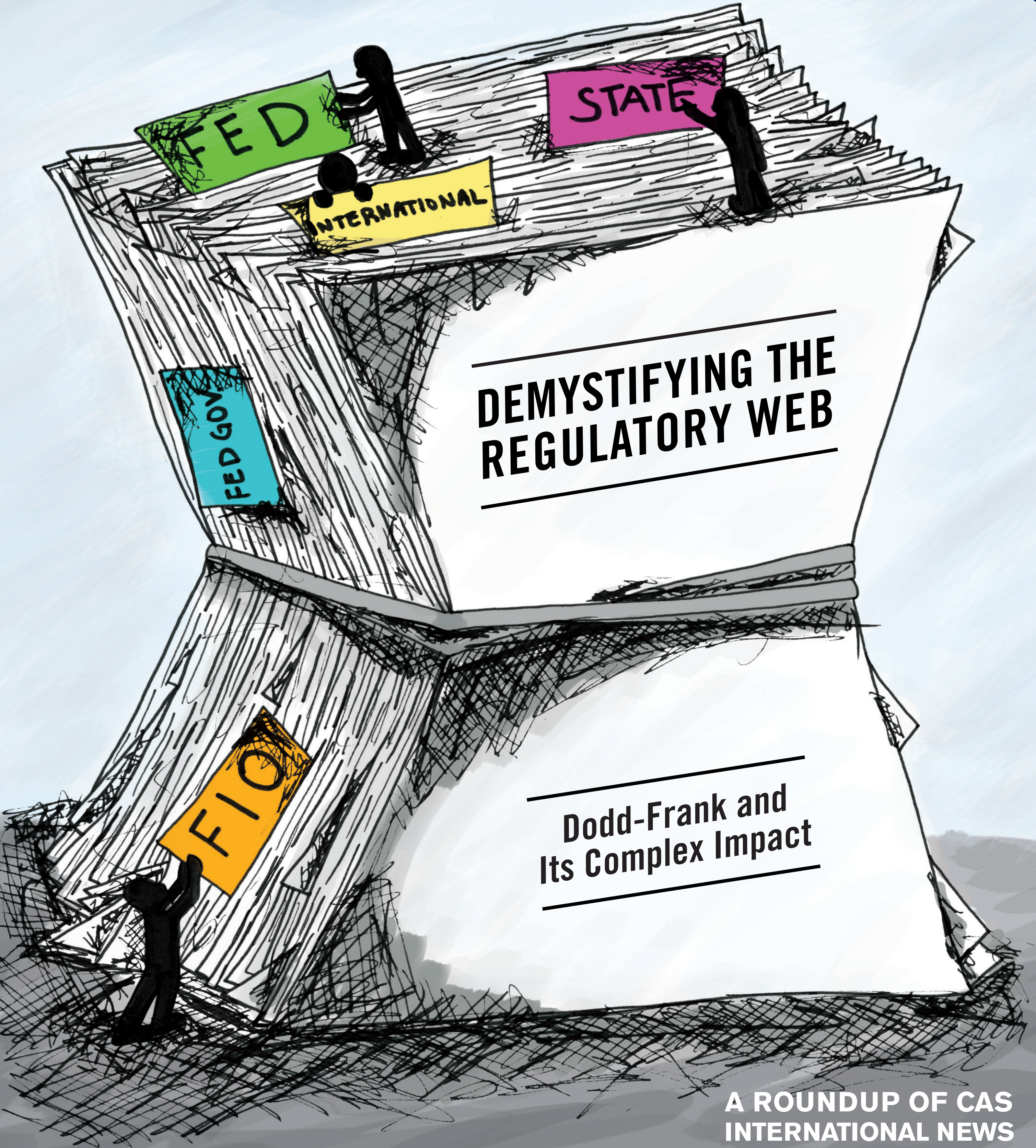
actuarial REVIEW

VOL 43 / NO 2 / MARCH-APRIL 2016

PUBLISHED BY THE CASUALTY ACTUARIAL SOCIETY



DEMYSTIFYING THE REGULATORY WEB

Dodd-Frank and Its Complex Impact

A ROUNDUP OF CAS INTERNATIONAL NEWS

DW SIMPSON
GLOBAL ACTUARIAL RECRUITMENT

actuarialREVIEW

March/April 2016

departments

FSC LOGO

on the cover

Actuarial Review (ISSN 10465081) is published bimonthy by the Casualty Actuarial Society, 4350 Fairfax Drive, Suite 250, Arlington, VA 22203. Telephone: (703) 276-3100; Fax: (703) 276-3108; Email: ar@casact.org. Presorted standard postage is paid in Lutherville, MD. Publications Mail Agreement No. 40035891. Return Undeliverable Canadian Addresses to PO Box 503, RPO West Beaver Creek, Richmond Hill, ON L4B 4R6.

The amount of dues applied toward each subscription of *Actuarial Review* is $10. Subscriptions to nonmembers are $10 per year. Postmaster: Send address changes to *Actuarial Review*, 4350 North Fairfax Drive, Suite 250, Arlington, Virginia 22203.

editor's NOTE By ELIZABETH A. SMITH, *AR* MANAGING EDITOR

It's Complicated

Actuaries know complexity. They deal with it every day. So in this *Actuarial Review*, we challenge readers to understand an intricate issue. Our cover story by Annmarie Geddes Baribeau tackles the subject of the Dodd-Frank Act and its place in the complicated world of actuaries and insurers. Baribeau's article is perhaps one of the first to take a deep dive into this U.S. legislation and its impact on the state, national and international levels.

Welcome and Kudos

I'd like to welcome Rick Gorvett, FCAS, as the newest member of the CAS staff. Gorvett is a long-standing CAS member and the first staff actuary for the association. He's gotten straight to work on a variety of projects — even providing a much-needed assist with *AR*. I'm positive that I can speak for the entire CAS staff when I say that it's so nice to have him on staff.

In other CAS staff news, Mike Boa has just celebrated 20 years with the CAS. He began as a membership coordinator and is currently chief communications officer — not too shabby! Congratulations to Mike!

Meeting attendees peruse items in the CAS booth during the 19th Annual Asia Actuarial Conference in Bangkok in November 2015. A CAS delegation attended and sponsored a tea break during the meeting. For more on CAS international activities, see pages 26-33.

Setting Goals

CAS President Steve Lowe has goals, and he lays out his ambitious agenda in the President's Message. Please be sure to read his column and let him know your ideas or — better yet — how you can help him reach these goals.

Speaking of goals, I'm proud to announce that the *AR* has reached one of ours. In the next few weeks, we will unveil a new and improved digital version of the magazine, featuring a responsive design that adapts to any mobile or desktop device you're viewing *AR* on. The new digital version will be easier to read online and has the capacity for new features such as photo slide shows, in addition to audio and video. We think that *AR* readers will really like the improvements. Keep an eye out for the new digital version and please let us know what you think at ar@casact.org.

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

SEND YOUR COMMENTS AND SUGGESTIONS TO:
Actuarial Review
Casualty Actuarial Society
4350 North Fairfax Drive, Suite 250
Arlington, Virginia 22203 USA
Or email us at AR@casact.org

Follow the CAS


Mitigate model 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
• Graphical displays of identified models
• Trends in three directions
• Volatility about trends
• Correlations
• Comprehensive model identification and validation tools
• Creative solutions for difficult problems within a robust, yet flexible, framework
• ... and much more!
Insureware
Innovative Statistical Solutions for P&C Insurance

 By STEPHEN P. LOWE

My Goals as President of the CAS

As I write this, it is late January, and I am approaching the point where 20 percent of my term as president will already be behind me. I am learning with some chagrin that time moves forward very quickly when you are in this role.

At the outset of my presidency, I set out just a few goals that I hoped to achieve. I focused on those issues that were of greatest strategic importance to the CAS, starting with a basic premise drawn from many CAS Board discussions last year about the purpose of the CAS:

> The CAS exists to foster a vibrant community of actuaries with the necessary analytical skills and expertise in property, casualty and related risks, who bring value to society by empowering business and government to make better risk decisions and assuring the soundness of mechanisms used to finance risks.

I set my goals at ambitious levels. Looking at them today, I see that I had better get busy. Here they are in summary, with a few comments on progress to date.

1 Move forward aggressively on data science and predictive analytics.

This is the number one priority identified by both the CAS Board and the broader leadership group within the CAS. It's a goal with three key dimensions: assure that our members have adequate training in this area; develop innovative and effective approaches to deliver that training; and make certain that all of our stakeholders understand the close alignment among actuarial science, data science and predictive analytics.

We are making good progress on this goal. A group of subject matter experts has been formed, and they are actively working on learning objectives. I expect the work will move quickly from learning objectives to educational and testing material. Initially, this group is focusing on the learning objectives for The CAS Institute (which I will refer to as "iCAS" to avoid confusion with The Institutes), whose programs will be available to both actuaries and non-actuaries seeking credentials in this area. The next step will be to tackle the question of which learning objectives need to become part of the education of all future casualty actuaries. This will lead to further changes in the syllabus.

2 Successfully implement iCAS and the alliance agreement with The Institutes.

This goal also has three dimensions: get iCAS up and running, both operationally and programmatically; identify areas where we can leverage the capabilities of The Institutes; and assure that stakeholders understand how both of these initiatives fit within the overall strategy of the CAS. A committee has been established to get iCAS going, and that group has been working hard since the creation of iCAS in November 2015.

The work thus far has been largely behind the scenes, but you should expect to hear public announcements on this work in the spring. Another committee has been piloting some of the capabilities of The Institutes (for example, the capability to use Word or Excel in an exam context), and we will be announcing some plans in that area, too. In the meantime, other members of leadership and I have been making iCAS and The Institutes a focal point in our presentations at Regional Affiliate and other outreach meetings.

3 Continue our outreach internationally to expand the CAS global presence and reputation.

Some of our members have questioned the importance of international outreach by the CAS. I believe it is important for the CAS to exhibit global leadership of the non-life actuarial community, working with local actuarial organizations to support the education and qualification of casualty actuaries. This view is heavily influenced by many CAS leaders' conversations with executives at multinational insurers, which I can sum up as follows:

- They value the CAS credentials because, when they hire an ACAS or FCAS, they are confident about the skills of the individual.
- From a talent management perspective, their preference would be that the CAS credentials be available throughout the world to help them fill non-life actuarial roles in all of the jurisdictions where they operate.

President's Message, page 8

President's Message

from page 6

My views about our international role are influenced by this expressed need by important stakeholders; the insurance industry and our profession are becoming increasingly global, creating opportunities for our members around the world. The CAS is well-positioned to effectively meet the need of multinational employers for a common credentialing platform for non-life actuaries, working collaboratively with actuarial organizations in each country, as we do with the Academy and the CIA. The CAS leadership continues to travel regularly to participate with other actuarial organizations at their meetings — in China, India, Mexico, Ireland and elsewhere. We are expanding the role of ambassador and reinvigorating our outreach efforts in Latin America. (For more on what's going on around the world, see stories beginning on page 26.)

4 Strengthen our research function and improve the quality of access to our knowledge base.

Research is critical to the CAS. Research gives CAS members and others the opportunity to engage in thought leadership on important issues, and it demonstrates that the CAS is continuously contributing to the advancement of knowledge within the profession. This year we are launching between five and seven new working parties, which are modeled after those run very successfully in the U.K. These working parties will dig into a specific topic, with the goal to produce concrete deliverables in time for the 2016 Annual Meeting. The working parties focus on both large and small issues of interest to the membership, but several will be focusing on important societal issues that can increase the visibility and stature of the CAS. (There may be an opportunity to participate in one of the new working parties. Please contact Dave Core at dcore@casact.org for more information.)

The CAS is also leading the effort to create a single search engine that will access all of the papers and presentations in the archives of all actuarial organizations focusing on non-life topics. This will be a benefit to our members in North America as well as other parts of the world.

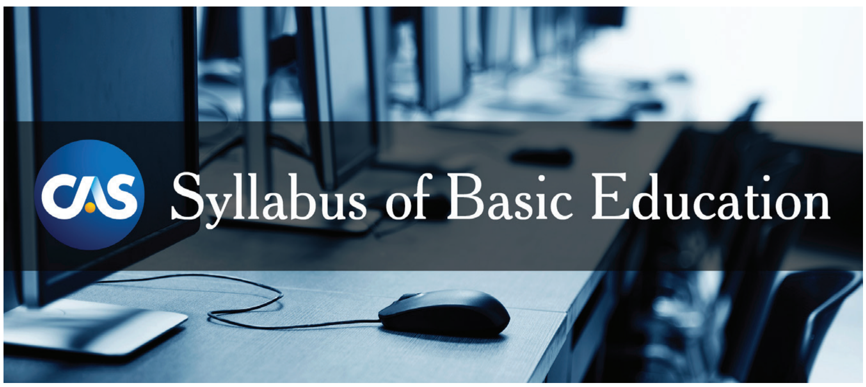
5 Take a fresh look at the long-term strategy for our basic education program.

There is a number of drivers to this goal. First, we expect that some additional learning objectives relating to data science and predictive analytics will emerge from the efforts listed above. Second, the International Actuarial Association is developing a new model syllabus for "the actuary of the future," and we will need to react to that syllabus. Third, The Institutes have innovative testing capabilities that we need to consider. Fourth, the SOA is developing a new syllabus, which will include revisions to the preliminary exams. Rather than responding to these drivers piecemeal, we need to address them comprehensively.

Efforts on this goal are underway, but I expect they will intensify mid-year once some of the drivers listed above have become clearer.

6 Refresh our strategy relating to ERM.

We continue to want casualty actuaries to play a major role in risk and capital management, particularly in quantitative risk measurement and design of risk mitigation programs. In a perfect world, our CERA designation would be a well-regarded credential, sought after by employers — similar to our ACAS and FCAS designations. We aren't where we need to be, yet, but we will be working with other actuarial organizations to find ways to articulate our role in risk management.



Getting to Work

As I said at the outset, this is an ambitious set of goals. To get them done will require an orchestrated effort by leadership, CAS staff and our many volunteer members. If you would like to help, let me know (stephen.lowe@willistowerswatson.com). I welcome any comments or questions you may have.

COMINGS AND GOINGS

Arch Capital Group announced that **Marc Grandisson, FCAS, MAAA,** has been promoted to the position of president and chief operating officer. He joined Arch Capital Group in 2001 and previously served as chairman and CEO of Arch Worldwide Reinsurance and Mortgage Groups. In his new role, Grandisson will have responsibility for all of the company's operating units, insurance, reinsurance and mortgage. Prior to his time at Arch Capital Group, Grandisson held various senior positions at Berkshire Hathaway and F&G Re.

Selective Insurance Group announced that **Nathan Rugge, FCAS, MAAA,** has been promoted to assistant vice president, actuarial pricing. Rugge joined Selective in November 2009 as an actuarial assistant. He earned his bachelor's degree in actuarial science and finance from Rider University in New Jersey.

Ohio Mutual Insurance Group has named **Susan E. Kent, FCAS, CPCU,** to serve as the company's vice president & chief analytics officer, effective February 1. In this role, Kent will be charged with obtaining and leveraging industry analytics to help the company drive business success. Kent served in a number of roles on the research and development team over the past 16 years for Nationwide Insurance and Nationwide Bank.

The CAS has named **Richard W. Gorvett, FCAS, CERA, MAAA, Ph.D.,** as its first staff actuary. The staff actuary will act as an in-house advisor to the organization, offering the perspective of an experienced property-casualty actuary on issues related to thought leadership, content development, strategic planning and communications. Gorvett is a 30-year veteran of the insurance industry and a longtime member of the CAS with a background in both corporate and academic practice. Gorvett has served as director of the actuarial science program at University of Illinois at Urbana-Champaign since 2004.

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

ACTUARIAL REVIEW *LETTERS POLICIES*

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

IN MEMORIAM

Lloyd F. Mathwick (ACAS 1956)
1926-2015

CALENDAR OF EVENTS

Interactive Online Courses
"Understanding CAS Discipline Wherever You Practice"
"Introduction to Predictive Modeling"
"Statistics for Reserve Variability Series"
www.casact.org/education/interactive/

April 6-8, 2016
Enterprise Risk Management Symposium & Seminars
Crystal Gateway Marriott
Arlington, VA

May 15-18, 2016
CAS Spring Meeting
Sheraton Seattle Hotel
Seattle, WA

June 6-7, 2016
Seminar on Reinsurance
Hyatt Regency Boston
Boston, MA

September 18-20, 2016
Casualty Loss Reserve Seminar (CLRS) & Workshops
Hyatt Regency O'Hare
Rosemont, IL

October 6-7, 2016
Enterprise Risk Management for the P&C Actuary
Hotel Sofitel Philadelphia
Philadelphia, PA

The CAS Institute Forms Panel of Industry Experts

Group Will Define Program for Data Science and Predictive Analytics Credential BY MICHAEL BOA, CAS CHIEF COMMUNICATIONS OFFICER

The CAS Institute has formed a panel of leading practitioners in data science and predictive analytics to define the curriculum and requirements for the organization's inaugural credentialing program. "I am thrilled with the caliber of the data science and predictive analytics professionals we have brought together to establish this first credential from The CAS Institute," said CAS Immediate Past President Robert S. Miccolis, who chairs The CAS Institute Leadership Advisory Council.

Established as a subsidiary of the Casualty Actuarial Society in late 2015, The CAS Institute will provide specialty credentialing and professional education to quantitative specialists in selected areas. The first credentials to be developed and granted by The CAS Institute will focus on data science and predictive analytics.

For the new credential, subject matter experts will determine learning objectives, create the curriculum, set the competency levels, direct educational material development, oversee examination and scoring, and establish eligibility requirements.

The panel will also define the experienced practitioner program, which will grant credentials to accomplished professionals in the field of data science and predictive analytics who possess the requisite knowledge, practical experience and evidence of achievements.

For credential requirements, the panel is deliberating on the appropriate levels of knowledge in areas such as:

- Data concepts, including data management and structured/unstructured data
- Data tools used by modeling specialists
- Modeling
- Project management
- Methodology, including validation
- Interpreting and utilizing results
- Storytelling and visualization, including communicating results to both technical and nontechnical audiences
- Domain expertise

The CAS Institute's programs are designed for professionals seeking a credential in specialized quantitative practice areas and looking to distinguish themselves from other professionals. "Knowing the experts involved, I am confident that the panel will develop a program that will be highly applicable to current and emerging practice and will meet the needs of both working professionals and their employers," said Miccolis. It is expected that professionals holding the credentials can enhance their skills, secure additional job duties, attract premium compensation and advance their careers.

The CAS Institute plans to begin offering its programs in the latter part of 2016. For more information, visit TheCASInstitute.org for the original CAS Institute announcement and a set of Frequently Asked Questions.

The CAS Institute Subject Matter Expert Panel for Data Science and Predictive Analytics

Todd W. Lehmann, Chairperson, VP, Corporate Research & Analytics, OneBeacon Insurance Companies

Peter T. Bothwell, VP, Data Science, The Hartford

Louise A. Francis, Consulting Principal, Francis Analytics & Actuarial Data Mining Inc.

James C. Guszcza, U.S. Chief Data Scientist, Deloitte Consulting, LLP

Ravi Kumar, VP, Managing Actuary, QBE North America

Glenn G. Meyers, Retired, formerly with ISO Innovative Analytics

Stephen J. Mildenhall, Aon Benfield Analytics

Christopher J. Monsour, VP & Actuary, Predictive Business Applications, CNA Insurance Companies

Cheng-Sheng Peter Wu, Director, Deloitte Consulting, LLP

Robert S. Miccolis, Director, Deloitte Consulting, LLP

Cynthia R. Ziegler, Executive Director, Casualty Actuarial Society

Amy Brener, CAS Institute Project Manager, Casualty Actuarial Society

CAS STAFF SPOTLIGHT

Meet Danelle Gee, Actuaries' Resource Center Manager

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

Danelle Gee

- **What do you do at the CAS?**
  I am the Actuaries' Resource Center Manager, and I oversee the daily functions of the ARC, which involves everything from phone reception to updating candidate profiles, processing new member applications, answering general email inquiries and just about everything in-between.
- **What do you enjoy most about your job?**
  I enjoy the feeling that I've helped someone every day. From answering questions via phone or email, or sending congratulatory notices to new members, the responses and gratitude I receive are very satisfying. Oh, and the people I work with are pretty awesome, too!
- **Hometown:**
  Alexandria, Virginia.
- **College and degree:**
  I graduated from Hampton University with a bachelor of science degree in sports management.
- **First job out of college:**
  Right out of college I became a personal trainer because I was training for the Olympics and the hours were flexible.
- **Describe yourself in three words:**
  Loyal, empathetic, observant.
- **Favorite weekend activity:**
  Spending time with family or friends. I do a lot of different activities that I find on Groupon; I enjoy the deals for activities that I wouldn't normally think to do. It keeps things interesting.
- **Favorite travel destination:**
  I love Curacao, one of the ABC Islands (Aruba, Bonaire and Curacao), which are all part of the Kingdom of the Netherlands and the three most western islands of the Leeward Antilles.
- **One interesting or fun fact about you:**
  I ran track for 20 years of my life and once set school records in high school and college for the 300 m, 500 m and 800 m runs. I have also been to the Junior Olympics twice.

MEMBER PROFILE BY MATT CARUSO, CAS MEMBERSHIP AND VOLUNTEER MANAGER

Runner, Hoosier and Dog Rescuer: Elaine Brunner is One Busy Actuary

Elaine Brunner (FCAS 2005) lives and works in Indiana, a land in the heart of the Midwest where the Indianapolis 500 is simply known as the "Race." Although a transplanted Michigander, she's a Hoosier and a proud one. In true Hoosier fashion, Brunner positively affects her community and the CAS through her participation and volunteerism, and she is one of the many examples of the Society's diverse membership.

Brunner (second from left) with her family.

After high school in northern Michigan, she majored in math at Carleton College, a small liberal arts school in Northfield, Minnesota. Northfield is so small it is known for the three Cs: "cows, colleges and contentment." Carleton's career center directed her toward the actuarial profession. "I signed up for the first exam, put together a resume and sent out applications to companies with intern programs," she said.

She interned at American States Insurance in Indianapolis in the summer following her junior year. At the end of her internship, American States offered her a position after she graduated. That's how she became a Hoosier.

Brunner worked at American States (later bought by Safeco) for five years and then moved to Indiana Farm Bureau Insurance (IFBI), where she works today. Because IFBI is a small company, Brunner has many opportunities to learn all aspects of the business. "I get to work in several areas: pricing, reserving and predictive modeling. It's fun!" she said.

Brunner is an enthusiastic runner and has completed four full marathons and many half marathons. "I'm a little obsessive about running and getting my run in on certain days," she said. During a CAS Leadership Summit at O'Hare Airport in Chicago, she had limited running options so she ran around the airport parking lot.

Along with running, she is involved in a program for rescuing retired racing greyhounds in Indianapolis. "They are the best pets ever!" she said. She has adopted two greyhounds of her own and five dogs over the years.

In addition to her work and activities, Brunner also manages to find time to volunteer for the CAS. "I started volunteering because I wanted to give back to the Society that has given me a great career," she said. Brunner currently serves as vice chair of the CAS Webinar Committee, a member of the Volunteer Resources Committee and the Member Advisory Panel. "Being a part of these committees has been a fantastic way to stay current on developments in the industry and to meet and network with actuaries from around the country and the world."

What is next for Brunner? "I'm interested in joining other committees someday, though I'm happy with what I'm doing right now."

IN REMEMBRANCE

In Remembrance is an occasional column featuring short obituaries of CAS members who have recently died. Longer versions of these obituaries are posted on the CAS website at http://www.casact.org/pubs/proceed/index.cfm?fa=pastind.

Her Brilliant Career and Home

Judy A. Gillam (FCAS 1989)

1949-2014

Born Judy Ann Johnson in Manchester, New Hampshire, to Ernest and Eva (Merryfield) Johnson, she earned a bachelor's degree in math from University of New Hampshire, a master's degree in math from Rutgers University and membership in the Phi Beta Kappa Society. She went to work for ISO in 1977 and in 1980 married William Robin Gillam (FCAS 1987). After the births of their sons Danny and Mark, the couple joined NCCI. She was in charge of residual market reserves at a time of inadequate rates and unparalleled expansion in the national pool. In this public position, Gillam did an exceptional job in the hot seat among actuaries, insurance companies and regulators.

After NCCI, she was an independent consultant until retiring in 2012. Gillam enjoyed redecorating and doing repairs, having learned by watching shows like *This Old House*.

Surviving are her husband, sons, her father, some aunts and several cousins.

State Insurance Official

Philip O. Presley (FCAS 1967)

1941-2012

Philip O. Presley, 71, of Londonderry, New Hampshire, and formerly of Austin, Texas, died December 28, 2012, in Manchester, New Hampshire. He was born November 9, 1941, in Upland, Pennsylvania, the son of the late Oran and Ione (Whitehead) Presley. Presley was a graduate of Kalamazoo College and attended Johns Hopkins University. He was employed as chief actuary for the Texas Department of Insurance. He was previously employed with the New Hampshire Department of Insurance in Concord and the American Mutual Life Insurance Co. He enjoyed unique travel and sharing his love of it with his family. Presley was an avid rock collector, reader, and adopter of many cats.

He is survived by his wife, Linda (Hamilton) Presley of Londonderry; two daughters, Susan (Presley) Spinney and her husband, David, and Kristin (Presley) Radford; and six grandchildren. He was predeceased by a grandson, Andrew Tyler Spinney and his brother, Mark Presley. Memorial donations may be made to the Nashua Humane Society.

The Joyful Volunteer

Arthur D. "A.D." Copestakes (ACAS 1959)

1922-2007

Through his volunteer work, A.D. Copestakes touched the lives and hearts of hundreds of individuals. He advocated for a wide variety of social justice issues and cited volunteering as the reason for a great deal of joy in his life.

Copestakes worked in the insurance industry for 27 years in Massachusetts. In 1977 he moved to New Hampshire to work for the New Hampshire Insurance Department where he was chief actuary until his retirement in 1988. He was also a certified flight instructor.

He is survived by his wife of 38 years, Janet (MacGillivray) Copestakes; his daughters, Christine Ritter of Naples, Florida, Vesta Copestakes of Forestville, California, and Sharon Copestakes of Barrington, New Hampshire; two granddaughters and two great-granddaughters. He was predeceased by a son, David Copestakes, in 2007.

Those who wish to honor Copestakes's life are encouraged to do so by contributing time, energy and funds to good causes that enhance the value of life and community.

Actuary Inventor

Martin W. Deede (FCAS 1987)

1957-2014

Martin W. Deede died November 6, 2014. He was 57. He was born in New York City, the son of William and Anne (Carstens) Deede.

Deed was vice president of the Actuarial Department at Metropolitan Life Insurance Company in Warwick, Rhode Island, where he worked for over 27 years. In 2009 he served as vice chair on the board of the directors of the Highway Loss Data Institute. Deede also held a patent for a computerized method and system of assessing insurance risk.

He enjoyed the outdoors, especially hiking, kayaking, motorcycling and bicycling, but most of all, he enjoyed spending time with his family and grandchildren.

He is survived by his wife, Donna; four children, Rebekah DiLernia, Sarah Alfieri, Emily Deede and Benjamin Deede; two step-children, Kenneth Arruda and Joshua Arruda; a brother, Richard Deede; and seven grandchildren.

In lieu of flowers, donations to the Hematology & Oncology Associates of Rhode Island, Inc., Attention: Jennifer, for the purchase of an Infusion Chair in Martin Deede's memory, would be appreciated.

Mentor, Musician, Renaissance Man

David "Dave" Benjamin Sommer (FCAS 1993)
1964-2015

Dave Sommer lived passionately and excelled in all his areas of interest. He died suddenly and tragically in January 2015, in São Paulo, Brazil.

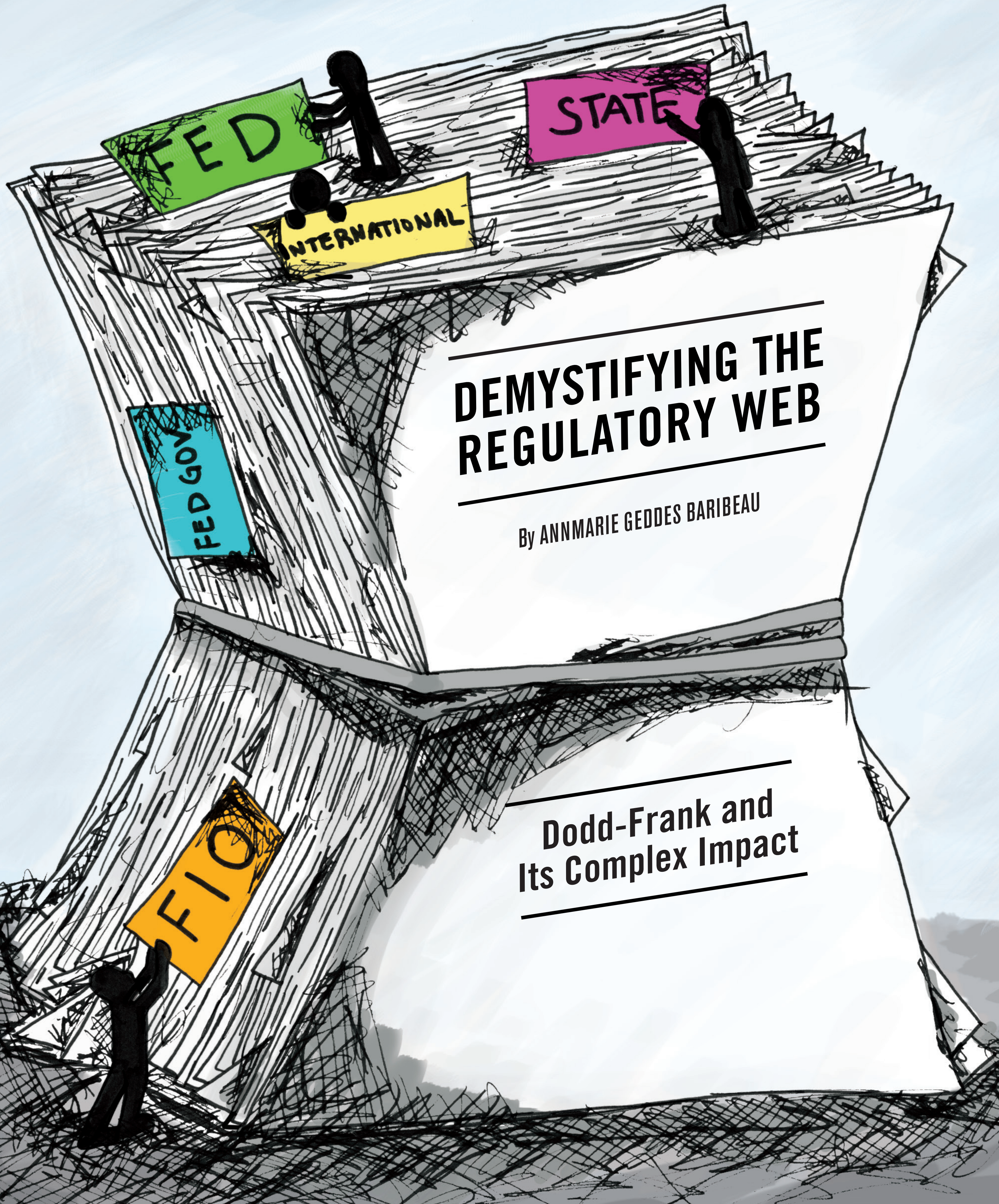
Born in Concord, California, the second-born of triplet boys, Sommer was an Eagle Scout and graduate of the University of California-Berkeley and UC-San Diego. He parlayed his actuarial career into an international one, working in 20 countries across six continents. He arrived in Brazil in 1999 and was taken with the country, the culture and the people.

Sommer was a down-to-earth, generous person and a natural teacher who encouraged his students to excel. Winner of the 1999 CAS Ratemaking Prize, Sommer held executive appointments at leading multinational insurance companies and consultancies. He also played the saxophone in many bands. He is survived by his parents, Melvin and Sybil; siblings Steven, Debbie, Scott and Bruce; and his son, Josef. Memorial donations can be made to the Spirit of Harmony Foundation.

DEMYSTIFYING THE REGULATORY WEB

By ANNMARIE GEDDES BARIBEAU

Dodd-Frank and Its Complex Impact



By inserting federal roles between state regulators and international groups, the impact of the Dodd-Frank Act remains unsettling.

Nearly six years ago, President Barack Obama signed the Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010 into law. As the nation's most expansive federal reach into the traditionally state-regulated insurance industry, Dodd-Frank's impact on property-casualty insurers and the actuaries who serve them continues to unfold.

At first glance, the law sponsored by Sen. Chris Dodd (D-Conn.) and Rep. Barney Frank (D-Mass.) appears to affect a limited number of insurers and their actuaries. There are signs, however, that Dodd-Frank's impact could gradually spread throughout the insurance industry.

The law granted limited regulatory authority to the Federal Reserve System (Fed) and directed the formation of the U.S. Treasury's Federal Insurance Office (FIO) to monitor the industry. By introducing unprecedented insurance federal regulation and policy influence, Dodd-Frank creates a web of ramifications to untangle.

Part of this includes Dodd-Frank authorizing the Fed and the FIO to act on the international insurance policymaking stage. This allows both organizations to influence — and be influenced by— the International Association of Insurance Supervisors (IAIS), where issues were already being largely addressed by state regulators through the National Association of Insurance Commissioners (NAIC).

"Despite its proven track record, the domestic regulatory landscape is being forced into significant changes," stated Rep. Blaine Luetkemeyer (R-Mo.), chairman of the House Financial Services' Housing and Insurance Subcommittee, at the subcommittee's hearing on September 29, 2015, according to an unofficial transcript provided to *Actuarial Review*.

"Today, we see more intrusion in insurance by not only the federal government, but also international financial regulators. Dodd-Frank has allowed that to happen, the integration of the Federal Insurance Office and the powers granted to the Federal Reserve Board of Governors," he noted.

And since the law left many regulatory decisions up to the Fed — an agency that did not historically regulate insurance — rule promulgation for the

Sweeping acts of the U.S. Congress generally occur in response to a significant national problem — and the Dodd-Frank Act is no exception.

insurers it regulates remains a work in progress. Meanwhile, both state regulators and the Fed continue to address similar concerns, such as solvency, on separate tracks with differing approaches, necessitating future harmonization to avoid overlap while both are responding to international pressures.

When the Fed finishes its rules and the IAIS completes its standards, actuaries will be key in addressing the "whole financial element" of these new standards, said David F. Snyder, vice president of international policy for the Property Casualty Insurers Association of America (PCI).

The affected actuaries, said Jim MacGinnitie, senior property-casualty fellow at the American Academy of Actuaries, will likely need to adapt and adjust loss reserving calculations and financial risk management processes.

At the same time, Congress, which monitors the progress of Dodd-Frank and has already passed legislation to adjust it, is considering even more changes.

Genesis

Sweeping acts of the U.S. Congress generally occur in response to a significant national problem — and the Dodd-Frank Act is no exception. "The Dodd-Frank Act was a creature of the 2008 financial crisis," said Robert Hartwig, president of the Insurance Information Institute (III).

At its core, offered John Huff, president of the NAIC and Missouri's insurance commissioner, "The financial crisis was a banking crisis, and the insurance industry generally weathered the storm." So it's unsurprising that Dodd-Frank's inclusion of insurers, and the resulting regulatory burden, remains a point of frustration.

"If we fast forward 10 to 20 years after Dodd-Frank," Hartwig opined, "many of its designers could say the focus on banks was appropriate but will recognize in time that including insurers was not." Instead, he added, "They will probably wish they had included other financial entities such as large hedge funds or other areas where economic risks are building."

Insurers were primarily included in the law, Hartwig said, because the American Insurance Group's (AIG) financial products division, a banking function unrelated to its insurance operations, contributed to the crisis. "AIG is repeatedly used," PCI's Snyder said, "as the main justification for a very broad interpretation of the limited additional authority that was given to the U.S. Treasury's FIO and Fed under Dodd-Frank."

Huff points out that when the financial crisis started, AIG's financial products division was already under federal regulation by the U.S. Treasury's Office of Thrift Supervision (OTS). "The state-regulated insurance subsidiaries were stable and eventually enabled the U.S government to profit on its cash infusion into the company," he added.

Federal Reserve Authority

The United States Constitution's commerce clause gives Congress authority to regulate interstate commerce, which can include insurance. However, for about 150 years, Congress has yielded regulatory authority to the states. With the War Between the States fresh in its memory, the U.S. Supreme Court concluded in 1868 that since insurance was not commerce, Congress did not have the authority to regulate it.

Seventy-six years later, the highest court of the land then recognized insurance as interstate commerce. Nonetheless, the next year Congress passed the McCarran-Ferguson Act of 1945 to preserve states' authority to regulate and tax insurers.

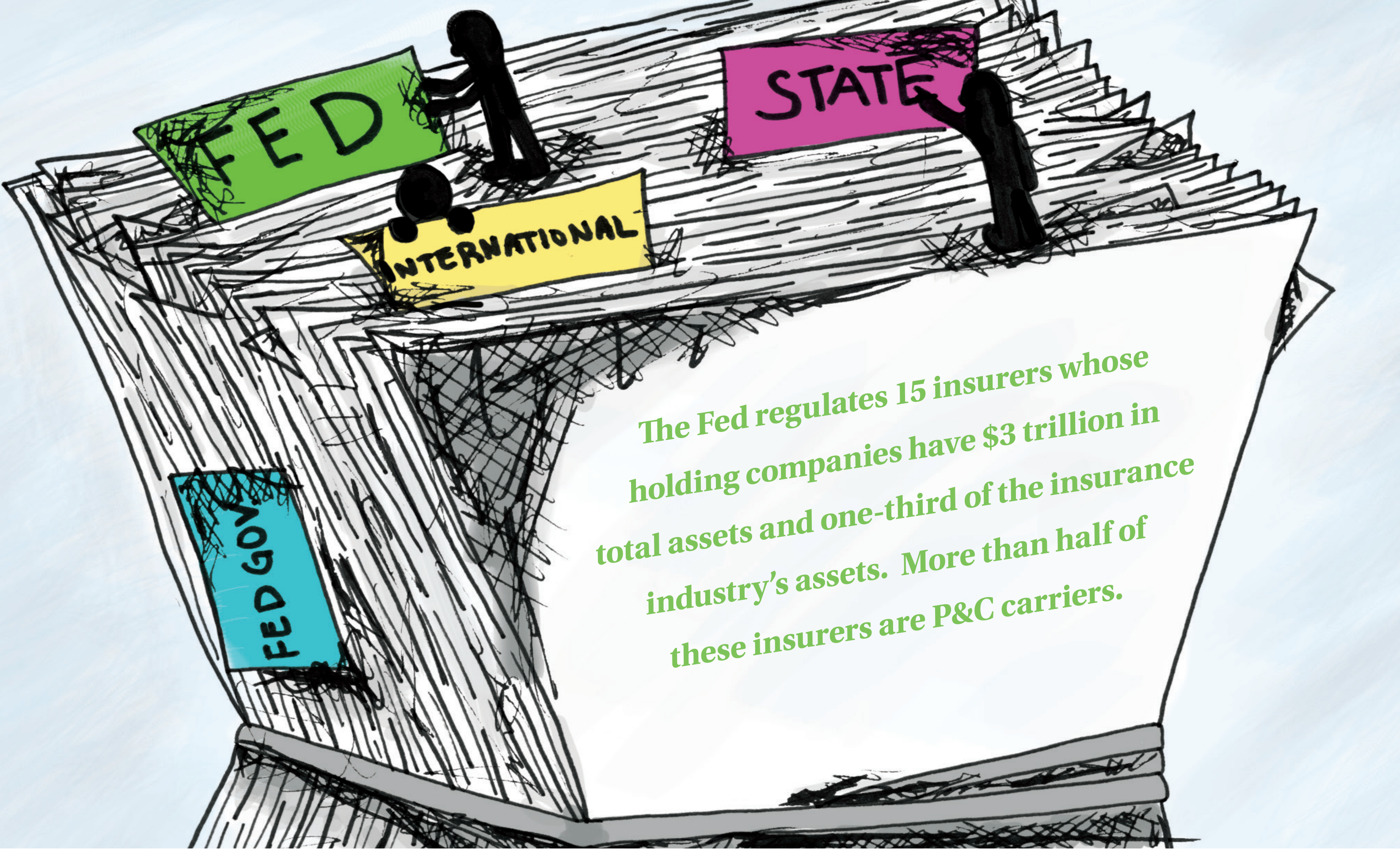
Dodd-Frank's focus on preventing systemic risk in the U.S. economy granted the Fed authority to regulate two types of insurance companies. One group consists of insurers considered to be systemically important financial institutions (SIFIs). The Fed's regulatory responsibility also includes insurance holding companies that have banks or thrifts.

The Financial Stability Oversight Council (FSOC), under the auspices of the U.S. Treasury, assigns a SIFI designation to financial institutions, including insurers, which could cause a national systemic economic disruption if they fail.

Of the three designated insurers, two offer property-casualty insurance —AIG and MetLife — while Prudential is a life insurance company.

The very notion of insurers being designated as SIFIs remains controversial. That's no surprise given the burden of additional regulation, the difference in business models between insurers and banks, and acknowledgement that insurers in general made a minimal contribution to the Great Recession. Further, the process of determining what makes a business a SIFI is "nebulous," Hartwig said. "Neither FSOC nor the Fed have provided a prescription that, if followed, allows insurers to stay off or get off the list," Hartwig maintained.

Roy Woodall, FSOC's independent member with insurance expertise, told the congressional subcommittee last fall



that two insurers (AIG and Prudential) were deemed international SIFIs before FSOC designated them as national SIFIs. "And I really feel like that we've got a situation where the international people have been driving that car," Woodall added.

Woodall also noted in his written testimony that he did not agree with FSOC's decision to designate MetLife and Prudential as SIFIs. MetLife is disputing FSOC's SIFI designation, so that could change.

The Fed also holds regulatory responsibility for insurance holding companies with banks or thrifts. At press time, the Fed regulates 15 insurers whose holding companies have $3 trillion in total assets and one-third of the insurance industry's assets.

More than half of these insurers are P&C carriers. According to a list provided by the Fed, these include State Farm Insurance, Nationwide Mutual Insurance Group, USAA, Auto Club Group, First American Financial Corp., Ohio Farmers Insurance Co., Illinois Farm Bureau and Donegal Insurance Co.

Other insurers, including Northwestern Mutual Life Insurance Co., Prudential Financial, Massachusetts Mutual Financial Group and W.R. Berkley Corp. have either reduced their thrifts to trust banks or divested their thrifts to avoid Fed regulations, according to the 2013 article, "W.R. Berkley Sells Interest in InsurBanc to a Bank He Chairs," at propertycasualty360.com.

The Fed has about 90 full-time equivalent employees supervising these insurers, said Thomas Sullivan, associate director of the Fed's division of banking supervision and regulation, at last September's congressional hearing.

The Fed monitors these insurers through day-to-day supervision to protect consolidated firms' safety and soundness and mitigate financial stability risks, added Sullivan, a former Connecticut state insurance commissioner. Fed supervision, he told the subcommittee, means working with insurers to strengthen their measurement and management of internal controls, corporate governance, and risk identification.

In summary, Fed oversight à la Dodd-Frank means that Fed-regulated insurers must:

- Develop living wills (also known as resolution plans) to be used in the case of bankruptcy.
- Meet liquidity requirements.
- Undergo stress testing.
- Adhere to capital standards.

So far, the Fed has developed standards on living wills and qualitative liquidity requirements, but there is still much work to be done. Quantitative liquidity requirement regulations have not been set. Stress testing will depend on first finishing capital requirement regulations, according to the Fed.

Since the Dodd-Frank Act became law, insurers have been very concerned that they will have to abide by banking-influenced regulations when their business models are different. The Insurance Capital Standards Clarification Act of 2014, supported by the Fed, answered some of that concern. It removed the Dodd-Frank mandate that Fed-regulated insurers must maintain the same capital standards as banks.

The Fed continues to build its "domestic regulatory capital framework" so it is well tailored to "specific business lines, risk profiles and systemic footprints," Sullivan told the congressional subcommittee.

"The Fed has not yet promulgated the capital standards, and Congress has been after them to move that forward," MacGinnitie said.

During the congressional hearing, Sullivan could not say when domestic capital standards would be ready because the Fed is not being driven by an "artificial timeline." "I don't think this is something we want to hurry or rush along," he said. "I think this is something we want to be very careful and thoughtful and deliberate about."

Of the year 2016, Snyder predicted that it "will be a busy year for developing these standards."

The Fed continues to consider how insurance holding company standards will affect state-based regulation or regulatory initiatives.

While the Fed expresses commitment to working with state insurance commissioners and the NAIC, there is also concern that the Fed is being too sensitive to international interests. "It's imperative that the Fed develop domestic standards first, then export it to the rest of the world," Rep. Luetkemeyer said.

When it comes to understanding the insurance industry, the Fed and FSOC are facing a learning curve. As a new insurance regulator, "The Fed is interested in how the SIFIs, in particular AIG, put their financial statements together," MacGinnitie explained. The Fed also wants to understand the reserving process and how actuarial judgment comes into play, he said.

At the invitation of FSOC's insurance representative, the American Academy of Actuaries has been providing FSOC's insurance industry work group with information about actuaries' role in promoting financial stability and the regulatory capital requirements for U.S. insurers. In December 2015, Academy representatives made two presentations to the work group, one focused on risk-based capital and the U.S. solvency framework, and the other focused on actuarial professionalism and the prominent role that the U.S. actuarial profession plays in ensuring the solvency and stability of domestic financial systems.

Explaining actuarial judgment, and demonstrating that it can be trusted, is perhaps the largest challenge. "It looks like a black box to an outsider, and I think it is fair to say there is

a distrust in black boxes because of the banking experience," MacGinnitie offered.

Since there is a high probability that regulators and insurers regulated by the Fed will want an even playing field, Snyder believes more insurers will see directives increase in the future. "CEO-level executives are understanding this dynamic," Snyder added.

Federal Insurance Office

The FIO serves several functions. To provide insurance information in one place, it assembles insurance data from various organizations including the III and the NAIC. If the FIO desires not-already-collected information, it has the power of subpoena, if necessary, to gather it directly from insurers. "The view was the federal government needed to have its own resource with respect to the insurance industry and previously it had none," Hartwig said.

The agency also monitors the insurance industry in various ways. It identifies insurance activities that could contribute to a broader U.S. financial systemic crisis, develops federal policy regarding nationally or internationally important insurance issues, and consults with state governments on insurance matters. Since its monitoring authority is so broad, Snyder pointed out, the FIO "can monitor almost anything they want and make recommendations."

One specific Dodd-Frank mandate is for the FIO is to monitor the affordability and availability of insurance, with the exception of health care coverage. "My impression is that the net is fairly wide here," MacGinnitie said.

The agency is currently focusing on automobile insurance affordability and availability. It published two requests in the Federal Register to gain industry insight on how to measure affordability and identify appropriate data for this purpose, Snyder said.

Says Hartwig, "The FIO wants to come up with an objective measure, but any such measure will be inherently arbitrary." For example, one approach under consideration is to define auto insurance as affordable if it accounts for two percent or less of a person's income, he added.

Snyder offered that the PCI approach to affordability is that it should be the function of how much a person has to pay for car insurance after essentials such as food and housing are covered. "With this approach, we believe auto insurance is affordable for everyone," he said.

Insurance commissioners, however, are already sensitive to affordability, availability and rating issues, MacGinnitie said. Such issues came up with credit scoring more than a decade ago and now with pricing optimization (see "Pricing Optimization and the Descending Confusion," *AR* September/October 2015.).

Regardless, MacGinnitie believes that the insurance industry will adapt as it did when the U.S. Supreme Court upheld a nontraditional definition of marriage. He expects more public dialogue about this in the future since Insurance Services Office Ltd. data show that auto insurance claim frequency and severity are increasing. This will probably lead to higher prices and perhaps draw more attention to affordability, availability and rating practices.

In the section on underwriting fairness in FIO's 2015 annual report, the office encourages states to reconsider gender as a factor for rating and underwriting, which can also complicate auto insurance applications for transgender individuals. Further, the FIO also encourages states to reconsider the marriage factor in premiums, which might not be fair to unmarried persons.

Another FIO responsibility is to work with the U.S. Trade Representative to negotiate covered agreements with foreign regulators that could alter state law, Snyder stated. For example, he pointed out that the FIO is developing a covered agreement for reinsurers and insurers in the U.S. to ensure that the country's requirements are deemed equivalent to those in the European Union (EU). The goal is to ensure that American companies are treated equally in the market and to address the EU's concerns regarding reinsurance collateral.

"This is the one area where the FIO has regulatory authority and can actually preempt state laws," Snyder emphasized. It is also an example of where the federal government is moving on a parallel track with state insurance regulators towards the same goal.

The NAIC has already been changing relevant provisions of its Credit for Reinsurance Model Regulation, which would reduce insurance collateral for reinsurers with a solid financial statement domiciled in a country with a solid regulatory environment, Snyder said.

At the congressional subcommittee hearing, Huff of the NAIC expressed concern that FIO could "unnecessarily" preempt state laws and insurance commissioners' progress on reinsurance reforms.

"We question whether a covered agreement or any formal

Top Actuarial Concerns from Dodd-Frank

The Dodd-Frank Act will affect actuaries in several ways, according to the SimErgy Consulting report, "Regulatory Risk and North American Insurance Organizations: A Company Perspective." The Casualty Actuarial Society, Canadian Institute of Actuaries and the Society of Actuaries sponsored the report, which was issued in February 2015. In the table below, Jim MacGinnitie, senior property-casualty fellow at the American Academy of Actuaries, identifies some of the most significant effects that Dodd-Frank will have upon P&C actuaries, based on the report.

Excerpt of "Appendix B: U.S. Research Study — Key Regulatory-Related Risks — Ranked by P&C Score"*

Theme	Risk Scenario	Average Likelihood (Over the next three years)†	Average P&C Severity (Loss in P&C Business Value)‡
Dual Regulation	Dual regulation (at state and federal level) results in new accounting and solvency standards emerging that create an inconsistent and non-level playing field in the insurance market.	6.5%	3.1%
Dual Regulation	Insurance industry becomes subject to a federal regulatory body (e.g., Securities and Exchange Commission) in addition to state regulation, resulting in regulations that are overly restrictive and more expensive to comply with.	4.8%	4.2%
Increase in Capital Requirements	Capital requirements (either issued by the International Association of Insurance Supervisors (IAIS), Federal Insurance Office, or other entity) increase by 20 percent.	3.1%	4.9%
Standardization Requirements Drive Commoditization	Federal Insurance Office unexpectedly succeeds in pressuring states to adopt standardized property-casualty forms, rate classifications or rates, commoditizing products and reducing competitive advantages and profit margins.	1.8%	7.8%
Dodd-Frank Regulation of Banks	Dodd-Frank further expands regulations on banks, resulting in significant increase to compliance costs for insurers that have banks within their organizational structure.	9.9%	1.8%

* https://www.casact.org/cms/pdf/NAAC_Reg_Risk_Research-FINAL.pdf
† As of February 2015
‡ The loss to the portion of company value attributable to the P&C business, which includes auto, homeowners, etc.

action by the federal government is necessary to resolve equivalence as it is clear that recognition can be achieved through other mechanisms," he said, adding that he expects the FIO to work with state insurance commissioners "to ensure our state regulatory system is not compromised."

International Concerns

Balancing United States insurer and consumer interests with international concerns, which was once funneled purely through state regulators through the NAIC, now has two additional intermediaries.

Dodd-Frank in essence sets up the conditions whereby the Fed and the FIO can be part of the international insurance standard-setting process by participating at the IAIS as the NAIC historically has. Federal representation introduces nuances that can affect how insurance regulations will look for insurers in the United States.

The Fed, FIO and NAIC — called "Team U.S.A." —have different missions and goals, which sometimes causes a collision of regulatory and policy approaches, sources say.

Since the Fed is deeply involved in international banking standards, Snyder sees the need to make sure it does not apply international banking concepts that might not be good for the insurers the Fed regulates.

The FIO has nary a regulatory role, but its impact on national and international regulation continues to grow. While FIO's regulatory power in ensuring U.S. insurers have international equivalence is a very limited de jure role, FIO's expansion in the policy arena is giving the agency a greater de facto power that goes beyond what most people thought the Congress intended in Dodd-Frank, Snyder explained.

The implications signal more than a mere turf battle, but could slowly shift the nation's state regulatory foundation and traditional international role.

Advocates in favor of federal regulation point to greater consistency in domestic and international standards. However, federal processes have not shown themselves to be as transparent as those of state insurance regulators, Snyder emphasized.

For example, the FIO is not adopting the NAIC's traditional transparent and open public approach to regulation, Snyder stressed. This transparency is intended to ensure protection of consumers and insurers. Instead, the FIO voted for closed-door procedures and eliminated observer participation in working groups, he added. "So you have a clash of regulatory culture, the one being closed door and the other being more open," Snyder added.

At the same time, the international community is pressuring the U.S. to grow its regulatory role due to deficiencies it sees in the state-based regulatory approach. "International banking bodies, such as the International Monetary Fund, advocate more centralized authority at the United States, which would give the federal government more regulatory power," Snyder explained.

The Treasury often advocates for more federal insurance regulatory authority by identifying opportunities for it, Snyder said. The news release announcing its 2013 report, "How to Modernize and Improve the System of Insurance Regulation in the United States," said that the report recommends a "hybrid" model for insurance regulation.

If the resulting international standards do not reflect current state-based regulation, Snyder speculated that there could be less product innovation, higher costs and fewer options for consumers. "The European top-down approach to regulation, if adopted here, could force insurers to consolidate, leaving fewer insurance options and ironically, creating larger insurers that could become systemically important," he said.

State regulators face higher accountability because they are elected or appointed by the state governor, Snyder said. "More accountable state regulation did much better," he maintained. Federal regulators are accountable to Congress, he said, but oversight has been challenging.

Conclusion

Assuring solvency is one of the most important roles actuaries play in the insurance industry. Since Dodd-Frank gave federal agencies regulatory and policy influence, actuaries have a greater role to play in educating federal officials. How state and federal regulations — along with international standards —will look is unclear, but property-casualty actuaries should keep up with state, federal and international activity to prepare for the future.

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

A Roundup of CAS *International News*

All around the world, the CAS is making inroads and, in the process, forging alliances and cementing friendships. In the following pages, the Actuarial Review *shines a spotlight on some of the Society's activities over the past few months.*

Mutual Recognition: *The CAS and the IAI Enter Agreement*

BY MIKE BOA, CAS CHIEF COMMUNICATIONS OFFICER

The CAS and the Institute of Actuaries of India (IAI) signed a mutual recognition agreement on November 5, 2015, in Bangkok, Thailand. Pictured are then CAS President Robert S. Miccolis (left) and IAI President Rajesh Dalmia. The two presidents were attending the 19th Asia Actuarial Conference.

The Casualty Actuarial Society has recently completed negotiations for a mutual recognition agreement with the Institute of Actuaries of India (IAI). The IAI joins the Institute and Faculty of Actuaries in the U.K. and the Actuaries Institute in Australia as organizations with which the CAS has mutual recognition agreements.

Mutual recognition is a bilateral agreement whereby a Fellow of the CAS may be granted Fellowship in another actuarial organization, subject to terms of the negotiated agreement. In turn, an actuary achieving Fellowship in the other mutually recognized actuarial organization can be granted Fellowship in the CAS.

The IAI, the sole professional membership organization for all actuaries practicing in India, confers the designation of FIAI on its Fellows, which is the

Sandilya Obtains FIAI through Mutual Recognition

Manalur Sandilya, FCAS, FIAI, (center) is the first CAS member to attain Fellowship through the mutual recognition agreement between the CAS and the Institute of Actuaries of India (IAI). CAS Board Chair Robert S. Miccolis (right) was on hand as Sandilya was presented the IAI Fellowship certificate by IAI President Rajesh Dalmia (left). The ceremony took place during the 2016 Actuarial Gala Function and Awards, part of the 18th Global Conference of Actuaries that was held February 1-2 in Mumbai.

designation required by statute in some situations to perform actuarial work. The IAI requires individuals to successfully complete its examination and other requirements to become Fellows. The CAS Education Policy Committee reviewed the current education and examination system of the IAI for property and casualty actuarial practice and deemed it of acceptable rigor, based on the CAS high standards.

The agreement with IAI specifies that an IAI Fellow must meet a number of requirements in his or her application in order to be recognized as a CAS Fellow. These include:

- Attaining FIAI designation by examination with examinations conducted in November 2000 or later, and completing the general insurance specialization within the examination system.
- Successfully completing the professionalism requirements as prescribed by the CAS.
- Demonstrating completion of at least a three-year period of substantive practical property and casualty actuarial work experience within the six-year period immediately prior to the application.
- Disclosing any public disciplinary sanctions imposed by an actuarial organization of which he or she is a member.

A CAS Fellow who wishes to be recognized by the IAI as a Fellow must:

- Attest that he or she wishes to pursue the actuarial profession in India or to advise on Indian business.
- Demonstrate completion of at least a three-year period of substantive practical property and casualty actuarial work experience within the six-year period immediately prior to the application.
- Successfully complete the professionalism course conducted by the IAI.
- Disclose any public disciplinary sanctions imposed by an actuarial organization of which he or she is a member.

Those admitted as Fellows have the same rights, duties and obligations as other Fellows of the organizations, including being subject to professional codes of conduct, standards of practice and disciplinary procedures.

Granting the FCAS designation to an IAI Fellow does not confer practice rights on the IAI Fellow. In the United States, the American Academy of Actuaries promulgates qualification standards for actuaries who issue actuarial opinions broadly or who sign prescribed statements of actuarial opinion specifically. The qualification standards address requisite knowledge, experience and continuing education.

The application form for IAI Fellows to apply for mutual recognition with the CAS is available on the CAS website in the membership section. CAS Fellows who wish to apply for mutual recognition with the IAI may contact the IAI through its website.

Kazakhstan: An Extended *Actuarial Community*

BY MARK SHAPLAND

Of all places in the world, Kazakhstan might seem like an unlikely venue for a seminar on Solvency II, but in September I had the privilege of representing the Casualty Actuarial Society as a featured speaker at a conference given by the Actuarial Society of Kazakhstan (ASK). Sponsored by the Asian Development Bank, the seminar was themed "International Experience of the Transition to Solvency II," and it was the fourth installment in the ASK's program aimed at expanding actuarial expertise in the region.

News of the event reached the CAS in May 2015 when ASK Board Chair Akzharkyn Knykova contacted CAS Vice President–International Jeff Courchene about the CAS participating. Held in Almaty, Kazakhstan's largest city, the seminar brought together speakers from the U.S., Canada and France and attracted some 20 participants from Azerbaijan, Armenia, Georgia, Kyrgyzstan, Mongolia, Tajikistan, Turkmenistan, Turkey and Uzbekistan as well as 50 participants from Kazakhstan.

My presentation focused on boot-

Pictured from left to right are Erdene-Ochir Ganbold, Mongolia Actuarial Society; Talaibek Imanaliev, deputy chair, Kyrgyz Actuarial Society; Almas Rymov, lecturer, Actuarial Society of Kazakhstan; Shorena Jadugishvili, president, Georgian Actuarial & Finance Association; Khatuna Jishiasjhvili, Georgian Actuarial & Finance Association; Vladimir Dolghi, Actuarial Association of Moldova; Mark Shapland, CAS; Lyudmila Orman, translator; Akzharkyn Knykova, chair, Actuarial Society of Kazakhstan; and Douglas Carey, Society of Actuaries.

strap modeling and methodologies for integrating reserve variability into enterprise risk management. The presentation was an abbreviated version of a three-day seminar on stochastic modeling that Milliman developed from our work on the book *Stochastic Modeling — Theory and Reality from an Actuarial Perspective*, which was published by the International Actuarial Association. The full-length seminar has been given in half a dozen countries throughout Europe. For the Kazakhstan conference, however, a shortened version of the presentation was needed because of time and language constraints, which required pausing after every few sentences so that each explanation could be translated into Russian.

Other topics covered at the seminar included challenges to implementing Solvency II, reinsurance and risk management under Solvency II, investment and social security, and valuation of life insurance, among others.

What was perhaps the most striking about the discussions were not the differences but the similar challenges that actuaries in this region of the world face. Like so many other actuaries, attendees were concerned about pricing adequacy, reserve variability, data quality and many other commonly discussed matters. The issues that they confront aren't really very much different from the issues that actuaries face anywhere else in the world; only the culture is different.

The sponsors' warm welcome was also impressive, as all the lecturers were invited to a guided tour of the area and an after-conference dinner. From the pre-dinner toasts to the traditional food to the singing, the evening was a complete submersion into Kazakh culture. Each guest was expected to make a toast, which occasionally were about learning opportunities but more often about meeting new people and forming new friendships. Language was never a barrier. Even though most of the toasts and conversation were in Russian, other guests who spoke English were very gracious to translate the conversation to English, so I felt a part of the evening. The warmth and openness of the Kazakh people gave me a strong sense of community and collegiate purpose.

Mark R. Shapland, FCAS, FSA, MAAA, is a frequent speaker at CAS meetings and is co-presenter of the CAS Limited Attendance Seminar on Reserve Variability. He is a senior consultant for Milliman in their Dubai, UAE office.

Projected Benefits:

Promoting the CAS in Mexico

BY JADA BRADLEY

Last October, Alejandro Ortega, FCAS, packed his bag for a trip to Cancún, Mexico — not to take in the sun (he had plenty of that at his home in Miami) but to represent the CAS at the Congreso of the Asociación Mexicana de Actuarios[1] (AMA, Association of Mexican Actuaries). An actuary and educator, Ortega spoke about the value of the CAS credential program and the career prospects for Mexican actuaries who pursue certification through the CAS.

Up to 2015, Ortega spent six years as AIG's chief actuary for Latin America. He recently left that role to spend the next three years advancing the education and training of actuaries in Latin America. He also parlayed his experience into positions on some key CAS committees. Ortega recently became chair of the CAS Latin America Regional Committee and is also vice chair of the Diversity Committee. He is a CAS University Liaison and serves on the CAS International Member Services Committee and the Joint CAS/SOA Committee on Career Encouragement and Actuarial Diversity.

Recently, *Actuarial Review* spoke to him about his experience at the AMA Congreso.

Latin America's Actuarial Landscape

According to Ortega, most professionals in Mexico have at least a working knowledge of English and many at the conference chose not to use the live interpretation (English to Spanish) offered when an international presentation was made. So while language may not be a huge barrier, there are some challenges facing the CAS in this region that seems ready for expansion. An increased presence there will require effort and strategy.

Some countries in Latin America, including Mexico, Argentina and Brazil, have universities that credential actuaries and developed their own professional infrastructure, while countries like Colombia and Chile are in the process of creating degree programs.

Andrea Melissa Boudreau, FCAS, (left) and Alejandro Ortega, FCAS, were speakers and attendees at the AMA Congress in October 2015.

Getting Ahead of the Competition

Ortega was clear in his presentation to actuaries in Mexico: He thought that Mexican actuaries could be great assets to U.S. companies. Some of the advantages he saw for U.S. companies to hire Mexican actuaries include proximity to the U.S. (good for projects all over the Americas), lower travel costs and a small time difference. He conceded, however, that some of the reasons a U.S. company might not choose to hire Mexican actuaries include the language barrier (for those who have

[1] http://www.ama.org.mx/

yet to learn English) and the lack of international credentials, which are considered important in the U.S. actuarial market — an issue that can be resolved by passing the CAS exams.

Promoting the Value of the CAS Credential

But of course, part of Ortega's mission was to present a convincing argument for pursuing the CAS credential — telling the conference audience why U.S. companies should welcome them was only part of the equation. Ortega explained that they should put in the effort necessary to pass the CAS exams for the international experience. Along with opportunities to broaden their knowledge base and travel internationally, there would likely be opportunities to travel regionally. Ortega also told conference attendees that Mexican actuaries who work for U.S. companies also stand to receive better pay and more opportunities to be promoted.

But not all actuaries in Mexico are looking to launch international careers. A challenging part of Ortega's talk at the Congreso was to impress upon his audience the benefits of taking the CAS exams even if they decided to remain in Mexico.

Ortega thinks the U.S. heavily values credentials like those acquired through the CAS, but for Mexico the focus is on the degree. Many Mexicans who get actuarial degrees do not work in insurance; they may work in related areas, analyzing demographic data, election analysis, finance and statistics or doing risk assessment for a bank, for example.

Studying for the CAS exams requires diligence. The more than seven universities that offer an actuarial degree allow students to bypass writing a thesis if they pass three of the actuarial exams. Thus, many students in Mexico take these exams, but they do not continue on to the practical exams that deal with how an actuary actually does his job, such as Exams 5 and 7.

One of the challenges to convince actuaries to pursue a CAS credential is the nation-specific Exam 6 (U.S., Canada or Taiwan). It isn't clear to an actuary in Mexico why they need to know U.S. GAAP accounting rules and U.S. regulations. It's a valid point. On the other hand, the rest of the upper exams are highly relevant, but the market in Mexico is not familiar with them.

In addition to helping Latin Americans see the significance of continuing past the first few exams, Ortega thinks offering study materials in Spanish would sway more actuarial students. While it is important to learn English terms used in the profession, the concepts could be taught in Spanish so students can digest them in their native language first.

Job Prospects

With Ortega looking to help actuaries in Mexico and Latin America increase their knowledge and become more marketable, a question arises: Will there be enough work if the region produces more actuaries? Ortega says that while it is possible that there may be more graduates than jobs, right now the region's best graduates are not necessarily ready for the international arena. He wants to see them become more competitive.

Ortega says there are working actuaries who do see the value of the CAS exams. With time and effort the perceived value of pursuing the CAS credentials will increase as companies in the region work with actuaries who have passed the exams. Then the companies can see for themselves the depth of their knowledge.

Educating Leaders in the Profession

Before becoming an actuary, Ortega was a computer programmer. He had ideas that were overlooked because his thoughts went beyond his assigned role. Looking for a new profession led him to become an actuary because he likes "math and working with people and being involved in the decision-making process."

The drive that led him to pursue the switch to the actuarial field is also what is behind his desire to help actuaries in Latin America strengthen the profession in that region. Ortega says that right now actuaries in Mexico are not at the leadership table and not included in the decision-making process. He observed that actuaries in the U.S. may have been in a similar position about three decades ago and that it took a decade to change that. More education would help Mexican actuaries be in a position to offer more leadership.

"Well-trained actuaries are a must," he says. "Communication and technical skills prove that you add value and that you are not just a number cruncher."

Jada Bradley is a freelance writer, editor and translator living in Arlington, Virginia. She is the author of U.S. Territories and Possessions, *part of the series for young readers "Let's Explore the States."*

Taking Off: *ARECA Hosts Second Meeting*

BY BOB CONGER, CAS INTERNATIONAL AMBASSADOR AND TONY GU, ARECA PRESIDENT-ELECT

ARECA (Asia Region Casualty Actuaries), the newest CAS Regional Affiliate, followed up its June 2015 launch in Beijing with a second vibrant event in Singapore on October 7, 2015.

The one-day seminar featured a diverse group of topics and speakers, which illustrated the breadth and variety of environmental, marketplace and regulatory issues that are calling upon the talents of property-casualty actuaries in the region.

The program featured updates on the general insurance market place, the actuarial career, and the CAS and its strategic plan. The seminar also presented emblematic actuarial topics, including catastrophe modeling, reinsurance (agricultural, marine), credit rating (A.M. Best methods), ERM, and analytics and business.

An ARECA session.

This rich program and the opportunity for networking drew a strong audience of junior and senior actuaries in all areas of practice from Singapore and elsewhere. Participants bore credentials from the CAS, the Singapore Actuarial Society, the Institute and Faculty of Actuaries, the Institute of Actuaries of Australia and other actuarial associations.

Generous support for the event was offered by Guy Carpenter, which provided the venue, and by HFG, which provided funds covering a large portion of the expenses. The event included an outstanding buffet lunch at a nearby restaurant, and many participants adjourned to a local pub at the end of the day to continue networking.

The ARECA meeting was also a great opportunity for new CAS members in Singapore. CAS Fellows and Associates working in Singapore now number close to 30, up from 22 just two years earlier. The growth is a result of both the development of local students and a recent wave of recruiting experienced actuaries from across the globe. The strongest staffing demand for property-casualty (general insurance) actuaries seems to be at the experienced level so far, but it is expected that growth in the number of experienced actuaries will begin stimulating demand for entry-level general insurance actuaries in the near future. Not surprisingly, local universities are taking note and showing interest as they plan the future direction of their actuarial programs.

With two excellent and well-attended seminars in 2015, ARECA is off to a great start. The Asia region is vast (Singapore is nearly 3,000 miles from Beijing, for example), so ARECA plans to conduct events on a scheduled basis across the area. In 2016 the ARECA leadership is planning to host at least two seminars similar to the 2015 events. As ARECA grows, its leadership team plans to add more sought-after activities for the local actuarial community. Ideas being considered include university relationship programs, exam preparation seminars and technical seminars targeted at specific issues.

ARECA was created as an initiative led by CAS members in Asia, Europe and North America: Delvin Cai (Shanghai), Tony Gu (Singapore), Bo Huang (Beijing), Herb Desson (Bangkok), Waswate Ayana (U.K. and Bangkok), Jeff Courchene (Munich) and Bob Conger (Chicago). The formation of ARECA shows how far the profession has come in size and stature in Asia. It is a platform to support the ongoing growth of CAS membership and influence in the future.

Robert F. Conger, FCAS, is a consultant with Willis Towers Watson PLC. Tao Tony Gu, FCAS, is a vice president at AXIS Reinsurance Company in Singapore.

Ideas and Volunteers Wanted

As a volunteer organization, ARECA is dependent upon the insights, involvement and energy of local CAS members. To share your ideas and to volunteer, please email Michael Chou, CAS International Relationship Manager in Hong Kong, at mchou@casact.org.

A Full Itinerary: *The CAS in Beijing*

A delegation of CAS members and staff traveled to Beijing to attend the China Association of Actuaries (CAA) annual meeting, September 21-25, 2015.

While in Beijing, they met with Delvin Cai, president of the newest CAS Regional Affiliate, Asia Region Casualty Actuaries, and later visited the office of China Re. The delegation also had the chance to meet with students and professors from the China Institute for Actuarial Science at Central University of Finance and Economics, Tsinghua University and Peking University.

Impromptu Ceremony
Rui Yao, FCAS (right), shares a lighthearted moment with Bob Conger as he receives a belated ceremonial diploma. Yao became a Fellow in 2014 and was unable to attend a CAS meeting for the recognition ceremony for new Fellows.

Ceremony for New Members
Ding Wei (right) waits his turn as Bob Conger (center) presents Li Zhu with a diploma. Wei and Zhu became CAS Associates in 2015 and were honored in a special recognition ceremony in a traditional Beijing courtyard. More than 30 people attended the ceremony and dinner afterwards, including CAS members, professors and students from local universities. The setting most recently hosted King Willem-Alexander of the Netherlands during his visit to China in October 2015.

The Delegation to Beijing
Left to right are interpreter Lin "Josey" Zhuoxi, CAS Executive Director Cynthia Ziegler, CAA President Cheng Dongshen, CAS International Ambassador Bob Conger, CAA Secretary General Wang Zheng and CAS International Manager Michael Chou.

An Official Meeting
CAS International Ambassador Bob Conger (left) chats with CAA President Cheng Dongshen (right) with the help of Lin "Josey" Zhuoxi (center).

A Reinsurance Company CEO Shares His Perspective on Innovation

BY AARON HALPERT, CAS INNOVATION COUNCIL CO-CHAIR

John Welch, FCAS and CEO, Reinsurance–North America with XL/Catlin, hosted a webinar on "Innovation from the CEO's Perspective" as part of the CAS Innovation Council's Actuarial Innovator Profile Series in December 2015. Welch stressed the importance of nurturing a culture of innovation to achieve the benefits that flow from innovation and change. Cultural change has to be driven by the leaders at the top of the organization.

Welch drew from the article "The Eights Pillars of Innovation" by Susan Wojcicki, formerly with Google and currently CEO of YouTube. Welch provided several examples of his organization's investment in innovation from four dimensions:

- Have a mission that matters.
- Think big but start small.
- Look for ideas everywhere.
- Never fail to fail.

Welch stressed that an organization's brand and mission make a big difference where innovation is concerned. "When your people rally around your brand and buy into your mission, they're much more likely to innovate." At XL/Catlin, innovation is interwoven into the organization's messaging to its stakeholders and its commitments.

Examples of thinking big but starting small included XL/Catlin's approach to introducing opportunities for innovation in limited regional and business line competitions. These opportunities ultimately evolved into a global, organization-wide Innovation Day. Welch emphasized that innovation efforts can fail when people equate being innovative with being revolutionary. "Innovation can be evolutionary rather than revolutionary."

The CEO's responsibility in driving innovation is to make it easy to collaborate by providing the right incentives and advertising the organization's innovation efforts. Welch challenged actuaries to look for ideas everywhere by focusing outside of the insurance industry. He offered examples from telematics to driverless cars to drones, and he detailed how each of these phenomena will impact insurers in the future. Welch also demonstrated how his company serves as an innovation partner to customers and other organizations, by offering data, access to capital, and modeling skills.

Finally, Welch emphasized the importance of failing as part of achieving success in innovation. "Formula 409 was named for the fact that the first 408 designs failed to work!" Welch said of the famous cleaning product. "As much as failure has to be tolerated, we don't bet the company on each new idea. One of the biggest shortcomings on the various innovation competition submissions has been the lack of credible analytics around cost and risk," Welch said. "Actuaries can be vital teammates to provide a more well-rounded proposal to management. I encourage actuaries to spend more energy on how something may work than ways to shut down a new idea."

"When your people rally around your brand and buy into your mission, they're much more likely to innovate."

As a parting message to actuaries, Welch challenged the audience members to take risks outside of their comfort zones and not to accept the status quo.

Help Spur Innovation!

Welch's webinar concluded the CAS Innovation Council's profile series for 2015 that saw five CAS members share how actuarial skills are applied in innovative ways to create new opportunities.

The free webinars will continue in 2016, but we need your help. The CAS Innovation Council is looking for actuarial innovators who have demonstrated the ability to apply actuarial skills and experiences to creatively address complex business issues.

Do you fit the bill or know someone who does? Please contact the CAS Innovation Council Co-Chairs, Kevin Bingham (kbingham@deloitte.com) or Aaron Halpert (ahalpert@amhadvisory.com).

Applying Innovation Principles to Managing Credit Risk

BY MICHAEL C. SCHMITZ

Recently I had the opportunity to lecture at a webinar presented as part of the CAS Innovation Council's Actuarial Innovator Profile Series. I discussed how the credit risk group I work with at Milliman has applied the principles articulated in Amy Wilkinson's book, *The Creator's Code: The Six Essential Skills of Extraordinary Entrepreneurs*. Wilkinson provides a valuable framework for fostering innovative thinking based on "six essential skills," which are described as:

1. Find the Gap
2. Drive for Daylight
3. Fly the OODA Loop
4. Fail Wisely
5. Network Minds
6. Give Small Gifts

Without being conscious of it, I found that I had been using all the skills Wilkinson describes, with excellent results in a global practice focused on managing credit risk. The book efficiently rationalizes and streamlines these elements, creating a useful working model for innovation.

Mind the Gap

The book describes how innovation starts with "finding the gap" — that is, looking for unaddressed needs in the market. In 2006, when my coauthor and I wrote the Milliman report, "What Happens When Credit Risks Come Home to Roost?,"[1] we had found a gap. We saw that many in the mortgage industry didn't appreciate two factors that were feeding upon each other to create an enormous risk: loosened underwriting standards on mortgage loans coupled with the exploding pace of housing price increases. Most credit risk models at that time tended to be based on a very short-term history of mortgage experience. We were convinced that that short-term history wasn't a valid basis on which to build a model for the long-term tail risks.

Our instincts served us well as our modeling embodied examples of both the "Architect" and "Sunbird" styles of innovation that Wilkinson describes in the book. Architects build a new model from the ground up while Sunbirds transplant solutions from one domain to a completely unrelated field. In our case, we started with core actuarial expertise and built a model from the ground up to analyze credit risk for mortgage guarantee insurers. Our model captured both the granular underwriting risks and the economic contagion risk. As the crisis unfolded, we saw an opportunity to transplant that model into the banking industry's sudden new requirement to assess repurchase risks, as their portfolios began to unravel with loan repurchase demands. We were also able to transplant the model into the reinsurance arena as well.

Work Through the Fine Points

With the second step in the process, "Drive for Daylight," innovators start to think in broad terms about their ideas. After defining a need, they begin to look for strategic market entry points, seeing openings far ahead. Innovators are oriented toward the future rather than nostalgic conventional wisdom. The phrase "Drive for Daylight" comes from the world of auto racing where speeds are too high to focus narrowly on close-up markers such as pavement striping or the relative positions of other cars. I have a personal appreciation for this concept as an amateur racecar driver, and I have a deep connection to other racers who say the secret to operating at those speeds is to keep your eyes up, far down the road and to "drive for the daylight."

After the financial crisis hit, we found credit risk manifesting in a wide variety of unexpected places; however, we also found ourselves in a position to put our innovations to practical use. Banks found themselves forced to buy back impaired loans and struggled with valuing the risks posed by such demands. In Sunbird fashion, we were able to respond to many of these unexpected secondary effects by adapting the models we had already developed to help better predict and control for the new risks.

Expecting to Fly and Flopping Sagely

We also got into the third step in the process: "Fly the OODA loop." OODA stands for "observe, orient, decide and act." The OODA loop was originally a framework designed for fighter pilots in wartime. This step emphasizes working out bugs in motion by focusing on the four steps in its name as problems arise. It is an iterative process to identify and dispatch

[1] Schmitz, M.C. & Mrotek, K. (November 1, 2006). "What Happens When Credits Risks Come Home to Roost?" Retrieved December 9, 2015, from http://www.milliman.com/insight/Articles/What-happens-when-credit-risks-come-home-to-roost/.

bugs quickly while maintaining the larger focus on the mission objective.

The fourth step, "Fail Wisely," is closely related. It involves placing small bets on ideas, picking spots to take risks with them, and learning from the results, again within the larger context of meeting a mission objective. In the years of the financial crisis, we were constantly testing and adjusting our models and spinning off limited pilot projects to test new analytical capabilities for new situations. It was a process almost as iterative as the OODA loop itself. This step might lead innovators to experience and learn from small failures, positioning them to better avoid large catastrophes.

Getting It Out to the World

The fifth and sixth steps in the process, "Network Minds" and "Give Small Gifts," are about bringing the ideas to the world. To network minds is to expose ideas to many disparate points of view for critical consideration. Networking minds is a place where our practice is particularly strong. We have actuaries, chartered financial analysts, MBAs, statisticians and computer programmers. All together, we possess a lot of different skills, but it's most important that we have listening skills.

To get ideas out successfully, it's essential to build a repertoire of contacts by sharing and collaborating with others, extending innovations into the world by freely demonstrating their benefits. This is something we do directly through relationships with our clients and also in our work with industry groups such as the CAS. We constantly strive to develop innovative ideas to expose through our collaborative processes. Once we have an idea, have thought through it carefully, tested it as far as we can, and think it has value, we then look for someone that can benefit by it. Indeed, we hope that innovation leads to everyone winning in the long run.

That's the true power of innovation.

Michael C. Schmitz, FCAS, is a principal and consulting actuary for Milliman, Inc. in Brookfield, Wisconsin.

EXPLORATIONS BY GLENN MEYERS

Bayesian Model Selection

A common complaint I hear from classically trained statisticians when I discuss loss reserve models is that we should be careful of overfitting. As I have been writing about fitting models with over 30 parameters to a 10 x 10 loss triangle (with 55 observations), I must admit that, at least on the surface, this sounds pretty bad. My response has always been that if there were a loss reserve model with a small number of parameters "out there," someone would have found it by now. We need to deal with models with a large number of parameters.

I was drawn to Bayesian MCMC modeling because it is well equipped to handle these situations. Given a "sensible" model, it is possible to get a statistically valid predictive distribution of outcomes for any number of parameters. In fact, that is what I have done in my monograph *Stochastic Loss Reserving with Bayesian MCMC Models*[1] where I successfully validated stochastic loss reserve models on the holdout lower triangle data.

While a model's successful validation on 10-year-old data should be a consideration in deciding which model to use, I have been hearing from actuaries who are considering Bayesian MCMC models with fewer parameters on current data. This article discusses how to compare the performance of alternative Bayesian MCMC models on current data while taking the number of parameters into account.

Let's start the discussion with a review of the Akaike Information Criteria (AIC).

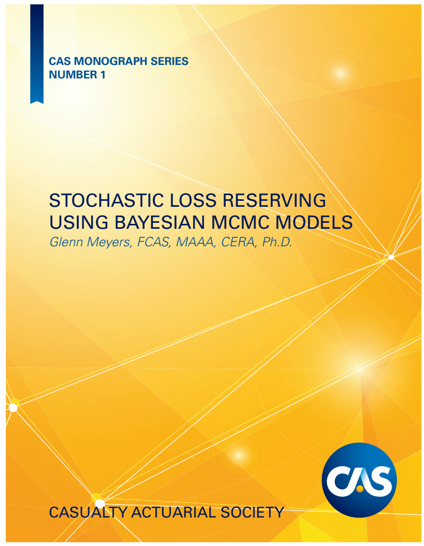
Suppose that we have a model with a data vector, $\mathrm{x} = \{x_n\}_{n-1}^{N}$ and a parameter vector θ with p parameters. Let $\hat{\theta}$ be the parameter value that maximizes the likelihood, L, of the data x. Then the AIC is defined as

$$\mathrm{AIC} = 2 \cdot \mathrm{p} - 2 \cdot \sum_{n-1}^{N} \log(\mathrm{L}(x_n|\hat{\theta})).$$

Given a choice of models, the model with the lowest AIC is usually preferred. This statistic rewards a model for having a high log-likelihood, but it penalizes the model for having more parameters.

There are problems with the AIC in a Bayesian MCMC environment. Instead of a single maximum likelihood estimate of the parameter vector, there is an entire sample, $\{\theta_s\}_{s-1}^{S}$ of parameter vectors taken from the model's posterior distribution. There is also the sense that the penalty for the number of parameters should not be as great in the presence of the parameters' informative priors or hierarchical structures or both.

To address these concerns, Gelman et al. describe a statistic, called the Watanabe-Akaike Information Criterion (WAIC) that generalizes the AIC in a way that is appropriate for Bayesian MCMC models.[2]



Stochastic Loss Reserving with Bayesian MCMC Models by Glenn Meyers is the first in the CAS series of Monographs. It can be downloaded at http://www.casact.org/pubs/index.cfm?fa=monographs.

First define the computed log pointwise predictive density as

$$L_{\mathrm{WAIC}} = \sum_{n-1}^{N} \log\left(\frac{1}{S}\sum_{s-1}^{S} L(x_n|\theta_s)\right).$$

The L_{WAIC} statistic replaces $\sum_{n-1}^{N} \log(\mathrm{L}(x_n|\hat{\theta}))$ in the expression for the AIC with the log of the average likelihood taken over the sample from the posterior distribution.

Next, define the effective number of parameters p_{WAIC} as

$$p_{\mathrm{WAIC}} = \sum_{n-1}^{N} Var_n[\log(L(x_n|\theta_s))].$$

p_{WAIC} has the property that it decreases with the tightness of the prior distribution. For a normal linear model with large sample size, known variance

[1] http://www.casact.org/pubs/monographs/index.cfm?fa=meyers-monograph01

[2] Gelman, Carlin, Stern, Denson, Vehtari and Rubin. Bayesian Data Analysis – Third Edition. CRC Press, Ch. 7.

Table 1 - Group 620 - Commercial Auto

AY	Premium	DY1	DY2	DY3	DY4	DY5	DY6	DY7	DY8	DY9	DY10
1	30,224	4,381	9,502	15,155	18,892	20,945	21,350	21,721	21,934	21,959	21,960
2	35,778	5,456	9,887	13,338	17,505	20,180	20,977	21,855	21,877	21,912	
3	42,257	7,083	15,211	21,091	27,688	28,725	29,394	29,541	29,580		
4	47,171	9,800	17,607	23,399	29,918	32,131	33,483	33,686			
5	53,546	8,793	19,188	26,738	31,572	34,218	35,170				
6	58,004	9,586	18,297	25,998	31,635	33,760					
7	64,119	11,618	22,293	33,535	39,252						
8	68,613	12,402	27,913	39,139							
9	74,552	15,095	27,810								
10	78,855	16,361									

Table 2 - Summary - Predictive Distributions of the Outcomes

Model	Estimate	Std. Dev.	L_{WAIC}	p_{WAIC}	WAIC
CSR	383,355	19,706	94.6	13.3	-162.61
ZSR	413,667	17,606	90.2	12.6	-155.24
SCC	402,803	22,629	40.8	8.0	-65.65

and uniform prior distribution of the coefficients, p_{WAIC} is approximately equal to p.

The final expression for the WAIC is analogous to that of the AIC and is given by

$$\text{WAIC} = 2 \cdot p_{\text{WAIC}} - 2 \cdot L_{\text{WAIC}}.$$

As with the AIC, the model with the lower WAIC is preferred.

Let's now show this calculation on the Changing Settlement Rate (CSR) model using the loss triangle in Table 1.

The CSR model is defined as follows:

1. $logelr$ ~ Uniform(-1, 0.5).
2. β_d ~ Uniform(-5, 5) for $d = 1, \ldots, 9$. $\beta_{10} = 0$.
3. γ ~ Normal(0, 0.05).
4. α_w ~ Normal(log(Premium$_w$) + $logelr$, $\sqrt{10}$) for w = 1, …, 10.
5. $\sigma_d^2 = \sum_{i=d}^{10} a_i$, a_i ~ Uniform(0, 1).
6. log(C_{wd}) ~ Normal($\alpha_w + \beta_d(1-\gamma)^{w-1}$, σ_d)

Let's consider two simplifications to the model. The first simplification is to fix the settlement rate, γ=0. The second simplification is the set α_w = log(Premium$_w$) + $logelr$. Let's call the model with only the first simplification the Zero Settlement Rate (ZSR) model, and model with both simplifications the Stochastic Cape Cod (SCC) model as it forces the expected loss ratio to be the same for all accident years. The nominal number of parameters for the three models is 31, 30 and 20, respectively.

I then took a sample of size 10,000 from the posterior distribution of parameters for each of the models using Bayesian MCMC. Table 2 shows some summary statistics for the predictive distributions of the outcomes. The p_{WAIC}, L_{WAIC} and WAIC statistics are also given.

Subject to simulation error, we expect to see lower values of the log of the average likelihood, L_{WAIC}, for simpler models. We should also expect to see lower values of the effective number of parameters, p_{WAIC}, for simpler models. The model that is preferred depends upon the difference between the two statistics.

For this example, the CSR model (with a posterior mean $\gamma = 0.03$) is the preferred model. Behind it is the ZSR model, and way behind it is the SCC model. I have run these models on other insurers and found that, on some occasions, the ZSR is the preferred model.

The R scripts that produced these results are posted on the CAS website. Model changes were implemented by short modifications of the JAGS script that can be activated or removed by using comments.

Price Comparison between Catastrophe Bonds and Catastrophe Reinsurance: Apple versus Pear?

BY XIAOXUAN (SHERWIN) LI AND XIAOYING CHANG

China Re issued China's first catastrophe bond on the international capital market on July 1, 2015. China Re P&C, a wholly owned subsidiary of China Re, issued the $50 million catastrophe bond, which covers risks incurred from earthquakes in China, through Panda Re, a Bermuda-based special purpose vehicle. Part of the earthquake insurance underwritten by China Re and its subsidiary was ceded to Panda Re, which then sought financing for the coverage on the bond market.

Catastrophe Bonds: Background

A catastrophe bond is a form of insurance-linked security (ILS) that falls in the category of alternative risk transfer. In contrast with traditional catastrophe reinsurance, the issuance of an ILS is arranged through capital markets rather than insurance markets. An ILS essentially transfers the insurance risk accepted from the insurance market to capital markets, aiming to relieve the underwriting capacity pressure in the insurance market.

The first catastrophe bond was issued in the U.S. in the 1990s. Since then, the catastrophe bond market has shown strong growth momentum. In 2014 the international market had record issuances of around $9.5 billion of catastrophe bonds, while hitting a record $22.5 billion of outstanding catastrophe bonds. Thus the catastrophe bond has become an important tool for catastrophe risk transfer.

Price Comparison between Catastrophe Bonds and Traditional Catastrophe Reinsurance

As a catastrophe bond is a special form of security, its pricing methodology is much different from that of traditional catastrophe reinsurance. Furthermore, it is not a simple job to compare the price of a catastrophe bond with that of a catastrophe reinsurance treaty directly, although comparisons are often made between the coupon rate and the rate-on-line (ROL). Here we will use a simplified example to explain the difference between catastrophe bond pricing and catastrophe reinsurance pricing.

For the purpose of illustration, we will assume that the coverage period of earthquake risk is one year and the coverage amount is $1 billion, assumed to be one unit. This means that the coverage amount of one unit is the face value of the catastrophe bond as well as the limit of the catastrophe reinsurance treaty. We will also assume that the probability of an earthquake occurrence in a single year is q, and correspondingly that $p = 1 - q$ is the probability that no earthquake occurs in a single year.

Since the probability of earthquake occurrence is very low, but the severity of earthquake losses is extremely high, it is additionally assumed that the face value of the catastrophe bond and the limit of the catastrophe reinsurance treaty will both be exhausted once an earthquake occurs.

(i) Price comparison without considering the time value of money

In order to make a comparison between the price of the catastrophe bond and that of the catastrophe reinsurance treaty, we will perform an evaluation that does not take into account the time value of money.

As the face value of the catastrophe bond and the limit of the catastrophe reinsurance treaty are both one unit, the coupon rate (C) of the catastrophe bond and the ROL of the catastrophe reinsurance treaty can be easily determined.

For the traditional catastrophe reinsurance treaty, according to insurance pricing principles, ROL is the expected value of future catastrophe losses. That is, $\text{ROL}=1\times q=q$.

For the catastrophe bond, according to bond pricing principles, we must have that $1=(1+C)\times p+0\times q$. That is, $C=q/p$.

Since p is less than 1, it can be seen that $C=q/p>q=\text{ROL}$. For the same catastrophe coverage, the coupon rate of a catastrophe bond is higher than the ROL of a traditional catastrophe reinsurance treaty.

(ii) Price comparison considering the time value of money

Now we will consider the situation where the time value of money is introduced.

For the traditional catastrophe reinsurance treaty, ROL becomes the present value of the expected future catastrophe losses. That is, $\text{ROL}=1\times q\times v$, where $v=1/(1+i)$ is the discount rate. Hence, we can express the bond face value as $1=\text{ROL}/(q\times v)$.

For the catastrophe bond, in accordance with bond pricing principles, the net present value of all the future cash flows at time 0 should equal zero, so we should have $1-(1+C)\times p\times v=0$. Here, we bring the above expression of the bond face value $1=ROL/(q\times v)$ into the formula and get the relationship $C=ROL\times(1+i/q)\times(1+i)/p$.

Since $(1+i/q)$ and $(1+i)/p$ are both larger than 1, it can be seen that $C>ROL$. Therefore, after taking into account the time value of money, we can also reach the conclusion that for the same catastrophe coverage, the coupon rate of a catastrophe bond is higher than the ROL of a traditional catastrophe reinsurance treaty.

The examples above are specific to a one-year coverage period. Extending the coverage period to n years, the general pricing formula of a catastrophe bond is shown below, which allows the coupon rate to be solved:

$$A-\sum_{t=1}^{n-1} C\times p_t\times v^t-(A+C)\times p_n\times v^n=0$$

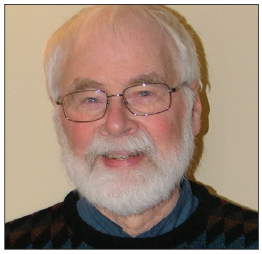
In the formula above, A stands for the face value and C stands for the coupon of the catastrophe bond. The item p_t represents the survival probability of the catastrophe bond, which means that no catastrophe event occurs before time t. This catastrophe bond will work as a normal bond in the absence of a catastrophe, but it will end when any catastrophe occurs.

To summarize, some people would like to compare the cost of a catastrophe bond with that of a traditional catastrophe reinsurance treaty, directly using the coupon rate and the ROL. However, one can conclude that we might be comparing an apple with a pear. It is not an easy job to draw a comparison between the two instruments, but an understanding of the difference in their fundamental pricing principles proves valuable.

Xiaoxuan (Sherwin) Li, FCAS, FIA, FCAA, CCRA, is the head of the actuarial department for China Re P&C in Beijing, and he has served as a member of the CAS Education Policy Committee. Xiaoying Chang, ACAA, is an actuarial analyst for China Re P&C in Beijing.

A Q & A with CAS Monograph Author David Bahnemann

BY KATE NISWANDER, CAS MARKETING AND COMMUNICATIONS MANAGER



David Bahnemann

In early 2016 the CAS released the second in its series of monographs, *Distributions for Actuaries*. The monograph's author, David Bahnemann, learned how to best convey technical subject matter over the course of 19 years teaching mathematics at the university level. Bahnemann then worked for more than two decades, applying this knowledge to all types of real actuarial problems that actuaries face every day. His monograph has been called a "rare presentation of mathematics that actuaries use whenever distributions are involved."

Briefly describe *Distributions for Actuaries*.

My monograph deals with the standard parametric families of probability distributions used by property-casualty actuaries to model the claim count, claim size, and aggregate loss random variables. In addition, it illustrates some basic applications of these distributions in actuarial practice — fitting distributions to claim data; incorporating policy concepts such as occurrence and aggregate limits; and generating pricing tools such as deductible factors and increased limit factors. The fundamental role that moments of limited random variables play in actuarial applications is highlighted throughout the text.

Why did you choose to write about this topic?

Coming to the insurance environment from the academic world mid-career, I would have found such a text on my bookshelf a great help as I tackled those early actuarial projects assigned to me. This work was the result of my later attempt to provide such a reference.

Who is your intended audience?

The monograph would be useful, I think, to students first learning this specialized area of probability, and then would be a handy reference later on, when they are faced with a custom project involving distributional applications.

What makes the material in this monograph unique?

A distinctive feature of the work is its traditional mathematical textbook format, including more than six dozen textbook-style examples designed to illustrate the basic concepts. Moreover, each chapter concludes with a generous supply of problems (over 175 in all) that enhance the theoretical aspects of the text and offer additional applications of the basic ideas.

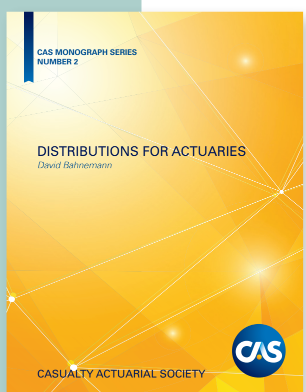
Since this monograph could serve as a desk reference for practicing actuaries, do you have any suggestions on the best way to take advantage of the material?

Of course, the monograph provides a handy reference for a variety of distributional formulas; a review of the examples and problems might suggest to the reader faced with a pricing project some approaches to problem solving and could help stimulate the creative process.

Do you have any parting thoughts?

I am grateful to the Casualty Actuarial Society for publishing my work and making it available to the actuarial community, and I sincerely hope that many of them will find it useful.

The CAS Monograph Series showcases CAS members' extensive specialized expertise, helping to raise the performance standard for property and casualty actuaries through insightful research. The monographs represent just one way that the CAS provides its members with access to relevant information, research and resources that they can apply directly on the job to advance in their careers.



If you have an idea for a monograph, please visit the Monograph Submission Guidelines page at https://www.casact.org/pubs/monographs/index.cfm?fa=monographs-guidelines.

IN MY OPINION BY GROVER EDIE

Alternate Claims Maturity Metric — It's About Time

It is about time we, the experts on property-casualty loss reserving, came up with some additional means of measuring the maturity of losses.

When I first got into this business, the passage of time was the sole dimension of claims maturity being used. That was long ago. The data we get from our company or clients is often only what is required to be reported on the NAIC Annual Statement. And even when we go beyond that data, we usually use whatever data is already available.

Arranging historical loss information by accident year and calendar age is generally acceptable. Where appropriate, however, our professional standards require us to modify the "standard" techniques by suitable adjustments; the goal is for our techniques to respond better to changing or unusual environments. I suggest that one of the parameters of historical loss data that could be improved is "age." There could be a host of reasons why the "maturity" of data is not properly reflected by calendar age: e.g., an acceleration in claims reporting or changes in case adequacy because of a change in claims handlers. Be it suspicion or fact, proving or disproving that "something happened" to affect the maturity of loss data is often a difficult, if not impossible, task.

In order to measure true claims maturity, we need to develop metrics that would enable us to verify the following:

- Material changes in the manner in which losses are reported — not just delay (time) between the incident and its reporting, but the level of detail provided. More early detail usually means the loss will be further along in the claims handling process than an identical claim with less information.
- Changes in claims personnel that cause an improvement or deterioration in claims processing.
- Changes in the legal environment requiring an attentive change in some component of claims handling, such as payment, first notice response, or other issues.
- Changes in the underlying characteristics of risks, causing future frequencies or severities (or both) to be materially different from historical data.

When I first got into this business, the passage of time was the sole dimension of claims maturity being used. That was long ago.

Ideally, such metrics would be more responsive to changes in underlying conditions, alerting decision makers and managers to possible changes in claims handling, underwriting or pricing.

Some of these metrics could be based upon information the claims department is already compiling. Examples of such information are:

- Caseload per adjuster — closed counts per unit of time, outstanding counts, outstanding amounts, count of claims in suit, average age of claims in inventory.
- Average call times per adjusting unit (department or type of coverage).
- Average call wait time per adjusting unit.
- Delay between occurrence and reporting to company, both averages and extreme values.
- Potential for salvage or subrogation. Important for physical damage lines, this could be an absolute or a scored value.

There is unlikely to be one metric that fits all. Each line of business or claim type is likely to require its own.

For liability lines, another factor would involve some sort of indicator of just how aggressive the attorney representing the plaintiff has been in the past. We score credit for underwriting and premiums, so why not score the plaintiff's representative for purposes of loss reserving? Furthermore, an attorney engaged on a claim is often not discovered by the claims adjuster until a suit is filed. Can we get information predicting the likelihood of attorney involvement before the suit is filed? Additional data elements might also be helpful.

The answer to all of this is in predictive modeling and the insights it can provide into relationships buried within mounds of data.

For workers compensation, the number of visits to a health care practitioner might be a measure of the claim maturity. The type of health care practitioner visited might also be an indicator.

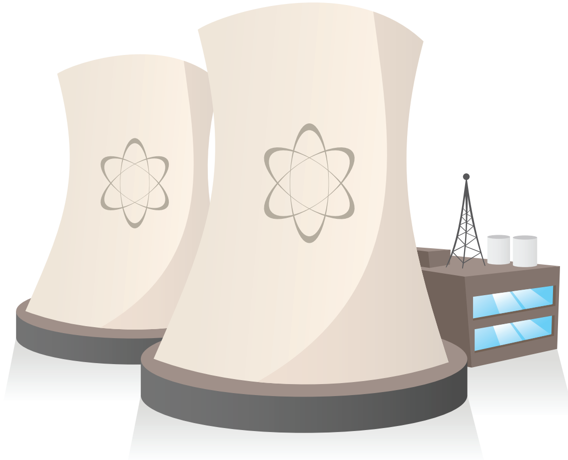
For automotive liability, the Insurance Institute for Highway Safety's occupant safety rating of the plaintiff's vehicle might have a predictive value. Perhaps knowing whether the injured individual was wearing a seat belt would help predict "time to heal," and thus future medical costs and the time until costs are finalized.

For personal injury protection and medical coverages, some sort of rating concerning the vehicle's loss propensity would be valuable. If an insured drives a safer car, will it produce lower or higher medical costs? Will the velocity of the claims handling process be different with safer vehicles?

The answer to all of this is in predictive modeling and the insights it can provide into relationships buried within mounds of data. We have a lot of very smart, talented and experienced people in our Society. If we put our heads together, we could come up with some additional measures of claims maturity that would benefit us and our companies and clients.

Many of us just finished doing year-end loss reserving for our companies and clients. What can we offer in terms of alternate maturity metrics?

Hopefully, the CAS's current initiative to create a predictive analytics credential and promote research in data science will help answer some of these questions. ●



IT'S A PUZZLEMENT BY JON EVANS

People Power

Hans, a philosophy major with a minor in physics, is having an interesting discussion with Ivana, a physics major with a minor in philosophy. Hans says that humans are simply biological machines and therefore a literal physical power output level in watts can be determined for them. In fact, he estimates that the total wattage of all the humans on Earth clearly exceeds the total wattage of all nuclear power plants on Earth. Ivana agrees with all of his wattage numbers and calculations except for one simple factor, which corresponds to a difference in interpretation of how to make the comparison. According to Ivana's estimate, the nuclear power plants have roughly at least the same, or higher, wattage as humans. How might have Hans and Ivana, respectively, done their estimates? Who do you think is right?

Uranium Enrichment for Peaceful Purposes

In this puzzle, Alireza hired Klaus to connect 1,500 centrifuges together to enrich his 100,000 kg of natural uranium. The natural uranium was 0.7% U235 by weight, with the remainder being U238. The goal was to produce within 60 days an overall total of approximately 180 kg of uranium that is at least 93 percent U235, which will be used in medical devices. Each centrifuge can process about 200 g of uranium feedstock per hour. Seventy percent of the U235 entering as feedstock into a centrifuge leaves as product and 30 percent ends up as tailings. Thirty percent of the U238 entering as feedstock into a centrifuge leaves as product and 70 percent ends up as tailings.

Bob Conger demonstrated a very efficient way for Klaus to connect the centrifuges together. When centrifuges are connected sequentially, with the product of one used as the feedstock for the next, the tailing output of the second centrifuge has the same level of enrichment as the feedstock that is input to the first one. (If *X* is the fraction of U235 in the feedstock of the first centrifuge, then the tailings of the second are $X(70\%)(30\%)/(X(70\%)(30\%)+(1\text{-}X)(70\%)(30\%)) = X$ fraction U235.) The centrifuges can be sequentially connected together in nine levels. Level 1 receives as feedstock natural uranium and the tailings from Level 2; Level 2 receives as feedstock the product of Level 1 and the tailings from Level 3; etc. The tailings from Level 1 are discarded and the final product from Level 9 is usable, being 93.5% U235.

Since the usable product is output from Level 9 at 500 g/hr, only 360 hours or 15 days are required to get the 180 kg of highly enriched uranium. Since Level 1 requires only 116,940 g/hr of natural uranium, only 42,079 kg out of the available 100,000 kg is needed.

Level	Number of Centrifuges	Feedstock Input (g/hr)	Product Output (g/hr)	Tailings Output (g/hr)
1	836	167,011	50,571	116,440
2	361	72,197	22,126	50,071
3	158	31,561	9,935	21,626
4	71	14,142	4,708	9,435
5	34	6,669	2,462	4,207
6	18	3,448	1,487	1,962
7	11	2,025	1,038	986
8	7	1,315	775	538
9	4	776	500	276

Bob, Klaus and Alireza all take a 45-day vacation, partying at various locations around the world with the proceeds of selling the remaining 57,921 kg of unneeded natural uranium, and they rejoice at the thought of their imminent Nobel Peace Prize.

Solutions were also submitted by Chris Norman.

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

SOLVENCY II, ORSA, AND IFRS4 METRICS FOR LONG-TAIL LIABILITIES

LOCATION: CONCOURSE E
HILTON NEW YORK
1335 AVENUE OF THE AMERICAS

TIME: 8:30 TO 4:30 MARCH 31ST 2016
8:30 TO 2:30 APRIL 1ST 2016

COST: COMPLIMENTARY

LIGHT BREAKFAST, DRINKS AND LUNCH PROVIDED

Register early to avoid disappointment.
Email your details to: admin@insureware.com

An Intensive One and a Half Day Course Presented by Dr. Ben Zehnwirth

Synopsis:

- Normality, linearity, correlations, linear regression, log-normal distributions;
- Economic inflation, social inflation and law reform;
    - o Multiplicative (calendar year) effects on a dollar scale;
    - o Linear effects on a log scale.
- Fundamental modeling axioms;
    - o Inflation does not change the variance on a log scale;
    - o Distributions that when the mean changes, the variance does not;
    - o Calendar year trends project in the other two directions;
    - o The distinction between variability and uncertainty.
- Mitigate model specification error;
    - o The Probabilistic Trend Family (PTF) modeling framework;
    - o Identifying the optimal model;
    - o Testing that the identified optimal model replicates the volatility in the data.
- The Multiple Probabilistic Trend Family (MPTF) modeling framework;
    - o Correlations and time series;
    - o Residual (volatility) correlations, parameter correlations and reserve distribution correlations between LoBs;
    - o One single composite model for a whole company.
- Liability stream (entire loss distributions and correlations) by calendar year;
- The differences between volatility correlation, accident year drivers and calendar year drivers;
- Solvency II one year risk horizon versus ultimate year risk horizon;
    - o Distress scenarios are generated by the model;
    - o Calendar year fungibility;
    - o Economic Balance Sheet.
- Three views on Solvency Capital Requirement (SCR) for the distress scenario;
    1. VaR for the next calendar year;
    2. The additional BEL plus (1);
    3. The additional Market Value Margin (Risk Margin) plus (2).
- Claims Development Result (CDR), variation in mean ultimate one year hence, the one year reserve risk and SCR (2);
- Risk capital and stress testing;
- ORSA and capital adequacy assessment;
- Risk Capital allocation.

The topics above are illustrated using the ICRFS™ Best's Schedule P database.

Expertise. Insight. Solutions.

Casualty Actuarial Society
4350 North Fairfax Drive, Suite 250
Arlington, Virginia 22203 USA
Phone: 703-276-3100, Fax: 703-276-3108
www.casact.org

PRESORTED
STANDARD MAIL
U.S. POSTAGE PAID
LUTHERVILLE, MD
PERMIT NO. 171