

actuarialREVIEW

VOL 48 / NO 3 / MAY-JUNE 2021

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Grown as much as you can in your current role? Take this opportunity to expand your skillset and gain new responsibilities. Growing Midwest client has an exciting opportunity for an ACAS or FCAS with 7+ years of relevant experience including strong technical knowledge and excellent project management skills. Candidate will be providing leadership to managers, supervisors and/or professional staff. This individual will be responsible for estimating and reporting on levels of outstanding claims services, review of premium rates/rating methods and providing input to the business plan of the actuarial function. (#50309)

Senior Data Scientist (Remote)

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Actuarial Analyst III (Ohio/Remote)

Ohio based insurance client has an exciting opportunity for a student actuary or ACAS who can work under limited supervision and help serve as a mentor for less experienced actuarial analysts. Candidate will conduct complex analyses and complete various assignments including Pricing, Loss Reserving, & Research and Development. The ideal candidate would have at least 4 years of actuarial experience, strong organizational skills, and experience utilizing programming languages such as SAS, R, SQL, and Visual Basic. Advanced proficiency in Excel is required. (#49978)

Actuarial Analyst or Associate (Virginia/Remote)

East Coast consulting client is in search of a student actuary with at least 2 actuarial exams passed and 2-3 years of actuarial experience. This self-motivated individual must be familiar with commercial lines, possess excellent communication skills, and be able to work on a diverse range of client projects. (#49455)

VP, Reserving Actuary (Texas/Remote)

Ready to step up to the next level? Leading national insurance distribution company is in search of a FCAS with at least 5 years of actuarial experience including 3 years reserving experience. This talented individual will produce, analyze, and explain quarterly loss and LAE reserve reviews for all programs. The ideal candidate would have a background in personal auto reserving or pricing, possess strong interpersonal skills, and the ability to work both independently and with others. Must have advanced skills in Excel and proficiency in SQL & SAS. Predictive modeling and GLM experience a strong plus. (#50098)

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**Getting Personal:
Can IoT do for
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By ANNMARIE GEDDES BARIBEAU

Exploring the progress of telematics could predict the success of internet-connected devices for homeowners insurance.

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This virtual CAS seminar features a cornucopia of sessions on COVID and P&C insurance, social justice and insurance rating and artificial intelligence.

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and Modeling
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editor'sNOTE By GROVER EDIE, AR EDITOR IN CHIEF

Emerging Issues and Expanding Careers

We have a full issue for May-June. There is a plethora of articles about how telematics, the internet of things, and self-driving vehicles, including drones, are impacting our lives and will be in the future. Commercial buildings have been using computerized heating and cooling programs to reduce energy consumption while optimizing temperature for some time. The characteristics of the building and its systems are matched to weather and occupancy forecasts, among other things. Our cover story, "Getting Personal," provides a glimpse of where new technology might be moving into the home. This is an emerging market that actuaries should pay attention to.

In our last issue, President Jessica Leong's interview of CAS President-Elect Kathy Antonello tells how Antonello rose to the top of her profession. The video and print interview are great for students considering professions and careers as well as working actuaries. Leong continues her President's video series this issue with Adam Driussi of Quantum. Driussi is an enterprising actuary from Sydney, Australia, who is turning what it means to be an actuary on its ear! Throughout

the interview, you learn how Driussi has broadened the expanse of actuarial services. Can actuaries help grocery stores? You bet! Be sure to check out this and all the interviews in the series on how to expand your career.

May is Asian/Pacific American Heritage Month, and in this issue, we highlight this important and growing CAS demographic in the CAS Member Infographic series. Mallika Bender, co-chair of the CAS/SOA Joint Committee on Diversity, Equity and Inclusion, looks back a year ago last May to report on the committees activities in "A Year of Progress."

If you didn't attend the virtual RPM — or even if you did — you can catch up on some of the great sessions covered at RPM. Topics include COVID-19 and P&C insurance, social justice and insurance ratings.

I hope you enjoy this issue. Thank you for reading!

Correction

The March-April Comings and Goings column contains an error. Aaron Hillebrandt was incorrectly listed as an ACAS. He is a Fellow of the Casualty Actuarial Society. ●

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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An Enterprising Actuary: A Conversation with Adam Driussi of Quantum

For my President's Message columns, I will be talking to distinguished actuaries who embody the new Envisioned Future for the CAS. Videos of these interviews will be available as Web Exclusives on the Actuarial Review website and the CAS YouTube channel.

No one would call Adam Driussi an ordinary actuary. This Australian actuary has a deep entrepreneurial spirit.

Eighteen years ago, Adam cofounded Quantum, a Sydney-based big data consultancy. Today, Quantum has offices all over the world, including Bentonville, Arkansas, home to one of their big clients, Walmart. Other clients include P&G, Facebook, Qantas and QBE.

Being from Australia myself, I had known of him for years and was very excited to interview him. Following is an excerpt of our talk, and you can watch the complete interview through the *Actuarial Review* website.

Building Quantum

Eighteen years ago, Quantum was ahead of its time in believing that big data had broad applications across many industries. Back then, Driussi and his business partner pitched to a fast-moving consumer goods company. "It couldn't have gotten any worse. The guy actually said, 'I despise actuaries.'" They didn't get very far with this customer, but it didn't deter them from the belief that they were on to something, and Quantum was born.

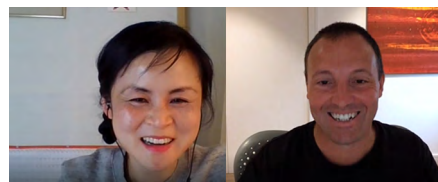
Driussi pitched techniques that insurance companies use to better price their products — how they think about the individual consumers and how they use data that is collected. He showed how techniques used in insurance could help other types of businesses expand and grow.

"Back then insurance companies were always ahead of the game," said Driussi. "They were collecting data for a specific purpose, whether it was rating, a risk or whatever it might have been,

"Back then insurance companies were always ahead of the game," said Driussi ... "a lot of these other businesses were collecting data without really even thinking about it ... Given all of this data, you could do amazing things with it — and insurance companies do a hell of a lot more with a fraction of the data."

where a lot of these other businesses were collecting data without really even thinking about it. The nature of their business meant it generated a lot of data, particularly as the internet took over ... Given all of this data, you could do amazing things with it — and insurance companies do a hell of a lot more with a fraction of the data."

Driussi's ideas have taken off today with a lot of other companies who "have the data and are now applying the techniques to big business problems."



Insurers can learn from other businesses now.

Talking Business

Communication skills are vital to getting business. He sometimes thinks that many internal teams can be "too academic." "I've seen some internal teams where the head data scientist seems more concerned about publishing papers than actually achieving results ... sometimes they're too splintered off and they are seen as the technical boffins¹

in another part of the business rather than working with the business. And it's a really difficult thing to work out," said Driussi.

Typically, businesses would be open to engaging with Quantum because the company would "come in and try and talk to them like business-people."

Building Commercial Skills

I reminded Driussi that he had said once

President's Message, page 8

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President's Message

from page 6

that actuaries really have three skill sets: technical, financial and commercial. Obviously, Driussi has a strong commercial side, and that's an area in which he thinks a lot of actuaries could benefit.

Typically, businesses would be open to engaging with Quantum because the company would “come in and try and talk to them like businesspeople.”

He came by his strong commercial instincts naturally. He has always been interested in new endeavors. He said that he had decent technical skills but that he had always loved business the most. Even as a child, he would sell things at school. He became very good at making deals. Although he was drawn to business, he feels that a lot of what he has come to love can be taught to actuaries.

Thinking in broader commercial terms and looking at business problems from the client's point of view is crucial to understanding and winning the business.

See More, Learn More

These are just a few of the things that I learned talking with Adam Driussi. He talks about transforming retailers as well as getting out of your comfort zone.

I encourage all AR readers to see this and other video interviews I have conducted. ●

CAS Releases 2020 Annual Report

The CAS is pleased to release the 2020 CAS Annual Report, a publication detailing the organization's notable activities and accomplishments over the past year. Throughout its pages, CAS members, candidates and other stakeholders will see examples of outstanding work done in 2020, with a view towards future initiatives the CAS is now pursuing in 2021.

Highlights from this year's report include:

- Key diversity statistics for the organization
- A snapshot of the computer-based testing launch in Fall 2020
- The story behind the new CAS Student Central Summer program

- A full listing of CAS's research and publication accomplishments
- A look back at the convenings, conferences and events of 2020
- Examples of the great work being done by members, volunteers and staff throughout the year



This year's report features testimonials from CAS volunteers and staff in different functional areas to provide additional insight into last year's CAS initiatives. The report also features a 2020 Year in Review video that encapsu-

lates the key statistics from the past year in a fast-paced, engaging format.

To view the complete report, visit the CAS Annual Report page. ●

ACTUARIAL REVIEW LETTERS POLICIES

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

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COMINGS AND GOINGS

Pinnacle Actuarial Resources welcomed three new actuarial consultants to its team. **CAS Fellows Gaétan Veilleux** and **Kunshan Yin**, and **CAS Associate Travis Murnan** were hired to enhance Pinnacle's modeling, data science and risk analytics expertise.

Christopher Laws, FCAS, has been appointed to executive vice president and chief actuary of Employers Holdings, Inc. Laws succeeds **CAS President-Elect Katherine Antonello** as chief actuary. CAS Fellow Antonello was chosen president and chief executive officer of Employers.

Chubb Tempest Re named **Sam Peters, FCAS**, division president of Chubb Tempest Re Bermuda. Peters currently serves as chief actuary for the same organization and Chubb Bermuda.

Iva Yuan, FCAS, has joined ICW Group Insurance Companies as vice president, product and pricing. Yuan brings more than 20 years of P&C insurance industry experience to the organization.

EMC Insurance Companies has promoted **Derek Dunnagan, MBA, FCAS, CPCU**, to vice president-pricing and modeling. Dunnagan now co-leads of the company's actuary department and joined EMC in 2017 as an assistant vice president-principal actuary.

Applied Underwriters in Omaha, Nebraska announced several promotions. **Justin Smith, FCAS, MAAA**, is chief underwriting officer. He joined the organization in 2006 and has taught at Oxford University, worked as government economist in the U.K., and holds 10 patents in the insurance

field. Named chief actuary, **Jing Hong, FSA, ACAS, MAAA**, joined in 2009 and worked previously at Aon Hewitt and Kaiser. **Joan Klucarich, FCAS, MAAA**, is chief reserving actuary. She worked for Fireman's Fund and Milliman prior to joining the company in 2005. **Jordan Comacchio, ACAS, ASA**, chief pricing actuary, recently joined the company from Greenlight Re, where he was the corporate actuary.

Greg Talbot, FCAS, has been promoted to vice president of actuarial at Summit, a leading provider of workers' compensation insurance services in the southeastern U.S. He joined Summit as an actuary in 2010 and most recently served as assistant vice president of actuarial.

Constellation, Inc. announced that **Ryan Crawford, FCAS**, currently Constellation's senior vice president of insurance operations, will succeed Bill McDonough as the company's president and chief executive officer effective June 1, 2021. Crawford has also been elected to Constellation's board of directors.

Eduard Alpin, FCAS, has been named chief actuary for Resilience Cyber Insurance Solutions. He joined Resilience in April and most recently served as the director of cyber solutions at Verisk Analytics. He led the ISO Cyber Rating Plan development and launched the Cyber Data Exchange, a first-of-its-kind global data-sharing platform.

Samuel J.Y. Tashima, FCAS, MAAA, MBA has been named one of 40 winners of the 2021 Business Insurance Break Out Awards. The awards program recognizes the next generation of insur-

ance industry leaders; nominations are open to anyone working in the commercial insurance and risk management sector who has no more than 15 years' experience in the industry. Tashima was nominated by an office coworker and will be highlighted as part of the June issue of Business Insurance. He is director & actuary, U.S.-actuarial & analytics for Aon's Global Risk Consulting in commercial risk solutions. ●

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

CALENDAR OF EVENTS

* Visit casact.org for updates on meeting locations.

July 20-21, 2021

Virtual In Focus Seminar

September 13-15, 2021

Virtual Casualty Loss Reserve Seminar

November 7-10, 2021*

Annual Meeting

Spring 2022*

Actuarial Colloquia (hosted by the CAS)

IN MEMORIAM

Boris Privman (FCAS 1991) 1957-2021

Diversity, Equity & Inclusion: A Year of Progress BY MALLIKA BENDER

It's been one year since a video of George Floyd's death on May 25, 2020 sparked protests, first in Minneapolis, Minnesota, and then across the United States and dozens of countries around the world. While George Floyd was not the first, nor the last victim of racial injustice in North America, that event, combined with evidence of racial disparities arising from COVID-19, compelled individuals and entire industries to contribute to change that has been

desperately needed for decades. On June 3, 2020, the CAS added our voice to the many organizations speaking out in support of justice, equity, diversity and inclusion, with a letter from then President Steven Armstrong and CEO Victor Carter-Bey.

Of course, words are made more meaningful when they are supported by action. The CAS has been committed to fostering a diverse, inclusive actuarial profession for many years, but progress

has been a challenge to achieve, and the events of last summer showed us that we needed to dig deeper. In September 2020, the board of directors approved a new CAS Approach to Diversity, Equity, and Inclusion (DE&I), supported by an action plan of over 40 activities to be initiated over the next year.

The board also approved a significant increase in funding for DE&I activities, including multi-year investments in the International Association of Black Actuaries (IABA), Organization of Latino Actuaries (OLA), The Actuarial Foundation, and organizations supporting higher education for Black, Hispanic/Latino and Native American students.

That same month, CAS volunteer leaders convened at the annual Leadership Summit and discussed strategies to attract, engage, retain and develop a diverse group of future CAS leaders. We also introduced the topic of "equity" and began thinking about how we can question our systems and processes to account for an external playing field that is never truly level. This training was a first step in scrutinizing the processes in place within the CAS to combat systemic bias.

While focusing inwards at the Leadership Summit, we also needed to make sure that CAS members were

CAS Strategic Approach to Diversity, Equity & Inclusion

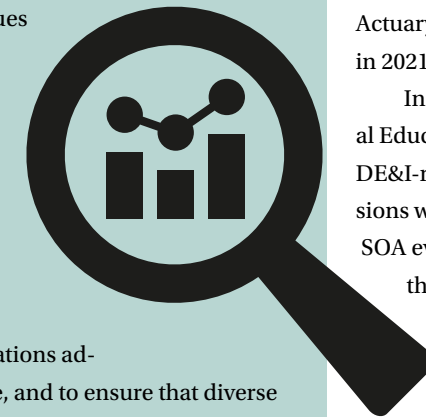
With a clearer understanding of the society in which we operate and its impacts on our own members and candidates, the CAS recognizes that equality will never be achieved until equity is our guiding principle and pledges to:

1. Center and amplify the viewpoints of underrepresented candidates and members — those who have been doing this work for years and know best how to address the issues of their constituencies.
2. Break down the Barriers to Entry identified in the 2017/2018 SOA/CAS/IABA/TAF Research Study.
3. Scrutinize and rebuild CAS systems to combat direct and indirect systemic bias, and ensure our work does no harm.
4. Recognize that we do not exist in a vacuum and that we cannot succeed unless we invest in the community at large, with particular focus on organizations that support racial justice in education.
5. Set concrete goals and maintain transparency and accountability around progress and failure.
6. Employ learnings from the above process to address issues facing members and candidates in other historically marginalized groups within and outside of North America.



CAS Approach to Race and Insurance Pricing — Focus Areas

- Basic and Continuing Education — to provide members and candidates with a strong foundation in the historical issues of systemic racism and their potential impacts on insurance, covering concepts of disparate impact and discrimination, past and current research, and professionalism implications.
- Research — to develop methodologies that identify, measure, and address disparate impact, to evaluate emerging technologies and to prepare actuaries and insurers for potential regulatory actions, in alignment with the CAS Core Values of continual improvement and innovation.
- Leadership and Influence — to play a leading role in the discourse on potential racial bias in insurance pricing, among our membership as well as across the insurance industry and with the public.
- Collaboration — to proactively engage and partner with regulators, insurers, actuarial bodies, consumer groups and other organizations addressing issues related to race and insurance, and to ensure that diverse perspectives contribute to CAS-commissioned efforts.



High School Actuarial Day ... addresses one of the many barriers to entry for underrepresented candidates — a lack of awareness or late awareness of the profession.

aware of important efforts underway in our partner organizations. 2020 saw the formation of the Sexuality and Gender Alliance of Actuaries (SAGAA) — an independent, cross-practice group of LGBTQ+ actuaries and allies. The CAS was excited to support this group in their efforts to promote inclusion, networking and advancement of LGBTQ+ actuaries. OLA also made great strides in 2020 with their new OLA Academy program, building Latinx candidates' resumes and interviewing skills and helping many candidates land actuarial jobs and internships. The IABA published

comprehensive recommendations for employers to increase the number of Black actuaries in North America, as well as "A Tale of Two Actuaries" comic strip, which will be featured in an upcoming AR issue. Members attending most CAS Regional Affiliates meetings got to hear more from SAGAA, OLA and IABA on these important programs and recommendations.

The summer and fall of 2020 also saw accomplishments in the CAS/SOA Joint Committee for Inclusion, Equity and Diversity (JCIED). The Career Encouragement Working Group pivoted

its High School Actuarial Day from an in-person to a fully virtual format. This event addresses one of the many barriers to entry for underrepresented candidates — a lack of awareness or late awareness of the profession. The pilot event, now called Be An Actuary Day, was held in September 2020 and was such a success that the JCIED will be hosting at least seven virtual Be An Actuary Days across the United States in 2021.

In addition, the JCIED's Professional Education Working Group ensured DE&I-related continuing education sessions were included in major CAS and SOA events throughout the year, and the Leadership Working Group developed a set of recommendations for both organizations to implement to develop a diverse group of future leaders.

Finally, the JCIED brought forth a recommendation to the CAS and SOA leadership to expand the Diversity Exam Reimbursement program. This program has been in place for many years to address another barrier to entry, lack of financial support for those attempting preliminary actuarial exams. The expanded program, informed and inspired by programs offered by OLA and IABA, now provides a study material stipend and exam fee reimbursement for students passing any of the first four preliminary exams, and it encourages failing candidates who made good faith attempts to persist in the exam process.

Meanwhile, CAS leaders turned their attention towards another important topic: how societal systemic racism impacts the work of actuaries and the role actuaries can play in addressing it. In December 2020, the board approved the CAS Approach to Race and Insur-

ance Pricing, with key areas of focus in education, research, leadership and collaboration.

Since December 2020, the CAS has initiated discussions with several external organizations to share information and identify opportunities to cooperate on research for topics such as systemic bias and disparate impact in insurance pricing. We have also included continuing education sessions on disparate impact and racial bias at the 2020 Annual Meeting and the 2021 RPM Seminar and Spring Meeting. In early 2021, we kicked off several research projects covering the impacts of systemic racism and potential solutions in insurance and other industries. We are also piloting a Race and Insurance Discussion Group, which is a series of six small-group discussions on the interactions between systemic racism, insurance and actuaries as individuals and professionals.

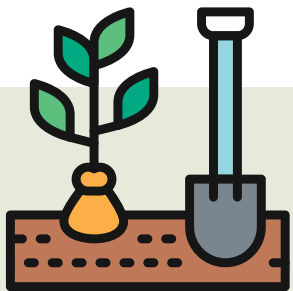
We kicked off several research projects covering the impacts of systemic racism and potential solutions in insurance and other industries.

Our work in DE&I will continue for many years to come, but we are making progress towards to ideals set out in the Strategic Approach to DE&I. The CAS published a series of four infographics, our Spotlight on Diversity 2020, detailing aggregate member demographics across gender and race/ethnicity groups, as well as long-term targets for increasing representation of underrepresented

and network with practicing actuaries, like the return of the CAS Student Central Summer Program, originally created to fill the void of lost internships in 2020 due to COVID-19. We will continue to identify opportunities for CAS members to learn more about and get involved with IABA, OLA and SAGAA in their efforts to advance Black, Latinx and LGBTQ+ actuaries and candidates, and we will look to those organizations

DIG it! Join the Diversity Impact Group!

- Visit the CAS Online Community at <http://bit.ly/CAScommunity>.
- Sign in with your casact.org password.
- In the COMMUNITIES menu, select ALL COMMUNITIES.
- Scroll down to Diversity Impact Group and select JOIN.



groups. Check them out on the CAS website or find select infographics in *Actuarial Review* throughout 2021 (including this issue).

In 2021 we are looking forward to stronger outreach to minority-serving colleges and universities as well as engaging our long-term university partners in our DE&I strategy. These efforts will help us increase awareness of the profession among underrepresented students. We will couple that with additional opportunities to gain relevant experience

for recommendations on how to best support the communities they serve. We are also keeping tabs on and offering our support to new actuarial affinity groups coming to life in 2021. We can't wait to bring more news of that to our members, so stay tuned!

Here are a few ways you can learn more or get involved in actuarial DE&I efforts:

- Check out the Diversity, Equity & Inclusion page coming soon on the CAS website for a host of resources you can use to promote DE&I in your volunteer committees or at your employer.
- Join the Diversity Impact Group (DIG) online community to stay up to date on news and volunteering opportunities from the CAS, JCIED, IABA, OLA, SAGAA, The Actuarial Foundation and more. (See DIG it! box for details on how to join.)
- Email Mallika Bender at mbender@casact.org with questions or suggestions.

Mallika Bender, FCAS, MAAA, (she/her/hers) is co-chair of the CAS/SOA Joint Committee on Inclusion, Equity and Diversity. She is a P&C actuary with experience in the United States and Australia.

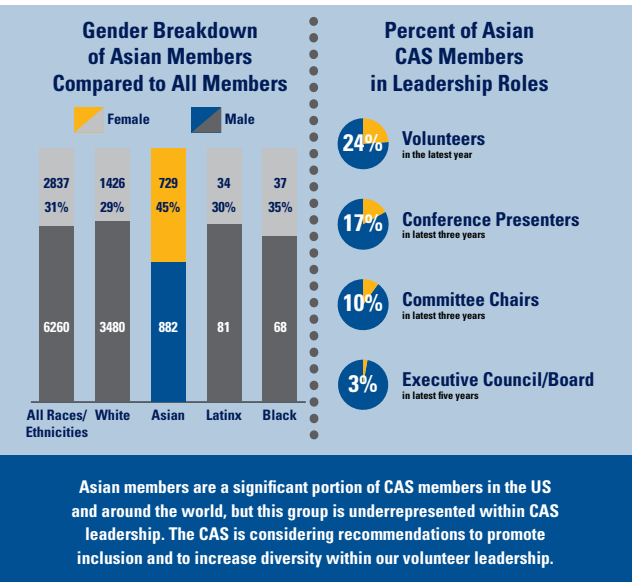
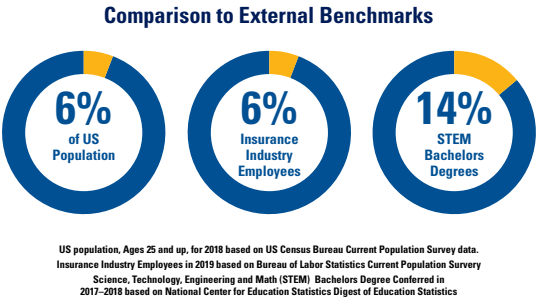
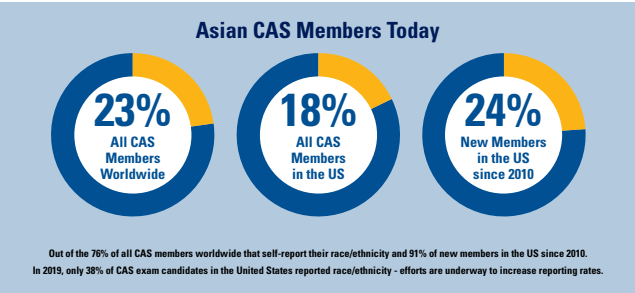
Spotlight on Diversity

As part of its Strategic Approach to Diversity, the CAS has developed a series of infographics to understand the current state and to track our progress on diversity efforts. In honor of Asian/Pacific American Heritage Month in May, *AR* presents the second in the series, "Asian Members in the CAS." Asian members come from a wide variety of backgrounds and make up a significant portion of overall CAS members in the U.S. and around the world. However, the infographic details a decline in representation at leadership levels. The CAS is dedicated to improved representation of Asian members at all levels within our volunteer leadership pipeline.



CAS SPOTLIGHT ON DIVERSITY 2020
ASIAN MEMBERS IN THE CAS
Membership data as of June 2020

The CAS is sharing demographic data of members and candidates, along with our goals for demographics in the future, to be transparent about our diversity and hold ourselves accountable.



YOU CAN HELP US GET THERE
JOIN THE DIVERSITY IMPACT GROUP AND SHARE YOUR IDEAS
AT COMMUNITY.CASACT.ORG
If you want to make sure that your demographic information is included in these metrics, please log on to the CAS website and update your membership profile.

IMSC Continues Its Successful OutReach Program

BY JOYCE CHEN, CHAIR OF THE INTERNATIONAL OUTREACH PROGRAM, AN IMSC SUBCOMMITTEE

The CAS International Member Services Committee (IMSC) serves the large and growing group of members and candidates residing outside of North America. Our committee consists of Regional Affiliate leads, volunteers from all over the world and liaisons to other committees, and we are organized into various subcommittees and working groups. All our work directly supports a major pillar of the CAS Strategic Plan: “Expanding globally.” We do this by reaching out to our international members, addressing their concerns, advocating for them within the CAS, supporting and providing for their continuing education needs, connecting them to each other and to fellow actuaries, and promoting further involvement with the CAS. We also have goals to improve our online global presence, encourage and support grassroot movements, and assist in developing university programs in other countries.

One key way that we achieve these goals is through our IMSC OutReach Program, which, as its name suggests, reaches out to CAS Members and Candidates abroad. As of year-end 2020, there are 569 CAS members living outside of North America. Since starting our OutReach Program in the past decade, we have sent out over 400 welcome emails to newly expatriated CAS members and students.

Conceived over 10 years ago, the International OutReach Program’s initial vision statement is still valid today: We provide a local contact, a friendly face and relevant information to someone

who may find themselves in a rather foreign environment. Paramount for us is to be relevant, and we achieve this best through local contacts who can adapt their outreach to best suit the specifics of the country and situation.

International OutReach Program Origins

The program was borne out of necessity and a desire to help. OutReach founder Gabriel Ware, FCAS, recalls the original inspiration for the program when he moved to Munich, Germany in 2007. “Navigating my new employment culture, apartment rental, health insurance system and even restaurant menus in this beautiful, albeit unfamiliar, world were a challenge, particularly with my limited German,” says Ware. The CAS IMSC chair at the time was Jeff Courchene, FCAS, who also lived in Munich. “Courchene was an invaluable source of guidance as he had navigated the same issues over his time in Munich (although with much better German!),” says Ware. “We realized that expat CAS members could be in a unique position to ably serve our membership in this way and the OutReach Program was born.”

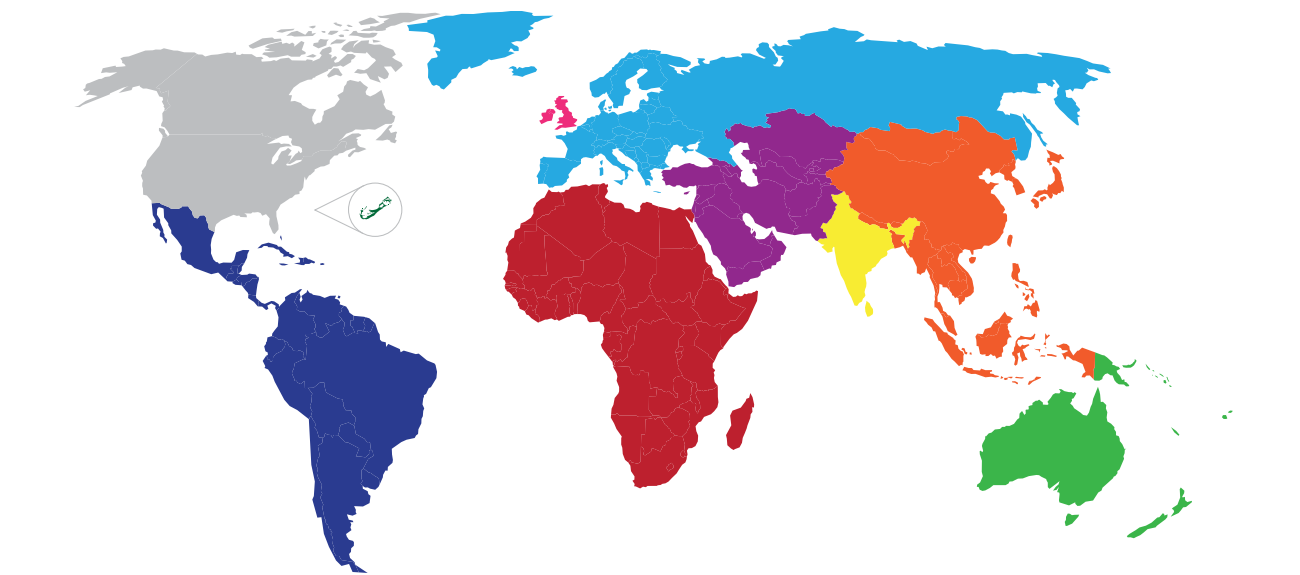
Our OutReach Subcommittee includes a chairperson and nine Regional Contacts — all volunteer CAS members with personal expat experience. Each month, we identify individuals whose address has recently changed to outside North America. These include new expats as well as a growing number of members who remain abroad but are switching countries. The respective Regional Contact will then send them

an email welcoming the individual to the foreign area, introducing themselves as a local CAS contact and providing country-specific information about Regional Affiliates, other local actuarial organizations and upcoming meetings. We offer ourselves as a local resource for actuarial and any expatriate-related questions or issues our members might have. We often provide members with ideas about how to support and be involved with CAS activities of their new country of residence.

OutReach success stories

Yvonne Palm, FCAS, is one such member who not only benefited from OutReach but became an enthusiastic volunteer. Palm learned about the IMSC by a welcome email from Gabriel Ware, soon after she settled in London in 2011. Ware’s email opened her eyes to what was available to her. “[It] helped me realize I was in good company,” says Palm. Later that year, she volunteered for the IMSC OutReach Subcommittee and was soon welcoming other CAS members that had recently moved to the U.K. and Ireland. She and other newcomers bonded over such stories as the difficulties of opening a bank account in their new home countries.

Over the years, Palm has sent numerous emails and met many new faces, one of which is Amber Rohde, FCAS, the current IMSC chairperson. “The welcome email and subsequent coffee with Yvonne was a pivotal moment for me,” say Rohde. “It led to connections and leadership opportunities that brought me closer to the larger CAS global com-



| OutReach Region | Regional Contact | CAS Members |
|-------------------------------|----------------------|-------------|
| Africa | Yvonne Palm | 0.5% |
| Asia (All Other) | Raksa Wimonsutthikul | 49.9% |
| Asia (India) | Hemanth Thota | 1.8% |
| Australia/New Zealand | Susan Macaulay | 3.3% |
| Bermuda | Blerta Tartari | 19.0% |
| Europe | Stephanie Akroyd | 12.0% |
| Latin/South America/Caribbean | Silvana Sarabia | 3.0% |
| Middle East | Rebecca Dunn | 1.6% |
| U.K./Ireland | Gabriel Ware | 8.9% |

munity — not to mention, it helped to create an all-around better experience for me as I began my life in a foreign country.”

Palm is now based in Nigeria, but the CAS community remains a global village to her because of the connections she made through the OutReach Program. “Even though I’m now in a location where it appears I’m the only CAS member, I still feel connected to the CAS community and take comfort in the fact that the CAS knows I am here,” says

Palm. “I’m looking forward to figuring out ways I can leverage my relationship with the CAS to make an impact in my region.”

How to Get Involved

OutReach is currently split into nine distinct Regions with a Regional Contact residing in each of them (see table above).

If you are a CAS member or candidate looking for information about moving abroad or an expat looking to

network or looking for continuing education opportunities, we are your resource! If you have any international questions, we are here to answer them or at least point you in the right direction. For more information on the International Member Services Committee or the IMSC Out-reach Program, please send an email to international@casact.org. ●

Joyce Chen, ACAS, is principal & consulting actuary for RenewalRe LLC.

IN REMEMBRANCE

In Remembrance is an occasional column featuring short obituaries of CAS members who have recently passed away. These obituaries and sometimes longer versions are posted on the CAS website; search for "Obituaries."

The Workers' Comp Expert

Allan Kerin (FCAS 1994)

1955-2020

Allan Kerin, chief actuary and executive vice president for Berkshire Hathaway GUARD Insurance Companies, died in August 2020.

A member of the American Academy of Actuaries, he earned a BS in mathematics and an MS in applied mathematics and statistics from the State University of New York at Stony Brook.

Kerin was a long-serving member of several CAS committees. He was active on the Syllabus and Exam Committee from 1995 to 2003, and in 2002 he served on the Design Task Force for Exams 3 and 4. From 1997 to 2000, he served on the Ratemaking Committee. He also served AR from 2002 to 2008.

A workers' compensation expert, Kerin wrote "Workers Compensation Pricing Perspectives: Factors Affecting Workers Compensation Insurance Efficiency and Cost," which was published in *The Standard* in May 2019. In the article he shared his thoughts on workers' compensation pricing and the factors that were driving rate reductions.

The Actuarial Scientist

Robert Arthur Bailey (FCAS 1955)

1930-2020

Robert Bailey seemed destined for the actuarial profession as his parents met in the actuarial program at the University of Michigan. He earned a BA in math-

ematics in 1951 and an MS in statistics in 1953 from the University of Iowa. In 1952 he married Shirley Segerstrom.

Bailey's actuarial career included posts at the National Bureau of Casualty Underwriters, the Insurance Department of Michigan, the NAIC and A.M. Best Company, where he was in charge of Best's ratings and reports on P&C insurers. He was a partner at the reinsurance broker E.W. Blanch Company, which awarded him its Employee of the Year Award for 1990.

A two-term CAS Board member, he contributed many papers to the *CAS Proceedings* and *Best's Review*, including seminal works in actuarial science. Bailey and LeRoy Simon wrote the 1960 *Proceedings* paper "Two Studies in Automobile Insurance Ratemaking." Bailey developed the concepts further in 1963 with "Insurance Rates with Minimum Bias."

Bailey was awarded the Matthew Rodermund Service Award in 1993 and the Michelbacher Significant Achievement Award in 2019. He served one term on the American Academy of Actuaries Board and, in 1999, received its Robert J. Myers Public Service Award. He was elected to the Michigan Insurance Hall of Fame in 1997. In 2008 he wrote *The Structure of Paul's Letters*, an in-depth analysis of some of the earliest existing Christian documents. He was a member of the Society of Mayflower Passengers in Michigan and served as its treasurer from

2001 to 2007.

Survivors include his wife, Shirley; their six children; a brother and two sisters; seven grandchildren; and four great-grandchildren.

The Supportive Caregiver

James E. "Jim" Scheid (FCAS 1969)

1934-2020

Jim Scheid of Simsbury, Connecticut, died in July 2020, at his daughter's home.

Scheid was born in Lancaster, Pennsylvania, and graduated from Franklin and Marshall College with a degree in mathematics. He moved to Connecticut and spent his entire career in the insurance industry, the majority of which with the Hartford Insurance Group as an actuary and executive. He also worked for the United Way, where he served others, including delivering "Meals on Wheels."

He was a loving and caring husband, father, grandfather and great-grandfather. He provided compassionate care to his wife, Betty Lou, during her final years dealing with dementia. The couple were married for 61 years.

He enjoyed camping, gardening, jogging, walking his dogs and skiing, which became a lifetime pursuit and passion. He enjoyed times spent with friends and family at the Okemo Mountain ski area in Ludlow, Vermont — he was notorious for wearing a lime green ski suit.

Scheid was described as naturally good-hearted, generous, unassuming, sensitive and quick-witted. He loved animals and one special pet was by his side when he died. A supportive parent, he encouraged his children in their endeavors. Survivors include sons Jim (Mary Claire DeHaven) Scheid Jr. and Steve (Lisa) Scheid; daughter Sue (Tom) Vogt; seven grandchildren; and one great-grandchild. ●



Obtain Your Credentials in Predictive Analytics and Catastrophe Risk Management From The CAS Institute



Certified Catastrophe Risk Management Professional (CCRMP) and Certified Specialist in Catastrophe Risk (CSCR)



The International Society of Catastrophe Managers (ISCM) and The CAS Institute (iCAS) have joined together to offer two credentials in catastrophe risk management. The Certified Catastrophe Risk Management Professional (CCRMP) credential is available to experienced practitioners in the field through an Experienced Industry Professional (EIP) pathway. The Certified Specialist in Catastrophe Risk (CSCR) credential is available both through an EIP pathway and an examination path.

Required assessments and courses for earning the CSCR include:

- Property Insurance Fundamentals
- Catastrophe Risk in the Insurance Industry
- Introduction to Catastrophe Modeling Methodologies
- The Cat Modeling Process
- Online Course on Ethics and Professionalism

Some exam waivers are available for specific prior courses and exams.

For more information, visit CatRiskCredentials.org.

Certified Specialist in Predictive Analytics (CSPA)



The CAS Institute's Certified Specialist in Predictive Analytics (CSPA) credential offers analytics professionals and their employers the opportunity to certify the analytics skills specifically as applied to property-casualty insurance. The program focuses on insurance as well as technical knowledge and includes a hands-on modeling project that challenges candidates to apply what they have learned throughout their studies to address a real-world scenario.

Required assessments and courses for earning the CSPA include:

- Property-Casualty Insurance Fundamentals
- Data Concepts and Visualization
- Predictive Modeling — Methods and Techniques
- Case Study Project
- Online Course on Ethics and Professionalism

Some exam waivers are available for specific prior courses and exams.

For more information, visit TheCASInstitute.org.



Getting Personal

Can IoT do for Homeowners Insurance
What Telematics Did for Auto Coverage?

By Annmarie Geddes Baribeau

Homeowners insurer-based internet-connected devices are expected to be as transformative as telematics for personal auto insurers.

Telematics is transforming personal auto insurance. What began as a way to track policyholder behavior more than 15 years ago has enhanced driver safety and spawned new rating approaches, process efficiencies, insurtech carriers and data aggregators.

Hoping to reduce losses, improve customer experience and develop rating factors, homeowners insurers started offering internet-connected devices to policyholders about five years ago — just as the insurtech movement began gaining momentum.

Although the equipment, risks and coverage are different between personal auto and residential property coverage, there is an expectation that connectivity for homeowners insurance will follow a similar path. Gaining insight into the future of insurer-based, internet-connected devices in the home begins with looking at how telematics is faring.

The State of Telematics

The results from insurer-sponsored telematics programs are nothing short of revolutionary. For decades, actuaries knew there was a relationship between accidents and certain driver behaviors, such as speeding, rapid turns and lane changes along with hard accelerat-

ing, decelerating and braking. Without knowing how individual policyholders operate their vehicles, the closest rating proxies available to actuaries are traffic citations and claims experience.

When a few personal auto insurers began using telematics with plug-in devices, the resulting data did not merely confirm what insurers had suspected for decades. Telematics data also gave insurers the opportunity to quantify the relationship between drivers' actions and resulting claims while supporting a new level of coverage personalization. It did not take long for competitors to follow suit.

Apps, which came on the scene about five years ago, are gradually replacing plug-in devices. The Insurance Research Council's (IRC) survey, "Auto Insurance Telematics & Smartphone Use: Consumer Survey Report," reveals that 51% of respondents are engaging in their insurers' telematics programs through apps. Meanwhile, 33% use temporary plug-in devices and 15% are participating with their car's onboard system, according to the survey of 2,099 respondents released in August 2020.

Insurer-based telematics programs offer several opportunities. Auto insurers are using telematics for actuarial, marketing, underwriting, claims and service functions, though the degree of use changed in 2021 compared to 2020, according to Novarica's "Emerging Technology in Insurance" reports for 2020

7 Reasons to ditch link ratios

- ▶ Link ratios cannot measure calendar year social inflation
- ▶ The assumptions are rarely met by the data
- ▶ No insight into trends in the business
- ▶ Too slow to review
- ▶ No connection to the risk characteristics of the data
- ▶ No early warning system
- ▶ No way to determine whether an answer is good, bad, or ugly

The Mack method is a regression formulation of volume weighted average link ratios (chain ladder). The regression formulation means the method can be tested statistically. Other method variants can be included such as different weights, an intercept (Murphy) and an accident year trend for each development year. All these methods are included in the Extended Link Ratio Family (ELRF) modeling framework.

In the Probabilistic Trend Family (PTF) modeling framework, we mitigate model specification risk by identifying a parsimonious model describing the trends in the three directions (development, accident, and calendar), along with the volatility about the trend structure.

MACK!

MACK!

MACK!

MACK!

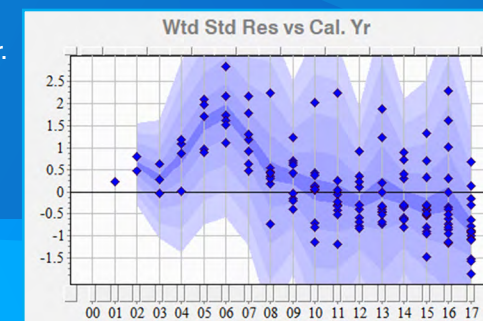
WHAT QUACKERY IS THIS?

Link ratio methods residuals trend down: Projections too **high**

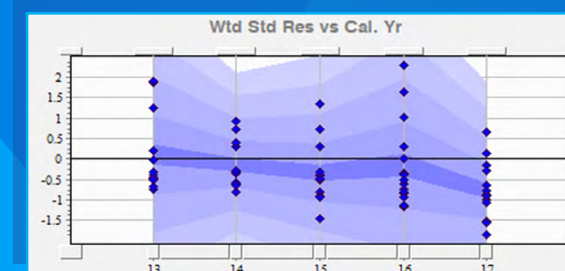
Consider anonymized Paid Loss data for an Auto Insurance provider (segment: Bodily Injury). The data can be downloaded from: icrfs.me/7reasons

The display on the right shows a strong downward trend in the residuals (trend in data minus trend in method) versus calendar year.

This means a link ratio method will grossly overstate the reserve estimates. The Mack method (volume weighted average) gives a total reserve of 902M. The arithmetic average link ratios gives a total reserve of 1.16B.



| Incremental | | Cumulative | | |
|---------------------------------------|-----------------|------------|---------|---------|
| Accident Period vs Development Period | | | | |
| | Cal.Per.Total. | 0 | 1 | 2 |
| 2015 | 163,954 | 9,618 | 54,613 | 88,689 |
| | 160,899 | 9,618 | 75,810 | 62,653 |
| 2016 | 210,078 | 15,225 | 86,451 | 86,647 |
| | 216,417 | 15,225 | 68,255 | 15,012 |
| 2017 | 289,335 | 13,628 | 77,383 | 94,464 |
| | 201,780 | 13,628 | 11,493 | 19,398 |
| | Fitted/Observed | | 2018 | 2019 |
| Cal. Yr Totals | 1,629,546 | | 284,355 | 241,747 |
| | 1,625,059 | | 30,270 | 34,119 |
| 1 Unit = £1,000 | | | | |



Left is the forecast table (incremental version) for the Mack method.

The company just paid 202M GBP in 2017 (blue numbers are observed) but the fitted mean value (black numbers) is much higher at 289M. Further, the method is projecting the company will pay 284M GBP in the next calendar year!

The method clearly provides false indications.

The optimal model identified in the Extended Link Ratio Family (ELRF) modeling framework applied to the last five calendar years has trends, intercepts, and very few ratios (because they have no predictive power). The residuals are much improved (left). The trends in the data are more in line with the trends in the method.

The total reserve mean projected from this identified model is 504M – around half the original Mack method projected mean reserve! This is a much better estimate of the reserve mean, but how do we know it's the best?

Let's see what is really going on

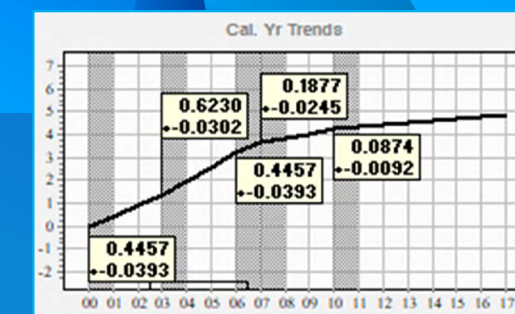
The identified model in the PTF modeling framework has calendar year trends as seen on the right. The calendar year trends are much lower more recently. Trends in other loss types (for instance: Case Reserve Estimates or Number of Claims Closed) can be related to the trends in the paid losses.

The actuary now has a narrative about the data.

Projections from the PTF model are much more realistic. The forecast scenario in PTF, using the 8.7%+ calendar year trend, projects a mean payment of 223M GBP next year – much more in line with the recent history. The total mean reserve is 598M.

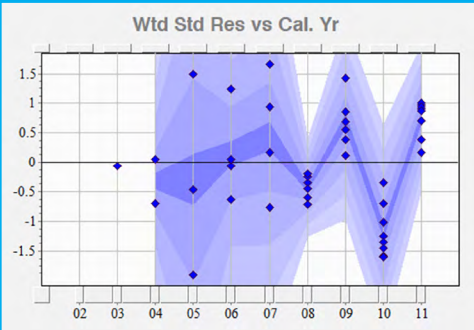
The actuary has control over all future trend assumptions in the PTF modeling framework. These can be related directly to the trends (or volatility) observed in the past – including CREs or NCC.

To get in the ballpark of the original forecasts of the Mack method, the future calendar year trend has to increase from the most recent 8.7%+ calendar year trend to more than 25%+ for the entire run-off period!



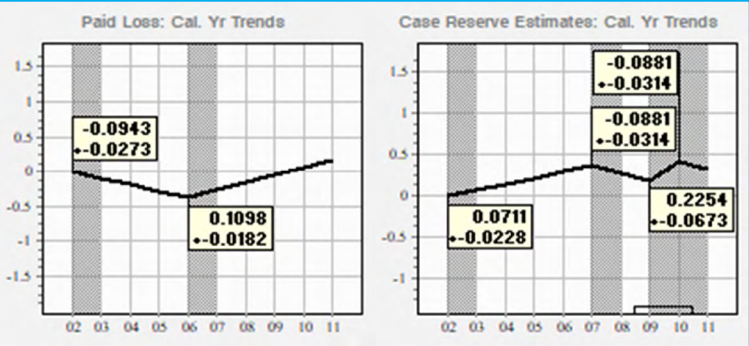
Link Ratio Methods residuals around zero: Projections too **low**

Maybe you think using Incurred Losses gives better estimates than Paid Losses?
Consider the Incurred Loss data from Best's Schedule P (2011) for Tower Group.
The data can be downloaded from: icrfs.me/7reasons



On the left are residuals from the Mack method applied to the Incurred Losses. The zig-zag conflates what is going on.
The total mean reserve projected by the Mack method is: 1.059B.
The held reserves by the company as of 2011 were 921.9M. By calculating chain ladder ratios excluding the 'high' calendar years of 2009 and 2011, the forecasted total reserve drops to 950M.
The held reserves were supported by link ratio methods.

In the PTF modeling framework, Paid Losses and Case Reserves are modeled separately. Note the calendar year trends are not the same in the Paid Losses (left) and Case Reserves (right).
In order to reach the reserves held, the calendar year trend for the future has to change from +11%+ to -16.85%+ - a total difference in trend of nearly 28%!! This is impossible!



- Without access to the PTF modeling framework, how would you know whether your projections are meaningful?
- Since 2006 the paid losses have been increasing 11%+ faster than Earned Premium. This is high social inflation. This leads to increases in loss ratios (not reflected in the company's held ultimates).
 - Since 2007 the Case Reserve Estimates have been fluctuating (thus the masking of trends in the Incurred Losses).

| Accident Period vs Development Period | | | | | | |
|---------------------------------------|-----------------|---------|---------|---------|---------|---------|
| | Cal. Per. Total | 0 | 1 | 2 | 3 | 4 |
| 2007 | 219,293 | 111,061 | 80,663 | 58,661 | 54,577 | 40,347 |
| | 221,653 | 115,284 | 89,880 | 56,719 | 25,047 | 34,904 |
| 2008 | 316,836 | 152,248 | 110,608 | 80,460 | 74,870 | 55,355 |
| | 324,522 | 143,386 | 121,849 | 38,678 | 67,792 | 14,165 |
| 2009 | 432,067 | 194,065 | 141,026 | 102,614 | 95,502 | 70,618 |
| | 427,253 | 181,575 | 108,336 | 95,660 | 13,288 | 18,302 |
| 2010 | 523,492 | 197,170 | 143,320 | 104,312 | 97,099 | 71,803 |
| | 393,802 | 209,186 | 140,943 | 14,492 | 14,224 | 18,940 |
| 2011 | 675,179 | 277,671 | 201,890 | 146,980 | 136,840 | 101,201 |
| | 694,364 | 319,844 | 27,323 | 21,663 | 21,305 | 27,288 |
| Fitted/Actual | | | 2012 | 2013 | 2014 | 2015 |
| Cal. Per. | 2,645,737 | | 512,550 | 394,896 | 317,782 | 232,166 |
| Total | 2,526,865 | | 45,323 | 41,549 | 39,884 | 38,057 |

1 Unit = \$1,000; Forecast Scenario: Data trend: 11%+

| Accident Period vs Development Period | | | | | | |
|---------------------------------------|-----------------|---------|---------|---------|---------|--------|
| | Cal. Per. Total | 0 | 1 | 2 | 3 | 4 |
| 2007 | 219,293 | 111,061 | 80,663 | 58,661 | 54,577 | 40,347 |
| | 221,653 | 115,284 | 89,880 | 56,719 | 25,047 | 34,904 |
| 2008 | 316,836 | 152,248 | 110,608 | 80,460 | 74,870 | 41,909 |
| | 324,522 | 143,386 | 121,849 | 38,678 | 67,792 | 10,725 |
| 2009 | 432,067 | 194,065 | 141,026 | 102,614 | 72,304 | 40,476 |
| | 427,253 | 181,575 | 108,336 | 95,660 | 10,060 | 10,491 |
| 2010 | 523,492 | 197,170 | 143,320 | 78,973 | 55,656 | 31,159 |
| | 393,802 | 209,186 | 140,943 | 10,972 | 8,153 | 8,219 |
| 2011 | 675,179 | 277,671 | 152,849 | 84,246 | 59,382 | 33,249 |
| | 694,364 | 319,844 | 20,686 | 12,417 | 9,245 | 8,965 |
| Fitted/Actual | | | 2012 | 2013 | 2014 | 2015 |
| Cal. Per. | 2,645,737 | | 388,046 | 226,348 | 137,902 | 76,276 |
| Total | 2,526,865 | | 34,314 | 23,815 | 17,308 | 12,503 |

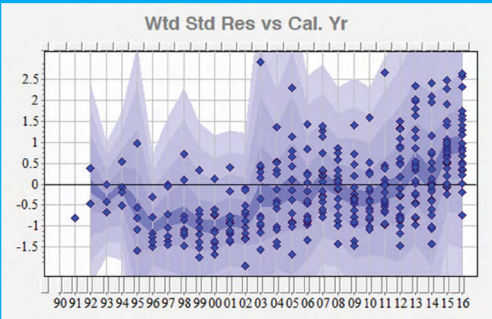
1 Unit = \$1,000; Forecast Scenario: Reserves held: -16.85%+

The forecast table on the left assumes the 11%+ trend continues. The projections are increasing down the accident periods (eg: dev 4) just like the observed paid losses (blue numbers) in dev 0.
On the right is the forecast where the assumed future trend is set to -16.85%. Projected payments are decreasing down the accident periods (dev 4) despite the significant increases in observed paid losses and Earned Premium.
(Tower Group went into administration in the fourth quarter 2013).

Link Ratio Methods residuals trend up: Projections too **low**

Consider anonymized Paid Loss data for a large Worker's Comp provider. The data can be downloaded from: icrfs.me/7reasons

The display on the right shows a strong upward trend in the residuals (trend in data minus trend in method) versus calendar year.
Any link ratio method will grossly understate the reserves – the trend in the method is less than the trend in the data. Using the Mack method (volume weighted average), the total reserve is 839M.

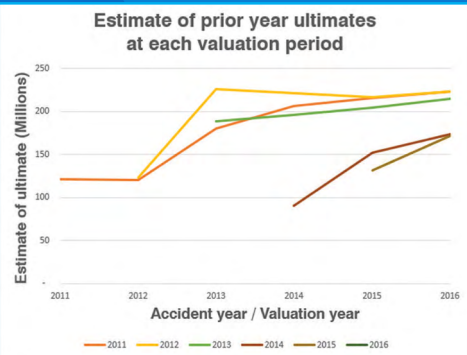


| Accident Period vs Development Period | | | | |
|---------------------------------------|-----------------|-----|---------|---------|
| | Cal. Per. Total | 0 | 1 | 2 |
| 2014 | 182,300 | 228 | 10,944 | 18,627 |
| | 179,707 | 228 | 14,998 | 27,366 |
| 2015 | 151,130 | 275 | 13,200 | 19,782 |
| | 181,395 | 275 | 15,895 | 3,810 |
| 2016 | 147,829 | 400 | 19,200 | 23,979 |
| | 188,415 | 400 | 3,537 | 6,058 |
| Fitted/Observed | | | 2017 | 2018 |
| Cal. Yr Totals | 2,916,318 | | 152,317 | 129,915 |
| | 2,732,505 | | 9,023 | 9,309 |

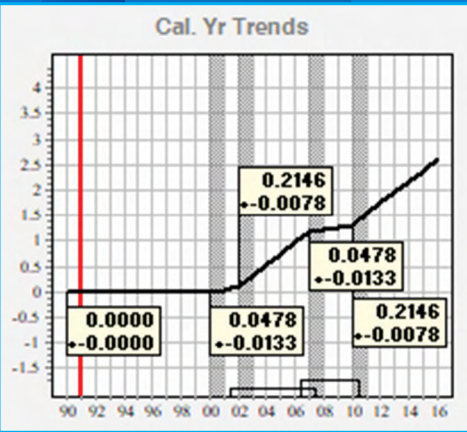
1 Unit = \$1,000

The company just paid 188M USD in 2016 (blue numbers are observed) and the method is projecting the company will pay 152M USD in the next calendar year (black numbers are fitted means).
The method clearly provides false indications.
If every successive year you take weighted average link ratios of the last four years, each year the estimates of the prior year ultimates will increase, and projections of the paid losses for the next year will be too low.

To illustrate this, estimate the four year weighted average each valuation period from 2011 through to 2016 and plot the prior year ultimates.
Assuming the same link ratio method is applied in each of the four years, the company is in catch up mode.
For this particular portfolio, the social inflation is very high.



The optimal PTF model, whose calendar year trends are displayed on the right, projects a total mean reserve of 1.309B if the trend of 21.46%+ continues for several years.
Link ratio type methods cannot measure social inflation.
The PTF modeling framework enables you to mitigate model specification risk and extract maximum information from the data.



Your competitors do not want you to have ICRFS™

The world's best long-tail liability risk management system

ICRFS™ is a high-powered analytical and data management system created by Insureware. It contains unique modeling frameworks for the design of models for single LoBs and composite models for multiple LoBs which mitigate model specification risk. Assumptions going forward are controllable, transparent, explicit, auditable, and linked to trends and volatility found in the data.

Every company is unique. The optimal statistical model identified by ICRFS™ provides a narrative and an accurate assessment about the risk characteristics of the business, including social inflation trends and volatility correlations between LOBs, in terms of interpretable parameters.

ICRFS™ provides critical insights into Risk Capital, ORSA, Solvency II, and IFRS 17. It includes a data driven reinsurance module expressly designed for ADCs, LPTs, and evaluating Runoffs. Benefits include: optimal retention strategies, efficient risk capital management, multiple contract management, and much more.

About Insureware

Insureware is in a league of its own. Our team of world-class statisticians originated many of the ideas that the industry now aspires to. We create and support the only comprehensive, enterprise wide, long-tail liability risk management software in the world.

Insureware has:

- worked with AM Best Company Inc. to include access to ELRF™ (Extended Link Ratio Family) reserve modeling software in Best's Financial Suite P/C, US.
- evaluated three reinsurance transactions which Andesine placed with Berkshire Hathaway. The latest transaction being the South Australian Motor Accident Commission deal.
- been involved in M&As reserve due diligence – the latest:
 - AIG's purchase of Validus Holdings (2018) for \$5.6B.
- challenged rating agencies on behalf of a large US insurer on capital and ratings issues (and won).

For more information on Insureware, our products, brochures, and services, please visit www.insureware.com

Mitigate model specification risk and see your business in a new light!

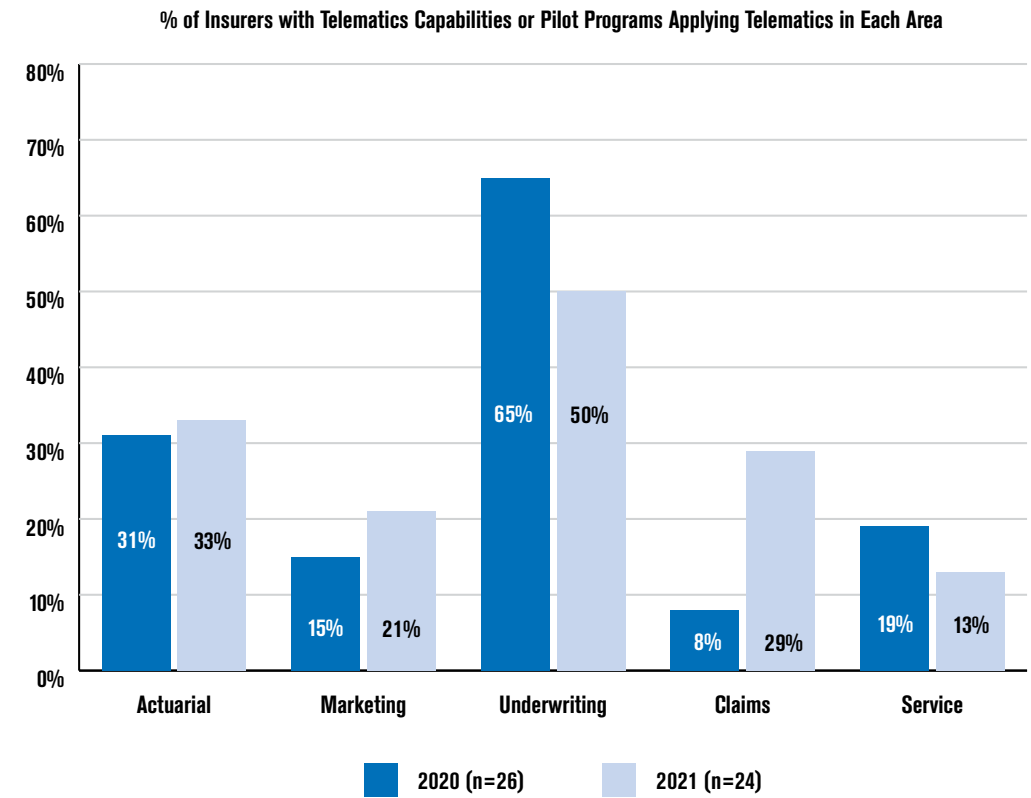
Insureware's platform

ICRFS™

can be implemented enterprise-wide in a few days and gives you:

- Long-tail liability Enterprise Risk Management
- Unparalleled insight and intelligence
- High powered analytics at ludicrous speed
- Structured databases for managing all risks
- ORSA and Solvency II metrics including the Economic Balance Sheet for the aggregate of multiple LoBs
- Single composite model for multiple LoBs
- Multiple aggregation at different levels of segmentation
- Reserve, pricing and reinsurance risk assessments
- Liability distributions and correlations by calendar year
- Risk capital allocation by LoB and calendar year
- Reserve Risk net of reinsurance contracts
- Graphical displays of identified models
 - Trends in three directions: including social inflation
 - Volatility about trends
 - Correlations
- Comprehensive model identification and validation tools
- Creative solutions for insoluble problems within a robust, yet flexible, framework
- ... and much more!

Figure 1. Telematics Deployment by Functional Area, 2020–2021



Source: Novarica Research Council CIO Surveys, 2019-Q4 and 2020-Q4. © Novarica, 2021. Used by permission.

and 2021 (see Figure 1).

Driver behavior is the most significant cause of accidents.^{1,2} Feedback from telematics can help motorists drive better, but the changes may not be long-term. In the IRC survey, 80% who participated in telematics programs changed the way they drive. However, 42% of those who initially made changes said that they now drive the same as before using telematics. Also, in the IRC survey, 58% who used telematics reported improving their driving in various degrees.

Telematics provides the “purest measure of a driver’s riskiness,” says Roosevelt C. Mosley, a principal for Pinnacle Actuarial Resources. “There are actually some companies big enough with telematics penetration [that they] certainly could use the information to account for a larger portion of the premium determination,” he observes, if they felt comfortable enough.

For rating, telematics-derived data is a game changer. “Driving behavior can be more predictive than most other standard rating factors [including] gender, marital status and credit scoring,” says Megan Klein, director of actuarial and data governance at Arity, a mobility data and tech company. “Insurtech companies are bringing telematics to the heart of their rating plans,” she says. “[They] are able to refine their pricing to be more competitive for lower risk, [which allows] greater opportunity for profitable growth.” However, that growth has not happened yet. “Most insurance companies are keeping their existing rating plan and layering telematics on top,” Klein says.

Confident that behavioral telematics can eliminate the need for the credit score factor, Root Insurance recently announced that by 2025 it would no longer use what they termed the traditional car insurance industry’s “unfair, discriminatory

biases” in its rating approach. Released in February 2020, “Credit Scores and Car Insurance: How Unfair Pricing Practices Discriminate against Millions of Drivers,” the company’s report calls for the auto insurance industry to stop using credit scores and to “uproot” the status quo to “bring fairness, transparency, and modernity to the insurance industry, making room for more effective and accurate measures of risk.”

“The big issue being debated now is exactly what is meant when people say that credit scores are unfairly discriminatory,” observes Mosely. Both credit scores and driver behavior are predictive of claims, but Mosley explains that the term “unfairly discriminatory” has specific legal and actuarial definitions, neither of which deem credit scoring as unfairly discriminatory.

Traditionally, insurers used the average amount of miles driven that policyholders reported as a rating factor. Thanks to telematics, usage-based insurance (UBI) is growing. UBI content includes the behavior-based PHYD (pay how you drive) and the miles-based PAYD (pay as you drive) or PAYGO (pay as you go). Metromile, which came on the insurance scene a decade ago, offers pay-per-mile coverage and requires policyholders to enroll in telematics. Nationwide Insurance projects that 70% or more new business will come from its usage-based insurance programs by 2025.

Even insurers offering usage-based coverage based on miles driven are not establishing rates primarily on telematics, Mosely says. “Based on their website, less than 25% of Root Insurance rates are based on telematics,” he adds. Metromile uses factors such as age, credit history and driving history.

Telematics is also useful for marketing and market selection. Root requires a “try-before-you-buy” telematics period. Progressive Insurance also gives potential customers the option to try its Snapshot Road Test™ app to determine if they drive safely enough to get a discount. Progressive is also offering a 30-day driving trial through Credit Karma’s “Karma Drive” app, allowing customers to learn if they qualify for a discount through the insurance carrier.

Auto insurers are applying telematics in varying degrees. “The least sophisticated programs are offering renewal

Real-time telematics data in the aggregate give insurers insight into current activity to detect changes on the road.



discounts based on driver scores,” says Harry Huberty, research director and chief of staff of Novarica. “The most sophisticated programs are branching into automatic accident detection [and] ingesting telematics data directly into claims systems for use in adjusting and offering trip-by-trip summaries with personalized recommendations for improving poor driving habits.” Farmers Insurance, for example, is offering crash detection and accident services through its Signal app.

Klein observes that some insurers are boosting their business propositions by offering other potential benefits to consumers, such as providing emergency roadside services and first notice of loss (FNOL) data to hasten the claims process.

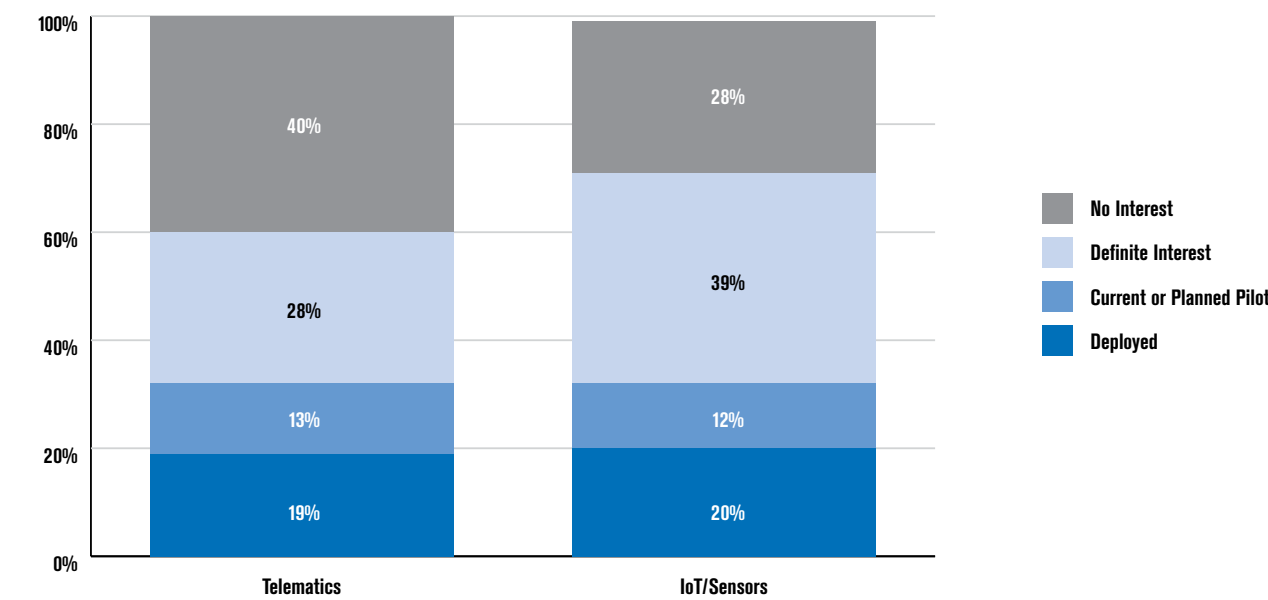
“The ability to grab objective information [from accidents] is an exponential leap forward,” says Tim Christ, vice president of growth for Claimatic, which automates claims distribution in real-time. “Data at first notice of loss is poor,” he says. “People do not always remember what really happened,” and the story changes as policyholders speak to agents, claims adjusters and forensic engineers. Not only will automating FNOL improve efficiency, but it also allows insurers to use the information for liability analysis, he says.

Real-time telematics data in the aggregate, Klein offers, give insurers insight into current activity to detect changes on the road. For example, during the beginning of the COVID-19-associated lockdowns, Arity’s telematics data revealed an early signal that traffic had declined but speeds were accelerating. By detecting the overall change in driver behavior, Arity could alert drivers and the insurance industry, she says. “I think the interesting part of seeing this data was that the traffic

¹ “Automated Vehicles and the Insurance Industry, A Pathway to Safety: The Case for Collaboration,” Casualty Actuarial Society’s Automated Vehicles Task Force report, CAS E-Forum, Spring 2018.

² “Automated Driving Systems 2.0: A Vision for Safety,” National Highway Traffic Safety Administration.

Figure 2. Telematics and IOT/Sensors Deployment and Interest Levels at P&C Insurers



Source: Novarica Research Council CIO Surveys, 2020-Q4. n=75 property/casualty insurers.
© Novarica, 2021. Used by permission.

reduction and its potential impact on frequency was expected, but telematics also allows insurers to review shifting behaviors like driving at high speeds and their opposing impact on severity, which was not as expected,” she adds.

Barriers to Adoption

Despite the multiple benefits of telematics programs, insurer and driver participation is limited. Since 2018, insurer movement toward telematics has stabilized rather than increased, Huberty says. About one-third of the 81 insurers surveyed in Novarica’s CIO Survey were actively participating in telematics or internet of things deployment (see Figure 2). Surprisingly, surveyed auto carriers show less interest in telematics in the 2021 survey (40%) compared to 2018 (33%) (see Figure 3). “Technologies like telematics and internet of things, whose value proposition is still becoming clear — and which have substantial startup costs — are a little less appealing in 2021,” Huberty observes. “I would expect interest to perk back up in 2022 and 2023.”

On average, telematics-related coverage insurance makes up about 6% to 8% of a company’s book of business. However, for some insurers, that figure is as high as 35%, says Huberty, who wrote the report, “Telematics in Insurance: Overview and Key Issues,” released in October 2020. Assuming consistent adoption rates of about 1% annually, telematics in the

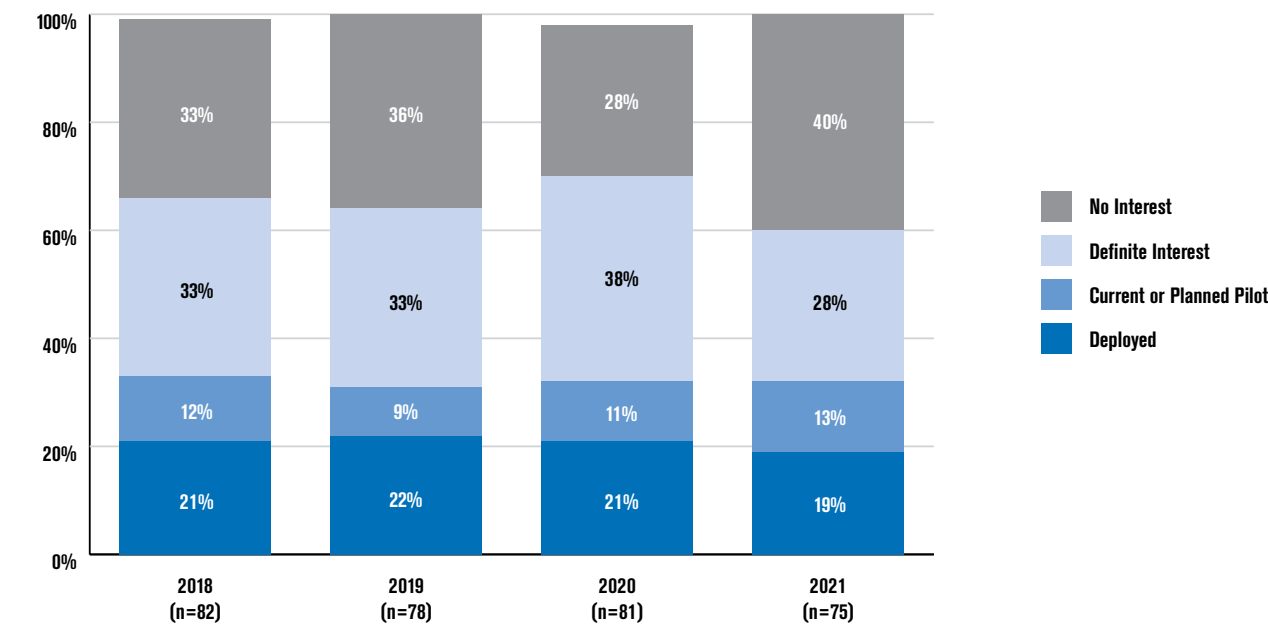
personal auto insurance market are estimated to make up \$22 billion to \$32 billion in collected premium by 2025, Huberty says, up from \$10 billion to \$15 billion.

As sensor-based technology, telematics programs are expensive and difficult to integrate into insurer processes, Huberty says. Gaining the “full measure” of what telematics can do for insurers and customers requires carriers to rethink how to integrate new products and processes with products already in place, he adds.

Realizing the full benefits of telematics also requires greater consumer participation, which depends on more public awareness. After reviewing a brief description of auto insurance telematics, 57% in the 2020 IRC survey indicated awareness of such programs, which is up somewhat from 50% in the 2015 survey. A Nationwide Insurance survey reveals that 27% of those surveyed “know what telematics is” but only 10% were participating in such programs. Nationwide’s survey was based on responses from 1,600 participants, including independent insurance agents, mid-market business owners with fleet vehicles, and consumers.

Overall, consumers appear willing to participate in telematics. Sixty-five percent of respondents in the Nationwide survey said so. In the IRC study, 90% of those who said they were invited to participate agreed to do so. This is a considerable increase from IRC’s telematics 2015 survey, when 51% of

Figure 3. Property-Casualty Insurer Telematics Activity, 2018–2021



Source: Novarica Research Council CIO Surveys, Q4-2017–Q4-2020. Survey groups are not identical year to year.
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respondents said they had installed a telematics device. While this is not an apples-to-apples comparison, it demonstrates a higher participation rate with app-based programs, according to the report.

As for the 10% of respondents in the 2020 IRC survey who would not participate, 58% cited privacy concerns, which continue to be a roadblock to more widespread participation in telematics programs. While younger drivers are more likely to participate, the differences across age groups are relatively small, the 2020 IRC study notes. “[It is] important that insurers provide transparency and show value for drivers participating in these programs,” Klein says.

Showing value has essentially meant providing premium discounts, which can entice non-participants to change their minds. The only problem is not everyone can get a discount, and drivers tend to have an inflated view of their skills. The IRC study reports that 29% of experienced telematics drivers experienced premium increases. When participating drivers who say it is “too soon to tell” the premium-cost impact are excluded, 40% report increases in premiums. Fifty-four percent of drivers with sufficient experience to make an assessment report a premium decrease, and 15% report that the decrease is substantial.

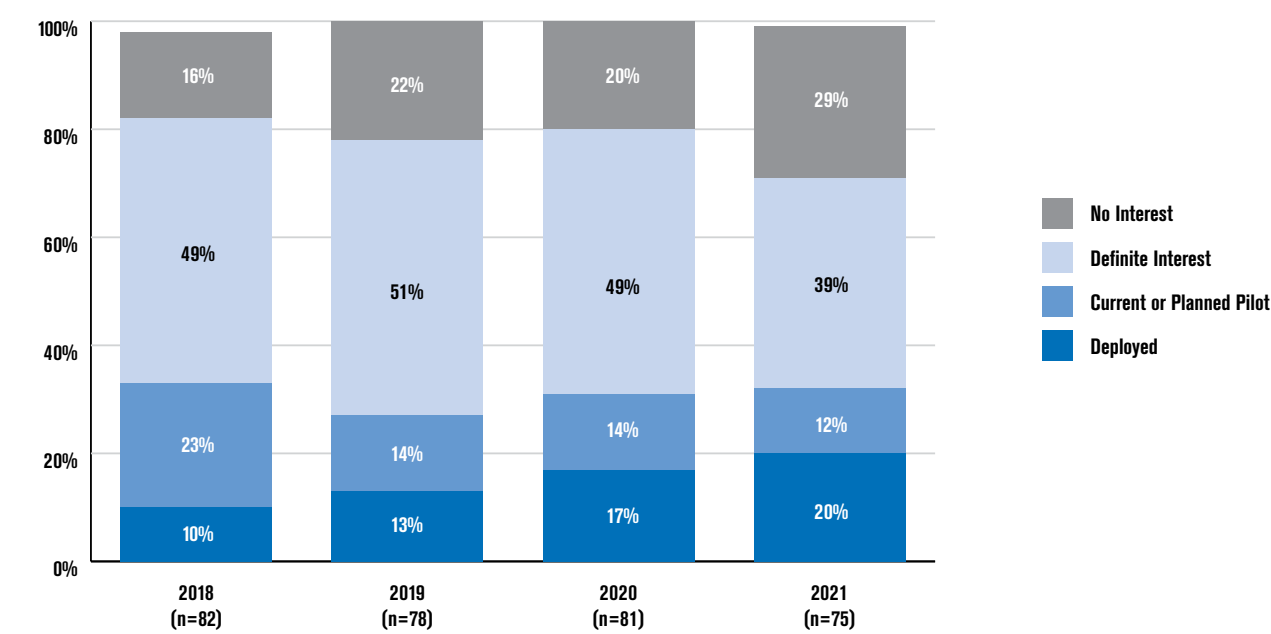
Some insurers “are moving away from discount-only

telematics programs and have started to reflect the indicated rate for the higher risk drivers,” Klein says. “Yet there is progress to be made toward making actual driving behavior a leading factor for most rating plans.”

Although driver participation is relatively low, there is sufficient data to attract aggregators from both inside and outside the insurance market. Insurance carriers are “very interested in aggregators and they should be,” Mosley says, because they can boost competition by allowing smaller companies to get access to data. “There is an arms race on who is going to get manufacturers signed up,” he observes. “As more (automakers) get on board with an exchange, I could see that becoming a pretty significant step in terms of getting customer adoption to a higher level,” he predicts.

Ironically, as telematics programs become more sophisticated in their ability to improve ratemaking and human driving behavior, advanced driver assistance systems (ADAS) and autonomous vehicles are evolving to reduce the drivers’ role in vehicle operation in the first place (AR, November-December 2019). This creates a challenge for insurers, since telematics data used in underwriting today does not distinguish whether the driver or the automatic equipment is compelling vehicle movement, says Adam Hudson, vice president and general manager of U.S. Connected Car at LexisNexis Risk Solutions, a

Figure 4. Property Casualty Insurer IOT/Sensors Activity, 2018–2021



Source: Novarica Research Council CIO Surveys, Q4-2017–Q4-2020. Survey groups are not identical year to year. © Novarica, 2021. Used by permission.

telematics exchange company.

“The first problem the insurance market has had to solve is not whether ADAS is on or off but whether the vehicle is equipped with ADAS,” Hudson says. Just the presence of ADAS technology tells an actuary that the vehicle should be safer overall, he explains. Interestingly, LexisNexis Risk Solutions sees little-to-no correlation between its telematics driving risk scores and the presence or absence of ADAS technology. “Insurance carriers should be able to use both telematics data and ADAS fitment in insurance underwriting, as both tell a carrier something unique about the driver, their vehicle and the associated risks,” he says. (“Fitment” refers to the parts that are fixed or built into the car.)

The State of Insurer-Based Internet-Connected Devices

After four years of unprecedented weather events, homeowners insurers are seeking ways to prevent inside-the-home incidents (*Actuarial Review*, March-April 2021). A growing number of carriers are encouraging policyholders to use internet-connected devices for improving risk management, the claims process, marketing and ratemaking. Specifically, the percentage of insurers using internet of things devices for the home has doubled from 10% in 2018 to 20% in 2021,

according to a 2021 Emerging Technology in Insurance report, released in January 2021 (see Figure 4).

Insurer-based internet-connected devices can mitigate risk by alerting policyholders of smoke, power outages, water leaks and intruders. Roost is a service provider that helps insurers start their programs by serving and supplying devices and collecting data. Roel Peeters, who started the company about seven years ago, remembers receiving push-back for the idea. “When we introduced the concept of home telematics, and we were the first to do it, people looked at me like, ‘who is this lunatic?’” he recalls. Now about two dozen insurers are contracting from the company, including USAA and Allstate for homeowners insurance, and Church Mutual for commercial property monitoring.

Peeters says that insurance companies pay for devices in almost all circumstances. The policyholder agrees to install the devices and share information. However, Huberty says, deploying insurer-based internet-connected devices in the home has not been easy because homeowners do not see the value compared to telematics; insurers and policyholders also want different types of devices. “People want insurers to buy their security cameras and window motion sensors,” he observes, “and insurers want water sensors. That has been a tough nut to crack.”

Educating customers is an integral part of what Peeters calls “property telematics” because customers need to learn why devices are necessary, where to place them and how to monitor them. Indeed, homeowners insurers overall would benefit from better educating consumers. Based on Chubb’s fourth Annual Homeowner’s Risk Survey results, homeowners do not realize their critical role in preventing accidents and claims (*AR*, March-April 2021).

Most residential dwellers — three out of four — are open to using insurer-based internet-connecting devices, according to a 2018 IRC study, “Smart Home Technology: Many Express Interest, But Cost and Privacy Concerns Slow Adoption.” For Hippo, which partners with internet of things-related providers for its smart home program, 70% of eligible customers have activated their kits. Customers who use both self and professional monitoring systems can get up to a 25% discount.

Not everyone is enthusiastic about tracking devices in the home, the most private space in people’s lives. In the IRC’s smart home technology report, older homeowners were much less likely to be interested in the technology, with willingness declining significantly after age 45. When asked what would cause respondents to not allow insurers to receive information, the top three reasons were: concluding that their privacy could not be protected (59%); discovering that their insurance costs might go up (58%); and realizing that their home network might be hacked and their personal information stolen (40%). However, since more Americans adopted insurer-connected devices during the COVID-19 epidemic, those results could be different now. Peeters says that the percentage of people rejecting property telematics for privacy reasons is in the low-single digits.

“If you poll people, they say they are concerned about privacy,” offers Robert P. Hartwig, clinical associate professor at the finance department and director for the Center for Risk and Uncertainty Management at the University of South Carolina. But if Americans perceive value, they are willing to give up personal information, he adds.

The reality is that Echo’s and Alexa’s successes may

Educating customers is an integral part of what Peeters calls “property telematics” because customers need to learn why devices are necessary, where to place them and how to monitor them.

bode well for many other types of internet-connected devices, Hartwig says. “People will be very comfortable having their homes monitored in ways that allow them to receive a benefit.” He cites the success of home security system Ring as an example. To improve consumer participation, installing and using the devices must be seamless, he offers. Customers want installation to be as simple and easy to as possible.

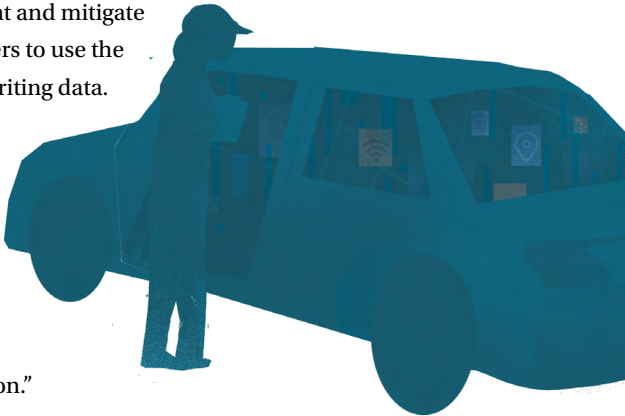
Actuarial Potential

Roost is working on developing data sets for actuarial purposes. “It’s been absolutely fascinating to start seeing real, actuarially relevant data,” Peeters says. The data reveals, for instance, that the actual number of water leaks is five

times more than the number of claims filed.

In 2017 Roost partnered with Willis Towers Watson to collect data from about a dozen of its customers to develop actionable aggregated data. “The crucial factor is having the actuarial data available,” he says, which he expects to be available in the next 12 to 18 months. He promises that the data will demonstrate the effectiveness of property telematics and will be the “lynchpin” that will compel more insurers to offer programs.

“When you are looking at putting out a rate, underwriting or pricing a property, you are looking at data from outside the walls; you are rating a black box,” Peeters says. What he calls “property telematics” can provide data in real time, allowing policyholders to receive instant alerts to help prevent and mitigate damages, and carriers to use the pricing and underwriting data. “All the technology is mature and available today,” Peeters says. “The actuarially relevant data is the last missing piece to enable mass adoption.”





Conclusion

The effectiveness of any program depends on participation. And when it comes to data, the greater the participation in telematics and insurer-sponsored internet-connected programs, the greater the potential.

Although large auto carriers have invested in educating the public about their potentially premium-saving telematics programs, the lack of consumer awareness appears to be limiting participation. Since homeowners do not fully realize their role in preventing unnecessary claims, all homeowners insurers, whether they offer internet of things devices or not, would benefit by investing more in consumer education.

Improving customer experience through more efficient claims processing or adding services can enhance an insurer's value proposition. Telematics and insurer-based internet-connected device programs have the potential to cause bad will for policyholders who do not qualify for a discount or see rates increase sans claim filing. While there are ample telematics data to attract data aggregators to the auto insurance market, insurer-sponsored internet-connected programs remain in their infancy.

Eventually, data from all consumer insurance lines, including auto, home, life and health, will be integrated. When that happens, insurers will be able to maximize existing data sets and discover those not yet conceived for ratemaking, pricing, underwriting and other purposes.

As insurers compete in the technology race, the industry also needs to carefully consider how it will treat policyholders who have legitimate concerns about privacy, data use and security. Technology holds tremendous power to help or harm. Algorithms are not always correct, and data are not always clean or complete. Remembering that each policyholder is a person, and not just a configuration of numbers to make a score, is a step in the right direction. ●

Annmarie Geddes Baribeau has been covering insurance and actuarial topics for more than 30 years. Her blog can be found at www.insurancecommunicators.com.

Confronting the Issues of Race and Pricing BY JIM LYNCH

The actuaries were shown a map, old and arguably outdated: Omaha, Nebraska, divided into zones A, B, C and D.

But the story behind it was as fresh as the day's news: racial discrimination.

Discrimination was present in the Omaha map as the C and D zones represented where Blacks lived primarily — and where the Federal Home Loan Corporation wouldn't authorize lending — and where, decades ago, insurers would not write business. The map represents a practice now known as *redlining*.

"Areas that have been the site of racial discrimination are most vulnerable to economic and natural catastrophes," said the map's presenter, Birny Birnbaum, executive director of the Center for Economic Justice and a consumer liaison representative to the National Association of Insurance Commissioners.

Untangling and addressing that troubled past are challenges to today's actuaries. They learned of several approaches to the problem in a session titled "Disparate Impact: The Impact of the Social Justice Movement on Insurance Rating" at the CAS 2021 Virtual Ratemaking, Product and Modeling Seminar.

The legacy of that map, Birnbaum said, lives on in today's insurance rates, but not through intentional discrimination. "I believe there is very little of that in insurance today," he said, but through proxy discrimination — the use of classification variables that serve as a proxy for race.

"This kind of unnecessary discrimination is amenable to your actuarial skill

Free Access to "Disparate Impact" Recording and Other Related Sessions

The CAS is offering free access to the recording of the RPM session covered here as well as other recordings on social justice and insurance.

As part of the CAS Approach to Race and Insurance Pricing that the CAS Board of Directors adopted in December 2020, the CAS is providing recordings of select sessions related to race and insurance free for members and the CAS community. The goal is to provide members and candidates with a strong foundation in the historical issues of systemic racism and their potential impacts on insurance. The sessions cover concepts of disparate impact and discrimination, past and current research, and professionalism implications. To read more about the Approach to Race and Insurance Pricing, visit <https://www.casact.org/article/letter-cas-president-and-cas-ceo-cas-approach-race-and-insurance-pricing>.

To access these special recordings, visit https://www.pathlms.com/cas/product_bundles/1938.



set," Birnbaum said. The challenge is helping to develop rates that can address the issue while remaining neither inadequate nor excessive to all policyholders.

The CAS is actively addressing the issues of race and insurance pricing, noted moderator Mallika Bender, FCAS, co-chair of the CAS/SOA Joint Committee for Inclusion, Equity and Diversity. Last fall the CAS adopted an approach to race and insurance pricing with the goal of employing leadership, collaboration,

research and education to let actuaries drive solutions in ways to benefit consumers and the industry.

Roosevelt Mosley, FCAS, CSPA, a principal and consulting actuary at Pinnacle Actuarial Resources, outlined several possible ways to examine price discrimination.

1. Do nothing.

This had been a standard industry response for decades but is not one

anymore. As Birnbaum put it, “Following the murder of George Floyd, many insurance company CEOs made forceful statements ... The place to start is an examination of their own company practices.”

2. Exclude certain risk classifications from rating plans.

Some states already do this with gender and insurance credit score, Mosley said. But it is hard to know if the strategy is effective. It might address the issue partially, but not completely, or not at all.

The tactic “is fairly direct,” he said.

Do nothing ... had been a standard industry response for decades but is not one anymore.

“It’s applicable across the industry ... [but]there really isn’t a blanket solution that if you eliminated a variable or a group of variables, it would eliminate the problem.”

And there is an arbitrariness to the process of excluding a variable. “Does it really fix the problem?” Mosley said. “And where does the problem lie? Which particular elements should be excluded, and what are the criteria for an element making it onto the list or not?”

3. Introduce a variable that controls for a protected risk characteristic.

Birnbaum favors such a method and spelled out his vision of how it would work.

Picture an additive model with three risk characteristics:

$$Y = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + e.$$

To this you would add a control variable for race. Call it C_1 . The new model is:

$$Y = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4C_1 + e.$$

If any of the variables are correlated with race, the model will reveal it, Birnbaum said. Suppose X_1 is perfectly correlated with race; adding the race variable will eliminate X_1 ’s predictive power.

If X_1 has predictive power beyond race, that will make it a sharper variable.

Mosley noted such a control could systematically control for proxy discrimination. But applying the methodology to nonlinear models is more complicated.

4. Evaluate the final price’s impact on protected classes.

Here, prices would be examined to determine if the entire rating plan has disparate impact. If so, the discrimination would have to be addressed.

This would shift emphasis. Instead of evaluating rating variables as inputs, it would regulate the output of the entire

rating plan, Mosley said.

If the plan is discriminatory, “there is a problem that needs to be addressed,” he said. It would also require collection of data from protected classes.

In general, Mosley said, bias can be addressed at three stages of model building:

- **Removing data bias.** “If the data itself is systematically biased, there are ways ... to debias that data up front, so that you are introducing into the modeling process adjusted information that is not biased.”
- **Modeling approaches.** Some models can “adjust model parameters to eliminate bias by satisfying defined fairness criteria.”
- **Adjusting for predictions.** This is a process that explores “how you test outcomes for bias, and then correct for that bias.”

Birnbaum urged actuaries to confront the issue head-on.

“If it’s going to happen,” he said, “it’s going to happen through actuaries, leading” regulators and others.

The recording for the session, “Disparate Impact: The Impact of the Social Justice Movement on Insurance Rating,” is available for free here https://www.pathlms.com/cas/product_bundles/1938. ●

James P. Lynch, FCAS, is chief actuary and vice president of research and education for the Insurance Information Institute.

How To Tap into the AI Revolution BY JIM LYNCH

Actuaries and other quantitative professionals have struggled to describe artificial intelligence to the C-suite. Artificial intelligence is Severence MacLaughlin’s career, and here is how he describes it to his mom:

“You’ve seen *The Terminator* ... You know Skynet, the bad company? Well, I do Skynet kind of shrunk down, but it’s a fuzzy pink bunny

rabbit version, not the scary robot.”

It’s a vivid picture, but MacLaughlin, founder and managing partner of DeLorean Artificial Intelligence, gave a sprawling, detailed look at the coming revolution in artificial intelligence — the potential it holds and the obstacles it faces — at the virtual CAS Ratemaking, Product and Modeling Seminar in a general session called “Avoiding an Extinction Event: Evolution to Artificial Intelligence in the Property & Casualty Insurance Industry.”

Artificial intelligence, or AI, is the next step forward in computer science.

Until now, for the most part, computers have done the clever things we have taught them, and they have done them really fast.

They can add a column of numbers or find a bunch of articles about, say, business interruption. They can isolate a pattern in a sea of data if we teach them what to look for.

With AI, the computer is doing the thinking, figuring things out on its own. It won’t be terribly smart at first — MacLaughlin compared the level of reasoning to a three-year-old or a dog — but that minimal brainpower will have a big impact. Even so, he said, AI will increase global GDP by almost 15%, or \$15 trillion, by 2030.

The pandemic has

only accelerated the emergence of AI, as the quick pivot to working at home forced businesses to embrace new technologies quickly.

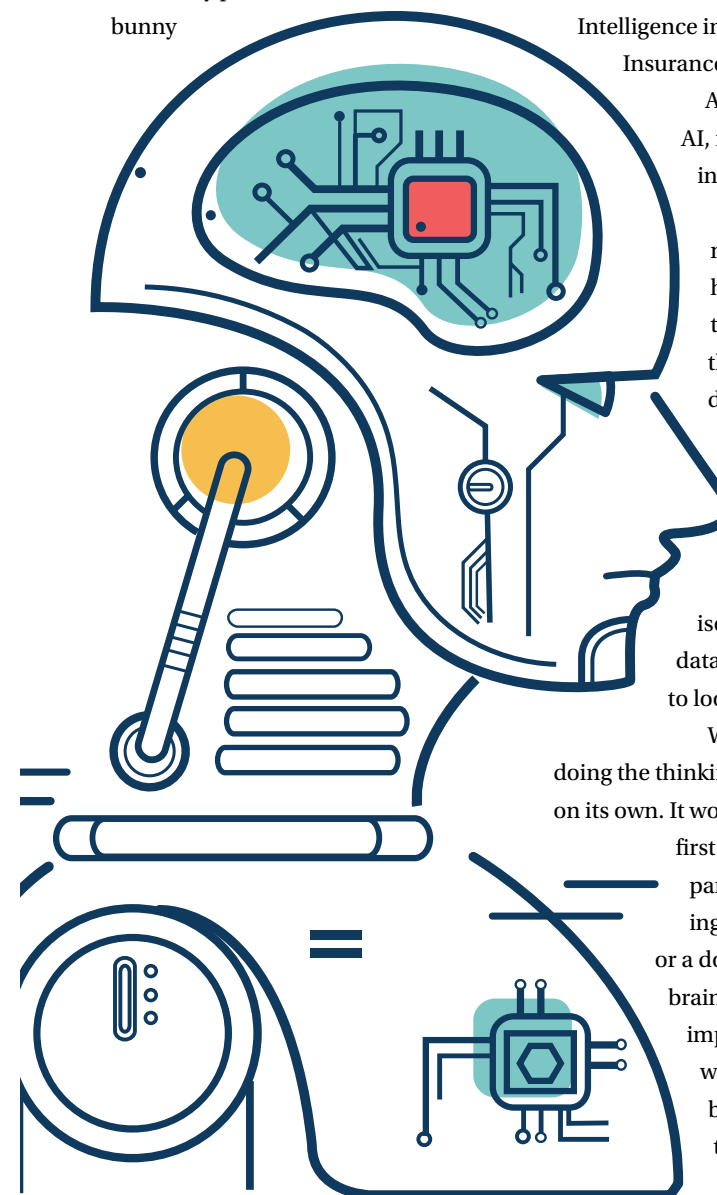
As quantitative experts and problem solvers at property-casualty companies, actuaries will doubtless be crucial to helping capture that future wealth.

MacLaughlin used a PricewaterhouseCoopers rubric to describe the forms of artificial intelligence, from the least to the most sophisticated:

- Automated intelligence, such as chatbots that automate a manual process.
- Assisted intelligence, which help people do their job better, like a computer that looks at a new claim and recommends paying the claim, denying it or reviewing it further. The computer makes the process more *efficient*.
- Augmented intelligence, where the computer decides, for example, to pay a claim, then instructs the adjuster when to intervene. The computer makes the process more *effective*.
- Autonomous intelligence, where the computer develops a system and that system makes decisions.

To properly develop artificial intelligence systems, MacLaughlin said, a company needs management buy-in, heaps of properly composed data and an organizational structure that focuses on creating measurable return on investment.

Fortunately, most property-casualty executives have already bought in, according to MacLaughlin’s research. Eighty-six percent are either investing in AI or plan to. About a third say AI will



lower costs, and a third say it will bolster customer engagement.

They do have concerns. Nearly half worry about regulatory risk — getting insurance departments to accept an AI-driven pricing algorithm, for example.

They also worry about data quality, and with good reason. Most insurers,

specialized analyses.

A successful AI program is carefully structured. MacLaughlin eschewed two common models:

- A stand-alone model, in which a data science team reports to company leaders. Too often, he said, this structure ends up cut off from

individual business units have their own data science teams. These can become siloed “science projects,” lacking the perspective that could make the project valuable for the entire organization. And any knowledge they gain in developing AI stays locked within the business unit.

He recommended a hybrid hub-and-spoke model. A centrally located data science team works with a quantitative subject matter expert for each project (sound much like an actuary?). The knowledge gained from each project can be used in the next.

“Setting this team up will save the company a whole lot of money and save you a whole lot of frustration,” he said. ●

the specialized requirements of the company’s business units and must compete with the business units for resources.

- Embedded models, in which

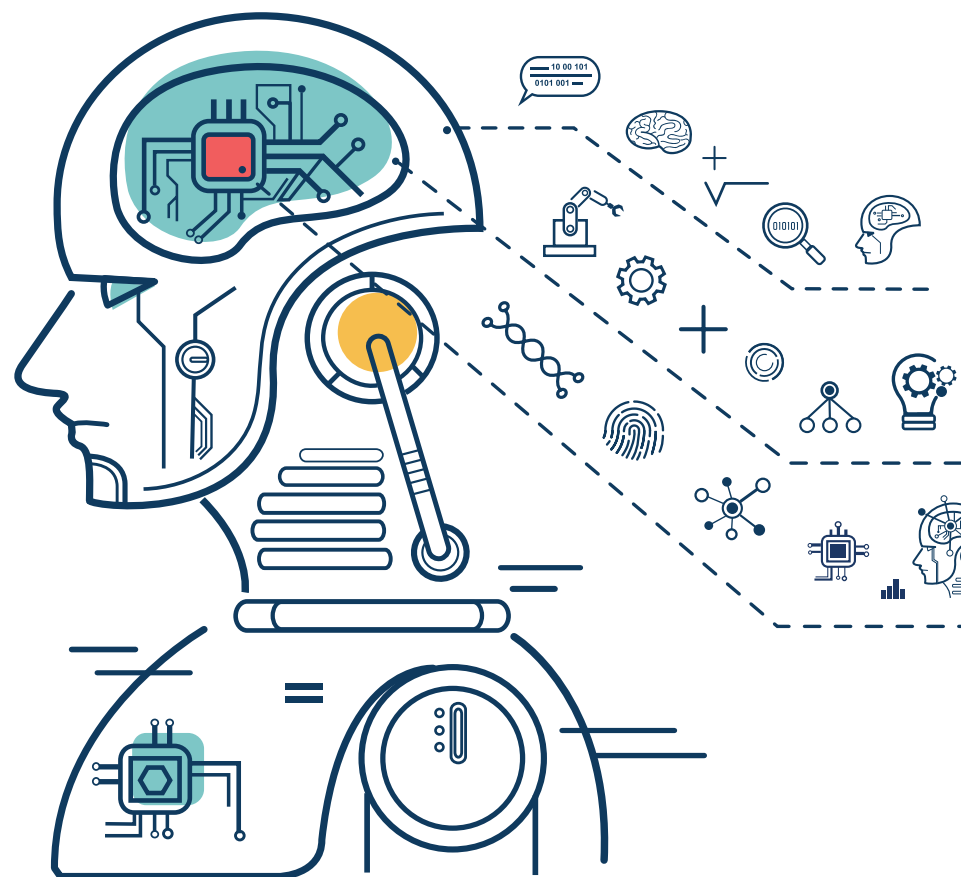
The organizations that figure out how to use AI will win the bulk of that \$15 trillion in additional global wealth.

MacLaughlin said, have heavily siloed data: Actuaries have pricing data from one data set, underwriters operate out of a separate data set, while marketing and finance have their own data realms. Often, he said, each of those groups taps more than one data set, thanks to legacy systems borne of long-ago mergers.

The company that pulls all those systems together, as MacLaughlin recommends, still only taps about 5% of the data that it could. Left out, he contends, are external data sets, such as on the weather, which could give insights into claim trends. Also frequently left behind is unstructured data — text files, video and other information that, properly prepared, could feed what will be the voracious data appetite of AI.

The data explosion of the past two decades, MacLaughlin said, creates the need for AI. There will be more insights than people could find on their own, and the organizations that figure out how to use AI will win the bulk of that \$15 trillion in additional global wealth.

An organization should have one true source of data, he said, with that source generating “sandboxes” on which actuaries and others can perform their



Pandemic and Insurance: How Were Auto and Workers’ Compensation Affected? BY JIM LYNCH

The pandemic has penetrated every corner of our lives, and actuarial science is no exception. The incredible disruption when the unemployment rate

zoomed past 15%, then plunged; the lockdowns that took millions of vehicles off the roads; the movement of millions of workers to at-home online work — all changed the way we live. Property-casualty insurance was similarly affected — employers who laid off workers reduced their workers’ compensation exposures; those who worked from home altered their likelihood of injury; and the cars that stayed in the garage reduced the likelihood of being in accidents.

The impact redounded through the industry last year. Actuaries, though, predict the future by studying the recent present. At the 2021 Virtual Ratemaking, Product and Modeling Seminar, actuaries got a look at what happened in auto lines and workers’ compensation as well as some insights into how to incorporate that knowledge into future pricing decisions.

In one session, “COVID-19 in Workers Compensation — The View Forward,” CAS Fellows David Bellusci, executive vice president, chief operating officer and chief actuary of the Workers’ Compensation Rating Bureau of California; Rick Poulin, vice president of workers’ compensation product at Travelers; and Neal Leibowitz, actuarial manager at Liberty Mutual Insurance, related a series of facts that were surprising in their impact, or, sometimes, in their lack of impact.

In the other, “COVID-19 Impact

on Auto Ratemaking,” John Fong, FCAS, senior actuarial manager at Lyft, documented changes in driving patterns caused by the spring lockdown and afterwards. Ralph Dweck, FCAS, senior manager at ISO/Verisk, showed how his

cost of the average claim to \$25,000 from earlier estimates of \$30,000. That was lower than the typical indemnity claim, Bellusci said.

- States with a presumption standard didn’t have appreciably more CO-

The work-at-home phenomenon means that jobs that were once in one state can now be filled throughout the country, causing a dispersion of exposures.

organization adapted an existing predictive model to run scenario tests that projected changes in loss costs for auto products.

Among the workers’ compensation insights:

- In the early stages, some states’ workers’ compensation programs were hit much harder than others. In second quarter 2020, more than half of all claims in New Jersey and Massachusetts were COVID-19 claims, versus less than 10% in South Carolina, Kansas and Texas.
- In California, more than 110,000 COVID-19 claims were reported through January 25, 2021, 20% of all indemnity claims. Twenty-eight percent were initially denied, mainly because the claimant had not shown a positive test for the disease. (That, incidentally, is a higher denial rate than the norm in workers’ comp, Bellusci said.)
- California data also showed that there were more mild claims (average cost: \$3,000) than expected, 90% versus 82%. The changing mix of claims drove down the estimated

VID claims than states lacking such a standard. (States with a presumption standard assume that certain ill workers, typically first responders, got COVID at work. Usually, an ill person must prove their illness resulted from their work to receive a comp benefit.)

- The jobs lost from the COVID recession were quite different from prior downturns. For example, in California, construction jobs fell more than 35% in the 2008 Great Recession, but last year they fell less than 10%. But leisure and hospitality jobs fell nearly 30% in the COVID recession, versus less than 5% in the Great Recession.

Job losses were also concentrated in low-wage industries this time. Jobs in the lowest pay quartile fell by 8 million, Bellusci said, while the number of jobs in the highest quartile rose by 1 million.

The nature of the workforce will also change, Leibowitz said. A lot of jobs lost won’t return. They will be replaced by new positions, like grocery shopper. That affects workers’ comp because people are more likely to be injured in

their first year of work. Also, the work-at-home phenomenon means that jobs that were once in one state can now be filled throughout the country, causing a dispersion of exposures.

One area without much data is the impact of long-haul COVID sufferers. There haven't been many credible studies of the phenomenon, Poulin said.

"Long-haulers is the most talked about [area]," he said, "but also the thing that people know the least about so far. It is a very big headache that keeps me up at night."

To examine the impact of the pandemic on auto issues, Fong considered three different areas: auto usage, driving behavior and auto insurance.

He cited data from Google's COVID-19 Community Mobility Reports to show stark differences in driving patterns. Driving to transit stations and workplaces were both down more than 15% from a baseline taken early in 2020, before the pandemic. These reflected the nationwide shift to remote working.

Overall vehicle miles driven also declined sharply during the spring lockdown. It largely recovered later in the year but dipped again in December, with the second wave of the virus.

At the same time, Fong said, drivers remaining on the road were taking greater chances. He cited:

- An increase in fatality rates per vehicle miles traveled, as measured by the National Highway Traffic Safety Administration.
- Telematics data from Zendrive showing sharp increases in both rapid acceleration and phone distractions.

"There's less traffic on the road, and people are thinking they can navigate the road at a higher speed and are

checking on their phones more," Fong said.

At the same time, there is greater interest in usage-based insurance, he said, perhaps because people realized that they could have saved substantially had their insurers been monitoring the decrease in miles driven.

Fong also said claims handling may have changed during the pandemic. With fewer claims to handle, claims estimates were likely posted faster than in the past, a fact that actuaries would need to account for in estimating ultimate claims costs. The rise of remote work also encouraged handling claims digitally, through increased use of photographs and apps.

Meanwhile, Dweck discussed a predictive model analysis that projected declines in commercial auto insurance loss costs from the pandemic.

A team tracking the pandemic at ISO homed in on the organization's Risk Analyzer Environmental models, which predict loss costs at a zip code level using noninsurance variables in areas such as traffic composition, weather and terrain, experience and trend, traffic generators (which capture information on types of businesses in an area, for example malls and train stations), and traffic density and driving patterns.

The last two of these seemed to be most affected by the pandemic, Dweck said. ISO developed a traffic score, which the existing models relate to the log of loss cost estimates for a given census block.

Next they looked for economic indicators that predict how that traffic score changes. The score itself, it turns out, is sensitive to the log of the number of operating locations in the region. During a recession or lockdown, the number

of operating locations in an area would presumably fall.

The team fit the relationship between the traffic score and operating locations, which gave them an estimate of the impact that a change in operating locations may have on loss costs (via the initial relationship between traffic score and loss costs).

For one type of commercial auto — trucks, tractors and trailers — decreases in operating locations reduced loss costs for both bodily injury and property damage coverages by a few percentage points. Perhaps surprisingly, collision coverage saw little change, which Dweck suggested may be related to the fact that many accidents that cause property damage (think of a big truck nudging an auto) are less likely to cause a first-party collision claim. Meanwhile, comprehensive coverage loss costs actually rose slightly according to the model, which Dweck suggested could be caused by increases in theft and vandalism of vehicles.

They also tested the model for private passenger type vehicles — an important exposure in commercial auto — and found similar results, except for a decrease in collision loss costs. Dweck said this result is more expected for private passenger types since a car striking a car would likely generate both a property damage claim and a collision claim. Finally, the exercise performed on the personal auto models yielded similar results to the results from commercial auto private passenger types.

Some of the analysis, Dweck said, entered ISO's regular loss cost reviews, which they perform annually for every state. ●

Hartwig Discusses the Economics and P&C Insurance in the Time of COVID

BY ANNMARIE GEDDES BARIBEAU

"You need asterisks to actually understand what ultimately happened to the economy," economist Robert P. Hartwig said of the years 2020 and 2021. These years are marked by their public policy responses to COVID-19 and several economic changes.

Hartwig was the sole panelist for "Pandemics, Politics and P/C Insurance: The Indelible Legacy of COVID-19," a general session held during the virtual CAS Ratemaking, Product and Modeling Seminar on March 17. At the University of South Carolina, he is a clinical associate professor in the finance department and director for the university's Center for Risk and Uncertainty Management.

Stressing that the P&C industry is "really joined at the hip with respect to economic activity overall," he discussed changing economic conditions prior to COVID-19 and ever since. Before COVID-19 led to lockdowns in mid-March 2020, the United States' economy was enjoying the longest economic expansion in U.S. history for 128 months. The public policy response to the pandemic abruptly ended that expansion. Pandemics happen periodically, he pointed out, but the global economy shutting down was unprecedented.

Thankfully, there are signs of a strong economic recovery in the United States. "The better-than-expected economic picture in terms of economic growth means that the economy is likely to have recovered its lost output (measured in terms of real GDP) by the end of the first quarter of 2021 relative to

year-end 2019," he said. "And then we're looking at very strong growth in the second half of 2021 of about 8% to 9%." These percentages are the largest numbers since post-World War II. A sharp boost in economic activity will help the P&C industry grow due to the increasing need for consumers and businesses to buy coverage.

There are also a few clouds on the horizon: The U.S. will be left with a huge "debt hangover" in the wake of trillions being spent on COVID relief. And unlike past periods of economic recovery, the debt-to-GDP ratio is not going to fall "unless we have some material tax increase, which is now being discussed."

"The expectation is the debt-to-GDP ratio will continue to grow. This has little to do with COVID-19 and everything to do with the increased cost of entitlement programs — Social Security, Medicare and so forth — as the last of the Baby Boomer generation approaches retirement, the last of whom will turn 65 in the year 2029," said Hartwig.

Meanwhile, unemployment remains a concern as more than eight million jobs lost since March 2020 have yet to return as of March 2021. The U.S. trade deficit is also a serious concern. "The U.S. economy is recovering, so we're importing a lot," he said. However, the nation's export sector is hurting because the economic recovery in the U.S. is far ahead of most other advanced economies, including Europe, which is lagging behind in its vaccine administration. He predicts that the country's trade balance will be out of sync for a while.

Concern about the growing U.S.

debt leads to other concerns. "We are up to \$27 trillion in debt. You can see it increasing exponentially even before COVID," he said. And the question is, will these large deficits as a share of the GDP become unsustainable since they tend to generate higher inflation? Currently, there is a surge in inflation in 2021, up to 2% to possibly 2.5%. "The Fed [Federal Reserve Board] has stated that it is more concerned about deflation rather than inflation in recent years, so don't look for the Fed to raise interest rates to try to head off any kind of inflationary surge, at least this year."

The Fed is now looking to target a long-run inflation rate of 2% rather than trying to cap inflation at 2%. "That is a change in how the Fed is operating," he said. "Nevertheless, we probably should start thinking a bit about maybe somewhat of an uptick in inflation over the shorter and intermediate term," he suggested, which can lead to inadequacy in both rates and reserves.

"If you investigate the primary concerns of insurance CEOs in the 1970s, they said that high inflation was the number one menace of the P&C insurance industry at that time because it resulted in perpetual rate and reserve inadequacy," he observed.

"I do think that the Fed's policy of keeping interest rates low is creating a variety of other bubbles out there, certainly in real estate, in many commodities and in a variety of other places," he said. These include asset prices such as the stock market. "We are no longer able to offset losses with investment earnings to the extent we were able to a year

ago,” Hartwig said. The yield on invested assets dropped to an estimated 3% last year — “just a hair’s breadth away from the lowest number ever recorded,” he said. It was 2.8% in 1961.

To complicate matters, 2020’s investment environment was very volatile and interest rates have fallen materially, which will have a bad effect on investment income. Hartwig predicted that investment income would “take a pretty good dip in 2020” —from about \$60 billion in 2019 down to about \$50 billion in 2020. “That’s real money.”

On March 16, 2020, the Dow fell by about 700 points, which was one of the largest losses ever both in absolute point and percentage terms. “You would never know it looking at where we wound up at the end of the year — up 16%,” he said.

The extremes of volatility understandably make insurers cautious. On March 16, 2020, the Dow fell by about 700 points, which was one of the largest losses ever both in absolute point and percentage terms. “You would never know it looking at where we wound up at the end of the year — up 16%,” he said.

When asked for his opinion concerning the national debt during the Q&A portion of the presentation, Hartwig first explained modern monetary theory (MMT), which presumes that the nation’s debt or how much money the government prints does not have much of an impact on inflation. “This is kind of an economic experiment,” he said.

Plenty of warning examples abound throughout global history of various governments attempting to inflate their way

out of situations and increasing their debt, usually causing severe economic situations. “I’m not saying we’re going to wind up like ... Argentina or Mexico ... [but] it’s pretty naive to assume we can rack up tens of trillions of dollars of debt and assume that there will never be any consequences.”

Hartwig posited that some public policy professionals and politicians believe that the U.S. can print as much money as it wants and accumulate debt without significant consequences. “That’s because they’re not thinking

far enough down the road,” he said. “If you don’t care about your children and grandchildren that might be true, but ultimately, someone’s going to have to pay the bill.”

Insurance Industry Indicators

While discussing the state of the property-casualty insurance industry, Hartwig relied on third-quarter 2020 results, the latest at the time. The “steep drop” of about 9% in policyholder surplus in the first quarter of 2020 was due primarily to a collapse in asset prices, but the good news was that surplus recovered by the third quarter. Hartwig predicted a record high for the fourth quarter.

Unfortunately, the net income or profit after tax dropped 20% for 2020 based on annualized third quarter data. This change was in part due to declin-

ing investment income and low-interest rates. Elevated catastrophe losses also played a role. Hartwig expects the P&C industry’s return on equity (ROE) to be down to 4.1% for 2020 as of the third quarter of 2020. This is within the ballpark of the average 4.5% for recessions during the past half century.

The insurance P&C industry’s ROE has been tracking below the overall Fortune 500 since the early 1990s. Hartwig also looked at how the ROE for the P&C industry has changed in the last 70 years under different presidential administrations, including the last administration, and determined that the occupant of the White House doesn’t really matter. The industry’s ROE averages have been about 8.1% when Democrats are in office compared to Republicans at 7.8%.

Regarding specific presidents, insurers enjoyed the greatest ROE under Democratic President Jimmy Carter during the late 1970s at 16.43% and Republican President Ronald Reagan’s second term during the mid-1980s at 15.10%. On the other extreme, ROE was just 3.55% under Democratic presidents John F. Kennedy and Lyndon B. Johnson’s first term in the early 1960s and 4.3% in Johnson’s second full term mid-decade.

A.M. Best’s overall P&C pre-COVID combined ratio estimate of 99.1% in 2020 was impressively close to the actual 99.3% considering last year’s events. “Rarely do you actually get a forecast that is that on target,” he said. But the reasons are different than the organization could have imagined. Depressed claim frequency across many lines, which contributed to an improvement of underwriting results, was offset “almost to the exact same extent” due to elevated claim losses.

COVID-19’s impact on the U.S. P&C industry was not nearly as bad as estimated, with losses close to his prediction of about \$30 billion. There are several reasons for this, including worst-case litigation outcomes that did not materialize and courts generally favoring insurers. Further, an explosion in workers’ compensation losses due to presumption expansions did not happen as many had feared.

Net growth did not increase as A.M. Best predicted with its pre-COVID forecast of 3.8% for the year 2020. Through third quarter 2020, premium for all P&C lines rose 3.1%, but Hartwig estimated a 1.8% uptick for full-year 2020. It was “below expectations but nowhere near as severe decline in premium that we saw back in the financial crisis just over a decade ago now.”

Regarding commercial lines’ performance, the market has been experiencing double-digit rate gains across businesses of most sizes, as reported by the Council of Insurance Agents and Brokers. Commercial property and business interruption costs contributed to the largest rate growth in years due to the cost of massive catastrophic losses.

Commercial umbrella later superseded commercial property losses due to “a lot of jackpot justice awards going on out there with the economy heating up,” resuming a trend that began even before COVID arrived. Directors & Officers insurance rates are rising due to increased merger and acquisition activity. Cyber is also seeing increases. Workers’ compensation is experiencing the flattest rate growth among all commercial lines, given current strong underwriting performance.

Despite the global pandemic, \$1.5 billion in riot-related losses, a presiden-

tial election year and another record-breaking year of natural catastrophes, the industry was able to withstand such an exceptional year. Insured natural catastrophe losses cost \$67 billion last year, ranking 2020 as the third costliest year in North America.

Hartwig expressed great concern about the impact of growing catastrophe losses on the P&C insurance industry worldwide. For the past four decades, frequency and severity have risen exponentially. On an inflation-adjusted basis, the average annual insured losses were about \$5 billion during the 1980s, increasing to \$15 billion in the 1990s, \$25 billion in the 2000s and for the most recent decade, \$35 billion. “Keeping with this very simple trend and ratcheting it up by \$10 billion, we’d wind up at about \$45 billion in average annual insured losses in the 2020s,” he predicted. While that may be thought as a high bar, considering 2020’s large losses and 2021 losses through March in the \$15 billion range, reaching insured catastrophe losses of \$45 billion is not an incredible stretch.

Hartwig does not place the primary cause of CAT losses on climate change, however; “some signature” of climate change are in these losses, but the “biggest signature” is the growing population of people moving to disaster-prone areas, which puts pressure on reinsurance pricing.

Actuarial Advice

During the Q&A session, Hartwig was asked about using the Consumer Price Index (CPI) as a measure of inflation. He answered that the CPI is biased a bit downward because it is not sensitive to some of the price increases that many people are experiencing, and it depends

on location. For instance, many people, particularly lower income individuals, spend a higher proportion of their income on staples such as food and housing, which are rising at more excessive rate than the 2.5% expected for 2021.

He advised actuaries to seek additional measures. “For actuaries, I would keep a closer eye on health-care medical expenses,” There is likely to be a resurgence of that in 2021 and 2022 as demand for medical services recover because many people deferred health care, increasing medical severity because people were not getting preventative screening.

Looking at the numbers, he noted that actuaries will have interesting jobs because they will “see things that simply don’t exist historically anywhere in the data.” Hartwig predicted tremendous variation in the results across states. “You’re going to have to ask yourself whether or not any of these sorts of trends are going to carry over into the year ahead.” So, the question is, “How useful is your data for 2020 for the years ahead?”

Hartwig cautioned against cutting out results from 2020 despite its anomalies. “It has a tail on it and we’re going to feel that tail through 2021 and into 2022.” Anytime there is some sort of shock to the system, the effects of that shock ripple through that system for some period of time before there is new period of normalcy or stability. The same is true for COVID.

Thus, Hartwig’s observations do underscore the necessity of asterisks. ●

Annmarie Geddes Baribeau has been covering insurance and actuarial topics for more than 30 years. Her blog can be found at www.insurancecommunicators.com.

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IN MY OPINION By GROVER EDIE, ACTUARIAL REVIEW EDITOR IN CHIEF

When Clutter is Important — How to Tackle Distractions and Stacks of Information

Several years ago, my wife and I were discussing organizing and concentrating skills with our friend Jane, who worked with school children with learning, organizing or focusing difficulties. Jane mentioned the need for many of them to physically separate themselves from distractions to enhance their focus while doing homework. Having a special place to do homework, separate from other activities, worked for some of them. When I mentioned my difficulties organizing my work papers, Jane suggested that I separate my “active work” papers from my “records, reference and other” papers.

I thought it was a great idea and started separating my storage items from my work items. I still have a sheet of paper next to my desk that says: “This is your workspace, *NOT* your storage space.” I have maintained that distinction since then.

That simple separation of work from storage helped get those tasks that I was not currently working on out of sight and out of mind. This helped me concentrate on active projects.

But my workspace still had piles of each of my active projects, and over time, the number of those piles increased. Some projects take many months to complete; those project stacks tend to be higher than the tasks that take

only a few days. I had solved the storage issue but was left with a projects-I-am-working-on issue. Those piles were at least as distracting as the storage piles I had moved to another location.

Some organization experts say, “Put your stuff in drawers after making a list of the things you have to do.” I tried that several times with limited success — the piles reappeared. I would make a to-do list, but still I had the piles.

I found help in the book *Organizing for the Creative Person*.¹ The authors describe “Ryan,” who organized paper much like I had been doing — in piles. “People who love the printed word tend to surround themselves with it. They depend on reading material, remember it, think about what they’ve read, and feel a relationship to it. And soon they have piles of paper in every available space.” (I believe this is why books may never be replaced by electronic media — some of us like to see those books on our bookshelves, like finding friends at a party. When I read the book title on my bookshelf, it reminds me of what I learned by reading the book.)

The authors’ description of the fictional Ryan struck a chord with me: “Ryan likes to be able to see every reminder of things he needs to do ... he feels that if a task is in view, he will remember to do it. To him, the saying ‘seeing is believing’ translates into ‘seeing

is remembering.’ Being able to see what he needs to do gives him a feeling of control. [He is] ... reluctant to file papers away out of sight because of a fear of not being able to find them again.”

After reading that, I understood why I sometimes would get away from my office to read or write: to avoid distractions. Usually, the piles are not a problem, but occasionally they would get to me. Pre-COVID one of my favorite places was the work cafeteria during off-hours. At home I like to work on the deck — where I am while writing this. The deck offers no distractions save for an occasional rabbit or squirrel. And if I am reading from paper or writing in longhand, I am not tempted to check the news or stocks on my PC because it is not with me.

My solution was to put the projects-I-am-working-on piles in a place that I cannot see from my desk. Once found, I placed all the to-do piles on it. Archives, reference and other not-working-on-currently files are still in file folders, which, for some reason, works for me.

Could too many distractions be why some school children have a hard time doing homework at home? In lockdown, their options for places with minimal distractions are limited.

If you try this, let me know if it works for you. ●

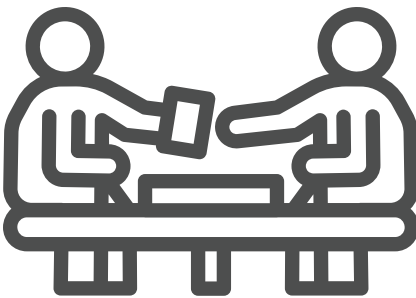
¹ Dorothy Lehmkuhl & Dolores Cotter Lamping, *Organizing for the Creative Person: Right-Brain Styles for Conquering Clutter, Mastering Time, and Reaching Your Goals*, Harmony, 1993.

IT'S A PUZZLEMENT By JON EVANS

Identifiable Sequences

Stephen Mildenhall suggested the following puzzle. Create two sequences of strictly increasing positive integers, $A(n)$ and $B(n)$ with $n = 1, 2, \dots$. These sequences must be such that any positive integer M is the sum $M = A(i) + B(j)$ for at most one pair i, j . Note, however, not all M need to be such a sum. When A and B together have this property, they are called *identifiable*.

Here is a magic trick to illustrate how identifiable sequences might be used. You will give list A to Person A and list B to Person B and ask them each to randomly select one number. They



confer and tell you only the sum. With identifiable sequences you can magically tell them which number each of them chose.

One pair of identifiable sequences is $A(1) = 1, B(n) = 2A(n), A(n+1) = 2B(n)$. Some example unique sums from these sequences are: $3 = 1 + 2, 6 = 4 + 2, 9 = 1 + 8, 12 = 4 + 8, \dots$ But A and B grow very rapidly with n .

In contrast, the slow growing sequences $A(n) = 2n$ and $B(n) = 2n + 1$

are not identifiable. For example, $7 = 2 + 5 = 4 + 3$.

In general, we expect only a small proportion of all the positive integers can be formed as $A(i) + B(i)$ when A and B are identifiable.

The challenge is to construct the slowest growing pair of identifiable sequences. Assume $A(1) = 1$ and $B(1) = 2$. What do you propose for a pair $A(n)$ and $B(n)$? How do you compute them as efficiently as possible? Can you say anything about their growth rates as functions of n ? Polynomial? Exponential? What is $A(100)$? $A(200)$? Extra credit: $A(1000)$? You may need a computer.

Some Infinite Games

1. Beyond some point S is a constant sequence of only 0s or only 1s. Horatio wins because he can, for example, alternate between picking 0 and 1 forever.
2. There is no point after which S is periodic (an endless repetition of a fixed sequence of finite length). Hypatia wins because, for example, she can pick alternating ever longer



Know the answer?
Send your solution to
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finite sequences of 0s and 1s (0, 1, 0, 0, 1, 1, 0, 0, 0, 1, 1, 1, ...) with each finite sequence long enough to break any prior periodicity.

3. S does not contain all possible finite binary sequences in it. Equivalently, at least one binary sequence of finite length is nowhere in S . Hypatia wins because, for example, she can pick all 0s.
4. For a given set C of countably infinite binary sequences $C = \{S_1, S_2, \dots\}, S \in C$. That is to say S must be some element of C . Horatio wins because, for example, as every time he picks the $2n + 1$ digit for S , he can pick the opposite of whatever the $2n + 1$ digit is for S_n .

Solutions were also submitted by John Berglund, Bob Conger, Clive Keatinge, Eamonn Long, Dan Paine and R.S. Pulis. ●

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