE Credit per 50 minutes of education session time.

Coursera (www.coursera.org)

Coursera provides access to online university-sponsored courses free of charge, or users can pay a fee to receive a certificate of completion at the end of completing each course. Users must register for courses prior to the start date, and each course runs during a pre-designated time period. Among many options Coursera offers, you may want to consider the following:

- **Johns Hopkins Coursera Data Science Series** (<https://www.coursera.org/specializations/jhudatascience>)
- **Stanford Machine Learning** (<https://www.coursera.org/learn/machine-learning>)
- **Michigan Programming for Everybody** (<https://www.coursera.org/learn/python>)

MIT OpenCourseWare (ocw.mit.edu)

MIT OpenCourseWare is a web-based publication of materials from its undergraduate- and graduate-level courses. MIT OpenCourseWare is supported by donations and corporate sponsors, so courses are free. Courses you may be interested in include:

- **Data Mining** ([http://ocw.mit.edu/courses/sloan-school-of-management/15-062-data-mining-](http://ocw.mit.edu/courses/sloan-school-of-management/15-062-data-mining-spring-2003/index.htm)

[spring-2003/index.htm](http://ocw.mit.edu/courses/sloan-school-of-management/15-097-prediction-machine-learning-and-statistics-spring-2012/))

- **Prediction: Machine Learning and Statistics** (<http://ocw.mit.edu/courses/sloan-school-of-management/15-097-prediction-machine-learning-and-statistics-spring-2012/>)
- **Machine Learning** (<http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-867-machine-learning-fall-2006/>)

Online Programming Language Courses

Whether you like to "learn things the hard way" or want an introductory level course, the following in-depth offerings are available free online and some even include video.

- **Learn Python the Hard Way** (<http://learnpythonthehardway.org/book/>)
- **Learn SQL the Hard Way** (<http://sql.learncodethehardway.org/book/>)
- **UCLA SAS Resources** (<http://www.ats.ucla.edu/stat/sas/>)
- **Introduction to Statistical Learning in R** (<http://www.r-bloggers.com/in-depth-introduction-to-machine-learning-in-15-hours-of-expert-videos/>)
- **Hadley Wickham's Advanced R** (<http://adv-r.had.co.nz/>)

Textbooks

Good textbooks on machine learning and predictive analytics are hard to come by. This is partially due to the new-

ness of the fields. Most books are written by researchers, none of whom seem to agree on what the jargon of the field should be or what prerequisite knowledge a novice should have before beginning. The following is a list of suggested books for those who prefer to expand their knowledge of predictive analytics through reading.

- *Predictive Modeling Applications in Actuarial Science*, Volume 1, eds. Edward W. Frees, Richard A. Derrig, and Glenn Meyers

The contents of this book are given right in the title. With contributions coming from a wide variety of researchers, professors, and actuaries — including several CAS Fellows — it's clear that this book will be valuable for any P&C actuary whose main concern is using predictive modeling in his or her own work. It's also available as a Kindle eBook.

- *Machine Learning: A Probabilistic Perspective* by Kevin P. Murphy

Murphy's book gives an excellent overview of the mathematical theory behind machine learning, but its applications are in MATLAB. Octave is an open source equivalent to MATLAB, but it's still not as common in the actuarial workplace as R or SAS. Those who have successfully completed Exam 4 will find the mathematical explanations in this book valuable.

- *Machine Learning with R* by Brett Lantz

Lantz's book lacks the mathematical context or theoretical rigor of Murphy's, and therefore probably won't lead to the same depth of understanding. This is perhaps because the explicit goal of this book is to be more of a hands-on guide than an educational resource. And its applications are in R, which is more

commonly found in the workplace and will translate easily to SAS for those who know both languages.

- *Predictive Analytics: The Power to Predict Who Will Click, Buy, Lie, or Die* by Eric Siegel

Dubbed "The *Freakonomics* of big data," this book is less of a theoretical investigation or how-to guide for predictive analytics than it is an accessible primer for those who are new to the field. An easy read, *Predictive Analytics* is a good first stop for those wanting to learn whether they want to learn more.

Developing Your Skills

Any of the above resources can be used by an individual working on his or her own. But remember, your employer wants you to develop, and you probably have coworkers who share your interest. Many employers may be supportive of using company time for a study group, especially if these skills are relevant to your work. Talk to your superiors about organizing a study group. At worst, they say no, and you look like a team player showing initiative to improve on everyone's skills. Even if using work hours isn't supported, nothing is stopping a group of you and your colleagues from studying together outside of work.

Happy (machine) learning! ●

David Zornek, MS, is an actuarial consultant at Oliver Wyman in Chicago. He specializes in data visualization, predictive analytics and nontraditional mathematical modeling. This article first appeared in Future Fellows, September 2015.



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CASCOR Releases Non-Technical Reserves Call Papers

BY DENISE AMBROGIO AND JULIE LEDERER, MEMBERS, CAS COMMITTEE ON RESERVES

When the CAS Committee on Reserves (CASCOR) initiated the 2015 Non-Technical Reserves Call Paper Program in November 2014, its ultimate goal was to foster the sharing of practical ideas among actuaries that can be used on a day-to-day basis and readily explained to others. The call paper program encouraged authors to focus on presenting ideas in a logical manner accessible to other actuaries and professionals with experience in reserving.

The results of the program are six papers published in the Fall *E-Forum*. CASCOR is pleased to offer brief summaries of each paper below. The first five of these papers will be presented at the 2015 Annual Meeting in Philadelphia, November 15 through 18.

“Accident Year/Development Year Interactions” by David R. Clark, FCAS, MAAA and Diana Rangelova, ACAS, MAAA — Winner of the 2015 Ronald Bornhuetter Loss Reserve Prize for best paper

This paper explores the reasons development patterns can change over time and surveys relevant literature on methods addressing this phenomenon. Clark and Rangelova include suggestions for future research that could improve reserving techniques.

“The Actuary’s Role in a Risk-Focused Statutory Examination” by Alan M. Hines, FCAS

This paper provides guidance to actuaries who are preparing for or assisting with a statutory financial examination.

Hines gives an overview of how examiners assess risk and describes the phases of the risk-focused exam, with the aim of preparing actuaries to assist with the risk assessment process and develop risk-focused testing plans for loss reserves.

“Interpolation Hacks and their Efficacy” by Lynne Bloom, FCAS, MAAA

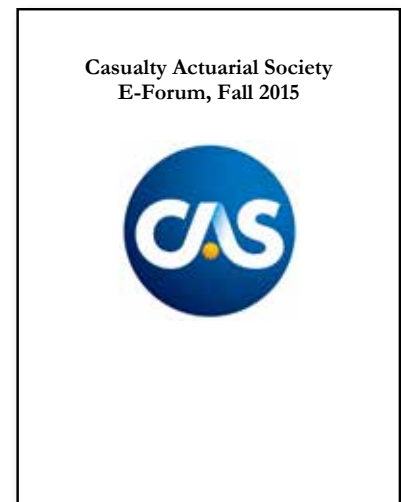
Bloom applies various interpolation methods to actual data and compares their performance. This paper lays out a variety of methods for actuaries to use and describes an additional process to account for unique situations, such as seasonal fluctuations in claim activity.

“Premium Deficiency Reserve Evaluation for Mortgage Insurers” by David Kaye, FCAS, MAAA

Kaye provides practical guidance on evaluating premium deficiency reserves for mortgage insurers. The paper also includes a brief discussion of the premium deficiency accounting considerations for mortgage insurance.

“Reserving Styles — Are Actuaries In-Sync with their Stakeholders?” by Mark Littmann, FCAS, MAAA

Littmann looks at changes in accident year loss ratios as the accident year ages. He focuses specifically on the differing perspectives amongst various stakeholders on how to modify the initial selections when actual experience diverges from expectations. The paper highlights certain implications of common actuarial methods and offers insight on the notion of a reserv-



ing cycle akin to an underwriting cycle. The investigation provides a framework for dialogue among stakeholders to the reserving process.

“Movement Analysis” by Andy Staudt, FIA, FCAS, MAAA

This paper provides simple formulas that decompose the change in ultimate loss estimates from one period to the next into two parts: the change due to loss experience and the change due to changes in assumptions or methods.

CASCOR recently announced the 2016 Reserves Call Paper program. There’s still time to get proposals in by the November 20 deadline. For details about this year’s program, visit <http://www.casact.org/press/index.cfm?fa=viewArticle&articleID=3033>.

Denise Ambrogio is chief reserving actuary for Munich Re America Inc. in Princeton, New Jersey. Julie Lederer is a property & casualty actuary for the Missouri Department of Insurance in Jefferson City.



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Why Diversity Matters to the Actuarial Profession

BY LINDA SHEPHERD, JOINT CAS/SOA

COMMITTEE ON CAREER ENCOURAGEMENT AND ACTUARIAL DIVERSITY, AND KWAME DAVIS, THE INTERNATIONAL ASSOCIATION OF BLACK ACTUARIES

Diversity, broadly defined, means appreciating each individual's uniqueness and recognizing our individual differences as a source of strength. These differences can be along the dimensions of race, ethnicity, gender, sexual orientation, socio-economic status, age, physical abilities, religious beliefs and political ideology among others. In the United States, diversity efforts generally refer to opportunities to increase the inclusion of women, as well as individuals from various races, ethnicities, religious affiliations, sexual orientations and differing abilities. It has been well-documented why diversity is important from society's standpoint. As a nation founded on the key principle of equality, that goal will not truly be realized until all segments of society, including businesses, occupations and professions are composed of individuals having diverse backgrounds in proportion to their share of the general population. This article serves to highlight the reasons why increasing diversity and building an inclusive work environment is crucial to the future of the actuarial profession.

Why is diversity particularly important to the actuarial profession? Diversity allows us:

- **To advance actuarial science's body of knowledge:** Today, many talented minorities with exceptional math, statistics and business skills are not exposed to the actuarial profession and are being heavily recruited into other science,

technology, engineering and math (STEM) careers. Many potential employees with the ability to develop new techniques for managing actuarial risks may be in a different profession today, simply because they have never been exposed to the field.

- **To ensure diverse points of view:** As recently as the mid-60s, some companies underwrote and priced insurance products based on characteristics such as race that are now illegal. For years many of these rating variables were not appropriately challenged, in part because the majority of actuaries were from homogeneous backgrounds and largely oblivious to the controversial usage of certain variables. As the number of women and minorities in the profession increased, actuaries have found more objective, practical and causal risk classification plans to replace some of these inappropriate and illegal factors; this is in no small measure due to increased diversity of the profession.
- **To improve the financial results of employers of actuaries:** Employers want to attract the most talented employees who are likely to be successful at their companies. Financial success is defined as directly or indirectly improving revenues and ultimately profits. Employers are not solely interested in the theoretical advancement of actuarial

techniques, but the practical benefits of actuarial work products that enhance the company's financial results as well. Increasing the pool of talented actuarial candidates from diverse backgrounds increases the likelihood of employing people with the ability to positively impact financial results.¹

- **To improve the overall diversity in the insurance industry:** Actuarial science is one of the least diverse professions within the insurance industry. Moreover, many studies have shown that the insurance industry overall is not attracting its share of the Millennial generation, which is also the most diverse generation in the history of the United States. Millennials expect to see a diverse workforce throughout all the functions of a company. If they don't observe a similar level of diversity to their generation, they may be less attracted to the industry.
- **To contribute to the overall economy:** While often employed by insurance companies, actuaries are also making an impact on other sectors through consulting, government and nontraditional roles. Many consulting actuaries provide risk management services to all sectors of the economy. Diversity plays a crucial role here since many clients will expect their service providers to mirror their diverse workforce. Clients who value diversity in all forms may be apprehensive of a service

¹ For more information on the financial impact of diversity, see "Why Diversity Matters," McKinsey & Company (January 2015), http://www.mckinsey.com/insights/organization/why_diversity_matters.

provider who doesn't seem to share the same values. This could result in lost revenue and opportunities.

- **To attract the best candidates to the profession:** By excluding or marginalizing certain segments of society, we reduce our opportunity to attract some of the brightest and most capable candidates to our profession.

Diversity Benefits Many

Diversity in the actuarial profession is significant not only to the future of the actuarial science body of knowledge and to the profitability of employers of actuaries, but it is essential to actuarial practitioners as well.

- **From the underrepresented community's perspective:** Having a higher percentage of underrepresented communities such as Black/African-American, Hispanic/Latino and Native Americans in the actuarial profession increases the number of potential role models for young people in their communities to emulate. This will, in turn, steadily increase the economic success of these respective communities as more members pursue lucrative careers in this field.
- **From the actuarial candidates' perspective:** Actuary has been rated the number one profession² for many years in terms of compensation, work environment, stress levels and other factors. For individuals with an affinity for math, computers and a business environment, matched with the ability to pass the actuarial exams, this field can provide a rewarding career.

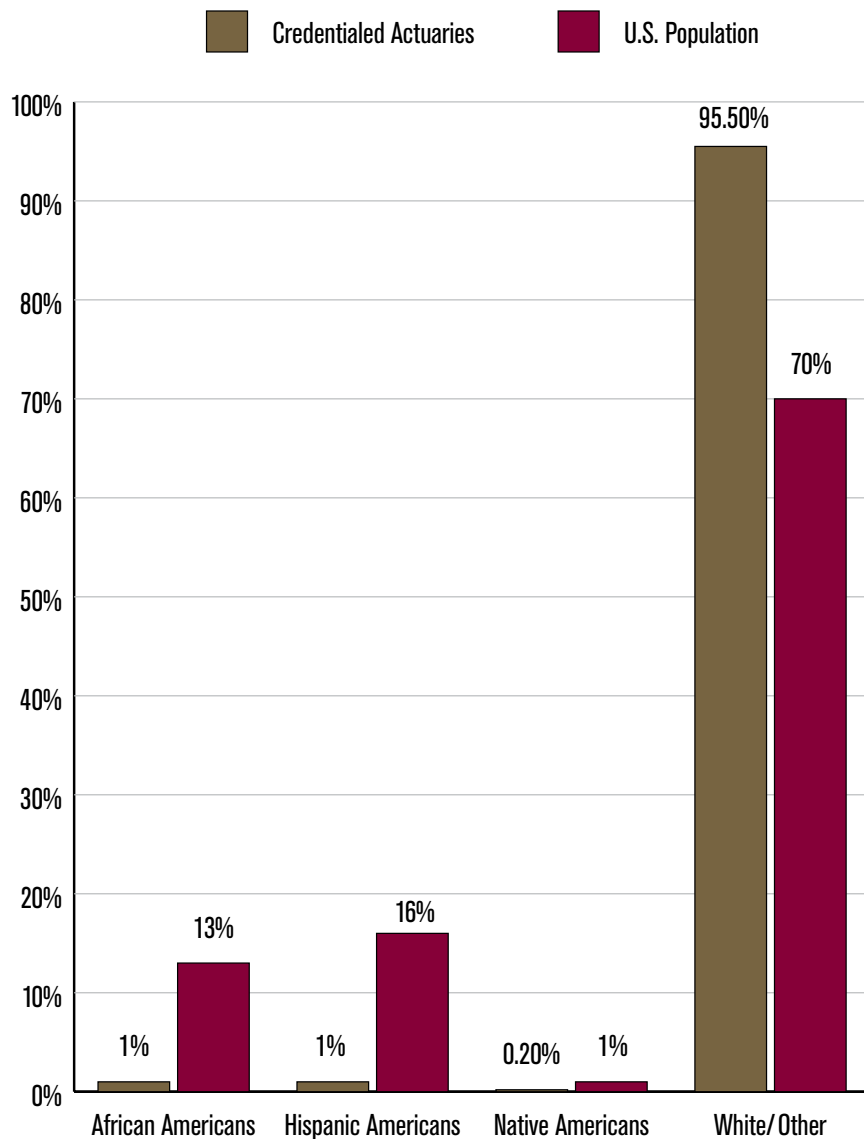
What We're Doing Now and in the Future

There are a significant number of activities being undertaken by the actuarial professional societies and by academia to increase the diversity of the actuarial profession. For example, the primary

efforts of the Joint CAS/SOA Committee on Career Encouragement and Actuarial Diversity are directed toward increasing the number of African-American, Hispanic and Native American actuaries.

Diversity is not only integral to the prosperity of our society but to each and

Figure 1. Disparity in Representation in the General U.S. Population and the Actuarial Profession in 2005



Source: 2005 SOA Survey.

² CareerCast, "The Best Jobs of 2015," <http://www.careercast.com/jobs-rated/best-jobs-2015>.

every profession. Increased diversity benefits the actuarial profession in a myriad of ways including advancing actuarial methodologies, contributing to richer perspectives on various issues, improving financial results for employers and the industry, and increasing opportunities for underrepresented groups. Acknowledging that diversity and inclusion are essential to the future of the profession is only the first step. While many efforts are underway to address this gap, there is still much more to be done to make the profession mirror the larger society. All contributions to diversity, regardless of size, stand to benefit us all.

The question to you, dear reader, is what will you do next? What diversity initiatives are underway in your firm? How will you get involved in making the profession more inclusive? ●

Linda A. Shepherd, FCAS, MAAA, is a member of the Board of Directors and a past president of the International Association of Black Actuaries. Kwame Akil Davis, FCAS, is a consulting actuary with Towers Watson in Arlington, Virginia.

How to Get Involved

Individuals or employers who are interested in volunteering for efforts to increase diversity in the actuarial profession should contact one or more of the following organizations focused on this mission.

The Joint CAS/SOA Committee on Career Encouragement and Actuarial Diversity (JCCEAD)

The JCCEAD is responsible for increasing the awareness of the actuarial career among students, educators and career influencers in high schools, colleges and universities. In support of that effort, the committee facilitates the evolution of a diverse profession by increasing the talent from the African-American, Hispanic and Native American communities. The committee is jointly sponsored by the Casualty Actuarial Society and the Society of Actuaries.

Website: www.BeAnActuary.org
 Contact: David Terné,
david.terne@thehartford.com

International Association of Black Actuaries

The International Association of Black Actuaries is a professional and student member organization whose mission is to contribute to an increase in the number of black actuaries and to influence the successful career development, civic growth and achievement of black actuaries.

Website: www.BlackActuaries.org
 Contact: Kate Weaver,
iaba@blackactuaries.org

The CAS Diversity Committee

This committee oversees the implementation of the CAS Diversity Strategy and ensures the strategy is reflected in all of the organization's initiatives.

Contact: David Terné,
david.terne@thehartford.com

The SOA Actuarial Diversity Task Force

This task force's purpose is to determine what investments the SOA can make, or programs it can undertake, to achieve the greatest impact on diversity in the actuarial profession over the long term in addition to identifying short-term solutions that could have immediate impact.

Contact: Greg Heidrich,
gheidrich@SOA.org

The Actuarial Foundation

The mission of The Actuarial Foundation is to enhance math education and financial literacy through the talents and resources of actuaries. The Foundation sponsors the Actuarial Diversity Scholarship for Black/African-American, Hispanic, Native North American and Pacific Islander students.

Website:
www.ActuarialFoundation.org
 Email: info@Actfnd.org

Tighter Medicare Reporting Requirements Could Shift Cost of Insured Losses to P&C Insurers

BY KATE NISWANDER, CAS MARKETING AND COMMUNICATIONS MANAGER

A new report sponsored by the CAS Committee on Health Care Issues provides a framework to estimate the potential future financial impact of Section 111 of the Medicare, Medicaid, and SCHIP Extension Act of 2007 (MMSEA) on the property and casualty insurance and self-insurance industry.

“Medicare Secondary Payer Status: The Impact of Section 111 Reporting Requirements” details the probable effect on losses for 10 cases involving workers compensation, private passenger automobile and homeowners insurance. The analysis revealed that recent Section 111 reporting requirements may cause modest increases in losses for injured

workers and individuals 65 and over for cases where Medicare has been making payments without being reimbursed by the property-casualty insurer or self-insured.

Section 111 requires property-casualty insurers and self-insureds to report to the Centers for Medicare and Medicare Services (CMS) certain information on medical treatments received by Medicare beneficiaries. Reporting began for workers compensation insurers on January 1, 2010, and for liability insurers on January 1, 2012.

“Although Section 111 went into effect over the past few years, there has been little information with which to estimate the financial impact of the

new reporting requirements,” says Guy Avagliano, FCAS, a consulting actuary at Milliman and one of the study’s authors. “This report provides a framework to better help property-casualty insurers and self-insureds evaluate the impact of those requirements.”

For a hypothetical insurer, the report estimates the impact for a particular condition or injury in the case illustrations to be an increase in total losses (medical and indemnity) between 0.1% and 0.3% for all workers. Using a set of generalized assumptions, for all conditions and injuries, the research estimates the aggregate impact on medical losses could be between 0.5% and 1.3% for all workers. For private passenger automobile injuries (and again, using a set of generalized assumptions), the estimated impact is an increase between 0.07% and 0.13% for all ages.

“The analysis of these 10 cases indicated a clear increase in losses,” says Philip Borba, a principal and senior consultant at Milliman. “While the examples used will not be applicable to every scenario and every company, the research can provide tools and insight to property and casualty insurers moving forward.”

“Medicare Secondary Payer Status: The Impact of Section 111 Reporting Requirements” is sponsored by the CAS Committee on Health Care Issues, which addresses actuarial issues related to property and casualty implications of health care. The report is published in the Summer 2015 edition of the CAS *E-Forum*, which is available on the CAS website. ●



EXPLORATIONS BY DON MANGO

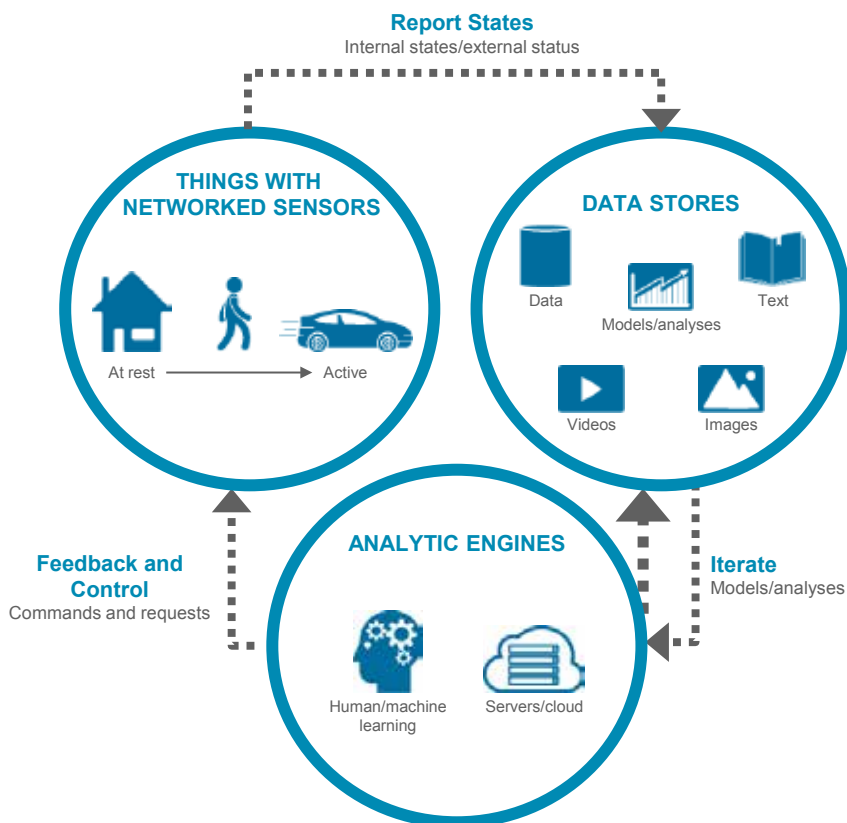
The Internet-of-Things and Actuarial Engineering

Should property-casualty actuarial science be considered an engineering specialty? This is not a theoretical exercise; thanks to the Internet of Things (IoT) revolution, there are compelling reasons to consider aligning ourselves with engineers. According to Wikipedia, the Internet of Things is “the network of physical objects or ‘things’ embedded with electronics, software, sensors and network connectivity, which enables these objects to collect and exchange data.” People, places and things are increasingly using these connections to exchange an exploding amount of digital information and data, which can then be used to analyze, understand, forecast and control activities. A recent European Commission study estimates that the market value of the IoT in the EU will exceed one trillion euros in 2020. Leading companies like Cisco, AT&T, GE and IBM are making substantial strategic investments in IoT capabilities.

What is the Internet of Things?

Figure 1, excerpted from a report by Celent,¹ shows the three interconnected components of the IoT: things with networked sensors, data stores and analytic engines. Sensors transmit information on the internal state of things and the external status of their environment, providing a richer picture of the hazards

Figure 1



Source: Celent. Used by permission.

of what is being insured. The networked sensors feed structured and unstructured data, text, videos and other digital images to data stores. This will not just be **big** data, but **new** data, unlike anything ever seen or used before. Insurers and actuaries are focused on the ways to use this new data and analytics to improve pricing, underwriting, segmen-

tation and claim management. Such opportunities represent an expansion to current actuarial practice. While we will face competition from statisticians and data scientists, casualty actuaries are relatively well-positioned to take on these challenges.

The more troubling threat — and potential opportunity — is the quantum

¹ “The Internet of Things and Property Casualty Insurance: Can an Old Industry Learn New Tricks?” Donald Light, Celent, April 23, 2014, <http://www.celent.com/reports/internet-things-and-propertycasualty-insurance>

Perhaps the more focused problem (opportunity) statement is: Which quantitative professionals will the world turn to for expertise, insight and solutions in causal analysis?

increase in the insured companies' understanding and control of their operations made possible by IoT. Take for example manufacturers: As they better understand their risk drivers, they will increasingly take ownership of their risk management: monitoring and even preventing incidents, mitigating the severity of incidents that do occur, measuring probabilities, planning preventive maintenance and assessing the cost-benefit of risk mitigation and transfer strategies. In short, they will become experts in **causal analysis**.

The implications for the actuarial profession are far from clear. We are experts in post-event **financial effects analysis** – i.e., analyzing the claims resulting from incidents – through the “screen” of the insurance process. What is our value proposition in causal analysis? What do we know about real-time, pre-event, condition and hazard level monitoring? What is our brand promise in this space?

Actuarial Engineering?

Perhaps the more focused problem (opportunity) statement is: Which quanti-

tative professionals will the world turn to for expertise, insight and solutions in causal analysis? We can make the case for actuaries as leading candidates because of our expertise in evaluating the financial impacts of contingent incidents. But actuaries are not known for causal analysis in the broader economy. That has been the domain of many specialties of engineering, including reliability, quality, industrial, operations and supply-chain engineering. The engineers are themselves an incomplete answer, however, as they lack the financial impact and portfolio risk evaluation skills of actuaries. In order for manufacturers to internalize this risk management capability, they will need both causal and financial analysis.

The ideal candidate seems to be a hybrid of actuary and engineer, which is not too farfetched an idea. Both actuaries and engineers are **applied scientists**, focused on solutions and finding what works in the real world. Reliability engineers are a “lost tribe of actuaries,” who model the mortality and morbidity of parts using Weibull curves. Also, actuarial university programs share many foundational courses with financial engineering.²

Questions to Explore

I ask you all:

- Do you believe the Internet of Things will facilitate the evolution to causal analysis?
- Can actuaries adapt and expand our brand to include causal analysis?
- Should we explore partnership with the engineers? ●

² See for example the University of Leuven (Belgium) Masters in Actuarial and Financial Engineering, onderwijsaanbod.kuleuven.be/opleidingen/e/CQ_50311077.htm.

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Inside *Variance* — A Q&A with Author Jessica Leong

BY KATE NISWANDER, CAS MARKETING AND COMMUNICATIONS MANAGER

In this installment of *Inside Variance*, Kate Niswander interviews author and CAS Board Member Jessica (Weng Kah) Leong. Leong and her coauthors Shaun S. Wang and Han Chen are the recipients of the latest *Variance* Prize for their paper “Back-Testing the ODP Bootstrap of the Paid Chain-Ladder Model with Actual Historical Claims Data.”

Briefly describe your paper.

Have you ever wondered if the common bootstrap model for measuring reserve risk actually works? That is, if you’d used it over the last 30 years for hundreds of companies to identify, say, the 90th percentile of your reserves, then you would have exceeded this number 10% of the time? This paper answers that question. (Hint: No, it doesn’t. Read the paper!)

Why did you choose to write about this particular topic?

The bootstrap model is a very popular way of measuring reserve risk. It helps insurers with important decisions, like how much capital you need to back your reserves. We use it because it’s an elegant mathematical solution, and it is grounded in what we’re familiar with — loss triangles. But no one’s checked to see if it actually works. Considering the wide reliance on the bootstrap model, Shaun, Han and I thought that we should do a rigorous back-testing of the model.

Who is your intended audience?

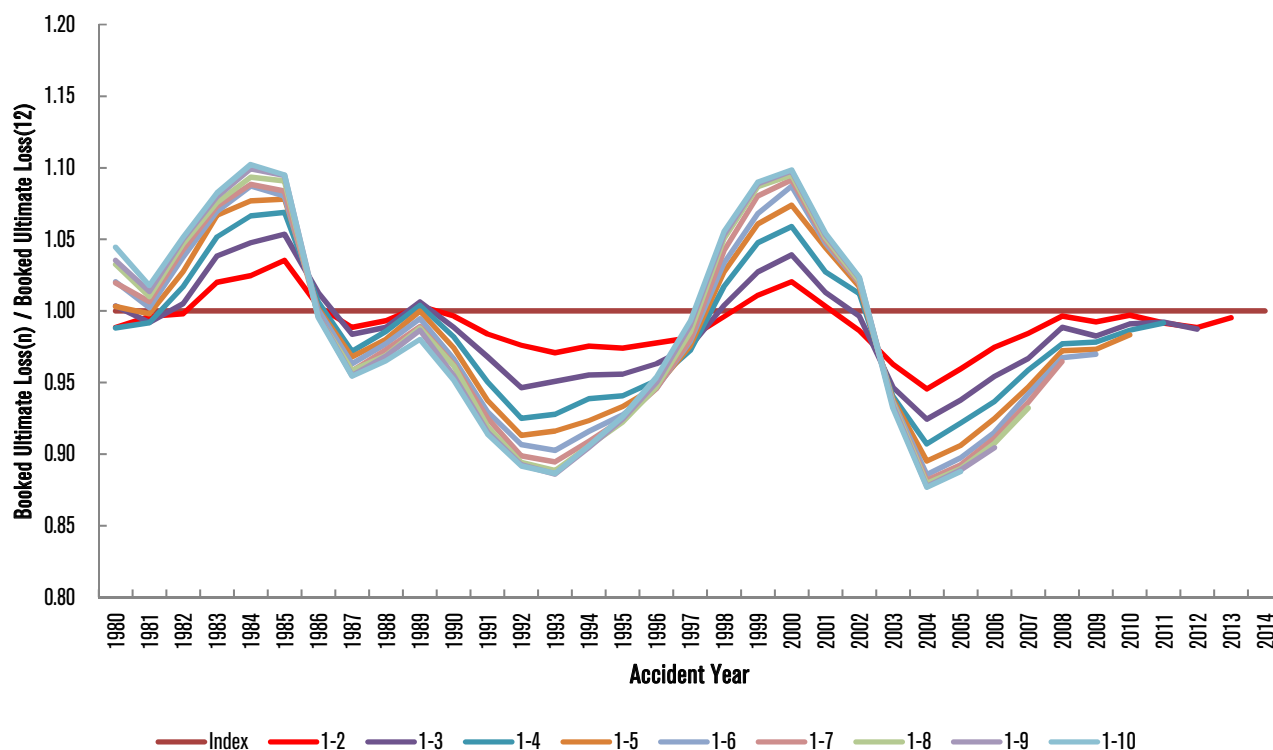
Actuaries who are estimating reserve risk. I hope they read this and get more insight into the way reserves really be-

have by looking at data on how reserves have moved in the past. The bootstrap model assumes that reserves move pretty randomly. They don’t. There’s a very real reserve cycle.

What makes this paper unique?

There isn’t much actuarial literature on back-testing models to check their performance on real data. That’s probably because it’s painful and expensive to do it. But it’s important. We produce hundreds of papers with new models and methods, but how will we know if they are advancing actuarial knowledge?

We used the Annual Statement data, and some of this is on the CAS website for free — I think that’s a great start for other budding back-testers.



Was there anything that surprised you during the course of your research?

Yes! Before I wrote this paper, I discovered the reserving cycle. This paper is the first time it's appeared in a peer-reviewed journal. When I first created it, I was shocked — there was such a regular pattern to the way reserves move. I had to check it with someone to make sure it wasn't a mistake.

On the x-axis are accident years. The lines show different ultimate loss

evaluations across accident years. For example, the flat horizontal line at \$1.00 shows that, at 12 months of evaluation, we thought that the ultimate loss was just \$1 for each of these accident years. The next red line is at 24 months of evaluation. So, for example, at accident year 2000, we thought the ultimate loss would be \$1 at 12 months, and then at 24 months we changed our minds and estimated \$1.02 instead. For this accident year, ultimately, at 120 months, we estimated \$1.10.

This is created using the booked ultimate loss for seven lines of business, for the whole U.S. P&C industry. It shows what reserve risk really looks like.

What are you working on now?

Around a year ago I took a position in predictive analytics at Zurich Insurance. I love it. My focus is now around business execution of insights. I also think there's a lot of room for research around predictive analytics for long-tailed lines. ●

CAS Releases New Monograph on Distributions

BY KATE NISWANDER, CAS MARKETING AND COMMUNICATIONS MANAGER

D*istributions for Actuaries*, the second volume of the new CAS Monograph Series, is now available for download. In *Distributions for Actuaries*, author David Bahnemann brings together two important elements of actuarial practice: an academic presentation of parametric distributions and the application of these distributions in the actuarial paradigm.

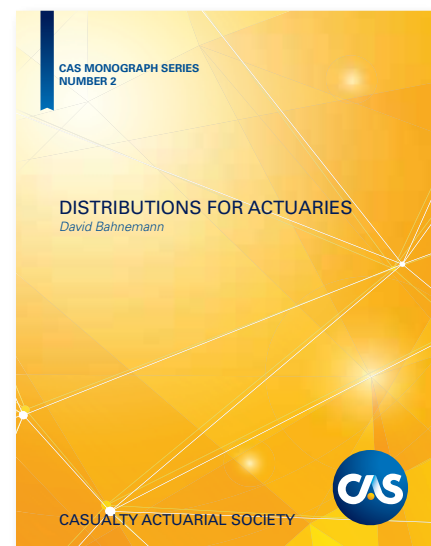
The Bahnemann monograph is a practical desk reference manual for CAS members to use whenever faced with a problem involving parametric distributions as well as an introductory text for those wishing to learn the subject matter.

All of the examples in *Distributions for Actuaries* are specifically insurance-related. The monograph contains more than six dozen illustrative examples and

more than 170 problems that serve as a tool for mastering the fundamentals. It is designed to expand on the basic ideas to demonstrate applications beyond those presented in the text.

Bahnemann studied mathematics and statistics at the University of Minnesota and at Stanford University. Now retired, he spent 25 years providing actuarial support to several excess and surplus lines underwriting departments.

CAS monographs are authoritative, peer-reviewed, in-depth works focusing on important topics within property and casualty actuarial practice. The CAS Monograph Series initiative fulfills the goal of creating an important addition to the existing body of CAS literature, with each monograph enabling the comprehensive treatment of a single subject. The Monograph Editorial Board (MEB) manages the monograph publication



process in close coordination with the CAS editorial staff. Submission guidelines can be found on the CAS website or by contacting Donna Royston at droyston@cas.org. ●

IN MY OPINION BY GROVER EDIE

The Value of a Knowledge Worker's Output

As I was writing this column, I got distracted by thoughts of my grandchildren. My wife and I “hire” them to do work around the house. It’s a good situation for all: They get to earn some spending money while learning the value of work, and we get some help with chores — but most importantly, we all get to spend time together.

My grandchildren are priceless to me — their worth cannot be measured — yet when my wife and I hire them, how much they get paid depends on the tasks and on their abilities. It also depends on who is the “payer.” My wife pays our grandchildren about twice the rate I pay. So *who* pays also has a bearing on the transaction value.

Sometimes a distraction can be inspiration....

Actuaries are Knowledge Workers

Peter F. Drucker coined the term “knowledge workers” in *Landmarks of Tomorrow* in the late 1950s. He expanded the scope of the term in *Management Challenges for the 21st Century*, writing:

[K]nowledge workers must know more about their job than their boss does — or else they are no good at all. In fact, that they know more about their job than anybody else in the organization is part of the definition of knowledge workers.¹

Thus, the value of knowledge workers’ output translates into just how much they should get paid; this is far different from assessing what knowledge workers are worth, however.

Keep in mind that your inherent worth is not the same as what people are willing to pay you to do something.

BusinessDictionary.com defines knowledge workers as employees “such as data analysts, product developers, planners, programmers, and researchers who are engaged primarily in acquisition, analysis, and manipulation of information as opposed to production of goods or services.”² Actuaries’ numerous responsibilities exactly fit the definition envisioned by Drucker, including roles as data scientists, analysts, modelers, researchers and presenters.

For simplicity, I will refer to the knowledge worker’s output as simply the “product.” The employer, boss, client or other customer will be called “the customer.” The actuary as a knowledge worker is the “producer” of information.

What is Our Product Worth?

Our product is timely, understandable, accurate and actionable information in the form of analysis and observations.

Our product’s value is realized in a transaction with a buyer or customer in a particular environment. The value is not realized until the transaction happens. If customers believe that the

value exceeds the cost and they have the funds, they will likely make the purchase. If you accept that premise, it establishes a few parameters for the value of a product.

First, worth is not measured by the effort put forth by the producer. Neither is it measured by the cost of goods, raw materials or any other output of the producer. Worth is only measured by the perceived value to the customer. Look at the price-to-book value compared to the price of any of the major stock indices. On average, the price is 50 percent to 100 percent above the book value. If perception is worthless, why are people paying well above book value for a stock? And not just for one stock, but for the market as a whole!

Again, worth only counts when a transaction occurs, whether it is to hire someone, to enter into a contract, or to make an outright purchase. You don’t make money on a stock until you sell it at a gain.

To make the transaction, customers need to believe that:

- The producer can deliver the desired product, including whatever attributes the customer deems necessary. For us, that usually means timely, understandable, accurate and actionable information.
- The value to them is greater than the cost to them.
- The good or service selected is the “best deal” among competing offers, including “no transaction,” i.e., the status quo.

Of course, buyers must have the discretionary funds to pay for the transaction.

¹ Drucker, P. 1999. *Management Challenges for the 21st Century*. HarperCollins: New York.

² <http://www.businessdictionary.com/definition/knowledge-worker.html>

The Value of the Product v. the Amount of Effort

The customer does not care how hard the actuarial exams are or how long it took you to pass them. Pontificating about *your* effort or what it took to get *your* credentials is worse than wasting time; it is wasting the opportunity to convey information truly important to customers. It cuts into your “word allotment,” the amount of attention listeners are willing to expend before they quit listening.

Effort has to do with the willingness of the provider to enter into the transaction. If the effort is too great for the reward (pay), the transaction will not happen. Effort sets a minimum price for the producer. The only effort customers care about is the effort they think it would take to do the same task, or possibly the effort of a competing producer.

Then what do customers care about regarding you? They care that you are capable of delivering the desired product, in all of its required aspects, including speed, accuracy, cost and whatever else they deem important.

You need to spend your word allotment on how you can provide what the customer wants, not how much effort it will take you. If you did it before, say so and give results. Remember, it is not the intrinsic value of the product, but the value perceived by the customer that is important.

To a new car buyer, a vehicle’s most important feature might be its perceived reliability. Whatever it is, the matching of the product to a need or desire is central to making the transaction happen. This is why a good car salesperson will ask you what you want in a car at the start of the sales conversation.

Asserting Your Value: Questions to Ask

One question you should ask yourself is: “Am I conveying a sense of competence to my customers? Does they believe I can provide the product they need, i.e., that I can do the job they wants me to do?”

The value versus cost tradeoff is complex. I say “cost to the customer” on purpose. It is different from the cost to the company. Cost to the individual includes the time she and her staff will need to spend with the producer in getting the scope, materials, etc., necessary to complete the project. While it will have an impact on the budget, if the project is already contemplated in the budget, the “cost” will likely be zero. (This is especially true when “use it or lose it” tends to be the unwritten budgetary rule.)

Underlying the value to the customer is the question “What is important?” Not what is important to the company, necessarily, but what is important to the individual making the decision to purchase or not. It is a subtle but important difference.

The second question is: “Am I conveying how the value of my product exceeds the cost to the customer, and at a sufficient level to make a transaction attractive?”

The value of each of the potential expenditures is weighed against others in an effort to get the biggest return. Do not forget that the customer’s staff time is included as a cost. Sometimes the project with the best financial return will not be the one that is funded, in deference to the one with the best career-enhancing return for the buyer (customer). It is the customer’s perception

of the value that matters, not the true or intrinsic value.

The next question is: “Is completing a transaction with you the best deal among competing opportunities the customer has available, including doing nothing?”

The amount of discretionary funds the purchasers have available sets a maximum for the spending capacity and thus indirectly a maximum amount they are willing or able to spend on the product.

Another question to ask, even before you approach potential customers, is whether it is likely that they will have the financial resources to be willing and able to pay for your product. If the answer is “no,” don’t waste your time.

Insuring a Ready Supply of Producers

The last question to ask yourself is, “What value does this customer place on my work?”

When my grandchildren are at the house and want to earn some money, they ask their grandmother, not me. They know that she will pay them more than I will for a given task. She always gets them to work, and I have a high “unemployment rate.” Even if I were to increase what I was willing to pay to their grandmother’s wage level, they likely would not work for me thinking something was undisclosed.

So the next time you feel you are underpaid (or underappreciated), think about what you can do to elevate your stature in the eyes of the person you wish would pay you more, i.e., your customer.

As for me, I need to work on labor negotiations with my grandkids. ●

IT'S A PUZZLEMENT BY JON EVANS

Uranium Enrichment for Peaceful Purposes

Alireza, a physician specializing in nuclear medicine, has hired Klaus, a nuclear engineering consultant, to help him connect his 1,500 centrifuges together to enrich his 100,000 kg of natural uranium. The natural uranium is 0.7% U235 by weight, with the remainder being U238. In the next 60 days Alireza needs an overall total of approximately 180 kg of uranium that is at least 93% U235 by weight to build three medical devices. The medical devices will be immediately shipped to hospitals in New York, Riyadh and Tel Aviv, where he feels they can do the most amount of good for the most people. Each centrifuge has a single input for feedstock and two outputs for product and tailings, respectively, and can process about 200 grams of uranium feedstock per hour. Seventy percent of the U235 entering as feedstock into a centrifuge leaves as product, and thirty percent ends up as tailings. Thirty percent of the U238 entering as feedstock into a centrifuge leaves as product, and seventy percent ends up as tailings. Klaus determines that it can be done in the time allotted, and he is sure they will get a Nobel Peace Prize for this great humanitarian achievement. How might Klaus plan to connect the centrifuges together?

The Darkness between Stars and the Size of the Universe

Puzzlers were asked to estimate the radius of the universe in units of the radius of a star; estimate the number of stars

there are; and determine what fraction of the sky would be covered in stars if the radius of the stars was 10 times greater but took up the same total volume.

In this puzzle the universe is spherical, eternal and static. The stars are all spherical with the same radius, and light does not reflect back from the edge of the universe. The very many stars are randomly distributed, and light scatters from the surface of a star but then travels in straight rays. Furthermore, stars take up a fraction of 1 in 10^{29} of the volume of the universe, and from the center of the universe looking out, stars appear to cover one part in a trillion of the sky.

Several different approaches lead to the right answer. Although a very rigorous calculation is possible, it is very tedious. So, most solutions rely on the very small size of the stars relative to the universe to make various implicit simplifying geometrical assumptions. For example, solutions tend to ignore the possibility of two stars overlapping in volume.

Let N be the number of stars in the universe, r be the radius of a star, and R be the radius of the universe. Since $N(4/3 \pi r^3) = (4/3 \pi R^3)/(10^{29})$, it follows that $N(r/R)^3 = 1/(10^{29})$. When looking out at a point in the sky from the center of the universe, the point will only appear with the light of a star if a star intersects the line segment of length R to the edge of the universe. This will only happen if the center of a star is within r distance of the ray. Equivalently, the point will be dark if no star has a



center within the volume of a "tube" (since $r \ll R$) around this line segment with volume $\pi r^2 R$. The number of stars per volume is $N/(4/3 \pi R^3)$. The expected number of stars in the tube is $(\pi r^2 R) N / (4/3 \pi R^3) = (3/4) N (r/R)^2$. Using a Poisson approximation, the probability of at least one star having its center in the tube is $1 - \text{Exp}[-(3/4) N (r/R)^2] = 1/(10^{12})$. So, $N (r/R)^2 = -(4/3) \text{Log}[1 - 1/(10^{12})] = 1.333/(10^{12})$. Dividing by the earlier equation, we get $R/r = 1.333 (10^{29})/(10^{12}) = 1.333 (10^{17})$ for the radius of the universe in units of a star radius. For the number of stars, $N = (R/r)^3/(10^{29}) = 2.37 (10^{22})$.

$\text{Exp}[-(3/4) N (r/R)^2] = 1 - 1/(10^{12})$ is the darkness fraction of the sky. If the radius of a star was 10 times greater, then r/R would be ten times greater and N would be $1/1000$ as great, and consequently the darkness fraction of the sky would be $(1 - 1/(10^{12}))^{(1/10)}$ or about $1 - 1/(10^{13})$. The stars would only cover about 1 part in 10 trillion of the sky. This makes sense intuitively since the stars would have only $1/10$ as much surface area. ●

Know the answer?
Send your solution to
ar@casact.org.



Those who do not learn from the past are likely to pay for it

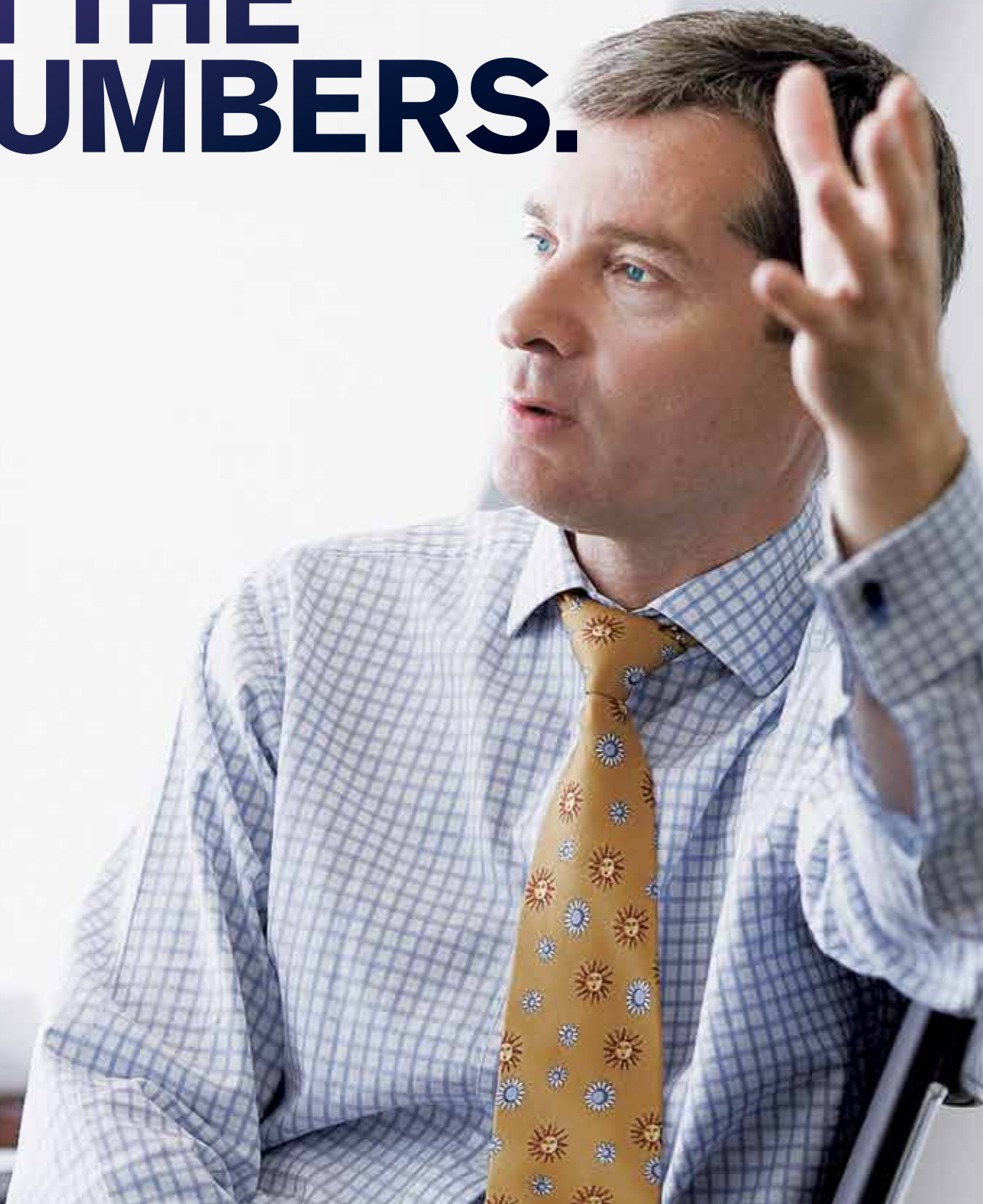
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NORTHEAST USA – ACTUARIAL ANALYST

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CALIFORNIA – PREDICTIVE MODELER

California insurer is searching for a property and casualty insurance predictive modeler for Position 66274. Requires 3+ years of experience. Experience with clustering, neural networks, generalized linear modeling (GLM), decision trees and machine learning ideal. R/SAS and SQL programming skills required.

MIDWEST USA – SENIOR ACTUARIAL ANALYST

Senior commercial lines actuarial analyst with 3 to 7 years of experience is sought by a Midwest USA insurer for Position 66426. Dynamic, high profile pricing role. Exam support.

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