Reinsurance Contracts with a Multi-Year Aggregate Limit

by Regina M. Berens, FCAS

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ABSTRACT

Excess of Loss reinsurance contracts commonly include an aggregate limit which specifies the maximum amount the reinsurer will pay under the contract. This paper discusses pricing implications of an aggregate limit which applies over multiple years. Monte Carlo simulations are used to test the sensitivity of the pricing to relationships between the average ground-up loss, the per-claim limit and the aggregate limit under the contract. A pricing example using historic data is also included. Risk charges and applications to clash covers are explored. Underwriting and reserving considerations of a contract with a multi-year aggregate are discussed.

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INTRODUCTION

A typical excess of loss contract protects the purchaser (the ceding insurance company) for a fixed amount per claim in excess of a per-claim retention, up to an aggregate limit. As an example, a ceding company may purchase reinsurance for $500,000 in excess of the first $1 million per claim, with the reinsurer's total liability under the contract limited to $10 million.

This has the advantage (to the reinsurer) of capping the liability under the contract. The ceding company, of course, wants to purchase reinsurance which will provide the maximum stability in its year-to-year loss experience. If the losses to the contract are less than the aggregate, the ceding company may reap part of the savings through loss-sensitive provisions in the contract or more favorable pricing at renewal, but any other savings goes to the reinsurer. If, in the second year if the contract, the losses are in excess of the aggregate, the reinsurer's liability is still capped at the agreed-upon limit and the ceding company must pay any additional losses.

One way to stabilize the results of the ceding company using an Excess of Loss contract is to provide a multi-year aggregate. This contract would, for example, cover the layer described above but include an aggregate limit of $30 million over three years. The purpose of this paper is to explore the pricing, underwriting and reserving implications of this concept. Although it applies to a contract between a primary insurance company and a reinsurer, it could apply with appropriate adjustments to excess coverage purchased by a self-insured entity. A three-year period was selected to simplify assumptions with regard to changes in exposures, inflation and other factors which change with each contract period; the model could obviously be generalized beyond three years.

SIMPLIFYING ASSUMPTIONS

1. The ceding company's exposure is relatively stable from year to year.
2. The treatment of Allocated Loss Adjustment Expenses (ALAE) will not be considered. This is equivalent to including ALAE in the loss portion when calculating the reinsurer's liability.
3. Inflation is minimal. Under the double-digit inflation conditions prevalent in the late 1970s, some indexing of the attachment points, layer and aggregate might be needed from year to year.
4. Losses have been adjusted to ultimate settlement value, including IBNR.

THE MODEL

A model was developed which would generate ground-up claims using a specified distribution. Using a Monte Carlo simulation, three years' worth of excess claims were generated, and the reinsured losses compared using a single-year aggregate and a three-year aggregate equal to three times the annual aggregate. A 6% annual rate of inflation was applied to claims in the second and third years.

The model was run for a variety of sample contracts in order to test the impact of a multi-year aggregate for various combinations of the following:

1. Per-claim retention as a function of the average claim size.
2. The reinsured layer in relation to the retention and as a function of average claim size.
3. The aggregate as a function of expected losses in the excess layer.

A PRIORI EXPECTATIONS

Direction of the pricing impact of a multi-year aggregate.

The impact of this contract provision cannot be a decrease in the pure premium. The reinsurer's liability in any given year is either what it would have been with a single-year aggregate limit (if losses under the contract are greater than or equal to one-third of the three-year aggregate) or greater (if the ceding company can carry over "credit" from a prior year in which losses were less than one-third of the three-year aggregate).

Retention as a function of average claim size.

If the ceding company retains a minimal portion of each claim, the frequency and severity on the excess cover are likely to be close to the ground-up frequency and severity. Conversely, if the excess cover is written with a high-level attachment point, claims will reach the excess layer less often. The advantage to the ceding company (and, thus, the percentage surcharge for a multi-year aggregate) will be greater if its retention is a substantial portion of the average claim size and thus losses to the excess layer are more volatile.

The reinsured layer as a function of the retention and the average claim size.

Given a particular retention, the larger the layer, the larger the average excess claim size. This means that the aggregate can be "used up" by fewer claims. If the coverage is written at a relatively high attachment point, the excess cover becomes low-frequency and high severity. The lack of predictability in this layer would again make a multi-year aggregate more desirable from the ceding company's point of view but also proportionately more expensive.

The aggregate as a function of expected losses in the layer.

If the aggregate is so large that it would cover all claims in the excess layer except under the most extreme circumstances, a multi-year aggregate has little effect. This would imply that a ceding company would be willing to accept a contract with a lower aggregate limit, if it applied to a series of years so that experience of favorable years might be recouped in the future.

FIRST MODEL: POISSON/ LOGNORMAL

The first simulation was a "vanilla casualty" book with a relatively simple loss distribution. A portfolio with a Poisson frequency with 30 expected claims was constructed, using a Lognormal severity with an average claim value of $150,000 and a Standard Deviation of $37,500. The distribution of the severity was thus $\Lambda(11.92, .25)$.

The top section of Exhibit I shows the results of the first model. Surcharges are shown by layer as well as by ratio of the annual aggregate to the expected losses. The results of four iterations are shown (each with 100 trials) to provide a gauge of variability.

As would be expected, the impact of a three-year aggregate on the $150,000 XS $150,000 layer is minimal if the annual aggregate is set at twice the expected losses in the layer. This is because the losses are relatively predictable, particularly with the selected Poisson/Lognormal functions. The most that could be said about providing a 3-year aggregate for a low-level excess contract on this type of business is that it could be offered to make a prospective deal more attractive at little or no extra cost. The surcharge for the $150,000 XS $300,000 layer is substantial because so few claims penetrate the layer that there is a large percentage increase to the expected losses when a three-year aggregate applies.

The second section of Exhibit I shows the results of the model when the distribution is changed to Poisson with 15 expected claims per year and the severity is Lognormal with an average claim size of $300,000. Again, the surcharge for a three-year aggregate increases as the underlying business becomes lower-frequency and higher-severity.

Exhibit II shows the results of this first model in graphic form. The indicated *percentage* surcharge increases as:

(a) The attachment point increases.

(b) The ratio of the annual aggregate to the expected losses decreases.
(c) The parameters change from 15 expected claims, $300,000 average severity to 30 expected claims, $150,000 average severity.

The last result appeared counter-intuitive, since the high-frequency, low-severity example was expected to be less volatile. An examination of the raw data, however, revealed the reason. For the layers in question (excess of $300,000), results in the excess layer are actually more volatile for the low-severity example since so few claims penetrate the layer.

It should be pointed out, however, that the Poisson-Lognormal model is probably not meaningful for some types of business, so the process was repeated with another frequency/severity distribution.

SECOND MODEL- NEGATIVE BINOMIAL/ SINGLE-PARAMETER PARETO

Negative Binomial claim frequency and Single-Parameter Pareto severity distributions have been used by various authors to model claim distributions for casualty business. [1, 2] The model was re-run with two distributions:

Negative Binomial frequency distribution with 30 expected claims, p =.10 and a Single Parameter Pareto Severity with q = 1.5 and average claim value of $150,000.

Negative Binomial frequency distribution with 15 expected claims, p =.05 and a Single-Parameter Pareto Severity with q = 1.5 and average claim value of $300,000.

The results are shown on Exhibit III in a format similar to Exhibit I. They are shown graphically in Exhibit IV. At the lower layers, the indicated percentage surcharge is higher for the new distribution than for the Poisson/Lognormal model. In the higher layers, however, the percentage surcharge is higher for the Negative Binomial/Pareto model. The reason becomes apparent from Exhibit V, which is a graph of percentiles of claim size from Monte Carlo runs of 3000 claims from a Lognormal and Pareto distribution, each with an expected claim value of $150,000. At a $150,000 attachment point, far more claims fall under the retention with the Pareto model. As the attachment point increases, more claims exceeding the attachment point are expected in the Pareto model, but many claims are so large that the expected payment in the layer is $150,000 (the maximum). This actually reduces volatility in the layer.

MEASURING VARIABILITY; RISK CHARGES

It becomes apparent from examining the detailed results of 100 iterations (which are not reproduced with this paper in order to conserve trees and tedium) that most of the time the three-year aggregate provides no benefit. Some examples are shown in graphic form on Exhibits VI and VII. The graphs were created as follows:

1. The losses covered by the reinsurance contract over the three year period, with single-year aggregates and with a three-year aggregate, were sorted based on the value of losses with single-year aggregates.

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[1] P. E. Heckman and G. G. Meyers, "The Calculation of Aggregate Loss Distributions from Claim Severity and Claim Count Distributions", PCAS LXX, P. 22.

[2] S.W. Philbrick, "A Practical Guide to the Single-Parameter Pareto", PCAS LXXII, p. 44.

2. Two lines were graphed: the sorted (ascending) losses for each iteration with single-year aggregates and the corresponding value of losses with a three-year aggregate. A "spike" thus represents an instance where the reinsurer covered more losses because of the existence of a multi-year aggregate.

Exhibit VI shows the results of the 100 iterations which make up the 7% surcharge shown on Exhibit III, the second iteration in the sixth line of data. This corresponds to $150,000 Excess of $300,000 coverage, with an annual aggregate equal to 2.5 times the expected losses in the layer. The expected (Negative binomial) number of ground-up losses is 30; average severity (Pareto) is $150,000.

For the iterations where incurred losses in the layer were low, the three-year aggregate had no benefit. Where the simulated losses were high, however, the number of cases where the three-year aggregate provided a benefit increased. There are 19 "spikes" in the graph, i.e. instances where the reinsurer would have paid more with a three-year aggregate. The average surcharge is $43,253, which is 6.50% of expected losses in the layer ($665,321). The largest actual benefit in the simulations was $758,752. The standard deviation of the differences between losses under annual and three-year aggregates was $123,175.

Exhibit VII shows the results of the 100 iterations which make up the 22% surcharge shown on Exhibit III, the second iteration in the seventh line of the second section of data. This corresponds to $150,000 Excess of $450,000 coverage, with an annual aggregate equal to 2.5 times the expected losses in the layer. The expected (Negative binomial) number of ground-up losses is 15; average severity (Pareto) is $300,000.

As would be expected, the losses in this example showed considerably more variation; so did the impact of the three-year aggregate. There are 32 "spikes" in the graph, where the reinsurer would have paid more with a three-year aggregate. The average surcharge is $108,117, which is 22.16% of expected losses in the layer ($487,968). The largest actual benefit in the simulations was $1,357,126. The standard deviation of the differences between losses under annual and three-year aggregates was $244,294.

With apologies to Feldblum[3], who has pointed out that a risk charge should be a function not only of the particular portfolio but of the insurer's entire book of business, a simplified risk charge will be calculated as a function of variance for the two graphed examples. If the risk charge is set at 0.5% of the standard deviation of the additional losses under the three-year aggregate, for the first example the risk-adjusted surcharge is 6.6% rather than the original 6.5%; for the second it is 22.4% rather than the original 22.16%.

CLASH COVERS

A clash cover example was constructed with the same set of random numbers used in the last section to produce the 22.16% (non-risk adjusted) surcharge. First, the individual claim severities were capped at $300,000, to simulate a case where the ceding company issues policies with limits no higher than $300,000 (or, alternatively, other reinsurance is available excess of that limit). A value of 5% was selected as the probability that another insured was involved in the same occurrence. (The possibility of occurrences with more than two claimants was ignored). Five percent of the claims, at random, were then increased by the amount of a second randomly-chosen claim value two simulate a two-claimant occurrence.

The indicated surcharge for $150,000 excess $450,000 was then calculated. The surcharge was $29,221, which was 160.9% of the $18,159 losses expected with annual aggregates. For 36 out of 100 iterations, the reinsurer would have paid more with a three-year aggregate. The largest

[3] S. Feldblum, "Risk Loads for Insurers", PCAS LXXVII, page 160.

difference was $244,000. The standard deviation of the difference between losses incurred under an annual aggregate and a three-year aggregate was $52,712. In this case, an adjustment for risk calculated as described in the earlier section would have a more substantial impact: the risk-adjusted surcharge would be [($29,221 + .05*52,712)/18,159], or 175.4%. Decreasing the probability of clash to 2.5% increases the surcharge to 317.6% (355% risk-adjusted) on expected losses of $5,419.

A REAL DATA EXAMPLE

Finally, a pricing example was developed using suitably disguised ground-up casualty claim statistics from an insured entity, in an attempt to see what happens when this coverage provision is priced using actual experience. The losses were mostly Workers' Comp, with a few Auto and GL claims. The following factors needed to be taken into account:

Loss Development

Loss development, so easily ignored in the Monte Carlo model, needs to be addressed when working with actual data. In the reinsured layer (or the layer excess of a Self-Insured Retention), there are three sources of development: (1) losses which have been reported to the ceding company but appear to be below the retention (and thus may not have been reported to the reinsurer), (2) reported losses above the attachment point but less than the layer, and (3) losses which have been incurred but not yet reported to the ceding company (also known as "pure IBNR"). An evaluation of the amount of aggregate left at the end of a contract period should include an estimate for this development.

In this example, losses with 9 or more years of development are in order to minimize distortion from undeveloped data.

Bringing Prior Year Claims to Present Level

In this example, an annual rate of 6% was used to bring all claims to current level.

Low Credibility of Experience

The number of reported claims per year for this entity ranged from 102 to 147. The results from this example should not be expected to be as smooth as the model would imply. A ceding company or self-insured operating under these conditions, however, is probably the perfect candidate for purchasing a multi-year aggregate because it has less tolerance for fluctuations in year-to-year results than a larger entity.

Changes in Exposure

This may or may not be a significant factor, but it should be investigated. A self-insured which varies the extent to which it uses "leased" employees on projects from year to year, for example, is not a good candidate for a multi-year aggregate. (This is because the number of employees actually on the self-insured's payroll, as opposed to the leasing company's payroll, will fluctuate.) Similarly, a ceding company increasing or decreasing its market presence in a given line of business will be more likely to prefer an annual aggregate which is adjusted based upon the facts in a given year..

Exhibit VIII shows the results of a three-year vs. annual aggregate for the self-insured entity.

Losses in the $6,000,000 XS $2,000,000 are shown for two subsequent three-year periods. This layer was selected because the entity generally had a few catastrophic claims of $3 to $8 million (ground-up) in each year, and it is realistic to expect that it would be interested in protecting its bottom line from losses of this magnitude. The annual aggregate in each case was set equal to

1.25 times the average incurred losses in the layer for the three-year period; the three-year aggregate was set equal to triple that value.

This example illustrates some of the perils of applying the model to real life. We must first assume that a reasonable estimate of prospective losses in the layer can be made, using either some averaging process on past results, or a selected theoretical distribution. In this example, using the results for Years 1 through 3 to set an aggregate limit for Years 4 through 6 would have produced an aggregate higher than the company needed in the later years. If an appropriate distribution were found to approximate results and select the aggregate shown in the Exhibit, a 13% surcharge would result. In Years 1 through 3, the entity would recover about $3 million more from its insurer under a three-year aggregate; in Years 4 through 6 it would have collected nothing extra, despite having paid the 13% surcharge.

An interesting complication is shown in the results of Years 7 and 8. The organization increased its emphasis on loss control and loss-reduction programs beginning in Year 6. Although results are shown for Years 7 and 8, it is clear that the underlying loss distribution has changed- both frequency and severity. Renewal decisions made after the implementation of this program would have to take these changes into account on a prospective basis.

ADDITIONAL CONSIDERATIONS

Indexation

The leveraged impact of inflation on excess claims has been well-documented in the actuarial literature and will not be reviewed here. [4] For an excess-of-loss contract with a multi-year aggregate, claim inflation will erode the amount of reinsurance coverage available. One solution, of course, is to index the attachment point, the layer covered and the aggregate every year by an agreed-upon inflation rate.[5] In the absence of indexation, the two parties should be aware of the impact of inflation on the coverage provided.

Renewal/Runoff Adjustments and Decisions

Since the model is based on a contract which is renewed annually (as opposed to a contract which runs from 1/1/YY to 12/31/YY+2), it is possible that either the ceding company or the reinsurer may decide not to renew. Two examples, using the contract described in the introduction:

1. The ceding company, having incurred $20 million of losses within the reinsurance layer in the first year, decides not to renew.
2. Losses to the contract in the first year are $8 million but the reinsurer decides to tighten pricing at renewal. The ceding company is faced with the decision of accepting renewal terms it finds unpalatable, or walking away from $2 million of coverage which could be carried forward to the next accident year (one-third of the $30 million aggregate, minus $8 million incurred) for which it has paid a surcharge. It is unlikely, of course, that renewal terms would be tightened with such favorable results, but it is probably not impossible.

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[4] J. T. Lange, "The Interpretation of Liability Increased Limits Statistics", PCAS LVI, Page 170.

[5] R. E. Ferguson, "Non-Proportional Reinsurance and the Index Clause", PCAS LXI, Page 141.

These contingencies are best handled at the inception of the contract. One simple solution would be a stipulation that, in the event of non-renewal, a pro-rated portion of the aggregate applies. These renewal or rate change rights are valuable options which can be priced as such. They may or may not offset each other.

In the event of losses which are more in line with expectations, some decisions can still be made on an annual basis.

First, the experience should be analyzed to determine whether the exposures are at a level anticipated under the contract. This should include an estimate of IBNR in order to determine whether the assumptions about expected losses under the contract are still valid. If the experience is different from that assumed at the inception of the contract, the rate, annual aggregate and/or multi-year aggregate should be adjusted. This could take the form of a re-pricing of the entire three-year period based on new information, with the adjustments applied to the future contract period. This, again is a possibility which must be agreed upon in advance between the ceding company and the reinsurer. If it is not, the likelihood exists that changes in the contract provisions for experience worse than expected could cause the ceding company to "walk away" from the contract at renewal.

Reinstatement

Considering Item 1 in the above section, what if the ceding company wishes to purchase additional limits so that $20 million (not $10 million) is available to cover losses in the layer over the next two years? The models used in this paper would probably imply a smaller reinstatement premium than is needed, if the worse-than-average experience in the first year is due to factors not recognized when the aggregate was determined. While the technique is still applicable, it is important to determine the reason for the adverse development. Was the exposure greater than expected? Has the limits profile changed? Do the initial assumptions about ground-up claim frequency and claim severity still hold true? Any changes should be taken into account in pricing the reinstatement, i.e. the extension of the three-year aggregate from $30 million to $40 million.

Changes in Exposures

It is generally not prudent to assume that anything in the reinsurance market will remain static. Pricing of a multi-year aggregate could be enhanced by including an estimate of the potential growth of the ceding company's book over the next three years, including changes in limits profiles if any are anticipated.

The author has done some preliminary analysis using the Negative Binomial/Pareto model with an assumption of a 6% growth in exposure (corresponding to a 6% increase in claim count from the first to the second year and from the second to the third year). If the calculation of expected losses and aggregate limits was based on an assumption of stable exposures, the ceding company has obviously purchased too little protection and will find itself responsible for more losses over the aggregate limit than it would had the proper aggregate limit been negotiated. The percentage surcharge for the 3-year aggregate on the portfolio with the expected severity of $300,000 would also be about half of what it should have been if exposure growth had been anticipated in the pricing.

Aggregates Covering More than Three Years

While an aggregate covering a lengthier period is possible, it has not been explored in the model. The property-casualty industry has occasionally provided coverage on a 3-year basis (an unfortunate example being three-year reinsurance contracts which could be found in the London market in the 1970s), and in the current market examples of longer-term contracts do exist. As a practical matter, however, many factors can change over the long run which would complicate pricing a longer-term aggregate.

Continuous Coverage

The possibility of the unused (or over-used) portion of an annual aggregate being rolled forward into the next year at renewal would be conducive to long-term relationships between a ceding company and its reinsurer, and such "roller" contracts exist in the current market. This is easiest to visualize in a zero-inflation, stable-exposure situation, with appropriate adjustments then made to reflect reality. The cumulative aggregate for year *n* would be *n* times the expected losses in the layer. The coverage available to the ceding company for losses in the excess layer in year *n* would be the cumulative aggregate, minus losses incurred on all preceding years.

With the volatile examples studied earlier in this paper, multi-year aggregates which accumulate each year would be a very attractive contract feature. Since, as observed earlier, the actual number of years where a multi-year aggregate provides additional coverage are infrequent, the extension of the multi-year aggregate beyond three years gives the ceding company a better chance of being able to take advantage of the additional coverage at some point. The author ran some extremely simplified simulations of contracts in which the aggregate was extended each year and found that the ceding company could nearly always be assured of collecting all losses in the layer each year, unless losses were particularly disastrous in the first year.

Varying exposures and claim inflation could be handled by increasing the aggregate each year by the agreed-upon multiple of expected losses in the layer, calculated using appropriate exposures and inflation assumptions. (The aggregate could even be adjusted after the fact based on actual exposures.)

It should be noted that, as the number of years covered by the aggregate increases at each renewal, the adequacy of reserve estimates can be extremely important. This is because the aggregate for the current year can be eroded by adverse development on old years.

Contracts with Annual Aggregate Deductibles

The concepts in this paper could be extended to contracts in which the ceding company or self-insured absorbs losses in the layer up to a certain level before the reinsurance coverage applies. As an example, a large self-insured might purchase coverage for $500,000 excess $500,000 per occurrence, with the agreement that the self-insured pays the first $1.5 million in claims in the layer. The insurer agrees to pay up to $5 million in losses in the layer *after* the first $1.5 million. The insured layer now exhibits more volatility because of the aggregate deductible, making it an ideal candidate for a multi-year aggregate limit approach.

Reserving Implications

As mentioned earlier, an IBNR provision is necessary to evaluate the amount of cover remaining at each evaluation point. Let us return again to the initial example. If, after the first year, the ultimate settlement value (including IBNR) of claims in the layer is $8 million, the reinsurer's liability under the contract for the second year could be anywhere from zero to $22 million. If, in fact, the losses exceeded 12 million, bringing total losses above 2/3 of the $30 million aggregate, the excess would be a "credit" against potential losses during the third year. Any method used to evaluate IBNR on contracts with single-year aggregate limits could be used for this type of contract, with the additional complication that the company's liability for the current year is a function of prior years' losses (including an appropriate IBNR provision) on the contract.

IBNR (both case development and pure IBNR) evaluation is particularly important in multi-year aggregate contracts because it is a critical part of the year-end decision-making. An understated estimate of ultimate losses gives the ceding company false assurance of how much of the three-year aggregate remains for subsequent years. It can also leave the ceding company blissfully unaware of the need to purchase reinstatement coverage, meaning that it will have less protection than expected for later years.

Could a Multi-Year Aggregate be provided at some level with no surcharge?

It was noted earlier that at low attachment points, the indicated surcharge is minimal. For higher attachment points, there should still be some multiple of the annual aggregate which could be provided as a three-year aggregate without increasing the expected losses. The answer, interestingly enough, is probably unmarketable. For the Negative Binomial/Pareto model, this level was determined from one of the simulations for both $150,000 excess of $150,000 where the average claim is $150,000 and for $150,000 excess $300,000 where the average claim is $300,000. The annual aggregate limit was set at 2.5 times the annual expected losses. The multi-year aggregate which could be supplied with no increase to the expected losses was about 65% of the annual aggregate in the first case and 55% in the second! This would be 1.625 and 1.375, respectively, times expected annual losses in the layer.

The reason for this result is that there are actually very few cases where the multi-year aggregate limit provided greater protection (about 5 out of 100 simulations in the $300,000 average claim case) but the impact when it did was substantial; generally 30% more losses were paid by the reinsurer. Thus, the multi-year aggregate had to be cut significantly in order to affect these cases.

CONCLUSIONS

The objective of this paper was to explore the implications of applying a multi-year aggregate limit to Excess of Loss reinsurance contracts rather than a single year limit. It is meant to generate additional thought and dialogue on how best to provide insurance and reinsurance products which fit the needs of the customer and are appropriately priced and reserved. Some conclusions can be drawn from the points covered in this paper are the following:

1. A multi-year aggregate can be a useful tool to provide coverage when and where the ceding company (or self-insured) needs it, while still limiting the liability of the reinsurer. It should, however, carry an appropriate price.

2. Pricing is highly dependent upon the loss distribution which is selected.

4. In general, the greater the volatility of the business, the higher the percentage surcharge and the indicated risk charge.

5. Prospective changes in exposures should be quantified in the pricing process.

6. The consequences of non-renewal during the 3-year period should be specified in the contract.

7. The validity of assumptions made at the inception of the contract should be checked at each renewal and adjustments made, if necessary.

8. The contract wording issues involved in offering a multi-year aggregate can be more complicated than the pricing issues.

Exhibit I

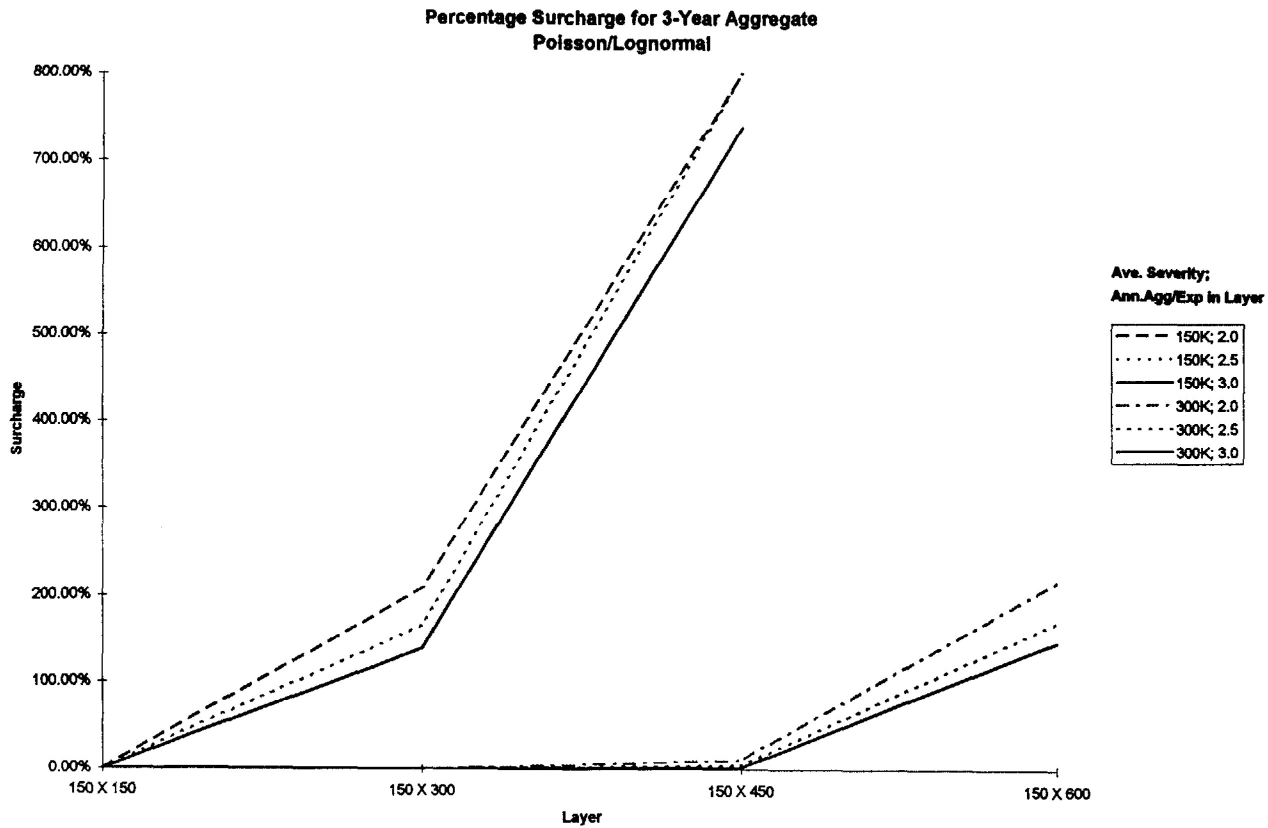
Percentage Surcharge for Three-Year Aggregate

Poisson Frequency; Lognormal Severity

Expected No. of Claims	Ave Claim		Iteration Number: 1	2	3	4	Average	Annual Agg/ Expected Losses In Layer
30	$150K	150 X 150	0%	0%	0%	0%	0%	2
30	$150K	150 X 300	182%	252%	194%	206%	208%	2
30	$150K	150 X 450	800%	N/A	N/A	N/A	800%	2
30	$150K	150 X 600	N/A	N/A	N/A	N/A	N/A	2
30	$150K	150 X 150	0%	0%	0%	0%	0%	2.5
30	$150K	150 X 300	146%	206%	151%	161%	166%	2.5
30	$150K	150 X 450	800%	N/A	N/A	N/A	800%	2.5
30	$150K	150 X 600	N/A	N/A	N/A	N/A		2.5
30	$150K	150 X 150	0%	0%	0%	0%	0%	3
30	$150K	150 X 300	123%	172%	122%	N/A	139%	3
30	$150K	150 X 450	739%	N/A	N/A	N/A	739%	3
30	$150K	150 X 600	N/A	N/A	N/A	N/A	N/A	3
15	$300K	150 X 150	0%	0%	0%	0%	0%	2
15	$300K	150 X 300	0%	0%	0%	0%	0%	2
15	$300K	150 X 450	10%	10%	12%	11%	11%	2
15	$300K	150 X 600	203%	177%	258%	224%	216%	2
15	$300K	150 X 150	0%	0%	0%	0%	0%	2.5
15	$300K	150 X 300	0%	0%	0%	0%	0%	2.5
15	$300K	150 X 450	4%	4%	6%	5%	5%	2.5
15	$300K	150 X 600	167%	130%	209%	171%	169%	2.5
15	$300K	150 X 150	0%	0%	0%	0%	0%	3
15	$300K	150 X 300	0%	0%	0%	0%	0%	3
15	$300K	150 X 450	2%	2%	3%	2%	2%	3
15	$300K	150 X 600	144%	98%	173%	171%	147%	3

Percentage surcharge is expressed as a function of expected losses within the layer.

Exhibit II



Percentage Surcharge for 3-Year Aggregate
Poisson/Lognormal
800.00%
700.00%
600.00%
500.00%
400.00%
300.00%
200.00%
100.00%
0.00%
Surcharge
150 X 150
150 X 300
150 X 450
150 X 600
Layer
Ave. Severity;
Ann.Agg/Exp in Layer
150K; 2.0
150K; 2.5
150K; 3.0
300K; 2.0
300K; 2.5
300K; 3.0

Exhibit III

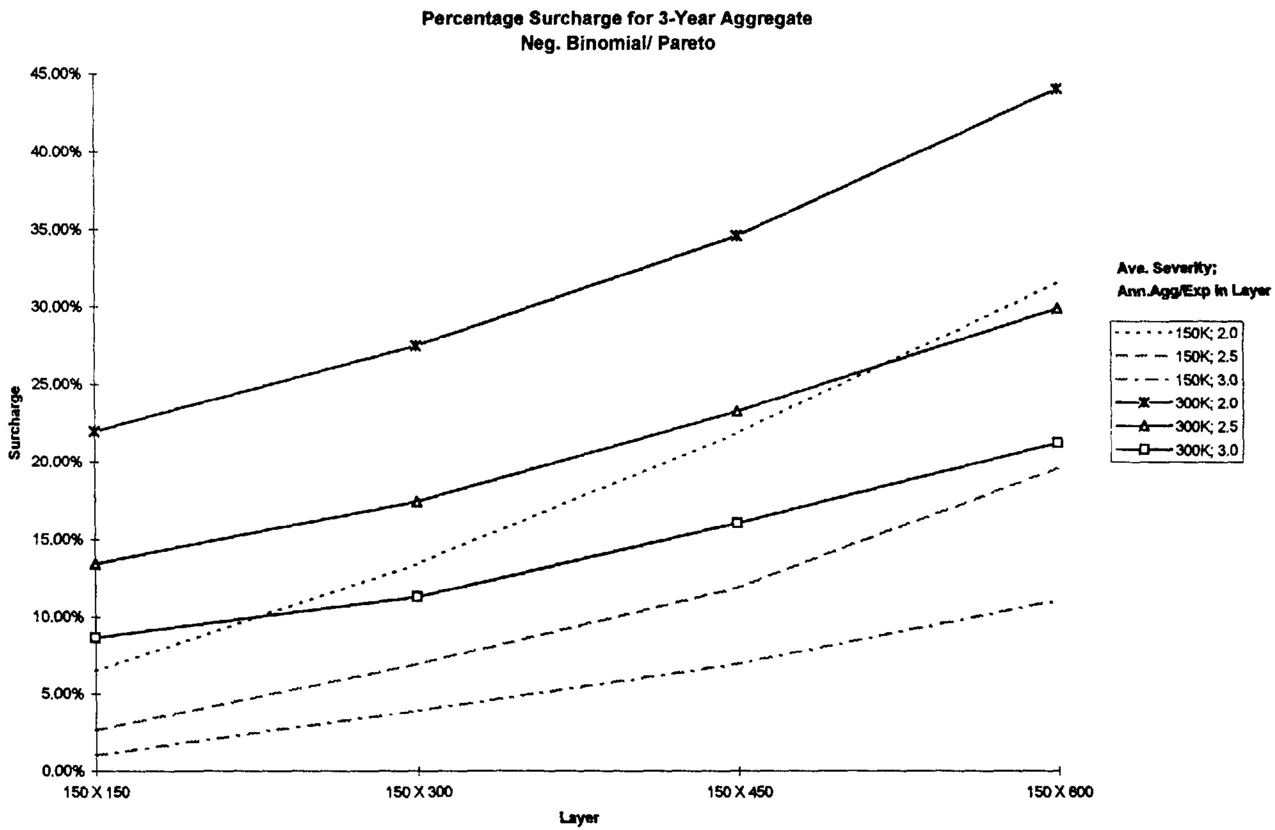
Percentage Surcharge for Three-Year Aggregate

Negative Binomial Frequency; Pareto Severity

Expected No. of Claims	Ave Claim		Iteration Number: 1	2	3	4	Average	Annual Agg./ Expected Losses in Layer
30	$150K	150 X 150	6%	5%	7%	7%	6%	2
30	$150K	150 X 300	15%	13%	14%	13%	13%	2
30	$150K	150 X 450	23%	21%	26%	17%	22%	2
30	$150K	150 X 600	27%	32%	38%	29%	32%	2
30	$150K	150 X 150	2%	2%	3%	3%	3%	2.5
30	$150K	150 X 300	7%	7%	7%	7%	7%	2.5
30	$150K	150 X 450	12%	12%	14%	10%	12%	2.5
30	$150K	150 X 600	18%	20%	24%	16%	20%	2.5
30	$150K	150 X 150	1%	1%	1%	1%	1%	3
30	$150K	150 X 300	4%	4%	4%	4%	4%	3
30	$150K	150 X 450	7%	6%	8%	6%	7%	3
30	$150K	150 X 600	11%	11%	14%	8%	11%	3
15	$300K	150 X 150	23%	21%	24%	19%	22%	2
15	$300K	150 X 300	32%	28%	27%	26%	27%	2
15	$300K	150 X 450	38%	34%	32%	39%	35%	2
15	$300K	150 X 600	52%	43%	43%	45%	44%	2
15	$300K	150 X 150	13%	12%	16%	11%	13%	2.5
15	$300K	150 X 300	21%	18%	18%	16%	17%	2.5
15	$300K	150 X 450	26%	22%	21%	25%	23%	2.5
15	$300K	150 X 600	35%	29%	30%	30%	30%	2.5
15	$300K	150 X 150	8%	7%	12%	7%	9%	3
15	$300K	150 X 300	13%	10%	13%	10%	11%	3
15	$300K	150 X 450	18%	15%	14%	18%	16%	3
15	$300K	150 X 600	25%	20%	21%	21%	21%	3

Percentage surcharge is expressed as a function of expected losses within the layer.

Exhibit IV



304

Exhibit V

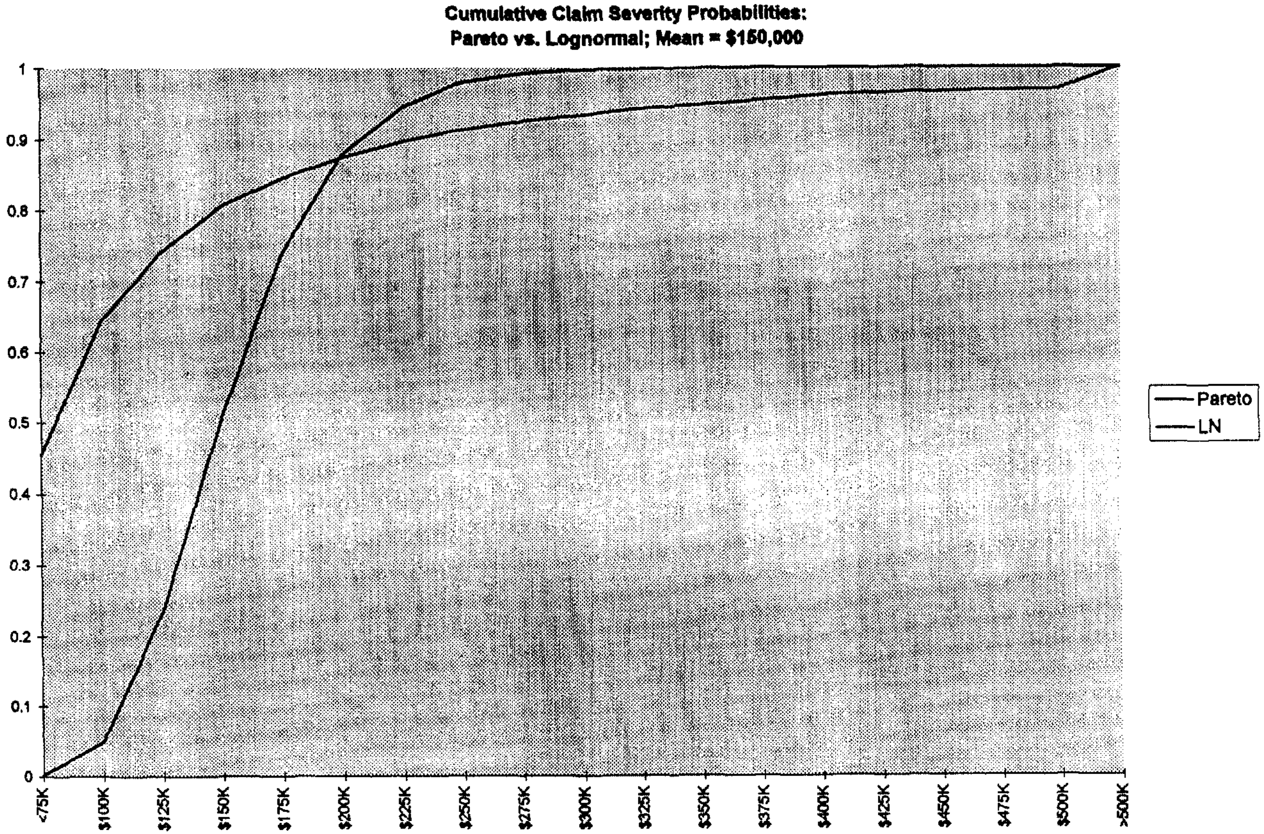

Cumulative Claim Severity Probabilities:
Pareto vs. Lognormal; Mean = $150,000
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
<75K
$100K
$125K
$150K
$175K
$200K
$225K
$250K
$275K
$300K
$325K
$350K
$375K
$400K
$425K
$450K
$475K
$500K
>500K
Pareto
LN

Exhibit VI

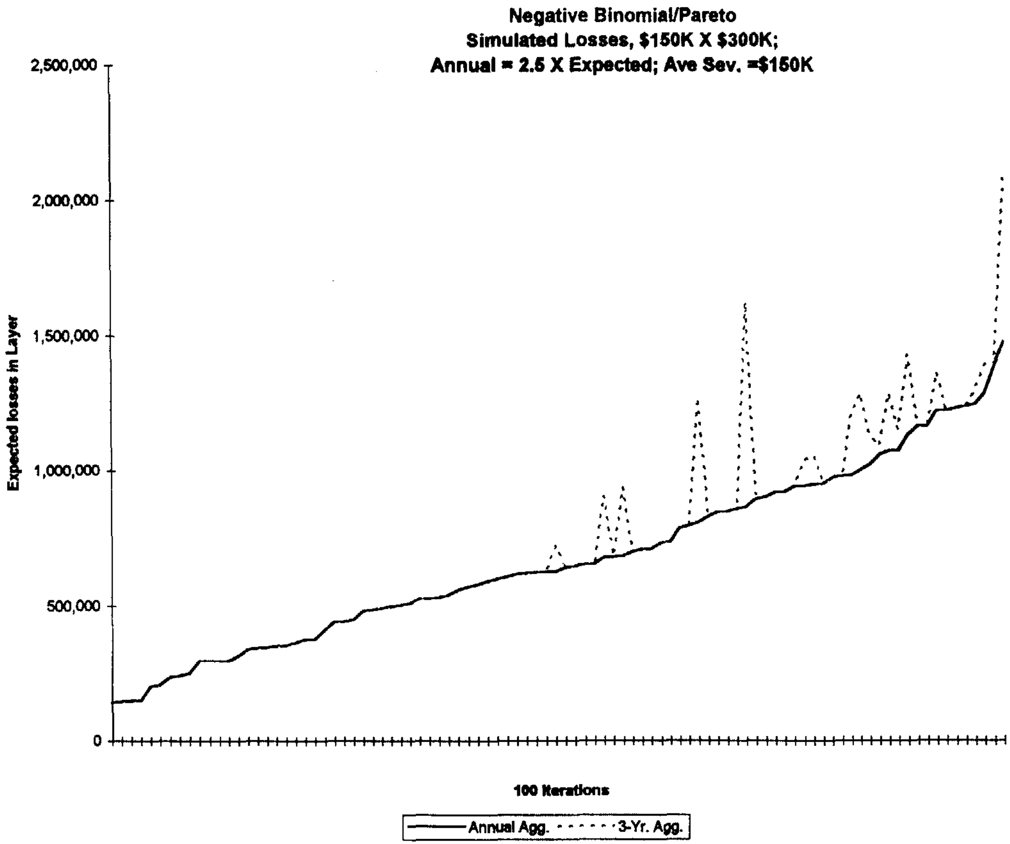
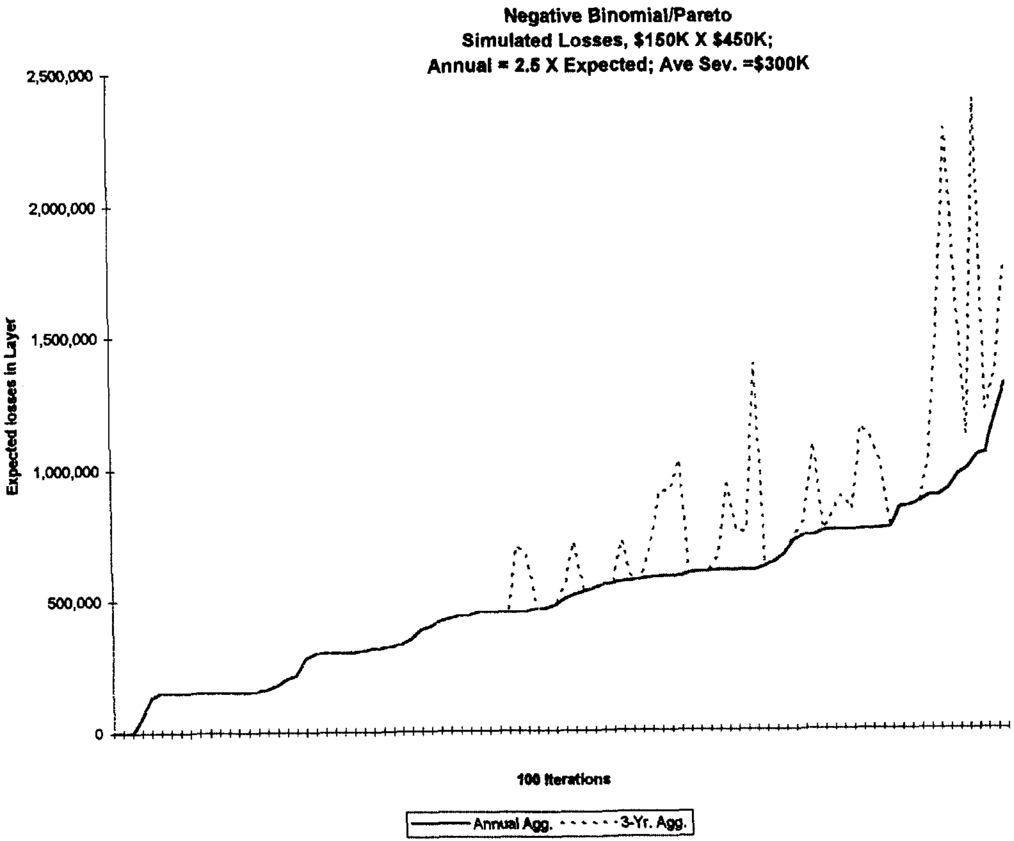

Negative Binomial/Pareto
Simulated Losses, $150K X $300K;
Annual = 2.5 X Expected; Ave Sev. =$150K
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
Expected losses in Layer
100 Iterations
Annual Agg.
3-Yr. Agg.

Exhibit VII



Negative Binomial/Pareto
Simulated Losses, $150K X $450K;
Annual = 2.5 X Expected; Ave Sev. =$300K
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
Expected losses in Layer
100 Iterations
Annual Agg.
3-Yr. Agg.

Exhibit VIII

Self-Insured Example

$6,000,000 Excess $2,000,000

Accident Year	(1) Number of Claims	(2) Average Ground-U Claim	(3) Claims in Layer	(4) Selected Annual Aggregate	(5) Losses Subj. to (4)	(6) Losses Subj. to 3-Yr Agg.	(7) Percentage Surcharge (6)/(5)-1
1	131	329,649	4,128,326	5,599,305	4,128,326	4,128,326	
2	105	355,307	4,097,040	5,599,305	4,097,040	4,097,040	
3	131	455,805	10,050,103	5,599,305	5,599,305	8,572,549	
			6,091,823		13,824,671	16,797,915	
4	124	335,791	4,800,232	5,599,305	4,800,232	4,800,232	
5	147	273,075	0	5,599,305	0	0	
6	102	308,162	3,800,963	5,599,305	3,800,963	3,800,963	
			2,867,065		8,601,194	8,601,194	
Yrs 1-6	740	342,456	4,479,444		22,425,865	25,399,109	13.3%
THE SEQUEL: A Loss Reduction Program was Implemented in Year 6.							
7	92	196,828	0				
8	75	198,553	1,120,884				
Total	907	315,128					

NOTES:

Column (4) is 125% of the average of Column (3) for the current and next two years. This annual aggregate is then used for a three-year contract period.

Losses in Column (6) are losses in the layer, limited to a cumulative value over 3 years of 3 times Column (4).