SIMPLIFIED CONFIDENCE BOUNDARIES

ASSOCIATED WITH CALENDAR YEAR PROJECTIONS

BY JAMES P. McNICHOLS

BIOGRAPHY:

Mr. McNichols is a Manager of Actuarial Consulting with Ernst & Young International, in their Hamilton, Bermuda office. Prior to joining E&Y, he was an Actuarial Consultant with Tillinghast, and previously worked as a Reserving Actuary with both the St. Paul and Zurich-American. He received a B.S. degree in Psychology from the University of Illinois at Champaign in 1984. He became an Associate of the CAS in 1988 and a Member of the American Academy in 1989. He is also the vice-president of the Casualty Actuaries of Bermuda, a regional affiliate to the CAS.

ABSTRACT:

Actuaries may use various simulation and risk theoretic techniques to assess the variability in loss reserves. However, non-actuaries are often involved in the selection of the reserve liability "point estimate", but they may not have as firm an understanding of the level of uncertainty implicit in the book of business. They often ignore the potential impact of reserve fluctuations due to the lack of any meaningful measure of a range of variability from their perspective. Perhaps a simpler measure of implicit variability is required.

This paper will describe a method which invokes small sampling theory to derive empirical confidence intervals about expected age-to-age LDF's. These interval LDF's are used to generate "simplified (upper and lower) confidence boundaries" associated with various calendar year projections. The results, when graphed yield an intuitive summary of the impact and nature of priors years' incurred effects to the income statement. These simplified confidence boundaries can be used to define the basis of a convenient hindsight test. Most importantly, the graphs may impart to non-actuaries a view of the levels of reasonable fluctuation that may be expected in the estimation of the mean of a stochastic process.

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Actuarial reserve analysts produce projections of future loss activity based on numerous historical statistical indications. Calendar year projections of old case development, IBNR emergence and total prior years' incurred effects are examples of the types of information that an analyst may be required to produce and explain in support of the reserve estimate.

The selection of an expected loss development factor (LDF) from the set of available LDF's at each age-to-age interval, is fundamental to the task of generating indicated ultimate loss estimates. Each age-to-age LDF may be thought of as an unbiased estimator of the true mean LDF for that age-to-age interval (assuming certain Gaussian conditions). The selected LDF represents a point estimate of the expected percentage development by age-to-age interval. Each of these age-to-age point estimates has associated with it a confidence interval depicting a range within which reasonable divergence may result due to chance fluctuations in the developing data.

The problem then is to determine a sum of these individual confidence intervals to construct an upper and lower boundary such that: if the actual future loss develops beyond these boundaries, then the assumptions underlying the projections may no longer be adequate and should be reviewed and perhaps re-aligned to reflect the most recently observed loss developments.

The following will describe a method of calculation that may be used to determine the upper and lower boundaries associated with calendar year projections of old case development, IBNR emergence and total prior years' incurred effects.

Total Prior Years' Incurred Effects

Given an accident period incurred loss triangle one can readily calculate the LDF's corresponding to this historical loss data. Each column of age-to-age LDF's represents a set of independent random sample mean LDF's. If we had an infinite number of sample units for a given age-to-age column, computed the natural logarithm of each and graphed the histogram, it would likely result in a normal distribution centered around the natural log of the population mean (μ) LDF. In fact, if 30 or more sample units are available, a fairly good approximation to the normal should result. Of course, a distortion may exist due to trend effects in the underlying development data. However, this is not a significant problem here since we will be primarily interested in the variance about the mean estimate and not the mean estimate itself.

In most applications one has a finite set of sample units which usually does not exceed 30. As such, we may invoke small sampling theory in order to generate estimates of the confidence intervals about the mean. Specifically, we will reference the "Student's" t distribution in estimating the desired confidence intervals.

The column of LDF's displayed in the table below is from the Reinsurance Association of America (RAA) Historical Loss Development Study 1989 Edition, Automobile Liability, Combined Treaty and Facultative, Incurred Case Losses.

Table 1

AY	LDF 1-2	logLDF
1975	1.920	0.652
1976	1.883	0.633
1977	1.957	0.671
1978	1.645	0.498
1979	1.824	0.601
1980	1.838	0.609
1981	1.846	0.613
1982	1.786	0.580
1983	1.878	0.630
1984	2.291	0.829
1985	2.315	0.839
1986	1.969	0.678
1987	1.897	0.640
Sample Mean ($\bar{x}$)	1.927	0.652
Sample Standard Deviation (s)	0.186	0.093

In addition to obtaining the sample mean ($\bar{x}$) we also calculate the sample standard deviation (s) corresponding to the sample mean.

It seems reasonable to assume that the observed LDF's derive from a distribution which has positive skewness since the LDF's lower than the mean have a practical limit of approximately 1.000 (and an absolute limit of zero), whereas the LDF's higher than the mean are unlimited. The purpose of transforming the data by taking the natural logs before doing the analysis is to obtain distributions which are "closer" to normal.

We can define confidence intervals by using the table of the t distribution (Appendix 1). In a manner similar to that used for normal distributions, we can estimate within specified limits of confidence the population mean (μ). For example, if $-t_{.95}$ and $t_{.95}$ are the values of t for which 5% of the area lies in each "tail" of the t distribution, then a 90% confidence interval for t is

$$-t_{.95} < [(\bar{x}-\mu)/s](\sqrt{n-1}) < t_{.95}$$

from which we see that (μ) is estimated to lie in the interval

$$\bar{x} - \{t_{.95}[s/\sqrt{n-1}]\} < \mu < \bar{x} + \{t_{.95}[s/\sqrt{n-1}]\}$$

with 90% confidence (i.e. probability 0.90). Note that $t_{.95}$ represents the 95 percentile value, while $t_{.05} = -t_{.95}$ represents the 5 percentile value. Also, (n - 1) represents the degrees of freedom (e.g. the number of independent observations in the sample minus the number of population parameters which must be estimated from sample observations). In general, we can represent confidence limits for population means by

$$\mu \in \bar{x} \pm t_c \ [s/\sqrt{n-1}]$$

where the values $\pm\ t_c$, called "critical values" or "confidence coefficients", depend on the level of confidence desired and the sample size.[1] They can be read from the table in Appendix 1.

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1 Speigel, M.R., **Theory and Problems of Statistics**, McGraw-Hill, 1961, pp. 188-191.

Using the data from Table 1 and a 90% confidence interval assumption, the resulting interval about the mean logLDF is bounded within the range determined as:

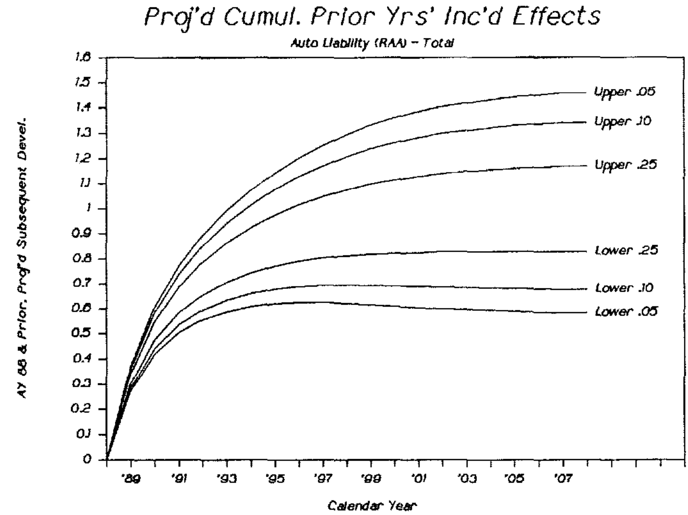
$$.652 \pm 1.782(0.093/3.464) = 0.700 \text{ and } 0.604$$

and then taking the natural antilog for each value yields an upper and lower LDF of 2.014 and 1.829, respectively.

This calculation was performed with the logLDF's of each age-to-age column from the RAA data and the summary calculations are shown in Exhibit I for selected confidence intervals of 50%, 80% and 90% . The age-to-age LDF's are converted into cumulative LDF's which are used to "square" (e.g. project to ultimate) the accident period incurred loss triangle. From this projection we can subtract out the current (e.g. most recent actual diagonal) total incurred loss amounts to determine the projected cumulative prior years' incurred effects on accident years 1988 and prior, during the twenty(20) subsequent calendar periods as shown in Exhibit II.

The graph on the following page plots the upper and lower boundary lines that result from these calculations for the three different selected confidence coefficients.

Auto Liability - Graph #1



The graph shows the potential future development for accident years 1988 and prior assuming different levels of implicit variability within the age-to-age LDF's. The method indicates that it is reasonable to expect that, 50% of the time, the actual future development will be between $828 million and $1.169 billion. It also indicates that there is a 1 in 20 expectation that the actual future development may exceed $1.458 billion.

The expected LDF's underlying the graph above were simply derived as the natural antilog of the sample mean logLDF for convenience. The selection of these factors is usually based on some objective measure but does not necessarily have to be a function of average LDF. An explicit adjustment to recognize the bias in the historical LDF's in a growing book of business, or the implicit bias of an analyst to usually select an average 3 of the latest 5 LDF's may be incorporated in the LDF selection logic. Clearly, if larger expected LDF's had been selected, the entire graph would be shifted upward but the relative width between the boundary lines would stay approximately the same. Also, any of the LDF patterns (expected, upper, lower) may be smoothed using curve fitting routines if such smoothing is deemed desirable for a particular application of the method.

It is important to point out that the upper and lower boundary lines from the graph do not define a "confidence interval" per se. While it may be appropriate to consider the range resulting from the upper and lower LDF's for each age-to-age as a confidence interval, it is not appropriate to refer to the cumulative LDF's implied by multiplying successive upper age-to-age LDF's as an "upper confidence interval".

A cumulative development pattern constructed this way may be considered a simplified (or specific as opposed to generalized) confidence boundary, but it is not a "confidence interval", since we have not considered whether or not their is a dependent relationship between consecutive age-to-age LDF's. Also, the projection of subsequent development as displayed in the graph is determined by applying the upper and lower LDF's to incurred loss amounts in a growing book of business. If the most recent accident year(s) experience unusually high actual LDF's, this will likely cause the actual total subsequent development amount to exceed a given confidence boundary even though the majority of loss years have experienced actual LDF's that were within the range of the given confidence coefficient at each age-to-age LDF.

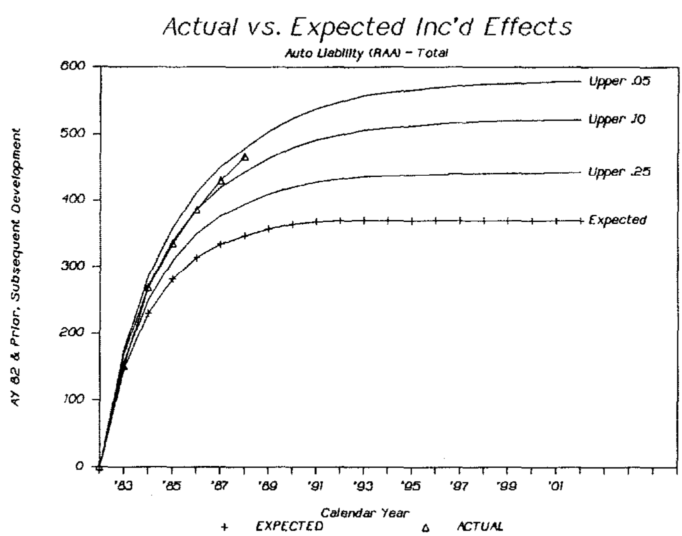
The graph is simply a practical demonstration of the future development possibilities described by the observed incurred loss variability implicit to a given insurance coverage.

It is intended to impart to non-actuaries a simplified view of the levels of reasonable fluctuation that may be expected in the estimation of the mean of a stochastic process. The graph lends itself to convenient hindsight testing and acts as an effective means for identifying the nature and amount of significant changes to the income statement.

As an example, using the RAA automobile liability data as above and assuming it is year end 1982, we can test whether or not the historical LDF's provided an appropriate means of projecting the future calendar developments on accident years 1982 and prior. The summary calculations are shown in Exhibit III.

The graph below plots the actual versus expected incurred effects for accident year 1982 and prior as well as the upper confidence boundary line for various coefficients.

Auto Liability - Graph #2 (@12/82 Evaluation Scenario)

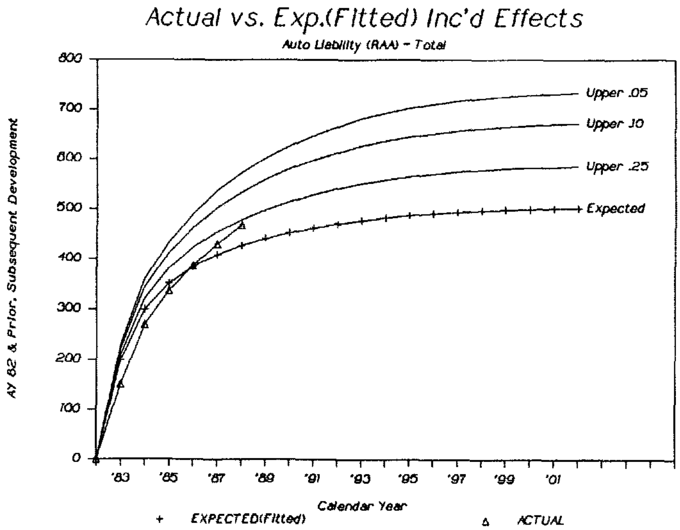


The graph on the preceding page indicates that although the actual loss development was behaving as "expected" at the end of calendar year '83, by the end of calendar year '88 the actual subsequent development on accident years 1982 and prior has exceeded the upper 10% boundary. In hindsight this is not altogether surprising since successive study's (1987 and 1989) of RAA data have shown a general shift to a longer reporting pattern.

Suppose the reserve analyst selecting LDF's at year end 1982 had a hunch that the reporting pattern would likely lengthen in future periods and chose not to use the average LDF but rather selected LDF's that recognized that the historical LDF's may have been too low. A convenient means to adjust for this type of distortion is to select the LDF's that result from a curve fit to the weighted average LDF's. In particular, an exponential power curve of the form $Y = e^{ax^b}$ produces a cumulative development pattern similar to the inverse power curve but with a steeper slope near the earliest evaluations and a longer tail. The summary calculations of the curve fit are shown in Appendix 2 and the summary calculations to derive the revised upper and lower boundaries are shown in Exhibit IV.

The next graph indicates that by using the LDF's that result from fitting an exponential power curve to the weighted average LDF's the expectation of subsequent development (and the corresponding boundary lines) is shifted upwards. As a result, the actual subsequent development would be perceived in hindsight as behaving more or less as "expected" since after six years of subsequent development the actual development appears to be coming in around the upper 25% boundary. This points to the importance of selecting LDF's which reflect the analysts informed judgments in addition to the historical statistical indications.

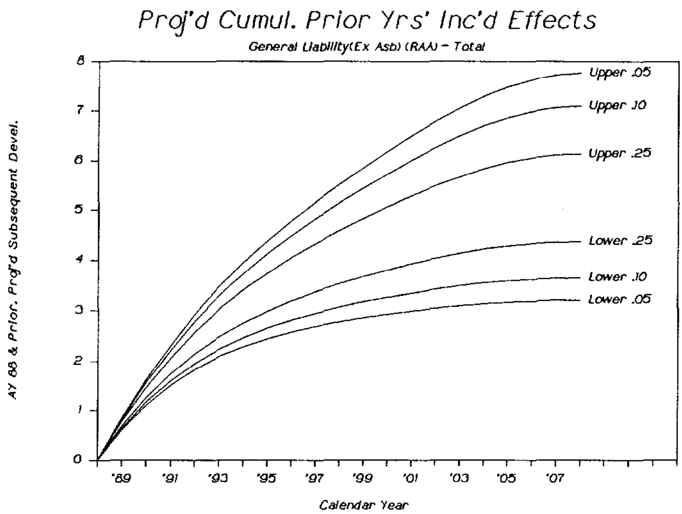
Auto Liability - Graph #3 (@12/82 Evaluation Scenario & Fitted Curve)



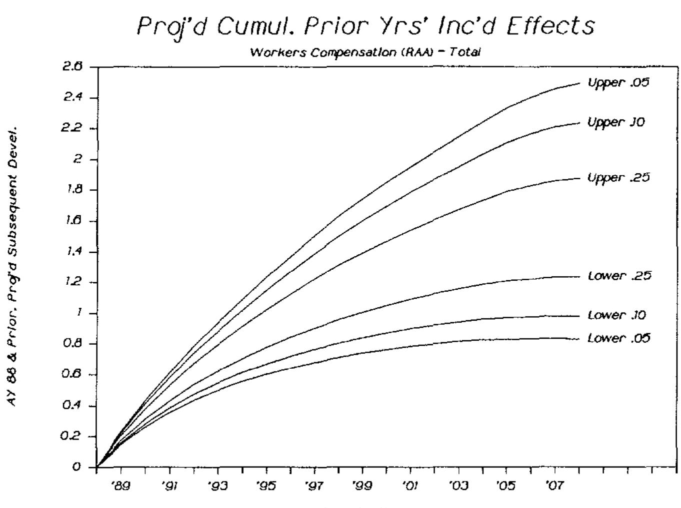
The six graphs displayed on the following three pages plot the same information as the Auto Liability graphs (#1, #2 and #3) except that the reviewed data is General Liability Excluding Asbestos and Workers' Compensation, respectively, from the 1989 RAA Study.

The graphs are based on historical developments through 21 years of maturity. The excess reinsurance loss reporting patterns for general liability (excluding asbestos) and workers compensation demonstrate development beyond 21 years of roughly 8% and 12%, respectively. While this is significant the vast majority of variability is observed within the first 21 years and the graphs are intended simply to demonstrate the relative difference in the boundaries for the three different excess coverages.

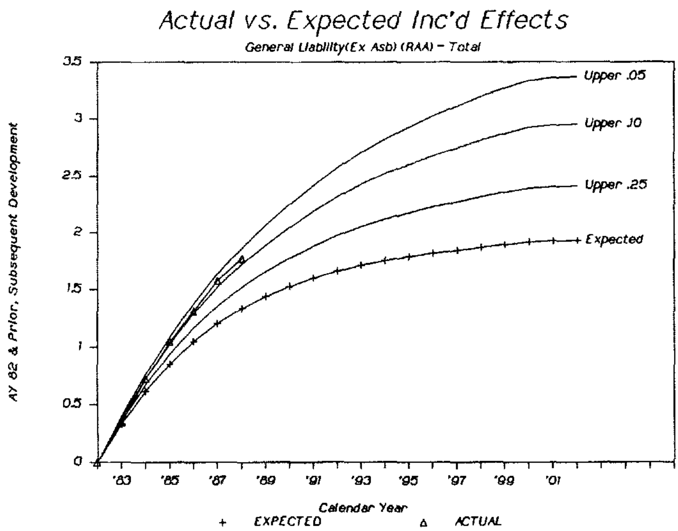
General Liability - Graph #1



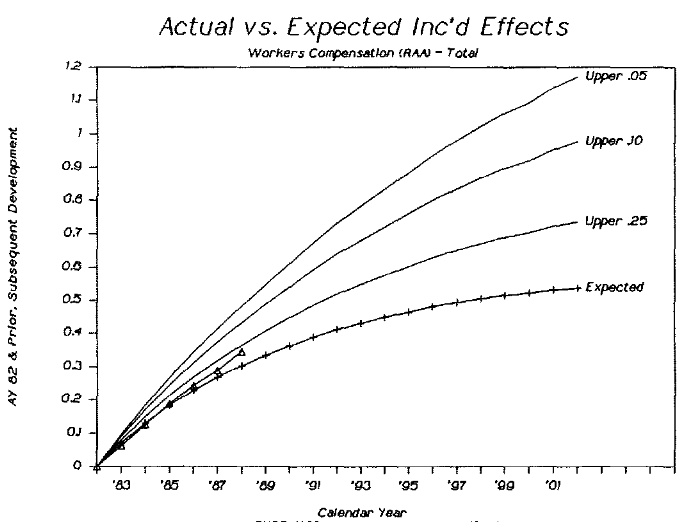
Workers Compensation - Graph #1



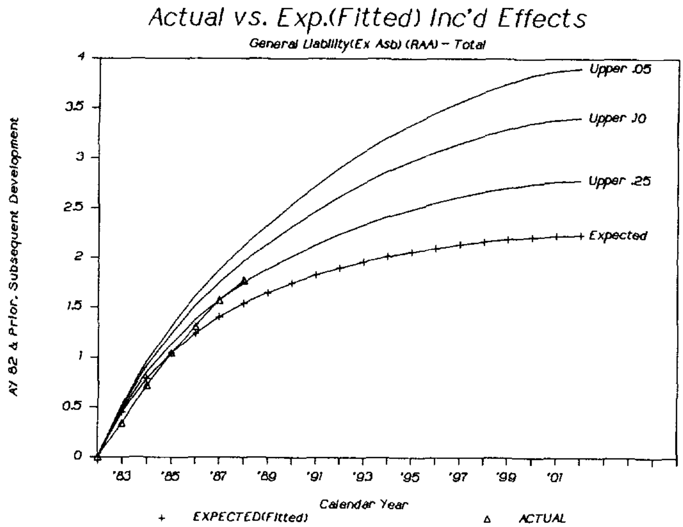
General Liability - Graph #2 (@12/82 Evaluation Scenario)



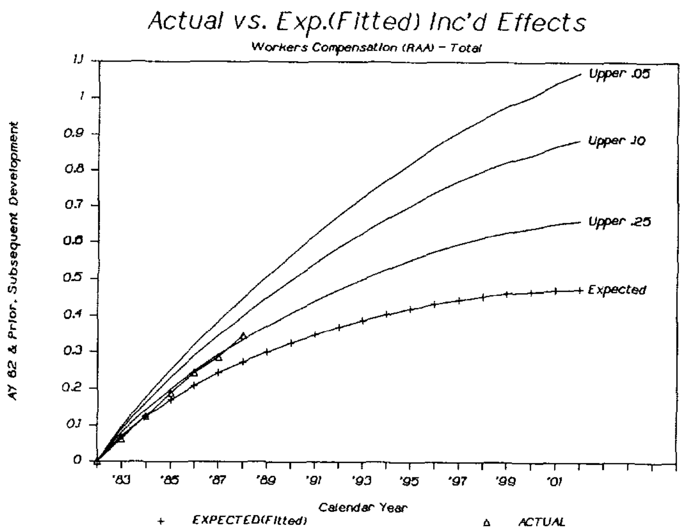
Workers Compensation - Graph #2 (@12/82 Evaluation Scenario)



General Liability - Graph #3 (@12/82 Evaluation Scenario & Fitted Curve)



Workers Compensation - Graph #3 (@12/82 Evaluation Scenario & Fitted Curve)



The table below summarizes the percentage difference from expected indicated by the boundaries in Auto Liability (AL) - Graph #1, General Liability (GL) - Graph #1, and Workers Compensation (WC) - Graph #1, after both 1 year and 20 years of subsequent development for the three coverages separately.

Table 2

	After 1 Year of Development			After 20 Years of Development		
	AL	GL	WC	AL	GL	WC
Upper .05	15.7 %	17.0 %	22.6 %	46.6 %	48.9 %	62.0 %
Upper .10	11.9	12.9	17.1	34.9	36.1	45.4
Upper .25	6.1	6.6	8.7	17.5	17.7	22.0
Lower .25	(6.0)	(6.5)	(8.6)	(16.8)	(16.1)	(19.6)
Lower .10	(11.7)	(12.6)	(16.7)	(32.0)	(30.2)	(36.3)
Lower .05	(15.4)	(16.5)	(21.9)	(41.6)	(38.6)	(46.2)

Notice the asymmetric property of the bounds as the upper bounds indicate larger percentage differences from expected than the lower bounds. This is due to the use of the logLDF to generate the upper and lower bounds, but can be understood intuitively since topside variation is unlimited while the bottom variation is more limited. It is probably not surprising that the general liability coverage indicates wider bounds after one year than auto liability. However, it is interesting to note that the lower bounds for general liability after 20 years are less than those for auto liability.

Old Case Development

The rationale underlying the development of upper and lower bounds for calendar year old case development is identical to that used for total prior years' incurred effects, with the exception that the data are report year as opposed to accident year. By repeating the procedure using report year data we can review the levels of implicit variability demonstrated by the historical development on known claims. This allows us to identify that portion of the variability which is not due to pure IBNR emergence.

IBNR Emergence

Total calendar year prior years' incurred effects are dependent upon the total calendar year old case development. Consequently, total calendar year IBNR emergence confidence boundaries are determined through an equation which considers this dependent relationship. Consider the following argument:

Let Y = total IBNR emergence,

X_1 = total calendar year prior years' incurred development,

X_2 = total calendar year old case development, and

ρ_{12} denote the correlation coefficient of X_1 and X_2 and k_i denote real constants.

If $Y = (k_1)(X_1) + (k_2)(X_2)$,

Then $\sigma_Y^2 = \sum_i k_i^2 \sigma_i^2 + 2 k_1 k_2 \rho_{12} \sigma_1 \sigma_2$.[2]

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2 Hogg, R.V., and Craig, A.T., **Introduction to Mathematical Statistics**, Macmillan, 1970, p.168.

Setting $k_1 = 1$ and $k_2 = -1$, yields the correct formula for expected IBNR emergence;

$$Y = X_1 - X_2 \text{ , or}$$

IBNR emergence = [(total prior yrs' inc'd development) minus (old case development)]; and

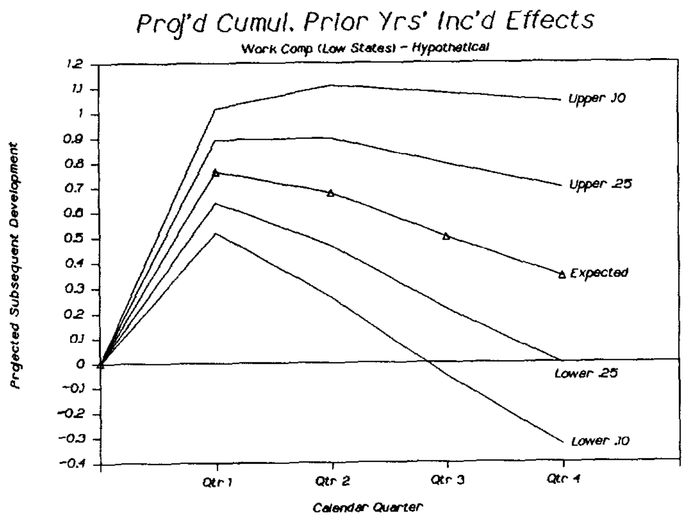
$$\sigma_Y^2 = \sum_i \sigma_i^2 - 2\rho_{12}\sigma_1\sigma_2 \ .$$

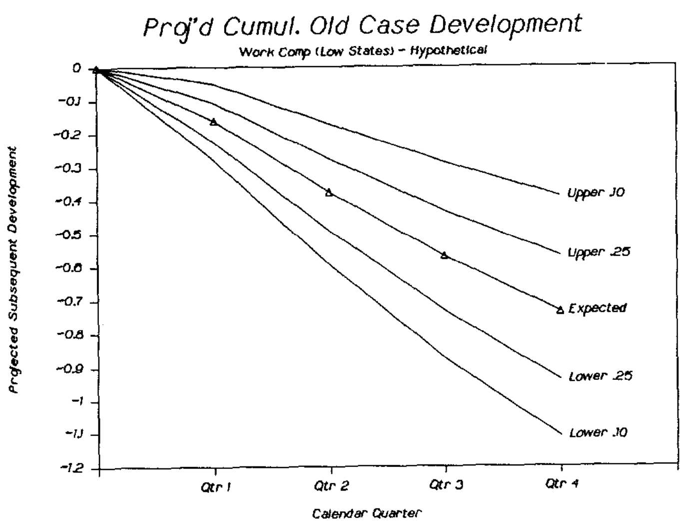
In order to solve the equation for σ_Y^2 we need to substitute values for σ_1 , σ_2 , and ρ_{12} . In estimating the value of σ_i^2 we will assume that the combined effect of individual confidence intervals for each age-to-age results in approximately a 95% confidence interval that is normal in the aggregate (e.g. $\pm 2\sigma$ = 95% of the area under a normal curve) and use the general formula for normal confidence intervals: $\{ X_i \pm 2\sigma_i \}$.

Setting $X_1 + 2\sigma_1$ = upper bound for total prior yrs' inc'd development, and

$X_2 + 2\sigma_2$ = upper bound for old case development (where X_i denotes the "expected" development), we derive the correlation coefficient (ρ_{12}) from linear regressions of past actual calendar year experience and then solve to determine the appropriate upper boundary for IBNR emergence: $\{ (X_1 - X_2) + 2\sigma_Y \}$.

The example which follows should help to illustrate these concepts. We will assume hypothetical quarterly data for a primary workers compensation insurer that write's low development states, consistently establishes redundant case reserves and has shown no significant increase or decrease in exposure level for the past several years. The two graphs on the following page summarize the expected prior years' incurred effects and old case development for the next four calendar quarters with corresponding confidence boundaries derived as before. The summary calculations for these two graphs are found in Exhibit V.


Proj'd Cumul. Prior Yrs' Inc'd Effects
Work Comp (Low States) – Hypothetical
Projected Subsequent Development
Upper .10
Upper .25
Expected
Lower .25
Lower .10
Qtr 1
Qtr 2
Qtr 3
Qtr 4
Calendar Quarter


Proj'd Cumul. Old Case Development
Work Comp (Low States) – Hypothetical
Projected Subsequent Development
Upper .10
Upper .25
Expected
Lower .25
Lower .10
Qtr 1
Qtr 2
Qtr 3
Qtr 4
Calendar Quarter

Using the results implied by the upper .25 boundary for the first subsequent calendar quarter, we set:

Upper bound for total prior yrs' = $X_1 + 2\sigma_1 = 764 + 2\sigma_1 = 892$

Upper bound for old case = $X_2 + 2\sigma_2 = -161 + 2\sigma_2 = -106$

and solve for σ_1 (= 64) and σ_2 (= 27.5) . We also determine from regressions of several historical calendar year developments separately, that a correlation coefficient of approximately 0.85 to 0.95 exists between the total incurred development and the old case development for this line of business and select $\rho_{12} = 0.90$, as a reasonable estimate.

Plugging the values into the equation:

$$\sigma_y^2 = [(\sigma_1)^2 + (\sigma_2)^2] - 2\rho_{12}(\sigma_1)(\sigma_2)$$

gives

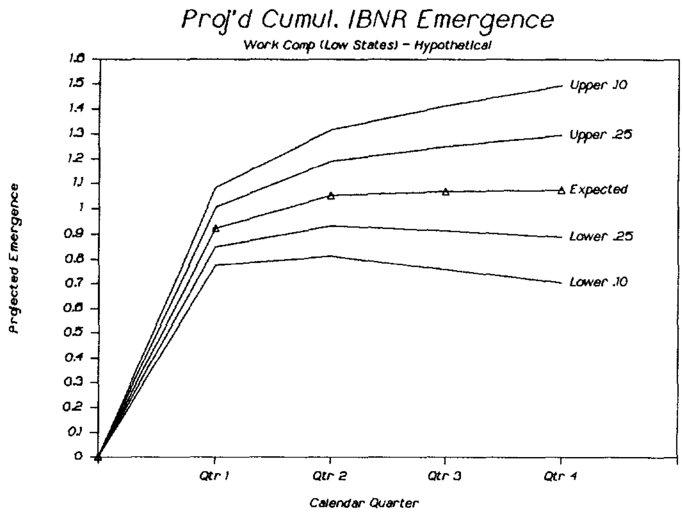
$$\sigma_y^2 = (4096 + 756.25) - 2(0.90)(64)(27.5)$$

$$\sigma_y^2 = 1684.25$$

and

$$\sigma_y = 41 .$$

Thus, given the above set of assumptions, we have determined that an appropriate upper .25 bound for the IBNR emergence after one subsequent quarter of development is equal to 1007 (i.e. [(764 - -161) + 2(41)]). Repeating the computation for the 2nd, 3rd and 4th quarters yields upper .25 boundaries of 1191, 1250 and 1296, respectively. The lower bound is established similarly and the resulting upper and lower boundaries for two different confidence coefficients are plotted along with the "expected" IBNR emergence in the graph on the following page. The summary calculations for this graph are included in Exhibit VI.



Summary

Observed historical loss experience (i.e. empirical) data is examined to estimate the variability in the development patterns at each age-to age LDF for both accident year and report year triangles. Small sample confidence interval calculations are used to determine an upper and lower boundary at each age-to-age LDF. These individual confidence intervals are combined to generate simplified confidence boundaries. Recognizing the dependent relationship of old case development to total prior years' incurred development the IBNR emergence confidence boundaries are derived via an ad hoc procedure.

Conclusions

The upper and lower bounds that result from the application of this method have several characteristics which prove intuitively appealing. The dollar intervals and the intervals as a percentage of expected, between upper and lower bounds increase with time. This is understandable since a projection of several years (or quarters) is less certain than a projection of one year (or quarter). The relative width of the upper and lower bounds will vary with the type of business under review owing to the inherent variability of the loss development patterns demonstrated by the line of business. That is, the width for auto liability (bodily injury) should be proportionately smaller than the width for say general liability (products bodily injury).

The method can be used to identify which elements of an insurance coverage have historically contributed to the variability of results. For example, the loss and allocated expenses may be reviewed separately and combined to study any significant differences and the old case versus pure IBNR components of each could be reviewed as well. Also, the method may be adapted to review the inherent variability of paid loss and claim count development patterns.

The sum of the upper and lower bounds for old case development and pure IBNR will not necessarily be equal to the upper and lower bounds for total. This is due to the dependent nature of the variables involved.

Changes in exposure levels should not distort the upper and lower boundaries disproportionately since the simplified confidence boundary is generated as a function of the actual losses. If losses increase the boundaries will expand accordingly and vice versa. Using the logLDF to generate the confidence intervals at each age-to-age results in simplified confidence boundaries that are asymmetric. This property is both an intended and useful result of the method.

The graphs may be used to summarize certain hindsight tests of actual versus expected calendar year developments. The graphs may also be used to convey to non-actuaries the level of variability implicit in any LDF based projection.

Acknowledgement

This method was initially derived while working with a large commercial insurance company with the primary intent of establishing a means of accountability for the individual reserve analysts. The executive management began requesting that certain reserve summary information be prepared in this same format since it gave them a more meaningful reference from which to review the past performance of the book of business. As a consulting actuary it has become a useful tool in explaining to clients various aspects of the reserving process.

The method as described has evolved through various revisions suggested by some users and reviewers. As such, I wish to recognize several individuals including Mike Larsen, Ron Wiser, Dierck Oosten and Craig Lassen whose suggested enhancements are incorporated in this version of the method.

I wish to thank the Reinsurance Association of America (RAA) for permission to reference the raw historical loss development data from their "Historical Loss Development Study, 1989 Edition". It is important to note that the RAA does not publish reporting patterns, but rather compiles the data of member companies and others to reinforce awareness of historical loss development patterns. The data is merely illustrative of loss development patterns that have been experienced in the past, and should serve to emphasize the need for close attention to casualty excess insurance loss reserves. The study makes no attempt to project future loss development.[3]

I also wish to thank Oliver & Boyd, Ltd., Edinburgh, for permission to include the table in Appendix 1, which is reproduced from the book "Statistical Methods for Research Workers" by the late Professor Sir Ronald A. Fisher, Cambridge.

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3 **Reinsurance Association of America - Loss Development Study - 1989 Edition,** Reinsurance Association of America, 1989, pp.2-6.

Simplified Confidence Boundaries
Source Data: RAA (1989 Edition)
Automobile Liability - Treaty and Facultative Combined
Incurred Case Losses (000s Omitted)

Exhibit I
Sheet 1

Evaluation Age (Measured in Years)

Accident Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1956																				9234	9234
1957																			13526	13582	13541
1958																		13788	13788	13741	13745
1959																	15683	15688	15675	15675	15676
1960																23719	23733	23594	23552	23678	23678
1961															23623	23460	23457	23466	23466	23535	23445
1962														25681	25676	25754	25753	25753	25753	25697	25728
1963													28817	28842	28738	28768	28770	28772	28772	28771	28771
1964												31742	31963	31693	31634	31583	31757	31749	31796	31706	31702
1965											33775	33846	33848	33843	33737	33737	33727	33737	33700	33700	33700
1966										39689	40048	39724	39711	39750	39747	40063	40159	40198	40199	40240	40240
1967									37327	37472	37545	37395	37338	37216	37360	37189	37201	37201	37194	37212	37215
1968								42876	42962	43390	43224	43401	43482	43588	43933	44010	44006	44026	44015	44015	43555
1969							53103	54333	56306	57970	57608	60081	59545	59425	60357	61635	61916	61880	62925	66491	
1970						55730	57024	56615	57341	57927	58290	58704	58479	56639	56596	56637	56723	56660	56621		
1971					59376	61455	61771	62444	62583	62826	63205	62894	63093	63384	63654	64207	64486	64611			
1972				64285	66180	64852	65260	66787	68106	68557	68535	68178	68233	68261	68099	68064	68048				
1973			77686	85742	89893	92321	93825	95208	95961	96531	96460	96584	96744	97678	98369	98923					
1974		66012	86285	98412	105150	108441	111659	114969	117709	119524	124838	130833	134383	135836	142491						
1975	44194	84836	106978	121558	130107	139070	140521	143194	145279	148577	151560	153700	155564	163995							
1976	54141	101964	119968	134525	143293	152726	157093	166068	170629	171771	175498	174776	176949								
1977	53917	105523	133712	145760	157339	163322	169688	177322	181761	185451	187954	192894									
1978	64710	106425	126783	139187	149497	159956	162443	166735	170650	173342	176094										
1979	64187	117097	140417	157394	161666	167887	175391	178591	184812	186069											
1980	63487	116702	142809	159642	175583	176979	185141	193358	190956												
1981	75639	139607	171193	192593	205603	218525	228529	233041													
1982	88898	158810	208402	233284	241188	251225	256256														
1983	99291	186463	243025	284328	309963	318678															
1984	106266	243468	323088	369161	393649																
1985	138512	320697	402753	446955																	
1986	150448	296164	372971																		
1987	138834	263428																			
1988	149910																				

Simplified Confidence Boundaries
Source Data: RAA (1989 Edition)
Automobile Liability - Treaty and Facultative Combined
Incurred Case Losses
Age-to-Age Development Factors

Exhibit I
Sheet 2

Evaluation Age (Measured in Years)

Accident	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Year	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1956																				1.000
1957																			1.004	0.997
1958																		1.000	0.997	1.000
1959																	1.000	0.999	1.000	1.000
1960																1.001	0.994	0.998	1.005	1.000
1961															0.993	1.000	1.000	1.000	1.003	0.996
1962														1.000	1.003	1.000	1.000	1.000	0.998	1.001
1963													1.001	0.996	1.001	1.000	1.000	1.000	1.000	1.000
1964												1.007	0.992	0.998	0.998	1.006	1.000	1.001	0.997	1.000
1965											1.002	1.000	1.000	0.997	1.000	1.000	1.000	0.999	1.000	1.000
1966										1.009	0.992	1.000	1.001	1.000	1.008	1.002	1.001	1.000	1.001	1.000
1967									1.004	1.002	0.996	0.998	0.997	1.004	0.995	1.000	1.000	1.000	1.000	1.000
1968								1.002	1.010	0.996	1.004	1.002	1.002	1.008	1.002	1.000	1.000	1.000	1.000	0.990
1969							1.023	1.036	1.030	0.994	1.043	0.991	0.998	1.016	1.021	1.005	0.999	1.017	1.057	
1970						1.023	0.993	1.013	1.010	1.006	1.007	0.996	0.969	0.999	1.001	1.002	0.999	0.999		
1971					1.035	1.005	1.011	1.002	1.004	1.006	0.995	1.003	1.005	1.004	1.009	1.004	1.002			
1972				1.029	0.980	1.006	1.023	1.020	1.007	1.000	0.995	1.001	1.000	0.998	0.999	1.000				
1973			1.104	1.048	1.027	1.016	1.015	1.008	1.006	0.999	1.001	1.002	1.010	1.007	1.006					
1974		1.307	1.141	1.068	1.031	1.030	1.030	1.024	1.015	1.044	1.048	1.027	1.011	1.049						
1975	1.920	1.261	1.136	1.070	1.069	1.010	1.019	1.015	1.023	1.020	1.014	1.012	1.054							
1976	1.883	1.177	1.121	1.065	1.066	1.029	1.057	1.027	1.007	1.022	0.996	1.012								
1977	1.957	1.267	1.090	1.079	1.038	1.039	1.045	1.025	1.020	1.013	1.026									
1978	1.645	1.191	1.098	1.074	1.070	1.016	1.026	1.023	1.016	1.016										
1979	1.824	1.199	1.121	1.027	1.038	1.045	1.018	1.035	1.007											
1980	1.838	1.224	1.118	1.100	1.008	1.046	1.044	0.988												
1981	1.846	1.226	1.125	1.068	1.063	1.046	1.020													
1982	1.786	1.312	1.119	1.034	1.042	1.020														
1983	1.878	1.303	1.170	1.090	1.028															
1984	2.291	1.327	1.143	1.066																
1985	2.315	1.256	1.110																	
1986	1.969	1.259																		
1987	1.897																			
$\bar{X}$	1.927	1.255	1.123	1.063	1.038	1.025	1.025	1.017	1.012	1.010	1.009	1.004	1.003	1.006	1.003	1.001	1.000	1.001	1.005	0.999
S	0.186	0.049	0.021	0.023	0.026	0.015	0.017	0.014	0.008	0.014	0.019	0.009	0.019	0.014	0.007	0.002	0.002	0.005	0.016	0.003

$\bar{X}$ = SUM (X) / N , where X denotes the individual values of each column and N = 13 (the number of sample units).

$$S = \sqrt{[\text{SUM}(X - \bar{X})^2] / (N - 1)}$$

Simplified Confidence Boundaries
Source Data: RAA (1989 Edition)
Automobile Liability - Treaty and Facultative Combined
Incurred Case Losses
Natural Logarithm (Age-to-Age Development Factors)

Exhibit I
Sheet 3

Evaluation Age (Measured in Years)

Accident Year	1 2	2 3	3 4	4 5	5 6	6 7	7 8	8 9	9 10	10 11	11 12	12 13	13 14	14 15	15 16	16 17	17 18	18 19	19 20	20 21
1956																				0.000
1957																			0.004	-0.003
1958																		0.000	-0.003	0.000
1959																	0.000	-0.001	0.000	0.000
1960																0.001	-0.006	-0.002	0.005	0.000
1961															-0.007	0.000	0.000	0.000	0.003	-0.004
1962														0.000	0.003	0.000	0.000	0.000	-0.002	0.001
1963													0.001	-0.004	0.001	0.000	0.000	0.000	0.000	0.000
1964												0.007	-0.008	-0.002	-0.002	0.005	0.000	0.001	-0.003	0.000
1965											0.002	0.000	0.000	-0.003	0.000	0.000	0.000	-0.001	0.000	0.000
1966										0.009	-0.008	0.000	0.001	0.000	0.008	0.002	0.001	0.000	0.001	0.000
1967									0.004	0.002	-0.004	-0.002	-0.003	0.004	-0.005	0.000	0.000	0.000	0.000	0.000
1968								0.002	0.010	-0.004	0.004	0.002	0.002	0.008	0.002	0.000	0.000	0.000	0.000	-0.011
1969							0.023	0.036	0.029	-0.006	0.042	-0.009	-0.002	0.016	0.021	0.005	-0.001	0.017	0.055	
1970						0.023	-0.007	0.013	0.010	0.006	0.007	-0.004	-0.032	-0.001	0.001	0.002	-0.001	-0.001		
1971					0.034	0.005	0.011	0.002	0.004	0.006	-0.005	0.003	0.005	0.004	0.009	0.004	0.002			
1972				0.029	-0.020	0.006	0.023	0.020	0.007	0.000	-0.005	0.001	0.000	-0.002	-0.001	0.000				
1973			0.099	0.047	0.027	0.016	0.015	0.008	0.006	-0.001	0.001	0.002	0.010	0.007	0.006					
1974		0.268	0.132	0.066	0.031	0.029	0.029	0.024	0.015	0.043	0.047	0.027	0.011	0.048						
1975	0.652	0.232	0.128	0.068	0.067	0.010	0.019	0.014	0.022	0.020	0.014	0.012	0.053							
1976	0.633	0.163	0.115	0.063	0.064	0.028	0.056	0.027	0.007	0.021	-0.004	0.012								
1977	0.671	0.237	0.086	0.076	0.037	0.038	0.044	0.025	0.020	0.013	0.026									
1978	0.498	0.175	0.093	0.071	0.068	0.015	0.026	0.023	0.016	0.016										
1979	0.601	0.182	0.114	0.027	0.038	0.044	0.018	0.034	0.007											
1980	0.609	0.202	0.111	0.095	0.008	0.045	0.043	-0.013												
1981	0.613	0.204	0.118	0.065	0.061	0.045	0.020													
1982	0.580	0.272	0.113	0.033	0.041	0.020														
1983	0.630	0.265	0.157	0.086	0.028															
1984	0.829	0.283	0.133	0.064																
1985	0.840	0.228	0.104																	
1986	0.677	0.231																		
1987	0.641																			
$\bar{X}$	0.652	0.226	0.116	0.061	0.037	0.025	0.025	0.017	0.012	0.010	0.009	0.004	0.003	0.006	0.003	0.001	0.000	0.001	0.005	-0.001
S	0.093	0.039	0.019	0.021	0.025	0.014	0.016	0.014	0.008	0.013	0.018	0.009	0.018	0.014	0.007	0.002	0.002	0.005	0.015	0.003

$\bar{X}$ = SUM (X) / N , where X denotes the individual values of each column and N = 13 (the number of sample units).

$$S = \sqrt{[\text{SUM}(X - \bar{X})^2] / (N - 1)}$$

Simplified Confidence Boundaries
Source Data: RAA (1989 Edition)
Automobile Liability - Treaty and Facultative Combined
Incurred Case Losses
Summary Confidence Interval Statistics

Evaluation Age (Measured in Years)

		1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21
(1)	$\bar{X}$	0.652	0.226	0.116	0.061	0.037	0.025	0.025	0.017	0.012	0.010	0.009	0.004	0.003	0.006	0.003	0.001	0.000	0.001	0.005	-0.001
(2)	S	0.093	0.039	0.019	0.021	0.025	0.014	0.016	0.014	0.008	0.013	0.018	0.009	0.018	0.014	0.007	0.002	0.002	0.005	0.015	0.003
(3)	Mean LDF	1.919	1.254	1.123	1.063	1.038	1.025	1.025	1.017	1.012	1.010	1.009	1.004	1.003	1.006	1.003	1.001	1.000	1.001	1.005	0.999
(4)	Upper .25	0.671	0.234	0.120	0.065	0.042	0.028	0.028	0.020	0.014	0.013	0.013	0.006	0.007	0.009	0.004	0.001	0.000	0.002	0.008	0.000
(5)	Lower .25	0.633	0.218	0.112	0.057	0.032	0.022	0.022	0.014	0.010	0.007	0.005	0.002	-0.001	0.003	0.002	0.001	0.000	0.000	0.002	-0.002
(6)	Upper .25 LDF	1.956	1.263	1.127	1.067	1.043	1.028	1.029	1.020	1.014	1.013	1.013	1.006	1.007	1.009	1.004	1.001	1.000	1.002	1.008	1.000
(7)	Lower .25 LDF	1.884	1.244	1.119	1.058	1.033	1.022	1.022	1.014	1.010	1.007	1.005	1.002	0.999	1.003	1.002	1.001	1.000	1.000	1.002	0.998
(8)	Upper .05	0.700	0.246	0.126	0.072	0.050	0.032	0.033	0.024	0.016	0.017	0.018	0.009	0.012	0.013	0.007	0.002	0.001	0.004	0.013	0.001
(9)	Lower .05	0.604	0.206	0.106	0.050	0.024	0.018	0.017	0.010	0.008	0.003	0.000	-0.001	-0.006	-0.001	-0.001	0.000	-0.001	-0.002	-0.003	-0.003
(10)	Upper .05 LDF	2.013	1.279	1.134	1.074	1.051	1.033	1.034	1.024	1.016	1.017	1.018	1.009	1.012	1.013	1.007	1.002	1.001	1.004	1.013	1.001
(11)	Lower .05 LDF	1.830	1.229	1.112	1.051	1.024	1.018	1.017	1.010	1.008	1.003	1.000	0.999	0.994	0.999	0.999	1.000	0.999	0.998	0.997	0.997
(12)	Upper .10	0.688	0.241	0.123	0.069	0.047	0.030	0.031	0.022	0.015	0.015	0.016	0.008	0.010	0.011	0.006	0.002	0.001	0.003	0.011	0.000
(13)	Lower .10	0.616	0.211	0.109	0.053	0.027	0.020	0.019	0.012	0.009	0.005	0.002	0.000	-0.004	0.001	0.000	0.000	-0.001	-0.001	-0.001	-0.002
(14)	Upper .10 LDF	1.991	1.273	1.131	1.072	1.048	1.031	1.032	1.023	1.015	1.015	1.016	1.008	1.010	1.012	1.006	1.002	1.001	1.003	1.011	1.000
(15)	Lower .10 LDF	1.851	1.235	1.115	1.054	1.028	1.020	1.019	1.012	1.009	1.005	1.002	1.000	0.996	1.001	1.000	1.000	0.999	0.999	0.999	0.998

Notes:
(1) from Exhibit I, Sheet 3 .
(2) from Exhibit I, Sheet 3 .
(3) = e^(row(1)), Where e denotes exponential base 2.71828... .
(4) = (row(1) + 0.695[(row(2))/((N-1)^0.5)]), where 0.695 = $t_{.25}$ for (N-1 = 12) degress of freedom .
(5) = (row(1) - 0.695[(row(2))/((N-1)^0.5)]) .
(6) = e^(row(4)) .
(7) = e^(row(5)) .
(8) = (row(1) + 1.782[(row(2))/((N-1)^0.5)]), where 1.782 = $t_{.05}$ for (N-1 = 12) degress of freedom .
(9) = (row(1) - 1.782[(row(2))/((N-1)^0.5)]) .
(10) = e^(row(8)) .
(11) = e^(row(9)) .
(12) = (row(1) + 1.356[(row(2))/((N-1)^0.5)]), where 1.356 = $t_{.10}$ for (N-1 = 12) degress of freedom .
(13) = (row(1) - 1.356[(row(2))/((N-1)^0.5)]) .
(14) = e^(row(12)) .
(15) = e^(row(13)) .

Simplified Confidence Boundaries
Source Data: RAA (1989 Edition)
Automobile Liability - Treaty and Facultative Combined
Incurred Case Losses (000s Omitted)
Incurred Development Summary

Exhibit II
Sheet 1a

Calendar Year	Lower .05	Lower .10	Lower .25	Expected	Upper .25	Upper .10	Upper .05
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1989	271,478	283,190	301,479	320,865	340,413	359,156	371,316
1990	418,903	440,807	475,127	511,652	548,639	584,250	607,430
1991	505,309	536,062	584,353	635,894	688,234	738,772	771,740
1992	555,280	594,164	655,367	720,881	787,614	852,241	894,501
1993	586,092	632,380	705,403	783,794	863,879	941,660	992,642
1994	606,604	659,415	742,874	832,663	924,600	1,014,087	1,072,845
1995	619,131	678,169	771,642	872,438	975,890	1,076,821	1,143,218
1996	623,626	688,396	791,121	902,133	1,016,322	1,127,971	1,201,546
1997	623,212	693,157	804,266	924,573	1,048,574	1,170,054	1,250,233
1998	618,846	693,730	812,899	942,223	1,075,827	1,207,012	1,293,754
1999	613,035	692,292	818,643	956,068	1,098,367	1,238,408	1,331,175
2000	607,454	690,137	822,129	965,931	1,115,095	1,262,144	1,359,687
2001	601,740	687,395	824,323	973,770	1,129,077	1,282,465	1,384,365
2002	598,222	686,147	826,849	980,618	1,140,637	1,298,894	1,404,146
2003	594,697	684,374	827,983	985,070	1,148,693	1,310,661	1,418,462
2004	591,100	682,302	828,438	988,403	1,155,149	1,320,326	1,430,326
2005	587,487	680,023	828,385	990,907	1,160,445	1,328,515	1,440,507
2006	584,542	678,199	828,456	993,190	1,165,182	1,335,829	1,449,616
2007	582,371	676,910	828,689	995,243	1,169,305	1,342,175	1,457,539
2008	581,302	675,956	827,937	994,739	1,169,090	1,342,276	1,457,867

Notes:
(2) from Exhibit II, Sheet 2e .
(3) from Exhibit II, Sheet 2g .
(4) from Exhibit II, Sheet 2c .
(5) from Exhibit II, Sheet 2a .
(6) from Exhibit II, Sheet 2b .
(7) from Exhibit II, Sheet 2f .
(8) from Exhibit II, Sheet 2d .

Simplified Confidence Boundaries
Source Data: RAA (1989 Edition)
Automobile Liability - Treaty and Facultative Combined
Incurred Case Losses
Incurred Development Percentage Difference From Expected Summary

Exhibit II
Sheet 1b

Calendar Year	Lower .05	Lower .10	Lower .25	Expected	Upper .25	Upper .10	Upper .05
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1989	-15.4%	-11.7%	-6.0%	0.0%	6.1%	11.9%	15.7%
1990	-18.1	-13.8	-7.1	0.0	7.2	14.2	18.7
1991	-20.5	-15.7	-8.1	0.0	8.2	16.2	21.4
1992	-23.0	-17.6	-9.1	0.0	9.3	18.2	24.1
1993	-25.2	-19.3	-10.0	0.0	10.2	20.1	26.6
1994	-27.1	-20.8	-10.8	0.0	11.0	21.8	28.8
1995	-29.0	-22.3	-11.6	0.0	11.9	23.4	31.0
1996	-30.9	-23.7	-12.3	0.0	12.7	25.0	33.2
1997	-32.6	-25.0	-13.0	0.0	13.4	26.6	35.2
1998	-34.3	-26.4	-13.7	0.0	14.2	28.1	37.3
1999	-35.9	-27.6	-14.4	0.0	14.9	29.5	39.2
2000	-37.1	-28.6	-14.9	0.0	15.4	30.7	40.8
2001	-38.2	-29.4	-15.3	0.0	15.9	31.7	42.2
2002	-39.0	-30.0	-15.7	0.0	16.3	32.5	43.2
2003	-39.6	-30.5	-15.9	0.0	16.6	33.1	44.0
2004	-40.2	-31.0	-16.2	0.0	16.9	33.6	44.7
2005	-40.7	-31.4	-16.4	0.0	17.1	34.1	45.4
2006	-41.1	-31.7	-16.6	0.0	17.3	34.5	46.0
2007	-41.5	-32.0	-16.7	0.0	17.5	34.9	46.5
2008	-41.6	-32.0	-16.8	0.0	17.5	34.9	46.6

Notes:
(2) = {([Exhibit I, Sheet 1a, Col (2)]/[Exhibit I, Sheet 1a, Col (5)]) - 1 }.
(3) = {([Exhibit I, Sheet 1a, Col (3)]/[Exhibit I, Sheet 1a, Col (5)]) - 1 }.
(4) = {([Exhibit I, Sheet 1a, Col (4)]/[Exhibit I, Sheet 1a, Col (5)]) - 1 }.
(5) = {([Exhibit I, Sheet 1a, Col (5)]/[Exhibit I, Sheet 1a, Col (5)]) - 1 }.
(6) = {([Exhibit I, Sheet 1a, Col (6)]/[Exhibit I, Sheet 1a, Col (5)]) - 1 }.
(7) = {([Exhibit I, Sheet 1a, Col (7)]/[Exhibit I, Sheet 1a, Col (5)]) - 1 }.
(8) = {([Exhibit I, Sheet 1a, Col (8)]/[Exhibit I, Sheet 1a, Col (5)]) - 1 }.

Simplified Confidence Boundaries
Source Data: RAA (1989 Edition)
Automobile Liability - Treaty and Facultative Combined
Incurred Case Losses (000s Omitted)
Incurred Development Calculation

Exhibit II
Sheet 2a

Accident Year	Actual Inc'd @12/88	Expected LDF from @12/88 to @12/89	Proj'd Inc'd @12/89	Expected LDF from @12/89 to @12/90	Proj'd Inc'd @12/90	Expected LDF from @12/90 to @12/91	Proj'd Inc'd @12/91	. . .	Expected LDF from @12/06 to @12/07	Proj'd Inc'd @12/07
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)		(9)	(10)
1969	66,491	0.999	66,425	1.000	66,425	1.000	66,425	. . .	1.000	66,425
1970	56,621	1.005	56,905	0.999	56,848	1.000	56,848	. . .	1.000	56,848
1971	64,611	1.001	64,676	1.005	65,000	0.999	64,935	. . .	1.000	64,935
1972	68,048	1.000	68,048	1.001	68,116	1.005	68,458	. . .	1.000	68,389
1973	98,923	1.001	99,022	1.000	99,022	1.001	99,121	. . .	1.000	99,518
1974	142,491	1.003	142,919	1.001	143,062	1.000	143,062	. . .	1.000	143,779
1975	163,995	1.006	164,982	1.003	165,478	1.001	165,643	. . .	1.000	166,473
1976	176,949	1.003	177,481	1.006	178,549	1.003	179,085	. . .	1.000	180,163
1977	192,894	1.004	193,667	1.003	194,249	1.006	195,418	. . .	1.000	197,185
1978	176,094	1.009	177,686	1.004	178,398	1.003	178,934	. . .	1.000	181,638
1979	186,069	1.010	187,939	1.009	189,638	1.004	190,398	. . .	1.000	193,856
1980	190,956	1.012	193,261	1.010	195,204	1.009	196,968	. . .	1.000	201,350
1981	233,041	1.017	237,037	1.012	239,898	1.010	242,309	. . .	1.000	249,938
1982	256,256	1.025	262,743	1.017	267,248	1.012	270,474	. . .	1.000	281,794
1983	318,678	1.025	326,745	1.025	335,017	1.017	340,761	. . .	1.000	359,308
1984	393,649	1.038	408,487	1.025	418,828	1.025	429,430	. . .	1.000	460,568
1985	446,955	1.063	475,068	1.038	492,975	1.025	505,454	. . .	1.000	555,827
1986	372,971	1.123	418,845	1.063	445,190	1.038	461,970	. . .	1.000	520,870
1987	263,428	1.254	330,227	1.123	370,843	1.063	394,169	. . .	0.999	461,176
1988	149,910	1.919	287,734	1.254	360,696	1.123	405,060	. . .	1.005	504,231
	=========		=========		=========		=========			==========
Total	4,019,030		4,339,895		4,530,682		4,654,924	. . .		5,014,273
Incurred Development			320,865		511,652		635,894	. . .		995,243

Notes:
(2) from Exhibit I, Sheet 1 .
(3) from Exhibit I, Sheet 4, Row (3) .
(4) = [(2) x (3)] .
(5) from Exhibit I, Sheet 4, Row (3) .
(6) = [(4) x (5)] .
(7) from Exhibit I, Sheet 4, Row (3) .
(8) = [(6) x (7)] .
(9) from Exhibit I, Sheet 4, Row (3) .
(10) = [(Proj'd Inc'd @12/06) x (9)] .

Simplified Confidence Boundaries
Source Data: RAA (1989 Edition)
Automobile Liability - Treaty and Facultative Combined
Incurred Case Losses (000s Omitted)
Incurred Development Calculation

Exhibit II
Sheet 2b

Accident Year	Actual Inc'd @12/88	Upper .25 LDF from @12/88 to @12/89	Proj'd Inc'd @12/89	Upper .25 LDF from @12/89 to @12/90	Proj'd Inc'd @12/90	Upper .25 LDF from @12/90 to @12/91	Proj'd Inc'd @12/91	. . .	Upper .25 LDF from @12/06 to @12/07	Proj'd Inc'd @12/07
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)		(9)	(10)
								. . .		
1969	66,491	1.000	66,465	1.000	66,465	1.000	66,465	. . .	1.000	66,465
1970	56,621	1.008	57,076	1.000	57,054	1.000	57,054	. . .	1.000	57,054
1971	64,611	1.002	64,741	1.008	65,261	1.000	65,235	. . .	1.000	65,235
1972	68,048	1.000	68,075	1.002	68,212	1.008	68,760	. . .	1.000	68,733
1973	98,923	1.001	99,062	1.000	99,101	1.002	99,300	. . .	1.000	100,059
1974	142,491	1.004	143,120	1.001	143,321	1.000	143,378	. . .	1.000	144,763
1975	163,995	1.009	165,446	1.004	166,176	1.001	166,409	. . .	1.000	168,084
1976	176,949	1.007	178,123	1.009	179,699	1.004	180,492	. . .	1.000	182,564
1977	192,894	1.006	194,017	1.007	195,304	1.009	197,032	. . .	1.000	200,174
1978	176,094	1.013	178,329	1.006	179,367	1.007	180,557	. . .	1.000	185,059
1979	186,069	1.013	188,430	1.013	190,821	1.006	191,932	. . .	1.000	198,023
1980	190,956	1.014	193,572	1.013	196,028	1.013	198,516	. . .	1.000	206,008
1981	233,041	1.020	237,703	1.014	240,959	1.013	244,017	. . .	1.000	256,440
1982	256,256	1.029	263,588	1.020	268,861	1.014	272,544	. . .	1.000	290,054
1983	318,678	1.028	327,664	1.029	337,039	1.020	343,782	. . .	1.000	370,881
1984	393,649	1.043	410,541	1.028	422,118	1.029	434,195	. . .	1.000	477,792
1985	446,955	1.067	477,074	1.043	497,545	1.028	511,576	. . .	1.000	579,049
1986	372,971	1.127	420,445	1.067	448,777	1.043	468,034	. . .	1.000	544,703
1987	263,428	1.263	332,821	1.127	375,184	1.067	400,466	. . .	1.000	486,066
1988	149,910	1.956	293,153	1.263	370,376	1.127	417,519	. . .	1.008	541,128
	=========		=========		=========		=========			=========
Total	4,019,030		4,359,443		4,567,669		4,707,264	. . .		5,188,335
Incurred Development			340,413		548,639		688,234	. . .		1,169,305

Notes:
(2) from Exhibit I, Sheet 1 .
(3) from Exhibit I, Sheet 4, Row (6) .
(4) = [(2) x (3)] .
(5) from Exhibit I, Sheet 4, Row (6) .
(6) = [(4) x (5)] .
(7) from Exhibit I, Sheet 4, Row (6) .
(8) = [(6) x (7)] .
(9) from Exhibit I, Sheet 4, Row (6) .
(10) = [(Proj'd Inc'd @12/06) x (9)] .

Simplified Confidence Boundaries
Source Data: RAA (1989 Edition)
Automobile Liability - Treaty and Facultative Combined
Incurred Case Losses (000s Omitted)
Incurred Development Calculation

Exhibit II
Sheet 2c

Accident Year	Actual Inc'd @12/88	Lower .25 LDF from @12/88 to @12/89	Proj'd Inc'd @12/89	Lower .25 LDF from @12/89 to @12/90	Proj'd Inc'd @12/90	Lower .25 LDF from @12/90 to @12/91	Proj'd Inc'd @12/91	. . .	Lower .25 LDF from @12/06 to @12/07	Proj'd Inc'd @12/07
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)		(9)	(10)
1969	66,491	0.998	66,385	1.000	66,385	1.000	66,385	. . .	1.000	66,385
1970	56,621	1.002	56,734	0.998	56,643	1.000	56,643	. . .	1.000	56,643
1971	64,611	1.000	64,611	1.002	64,740	0.998	64,636	. . .	1.000	64,636
1972	68,048	1.000	68,021	1.000	68,020	1.002	68,156	. . .	1.000	68,047
1973	98,923	1.001	98,982	1.000	98,943	1.000	98,942	. . .	1.000	98,981
1974	142,491	1.002	142,719	1.001	142,804	1.000	142,747	. . .	1.000	142,802
1975	163,995	1.003	164,519	1.002	164,782	1.001	164,881	. . .	1.000	164,878
1976	176,949	0.999	176,841	1.003	177,406	1.002	177,689	. . .	1.000	177,793
1977	192,894	1.002	193,318	0.999	193,200	1.003	193,817	. . .	1.000	194,240
1978	176,094	1.005	177,045	1.002	177,434	0.999	177,326	. . .	1.000	178,281
1979	186,069	1.007	187,449	1.005	188,462	1.002	188,876	. . .	1.000	189,777
1980	190,956	1.010	192,951	1.007	194,383	1.005	195,433	. . .	1.000	196,797
1981	233,041	1.014	236,372	1.010	238,842	1.007	240,614	. . .	1.000	243,602
1982	256,256	1.022	261,901	1.014	265,644	1.010	268,420	. . .	1.000	273,769
1983	318,678	1.022	325,829	1.022	333,007	1.014	337,766	. . .	1.000	348,097
1984	393,649	1.033	406,443	1.022	415,563	1.022	424,718	. . .	1.000	443,964
1985	446,955	1.058	473,071	1.033	488,446	1.022	499,406	. . .	1.000	533,538
1986	372,971	1.119	417,251	1.058	441,631	1.033	455,985	. . .	1.000	498,080
1987	263,428	1.244	327,653	1.119	366,553	1.058	387,971	. . .	0.998	437,561
1988	149,910	1.884	282,415	1.244	351,269	1.119	392,973	. . .	1.002	469,850
Total	4,019,030		4,320,509		4,494,157		4,603,383	. . .		4,847,719
Incurred Development			301,479		475,127		584,353	. . .		828,689

Notes:
(2) from Exhibit I, Sheet 1 .
(3) from Exhibit I, Sheet 4, Row (7) .
(4) = [(2) x (3)] .
(5) from Exhibit I, Sheet 4, Row (7) .
(6) = [(4) x (5)] .
(7) from Exhibit I, Sheet 4, Row (7) .
(8) = [(6) x (7)] .
(9) from Exhibit I, Sheet 4, Row (7) .
(10) = [(Proj'd Inc'd @12/06) x (9)] .

Simplified Confidence Boundaries
Source Data: RAA (1989 Edition)
Automobile Liability - Treaty and Facultative Combined
Incurred Case Losses (000s Omitted)
Incurred Development Calculation

Exhibit II
Sheet 2d

Accident Year	Actual Inc'd @12/88	Upper .05 LDF from @12/88 to @12/89	Proj'd Inc'd @12/89	Upper .05 LDF from @12/89 to @12/90	Proj'd Inc'd @12/90	Upper .05 LDF from @12/90 to @12/91	Proj'd Inc'd @12/91	. . .	Upper .05 LDF from @12/06 to @12/07	Proj'd Inc'd @12/07
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)		(9)	(10)
1969	66,491	1.001	66,527	1.000	66,527	1.000	66,527	. . .	1.000	66,527
1970	56,621	1.013	57,346	1.001	57,377	1.000	57,377	. . .	1.000	57,377
1971	64,611	1.004	64,842	1.013	65,672	1.001	65,708	. . .	1.000	65,708
1972	68,048	1.001	68,118	1.004	68,362	1.013	69,237	. . .	1.000	69,274
1973	98,923	1.002	99,124	1.001	99,226	1.004	99,581	. . .	1.000	100,910
1974	142,491	1.007	143,435	1.002	143,726	1.001	143,874	. . .	1.000	146,316
1975	163,995	1.013	166,174	1.007	167,275	1.002	167,615	. . .	1.000	170,635
1976	176,949	1.012	179,132	1.013	181,512	1.007	182,714	. . .	1.000	186,385
1977	192,894	1.009	194,566	1.012	196,966	1.013	199,583	. . .	1.000	204,941
1978	176,094	1.018	179,339	1.009	180,893	1.012	183,125	. . .	1.000	190,539
1979	186,069	1.017	189,200	1.018	192,687	1.009	194,357	. . .	1.000	204,721
1980	190,956	1.016	194,058	1.017	197,324	1.018	200,960	. . .	1.000	213,511
1981	233,041	1.024	238,750	1.016	242,629	1.017	246,711	. . .	1.000	266,950
1982	256,256	1.034	264,915	1.024	271,404	1.016	275,813	. . .	1.000	303,461
1983	318,678	1.033	329,107	1.034	340,227	1.024	348,562	. . .	1.000	389,732
1984	393,649	1.051	413,774	1.033	427,315	1.034	441,754	. . .	1.000	506,031
1985	446,955	1.074	480,228	1.051	504,779	1.033	521,299	. . .	1.000	617,327
1986	372,971	1.134	422,959	1.074	454,445	1.051	477,678	. . .	1.000	584,184
1987	263,428	1.279	336,919	1.134	382,075	1.074	410,518	. . .	1.001	527,716
1988	149,910	2.013	301,834	1.279	386,039	1.134	437,778	. . .	1.013	604,324
	=========		=========		=========		=========			=========
Total	4,019,030		4,390,346		4,626,460		4,790,770	. . .		5,476,569
Incurred Development			371,316		607,430		771,740	. . .		1,457,539

Notes:
(2) from Exhibit I, Sheet 1 .
(3) from Exhibit I, Sheet 4, Row (10) .
(4) = [(2) x (3)] .
(5) from Exhibit I, Sheet 4, Row (10) .
(6) = [(4) x (5)] .
(7) from Exhibit I, Sheet 4, Row (10) .
(8) = [(6) x (7)] .
(9) from Exhibit I, Sheet 4, Row (10) .
(10) = [(Proj'd Inc'd @12/06) x (9)] .

Simplified Confidence Boundaries
Source Data: RAA (1989 Edition)
Automobile Liability - Treaty and Facultative Combined
Incurred Case Losses (000s Omitted)
Incurred Development Calculation

Exhibit II
Sheet 2e

Accident Year	Actual Inc'd @12/88	Lower .05 LDF from @12/88 to @12/89	Proj'd Inc'd @12/89	Lower .05 LDF from @12/89 to @12/90	Proj'd Inc'd @12/90	Lower .05 LDF from @12/90 to @12/91	Proj'd Inc'd @12/91	. . .	Lower .05 LDF from @12/06 to @12/07	Proj'd Inc'd @12/07
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)		(9)	(10)
1969	66,491	0.997	66,322	1.000	66,322	1.000	66,322	. . .	1.000	66,322
1970	56,621	0.997	56,467	0.997	56,324	1.000	56,324	. . .	1.000	56,324
1971	64,611	0.998	64,510	0.997	64,335	0.997	64,171	. . .	1.000	64,171
1972	68,048	0.999	67,978	0.998	67,871	0.997	67,687	. . .	1.000	67,515
1973	98,923	1.000	98,920	0.999	98,818	0.998	98,663	. . .	1.000	98,146
1974	142,491	0.999	142,405	1.000	142,401	0.999	142,255	. . .	1.000	141,286
1975	163,995	0.999	163,798	0.999	163,700	1.000	163,695	. . .	1.000	162,413
1976	176,949	0.994	175,845	0.999	175,634	0.999	175,528	. . .	1.000	174,149
1977	192,894	0.999	192,773	0.994	191,570	0.999	191,340	. . .	1.000	189,722
1978	176,094	1.000	176,048	0.999	175,937	0.994	174,840	. . .	1.000	173,153
1979	186,069	1.003	186,686	1.000	186,638	0.999	186,520	. . .	1.000	183,569
1980	190,956	1.008	192,468	1.003	193,106	1.000	193,056	. . .	1.000	189,881
1981	233,041	1.010	235,336	1.008	237,198	1.003	237,985	. . .	1.000	234,011
1982	256,256	1.017	260,589	1.010	263,155	1.008	265,238	. . .	1.000	261,674
1983	318,678	1.018	324,401	1.017	329,886	1.010	333,135	. . .	1.000	331,260
1984	393,649	1.024	403,267	1.018	410,509	1.017	417,451	. . .	1.000	419,189
1985	446,955	1.051	469,964	1.024	481,446	1.018	490,092	. . .	1.000	500,454
1986	372,971	1.112	414,771	1.051	436,123	1.024	446,779	. . .	1.000	464,418
1987	263,428	1.229	323,668	1.112	359,942	1.051	378,472	. . .	0.997	403,026
1988	149,910	1.830	274,292	1.229	337,016	1.112	374,787	. . .	0.997	420,717
Total	4,019,030		4,290,508		4,437,933		4,524,339	. . .		4,601,401
Incurred Development			271,478		418,903		505,309	. . .		582,371

Notes:
(2) from Exhibit I, Sheet 1 .
(3) from Exhibit I, Sheet 4, Row (11) .
(4) = [(2) x (3)] .
(5) from Exhibit I, Sheet 4, Row (11) .
(6) = [(4) x (5)] .
(7) from Exhibit I, Sheet 4, Row (11) .
(8) = [(6) x (7)] .
(9) from Exhibit I, Sheet 4, Row (11) .
(10) = [(Proj'd Inc'd @12/06) x (9)] .

Simplified Confidence Boundaries
Source Data: RAA (1989 Edition)
Automobile Liability - Treaty and Facultative Combined
Incurred Case Losses (000s Omitted)
Incurred Development Calculation

Exhibit II
Sheet 2f

Accident Year	Actual Inc'd @12/88	Upper .10 LDF from @12/88 to @12/89	Proj'd Inc'd @12/89	Upper .10 LDF from @12/89 to @12/90	Proj'd Inc'd @12/90	Upper .10 LDF from @12/90 to @12/91	Proj'd Inc'd @12/91	. . .	Upper .10 LDF from @12/06 to @12/07	Proj'd Inc'd @12/07
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)		(9)	(10)
1969	66,491	1.000	66,503	1.000	66,503	1.000	66,503	. . .	1.000	66,503
1970	56,621	1.011	57,240	1.000	57,250	1.000	57,250	. . .	1.000	57,250
1971	64,611	1.003	64,802	1.011	65,511	1.000	65,522	. . .	1.000	65,522
1972	68,048	1.001	68,101	1.003	68,303	1.011	69,050	. . .	1.000	69,062
1973	98,923	1.002	99,100	1.001	99,177	1.003	99,471	. . .	1.000	100,576
1974	142,491	1.006	143,311	1.002	143,567	1.001	143,679	. . .	1.000	145,706
1975	163,995	1.012	165,889	1.006	166,844	1.002	167,141	. . .	1.000	169,631
1976	176,949	1.010	178,736	1.012	180,799	1.006	181,840	. . .	1.000	184,878
1977	192,894	1.008	194,351	1.010	196,313	1.012	198,580	. . .	1.000	203,060
1978	176,094	1.016	178,942	1.008	180,294	1.010	182,114	. . .	1.000	188,373
1979	186,069	1.015	188,898	1.016	191,953	1.008	193,403	. . .	1.000	202,069
1980	190,956	1.015	193,867	1.015	196,815	1.016	199,998	. . .	1.000	210,538
1981	233,041	1.023	238,339	1.015	241,973	1.015	245,652	. . .	1.000	262,781
1982	256,256	1.032	264,394	1.023	270,405	1.015	274,528	. . .	1.000	298,135
1983	318,678	1.031	328,541	1.032	338,974	1.023	346,681	. . .	1.000	382,233
1984	393,649	1.048	412,504	1.031	425,271	1.032	438,776	. . .	1.000	494,770
1985	446,955	1.072	478,989	1.048	501,932	1.031	517,466	. . .	1.000	602,033
1986	372,971	1.131	421,972	1.072	452,215	1.048	473,875	. . .	1.000	568,381
1987	263,428	1.273	335,307	1.131	379,359	1.072	406,549	. . .	1.000	510,984
1988	149,910	1.991	298,401	1.273	379,823	1.131	429,724	. . .	1.011	578,723
Total	4,019,030		4,378,186		4,603,280		4,757,802	. . .		5,361,205
Incurred Development			359,156		584,250		738,772	. . .		1,342,175

Notes:
(2) from Exhibit I, Sheet 1 .
(3) from Exhibit I, Sheet 4, Row (14) .
(4) = [(2) x (3)] .
(5) from Exhibit I, Sheet 4, Row (14) .
(6) = [(4) x (5)] .
(7) from Exhibit I, Sheet 4, Row (14) .
(8) = [(6) x (7)] .
(9) from Exhibit I, Sheet 4, Row (14) .
(10) = [(Proj'd Inc'd @12/06) x (9)] .

Simplified Confidence Boundaries
Source Data: RAA (1989 Edition)
Automobile Liability - Treaty and Facultative Combined
Incurred Case Losses (000s Omitted)
Incurred Development Calculation

Exhibit II
Sheet 2g

Accident Year	Actual Inc'd @12/88	Lower .10 LDF from @12/88 to @12/89	Proj'd Inc'd @12/89	Lower .10 LDF from @12/89 to @12/90	Proj'd Inc'd @12/90	Lower .10 LDF from @12/90 to @12/91	Proj'd Inc'd @12/91	. . .	Lower .10 LDF from @12/06 to @12/07	Proj'd Inc'd @12/07
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)		(9)	(10)
1969	66,491	0.998	66,347	1.000	66,347	1.000	66,347	. . .	1.000	66,347
1970	56,621	0.999	56,572	0.998	56,449	1.000	56,449	. . .	1.000	56,449
1971	64,611	0.999	64,549	0.999	64,493	0.998	64,353	. . .	1.000	64,353
1972	68,048	0.999	67,995	0.999	67,930	0.999	67,871	. . .	1.000	67,723
1973	98,923	1.000	98,944	0.999	98,867	0.999	98,772	. . .	1.000	98,472
1974	142,491	1.000	142,528	1.000	142,559	0.999	142,447	. . .	1.000	141,878
1975	163,995	1.001	164,080	1.000	164,123	1.000	164,159	. . .	1.000	163,375
1976	176,949	0.996	176,235	1.001	176,326	1.000	176,372	. . .	1.000	175,568
1977	192,894	1.000	192,986	0.996	192,207	1.001	192,307	. . .	1.000	191,480
1978	176,094	1.002	176,438	1.000	176,523	0.996	175,810	. . .	1.000	175,145
1979	186,069	1.005	186,985	1.002	187,351	1.000	187,440	. . .	1.000	185,977
1980	190,956	1.009	192,657	1.005	193,606	1.002	193,984	. . .	1.000	192,562
1981	233,041	1.012	235,741	1.009	237,841	1.005	239,012	. . .	1.000	237,724
1982	256,256	1.019	261,103	1.012	264,128	1.009	266,481	. . .	1.000	266,349
1983	318,678	1.020	324,960	1.019	331,106	1.012	334,942	. . .	1.000	337,759
1984	393,649	1.028	404,509	1.020	412,482	1.019	420,284	. . .	1.000	428,729
1985	446,955	1.054	471,179	1.028	484,177	1.020	493,721	. . .	1.000	513,168
1986	372,971	1.115	415,741	1.054	438,273	1.028	450,364	. . .	1.000	477,330
1987	263,428	1.235	325,224	1.115	362,519	1.054	382,166	. . .	0.998	416,223
1988	149,910	1.851	277,447	1.235	342,532	1.115	381,812	. . .	0.999	439,328
Total	4,019,030		4,302,220		4,459,837		4,555,092	. . .		4,695,940
Incurred Development			283,190		440,807		536,062	. . .		676,910

Notes:
(2) from Exhibit I, Sheet 1 .
(3) from Exhibit I, Sheet 4, Row (15) .
(4) = [(2) x (3)] .
(5) from Exhibit I, Sheet 4, Row (15) .
(6) = [(4) x (5)] .
(7) from Exhibit I, Sheet 4, Row (15) .
(8) = [(6) x (7)] .
(9) from Exhibit I, Sheet 4, Row (15) .
(10) = [(Proj'd Inc'd @12/06) x (9)] .

Simplified Confidence Boundaries
Source Data: RAA (1989 Edition)
Automobile Liability - Treaty and Facultative Combined
Incurred Case Losses
Age-to-Age Development Factors
@12/82 Evaluation Scenario

Exhibit III
Sheet 1

Evaluation Age (Measured in Years)

Accident	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Year	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1956																				1.000
1957																			1.004	0.997
1958																		1.000	0.997	1.000
1959																	1.000	0.999	1.000	1.000
1960																1.001	0.994	0.998	1.005	1.000
1961															0.993	1.000	1.000	1.000	1.003	0.996
1962														1.000	1.003	1.000	1.000	1.000	0.998	1.001
1963													1.001	0.996	1.001	1.000	1.000	1.000	1.000	
1964												1.007	0.992	0.998	0.998	1.006	1.000	1.001		
1965											1.002	1.000	1.000	0.997	1.000	1.000	1.000			
1966										1.009	0.992	1.000	1.001	1.000	1.008	1.002				
1967									1.004	1.002	0.996	0.998	0.997	1.004	0.995					
1968								1.002	1.010	0.996	1.004	1.002	1.002	1.008						
1969							1.023	1.036	1.030	0.994	1.043	0.991	0.998							
1970						1.023	0.993	1.013	1.010	1.006	1.007	0.996								
1971					1.035	1.005	1.011	1.002	1.004	1.006	0.995									
1972				1.029	0.980	1.006	1.023	1.020	1.007	1.000										
1973			1.104	1.048	1.027	1.016	1.015	1.008	1.006											
1974		1.307	1.141	1.068	1.031	1.030	1.030	1.024												
1975	1.920	1.261	1.136	1.070	1.069	1.010	1.019													
1976	1.883	1.177	1.121	1.065	1.066	1.029														
1977	1.957	1.267	1.090	1.079	1.038															
1978	1.645	1.191	1.098	1.074																
1979	1.824	1.199	1.121																	
1980	1.838	1.224																		
1981	1.846																			
$\bar{X}$	1.845	1.232	1.116	1.062	1.035	1.017	1.016	1.015	1.010	1.002	1.006	0.999	0.999	1.000	1.000	1.001	0.999	1.000	1.001	0.999
Wtd. Avg.	1.837	1.227	1.115	1.066	1.041	1.019	1.018	1.016	1.010	1.002	1.007	0.998	0.999	1.001	1.000	1.001	0.999	1.000	1.001	0.999

$\bar{X}$ = SUM (X) / N , where X denotes the individual values of each column and N = 7 (the number of sample units).

Simplified Confidence Boundaries
Source Data: RAA (1989 Edition)
Automobile Liability - Treaty and Facultative Combined
Incurred Case Losses
Natural Logarithm (Age-to-Age Development Factors)
@12/82 Evaluation Scenario

Exhibit III
Sheet 2

Evaluation Age (Measured in Years)

Accident	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Year	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1956																				0.000
1957																			0.004	-0.003
1958																		0.000	-0.003	0.000
1959																	0.000	-0.001	0.000	0.000
1960																0.001	-0.006	-0.002	0.005	0.000
1961															-0.007	0.000	0.000	0.000	0.003	-0.004
1962														0.000	0.003	0.000	0.000	0.000	-0.002	0.001
1963													0.001	-0.004	0.001	0.000	0.000	0.000	0.000	
1964												0.007	-0.008	-0.002	-0.002	0.005	0.000	0.001		
1965											0.002	0.000	0.000	-0.003	0.000	0.000	0.000			
1966										0.009	-0.008	0.000	0.001	0.000	0.008	0.002				
1967									0.004	0.002	-0.004	-0.002	-0.003	0.004	-0.005					
1968								0.002	0.010	-0.004	0.004	0.002	0.002	0.008						
1969							0.023	0.036	0.029	-0.006	0.042	-0.009	-0.002							
1970						0.023	-0.007	0.013	0.010	0.006	0.007	-0.004								
1971					0.034	0.005	0.011	0.002	0.004	0.006	-0.005									
1972				0.029	-0.020	0.006	0.023	0.020	0.007	0.000										
1973			0.099	0.047	0.027	0.016	0.015	0.008	0.006											
1974		0.268	0.132	0.066	0.031	0.029	0.029	0.024												
1975	0.652	0.232	0.128	0.068	0.067	0.010	0.019													
1976	0.633	0.163	0.115	0.063	0.064	0.028														
1977	0.671	0.237	0.086	0.076	0.037															
1978	0.498	0.175	0.093	0.071																
1979	0.601	0.182	0.114																	
1980	0.609	0.202																		
1981	0.613																			
$\bar{X}$	0.611	0.208	0.109	0.060	0.034	0.017	0.016	0.015	0.010	0.002	0.005	-0.001	-0.001	0.000	0.000	0.001	-0.001	0.000	0.001	-0.001
S	0.056	0.038	0.017	0.016	0.029	0.010	0.012	0.012	0.009	0.006	0.017	0.005	0.004	0.004	0.005	0.002	0.002	0.001	0.003	0.002

$\bar{X}$ = SUM (X) / N , where X denotes the individual values of each column and N = 7 (the number of sample units).

$S = \sqrt{[\text{SUM } (X - \bar{X})^2] / (N - 1)}$

Simplified Confidence Boundaries
Source Data: RAA (1989 Edition)
Automobile Liability - Treaty and Facultative Combined
Incurred Case Losses
Summary Confidence Interval Statistics
@12/82 Evaluation Scenario

Exhibit III
Sheet 3

Evaluation Age (Measured in Years)

		1 2	2 3	3 4	4 5	5 6	6 7	7 8	8 9	9 10	10 11	11 12	12 13	13 14	14 15	15 16	16 17	17 18	18 19	19 20	20 21
(1)	$\bar{X}$	0.611	0.208	0.109	0.060	0.034	0.017	0.016	0.015	0.010	0.002	0.005	-0.001	-0.001	0.000	0.000	0.001	-0.001	0.000	0.001	-0.001
(2)	S	0.056	0.038	0.017	0.016	0.029	0.010	0.012	0.012	0.009	0.006	0.017	0.005	0.004	0.004	0.005	0.002	0.002	0.001	0.003	0.002
(3)	Mean LDF	1.842	1.231	1.115	1.062	1.035	1.017	1.016	1.015	1.010	1.002	1.005	0.999	0.999	1.000	1.000	1.001	0.999	1.000	1.001	0.999
(4)	Upper .25	0.627	0.219	0.114	0.065	0.043	0.020	0.020	0.019	0.013	0.004	0.010	0.000	0.000	0.001	0.001	0.002	0.000	0.000	0.002	0.000
(5)	Lower .25	0.595	0.197	0.104	0.055	0.025	0.014	0.012	0.011	0.007	0.000	0.000	-0.002	-0.002	-0.001	-0.001	0.000	-0.002	0.000	0.000	-0.002
(6)	Upper .25 LDF	1.873	1.245	1.121	1.067	1.043	1.020	1.020	1.019	1.013	1.004	1.010	1.000	1.000	1.001	1.001	1.002	1.000	1.000	1.002	1.000
(7)	Lower .25 LDF	1.812	1.218	1.110	1.057	1.026	1.014	1.013	1.012	1.007	1.000	1.000	0.998	0.998	0.999	0.999	1.000	0.998	1.000	1.000	0.998
(8)	Upper .05	0.655	0.238	0.122	0.073	0.057	0.025	0.026	0.025	0.017	0.007	0.018	0.003	0.002	0.003	0.004	0.003	0.001	0.001	0.003	0.001
(9)	Lower .05	0.567	0.178	0.096	0.047	0.011	0.009	0.006	0.005	0.003	-0.003	-0.008	-0.005	-0.004	-0.003	-0.004	-0.001	-0.003	-0.001	-0.001	-0.003
(10)	Upper .05 LDF	1.926	1.269	1.130	1.075	1.059	1.025	1.026	1.025	1.017	1.007	1.019	1.003	1.002	1.003	1.004	1.003	1.001	1.001	1.003	1.001
(11)	Lower .05 LDF	1.762	1.195	1.100	1.048	1.011	1.009	1.007	1.005	1.003	0.997	0.992	0.995	0.996	0.997	0.996	0.999	0.997	0.999	0.999	0.997
(12)	Upper .10	0.644	0.230	0.119	0.069	0.051	0.023	0.023	0.022	0.015	0.006	0.015	0.002	0.001	0.002	0.003	0.002	0.000	0.001	0.003	0.000
(13)	Lower .10	0.578	0.186	0.099	0.051	0.017	0.011	0.009	0.008	0.005	-0.002	-0.005	-0.004	-0.003	-0.002	-0.003	0.000	-0.002	-0.001	-0.001	-0.002
(14)	Upper .10 LDF	1.904	1.259	1.126	1.072	1.052	1.023	1.023	1.022	1.015	1.006	1.015	1.002	1.001	1.002	1.003	1.002	1.000	1.001	1.003	1.000
(15)	Lower .10 LDF	1.783	1.204	1.104	1.052	1.017	1.011	1.009	1.008	1.005	0.998	0.995	0.996	0.997	0.998	0.997	1.000	0.998	0.999	0.999	0.998

Notes:
(1)&(2) from Exhibit III, Sheet 2 .
(3) = e^(row(1)), Where e denotes exponential base 2.71828... .
(4) = { row(1) + 0.718[(row(2))/((N-1)^0.5)] }, where 0.718 = $t_{.25}$ for (N-1 = 6) degress of freedom .
(5) = { row(1) - 0.718[(row(2))/((N-1)^0.5)] } .
(6) = e^(row(4)) .
(7) = e^(row(5)) .
(8) = { row(1) + 1.943[(row(2))/((N-1)^0.5)] }, where 1.943 = $t_{.05}$ for (N-1 = 6) degress of freedom .
(9) = { row(1) - 1.943[(row(2))/((N-1)^0.5)] } .
(10) = e^(row(8)) .
(11) = e^(row(9)) .
(12) = { row(1) + 1.440[(row(2))/((N-1)^0.5)] }, where 1.440 = $t_{.10}$ for (N-1 = 6) degress of freedom .
(13) = { row(1) - 1.440[(row(2))/((N-1)^0.5)] } .
(14) = e^(row(12)) .
(15) = e^(row(13)) .

Simplified Confidence Boundaries
Source Data: RAA (1989 Edition)
Automobile Liability - Treaty and Facultative Combined
Incurred Case Losses
Summary Confidence Interval Statistics
@12/82 Evaluation Scenario (Fitted "Selected" LDF)

Exhibit IV

Evaluation Age (Measured in Years)

		1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21
(1)	$\bar{X}$	0.877	0.245	0.087	0.048	0.030	0.021	0.015	0.011	0.009	0.007	0.006	0.005	0.004	0.003	0.003	0.003	0.002	0.002	0.002	0.002
(2)	S	0.056	0.038	0.017	0.016	0.029	0.010	0.012	0.012	0.009	0.006	0.017	0.005	0.004	0.004	0.005	0.002	0.002	0.001	0.003	0.002
(3)	Fitted LDF	2.403	1.277	1.091	1.049	1.030	1.021	1.015	1.011	1.009	1.007	1.006	1.005	1.004	1.003	1.003	1.003	1.002	1.002	1.002	1.002
(4)	Upper .25	0.893	0.256	0.092	0.053	0.038	0.024	0.018	0.014	0.012	0.009	0.011	0.006	0.005	0.004	0.004	0.004	0.003	0.002	0.003	0.003
(5)	Lower .25	0.860	0.233	0.082	0.043	0.021	0.018	0.011	0.007	0.006	0.005	0.001	0.004	0.003	0.002	0.002	0.002	0.001	0.002	0.001	0.001
(6)	Upper .25 LDF	2.443	1.291	1.096	1.054	1.039	1.024	1.019	1.015	1.012	1.009	1.011	1.006	1.005	1.004	1.004	1.004	1.003	1.002	1.003	1.003
(7)	Lower .25 LDF	2.364	1.263	1.086	1.044	1.021	1.018	1.011	1.007	1.006	1.005	1.001	1.004	1.003	1.002	1.002	1.002	1.001	1.002	1.001	1.001
(8)	Upper .05	0.921	0.275	0.101	0.061	0.053	0.029	0.024	0.020	0.016	0.012	0.019	0.009	0.007	0.006	0.007	0.005	0.004	0.003	0.004	0.004
(9)	Lower .05	0.832	0.214	0.074	0.035	0.007	0.013	0.005	0.001	0.002	0.002	-0.008	0.001	0.001	0.000	-0.001	0.001	0.000	0.001	0.000	0.000
(10)	Upper .05 LDF	2.512	1.316	1.106	1.062	1.054	1.029	1.025	1.021	1.016	1.012	1.020	1.009	1.007	1.006	1.007	1.005	1.004	1.003	1.004	1.004
(11)	Lower .05 LDF	2.299	1.239	1.076	1.036	1.007	1.013	1.005	1.001	1.002	1.002	0.993	1.001	1.001	1.000	0.999	1.001	1.000	1.001	1.000	1.000
(12)	Upper .10	0.910	0.267	0.097	0.057	0.047	0.027	0.022	0.018	0.014	0.011	0.016	0.008	0.006	0.005	0.006	0.004	0.003	0.003	0.004	0.003
(13)	Lower .10	0.844	0.222	0.077	0.038	0.013	0.015	0.008	0.004	0.004	0.003	-0.004	0.002	0.002	0.001	0.000	0.002	0.001	0.001	0.000	0.001
(14)	Upper .10 LDF	2.483	1.306	1.102	1.059	1.048	1.027	1.022	1.018	1.014	1.011	1.016	1.008	1.006	1.005	1.006	1.004	1.003	1.003	1.004	1.003
(15)	Lower .10 LDF	2.325	1.249	1.080	1.039	1.013	1.015	1.008	1.004	1.004	1.003	0.996	1.002	1.002	1.001	1.000	1.002	1.001	1.001	1.000	1.001

Notes:
(1) = LOGe(row(3)), Where e denotes exponential base 2.71828... .
(2) from Exhibit III, Sheet 2 .
(3) = from Appendix 2 .
(4) = { row(1) + 0.718[(row(2))/((N-1)ˆ0.5)] }, where 0.718 = $t_{.25}$ for (N-1 = 6) degress of freedom .
(5) = { row(1) - 0.718[(row(2))/((N-1)ˆ0.5)] } .
(6) = eˆ(row(4)) .
(7) = eˆ(row(5)) .
(8) = { row(1) + 1.943[(row(2))/((N-1)ˆ0.5)] }, where 1.943 = $t_{.05}$ for (N-1 = 6) degress of freedom .
(9) = { row(1) - 1.943[(row(2))/((N-1)ˆ0.5)] } .
(10) = eˆ(row(8)) .
(11) = eˆ(row(9)) .
(12) = { row(1) + 1.440[(row(2))/((N-1)ˆ0.5)] }, where 1.440 = $t_{.10}$ for (N-1 = 6) degress of freedom .
(13) = { row(1) - 1.440[(row(2))/((N-1)ˆ0.5)] } .
(14) = eˆ(row(12)) .
(15) = eˆ(row(13)) .

Simplified Confidence Boundaries
Source Data: (Hypothetical)
Workers Compensation (Low States)
Incurred Case Losses (Accident Quarter)
Summary Confidence Interval Statistics

Exhibit V
Sheet 1

Evaluation Age (Measured in Quarters)

	1 2	2 3	3 4	4 5	5 6	6 7	7 8	8 9	9 10	10 11	11 12	12 13	13 14	14 15	15 16	16 17	17 18	18 19	19 20	20 21
(1) $\bar{X}$	0.615	0.049	-0.010	-0.005	-0.010	-0.010	-0.010	-0.005	-0.010	-0.010	-0.005	-0.005	-0.005	-0.005	-0.003	-0.002	-0.001	0.000	0.000	0.000
(2) S	0.100	0.035	0.025	0.025	0.020	0.015	0.014	0.013	0.012	0.011	0.010	0.009	0.008	0.007	0.006	0.005	0.004	0.003	0.002	0.001
(3) Mean LDF	1.850	1.050	0.990	0.995	0.990	0.990	0.990	0.995	0.990	0.990	0.995	0.995	0.995	0.995	0.997	0.998	0.999	1.000	1.000	1.000
(4) Upper .25	0.636	0.056	-0.005	0.000	-0.006	-0.007	-0.007	-0.002	-0.007	-0.008	-0.003	-0.003	-0.003	-0.004	-0.002	-0.001	0.000	0.001	0.000	0.000
(5) Lower .25	0.594	0.042	-0.015	-0.010	-0.014	-0.013	-0.013	-0.008	-0.013	-0.012	-0.007	-0.007	-0.007	-0.006	-0.004	-0.003	-0.002	-0.001	0.000	0.000
(6) Upper .25 LDF	1.889	1.058	0.995	1.000	0.994	0.993	0.993	0.998	0.993	0.992	0.997	0.997	0.997	0.996	0.998	0.999	1.000	1.001	1.000	1.000
(7) Lower .25 LDF	1.811	1.043	0.985	0.990	0.986	0.987	0.987	0.992	0.988	0.988	0.993	0.993	0.993	0.994	0.996	0.997	0.998	0.999	1.000	1.000
(8) Upper .05	0.669	0.068	0.004	0.009	0.001	-0.002	-0.002	0.002	-0.004	-0.004	0.000	0.000	-0.001	-0.001	0.000	0.001	0.001	0.002	0.001	0.001
(9) Lower .05	0.561	0.030	-0.024	-0.019	-0.021	-0.018	-0.018	-0.012	-0.016	-0.016	-0.010	-0.010	-0.009	-0.009	-0.006	-0.005	-0.003	-0.002	-0.001	-0.001
(10) Upper .05 LDF	1.953	1.070	1.004	1.009	1.001	0.998	0.998	1.002	0.997	0.996	1.000	1.000	0.999	0.999	1.000	1.001	1.001	1.002	1.001	1.001
(11) Lower .05 LDF	1.752	1.031	0.977	0.982	0.979	0.982	0.983	0.988	0.984	0.984	0.990	0.990	0.991	0.991	0.994	0.995	0.997	0.998	0.999	0.999
(12) Upper .10	0.656	0.063	0.000	0.005	-0.002	-0.004	-0.004	0.000	-0.005	-0.005	-0.001	-0.001	-0.002	-0.002	-0.001	0.000	0.001	0.001	0.001	0.000
(13) Lower .10	0.574	0.035	-0.020	-0.015	-0.018	-0.016	-0.016	-0.010	-0.015	-0.015	-0.009	-0.009	-0.008	-0.008	-0.005	-0.004	-0.003	-0.001	-0.001	0.000
(14) Upper .10 LDF	1.927	1.065	1.000	1.005	0.998	0.996	0.996	1.000	0.995	0.995	0.999	0.999	0.998	0.998	0.999	1.000	1.001	1.001	1.001	1.000
(15) Lower .10 LDF	1.775	1.035	0.980	0.985	0.982	0.984	0.984	0.990	0.985	0.986	0.991	0.991	0.992	0.992	0.995	0.996	0.997	0.999	0.999	1.000

Notes:
(1)&(2) Hypothetical sample data for N=12 accident quarters .
(3) = e^(row(1)), Where e denotes exponential base 2.71828... .
(4) = { row(1) + 0.697[(row(2))/((N-1)^0.5)] }, where 0.697 = $t_{.25}$ for (N-1 = 11) degress of freedom .
(5) = { row(1) - 0.697[(row(2))/((N-1)^0.5)] } .
(6) = e^(row(4)) .
(7) = e^(row(5)) .
(8) = { row(1) + 1.796[(row(2))/((N-1)^0.5)] }, where 1.796 = $t_{.05}$ for (N-1 = 11) degress of freedom .
(9) = { row(1) - 1.796[(row(2))/((N-1)^0.5)] } .
(10) = e^(row(8)) .
(11) = e^(row(9)) .
(12) = { row(1) + 1.363[(row(2))/((N-1)^0.5)] }, where 1.363 = $t_{.10}$ for (N-1 = 11) degress of freedom .
(13) = { row(1) - 1.363[(row(2))/((N-1)^0.5)] } .
(14) = e^(row(12)) .
(15) = e^(row(13)) .

Simplified Confidence Boundaries
Source Data: (Hypothetical)
Workers Compensation (Low States)
Incurred Case Losses (Report Quarter)
Summary Confidence Interval Statistics

Exhibit V
Sheet 2

Evaluation Age (Measured in Quarters)

	1 2	2 3	3 4	4 5	5 6	6 7	7 8	8 9	9 10	10 11	11 12	12 13	13 14	14 15	15 16	16 17	17 18	18 19	19 20	20 21
(1) $\bar{X}$	0.039	-0.015	-0.020	-0.025	-0.020	-0.010	-0.010	-0.005	-0.010	-0.005	-0.005	-0.005	-0.005	-0.005	-0.005	-0.005	-0.005	-0.005	-0.005	-0.005
(2) S	0.031	0.024	0.022	0.020	0.018	0.016	0.014	0.012	0.010	0.009	0.008	0.007	0.006	0.005	0.004	0.003	0.002	0.002	0.001	0.001
(3) Mean LDF	1.040	0.985	0.980	0.975	0.980	0.990	0.990	0.995	0.990	0.995	0.995	0.995	0.995	0.995	0.995	0.995	0.995	0.995	0.995	0.995
(4) Upper .25	0.046	-0.010	-0.015	-0.021	-0.016	-0.007	-0.007	-0.002	-0.008	-0.003	-0.003	-0.004	-0.004	-0.004	-0.004	-0.004	-0.005	-0.005	-0.005	-0.005
(5) Lower .25	0.032	-0.020	-0.025	-0.029	-0.024	-0.013	-0.013	-0.008	-0.012	-0.007	-0.007	-0.006	-0.006	-0.006	-0.006	-0.006	-0.005	-0.005	-0.005	-0.005
(6) Upper .25 LDF	1.047	0.990	0.985	0.979	0.984	0.993	0.993	0.998	0.992	0.997	0.997	0.996	0.996	0.996	0.996	0.996	0.995	0.995	0.995	0.995
(7) Lower .25 LDF	1.033	0.980	0.976	0.971	0.976	0.987	0.987	0.993	0.988	0.993	0.993	0.994	0.994	0.994	0.994	0.994	0.995	0.995	0.995	0.995
(8) Upper .05	0.056	-0.002	-0.008	-0.014	-0.010	-0.001	-0.002	0.001	-0.005	0.000	-0.001	-0.001	-0.002	-0.002	-0.003	-0.003	-0.004	-0.004	-0.004	-0.004
(9) Lower .05	0.022	-0.028	-0.032	-0.036	-0.030	-0.019	-0.018	-0.011	-0.015	-0.010	-0.009	-0.009	-0.008	-0.008	-0.007	-0.007	-0.006	-0.006	-0.006	-0.006
(10) Upper .05 LDF	1.057	0.998	0.992	0.986	0.990	0.999	0.998	1.001	0.995	1.000	0.999	0.999	0.998	0.998	0.997	0.997	0.996	0.996	0.996	0.996
(11) Lower .05 LDF	1.022	0.972	0.969	0.965	0.971	0.982	0.983	0.989	0.985	0.990	0.991	0.991	0.992	0.992	0.993	0.993	0.994	0.994	0.994	0.994
(12) Upper .10	0.052	-0.005	-0.011	-0.017	-0.013	-0.003	-0.004	0.000	-0.006	-0.001	-0.002	-0.002	-0.003	-0.003	-0.003	-0.004	-0.004	-0.004	-0.005	-0.005
(13) Lower .10	0.026	-0.025	-0.029	-0.033	-0.027	-0.017	-0.016	-0.010	-0.014	-0.009	-0.008	-0.008	-0.007	-0.007	-0.007	-0.006	-0.006	-0.006	-0.005	-0.005
(14) Upper .10 LDF	1.053	0.995	0.989	0.983	0.987	0.997	0.996	1.000	0.994	0.999	0.998	0.998	0.997	0.997	0.997	0.996	0.996	0.996	0.995	0.995
(15) Lower .10 LDF	1.027	0.975	0.971	0.967	0.973	0.984	0.984	0.990	0.986	0.991	0.992	0.992	0.993	0.993	0.993	0.994	0.994	0.994	0.995	0.995

Notes:
(1)&(2) Hypothetical sample data for N=12 report quarters .
(3) = e^(row(1)), Where e denotes exponential base 2.71828... .
(4) = { row(1) + 0.697[(row(2))/((N-1)^0.5)] }, where 0.697 = $t_{.25}$ for (N-1 = 11) degress of freedom .
(5) = { row(1) - 0.697[(row(2))/((N-1)^0.5)] } .
(6) = e^(row(4)) .
(7) = e^(row(5)) .
(8) = { row(1) + 1.796[(row(2))/((N-1)^0.5)] }, where 1.796 = $t_{.05}$ for (N-1 = 11) degress of freedom .
(9) = { row(1) - 1.796[(row(2))/((N-1)^0.5)] } .
(10) = e^(row(8)) .
(11) = e^(row(9)) .
(12) = { row(1) + 1.363[(row(2))/((N-1)^0.5)] }, where 1.363 = $t_{.10}$ for (N-1 = 11) degress of freedom .
(13) = { row(1) - 1.363[(row(2))/((N-1)^0.5)] } .
(14) = e^(row(12)) .
(15) = e^(row(13)) .

Simplified Confidence Boundaries
Source Data: (Hypothetical)
Workers Compensation (Low States)
Incurred Case Losses (000s Omitted)
IBNR Emergence Calculation Summary

Exhibit VI

	Subsequent Development			
	Qtr 1	Qtr 2	Qtr 3	Qtr 4
Prior Yrs' Inc'd Effects				
(1) Upper .10	1,016	1,109	1,076	1,042
(2) Upper .25	892	898	793	698
(3) Expected	764	678	500	340
(4) Lower .25	638	465	215	(4)
(5) Lower .10	518	261	(55)	(331)
Old Case Development				
(6) Upper .10	(50)	(172)	(288)	(389)
(7) Upper .25	(106)	(276)	(433)	(569)
(8) Expected	(161)	(376)	(570)	(736)
(9) Lower .25	(225)	(493)	(733)	(938)
(10) Lower .10	(281)	(595)	(874)	(1,112)
IBNR Emergence				
(11) Upper .10	1,085	1,317	1,415	1,494
(12) Upper .25	1,007	1,191	1,250	1,296
(13) Expected	925	1,054	1,070	1,076
(14) Lower .25	851	935	915	891
(15) Lower .10	777	814	759	705

Notes:
(1)-(10) Derived using the "summary confidence interval statistics" from Exhibit V and the same calculation procedure as shown in Exhibit II.
(11) = (13) + 2([((0.5((1)-(3)))^0.5)+((0.5((6)-(8)))^0.5)]-[2(0.9)(0.5((1)-(3)))(0.5((6)-(8)))]) .
(12) = (13) + 2([((0.5((2)-(3)))^0.5)+((0.5((7)-(8)))^0.5)]-[2(0.9)(0.5((2)-(3)))(0.5((7)-(8)))]) .
(13) = (3) - (8) .
(14) = (13) - 2([((0.5((4)-(3)))^0.5)+((0.5((9)-(8)))^0.5)]-[2(0.9)(0.5((4)-(3)))(0.5((9)-(8)))]) .
(15) = (13) - 2([((0.5((5)-(3)))^0.5)+((0.5((10)-(8)))^0.5)]-[2(0.9)(0.5((5)-(3)))(0.5((10)-(8)))]) .

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Degrees of freedom n	Probability of a deviation greater than t											
	0.005	0.010	0.025	0.050	0.100	0.150	0.200	0.250	0.300	0.350	0.400	0.45
1	63.657	31.821	12.706	6.314	3.078	1.963	1.376	1.000	0.727	0.510	0.325	0.15
2	9.925	6.965	4.303	2.920	1.886	1.386	1.061	0.816	0.617	0.445	0.289	0.14
3	5.841	4.541	3.182	2.353	1.638	1.250	0.978	0.765	0.584	0.424	0.277	0.13
4	4.604	3.747	2.776	2.132	1.533	1.190	0.941	0.741	0.569	0.414	0.271	0.13
5	4.032	3.365	2.571	2.015	1.476	1.156	0.920	0.727	0.559	0.408	0.267	0.13
6	3.707	3.143	2.447	1.943	1.440	1.134	0.906	0.718	0.553	0.404	0.265	0.131
7	3.499	2.998	2.365	1.895	1.415	1.119	0.896	0.711	0.549	0.402	0.263	0.13
8	3.355	2.896	2.306	1.860	1.397	1.108	0.889	0.706	0.546	0.399	0.262	0.13
9	3.250	2.821	2.262	1.833	1.383	1.100	0.883	0.703	0.543	0.398	0.261	0.12
10	3.169	2.764	2.228	1.812	1.372	1.093	0.879	0.700	0.542	0.397	0.260	0.12
11	3.106	2.718	2.201	1.796	1.363	1.088	0.876	0.697	0.540	0.396	0.260	0.129
12	3.055	2.681	2.179	1.782	1.356	1.083	0.873	0.695	0.539	0.395	0.259	0.128
13	3.012	2.650	2.160	1.771	1.350	1.079	0.870	0.694	0.538	0.394	0.259	0.128
14	2.977	2.624	2.145	1.761	1.345	1.076	0.868	0.692	0.537	0.393	0.258	0.128
15	2.947	2.602	2.131	1.753	1.341	1.074	0.866	0.691	0.536	0.393	0.258	0.128
16	2.921	2.583	2.120	1.746	1.337	1.071	0.865	0.690	0.535	0.392	0.258	0.128
17	2.898	2.567	2.110	1.740	1.333	1.069	0.863	0.689	0.534	0.392	0.257	0.128
18	2.878	2.552	2.101	1.734	1.330	1.067	0.862	0.688	0.534	0.392	0.257	0.127
19	2.861	2.539	2.093	1.729	1.328	1.066	0.861	0.688	0.533	0.391	0.257	0.127
20	2.845	2.528	2.086	1.725	1.325	1.064	0.860	0.687	0.533	0.391	0.257	0.127
21	2.831	2.518	2.080	1.721	1.323	1.063	0.859	0.686	0.532	0.391	0.257	0.127
22	2.819	2.508	2.074	1.717	1.321	1.061	0.858	0.686	0.532	0.390	0.256	0.127
23	2.807	2.500	2.069	1.714	1.319	1.060	0.858	0.685	0.532	0.390	0.256	0.127
24	2.797	2.492	2.064	1.711	1.318	1.059	0.857	0.685	0.531	0.390	0.256	0.127
25	2.787	2.485	2.060	1.708	1.316	1.058	0.856	0.684	0.531	0.390	0.256	0.127
26	2.779	2.479	2.056	1.706	1.315	1.058	0.856	0.684	0.531	0.390	0.256	0.127
27	2.771	2.473	2.052	1.703	1.314	1.057	0.855	0.684	0.531	0.389	0.256	0.127
28	2.763	2.467	2.048	1.701	1.313	1.056	0.855	0.683	0.530	0.389	0.256	0.127
29	2.756	2.462	2.045	1.699	1.311	1.055	0.854	0.683	0.530	0.389	0.256	0.127
30	2.750	2.457	2.042	1.697	1.310	1.055	0.854	0.683	0.530	0.389	0.256	0.127
infinite	2.576	2.326	1.960	1.645	1.282	1.036	0.842	0.674	0.524	0.385	0.253	0.126

The probability of a deviation NUMERICALLY greater than t is twice the probability given at the head of the table

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Simplified Confidence Boundaries
Source Data: RAA (1989 Edition)
Auto Liability - Treaty and Facultative Combined
Exponential Power Curve Fitting Detail
@12/82 Evaluation Scenario

Appendix 2

Regression Output:	
Constant	-0.132
Std Err of Y Est	0.488
R Squared	0.919
No. of Observations	11
Degrees of Freedom	9

X Coefficient(s)	-2.100
Std Err of Coef.	0.207

Equation of the form:

$$y = e^{ax^b}$$

$$\ln(y) = ax^b$$

$$\ln(\ln(y)) = \ln(a) + b(\ln(x))$$

$$Y = A + b X$$

Time(t)	LOGe(t)	Actual LN(LN(f))	Actual Incurred LDF(f)	Fitted Incurred LDF(f)
(1)	(2)	(3)	(4)	(5)
1	0.000	-0.497	1.837	2.403
2	0.693	-1.587	1.227	1.227
3	1.099	-2.218	1.115	1.091
4	1.386	-2.750	1.066	1.049
5	1.609	-3.214	1.041	1.030
6	1.792	-3.973	1.019	1.021
7	1.946	-4.026	1.018	1.015
8	2.079	-4.143	1.016	1.011
9	2.197	-4.610	1.010	1.009
10	2.303	-6.216	1.002	1.007
11	2.398	-4.965	1.007	1.006
12				1.005
13				1.004
14				1.003
15				1.003
16				1.003
17				1.002
18				1.002
19				1.002
20				1.002

Notes:
(1) evaluation age (in years).
(2) = LOGe(col(1)). Independent regression variable.
(3) = LOGe(LOGe(col(4)). Dependent regression variable.
(4) weighted average LDF from Exhibit III, sheet 1.
(5) = e^[e^(-0.132) x col(1)^(-2.100)].