IT-1: Overlooking Tails

CARe Seminar, June 4-5, 2018
Brooklyn, NY

John W. Buchanan, FCAS, MAAA, Managing Principal, Verisk / ISO
Aleksey Popelyukhin, Ph.D., Head Actuarial Data Services, Swiss Re
Dave Clark, FCAS, MAAA, Senior Actuary, Munich Re

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IT-1: Overlooking Tails Agenda

- **Overview – John 10 mins**
  - Introducing the hypothetical submission
  - Case study data and benchmarks
- **Illustrative Ultimate Loss and Reserve Estimates – Aleksey 25 mins**
  - Initial investigation of information including assessing the tail
  - Techniques to test and extrapolate beyond the data given
  - Additional considerations
- **Illustrative Policy Year Pricing Estimates – Dave 25 mins**
  - Credibility for loss development – creating a prior distribution
  - Application using a range of benchmark patterns blended with case study data
  - Illustration of final layer pricing and aggregate distribution
- **Wrap-up and Further Investigation - Panel 5 mins**
  - Tail skill assessment and overconfidence
  - Further investigation
- **QA 10 mins**

To the extent there is time, will pause for questions after each of the main sections. Otherwise, will have questions at the end.

IT-1: Overlooking Tails Overview

- Actuaries are faced with a multitude of decisions when either pricing contracts and establishing reserves. One of the most common decisions to make when confronted with less than fully credible data is establishing what development factors to select, how to weigh them with a library of layered incurred and paid industry benchmarks, and quite importantly trying to assess the length of the "tail".

- This session will use a “hypothetical real life example" of items typically found in an excess casualty submission, a set of industry benchmarks, and lots of ingenuity to try to derive various pricing, reserving, and aggregate distribution indications. The "real" issue is that the illustrative data is 8x8, while it is expected that the actual development could go to 20+ years. Two very skilled actuaries will try to tackle the analysis in different ways: one from a classical probability approach using various transforming, scaling, and duration mechanisms. While the other approach will use a Bayesian Loss Development Credibility model to try to build a maximum likelihood estimate that compromises between the actual and benchmark patterns when confronted with wide ranges.

- While at times the presenters will delve into complexities such as using the Cape Cod method, Mata / Verheyen limit adjustments, measuring heteroskedasticity, and loglogistic growth curves, it is hoped that this presentation will provide the practitioner with new tools and ways of thinking for an age-old problem. We will also discuss the measuring of "skill" of indications from five and other years of data when tails are 20+years, with an important concept of not being overconfident when assessing less than mature data.

Moderator:
John W. Buchanan, FCAS, MAAA, Managing Principal, Verisk / ISO

Panelists:
Aleksey Popelyukhin, Ph.D., Head Actuarial Data Services, Swiss Re
Dave Clark, FCAS, MAAA, Senior Actuary, Munich Re

Overlooking Tails

Case Study Introduction Slides

IT-1: Overlooking Tails Submission

Illustrative

CARe 2018 - Overlooking Tails Submission
Illustrative Account Triangle - Skipper Insurance Company
Casualty Treaty Placement Slip

Looking for Expected Loss Costs for:
First Casualty Excess - 500x500k
ALAE ProRata
With and without AAD of 500k
With and without loss free discount

Management Info:
In business 20+ years
Relatively consistent book of niche countrywide Casualty business
Management and reserving philosophy consistency

"We appreciate your business, and thanks for all the fish!"

Hypothetical Account – Information and amounts purely for illustration of reserving and pricing principles; all pictures from J. Buchanan

IT-1: Overlooking Tails Submission (cont.)

Illustrative

Data Provided:

Excess triangles - paid and incurred (Indemnity+ALAE PR), counts and amounts (8-year N-1, N-2,… - all detrended 3% to N-1)
Ultimate on-level earned premium and exposure trend (8-year; Subject premium = 20M)
Benchmark generic casualty "penguins" - 10/Fast/All/Slow/90 (Skipper one of hundreds of aggregated companies)
- 4.9Mx100k, 400x100, 500x500; reported and paid (all detrended 3%)
Individual claims > 250k (indemnity only)
Policy limits and deductibles from Skipper
Benchmark policy limit distribution

Exercise #1

Estimate total reserves for loss portfolio transfer pricing (Aleksey)

Exercise #2

Price Policy year N losses and distribution (Dave)

Hypothetical Account – Amounts purely for illustration

IT-1: Overlooking Tails Submission

The submission included aggregated 8x8 triangles, for 4.9Mx100k, 400x100k, and 500k500k, with relatively little overall credibility (89 claims>100k).

The total triangle, and underlying layer of 400x100 shows a fair amount of continuing development, the target layer of 500x500, did not. Inspecting the paid and incurred triangles also indicates a fair amount is still outstanding in the latter part of the triangles.

But how much credibility can you give this?

CARe 2018 - Overlooking Tails Submission

Illustrative Account Triangle - Skipper Insurance Company

Illustrative

4.9M x 100K

Incurred $ Indemnity+Alae (Prorata) Triangle

Threshold Min	Threshold Max		12	24	36	48	60	72	84	96
81,310	4,065,457	AY 2009	14,700	933,700	1,867,400	2,305,400	2,806,400	3,125,900	4,014,400	4,963,600
83,749	4,187,421	AY 2010	196,900	1,060,500	1,786,100	2,517,000	3,641,500	4,262,700	4,794,700	
86,261	4,313,043	AY 2011	459,000	1,369,100	2,158,000	2,684,000	2,805,600	2,744,700		
88,849	4,442,435	AY 2012	215,700	527,800	1,507,700	2,731,100	2,541,100			
91,515	4,575,708	AY 2013	332,100	1,508,100	3,096,400	3,965,300				
94,260	4,712,979	AY 2014	284,800	1,206,900	2,292,300					
97,088	4,854,368	AY 2015	132,800	262,100						
100,001	5,000,000	AY 2016	20,100							
			12,752,000	18,249,900	21,583,900					

Incurred # Occurrence Indemnity Triangle

Threshold Min	Threshold Max		12	24	36	48	60	72	84	96
81,310	4,065,457	AY 2009	1	4	7	9	11	14	16	19
83,749	4,187,421	AY 2010	3	8	12	15	16	19	21	
86,261	4,313,043	AY 2011	2	6	8	10	12	14		
88,849	4,442,435	AY 2012	2	5	7	10	11			
91,515	4,575,708	AY 2013	2	7	12	15				
94,260	4,712,979	AY 2014	2	6	7					
97,088	4,854,368	AY 2015	2	3						
100,001	5,000,000	AY 2016	1							
			55	75	89					

IT-1: Overlooking Tails Submission

Historical premium was on-leveled using historical rate changes. Benchmark policy limit information was given, with attachments and limits from submission also supplied on individual large claim listing.

If this information isn't supplied, adjustments would need to be made accordingly.

Illustrative

Ultimate On-Level Earned Premium

Accident Year

2009	18,432,700
2010	17,258,900
2011	17,916,600
2012	18,544,100
2013	18,470,700
2014	19,199,500
2015	19,157,800
2016	19,374,100
	148,354,400

Policy Limit Distribution - from LOB Family of Benchmarks

	300k	1M	5M
2008	10.0%	85%	5.0%
2009	9.5%	85%	5.5%
2010	9.0%	85%	6.0%
2011	8.0%	85%	7.0%
2012	7.5%	85%	7.5%
2013	7.0%	85%	8.0%
2014	6.5%	85%	8.5%
2015	5.5%	85%	9.5%
2016	5.0%	85%	10.0%

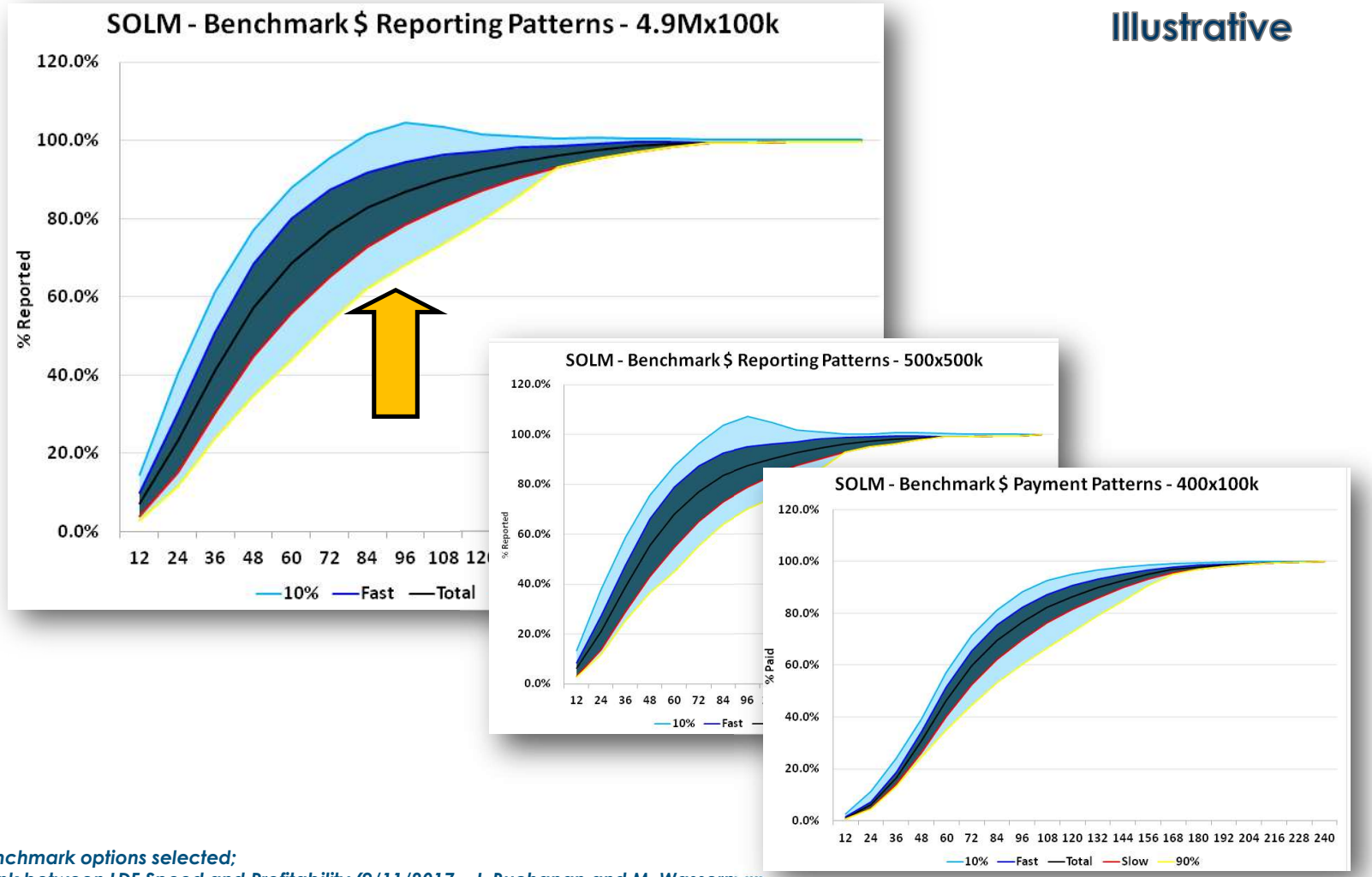
Limits tend to cluster around 3 sizes

IT-1: Overlooking Tails Submission

A set of general casualty incurred and paid benchmark patterns by layer and "company speed" was supplied. These show the significant variation in company loss development factors.

Depending upon the market, these variations can be significant.

Illustrative



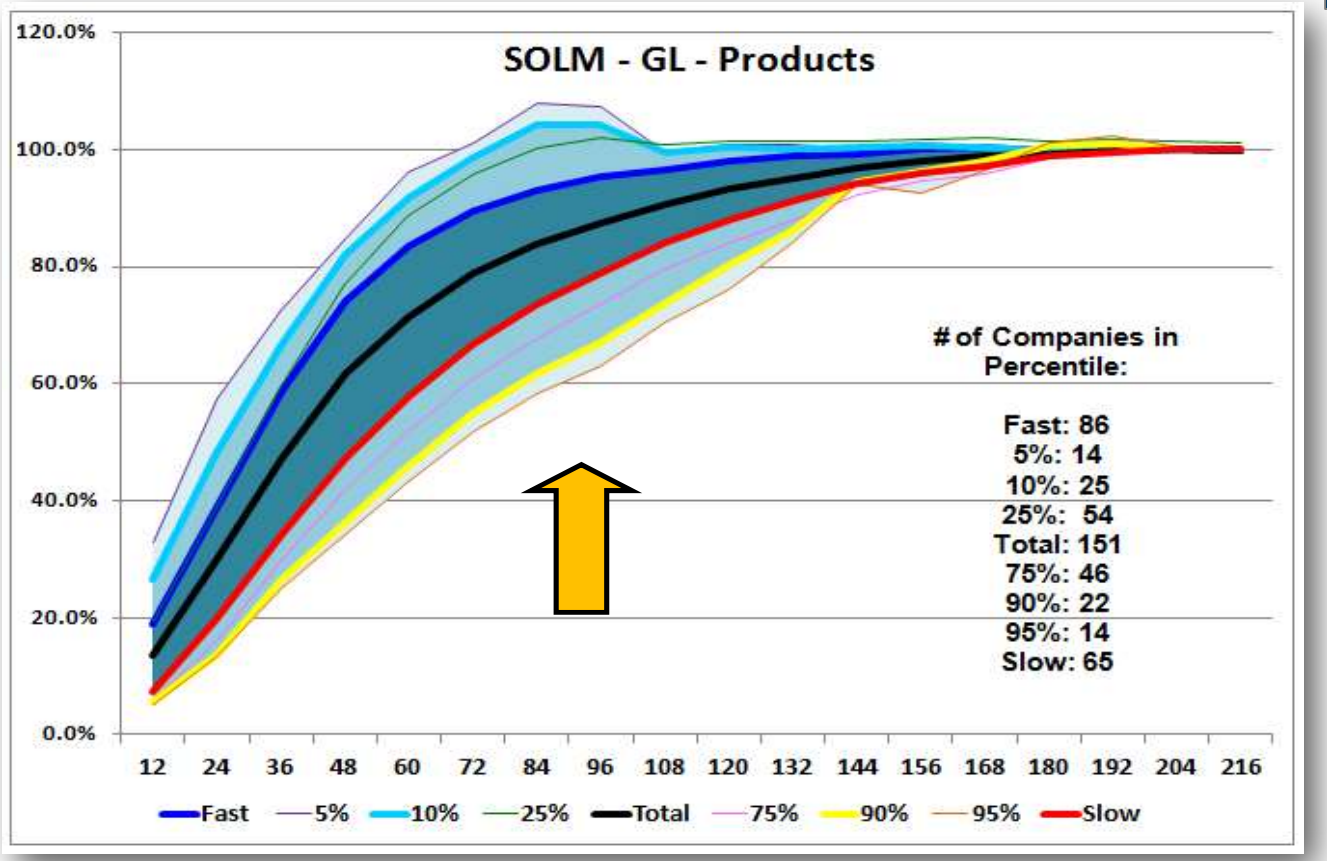
Note: Values shown may not match benchmark options selected;
See Verisk Monday Webinar on link between LDF Speed and Profitability (9/11/2017 – J. Buchanan and M. Wasserman

IT-1: Overlooking Tails Submission

The general casualty benchmarks were established through a company ranking exercise with 20-year triangles. The tail to pick at 8 years can run from close to only 60% reported for the slowest companies, to being over reserved for the fastest companies for this market.

The LDF speed can also dramatically affect profitability.

Illustrative



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Illustrative

A wide array of benchmarks are available. The selection of the tail can often make or break an analysis.

How do you choose, and what adjustments do you make, with limited information?

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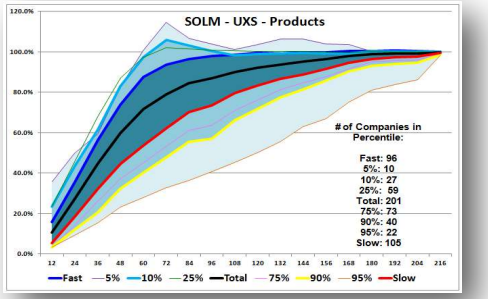

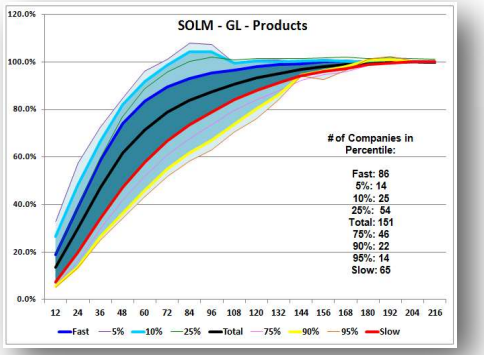

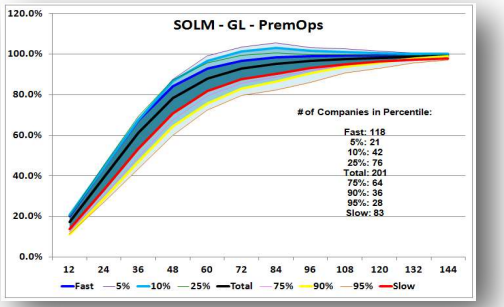

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IT-1: Overlooking Tails Submission

Illustrative

Individual claim information (41 claims over 250k threshold) was also given. Additional requests for claims ever over the threshold was given.

How to use this additional information?

Individual Claims Current Trended Valuation >250k (adjusted to include claims ever over 250k)

				Incurred Indemnity									Paid Indemnity								
Claim	Year	Deductible	Limit	6	18	30	42	54	66	78	90	102	6	18	30	42	54	66	78	90	102
1	2009					50,000	225,000	225,000	225,000	225,000	225,000	225,000				225,000	225,000	225,000	225,000	225,000	225,000
2	2009					1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000				1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000
3	2009	0	1,000,000				360,000	359,800	422,000	422,000	422,000	422,000						422,000	422,000	422,000	422,000
4	2009	0	1,000,000		1,000	50,000	50,000	250,200	250,200	250,200	250,200	250,200					200	200	200	200	200
5	2009	0	1,000,000								25,000	350,000									
6	2009	0	1,000,000					25,000	25,000	25,000	225,000	210,000									210,000
7	2009					25,000	25,000	50,000	50,000	262,500	358,600	358,600							12,500	358,600	358,600
8	2009	0	1,000,000							35,000	236,400	236,400									236,400
9	2009					1,000	10,000	10,000	95,000	95,000	295,000	295,000						45,000	45,000	295,000	295,000
10	2009	0	1,000,000			50,000	50,000	50,000	200,000	200,000	200,000	250,000									250,000
11	2009					200,000	200,000	400,000	420,000	420,000	420,000	420,000						420,000	420,000	420,000	420,000
12	2010	0	1,000,000		10,000	[illegible]	400,000	375,000	375,000	375,000	375,000						375,000	375,000	375,000	375,000	
13	2010						100,000	400,000	400,000	400,000	400,000						400,000	400,000	400,000	400,000	
14	2010						200,000	350,000	790,000	790,000	790,000							790,000	790,000	790,000	
15	2010			1,000	150,000	250,000	265,000	265,000	265,000	265,000	265,000					265,000	265,000	265,000	265,000	265,000	
16	2010						25,000	25,000	300,000	308,100	308,100								308,100	308,100	
17	2010			1,000	264,800	264,800	264,800	264,800	264,800	264,800	264,800			264,800	264,800	264,800	264,800	264,800	264,800	264,800	
18	2010							374,400	224,400	224,400	224,400						374,400	224,400	224,400	224,400	
19	2010	0	1,000,000		25,000	466,000	355,600	355,600	355,600	355,600	355,600					355,600	355,600	355,600	355,600	355,600	
20	2010	0	1,000,000								400,000										
21	2011	0	1,000,000	1,000	750,000	750,000	705,000	705,000	705,000	705,000						705,000	705,000	705,000	705,000		
22	2011							137,500	400,000	224,500									224,500		
23	2011				70,000	225,000	475,000	[illegible]	488,800	488,800							[illegible]	488,800	488,800		
24	2011							180,000	283,500	283,500								283,500	283,500		
25	2011	100,000	1,000,000					1,000	150,000	275,000											
26	2011				25,000	25,000	300,000	300,000	300,000	300,000						300,000	300,000	300,000	300,000		
42	2011					500,000	250,000	62,500	12,500	12,500							12,500	12,500	12,500		
27	2012				5,000	5,000	850,000	850,000	850,000								850,000	850,000			
28	2012					50,000	50,000	264,300	264,300								264,300	264,300			
29	2012	0	1,000,000				40,000	250,000	250,000												
43	2012					1,000	500,000	500,000	500												
30	2013			1,000	240,000	240,000	240,000	240,000						240,000	240,000	240,000	240,000				
31	2013				25,000	500,000	1,000,000	1,000,000									1,000,000				
32	2013	0	1,000,000		1,000	1,000	1,000	325,000													
33	2013	0	1,000,000			500,000	500,000	500,000													
34	2013	0	1,000,000			10,000	300,000	300,000													
35	2013	0	1,000,000		1,000	1,000	250,000	250,000													
36	2013	0	1,000,000	1,000	250,000	250,000	425,000	425,000								325,000	325,000				
37	2013	0	1,000,000	1,000	175,000	178,500	178,900	428,900						175,000	175,000	178,900	178,900				
38	2014	0	1,000,000		180,000	460,000	424,800									24,800					
39	2014	0	1,000,000		50,000	550,000	1,000,000														
40	2014	0	1,000,000		1,000	300,000	300,000														
41	2014			1,000	300,000	288,400	288,400								288,400	288,400					

Note: All above are hypothetical values

John’s Wrapup Slides

Bios

John W. Buchanan

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John Buchanan, FCAS, MAAA, is a principal in charge of ISO's Excess and Reinsurance Division. He has over 30 years of experience as a front-line pricing actuary and consultant in the US, London, and other international reinsurance marketplaces.

In John's career, he has conceptualized, developed and implemented extensive benchmarking and modeling services for various reinsurers, excess carriers, and industry groups. He has pioneered extensive work to extend information gathered in mature benchmarking markets, and applying the information to other International markets making use of local and customized knowledge. He was a frontline sign-off actuary for many domestic and international lines of business. While a consultant, he was also the main contact for many years for the Reinsurance Association of America and the Reinsurance Research Council of Canada as well as having worked extensively with the London and European reinsurance market through the Casualty Actuaries in Reinsurance in London. He also formed and is the chairperson of the joint IFoA-CAS International Pricing Research Working Party. The paper prepared for the 2016 GIRO Conference, *"Analyzing the Disconnect Between the Reinsurance Submission and Global Underwriter's Needs - Property Per Risk*", won the UK Brian Hey award for best paper presented at the conference. He is spearheading the potential for a 2018-2019 GIRO version, focused on Energy risks.

John's professional accomplishments also include being heavily involved with many international meteorological groups including NOAA, UK-Met, GLOBE, ACRE, and was chairperson of the CAS Climate Change Student Outreach subcommittee. He is on the CARe committee responsible for many of the annual CARe conference educational tracks, and previously at the CAS Ratemaking Seminar. He has been a moderator and panelist at dozens of industry seminars on the topic of domestic and international reinsurance pricing, the underwriting cycle, international benchmarking, etc.

Prior to joining Verisk, John was a Senior Vice President at Platinum Underwriters (previously St. Paul Reinsurance), a Principal at Tillinghast (now Towers Watson), and a Senior Consultant at KPMG, Peat Marwick. He has also competed as an amateur in the annual Miami World Salsa Summit championships, and is determined to write the book "The Mathematician's Guide to Salsa Dancing". He has also written and directed a few sponsored films entitled "Franklin Climate Change" and "Cuba People to People" with the former being used to incentivize middle and high school students around the world to investigate the connection between old weather records and today, and the latter selected to run at various in-person and on-line film festivals in the short documentary category in 2017 and 2018. The *Actuarial Review* is preparing a 2018 article on these non-actuarial pursuits.

Dave R. Clark

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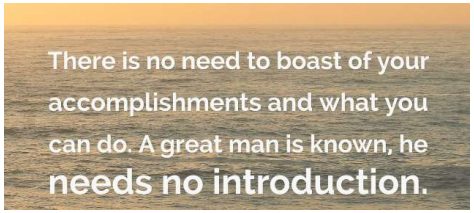

David R Clark is a Fellow of the Casualty Actuarial Society (FCAS) and a member of the American Academy of Actuaries (MAAA). He works for Munich Reinsurance as part of the Actuarial Research and Modeling team in Princeton.

Dave began his career in the insurance field at CIGNA Property & Casualty (now ACE USA Chubb) in Philadelphia in 1985 and joined Munich Reinsurance in 2000. He is known within the actuarial community for his study note on "Basics of Reinsurance Pricing" on the CAS examination syllabus. He was the recipient of the CAS's Non-Technical Reserving Call Paper Prize in 2015 for his paper on "Accident Year and Development Year Interactions" co-written with Diana Rangelova.

Aleksey Popelyukhin

Swiss Re
Aleksey_Popelyukhin@swissre.com

Aleksey Popelyukhin is a Head of Actuarial Data Services at Swiss Re US Casualty Hub. Prior to that, he held positions ranging from SVP of Information Systems to the Head of Quantitative Analytics Group with various reinsurance and financial companies. He holds a Ph.D. in Mathematics and Physics from Moscow Lomonosov University and is an active member of American Mathematical Society. Aleksey actively participates in CAS research and is frequent presenter on CAS conferences and a member of various CAS committees. CAS recognized Aleksey's contributions by awarding him "Best Actuarial Paper" prize in the very first Data Management papers competition, and by inviting him to the very first CAS Working Party (on presentation of results of actuarial modeling).

In addition to numerous publications, Aleksey helps to advance actuarial science by building convenient software tools for actuaries such as Triangle Maker®, Affinity and Actuarial Toolchest™ as well as proprietary systems for his numerous employers and clients. For those actuaries having troubles explaining statistics to the management Aleksey built a DRM presentation template available from CAS website. For those having troubles fitting clean models to dirty data Aleksey developed an advanced data quality service called Data Quality Shield℠. For those needing help with visualizing actuarial reports Aleksey wrote a white paper as part of "Good Actuarial Report" working party. Aleksey strongly believes in gamezation of activity: his integrated pricing/reserving modeling system for reinsurance looks and feels like an action/adventure video game and suitably called "SimActuary".

He also utilizes his fine-arts background by working on huge painting depicting our Ultimate Destination which he tentatively named "Actuarial Judgment Day."