

actuarialREVIEW

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PUBLISHED BY THE CASUALTY ACTUARIAL SOCIETY 

2017 THE YEAR OF THE CATs

There's A Lot to Learn From the
Nation's Most Costly Year
of Weather Catastrophes



2018 CAS Elections

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2017

Salary Survey

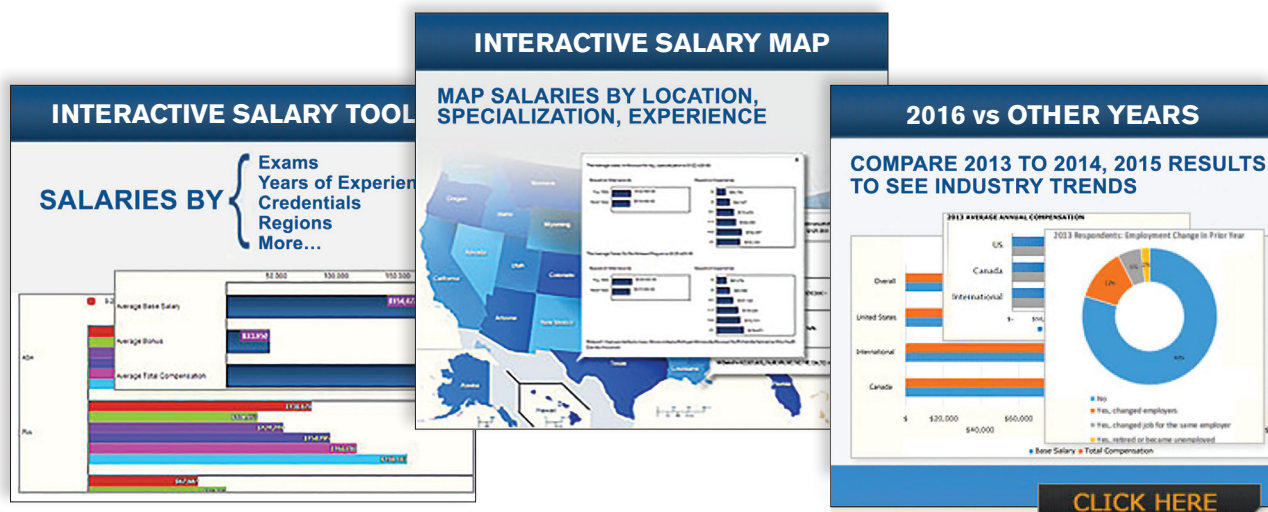
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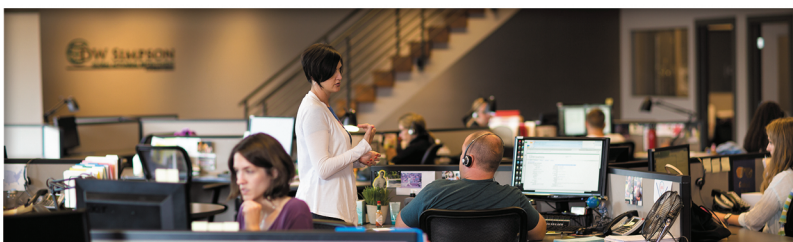
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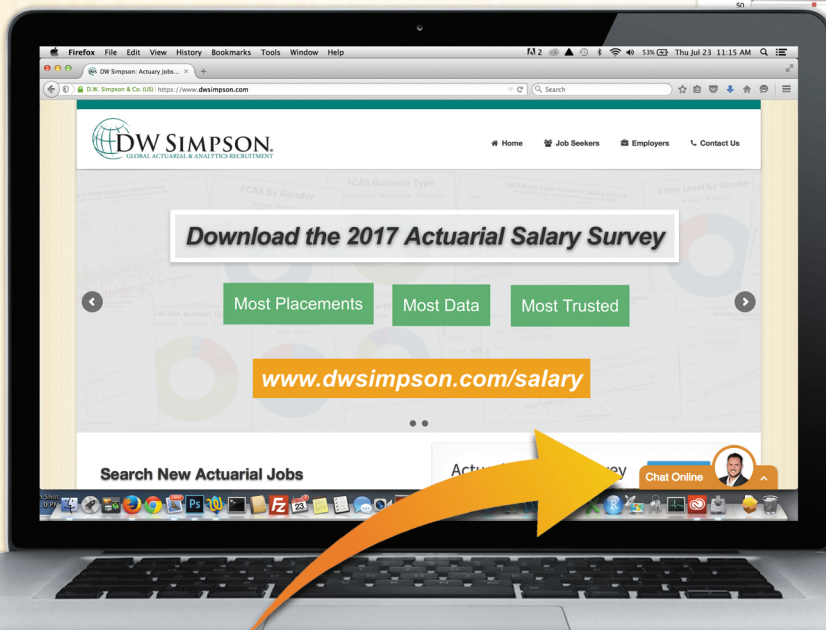
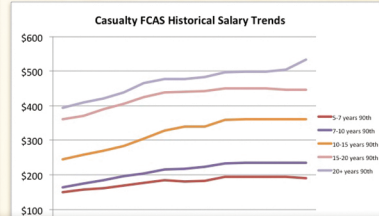
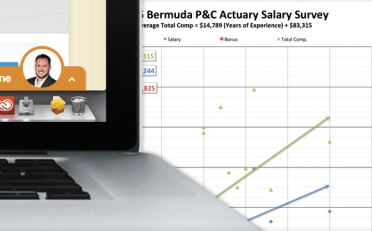
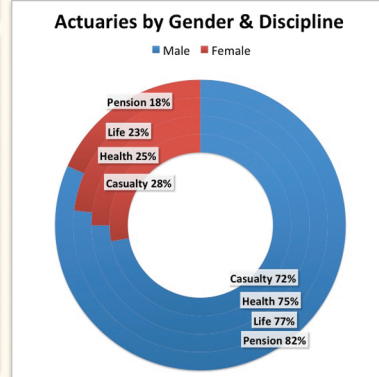
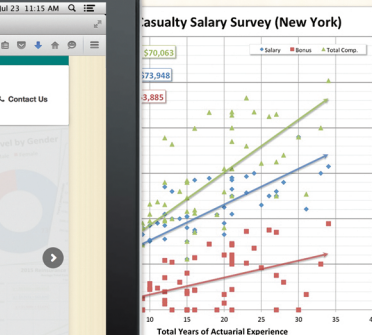
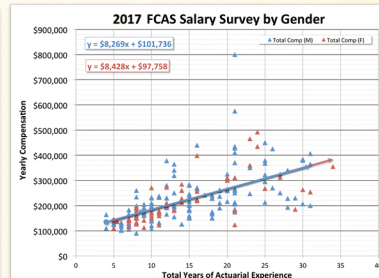
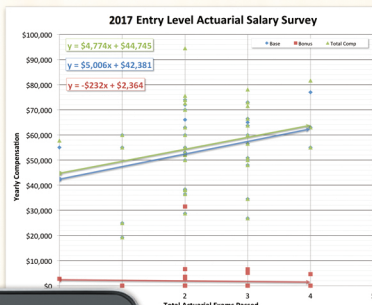
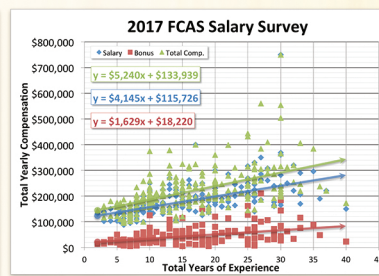
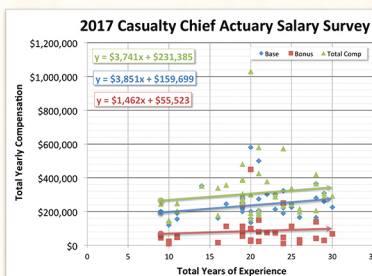


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2017: The Year of the CATs

BY ANNMARIE GEDDES BARIBEAU

The year 2017 was filled with numerous teachable moments regarding natural catastrophes.

2018 CAS Elections

Meet the Candidates for President-Elect and Board Directors.



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editor'sNOTE By ELIZABETH A. SMITH, AR MANAGING EDITOR

Summer's Here and the Time is Right

Summer is often a time to relax and recharge and to celebrate. Kicking off with a slew of graduations, students take a much needed break from academics to look forward to new challenges in the future.

Many people growing up could not wait for the day when they would graduate from school and no longer be tied down with studying.

Yet for many, learning no longer seems to be a chore but a necessity or a drive. It is a way to get that better job or develop that interest in a subject that you want to master.

This drive is evident in all CAS members. They didn't give up on learning — and we have the proof in these pages with photos of the new Fellows, Associates and CERA who celebrated important milestones in their careers this past May in Boston. (Woohoo, new ACAS Elizabeth Smith!)

At that Boston Spring Meeting, Mary Hennessey addressed the new members with some useful advice that applies to all CAS members, new and otherwise. Also, read what Richard Fein wrote in 1993 about actuaries in "Twenty-Five Years Ago in the AR" to see



how some concepts are evergreen.

Summer is also a time to plan. Brian Brown is planning for the future by investing time meeting with high schoolers and actuarial students at the many schools he has traveled to during his presidency. These potential new members are the hope for the future of the association. You can read about Brown's interactions with these bright young people in this issue's President's Message.

Summer is also the time to elect new CAS leaders. Take some time to meet the candidates for the upcoming election and learn about their plans for the future of the association.

We at the *Actuarial Review* hope that your summer or winter (to our members south of the Equator) is a fruitful time for relaxation and future plans. ●

Actuarial Review 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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The Future of the Actuarial Profession is in Good and Capable Hands

I enjoy visiting universities and speaking with students about the actuarial profession. The students have a lot of energy, ask great questions and are eager to learn. After visiting six U.S. schools that won the CAS University Award in 2016 and 2017, and several schools outside the U.S., I am confident that the future of the actuarial profession is in very good hands.

One of the biggest changes since my university days is the vast diversity of the student body. I enjoy interacting with people from different cultures and backgrounds and believe that diverse teams are more productive as they bring together different viewpoints.

A 2015 report by McKinsey & Company, "Why Diversity Matters,"¹ supports this. Based on its analysis of 366 public companies, it found that

those in the top quartile for ethnic and racial diversity in management were 35 percent more likely to have financial returns above their industry mean.

I was fortunate to grow up in a diverse neighborhood in a south suburb of Chicago. The neighborhood consisted of working class families with diverse backgrounds, including African-American and Hispanic families. There were also many families made up of first-generation immigrants such as mine; my mother was born in Austria. I played a lot sports, and it was apparent to me at an early age that the most successful sports teams were diverse teams.

My experience in college, however, was that the advanced math classes were not very diverse. Most of the students were white males, with a few women and some Asian students.

Today, the mix of students from around the world attending U.S. universities is amazing. I have met students from Mongolia, Malaysia, Saudi Arabia, China, Africa and India. These students all speak multiple languages and their English is exceptional. Most of the students intend to work in the U.S.; however, some want to apply their actuarial skills to provide insurance solutions in their native countries. Those who do return to their home countries often bring the CAS with them, leading to greater participation in the CAS as well as growing our membership. This was apparent to me when I visited Malaysia. I met with many of our members there last year, some who studied and worked in the U.S. before moving back to Malaysia. These members have created a strong

¹ mckinsey.com/business-functions/organization/our-insights/why-diversity-matters

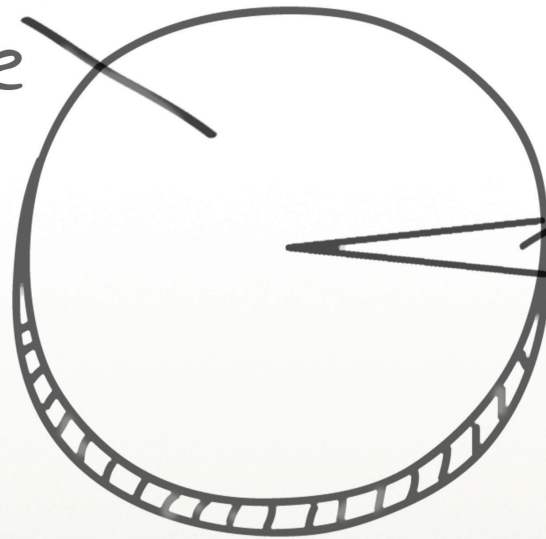
President's Message, page 8



Participants in the CAS Student Central Program held during the 2018 Spring Meeting.

$$q(w,d) = r \times \sqrt{\text{abs}\{m^2 w,d\}} + M_{w,d}$$

Time spent
crunching
loss reserve
numbers.

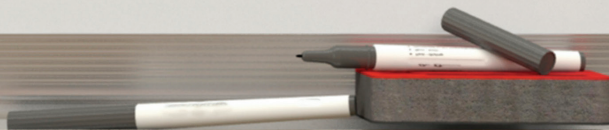


time to
think

It's time to
rethink reserving

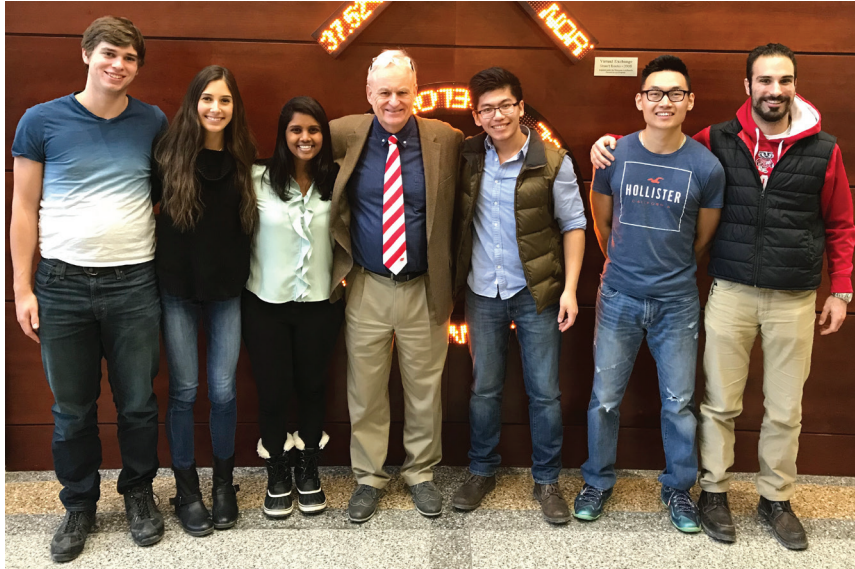
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President's Message

from page 6



Brian Brown (center) with officers of the Actuarial Science Club, at the University of Wisconsin-Madison.

CAS community in Malaysia.

Students of color from the U.S. are also better represented in actuarial programs today. Many universities hold summer programs to educate high school students of color about the actuarial profession. Women are also better represented today and are taking leadership positions. Of the schools I visited, at least half of the presidents of the student actuarial clubs were women.

The students also are more active in volunteer activities, from educating high school students about the actuarial profession, to raising money to end childhood hunger in India. Today's students seem to have a strong desire to give back to society.

A diverse student body can provide important and unique feedback in some cases. I know actuaries from Africa who were educated in the U.S. and who work in the U.S. on microinsurance projects

for Africa such as crop insurance. This is a much needed coverage when weather interferes with crop yields. Individuals from these countries likely have a better knowledge of local customs that affect the insurance process.

The students also are very knowledgeable about the actuarial profession and ask great questions. One student, for example, asked me how credit score was first discovered as a reliable predictor of insurance losses.

Compared to my college days, women, people of color and those from other nations make up a larger share of the actuarial programs. Many of these individuals are also in leadership roles. When I think about how the variety of students will challenge one another and further the profession, I know the profession is in very good and capable hands. ●

FROM THE READERS

Sea Level Rise

Dear Editor:

It was a beautiful Friday afternoon in the Philadelphia area, and my weekend was almost ruined by the news that the world's sea level is rising at the fastest rate in human history, threatening lives and property ("The SLR Factor," *AR*, May-June 2018) — and it was Friday the 13th, no less.

But I was comforted, perhaps falsely, by recalling that, despite the drastic rise in sea levels from 1990 to 2016 as reported by the Actuaries Climate Index®, the insurance industry over that time period has been, if anything, awash in capital. Not only that, but the segment most likely to see the impact first, the cat reinsurers, have been doing quite well — profitable enough to bring about a soft market for a number of recent years. Maybe measurements that are thought to be likely predictors of insurance losses are not measured as accurately as we assume, or are not as correlated with claims experience as we tend to believe. That gave me enough reason to believe we'll at least survive the weekend.

There's a cost to predictions of great catastrophes that do not come to pass. Let's be careful not only to warn of the possible devastation from sea levels rising, but also to see levels of risk through the data judiciously, with a healthy dose of professional skepticism.

—Mark R. Proska, FCAS

COMINGS AND GOINGS

Aritra “Ari” Chatterjee, ACAS, has been appointed to the position of chief underwriting officer or Envelop Risk, the London-based cyber insurance analytics and underwriting firm. Chatterjee was formerly the lead cyber underwriter with Hannover Re.

James Gilbert, ACAS, has been appointed to the role of executive vice president at W. R. Berkley. Gilbert has nearly 30 years of experience in the property-casualty insurance industry, most recently serving as president of BerkleyNet.

Mark D. Lyons, ACAS, has joined AIG as senior vice president and chief actuary, general insurance. Lyons is joining AIG from Arch Capital Group Ltd., where he served as executive vice president, chief financial officer and treasurer since 2012.

François Morin, FCAS, has been promoted to executive vice president

and chief financial officer at Arch Capital Group, Ltd. Morin joined Arch Capital Group in 2011 and previously held the position of senior vice president, chief risk officer and chief actuary.

Alice Gannon, FCAS, has been appointed to the board of SECURA Insurance. Gannon brings more than 40 years of insurance experience to her role, having most recently served as senior vice president and chief actuary of USAA. Gannon served as CAS president from 1999 to 2000. ●

EMAIL “COMINGS AND GOINGS”
ITEMS TO [AR@CASACT.ORG](mailto:ar@casact.org).

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on CAS member
activities? We post
real-time news on
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IN MEMORIAM

David Lawrence Larson (ACAS 1993)
1964-2018

Alan F. Royer (ACAS 1959)
1924-2018

CALENDAR OF EVENTS

September 5-7, 2018

Casualty Loss Reserve Seminar
(CLRS) & Workshops
Anaheim Marriott
Anaheim, CA

October 15-16, 2018

2018 In Focus Seminar: "Taking
Root: Insurtech in P&C Insurance"
Toronto Marriott Eaton Centre
Toronto Ontario

November 11-14, 2018

Annual Meeting
Caesars Palace Las Vegas
Las Vegas, NV

March 25-27, 2019

Ratemaking, Product and
Modeling (RPM) Seminar &
Workshops
The Westin Boston Waterfront
Boston, MA

May 19-22, 2019

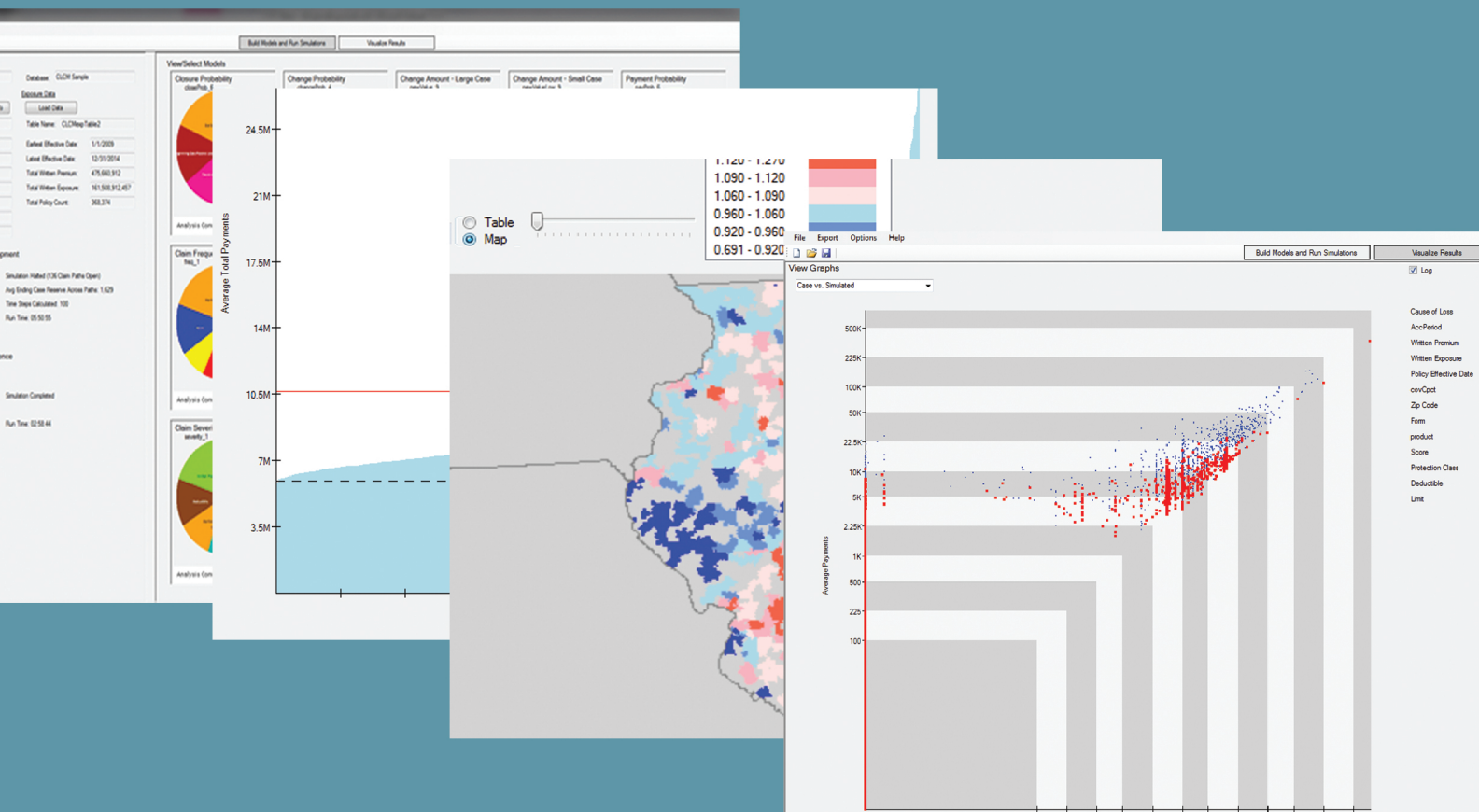
Spring Meeting
Hyatt Regency New Orleans
New Orleans, LA

June 3-4, 2019

Seminar on Reinsurance
Fairmont Southhampton
Hamilton, Bermuda

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MEET THE VEEP

Meet CAS Vice President-Research and Development Avraham Adler

Our Meet the Veep column introduces our members and candidates to the CAS Vice Presidents who serve on the Executive Council (EC). The EC is the governance arm of the CAS that oversees the operations of the organization. It consists of the president, president-elect, executive director and six vice presidents in charge of different functional areas.

In this installment, we are pleased to introduce the CAS Vice President-Research and Development Avraham Adler, FCAS, CERA, CSPA, who is in the midst of his first year as a vice president (VPs typically serve three-year terms).

What is your day-to-day job?

I'm a senior vice president at Guy Carpenter in New York City. My job includes a variety of tasks, including preparing company-specific analyses such as large-scale optimization studies for client reinsurance transactions and capital allocation; performing enterprise risk management analyses; developing and giving presentations for in-house employees, clients and business partners; and managing other actuaries. My job also includes a fair amount of in-house research, which fits in well with my CAS volunteer role.

What is your role as the CAS vice president-professional education?

I oversee the CAS's research function, which, broadly speaking, means imple-

menting the CAS Board of Directors strategic vision for research. This is a two-way street — while the board provides direction, I also bring ideas, issues and suggestions raised by the membership to the board.

On more of a day-to-day basis, I manage our research committees, such as reserving, ratemaking and reinsurance research, which are responsible for facilitating and supporting research projects through calls for papers and funded research.

The ultimate goal is to allow CAS members to move the boundaries of casualty actuarial science.

What volunteer work had you done for the CAS that led to your appointment as VP?

I started volunteering for the CAS as soon as I became a Fellow, but I took a different path than most new Fellows. I bypassed the typical Exam Committee route and joined a research committee, the Committee on Reinsurance Research.

From there, I have mostly been involved in groups focused on either conducting research, such as the Cyber Risk Task Force and various research working parties, or publishing research, such as the Editorial Committee and Publications Management Board. I have also done peer review for *Variance*.

I took a different volunteer opportunity a few years ago, when I was asked



Avraham Adler

to serve on the CAS Nominating Committee as the "New Fellow" (an FCAS with less than 10 years' experience). This gave me exposure to the CAS governance process, where I saw firsthand the care, dedication and passion our volunteers have for managing the CAS. This inspired me to continue giving back and to look for leadership opportunities. After an unsuccessful run for the board of directors, I was honored to accept the appointment of vice president.

What are your goals as the CAS vice president-research and development?

The goals of the CAS vice presidents are well-defined. As I mentioned, the board of directors sets the strategic direction of the CAS, with a set of objectives articulated in the CAS Strategic Plan. The VPs identify goals that support these objectives.

I have goals for our traditional approaches to research, such as funding projects on priority topics through our traditional committee structure. One

goal in particular is building research communities of interest. These are neither committees nor working parties. They are CAS-sponsored email discussion lists. Consider them as virtual break rooms into which actuaries can drop in and out at will and be involved to whatever extent they wish on topics that may interest them, prompted at times by a moderator seeding the conversation. The point is to create an informal place where actuaries can go to discuss a particular research area, with the opportunity to take the discussion further by spinning off a more formal research committee or working party.

I wrote about the development of these communities in detail on The CAS Roundtable blog for anyone who wants to learn more. I encourage members to join the conversations!

We think this new initiative can help address some of the stagnation we've seen around the CAS research function — member involvement in research is not growing at the rate that membership is growing. With more members thinking about research problems, we can rejuvenate and reenergize research in the CAS and continue pushing the boundaries to make everyone better.

Could you share an interesting fact about yourself?

I was born and bred in New York City. Although I have spent time living in Miami Beach and now reside in upstate New York, I spent most of my life in the city, living in Manhattan, Brooklyn and Queens (during my days at Queens College University of New York). I love the city — it's an incredibly energetic place to be. But when it's time for an escape, I love a good book, especially the work of Tolkien.

When you meet new Associates and Fellows at the Spring and Annual Meetings, what information or advice do you try to impart?

To new Associates, I say, "Don't stop now. Keep going and finish your Fellowship exams. The further you get in your career, the less time you will have to sit for exams."

And to new Fellows, I say, "Enjoy real-life now that you have the time, but don't stop learning. Make sure that you understand statistical software and teach yourself some form of coding because it is the wave of the present. You'll have the ability to take your actuarial insights beyond the spreadsheet, which will make a big difference in your career." ●

From borough to beachtown to the city to upstate, Avraham Adler has lived in both the urban and bucolic.



CAS STAFF SPOTLIGHT

Meet Shelby Wolff, CAS Membership and Volunteer Manager

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

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

My primary role is to recruit and place volunteers for all CAS volunteer needs. My other responsibilities include working closely with the Leadership Development Committee to help develop and provide resources for CAS volunteer leaders, integrating New Fellows and Associates with the New Members Committee and providing support for our Regional Affiliates.

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

My favorite part of my job is when I finally get to meet volunteers that I work with at CAS meetings. It's always nice when I get to put a face with a voice!

- **What's your hometown?**

Muskegon, Michigan. If you look at your left hand it's located on the middle knuckle of your pinky finger.

- **Where'd you go to college and what's your degree?**

Central Michigan University.
Bachelor of Science in business administration. Fire up Chips!

- **What was your first job out of college?**

I worked as a catering manager for a fast-casual, Mexican restaurant chain. The best part was all the free tacos and guacamole you could ever want!

- **Describe yourself in three words.**

Bold, friendly, observant.

- **What's your favorite weekend activity?**

Sleeping in is my favorite thing to do on the weekends — also having brunch with friends or taking mini-



Shelby Wolff

trips to visit friends and family. Now that the weather is nice, you can probably find me relaxing by the pool or sipping wine at one of northern Virginia's many wineries!

- **What's your favorite travel destination?**

I frequently visit my family in Michigan, but that's not too glamorous. My next destination that I would like to cross off my bucket list is Iceland!

- **Name one interesting or fun fact about you.**

I never learned to ride a bicycle. So, I really don't know what they mean when people say, "It's like riding a bicycle." I've been taking cycling classes for about a year now, so who knows? Maybe I just picked up a new skill! Stationary bikes are the same as moving bikes, right? ●



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

Entropy, WC and the Casualty Actuary

In an August 1993 article, "Entropy, Workers' Compensation, and the Casualty Actuary," Richard Fein writes about the importance of casualty actuaries in a time of rapid change in the insurance industry. His observations are still valid.

Four observations

1. Actuaries serve business.

They measure the costs of alternative risk transfer and retention protocols. As such, they have to participate in the environment that businesses operate in: competition. We need to have the same skill sets that every business person needs today: financial skills, communication skills, management skills, and a heavier knowledge of the macro forces which shape the business operating environment.

2. Actuaries serve the consumer.

The risk transfer and retention product serves a valid social need. It is the safety net which permits the fluid operation of commerce and the protection for the economic stability of society. As such, actuaries should participate in the environment in which the product exists. Actuaries need to be students of the forces and trends which shape the fluctuating needs and demands, as well as the perceptions of the members of society . . .

3. Actuaries serve the actuarial craft.

Researchers need feedback on the direction for their work. We are lucky to have among us individuals with the skills that can advance the tool sets we use and expand our capabilities. We have to do a

better job of communicating with these special craftsmen by identifying the areas in which we must become facile if we are to continue to serve. We need more tractable work on risk assessment and profitability, particularly the contribution to profitability of financial and risk transfer/retention products. Improvements on a micro scale, while technically interesting and satisfying, will do nothing to improve management's ability to reach its goals . . .

4. Actuaries serve as professionals.

We have garnered a high degree of respect amongst ourselves and some of the people we contact, but an unfortunate number find us a profession to be tolerated (at times barely), overly analytical, and an obstacle. In the natural drive in many to "succeed" and be accepted, there is a tendency to try to fit in and perhaps acquiesce. There is a balance between adherence to rigid and dogmatic application of process, and the recognition that some of our methods of analyses, by their nature, do not directly consider all of the variables of risk. We need an even greater and widespread communication of the role of ethics and how to maintain professionalism under fire . . . ●

Walt Wright, FCAS, is the former editor in chief of Actuarial Review.

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Connecting Universities with CAS Members through the CAS University Liaison Program

BY JARIS WICKLUND, UNIVERSITY ENGAGEMENT COMMITTEE MEMBER AND WORKING GROUP CHAIR

The CAS University Liaison Program connects over 300 member volunteers, known as University Liaisons, with professors and students at colleges and universities worldwide. Introduced in 1999, the program was developed to facilitate the partnership between the academic community and the actuarial profession. This partnership is vital to securing the pipeline of high-quality candidates who will become future CAS members.

The primary goal of a University Liaison is to develop a relationship with educators and student groups at their school and, through these relationships, share all of the exciting prospects and resources that the CAS and the P&C industry have to offer. University Liaisons accomplish this goal in a variety of ways. They visit campuses each semester, conducting presentations to student clubs and in the classroom. The presenters discuss topics that range from introductions to the P&C industry to more in-depth subject areas such as catastrophe modeling. University Liaisons also assist in advising students and professors, and informing them of the extensive resources available through membership in CAS Student Central and Academic Central.

Thanks to the great efforts of the 60+ volunteers on the University Engagement Committee, there is a wide range of materials available to University Liaisons to educate professors and students about P&C topics. These materials include case studies, case competition toolkits and an escape



Ohio State actuarial students meet with CAS University Liaisons.

room toolkit as well as a P&C resource library with sample syllabi. Additionally, the committee creates education and networking opportunities for students and teachers, including webinars and in-person events.

The CAS University Liaison Program has a dedicated online community with tools and templates developed to facilitate campus visits. As a University Liaison myself, I know how much time and effort is required in visiting a campus. Therefore as chair of the program, I want to ensure that we make the process as easy as possible. We are continually reviewing and updating the available off-the-shelf presentations, the campus visit checklist, FAQs and answer guides, and informational handouts that the volunteers can easily distribute. We provide fun student giveaways, too!

At the start of each semester, we hold a kickoff webinar with the army of University Liaisons to orient them in their roles and to ensure that they

have the latest information on exams, the resources available to students and examples of what successful University Liaisons are doing with their schools (see "What Does a University Liaison Program Look Like?"). We also send periodic newsletters and obtain regular feedback through our University Liaison Activity Report, which allows us to monitor what is taking place across the program and helps us react with new or revised materials.

University Liaisons play a critical role in the CAS's mission by building and maintaining relationships that will help ensure the continued growth and development of the CAS. We plan on continuing to provide University Liaisons with the most effective support possible. Join us and become part of this exciting team! ●

Jaris Wicklund, FCAS, is an actuary at The Hanover Insurance Group in Worcester, Massachusetts.

What Does a University Liaison Program Look Like?

Arizona State University

Interactive and *rewarding* are the words Dr. Jelena Milovanovic, professor of practice at Arizona State University (ASU), uses to describe the CAS University Liaison Program. For the last



four years, ASU liaison Melissa Tomita, FCAS, has been an active presence on campus, helping to expose students to the P&C industry. In 2016, she and Dr. Milovanovic partnered to run a CAS Case Competition, which has become an annual event each of the last three years. Tomita has also facilitated mock interview nights, met with students one-on-one, and was the first industry partner to mentor a student honors thesis project over the past academic year. ASU is a recipient of the 2018 CAS University Award.

Bryant University

Bryant University has a team of CAS University Liaisons who work closely



with its actuarial science faculty. The liaisons David Deacon, ACAS, Joe Muccio, FCAS, and James Wood, ACAS, support

the university in a number of ways. They assist with the annual Bryant Case Competition each fall, preparing the data

with which the students will work and advising the students as they participate in the competition throughout the semester. During the spring semester, they facilitate job-shadow events at three companies for groups of students, which they have done in 2017 and 2018.

Deacon has taught a casualty reserving course since 2016 and Wood has developed a ratemaking course scheduled for the upcoming academic year. Bryant mathematics department chair Kris Kennedy says that the University Liaisons have helped students secure internships and jobs in Rhode Island and other parts of New England. "[University Liaisons] have the opportunity to get to know our students personally, and they are most willing to help them find the right job," says Kennedy. "We are most appreciative of all they do for our program, and we look forward to a long relationship with them that will build every year."

The Ohio State University

For several years, The Ohio State University has had a close relationship with its CAS University Liaisons. Since 2013, they have worked together to host an annual event featuring actuaries representative of several areas within the P&C industry. Organized this year by their University Liaison Tony Hovest, FCAS, this annual event exposes actuarial students to the wide range of opportunities available. Liaison volunteers have provided curriculum guidance to academic advisors and have worked closely with

the CAS Student Ambassadors, including 2018 graduate Phillip Sanderell, to plan events for the students.

University of Toronto

CAS Fellow Li Li Lin, CAS Associate Jimisha Hooda and CAS Candidate Shivani Karani make up the University Liaison team at the University of Toronto. They have partnered closely with CAS Student



Ambassadors Davis Yuan and Akmar Chowdhury and the campus actuarial club to plan a variety of engaging and informative events for students. Their activities include conducting workshops (resume-building, and introductions to Excel, ratemaking, reserving and the P&C industry) and exhibiting at the annual University of Toronto career fair.

How You Can Become a University Liaison!

The CAS University Engagement Committee maintains a target list of schools in need of University Liaisons and a list of schools with volunteer matches. If you are interested in joining a University Liaison team or selecting a school in need of a University Liaison, please contact CAS University Engagement Manager Tamar Gertner (tgertner@casact.org) for more information.

NEW FELLOWS ADMITTED IN MAY 2018



Row 1, left to right: Min Xu, Huixian Xie, Anuttama Sheela Mohan, **CAS President Brian Brown**, Mark Harrison, Helen Zhao, Wendy Coffing.
Row 2, left to right: Kathryn Yerry, Elizabeth Suter, Christopher Wunderlich, David Sidney, Jennifer Dyson, Dana Ryan, Kara Anderson.
Row 3, left to right: Eugene Itskovich, Nathaniel Yankelev, Brian Garfield, Alex Sadowski, Yiheng Zhao, Thomas James Harrington.



Row 1, left to right: David Back, Wenuyan Shi, Luchen Wang, **CAS President Brian Brown**, Eunice Lim, Rebecca Chow, Andrew Brady.
Row 2, left to right: Yu Shi Feng, Christopher Cahill, Derek Shupe, Erin Yetter, Daniel Swain, Phillip Spolarich, Ka Lap Au.
Row 3, left to right: Chun Hei Ng, Clayton McFerran, Yilin Wei, Ross Fernwood, Steven Burak, Jiten Voralia, Adam Peleshok, Patrick O'Rourke.



Row 1, left to right: Carl Sorel, Jeffrey Katzman, Alex Butensky, Mohan Sivapatham, **CAS President Brian Brown**, Sumit Koli, Jordan Pilgrim, Jin Lin, David Bagnoli.

Row 2, left to right: Marc Pezzicara, Kunshan Yin, Vincent Chartier, Abigail Korthals, Julia Spence, Sonia Fincke, Meghan Gaier, Amelie Fournier, Melissa Brisson.

Row 3, left to right: John Massari, Kalev Maricq, Adam Rinker, Ho Yen Chung, Alexandre Dion, David Yuan, Adam Braithwaite, Jonathan Garellek, Ruiqi Li, Delyan Georgiev.

New Fellows not shown: Justin Ahn, Stephanie Aube, Yat Fung Chan, Jose Couret, Crystal Garcia, Hyunho Kang, Ik-kyeom Kim, Eric Kitchens, Victoria Marciano, James Pilarski, Sergey Sidorov, Arooran Sivasubramaniam, Anderson St. Hill, Deborah Volstromer, Shuai Wang, Hang Chun Yu, Hengyu Yuan.

NEW FELLOWS BY MUTUAL RECOGNITION

Jean-François Greeff
PricewaterhouseCoopers
Fellow of the Institute and Faculty of Actuaries, U.K.

Ben Ratcliffe
Zurich North America
Fellow of the Institute and Faculty of Actuaries, U.K.

Alan Tiernan
Arch Capital Group Ltd.
Fellow of the Institute and Faculty of Actuaries, U.K.

Jiten Voralia
Swiss Re
Fellow of the Institute and Faculty of Actuaries, U.K.

NEW CHARTERED ENTERPRISE RISK ANALYST

Janet Qing Wesner, FCAS

NEW ASSOCIATES ADMITTED IN MAY 2018



Row 1, left to right: Raymond Rabel, Allison Brune, Rachel Soich, **CAS President Brian Brown**, Winnie Sloan, Scott Brown, Kwan Yee Gladys Wong.

Row 2, left to right: Andrew DiFronzo, Hilary Spink, Dorothy White, Brooke Katzmarek, Zhiwei Wang, Jourdan Giambona, Li Qin.

Row 3, left to right: Erich Tjiawi, Bradley Keuten, Ya Zhang, Jeffrey Reed, Justin Rubin, Xinyue Li, Gary Cummings.



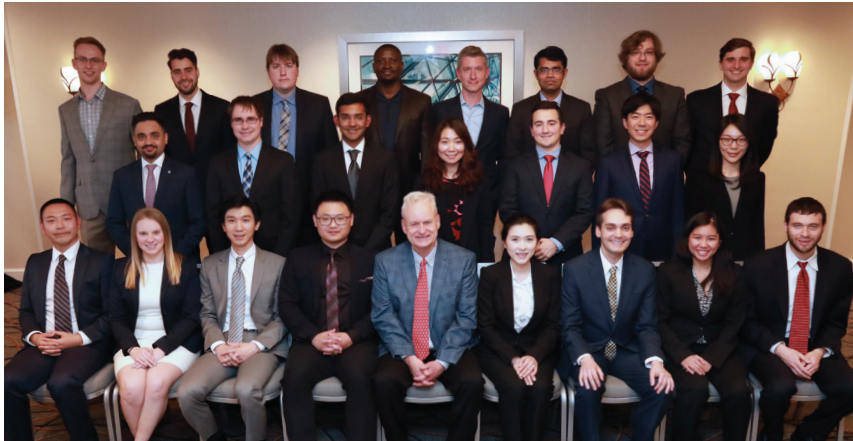
Row 1, left to right: Cindy Vigue, Kaitlyn Sutter, Alyssa Bassler, Katherine Pipkorn, **CAS President Brian Brown**, Jennifer Johnson, Kari Vaughn, Arun Madappat, Brandon Middlebrook.

Row 2, left to right: Tingjiao Chen, Zixuan Li, Taylor Martin, Victor Araujo, Alyssa Westfall, Tiffany Valdecantos, Le May Foo, Kylie Gauthier.

Row 3, left to right: Robert Golightly, Katherine Hiltz, Noah Williams, Hyun Jin Park, Micah Zart, Bradley Sevcik, Peter Klinner, Asiri Gunathilaka.



Row 1, left to right: Yuta Saito, Hien (Haley) Dang, Joyce Li, **CAS President Brian Brown**, Kathryn Vista, Juhyun Yi, Alyssa Webb.
Row 2, left to right: Ting Xia, Li Chen, Sergio Cornejo, Peising Sichaleune, Tara Sooreechine, Erick Arnaldo, Austin Mancenido.
Row 3, left to right: Shmuel Wilhelm, David Hall, Devin Jones, Brendan Coker, David Bibo, Brian Choi.



Row 1, left to right: Zizhu Liang, Jennifer Bostedt, Robert Chin, Ziruo Wang, **CAS President Brian Brown**, Yu-Hsien Yang, Thomas Haggerty, Jovana Nguyen, David Washor.
Row 2, left to right: Gurinder Sekhon, Geoffrey Malott, Dushyant Pattni, Winnie Yuntao Chen, Justin Rosile, Andrew Tang, Yuan Zhuang.
Row 3, left to right: Simon Chowanec, Alexei Smolko, Jackson Hatch, Pelepala Alexis Coulibaly, James Fauerbach, Prem Prakash, Pavel Derlukiewicz, Benjamin Markowski.

NEW ASSOCIATES ADMITTED IN MAY 2018



Row 1, left to right: Rahim Rawji, Patrice Boily-Martineau, Jade Nasr, **CAS President Brian Brown**, Charles Lamarche, Coty Hallay, Eugene Kim.

Row 2, left to right: Jeffrey Huang, Michael Paradiso, Christina Doran, Kelsey McGowan, Gina Donnelly, Sarah Nimphie, Carmen Lam.

Row 3, left to right: Matthew diStefano, Nicole Harrington, Andrew Pisacano, John Hildebrand, Michael Cook, Daniel Aarhus.



Row 1, left to right: Brian Norton, Matthew Simcha, Vicky Liang, Annie Que, **CAS President Brian Brown**, Linda Kim, Timothy Vincze, Kyle Dolisi, Cheuk Kit Cheng.

Row 2, left to right: Karin Gore, Lindsey Halsey, Justin Caruso, Ying Meng, Jason Lam, Zachary Luety, Kenneth Hsu, Vaishnavi Chandhiramouli.

Row 3, left to right: Phillip Kall, Alexandre Guerin, Michael Gallenberg, Christopher Choi, Darren Toh, Jemmy Gu, Anthony Dake, William Stouffer.



Row 1, left to right: Emily Hendershott, Lief Godlin, Ryan Landers, **CAS President Brian Brown**, Kelly Bruett, Hana Carpenter, Dalesa Bady.
Row 2, left to right: Dennis Dionne, So Won Kang, Hao Wang, Xiaohua Cheng, Amelie Carrier-Bolduc, Giancarlo Lahura.
Row 3, left to right: Mitchell Tencer, Samuel Annan, Christopher Burgess, Joseph Testa, Joseph Krug, Kevin Dugal, Jean-Philippe Le Cavalier, Xiaoyang Leng.



Row 1, left to right: Benjamin Britzius, Evan Cole, Alexander DeWitt, Matthew Kendall, **CAS President Brian Brown**, Sylvia Espitia, Miles Espitia, Icon Mazzaccari, Andrew Baglini.
Row 2, left to right: Geena Baldi, Melissa Brown, John Dawdy, Paige Fox, A. Wil Edie, Adam Carvalho, Margo Mackenzie, T.J. Teo.
Row 3, left to right: Stuart Atkinson, Sandra Anunciacao, Daniele D'Antico, Minrui Tang, Jarred Quinlan, Gregory Kelleher, Tyler Sifers, Benjamin Singhurst.

NEW ASSOCIATES ADMITTED IN MAY 2018



Row 1, left to right: Kevin Knight, Matthew Schreckenberger, Megan Brown, **CAS President Brian Brown**, Taylor Norland, Carri Nicodemo, Elizabeth Smith.

Row 2, left to right: Kevin Ka Chun Suen, Brian Gorzkowski, Phillip Moon, Paul Chang Hoon Chae, Derek England, Safdar Ali.

Row 3, left to right: Kristin Ryan, Maxime Richer, Chad Conrad, Justin Ewald, Liam Ramsammy, Matthew Gliebe, Charles-Olivier Rondeau, Nicholas Klinka.



Row 1, left to right: Kenneth Amador, Alexander Martin, Kelly Gates, **CAS President Brian Brown**, Jacy Waldrop, Taylor Peltier, Alison Rexroat.

Row 2, left to right: Sara Moffat, Yun-An Liu, Lauren Harris, Meagan Dolby, Tyler Downs, Kathleen Fehr, Ford Keqin Lu.

Row 3, left to right: Drake Landry, Robert McDonough, Siqi Xu, Tyler Lantman, Alex Buzzell, John Callahan, Jan Kmiec, Abraham Bobrowsky.

New Associates not shown: Kathryn Bartha, Jonathan Boucher, Maria Bunner, Denisse Calixto-Michel, Douglas Carey, Karen Casatelli, Gregory Chambers, James Chan, Erik Christianson, Jillian Chung, Brian Davis, Julia Druce, Tanya Eshel, Pierre-Antoine Espagnet, Andrew Ford, Fengyu Gao, Wenyan Gu, Michael Hall, Tanner Harrie, Jackson Hatch, Cara Heffling, Brian Hunt, Ashwin Jayaraman, Gen Jin, Janet Kang-Gurvin, Bradley Keuten, Jaea Kim, Stephanie Lerner, Jiandong Li, Keah Chuan Lim, Yi-Hsuan Lin, Briza Ling, Zhenglun Lou, James Low, Siu On Leon Luk, Benjamin Marleau Donais, Brian Mastro, Richard McCleary, Matthew Mielnik, Eliane Morin, Yue Mu, Chih-Heng Peng, Patrick Peters, Bryant Quinn, Viqas Shah, Kun Shi, Peng Shi, Tyler Silber, David Singh, Richard Slim, Karl Song, Leo Spornstarr, Gregory Stone, Alexander Svoboda, Brady Swope, Kelvin Tong, Matthew Tuite, Rick van den Hengel, Lawrence Wang, Saul Warhaft, Nathan White, Ryan Wilkins, Fangyuan Wu, Haotian Wu, Yichen Wu, Xiaoxiao Xie, April Yu, Frank Zhang, Lei Zhang, Qiao Zhang, Xiaoran Zhang, Tianchen Zhao.

CASUALTY · LOSS · RESERVE · SEMINAR

CL·R·S



September 5-7, 2018
Anaheim Marriott • Anaheim, CA

2018 Spring Meeting

1. **Award-winning author.** CAS President Brian Brown (right) presents Douglas Collins, FCAS, with a plaque for his paper, "Worldwide Tropical Cyclone Activity Measured Using the Actuaries Climate Index" Methodology." Collins's paper was judged the best submission to the 2018 CAS Call for Papers on Climate Change. The paper is published in the E-Forum, Spring 2018-Volume 2.
2. **Special guest.** Mary Downs, executive director of the American Academy of Actuaries, stands and is recognized during the CAS Business Session on May 14, 2018.
3. **Salut!** Meeting attendees take time to relax and enjoy the reception.
4. **Good tidings!** New Associate Samuel Annan (right) connects with friends at the New Associates Reception.
5. **Grip and grin.** CAS President Brian Brown (left) congratulates new Fellow Marc Pezzicara.
6. **A splendid time!** Colleagues catch up at a reception.
7. **Join the IABA!** From left to right, new ACAS Nicole Harrington, Matthew Duke, ACAS, and Gloria Gilliam, ACAS, reported on the activities of the International Association of Black Actuaries during the CAS Business Session. Membership is open to all who support the IABA mission. For more information, visit blackactuaries.org/.
8. **Time to celebrate.** New ACAS David Hall has a chat at the Reception for New Associates on May 13.
9. **Bringing down the house.** Featured speaker Jeffrey Ma spoke on "The House Advantage: How to Win with Data."
10. **A family affair.** Paul Braithwaite, FCAS, (far left) is the proud father of new Fellow Adam Braithwaite (far right). The father and son are joined by their spouses Nancy Braithwaite (center left) and Nicole Braithwaite.



May 13-16, 2018
Boston Marriott Copley Place • Boston, MA





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Pathway to the Credential

1. PROPERTY – CASUALTY INSURANCE FUNDAMENTALS



Covers the core principles underlying P&C insurance and risk management, and introduces the primary concepts needed for analyzing and modeling P&C data and risks.

2. DATA CONCEPTS AND VISUALIZATION



Covers the foundational concepts and tools associated with preparing and managing data and datasets to be used in quantitative analyses, predictive modeling and data analytics with applications for P&C insurance.

3. PREDICTIVE MODELING – METHODS AND TECHNIQUES



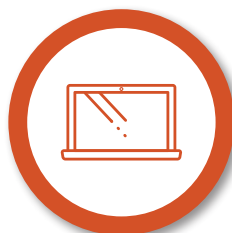
Covers the concepts, methods and tools used for statistical analyses, predictive modeling and data analytics for P&C insurance applications.

4. CASE STUDY PROJECT



Demonstrates a candidate's ability to apply the knowledge and skills covered in the other CSPA requirements.

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2018

CAS ELECTION

CAS Fellows will vote on a slate of candidates for the CAS Board of Directors and CAS president-elect, with online voting beginning on August 1, 2018. On that day, the CAS will email Fellows a link to the online ballot. Paper ballots will be mailed on August 1 to those Fellows who do not have an email address on file with the CAS office. Completed ballots must be submitted online or returned to the CAS office by August 29, 2018.

In the following pages, readers can learn about the candidates through the 100-word summaries they provided regarding their interest in running for CAS leadership positions.

More details about each candidate can be found in the Meet the Candidates section of the CAS website. Please contact Mike Boa (mboa@casact.org) with any questions or comments about the election process. ●



Meet the *Candidates*

President-Elect Nominee



Steven D. Armstrong

FCAS 1996

I want to bring refined focus and renewed energy to those things that the CAS needs to pursue as a growing global organization. I want the organization to feel momentum. I do not want to see our

volunteers, staff, and the board stretched too thin. I want to ensure that the future we envision is met by properly prioritizing the six strategic plan goals while recognizing that we will need to work with other organizations to achieve these goals. And I want to dare us all to be different!

Board Director Nominees



A. David Cummings

FCAS 2002

I recently completed a three-year term as CAS VP for Research

& Development and a member of the CAS Executive Council. As a CAS Board member, I will be committed to serving and strengthening the growing CAS community. As the CAS and The CAS Institute continue to grow, one of our key challenges is to continue to enhance the collaboration, learning and relationships that make the Society valuable to our members and our employers. The CAS will become even more valuable as we foster an even more dynamic and diverse community for casualty actuaries and related professionals.



Terri Dalenta

FCAS 1993

I have spent over 10 years in traditional pricing and reserving roles, and over 10 years

in enterprise risk management. I have also led product development, customer service and claims. In my current role as CFO at Grange Insurance, I have responsibility for accounting, audit, investments, actuarial, data science, strategy and risk management. I believe my training as an actuary made this progression possible. The Casualty Actuarial Society gave me the professional skills to ask the questions that need asked and think through problems analytically. The Society has given much to me, and I would like to give something back.



Andy Doll

FCAS 1997

I am honored to be a member of the CAS and am indebted to the Society and the

profession for what has transpired in my career. As a board member, I will continue to pay off this debt. The CAS is at a crossroads with how the society will look and perform going forward. The role of the board is to work with the staff and dedicated volunteer-based committees to shape the future and pick the correct fork in the road. The road to travel is the one of being proactive and building upon our foundation, creating an incredible dwelling.



Stephen J. Mildenhall

FCAS 1995

The CAS is facing many challenges. New tools are replacing ac-

tuarial judgment and actuaries must learn new skills to remain relevant. Our education process must reflect the best research and current practice, ensuring all actuaries are equipped with the tools necessary to compete successfully with other practitioners. My experience in education, research and 25 years of practice, encompassing the introduction of statistics into ratemaking, simulation modeling into ERM and catastrophe risk assessment, and computers into everything, gives me the ability to effectively help the CAS move forward. I am eager to serve on the board and ask for your support.



Matthew C. Mosher

FCAS 1999

I want to serve on the CAS Board to ensure the CAS and our designa-

tions remain the leading P&C designation in a changing insurance world and to expand risk without expanding travel time. While the high standards of the CAS are important standards to uphold, as we continue to see the sophistication of risk expand, the CAS must also remain focused on travel time for actuarial students taking exams. If we look to continue to expand the topics covered with-

out acknowledging the overall breadth of the topics, we will begin to develop jacks of all trades, but kings of none.



Julia Causbie Stenberg

FCAS 1997

As an enthusiastic, energetic CAS volunteer who has held leadership roles in critical ar-

reas of the organization, including three years as a vice president, I understand the issues facing the CAS. As a pricing actuary at an insurance company managing a talented team of actuaries, I see how the demand for our services has changed in recent years and how we might shape that demand in the future. I would love the opportunity to bring my experiences and unique point of view to CAS Board discussions as it sets the strategic direction for the organization.



Melissa Tomita

FCAS 2013

Remaining relevant is our biggest challenge. We need to become just as good at outreach as we are

at actuarial science! My experience as the chair of the University Engagement Committee and knowledge of the many CAS committees and programs will enable me to provide strategic direction to the CAS. The more rooted I become in the CAS community, the more I appreciate our diversity and wide range of

opportunities. We need to tell our story and give our members more visibility to the many initiatives. There are so many great things going on that people need to hear about!

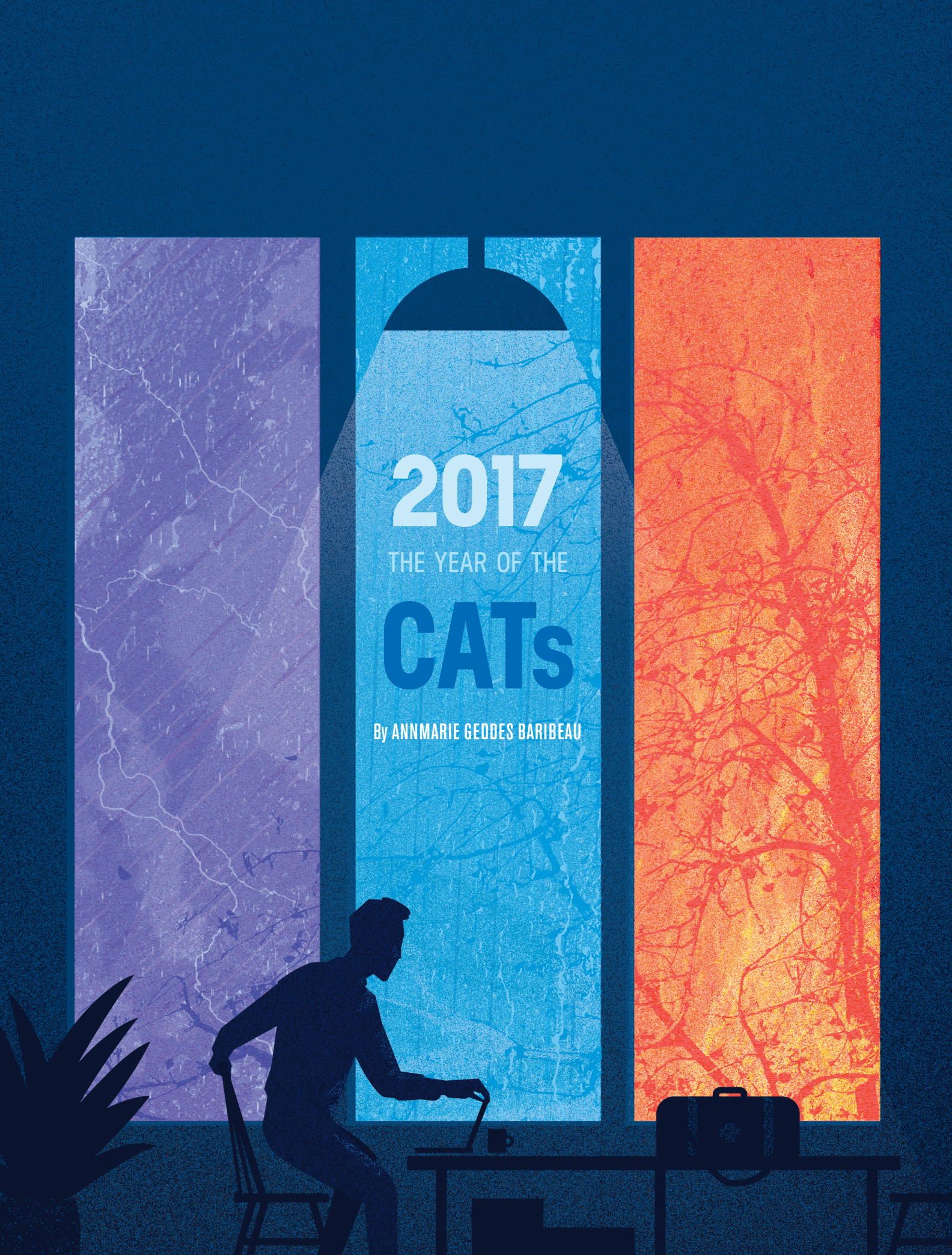


Jim Weiss

FCAS 2009

We as actuaries underestimate ourselves sometimes. Insurance is the promise to make someone

whole after a difficult time, and actuaries are stewards of this promise. This is awesome work. It is prudent to remain aware of how the world changes around us, but we don't need to feel insecure or morph ourselves into data scientists, digital disruptors, etc., if that's not who we are. I've always felt I make my greatest impact when I am who I am and, as a member of the CAS Board, I would like to help us practice this mindset as a profession. ●



2017

THE YEAR OF THE

CATs

By ANNMARIE GEDDES BARIBEAU

There's a lot to learn from the U.S.'s costliest year of weather catastrophes.

The year 2017 was the most costly year on record from natural catastrophes in the United States and its territory of Puerto Rico — *ever*. Major catastrophic events — Hurricanes Harvey, Irma and Maria, and last fall's combined California wildfires — notably broke their own records as well.

Shifting weather patterns will likely play a role in future loss severities, with the potential of stronger hurricanes and additional drought-fueled western wildfires causing larger losses. Socioeconomic shifts in the United States also increase the potential for more damaging future cats.¹

Other perils can cause cat events. From a geophysical perspective, the chance of earthquakes continually looms large. The Kilauea volcanic eruptions on Hawaii's Big Island and the ensuing major earthquakes demonstrate Mother Nature's worst. It also shows that people are willing to live in extremely vulnerable areas partly because they believe "the government will bail them out," observes Robert Hartwig, director of the University of South Carolina's Center for Risk and Uncertainty Management. "Kilauea is a recent illustration of how humans are creating and exacerbating the tragedy of loss and damage from natural catastrophes," he adds.

Besides costing lives and causing a historic financial loss, last year's major cats also allow the insurance industry to gauge its progress on loss prevention efforts and its ability to handle large cat events. While the insurance industry's claim paying resources have grown substantially since 2005 — the most expensive cat year for insurance losses on record largely from hurricanes Katrina, Rita and Wilma — significant vulner-

abilities from natural perils and large uninsured and underinsured populations.

The Financials

The economic cost of last year's four major cats and 12 other weather and climate disasters in the U.S. was \$306 billion,² according to National Oceanic and Atmospheric Administration (NOAA) estimates, which include insurer losses. "Last year will go down as the second costliest year for U.S. insurers of all time," says Don Griffin, vice president of personal lines for the Property Casualty Insurers Association of America (PCI). "At this point, more than 95 percent of the claims from the wildfires and hurricanes have been settled," he explains.


Last year's major catastrophes showcase the insurance industry's financial vitality. "The industry was able to internalize the losses and manage them financially and logically in a way that, quite frankly, should be the envy of every industry," Hartwig says. If similar circumstances happened to any other industry, he adds, it would lead to a plunge in the stock market.

However, 2017's major cats also left imprints, including profitability declines, according to industry reports. For U.S. P&C insurers and reinsurers, the 2017 combined ratio rose to 103.8 percent, a three point deterioration from 2016, according to "First Look — 2017 Property/Casualty Financial Results," released in March. Cat losses account for 10 points of the combined ratio, according to the report, which is based on data from carriers representing 96 percent of total industry net written premiums and 94 percent of total policyholder surplus.

Fitch Ratings' look at GAAP 2017 year-end results for 51 North American P&C insurers and reinsurers concludes that

¹ "Cat" is actuarial shorthand for catastrophe and will be used throughout this article.

² <https://www.ncdc.noaa.gov/billions/events/US/2017> (accessed May 4, 2018).



the combined ratio rose to 102 percent in 2017, up from 96.8 percent in 2016, according to its report, “North American Property/Casualty Insurers’ 2017 Results.” Cat losses rose to \$33.7 billion, or 9.5 percent of earned premiums, up from \$12.9 billion, or 3.9 percent in 2016, the March report states.

In a joint release in May,³ Insurance Services Office (ISO) and PCI estimate that P&C carriers’ 2017 net income declined nearly 16 percent to \$36 billion compared to 2016. Meanwhile, underwriting losses substantially rose to \$23.33 billion in 2017, up from \$4.71 billion the prior year, notes the ISO and PCI.

Investment earnings did cushion the blow. Insurer and reinsurance surplus grew 6.8 percent to \$733.8 billion in 2017, propelled by a \$39.4 billion rise in unrealized capital gains, according to A.M. Best. This was offset by a \$17.5 billion decline in other surplus gains and a \$4.4 billion increase in stockholder dividends. “Insurers, it seems, were fortunate in that what Mother Nature taketh away, Wall Street returneth,” Hartwig says.

Experiences of State Farm Insurance and Liberty Mutual Insurance Company — two of the nation’s top 10 largest personal lines insurance companies — provide glimpses into the financial impact of cat losses on insurers.

State Farm Group, the largest U.S. personal lines insurer, reports a pre-tax operating loss of \$1.7 billion due to a combined underwriting loss of \$6.5 billion in 2017 caused by “significant

catastrophe losses.” Meanwhile, the group’s net worth grew to \$97 billion, primarily due to an increase in the value of its unaffiliated stock portfolio.

Boston-based Liberty Mutual Holding Company saw net income drop significantly from \$1 billion in 2016 to \$17 million for 2017 partially due to the cats. When claims from the hurricane trio arrived during the third quarter, the insurer’s combined ratio climbed to 116.2 percent.⁴ However, the total 2017 combined ratio settled at 105.6 percent, a 7.3 point increase from 2016.

Due to the cause of damage and participation in insurance coverage, each major cat hit specific lines differently. Harvey especially affected the National Flood Insurance Program (NFIP) and private auto insurers. Because of the lack of personal lines coverage, commercial insurance bore most of Hurricane Maria’s insured losses in Puerto Rico. Homeowners’ insurers and ceded reinsurance partners covered California’s wildfires.

Irma greatly affected the Florida residential property market with sizable recoverables from the reinsurance market, according to Fitch’s report. Specifically, in 2017 the reinsurance and Florida specialist subsegments saw cat losses, as expressed in terms of earned premium, rise 24 percent and 11.6 percent, respectively.

For the NFIP, 2017 was the second worst loss year at \$9.335 billion for the hurricane trio alone.⁵ NFIP’s first reinsurance purchase last year was a great call, as the nation’s public flood insurer

³ <http://news.cision.com/property-casualty-insurers-association-of-america/r/property-casualty-insurance-industry-s-surplus-continued-to-grow-in-2017--despite-15-8-percent-drop-,cm112642>

⁴ https://libertymutualgroup.com/about-liberty-mutual-site/investor-relations-site/Documents/Q3_2017_Earnings_Presentation.pdf

⁵ <https://www.fema.gov/significant-flood-events>

recovered \$1.042 billion to pay losses.⁶ For 2018 the NFIP raised rates by 8 percent,⁷ bought \$1.46 billion in reinsurance⁸ and, for the first time, plans to transfer additional risk through insurance-linked securities on or about July 1, 2018.⁹ Due to last year's rise of flood claims, insurer interest in selling private residential flood coverage has slowed down a bit, Griffin observes.

U.S. cat losses comprised the largest cost to reinsurers around the globe. For Swiss Re Group, as an example, aggregate fiscal year net income dropped 91 percent to \$331 million, down from \$3.56 billion in 2016, partially due to U.S. cats.¹⁰ The group's combined ratio rose to 111.5 percent, up from 93.5 in 2016.

Lloyds of London, a major flood insurance backer in the United States, posted a pretax loss of 2.3 billion euros (\$2.7 billion) as of December 31, 2017 compared to a pre-tax profit of 2.5 billion euros (\$2.6 billion) in 2016. Its combined ratio deteriorated from 98 percent in 2016 to 114 percent in 2017.¹¹ Lloyds anticipates \$4.8 billion in losses from hurricanes Harvey, Irma and Maria, the *Miami Herald* reports.¹²

And yet, despite the losses, rates are stable overall. "The record catastrophe losses of 2017 are having a remarkably muted effect on P&C insurance markets in the United States," Hartwig observes. Pricing for homeowners insurance continues to move gradually upward. Commercial property and business interruption coverage prices, which had been declining, are now flat to up slightly, though increases are larger in catastrophe-impacted areas, Hartwig adds.

"Commercial and personal auto lines continue to see the most robust and sustained rate gains of all major P&C lines, but these trends are driven primarily by rising non-cat claim

severities," he explains. For reinsurers, he says, last year's high cat losses "arrested a multi-year slide in property-catastrophe reinsurance pricing, with 2018 rates flattening or even rising slightly for some categories of risk."

Strengths and Opportunities

Last year's cats reveal both the strength of the insurance industry and room for adjustment. For starters, cat modeling

has come a long way and continues to evolve. While most insurers and reinsurers are using hurricane cat models that combine only wind and storm surge, new models are becoming available that include flood risk, says Dag Lohmann, CEO of KatRisk, a catastrophe modeling company. He expects greater adoption of these models, including his company's, by the 2019 hurricane season.

New models for the wildfires in the U.S. and Canada are also becoming available, he says. "The whole industry is waking up to the fact that we need to better embed correlation of perils (among) regions or continents into these models," observes Lohmann. For example, wildfire models should reflect the anti-correlation with floods. "Before, we were not able to quantify the interconnectedness and didn't have

the tools to make informed decisions," he explains.

The insurance industry is driving cat modeling because weather and climate models do not inform insurer portfolios, he notes. "The link between climate models and cat models is not as well established as it should be," he says. "Machine learning and artificial intelligence will play a prominent role in making that connection in the future."

**NFIP's first
reinsurance
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billion to pay losses.**

⁶ <https://www.fema.gov/blog/2018-01-05/public-and-private-partnerships-strengthen-flood-protection-reinsurance>

⁷ <https://www.insurancejournal.com/app/uploads/2018/04/Summary-of-the-NFIP-April-2018-and-January-2019-Program-Changes-final.pdf>

⁸ <https://www.fema.gov/news-release/2018/01/05/fema-expands-its-reinsurance-program-manage-future-flood-risk>

⁹ <https://www.fema.gov/news-release/2018/04/02/fema-announces-its-intent-transfer-nfip-risk-capital-markets>

¹⁰ http://media.swissre.com/documents/2017_financial_report_en.pdf

¹¹ <https://www.lloyds.com/news-and-risk-insight/press-releases/2018/03/2017-annual-results-gbp>

¹² <http://www.miamiherald.com/news/business/biz-monday/article207691339.html>

CATS BY THE NUMBERS

Hurricane Harvey

Economic Losses: \$126.3 billion
Insurance Losses: \$30 billion
Death Toll: 89 people

Hurricane Irma

Economic Losses: \$50.5 billion
Insurance Losses: \$29 billion
Death Toll: 97 people

Hurricane Maria

Economic Losses: \$90.9 billion
Insurance Losses: \$30 billion
Death Toll: 65 people (Figure is for Puerto Rico only and does not include other Caribbean island nations.)

Note: A Harvard study published May 29, 2018, in the *New England Journal of Medicine* estimates the death toll related to Hurricane Maria in Puerto Rico as 4,645.*

California Wildfires

Economic Losses: \$18 billion
Insurance Losses: \$11 billion
Death Toll: 54 people
Note: Economic losses and death tolls are estimates from the National Oceanic and Administration.† Insurance losses are an average of several industry estimates.

* <https://www.nejm.org/doi/full/10.1056/NEJMsa1803972>

† NOAA website: <https://www.ncdc.noaa.gov/billions/events/US/2017> (accessed May 15, 2018).

Strong Building Codes and Materials Work

The strength of building codes and compliance, as well as the use of the appropriate building materials, are critical for reducing risk potential. “Irma showed us that the strict building codes of Florida are doing their job,” observes Mark Bove, senior research meteorologist at Munich Reinsurance America, Inc. “It is a success story that really needs to be amplified.”

Adhering to the Federal Emergency Management Administration (FEMA) standards makes big differences as well. In Texas, buildings elevated to current FEMA standards suffered much less damage than those built before FEMA’s flood maps, which were grandfathered with previous code standards, according to Aon Benfield’s report, “Hurricane Harvey: Event Recap.”

Elevating buildings to FEMA standards can be expensive and easily reaches six figures per structure. One contractor estimates elevation costs at \$75 per square foot.¹³ Some residents are paying the tab, sometimes with help from FEMA, while others have to move. However, presuming flood-risk potential with FEMA maps can give people a false sense of security, Bove warns. “In reality, everyone has a flood risk,” he says. A Rice University/Kinder Institute study supports that view, concluding that 41 percent of likely flooded homes during Harvey were outside of the NFIP’s special flood hazard areas.¹⁴

Coastal Texas will become more vulnerable to flooding as time passes. In some areas within Houston, the ground is sinking by up to 6 cm or 2.36 inches annually, and building on alluvial soil, groundwater abstraction and rivers with low discharge capacity will also exacerbate flood risk in the region, according to Munich Re’s report, “Hurricane Harvey: Record-breaking floods inundate Houston.”¹⁵ Since Harvey, the Houston area is shelving work on libraries, street replacements, utility infrastructure and more in order to address reconstruction and mitigation.

In Puerto Rico, residential homes built to proper code experienced minimal damage, according to “Hurricane Maria: Recap Report,” issued in March 2018 by Aon Benfield. But a significant portion of residential property, which was illegally built with wood-frame construction or additions, suffered

¹³ <https://www.texastribune.org/2018/03/14/harvey-elevate-homes-flood-houston-money-costs/>

¹⁴ <https://ricegis.maps.arcgis.com/apps/Cascade/index.html?appid=6ea5082d69484c7a922bd18705afb85>

¹⁵ <https://www.munichre.com/topics-online/en/2017/12/hurricane-harvey>

extensive or total damage.

Building materials also matter. In Puerto Rico, the best-built homes are of concrete construction with a bunker-style frame, the report notes. In Florida, metal roofs performed the best and ceramic and clay tile generally did well, according to Aon Benfield's report, "Hurricane Irma: Event Recap," published in March. However, standard shingle roofs struggled with winds exceeding 100 mph.¹⁶

Protecting buildings from wildfire damage means using noncombustible construction materials such as asphalt shingles and masonry or stucco cladding, Bove says. Landowners should avoid planting trees and shrubs immediately around structures, he advises. Bove believes that wildfire risk should be a community commitment to remove potential kindling from yards, roofs and

**Small businesses
also need a nudge.
Where cat events
hit last year, 40
percent of 1,800
small businesses
with 500 or
fewer employees
lost revenue
and experienced
uninsured damages.**

gutters, especially in urban areas.

More Coverage Needed

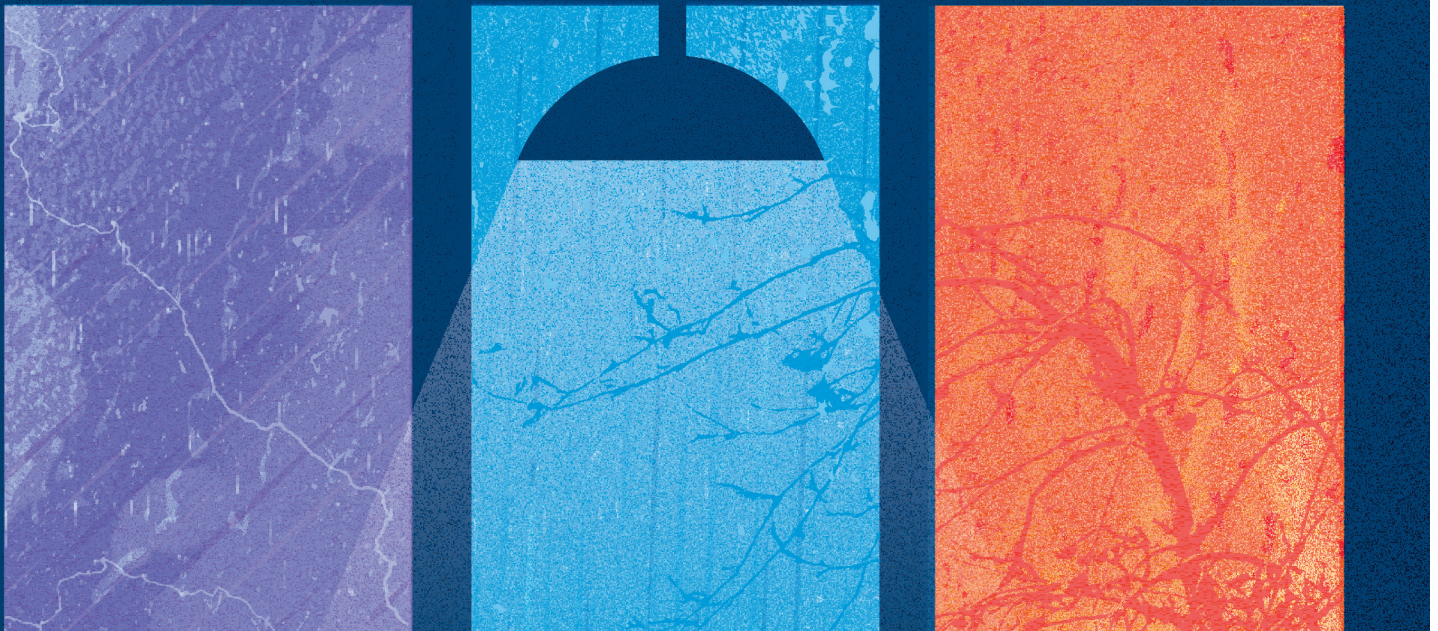
While amplifying risk awareness and prevention is critical, lack of sufficient insurance coverage hampers recovery. California residents and businesses were generally well-covered against wildfire losses. However, the majority of residents in Puerto Rico, as well as high percentages of those in cat-affected areas in Texas, Florida, Georgia and South Carolina, lacked sufficient flood insurance.

Small businesses also need a nudge. Where cat events hit last year, 40 percent of 1,800 small businesses with 500 or fewer employees lost revenue and experienced uninsured damages, according to a Federal Reserve Bank survey released in April. Of those, 61 percent lost up to

¹⁶ Hurricane Irma: Event Recap Report March 2018, page 45.

¹⁷ <https://www.newyorkfed.org/medialibrary/media/smallbusiness/2017/SBCS-Report-on-Disaster-Affected-Firms.pdf>, page iv.





\$25,000 in revenue and 35 percent lost more than \$25,000, while only 4 percent reported no losses, notes the report, “Small Business Credit Survey: Report on Disaster-Affected Firms.”¹⁷

Claims Administration Improvements

From a claims administration standpoint, the timing and magnitude of last year’s cats were especially challenging, observes Mitch Balter, Aon Benfield’s executive managing director of client operations. Balter explains that this marked the first time that “collateralized markets were challenged with a notable volume of claims activity.”

To help insurers pay claimants faster, there were several hurdles to overcome. Most premium payments started in June and July, leaving little time for fund accrual. Because of the number of events, including wildfires, the letter of credit season got a late start, emphasizing the critical need for effective communication between brokers, insurers and reinsurers.

The insurance brokers assembled cat modelers to identify clients most likely to be affected, enabling insurers to pay customers quickly. Insurers agreed to potential pre-funding of paid losses

without formal proof of loss reports, Balter says.

Almost all reinsurers could pre-fund losses at the lower limit and retention layers of cat programs; however, Balter explains, “We found that collateral posted was exhausted quickly and actions were needed to obtain additional payments.” To address this, Aon Benfield secured periodic reports on actual and projected payments from their insurer clients to facilitate pre-funding at the higher limit layers and retentions of multi-layer placement.

Insurers deploying e-commerce solutions, particularly ACORD, were able to secure client information immediately and quicken settlement, he observes, due to consistent electronic messaging protocols.

To prepare for the next major cat, Balter says that during renewals Aon Benfield is addressing contract language for collateralized markets to reduce payment delay. For example, policies affected by California wildfires have a 168-hour clause that raises questions regarding start-to-finish dates.

Since the major cat events were practically back-to-back, there were higher-than-anticipated loss adjustment expenses and report delays

necessary to pay claims, Balter notes. Developing a method to more quickly determine the cause of damage, such as determining flood versus wind, would also quicken the claims process, he says.

Conclusion

The record-breaking 2017 year of the cats demonstrates the insurance industry’s financial strength and agility to handle a tight succession of intense weather events. Though cat modeling is progressing significantly, there is much work to do.

At the same time, the United States needs to face the unshakable reality of its vulnerability to cat weather events. The concept of environmental sustainability should guide where and how structures are built. Smart community planning requires greater infrastructure investment and Americans must see insurance as a property ownership necessity. The cats are sending the message to better prepare, but will the U.S. take heed? ●

Annmarie Geddes Baribeau has been covering insurance and actuarial topics for more than 25 years. Her blog can be found at www.insurancecommunicators.com.

The Cat Walk

Last year's parade of major cat events, except Southern California's December wildfires, took place within a six-week period. From August's end until early October, a trio of hurricanes unleashed their might in U.S. southern states and island territories. As Maria dissipated, raging wildfires in thirsty Northern California began destroying property. To cap off an exhausting year, wildfires ignited in December, engulfing parched areas of Southern California.

Hurricane Harvey

As the wettest tropical cyclone to hit the United States on record and the second most costly one in the nation's history, Hurricane Harvey hit the Texas coastline August 25, 2017, as a Category 4 storm. Harvey mercilessly dropped up

Harvey dumped rain on the fifth largest metropolitan area in the U.S.¹⁸ The storm damaged or destroyed more than 200,000 homes, while 4,229 businesses suffered from major damage, according to Aon Benfield's report, "Hurricane Harvey: Event Recap Report," released in March. At least a half million cars were destroyed.

Hurricane Irma

Within two weeks of Hurricane Harvey's final landfall, Hurricane Irma began her powerful visit to Florida on September 10 as a Category 4 cyclone after devastating some Caribbean islands and brushing Puerto Rico. Irma is recognized for her powerful wind intensity and storm surges — and unrealized loss potential. Had she directly



to 45 to 60 inches of rain over a wide portion of southeast Texas before making his last significant landfall in Louisiana on August 30. "The sheer magnitude and geographic scale of Harvey's rain were beyond the bounds of what we have seen before as far as an urban flood in the U.S.," said Mark Bove, senior research meteorologist at Munich Reinsurance America, Inc.

hit the Miami-Dade County area, Irma could have been the first \$100 billion storm.¹⁹

Moving inland from the Florida Keys, Irma accelerated to the north-northwest, weakening to a Category 3 until passing east of Tampa as a Category 1 storm. At one point, approximately three-quarters of Floridians had lost power. After calming to a tropical storm²⁰ she left exten-

¹⁸ https://en.wikipedia.org/wiki/List_of_metropolitan_statistical_areas#United_States

¹⁹ Junaid Seria, <https://www.scor.com/en/media/news-press-releases/cost-catastrophes>

sive damage in Georgia and South Carolina. Irma was the top Google search term in the United States and globally in 2017.

Hurricane Maria

During the cleanup following Irma, Hurricane Maria arrived in Puerto Rico as a Category 4 cyclone on September 20 after leaving a destructive path through several Virgin and Caribbean islands, according to the Aon Benfield's, "Hurricane Maria: Event Recap Report,"²¹ released in March. Puerto Rico's most destructive natural disaster on record boasted a wind field that engulfed nearly the entire island before dissipating October 3.

Maria decimated the U.S. territory, damaging or destroying at least 250,000 homes along with large pharmaceutical factories and hospitality sector businesses.



Infrastructure damage made rescue and recovery extremely difficult. Power loss was nearly 100 percent.²²

California Wildfires

Months of drought followed by harrowing winds fueled fires in Northern California on October 8, destroying over 8,900 structures. The Tubbs Fire alone burnt down 5,500



buildings, according to "Rain Fuels Wildfire Risk,"²³ published by Munich Re in April. The flames practically destroyed complete neighborhoods in Santa Rosa within 24 hours of ignition, according to the article.

Then came the Thomas Fire on December 4 in Southern California. The largest wildfire in the state's history began in a Ventura County canyon, about 60 miles from downtown Los Angeles. Within two weeks, at least 800 structures were burnt down.

For the California wildfires overall, each building was a million-dollar claim, according to Munich Re, resulting in very high cost severity. Nearly 20 percent of losses were commercial enterprises, affecting commercial property and business interruption lines.

"The wildfires suggest that the state of California has not gotten ahold of its vulnerabilities," observes Robert Hartwig, director of the University of South Carolina's Center for Risk and Uncertainty Management. "The climate in the West is dry and could get dryer as these are long-term climate cycles —[and yet] people say they are going to rebuild."

²⁰ https://en.wikipedia.org/wiki/Effects_of_Hurricane_Irma_in_Florida

²¹ <http://thoughtleadership.aonbenfield.com/Documents/20180328-ab-if-hurricane-maria-recap.pdf>

²² "Hurricane Maria: Event Recap Report," page 20.

²³ <https://www.munichre.com/topics-online/en/2018/01/rain-fuels-wildfire-risk>

DIVERSITY

At the Casualty Actuarial Society, we know that a diversity of perspectives and life experiences will help build an actuarial profession that grows and evolves to meet the needs of tomorrow. Learn more about our commitment to this multidimensional picture at casact.org/diversity.



**Expertise. Insight.
Solutions.®**

casact.org



Opening the Door to Diversity and Inclusion BY JIM LYNCH

With its examination-based credentialing process, the Casualty Actuarial Society would seem to have created the perfect meritocracy: If you are smart and work hard, the thinking goes, you will pass the exams, get your credential and have a successful actuarial career.

Not quite, unfortunately.

Several barriers to success — before, during and after the exam process — seem to curtail underrepresented groups from attaining CAS membership, which skews predominantly male and white.

At the CAS Spring Meeting in Boston, the meritocracy myth was challenged head-on in the opening general session, “Think You Know About Diversity and Inclusion? Three Perspectives That May Surprise You.”

Mallika Bender, an FCAS and consultant at Willis Towers Watson, and chair of the CAS Diversity Committee, documented the skewness of the CAS membership as of 2016:

- 70 percent of CAS members are male; 30 percent are female.
- 74 percent are non-Hispanic white and 21 percent Asian.
- Less than 5 percent are Hispanic or African-American or other.

By contrast, 59 percent of actuarial science majors in 2016 were male and 68 percent were non-Hispanic white. Perhaps the CAS is on the cusp of progress as new students enter the profession. Or perhaps this is a sign of the challenge some groups face achieving their career goals.

Most actuaries acknowledge the issue. More than 80 percent of respon-

dents to a survey commissioned, in part, by the CAS, indicated that the profession is not as diverse as it could be or should be, said Lori Bailey, global head of cyber risk and head of the Women's Innovation Network (WIN) at Zurich Insurance. She noted four challenges that underrepresented populations face.

Self-examination is the way to overcome our internal biases.

Barriers to entry. Many people well suited to be actuaries don't know the profession exists — the ultimate barrier to entry. To that end, the CAS and other actuarial organizations sponsored a High School Actuarial Day in Chicago in April. The event focused on introducing persons of color to the profession, with more than 300 students from 14 high schools attending.

Workplace culture. More than half of those surveyed had either experienced or heard of discrimination in the workplace.

Unconscious bias. Not just race or gender, but name, appearance or school affiliate may unintentionally elicit prejudice. Panelist Erika Schurr, a Fellow of both the CAS and the Canadian Institute of Actuaries, and VP and chief actuary for Travelers Canada, noted that rooting out unconscious bias is at the heart of the profession. Think: Bailey minimum bias procedure — “We [actuaries] think about it in our work all the time,” Schurr said.

Confidence. This fourth item was

an important focus of Bailey's talk. It can be a difficult barrier because confidence changes over time and some of the barriers are, at least in part, self-imposed.

Bailey pointed to surveys that indicate that, as their careers begin, women have higher aspirations than men — more want to reach top management — and are just as confident they can reach their dreams.

The ambition, though, ebbs as their careers evolve. Experienced female employees express less aspiration to reach the top and fewer are confident they will make it.

Why does this happen? Bailey cited three factors:

Biology. There is scientific evidence which suggests that certain genes associated with risk taking are more prevalent in men than in women.

But that's only one part.

Schooling. Girls tend to be raised as rule-followers. “We are trained early to work hard, get good grades, do well,” Bailey said. “This leads to perfectionism, and that perfectionism leads to a fear of failure” — as in turning away from the profession after the first failed exam.

Workplace setting. At work, Bailey noted, “You want to see that you fit in.” If there is a lack of diversity — a lack of role models — that “ultimately impacts one's confidence.”

She cited four important elements to focus on in order to build confidence:

- Competence: the technical skills and acumen required to do one's job.
- Character: the values and attributes one brings to any interaction.
- Comfortability: how genuine you are in your interactions.

- Consciousness: the ability to “understand yourself ... and be able to act accordingly.”

Women often focus solely on competence and fail to realize that all of these components are required for ultimate success.

Schurr said that self-examination is the way to overcome our internal biases. She went on to explain that we have to recognize the biases we all harbor — intentional or not — and offered restaurants as a nonthreatening example. If you get lousy service one time at your favorite restaurant, you will probably dismiss it as an aberration; You are biased favorably toward the restaurant. If it’s a new restaurant and service is poor, you are unlikely to return; You are biased against that restaurant.

If you recognize the bias or the filter, then you can work to overcome it, tapping into the curiosity that most actuaries possess. Ask yourself, “Why am I using only this filter?” As an example, she acknowledged that, as a Canadian and University of Waterloo graduate, she had once found herself partial to actuarial candidates from that particular actuarial program.

However, studies have found that companies with more diverse workforces actually return better earnings and generate better income, and Schurr explained that a diversity of thought in her team provides “new ideas that translate into innovation.” She went on,



The panel (left to right) are Moderator Mallika Bender, Lori Bailey, Erika Schurr and Dawn Frazier-Bohnert.

“Given how insurtech is challenging our industry, don’t you want that innovation on your team? Don’t you want that as your competitive advantage?”

The final panelist, Dawn Frazier-Bohnert, SVP and chief diversity & inclusion officer for Liberty Mutual Insurance, outlined how her company extended the idea of inclusion to everyone, specifically men. Her point: Gender means men and women; races mean all races.

Liberty’s program, Frazier-Bohnert said, was called the Men as Allies initiative. The company wanted to find out how men feel about the evolution towards greater diversity in the workplace that surrounds them. “Did they feel included?” she said. “What did they need?”

“We didn’t want to do something to men. We wanted to *include* them.”

The program involved a 2017 retreat at which men were invited to talk about

the challenges they face in the workplace — their child-care issues, the disabilities that challenge some, the fact that some work events allow a man to attend with a wife, but not with a partner.

“We need to call out diversity,” Frazier-Bohnert said. “We want to welcome those differences” so people can be valued for the ways that they are different.

Want to learn more? The Spring Meeting session was webcast and recorded, and the recording, including video, audio, and PowerPoint slides, can be viewed on the CAS website via <http://bit.ly/CASSpring18Webcast>. (Note: Dawn Frazier-Bohnert’s portion of the session was not permitted to be recorded.) ●

James P. Lynch, FCAS, is chief actuary and director of research for the Insurance Information Institute. He serves on the CAS Board of Directors.

Regulators and the Predictive Modeling Challenge BY JIM LYNCH

Big data, predictive models, neural networks — the world of insurance pricing is changing fast, as any actuary can attest.

It falls to the regulators — some of them actuaries — to figure out how get the old rules to apply to this new world.

Three actuaries explored the evolving dialogue between company and regulator at the Casualty Actuarial Society Spring Meeting in Boston, and looked for ways the two can work together to mutually navigate the regulatory landscape.

The National Association of Insurance Commissioners (NAIC) recognizes the issue, said Robert Curry, FCAS, an assistant vice president and regulatory actuary at ISO, a division of Verisk Analytics.

The NAIC's Big Data Working Group has regulators developing best practices for reviewing predictive models. The working group looks for ways to make it easier to train regulators in reviewing predictive models, and it is considering whether to develop predictive analytics webinars or insurance summits on the topic.

The regulatory consortium is also looking at ways to help individual states review models, considering whether to create a central resource that insurance departments could tap to review models — the regulatory equivalent of when baseball umpires send disputed calls to centralized video review experts in New York.

Regulators are acutely aware of the challenge, said Dorothy Andrews, an ASA and statistician who reviews filings for regulators as part of her work at Mer-

linos and Associates.

They are “working really hard to get up to speed and are very keenly interested in making sure consumers are protected from harm,” she said. They focus on rating variables, she said, asking, “Do these variables have a logical relationship to the risk being insured?”

One typical question concerns how “black box” variables like insurance scores are constructed. Regulators want to be sure that none of the components of the black box variable are used elsewhere. Instead of a black box, Andrews recommended that companies build a “glass box,” one that lets regulators understand what is going on so they can ask the questions they need to in order to protect consumers.

Another typical question is whether any of the variables are intentional proxies for other disallowed variables. (The classic forbidden variable would be one that serves as a proxy for race.)

Andrews recalled that when she built predictive models as a company actuary, the insurer's legal department had to review and sign off on every model variable. “I sometimes get the distinct impression that is not happening at other companies,” she said. Insurers should consider the time spent reviewing in advance as a good investment, however, especially in light of the alternative.

“A market conduct exam can take years to resolve at great expense to a company,” she said.

Within the insurance world, ISO is well known for making a tremendous number of loss cost filings annually in every state and the District of Columbia. At ISO, CAS Fellow Jim Weiss observed

that he is often the actuary preparing responses to regulatory inquiries pertaining to predictive models.

He recommended choosing variables with great care. “The more parameters you have, the more quickly the models can deteriorate [in effectiveness],” he said. A live poll at the session determined that parsimony was often the most important consideration in a model — even more so than practicability, tractability, stability and accuracy. Parsimony is defined by Oxford Reference as “the principle that the most acceptable explanation of an occurrence, phenomenon, or event is the simplest, involving the fewest entities, assumptions, or changes.”

Weiss said at ISO he works to make sure that regulators can see the care that has gone into developing the models that underlie the filing.

In any filing, both company and regulator must be confident that the model is a valid tool for pricing. When evaluating generalized linear models (GLMs), regulators have a good understanding of *p*-values (a statistical measure that purports to show the likelihood that the modeled relationships occurred by chance) but, Andrews said, regulators also consider other metrics. Weiss personally favors other metrics, as *p*-values are regarded by many as presenting false precision. It also is more relevant for GLMs than for emerging analytical techniques, such as decision trees.

Weiss and Andrews (as well as respondents to a live poll) said that lift charts — bar charts that show how losses grow as a variable changes — are a useful tool in validating a model.

For insurers and regulators, it can

be a challenge to reach a common standard. "There's no universal metric for what makes an ideal model," Weiss said. "It's kind of like figure-skate judging. It's kind of subjective."

For regulators, Andrews said, disparate impacts are important to avoid, despite how statistically significant the

model may be. An excessive number of variables with an unclear relationship to risk can be difficult to explain and justify, delaying the approval of a filing. "Keep your models simple enough that a 6-year-old can understand them," she said, paraphrasing a quote made famous by Einstein. She also quoted noted 20th

century statistician George Box: "Essentially all models are wrong, but some are very useful." ●

James P. Lynch, FCAS, is chief actuary and director of research for the Insurance Information Institute. He serves on the CAS Board of Directors.

CAS Issues Call for Monographs on Data Quality Techniques

The Casualty Actuarial Society, in conjunction with the CAS Monograph Committee, is pleased to extend a call for monographs on the topic of "Data Quality Techniques." The purpose of this call is to develop a source of literature with emphasis on the educational and professional needs of actuaries to foster better understanding of data quality issues and data management techniques, with particular regards to their impact on P&C actuarial practice.

Dealing with data from various sources is a fundamental skill required of actuaries, with data quality issues impacting a significant part of an actuary's work. Managing and maintaining the quality of internal data systems, sourcing alternative data, and understanding the quality of external data are important parts of actuarial analysis. This call is intended to develop relevant literature on the topic. Monographs in this series can range from compendia of data assurance techniques in P&C insurance to detailed notes on data quality improvement strategies. The authors may discuss one or a small number of methods in great detail or provide a survey of the

various methods, elucidating the pros and cons of each method and connections between them.

Some examples of specific questions these monographs may address include:

- A comprehensive review of exploratory data assurance techniques
- A comprehensive review of data cleansing
- Quality improvement strategies
- Techniques of cost/quality/performance tradeoff measurement
- A survey of data quality management in casualty insurance
- Best practices in data quality management
- Privacy and data quality
- Data quality frameworks
- Information quality
- Measuring data quality
- The insurance data life cycle
- Regulatory requirements and ASOP 23

All monographs are expected to either be accompanied by tools or code that allows the techniques discussed to be implemented, or include links to open source software and code for this purpose.

Topics noted within this Call for

Monographs are not only of interest to many practicing actuaries but may also be of interest to the CAS Syllabus Committee. The Monograph Editorial Board especially welcomes proposals that enrich material currently used to train P&C actuaries. This means that monographs that are highly readable and are structurally amenable to having questions set from them are preferred. Authors are encouraged, but not required, to include examples and exercises that help teach the concepts being explained.

Authors must submit their work in accordance with the Guidelines for Submission of Monographs published on the CAS website. The Monographs will be subject to peer review prior to final acceptance. Authors of monographs that are accepted within the timeline outlined below may be invited to present their work at a related CAS seminar or meeting.

For more information on scope, submission guidelines and timetable for the Monograph Call, visit <https://www.casact.org/press/index.cfm?fa=viewArticle&articleID=4095>.

Any questions on this Call may be addressed to Donna Royston at droyston@cas.org. ●

Tax Reform Creates New Challenges for Actuaries BY JIM LYNCH

The passing of tax reform in the U.S. late last year set off a scramble as corporations, including property-casualty insurers, had to adjust their tax calculations at year-end. Now companies have begun planning how to hone their business models in response to the changes, a trio of tax experts said at a session of the Casualty Actuarial Society Spring Meeting in Boston.

A \$1.5 trillion tax cut was the most prominent feature of the reform, which cut the corporate tax rate to 21 percent from 35 percent.

The new law makes the U.S. statutory tax rate closer to the average of most nations reporting to the Organization for Economic Cooperation and Development (OECD). The U.S. corporate rate (federal and state combined) fell to 25.75 percent, just above the 23.75 percent average of other OECD countries. Before reform, the rate had been 38.9 percent.

But the reform was complex. A number of reforms increased taxes. The issue is important for actuaries, who are often close to the financial calculations that determine how much an insurer pays. Actuaries also include estimates of income taxes in ratemaking, so the changes directly affect that work.

The law passed so quickly, said Kevin Johnston of PricewaterhouseCoopers, that most companies had to “race to get to year-end financials.” Only by spring did companies have a chance to consider how to retool operations to respond to the reforms, he said.

“I think companies are really starting to think more strategically,” he said. “You’re starting to see companies address operations more.”

The impact of the law varies by the type of insurer. U.S. multinational insurers benefit, as do most domestic insurers, though circumstances vary. Foreign multinationals, though, are likely to see increased costs.

While the overall rate fell, the law also includes a new minimum tax, the Base Erosion and Anti-Abuse Tax, or BEAT. That tax is designed to discourage the movement of profits out of the United States to avoid the U.S. income tax.

The BEAT would likely apply to companies that cede reinsurance to an offshore affiliate, said Lynne Bloom, FCAS, a director at PricewaterhouseCoopers in Philadelphia. In 2006, \$48 billion, or 35 percent of all ceded premium by U.S. domiciled companies, was ceded to offshore affiliated insurance companies. Beginning in 2018, such premiums may be subject to the tax, she said.

The way the law was written, Johnston said, magnifies its effect on insurers. The tax is applied to the premium ceded rather than underwriting profit.

Actuaries could likely become involved in strategic work around a company’s internal reinsurance policies to minimize the BEAT’s impact, with one such potential option being moving away from quota share reinsurance, in which a company cedes a set proportion of premium and losses.

To lower their tax bill, Bloom said, ceding companies could replace the quota share with a stop-loss treaty, in which the reinsurer becomes responsible for losses when the program’s loss ratio hits a certain level. Stop-loss treaties can provide downside risk protection, and thus capital relief, while ceding

significantly less premium, thereby reducing the amount subject to the BEAT. It should be noted, however, that tax reduction is not the sole purpose for internal reinsurance cessions, as companies use offshore affiliates for capital purposes as well.

Another change that could affect actuaries concerns the discounting of loss reserves. Insurance companies pay taxes based on discounted loss reserves, and the new law makes several changes to the discounting procedure, said Ian Sterling, FCAS, a senior actuarial advisor for EY in Philadelphia.

In the past, companies could elect to utilize a payment pattern from their own historical data or use one provided by the IRS. Now they must use the IRS-provided pattern, which is based on industry aggregate data.

The payment pattern that used to be limited to 15 years will move to 24 years and will affect only certain lines of business.

Finally, the interest rate will be higher, as the rates had been based on federal midterm rates but will now be based on high-quality bonds.

The net effect of the discounting changes will likely increase insurers’ taxable income. Insurers writing long-tail lines, like workers’ compensation or products liability, will be affected the most.

Other changes extending beyond the U.S. will have an impact.

Generally in the past, every dollar of income that a U.S. company made anywhere in the world was subject to income tax. Now only the income made in the U.S. is subject to tax. This left more than \$2 trillion overseas, according



to *Fortune* magazine, waiting for a tax break to move it to the U.S.

The new tax law considers all that money to be repatriated, and companies have eight years to pay the taxes on it. The change affects multinationals based in the United States.

“For U.S. multinationals, this is a big, big deal,” Johnston said.

The law adds a tax on global intangible low-taxed income, known as GILTI, for U.S. shareholders of controlled foreign corporations. It’s a “big deal” for financial services companies because, Johnston said, “this tax will hit you harder if you have limited tangible assets outside the United States.”

Proration of tax-free securities changed in offsetting ways, to no net effect. Insurers, major buyers of tax-free municipal bonds, actually paid tax on 15 percent of tax-free bond income under the old law. With the corporate rate falling to 21 percent, the taxable portion of tax-free securities rose to 25 percent. The two changes offset so the effective tax rate on tax-free securities remains 5.25

percent.

There are also new rules for life insurers and other corporations regarding the application of net operating losses in one year to offset profits in other years. Starting this year, those entities cannot use new losses generated to offset more than 80 percent of income in any given year, but those losses can be carried forward indefinitely for use in future years. However, they can’t be carried back to offset income in prior years.

Non-life insurers, though, still have their old rules, and are able to offset going back two years and going forward 20 with no limitation.

This creates a fair amount of uncertainty for insurers that have both life and non-life operations, Johnston said. The IRS will eventually provide guidance, he said, but it doesn’t seem to be a high priority.

Though the impact varies by type of insurer, Sterling said some common themes were emerging.

In pricing, there is a perception among some U.S.-based insurers that

the BEAT may level the playing field by removing the tax advantage that some believed companies with foreign affiliates enjoyed. Some of the tax benefit is likely to be passed to policyholders through lower rates. A few regulators are checking specifically on that point.

In addition to policyholders, company personnel may stand to benefit, perhaps through increased wages, benefits or training. Companies may also be likely to invest in technology infrastructure to enhance operations.

Yet another common theme is that reinsurers subject to the BEAT are revisiting their reinsurance strategy. They are looking at the aforementioned stop-loss treaties, organizing an offshore entity that pays U.S. tax, or even canceling treaties with offshore affiliated entities.

“It will take a couple of years for this to shake out,” Sterling said. ●

James P. Lynch, FCAS, is chief actuary and director of research for the Insurance Information Institute. He serves on the CAS Board of Directors.

EXPLORATIONS BY CHRISTOPHER GROSS

In Search of a Better Triangle

For over a century, actuaries have used triangle methods to estimate reserves. While other methods are now being considered, development triangles will likely continue to be in practical use for the foreseeable future. But what if we reconsider the raw data used to construct these triangles?

What if each case reserve, at every point in time, were an unbiased estimate of the future payments of that claim based on all information then available? There would still be uncertainty about the outcome, but the expected value of future payments would be reflected by the case reserve. What impact would this have on reserving — and pricing?

This would reduce our reserving challenges considerably. A change in the speed of claim settlement would have little impact on incurred triangles because the aggregate incurred loss would be unaffected by claim settlements. IBNR would truly be “Incurred But Not Reported,” instead of also including “Incurred But Not Enough Reported.” Since differences in case adequacy among different types of claims are removed, a changing mix of claims is less problematic for development patterns, unless those differences are due to claim reporting.

Pricing work would benefit too. Whether based on traditional ratemaking or on predictive modeling, the use of immature, open claims (which is necessary in a changing world) requires assumptions about loss development. Different levels of development across

different risk segments can skew the analysis, often dramatically. The primary input into the pricing becomes much more reliable as the bias in case reserves is made more uniform and closer to zero.

Actuaries would be the ones generating these new unbiased case reserves and policy IBNR reserves. They are the ones who have the expertise in insurance operations and exposure, and the ability to properly reflect the small probabilities of large events.

How close are we to this ideal? It varies across companies, with some better than others. But even with the best, biases in the case reserves usually exist, and the biases are likely not uniform across claim and exposure characteristics. The bigger the differences in bias among different types of claims, the bigger the impact of mix shifts, changes in the speed of claim settlement and other distortions of reserving and pricing analyses.

What if we had a whole new type of detailed reserve — a policy IBNR reserve? This reserve would reflect, at

various points in time, the anticipated losses yet to be reported for the policy. It would equal the expected value of all future reported claims for that policy with the available information at that point in time. Differences in claim reporting lags and loss potential across policies based on policy characteristics would be reflected in the reserves. What impact would this have on actuarial reserving and pricing?

Adding this new reserve to paid and case losses now gives us a new triangle with flat development — sometimes greater than 100 percent of ultimate, sometimes less, but generally flat. Triangle analysis would be a check on the ability of the detailed reserves to hold true to their promise, and aggregate adjustments/bulk reserves should be small. Allocation of reserves for management reporting? Unnecessary.

Actuarial pricing practice with such inputs focuses on removing the variability and noise caused by claim behavior.

How much actuarial expertise would be needed in such a world? More than ever. Actuaries would be the ones generating these new unbiased case reserves and policy IBNR reserves. They are the ones who have the expertise in insurance operations and exposure, and the ability to properly reflect the small probabilities of large events. The small probability of large outcomes is usually not properly included, which is why most judgment-based case reserves develop upward in the aggregate. Sometimes companies reserve at the limit



to avoid the negative impact of a claim blowing up. But this conservative bias is equally problematic: The true information about the claim is lost, and the bias is not equal across claims. Human judgment at a granular level is ill-equipped to develop unbiased case reserves.

Actuaries need not wait for their companies to embrace this vision of unbiased case reserves and policy-level IBNR reserves. They can build models of such reserves while the “actual” case reserves continue to exist. The detailed reserves the actuaries build can be based on the objective information about claims and exposure. They can build these objective models to be consistently applied to open claim reserves across time, removing the problem of changes in case reserve adequacy. Think Berquist-Sherman, but with a laser scalpel instead of a machete. They can build policy-level IBNR reserves that relate to premium but that respond directly to changes in pricing and mix of business. Think Bornhuetter-Ferguson, but

with a microchip instead of a vacuum tube. These actuarial case reserves and policy-level IBNR reserves can then be aggregated and analyzed, together with

**Think Berquist-Sherman,
but with a laser scalpel
instead of a machete.**

**... Think Bornhuetter-
Ferguson, but with a
microchip instead of a
vacuum tube.**

paid losses, in the well-known and understood triangle framework, to adjust for any remaining biases and illustrate their stability in the aggregate.

The line between reserving actuary and pricing actuary fades away in this vision. You cannot answer one question without answering the other. The IBNR reserve for the policy at commencement

is the loss cost. Predictive modelers on the pricing side would no longer be the only ones who require policy and claim data to be joined. Reserving actuaries would need this data as well, as an input, revealing to them all the problems that usually exist with detailed coding, and pressing the need for system consistency and improvement.

Approaching actuarial work in this way provides insurance companies with considerable value. Any significant slice of the business by agency, line of business, business segment, etc. would be understood much more easily and clearly. Actuaries’ focus would be sharper. Analysis would be less aggregated and more detailed, continuing an inevitable trend in actuarial practice. This isn’t a distant vision; it’s feasible right now. If you want to see how, I will be presenting a hands-on workshop at the CLRS this September. ●

Christopher Gross, ACAS, is CEO of Gross Consulting in St. Paul, Minnesota.

RANDOM SAMPLER BY URI KORN

My Paternity Leave

I was recently blessed with a new addition to my family, and I am lucky to be working at a company like AIG that gives eight weeks of paternity leave. I enjoyed being able to use this time to bond with my family and to take a break from the exacting and analytical nature of my work as an actuary.

Some people like to find out the gender of their baby, but my wife, Sheri, and I decided to be more spontaneous and keep it a surprise. Truthfully, I was expecting a boy, as they're much more prevalent in my extended family — 84 percent males to be exact. Taking credibility into account, due to the small sample size, still yielded a probability of around 77 percent. The prediction turned out to be correct and Sheri gave birth to a baby boy, whom we welcomed into the world on a Sunday night.

During the eight weeks of paternity leave, it was nice to be able to focus on more mundane tasks that didn't require my full concentration, like getting my older kids ready for school. I put out their clothes, fed them breakfast, and made sure that we were out of the house by 8:15 to allow for only a 0.5 percent chance of missing the bus. Afterwards, I liked to do my shopping as early as possible in the morning, as the supermarket traffic grows exponentially until evening.

It can be difficult to decide what and how much of everything to buy, but I used the simplifying assumption that breakfast cereals and other like items are independent. I also conducted regular inventory reviews to see if anything

was running low or had a surplus. Sheri said that I bought too much, but I think it was okay to be a bit conservative to make sure that we didn't run out of any essentials.

As Sheri was recovering, I also learned how to help out more around the house. I had never cooked before, but it was a learning experience that I found to be very relaxing and enjoyable. It was a challenge to prepare food for our two older boys, who are picky eaters, but after some trial and error and a few rounds of designed randomized experiments, I soon learned the foods they ate. Sheri also taught me to cook twice the amount needed and freeze the extra, so I wouldn't have to cook every night.

She told me that meatballs freeze well, which I found to be true, but the spherical shape was very inefficient space-wise. My square meatballs, or meat-cubes, only took up around two-thirds of the space for the same amount of meat and were also less likely to roll off the kids' plates.

The part of my routine I enjoyed most was my daily outing with the baby. As long as it wasn't too cold, I would try to take him outside for some fresh air. For our longer outings, I brought three diapers, to ensure my supply was

sufficient over 99.9 percent of time. Determining the number of wipes was a bit more complicated, however, due to "cat" events, which require many more wipes (and an outfit change). Anyone who has cared for a baby knows what I'm talking about, and for those who haven't, it's too graphic to go into detail here.

Babies also always seem to do their business right when you need to leave for an appointment or pick up the kids from the bus. So, it was important that my diaper changing time be as fast as possible for these stress scenarios. Even with regular drills, it was hard to lower my time to an acceptable number. That is, until I realized that the unsnapping and snapping of the baby's outfit was a bottleneck in the process. I recommend-



ed to Sheri that we invest in zippered onesies, and with this process improvement, I was able to decrease my changing time by over 20 percent!

Overall, my time off really helped me take a breather from all of the ins and outs that my job entails, and it enabled me to see the world in a different light. I just hope that being away for so long hasn't made me too rusty. ●

Uri Korn, FCAS, is a director of predictive modeling for AIG, Client Risk Solutions in New York City.

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Becoming a Super Actuary

The following is an excerpt from Mary Hennessy's Address to new members, delivered on May 14 at the 2018 CAS Spring Meeting in Boston.

While the FCAS designation and your actuarial skills really are the best “union card” in the world — providing instant credibility in the insurance world — you can’t stop there.

The same talents that drove you (or that will drive you) to successfully completing your FCAS are absolutely essential to helping insurance companies thrive and reinvent themselves in today’s rapidly evolving landscape.

To become more than an actuary, you need to gain the broadest possible understanding of the insurance business that you can.

How?

Make it a priority to team up with underwriters or claims people, marketing or finance people — hopefully all of the above — to learn what they do.

The most successful actuaries I know are people who made sure that they found a way to learn all parts of the insurance business — not just from exams, but from practitioners and in many cases by joining other departments like underwriting, finance, IT and claims.

If you buy in, let me make another bold suggestion: In for a penny, in for a pound, as they say — follow through on your course of action, no matter what it entails. If you become a broad student of the business, understand how compa-

nies work and how to meet consumer needs. Become that super actuary I am describing. I believe we are also describing a future CEO. Brian Brown asked me to talk to you today because he truly believes that not enough of the talented people in the CAS recognize how far they can go. He asked me to share a bit

The most successful actuaries I know . . . made sure that they found a way to learn all parts of the insurance business . . .

of my story ... to prove the point that even someone who might have been the unlikeliest choice can leverage the actuarial skills and credentials to go a long way.

An Unlikely Beginning

I fell into actuarial student status after being laid off as a high school math teacher. Thankfully, those were the days when in lieu of passing Part 1, you could take the advanced math section of the GRE. A score over 630 got you credit for Part 1. I squeaked by with a 640. I am certain I could never have passed Part 1; I hated calculus. Most of the actuaries I met seemed to be geeks, but I persevered because I was the breadwinner.

I did my early training in a big primary insurance company with an established actuarial student program.

I learned personal lines ratemaking and reserving. It was clear that the geeks really were better at a lot of the work than I was. My aspiration quickly became to transfer out of the actuarial department and go run a branch office somewhere. In those days, no company had enough actuarial talent to support their needs, so my company felt they couldn’t redeploy me to branch operations. Also in those days, virtually no P&C insurance company in the U.S. was led by a female CEO.

So I moved to what was then a boutique consulting practice that specialized in insurance strategy and operations and, importantly, that was led by people who weren’t actuaries.

Learning on the Job

I learned over the next eight to 10 years and over hundreds of projects how insurance really worked — what distinguished the best companies (those with excellent operations, strong technical claims and underwriting processes and training, strong and consistent financial results) from the worst (those who suffered from poor underwriting, bad data, under-reserving, fraud, you name it).

I learned how to do underwriting audits and evaluate claims handling and claims files. I read hundreds of SEC filings and reinsurance contracts. I dealt with insurance auditors and regulators as well as financial reporting. And, of course, I still did or reviewed loss reserves and price adequacy, product design and marketing.

Honing Skills

For personal reasons, I left that great job and, as luck would have it, joined one of the most successful reinsurance companies in America.

We believed strongly in the value of using a multidisciplined team approach across the enterprise. It was evident that this approach was wildly successful in winning business and consulting with clients as well as building actuarial capabilities to grow great business leaders. Those practices and processes firmly established our company as the leading M&A consulting group in the U.S. We typically deployed a group of 25+ underwriters, claims people, actuaries, finance professionals and IT experts to diligence a target company — by 1995 our teams had evaluated companies comprising over half of the total U.S. P&C premiums.

I made it a point during that period to push many of my actuarial colleagues into business unit underwriting or other roles and, as far as I know, none of them ever came back to pure actuarial work.

The next move was my breakout move: joining an insurance holding company with both insurance and reinsurance operations, not as chief actuary, but as chief underwriting officer and shortly thereafter as president.

It was a turnaround, with legacy issues and public company shareholders that had been disappointed for years. That combination ultimately made a rehab too difficult: Our shareholders had lost patience. So my M&A skills came to great use in helping sell the company to a larger and better-funded organization.

Following that, I tried the turnaround thing again, two more times. The first time was as CEO of a Bermuda reinsurer that began with a pretty “big bang” — a \$2 billion reserve increase within

my first 30 days on the job. Luckily we started with \$4 billion in capital, so it wasn’t fatal, but it still made for some testy board meetings and shareholder discussions.

The second time, was working at a specialty personal lines carrier. Reserves were good that time, but operations were bloated. So two months into that job, I had to lay off 20 percent of the workforce or shut the place down. Talk about character-building! In no way could the exams themselves could prepare me for that, but the grit and determination involved in taking those 10 exams definitely served me well.

Wisdom Gained

I’m sure that I made mistakes in all these roles, but I am also confident that from day one of studying for my actuarial exams to attain my FCAS that I was training for those roles. Because of my actuarial training and knowledge, I was better positioned to evaluate operations, make tough decisions and define the paths companies needed to be successful, and then recruit and motivate teams of people who could help make it happen.

Today, eight of the people who were



Mary Hennessy

my senior leaders are themselves CEOs; three of those eight are actuaries. I am prouder of that more than any of my achievements.

So what’s next? If it was possible for an actuary who hated calculus to nevertheless use all the wonderful foundation of our exam process to leverage the FCAS training into numerous CEO roles, it is definitely possible for this group of smarter, more savvy people. I urge you to build the broadest possible career plan. ●

Mary Hennessy, FCAS, is a consultant and resides in Moorestown, New Jersey.

IN MY OPINION BY GROVER EDIE, AR EDITOR IN CHIEF

Conventional Wisdom

When it comes to investments, there seems to be a lot of “conventional wisdom.”

We have heard that we should *rebalance* our investment portfolio periodically. That means if you have 30 percent in bonds, 10 percent in precious metals and 60 percent in stocks, periodically you sell some in a category whose proportion is greater than it was the last time you rebalanced and buy some in the categories that have shrunk proportionally. But does it make sense to sell some of the assets in a class that has performed well to purchase more assets in a class that has performed poorly? In other words, conventional wisdom tells me to sell some of my winners to buy more of my losers. That doesn’t make sense to me.

I must make a disclaimer here: My wife, Diane, handles all our investments, and she does an excellent job of it. We have two rules. One is that she is not to listen to me when it comes to investment matters. That rule saved us a bunch during the recent market turmoil. The second rule is “too many cooks spoil the broth.” More on that later.

So where did the “rebalance your portfolio” concept come from? I don’t know, but let’s think of who would benefit from your rebalancing your portfolio. One who would benefit would be the investor who is selling some of her losers to buy more winners. That person might just be your investment advisor, or the

market leaders in general.

I hear from some investment experts that stock A is undervalued by the market, so you should buy more of it. Wait a minute. What happened to the efficient market hypotheses (EMH)? That theory that states: “It is impossible to

So where did the “rebalance your portfolio” concept come from? I don’t know, but let’s think of who would benefit from your rebalancing your portfolio.

‘beat the market’ because stock market efficiency causes existing share prices to always incorporate and reflect all relevant information.¹” Did the EMH get repealed? Does the speaker have some insider information, which is illegal to use in purchasing or selling equities?

I have a different take on the EMH. First, not everyone gets the information at the same time. That was a bigger issue before the internet was so ubiquitous. Brokerage houses, investment banks, private equities firms and hedge funds spend millions, perhaps even billions, of dollars trying to develop and maintain computerized trading to be one nano-second ahead of the other brokerage houses, investment banks and private equity firms with their trading. They

know if they are first to the exchange with information that reflects a change in the value of an equity, they win.

Secondly, two different investors might view the same information as having opposite effects on the value of a stock. Even if the two agree as to the direction the stock will go, they might not agree on the magnitude. Not all the information is available to everyone, and not at the same time. Sometimes the news is erroneous, and sometimes the recipient has a bias towards the source of the information itself.

Another rule of thumb is that “if you cannot buy a lot of different stocks, buy into a fund and let a professional manage your money.” Sounds good, but then who is really making the money? Likely the fund manager, who gets a bonus if he makes money but doesn’t give it back when he loses your money, even though you get the brunt of both gains and losses. And the fund manager doesn’t work for free, no matter how the prospectus is worded.

I have also heard “You should invest your age in bonds.” This one is like the “periodically rebalance your portfolio,” but with a twist. You rebalance towards fixed income instruments, like bonds, as you age. But there can be a problem when interest rates change, as they do: Bond values rise or fall. If you need the money that you have in a 2 percent, 20-year bond and interest rates have increased to 3 percent, you will take a

¹ Investopedia <https://www.investopedia.com/terms/e/efficientmarkethypothesis.asp>



big loss if you sell the bond with interest rates 50 percent higher than the bond's coupon rate. And it is likely that interest rates went from 2 percent to 3 percent because inflation went up proportionally, meaning your cost of living went up as well.

My second rule of investing is that “too many cooks spoil the broth.” Translation: One person's successful investment strategy will get diluted, and thus become less effective, if the advice of another is added to the decision process. That does not mean that the investor shouldn't get as much knowledge and advice as she can, but the investor needs to weigh it all according to her individual investment objectives, risk tolerances and time horizon. That includes knowledge and advice from investment advisors, television pundits and co-workers. I believe that if two or more very successful investors band

together to manage a pool of assets, they will generate an outcome that is suboptimal to what either could do alone unless

My second rule of investing is that “too many cooks spoil the broth.”

Translation: One person's successful investment strategy will get diluted, and thus become less effective, if the advice of another is added to the decision process.

they all have exactly the same strategy, purpose, investment horizon, view of

risk and transaction propensity.

“Invest in a basket of equities” is another oft-heard phrase. This encourages individuals to invest in companies and industries about which they have no expertise, let alone knowledge. We know what happens when you spread such risk — the losers will be offset by the winners. That works great in insurance, even though we have the underwriting and selection process to try to keep us from insuring losers, but that's a different story. (Or is it?) Again, brokers who want you to “have a balanced portfolio” and “spread your investments in a variety of market segments” might have a different (sales commission) motive in mind.

When it comes to investing, conventional wisdom can be controversial. ●

IT'S A PUZZLEMENT BY JON EVANS

Hanging Rope

Two ends of a rope are fixed to the tops of two poles standing straight above a flat ground surface. The poles are unequal in height, with one pole being twice as tall as the other. When the rope is taut and forms a straight line between the tops of the poles, then its length is equal to the sum of the heights of the two

poles. What is the approximate maximum possible percentage increase in the rope's length, relative to its length when taut, so that its lowest hanging point will still be no lower than the top of the shorter pole? Also, what is the approximate minimum percentage increase in the rope's length, relative to its length when taut, so that its lowest hanging point just barely touches the ground?

Public Key Decryption

Here is a solution is based on Jon Constable's submission to the March-April 2018 puzzle. In this problem, the encrypted message $\alpha = 69,176,418,906,672,230$

is of the form $x^{3,038,795,305} \bmod 2,853,926,939,827,803,391$. Furthermore, $x = a_n \cdot 27^n + a_{n-1} \cdot 27^{n-1} + \dots + a_1 \cdot 27 + a_0$, where $a_i \in \{0, 1, 2, \dots, 25, 26\}$ corresponding to a blank space for 0 together with the order of the letters of the alphabet.

Let $e = 3,038,795,305$ and $N = 2,853,926,939,827,803,391$. Observe, through some computer assistance, that N is the product of two prime numbers, namely $p = 1,400,305,337$ and $q = 2,038,074,743$. Let ϕ be the Euler Totient function and recall that $\phi(N) = \phi(pq) = (p-1) \cdot (q-1) = 2,853,926,936,389,423,312$.

Observe $\gcd(e, \phi(N)) = 1$. To undo the modular arithmetic, we must determine the multiplicative inverse of e modulo $\phi(N)$. Let this be denoted by d . Using computer assistance, we find $d = 432,954,680,896,144,041$. We now determine x by computing $\alpha d \bmod N$, where x and α are defined in the statement of the problem. We conclude $\alpha = 2,133,862,917,804,125,260$.

In base 27 α is represented as $\{14, 5, 23, 0, 25, 15, 18, 11, 0, 3, 9, 20, 25\}$. The message decodes to "NEW YORK CITY."

Solutions were also submitted by Kristen Fox-Neff, Clive Keatinge, Kenneth Klinger, Eamonn Long, Zachary R. Luety, Sean Moore, Chris Norman and John Robertson. ●



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Casualty Actuary at the FCAS or near-FCAS level needed in Boston for Position 80841. Requires predictive modeling experience. R or SAS programming experience ideal. Experience with Emblem, IBM, Guidewire, Angoss, Valen or other modeling software a definite plus.

MODELING ACTUARY - OHIO

For Position 80431Q, an Ohio insurer has an immediate need for an FCAS or ACAS modeling and pricing actuary. Strong programming skills are a must. SQL or Python or SAS or R programming skills required. Pricing experience preferred.

REINSURANCE ACTUARY - CALIFORNIA

A reinsurer seeks a property and casualty pricing actuary in San Francisco for Position 80429Q. FCAS or ACAS with 13+ years of property and casualty actuarial experience sought. Reinsurance pricing experience required. Ideal candidates must have some workers compensation experience.

PREDICTIVE MODELING ACTUARY - ILLINOIS

A Chicago client is looking for a Predictive Modeling Actuary for Position 80836. ACAS or FCAS with at least five years of property and casualty actuarial experience preferred. Predictive modeling superstars sought. You must have great communications skills and be able to explain your work to everyone.

NEAR-ACAS / ACAS - GEORGIA

For Position 80272, an Atlanta insurer seeks a Near-ACAS / ACAS. The key experience this client requires is that this actuary should be able to program well in SAS, R, Hadoop, SQL or Python. 3+ years of property and casualty actuarial experience required. Commercial pricing role.

PERSONAL LINES PRICING - MASSACHUSETTS

Personal lines pricing actuary sought by Massachusetts insurer for Position 80377. FCAS with personal lines ratemaking experience and management experience preferred.

ACTUARIAL ANALYST - MIDWEST USA

For Position 80641, an Midwest USA insurance company plans to hire a commercial pricing actuarial analyst. Requires 2 to 5 years of property and casualty actuarial experience, as well as 3 to 6 actuarial exams passed.

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