Commutation Pricing – Cedent and Reinsurer Perspectives

Brian MacMahon, FCAS, CERA

Abstract:

A commutation is an agreement between the cedent and the reinsurer. In exchange for a onetime payout to the cedent, the commutation completely releases the reinsurer from an identified set of reserves that fall under the reinsurance contract. Reinsurers and cedents agree to commute claim obligations for a variety of reasons. Foremost on this list is reinsurer or cedent insolvency. In the case of reinsurer insolvency there is rarely a use for a pricing formula as all of the reinsurer's cedents will likely get some negotiated fraction of their outstanding obligations from the reinsurer. In other cases, including cedent insolvency, pricing formulas are useful. However, even if the pricing methodology is agreed between cedent and reinsurer, the parameters used in these formulas often vary between the reinsurer and the cedent. In some cases, this will widen the gap of acceptable prices and make it harder for an agreement to be reached. In other cases it will do the opposite.

In this paper, I consider a variety of factors that would influence how a cedent and, separately, how the reinsurer would value a commutation. Examples are given to broadly illustrate how these factors could be included in a pricing formula. At the end, there is also a short discussion on more qualitative considerations that may override pricing formulae.

1. INTRODUCTION

Once a motivation has been established that brings the cedent and the reinsurer to the table to discuss a commutation, the key factors that influence the acceptable price for each party must be valued.

For example, the cedent may consider:

1. Valuation of the reserves to be reassumed, especially the worst case scenarios. In the case of significant Bodily Injury, assumptions on increases in medical utilization and medical inflation are important.
2. Tax value based on both internal effective tax rate and value of the IRS discount unwind
3. Capital required to take back the reserves, considering both internal calculation of economic capital and rating agency required capital
4. Cost of capital
5. Value of eliminating credit risk and any Sch. F penalties
6. Value of reduction in recoverables, if overloaded on the given reinsurer
7. Internal new money investment rate compared to the risk free yield
8. Value of cash in the prevailing investment environment

9. Impact on financial statements – generally an income loss at time of transaction
10. Value of avoiding costly litigation when dispute exists over coverage with the reinsurer
11. Expense savings due to elimination of future claims and processing expenses

The reinsurer is likely to consider the flip side of most of these issues. However, there are likely to be differences in how each party interprets and values the same items. For example, the valuation of the IRS discount unwind is likely to be based on different discount factors, perhaps higher discount factors if the reinsurer relies on an excess of loss table while the cedent relies on a primary line of business table. The reinsurer may have a different tax position than the cedent and the impact of tax may be more or less significant. The reinsurer is likely to have a different and perhaps higher cost of capital than the cedent, given the relatively higher probability of ruin for a reinsurance company compared to that of a primary company, all else being equal. The reinsurer may strive to attain a high rating from the rating agencies, and thus need more capital, if this impacts their ability to be on the authorized list for the various ceding companies. If the transaction results in an income gain in the financial statement, and income already meet targets for the year, the fact that the transaction generates income may not be important. Even the magnitude of the income impact may differ between the reinsurer and the cedent if they are not carrying the same reserves. The cost of potential insolvency of the cedent to the reinsurer will have a different value (mostly based on the notion that claims will not be handled as robustly as when the cedent is solvent) than the removal of the credit risk of the reinsurer has to the cedent. The reinsurer may also have a different investment strategy than the cedent and paying cash may be more or less costly to the reinsurer.

In the remainder of the paper, I will consider several scenarios that reflect some of these differences in viewpoint and illustrate a way to price for them.

2. THE EFFECT OF TAX ON COMMUTATION VALUES

Using the formula put forth by Connor and Olsen[1], we calculate the commutation price for the cedent and separately, the reinsurer, as the ambivalence point where the cost of not commuting is equal to the cost of commuting. If the commutation price for the reinsurer is larger than the commutation price for the cedent, then the commutation is feasible.

2.1 Cedent

The cost of not commuting is equal to the tax benefit that would accrue due to unwind of IRS discount on reserves. In other words, the cedent, by transferring reserves to the reinsurer has lost the tax benefit that would exist if they had kept the reserves.

[1] Connor and Olsen, "Commutation Pricing in the Post-Tax Reform Era", CAS *Proceedings* 1991

The cost of commuting is equal to present value of the reserves taken back less the commutation payment plus the tax the cedent would pay on any tax based profit from the transaction.

Putting this into equation form:

$$\textit{Cost of Not Commuting} = \textit{Tax Benefit on IRS Discount Unwind}_C \tag{2.1}$$

$$\textit{Cost of Commuting} = NPV(Loss) - CP_C + (CP_C - Disc_{IRSC}(Loss)) * \textit{Tax Rate}_C \tag{2.2}$$

Setting the two equations equal and solving for the commutation price, CP_C,

$$CP_C = (NPV(Loss) - \textit{Tax Disc Unwind}_C - Disc_{IRSC}(Loss) * \textit{Tax Rate}_C)/(1 - \textit{Tax Rate}_C) \tag{2.3}$$

CP_C = *Cedent Commutation Price*

$Disc_{IRSC}$ = *Discounted Value of Unpaid Loss, using Cedent IRS discount factors*

$\textit{Tax Rate}_C$ = *Cedent Tax Rate*

2.2 Reinsurer

The cost of not commuting is equal to the present value of the reserves less the tax benefit from the unwind of IRS discount on reserves.

The cost of commuting is equal to the commutation payment made plus the tax paid on any tax based profit from the transaction. Note that the profit on the transaction, itself, is not included here because the profit would be realized in the future in the form of investment income on reserves.

$$\textit{Cost of Not Commuting} = NPV(Loss) - \textit{Tax Benefit on IRS Discount Unwind}_R \tag{2.4}$$

$$\textit{Cost of Commuting} = CP_R + (Disc_{IRSR}(Loss) - CPR) * \textit{Tax Rate}_R \tag{2.5}$$

Setting the two equations equal and solving for CP_R,

$$CP_R = (NPV(Loss) - \textit{Tax Disc Unwind}_R - Disc_{IRSR}(Loss) * \textit{Tax Rate}_R)/(1 - \textit{Tax Rate}_R) \tag{2.6}$$

CP_R = *Reinsurer Commutation Price*

$Disc_{IRSR}$ = *Discounted Value of Unpaid Loss, using Reinsurer's IRS discount factors*

$\textit{Tax Rate}_R$ = *Reinsurer's Tax Rate*

In other words, the two equations are equal if the loss estimations and payout patterns are the same, the discount rate used to present value the losses are the same, the IRS discount factors are the same and the effective tax rates are the same.

Under what conditions would the commutation be feasible, i.e. the payment acceptable to the cedent is less than the commutation payment the reinsurer is willing to make?

If the effective tax rate of the cedent is higher than the tax rate of the reinsurer, the cedent will get more benefit from taking back the reserves than the reinsurer will lose from giving up the reserves. Thus the cedent's acceptable price will be lower than the reinsurer's.

Likewise, if the IRS discount unwind benefit is larger for the cedent than the reinsurer, the cedent's price will be lower than the reinsurer's. This means the cedent would need to be using a longer IRS payment pattern than the reinsurer. The reverse is more likely, which will make the commutation less feasible.

The example below assumes an effective tax rate of 30% for the cedent and 25% for the reinsurer. In addition, it assumes that the cedent uses the IRS discount factors for the "Other Liability" line while the reinsurer uses the factors from the "Reinsurance Non-Proportional Assumed Liability". The tax rate difference facilitates the commutation since the cedent gets more benefit from the tax aspects of the commutation than the reinsurer. On the other hand, the longer IRS discount pattern impedes the commutation since the cedent has a smaller tax discount unwind. The tax rate differential has a slightly larger impact so the commutation is feasible.

Table 1

	Cedent	Reinsurer	Govt
Tax Rate	30.0%	25.0%	35.0%
Tax Table	Other Liab	Reinsurance	
New $ Rate	2.50%	2.5%	1.00%

Cedent Discounts at their New Money Rate of 2.5%

	(1)	(2)	(3)	(4)
Calendar Years	Unpaid	Payout Pattern	Disc Factor	Disc Loss
2014	20,000,000	35.0%	0.99	6,914,107
2015	13,000,000	25.0%	0.96	4,818,193
2016	8,000,000	20.0%	0.94	3,760,541
2017	4,000,000	15.0%	0.92	2,751,615
2018	1,000,000	5.0%	0.89	894,834
2019	-	0.0%	0.87	-
		100.0%		19,139,291

IRS Discount Factor - "Other Liability - Occurrence" 2013

(5)	(6) = (1)*(5)	(7) = (1) - (6)	(8) = $(7)_i$ - $(7)_{i+1}$	(9) = (8)*(3)
IRS Disc Factor	IRS Disc Unpaid	IRS Discount	IRS Disc Unwind	NPV(IRS Discount Unwind)
93.5%	18,702,600	1,297,400		
94.4%	12,278,383	721,617	575,783	554,847
95.0%	7,597,072	402,928	318,689	299,611
95.6%	3,822,832	177,168	225,760	207,068
96.4%	964,140	35,860	141,308	126,447
96.6%	-	-	35,860	31,306
			1,297,400	1,219,279

Cedent - Cost to Not Commute

(a) = $(4)_{Total}$	(b) = $(9)_{Total}$	(c)	(d) = (b)*(c)	(e) = (d)
NPV Loss	NPV Tax Disc Unwind	Tax Rate	Tax Hit on Unwind of Discount	Cost to Not Commute
19,139,291	1,219,279	30.0%	365,784	365,784

Cedent - Cost to Commute

(f)=(a)	(g) = [(f) - (d) - $(6)_{2014}$ * (c)]/[1-(c)]	(h) = (g) - $(6)_{2014}$	(i) = (c)*(h)	(j) = (f) - (g) + (i)
NPV Loss	Commutation Payment	Profit	Tax on Profit	Cost to Commute
19,139,291	**18,803,896**	101,296	30,389	365,784

Reinsurer Discounts at their New Money Rate of 2.5%

	(1)	(2)	(3)	(4) = $[(1)_i - (1)_{i+1}]$*(3)
Calendar Years	Unpaid	Remaining Payout Pattern	Disc Factor	Disc Loss
2014	20,000,000	35.0%	0.99	6,914,107
2015	13,000,000	25.0%	0.96	4,818,193
2016	8,000,000	20.0%	0.94	3,760,541
2017	4,000,000	15.0%	0.92	2,751,615
2018	1,000,000	5.0%	0.89	894,834
2019	-	0.0%	0.87	-
		100.0%		19,139,291

IRS Discount Factor - "Reinsurance Non-Proportional Assumed Liability" 2013

(5)	(6) = (1)*(5)	(7) = (1) - (6)	(8) = $(7)_i$ - $(7)_{i+1}$	(9) = (8)*(3)
IRS Disc Factor	IRS Disc Unpaid	IRS Discount	IRS Disc Unwind	NPV(IRS Discount Unwind)
92.2%	18,435,480	1,564,520		
88.0%	11,433,695	1,566,305	(1,785)	(1,720)
89.0%	7,118,872	881,128	685,177	644,159
93.6%	3,743,648	256,352	624,776	573,048
96.0%	959,635	40,365	215,987	193,273
95.3%	-	-	40,365	35,239
			1,564,520	1,443,998

Reinsurer - Cost to Not Commute

(a) = $(4)_{Total}$	(b) = $(9)_{Total}$	(c)	(d) = (b)*(c)	(e) = (a) - (d)
NPV Loss	NPV Tax Disc Unwind	Tax Rate	Tax Benefit on Unwind Disc	Cost to Not Commute
19,139,291	1,443,998	25.0%	361,000	18,778,291

Reinsurer - Cost to Commute

(f) = [(a) - (d) - $(6)_{2014}$ * (c)]/[1-(c)]	(g) = (6), 2014 row	(h) = (g) - (f)	(i) = (c)*(h)	(j) = (f) + (i)
Commutation Payment	IRS Reserves Taken Down	Profit	Tax on Profit	Cost to Commute
18,892,562	18,435,480	(457,082)	(114,270)	18,778,291

CP = (NPV(Loss) - Tax Disc Unwind - IRS Disc (Loss)*Tax Rate)/(1-Tax Rate)

CP_C = (19,139,291 - 365,784 - 18,702,600*30%)/(1-30%) = **18,803,896**

CP_R = (19,139,291 - 361,000 - 18,435,480*25%)/(1-25%) = **18,892,562**

3. INCORPORATING RISK LOAD

We are going to start with the same commutation price formula as above, except now we are going to factor in the cost of capital. Capital is required to support negative variation in reserve outcomes. When the reinsurer commutes reserves, capital supporting the reserves can be taken down, which is a benefit if you assume that there is an immediate business use for the capital. Conversely, the cedent in taking back the reserves has to put capital up, which could otherwise be used to generate profits. This is a cost to the cedent, assuming that the cedent does not have unused capital with no immediate use.

The relationship between this benefit to the reinsurer and the cost to the cedent depends on how much capital is employed and the relative costs of capital. The combination of capital and cost of capital can be viewed as a risk load. If the risk load required by the cedent is less than the risk load released by the reinsurer, then the transaction will be facilitated.

Note that risk load is an internal computation that does not impact the income statement, so there are no tax consequences.

We can use the equations from above.

3.1 Cedent

The cost of not commuting remains the same as above, no risk load is needed.

The cost of commuting has the additional cost of the risk load.

$$CP_C = (NPV(Loss) - Tax\ Disc\ Unwind_C - Disc_{IRSC}(Loss) * Tax\ Rate_C + RL_C)/(1 - Tax\ Rate_C)$$
$$RL_C = Cedent\ Risk\ Load \quad (3.1)$$

3.2 Reinsurer

The cost of commuting remains the same, no risk load is needed.

The cost of not commuting has the additional cost of the risk load.

$$CP_R = (NPV(Loss) - Tax\ Disc\ Unwind_R - Disc_{IRSR}(Loss) * Tax\ Rate_R + RL_R)/(1 - Tax\ Rate_R)$$
$$RL_R = Reinsurer's\ Risk\ Load \quad (3.2)$$

Now let's look at how the risk load for the cedent could compare to the risk load for the reinsurer. As mentioned above, there are two components to a risk load – the required capital and the target return on capital. The concepts discussed in this section will be applicable to any capital approach. There are many ways to set required capital. For example, it could be set using an economic approach such as Value at Risk (VaR) or Tail Value at Risk (TVaR); based on regulatory required capital or rating agencies requirements for a given rating; or on a more simplified formula like reserves/capital. For the purposes of illustration, we are going to use an economic approach based on the 99th percentile VaR. Nowadays, most reserving software will produce reserve distributions that can be used to estimate this. Let's assume that both the reinsurer and the cedent set capital based on the profit/loss at the 99th worst income result at the time of commutation and run off this capital as the 99th worst income diminishes with loss payments. Let's assume that the runoff of the capital can be expressed as a factor against the initial 99th worst income. Appendix A shows the derivation of this runoff factor. The risk load required is then equal to the cost of capital (think of this as "target ROE"), reduced for the after-tax investment income rate earned on the capital, multiplied by the 99th worst income multiplied by the Factor for Runoff of capital.

$$RL_C = [(Target\ ROE_C - Investment\ Rate\ after\ Tax)]*Income_{99thC}*F_{RunoffC} \quad (3.3)$$

$$RL_R = [(Target\ ROE_R - Investment\ Rate\ after\ Tax)]*Income_{99thR}*F_{RunoffR} \quad (3.4)$$

RL = Risk Load

F = Factor for Runoff of Capital

Target ROE = Companies cost of capital

As before, subscripts C and R stand for Cedent and Reinsurer, respectively.

It is unlikely that these two risk loads will be equal. For example, the reinsurance business, being inherently more volatile than primary insurance, will generally require a higher cost of capital. The view of the reinsurer on the 99th worst outcome could be better or worse than the cedent and their view on how uncertainty diminishes over the lifetime of the reserve payments will also differ. For example, information on the claims making up the reserves is asymmetric. The cedent has more information on the reserves than the reinsurer. Generally, more information will allow for less parameter risk in estimating the aggregate loss distribution. This means the 99th worst outcome will be lower for the cedent, all else being equal. With a higher cost of capital and a worse 99th income, both of which imply a higher risk load for the reinsurer, the transaction will be facilitated.

Let's now introduce a diversity factor. If the relationship between the 99th percentile of the commutation reserves and the 99th percentile of the rest of the company's reserves do not move in full unison (for example as measured by correlation or a tail copula value), there will be a reduction in the required risk load for the commutation reserves. The diversity factor is the marginal impact of the 99th worst outcome for the commutation reserves on the 99th worst outcome of the company's other reserves. For example, in property catastrophe, if the set of commutation reserves comes from one cat zone, the diversity will be more significant if the insurer has cat reserves spread over many cat zones. If all their reserves come from one cat zone (e.g. a mono-state writer), then there will be little to no diversity. For casualty, the same impact would result if the commutation reserves came from one line of business and the insurer book is spread over many lines of business.

It may be that a large multi-line primary insurer has more diversity than a reinsurer focused on higher layers. This would also facilitate the commutation since the risk load released by the reinsurer would be larger than the risk load required by the cedent. Of course, if the cedent is a less diversified insurer, such as a small mono-line writer, the opposite may be true.

In the example below the reinsurer's cost of capital is assumed to be 15%, while the cedent's is 10%. In addition, the cedent is assumed to have a diversity factor of 50%, i.e. that only half the capital that the transaction requires on a stand-alone basis is needed when it is considered part of the cedent's whole reserve portfolio. The reinsurer's diversity factor is assumed to be 75%. "Capital" as used here refers to the economic capital at the 99th income percentile, as above, not capital required by a rating agency.

The factor for the runoff of capital is based on the simplified notion that the risk in the reserves diminishes in accordance with the reduction in outstanding losses. Thus, it is fully determined by the payout pattern and the discount rate. The calculation of this is shown in Appendix A. A more sophisticated reserve variability model could show that risk falls off faster than outstanding reserves.

Note, in the calculation of the risk load below, that a "premium" is calculated in order to determine the capital required, since the required capital considers the downside "profit" not just the downside losses.

One way to think of this is that when the reinsurance contract incepted, the reinsurer received funds from the cedent to pay for the risk assumed. The capital put up by the reinsurer would be based on the 99th worst outcome considering both inflows and outflows. Inflows would be initial premium and the expected value of reinstatement or sliding scale premiums (if any). Outflows would be expected losses, ceding commissions (if any), reinsurer expenses, brokerage (if involving a broker market reinsurer), and any loss sensitive profit features like a profit commission, no claims bonus, sliding scale cede, etc., although the profit features are not likely to apply in the worst outcome scenarios used to set the capital.

What I'm doing in the example below is inferring the premium needed to hit the ROE target. This is purely notional because it has nothing to do with the commutation payment, other than its use in determining the risk load. One could think of it as the original target ROE premium reduced for the proportional reduction in risk since the contract incepted. The derivation of the premium is shown in Appendix B. Note that line (6), "NPV Profit (after Tax)" is the risk load.

Calculation of Risk Load:

Table 2

	Cedent	Reinsurer	Govt
Tax Rate	30.0%	25.0%	35.0%
Tax Table	Other Liab	Reinsurance	
Discount Rate	2.50%	2.50%	1.00%

		Cedent	Reinsurer
(1)	Premium	22,372,729	25,190,017
(2)	Expected Loss	20,000,000	20,000,000
(3)	Discounted Loss	19,139,291	19,139,291
(4) = 1-3	NPV Profit (before Tax)	3,233,438	6,050,726
Tax	Tax Rate	30.0%	25.0%
(6) = 4*(1-Tax)	NPV Profit (after Tax)	**2,263,407**	**4,538,044**
(7)= Disc Rate*(1-Tax)	Passive Return	1.8%	1.9%
(8) = 15	Capital	27,435,234	34,575,576
(9) = 7 + 6/8	ROE	10.0%	15.0%

Cost of Capital

	Risk Free	Risk Margin	Total
Reinsurer	1.0%	14.0%	15.0%
Cedent	1.0%	9.0%	10.0%

Capital Calculation

		Cedent	Reinsurer
(10) Agg Loss Curve	99th Downside Loss (Disc)	40,000,000	40,000,000
(11) = 1-10	99th Downside NPV Profit	(17,627,271)	(14,809,983)
(12) Selected	Diversity Factor	0.50	0.75
(13)=11*12*-1	First Year Capital	8,813,635	11,107,487
(14)=Sum NPV(O/S)	Runoff Multiplier	3.11	3.11
(15) = 13*14	All Years Capital	27,435,234	34,575,576

Calculation of Commutation Price:

Table 3

Cedent

Cost to Not Commute

(1) NPV Tax Disc Unwind	(2) Tax Rate	(3) Tax Hit on Unwind Disc			(4) = 3 Cost to Not Commute
1,219,279	30.0%	365,784			365,784

Cost to Commute

(1) NPV Loss	(2) Risk Load	(3) CP	(4) Profit	(5) Tax on Profit	(6) = 1 + 2 + 5 - 3 Cost to Commute
19,139,291	2,263,407	**22,037,334**	3,334,734	1,000,420	365,784

Reinsurer

Cost to Not Commute

(1) NPV Loss	(2) NPV Tax Disc Unwind	(3) Tax Rate	(4) Tax Benefit on Unwind Disc	(5) Risk Load	(6) = 1 + 5 - 4 Cost to Not Commute
19,139,291	1,443,998	25.0%	361,000	4,538,044	23,316,336

Cost to Commute

(1) CP	(2) Reserves Taken Down	(3) Profit on Transaction	(4) Tax on Transaction		(6) = 1 + 4 Cost to Commute
24,943,288	18,435,480	(6,507,808)	(1,626,952)		23,316,336

CP = (NPV(Loss) - Tax Disc Unwind - IRS Disc (Loss)*Tax Rate + RL)/(1-Tax Rate)

CP_C = (19,139,291 - 365,784 - 18,702,600*30% + 2,263,407)/(1-30%) = **22,037,334**

CP_R = (19,139,291 - 361,000 - 18,435,480*25% + 4,538,044)/(1-25%) = **24,943,288**

As you can see the commutation is facilitated by the fact that the risk load released by the reinsurer is larger than the risk load put up by the cedent.

Required capital could also be driven by a rating agency's required capital level to maintain a given rating. If you assume that primary insureds are less sophisticated than insurers, it would follow that a higher rating would be more valuable to a reinsurer than an insurer. It is also likely that a rating agency will require a reinsurer to hold more capital for a given level of reserves for a given rating level than an insurer. Both of these factors would increase the reinsurer's risk load relative to the cedent and facilitate the commutation.

Generally, a cedent or a reinsurer that is concerned with financial ratings may base their required capital, for pricing purposes, on the capital required by the rating agency to achieve their desired rating. One would think that this is likely to exceed the economic capital required, since rating agencies should build in a margin of error.

4. INCORPORATING REINSURER CREDIT RISK AND SCHEDULE F PENALTIES

Unlike the previous costs and benefits discussed above, we will assume that reinsurer credit risk will impact only the cedent's commutation ambivalence point. It could be argued that there is a possible benefit to the reinsurer of commuting reserves, if it has an impact on their rating agency credit rating. A commutation would generally have to be very large and the credit rating unstable for this to have any impact. We'll ignore this potential benefit to the reinsurer.

In the required capital formula for one of the larger rating agencies, there is a fixed factor applied to reinsurance recoverables of 10%. This factor can vary considerably based on the rating of the reinsurer, the dependence of the cedent upon reinsurance (leverage of recoverables plus ceded premiums to surplus), and the concentration of recoverables with the given reinsurer. It could be as low as 2% and as high as 100%. The charge for credit risk requires the cedent to put up capital to support the ceded reserves. The cost can be viewed as a risk load based on the cedent's cost of capital. Unlike the cedent risk load discussed above, which only arises when the reserves are commuted, this risk load exists when the reserves are not commuted and disappears when they are.

Commuting will eliminate this risk load which will lower the required commutation price for the cedent.

$$CP_C = (NPV(Loss) - Tax\ Unwind_C - Disc_{IRSC}(Loss) * Tax\ Rate_C + RL_{Economic} - RL_{Credit}) / (1\text{-}Tax\ Rate_C) \quad (4.1)$$

Note that this charge is an internal cost to the cedent and does not enter into the income statement, so there is no tax impact.

An alternative approach to assessing an economic impact of reinsurance credit risk, as opposed to the rating agency charge, is to use transition matrices, such as those calculated by S&P. These matrices will give the probability of default over a specified time horizon for a given starting rating value. These can then be extended as far as desired into the future and a cumulative default rate determined. To that default rate, an assumed percentage of recovery has to be applied to get a total loss amount. Note that this calculation does not reflect the impact of a slowdown in reinsurance payments such as that reflected in Schedule F.

Schedule F penalties are generally a charge against surplus. This means that the ceded reserves are assigned additional capital. So another risk load is required to support the ceded reserves. The impact is exactly identical in form to the impact of credit risk. Commutation will eliminate this cost, and the cedent will accept a lower commutation price to eliminate this risk load.

$$CP_C = (NPV(Loss) - Tax\ Unwind_C - Disc_{IRSC}(Loss) * Tax\ Rate_C + RL_{Economic} - RL_{Credit} - RL_{SchF}) / (1 - Tax\ Rate_C) \quad (4.2)$$

Schedule F penalties (or equivalents for GAAP accounting) apply to financial statement capital. Presumably, rating agencies will have factored in slowdown in payments or other drivers of Schedule F penalties into the factor they select above, which means that it would be double counting to include risk loads for both components.

In the example below, both loads are included under the assumption that "credit risk" refers to the default of the reinsurer, while Schedule F penalties applies to the slowdown in payments that can occur independent of default.

The credit risk charge is based upon the assumption that the cedent has a reinsurance leverage of 100% (current recoverables plus ceded premiums is equal to surplus) and the charge is 45%. To simplify the calculation, we assume that the charge is then the capital needed to support the transaction *45%, i.e. we assume no extra diversity reduction. The risk load associated with it is 10% of capital, i.e. an ROE of 10%. The Schedule F penalty is based on the reinsurer being classified as a slow payer. The capital in this case is the reinsurance recoverable of $20m * Sch. F Penalty of 20%.

Calculation of Risk Load:

Table 4

	Cedent	Reinsurer	Govt
Tax Rate	30.0%	25.0%	35.0%
Tax Table	Other Liab	Reinsurance	
New $ Rate	2.50%	2.50%	1.00%
Reinsurance Leverage	100.0%	N/A	
Credit Charge (Rating Agency)	45%		
Schedule F Penalty	20%		

		Cedent	Reinsurer
(1)	Premium	22,372,729	25,190,017
(2)	Expected Loss	20,000,000	20,000,000
(3)	Discounted Loss	19,139,291	19,139,291
(4) = 1-3	NPV Profit (before Tax)	3,233,438	6,050,726
Tax	Tax Rate	30.0%	25.0%
(6) = 4*(1-Tax)	NPV Profit (after Tax)	2,263,407	4,538,044
(7)= Disc Rate*(1-Tax)	Passive Return	1.8%	1.9%
(8) = 17	Capital	27,435,234	34,575,576
(9) = 7 + 6/8	ROE	**10.0%**	**15.0%**

Cost of Capital

	Risk Free	Risk Margin	Total
Reinsurer	5.0%	10.0%	15.0%
Cedent	5.0%	5.0%	10.0%

Capital Calculation

		Cedent	Reinsurer
(10) Agg Loss Curve	99th Downside Loss (Disc)	40,000,000	40,000,000
(11) = 1-10	99th Downside NPV Profit	(17,627,271)	(14,809,983)
(12) Selected	Diversity Factor	0.50	0.75
(13)=11*12*-1	First Year Capital	8,813,635	11,107,487
(14)=Sum NPV(O/S)	Years Held Multiplier	3.11	3.11
(15) = 13*14*Reins Lev*Credit Chg	Credit Risk Capital	12,345,855	-
(16) = 2*Sch F Penalty	Sch F Capital	4,000,000	-
(17) = 13*14	Economic Risk Load Capital	27,435,234	34,575,576

Calculation of Commutation Price:

Table 5

Cedent

Cost to Not Commute

NPV Tax Disc Unwind	Tax Rate	Tax Hit on Unwind Disc	Credit Risk Load	Sch F Risk Load	Cost to Not Commute
1,219,279	30.0%	365,784	1,234,586	400,000	2,000,369

Cost to Commute

NPV Loss	Economic Risk Load	Commutation Payment	Profit on Transaction	Tax on Profit	Cost to Commute
19,139,291	2,263,407	**19,702,212**	999,612	299,884	2,000,369

Reinsurer

Cost to Not Commute

NPV Loss	NPV Tax Disc Unwind	Tax Rate	Tax Benefit on Unwind Disc	Risk Load	Cost to Not Commute
19,139,291	1,443,998	25.0%	361,000	4,538,044	23,316,336

Cost to Commute

Commutation Payment	Reserves Taken Down	Profit on Transaction	Tax on Transaction		Cost to Commute
24,943,288	18,435,480	(6,507,808)	(1,626,952)		23,316,336

CP_C = (NPV(Loss) - Tax Disc Unwind - IRS Disc (Loss)*Tax Rate + RL - Risk Load$_{Credit}$ - Risk Load$_{Sch\ F}$)/(1-Tax Rate)

CP_C = (19,139,291 - 365,784 - 18,702,600*30% + 2,263,407 - 1,234,586 - 400,000)/(1-30%) = **19,702,212**

CP_R = (19,139,291 - 361,000 - 18,435,480*25% + 4,538,044)/(1-25%) = **24,943,288**

Note that the commutation price is unchanged for the reinsurer.

5. INCORPORATING FUNDING OF COMMUTATION PAYMENTS

This addresses the issue of the cost to the reinsurer of converting reserves into cash for a commutation payment and the cost to the insurer of investing cash to pay for the future payments on the commuted reserves.

In a rising interest rate environment, relative to when the reserves were funded by the reinsurer, if the reinsurer is matching assets with liabilities and has to liquidate assets to fund the commutation, it is likely to realize capital losses in the process. This will increase the cost to it and lower its acceptable commutation price. The opposite is true in a falling interest rate environment.

In a very low and flat yield curve environment such as that prevailing in 2014, there is likely to be much more investment in short-term instruments since liquidity is valuable and there is less to be gained from investing long. In this case, the reinsurer is likely to have sufficient cash or short-term instruments on hand to fund the commutation payment. Thus, there may not be the need to realize capital losses to fund the commutation.

On the other hand, the cedent will often invest new cash in a variety of instruments that maximize the overall portfolio return without slavish regard to the exact matching of assets and liabilities. In this case, the new money rate of the cedent is the defacto maximum discount rate the cedent will use to value the commutation reserves, even if long term assets that match the liability duration have a higher return.

The literature often advocates the use of risk-free discount rates under the assumption that any higher discount rate involves risk for the cedent and should be separated from the pure commutation value (or another risk load added). In practice, the risk free rate is determined by the lowest risk available investments. This is often considered to be the rates offered by US Government securities. However, there remains a risk of default, even of the US Government, so the theoretical risk-free rate should be even lower.

At the present time, the rates on US Government securities have been maintained per monetary policy at extremely low rates. These rates would probably not be feasible to use in valuing a commutation. For example, if the cedent invested in US Government bonds, the current yield curve for the duration of reserves in our example would imply a yield of 0.43%. The examples above have assumed a 2.5% new money rate. If the 0.43% rate was used, how would the cedent's commutation price change? First, the NPV(Loss) would increase. Second the discounted 99^{th} worst loss outcome would increase, which would increase the capital required. The income would go down because the discounted loss is higher and the passive return on capital would decrease. The rating agency credit charge, since it is applied against required capital (before diversity) would also increase, which increases the credit risk load. This would be slightly offset by an increase in the present value of the IRS discount unwind. The net effect would drive the cedent to a higher risk load and a higher required commutation price.

NPV(Loss) would increase from $19.1m to $19.8m

99^{th} worst loss outcome increases from $40.0m to $41.5m

NPV(IRS Discount Unwind) from increase from $365k to $385k

Years Held Multiplier would increase from 3.11 to 3.27

Economic risk load would increase from $2.3m to $2.8m

Credit risk load would increase from $1.2m to $1.3m

Commutation price would increase from $19.7m to $21.4m

<u>Commutation Price at 2.5% new money rate</u>

CP_C = (19,139,291 - 365,784 - 18,702,600*30% + 2,263,407 - 1,234,586 - 400,000)/(1-30%) = **19,702,212**

<u>Commutation Price at 0.43% Government Rate</u>

CP_C = (19,846,402 - 385,021 - 18,702,600*30% + 2,794,042 - 1,296,339 - 400,000)/(1-30%) = **21,354,721**

This calculation assumes that the cedent will match the pure loss component of the commutation proceeds with the liability duration, i.e. that the current risk-free rate will be used to price the commutation. In this historically low interest rate environment, various other strategies may be employed to maximize the return on the commutation proceeds. For example, the cedent could hold all the proceeds in short-term investments and reinvest to match the remaining loss duration if and when the interest rates turn upwards. An example illustrating this approach is given in Appendix D.

If there is a cost to liquidating investments to fund the commutation, the Commutation Price formula for the reinsurer includes an additional term:

$$Cost\ of\ Commuting = CP_R + (Disc_{IRSR}(Loss) - CP_R) * Tax_{\ RateOrdinary\ Income} + Realized\ Capital\ Losses * (1 - Tax\ Rate_{Capital\ Gains}) \quad (5.1)$$

The realized investment losses are netted for capital gains tax. The commutation payment formula then includes an additional term for the realized capital loss. It is a negative term because the larger the capital loss, the lower the acceptable commutation price for the reinsurer.

$$CP_R = (NPV(Loss) - Tax\ Disc\ Unwind_R - Disc_{IRSR}(Loss) * Tax_{\ RateOrdinary\ Income} + RL_R - Realized\ Capital\ Losses * (1 - Tax\ Rate_{Capital\ Gains}))/(1 - Tax\ Rate_R) \quad (5.2)$$

Calculation of Capital Loss on Commutation:

Table 7

		Strips At Time of Purchase			Strips At Time of Commutation		
Calendar			Yield			Yield	
Year	Payments	Maturity	Curve	Price	Maturity	Curve	Price
2014	7,000,000	1	1.0%	6,930,693	1	3.00%	6,796,117
2015	5,000,000	2	1.3%	4,877,305	2	3.25%	4,690,184
2016	4,000,000	3	1.5%	3,825,268	3	3.50%	3,607,771
2017	3,000,000	4	1.8%	2,798,876	4	3.75%	2,589,219
2018	1,000,000	5	2.0%	905,731	5	4.00%	821,927
	20,000,000			19,337,873			18,505,218
	Capital Loss at Time of Commutati			**832,655**			

CP_R = (19,139,291 - 361,000 - 18,435,480*25% + 4,538,044 - **832,655*(1-20%)**)/(1-25%) = **24,055,123**

This is a decrease of $881k.

6. MEDICAL COST, MEDICAL UTILIZATION AND TORT LIABILITY TRENDS

So far, we have avoided any discussion of disagreement between the insurer and the reinsurer in the size of the ultimate reserves. For reserves that are likely to be impacted by future medical inflation, medical utilization or tort liability award trends, the cedent is likely to have a more conservative view than the reinsurer. Complicating the situation is that some cedents may not explicitly include the cost of medical inflation or medical utilization into their reserve estimates. The reinsurer may take the reserves presented by the cedent at face value without knowing whether or not such future costs are built in. However, the cedent will include this cost when negotiating the commutation potentially creating a large gap between the reserves held by the reinsurer and the ultimate values estimated by the cedent.

Workers Compensation claims involving permanent total injuries with an expectation of lifetime medical payments often have these characteristics. In order to calculate a discounted reserve value for a single such claim, the following information is required:

- Information about weekly indemnity payments, COLAs associated with them and any time limit on indemnity,
- Ongoing medical costs, anticipated future surgeries, medication costs, home care, etc. and the inflation associated with these costs
- Estimated life expectancy and the appropriate life table

Differences in inflation assumptions can have a huge impact, especially on excess of loss layers. The following example illustrates the impact of assuming a 3% medical inflation (near-term medical CPI) vs. a 6% inflation (longer-term medical CPI). In practice, different inflation assumptions would be made for each medical cost component, such as medications (including brand label becoming generic), anticipated advances in medical devices/surgeries which may have a very high initial cost, inflation in home health care, cost of prosthetics, end of life spike in costs, etc.

In the example below, under both scenarios, the full $5m limit is exhausted. However, the present value of the reserves, when the medical inflation is 6%, is $1.5m compared to $1.1m when the medical inflation is 3%.

In this case, distributions around the key cost parameters should be employed in order to arrive at a fair expected value. Improvements in life expectancy, not always captured in the latest available life table, would be one such key parameter.

Many of these considerations also play a role in serious automobile claims, product liability claims, latent injury claims, etc. that have the possibility of catastrophic bodily injury.

Table 8

Example of Medical Inflation Rate on Commutation Value

Parameters		
Date of Loss	1/1/2008	
Evaluation Date:	12/31/2014	
Rated Age:	65	
Gender	M	
Est'd Annual Indem. Pmt:	$ 20,000.00	Per State Formula
Est'd Annual Med. Pmt:	$ 50,000.00	Estimated by Cedent
Cost of Living Adjustment:	2.00%	Specified by State as 20 year COLA
Est'd Medical Cost Infl'n:	**6.00%**	
Indemnity Paid to Date:	200,000	
Medical Paid to Date:	500,000	
Reins. Attachment Point:	1,000,000	
Reins. Limit:	5,000,000	
Discount Rate:	2.50%	
100% Expected Layer Pmt, Discounted	1,508,781	

Cal Yr.	Incremental Indemnity Payment	Incremental Medical Payment	Total Payment	Cumulative Payment	Excess of Attachment	Probability of Surviving to the Pmt Yr	2.5% Discount Factor	Expected Disc't Pmt
2014	200,000	500,000	700,000	700,000	0		1.00	
2015	20,199	51,478	71,677	771,677	0	100.0%	0.99	-
2016	20,603	54,567	75,170	846,847	0	98.6%	0.96	-
2017	21,015	57,841	78,856	925,703	0	97.0%	0.94	-
2018	21,435	61,311	82,747	**1,008,450**	8,450	95.3%	0.92	7,389
2019	21,864	64,990	86,854	**1,095,304**	95,304	93.6%	0.89	72,725
2020	22,301	68,889	91,191	**1,186,494**	186,494	91.7%	0.87	72,980
2021	22,747	73,023	95,770	**1,282,264**	282,264	89.6%	0.85	73,122
2022	23,202	77,404	100,606	**1,382,871**	382,871	87.5%	0.83	73,141
2023	23,666	82,048	105,715	**1,488,586**	488,586	85.2%	0.81	73,015
2024	24,140	86,971	111,111	**1,599,696**	599,696	82.7%	0.79	72,718
2025	24,622	92,190	116,812	**1,716,508**	716,508	80.1%	0.77	72,230
2026	25,115	97,721	122,836	**1,839,344**	839,344	77.4%	0.75	71,551
2027	25,617	103,584	129,201	**1,968,546**	968,546	74.5%	0.73	70,679
2028	26,130	109,799	135,929	**2,104,474**	1,104,474	71.4%	0.72	69,589
2029	26,652	116,387	143,039	**2,247,514**	1,247,514	68.3%	0.70	68,245
2030	27,185	123,370	150,556	**2,398,069**	1,398,069	64.9%	0.68	66,618
2031	27,729	130,773	158,502	**2,556,571**	1,556,571	61.3%	0.67	64,696
2032	28,283	138,619	166,902	**2,723,473**	1,723,473	57.7%	0.65	62,491
2033	28,849	146,936	175,785	**2,899,259**	1,899,259	53.9%	0.63	60,010
2034	29,426	155,752	185,178	**3,084,437**	2,084,437	50.0%	0.62	57,259
2035	30,015	165,097	195,112	**3,279,549**	2,279,549	46.1%	0.60	54,237
2036	30,615	175,003	205,618	**3,485,167**	2,485,167	42.2%	0.59	50,974
2037	31,227	185,503	216,731	**3,701,898**	2,701,898	38.2%	0.57	47,496
2038	31,852	196,634	228,485	**3,930,383**	2,930,383	34.3%	0.56	43,842
2039	32,489	208,432	240,921	**4,171,304**	3,171,304	30.4%	0.55	40,055
2040	33,139	220,938	254,076	**4,425,380**	3,425,380	26.7%	0.53	36,187
2041	33,801	234,194	267,995	**4,693,375**	3,693,375	23.2%	0.52	32,295
2042	34,477	248,245	282,723	**4,976,098**	3,976,098	19.8%	0.51	28,442
2043	35,167	263,140	298,307	**5,274,405**	4,274,405	16.7%	0.49	24,690
2044	35,870	278,929	314,799	**5,589,204**	4,589,204	13.9%	0.48	21,100
2045	36,588	295,664	332,252	**5,921,456**	4,921,456	11.3%	0.47	17,730
2046	37,319	313,404	350,724	6,272,180	5,000,000	9.1%	0.46	3,276
2047	38,066	332,208	370,274	6,642,454	5,000,000	7.1%	0.45	-
2048	38,827	352,141	390,968	7,033,422	5,000,000	5.5%	0.44	-
2049	39,604	373,269	412,873	7,446,295	5,000,000	4.1%	0.43	-
2050	40,396	395,666	436,061	7,882,357	5,000,000	3.0%	0.42	-
2051	41,204	419,405	460,609	8,342,966	5,000,000	2.0%	0.41	-
2052	42,028	444,570	486,598	8,829,563	5,000,000	1.1%	0.40	-
2053	42,868	471,244	514,112	9,343,676	5,000,000	0.4%	0.39	-
2054	43,726	499,519	543,244	9,886,920	5,000,000	0.0%	0.38	-
2055	44,600	529,490	574,090	10,461,010	5,000,000	0.0%	0.37	-
2056	45,492	561,259	606,751	11,067,761	5,000,000	0.0%	0.36	-
Total								1,508,781

Table 9

Example of Medical Inflation Rate on Commutation Value

Parameters		
Date of Loss	1/1/2008	
Evaluation Date:	12/31/2014	
Rated Age:	65	
Gender	M	
Est'd Annual Indem. Pmt:	$ 20,000.00	Per State Formula
Est'd Annual Med. Pmt:	$ 50,000.00	Estimated by Cedent
Cost of Living Adjustment:	2.00%	Specified by State as 20 year COLA
Est'd Medical Cost Infl'n:	**3.00%**	
Indemnity Paid to Date:	200,000	
Medical Paid to Date:	500,000	
Reins. Attachment Point:	1,000,000	
Reins. Limit:	5,000,000	
Discount Rate:	2.50%	
100% Expected Layer Pmt, Discounted	1,098,766	

Cal Yr.	Incremental Indemnity Payment	Incremental Medical Payment	Total Payment	Cumulative Payment	Excess of Attachment	Probability of Surviving to the Pmt Yr	2.5% Discount Factor	Expected Disc't Pmt
2014	200,000	500,000	700,000	700,000	0		1.00	
2015	20,199	50,744	70,943	770,943	0	100.0%	0.99	-
2016	20,603	52,267	72,870	843,813	0	98.6%	0.96	-
2017	21,015	53,835	74,850	918,663	0	97.0%	0.94	-
2018	21,435	55,450	76,885	995,548	0	95.3%	0.92	-
2019	21,864	57,113	78,977	**1,074,526**	74,526	93.6%	0.89	62,402
2020	22,301	58,827	81,128	**1,155,654**	155,654	91.7%	0.87	64,927
2021	22,747	60,592	83,339	**1,238,993**	238,993	89.6%	0.85	63,631
2022	23,202	62,409	85,612	**1,324,604**	324,604	87.5%	0.83	62,240
2023	23,666	64,282	87,948	**1,412,552**	412,552	85.2%	0.81	60,743
2024	24,140	66,210	90,350	**1,502,902**	502,902	82.7%	0.79	59,130
2025	24,622	68,196	92,819	**1,595,721**	595,721	80.1%	0.77	57,394
2026	25,115	70,242	95,357	**1,691,078**	691,078	77.4%	0.75	55,545
2027	25,617	72,349	97,967	**1,789,044**	789,044	74.5%	0.73	53,592
2028	26,130	74,520	100,650	**1,889,694**	889,694	71.4%	0.72	51,528
2029	26,652	76,756	103,408	**1,993,102**	993,102	68.3%	0.70	49,337
2030	27,185	79,058	106,243	**2,099,345**	1,099,345	64.9%	0.68	47,011
2031	27,729	81,430	109,159	**2,208,504**	1,208,504	61.3%	0.67	44,556
2032	28,283	83,873	112,156	**2,320,660**	1,320,660	57.7%	0.65	41,993
2033	28,849	86,389	115,238	**2,435,899**	1,435,899	53.9%	0.63	39,340
2034	29,426	88,981	118,407	**2,554,305**	1,554,305	50.0%	0.62	36,612
2035	30,015	91,650	121,665	**2,675,970**	1,675,970	46.1%	0.60	33,820
2036	30,615	94,400	125,015	**2,800,985**	1,800,985	42.2%	0.59	30,992
2037	31,227	97,232	128,459	**2,929,444**	1,929,444	38.2%	0.57	28,152
2038	31,852	100,149	132,000	**3,061,444**	2,061,444	34.3%	0.56	25,328
2039	32,489	103,153	135,642	**3,197,086**	2,197,086	30.4%	0.55	22,551
2040	33,139	106,248	139,386	**3,336,472**	2,336,472	26.7%	0.53	19,852
2041	33,801	109,435	143,236	**3,479,709**	2,479,709	23.2%	0.52	17,261
2042	34,477	112,718	147,196	**3,626,904**	2,626,904	19.8%	0.51	14,808
2043	35,167	116,100	151,267	**3,778,171**	2,778,171	16.7%	0.49	12,520
2044	35,870	119,583	155,453	**3,933,624**	2,933,624	13.9%	0.48	10,420
2045	36,588	123,170	159,758	**4,093,382**	3,093,382	11.3%	0.47	8,525
2046	37,319	126,865	164,185	**4,257,566**	3,257,566	9.1%	0.46	6,848
2047	38,066	130,671	168,737	**4,426,303**	3,426,303	7.1%	0.45	5,392
2048	38,827	134,591	173,418	**4,599,722**	3,599,722	5.5%	0.44	4,157
2049	39,604	138,629	178,233	**4,777,955**	3,777,955	4.1%	0.43	3,132
2050	40,396	142,788	183,184	**4,961,138**	3,961,138	3.0%	0.42	2,302
2051	41,204	147,072	188,275	**5,149,413**	4,149,413	2.0%	0.41	1,544
2052	42,028	151,484	193,511	**5,342,925**	4,342,925	1.1%	0.40	859
2053	42,868	156,028	198,897	**5,541,822**	4,541,822	0.4%	0.39	323
2054	43,726	160,709	204,435	**5,746,256**	4,746,256	0.0%	0.38	(0)
2055	44,600	165,530	210,131	**5,956,387**	4,956,387	0.0%	0.37	(0)
2056	45,492	170,496	215,988	6,172,375	5,000,000	0.0%	0.36	(0)
Total								1,098,766

7. QUALITATIVE CONSIDERATIONS IN COMMUTATIONS

The following illustrate some of the considerations that may cause the cedent or the reinsurer to be motivated to commute beyond the formula dynamics described above. These examples are merely a sampling of reasons and are far from exhaustive.

1. Distressed Reinsurer or Cedent - Here, the first party to the negotiation table generally will get the best outcome (as long as the distressed company is expected to run-off without going into receivership. Otherwise any agreement may be subject to unwind due to the principle of "voidable preference"). So the solvent party may be highly motivated to settle. Settling for discounted loss values (effectively harvesting the imbedded value in the undiscounted reserves) may bolster the solvency of the distressed party. These situations will often involve global commutations and can be quite large. Usually cost considerations such as risk loads, different tax treatment, credit risk, etc. will not play into the settlement.
2. Two bombs are detonated in a large city within blocks of each other 1 hour apart. The cedent has a WC reinsurance treaty for $5m xs $5m on an occurrence basis. The issue at hand: is it one or two occurrences? The total loss is calculated at $25m. If it is considered two occurrences, the insurer believes it is entitled to collect $10m in recoveries; if one occurrence, only $5m. This same issue is affecting many reinsurance contracts and the resolution is tied up in court proceedings that will take many years to resolve. However, the insurer has already paid the full $25m loss. The amount of the reinsurance recovery, and the delay in determining it, will affect both the balance sheet and the income statement for several years. The cedent is motivated to commute. The insurer and reinsurer may agree to commute for a compromise payment of $7.5m.

   Another example of dispute over the number of occurrences could arise in consecutive risks attaching property cat treaties with an interlocking clause that limits the recovery from a single event to one occurrence limit, even when both treaties are involved. If there is a question about the number of events, such as when a hurricane hits in one area, strengthens and then later hits in another area, this can tie up recoveries.

3. A cedent has a WC reinsurance treaty for the layer $8m xs $2m. One of the employees of an insured, 25 years old, has suffered a traumatic brain injury and will need lifetime care. The rated age of the injured worker is 75 years. The claim is valued at $10m and the duration of the claim is expected to be 30 years. The discounted value is $4.1m. This splits into a discounted value of $1.4m for the insurer and $2.6m for the reinsurer. The insurer has the opportunity to enter into a structured settlement for $3.0m. The strict application of the reinsurance language would allow a recovery of only $1.0m. However, if the settlement is not

entered into, both the insurer and reinsurer will pay more on a present value basis. The duration of the first $1m of payments is 12 years and the duration of the $8m xs $2m payments is 39 years.

No settlement:

Insurer: $1.4m

Reinsurer: $2.6m

Structured Settlement with no commutation:

Insurer: $2.0m

Reinsurer: $1.0m

Structured Settlement with allocation of discount to each layer:

Insurer: $1.3m

Reinsurer: $1.7m

The insurer and reinsurer agree to commute the claim for $1.7m. The reinsurer saves $0.9m and the insurer saves $0.1m and both eliminate future uncertainty.

4. A large multi-line insurer decides to exit the surety line. The book consists largely of contract surety bonds. They have an uncapped quota share treaty on a risks attaching basis. The book has produced a higher than expected combined ratio result of 90%. A lower combined ratio was anticipated because the insurer price included a profit load higher than 10%, due to the systemic catastrophe potential. Claims handling is crucial for this line of business. In particular, the extension of credit to obligees can often ameliorate potential cash-flow induced claims. The ascertaining of where this is likely to lower losses involves substantial involvement and ongoing discussions with the obligees. The reinsurer is concerned about the claims handling expertise that will be applied in the run-off of this book. The insurer believes their run-off results will be equal to or better than historical results. The reinsurer may be motivated to commute for a combined ratio of 100% on the run-off exposure and the insurer may be happy to accept this.
5. Casualty reinsurance purchased in the time period 1960 – 1980. Attachment points and limits are quite low relative to current cost levels – $4m xs $1m layers in today's dollars are equivalent to $400k xs $100k or $800k xs $200k during those time periods. Any remaining claim recoveries will be small in magnitude and few in number. Both insurer and reinsurer are motivated to commute just to eliminate future administrative costs. The commutation amounts are likely to be small as well, which will also facilitate the commutation.

6. Sidecar/Cat Bond/Hedge Fund Reinsurer – the hedge fund has provided the initial capital to fund the agreement (generally in the form of a "special purpose vehicle") and now wants to commute in order to repatriate capital to investors. The underlying business in these agreements is typically short-tail business where reserves are paid quickly and commutation values can be agreed soon after the expiration of the agreement. In these cases, usually commutation is an up-front expectation so the mechanism for calculating the commutation does not involve compromise.

   Another example of a pre-agreed commutation is when a reinsurance contract includes a mandatory commutation clause. This was often seen in worker's compensation excess of loss facultative certs where one of the reinsurers was a life company. In these cases all the parameters for calculation of the individual claim values were generally spelled out in the cert.

7. Coverage dispute on specific underlying claims. For example, Cedent A may write a layer of an insured's program. There may be a strong case for an expected and intended defense (i.e. the insured knew of the loss before the policy period). Cedent A settles the claim for a small discount on the full layer value without taking the case to trial. However, the reinsurer also covers Cedent B participating higher up on the insured's coverage tower. Cedent B more aggressively fights the claim and eventually gets a better result at a higher discount on the layer value. The reinsurer disputes the settlement value of Cedent A. Cedent A and the reinsurer may agree to commute the claim using the higher discount on the lower layer.

8. Conclusion

A cedent and a reinsurer may agree to commute individual claims or entire books of business for many reasons. When both parties are solvent, the commutation negotiation may involve many cost/benefit considerations beyond the simple discounted value of the outstanding reserves. Some of those addressed here include tax value embedded in the reserves, capital needed to support the reserves, reinsurer credit risk, funding considerations and differing viewpoints on cost inflation. When these costs/benefits are included in the commutation price, the commutation may be facilitated or hindered depending on the magnitude of the cost/benefit of these items to both parties.

There are also many other financial reasons that may drive commutation settlements that may not allow for such a detailed cost/benefit analysis. Principal among these is commutation involving a distressed counterparty. Some other reasons include disputed claims, structured settlements, cedent exit from a line of business, expense considerations on low activity treaties and prior commutation expectations, such as a mandatory commutation clause. There are, of course, many other reasons that are not enumerated here.

DISCLAIMERS

The opinions expressed are solely those of the author and are not presented as a statement of the views or practices of any past or present employer. The author assumes no liability whatsoever from any damages that may result, directly or indirectly, from use or reliance on any observation, opinion, idea or method presented in this paper.

Biography of the Author

Brian MacMahon is Chief Actuary, Reinsurance for the Liberty Mutual Reinsurance unit within Liberty Mutual Group. He is responsible for all aspects of actuarial support for reinsurance including treaty pricing, treaty reserving, financial planning and capital allocation. He has a Master's of Science in Applied Mathematics from California State University at Hayward. He is a Fellow of the CAS, a Chartered Enterprise Risk Analyst (CERA), and a Member of the American Academy of Actuaries. He participates on the CAS Reinsurance Research committee, and is a frequent presenter at industry symposia.

Appendix A – Derivation of Capital Run-off Factor (Section 3)

The capital run-off factor is the multiplier applied to initial capital in order to get at total capital. Initial capital is set at the time of commutation and is based on the selected approach. In this paper, we have used the 99th percentile VaR of income. In other words, if the final amount of reserves to be paid was known at the end of the year and it was the 99th worst outcome, we would utilize the full initial capital held to pay the losses.

However, if the payout pattern extends over several years, and the outcome remains uncertain over those years, we have to continue to hold capital until the final outcome either requires us to use part or all of the capital or release the capital for other uses. Generally, the uncertainty reduces as the outstanding losses are paid down. This means that the 99th worst outcome also reduces. So, while capital has to be held for many years, the amount of that capital reduces each year. In this paper, we have made the simplifying assumption that capital reduces proportionally as outstanding losses reduce. An argument can be made that the major risk is frontloaded in the payment pattern and capital should be taken down more rapidly than the reduction in the outstanding losses. Certainly one can construct cases where the risk is front loaded and other cases where it is back loaded.

In Table A below, the calculation of the capital runoff factor, 'F', is shown. The implication with this method is that the initial variation as a percentage of the mean, remains the same as reserves are paid out. For example, if the aggregate income curve was a lognormal, the coefficient of variation would determine the 99th percentile. This method would be equivalent to assuming that the CoV remains the same each year as the reserves are paid out, i.e. the mean would shrink but the CoV would stay the same. This is probably conservative for claims that are certain as to amount but the payment is slow. One example would be a set of high excess Fortune 100 casualty claims, all of which are large enough to exhaust the insurer's layers with certainty but payment is slow because of negotiations with all of the insurers on the full tower of coverage. On the other hand, there are claims where payments do not indicate a proportional reduction in future uncertainty. One example would be Worker's Compensation lifetime pension cases, where the biggest source of variability is the future medical inflation and utilization. As payments are made (especially indemnity payments), this variability may not decrease in proportion to the reduction in outstanding loss.

In formula terms, the runoff factor, 'F', can be expressed as:

$$Runoff\ Factor = \text{'}F\text{'} = 1 + \sum_{i=2}^{n}\sum_{j=i}^{n} NPV_0(Unpaid_{j-1} - Unpaid_j) \tag{A.1}$$

Where,

NPV_0 = NPV back to time of commutation

$i = 1$ is time of commutation

$i = n$ is time of last payment

Table A

i	Year	O/S Loss	(1) O/S Reserves	(2) = (1)i-1 - (1)i Payout	(3) = NPV[Sum(2_i to 2_6)]/(1+d)^$Year_i$ % of Intial Capital
1	0.00	20,000,000	100.0%		100.0%
2	0.50	13,000,000	65.0%	35.0%	93.4%
3	1.50	8,000,000	40.0%	25.0%	59.6%
4	2.50	4,000,000	20.0%	20.0%	36.1%
5	3.50	1,000,000	5.0%	15.0%	17.8%
6	4.50	-	0.0%	5.0%	4.4%
				Runoff Factor 'F':	3.11

Appendix B – Derivation of Premium used in Risk Load Calculation (Section 3)

The example in Table 2 of Section 3 did not include any expense. In this derivation, it will be included. The premium we are deriving here can be viewed as the premium that the reinsurer would charge if it was to assume the same reserves that are being considered for commutation. In other words, it would want the premium to cover the expected value of the reserves, all expenses associated with the transaction -both internal and external- and a profit load that yields their target after-tax return on capital. Losses, expenses and the stream of capital supporting the reserves would all be considered on a present value basis.

Premium is equal to the sum of discounted losses, discounted expenses and profit margin. Now, profit margin does not have to cover the entire target return on capital. Capital is invested while it is used to support the reserves. Let's call the after-tax investment income earned on capital, the "passive" return. The after-tax profit margin on the insurance cash flows, we'll call the "active" return. We'll assume that the discount rate used to present value the cash flows is equal to the investment income rate on the capital. The sum of the passive and active returns has to equal the after-tax target return on capital.

The after-tax profits from both the active and passive returns have to equal the target after-tax ROE times the capital. In formulaic terms:

$$Premium = Loss_{Disc} + Expense_{Disc} + Active\ Profit \quad \text{(B.1)}$$

$$Premium = Loss_{Disc} + Expense_{Disc} + Total\ Profit - Passive\ Profit \quad \text{(B.2)}$$

$$Premium = Loss_{Disc} + Expense_{Disc} + ROE*Capital/(1\text{-}Tax\ Rate) - Discount\ Rate*Capital \quad \text{(B.3)}$$

$$Capital = (99^{th}\ percentile\ worst\ loss - Premium)*Diversity\ Factor*Runoff\ Multiplier \quad \text{(B.4)}$$

Note that the profit due to the active return is just the premium less the loss and expense,

$$Active\ Profit = ROE*Capital/(1\text{-}Tax\ Rate) - Discount\ Rate*Capital \quad \text{(B.5)}$$

After Tax, it becomes

$$After\text{-}Tax\ Active\ Profit = ROE*Capital - Discount\ Rate*Capital*(1\text{-}Tax\ Rate) \quad \text{(B.6)}$$

While the after-tax passive profit is:

$$After\text{-}Tax\ Passive\ Profit = Discount\ Rate*Capital*(1\text{-}Tax\ Rate) \quad \text{(B.7)}$$

Finally, the sum of the active and passive profits equals:

$$After\text{-}Tax\ Active\ Profit + After\text{-}Tax\ Passive\ Profit = ROE*Capital = Target\ Profit \qquad (B.8)$$

Replacing Capital in equation (A.3) with (A.4) and solving for Premium, gives the following expression:

$$Premium = [L_{Disc}+E_{Disc} + (ROE/(1\text{-}T) - d)*L_{99th}*D*F]/[1+ (ROE/(1\text{-}T) - d)*D*F] \qquad (B.9)$$

L_{Disc} = Present Value of Expected Loss

E_{Disc} = Present Value of Expenses

ROE = Target after-tax Return on Capital

T = Tax Rate on income

d = Discount Rate

L_{99} = Present Value of 99th percentile worst loss (not income)

D = Diversity Factor

F = Runoff multiplier

Appendix C – Sensitivity of Commutation Price to Variations in Factors

Section 2

	Tax Rate			
	20.0%	25.0%	30.0%	35.0%
IRS Table = "Other Liab"				
Discount Rate				
2.50%	18,943,644	18,878,428	18,803,896	18,717,897
5.00%	17,976,062	17,851,064	17,708,209	17,543,376
IRS Table = "Reinsurance"				
Discount Rate				
2.50%	18,954,244	18,892,562	18,822,068	18,740,729

Section 3

Tax Rate of 30% and IRS Discount Pattern = "Other Liab"

Risk Load

	ROE			
Disc Rate	5%	10%	15%	20%
2.5%	984,091	2,263,407	3,323,005	4,215,012
5.0%	428,495	1,684,923	2,728,443	3,608,946

Commutation Price

	ROE			
Disc Rate	5%	10%	15%	20%
2.5%	20,209,740	22,037,334	23,551,046	24,825,342
5.0%	18,320,344	20,115,242	21,605,985	22,863,846

Appendix D – Example of Investing Short (Section 5)

In Section 5, a component of the commutation payment is duration matched to the loss payments using the risk free rate. In today's historically low interest rate environment, one could ask if there are other better strategies to investing than duration matching. For example, what would happen if assets were kept short with the expectation of an imminent upward movement in interest rates? An upward movement in interest rates, as long as the yield curve was upward sloping, would have less impact on the short assets than the longer duration matched assets. The short assets could then be reinvested at the longer duration needed to match the remaining liabilities. It is possible that the realized loss, when interest rates rise, on the short assets would be more than offset by the gain in return on the reinvested longer assets. This strategy would provide funds in excess of the required loss payments. This is a good strategy as long as interest rates are expected to rise significantly enough and soon enough relative to the payment of the losses. There are multiple dimensions involved here – the timing of the change, the magnitude of the change, the slope of the yield curve, etc. The breakeven solution would be a bounded surface along these dimensions. There may be no solutions or a continuum of solutions. For example, take the following table:

Table 6

Breakeven Increases in Interest Rate by Year

Years	Payments	2014 Yield Curve	Discounted Payments	Interest Rate Rise in Year 2	Discounted Payments	Interest Rate Rise in Year 3	Discounted Payments	Interest Rate Rise in Year 4	Discounted Payments
0.5	7,000,000	0.125%	6,995,629	0.125%	6,995,629	0.125%	6,995,629	0.125%	6,995,629
1.5	5,000,000	0.250%	4,981,308	**1.358%**	4,960,192	0.125%	4,990,640	0.125%	4,990,640
2.5	4,000,000	0.750%	3,925,973	**1.483%**	3,907,758	**4.940%**	3,894,971	0.125%	3,987,527
3.5	3,000,000	1.250%	2,872,358	**1.983%**	2,852,722	**5.065%**	2,778,744	**32.607%**	2,595,438
4.5	1,000,000	1.500%	935,196	**2.483%**	916,593	**5.565%**	871,192	**32.732%**	651,492
Realized Loss, Discounted to Inception:					77,572		179,290		489,740
			19,710,466		19,710,466		19,710,466		19,710,466

The column labeled "2014 Yield Curve" uses the risk-free US Governmental bond yield curve effective in October, 2014. This is our base case: duration matching using the current risk-free yield curve. The three remaining interest rate columns are derived by holding assets at the 6 month rate until interest rates rise. The yield curve is assumed to move upward, using the slope of the current yield curve, at the beginning of Year 2, Year 3 or Year 4. Table 6 shows the required interest rate, highlighted in red, at 6 months and each year thereafter in order to breakeven with the current yield curve. When the 6 month interest rate rises, the assets held at the 6 month rate must be liquidated to be reinvested at the higher interest rates. When they are liquidated, there is a realized loss. This is indicated in the table above as "Realized Loss, Discounted to Inception". The sum of the discounted payments and the realized loss has to equal the original discounted payments. This table shows that large increases in interest rates are required to offset the loss in income from investing short. This is due to the short payment pattern in this example. Results would be more reasonable for a long tail liability type payment pattern.

Realized Loss:

Let A_i = Funds assumed to be the investable at the end of Year i. Year 1 is the first year after the date of commutation. A_0 = NPV(Loss) using original yield curve assumed to be starting funds.

Let P_i = Payment in Year i

Let r_i = investment rate for a duration of i – 6 months from original yield curve. r_1 is our initial short-term (6 month) rate

Let R_i = investment rate for a duration of i – 6 months after increase in yield curve. R_1 is our short-term (6 month) rate after the increase in yield curve

Let H_i = realized loss at beginning of Year i from liquidating assets at investment rate r_1

Assets investable at end of Year i, assuming that assets are kept at the 6 month rate:

$$A_i = [A_{i-1}*(1+r_1)^{0.5} - P_i]*(1+r_1)^{0.5} \quad \text{(D.1)}$$

Realized loss at beginning of Year i:

$$H_i = [A_{i-1}*(1+R_1)^{0.5} - A_{i-1}*(1+r_1)^{0.5}]/(1+R_1)^{0.5} \quad \text{(D.2)}$$

Using the example in Table 6 for the 6 month interest rate increasing in year 2,

A_0 = $19,710,466

A_1= [$19,710,466*(1.00125)$^{0.5}$ - $7,000,000]*(1.00125)$^{0.5}$ = $12,730,730

H_2 = [$7,743,520*(1.01358)$^{0.5}$ - $7,743,520*(1.00125)$^{0.5}$]/(1.01358)$^{0.5}$ = $77,669

Discounting H_3 back to inception requires discounting for one years at R_1 = 1.01358

Realized loss, discounted back to inception:

$77,669/(1.01358)^{1} = $77,572

Clearly, H_2 cannot be calculated without knowing R_1, which is calculated in the following section.

Required Interest Rate Change:

Depending on how long the assets are kept at the investment rate r_1, the increase in the discounted loss payments compared to those derived from the duration matched yield curve, must be made up by the lower discounted value of the future loss payments discounted at rate R_1, R_2, etc. In addition, the discount on the future loss payments must be enough to also offset the realized loss, calculated above.

Using the original yield curve, the formula for the NPV of losses is:

$$\sum_{i=1}^{n} P_i/(1+r_i)^{(i-0.5)} \quad \text{(D.3)}$$

When the yield curve increases in year j+1, the formula for the NPV of losses combined with the realized loss is:

$$\sum_{i=1}^{j} P_i/(1+r_1)^{(i-0.5)} + \sum_{i=j+1}^{n} P_i/[(1+r_1)^{(j)}(1+R_{i-j})^{(i-j-0.5)}] + H_{j+1}/(1+r_1)^{(j-1)} \quad \text{(D.4)}$$

Set (D.3) equal to (D.4) and solve for R_1. You need to use the consistent slope assumption in the following formula:

$$R_i = R_1+(r_i - r_1) \quad \text{(D.5)}$$

Note that the formula for H_{j+1} also includes R_1.

In the case where the 6 month investment rate changes in Year 2, R_1 = 1.1358%

9. REFERENCES

[1.] Connor, Vincent and Olsen, Richard, "Commutation Pricing in the Post-Tax Reform Era", *CAS Proceedings,* 1991, Vol. 78 Part 2, No. 149, 81 - 109
[2.] Meyer, Jeffrey, Moore, Scott and Ogden, Dale, "3E. Reinsurance Commutations", *CLRS,* 1990, 705-740
[3.] Ogden, Dale, Powell, David and Hutter, Heidi, "7E. Reinsurance Commutations", *CLRS,* 1990, 1577-1598
[4.] Blumsohn, Gary, "Levels of Determinism in Workers Compensation Reinsurance Commutations", *CAS Proceedings,* 1999, Vol. 86 Part 1, No. 164, 1 – 79
[5.] Steeneck, Lee, "Commutation of Claims – a CAS Study Note", 1-26
[6.] AM Best, "Understanding BCAR", *Methodology*, 2003, 1-23

Abbreviations and notations

CP, commutation price
NPV, net present value
RL, risk load
T, tax rate
ROE, return on equity
F, runoff factor for capital
d, discount rate
D, diversity factor