actuarial REVIEW

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PUBLISHED BY THE CASUALTY ACTUARIAL SOCIETY

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THE QUEST FOR DATA GOLD

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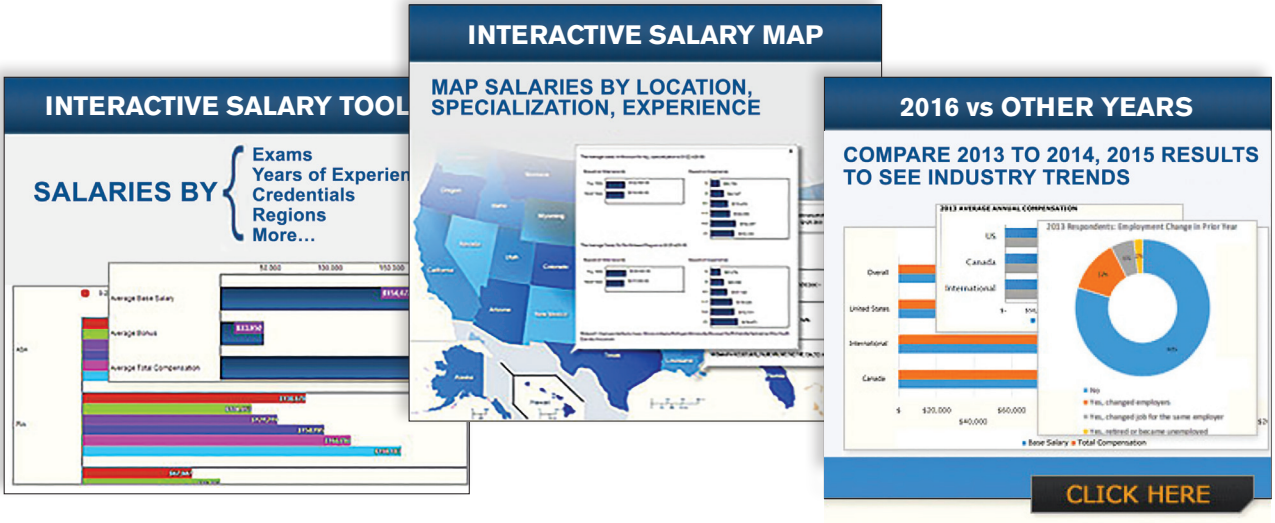

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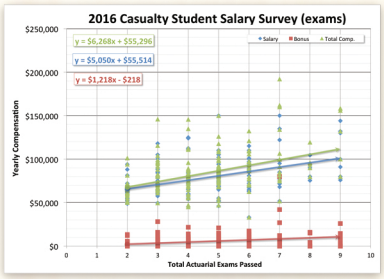

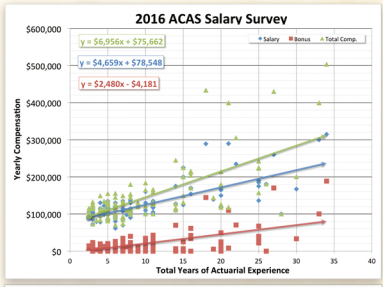

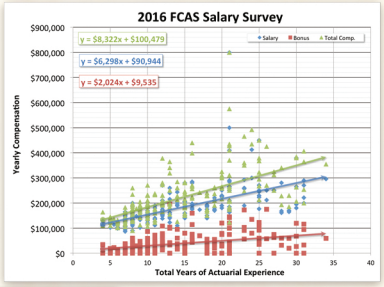

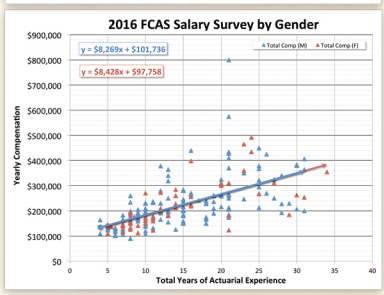

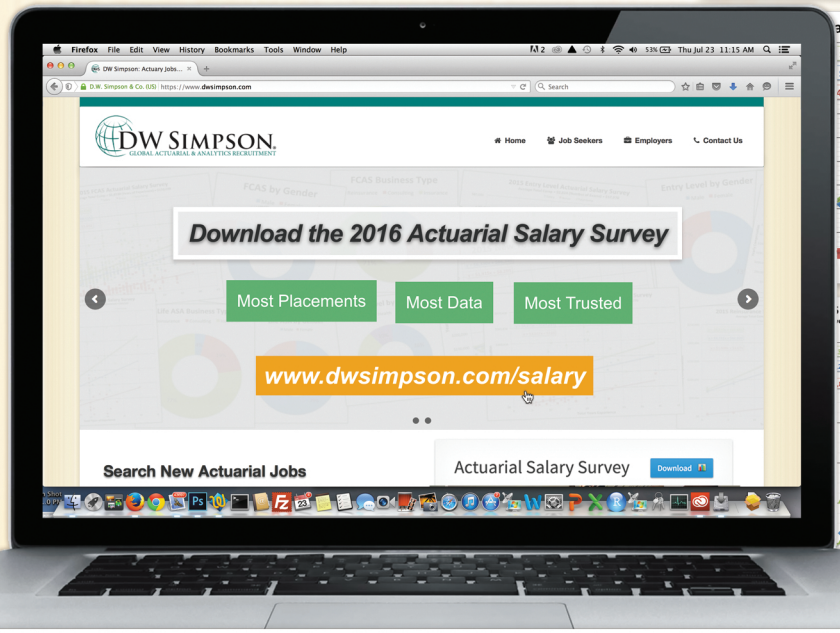

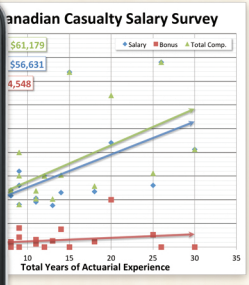

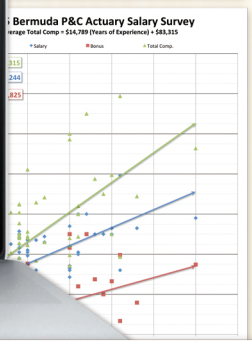

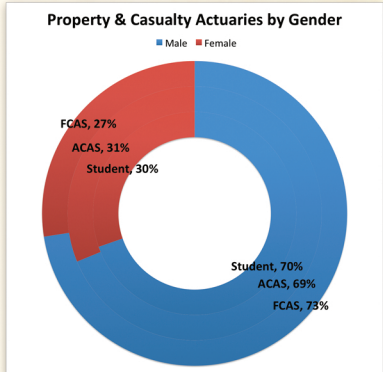

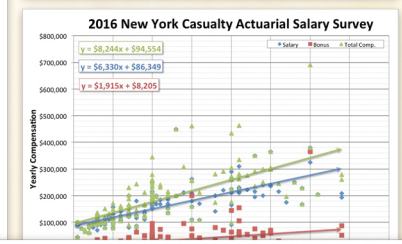

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November/December 2016

actuarial REVIEW

departments

FSC LOGO

on the cover

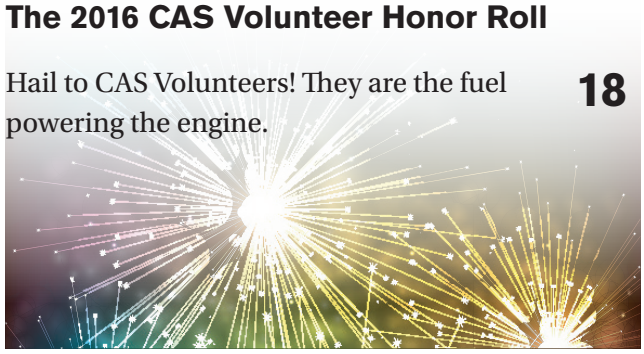
Predictive Modeling: The Quest for Gold

BY ANNMARIE GEDDES BARIBEAU

The widening stream of data availability has created a rush to find competitive data gold.

The 2016 CAS Volunteer Honor Roll

Hail to CAS Volunteers! They are the fuel powering the engine.



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actuarialREVIEW
The magazine of the
Casualty Actuarial Society

Volunteers — Sight Unseen

Consistently, the CAS gets good volunteer turnout — 33 percent of our 7,700+ membership is nothing to sneeze at. It's a respectable, decent number that's downright enviable compared to other associations.

I have worked for the CAS for nearly 20 years, in which time the office has grown from 10 or so to 37 staff members. I've seen a lot of people come and go from this institution — presidents, committee chairs and members, and staff, but there is one thing for me that is as rare a sighting as Sasquatch: an *Actuarial Review* volunteer.

Although the *AR* is my main committee, I rarely get to meet my volunteers. Sure, I might run into one at a CAS meeting or seminar every few years or so, but we have never had a formal face-to-face meeting. We don't have teleconferences, and, except for the editor in chief, I don't even talk to them one on one on the phone.

And yet, I know these people.

I know their habits. I know their editorial pet peeves. I know that they delight in turns of phrases. I know they are fascinated by good story telling. I know they can dissect the logic of an argument.

They are word lovers and grammar gurus from all over the world. Sometimes English is not their first language. These volunteers are many times the one who scrutinize text the most.

AR volunteers catch things I could never dream of understanding. (Sometimes I have caught actuarial typos, too, which always amazes me.)

They are dedicated, often staying with the committee for several years.

AR volunteers hail from a tradition begun in a basement with one lone volunteer and his wife, Matt and Edyth Rodermund, creating a newsletter printed on mimeographed sheets. (Millennials, look it up.)

I started out working with just two copyeditors. Today we have a team of 20 copyeditors and seven regular volunteer contributors. (You do the math, actuaries.)

It doesn't matter that the *AR* Committee's only contact is through email. We are proof positive that people can work together for a common goal without laying eyes on each other.

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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Research is Elemental to Our Mission and Needs to Address Policy Issues that Involve Our Expertise

My term as president of the CAS has concluded, and this will be the last time I put pen to paper to write this column. I have enjoyed being CAS president immensely. It has afforded me the opportunity to work with a great group of individuals, including CAS staff, member volunteers and leaders of other actuarial organizations. Throughout the year, the work has been rewarding, involving a diverse set of issues with many challenges but with a clear sense of purpose. I think we have made good progress on many of the areas where we set objectives for the year.

One area that I had hoped to do more work during my term was research. Research is a key component of the CAS mission. Through an ongoing research program, we develop new approaches and tackle emerging problems so that our profession stays relevant and contributes positively to society.

Over the last year, we have made worthy strides, defining a specific set of research priorities and setting up working parties to focus on them, but there is more we can do. We might take a cue from the Institute and Faculty of Actuaries (IFoA), which has launched a set of high-level research initiatives focusing on major global issues such as retirement income security and longevity risk. The IFoA has articulated each issue and the questions raised by the issues, conducted an RFP process to identify the researchers, and is now providing significant funding to those selected, over a multiple-year time horizon, as the researchers develop answers to the questions. The IFoA's goal in sponsoring this research is to contribute positively to the development of solutions by offering thought leadership.

I thought I would use this final column to "throw down the gauntlet" for those who follow me.

Since any initiative of this type would touch on public policy issues, I would expect that the CAS would want to partner with the American Academy of Actuaries (AAA), the Canadian Institute of Actuaries (CIA) and other country-specific organizations in such an endeavor. (As with the IFoA, the issue should be global.) The CAS would fund the research and perhaps develop ideas through collaborating working parties; publication of materials for policymakers would then occur through the AAA in the U.S., the CIA in Canada, etc. This is a similar construct to the one being employed around the Actuaries Climate Index.

The IFoA did invite the CAS to join in their initiatives, but given that the policy issues mostly related to life and pension, we declined. They also suggested that if we could articulate a similar public policy issue of greater relevance to us, they might join us in supporting an initiative in that area as well. I would favor this partnership, since I think it would contribute to our strategic goal of developing a global property and casualty actuarial community.

Ever since the IFoA first offered to join with us I have been trying to find the time to sit down and draft an articulation of a suitable issue, without success. However, rather than abandoning what I think is an excellent initiative, I thought I would use this final column to "throw down the gauntlet" for those who follow me.

While private property insurance provides protection against a variety of perils, it does not provide comprehensive coverage of the economic losses from all perils, and is neither available to, nor affordable for, everyone.

For some time it has struck me that the current system for managing property risk is not as good as it could be. While private property insurance

President's Message, page 8

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President's Message

from page 6

provides protection against a variety of perils, it does not provide comprehensive coverage of the economic losses from all perils, and is neither available to, nor affordable for, everyone. The private property insurance system is supplemented by a variety of public and quasi-public programs that attempt to fill the gaps; these programs work well in some respects and poorly in others. The statistics on take-up rates for flood and earthquake insurance suggest massive levels of uninsured properties, which will push the losses from a major event onto banks and the federal government. Studies of flood claims make it clear that properties need to be rebuilt at a greater elevation to avoid repeat claims; in some cases, some properties should not be rebuilt at all. Political pressures on prices cause property development to continue in disaster-prone areas without adequate consideration of the consequences of further risk concentration. The potential issues in the overall system include gaps in protection, unavailability, unaffordability and misalignment of economic signals and incentives.

Here are some of the questions that I believe need to be addressed:

- Are there catastrophic events of sufficient size that government should share in paying the costs? What is the private insurance industry's capacity to absorb losses from major disasters, and how might that capacity be expanded if it is insufficient?
- How can insurers be encouraged to expand coverage to be more comprehensive, for example, covering flood and earthquake? Are there real insurability issues with some perils, and how can they be mitigated?
- If there are situations where some perils are commercially uninsurable, would it not make more sense for governmental programs to provide reinsurance coverage to primary insurers rather than offering primary insurance directly, to take the insured out of the middle of coverage disputes (for example, flood versus wind)?
- If the best policy solution is to rebuild to a more resilient standard, how can this be handled within the insurance mechanisms? And, if the best policy solution is not to rebuild at all, how can this be accommodated?
- How can proper economic signals be provided as to the cost of disaster risk, and what is the best way to provide them?
- Can consumers be better educated as to the value of property insurance? Is there a better choice architecture for their purchasing decision process?
- What is the best way to address affordability issues? In some areas price increases have been limited, inadvertently providing subsidies for wealthy as well as lower income homeowners.
- To the extent that climate change has or will affect the frequency or severity of disasters, how can the impact of climate change be reflected in pricing?
- Would it not be better to mandate the purchase of more comprehensive coverage as a condition of obtaining a mortgage? What would the impact on prices of such a mandate?
- Should coverage be restructured into (a) disaster coverage with high deductible to protect against rare significant losses and (b) routine coverage with lower deductible to handle more frequent events? Would this facilitate a better choice architecture for consumers?

There are a plenty of policy questions that need to be addressed, and our members are certainly well-qualified to contribute to developing solutions.

This list is very much a draft, but its main point is to suggest that there are a plenty of policy questions that need to be addressed, and our members are certainly well-qualified to contribute to developing solutions. We would not be alone, as others are already at work in this area. Both Wharton and the Geneva Association have recently published material touching on these issues. However, it is never too late to enter into collaboration with these or other organizations.

As I pass the baton on to the next generation of leaders I would encourage them to consider sponsoring a thought leadership initiative in the property insurance area.

COMINGS AND GOINGS

Chubb Limited has appointed **Michael B. Kessler, FCAS, MAAA, CFA**, as vice president, Chubb Group and as chief reinsurance officer. He will be responsible for design and purchase of reinsurance programs for Chubb and its business units globally, the company's reinsurance recoverable asset and relationships with its reinsurers and reinsurance brokers. He will chair Chubb's Reinsurance Security Committee and be a member of its Global Credit Committee. Kessler has 25 years' experience in insurance and actuarial consulting. Since 2008, prior to ACE's January 2016 acquisition of Chubb, he has served as chief actuary for the company's international general insurance business. Kessler joined ACE in 2003 as senior VP and chief actuary for the specialty group of ACE Westchester. Kessler began his career at Aetna Life and Casualty and has held senior manager and consulting actuary positions at Ernst & Young LLP and PricewaterhouseCoopers LLP.

Selective Insurance Group has promoted **Todd Hoivik, FCAS**, to senior vice president, commercial lines pricing & research. Hoivik joined Selective in June 2016. Prior to that, he served as second vice president and actuary, CASD predictive modeling pricing team lead and second vice president, commercial auto lead actuary at Travelers Insurance Group.

Effective November 1, 2016, **David Cook, ACAS**, will succeed Jean Laurin as president of ENCON Group Inc., a leading managing general agent in Canada. Cook is a 24-year veteran with ENCON and the current chief underwriting officer (CUO). He has served company as vice president and chief actuary for underwriting management division. As a senior vice president, he was responsible for the underwriting review of large accounts and the provision of application handling and policy issuance services to brokers. Cook was promoted to CUO in 2009 and appointed managing director in 2016.

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

ACTUARIAL REVIEW *LETTERS POLICIES*

Letters to the editor may be sent to ar@casact.org or the CAS Office address. Include a telephone number with all letters. Actuarial Review reserves the right to edit all letters for length and clarity and cannot assure the publication of any letter. Please limit letters to 250 words. Under special circumstances, writers may request anonymity, but no letter will be printed if the author's identity is unknown to the editors. Announcement of events will not be printed.

IN MEMORIAM

Kenneth L. Leonard Jr. (FCAS 2007)
1971-2016

Erica P. Partosoedarso (ACAS 1996)
1961-2015

John S. Trees (ACAS 1966)
1932-2016

CALENDAR OF EVENTS

November 13-16, 2016
CAS Annual Meeting
Loews Royal Pacific Resort
Orlando, FL

March 6 - 7, 2017
Underwriting Collaboration Seminar
Crowne Plaza Chicago O'Hare
Rosemont, IL

March 27 - 29, 2017
Ratemaking and Product Management (RPM) Seminar & Workshops
Marriott Marquis San Diego Marina
San Diego, CA

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 2016. This brings the total contribution by D.W. Simpson to the Trust to $200,000 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.

TWENTY-FIVE YEARS AGO IN THE *AR* BY WALTER WRIGHT

Conflicting Views

Issues surrounding discounting loss reserves were heating up in 1991, and the November 1991 AR ran two articles on discounting that took up almost half the newsletter. The longer of the two articles was a "Point: Counterpoint" discussion, with Steve Philbrick making the case for discounting and Ron Ferguson making the case against it; this debate provides a good overview of the conflicting views that fed the issue. The shorter article, which is excerpted below, summarized results of a public hearing before the Actuarial Standards Board — the headline and subheadline suggest the controversial nature of this issue.

CAS Supports Standards for Discounting of Loss Reserves at ASB Hearing

But Neil Bethel Notes That This Support is not an Endorsement of Discounting

A CAS official joined a half-dozen other prominent actuaries in supporting the issuance of a standard of practice on loss reserve discounting, but warned the Actuarial Standards Board (ASB) that such a standard "must include a discussion of the relationship of discounting and the amount of risk margin that may be present in a reserve."

Neil A. Bethel, chairperson of the CAS Committee on Reserves, spoke at a public hearing held by the ASB on September 25, in conjunction with the Casualty Loss Reserve Seminar in Arlington, VA. The ASB, which had published two exposure drafts of a proposed standard titled, Discounting of Property and Casualty Loss and Loss Adjustment Expense Reserves, asked witnesses at the hearing two questions:

1. Should loss reserve discounting be addressed by an actuarial standard of practice?
2. If so, how should such a standard address risk margins?

Seven of nine actuarial witnesses at the hearing voiced support for the issuance of a standard. There was some sentiment that it should be delayed until a standard on risk margins could also be promulgated, but development of the latter might be years off, the hearing was told.

Bethel was one of those not favoring delay … If the ASB delayed its discounting standard "until generally accepted actuarial methods of determining risk margins were formulated," it might tum out to be a long delay, he suggested …

"This standard would be seen by company management and accountants as de facto endorsement of discounting," declared Daniel K. Lyons, speaking for the actuaries at General Reinsurance Corp …

Robert J. Gossrow, casualty actuary for the Illinois Department of Insurance, said the NAIC was not opposed to promulgation of the proposed standard. He suggested only that the document might benefit by adding a statement to "discourage discounting in statutory financial statements." …

If the ASB does not promulgate a standard, "it is likely that others will step in and state what actuaries should do," warned Harold J. Brownlee, a consulting actuary and recent past president of the American Academy of Actuaries (AAA). He mentioned the Financial Accounting Standards Board (FASB) and insurance regulators as among the "others." …

The FASB has in fact taken two recent initiatives that may lead to allowing discounting of reserves under generally accepted accounting principles (GAAP), said Ralph S. Blanchard, III, speaking for fellow actuaries involved with the issue at Aetna Life & Casualty … "Discounting for GAAP may be only several years away," said Blanchard, and for this and other reasons, the ASB should have a standard.

Personal Preference Voiced

But the chairman of the AAA Committee on Property-Liability Financial Reporting, David G. Hartman, voiced a personal preference for having a standard on risk margins issued before a standard on loss reserve discounting …

The final speaker of the day disagreed that a standard was needed. In fact, Thomas J. Kozik, a senior research actuary at Allstate, declared that "discounting is too trivial a task to glorify with a standard. It is analogous to having a standard for computing compound interest." ….

Meet Katie Hettler, Marketing and Corporate Relations Manager

Welcome to the CAS Staff Spotlight, a column featuring members of the CAS staff. In this edition, we are proud to introduce Katie Hettler.

- **What do you do at the CAS?**
  My main responsibility is to manage the Society Partners Program. Society Partners are crucial to our association, as they demonstrate a yearly commitment by supporting annual CAS activities. I ensure that their marketing objectives are carried out by coordinating their sponsorships and exhibitor booths at various events. Aside from that, I take part in advertising for the *Actuarial Review* as well as webinars, seminars and meetings.
- **What do you enjoy most about your job?**
  Learning! It is impossible to perfect this role, because it is constantly evolving. I love coming to work knowing every day will be different than the last. Additionally, my coworkers leave sweet treats in the kitchen roughly once a week, which is cool.
- **What's your hometown?**
  Born in Pittsburgh (go Steelers!) — raised in Jacksonville Beach, Florida.
- **Where'd you go to college and what's your degree?**
  Graduated from University of North Florida (you've probably never heard of it) with a degree in political science.
- **What was your first job out of college?**
  Personal trainer and sales rep at Gold's Gym!
- **Describe yourself in three words:**
  Sarcastic, athletic and, at the moment, hungry.

Katie Hettler

- **What's your favorite weekend activity?**
  Traveling home to Florida to visit my family, work on my tan and rack up my airline miles.
- **What's your favorite travel destination?**
  Easy. Punta Cana, Dominican Republic.
- **Name one interesting or fun fact about you:**
  I can write, eat and throw with both hands. Is that even interesting?

MEET THE VEEP

Cummings Has Singleminded Goals for R&D

Our Meet the Veep column introduces CAS Vice Presidents who serve on the Executive Council to our members and candidates. In this installment, we are pleased to introduce CAS Vice President–Research and Development David Cummings.

What do you do?

I am the senior vice president of insurance operations and analytics at ISO Solutions. I lead the operational and analytic services that ISO provides to the property-casualty insurance industry, which includes coverage, actuarial and predictive modeling products.

What is your role as VP-R&D?

I oversee our research committees as they work to advance the state of casualty actuarial practice. Research is central to the CAS's mission — in fact, it's the first thing mentioned in our mission statement; it says that our purpose is to advance the body of knowledge of actuarial science. And so we have more than 20 research committees, task forces or working parties that I encourage to advance our traditional functions like ratemaking and reserving, and to explore emerging risks like cyber and automated vehicles.

What volunteer work had you done that led to your appointment?

Like many Fellows, my first volunteer work with the CAS was on the Exam Committee, which I worked on for a few years. I also served as a member and then chair of one of our research committees, the Hachemeister and Michelbacher Prizes Committee. I've also had volunteer opportunities outside the CAS. I served on the Committee on Consumer Education and as a member of the Board of Trustees of The Actuarial Foundation. I also was elected to the CAS/CIA/SOA Joint Risk Management Section Council and then served as council chair.

What are your goals as VP-R&D?

My goals are focused in two directions.

First, I want to foster member-driven research that will assist our members in their day-to-day practice. This is supported by the formation of research working parties, which are groups of volunteers who come together to address a specific research challenge in a short time frame. For example, we have a Sustainable ERM Working Party that is developing a risk management framework and practical tools for sustainability-related risk identification, measurement and decision-making. We have other working parties looking at things like claims-level analytics, micro-insurance, agricultural insurance and hospital professional liability.

Second, I also want to energize CAS-driven research in support of our recently adopted research priorities. This will be accomplished through funded research. The Executive Council has recently agreed to invest $500,000 from the CAS Research Fund as a budget for the research priorities, or $100,000 dedicated to each of the five key research topics: (1) predictive modeling and data analytics; (2) modeling in general; (3) reserving; (4) economic scenarios and stress-testing; and (5) cyberrisk.

David Cummings

Share an interesting fact about yourself.

I graduated from the Air Force Academy during the draw-down years after the end of the Cold War. Cadets are normally guaranteed pilot slots, but the year I graduated, they limited pilot slots to only 200 cadets out of the entire graduating class. So I thought about what I wanted to do as an alternative to flying. I wanted to do something intellectually challenging and to use my mathematical side, so I ended up serving in the Air Force as a scientific analyst.

When you meet new ACAS and FCAS, what advice do you try to impart to them?

I talk to them about getting involved as a volunteer and the benefits they can get from that. Volunteering in the CAS has benefited my professional growth, both in the actuarial profession and for my career.

Honoraria Awarded for Three Stochastic Reserving Papers

The CAS Monograph Editorial Board (MEB) has awarded three honoraria for monographs published in response to its call for papers on stochastic reserving.

The MEB established the honoraria for the stochastic reserving topic in order to motivate authors to explore this area, and to recognize worthwhile contributions to the literature on this important topic. The call for monographs on stochastic loss reserving was issued in August 2012 and included the direction that the monographs should be "primarily viewed as educational."

Three papers were received and published in response to this call:

- *Stochastic Loss Reserving Using Bayesian MCMC Models* by Glenn Meyers, FCAS
- *Using the ODP Bootstrap Model: A Practitioner's Guide* by Mark Shapland, FCAS
- *Stochastic Loss Reserving Using Generalized Linear Models* by Greg Taylor and Gráinne McGuire

An MEB subcommittee reviewed the three monographs to determine the awarding of honoraria. The monographs were evaluated in four key areas: responsiveness, originality, usefulness, and readability. The subcommittee ultimately decided that all three monographs were important additions to the literature, and that each of the three monographs was deserving of recognition. The subcommittee proposed that the honorarium fund be divided equally among the three publications.

The total amount of the original $10,000 honorarium was increased in order to award $3,500 to each chosen paper. The recipients will be recognized and honored at the 2016 CAS Annual Meeting, November 13-16, 2016 in Orlando, Florida.

The CAS Monograph Series now has five total entries; the remaining two were submitted outside of the stochastic reserving call, and cover other relevant property and casualty subjects:

- *Distributions for Actuaries* by David Bahnemann
- *Generalized Linear Models for Insurance Rating* by Mark Goldburd, FCAS, Anand Khare, FCAS, and Dan Tevet, FCAS

CAS monographs are authoritative, peer-reviewed, in-depth works focusing on important topics within property and casualty actuarial practice. Monographs are available to the CAS community as free downloads. If you are interested in contributing a monograph, submission guidelines can be found on the CAS web site or by contacting Donna Royston at droyston@casact.org.

New Research Project to Examine Diversity of Actuarial Profession

The CAS is partnering with the International Association of Black Actuaries (IABA) and Society of Actuaries (SOA) on a research project focusing on ways to support diversity and inclusion within the actuarial profession. The organizations are working with a market research firm to understand the barriers for individuals pursuing the actuarial career.

The actuarial profession is often mentioned as a leading career, but African-Americans, Hispanics and Latinos are generally underrepresented in the profession in the United States.

"Through this research with the IABA and SOA, we will identify resources that will encourage and support African-Americans, Hispanics and Latinos to join the actuarial profession," said CAS President Stephen Lowe.

The research project supports the CAS Diversity Strategy, and it builds upon existing efforts of the CAS Diversity Committee and the Joint CAS/SOA Committee on Career Encouragement and Actuarial Diversity. Research results are expected to be available in early 2017.

Certify Compliance with the CAS Continuing Education Policy

All Fellows and Associates need to certify their compliance with the CAS CE Policy's requirements as of December 31, 2016. Compliance with the CAS CE Policy allows the member to provide actuarial services in the year immediately following certification of compliance. Note that even members who are not in actuarial roles should review the requirements as CE compliance may still be required. If a member is not providing actuarial services at all, he/she must still attest this on the website.

For more information on certification, visit http://www.casact.org/education/index.cfm?fa=ceinfo.

2016 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. 2016 Activity: There were two cases referred to the ABCD. There are no cases pending before the committee. This notice will be published in the November/December 2016 issue of *Actuarial Review*.

— Tom Myers, Chairperson of the 2016 Discipline Committee, October 18, 2016

Scenes from the 2016 International Association of Black Actuaries Annual Meeting

The CAS was a sponsor of the 2016 International Association of Black Actuaries (IABA) Annual Meeting held July 28-30 in Las Vegas. The meeting drew around 300 attendees, about a third of whom were connected to the CAS, including credentialed members, candidates, and members of CAS Student Central.

Members of the CAS community at the IABA Annual Meeting at a networking reception hosted by the CAS.

The general session panel titled"Diversity in the U.S. Actuarial Profession."

Art Randolph, FCAS, presenting during a session.

Kwame Davis, FCAS, during the "Diversity in the U.S. Actuarial Profession" General Session.

Linda Shepherd, FCAS, during the "Diversity in the U.S. Actuarial Profession" General Session.

Group photo of all exam passers attending the IABA Annual Meeting.

Gloria Gillam, ACAS, with IABA Executive Director Kate Weaver.

HUMOR ME

How Risk Adverse are You — for an Actuary? BY SUNG YIM

As most of us actuaries know, we are a group of risk-adverse people. Right? Naturally, I don't want to generalize a whole group of professionals into a specific risk category, however from my personal experience of working with many other actuaries, I have come to realize that many of us are in fact conservative by nature. Now I don't mean conservative in the political sense, but the normal everyday decisions that we make seem to have a built in conservatism to them. Judge for yourself by taking this simple test below to determine your level of actuarial conservatism!

1) When making lunch reservations for 10 people that replied yes to your invite, you:
   a. Reserve a table for 10.
   b. Reserve a table for 12 just in case more people show up.
   c. Reserve a table for eight since you know based on historical experience some people will not show up.

2) When getting to a 10 a.m. doctor's appointment, you:

   a. Plan to be there by 10 a.m.
   b. Plan to be there by 9:45 a.m. just in case there is traffic.
   c. Plan to be there by 10:15 a.m. since you know, based on historical experience, that the doctor is always late.

3) You are sitting at the blackjack table. The dealer shows four and you have 11.

   a. You hit.
   b. You stay just in case you might catch a string of low cards.
   c. You double down since you know that is the text book play.

4) You are playing golf. The distance to the green is 150 yards with a water hazard in front and wind is blowing 20 M.P.H. from behind.

   a. You hit your normal 7 iron.
   b. You lay up to 100 yards using your sand wedge just in case the wind might knock your ball into the water.
   c. You hit your 7 iron but choke down on the grip and do a three-quarter back swing to take into account the wind impact.

5) You are walking down the hallway and see someone you recognize but do not remember his or her name. As you walk by, you:
   a. Say. "Hey there!"
   b. Take out your smartphone and pretend to take an urgent call while looking down.
   c. Say, "Hi, Chris!" because you remember that, statistically speaking, that is the most common gender-neutral name.

6) When making instant ramen noodles at home, you:

   a. Eyeball the amount of water to put in.
   b. Take out a measuring cup and add in a quarter cup more just in case.
   c. Take out a weight scale in order to factor in the water volume displacement.

7) You are purchasing a new smartphone, and you decide to buy:
   a. The latest Apple iPhone.
   b. A non-Samsung phone since they can catch on fire.
   c. A Samsung Galaxy since they are now on discount and you figure, statistically, another fire is improbable.

8) When purchasing a commuter car for work, you buy:
   a. The best car within your budget.
   b. A compact car with the most efficient gas mileage and safety record.
   c. A luxury car with premium op-

tions so that you will be most comfortable.

9) You are attending the CAS Annual Meeting in Orlando and the first thing you do is:
   a. Register for the meeting.
   b. Book the hotel room before they are all sold out.
   c. Book the flight since you figure there is always another hotel nearby and they take registration on site.

10) When investing for your retirement, you hold:
   a. A mix of stocks and bonds.
   b. A mix of cash and gold.
   c. A mix of stocks, options, hedge funds and private equity

investments optimized and rebalanced every calendar year taking into account future expected inflation trends.

***

For your answers, assign one point for every "a," two points for every "b" and three points for every "c." Add up your points for your results.

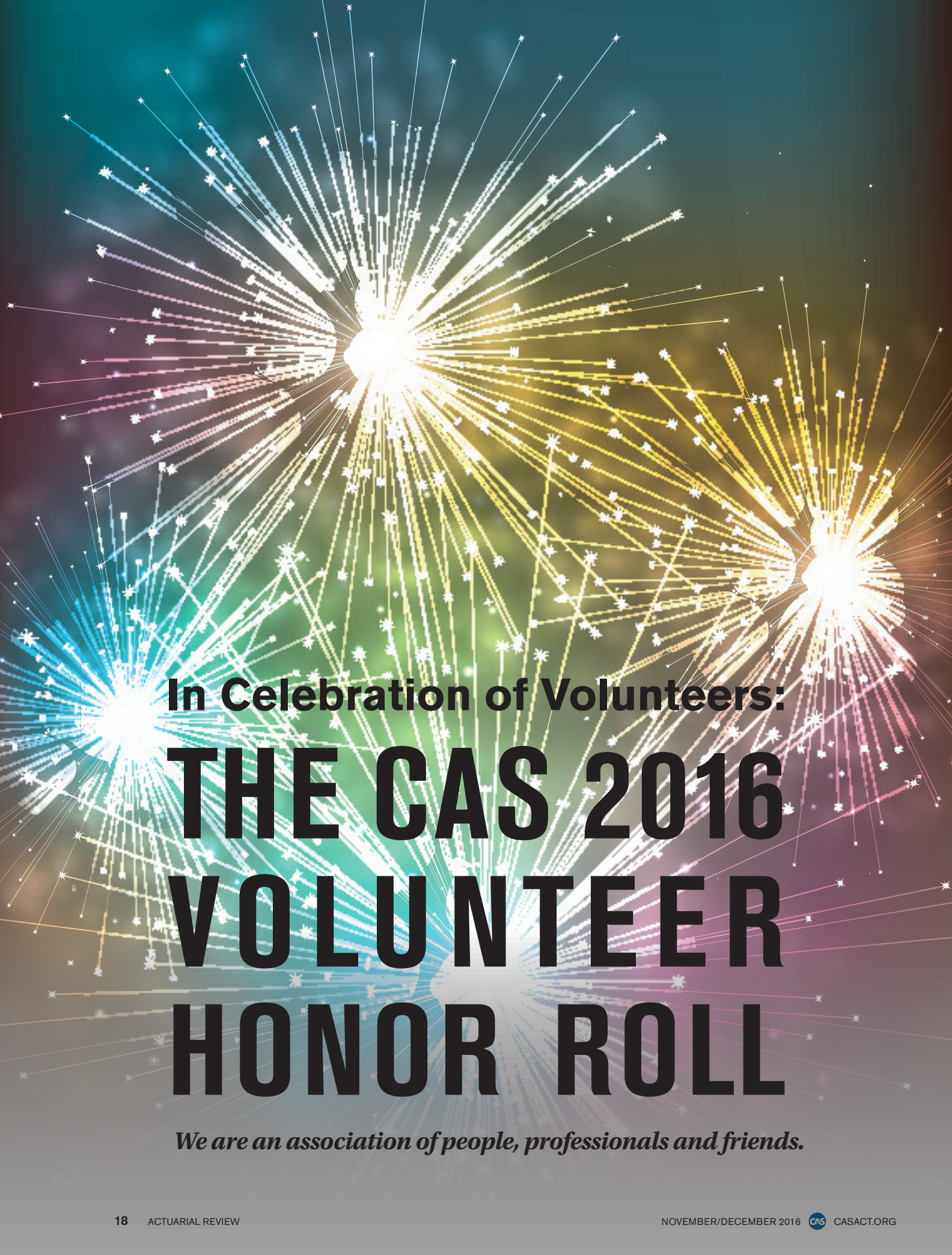
Total points:

10-13 points: Are you sure you are an actuary?

14-22 points: You must be a reserving actuary. Keep up the good work!

23-30 points: You must be a pricing actuary. Keep up the good work!

Sung Yim, FCAS, MAAA, is an insurance reserving director for Everest Global Services, Actuarial Corporate in Liberty Corner, New Jersey.



In Celebration of Volunteers:

THE CAS 2016 VOLUNTEER HONOR ROLL

We are an association of people, professionals and friends.

Since the founding of the Casualty 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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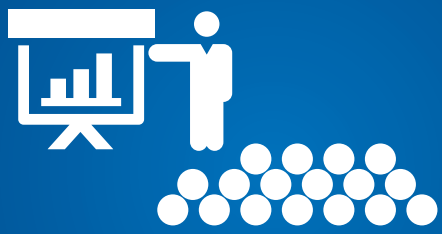

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PREDICTIVE MODELING

The Quest for Data Gold

By ANNMARIE GEDDES BARIBEAU

Data may be in abundance, but it's not all valuable. Actuarial prospectors must sort through the morass to find the meaningful nuggets — and do it fast to keep up.

Predictive modeling is advancing far beyond its general linear modeling (GLM)-based roots. Thanks to the explosion of new data sources, technological innovation and advanced analytics, predictive modeling is promising solutions while being poised to disrupt the insurance company business model.

The solutions vary by each property-casualty insurance line. Generally, personal lines insurers are enjoying more opportunities for building proxies for human behavior beyond tried-and-true credit scoring. Faced with the boundless multiplicity of potentially predictive factors, commercial lines carriers are determining risk by attaining deeper client knowledge while focusing on uses beyond pricing including claims management, underwriting and premium auditing.

To reveal the latest trends in predictive modeling, Actuarial Review is presenting a three-part series. This first article focuses on data: the energy that drives the models. Part II will consider the vehicle for analyzing data: the models. Part III will take a closer look at the implications of modeling going forward, including decision-making, regulatory considerations and loss mitigation.

The Quest for Data

From the potential of big data to the internet of things (IoT), data buzz abounds in the property-casualty industry. The widening stream of data availability has created a rush to find competitive data gold, requiring actuaries to sift through the electronic morass to find truly valuable indicators that will meaningfully answer questions.

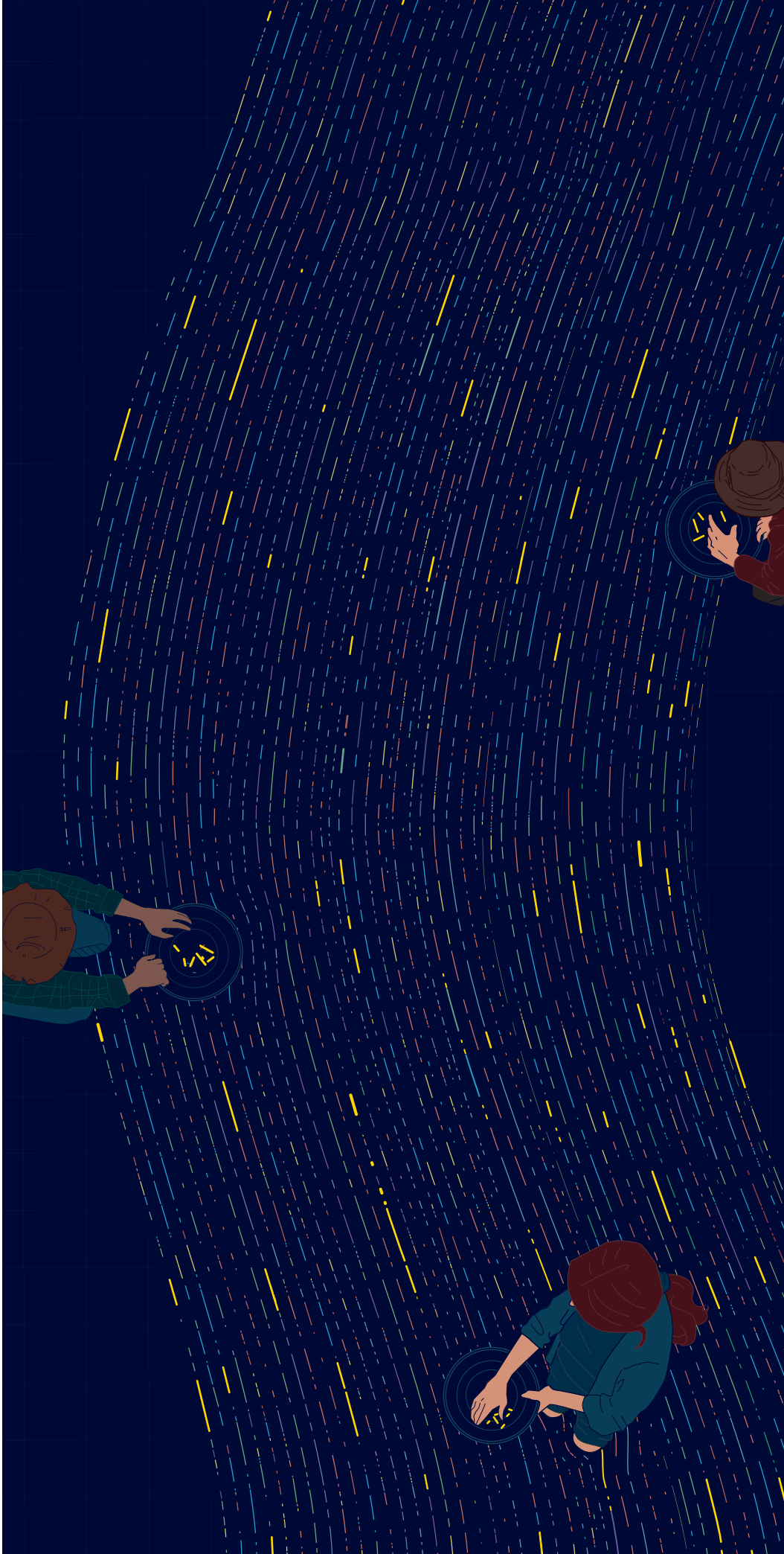
The reason is simple. "The predictive models get better with new data sources," said Christopher Monsour, vice president of analytics at CNA.

The data influx derives primarily from external data offered by vendors,

sources said. “More companies are offering more information,” said Roosevelt C. Mosley, principal and consulting actuary for Pinnacle Actuarial Resources. “It seems to keep going and at some point you think it will level off, but from my perspective it hasn’t.”

Some vendors are expanding their products and tools while others are new entrants into the insurance market. Procuring and analyzing data are expensive but necessary, Mosley said. “The goal in this arms race is to find things that allow you to get ahead of your competitors or keep up with them, and it creates the dichotomy of the haves and have nots,” he explained.

Big companies have an advantage in today’s data and analytics arms race, said Stephen J. Mildenhall, who recently left his post as global CEO of Analytics for Aon to join the faculty at St. Johns University’s risk management and insurance department. Larger insurers “have more data and can invest more in statisticians and modelers to uncover



relationships in that data," he added.

What kind of data actuaries need depends on several variables. These include: the question being asked, the property-casualty line and the type of model. Data and the kind of model being used should work in tandem along with other considerations, said Serhat Guven, Willis Towers Watson's P&C sales practice leader for the Americas. "(Without) thinking about the data, the modeling layer becomes worthless," he noted.

There are also legal and regulatory restrictions to recognize along with ensuring data is being used in its proper context, Mildenhall said. "There is a real danger, if you do not … understand the data elements you use, you are going to get bad readings coming out," he added. He cited Google's attempt to predict flu outbreaks based on web searches, which worked until the company changed its algorithms.

Finding Reliable Proxies

Since personal lines insurers cover people and their property, one goal is to find relevant factors that indicate the behavioral risk of current and potential customers. In particular, much potentially relevant behavioral information for personal lines emanates from the "data breadcrumbs" people leave through internet searches, social media participation, digital wearables and mobile devices, as well as connected cars and dwellings, said Jim Guszcza, U.S. chief data scientist at Deloitte Consulting.

Using data footprints from multiple sources, such as online searching and shopping, for consumer marketing is a common practice for organizations, including insurers. What's different now is that insurers are finding some of this information helpful for building proxies predictive of potential behavior.

Credit scoring remains the best example of a reliable proxy that predicts how people are likely to behave by correlating biological and psychobehavior[1] with risk taking. It provides the proof that "a man drives as he lives," a conclusion from a 1949 research study.[2]

There are deep reasons why credit scoring works, including human brain chemistry and neurotransmitters, which is why impulse control with money and driving often have the same underpinnings, Mildenhall said. "People have reasonably fixed personalities to tease out," he explained, and since their behaviors tend to be immutable, additional information provides a better picture of risk.

The ultimate goal for personal lines predictive modeling is to find data that provides another useful psychological proxy like credit scoring. "If someone discovered the next credit score, (it would) get locked up in a vault and no one is going to talk about it," Mildenhall said. "It is a huge competitive advantage if you can figure that out."

Consumer information such as magazine subscriptions and purchases at home improvement retailers can

"If someone discovered the next credit score, (it would) get locked up in a vault and no one is going to talk about it," Mildenhall said.

[1] Brockett, Patrick L., and LindaGolden, "Biological and Psychobehavioral Correlates of Credit Scores and Automobile Insurance Losses: Toward an Explication of Why Credit Scoring Works," *The Journal of Risk and Insurance* 74:1, 2007, pp. 23-63.
[2] Tillman, W.A., and G.E. Hobbs, "The Accident-Prone Automobile Driver: A Study of the Psychiatric and Social Background," *The American Journal of Psychiatry* 106, 1949, pp. 321-331.
[3] See http://www.economist.com/node/21536605
[4] See http://blogs.deloitte.com/centerforhealthsolutions/a-tale-of-two-patients-making-the-case-for-life-style-based-analytics-in-health-care/

predict if a homeowner is committed to home maintenance and how that reflects risk. Insurers and vendors are already looking into these types of relationships, Mildenhall said.

Using credit scores to select and price personal home and auto is a familiar example of the predictive power of nontraditional behavioral data sources. Supermarket loyalty card data can be similarly predictive of people less likely to file claims.[3] More recently, the sort of lifestyle data traditionally used for target marketing has been repurposed to help infer individuals' health risks[4] — an application of use to life insurers and healthcare providers. As an added bonus, healthy consumers also are more likely to physically recover faster from accidents, which reduces medical costs.

While finding useful data for reliable proxies is a critical piece of the predictability puzzle, telematics offers something more novel: actual driver data. Considered by many to be the first true foray into the IoT, large insurers have enjoyed the competitive edge telematics can provide.

However, "the plug-in solution is on its way out," Mosley said, because smart phone tracking apps are proven to be just as effective as black boxes. "That will help a lot of small companies that could not pay for devices," he explained. Eventually, apps will become obsolete in the advent of imbedded devices installed by vehicle manufacturers and semiautonomous or autonomous cars, he added.

Guszcza said that while automobile telematics data is "particularly relevant for predicting auto accident frequency and severity," any behavioral data gleaned from nontraditional sources is potentially relevant for inferring various types of insurance risk behaviors.

Meanwhile, insurers are still learning how to benefit from all the telematics data they are or could be collecting, Mildenhall said, noting the technical problems with acquiring large amounts of detailed information on a real-time basis. Further, he noted, "underwriters and regulators are not happy with black box models in part because it is hard to prove they do not discriminate in some unwitting way."

In addition, usage-based insurance "is not something consumers are clamoring for and I don't see that changing relatively soon," added Mosley, due to privacy concerns and lack of a compelling value proposition. Consumer privacy concerns, of course, are not limited to telematics data. As the volumes and level of detail of consumer data continue to increase, insurers must be careful to use the information ethically, said Guszcza, who desires a greater industry conversation about data use.

Beyond human behavior data, personal auto insurers can access other useful information. For example, more data is available about the vehicles themselves through various vendors including CarFax, which can also fine-tune ratings, Mosley said.

Besides external sources, some insurers are discovering additional policyholder data that is useful for predictive modeling, Mosley noted, such as the date of policy purchase. Advance purchasing, like credit scoring, indicates responsible customers who also tend to have a more favorable loss history, he added. As a result, some companies are rewarding customers who buy policies seven days before the policy date with an advanced quote discount.

On the commercial side, there is greater accessibility of text data from claims adjuster notes, Monsour said.

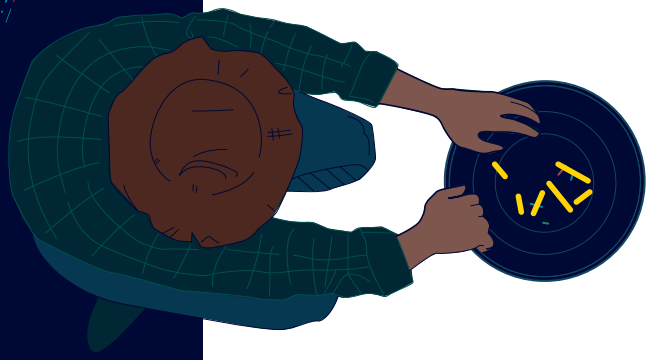
Commercial Cues

For commercial lines insurance, data availability varies greatly by line. When asked where predictive modeling will have the most impact in commercial lines, Guven cited workers' compensation, commercial auto, commercial property and business owners policies (BOP).

"The more data, the more common the risk, the more valuable our predictive modeling becomes," he said. For unique specialty lines, Guven explained, insurers do not have sufficient data for predictive modeling.

Detailed, granular data is already widely available on crime rates and weather; but looking forward, risk assessment for engineered buildings could be based on architectural and building plans, Mildenhall said. "By feeding plans into a computer, insurers can know the location of every nut and bolt and could use that for catastrophe risk assessment."

Commercial lines require more qualitative information than personal lines because there are more variables to



consider. A company's nature of operations and services being offered are two examples, Monsour said, because two companies can be considered retailers, but one that sells equipment has different risks than one that installs it. Other qualitative information includes management quality, liability chain/supply chain issues, strength of a company's hold-harmless provisions, and other risk transfer provisions such as contracts with subcontractors, he added.

Another major consideration is that while personal lines actuaries can rely on the fact that people generally do not change, commercial lines actuaries have to keep up with the dynamic nature of organizations, Mildenhall said, due to new management priorities, growth, location and other factors. "The company you measure one year can be different from what you measure next year," he explained.

The good news is that more useful data has become available for commercial lines predictive modeling, Monsour said. However, it requires very careful examination. In his experience with commercial lines data, "Many vendors do not have useful data and you have to evaluate them quickly to sort the wheat from the chaff." Many data providers are new to the insurance market, he explained, and might not have necessary historical data. It is critical, he advised, to determine how much coverage the vendor offers and how many customers the data covers, and to review a sample.

Vendors also offer similar types of data, but it is difficult to evaluate accuracy when cross comparisons of information among vendors is not possible, according to Monsour. Further, customers can have several company names or "doing-business-as" (DBA) names. "The data has to match the customers," he added.

While vendors are actively trying to sell external data to commercial insurers, some of the potentially best predictive information belongs to customers who are unwilling or unable to share it. From an IoT perspective, information from cameras and sensors located on many commercial properties would be helpful for pricing commercial package coverage, Monsour said. "The hard thing is getting permission to access the data," he noted.

This also holds true for telematics. While personal lines actuaries are benefitting from actual driving behavior information, commercial auto insurers are struggling to collect the same material about employee drivers. "The story of telematics is the fleet managers have the data but nobody wants the insurance companies to have it," Monsour said. To solve this problem, some insurers are offering discounts.

Another difficulty is that commercial lines insurers face limitations in using the same kind of personal information as personal lines can when the same person, in effect, is being covered. (This issue will be further discussed in part III of this series.) Employers usually

Already, forward-moving insurers are exploring the potential of IoT information in the home to detect problems with water leaks, carbon monoxide and other causes that lead to claims.

take the privacy of their employees very seriously and would likely have a lot more to lose than to gain, Mildenhall said. There are also employment laws and state insurance regulations that can limit what commercial insurers can use.

Future Data

While actuaries are looking forward to the IoT for its data potential, many sources believe realizing the data for modeling purposes remains years away.

Already, forward-moving insurers are exploring the potential of IoT information in the home to detect problems with water leaks, carbon monoxide and other causes that lead to claims. "The most I have seen up to this point are companies developing partnerships and/or other facilities to take advantage of this kind of information," Mosley said.

Some insurers are also offering discounts to encourage smart home detection. Liberty Mutual's Smart Home Discount Program rewards customers with savings for adopting self-monitored and professionally monitored protection devices for theft, fire and water; and the discount doubles if the customer allows data sharing for verification purposes. State Farm also offers discounts for certain smart home systems.

Even so, since older generations are more privacy-oriented, Mildenhall said, it would take many years for homeowners to install home IoT devices.

For commercial lines, Monsour said, insurers will be spending the next decade determining how to integrate coverage with IoT. For example, if a commercial insurer could integrate with a fleet management service — which optimizes factors such as routes and gas mileage — they would have access to a huge amount of information that is otherwise difficult to obtain, he explained.

"Similarly," he said, "integrating with a security company that has cameras in a warehouse would allow the insurer to use the cameras for other things, like detecting fire hazards on an ongoing basis and warning about them," or ensuring that the owner is having sidewalks cleared of snow.

Monsour is optimistic that IoT will provide additional useful data for commercial property coverage. Guven, however, is less hopeful about the predictability of sensor technology for it or homeowners policies.

Mosley sees great potential from drones that are currently taking photographs of property for purposes of claims adjustment. "These drones are collecting a ton of data. While companies might not be using it at the moment, I think it is information we are going to figure out how to use somehow — and it is going to become much more valuable," he added.

Sources are also hoping that converting text to data will also unearth more predictive power. "A lot of the most interesting sources about businesses," Monsour said, "have a lot of text. How do you best leverage that kind of information?"

Conclusion

In the quest to find predictive correlations within data, actuaries are finding that reliable, rich and contextual data that is useful for predictive modeling is becoming more available in some areas. However, data scarcity continues to leave important questions about risk unanswered, especially for commercial lines.

Looking forward, technological advancement, the continual expansion of data collection, potential revelations through IoT, consumer privacy concerns and regulatory determinations will greatly affect both the availability and usability of future data.

Ultimately, however, the models determine the value of data. The next article, "Modeling Predictability," will delve into the latest models, their purposes and applications beyond rating and pricing.

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

ON THE SHELF BY LAURIE MCCLELLAN

The Darker Side of Data

Weapons of Math Destruction **by Cathy O'Neil (Crown 2016. 259 pp. $26.00)**

In 2011, Sarah Wysocki, a fifth-grade teacher in Washington, D.C., was fired from her job — apparently by an algorithm. Wysocki, who had received excellent reviews from her principal and her students' parents, was given a low score that year by a model that evaluates teachers by crunching their students' test scores. When she questioned the decision, Wysocki was unable to learn how her low score was calculated because the algorithm was proprietary.

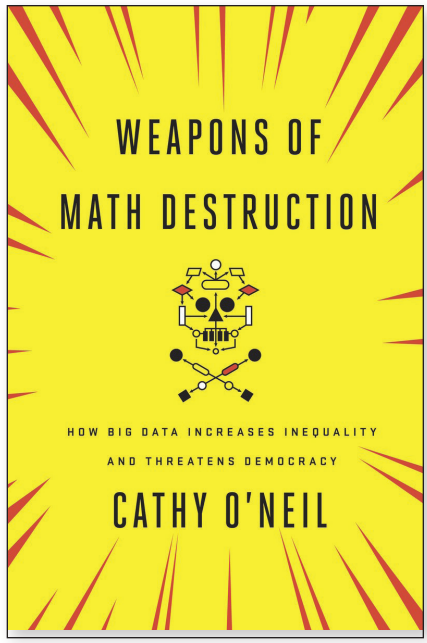
Data scientist Cathy O'Neil loves numbers, but as she points out, "Analyzing the test scores of only 25 or 30 students is statistically unsound, even laughable." As a result, she calls these types of big data algorithms run amok "Weapons of Math Destruction," or WMDs for short. In her first book, O'Neil invites the reader on a tour of the damage WMDs can inflict, writing, "Welcome to the dark side of data."

As a tour guide, O'Neil is a uniquely qualified insider. With a Ph.D. in math, she got a front-row seat to the workings of big data when she joined the Wall Street hedge fund D.E. Shaw as a quantitative analyst in 2007. In 1996 *Fortune* magazine called Shaw "the most intriguing and mysterious force on Wall Street today ... [with] market-beating algorithms so secret, even limited partners ... aren't entirely sure what's going on behind the curtain."

Watching the 2008 financial crisis unfold left O'Neil both disillusioned and determined to pull back the curtain. "The crash made it clear that mathematics, once my refuge, was not only deeply entangled in the world's problems but also fueling many of them," she explains in the book. "The housing crisis, the collapse of major financial institutions ... all had been aided and abetted by mathematicians wielding magic formulas." After leaving the hedge fund in 2009, O'Neil worked as a data scientist for an e-commerce start-up. She began blogging about the problems she saw with big data under the moniker MathBabe, then quit her job in 2012 to write the book she calls "a wake-up call."

O'Neil identifies three major problems with the magic formulas that turn into WMDs: opacity, scale and damage. As the fired teacher discovered, algorithms are often protected as intellectual property — and an algorithm you can't analyze is one you can't argue with.

Even algorithms that aren't secret can become a problem when their use spreads exponentially. Credit scores, for example, are now commonly used to judge job applicants. FICO scores are widely considered a fair and objective measure of whether someone will pay their bills on time. It's built from relevant data — a person's payment history. But it was never designed to predict whether someone is conscientious or hard working.



The result? Because medical bills are the most common cause of bankruptcy in the U.S., O'Neil argues, a bad credit score can easily stem from a past medical emergency, not a lack of responsibility. The damage inflicted by this misreading of data then escalates by creating a negative feedback loop. The person trying to recover from bankruptcy now has trouble finding a job ... which leads to more financial trouble, and a lower credit score.

Paved with Good Intentions

Ironically, O'Neil believes that many WMDs are born of good intentions and the hope that relying on data instead of human judgment can eliminate bias. "I

don't want to ascribe blame to people," says O'Neil. "They're using these risk scores because they want to do things fairly. But the problem is … that they're not actually fair." According to O'Neil, one flaw common to many WMDs is confusing correlation with causation. Recidivism scores are a case in point.

As the fired teacher discovered, algorithms are often protected as intellectual property — and an algorithm you can't analyze is one you can't argue with.

In many states, prisoners awaiting sentencing fill out a questionnaire, which is used to model their risk of becoming repeat offenders or violating parole or probation. Their answers can affect the length of their sentences. But among the questions are some that relate to factors beyond a person's control, like whether any relatives have criminal convictions. "We might have something that's very predictively accurate, like recidivism scores," says O'Neil, "but that doesn't mean that individuals should be held accountable for their risk. Because if my risk is high because I'm a black man living in a poor neighborhood, not because of criminal acts in my past, that's not fair … that is a confusion between correlation and causation."

While data analysts understand math and statistics, not all decision-makers do. O'Neil thinks that adds an extra layer to the WMD problem. "They're both afraid of math, and they trust math," she says. "There's an element of math that prevents people from scrutinizing and interrogating the actual decision-making process." As a result, she says, "the verdicts from WMDs land like dictates from the algorithmic gods."

Insurance: The Big Explosion

O'Neil sums up the collision of big data and health insurance this way: "Insurance meets big data and there's a big explosion." The problem, she says, is that "The big data movement is essentially incompatible with insurance. Insurance is pooled risk … in order for insurance to work, you kind of need to be ignorant in certain ways. In particular, you don't know exactly who's going to need the money."

With car insurance, O'Neil sees a different kind of damaging algorithm at work. The book cites a *Consumer Reports* study on car insurance prices that found adults in Florida with clean driving records, but poor credit scores, paid more — an average of $1,552 more — than drivers with drunk-driving convictions who happened to have excellent credit.

The result, according to O'Neil, is a pricing model that's fundamentally unfair and punishes the poor. "The other thing that's really frightening about [car] insurance," O'Neil says, "is that people are being charged more for risk in advance of actually doing something risky, in advance of getting in trouble or having a car accident, because of big data."

Calling All Actuaries

What can actuaries do about the intersection of big data and insurance? "I would call for them to make their own suggestions on how to deal with this," says O'Neil. "Because I would like to know what experts think. It's really hard. The example I gave in the book about understanding people's future health risk … and how that could play out for good or for evil … if your doctor had [data] to help you stay healthy, [versus] if an employer had it to prevent you from getting a job, because you pose expenses on a health plan. I actually don't know how to deal with that in a fair way."

O'Neil thinks that professional organizations can use their expertise to defuse damaging models. She points to a statement released by the American Statistical Association in 2014 on the shortcomings of the using value-added models (VAMs) to evaluate teachers like Sarah Wysocki. One sentence in the seven-page statement reads, "VAMs typically measure correlation, not causation: Effects — positive or negative — attributed to a teacher may actually be caused by other factors that are not captured in the model."

These statements can be effective, O'Neil says, because "the people building the models are relatively politically powerless … and they're working for their bosses. If an individual can point to a statement made by their society, and say, 'I'm just following the consensus in my industry,' then that gives the individual more power."

The Future of Big Data

Now that her book is finished, O'Neil is starting a new company called O'Neil Risk Consulting and Algorithmic Auditing. In its first phase, the company will consult with organizations about the risks they take on by using algorithms internally. The next phase, says O'Neil, "will be to build a tool that I could use more generally — and I want it to be open source, and I want people to understand what this tool is doing and how

it tries to measure fairness and discriminatory trends. And ultimately I would want this tool to be used by regulators, not myself."

Regulation, O'Neil believes, could hold the key to disarming WMDs. One example she cites as effective is the provision in the Affordable Care Act that prohibits insurers from charging people with preexisting conditions higher rates. "What happens here when there's a law," she says, "is that people who aren't yet sick pay a little bit more, and people who are sick don't have to pay as much as they would otherwise. So there's a little bit of a leveling of the playing field."

Another possibility for regulation: The U.S. could move closer to the European model in which it's illegal to sell user data. O'Neil would also like to see more transparency. E-scores, which are measures of creditworthiness based on factors like the geographic location of a user's computer, web browsing and purchase history, could be accessible to all consumers on an app.

O'Neil says she wrote the book "to warn the public," but now that it's finished, she says, "I have gotten a little more optimistic over the last four years … because more and more people are starting to step up and realize what's going on. I certainly have found a lot of people who are interested in talking about this," including sociologists, data journalists and researchers at Princeton who recently launched the Web Transparency and Accountability Project, which tracks bias in search engines and job placement sites.

Data scientists concerned about big data are a little like Dorothy at the end of *The Wizard of Oz*, when she pulls back the curtain to reveal an ordinary person, scolding him, "You're a very bad man!" "Oh no," he replies. "I'm a very good man. I'm just a very bad wizard."

O'Neil's book makes it clear: Big data has the potential to be helpful or harmful — the good man or the bad wizard. What people decide to do with the data will make all the difference.

CAS Members Present Findings at London "R in Insurance" Conference BY MARCELA GRANADOS LAVOIE

Practitioners and academics met this September in London, England, to learn the latest on loss modeling, reserving and pricing as well as the use of R in a production environment. The global "R in Insurance" Conference focused on applications in insurance and actuarial science that use R, the lingua franca for statistical computation. Dan Murphy, FCAS, from Trinostics, and I represented the CAS and presented our findings.

Widely used by actuaries and scientists, R is an open-source software whose use has also been advocated by industry leaders and clients. With big data taking the center stage, this year's conference was an ideal venue for practitioners interested in disruptive innovation/statistical techniques. The prestigious Cass University of London hosted the conference, which was developed by a scientific panel that carefully reviewed all submissions and brought together top consulting companies as sponsors.

Given the ever-changing business world, the CAS has put a lot of effort into keeping its members current and encouraging them to broaden their skills beyond the traditional demands of the actuarial market. Recent efforts include the creation of The CAS Institute, which is now is offering the newly created credential Certified Specialist in Predictive Modeling (CSPM), and changes to the CAS syllabus to include more statistical content. Presenting at conferences outside the CAS is another example of how the CAS showcases its members and their value to predictive analytics.

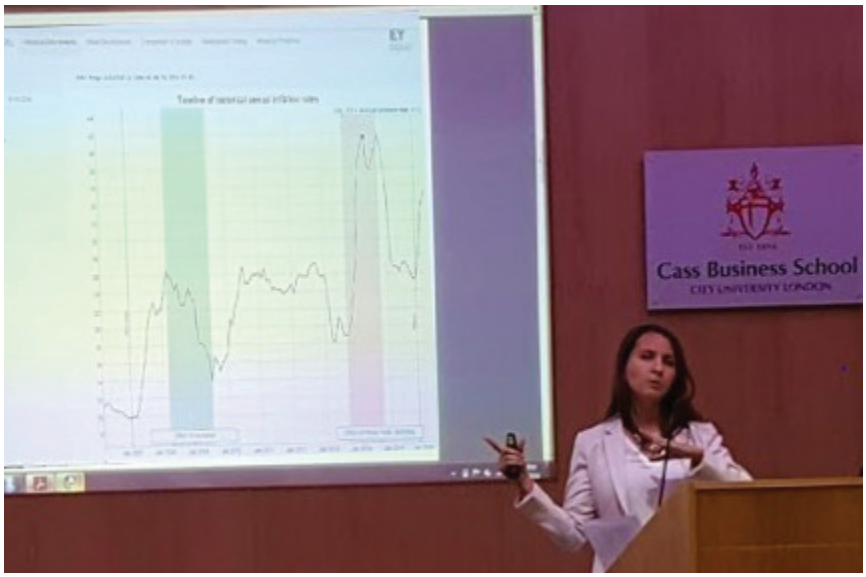
In my presentation, "Modelling the Impact of Reserving in High Inflation Environment," I focused on Argentina because of the complications arising from that country's high and changing inflation rate and its reporting methods. My solution to this challenge was a tool, capable of forecasting inflation to a reasonable extent using advanced time-series modeling. I used the inflation forecasts in a sophisticated frequency-severity reserving model to demonstrate the impact on reserves, which are crucial for insurance firms' survival.

The case study was Argentina Inflation and its leveraged impact on reserves. A time series model was built in R to respond to challenges of inaccurate inflation data and lack of reliability of public resources. The "Billion Prices Project" was researched and used as the input for her R inflation model. The time series analysis modeled the mean of in-

flation using an ARMA (auto-regressive moving average) model and the volatility using a GARCH (generalized autoregressive conditional heteroscedasticity) model.

In the closing keynote, Dan Murphy discussed his experience on how to provide persuasive actuarial advice to senior management using "The Three Cs": context, confidence and clarity. As conference organizer Markus Gesmann puts it in "Notes from the 4th R in Insurance Conference,"[1] "Context is about articulating the problem in a language senior management can understand … If you have a solution, then you have to deliver it with conviction, because, most importantly is has to be actionable. Clarity, of your actionable insight, ensures that those actions can be delegated to the relevant team/employee by the management without you in the room."

Murphy is a contributor to the ChainLadder package in R, which provides various statistical methods typically used for the estimation of outstanding claims reserves in general insurance, including those to estimate the claims development results as required under Solvency II. Some of the nontraditional reserving techniques that are available in this package are stochastic techniques (bootstrapping) and modeling (GLMs).



The author during her presentation.

In general, this conference offered great insight into cutting-edge predictive analytics and data visualization techniques through releasing R packages. During coffee breaks and dinner, the presenters and attendees from various many different continents shared insights about challenges faced by the insurance industry and how those challenges tend to be similar in many countries around the world.

Marcela Granados Lavoie, FCAS, is a manager in the advisory practice of Ernst & Young LLP (EY), focusing on predictive analytics in the insurance sector.

[1] http://www.magesblog.com/2016/07/notes-from-4th-r-in-insurance-conference.html

Data in the C-Suite — CAS Sponsors CDO Insurance Forum

In September the CAS sponsored the Chief Data Officer Forum Insurance 2016 in Chicago, an event that gathered insurance-specific chief data officers (CDO), chief analytics officers (CAO) and other senior analytics professionals. The purpose of the Forum was to foster discussions about the evolving demands of big data and analytics in the insurance space. Highlighting data's growing importance to insurance companies and services, the event also explored topics such as fraud analytics, predictive modeling, customer data management, disruptive innovation and data quality.

One panel, "Data Scientists and Actuaries — Partnering for Success to Maximize Business Outcomes," explored the growing intersection between actuarial and data science roles at insurance companies. Chris Monsour, FCAS, MAAA, vice president, analytics, CNA Insurance Companies, shared his personal experiences as both an actuary and data analyst, illustrating how the two functions can best collaborate within an insurance company.

Monsour serves as a subject matter expert for The CAS Institute, a new CAS

subsidiary that recently launched the Certified Specialist in Predictive Analytics (CSPA) credential. The CSPA will recognize expertise in the specialized area of predictive analytics for property and casualty insurance applications. The CAS Institute will also provide resources and a broader practice community for many specializations of the insurance industry's quantitative professionals.

Eric Huls, FCAS, SVP, Chief Data Science Officer, AllState, also presented a keynote At the September's Forum. In "Building Internal Bridges and Creating a Culture of Mature Analytics," Huls talked about data as a business function, explaining that the value of data is not just from having it, but from using it. Huls also defined the reality of becoming an analytics-driven organization within today's insurance market, and the change management that can foster a deeply embedded culture of analytics.

Actuary on the Street: Adler's Take on the CDO Forum

Avraham Adler, FCAS, CERA, MAAA, isn't a CDO, but he was intrigued by the content of the CDO Forum Insurance 2016. Adler, who is senior vice president, GC Analytics™ for Guy Carpenter in Chicago, attended the event and shared some of his thoughts from the day with *Actuarial Review*.

***Actuarial Review:* What were some of your take-aways from the event?**
Avraham Adler: For me, some of the take-aways from the event were that to perform efficient, high-throughput data analytics, especially on large data sets, requires planning and investment in the underlying hardware infrastructure as well as the software. Also that there is so much information "in the wild" that for an organization to keep track and remain current may require more than one person in the data analytics support role — separate and distinct from classic IT.

***AR:* What are some of the main challenges facing data analytics professionals right now?**
AA: I would say that one of the main challenges now is the relative newness and thus somewhat chaotic nature of the field. So many ideas and products are competing for the limited attention and resources of the data professional that it is hard to decide where to focus. Should investment be in hardware? Do we invest in people with knowledge and push off the inanimate (hard/software) investing?

***AR:* How does being an actuary play into data analytics skills?**
AA: I think one of the main advantages being an actuary offers is training and experience in understanding the data with which one is working. Not every data set can be equally considered "a bunch of numbers." Knowing the context in which one is working helps the actuary understand the limits of the data and thus the limits of any analysis to which it will be subject. Moreover, knowing the context of the problem and the data helps the actuary determine which method may be best under the circumstance. Similarly, understanding the context of the data and the problem allows the actuary to recognize when a result, even if valid, is inappropriate.

Avraham Adler

***AR:* What do actuaries need to know to succeed in data analytics? How do you feel about professional education for this expanding field?**
AA: I believe that the FCAS needs to know the basics of predictive modeling, and, more importantly, where to go to develop any needed expertise, but not that every FCAS needs to be a predictive modeling expert. Also, not every person who wants to spend their career in predictive modeling for the insurance industry wants to become an FCAS. Having the CAS, through The CAS Institute, develop, maintain, and test a curriculum geared to predictive modeling for risk ensures that the syllabus and testing will be recognized throughout the industry as comprehensive, rigorous and fair.

DIVERSITY

At the Casualty Actuarial Society, we believe that a diversity of perspectives and life experiences helps to create an actuarial profession that can grow and evolve to meet the needs of tomorrow. Learn more about our commitment to building a multi-dimensional actuarial profession at: casact.org/diversity.

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Morris Wins 2016 Reserves Prize; Shapland & Courchene Receive New Award

The CAS Reserves Committee concluded another successful call paper program that features four papers, which were presented at the CLRS and are posted in the 2016 Summer E-Forum on the CAS website.

This year the Ronald Bornhuetter Loss Reserve Prize for Best Paper was awarded to Jake Morris for his paper "Hierarchical Compartmental Models for Loss Reserving." Cited for its originality, the paper was described as "a fresh and different parameterization of the loss process" and that it "moves the current reserving research in the right direction." Morris is an actuary at Liberty Specialty Markets in London, England, and is a Fellow of the Institute and Faculty of Actuaries.

Jake Morris

Mark Shapland

Jeff Courchene

The Reserves Committee also a prize for the Best Practical Tool to accompany a paper. This prize had been in existence for a few years, but this year was the first time it was ever awarded. Mark Shapland and Jeff Courchene received the award for their paper "The Actuary and Enterprise Risk Management: Integrating Reserve Variability." Shapland and Courchene included two Excel spreadsheets along with their paper, which the committee found immediately practical.

Morris and Shapland were on hand at the seminar to accept their awards.

To read all the Reserves Call Papers, visit http://bit.ly/Su16EForum.

CAS Committee Launches Reserving Research Hall of Fame; Three Papers Inducted into Inaugural Class

BY JON MICHELSON, CAS RESERVES COMMITTEE MEMBER, RRHOF SUBCOMMITTEE CHAIR

To both honor and draw attention to certain important reserving-related papers and research, the CAS Reserves Committee has established the Reserving Research Hall of Fame (RRHOF). At the September 2016 Casualty Loss Reserve Seminar, RRHOF's inaugural class was announced, and the Committee seeks your input for future possible inductees.

The RRHOF Subcommittee of the CAS Reserves Committee has established criteria for RRHOF inclusion that include the concepts listed below. The following is not a strict set of requirements, but rather a list of matters to consider favorably when evaluating possible RRHOF induction.

- Originality/Value Added
- Wide Applicability
- Frequently Referenced
- Readability/User-friendliness
- Test of Time/Staying Power/Lasting Influence

Recognition by the RRHOF could include papers or articles, as well as other possible categories like presentations or models, or an author's body of work.

RRHOF's first class includes three papers that have been widely referenced and used by P&C reserving actuaries for many years.

- **"The Actuary and IBNR"** by Ronald L. Bornhuetter and Ronald E. Ferguson. 1972 *Proceedings of the CAS*.
- **"Loss Reserve Adequacy Testing: A Comprehensive Systematic Approach"** by James R. Berquist and Richard E. Sherman. 1977 *PCAS*.
- **"Distribution-Free Calculation of the Standard Error of Chain Ladder Reserve Estimates"** by Thomas Mack. 1993 *ASTIN Bulletin*.

"The Actuary and IBNR" is the source for one of the most frequently used reserve estimation techniques. Though now over 40 years old, the

"Bornhuetter-Ferguson Method" (and techniques using similar concepts) is still applied in the estimation of ultimate amounts for both losses and loss adjustment expense, reported and closed claim counts, and primary and excess layers.

Some of the methods introduced in Berquist and Sherman's seminal paper are still widely used as the go-to approach by many actuaries when performing reserve analyses in certain changing environments, especially changes in case reserve adequacy or claim settlement rates. The paper's descriptions and detailed examples have contributed to the techniques' transition from concept to application.

Thomas Mack has actually authored a series of papers on the important concept of reserve variability. The committee deliberated between the selected 1993 Mack paper and his 1994 paper, "Measuring the Variability of Chain Ladder Reserve Estimates," the latter of which had the extra advantage of being on the current CAS Exam 7 syllabus. In the end, the 1993 paper was chosen since it was one of the earliest of the Mack papers. At just 13 pages, it is relatively brief and may serve as a starting point when reading the Mack papers series.

Links to each of the three RRHOF inductee papers and more information regarding RRHOF criteria can be found on the CAS website at http://bit.ly/CASreserving.

Is there a reserve-related paper or other research that has had an important influence on your work and that you feel meets most of the RRHOF criteria listed above? The RRHOF webpage has a short form where we seek your suggestions for future RRHOF nominees.

While visiting the RRHOF page, check out other helpful material in the webpage sidebar, including links to reserving resources, reserve-related standards and principles, and reserve-related committees. Suggestions for other content ideal for practitioners are always welcome.

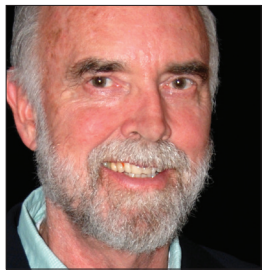
Jon Michelson, FCAS, is the owner of Expert Actuarial Services, LLC in Wildwood, Missouri, where he works as a consulting actuary.

Venter and Sahasrabuddhe Win 2015 *Variance* Prize

The *Variance* Prize for papers published in *Variance* volume 9 has been awarded to Gary Venter and Rajesh Sahasrabuddhe for their paper "A Note on Parameter Risk." The winning paper explores parameter risk, the uncertainty associated with the parameter values that are used to model a stochastic process. Unlike process risk, parameter risk does not diversify away when modeling a greater number of independent exposures. Thus, inadequate recognition of parameter risk can lead to a significant understatement in the actual risk of the underlying process.

In "A Note on Parameter Risk," Venter and Sahasrabuddhe examine the parameter uncertainty models associated with several common actuarial approaches to estimating parameters. This inventory of uncertainty models can provide a framework for better quantification of risk, and thus potentially better decision-making regarding underwriting and pricing of risks.

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.



Gary Venter

Rajesh Sahasrabuddhe

Gary Venter, FCAS, CERA, ASA, MAAA, is head of economic capital modeling at Chartis and teaches graduate courses in actuarial science at Columbia University. His 35+ years in the insurance and reinsurance industry has included stints at the Instrat group, which migrated from EW Payne through Sedgwick to Guy Carpenter; the Workers Compensation Reinsurance Bureau; the National Council on Compensation Insurance; Prudential Reinsurance; and Fireman's Fund.

Rajesh Sahasrabuddhe has provided actuarial consulting services for most of his career, including positions at a Big Four audit firm, an international brokerage firm, and a litigation support firm. He is currently employed in the actuarial practice at a leading management consulting firm.

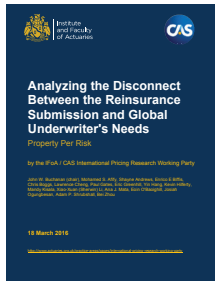
The winning paper is published in *Variance* volume 9, number 1.

Joint CAS/IFOA Research Working Party Wins Brian Hey Prize

A joint working party of the Casualty Actuarial Society's Casualty Actuaries in Reinsurance (CASCARe) and the U.K. Institute and Faculty of Actuaries' General Insurance Research Organization (IFoA-GIRO) was awarded the 2016 Brian Hey Prize for its pricing paper, "Analyzing the Disconnect Between the Reinsurance Submission and Global Underwriter's Needs." The announcement was made at the recent 2016 GIRO Conference in Dublin, Ireland.

The Brian Hey Prize is given by the IFoA in honor of Brian Hey, a senior and respected actuary who worked in general insurance. The Brian Hey Prize is awarded for the best paper submitted to each year's GIRO Conference.

Released in March 2016, the winning paper analyzes international property per risk exposures, emphasizing the critical importance of properly assessing the valuations of properties and related rating variables. The paper is now being used as a reference document by primary companies, brokers, and reinsurers globally to highlight the need for capturing the most important data elements used by reinsurers and forge a deeper understanding of how each of the elements fits together. The paper is available for free download on the CAS website.



Earlier this year, John Buchanan, FCAS, MAAA, chair of the joint CAS/IFoA International Pricing Research Working Party and one of the paper's authors, presented findings from the report at the CAS Seminar on Reinsurance.

To view past winners of the Brian Hey Prize, visit the IFoA website.

Taking a Break at GIRO in Dublin

GIRO attendees take a break from the 2016 GIRO Conference, which was held September 20-23 in Dublin. CAS Immediate Past President Bob Miccolis, CAS Executive Director Cynthia Ziegler and CAS Vice President-International Jeff Courchene attended. GIRO, or General Insurance Research Organising Committee, is a part of the Institute and Faculty of Actuaries (U.K.) that develops and builds on the strong research output carried out in the general insurance practice area.

ASTIN Working Party Releases Report on Reserving Practices for General Insurance Worldwide BY LOUISE FRANCIS

Culminating work begun in spring 2015, the ASTIN Working Party on Non-Life Reserving Practices recently conducted and analyzed a survey on non-life reserving practices throughout the world. The survey results were presented at the 2016 ASTIN Colloquium in Lisbon, Portugal, which was held May 31-June 3.. All those attending the colloquium were given a flash drive with working party results. A webinar on the working party results took place in September 2016.

Forty-two countries accounting for 87 percent of worldwide non-life premium participated in the survey. Countries were included from North America, Europe, Asia, Latin America, Oceania, the Middle East and Africa. The survey sought to understand key aspects of actuarial reserving practices, including what methods are used to provide the point estimate for reserves (referred to as deterministic methods), what methods are used to model reserve variability and what software is used in reserving.

Not surprisingly, the survey showed chain ladder as the most-used method for point estimates, followed by Bornhuetter-Ferguson. The loss ratio method also is quite widely used, and average cost and Cape Cod also enjoy wide use. Other emerging approaches and more statistically based methods, such as generalized linear models (GLMs), appear to be rarely used by actuaries for reserving at this time. These results are displayed in the "Main deterministic methods" graph,[1] taken from the working party paper.

Bootstrap and Mack are the predominant methods for reserve variability. According to the survey, some countries favor Mack (the U.S. and Germany) while others prefer the bootstrap (Canada and Australia). The multivariate Merz and Wüthrich[2] and GLM methods also are used, but MCMC (Markov Chain Monte Carlo[3]) appears to be used infrequently.

Based on the survey, the most frequently used tool in reserve analyses is Excel, though it is used less than 50 percent of the time. The next most common tool is specialized software, however, internally developed reserve specific software is also frequently used.

To access the report of the working party, visit the International Actuarial Association website at http://bit.ly/ASTINdocs.

panies in the survey perform reserve analyses quarterly, though some do them monthly. A small proportion, likely of smaller companies, conducted reserve analyses annually. Note that the survey respondents were predominantly working for medium ($50 M to $500 M of premium) and large (greater than $500 M of premium) companies.

Another notable outcome was the low representation of U.S. companies in the survey. Only six U.S. companies participated, and those companies represent merely 20 percent of the U.S. market. This compares to participation by 24 Canadian companies representing 80 percent of the market in Canada.

Another notable outcome was the low representation of U.S. companies in the survey. Only six U.S. companies participated, and those companies represent merely 20 percent of the U.S. market.

A surprising conclusion for me is that R is not used at all in reserving among survey respondents, even though the chain ladder library provides many functions useful for reserving applications.

The majority of insurance com-

The working party's survey results indicate an increase in the complexity

[1] http://www.actuaries.org/ASTIN/Documents/ASTIN_WP_NL_Reserving_Report1.0_2016-06-15.pdf

[2] Merz and Wüthrich describe a multivariate approach for combining chain ladder and additive reserving methods in their 2009 paper "Prediction Error of the Multivariate Additive Loss Reserving Method for Dependent Lines of Business," *Variance* 3:1.

[3] See CAS Monograph No. 1, *Stochastic Loss Reserving Using Bayesian MCMC Models*, by Glenn Meyers. Myers has also published a number of Explorations columns in Actuarial Review describing the use of MCMC.

of methods and technologies applied to reserving. For instance, there appears to be an increase in the use of reserve variability models. The working party believes that, in the future, more reserving methods will be applied at the individual claim level and the application of big data approaches will increase.

This latest report is the second one released by an ASTIN Working Party. In 2015 the Big Data Working Party released its report on data analytics in non-life insurance. The work on data analytics continues, with the terms of reference (TOR) for a follow-up working party on predictive modeling expected to be released soon. The TOR describes the working party objectives, provides the working party's schedule and is used to recruit working party volunteers.

Several years ago, ASTIN developed a goal to encourage the formation of working parties as a way to provide practical applied research to the international non-life actuarial community. Any member of ASTIN can organize a working party. The procedure for doing so is found at http://www.actuaries.org/ASTIN/Documents/ASTIN_WorkingParties_v6.pdf. A key component of initiating a working party is drafting the TOR. The working parties are one of the benefits of membership in ASTIN.

It's anticipated that the work of one or more new working parties will be presented in 2017 at the ASTIN Colloquium in Panama City, Panama, August 20-24, 2017. More information on next year's colloquium can be found at http://www.actuaries.org/panama2017/. CAS members are encouraged to propose a presentation for the 2017 colloquium.

Louise Francis, FCAS, MAAA, is consulting principal for Francis Analytics & Actuarial Data Mining Inc. in Philadelphia.

Join ASTIN and Reap the Benefits

ASTIN stands for the Section for **A**ctuarial **ST**udies **I**n **N**on-life insurance. Created in 1957 as the first section of the International Actuarial Association (IAA), ASTIN promotes actuarial research related to non-life insurance and the practice of actuarial work. ASTIN fosters collegiality among members of the actuarial community and is continually working to further develop the mathematical foundation of non-life insurance and reinsurance.

The following are some of ASTIN's main activities and some very good reasons to join ASTIN.

- **Professional Education:** Each year ASTIN conferences offers ASTIN members the chance to meet with academics and practitioners. These outstanding forums are knowledge exchanges among actuaries from around the world, who are engaged in various disciplines that apply research to practical problems. Financial or logistical support may also be available for members of emerging countries to participate in these colloquia — especially for those presenting papers.
- **Working Parties:** Acting as a framework for discussing scientific or practical subjects, ASTIN Working Parties search for solutions by combining the expertise of both practitioners and academic researchers. Joining these working parties gives ASTIN members the opportunity to interact with an international network of ASTIN non-life actuaries,
- **Webinars:** Offered several times a year, webinars are free to ASTIN members and feature discussions on the latest developments in non-life actuarial science, such as presenting the results of ASTIN working parties. Webinars also allow and encourage participants' questions.

As a member of the ASTIN section, you will also receive the *ASTIN Bulletin*, which is the IAA's scientific actuarial journal.

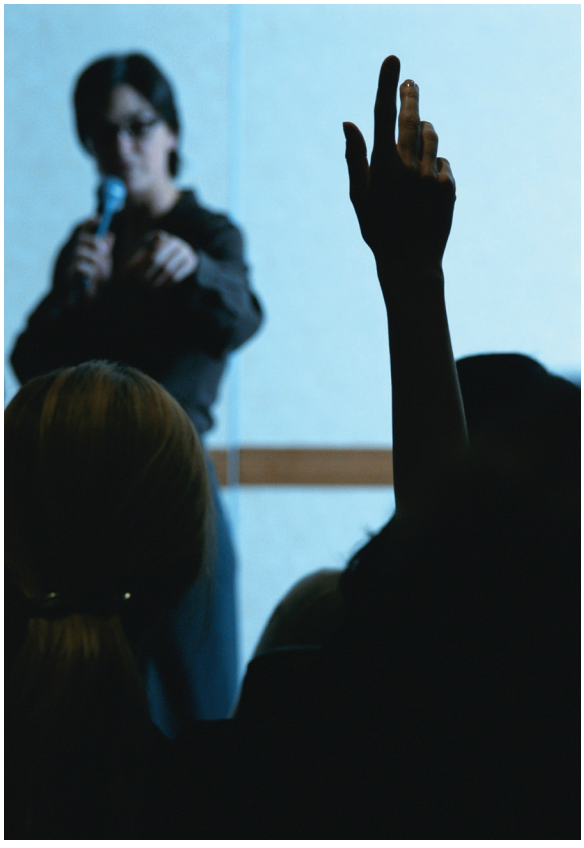
ASTIN membership sign-up typically occurs when renewing your CAS membership at the end of the year. You can check the box for ASTIN membership. Membership costs $40 per year.

IN MY OPINION BY GROVER EDIE

Questions and Answers

I am writing this piece in lieu of watching the second presidential debate. I started to watch it but got so frustrated, I elected not to continue. (Pun intended.) By not watching, I am not saying we should be uninformed about the issues or the candidates; I just got exasperated with that forum.

The moderators did not ask the candidates how they would perform the duties of the office, which is to execute the laws on the books. In turn, the candidates skirted the moderators' questions and answered a different question entirely.



It got me wondering: How many times have I acted similarly?

How many times have I asked a wrong or inappropriate question? How many times did I clothe an indictment in the form of a question? How many times did I ask a question, not to be informed, but to embarrass the recipient of the query? Words are tools, and how often have I used them as weapons?

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These were unsettling thoughts, to say the least.

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But I wasn't always on the asking side of the dialogue. I thought of the times I was asked difficult questions, and I thought of my responses.

How many times had I not answered the question that was asked, but instead answered the question I had hoped was asked or thought was asked or thought should have been asked? How many times did I simply miss the intent of the question? How often did I explain in too much detail or not enough? And how many times have I asked questions that were not appropriate for the work product being discussed?

I was reminded of a column I had written earlier this year, "Slow Down to Speed Up" (*Actuarial Review*, January-February 2016), and I realized that I need to slow down my responses. I need to slow down when asking and when answering.

As for answering, I first thought of "count to ten before you respond." That doesn't work for me. By the time I get to seven, I have forgotten the question. I need something else.

I recalled a little trick I picked up from taking the actuarial exams: Read every question twice before you answer it. So I decided to repeat the question in my mind before responding. In doing so, I might need clarification or might need a little time to think before answering. I think I am going to try that tactic for a while.

Asking questions will involve a bit more "pre-thought." I need to think about why I am asking the question first and then decide whether to continue.

And sometimes it might just be better to not ask a question in the first place; other times I might be better off by simply not answering at all.

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IT'S A PUZZLEMENT BY JON EVANS

Competition between Widget Manufacturers

General Widget Makers (GWM) is in a fierce competition with United Widget Alliance (UWA). Every day each company can choose to either raise or lower the price of its widgets by 10 cents. By law:

- The price cannot be unchanged from the previous day.
- The price change must be fixed for the whole day.
- The companies cannot collude or cooperate and must have no knowledge of what the price change for the other will be before both price changes are chosen for the day.

Neither company will ever exit the market, as each has determined the cost of withdrawal to far exceed the present value of any possible loss from participating into perpetuity.

Depending on the price changes for any given day, here is a table of the profit to GWM (equivalently the loss to UWA) for the day:

		UWA	
		Lower Price	Raise Price
GWM	Lower Price	-$30,000	$50,000
	Raise Price	$10,000	-$100,000

How would you recommend that GWM select its price changes over the next year to maximize its expected profit? Similarly, what would you recommend UWA do over the next year to maximize its expected profit?

Truth versus Politics

One of nine candidates will lower taxes, and the others will either raise taxes or leave taxes unchanged. The candidate who will lower taxes tells the truth. Candidates who will raise taxes lie. The candidates, numbered 1 through 9, make the following statements:

1. Either 3, 5, 7, 9 or I will lower taxes.
2. I will leave taxes unchanged.
3. Either 5 is telling the truth or 7 is lying.
4. 1 is lying.
5. Either 2 or 4 is telling the truth.
6. 3 is lying.
7. 1 is not going to lower taxes.
8. I will raise taxes, and 9 will leave taxes unchanged.
9. I will raise taxes, and 6 is lying.

You also know whether candidate 8 will leave taxes unchanged.

Bob Conger sent in the following solution. Begin with Candidates 8 and 9. For Statement 8 to be TRUE, 8a AND 8b must be TRUE (8a and 8b being the two component statements within 8). For Statement 8 to be FALSE, 8a AND/OR 8b must be FALSE. Similarly for statement 9.

Neither Candidate 8 nor Candidate 9 can be a tax-reducer, since tax-reducers tell the truth and each of these candidates claims to be a tax increaser.

If Candidate 8 were a tax no-changer, then Statement 8a would be False, meaning that Statement 8 would be False regardless of the True/False status of 8b. Thus, in this case the confidential information provided to us would not be sufficient to unravel the candidate mystery, in conflict with the characterization of the confidential information. Therefore, we conclude that:

- Candidate 8 is a tax increaser, and therefore:
- Statement 8 is False.

Statement 8 is False, but 8a is True. Therefore:

- 8b is False, and
- Candidate 9 is a tax increaser, and therefore
- Statement 9 is False.

Statement 9 is False, but 9a is True. Therefore:

- 9b is False, and
- Statement 6 is True. Therefore:
- Statement 3 is False. Therefore:
- Candidate 3 is not a tax reducer.

Statement 3 is False. Therefore:

- Statement 5 is False.
- Statement 7 is True.

Statement 7 is True. Therefore:

- Candidate 1 is not a tax reducer.

Statement 5 is False. Therefore:

- Candidate 5 is not a tax reducer.
- Statement 2 is False.
- Statement 4 is False.

Statement 2 is False. Therefore:

- Candidate 2 is a tax increaser.

Statement 4 is False. Therefore:

- Statement 1 is True. Therefore:
- Either 1, 3, 5, 7, or 9 is a tax-reducer. Therefore:
- Candidate 7 is the tax reducer.

Solutions were also submitted by Kyle Bartee, Brock Childs, Sam Kessler, Billy Litner, Juan C. McNamara and Brad Rosin.

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

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Chief Actuary sought by Northeast USA reinsurer for Position 72795. FCAS with 17.5+ years of actuarial experience ideal. Strong programming, pricing, reserve analysis and financial reporting experience required. Should have large accounts or casualty reinsurance experience.

WISCONSIN – SENIOR ACTUARIAL ASSISTANT

For Position 72979, a senior property and casualty actuarial assistant is sought by a Wisconsin insurer. Requires 3+ years of experience. Pricing, reserving and financial forecasting of personal lines and commercial lines insurance. Exam support.

CONNECTICUT – PERSONAL AUTO ACTUARY

For Position 72763, our Hartford, Connecticut client seeks a personal auto actuary and predictive modeler. Must have 5 to 15 years of P&C insurance statistical modeling experience. ACAS or Senior Actuarial Analyst or Ph.D. or M.S. degree holder sought.

NEW JERSEY – PERSONAL LINES ACTUARY

Organization has asked Ezra Penland to find an ACAS for Position 72501W. Should have 5 to 12 years of actuarial experience. Personal lines pricing, product development, predictive modeling, reserving and actuarial modeling role.

ILLINOIS – ANALYTICS LEADER

For Position 72933, our Chicago client plans to hire a commercial lines pricing actuary and analytics leader. FCAS or ACAS. Commercial lines pricing experience is a must. Management experience and predictive modeling expertise preferred.

NEW YORK – PERSONAL LINES CAPTAIN

For Position 72499X, our New York client plans to hire a Personal Lines Captain. ACAS or near-FCAS actuary with 5 to 11.5 years of personal lines property and casualty actuarial experience ideal. Must have predictive modeling experience.

MISSOURI – ACTUARIAL ANALYST

For Position 72268, property and casualty actuarial analyst is needed by a Missouri insurer. Must have at least two years of P&C actuarial experience. Pricing, data analysis, rate filings, management reporting, reserve studies and special projects.

GEORGIA – CONSULTING ACTUARY

ACAS or FCAS consulting actuary is immediately needed by our Atlanta client for Position 72978. Requires 5 to 10 years of property and casualty actuarial experience. Some travel. Requires outstanding written and verbal communications skills.

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