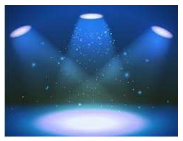
LOB-13: Overlooking Tails
A Multi-Media Event



CLRS Seminar, September 6-7, 2018
Anaheim, CA

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

Including materials from CARe 2018:
***Dave Clark**, FCAS, MAAA, Senior Actuary, Munich Re*

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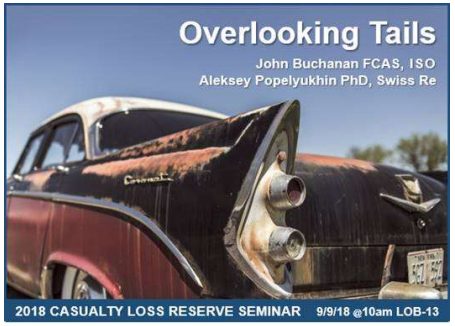
- It is the responsibility of all seminar participants to be aware of antitrust regulations, to prevent any written or verbal discussions that appear to violate these laws, and to adhere in every respect to the CAS antitrust compliance policy.

LOB-13: 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
(Aleksey also covering material from Dave Clark, FCAS, MAAA, Senior Actuary, Munich Re)

LOB-13: Overlooking Tails Agenda

- **Overview – John 15 mins**
  - Introducing the hypothetical submission
  - Case study data and benchmarks
- **Illustrative Ultimate Loss and Reserve Estimates – Aleksey 35 mins**
  - Initial investigation of information including assessing the tail
  - Techniques to test and extrapolate beyond the data given
  - Additional considerations
  - Alternate approach (from CARe-Dave Clark)
- **Wrap-up and Further Investigation – John 15 mins**
  - Additional Run-off Reserve Testing for lengthening Tails
  - Various ground-up and excess runoff tests
  - 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.

Overlooking Tails

Case Study Introduction Slides

Overlooking Tails Submission

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

Illustrative

"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

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

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					

Submission from Skipper Insurance Company

Munich RE

Reported (paid+case) Development Triangles

400K x 100K

Incurred $ Indemnity+Alae (Prorata) Triangle

	12	24	36	48	60	72	84	96
AY 2009	14,700	462,500	1,082,700	1,675,200	2,156,100	2,458,500	3,347,000	4,296,200
AY 2010	196,900	1,033,300	1,758,900	2,517,000	3,455,800	3,891,300	4,423,300	
AY 2011	275,800	946,400	1,738,400	1,956,200	2,077,100	2,383,000		
AY 2012	215,700	527,800	1,192,300	2,126,000	2,009,200			
AY 2013	332,100	1,447,500	2,562,800	3,170,400				
AY 2014	284,800	1,141,400	1,758,600					
AY 2015	132,800	262,100						
AY 2016	20,100							

Number of Losses: 89

Age-to-Age (ATA) Factors

	12-24	24-36	36-48	48-60	60-72	72-84	84-96
AY 2009	31.463	2.341	1.547	1.287	1.140	1.361	1.284
AY 2010	5.248	1.702	1.431	1.373	1.126	1.137	
AY 2011	3.431	1.837	1.125	1.062	1.147		
AY 2012	2.447	2.259	1.783	0.945			
AY 2013	4.359	1.771	1.237				
AY 2014	4.008	1.541					
AY 2015	1.974						
Avg	4.007	1.816	1.373	1.172	1.136	1.224	1.284

500K x 500K

Incurred $ Indemnity+Alae (Prorata) Triangle

	12	24	36	48	60	72	84	96
AY 2009	-	322,700	537,600	431,700	450,900	468,000	468,000	468,000
AY 2010	-	27,200	27,200	-	185,700	371,400	371,400	
AY 2011	183,300	422,700	419,500	603,500	604,200	361,700		
AY 2012	-	-	315,300	605,100	531,900			
AY 2013	-	60,600	463,600	678,500				
AY 2014	-	65,500	482,900					
AY 2015	-	-						
AY 2016	-							

Number of Losses: 10.5

Age-to-Age (ATA) Factors

	12-24	24-36	36-48	48-60	60-72	72-84	84-96
AY 2009	inf	1.666	0.803	1.044	1.038	1.000	1.000
AY 2010	inf	1.000	0.000	inf	2.000	1.000	
AY 2011	2.306	0.992	1.439	1.001	0.599		
AY 2012	inf	inf	1.919	0.879			
AY 2013	inf	7.650	1.464				
AY 2014	inf	7.373					
AY 2015	inf						
Avg	4.903	2.499	1.315	1.081	0.968	1.000	1.000

Source: CARe June 2018 IT1- Dave Clark Presentation

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

Submission from Skipper Insurance Company

Munich RE

Preliminaries: Check for Stability and Policy Limit Drift

Year	Onlevel Premium	Policy Limit Profile 300,000	1,000,000	5,000,000	Allocation of Premium to Layer 400 x 100	500 x 500
2008	na	10.0%	85.0%	5.0%		
2009	18,432,700	9.5%	85.0%	5.5%	26.2%	11.6%
2010	17,258,900	9.0%	85.0%	6.0%	26.2%	11.6%
2011	17,916,600	8.0%	85.0%	7.0%	26.2%	11.7%
2012	18,544,100	7.5%	85.0%	7.5%	26.2%	11.8%
2013	18,470,700	7.0%	85.0%	8.0%	26.2%	11.8%
2014	19,199,500	6.5%	85.0%	8.5%	26.1%	11.9%
2015	19,157,800	5.5%	85.0%	9.5%	26.1%	12.0%
2016	19,374,100	5.0%	85.0%	10.0%	26.1%	12.0%
Future	20,000,000	5.0%	85.0%	10.0%	26.1%	12.0%

All numbers for illustration only

Mata & Verheyen "An Improved Method for Experience Rating Reinsurance Treaties using Exposure Rating Techniques" (2005)
http://www.casact.org/pubs/forum/05spforum/05spf171.pdf

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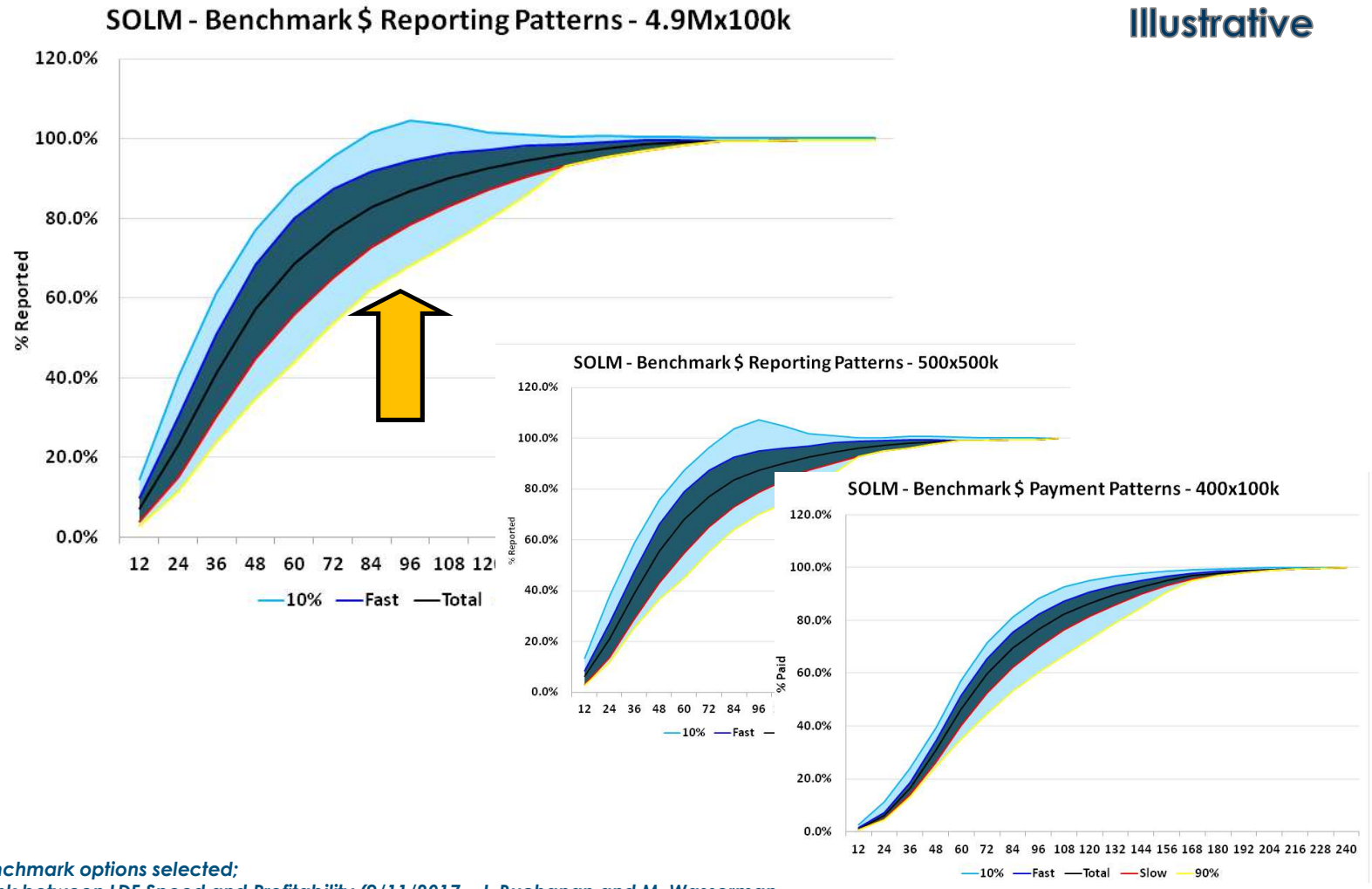
Source: CARe June 2018 IT1- Dave Clark Presentation

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



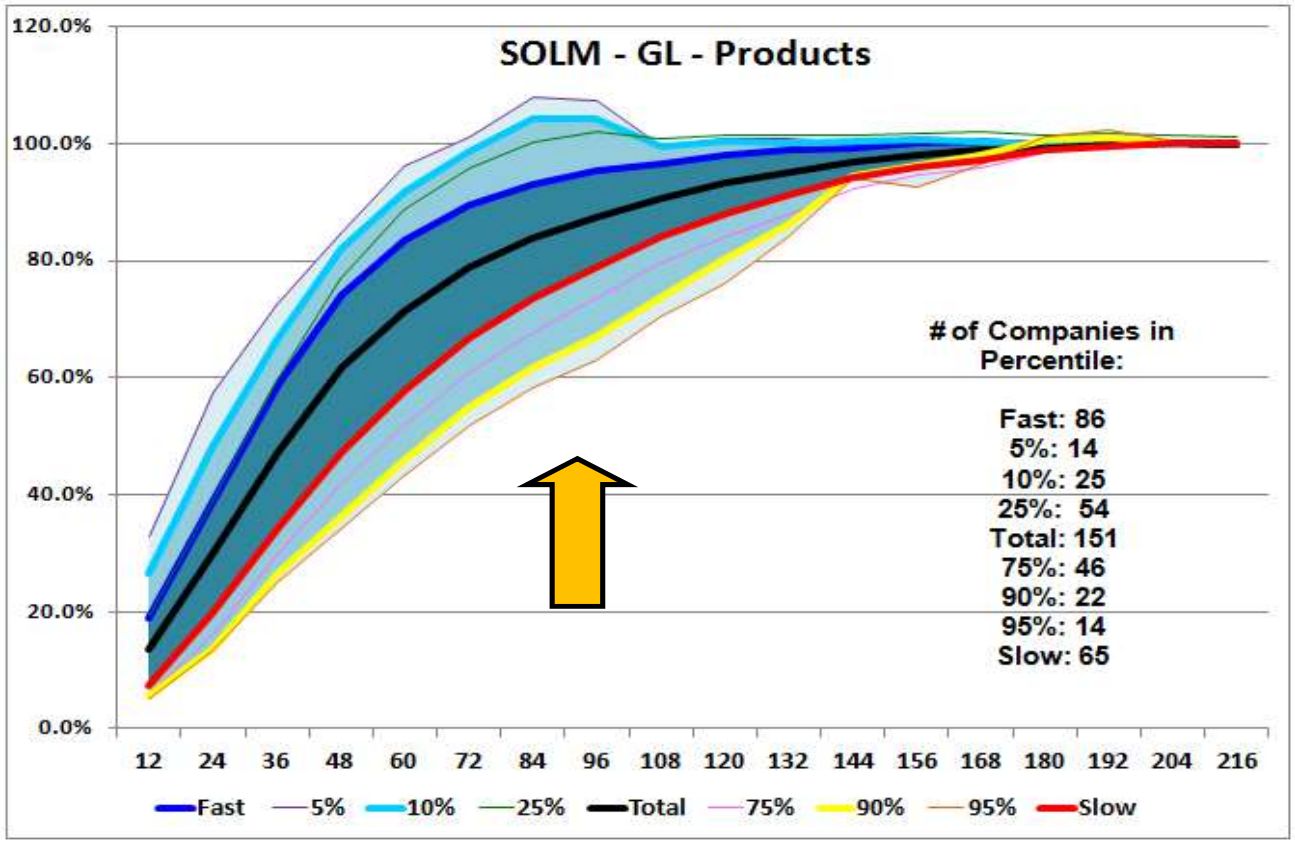
Note: Values shown may not match benchmark options selected;
See Verisk Monday Webinar on link between LDF Speed and Profitability (9/11/2017 – J. Buchanan and M. Wasserman

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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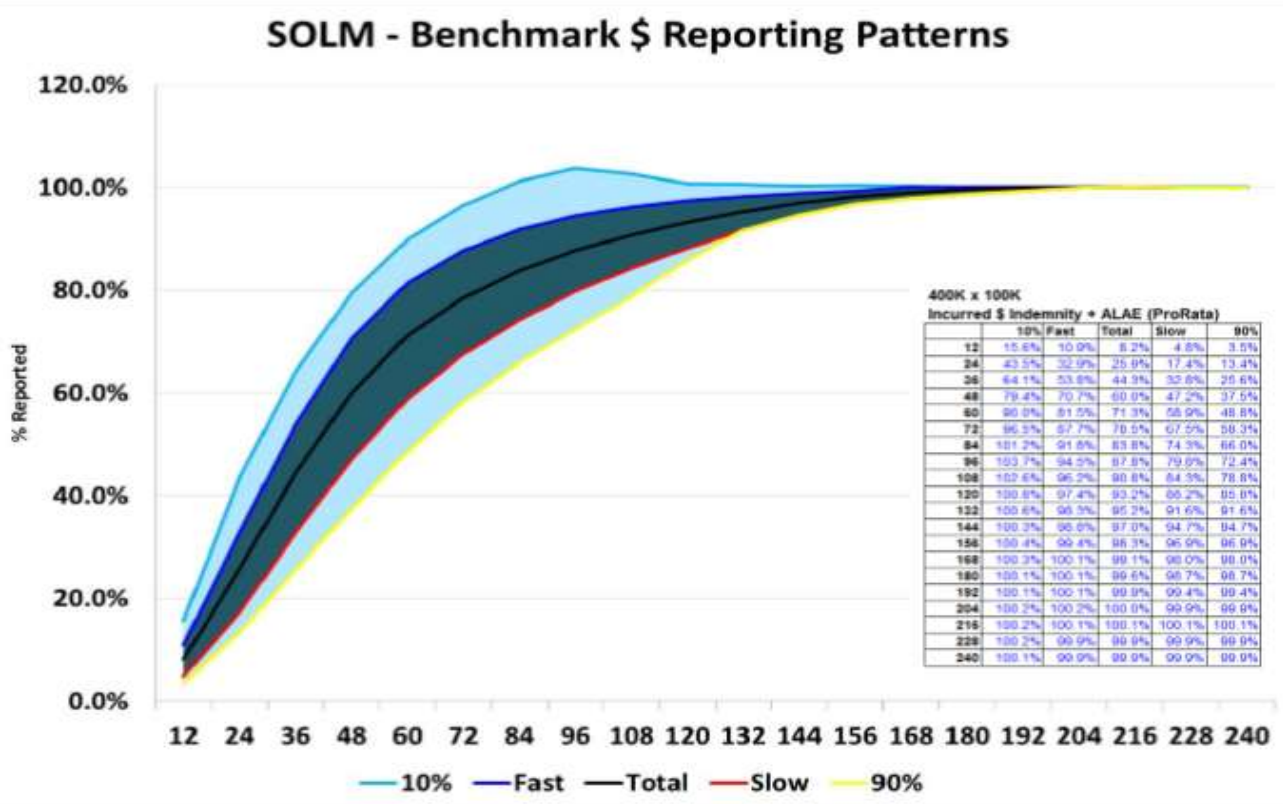
Credibility Theory: Creating a Prior Distribution

Munich RE



400K x 100K
Incurred $ Indemnity + ALAE (ProRata)

	10%	Fast	Total	Slow	90%
12	15.6%	10.9%	6.2%	4.8%	3.5%
24	43.5%	32.9%	25.9%	17.4%	13.4%
36	64.1%	53.8%	44.9%	32.8%	25.6%
48	79.4%	70.7%	60.0%	47.2%	37.5%
60	90.0%	81.5%	71.3%	58.9%	48.8%
72	96.3%	87.7%	78.5%	67.5%	58.3%
84	101.2%	91.8%	83.8%	74.3%	66.0%
96	103.7%	94.5%	87.8%	79.8%	72.4%
108	102.6%	96.2%	90.8%	84.3%	78.8%
120	100.8%	97.4%	93.2%	88.2%	85.8%
132	100.6%	98.3%	95.2%	91.6%	91.6%
144	100.3%	98.8%	97.0%	94.7%	94.7%
156	100.4%	99.4%	98.3%	96.9%	96.9%
168	100.3%	100.1%	99.1%	98.0%	98.0%
180	100.1%	100.1%	99.6%	98.7%	98.7%
192	100.1%	100.1%	99.9%	99.4%	99.4%
204	100.2%	100.2%	100.0%	99.9%	99.9%
216	100.2%	100.1%	100.1%	100.1%	100.1%
228	100.2%	99.9%	99.9%	99.9%	99.9%
240	100.1%	99.9%	99.9%	99.9%	99.9%

In addition to the "client" data for Skipper Insurance Company, we have "industry" data showing the range of patterns collected by ISO.

For example:
10% = the average of the quickest 10% of companies in the SOLM database.

The "variance of hypothetical means" would be narrower than this range if we could control for the variance from individual companies.

All numbers for illustration only

7

Source: CARe June 2018 IT1- Dave Clark Presentation

Overlooking Tails Submission

CARe 2018 - Overlooking Tails Submission
Illustrative Account Triangle - Skipper Insurance Company

4.9M x 100K
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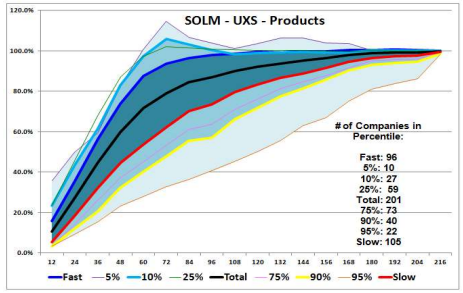
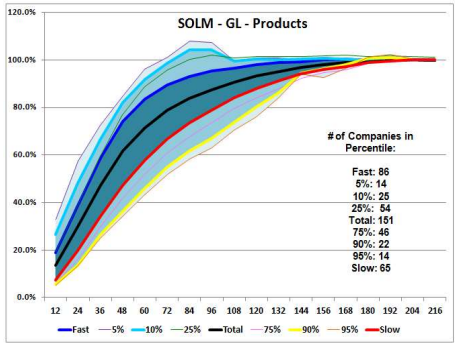
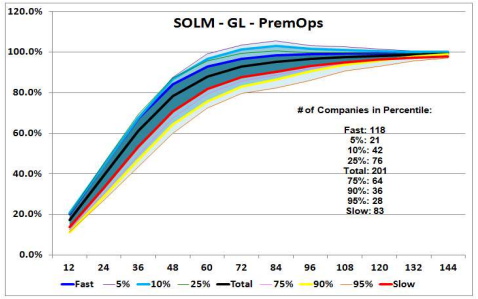
Illustrative







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?

What pattern do you give the reserving actuaries for their actual vs expected testing?

Note: Values shown may not match benchmark options selected

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)

Claim	Year	Deductible	Limit	Incurred Indemnity 6	18	30	42	54	66	78	90	102	Paid Indemnity 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

Overlooking Tails Submission – Additional Info "Know Your Benchmark"

Reserve Run-off Test – Testing to see if Excess Benchmarks getting longer

Illustrative

For all commercial casualty lines combined, excess benchmark LDFs show some deterioration for all calendar years from 2012 to 2017.

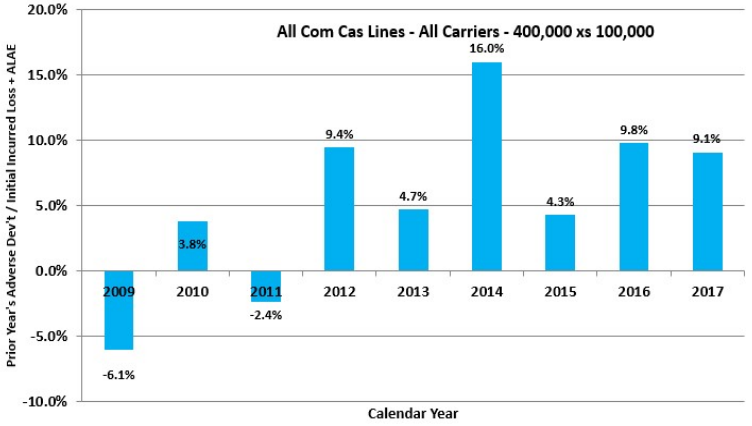
The most significant deterioration is for calendar year 2014 at 16%.

CY=2016 2 Ex Ante

AY	Actual n-2	Actual n-1	7-Yr ATA	Expected n-1	AY	Actual increase	Expected	Actual - Expected	%
1999	3,094,341,139	3,095,984,629	1.001	3,097,322,415	1999	1,643,490	2,981,276	(1,337,786)	-44.9%
2000	3,119,151,694	3,119,389,192	1.001	3,123,808,636	2000	237,498	4,656,942	(4,419,444)	-94.9%
2001	4,186,972,630	4,189,099,690	1.000	4,188,597,889	2001	2,127,060	1,625,259	501,801	30.9%
2002	3,759,246,507	3,763,793,107	1.001	3,762,639,100	2002	4,546,600	3,392,593	1,154,007	34.0%
2003	3,654,492,395	3,655,353,745	1.001	3,658,502,149	2003	861,350	4,009,754	(3,148,404)	-78.5%
2004	3,638,344,690	3,641,830,902	1.002	3,644,049,116	2004	3,486,212	5,704,426	(2,218,214)	-38.9%
2005	3,843,230,912	3,847,056,091	1.002	3,850,075,957	2005	3,825,179	6,845,045	(3,019,866)	-44.1%
2006	4,026,545,702	4,036,659,678	1.002	4,036,169,249	2006	10,113,976	9,623,547	490,430	5.1%
2007	4,296,936,347	4,322,919,389	1.003	4,310,253,005	2007	25,983,042	13,316,658	12,666,384	95.1%
2008	3,985,387,439	3,994,543,554	1.004	4,001,850,825	2008	9,156,114	16,463,386	(7,307,272)	-44.4%
2009	3,775,033,095	3,798,410,795	1.006	3,796,278,022	2009	23,377,699	21,244,927	2,132,773	10.0%
2010	4,003,426,206	4,042,108,064	1.010	4,045,043,725	2010	38,681,858	41,617,519	(2,935,661)	-7.1%
2011	3,940,943,218	4,052,295,946	1.024	4,034,205,065	2011	111,352,728	93,261,847	18,090,881	19.4%
2012	3,636,241,542	3,907,565,271	1.063	3,865,361,479	2012	271,323,729	229,119,937	42,203,792	18.4%
2013	3,261,271,035	3,907,137,548	1.155	3,767,651,769	2013	645,866,513	506,380,734	139,485,779	27.5%
2014	2,580,575,801	3,634,654,741	1.360	3,510,072,347	2014	1,054,078,940	929,496,546	124,582,394	13.4%
2015	1,099,904,223	2,575,545,051	2.277	2,504,011,844	2015	1,475,640,828	1,404,107,621	71,533,207	5.1%
Sum x201	58,802,140,353	61,008,802,342		60,691,880,749	Sum x2015	2,206,661,989	1,889,740,395	316,921,594	16.8%
1999-2003	17,814,204,365	17,823,620,364		17,830,870,189	1999-2003	9,415,998	16,665,824	(7,249,826)	-43.5%
2004-2008	19,790,445,091	19,843,009,614		19,842,398,151	2004-2008	52,564,523	51,953,061	611,462	1.2%
2009-2014	21,197,490,897	23,342,172,364		23,018,612,408	2009-2014	2,144,681,467	1,821,121,511	323,559,957	17.8%

CY tots-2014,2015,2016,2017: 60,966,899,121 65,386,260,791 70,233,055,501 75,392,043,543

	24/12	36/24	48/36	60/48
AY 2001	2.231	1.388	1.183	1.054
AY 2002	2.027	1.394	1.164	1.050
AY 2003	2.162	1.367	1.144	1.051
AY 2004	2.170	1.331	1.143	1.061
AY 2005	2.226	1.316	1.157	1.057
AY 2006	2.172	1.318	1.141	1.050
AY 2007	2.115	1.342	1.125	1.045
AY 2008	2.209	1.338	1.135	1.076
AY 2009	2.301	1.313	1.181	1.071
AY 2010	2.168	1.364	1.152	1.076
AY 2011	2.365	1.350	1.181	1.069
AY 2012	2.277	1.418	1.178	1.075
AY 2013	2.444	1.401	1.198	1.085
AY 2014	2.206	1.408	1.187	
AY 2015	2.342	1.436		
AY 2016	2.334			



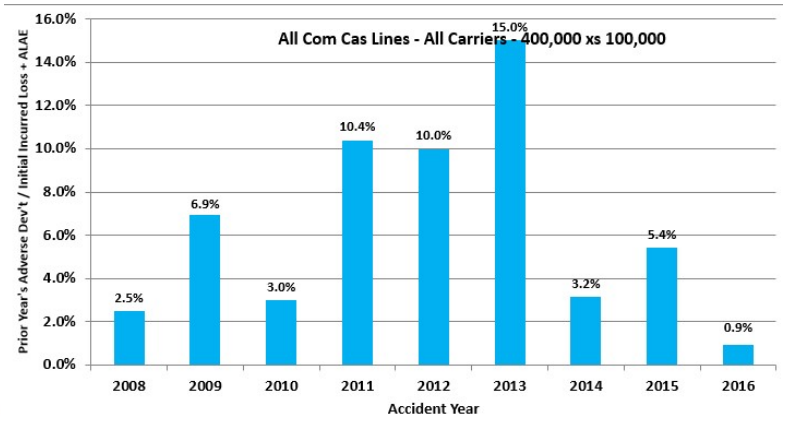
Sources: Using pre-release SOLM 2018 v2 – mechanical selections of VWA (100% 7-year)

Overlooking Tails Submission – Additional Info

Reserve Run-off Test Details @12/31/2017 – 400 xs 100k

Illustrative

The excess LDFs for each accident year from 2008 to 2016 shows some adverse development. Accident year 2013 has lengthened the most thus far, by a total of 15% from an initial estimate of $3.6B for 400x100k.



ISO SOLM 2018 v1.99a - Development Triangle and Analysis
Ex-ante Reserving Analysis Runoff Tests (through 12/31/2017)

Market Analysis: All Com Cas Lines - All Carriers
Assumptions: Incurred $ Indemnity+Alae (Prorata); 400,000 xs 100,000; 7 yr VWA (100% wt); 3.0% detrended threshold

Select Metric here:

Runoff % Adv (Fav)	Ultimate Est. INCURRED @12 mos	Adverse (Fav) Devt	AY	CY2017 1	CY2016 2	CY2015 3	CY2014 4	CY2013 5	CY2012 6	CY2011 7	CY2010 8	CY2009 9	CY2008 10	CY2007 11	CY2006 12	CY2005 13	CY2004 14
0.1%	2,478,154,761	1,793,156	2000	3,560,099	(4,419,444)	29,002	2,860,901	4,305,828	(8,330,668)	1,823,921	(14,339,632)	(1,834,988)	4,842,246	8,289,156	(28,841,380)	(24,586,970)	(37,820,881)
-13.8%	4,313,571,410	(597,384,561)	2001	(822,648)	501,801	(6,602,404)	12,092,613	(13,933,631)	852,575	(15,811,237)	(21,801,320)	(19,853,995)	(10,035,712)	(24,048,207)	(97,941,793)	(174,907,937)	(139,309,537)
-13.7%	4,663,425,672	(640,437,434)	2002	2,575,928	1,154,007	772,498	7,936,744	(7,323,930)	(8,625,358)	4,334,791	(15,140,290)	(20,514,644)	(17,095,661)	(67,390,223)	(126,383,826)	(145,868,544)	(95,752,382)
-10.5%	4,434,989,791	(465,126,068)	2003	1,459,811	(3,148,404)	(1,883,563)	(4,811,807)	6,952,204	(11,744,822)	(4,742,707)	(24,747,424)	(40,819,984)	(5,368,195)	(94,204,234)	(171,492,507)	(131,123,002)	20,548,564
-10.6%	4,418,031,191	(467,368,877)	2004	1,812,394	(2,218,214)	(7,987,820)	(2,489,682)	(10,326,188)	(6,969,837)	(11,966,073)	(34,401,602)	(38,265,218)	(45,852,023)	(144,411,647)	(189,297,381)	25,004,415	
-6.7%	4,406,220,050	(294,999,927)	2005	(98,618)	(3,019,866)	(8,617,586)	6,687,355	(9,268,111)	2,727,765	(555,887)	(38,797,260)	(45,770,592)	(82,422,429)	(197,548,806)	81,684,107		
-6.9%	4,719,106,744	(325,049,873)	2006	3,836,769	490,430	(8,329,122)	(10,173,961)	9,698,180	5,000,333	(12,821,752)	(54,600,282)	(113,919,530)	(157,758,909)	13,527,971			
-5.0%	5,044,582,911	(249,720,202)	2007	11,658,717	12,666,384	(3,674,259)	3,876,299	8,930,600	23,281,280	(49,726,105)	(138,024,181)	(59,064,915)	(59,644,022)				
2.5%	4,223,338,071	104,908,538	2008	6,574,525	(7,307,272)	(4,631,086)	22,249,847	26,270,226	82,632,162	(48,321,187)	(28,545,382)	55,986,704					
6.9%	4,701,231,232	256,127,853	2009	(81,493)	2,132,773	(10,018,896)	26,310,583	53,854,998	109,216,873	(65,380,747)	140,093,764						
3.0%	4,076,043,385	122,004,788	2010	(342,804)	(2,935,661)	(12,358,499)	65,766,358	21,567,232	74,271,492	(23,963,330)							
10.4%	3,648,922,789	379,271,178	2011	16,437,670	18,090,881	26,210,882	106,156,159	41,761,534	170,614,053								
10.0%	3,614,335,236	361,173,931	2012	298,903	42,203,792	79,690,003	180,933,350	58,047,883									
15.0%	3,641,158,282	546,527,906	2013	75,024,258	139,485,779	122,000,079	210,017,790										
3.2%	4,649,834,487	146,951,391	2014	86,381,727	124,582,394	(64,012,730)											
5.4%	4,427,403,856	239,126,288	2015	167,593,081	71,533,207												
0.9%	4,799,418,439	43,731,246	2016	43,731,246													

	Minimum	Maximum	Actual vs Expected Development: AY x CY
	-4.5%	-1.3%	Favorable development
	-1.3%	-0.5%	Somewhat favorable
	-0.5%	0.5%	Within +-.5% of original estimate
	0.5%	1.8%	Somewhat adverse
	1.8%	5.8%	Adverse development

Sources: Using pre-release SOLM 2018 v2 – mechanical selections of VWA (100% 7-year)

John’s Wrap-up Slides

Credibility Theory: Application

Munich RE

The same procedure is followed for the 500x500 layer.

Instead of the initial 33.33% weights for each benchmark, however, we can start with the result from the 400x100 layer. Because of the low credibility for the 500x500 layer, the final pattern is close to the "slow" benchmark.

Loss Development Factors (LDF to Ultimate)

	12	24	36	48	60	72	84	96	108	120
Fast	9.909	3.242	1.866	1.399	1.203	1.084	1.038	1.025	1.020	1.015
Medium	16.705	4.811	2.474	1.760	1.462	1.286	1.195	1.143	1.109	1.081
Slow	33.051	7.635	3.480	2.416	1.965	1.638	1.454	1.343	1.267	1.201
Average	29.273	7.087	3.303	2.303	1.880	1.582	1.414	1.313	1.244	1.184

A Posteriori Weights	
Fast	0.16%
Medium	12.81%
Slow	87.03%

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Source: CARe June 2018 IT1- Dave Clark Presentation

Final Pricing: Experience Rating 500x500 Layer

Munich RE

Experience Rating 500K xs 500K

Accident Year	Onlevel Premium	Exposure Trend	Trended Premium	LDF	Premium / LDF	500x500 Reported	Severity Trend	Frequency Trend	Policy Limit Drift	500x500 Trended	Rate
2009	18,432,700	1.083	19,959,973	1.313	15,201,243	468,000	1.267	1.000	1.037	615,038	4.05%
2010	17,258,900	1.072	18,503,877	1.414	13,086,268	371,400	1.230	1.000	1.033	471,909	3.61%
2011	17,916,600	1.062	19,018,832	1.582	12,025,363	361,700	1.194	1.000	1.025	442,533	3.68%
2012	18,544,100	1.051	19,490,035	1.880	10,365,628	531,900	1.159	1.000	1.020	629,230	6.07%
2013	18,470,700	1.041	19,220,684	2.303	8,345,310	678,500	1.126	1.000	1.016	776,103	9.30%
2014	19,199,500	1.030	19,781,264	3.303	5,988,474	482,900	1.093	1.000	1.012	534,101	8.92%
2015	19,157,800	1.020	19,542,872	7.087	2,757,550	0	1.061	1.000	1.004	0	0.00%
2016	19,374,100	1.010	19,567,841	29.273	668,468	0	1.030	1.000	1.000	0	0.00%
	148,354,400		155,085,378		68,438,304	2,894,400				3,468,914	5.07%
Prospective	20,000,000									1,013,735	5.07%

400xs100 Rate:	32.17%
Exposure-Rating Relativity:	0.461
Expected 500xs500 Rate:	14.83%
Credibility:	75%
Selected 500xs500 Rate:	7.51%
Selected 500xs500 Expected Loss:	**1,501,765**

All numbers for illustration only

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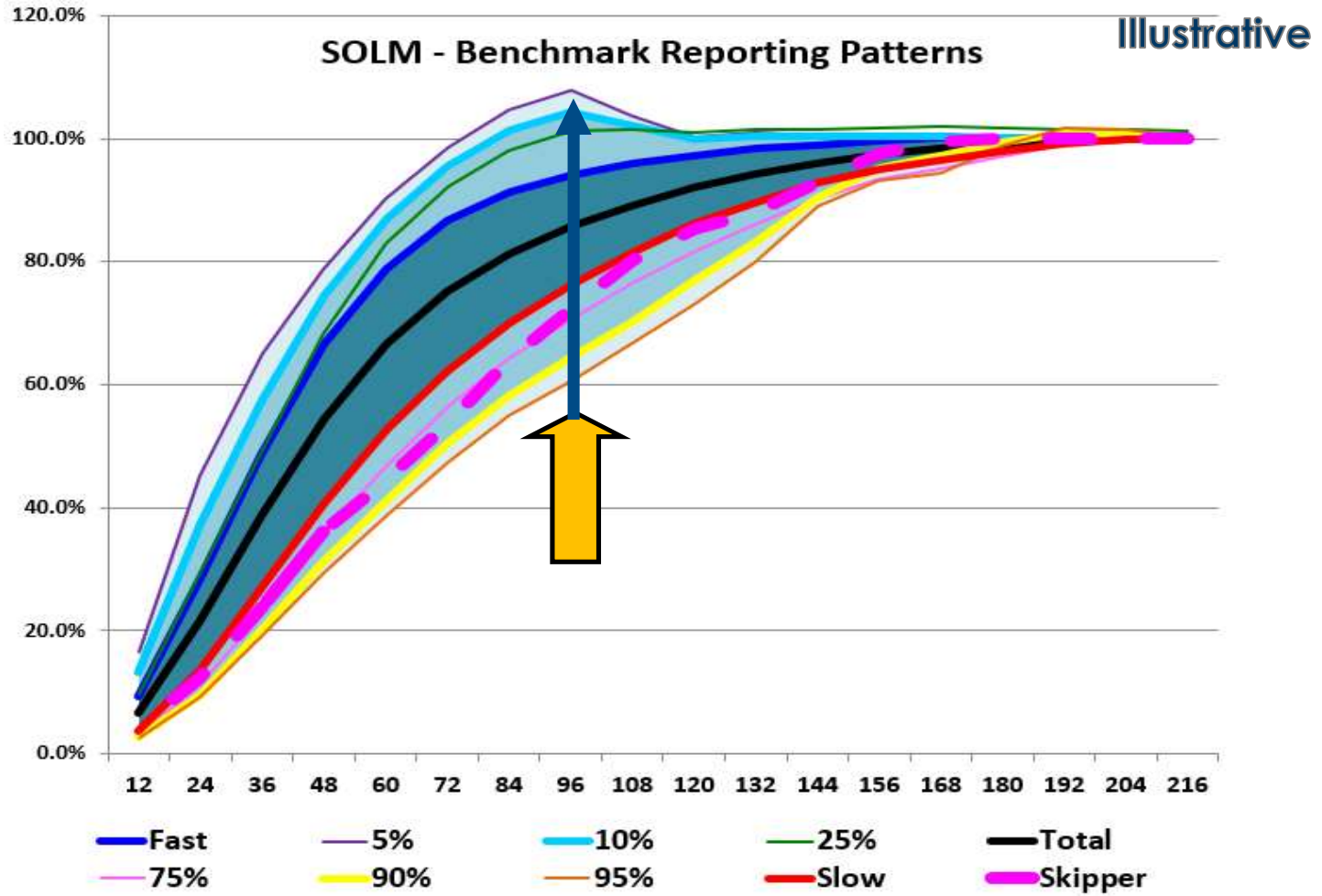
Source: CARe June 2018 IT1- Dave Clark Presentation

Overlooking Tails Wrap-up

Skipper actual pattern behaves like 75% percentile. The two case study selections were a bit slower than 50th% and close to Slow. Both a bit faster than the actual pattern.

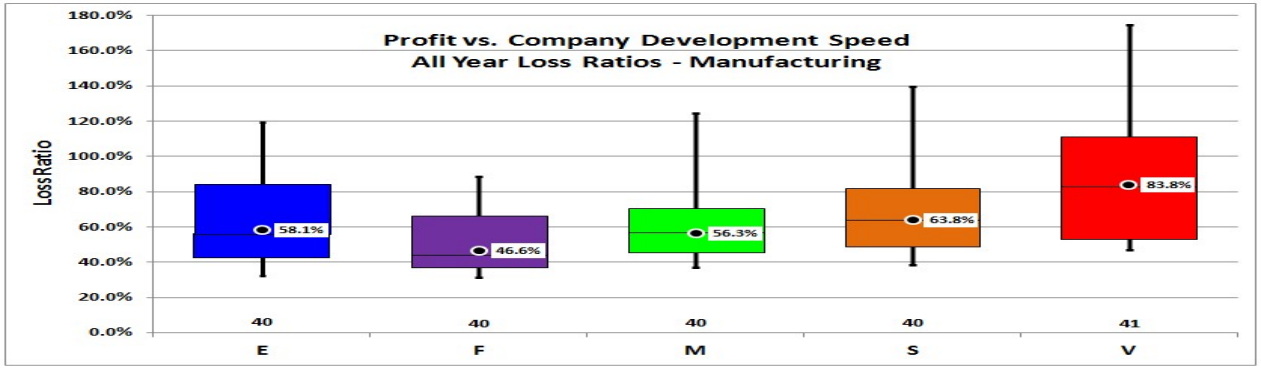
But neither were fooled by the apparent lack of development in the 500x500 layer.

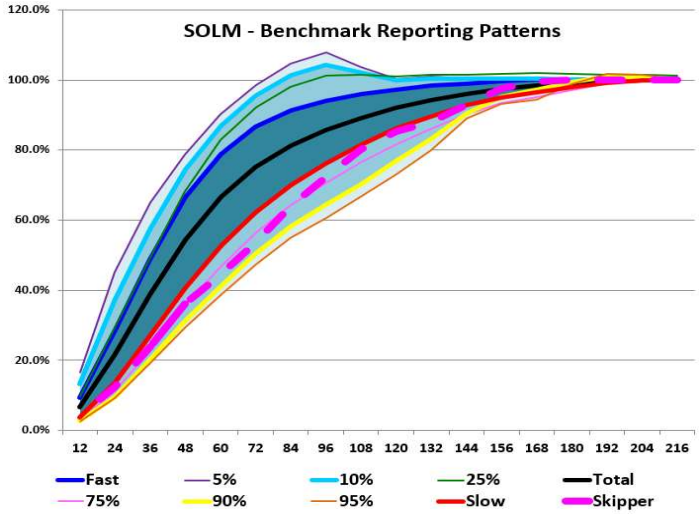


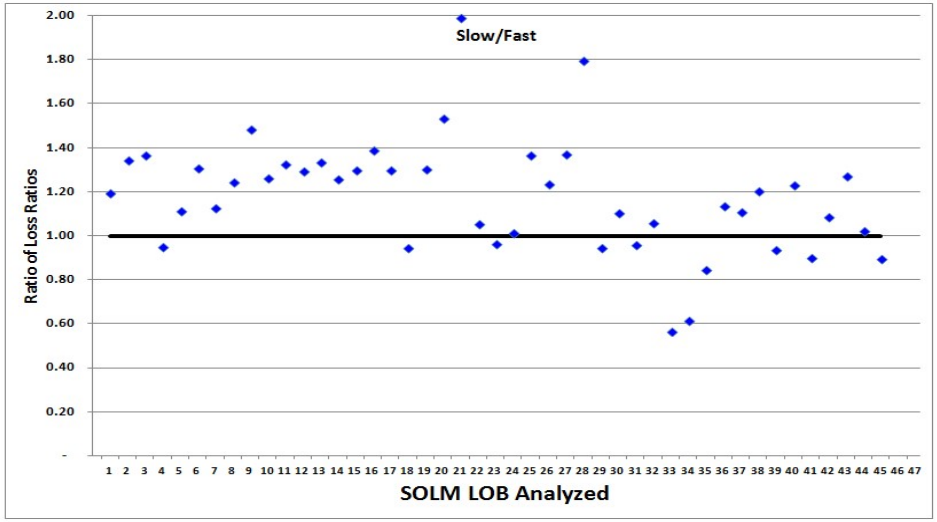
Note: Values shown may not match benchmark options selected;
See Verisk Monday Webinar on link between LDF Speed and Profitability (9/11/2017 – J. Buchanan and M. Wasserman

Overlooking Tails Wrap-up

Strong connection made between LDF Speed and Profitability. Companies that don't recognize their longer than industry LDFs, very strongly have much worse ultimate loss ratios. Almost every one of the 44 markets we analyzed (besides short-tail property lines) experienced this important connections.







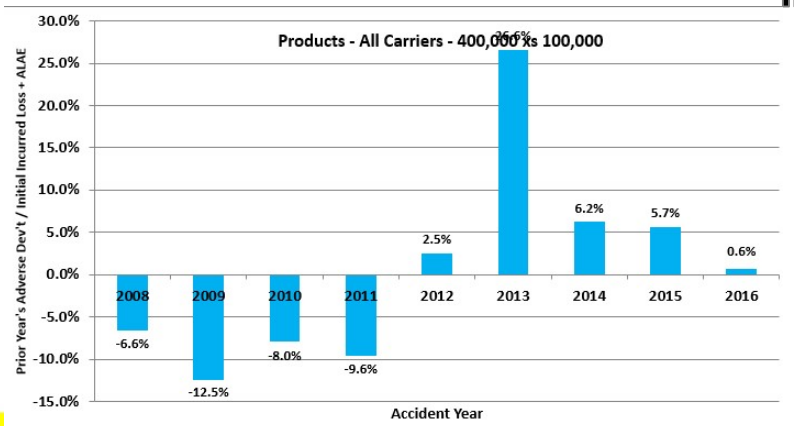
Note: See Verisk Monday Webinar on link between LDF Speed and Profitability (9/11/2017 – J. Buchanan and M. Wasserman)

Overlooking Tails Wrap-up

Products Class Group C – Reserve Run-off Test @12/31/2017 – 400 xs 100k

Illustrative

The benchmark group where Skipper belongs, exhibits downward development in the AY's 2011 and prior, but some adverse development in all subsequent years for 400x100.



ISO SOLM 2018 v1.99a - Development Triangle and Analysis
Ex-ante Reserving Analysis Runoff Tests (through 12/31/2017)

Market Analysis: Products - All Carriers Class Group C
Assumptions: Incurred $ Indemnity+Alae (Prorata); 400,000 xs 100,000; 7 yr VWA (100% wt); 3.0% detrended threshold

Select Metric here:

Runoff % Adv (Fav)	Ultimate Est. INCURRED @12 mos	Adverse (Fav) Devt	AY	CY2017 1	CY2016 2	CY2015 3	CY2014 4	CY2013 5	CY2012 6	CY2011 7	CY2010 8	CY2009 9	CY2008 10	CY2007 11	CY2006 12	CY2005 13	CY2004 14
6.5%	58,682,589	3,793,200	2000	793,355	540,262	818,827	(1,262,145)	447	(844,921)	(421,750)	(3,971,031)	(1,098,524)	(2,368,280)	2,127,724	(837,040)	(4,804,105)	244,894
-3.4%	81,181,111	(2,733,734)	2001	(535,493)	711,906	(1,057,400)	65,708	(789,960)	(1,767,121)	(205,800)	(631,553)	(84,306)	(356,002)	5,899,148	(5,244,411)	(2,429,502)	5,217,882
-8.5%	77,861,395	(6,644,325)	2002	2,092,298	507,476	383,582	(78,407)	1,071,262	(2,619,701)	(1,183,932)	(1,438,675)	1,687,090	85,968	(2,122,361)	(4,163,894)	(7,962,861)	6,717,965
-17.1%	126,192,825	(21,634,844)	2003	(241,044)	(287,086)	(46,205)	683,429	449,330	(2,527,794)	(1,711,375)	(2,208,639)	3,949,562	(1,234,728)	1,956,543	(1,500,307)	(11,287,400)	(7,629,129)
3.2%	78,574,142	2,480,278	2004	(594,325)	272,469	(2,091,142)	147,391	(1,405,143)	1,234,294	1,891,873	(4,992,663)	3,357,223	4,767,790	(2,937,909)	(2,290,347)	5,120,768	
-3.1%	93,853,764	(2,926,086)	2005	290,525	1,796,824	(1,141,683)	1,284,533	1,642,278	(2,400,323)	846,293	(607,593)	1,849,869	(1,444,408)	(6,157,432)	1,115,032		
-2.0%	110,359,789	(2,189,133)	2006	663,155	(679,492)	(1,140,261)	1,746,558	433,164	523,212	196,254	1,009,909	(3,571,004)	822,299	(2,192,928)			
-10.2%	132,543,275	(13,548,150)	2007	1,592,036	(755,053)	(2,031,285)	(1,759,240)	(1,998,628)	4,627,822	5,729,468	(11,364,580)	(3,186,599)	(4,402,092)				
-6.6%	122,721,831	(8,116,600)	2008	1,684,377	(2,187,278)	(872,455)	41,332	(1,626,002)	6,228,820	(2,519,488)	(8,938,101)	72,195					
-12.5%	179,064,728	(22,411,704)	2009	(1,594,955)	3,412,898	(2,529,670)	(1,288,781)	(1,311,764)	3,343,909	(7,259,981)	(15,183,359)						
-8.0%	118,184,694	(9,403,142)	2010	(814,816)	(1,234,638)	(5,450,375)	(1,193,777)	9,834,247	(5,242,240)	(5,301,543)							
-9.6%	112,348,260	(10,806,732)	2011	(1,674,911)	(1,553,825)	(7,279,641)	666,261	1,679,619	(2,644,234)								
2.5%	78,764,731	2,008,005	2012	1,433,079	(6,960,193)	(1,732,669)	8,046,257	1,221,531									
26.6%	75,234,082	20,032,267	2013	2,290,397	9,285,875	5,805,544	2,649,850										
6.2%	91,896,756	5,721,652	2014	1,410,250	(2,136,105)	6,447,507											
5.7%	72,386,107	4,114,914	2015	2,186,374	1,928,539												
0.6%	81,069,414	521,152	2016	521,152													

Minimum	Maximum	Actual vs Expected Development: AY x CY
-10.2%	-3.2%	Favorable development
-3.2%	-0.5%	Somewhat favorable
-0.5%	0.5%	Within +-.5% of original estimate
0.5%	4.5%	Somewhat adverse
4.5%	14.1%	Adverse development

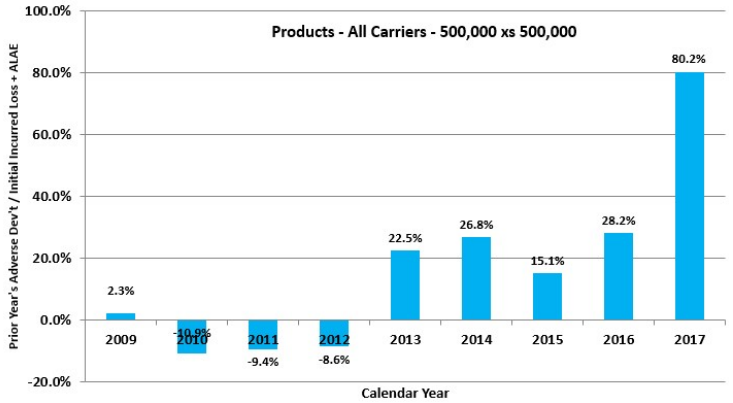
Sources: Using pre-release SOLM 2018 v2 – mechanical selections of VWA (100% 7-year)

Overlooking Tails Submission – Additional Info

Products Class Group C – Reserve Run-off Test @12/31/2017 – 500 xs 500k

Illustrative

However, the 500x500 layer shows significant and growing lengthening of the LDF tails in all calendar years from 2013 to 2017. Most troubling is that calendar year 2017 shows adverse development in this layer of 80%.



ISO SOLM 2018 v1.99a - Development Triangle and Analysis
Ex-ante Reserving Analysis Runoff Tests (through 12/31/2017)

Market Analysis: Products - All Carriers Class Group C
Assumptions: Incurred $ Indemnity+Alae (Prorata); 500,000 xs 500,000; 7 yr VWA (100% wt); 3.0% detrended threshold

Select Metric here:

Runoff % Adv (Fav)	Ultimate Est. INCURRED @12 mos	Adverse (Fav) Devt	AY	CY2017 1	CY2016 2	CY2015 3	CY2014 4	CY2013 5	CY2012 6	CY2011 7	CY2010 8	CY2009 9	CY2008 10	CY2007 11	CY2006 12	CY2005 13	CY2004 14
19.4%	18,346,120	3,556,657	2000	(332,180)	54,621	546,109	(139,127)	(290,153)	(886,831)	426,483	(1,732,104)	(1,194,277)	319,150	(678,532)	1,290,191	(863,145)	(1,886,320)
-6.7%	44,962,770	(3,024,411)	2001	112,346	68,774	(822,211)	(514,561)	989,766	(167,043)	761,206	(1,390,172)	686,276	1,557,646	922,218	(63,442)	94,739	3,399,839
-2.3%	37,661,017	(853,717)	2002	1,776,942	1,022,015	(165,554)	95,983	913,213	1,313,307	(211,233)	(2,041,093)	(1,717,316)	780,565	(1,216,852)	1,590,202	(4,007,317)	1,220,889
-22.3%	63,202,440	(14,095,609)	2003	(414,085)	(398,468)	59,617	418,592	732,263	(1,875,229)	740,455	(1,812,441)	1,888,806	(2,106,787)	(4,648,076)	821,045	(4,405,985)	(3,095,316)
-1.7%	27,687,105	(465,439)	2004	(673,279)	237,263	246,399	(1,248,349)	1,506,765	(712,100)	(76,013)	(1,982,761)	26,988	(266,639)	(747,537)	156,911	3,066,912	
15.5%	32,094,688	4,969,701	2005	1,351,802	492,679	1,593,836	377,299	2,274,936	(572,411)	206,381	(2,735,432)	2,923,964	(809,758)	(3,174,337)	3,040,743		
-7.5%	65,842,815	(4,949,378)	2006	(829,194)	30,645	(142,708)	9,335	1,302,042	(731,215)	2,172,020	2,126,116	(1,755,339)	(2,816,521)	(4,314,558)			
-5.0%	51,697,282	(2,572,663)	2007	675,957	980,563	(496,112)	434,477	(1,835,678)	1,061,695	616,449	(6,203,517)	3,604,345	(1,410,842)				
-18.2%	60,359,175	(10,989,654)	2008	998,600	(1,662,103)	218,622	(1,498,481)	(2,863,279)	1,647,918	(1,021,024)	(4,007,552)	(2,802,355)					
-14.3%	103,903,842	(14,841,377)	2009	419,725	2,014,957	(1,183,793)	1,851,281	691,885	(2,402,761)	(4,932,645)	(11,300,027)						
9.7%	36,917,852	3,563,239	2010	(217,545)	182,631	(867,130)	1,172,403	4,252,434	752,368	(1,711,923)							
-13.1%	63,122,673	(8,273,318)	2011	10,699	1,759,894	(5,433,997)	(1,554,905)	2,184,517	(5,239,527)								
17.2%	25,343,634	4,357,936	2012	2,511,084	(1,729,487)	1,837,538	(1,051)	1,739,852									
117.5%	12,533,203	14,732,751	2013	6,700,259	3,922,885	1,062,811	3,046,795										
7.0%	30,442,720	2,127,026	2014	956,738	(2,315,116)	3,485,404											
19.7%	27,767,949	5,465,787	2015	3,766,591	1,699,195												
0.3%	23,648,502	80,470	2016	80,470													

	Minimum	Maximum	Actual vs Expected Development: AY x CY
	-16.3%	-5.3%	Favorable development
	-5.3%	-0.5%	Somewhat favorable
	-0.5%	0.5%	Within +-.5% of original estimate
	0.5%	17.7%	Somewhat adverse
	17.7%	53.5%	Adverse development

Sources: Using pre-release SOLM 2018 v2 – mechanical selections of VWA (100% 7-year)

Emergence Lag – Impact of Wrong Signals

Figure 1 Underwriting Cycle – Accident Year (AY) vs. Calendar Year (CY)

Apparent vs. Actual Market Signals – Operating Results

Sch P Year	CY	AY @2010	CY vs. AY Difference	"Breakeven"	"Apparent" Market	"Actual" Market
1980	100%	121%	21.7%	95.0%	Transitional	Soft
1981	101%	134%	33.0%	95.0%	Transitional	Soft
1982	110%	142%	32.8%	95.0%	Transitional	Soft
1983	109%	153%	44.6%	95.0%	Transitional	Soft
1984	118%	121%	2.3%	95.0%	Soft	Soft
1985	130%	96%	-33.5%	95.0%	Soft	Transitional
1986	109%	72%	-36.4%	95.0%	Transitional	Hard
1987	92%	62%	-29.8%	95.0%	Transitional	Hard
1988	84%	60%	-24.1%	95.0%	Transitional	Hard
1989	61%	62%	0.9%	95.0%	Hard	Hard
1990	69%	73%	4.2%	95.0%	Hard	Hard
1991	67%	91%	24.6%	95.0%	Hard	Transitional
1992	76%	95%	19.1%	95.0%	Hard	Transitional
1993	65%	100%	34.6%	95.0%	Hard	Transitional
1994	69%	96%	27.2%	95.0%	Hard	Transitional
1995	71%	117%	46.0%	95.0%	Hard	Soft
1996	76%	119%	43.0%	95.0%	Hard	Soft
1997	78%	134%	56.0%	95.0%	Hard	Soft
1998	88%	151%	63.7%	95.0%	Transitional	Soft
1999	106%	143%	37.4%	95.0%	Transitional	Soft
2000	106%	136%	29.7%	95.0%	Transitional	Soft
2001	136%	138%	2.8%	95.0%	Soft	Soft
2002	130%	122%	-7.4%	95.0%	Soft	Soft
2003	122%	89%	-33.0%	95.0%	Soft	Transitional
2004	96%	72%	-24.0%	95.0%	Transitional	Hard
2005	87%	70%	-17.4%	95.0%	Transitional	Hard
2006	72%	70%	-2.4%	95.0%	Hard	Hard
2007	68%	79%	11.8%	95.0%	Hard	Hard
2008	70%	89%	19.0%	95.0%	Hard	Transitional
2009	72%	96%	24.8%	95.0%	Hard	Transitional
2010	64%	104%	39.9%	95.0%	Hard	Transitional
2011					?	?

Red Years = CY indications -> write MORE business, while actual results much WORSE (average=41% worse)
Blue Years = CY indications -> write LESS business, while actual results much BETTER (average = 29% better)
Green Years = Actual Results TBD after Information Emerges

Benchmark Patterns

ISO's Size-of-Loss Matrix 2018 v2 includes data on the following lines of business:

Commercial Auto Liability (8)
- buses
- composite-rated risks
- garages
- miscellaneous
- private passenger types
- publics
- trucks, tractors, and trailers
- trucks, tractors, and trailers – zone-rated

Commercial Auto Physical Damage

Commercial Property (3)
- commercial
- manufacturing
- residential

Commercial Inland Marine (5)
- builder's risk
- contractor's equipment
- motor truck cargo
- wireless communications equipment
- other

General Liability (12)
- completed operations
- composite-rated risks
- contractors (countrywide)
- contractors (CA, FL, IL, NJ, NY, NYC, PA, TX)
- liquor
- local products
- manufacturers (countrywide)
- manufacturers (CA, NY)
- owners, landlords, and tenants
- pollution
- premises operations combined - Classes 1, 2, and 3
- products combined – Classes A, B, and C

Businessowners

Umbrella and Excess (4)
- premises/operations only
- commercial auto only
- premises/operations and commercial auto
- products

Professional Liability (13)
- accountants
- agents
- architects and engineers
- directors and officers – for profit
- directors and officers – not for profit
- employment practices liability
- lawyers professional liability
- medical – allied health claims-made
- medical – allied health occurrence
- medical – dentists claims-made
- medical – hospital claims-made
- medical – physicians and surgeons claims-made
- other errors and omissions

Total Commercial Lines (47)

Homeowners (3)
- forms 2&3
- forms 4&6
- form 5

Personal Umbrella (4)
- auto excess
- homeowners and other excess
- primary
- other

Total Personal Lines (7)

New for SOLM 2018 v2; each market (54) contains more than $1B of either premiums or losses in triangles from 2001-2017

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 downtime pursuits.

Aleksey Popelyukhin

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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."

Dave R. Clark

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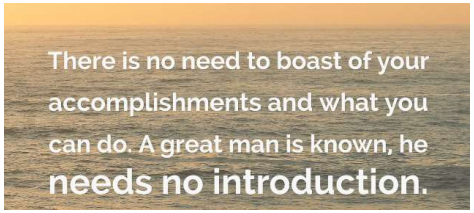

David R Clark is a Fellow of the Casualty Actuarial Society (FCAS) and a member of the American Academy of Actuaries (MAAA). He works for Munich Reinsurance as part of the Actuarial Research and Modeling team in Princeton.

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.

For CLRS 2018 LOB13, an extract of Dave's methods will be presented by Aleksey. For a full recorded description, the interested reader is directed to the CARe 2018 recorded session Intermediate Track 1

http://www.verisk.com/iso/excess-reinsurance