Assessing Your Own Risk and Solvency

Or, Said Differently… "How Risky are We?" By Joel Kress, ARe

Introduction

Well before the National Association of Insurance Commissioners (NAIC) released their proposed Own Risk and Solvency Assessment (ORSA), we have been asking the question, "How risky is our captive insurance company?" It seems like an innocuous question, but stripping away the layers of complexity took many years as each nuanced answer created another question. Even with a hypothetically incontrovertible answer as to the amount of Risk we bear, it is impossible to gauge the risk appetite of our Board of Directors and the impact of future business opportunities.

The Oxford English Dictionary (OED) defines Risk as "*(Exposure to) the possibility of loss, injury, or other adverse or unwelcome circumstance; a chance or situation involving such a possibility."* The key words for discussion within a captive insurance company are "adverse" and "unwelcome." Statistically, there may be the same equally remote chance of no claims occurring as a $20,000,000 claim occurring. But, we spend all our time worrying about, planning for, and purchasing insurance for the $20,000,000 loss. [Perhaps this downside risk is given greater attention because no one ever got fired for upside risk!] For the layperson, we might be able to revise the OED definition to read 'the chance of things not going as planned' but, for the insurance layperson, it usually goes something like, 'the chance of claims costing more money'.

The following article looks to trace the history of our risk analysis odyssey, assess the benefits and detriments of our current method, and look to the future for improvement.

The Question and the Process

The labyrinthine question was (and is), "How risky are we?" The non-linear process continues to this day. In conjunction with our consulting actuary, we began a conversation which unraveled some of the challenges to answering the question. The first challenge was to determine which risks to model. More complex and holistic models aim to quantify risk such as Interest Rate Risk, Currency Risk, etc., but we decided to simply model the most detrimental and most quantifiable risks: Underwriting Risk and Reserve Development Risk.

For Underwriting Risk, we sought to quantify the risk transfer contracts we write on an annual basis. Our Company writes reinsurance to a specific niche market. Depending on the contract, the Self-Insured Retention (SIR) and our Company's limit of liability varies. For Reserve Development Risk, we outlined and measured the risk associated with all past contracts we have written. Since our Company is almost 10 years old, and we write Liability, Workers' Compensation, and Property reinsurance coverage, there will be years (and decades) of further Incurred But Not Reported (IBNR) development on our Balance Sheet. This type of risk accumulates geometrically as the years move on.

Another significant challenge was to supplement our Company's data, since our loss experience alone is limited and statistically non-credible. Using actuarial principles, we compiled our own loss experience by line of business and policy year. Our limited and non-credible loss experience was then supplemented by industry reinsurance data. From this database, our actuaries were able to select both a frequency and severity

distribution. The product of the two distributions is a single loss distribution, which statistically estimates our predictability of loss (sample in Chart 1 and Figure 1).

CHART 1

Global Simulation Distribution Selections

Severity Simulation

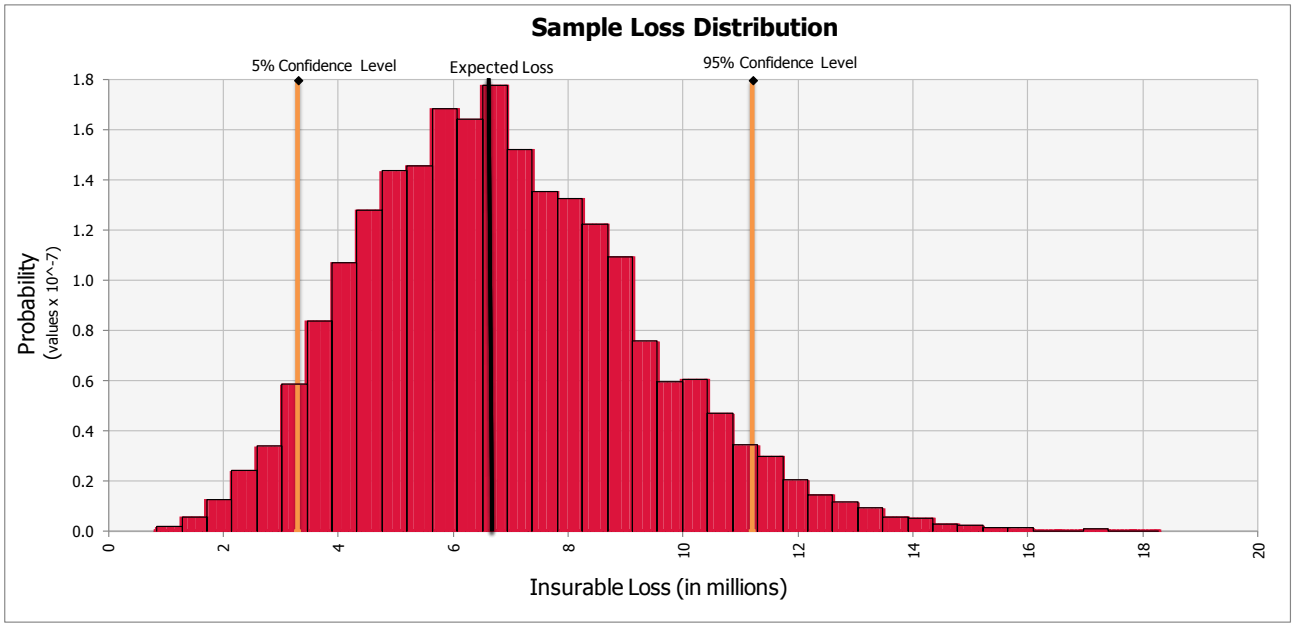
Selected Distribution:	**Pareto**	Parameters:	Theta:	**337,000**
			Alpha:	**1.672**
			Shift:	**100,000**

Frequency Simulation (Claims xs $100,000)

Selected Distribution:	**Poission**	Parameters:	Lambda:	**24**	(distributed by Gamma)
			Alpha:	**400**	
			Beta:	**0.165**	

Note: All information is illustrative and does not represent actual data or assumptions of captive's risk simulation model.

FIGURE 1



Using commercially available simulation software, we then created a profile for each contract written in the most recent policy year (2011). Each profile contains a contract's effective date, expiration date, and line of business. The profile also differentiated Severity information: SIR attachment, our Company's limit of liability, quota share, etc.; and Frequency information: Claim Count, Loss Costs, Exposure Base, etc. (See Chart 2). The goal was to distill the amount of exposure to loss, which is simply frequency x severity, that our Company held as the risk bearing captive.

CHART 2

Policy Year 2011 Loss Simulation

Contract Number	ABC	DEF	GHI	JKL	...
Effective Date	1/1/11	1/1/11	7/1/11	9/1/11	...
Expiration Date	1/1/12	1/1/12	7/1/12	9/1/12	...
Severity Retentions					
Layer 1					
Contract Retention	500,000	1,000,000	1,000,000	1,000,000	...
Captive Retention	1,500,000	9,000,000	3,000,000	9,000,000	...
Captive Quota Share	100.0%	16.5%	83.0%	20.0%	...
Captive Layer 1 Retained	1,500,000	1,485,000	2,490,000	1,800,000	...
Layer 2					
Contract Lower Limit		10,000,000			
Size of Layer		5,000,000			
Quota Share		20.0%			
Captive Layer 2 Retained		1,000,000			
Frequency Exposures					
Net Written Premium	178,925	140,285	50,784	93,033	...
Claim Counts	12	41	7	37	...
Expected $100k Loss Costs	313,904	988,619	121,400	811,332	...
Trended Ult Loss >$100,000	8,955,727	18,371,187	1,474,911	27,264,492	...
Estimated Exposure	470,589,769	3,851,972,484	5,449	4,153,388	...
Exposure Base	Expenditures	Expenditures	Expenditures	Expenditures	...
Selected Freq Exposures					
Net Written Premium	38.6%	30.3%	11.0%	20.1%	...
Claim Counts	11.9%	42.9%	7.1%	38.1%	...
Expected $100k Loss Costs	14.0%	44.2%	5.4%	36.3%	...
Trended Ult Loss >$100,000	16.0%	32.8%	2.6%	48.6%	...
Selected Freq Exp	**14.0%**	**40.0%**	**5.1%**	**41.0%**	...

Note: All information is illustrative and does not represent actual data or assumptions of captive's risk simulation model.

The final piece was to estimate the risk for the historical policy periods. Our Company receives an annual Statement of Actuarial Opinion, which includes an actuarially determined expected value, or point estimate, for IBNR and Case Reserves by line of business and policy year (see Chart 3). Using the selected loss distribution, we could also measure the variability around the expected loss reserves. This variability or, of greater concern, the variability of losses costing more than expected, was the third piece to our risk metric.

CHART 3

	Actuarial Reserves as of 12/31/10					
Accident Year Ending 12/31/XX	LB Loss & DCC Reserves	WC Loss & DCC Reserves	PROP Loss & DCC Reserves	**TOTAL Loss & DCC Reserves**	Estimated AOE Reserves	**TOTAL Loss & LAE Reserves**
2003	1,299,931	251,230	135,277	**1,686,438**	21,542	**1,707,980**
2004	529,703	957,954	515,822	**2,003,479**	14,741	**2,018,220**
2005	787,509	1,145,518	616,818	**2,549,845**	19,221	**2,569,066**
2006	1,016,427	630,021	339,242	**1,985,690**	24,129	**2,009,819**
2007	1,706,467	848,281	456,766	**3,011,514**	38,814	**3,050,328**
2008	4,232,038	1,134,522	610,897	**5,977,457**	62,175	**6,039,632**
2009	3,576,221	831,968	447,983	**4,856,172**	47,598	**4,903,770**
2010	3,835,166	1,481,251	797,597	**6,114,014**	91,133	**6,205,147**
Total	16,983,462	7,280,746	3,920,401	28,184,609	319,354	28,503,963

Note: All figures are illustrative and do not represent any one company.

Again and Again. 10,000 Times…

Our selected loss distribution looks like many other (re)insurance loss distributions. It is skewed towards the right, which indicates a chance, albeit slim, of a large, calamitous loss. In our discussion of Risk, everyone seems content to focus on the right side of the curve. This is the statistical side of the curve that "costs more money".

The majority of risk is for contracts which are currently being written, since the insurable events have not yet occurred. To assess this risk, we turn to modern technology. Using the above discussed input variables, the simulation software estimates our Company's losses for the current policy year's contracts. The algorithm is as follows:

1. Randomly identifies a number of claims based on the selected frequency distribution.
2. Randomly identifies a size for each claim based on the selected severity distribution.
3. Assigns each claim and its associated severity to a contract written based on the selected frequency exposure percentage.
4. Using the contract profile, the exposure to the Company is calculated.
5. Sums all the Company's exposure for the entire current policy year.

This process is for a single statistical policy year. To take advantage of the simulation software and the Law of Large Numbers, this algorithm is run for 10,000 hypothetical policy years. From this tome of data, the statistical metrics such as Expected Level, 60th Confidence Level, 70th Confidence Level, etc. are determined. The output is shown in the second column of Chart 4 labeled "Loss Forecast".

CHART 4

Simulation Results - In-Force Policies and Historical Reserves
Loss Forecast : Scenario 1
(000's Omitted)

Statutory Surplus as of 12/31/10 — 23,275

	Simulated Values				
Confidence Level	Loss Forecast	Reserves	Forecast and Reserves	Amount Over Expected	Adjusted Surplus
Expected	6,946	28,504	35,450		
60%	7,360	29,376	36,415	965	22,310
70%	8,086	30,359	37,623	2,172	21,102
80%	8,943	31,538	39,080	3,629	19,645
90%	10,226	33,211	41,037	5,587	17,688
95%	11,280	34,729	42,661	7,211	16,064
97%	12,005	35,615	43,639	8,189	15,086
99%	13,411	37,414	46,027	10,576	12,698

		Confidence Level
Captive's Contributed Capital	**18,468**	**86.6%**
RBC Company Action Level	19,176	82.8%
RBC Regulatory Action Level	16,045	95.0%
RBC Authorized Control Level	12,675	98.9%
RBC Mandatory Control Level	10,972	99.6%

Note: All figures are illustrative and do not represent any one company.

The third column labeled "Reserves" is the variability of the historical policy year's reserves. Note, the Expected figure of $28,504 (rounded to the 1,000) matches the actuarial opinion figure in Chart 3. These two columns are added together in "Forecast and Reserves" and the difference between the Expected and various Confidence Levels can been seen in "Amount over Expected".

This is the end of the simulation portion of the process. From here, we needed a way to measure the results. We decided to use Surplus as a measuring stick since it is easily understood, readily calculable, and of concern to most interested parties. At the top right of Chart 4, you see our year-end 12/31/10 Surplus level of $23,275 (in 000's). Below it is the column labeled "Adjusted Surplus". This is calculated by subtracting the respective amounts in column "Amount over Expected", which can be thought of as a drain on Surplus. For instance, at a 60% Confidence Level, our Surplus would need to make up a $965,000 shortfall in losses.

This is the Risk we are modeling. The amount of extra money our current and historical contracts will cost beyond what is expected.

The last step was to determine the statistical benchmarks we would measure ourselves against. Five benchmarks of ruin are listed. The first is the total Captive's Contributed Capital, which represents the point in which all contributed capital could be returned, and all losses could be paid for by premium and investments. By pegging that number at the 86.6% Confidence Level, this implies a 13.4% chance of our risk contracts depleting our Surplus to the point of the exact amount of contributed capital.

The second set of benchmarks is the Risk Based Capital ("RBC") marks of Company Action Level, Regulatory Action Level, Authorized Control Level, and Mandatory Control Level. These benchmarks signify varying degrees of regulatory authority from "requesting a comprehensive financial plan to address concerns" to "taking steps to place the insurer under control". Respectively, the chances of this happening are between 17.2% and 0.4%.

The Power of the Information Age

None of this minutia would be possible without the power of computers. It is one thing to program an algorithm to do a set of tasks, as outlined above. It is another thing entirely to make the computer work for you. There are two main benefits of having this tool at our Company's fingertips.

The first benefit stems from the first natural question any analyst looking at one data point has: "How has this changed over time?" As stated previously, our Company has existed for almost 10 years. Since the first couple of years were considered premature, we aimed to recreate historical snapshots back to 2006 to compare to the current measures of Risk. Charts 6 and 7 show how the Contributed Capital and two RBC Benchmarks have changed over the past several years. The model correctly estimated increases in our Company's capacity and additional contracts written, but by and large we have become less risky over the years.

The second benefit of the model is to be able to simulate hypothetical future policy years. These results are shown as the right-hand bars of Charts 6 and 7 (lightly shaded 2012 data). This output was run before the 2012 contracts were written, essentially allowing us to create "What If?" scenarios. Most of our contracts do not change from year to year, but "What If" you have the opportunity to write a contract valued at roughly 20% of your portfolio? How does that affect the Risk to your current Surplus? Are you comfortable with an increased (or decreased) Risk to your Company's assets? These are all questions we can now answer, at least from a consistent and statistical standpoint.

CHART 6

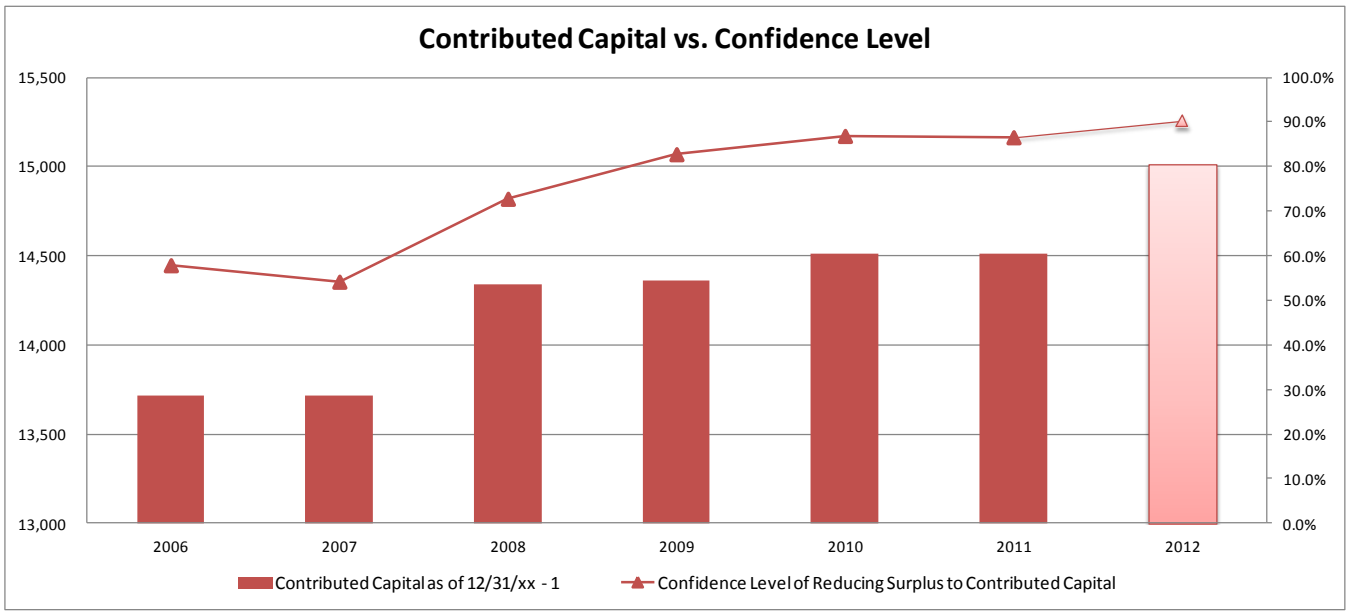
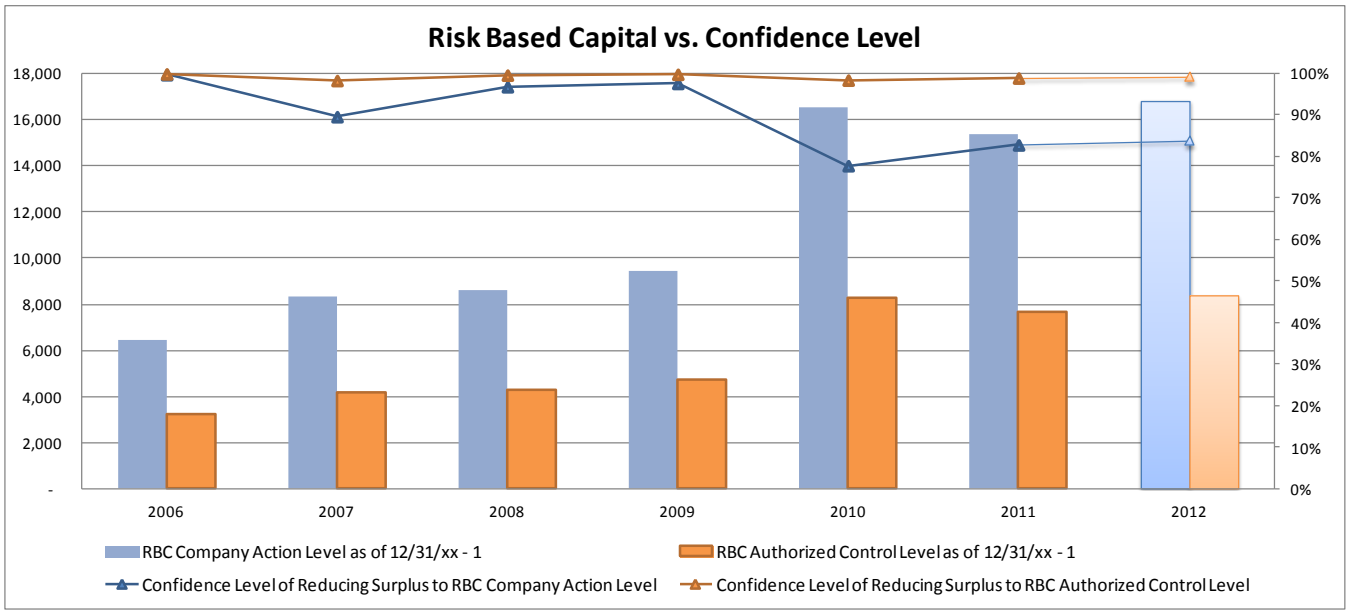


CHART 7



"Essentially, all models are wrong, but some are useful." **-George E.P. Box**

It is fairly common knowledge that all models are limited in their ability to simulate real world events. Our Company's model is no exception to this statement. Albeit imperfect, we believe there are large benefits to maintaining and assessing our risk tolerance for current and future books of business using this particular model.

Acknowledging the model's flaws is the first step towards understanding it is just one tool that management has to make sure our Company is running smoothly. We are constantly tweaking the model to make it more accurate, more relevant, and more useful. In the immediate future, we aim to be able to tie it to budgeting, integrate it with pricing, and use it within governance. With respect to governance, this may help our Company later on down the road with the NAIC's ORSA initiative. By creating a policy around Risk, as the proposed ORSA directs, our Board of Directors and Regulators can feel comfortable that management's day-to-day decisions will not exceed the predetermined desired risk levels.

How risky are we? A lot less so, now that we know more than we did before.

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