

Update to Property and Casualty Risk-Based Capital Underwriting Factors Experience

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Presentation to the Property and Casualty Risk-Based Capital (P/C RBC) (E) Working Group



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Contents

- Time Management
- Context for this Report
- Results
- Methodology
- Analysis of Change



Time Management for This Presentation

- We will take questions throughout the presentation
- To the extent that time does not allow us to cover all slides at this session, and/or there are further questions:
 - We understand the Working Group intends to have further meetings, as needed
 - Those further meetings can address questions from Regulators and Interested Parties that are not raised at this meeting.



Context

- This Report is an update to the 2016 Academy Report that also presented indicated Line 4 factors for premium and reserve risk.
- This Report is the first of three reports on underwriting (UW) risk factors that the academy described to the working group in May 2019.
https://www.actuary.org/sites/default/files/2019-05/PCRBCUnderwritingRiskComments_05052019.pdf
 - Report 2 will deal with investment income adjustment factors
 - Report 3 will deal with the loss/premium concentration factors
- Action on indications in this Report will follow completion of Report 2, per prior discussions at the Working Group.
 - However, results of this Report will affect the Report 2 analysis, so robust discussion at this time is important.
- The approach in this Report is broadly the same as the approach in the 2016 Report
 - We summarize that approach later in this presentation
 - We also discuss some changes in methodology

4



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Correction

- We found that “Impact Analysis” in Appendix 13 and summarized in Tables 1c-1f in the March 2021 Report was not the final “Impact Analysis” prepared by the NAIC and did not correctly reflect the indicated risk factors and desired minimum risk charges.
- The differences are not large. For example, the next shows the correct values, April 21, 2021, and the original values, March 2021, for Table 1e of the Report.
- In this presentation we will use the correct Impact Analysis values, and we will provide a corrected report, to the NAIC, for distribution to interested parties.
- We apologize for this inconvenience.



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Correction – Table 1e

Table 1e. April 21, 2021 Report				
Type of Company	ACL Value with 2020 Risk Charges (\$Billions)	Indicated 2017 vs. Indicated 2014		
		Reserve Risk Charge	Premium Risk Charge	ACL
Commercial	64.9	-3.3%	-0.7%	-1.7%
Med Prof Liab	2.4	-14.9%	-6.9%	-3.0%
NOC	0.9	-26.9%	-1.7%	-12.5%
Personal	84.3	4.8%	0.9%	0.5%
Reinsurance	8.2	-5.1%	-3.4%	-0.5%
Workers Comp	10.1	-3.2%	-4.3%	-2.1%
Total	170.6	-1.9%	-0.4%	-0.7%

Table 1e. March 2021 Report				
Type of Company	ACL Value with 2020 Risk Charges (\$Billions)	Indicated 2017 vs. Indicated 2014		
		Reserve Risk Charge	Premium Risk Charge	ACL
Commercial	64.9	-2.8%	-0.7%	-1.5%
Med Prof Liab	2.4	-14.9%	-6.9%	-3.0%
NOC	0.9	-23.0%	-1.7%	-10.8%
Personal	84.3	4.9%	0.9%	0.5%
Reinsurance	8.2	-4.9%	-3.4%	-0.5%
Workers Comp	10.1	-3.0%	-4.3%	-2.0%
Total	170.6	-1.5%	-0.4%	-0.6%



Indicated Risk Factors

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Line	PRFs			RRFs		
	2020 RBC Formula	Indicated (2014 Data)	Indicated (2017 Data)	2020 RBC Formula	Indicated (2014 Data)	Indicated (2017 Data)
(1) H/F	0.964	0.964	0.960	0.213	0.213	0.223
(2) PPA	0.969	0.969	0.975	0.179	0.179	0.201
(3) CA	1.010	1.010	1.022	0.276	0.348	0.361
(4) WC	1.044	1.044	1.030	0.344	0.344	0.335
(5) CMP	0.901	0.901	0.897	0.494	0.494	0.499
(6) MPL Occ.	1.668	1.490	1.480	0.383	0.296	0.265
(7) MPL C-M	1.130	1.176	1.149	0.276	0.089	0.094
(8) SL	0.938	0.949	0.952	0.304	0.431	0.415
(9) OL	1.013	1.013	1.014	0.531	0.531	0.527
(11) Spec. Prop.	0.879	0.831	0.831	0.246	0.428	0.278
(12) APD	0.836	0.836	0.837	0.155	0.155	0.132
(10) Fidelity / Surety	0.854	0.680	0.666	0.371	0.917	0.600
(13) Other	0.935	0.935	0.933	0.220	0.375	0.225
(15) International	1.234	1.638	1.712	0.359	0.695	1.044
(16) Reins. Prop. / Fin.	1.239	1.240	1.240	0.415	0.415	0.343
(17) Reins. Liab.	1.323	1.322	1.252	0.656	0.656	0.636
(18) PL	1.263	1.285	1.270	0.802	1.345	1.472
(14) Financial / Mortgage	1.598	2.513	2.588	0.179	0.060	0.001
(19) Warranty	0.854	1.028	0.975	0.371	0.316	0.312
Average Risk Factor- all Lines	0.964	0.968	0.967	0.362	0.383	0.376
Average Risk Factor- 10-Yr Lines	0.996	0.996	0.995	0.375	0.387	0.390
Average Risk Factor- 2-Yr Lines	0.880	0.895	0.897	0.226	0.344	0.218

Line 4 Risk Factors:

- ▣ 2020 formula
- ▣ Indicated with 2014 Data
- ▣ Indicated with 2017 Data

We discuss the effect of these factors in the next set of slides.

Source: Table 1a Page 7



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Indicated Change in Risk Charges - Total

- We can look at the effect of the new analysis (2017 data) compared to the 2016 analysis (2014 data) from two perspectives:
- Indications from the 2017 data compared to the factors in the 2020 Formula (“Current Factors” or “Current”)
- Indications from the 2017 data compared to the indication from the 2014 data.
- Column 4, the movement from 2014 data to 2017 data, tests the stability of indicated risk factors with respect to additional data and refinements in methodology

(1)	(2)	(3)	(4)	(5)
Row	Risk Element	Indicated 2014 vs. 2020	Indicated 2017 vs. Indicated 2014	Indicated 2017 vs 2020
1	Change in Reserve Risk RBC	9.3%	-1.9%	7.2%
2	Change in Premium Risk RBC	-1.9%	-0.4%	-2.3%
3	Change in ACL	2.8%	-0.7%	2.1%

Source: Col 3 from Report Appendix 13, Part 1 3rd row of each risk category section, page 49. Col 4 from Table 1c (page 10); Col 5 = Row 3 from Table 1f (page 14)



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Distribution of # of Companies by % Change in ACL RBC Value

(1)	(2)	(3)
% Change in ACL RBC	Indicated: 2017 Data vs 2014 Data	Indicated: 2017 Data vs 2020
Less Than -50%	0	26
-50% to -25%	26	78
-25% to -15%	26	55
-15% to -5%	173	138
-5% to 5%	1,525	1,161
5% to 15%	85	242
15% to 25%	2	70
25% to 50%	0	58
Over 50%	0	9
Total	1,837	1,837

Source: Col (2) from Table 1d page 10. Col (3) from Appendix 13, Part 2.



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Indicated Change in Risk Charges - After Capping

Percentage Change from 2020 Formula to 2017 Indicated
First Year Change With Various Minimum and Maximum Rules

(1)	(2)	(3)	(4)	(5)
Row	Risk Factors/Capping	% Change From 2020 Formula		
		Reserve Risk Charge	Premium Risk Charge	ACL
1	2020 RBC Formula	Base	Base	Base
2	2014 Indicated -Uncapped	9.3%	-1.9%	2.8%
3	2017 Indicated -Uncapped	7.2%	-2.3%	2.1%
4	2017 Indicated - 5% Min. - Uncapped	7.9%	-2.3%	2.2%
5	2017 Indicated - 5% Min. - ±10% Max	0.5%	-0.6%	0.0%
6	2017 Indicated - 5% Min. - ±20% Max	2.1%	-1.5%	0.4%
7	2017 Indicated - 5% Min. - ±35% Max	3.4%	-2.5%	0.7%



Indicated Change in Risk Charges – by Type of Company

Type of Company Definition

Schedule P Line	Type of Company
H/F	Personal Lines
APD	Personal Lines
PPA	Personal Lines
OL	Commercial Lines
CMP	Commercial Lines
CA	Commercial Lines
PL	Commercial Lines
Spec. Prop.	Commercial Lines
WC	Workers Compensation
MPL Occ.	Medical Professional
MPLC-M	Medical Professional
Reins. Prop. / Fin.	Reinsurance
Reins. Liab.	Reinsurance
SL	NOC
Fidelity / Surety	NOC
Other	NOC
International	NOC
Financial / Mortgage	NOC
Warranty	NOC



Distribution of Lines of Business (LOBs) by Type of Company

LOB/ Category	Commercial	Med Prof	NOC	Personal	Reinsurer	Workers Comp	Total
HF	6%	0%	0%	17%	2%	2%	10%
PPA	6%	0%	0%	45%	2%	4%	22%
CA	8%	0%	0%	3%	2%	4%	5%
WC	16%	1%	0%	2%	2%	73%	15%
CMP	10%	0%	0%	3%	1%	6%	6%
MM Occ	0%	24%	0%	1%	0%	0%	1%
MM CM	1%	72%	0%	1%	0%	0%	2%
SL	2%	0%	20%	0%	2%	0%	1%
OL	30%	2%	22%	3%	8%	6%	16%
SP	9%	0%	2%	2%	6%	1%	5%
APD	4%	0%	0%	18%	1%	2%	9%
Fid/Surety	1%	0%	38%	0%	0%	1%	1%
Other	1%	0%	13%	0%	0%	0%	1%
Int'l	0%	0%	0%	0%	3%	0%	0%
Rein (Prop and Fin)	1%	0%	0%	2%	21%	0%	2%
Rein (Liab)	3%	1%	0%	2%	49%	1%	3%
PL	2%	0%	0%	0%	0%	1%	1%
Fin/Mortg	0%	0%	0%	0%	0%	0%	0%
Warranty	0%	0%	4%	0%	0%	0%	0%
Total %	100%	100%	100%	100%	100%	100%	100%
Total - \$Mil	612,343	21,289	7,852	524,170	14,842	119,683	1,300,179

Total = Net Written Premium plus Net Loss and LAE reserve, in millions, 2019.

Red highlight indicates the LOB is one of the top three for that Type of Company.

Bold and heavy box indicates the LOBs that are part of the Type of Company definition.

Source: Appendix 13, Part 5, page 52.



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Indicated Change in Risk Charges - 2017 vs. 2020 Formula - by Risk Category and Type of Company

(1)	(2)	(3)	(4)	(5)	(6)
Row	Type of Company	2020 Risk Charges (\$Billions)	Risk Category		
			Reserve	Premium	ACL
1	Commercial	64.9	9.9%	-4.4%	4.8%
2	Med Prof Liab	2.4	-74.5%	-4.4%	-19.5%
3	NOC	0.9	35.5%	-18.0%	5.7%
4	Personal	84.3	8.0%	0.5%	0.8%
5	Reinsurance	8.2	0.6%	3.6%	0.1%
6	Workers Comp	10.1	4.2%	-4.2%	1.7%
7	Total	170.6	7.2%	-2.3%	2.1%

Type of Companies with the largest changes are Medical Professional, not otherwise classified (NOC), and Commercial. Next Slide for Further discussion.

Source: Appendix 13, Part 1, 5th row, of each risk category section, page 49



Indicated Change in Risk Charges – by Type of Company

Change in Indicated Authorized Control Level (ACL)

(1)	(2)	(3)	(4)	(5)	(6)
Row	Type of Company	2020 Risk Charges (\$Billions)	ACL		
			2014 vs. 2020	2017 vs 2014	2017 vs 2020
1	Commercial	64.9	6.6%	-1.7%	4.8%
2	Med Prof Liab	2.4	-17.1%	-3.0%	-19.5%
3	NOC	0.9	20.7%	-12.5%	5.7%
4	Personal	84.3	0.3%	0.5%	0.8%
5	Reinsurance	8.2	0.6%	-0.5%	0.1%
6	Workers Comp	10.1	3.9%	-2.1%	1.7%
7	Total	170.6	2.8%	-0.7%	2.1%

Change in Indicated Reserve Risk

(1)	(2)	(3)	(4)	(5)	(6)
Row	Type of Company	2020 Risk Charges (\$Billions)	Reserves		
			2014 vs. 2020	2017 vs 2014	2017 vs 2020
1	Commercial	78.3	13.7%	-3.3%	9.9%
2	Med Prof Liab	2.3	-70.1%	-14.9%	-74.5%
3	NOC	0.6	85.3%	-26.9%	35.5%
4	Personal	26.8	3.1%	4.8%	8.0%
5	Reinsurance	3.1	6.0%	-5.1%	0.6%
6	Workers Comp	12.3	7.7%	-3.2%	4.2%
7	Total	123.4	9.3%	-1.9%	7.2%



Indicated Change in Risk Charges – by Type of Company

Change in Indicated Premium Risk

(1)	(2)	(3)	(4)	(5)	(6)
Row	Type of Company	ACL Value with 2020 Risk Charges	Premium		
			2014 vs. 2020	2017 vs 2014	2017 vs 2020
1	Commercial	33.9	-3.7%	-0.7%	-4.4%
2	Med Prof Liab	1.5	2.7%	-6.9%	-4.4%
3	NOC	0.7	-16.6%	-1.7%	-18.0%
4	Personal	32.1	-0.5%	0.9%	0.5%
5	Reinsurance	0.7	7.3%	-3.4%	3.6%
6	Workers Comp	5.5	0.1%	-4.3%	-4.2%
7	Total	74.4	-1.9%	-0.4%	-2.3%

Source (slides 14 and 15):

Col 4 from Appendix 13, Part 1, 3rd row of each risk category section, page 49.

Col 5 from Table 1e, page 11.

Col 6 from Appendix 13, Part 1, 5th row of each risk category section, page 49.

Notes: Commercial with zero PL change has Reserve, Premium and ACL changes of 2.6%, -4.4%, and 0.8% respectively.



Current and Indicated Risk Factors by LOB

Comparison of Risk Factors						
2020 RBC Formula versus 2017 Indicated						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Line	PRC%s			RRC%s		
	2020 RBC Formula	Indicated (2017 Data)	% Change	2020 RBC Formula	Indicated (2017 Data)	% Change
(1) H/F	25.4%	24.9%	-1.7%	21.3%	22.3%	4.5%
(2) PPA	19.7%	20.4%	3.2%	17.9%	20.1%	12.5%
(3) CA	29.6%	30.8%	4.0%	27.6%	36.1%	30.9%
(4) WC	30.6%	29.1%	-4.7%	34.4%	33.5%	-2.6%
(5) CMP	25.7%	25.3%	-1.6%	49.4%	49.9%	1.0%
(6) MPL Occ.	92.3%	73.5%	-20.3%	38.3%	26.5%	-30.7%
(7) MPL C-M	38.5%	40.4%	5.0%	27.6%	9.4%	-66.0%
(8) SL	27.6%	29.1%	5.2%	30.4%	41.5%	36.5%
(9) OL	31.7%	31.8%	0.3%	53.1%	52.7%	-0.7%
(11) Spec. Prop.	18.0%	13.2%	-26.6%	24.6%	27.8%	12.9%
(12) APD	6.8%	6.9%	1.5%	15.5%	13.2%	-14.6%
(10) Fidelity / Surety	35.4%	16.6%	-53.2%	37.1%	60.0%	61.8%
(13) Other	19.1%	18.9%	-1.0%	22.0%	22.5%	2.3%
(15) International	67.3%	115.1%	71.0%	35.9%	104.4%	190.9%
(16) Reins. Prop. / Fin.	50.7%	50.7%	0.1%	41.5%	34.3%	-17.3%
(17) Reins. Liab.	59.0%	52.0%	-11.9%	65.6%	63.6%	-3.0%
(18) PL	59.3%	60.0%	1.2%	80.2%	147.2%	83.6%
(14) Financial / Mortgage	93.9%	192.9%	105.4%	17.9%	0.1%	-99.4%
(19) Warranty	11.2%	23.3%	108.0%	37.1%	31.2%	-15.8%
Average Risk Factor- all Lines	23.4%	23.8%	1.6%	36.2%	37.6%	3.8%
Average Risk Factor- 10-Yr Lines	26.9%	26.7%	-0.5%	37.5%	39.0%	4.2%
Average Risk Factor- 2-Yr Lines	14.6%	16.3%	11.6%	22.6%	21.8%	-3.2%



Notes:

Current and Indicated Risk Factors by LOB Source:

Notes:

- As shown in slides 14-15, much of the change shown in this table was already recognized in review with 2014 data.
- The next slides discuss LOBs affected by particular issues.

Source:

- Col 3 and Col 6 from Table 1b, col 3 and 6 respectively.
- Col 2 calculated from Table 1a, Col 2, Risk Factor in col 2 plus 2017 industry average expense by LOB, minus 100%
- Col 5 from Table 1a, col 5.
- Col 4 = col 3 / col 2 - 100%; col 7 = col 6 / col 5 - 100%



LOB-Specific Considerations – Page 1 of 2

The bulk of the premium/reserves is from LOBs with no notable features; however, we note the following about certain LOBs.

- **Warranty**
 - Low volume
 - Limited number of years as started in 2008 on phase-in basis (for many companies). Therefore, incomplete data until Annual Statement Year 2017
- **Financial /Mortgage Guarantee**
 - Low volume
 - RBC data excludes single state monoline guaranty companies. That excludes more than half the data from RBC calibration. Exclusion is OK, as excluded companies are not subject to RBC, but it creates differences in indications between Annual Statement and RBC data.
 - These companies are subject to some special reserve provisions that we have not investigated.
- **International**
 - Low Volume
 - Proportionately more of historical experiences arises from earlier years. Therefore, relevance to current experience is lower.



LOB-Specific Considerations – Page 2 of 2

- Products Liability
 - Asbestos and environmental liability claim emergence from 1980's and prior affects Reserve Runoff Ratios (RRRs) in each runoff year in our experience period. We have not measured the extent to which that factor contributes to the 87.5th percentile RRR.
 - The same issue might affect reinsurance liability and other liability, but it appears to be a lower influence on those LOBs.
- Workers' Compensation:
 - Tabular discount effects development WC. We have not adjusted development which arises from that discount, and we have not collected information on the extent to which it is significant.
- Minimum Risk charge
 - Medical Professional Liability (MPL) claims made and financial/mortgage guaranty reserve risk charges are below zero after Investment Income Adjustment (IIA).
 - Auto physical damage premium risk below 5%



Methodology-1 - History

- NAIC established Line 4 risk factors when the RBC formula was first implemented in 1996.
- At the request of the NAIC, the Academy issued reports reviewing the factors in 2004, 2007, 2010, 2016 and 2021.
- The NAIC and Academy methodology through 2010 used a single Annual Statement (at most ten Accident Years (AYs) and nine Reserve Years) of data.
- In 2010 the Casualty Actuarial Society (CAS) initiated research into the calibration method, and the Academy indications based on 2014 data and currently 2017 data, reflect the results of that CAS Research.
- A major change in the 2014 and 2017 indications is the use of multiple Annual Statements and all available AYs and reserve years, rather than just the latest ten years. In this Report, the experience periods covers 30 years.
 - The longer period reflects risks of more underwriting cycles, variations in economic conditions, and uses more mature year (many data points are 10 years mature, whereas most data points are less than 10 years mature when using a single Annual Statement)



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Methodology-2: Premium Risk Factor (PRF)

- The PRF for a LOB is a component of the premium risk charge, which reflects the risk that a subsequent year of company premium, net of reinsurance, will produce an adverse UW result.
- The indicated PRF for each LOB is derived from loss and loss adjustment expense ratios net of reinsurance (“loss ratios” LRs”), for each company/year.
- The indicated PRF is the 87.5th percentile of the LRs after the filtering described below.
 - LRs company and AY are from Schedule P Part 1 for Ten-Year LOBs and from RBC Filings for Two-Year LOBs
 - 30 Accident Years – 1988 through 2017

LOB	Co./Pool	AY	Prem	Loss	LR
A	abc	1988	1,227	1,051	85.7%
A	def	1988	1,234	962	78.0%
A	gji	1988	1,247	773	62.0%
...
A	jkl	2017	1,737	685	39.4%
A	mno	2017	1,767	788	44.6%
A	pqr	2017	1,829	964	52.7%
...
B	stu	1988	1,536	1,867	121.5%
B	vwx	1988	1,543	0	0.0%
B	aab	1988	1,558	2,295	147.3%



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Methodology-2: Reserve Risk Factor (RRF)

- The RRF for a LOB is a component of the reserve risk charge, which reflects the risk that currently reported reserves for loss and all loss adjustment expense, net of reinsurance, will develop adversely from the initial reserve date to ultimate.
- The indicated RRF for each LOB is derived from RRRs by company/year. The denominator of the RRR is the carried loss reserve, for all AYs combined, at the initial reserve date. The numerator of the RRR is the increase/decrease in the company estimated incurred losses for all AYs combined from that initial reserve date to the latest available evaluation date.
- The indicated RRF is the 87.5th percentile of the RRRs after the filtering described below.
- 29 Initial Reserve Dates – 1988-2016

LOB	Co./Pool	Init Rsv Yr	Init'l Rsv	Inc'd Dev	RRR
A	abc	1988	1,290	-43	-3.3%
A	def	1988	1,291	1,032	79.9%
A	gji	1988	1,314	-39	-3.0%
...
A	jkl	2016	2,739	-1,064	-38.8%
A	mno	2016	2,741	-94	-3.4%
A	pqr	2016	2,791	-501	-18.0%
...
B	stu	1988	9,558	2,352	24.6%
B	vwx	1988	9,621	1,514	15.7%
B	aab	1988	9,669	-29	-0.3%



Data

- We obtain our data from:
 - Annual Statements, for years 1989–2017
 - Ten-Year LOBs
 - Two-Year LOBs
 - Confidential RBC Filings for Two-Year LOBs, for filing years 1994–2017
 - Two-Year LOBs

- That data provides the following experience periods, for at least some LOBs:
 - AYs – 1980-2017
 - Initial Reserve Years -1980 – 2016

23

Source: Pages 15-16. Appendix 1 pages 22-24.



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Reserve Runoff Example

Step 1 – Incurred Movement

Schedule P - Part 2

	1	2	3	4	5	6	7	8	9	10	11	12
INCURRED NET LOSSES AND DEFENSE AND COST CONTAINMENT EXPENSES REPORTED AT YEAR END (\$000 OMITTED)											DEVELOPMENT	
Years in Which Losses Were Incurred	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	One Year	Two Year
1 Prior	730	510	470	450	450	450	440	440	440	440	0	0
2 2008	4,890	3,750	3,700	3,620	3,620	3,620	3,620	3,620	3,620	3,620	0	0
3 2009	XXX	5,010	4,110	3,680	3,730	3,660	3,650	3,650	3,660	3,660	0	10
4 2010	XXX	XXX	3,720	2,850	2,810	2,670	2,640	2,620	2,620	2,620	0	0
5 2011	XXX	XXX	XXX	3,150	2,500	2,490	2,480	2,480	2,480	2,470	-10	-10
6 2012	XXX	XXX	XXX	XXX	2,900	2,230	2,190	2,170	2,170	2,150	-20	-20
7 2013	XXX	XXX	XXX	XXX	XXX	2,700	1,960	1,970	1,960	2,050	90	80
8 2014	XXX	XXX	XXX	XXX	XXX	XXX	3,770	3,580	3,530	3,370	-160	-210
9 2015	XXX	XXX	XXX	XXX	XXX	XXX	XXX	270	310	300	-10	30
10 2016	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0	0	0	XXX
11 2017	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0	XXX	XXX
12 Total											-110	-120

2008 example	730	440
	4,890	3,620
	5,620	4,060
		-1,560

Source: Appendix 12, Table A-9a, pages 45-46.



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Reserve Runoff Example – Step 2: Initial Reserve and RRR

Schedule P - Part 3

Years in Which Losses Were Incurred	1	2	3	4	5	6	7	8	9	10	Number of Claims Closed With Loss Payment	Number of Claims Closed Without Loss Payment
	CUMULATIVE PAID NET LOSSES AND DEFENSE AND COST CONTAINMENT EXPENSES REPORTED AT YEAR END (\$000 OMITTED)											
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017		
1 Prior	0	390	450	440	440	440	440	440	440	430	1,110	170
2 2008	2,100	3,360	3,580	3,620	3,620	3,620	3,620	3,620	3,620	3,620	860	150
3 2009	XXX	1,540	2,770	3,350	3,620	3,640	3,650	3,650	3,660	3,650	610	100
4 2010	XXX	XXX	1,410	2,180	2,380	2,570	2,600	2,600	2,600	2,600	490	90
5 2011	XXX	XXX	XXX	1,280	2,120	2,310	2,430	2,440	2,440	2,470	420	50
6 2012	XXX	XXX	XXX	XXX	980	1,630	1,880	2,010	2,080	2,100	410	40
7 2013	XXX	XXX	XXX	XXX	XXX	1,150	1,780	1,830	1,890	2,000	460	50
8 2014	XXX	XXX	XXX	XXX	XXX	XXX	1,560	2,590	3,200	3,300	530	70
9 2015	XXX	XXX	XXX	XXX	XXX	XXX	XXX	140	150	160	40	0
10 2016	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0	0	0	0
11 2017	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0	0	0

2008 Example	730	0										
	4,890	2,100										
	5,620	2,100	3,520									
							RRR= -1,560 divided by	3,520 =				-44.3%

Source: Appendix 12, Table A-9b, pages 45-46.



Methodology-3

- Risk Factor equals the observed 87.5th percentile LR or RRR, respectively,
- After “filtering” data to consider the following:
 - RBC vs Annual Statement Data for Two-Year LOBs
 - Experience Period
 - Anomalous data points
 - Pooling adjustment
 - “Minor lines” (threshold usually 5% of all-lines premium, by company)
 - Maturity of data points
 - LOB years of experience (“Age”)
 - LOB Size (LOB-premium or LOB initial reserve)
 - Survivorship
- We discuss these filters in the next set of slides



Data Source – RBC Filings or Annual Statement Data for Short Tail LOBs

LOB	Indicated PRFs					
	RBC	A/S	A/S - RBC	RBC	A/S	% increase in
	(1)	(2)	(3)	No. Pts (4)	No. Pts (5)	No Pts [(5)-(4)]/(4) (6)
(11) Spec. Prop.	0.831	0.836	0.005	13,073	14,941	14%
(12) APD	0.837	0.847	0.010	13,847	15,121	9%
(10) Fidelity / Surety	0.666	0.704	0.038	2,830	3,389	20%
(13) Other	0.933	0.953	0.020	2,698	3,083	14%
(14) Financial / Mortgage	2.588	1.929	(0.659)	339	1,042	207%
(19) Warranty	0.975	0.902	(0.073)	134	182	36%

LOB	Indicated RRFs					
	RBC	A/S	A/S - RBC	RBC	A/S	% increase in
	(1)	(2)	(3)	No. Pts (4)	No. Pts (5)	No Pts [(5)- (4)]/(4) (6)
(11) Spec. Prop.	0.278	0.238	(0.040)	8,903	11,767	32%
(12) APD	0.132	0.163	0.030	7,508	11,161	49%
(10) Fidelity / Surety	0.600	0.311	(0.290)	1,941	2,636	36%
(13) Other	0.225	0.175	(0.050)	1,886	2,434	29%
(14) Financial / Mortgage	0.001	0.274	0.273	226	957	323%
(19) Warranty	0.312	0.349	0.037	76	144	89%

Source: Table A-1, Appendix 1, pages 24-26.



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Exclude AYs and Initial Reserve Years Prior to 1988

- Experience for AYs/Reserve Years 1980 to 1987 were not available for the 2016 Report.
- Looking at indicated Risk Factors by decade, we find that for nearly all the liability LOBs, this oldest block of years shows the highest indicated PRFs and RRFs.



Experience by Decade – PRFs

Line	PRF			
	80-89	90-99	00-09	10-17 ⁽²⁾
(1) H/F	0.918	0.999	0.946	0.909
(2) PPA	1.074	0.969	0.955	0.959
(3) CA	1.193	1.069	0.958	1.017
(4) WC	1.198	1.041	1.042	0.928
(5) CMP	1.020	0.951	0.848	0.857
(6) MPL Occ.	1.777	1.634	1.379	1.254
(7) MPL C-M	1.035	1.368	1.084	1.023
(8) SL	1.145	0.996	0.892	0.882
(9) OL	1.634	1.076	1.016	0.930
(11) Spec. Prop.	0.722	0.858	0.797	0.840
(12) APD	0.773	0.847	0.817	0.857
(10) Fidelity / Surety	0.673	0.666	0.760	0.543
(13) Other	0.905	0.947	0.932	0.903
(15) International	1.708	1.623	1.675	1.630
(16) Reins. Prop. / Fin.	1.363	1.235	1.268	1.127
(17) Reins. Liab.	1.785	1.328	1.359	0.903
(18) PL	1.496	1.378	1.290	1.067
(14) Financial / Mortgage	2.726	2.530	2.506	2.000
(19) Warranty		0.663	0.937	0.900
Average Risk Factor- all Lines	1.056	0.991	0.950	0.925
Average Risk Factor- 10-Yr Lines	1.143	1.023	0.979	0.941
Average Risk Factor- 2-Yr Lines	0.834	0.907	0.877	0.884

29

Source: Table A-3, page 28. Appendix 2, pages 26-29.

Using AY 1988-2017, versus 1980-2017 reduces all-lines indicated average PRF from .992 to .967 (Table A-4, page 21).



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Experience by Decade – RRFs

Line	RRF			
	80-89	90-99	00-09	10-16 ⁽²⁾
(1) H/F	0.398	0.195	0.272	0.200
(2) PPA	0.396	0.165	0.195	0.246
(3) CA	0.589	0.349	0.359	0.423
(4) WC	0.536	0.293	0.382	0.134
(5) CMP	0.973	0.553	0.456	0.366
(6) MPL Occ.	0.981	0.246	0.361	0.138
(7) MPL C-M	0.242	0.133	0.081	0.116
(8) SL	0.651	0.680	0.277	0.102
(9) OL	1.612	0.619	0.521	0.261
(11) Spec. Prop.	0.252	0.305	0.246	0.282
(12) APD	0.045	0.119	0.164	0.146
(10) Fidelity / Surety	0.373	0.915	0.560	0.264
(13) Other	0.132	0.239	0.272	0.119
(15) International	2.489	2.141	0.460	0.273
(16) Reins. Prop. / Fin.	0.732	0.416	0.314	0.000
(17) Reins. Liab.	1.023	0.658	0.729	0.060
(18) PL	2.490	1.532	1.701	0.701
(14) Financial / Mortgage		0.059	0.000	0.006
(19) Warranty			0.113	0.508
Average Risk Factor- all Lines	0.780	0.389	0.392	0.223
Average Risk Factor- 10-Yr Lines	0.835	0.400	0.409	0.227
Average Risk Factor- 2-Yr Lines	0.163	0.267	0.212	0.182

30

Source Table A-3, page 28., Appendix 2, pages 26-29.

Using AY 1988-2016, versus 1980-2016 reduces all-lines indicated average RRF from .471 to .376 (Table A-4, page 21).



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Exclude AYs and Initial Reserve Years Prior to 1988

- This pattern may be due to factors that might not be applicable to current conditions. For example, the 1993 Report on Reserve and Underwriting Risk Factors by the American Academy of Actuaries Property/Casualty Risk-Based Capital Task Force (page 4) identified four reasons why the experience of the 1980's might not be suitable for projection of the future. These are:
 - *The tort liability explosion, particularly in respect to asbestos and environmental liabilities.*
 - *A great deal of naïve capacity, focused especially on general liability and reinsurance lines.*
 - *High interest rates, creating intense pressures to engage in cash flow underwriting*
 - High inflation rates
- Other considerations include:
 - Company loss reserving practices may have improved because of required actuarial opinions and increased regulatory, rating agency and management attention to reserving.
 - The adverse experience in these years triggered expansion in the use of claims-made policies, pollution exclusions, asbestos exclusions, and other policy changes.
 - Company pricing discipline and pricing methodology may have improved since the 1980's.



Anomalous Data – Introduction

- Unexpected zeros
- Zero interior
- $RRR > 5$

We discuss these filters in the next three slides



Anomalous Data- Unexpected Zeros

Premium Risk

- For PRFs, we exclude risk data points with anomalous values, i.e., negative values for premiums or incurred losses. We exclude zero incurred losses, as these can represent unusual financial transactions or other data anomalies.

Reserve Risk

- For RRFs, we exclude the entire company/LOB/statement year data triangle, before pooling, if:
 - Any calendar year has negative cumulative incurred losses, all AYs combined
 - Any calendar year has negative total cumulative paid losses, all AYs combined
 - Any calendar year has a negative total reserve, all AYs combined
 - The interior of the development triangle is entirely zero values
- Also, for both Annual Statement and RBC data, we exclude risk data points where the initial reserve is zero.



Anomalous Data - RRR>5

Absolute (RRR)>5

We exclude RBC risk data with absolute values of RRR>5 for Two-Year LOBs. In the 2016 Report, we excluded RRR values greater than 5 for both Ten-Year LOBs and Two-Year LOBs because we were concerned that the ratios reflected data quality issues.

Line	RRR - Exclude if over 500%		Difference	
	Yes	No	%	value
(1) H/F	0.221	0.223	1%	0.002
(2) PPA	0.200	0.201	1%	0.001
(3) CA	0.361	0.361	0%	0.000
(4) WC	0.334	0.335	0%	0.001
(5) CMP	0.494	0.499	1%	0.005
(6) MPL Occ.	0.259	0.265	2%	0.006
(7) MPL C-M	0.090	0.094	4%	0.004
(8) SL	0.386	0.415	7%	0.029
(9) OL	0.520	0.527	1%	0.007
(15) International	0.850	1.044	23%	0.195
(16) Reins. Prop. / Fin.	0.342	0.343	0%	0.002
(17) Reins. Liab.	0.598	0.636	6%	0.038
(18) PL	1.280	1.472	15%	0.192
Average Risk Factor- 10-Yr Lines	0.381	0.390	2.4%	0.009

Source: Table A-5a, Appendix 4, page 32.



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Sample RBC Zero Interior Triangle

	1	2	3	4	5	6	7	8	9	10
INCURRED NET LOSSES AND DEFENSE AND COST CONTAINMENT EXPENSES REPORTED AT YEAR END (\$000 OMITTED)										
Years in Which Losses Were Incurred	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
1 Prior	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2 2008	1,875									1,231
3 2009		1,926								1,267
4 2010			3,378							2,943
5 2011				7,774						7,393
6 2012					8,010					9,423
7 2013						9,751				9,927
8 2014							11,581			18,535
9 2015								14,533		18,086
10 2016									23,314	24,070
11 2017										



Other Filters – Page 1 of 4

Pooling adjustment

- We combine risk data points from intercompany pool participants into a single pool-wide risk data point. Two features of the pooling process are new in this Report.
 - Select the most mature data point before pooling (Maturity First)
 - Exclude Zero Interior data before pooling
- Based on prior year studies, the pooling adjustment generally (and appropriately) increases risk charge.

Source: Page 18, Appendix 3, pages 29-3.1



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Other Filters – Page 2 of 4

“Minor lines” (under 5% of all-line premium by company)

- Exclude risk data points where the premium for the LOB represents a small portion of a company’s all lines premium as defined below.
- For PRFs, the Minor Lines filter compares the LOB premium to the all-lines Net Earned Premium (NEP) for each AY separately. (Same as with 2014 Data)
- For RRFs, the Minor Lines filter compares the NEP for the LOB for a period of years—10 years prior to the reserve data, where practical—to the corresponding all-lines premium. (Revised from method with 2014 Data)
- Thresholds for categorization as a Minor Line are 5% for most LOBs, OL+PL considered together in setting 5%; 2.5% for Special Liability, Fidelity/Surety and Warranty; no filter for International or Financial/Mortgage Guaranty
- Effect of minor line filter:
 - “Standard lines” – little effect
 - “Specialty lines” – reduces risk charge
 - All-year vs 10-year for RRFs. Decreases RRF overall. Magnitude of decreases vary by LOB (see slide 39).

Source: Page 19. Table A-6, page 34. Appendix 5, pages 33-35.



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Other Filters – Page 3 of 4

LOB Size (LOB-premium or LOB initial reserve)

We exclude risk data points where, for a LOB, NEP (or initial reserve) is less than the 15th percentile for the AY or initial reserve year. We smooth the 15th percentile size threshold in one of several ways that we discuss in Report Appendix 7.

Source: Page 19. Appendix 7, page 35-36.

LOB years of experience (“Age”)

We exclude premium and reserve risk data points where, for a particular company/LOB, there are less than **five years** of NEP greater than zero.

This is the same filter that we used in the 2016 Report, although (1) with additional years of experience, there are some “young” LOBs excluded by this age filter in the 2016 Report that are not excluded in this Report, and (2) in this Report we determined age by pool while in the 2016 Report pool age equaled the age of the oldest company within the pool. This change may have excluded some data points that had been included in the 2016 Report.

Source: Appendix 6, page 35.



Other Filters – Page 4 of 4

Maturity of data points

We exclude the least mature risk data points, as we did in the 2016 Report.

For PRFs – Affects five LOBs: MPL Occ, Int’l, Re Liab., PL, Guaranty, and Warranty

For RRFs – Affects All Ten-Year LOBs (except International); Does not affect Two -Year LOBs

The approach is unchanged.

Source: Page 20. Appendix 8, page 37.

Survivorship

By using Annual Statement from all years, we avoid survivorship bias, i.e., companies that cease operation, perhaps because of poor experience, would be excluded if we did not consider old Annual Statement years.

The approach is unchanged.



Analysis of Change – RRF – Compared to 2014 Data

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Line	2014 Indicated RRF	Change as a Percentage of Reserves, Due to:								2017 Indicated RRF
		Minor Line Filter	Other Filters	New Data (< 2014), Development	Recent Years (2014-17)	Zero Interior	Maturity First	Allow |RRR| >500%	Total Change	
(1) H/F	0.213	-0.4%	-0.9%	1.4%	0.0%	0.6%	0.1%	0.2%	1.0%	0.223
(2) PPA	0.179	0.3%	-0.2%	1.2%	0.3%	0.3%	0.2%	0.1%	2.2%	0.201
(3) CA	0.348	-1.1%	-0.1%	1.7%	0.5%	0.4%	0.0%	0.0%	1.4%	0.361
(4) WC	0.344	-0.5%	0.3%	-0.6%	-0.3%	0.2%	0.0%	0.1%	-0.9%	0.335
(5) CMP	0.494	-1.1%	-0.1%	0.2%	0.0%	0.7%	0.2%	0.5%	0.5%	0.499
(6) MPL Occ.	0.296	-1.0%	0.0%	-3.0%	-0.4%	0.4%	0.3%	0.6%	-3.1%	0.265
(7) MPL C-M	0.089	0.0%	0.0%	0.5%	0.0%	0.3%	-0.6%	0.4%	0.5%	0.094
(8) SL	0.431	-0.5%	0.0%	-3.2%	-1.4%	1.3%	-0.7%	2.9%	-1.6%	0.415
(9) OL	0.531	-1.3%	0.3%	-0.5%	-1.0%	1.0%	0.3%	0.7%	-0.4%	0.527
(11) Spec. Prop.	0.428	-4.1%	1.2%	-1.9%	0.0%	-10.9%	0.7%	0.0%	-15.1%	0.278
(12) APD	0.155	0.9%	0.4%	0.9%	0.3%	-3.0%	-1.9%	0.0%	-2.3%	0.132
(10) Fidelity / Surety	0.917	-1.7%	5.7%	4.4%	7.2%	-46.3%	-1.1%	0.0%	-31.6%	0.600
(13) Other	0.375	-5.7%	5.4%	-0.1%	0.6%	-15.8%	0.6%	0.0%	-15.0%	0.225
(15) International	0.695	-0.6%	26.7%	-2.1%	-6.9%	0.4%	-1.9%	19.5%	34.9%	1.044
(16) Reins. Prop. / Fin.	0.415	-6.6%	0.2%	0.7%	-1.6%	0.9%	-0.9%	0.2%	-7.2%	0.343
(17) Reins. Liab.	0.656	-4.7%	0.6%	-3.1%	-1.0%	0.5%	2.0%	3.8%	-1.9%	0.636
(18) PL	1.345	-3.9%	2.8%	-4.5%	-1.1%	0.5%	-0.3%	19.2%	12.8%	1.472
(14) Financial / Mortgage	0.060	-3.7%	-2.3%	0.7%	5.5%	-4.2%	-2.0%	0.0%	-5.9%	0.001
(19) Warranty	0.316	33.2%	-4.7%	8.1%	17.5%	-47.0%	-7.5%	0.0%	-0.4%	0.312
Average Risk Factor - All Lines	0.383	-1.1%	0.3%	-0.1%	-0.2%	-0.5%	0.1%	0.9%	-0.7%	0.376
Average Risk Factor - 10-Yr Lines	0.387	-1.0%	0.2%	-0.1%	-0.3%	0.5%	0.2%	0.9%	0.4%	0.390
Average Risk Factor - 2-Yr Lines	0.344	-3.2%	1.3%	-0.2%	1.9%	-12.0%	-0.4%	0.0%	-12.6%	0.218

Source: Table A-8a, page 43. Appendix 11, pages 42-45.



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Analysis of Change – PRF - Compared to 2014 Data

(1) Line	(2) 2014 Indicated PRF	(3) through (7) Change as a Percentage of Premium, Due to:					(8) 2017 Indicated PRF
		(3) Data, Maturity First	(4) Filter	(5) Development	(6) Recent Years	(7) Total Change	
(1) H/F	0.964	0.2%	0.1%	0.0%	-0.7%	-0.4%	0.960
(2) PPA	0.969	0.7%	0.0%	0.2%	-0.2%	0.6%	0.975
(3) CA	1.010	0.6%	0.1%	0.9%	-0.4%	1.2%	1.022
(4) WC	1.044	0.3%	0.1%	-0.4%	-1.4%	-1.5%	1.030
(5) CMP	0.901	0.2%	0.0%	0.2%	-0.8%	-0.4%	0.897
(6) MPL Occ.	1.490	2.6%	-3.2%	-0.3%	0.0%	-0.9%	1.480
(7) MPL C-M	1.176	-0.1%	-0.2%	-0.6%	-1.8%	-2.7%	1.149
(8) SL	0.949	0.3%	-0.1%	0.1%	0.0%	0.4%	0.952
(9) OL	1.013	0.5%	0.1%	0.3%	-0.7%	0.1%	1.014
(11) Spec. Prop.	0.831	N/A	N/A	N/A	N/A	0.0%	0.831
(12) APD	0.836	N/A	N/A	N/A	N/A	0.1%	0.837
(10) Fidelity / Surety	0.680	N/A	N/A	N/A	N/A	-1.4%	0.666
(13) Other	0.935	N/A	N/A	N/A	N/A	-0.2%	0.933
(15) International	1.638	7.4%	0.0%	0.0%	0.0%	7.4%	1.712
(16) Reins. Prop. / Fin.	1.240	-1.2%	1.3%	-0.1%	0.0%	0.0%	1.240
(17) Reins. Liab.	1.322	-3.7%	-3.5%	0.2%	0.0%	-7.0%	1.252
(18) PL	1.285	-0.3%	-2.0%	0.9%	0.0%	-1.5%	1.270
(14) Financial / Mortgage	2.513	N/A	N/A	N/A	N/A	7.5%	2.588
(19) Warranty	1.028	N/A	N/A	N/A	N/A	-5.3%	0.975
Average Risk Factor - All Lines	0.968	N/A	N/A	N/A	N/A	0.0%	0.967
Average Risk Factor - 10-Yr Lines	0.996	0.3%	0.0%	0.1%	-0.6%	-0.1%	0.995
Average Risk Factor - 2-Yr Lines	0.895	N/A	N/A	N/A	N/A	0.3%	0.897

Source: Table A-7a, page 40. Appendix 11, page 38-41



Thank You

Questions?

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