A METHOD TO INCLUDE MULTIPLE YEARS OF DATA IN A COMPANY'S RATE INDICATION

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Abstract   GEORGE BUSCHE

It is the contention of this paper that the renewal retention ratio can be used
in an ad hoc method to adjust indications to reflect the degree of stability.
If an insurer has a stable book of business, as reflected by a high constant
renewal retention ratio, the years used in the indication should be given
similar weight. Unstable or low renewal retention ratios will cause older years
to have less weight. In addition, as more years are added to an indication, the
older years' data should have a decreasing influence on credibility. The
renewal retention ratio can also measure this effect.

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Introduction

Almost all rate indications can contain various weighting schemes when combining

years of data to produce the indicated rate level. In addition, by adding more

years of data to a state's indication, one may increase the credibility factor

applied to the state indication.

This paper describes the renewal retention ratio and how it can be used to

affect an actuarial indication. The first part defines the renewal retention

ratio. Next is a description of two ad hoc refinements to the rate indication

utilizing the renewal retention ratio of the book of business. First, the

renewal retention ratio can be used in a method to assign weights to the

multiple years of data that may be incorporated in the rate indication. Then,

the renewal retention ratio can be used in developing the credibility factor of

the experience period.

The Renewal Retention Ratio

The renewal retention ratio (RRR) is the percentage of inforce business that

renewed in a given year. This ratio can vary by line of business, agency plant,

geographical area, the number of years insured with the company, and the size of

the account. Its complement is the lapse ratio (LR) which describes the

percentage of inforce business that does not renew in a given year. That is,

RRR = 1 - LR.

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These ratios can be influenced by the current insurance environment, such as the underwriting cycle, the company's experience, recent rate revisions and any underwriting audits. If a company chooses to cancel or not renew a large portion of a book of business during a hard market, the renewal retention ratio would be reduced. Adverse experience, significant rate increases and underwriting audits would also tend to decrease the renewal retention ratio.

The lapse ratio or renewal retention ratio can be incorporated into the rate indication to reflect the stability of the book of business. Either premium or policy counts can be used to calculate the ratio. The preferred choice would be premium because the ratio would be applied in the weighting scheme directly to the earned premium. However, policy counts can be used to develop the ratio for the following reasons:

1)   Availability. A company is more likely to possess statistics on renewal pricing by policy counts than by premium amounts.

2)   Simplicity. Both renewal and nonrenewal counts have the same definition. The premium for canceled or nonrenewed policies would have to be estimated in addition to the premium for the renewed policy. This premium estimation for policies no longer inforce would require additional time and expense.

3)   If one believes that the renewal retention ratio is similar across various policy size segments of the data base, the assumption could be made that the renewal retention ratio will not vary by size of risk.

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Exhibit I describes the calculation of the lapse ratio and the renewal retention
ratio based on policy counts. It should be noted that column (2) includes only
policies-in-force at the time of renewal for the particular effective month.
That is, if a policy was canceled three months prior to renewal, it would not be
included in column (2). It is assumed that midterm cancellations are few in
number and usually are not influenced by the insurance environment. An example
of this would be an insured who cancels his policy because of the selling of his
property. In addition, midterm cancellations are a data item that is not as
easily available within a company. The nonrenewal of the policies listed under
column (3) can be due to either a decision of the company or the insured. The
nonpayment of premium at inception would be considered under column (3). Since
these nonpayments are not necessarily known until a few months after the
effective date, the count for policies nonrenewing (column {3}) could increase
in subsequent reports for the last few effective months.

The Application

The inclusion of the renewal retention ratio in the rate indication is intended
to adjust the data for items that may produce instability. Frequently, rate
indications require judgment factors. The renewal retention ratio can assist in
improving the indication by applying an alternative ad hoc weighting method.
The example used to highlight these refinements will be based upon a commercial
fire indication. However, the adjustments can be applied to an indication for
any line of business, even an indication using as few as two years of
experience.

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Exhibit II displays a typical indication procedure for Company XYZ for commercial fire based on the conventional approach. The three-way credibility weighting procedure (line {13}) is different from that used in the traditional fire indication. The equation in line (13) was used for Company XYZ to reflect specific aspects of its operation and book of business. Half of the state's credibility complement was applied to industry data and the other half of the complement was applied to Company XYZ's countrywide indication for commercial fire. The industry experience is adjusted to Company XYZ's rate level and is intended to reflect the large body of risks the insurer could write as new business. The countrywide indication is intended to reflect the underwriting, marketing, and pricing philosophy unique to Company XYZ.

It should also be noted, that the credibility standard may vary by company for a line of business based upon the degree of risk, variability, and/or confidence the management of a company is willing to accept for the indication of a line of business. If less risk or variability and more confidence is required, the selected value of K would increase to possibly $25,000,000. If more risk or variability and less confidence is acceptable, K may be selected as $5,000,000.

Other than the brief explanation as to why the indication in Exhibit II may vary from a more traditional rate indication approach, this paper is not intended to discuss in detail the credibility standard or the specifics of the existing rate indication. IT NEEDS TO BE EMPHASIZED THAT THE ADJUSTMENTS USING THE RENEWAL RETENTION RATIO ARE AD HOC MODIFICATIONS TO A COMPANY'S ALREADY EXISTING RATE INDICATION PROCEDURE AND CREDIBILITY STANDARD.

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As can be seen in Exhibit II, the rate indication for the state is +1.5%. The renewal retention ratio will be used to adjust this indication for stability or for the lack of stability by determining the appropriate weights to be used in column (4). In addition, the renewal retention ratio will be used to adjust the credibility factor in line (12).

It should be noted that the state's rate indication for the line of business could be developed by specifically excluding from consideration the experience of lapsed policyholders. However, it is recommended that weights and credibility be assigned to the entire body of data for the following reasons:

a) A company may not be able to segregate data for inforce policies from those that canceled or nonrenewed. Even if it was possible, it would add time and costs to the evaluation.

b) State regulators typically require the company's data that is used in a rate filing to balance to some form of financial reporting such as Page 14 of the Annual Statement. Excluding data may cause the regulators to question the validity of the indication.

c) Indications based only on the experience of inforce business could guarantee an inadequate rate level. That is, to the extent that lapsed business is worse than inforce business, the lower rate level indication may suggest and produce rate levels that are not anticipated to be unprofitable, but will likely be unprofitable.

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Weighting the Years

The number of years used in an indication is normally based upon tradition.
Likewise, the weighting scheme is also based upon tradition. For example, a
commercial fire indication uses five years of data weighted 10%, 15%, 20%, 25%
and 30%, with the largest weight going to the most recent year. This increasing
pattern implies that the more recent years are more responsive when indicating
the prospective results.

The method below calculates the weighting scheme to be applied to the years of
data based upon the stability of the book of business as measured by the renewal
retention ratio. Equal weights would be applied to each year for a completely
stable book of business. That is RRR = 1.0, meaning every policyholder renewed
each year. If only a portion of the policyholders renewed each year, an
increasing weighting scheme would result with the more recent years receiving
the greater weights. If no policyholders renewed, or RRR = 0.0, only the latest
year should be used in the state indication.

It should be noted that if the trended experience is identical for each year,
then any weighting scheme would produce the same expected rate indication. The
variability in the trended loss ratio experience between each year could imply
that the experience from older years deserve less weight.

The weights that are applied to the years of data could also be based upon other
factors besides just the renewal retention ratio. Two factors that come to mind

are the trend factor and the loss development factor. Any positive trend would

result in more weight to the more recent years. That is, the lower the trend

factor as determined from the positive trend, the more stable the data base.

Likewise, lower loss development factors would indicate data that is more stable

or predictable. For long-tailed lines one would give more weight to older years

than short-tailed lines. Overall, one could develop some weighting scheme that

incorporates the renewal retention ratio, trend factors, and loss development

factors. (See Appendix A for a possible approach.)

The renewal retention ratio can be calculated using policies on a state, branch,

region, or countrywide basis. Usually, for a company's indication, a

countrywide renewal retention ratio is sufficient to reflect the insurer's

desire to retain its book of business for the line of business. However,

adjustments to the renewal retention ratio can be made to reflect unique

circumstances for a given state such as an underwriting audit. Often, actuaries

have been asked to consider the effect of audits when determining a rate

indication. This is usually true if the audit results in the nonrenewal of a

large portion of unprofitable experience. This refinement would be a way to

account for the underwriting audit and its subsequent cancellations or

nonrenewals.

Exhibit III reflects three different weighting schemes based upon renewal

patterns. Part I deals with a constant renewal retention ratio of 85%. Each

year, 85% of all policyholders renew. Part II describes historical ratios

reflecting definitive characteristics such as the underwriting cycle, rate

revisions, etc. Part III is identical to Part I except that 1990 contains a

reduction in the renewal retention ratio due to an underwriting audit in late

1989. As a result of the audit, the company decided to not renew a large

portion of its business in 1990 due to prior unprofitable results.

For the constant, high renewal retention ratio in Part I, the indicated weights

are more flat (14%, 17%, 19%, 23%, and 27%) than the traditional weights (10%,

15%, 20%, 25%, and 30%). More weight can be given to older years because of the

high stable renewal retention ratio. With the historical renewal retention

ratios in Part II, more weight is given to the more recent years because of the

unstable and lower ratios in the earlier years. Part III, which reflects the

effect of the underwriting audit, gives 54% weight to 1990 and 1991, while

Part I only assigns a 50% weight to the same years. As a result, the effect of

the underwriting audit and the subsequent cancellations were systematically

considered in the rate indication.

Determining a Credibility Factor

Bailey and Simon have shown "that if an individual insured's chance for an

accident remained constant from one year to the next and if there were no risks

leaving the class or no new risks entering the class, the credibilities for

experience periods of one, two and three years would be expected to vary

approximately in proportion to the number of years[1]". They also demonstrated

that the relative credibilities for two and three years are much less than 2.00

and 3.00 which is caused by risks entering and leaving the class. "But it can

be fully accounted for only if an individual insured's chance for an accident

changes from time to time within a year and from one year to the next, or if the

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risk distribution of individual insureds has a marked skewness reflecting varying degrees of accident proneness[2]". If this phenomenon is true for any line of business or block of business, then an older year's data should have less influence on credibility than the more recent year's data.

A way to measure the relevancy of a year's data is to use the percentage of insureds still with the company for the year being priced as calculated by the renewal retention ratio. Exhibit IV describes the calculation of the adjusted credibility Z' where P' is the five year adjusted premium. For each year, the estimated percent of insureds still with the insurer are multiplied by its current level earned premium. The result is an adjusted earned premium for each year. The total of all years equals P'. K is still the selected constant. In these examples $K = 10,000,000$.

All three parts produced credibility factors less than the .708 used in Exhibit II. One should expect premium from older years to have a decreasing influence on the credibility of the data. The intent of this ad hoc adjustment is to develop a methodology of combining multiple years of data. That is, a given credibility standard is being applied to the data base which consists of many years. For example, assume that full credibility is based on 683 claims. If the most recent year has 683 or more claims, that year is considered fully credible. If the data base used in the indication consists of 683 claims over 5 years, that experience should be considered fully credible only if all policyholders renewed each year. If only a portion renewed each year, the 683 claims over 5 years should not be considered fully credible. The renewal

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retention ratio systematically allows older years to be brought into the rate

indication, but with less relevancy for older years.

Summary

Exhibit V describes the effect of the indication using the renewal retention

ratio. The indication reflects the factors as calculated under Part III of both

Exhibit III and Exhibit IV. As can be seen, the indication has increased from

+1.5% to +4.3%.

Exhibit I

Calculation of Renewal Retention Ratio

(1) Policy Effective Month	(2) Number of Policies Eligible for Renewal	(3) Number of Policies Non-Renewing	(4) Lapse Ratio (3)/(2)
Jan.	123	20	.16
Feb.	86	10	.12
Mar.	87	12	.14
Apr.	94	8	.09
May	85	14	.16
June	63	8	.13
July	74	12	.16
Aug.	93	14	.15
Sep.	83	13	.16
Oct.	95	17	.18
Nov.	62	13	.21
Dec.	75	14	.19
Total	1,020	155	.15

Renewal Retention Ratio   .85

Exhibit II

COMPANY XYZ
STATEWIDE COMMERCIAL FIRE COVERAGE RATE LEVEL INDICATION
Proposed Effective Date: 04/01/92
(Reflecting Underwriting Audit and Renewal Retention Ratio)

Year	(1) Current Comm'l Fire* Earned Premiums	(2) Adjusted Comm'l Fire** Incurred Losses
1987	5,536,623	3,208,600
1988	5,201,269	3,308,180
1989	5,107,018	2,629,308
1990	4,078,421	1,645,927
1991	4,335,716	1,676,192

Year	(3) Rate Level Loss Ratio (2)/(1)	(4) Weights	(5) Loss Ratio Factor (3)x(4)
1987	.580	.10	.058
1988	.636	.15	.095
1989	.515	.20	.103
1990	.404	.25	.101
1991	.387	.30	.116

(6) Weighted Loss Ratio $\quad=\quad$ .473

(7) Loss Ratio Including Loss Adjustment Expense (6) x 1.090 $\quad=\quad$ .516

(8) Expected Loss and Loss Adjustment Ratio $\quad=\quad$ .531

(9) ISO Trended Loss and LAE Ratio for the State $\quad=\quad$ .523

(10) Company's Average Deviation for the State $\quad=\quad$ .873

(11) Company's Countrywide Indication $\quad=\quad$ 1.128

(12) State's Credibility Factor*** $\quad=\quad$ .708

(13) Credibility Weighted Loss and Loss Adjustment Expense Ratio
(12) x (7) + ((1-(12))/2) x (9)/(10) + ((1-(12))/2) x (11) x (8) = .539

(14) Indicated Coverage Rate Change (13)/(8) $\quad=\quad$ 1.015

or $\quad$, +1.5%

*All premiums reflect current rate level.

**Incurred Losses are adjusted to current deductible and 04/01/93 cost levels.

***The credibility weight is calculated based on the formula $Z = P/(P + K)$ where P is the five year premium and K is a constant equal to 10,000,000.

Exhibit III

CALCULATION OF WEIGHTS

I)   Constant Renewal Retention Ratio

(1)	(2)	(3) Percent Still	(4) Weights
Year	RRR	With Company	(Normalized)
1987	--	.445	.14
1988	.85	.523	.17
1989	.85	.615	.19
1990	.85	.723	.23
1991	.85	.850	.27
1992*	.85	--	--
		3.156	

II)   Historical Renewal Retention Ratio

(1)	(2)	(3) Percent Still	(4) Weights
Year	RRR	With Company	(Normalized)
1987	--	.211	.08
1988	.60	.352	.13
1989	.65	.542	.20
1990	.75	.723	.27
1991	.85	.850	.32
1992*	.85	--	--
		2.678	

III) Reflect Underwriting Audit

(1)	(2)	(3) Percent Still	(4) Weights
Year	RRR	With Company	(Normalized)
1987	--	.366	.13
1988	.85	.430	.15
1989	.85	.506	.18
1990	.70	.723	.25
1991	.85	.850	.29
1992*	.85	--	--
		2.875	

*Same as most recent year available which is 1991.

Exhibit IV

CREDIBILITY FACTOR

I)   Constant Renewal Retention Ratio

(1)	(2)	(3)	(4)
	Percent Still	Current Fire	Adjusted Fire Earned Premium
Year	With Company	Earned Premium	(2) x (3)
1987	.445	5,536,623	2,463,797
1988	.523	5,201,269	2,720,264
1989	.615	5,107,018	3,140,816
1990	.723	4,078,421	2,948,698
1991	.850	4,335,716	3,685,359

$P' = 14,958,934$

$Z' = .599$

II) Historical Renewal Retention Ratio

(1)	(2)	(3)	(4)
	Percent Still	Current Fire	Adjusted Fire Earned Premium
Year	With Company	Earned Premium	(2) x (3)
1987	.211	5,536,623	1,168,227
1988	.352	5,201,269	1,830,847
1989	.542	5,107,018	2,768,004
1990	.723	4,078,421	2,948,698
1991	.850	4,335,716	3,685,359

$P' = 12,401,135$

$Z' = .554$

III) Reflect Underwriting Audit

(1)	(2)	(3)	(4)
	Percent Still	Current Fire	Adjusted Fire Earned Premium
Year	With Company	Earned Premium	(2) x (3)
1987	.366	5,536,623	2,026,404
1988	.430	5,201,269	2,236,546
1989	.506	5,107,018	2,584,151
1990	.723	4,078,421	2,948,698
1991	.850	4,335,716	3,685,359

$P' = 13,481,158$

$Z' = .574$

Note: $Z' = P'/(P' + K)$
       where $K = 10,000,000$

Exhibit V

COMPANY XYZ
STATEWIDE COMMERCIAL FIRE COVERAGE RATE LEVEL INDICATION
Proposed Effective Date: 04/01/92
(Reflecting Underwriting Audit and Renewal Retention Ratio)

Year	(1) Current Comm'l Fire* Earned Premiums	(2) Adjusted Comm'l Fire** Incurred Losses
1987	5,536,623	3,208,600
1988	5,201,269	3,308,180
1989	5,107,018	2,629,308
1990	4,078,421	1,645,927
1991	4,335,716	1,676,192

Year	(3) Rate Level Loss Ratio (2)/(1)	(4) Weights	(5) Loss Ratio Factor (3)x(4)
1987	.580	.13	.075
1988	.636	.15	.095
1989	.515	.18	.093
1990	.404	.25	.101
1991	.387	.29	.112

(6) Weighted Loss Ratio   =   .476

(7) Loss Ratio Including Loss Adjustment Expense (6) x 1.090   =   .519

(8) Expected Loss and Loss Adjustment Ratio   =   .531

(9) ISO Trended Loss and LAE Ratio for the State   =   .523

(10) Company's Average Deviation for the State   =   .873

(11) Company's Countrywide Indication   =   1.128

(12) State's Credibility Factor***   =   .574

(13) Credibility Weighted Loss and Loss Adjustment Expense Ratio
     (12) x (7) + ((1-(12))/2) x (9)/(10) + ((1-(12))/2) x (11) x (8) =   .554

(14) Indicated Coverage Rate Change (13)/(8)   =   1.043

                                                            or   +4.3%

   *All premiums reflect current rate level.

  **Incurred Losses are adjusted to current deductible and 04/01/93 cost
    levels.

 ***The credibility weight is calculated based on the formula $Z' = P'/(P' + K)$
    where P is the five year adjusted premium and K is a constant equal to
    10,000,000.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		Trend			Loss Development			Weights Average
	RRR			Offset			Offset	$(1)+(4)+(7)$
Year	(Part III)	Factor	Normalize	$\{.2+.2-(3)\}$	Factor	Normalize	$\{.2+.2-(6)\}$	3

Commercial Fire

Year	RRR	Factor	Normalize	Offset	Factor	Normalize	Offset	Avg
1987	.13	$1.01^5=1.051$	.20	.20	1.00	.19	.21	.180
1988	.15	$1.01^4=1.041$	.20	.20	1.00	.19	.21	.186
1989	.18	$1.01^3=1.030$	.20	.20	1.00	.19	.21	.197
1990	.25	$1.01^2=1.020$	.20	.20	1.02	.19	.21	.220
1991	.29	$1.01^1=\underline{1.010}$ 5.152	.20	.20	$\underline{1.30}$ 5.32	.24	.16	.217

Medical Malpractice

Year	RRR	Factor	Normalize	Offset	Factor	Normalize	Offset	Avg
1987	.13	$1.10^5=1.611$	.24	.16	1.20	.12	.28	.190
1988	.15	$1.10^4=1.464$	.22	.18	1.30	.13	.27	.200
1989	.18	$1.10^3=1.331$	.20	.20	1.50	.15	.25	.210
1990	.25	$1.10^2=1.210$	.18	.22	1.80	.18	.22	.230
1991	.29	$1.10^1=\underline{1.100}$ 6.716	.16	.24	$\underline{4.20}$ 10.00	.42	-.02	.170

Footnotes

1. "An Actuarial Note on the Credibility of Experience of a Single Private
   Passenger Car," Robert A. Bailey and LeRoy J. Simon, P.C.A.S. XLVI, P160

2. Ibid