

Reinsurance Accounting & Strategy for the Actuary

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From its roots in ancient shipping to contemporary applications within the financial system – reinsurance continues to evolve. In spite of significant innovation, the theme remains the same: reinsurance enables insurers to take risk, satisfying internal and external constraints. In this paper, we provide a foundational discussion of the functions and financial implications of reinsurance. Throughout the discussion, we provide examples of the accounting treatment of reinsurance transactions on an array of financial statements. Understanding the accounting impact of reinsurance decisions is important, but true strategic decision-making requires a deeper understanding of the legal, regulatory, economic, tax and financial impacts. While not exhaustive, this paper aims to lay a solid foundation for more robust actuarial dialogue regarding reinsurance transactions and the impact to key financial metrics.

Keywords: Reinsurance, Accounting, Actuarial, Retroactive Reinsurance

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Introduction

On May 5th, 1842, a small fire began to smolder inside a local cigar factory on the outskirts of Hamburg, Germany. Three days later over one third of the city had burned. Although the town had established a *City Fire Fund* to handle such an event, the primary insurance market was not adequately able to cope with the severity of the blaze. From its ashes emerged the first dedicated reinsurance company, Cologne Re. Cologne Re was established to protect against catastrophic risk, a key function the reinsurance market serves to this day.

In the following nine sections we discuss catastrophic risk and eight other roles reinsurance plays in the insurance marketplace today. We examine the individual functions by working through real world business issues and corresponding reinsurance solutions. Along the way we highlight the accounting impact of each solution to financial statements and metrics. Throughout, we shed light on strategic considerations regarding reinsurance programs.

Nine Functions of Reinsurance

1. Large Line Capacity

Business Issue: An attractive opportunity to underwrite high value properties is presented, but underwriting authority / risk appetite is \$100 million for a single policy.

Reinsurance Solution: The company purchases per-risk insurance to limit individual account exposure.

Large line capacity is an insurer's maximum appetite for assuming risk on a **single insurance policy or location**. In this case, underwriting guidelines state no single risk is to exceed \$100 million in net loss exposure. Such internal thresholds are designed to prevent individual accounts from exposing the company to outsized, standalone risk. To address this concern, an insurance company may purchase per-risk reinsurance, in some cases ceding a large portion of each contract. This simultaneously satisfies market demand for coverage while maintaining internal underwriting standards.

The potential impact of implementing such a strategy can be illustrated by comparing the statutory statement of earnings under two scenarios shown below. In Scenario A, the company declines to insure any individual risks exceeding their individual risk appetite of \$100 million. In Scenario B, the company writes these large accounts and then purchases reinsurance to limit their retained net exposure on each risk, allowing the company to increase written premium without violating underwriting controls.

Assumptions:

- 1) Writing large risks results in a 50% increase to earned premium, \$10 million → \$15 million
- 2) Ceded premium for reinsurance is 40% of incremental earned premium (\$2 million)
- 3) The gross loss ratio is assumed to be 55% in both scenarios
- 4) The ceded loss ratio is 47.5%.
- 5) Only the variable component of other underwriting expenses scales proportionally with the premium growth. Fixed expenses are \$2 million.
- 6) Investment income increases as a result of greater premiums earned

Exhibit 1: The Insurance Company Statutory Statement of Income (\$ thousands)

<u>Line</u>	<u>Description</u>	Scenario A	Scenario B Gross	Scenario B Ceded	Scenario B Net	Difference Scenario B vs. A
1.	Premiums earned ^{1,2}	10,000	15,000	2,000	13,000	3,000
2.	Losses incurred ³	4,950	7,425	855	6,570	1,620
3.	Loss adjustment expenses incurred ^{3,4}	550	825	95	730	180
4.	Other underwriting expenses incurred ⁵	4,500	5,750	-	5,750	1,250
8.	Underwriting income	-	1,000	1,050	(50)	(50)
11.	Investment income ⁶	1,000	1,150	-	1,150	150
16.	Net income before income tax	1,000	2,150	1,050	1,100	100
19.	Federal and foreign income taxes incurred	210	231	-	231	21
20.	Net income	790	1,919	1,050	869	79

Increase in net income due to reinsurance strategy: 10.0%

Exhibit 2: The Insurance Company Loss, Expense and Combined Ratios

	Scenario A	Scenario B	Difference
Gross Loss Ratio	55.0%	55.0%	0.0%
Net Loss Ratio	55.0%	56.2%	1.2%
Ceded Loss Ratio	-	47.5%	-
Gross Expense Ratio	45.0%	38.3%	-6.7%
Net Expense Ratio	45.0%	44.2%	-0.8%
Ceded Expense Ratio	-	N/A	-
Gross Combined Ratio	100.0%	93.3%	-6.7%
Net Combined Ratio	100.0%	100.4%	0.4%
Ceded Combined Ratio	-	N/A	-

Observe that the loss ratio and expense ratio are lower on a gross basis than net for Scenario B. The ceded loss ratio (47.5%) is lower than the gross loss ratio for the ceding company (55%). This is common in excess of loss reinsurance treaties, where the reinsurer is typically assuming the riskier layers of business from the ceding company. As a result, the net loss ratio in scenario B is worse. Similarly, the company's net expense ratio, after ceding premium for reinsurance, is worse than its gross expense ratio (44.2% versus 38.3%). However, a comparison of the key accounting entries shows that while the insurer does cede considerable reinsurance premium and profit, there is additional expected net income associated with the growth of the business. Importantly, no growth would have been possible without reinsurance to cover high value property limits.

It is worth noting that there are risks associated with entering into any reinsurance transaction. These risks include: reinsurer credit risk (i.e. default risk), claim dispute risk, liquidity risk (slow-paying risk), affordability risk due to changes in reinsurance pricing, as well as availability risk if there is a shortfall in the supply of reinsurance capacity in the market. Although the risks associated with reinsurance are discussed in the context of capacity reinsurance, they apply to all reinsurance examples discussed in subsequent sections. As a result, insurance companies should consider the financial strength, reputation, and diversity of the reinsurers they utilize. When the primary insurers' ability to pay gross claims is in question, contract provisions such as prompt payments to the cedant should be considered as well.

2. Catastrophic Risk Protection

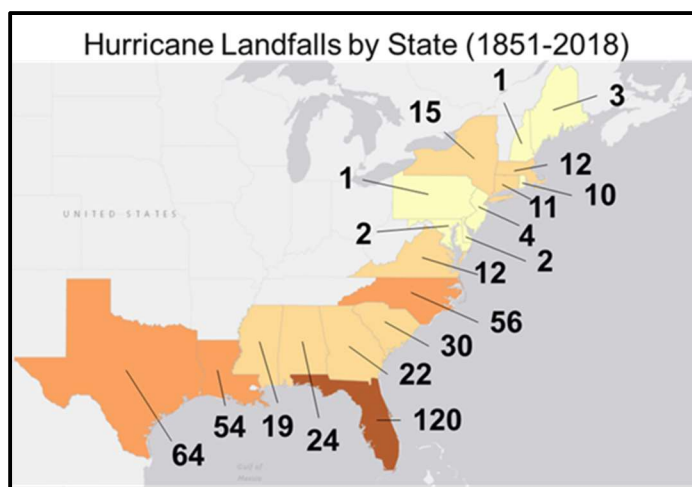
Natural disasters such as hurricanes, earthquakes, tornados, and wildfires can cause damage to large numbers of insureds simultaneously. These risks pose a significant threat to the financial solvency and earnings stability of property and casualty insurance companies. Companies with significant exposure must manage the potential for catastrophic single events and the accumulation of multiple large events.

Business Issue: A company writes 10 billion of property insurance along the coast of Florida. One large hurricane could cause the company to become insolvent.

From June through November, properties in Florida are exposed to the possibility of severe seasonal weather. In recorded history, 120 Atlantic hurricanes directly hit the state, causing significant insurable damage.¹

¹ Landsea, Chris, NOAA, June 19, 2019, www.aoml.noaa.gov/hrd/tcfaq/E19.html

Exhibit 3: Hurricane Landfalls by State



Reinsurance Solution: The company purchases an annual aggregate excess of loss treaty covering losses arising from hurricanes.

The treaty includes the following features:

- Per-Occurrence Deductible: \$500 million
- Annual Aggregate Deductible: \$2 billion
- Annual Limit: \$9 billion
- Covered Peril: Hurricane
- Cost: \$1.5 billion
- Coverage Period: Annual policy beginning on January 1st

This treaty's \$500 million per-occurrence deductible means the company is responsible for the first \$500 million of loss arising from each and every hurricane. This feature reduces the cost of the reinsurance treaty as the company will retain losses from more frequent, less severe events. The \$2 billion annual aggregate deductible represents the amount of loss, in excess of the per-occurrence deductible, that the company is responsible for retaining annually before coverage kicks in. If annual hurricane losses exhaust both deductibles, the treaty will cover losses up to the \$9 billion limit.

We will evaluate this contract by analyzing the statutory surplus position on the balance sheet, at the end of the next calendar year, under three alternative hurricane seasons (high versus medium versus low severity seasons). We isolate the balance sheet impact of reinsurance by introducing a ceded adjustment column. In practice, only the net column exists on a statutory balance sheet. The hurricane loss experience and reinsurance recoveries for the high severity hurricane loss scenario are as follows:

Exhibit 4: Hurricane Loss Experience and Reinsurance Recoveries [High] (\$ millions)

High	Hurricane Season		Net of Per Occurrence
	Gross	Per-Occurrence Deductible	
Hurricane 1	5,000	500	4,500
Hurricane 2	1,000	500	500
Hurricane 3	4,000	500	3,500
	10,000	1,500	8,500
			2,000 <-- Annual Aggregate Deductible
			6,500 <-- Reinsurance Recoverables
			3,500 <-- Net Loss

Assumptions:

- 1) The primary company has paid all direct losses from the first hurricane, i.e. \$5 billion in this scenario, but has yet to be reimbursed by the reinsurance counterparty as of year-end.
- 2) No losses have been paid on hurricanes 2 and 3 on either a direct or ceded basis.

Exhibit 5: The Insurance Company Statutory Balance Sheet [High] (\$ millions)

Statutory Balance Sheet (as of year-end)		Net	Gross	Ceded	Net
		[No Events]	[w/ Events]	Adjustment	[w/ Events]
				[w/ Events]	
<u>Assets</u>					
12.	Cash and invested assets	37,000	32,000	(1,500)	30,500
16.1	Amounts recoverable from reinsurers	0	0	2,500	2,500
28.	Total Assets	37,000	32,000	1,000	33,000
<u>Liabilities, Surplus, and Other Funds</u>					
1.,3.	Losses and loss adjustment expense	15,000	20,000	(4,000)	16,000
9.	Unearned premiums	7,000	7,000	0	7,000
28.	Total Liabilities	22,000	27,000	(4,000)	23,000
37.	Surplus as regards policyholders	15,000	5,000	5,000	10,000

We discuss four of the statutory balance sheet lines impacted by the hurricane loss experience and reinsurance contract:

Assets

I. Cash and Invested Assets

The cost of the reinsurance contract reduces the company's assets by \$1.5 billion. In addition, the company paid \$5 billion in direct loss for the first hurricane, further reducing assets.

II. Amounts Recoverable from Reinsurers

Reinsurance recoverables on losses **paid** by the primary company but not yet recovered from the reinsurer shall be accounted for as an asset. The asset amount is established by first taking the amount **paid to date** for all hurricanes (\$5 billion) net of the per-occurrence deductible of \$500 million. The annual aggregate deductible of \$2 billion is then applied to the remaining \$4.5 billion of contributing loss, resulting in an asset of \$2.5 billion on the balance sheet.²

Liabilities

III. Losses and Loss Adjustment Expense (LAE)

The remaining \$5 billion of unpaid direct losses from hurricanes 2 and 3 are first added to the reserves. Reinsurance recoverables on **unpaid** case and IBNR (Incurred but not reported) loss and LAE reserves shall then be netted against their equivalent gross liabilities. In this case, the remaining \$4 billion of expected ceded recoverables from hurricanes 2 and 3 are subtracted from the gross reserves.

IV. Unearned Premiums

No ceded unearned premium liability exists at year-end since the January 1st contract is fully earned after twelve months.

The hurricane loss experience and reinsurance recoveries for the low and medium severity hurricane loss scenarios are as follows:

Exhibit 6: Hurricane Loss Experience and Reinsurance Recoveries [Low] (\$ millions)

Low	Hurricane Season		Net of Per Occurrence
	Gross	Per-Occurrence Deductible	
Hurricane 1	2,000	500	1,500
Hurricane 2	0	0	0
Hurricane 3	0	0	0
	2,000	500	1,500
			2,000 <-- Annual Aggregate Deductible
			0 <-- Reinsurance Recoverables
			2,000 <-- Net Loss

² If there are collectability issues with the reinsurer, the amount would be accounted for separately when computing the Provision for Reinsurance within Schedule F.

Exhibit 7: Hurricane Loss Experience and Reinsurance Recoveries [Medium] (\$ millions)

Medium Hurricane Season	Gross	Per-Occurrence Deductible	Net of Per Occurrence	
Hurricane 1	1,000	500	500	Gross paid in full by YE
Hurricane 2	500	500	0	
Hurricane 3	3,600	500	3,100	
	5,100	1,500	3,600	
			2,000	<-- Annual Aggregate Deductible
			1,600	<-- Reinsurance Recoverables
			3,500	<-- Net Loss

Assumptions (both scenarios):

- 1) The primary company has paid all direct losses from the first hurricane but has yet to be reimbursed by the reinsurance counterparty as of year-end.
- 2) No losses have been paid on hurricanes 2 and 3 on either a direct or ceded basis.

The tables below summarize the hurricane loss experience and statutory surplus position for each alternative hurricane season.³ Without this protection, the surplus at year-end would range from \$13 billion in the low hurricane year to only \$5 billion in the high hurricane year presented above. The key takeaway: when weather does strike, reinsurance can significantly mitigate large drops in statutory surplus. Without reinsurance, this company may not have enough operating capital to write new business and could require capital infusion to maintain sound leverage ratios.

Exhibit 8: Gross, Ceded, and Net Hurricane Losses (\$ millions)

Hurricane Losses (\$ millions)

	Low	Medium	High
Gross	\$2,000	\$5,100	\$10,000
Ceded	–	\$1,600	\$6,500
Net	\$2,000	\$3,500	\$3,500

Exhibit 9: The Insurance Company Statutory Surplus (\$ millions)

Statutory Surplus at Year End (\$ millions)

	Low	Medium	High
Without Reinsurance	\$13,000	\$9,900	\$5,000
With Reinsurance	\$11,500	\$10,000	\$10,000

³ Additional financial details for the low and medium scenarios may be found in the appendix.

This is an admittedly simplified case study that contemplates only three weather seasons, one reinsurance structure and one financial metric. In practice, companies rely on sophisticated models that can generate millions of potential hurricane seasons. Companies use this robust information to evaluate many different scenarios and optimize their reinsurance structures accordingly. Given the tangible threat posed to companies' balance sheets, reinsurance plays a significant role in the global catastrophe insurance market.

3. Surplus Relief / Capital Efficiencies

Each insurance company is required by its applicable regulators and rating agencies to maintain a certain level of surplus to support its business operations and maintain desired financial ratings.⁴ For example, regulators establish minimum capital requirements with a focus on the protection of policyholders. Rating agencies, on the other hand, focus on capital adequacy to evaluate the relative safety from a credit or investment perspective.

An insurance company lacking adequate surplus to support its business may decide to raise additional capital through the issuance of stock or debt, with the exact option(s) available being a function of its corporate structure (e.g. stock vs mutual).⁵ Alternatively, an insurance company could directly decrease the amount of capital required. By buying reinsurance, a company can reduce its net exposure to loss and lower its surplus requirement. The purchase of reinsurance can be thought of as an insurer's decision to use reinsurers' surplus to underwrite a portion of risk.

Business Issue: A publicly traded insurance company wishes to optimize the cost of obtaining the capital required to write a certain insurance policy.

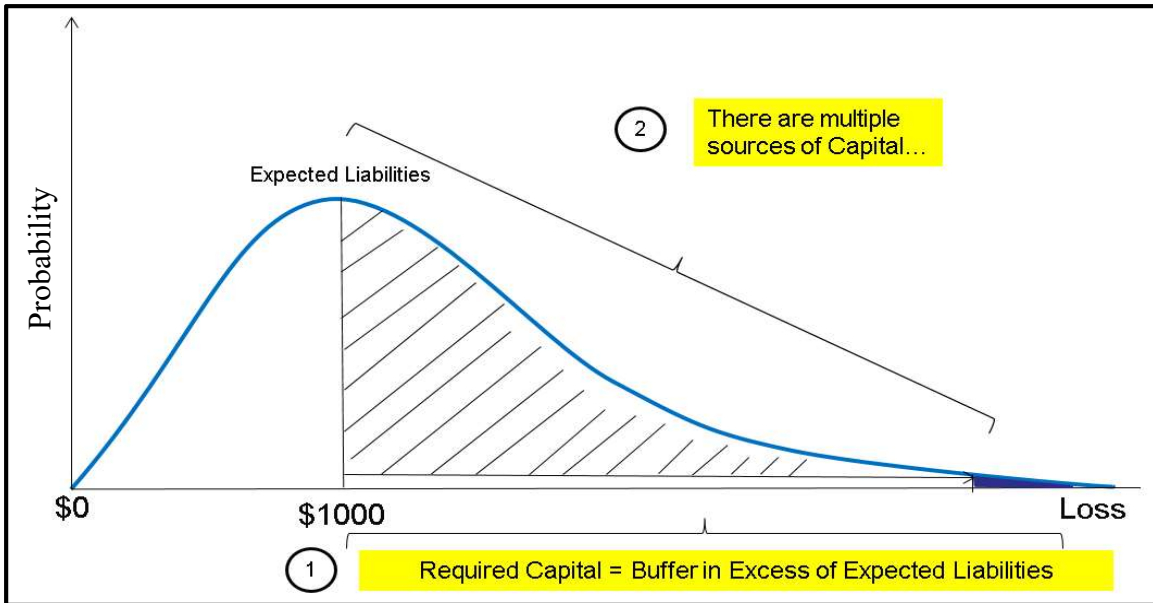
Reinsurance Solution: The company can consider the cost of various combinations of stock, bonds, and reinsurance in an effort to improve its cost of capital.

An insurer considering the use of reinsurance must consider and balance several opposing forces. For example, although ceding risk generally decreases an insurer's **required** surplus, the cost of reinsurance also decreases the insurer's **available** surplus to meet policyholder obligations. In addition, the purchase of reinsurance from poorly rated and/or poorly capitalized reinsurance carriers exposes the primary insurer to additional risk. The reinsurer may not pay or be able to pay the ceded losses given an event, increasing the amount of surplus a company must hold.

⁴ **NAIC [US]:** Risk-Based Capital [RBC], IRIS Ratios; **A.M. Best:** (Stochastic) Best's Capital Adequacy Ratio [(Stochastic) BCAR]; **Standard and Poor's:** S&P Capital Adequacy Ratio [CAR]; **Moody's Investor Service:** Moody's P&C Risk Adjusted Capital Model [MRAC]; **OSFI [Canada]:** Minimum Capital Test [MCT], DCAT, Capital Adequacy Requirements [CAR]; **European Regulators:** Solvency II; **International Standard [TBD]**

⁵ A description of such options is beyond the scope of this paper.

Exhibit 10: Probability Distribution of Loss for Single Insurance Policy



Single policy assumptions:

Expected loss: \$1,000

Premium charged: \$1,200

Net Investment Income [NII] = \$0

No expenses associated with issuing or maintaining the policy...

Required economic capital: \$2,700

Target return on equity capital: 12%

Coupon on debt capital: 4%

Target debt to equity ratio: 25%

Exhibit 11: Sources of Capital for Publicly Traded Company [Illustrative]

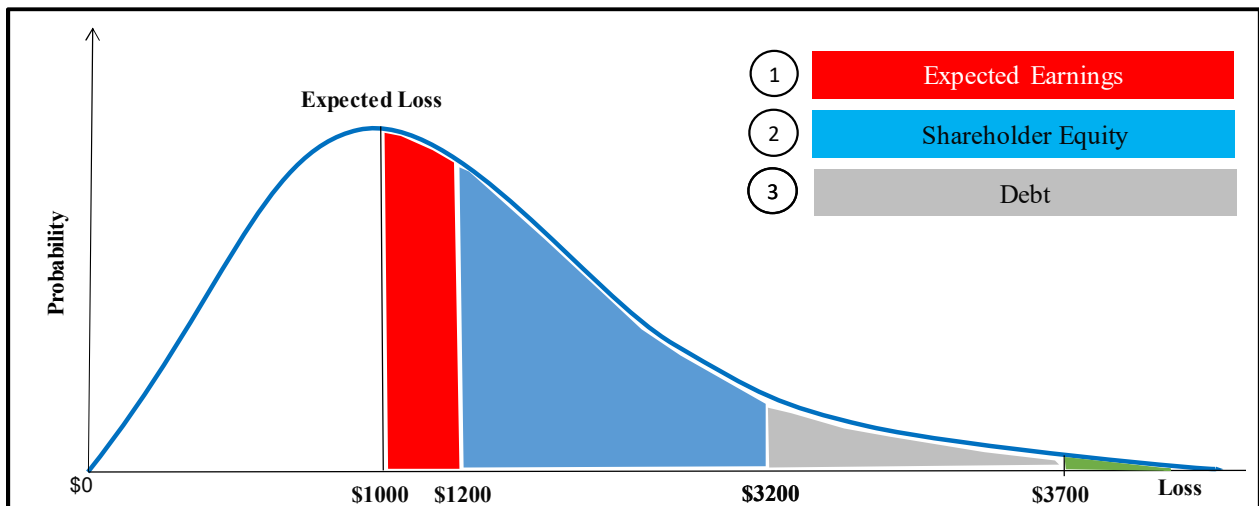


Exhibit 12: Cost of Capital, without Reinsurance

Option #1 - No Reinsurance			
Capital Source	\$ Amount	% Cost	\$ Cost
Expected Earnings	200	0%	-
Equity	2,000	12%	240
Debt	500	4%	20
Reinsurance	-	0%	-
Weighted Average	2,700	9.6%	260

- ① The first source of capital comes from the expected earnings loaded into the premium paid by the policyholder. Embedded in the premium is an implicit margin or underwriting profit. The company charged the policyholder \$1,200, leaving an expected \$200 cushion above the expected loss of \$1,000 to cover some adverse deviation.⁶
- ② / ③ The remaining required economic capital of \$2,500 is then split proportionally between shareholder equity and corporate debt based on a targeted debt to equity ratio of 25%.⁷ Importantly, debt providers will only suffer a loss **after** the shareholder equity has been depleted. Debt holders' lower expected loss is compensated with a lower expected return. The cost of capital associated with writing this policy is \$260.

Alternatively, via reinsurance, the primary company can indirectly substitute its own equity and debt capital with that of the reinsurers, hopefully at a lower cost.

Additional assumptions regarding reinsurance:

Reinsurance Premium: \$45

Expected Ceded Loss: \$15

Reinsurance Ceded Profit / Cost = \$45 - \$15 = \$30

Economic Capital Reduction: \$500 implies net economic capital need is \$2,200

⁶ In this example we ignore investment income earned on the premium itself. In practice, this can be a significant financial item, particularly for long-tailed lines of business.

⁷ To clarify, this implies 20% of the remaining capital is provided with debt issuance and 80% is equity financed.

Exhibit 13: Sources of Capital, including Reinsurance [Illustrative]

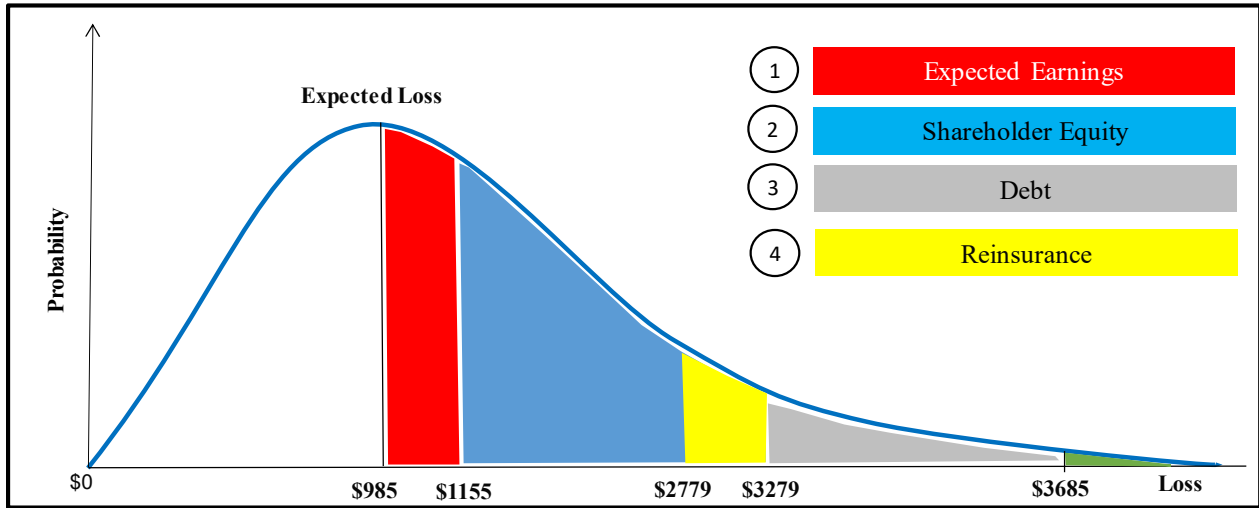


Exhibit 14: Sources of Capital, Net of Reinsurance [Illustrative]

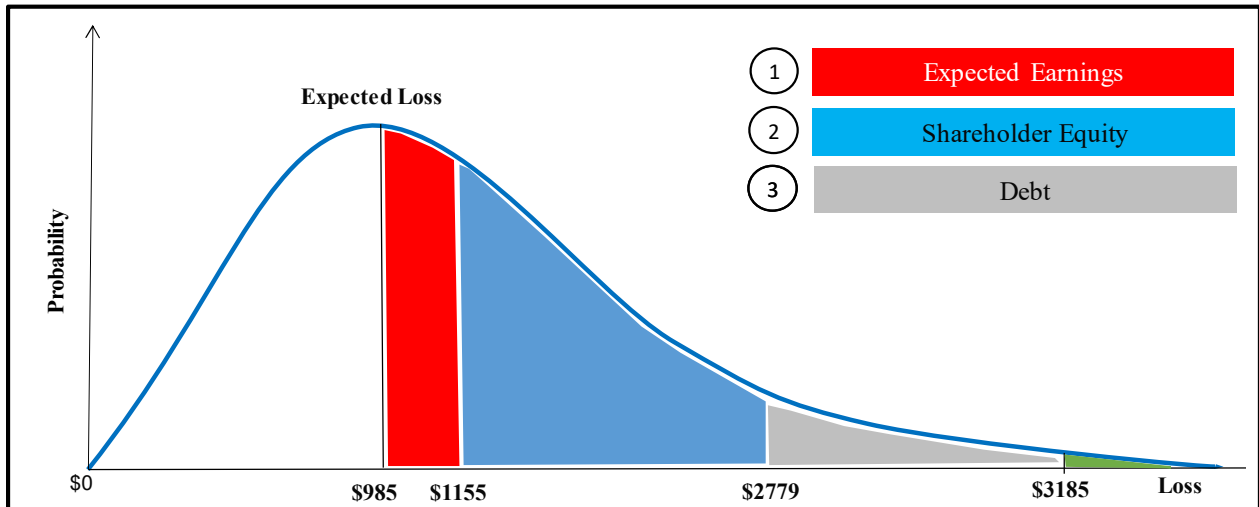


Exhibit 15: Cost of Capital, without Reinsurance

Option #2 - With Reinsurance			
Capital Source	\$ Amount	% Cost	\$ Cost
Expected Earnings	170	0%	-
Equity	1,624	12%	195
Debt	406	4%	16
Reinsurance	500	6%	30
Weighted Average	2,700	8.9%	241

- ① The company charged the policyholder \$1,200, leaving an expected \$200 cushion above the expected loss of \$1,000 to cover some adverse deviation. As a result of buying reinsurance, the company's expected loss decreases \$15 to \$985 for a ceded premium of \$45. This \$30 ceded profit reduces the net expected earnings to \$170.
- ② / ③ The remaining required net economic capital of \$2,030, which is \$500 less as a result of buying the treaty, is then split proportionally between equity and debt based on a targeted debt to equity ratio of 25%.
- ④ The company bought reinsurance to reduce net exposure to loss. For a reinsurance cost of \$15, the company was able to reduce net required economic capital by \$500. The overall cost of capital savings of \$19 represents a little over 1.5% of gross premium, allowing the company to potentially price more competitively in the marketplace. A lower price may lead to increased market share, satisfying the investor, while decreasing cost to the consumer.

In practice, the evaluation of the “optimal” reinsurance structure involves analysis beyond pure economics. Insurers may leverage sophisticated capital models to simulate thousands of potential future realities upon which they may overlay various reinsurance strategies. The insights gleaned from these exercises provide the foundation on which to construct their reinsurance portfolios. Ultimately the tax, rating agency, regulatory, and market consequences are equally if not more important to consider. Having a framework which includes reinsurance as a capital ingredient allows companies to explicitly and quantitatively consider these available alternatives.

4. Stabilization of Results

Business Issue: Management is concerned that large year to year earnings volatility is impacting the investment community's valuation of the company stock.

Reinsurance Solution: The company evaluates various reinsurance retention levels to improve earnings stability.

Reinsurance has the ability to stabilize results by mitigating adverse loss volatility. A company that aims to stabilize quarterly loss volatility within a single business unit may pursue a different reinsurance strategy than one whose objective is to maximize long-term corporate earnings. Therefore, it is critical to clearly define what is meant by stabilization: stability of what **metric** (net combined ratio, earnings), over what **time horizon** (quarter to quarter, year to year).

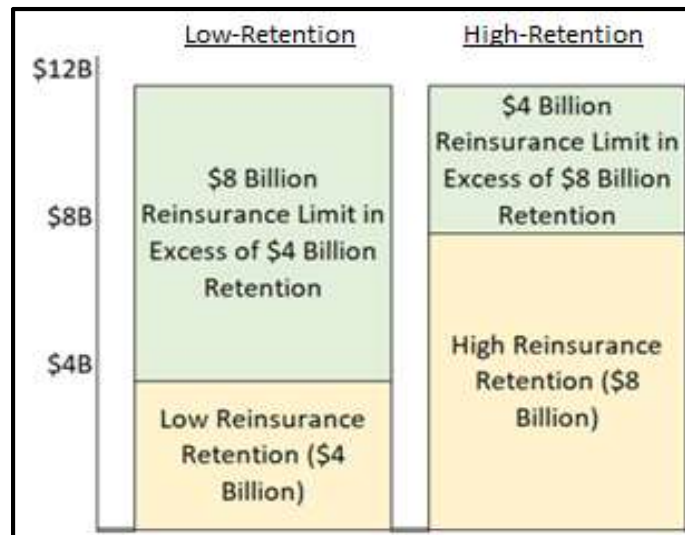
Consider an insurance company that is only exposed to property catastrophe risk. This company's management emphasizes the importance of **corporate earnings**, but also values stability of earnings over a **five-year** time horizon. The distribution of gross annual aggregate loss and LAE for the company is as follows:

- Average annual aggregate loss and LAE: \$5 million
- 1 in 5-year annual aggregate loss and LAE: \$8,059 million
- 1 in 10-year annual aggregate loss and LAE: \$9,824 million

The company has a business plan for the prospective year where it expects to earn \$10 million in premium and pay \$4 million and \$1 million in loss and LAE, respectively. The company is deciding between two reinsurance strategies:

- 1) A low-retention reinsurance option: \$8 billion of limit in excess of a \$4 billion loss and LAE retention which costs \$3.2 billion per year.
- 2) A high-retention option: \$4 billion of limit in excess of \$8 billion loss and LAE retention which costs \$1 billion per year.

Exhibit 16: Reinsurance Structures by Retention Option



By comparing the statutory accounting entries between the low reinsurance retention and the high retention options, we can evaluate the effectiveness of each strategy with respect to maximizing overall earnings and minimize earnings volatility.

Assumptions:

- 1) Annual gross earned premium for the company is \$10 billion
- 2) Net investment income earned is greater for the high-retention insurance company resulting from the greater earned premium.
- 3) Reinsurance recoveries are proportionally allocated between loss and LAE
- 4) Assume the actual catastrophe loss and LAE by accident year emerge as follows (in \$ billions):

Exhibit 17: Annual Catastrophe Loss and LAE (\$ millions)

	Loss	LAE	Loss + LAE
Year 1:	4,000	1,000	5,000
Year 2:	3,200	800	4,000
Year 3:	4,800	1,200	6,000
Year 4:	8,000	2,000	10,000
Year 5:	0	0	0
Average	4,000	1,000	5,000

Exhibit 18: The Insurance Company Statutory Statement of Income [Low] (\$ millions)

Low-Retention Insurance Company Statutory Statement of Income (in \$millions)								
Line	Description	Plan	Year 1	Year 2	Year 3	Year 4	Year 5	Total
1.	Premiums earned	6,800	6,800	6,800	6,800	6,800	6,800	34,000
2.	Losses incurred	2,582	3,200	3,200	3,200	3,200	-	12,800
3.	Loss adjustment expenses incurred	645	800	800	800	800	-	3,200
4.	Other underwriting expenses incurred	3,500	3,500	3,500	3,500	3,500	3,500	17,500
8.	Underwriting income	73	(700)	(700)	(700)	(700)	3,300	500
11.	Investment income	1,000	1,000	1,000	1,000	1,000	1,000	5,000
16.	Net income before income tax	1,073	300	300	300	300	4,300	5,500
							Average Net Income BFIT	1,100
							Standard Deviation of Net Income BFIT	1,789
							Coefficient of Variation of Net Income BFIT	163%

Exhibit 19: The Insurance Company Statutory Statement of Income [High] (\$ millions)

High-Retention Insurance Company Statutory Statement of Income (in \$millions)								
Line	Description	Plan	Year 1	Year 2	Year 3	Year 4	Year 5	Total
1.	Premiums earned	9,000	9,000	9,000	9,000	9,000	9,000	45,000
2.	Losses incurred	3,713	4,000	3,200	4,800	6,400	-	18,400
3.	Loss adjustment expenses incurred	928	1,000	800	1,200	1,600	-	4,600
4.	Other underwriting expenses incurred	3,500	3,500	3,500	3,500	3,500	3,500	17,500
8.	Underwriting income	858	500	1,500	(500)	(2,500)	5,500	4,500
11.	Investment income	1,110	1,110	1,110	1,110	1,110	1,110	5,550
16.	Net income before income tax	1,968	1,610	2,610	610	(1,390)	6,610	10,050
							Average Net Income BFIT	2,010
							Standard Deviation of Net Income BFIT	2,966
							Coefficient of Variation of Net Income BFIT	148%

Plan net income before income tax is lower for the low-retention reinsurance program [\$1.073 billion] compared to the high-retention program [\$1.968 billion], due to the greater expected reinsurer profit ceded and lower net investment income. The results based on actual catastrophe

emergence show similar findings. Actual income over the five-year period is greater for the high retention solution.

The low reinsurance deductible option does mitigate losses in certain years. This results in a lower standard deviation of annual earnings, but standard deviation is not the only measure of volatility. The coefficient of variation [standard deviation divided by the mean] is actually lower under the high-retention strategy. Here, the increase in expected earnings outweighs the additional volatility that comes with the higher retention.

The conclusion of this particular case study (that the high deductible option is the better choice with respect to earnings stability) is not representative of all possible scenarios. If the distribution of catastrophe losses or cost of the reinsurance protection itself varied, then it would be entirely possible to reach an alternative conclusion regarding the optimal reinsurance strategy. The key takeaways are to be thoughtful when defining a measure of stability – inclusive of both the metric and the time horizon – and to weigh the reinsurance costs associated with achieving such stability.

5. Market Entrance / Underwriting Guidance

Rapid expansion in a relatively untested or unknown area of the market may be fraught with growing pains. These pains may manifest themselves in the form of poor underwriting results, adverse selection, or generally mispriced business until experience becomes voluminous enough to be credible and reliable. Reinsurance is a useful tool to help companies enter a market segment or a product line where they may not fully understand the inherent risk. Reinsurers, who cannot directly service the primary market may share their pricing and underwriting expertise with their ceding insurers. This symbiotic relationship is fundamental to expanding and developing new markets.

Business Issue: A U.S. based company is interested in writing a new cyber risk product.

Reinsurance Solution: Use quota share reinsurance to facilitate market entrance.

Consider a U.S. company which recognizes the market opportunity for cyber insurance but does not yet have the requisite actuarial data or underwriting experience to price the product appropriately. To reduce the company's risk while it develops the new product, the company pursues a quota share reinsurance arrangement with a reinsurer who has experience with cyber insurance. Motivated by the lack of expertise with this coverage, the company decides to cede 80% of all premium and loss associated with the new business. In return, the reinsurer agrees to pay a ceding commission of 20% to cover the primary carriers cost of writing new business. For accounting simplicity, assume a new legal entity is established to handle this business.

Exhibit 20: Quota Share Reinsurance Assumptions (\$ thousands)

Quota Share Reinsurance	
(in \$thousands)	
Quota Share %	80%
Written Premium	20,000
Earned Premium	10,000
Loss + LAE Ratio	70%
Expense Ratio	18%
Ceding Commission	20%
Gross Loss Paid in Year 1	5,000
Reinsurance Recoveries Received in Year 1	3,000
Initial Capitalization	5,000

Exhibit 21: The Insurance Company Statutory Balance Sheet (\$ thousands)

Stat Balance Sheet (December 31)		Initial <u>Capitalization</u>	Before <u>Reinsurance</u>	Ceded <u>Adjustment</u>	<u>Net</u>
<i>Assets</i>		(January 1st)			
12.	Cash and invested assets	5,000	16,400	(9,800)	6,600
16.1	Amounts recoverable from reinsurers	0	0	1,000	1,000
28.	Total Assets	5,000	16,400	(8,800)	7,600
<i>Liabilities, Surplus, and Other Funds</i>					
1.,3.	Losses and loss adjustment expense	0	2,000	(1,600)	400
9.	Unearned premiums	0	10,000	(8,000)	2,000
28.	Total Liabilities	0	12,000	(9,600)	2,400
37.	Surplus as regards policyholders	5,000	4,400	800	5,200

We discuss four of the statutory balance sheet lines impacted by the cyber loss experience and reinsurance contract:

Assets

I. Cash and Invested Assets

The company writes and receives \$20 million in direct written premium. The company make a \$5 million loss payment and a \$3.6 million expense payment in year one. As a result, invested assets increase by \$11.4 million [\$20 million - \$5 million - \$3.6 million] on top of the initial capitalization of \$5 million. The company cedes 80% of the premium or \$16 million to the reinsurer. This is offset by the ceding commission of 20% or \$3.2 million to cover the costs of writing new business. Finally, the reinsurer makes a payment of \$3 million in year one. These result in a net decrease in cash of \$9.8 million [-\$16 million + \$3.2 million + \$3 million].

II. Amounts Recoverable from Reinsurers

This line accounts for expected recoveries on Loss and LAE already **paid** by the company and excludes **expected** reinsurance recoveries on Loss and LAE reserves. The company paid \$5 million in year 1; 80% or \$4 million of which is the responsibility of the reinsurer. Given the reinsurer only paid \$3 million (and assuming the bill was sent recently, i.e. not overdue), a reinsurance recoverable asset of \$1 million is established on a net basis.

Liabilities

III. Losses and LAE

Loss and LAE reserves are reflected net of reinsurance recoveries on the balance sheet. The expected ultimate gross value of the liabilities is 70% of \$10 million of earned premium or \$7 million. As of year-end the company has paid \$5 million. Therefore, a liability for the outstanding \$2 million is established. 80% of the gross reserves, or \$1.6 million, is ceded to the reinsurer leaving a net liability of \$0.4 million.

IV. Unearned Premium

The unearned premium liability represents the unearned portion of outstanding contracts. As of year-end there is \$10 million of gross unearned premium. Again, 80% or \$8 million is ceded to the reinsurer leaving a \$2 million unearned premium reserve on the balance sheet.

Exhibit 22: Premium to Statutory Surplus Ratios (\$ thousands)

	<u>Without</u> <u>Reinsurance</u>	<u>With</u> <u>Reinsurance</u>
GWP	20,000	20,000
NWP	20,000	4,000
Surplus	4,400	5,200
GWP / Surplus	4.55	3.85
NWP / Surplus	4.55	0.77

Through reinsurance, the primary company is able to enter the cyber marketplace and operate at sound premium to surplus levels. Each year as the relationship progresses, the underwriters learn valuable information about the product while the actuaries gain better data. The reinsurer is equally content to assume 80% of the new business and build a strong working relationship with the carrier. In the long run, the primary company may slowly decide to reduce the quota share percentage and begin to retain more of the risk and reward in-house. But importantly, without reinsurance, this company would not have been in a position to make that decision in the first place!

6. Withdrawal from a Market Segment

Business Issue: New management wishes to exit the workers compensation market and focus future business plans on home and auto.

Reinsurance Solution: Purchase retroactive reinsurance for the balance sheet reserves. Discontinue writing new and renewal business prospectively.

In addition to market *entrance*, reinsurance can also facilitate *withdrawal* from a market segment. Insurers may wish to exit a line of business due to its low profit margins, unpredictable losses, or excessive capital requirements. Other times, management may wish to put decisions of the past behind them by removing liabilities from their balance sheet via retroactive reinsurance. Regardless of motivation, any retroactive strategy comes with complex accounting requirements.

Per SSAP 62R, “Certain reinsurance agreements which transfer both components of insurance risk [and] cover liabilities which occurred **prior** to the effective date of the agreement” require retroactive accounting. The statement continues: “Due to potential abuses involving the creation of surplus to policyholders and the distortion of underwriting results, special accounting treatment for these agreements is warranted.” The differences between U.S. GAAP and Statutory accounting treatment of such transactions are discussed using a hypothetical retroactive reinsurance contract to reinsure workers compensation liabilities on a firm’s balance sheet.

From 2014-2016 a company wrote workers compensation insurance, in addition to home and auto. New management made the decision to discontinue writing workers compensation beginning January 1, 2017 and instead focus resources on their home and auto business moving forward. The company entered into a retroactive reinsurance agreement, effective December 31st, 2016, to reinsure all legacy workers compensation liabilities on their balance sheet. A price of \$2 million was agreed to transfer booked reserves of \$2.47 million. Assume that the reinsurance limit is capped at \$4 million. The price is based on a discounted reserve estimate of \$1.8 million plus a risk margin of \$0.2 million to compensate the reinsurer for volatility.

We first look at how this transaction is accounted for on a statutory balance sheet over time. Assume no other reinsurance has been or is purchased. Importantly, the ceding entity shall record, **without recognition of the retroactive reinsurance**, all loss and loss expense reserves on the balance sheet and in all schedules and exhibits. Only prospective reinsurance is to be included. The ceded triangles therefore are included here as informational to help with the example and would not be included in Schedule P exhibits.

Exhibit 23: Selected Workers Compensation Triangles (\$ thousands)

<u>Ultimate Incurred Workers Compensation Gross Loss + LAE</u>					
<i>(as of year-end)</i>					
<i>AY / CY</i>	<i>2014</i>	<i>2015</i>	<i>2016</i>	<i>2017</i>	<i>2018</i>
2014	2,000	2,100	2,300	2,500	2,500
2015		2,500	2,500	2,700	2,700
2016			3,000	3,300	3,300
2017				0	0
2018					0
CY Totals	2,000	4,600	7,800	8,500	8,500

<u>Outstanding Workers Compensation Gross Loss + LAE</u>					
<i>(as of year-end)</i>					
<i>AY / CY</i>	<i>2014</i>	<i>2015</i>	<i>2016</i>	<i>2017</i>	<i>2018</i>
2014	1,000	525	345	125	0
2015		1,250	625	405	135
2016			1,500	825	495
2017				0	0
2018					0
CY Totals	1,000	1,775	2,470	1,355	630

<u>Incremental Paid Workers Compensation Gross Loss + LAE</u>					
<i>(by calendar year)</i>					
<i>AY / CY</i>	<i>2014</i>	<i>2015</i>	<i>2016</i>	<i>2017</i>	<i>2018</i>
2014	1,000	575	380	420	125
2015		1,250	625	420	270
2016			1,500	975	330
2017				0	0
2018					0
CY Totals	1,000	1,825	2,505	1,815	725

<u>Ultimate Incurred Workers Compensation Ceded Loss + LAE</u>					
(as of year-end of each calendar year)					
AY / CY	2014	2015	2016	2017	2018
2014			345	545	545
2015			625	825	825
2016			1,500	1,800	1,800
2017				0	0
2018					0
CY Totals			2,470	3,170	3,170

Exhibit 24: The Insurance Company Statutory Balance Sheet (\$ thousands)

Stat Balance Sheet (as of year-end)		2016	2016	2017	2018
		Without Reinsurance	With Reinsurance	With Reinsurance	With Reinsurance
<u>Assets</u>					
1.	Bonds	25,000	25,000	25,000	25,000
5.	Cash	10,000	8,000	8,000	8,000
28.	Total Assets	35,000	33,000	33,000	33,000
<u>Liabilities, Surplus, and Other Funds</u>					
1.,3.	Losses and loss adjustment expense	20,000	20,000	18,885	18,160
25.	Contra-liability - Retro Reinsurance Ceded	0	-2,470	-1,355	-630
28.	Total Liabilities	20,000	17,530	17,530	17,530
29.	Special Surplus from Retroactive Reinsurance	0	470	1,170	630
35.	Unassigned Surplus	15,000	15,000	14,300	14,840
37.	Surplus as regards policyholders	15,000	15,470	15,470	15,470
Income Statement Impact (to "Other Income")			470	700	0

2016 (with Reinsurance) [Transfer of \$2.47 million of reserves for \$2 million cash]

- The amount paid for the contract reduces the cash balance (-\$2 million).
- All reserves are recorded gross of retroactive reinsurance. Instead, the ceding entity establishes a write-in contra-liability equal to the total amount of reserves transferred (\$2.47 million).
- The resulting surplus gain (+\$0.47 million) is restricted via a write-in item aptly named "Special Surplus from Retroactive Reinsurance." The surplus gain remains restricted, i.e. cannot be extracted, until the reinsurance recoveries exceed the consideration paid (\$2 million).
- The ceding entity reports the initial gain arising from the retroactive reinsurance, the difference between the consideration paid (\$2 million) and the total reserves ceded (\$2.47 million), as a write-

in item on the Income Statement identified as Retroactive Reinsurance Gain and included in Other Income.

2017 [Gross and Ceded Ultimate increased to \$3.17 million, paid loss = \$1.815 million]

- a. Gross reserves decrease by the amount paid in 2017 (-\$1.815 million) and increase to reflect the increased estimate of our workers compensation reserves (+\$0.7 million).
- b. The contra-liability is similarly reduced by the amount paid by the reinsurer (-\$1.815 million), who we assume pays their bills promptly, and increased to reflect future expected payments (+\$0.7 million), resulting in a net decrease of \$1.115 million.
- c. \$0.7 million moves from unassigned surplus to special surplus to account for the expected increase in ceded recoveries (+\$0.7 million). Remember, this remains restricted as the cumulative recoveries as of year-end 2017 are only \$1.815 million, which is still less than the consideration paid of \$2 million.
- d. The ceding entity reports the incremental annual gain arising from the retroactive reinsurance, the difference between the initial reserves (\$2.47 million) and the current ceded reserve estimate (\$3.17 million) as a write-in item on the Income Statement identified as Retroactive Reinsurance Gain and included in Other Income. (+\$0.7 million)

2018 [Gross and Ceded Ultimate remains at \$3.17 million, paid loss = \$0.725 million]

- a. Gross reserves decrease by the amount paid in 2018 (-\$0.725 million).
- b. The contra-liability is similarly reduced by the amount paid by the reinsurer (-\$0.725 million).
- c. The cumulative recoveries from the reinsurer as of year-end 2018 are now \$2.54 million. Because the cumulative recoveries now exceed the consideration paid (\$2 million), the excess or \$0.54 million of the \$1.17 million special surplus is transferrable from special surplus to unassigned surplus.
- d. There is no income statement impact in 2018.

These special rules prevent companies from extracting capital and returning it to shareholders prematurely by inflating ceded reserves at the onset of the contract. This treatment/rule is consistent with statutory accounting's conservatism principle and the protection of policyholders.

Next, we'll contrast how the U.S. GAAP balance sheet accounts for this transaction over time. The basic concept under U.S. GAAP is to treat the retroactive reinsurance the same as prospective reinsurance, but to defer the recognition of any gain. This is in contrast to the statutory treatment just discussed which does not recognize the retroactive ceded losses as a direct offset, but does

allow the recognition of the gain in surplus, albeit restricted. As a reminder, ceded reserves under U.S. GAAP are shown as an asset line item, not as an offset to the gross liabilities.

Exhibit 25: The Insurance Company GAAP Balance Sheet (\$ thousands)

GAAP Balance Sheet	2016	2016	2017	2018
	Without Reinsurance	With Reinsurance	With Reinsurance	With Reinsurance
<i>Assets</i>				
Investments	25,000	25,000	25,000	25,000
Cash	10,000	8,000	8,000	8,000
Net Reinsurance Receivable	0	2,470	1,355	630
Prepaid Reinsurance Premiums	0	0	0	0
Total Assets	35,000	35,470	34,355	33,630
<i>Liabilities</i>				
Liabilities for claim and claim settlement expenses	20,000	20,000	18,885	18,160
Deferred Retroactive Reinsurance Gain		470	825	383
Equity	15,000	15,000	14,645	15,087
Total Liabilities and equity	35,000	35,470	34,355	33,630
Income Statement Impact (to "Other Income")		0	345	441
Recovery Method:			73%	54%

2016 (with Reinsurance) [Transfer of \$2.47 million of reserves for \$2 million cash]

- The amount paid for the contract reduces the cash balance. (-\$2 million)
- An asset is established equal to the ceded reserves. (\$2.47 million)
- A deferred retroactive reinsurance gain is established to account for the resulting capital gain on the balance sheet. (+\$0.47 million)
- This gain is deferred and amortized over the remaining settlement period on the Income Statement.⁸ [\$0 in 2016 as the contract goes into effect effectively in 2017]

2017 [Gross and Ceded Reserve opinion increased to \$3.17 million, paid loss = \$1.815 million]

- The reinsurance receivable asset shall reflect the related change in the amount recoverable from the reinsurer as a result on increase in reserves (+\$0.7 million). The receivable is also reduced by the amount paid by the reinsurer in 2017 (-\$1.815 million). We assume, for simplicity, the reinsurer

⁸ There are two methods to amortize resulting gain on the balance sheet: 1) Effective-Interest Method and 2) Recovery Method

reimburses the primary carrier immediately with no delay. The net impact is a reduction of -\$1.115 million.

b. The gross liabilities are similarly increased by the change in ultimate incurred losses (+\$0.7 million) and reduced by the amount paid (-\$1.815 million).

c. The deferred retroactive reinsurance gain is increased by \$0.7 million to account for the updated ceded reserve estimates. In addition, the balance is reduced by the amount of gain which amortized in 2017 (-\$0.345 million) (See step d), resulting in a net increase of \$0.355 million.

d. To compute the impact to the income statement, we must determine what portion of the prior year gain (\$0.47 million) is amortizable in 2017. Using the recovery method, we compute the ratio of paid reinsurance receivables in 2017 (\$1.815 million) to total outstanding ultimate ceded reserves as of prior year-end 2016 (\$2.470) = 73%. We then multiply the prior deferred retroactive gain of \$0.47 million by 73% to compute the income statement benefit of \$0.345.

2018 [Reserve opinion remains at \$3.17 million, paid loss = \$0.715 million]

a. The reinsurance receivable asset is reduced by the amount paid by the reinsurer in 2018 [-\$0.725 million].

b. The gross liabilities are similarly reduced by the amount paid [-\$0.725 million].

c. The deferred retroactive gain is reduced by the amount of amortization in 2018 [-\$0.441 million] – see d.

d. To compute the impact to the income statement, we must determine what portion of the prior year gain (\$0.825 million) is amortizable in 2018. Using the recovery method, we compute the ratio of paid reinsurance receivables in 2018 (\$0.725 million) to total outstanding ultimate ceded reserves as of prior year-end 2017 (\$1.355 million) = 54%. We then multiply the prior deferred retroactive gain of \$0.825 million by 54% to compute the income statement cashflow of \$0.441 million.

As with most U.S. GAAP accounting conventions, the retroactive reinsurance rules attempt to align earnings in order to provide insight to the investment community. The conventions prevent companies from artificially boosting earnings via retroactive reinsurance by unlocking and recognizing the discount embedded in the reserves at the onset of a deal.

7. Mandatory and Voluntary Pools

Public Policy Issue: A state wants to ensure that property insurance is available for all residents , even those not desired by the voluntary market.

Reinsurance Solution: Insurance companies must participate in a state FAIR Plan which insures homes not able to obtain insurance in the voluntary market

Mandatory pools are an insurance mechanism for risks not able to obtain coverage from the voluntary market. In return for access to the market, carriers **must** participate in the mandatory pools to provide insurance for these “uninsurable” risks. Mechanically, insurance companies, either designated “servicing carriers” for that residual market or any voluntary writer under a “take all comers” provision, provide coverage by directly insuring these unwanted risks, then cede the associated premium and loss to a centrally-maintained pool. The voluntary writers then assume a portion of the aggregate financial results of the pool based on predetermined allocation arrangements.⁹ It is possible for a pool member to be both a cedant to and reinsurer of the pool simultaneously¹⁰. Examples of mandatory pools include residual markets for workers compensation and automobile as well as FAIR plans and coastal wind pools¹¹ for property.

Voluntary pools are similar to mandatory pools in structure but are not mandated by states to participate. Voluntary pools are often used to share risks too large for a single insurer / or reinsurer to cover alone (e.g., nuclear, aircraft, or energy risks). Pool participants are able to diversify their portfolios and reduce risk by taking on only small shares of several independent high-risk exposures. From an accounting perspective, pools can represent significant ceded balances within the financial statements for insurance carriers. Actuaries should understand the pooling arrangements companies have in place prior to the evaluation of financial statements and capital requirements.¹²

8. Internal Reinsurance Transactions

Business Issue: Business unit appetite is only \$20 million dollars per exposure, whereas the corporate appetite is \$50 million dollars per exposure.

Reinsurance Solution: Internal reinsurance is an alternative to buying reinsurance externally.

⁹ For residual markets, the allocation is typically a percent of premium written.

¹⁰ This occurs when the insurer is a servicing carrier for the residual market, or when the residual market is of the “take all comers” variety. Under a “take all comers” market an insurer cannot refuse to insure a customer but can cede customers it does not choose to retain to the residual market pool.

¹¹ Not all such pools operate as reinsurance entities. Some issue policies directly, then assess writers in the voluntary market for any net loss.

¹² For example, cessions to mandatory pools have zero charge within the ceded reinsurance credit risk portion of the US RBC Model.

Internal reinsurance in this context refers to the pooling and sharing of premium and loss among business units **within the same legal entity** (or pool) for the purpose of normalizing losses and stabilizing results within business units. Assume the Chief Risk Officer (CRO) deemed a retention of \$50 million per-risk is the most capital-efficient trade-off for the company. Accordingly, an enterprise-wide property reinsurance program attaching at \$50 million per-risk was implemented.

However, a reinsurance retention of \$50 million is greater than the risk tolerance of certain individual business units. The business units express interest in purchasing \$30 million of reinsurance cover in excess of \$20 million per-risk to fill the gap between the enterprise risk appetite and their own. The business units could purchase reinsurance externally, but as an alternative, each business unit could cede premium and loss to an internal reinsurance facility. From the business units' perspectives, this behaves just like external reinsurance. From the company perspective, the \$30 million excess of \$20 million layer is retained in-house. The company can retain the profitable business, rather than ceding it to an external reinsurer. This helps to accommodate the differing risk appetites held by the CRO and the business units, and ought to save money for the company over time.

9. Fronting Arrangements

Business Issue: An insurer, that is an admitted carrier only in the United States, wants to insure a policyholder who owns commercial property both in the U.S. and Japan.

Reinsurance Solution: Enter into fronting arrangement with Japanese carrier to facilitate coverage

Fronting arrangements are used to issue policies on behalf of clients with no access to properly licensed insurance companies. Typically, a customer acquires coverage directly from an admitted insurance company that is licensed to write business in the state where the customer is located. But what if the customer wants to cover a risk outside of the primary carrier's legal underwriting jurisdiction? In those circumstances, another carrier, who is licensed in the state or country where the risk is located, can issue the policy as part of a fronting agreement. The fronting company issues the original policy, and then immediately cedes all of the financial results to the unlicensed company or group, who acts as a reinsurer.

Consider an insurer in the United States who wishes to insure a multinational company. The majority of the business is located in the United States, but the company owns several properties in Japan, where the insurer is not licensed to write business. In this case the insurer is not broadly attempting to enter the Asian market. The insurer simply wants to fully service its U.S. customer, wherever the risks may be located. A fronting arrangement can facilitate this business objective whereby a Japanese company issues the policy and cedes 100% to the U.S. company.

Conclusion

This paper provides an introductory-level description of the motivations for buying reinsurance and the financial impacts of such decisions. We hope to impart on readers that a truly holistic approach to reinsurance includes an analysis and understanding of the accounting, legal, regulatory, economic, tax, and financial facets of the transaction.

Appendix

Additional Detail Related to Catastrophe Reinsurance: Low & Medium Severity Financials

(\$ millions)

Low

Statutory Balance Sheet (as of year-end)		Net	Gross	Ceded	Net
		[No Events]	[w/ Events]	Adjustment	[w/ Events]
				[w/ Events]	
<i>Assets</i>					
12.	Cash and invested assets	37,000	35,000	(1,500)	33,500
16.1	Amounts recoverable from reinsurers	0	0	0	0
28.	Total Assets	37,000	35,000	(1,500)	33,500
<i>Liabilities, Surplus, and Other Funds</i>					
1.,3.	Losses and loss adjustment expense	15,000	15,000	0	15,000
9.	Unearned premiums	7,000	7,000	0	7,000
28.	Total Liabilities	22,000	22,000	0	22,000
37.	Surplus as regards policyholders	15,000	13,000	(1,500)	11,500

Medium

Statutory Balance Sheet (as of year-end)		Net	Gross	Ceded	Net
		[No Events]	[w/ Events]	Adjustment	[w/ Events]
				[w/ Events]	
<i>Assets</i>					
12.	Cash and invested assets	37,000	36,000	(1,500)	34,500
16.1	Amounts recoverable from reinsurers	0	0	0	0
28.	Total Assets	37,000	36,000	(1,500)	34,500
<i>Liabilities, Surplus, and Other Funds</i>					
1.,3.	Losses and loss adjustment expense	15,000	19,100	(1,600)	17,500
9.	Unearned premiums	7,000	7,000	0	7,000
28.	Total Liabilities	22,000	26,100	(1,600)	24,500
37.	Surplus as regards policyholders	15,000	9,900	100	10,000