

7

Pitfalls of the Current Experience Rating Plan

Arthur E. Parry
Steven E. Math

ABSTRACT

Experience rating, a method for adjusting class experience to an individual risk, has certain basic assumptions based on ownership of the firm that do not always apply. We examine situations in which the assumptions do not hold. We then offer recommendations for adjusting the experience rating formula to offset the variations that exist in real-world events.

Introduction

Workers' compensation insurance is the largest line of commercial casualty insurance in the United States and the oldest for which standard rating approaches have been developed. The principal statistical and ratemaking body, the National Council on Compensation Insurance (NCCI), uses similar experience rating techniques for individual states with variations by state, depending on unique classes or individual state requirements.

The rather complex rate development process can be summarized as follows: (1) The premiums and losses for a state are collected totally; separately by manufacturing, contracting, and all other classes; and individual classification. (2) Rates are determined by class using credibility factors and adjusting total rate levels in accordance with permissible levels and state increase parameters. The insurance rates developed through this process may be modified under the regulatory process in each state. The results of the ratemaking process are known as class rates. The premium for an individual risk is the result of applying class rates to the applicable number of payroll units (\$100 of payroll) subject to a premium discount based on the size of the overall premium.

Experience rating is a supplemental procedure that utilizes the individual risk's past loss experience to forecast future losses. It is an effort to modify the ratemaking process by recognizing an individual risk's potential for incurring claims. An effective experience rating plan surcharges "poor" risks and credits

Arthur E. Parry is a Consultant with The Wyatt Company in Dallas. Steven E. Math is Chief Actuary at Trinity Universal Insurance Company in Dallas. The authors thank the anonymous reviewers who made several excellent suggestions toward improving the article.

"good" risks in proportion to relative exposure to loss. In other words, experience rating adjusts the class premium to provide all policyholders with relatively equal expected loss ratios. However, when basic assumptions involving firm ownership are violated, the appropriateness of the method comes into question. For example, significant rating differences may exist depending on whether Company A buys Company B or Company B buys Company A.

The experience rating procedure utilizes three years of loss history (second through fourth prior) as an indicator of future losses. A policy rated on January 1, 1993, would therefore utilize the loss experience of 1989, 1990, and 1991 to develop an experience modification factor. (Losses for the immediate prior year are considered too "green" and generally are not available for use in the experience rating process.)

The process used to calculate an experience modification factor is a form of "split" rating. The incurred loss value for each claim is split between a "primary" value and an "excess" value. The rationale is to give more weight to the frequency than to the severity of claims. This is intuitively reasonable as the size of the loss is more subject to chance than the number of losses.

Perryman (1937) developed the generally accepted formula for experience modification factors:

$$M = \frac{A_p + B + WA_e + (1-W)E_e}{E+B}, \quad (1)$$

where A_p = actual primary losses,

B = ballast (stabilizing) value,

W = credibility weight assigned to actual excess losses,

A_e = actual excess losses,

E_e = expected excess losses, and

E = total expected losses.

The values B and W vary according to the size of the risk. At one extreme, a small risk will have no credibility assigned to historical excess losses ($W = 0$) and will have a ballast (stabilizing) value of \$20,000 added to the numerator and denominator of the experience modification formula. The use of a low W -value and a high B -value gives lower credibility to actual loss experience and thus reduces the difference from the rate.

A large, self-rated risk, however, could have full credibility for its loss experience ($W = 1$) with no ballast. In such a case, the individual risk's own loss experience is weighted 100 percent. Thus, the experience modification formula for a self-rated risk reduces to the formula $M = A/E$. In such instances, the manual rate becomes meaningless. For a small risk, the experience modification formula is

$$M = \frac{(A_p + B + E_e)}{(E+B)}. \quad (2)$$

The addition of a \$20,000 ballast and the elimination of actual excess losses result in little modification from the manual rate. As the risk increases in size,

however, actual primary and expected losses become the predominant factors in the calculation.

The NCCI has recently introduced a revised experience rating plan in several states, with modified W and B credibility parameters. Mahler (1991) compares the credibilities under the two experience rating plans and outlines the differences from both practical and theoretical points of view. Additional mathematical properties of the NCCI experience rating plan are discussed by Tiller (1990).

Experience Rating Is Not Always Responsive to Individual Risks

There are several actuarial problems implicit in the use of experience rating. Although they do not represent the focus of this article, they underline the difficulties in changing the current approach.

The first difficulty is the reduction in the data base itself. Ratemaking is an attempt to predict future losses based on past experience. It is not an absolute science and is fraught with difficulties, including a change in the universe (from past exposures to future); internal changes in management or safety practices; and external changes (economic, legal, social).

The process seeks to bring reasonableness to prospective expectations and therefore uses macrotechniques to reflect credibility. For example, it had long been accepted in workers' compensation that the entire experience within a state, no matter how small, should be 100 percent credible. In other words, the past experience for all classes should be the total experience basis for projecting future rates. Another assumption is that experience within individual classes within a state will be less than sufficient for ratemaking purposes. As individual risks are increasingly experience rated, the measure by class of the underlying pure premiums against the actual pure premiums becomes less satisfactory. This is a result of the increased heterogeneity of such data when recombined with "class" rates for overall experience.

Ultimately, collected premiums are compared with collected losses in ratemaking. As individual risks are experience rated, the effect is both to reduce the rate individually (we state as an actuarial principle that experience rating collectively will have a negative off balance) and to obscure any commonality among risks. Ideally, the rate for a class of risks ought to represent the expectation of most of the risks in the class. To the extent that a significant subset is experience rated or identified as having a different loss expectation, the homogeneity implicit in class rating is lost.

Klugman (1992) identifies the problem that all credibility procedures seek to solve:

On the basis of observations from both members of the class under consideration and members of the other classes, estimate the distribution (or its properties) of future claims from members of the class.

The use of multiple credibility factors (for the class and individual risks) creates a difficulty, and with credibility applying to several individual risks in the same class, the rationale for credibility itself becomes suspect.

However, experience rating has long been accepted in workers' compensation. It represents an attempt to adjust average or class rates with respect to what are believed to be statistically valid departures from the average. Experience rating has been applied for many years, and its techniques have not changed much over time. This steady application of experience rating is reasonable, because continued changes in an adjustment mechanism would render the mechanism itself suspect. Nevertheless, rigid application of experience rating does result in certain inequities, and these inequities are the focus of this article.

There are several factors which, when improperly or inadequately addressed, result in individual risks or insurers seeking alternatives to a rigorous experience rating formula. These factors include a significant change in size of an individual company, a significant change in activities and processes of an individual company, the acquisition or buyout of another company, or divestiture of a major portion of a business.

We will examine these four factors and provide examples based on case studies. Other factors that are less susceptible to mathematical analysis are not addressed in this article. These include a major change in ownership or management, an improvement or deterioration in loss control or claims handling, and an increase or decrease in moral hazard caused by other activities within the company.

Significant Change in Company Size

A former executive of a major transportation company starts his own company. The new company is extremely successful and in five years the payroll grows from \$1 million to \$16 million, as shown in Table 1.

On January 1, 1991, the experience modification factor is based on the 1987-1989 policy years. The \$16 million payroll exposure in 1991 will be experience rated based on a combined three-year payroll exposure of only \$7 million. It is incorrect to assume that the loss experience developed in 1987, when the firm was in its infancy, reflects the losses that may be expected for the company's larger exposure base in 1991. The 1987-1989 experience translates into an experience modification factor of 2 (as shown in Table 2). Therefore, the 1991 premium is doubled based on payrolls for three previous years, each of which is less than half of the current annual payroll. Other concerns also arise. For example, would the use of more current experience with its "green" losses be more acceptable than the use of earlier data? Use of both out-of-date and unrepresentative loss data and more current "green" loss data creates application problems.

Another way of expressing the inequity is to say that current employees constitute a work force two-and-a-half times that of the "experience" period, yet they are being rated by the experience of the smaller group. Again, the

Table 1
Five-Year Growth of New Transportation Company

<i>Year</i>	<i>Payroll</i>	<i>Number of Employees</i>	<i>Average Salary</i>
1987	\$1,000,000	40	\$25,000
1988	2,000,000	80	25,000
1989	4,000,000	160	25,000
1990	8,000,000	320	25,000
1991	16,000,000	640	25,000

Table 2
Hypothetical Loss History of a Transportation Company

<i>Year</i>	<i>Primary Losses</i>	<i>Rateable Excess Losses</i>	<i>Expected Losses</i>
1987	\$400,000	\$200,000	\$200,000
1988	300,000	500,000	400,000
1989	800,000	600,000	800,000
Total	\$1,500,000	\$1,300,000	\$1,400,000

Experience Rated Losses (Actual) = \$2.8 million

Experience Rated Losses (Expected) = \$1.4 million

1991 Calculated Experience Modification Factor = 2

cause of this potential inequity is the use of ownership as the sole determinant of payroll.

The example demonstrates the effect of using adverse loss experience from a smaller base of employees in the current year's premium calculation. It goes beyond mathematical analysis to project that, in 1991, the company will experience \$2.8 million in losses, rather than the \$1.4 million expected, solely because of the adverse loss experience in the company's earlier years. The company is locked into the prior losses even though the company is much larger. Conversely, favorable loss experience in prior years would reward the company in determination of its current experience premiums.

Historical experience was used to determine future premiums, with a potential inequity from the assumption that the changed employee work force will experience the same level of losses. But as the employee work force changes significantly, a different population results. Assumptions based on the experience of the prior population are not necessarily valid.

Another observation is needed with respect to a change in population size between one employer and a total class in a state. Although individual classes vary, normally the overall change in both number of employees and workers' compensation premiums for a given industry in any one state seldom varies by as much as 10 percent. The annual variation for a single employer can be much greater.

Significant Change in Activities and Processes

Assume that the transportation company in the first example adds manufacturing capabilities and has devoted significant time and expense to training its

manufacturing employees. Assume further that the poor loss experience of the firm was actually a good measure of prospective loss experience. It does not follow that the new manufacturing exposure should be "charged with" the earlier transportation experience.

Unfortunately, experience rating applies to the entire risk and, as a result, the manufacturing operations, being under the same ownership, will have the overall experience modification, which reflects only the transportation exposure. If, however, ownerships were separate, the credibility would be small and the modification factor would be very close to manual.

A basic principle in experience rating is that ownership creates the rating and thus the ownership is responsible for the high modification under transportation and will cause a similar loss level for manufacturing. Currently, the NCCI plan requires pooling of experience when there is common majority ownership. An acquired entity's experience may be excluded only if the entire ownership after the change (i.e., the new ownership) had no prior interest in the entity. This acts to eliminate carrying forward of entity experience when ownership shifts.

Acquisition or Buyout of Another Company

We consider the acquisition or buyout of another company from two perspectives: that the acquired manufacturer has had excellent experience, and that the acquired manufacturer has had poor experience.

In the first example, rated on its own, the manufacturer had excellent loss experience and had been stable in size. The experience modification factor in 1991 prior to being acquired would have been 0.5 (see Table 3).

Table 3
Hypothetical Loss History of a Manufacturing Company

<i>Year</i>	<i>Primary Losses</i>	<i>Rateable Excess Losses</i>	<i>Expected Losses</i>
1987	\$150,000	\$50,000	\$400,000
1988	150,000	50,000	400,000
1989	150,000	50,000	400,000
Total	\$450,000	\$150,000	\$1,200,000

Experience Rated Losses (Actual) = \$600,000

Experience Rated Losses (Expected) = \$1,200,000

1991 Calculated Experience Modification Factor = 0.5

If the transportation company in the previous example acquires the manufacturer, then the applicable premium for the manufacturing exposure will quadruple based on an experience modification factor of 2 rather than the 0.5 developed by using the manufacturer's own loss experience. Here again, ownership, not experience, determines the modification.

Conversely, the manufacturer could have had poor loss experience that would be wiped out by the change of ownership. The transportation company rated alone would have an experience modifier of 1. The manufacturing firm

rated alone would have an experience modifier of 2. The acquisition of the "bad" company by the "good" company eliminates the poor loss history and "awards" the manufacturing exposure with a reduced modification of 1 (see Table 4).

Table 4
Acquisition of Manufacturing Firm by Transportation Company

Year	Transportation Company		Manufacturing Firm	
	<i>Experience Rated Losses</i>	<i>Expected Losses</i>	<i>Experience Rated Losses</i>	<i>Expected Losses</i>
1987	\$500,000	\$500,000	\$400,000	\$200,000
1988	500,000	500,000	400,000	200,000
1989	500,000	500,000	400,000	200,000
Total	\$1,500,000	\$1,500,000	\$1,200,000	\$600,000

The results show that "old ownership" and actual experience do not affect the calculation, but instead, in all cases, the modification of the acquiring company prevails. Based on the significant rate level differences that result from ownership differences, the current ownership interest may be subject to distortion whenever it is possible to do so.

Divestiture of a Major Portion of a Business

An interesting variation involves a company splitting and selling off half of its facilities. The facilities and experience for this example are illustrated in Table 5. The table describes a company with two divisions, a high loss division (steel fabrication) and a low loss division (structural steel). The steel fabrication division has an experience rating modification factor of 2.25, while the modification factor for the structural steel division is 0.75. The firm's combined modification factor is 1.50.

Now suppose that the firm divests the steel fabrication division during 1990. In 1991, the remaining division retained the combined modification of 1.5 because the rules state that the company must retain its "developed" modification. Conversely, the acquiring company was able to use its own modification (at that time about 1) in place of the "real" 2.25 modification based on the acquired company's actual losses.

Table 5
Company with Two Divisions

Year	Structural Steel Division		Steel Fabrication Division		Combined Company Modification
	<i>Manual Premium</i>	<i>Calculated Modification</i>	<i>Manual Premium</i>	<i>Calculated Modification</i>	
1987	\$ 1 million	0.75	\$ 2 million	2.25	1.50
1988	1.2 million	0.75	2.4 million	2.25	1.50
1989	1.2 million	0.75	2.4 million	2.25	1.50
1990	1.4 million	0.75	2.8 million	2.25	1.50
1991	1.5 million	1.50			

Correcting the Problems

Clearly, rigid application of the experience rating procedure based on corporate ownership can lead to inequities in the ratemaking process. An adjustment to the current procedural approach should be considered.

Recall the experience modification factor:

$$M = \frac{A_p + B + WA_e + (1-W)E_e}{E+B}$$

One option for modifying the current formula would be to lengthen the experience period from three to five years of loss history. However, we do not believe such a procedure would be effective because use of earlier experience periods may utilize older data that may not reflect present day loss conditions, and data from earlier experience periods may not be available.

Rather than increase the length of the historical experience period used in the formula, it may be more practical to use the current three-year experience period to the extent that it reflects future loss potential. While expanding on this approach, we emphasize the absolute necessity that the rating organization or the state address "future loss potential" on an equitable basis.

In our first example, the transportation company's payroll exposure grew from \$1 million in 1987 to \$16 million in 1991. How might experience rating more appropriately measure a change of such magnitude? We suggest the following alternative.

Since the 1987-1991 experience period comprised a total payroll of \$7 million, the experience modification factor M , could be applied to \$7 million of the 1991 exposure. A second experience modification factor, M^1 may be applied to the remaining \$9 million of 1991 exposure.

If the \$9 million of exposure in excess of the initial \$7 million was considered totally independent with respect to loss producing potential from the initial \$7 million, then one can argue that $M^1 = 1$. Thus, the insured's standard premium would equal

$$\frac{7}{16} \times (\text{Standard Premium Developed Under Current Experience Rating Plan})$$

$$\text{Plus } \frac{9}{16} \times \text{Manual Premium (i.e., } M^1 = 1). \quad (3)$$

It is not appropriate to assume complete independence between losses produced from the first \$7 million of exposure and the remaining \$9 million of exposure, and therefore M^1 should be somewhere between M and unity. A value of unity means that the current experience rating plan is unchanged.

$$\begin{aligned} \text{For } M > 1; 1 < M^1 &\leq M \\ \text{For } M < 1; 1 > M^1 &\geq M \end{aligned} \quad (4)$$

The value of M^1 , which is applied to "new" or "different" exposure is effectively a credibility weighted value that assigns a weight of Z to prior loss history and the complement $(1 - Z)$ to unity.

$$M^1 = ZM + (1 - Z)1, \quad (5)$$

where $0 < Z \leq 1$.

The net effect of applying M to one portion of the risk's exposure, and M^1 to its remaining exposure produces an overall revised experience modification factor, M^* .

$$M^* = \frac{(P_1 M) + (P_2 M^1)}{P_1 + P_2}. \quad (6)$$

The above formula assumes that P_1 is the amount of current payroll exposure rated using the current experience modification factor, and P_2 is the amount of current payroll exposure to which M^1 is applied. The sum of P_1 and P_2 should equal the individual risk's total current exposure, P_T ($P_1 + P_2 = P_T$). Under this approach, the individual risk's revised standard premium equals

$$\text{Manual Premium} \times M^*. \quad (7)$$

In order to calculate M^* , we must first calculate M^1 , the experience modification factor applied to the "new" or "different" exposure. As this additional exposure grew relative to the experience used to calculate the current experience modification factor, M^1 should approach unity.

$$\text{As } \frac{P_2}{P_1} \rightarrow \infty, M^1 \rightarrow 1. \quad (8)$$

For relatively small values of P_2 , the value of M^1 should be very close to M .

$$\text{As } \frac{P_2}{P_1} \rightarrow 0, M^1 \rightarrow M. \quad (9)$$

Thus, for individual risks experiencing no underlying changes in exposure, $M^1 = M = M^*$. The result of this instance would be the use of the current experience rating formula.

In order to assign values to P_1 and P_2 for the purpose of deriving M^1 and M^* , we must determine the *value* of prior loss experience with regard to predicting future losses. We propose that the payroll exposure for the three-year exposure period used in experience rating be totaled and referred to as P_E . We must then compare P_T , the total payroll exposure for the current year, to P_E .

Once the amount P_T exceeds P_E , an adjustment to the current experience rating methodology is needed. We will assume that

$$\begin{aligned} P_1 &= \text{MIN}(P_T, P_E), \\ P_2 &= P_T - P_E \\ &\text{for } P_T > P_E. \end{aligned}$$

Thus, for $P_T \leq P_E$, $P_1 = P_T$, and $M^* = M$, no change is made to the current experience rating procedure. For $P_T > P_E$, only payroll equal to P_E may be experience rated under the current formula. We referred to this approach in the transportation example for which only \$7 million of the current \$16 million payroll was experience rated with the current formula. As stated in equation (8), $1 < M^1 \leq M$ for $M > 1$. The ratio of P_T/P_E can be utilized to determine the value Z to be incorporated into formula (9) to calculate M^1 . We propose that the following values be assigned to Z .

P_T/P_E	Z	M^1
≤ 1	1.00	M
2	0.75	$0.75M + 0.25$
4	0.50	$0.50M + 0.50$
6	0.25	$0.25M + 0.75$
8	0.00	1.00

The value Z can be described by the following function:

$$Z = 1 \text{ for } P_T \leq P_E,$$

$$Z = \frac{5}{4} - \frac{P_T}{4P_E} \text{ for } 2P_E > P_T > P_E,$$

$$Z = 1 - \frac{P_T}{8P_E} \text{ for } P_T \geq 2P_E.$$

Let us now return to the transportation company described in the first example, whose experience modification factor was 2. We consider the following payroll exposure growth scenarios:

Year	Doubling Payroll	Tripling Payroll
1987	\$1,000,000	\$1,000,000
1988	2,000,000	3,000,000
1989	4,000,000	9,000,000
1990	8,000,000	27,000,000
1991	16,000,000	81,000,000

For the scenario that contemplates an annual doubling in payroll,

$$P_T = \$16,000,000,$$

$$P_E = P_1 = \$7,000,000.$$

$$P_2 = \$9,000,000,$$

$$P_T/P_E = 16/7 = 2.29, \text{ and}$$

$$Z = 1 - 16/56 = 0.714.$$

$$M^1 = (0.714 \times 2) + 0.286 = 1.71.$$

$$M^* = \frac{(7 \times 2) + (9 \times 1.71)}{16} = 1.84.$$

For the same individual risk with $M = 2$, if payroll exposure were tripling each year,

$$M^1 = (0.220 \times 2) + 0.780 = 1.22.$$

$$M^* = \frac{(13 \times 2) + (68 \times 1.22)}{81} = 1.35$$

As an alternative, the ratio P_T/P_E may be used to adjust the credibility values B and W used in the current experience rating formula. However, such an approach would be similar in concept and application to the methodology outlined here.

The adjustment above addresses the pitfalls created by above-normal expansion of the exposure base. Other problems referred to above are a change in activities or processes, acquisition of another company, and divestiture of a major portion of a company's operations. The proposed approach to addressing changes in the exposure base utilizes both the initial and the changed exposure bases with adjustment over time. That concept could apply to each of the other problems.

A change in activities could be weighted as follows:

Year 1 Changed exposure at manual premium times two-thirds.

Modifier based on existing exposure times one-third.

Year 2 Changed exposure at manual premium times one-third.

Modifier based on existing exposure times two-thirds.

Year 3 Modification across entire exposure.

Acquisitions could be rated in a similar manner:

Year 1 Rate acquiring company separately.

Rate acquired entity.

Weight two-thirds of modifier earned previously.

Weight one-third of modifier acquiring company.

Year 2 Reduce two-thirds/one-third to one-third/two-thirds.

Year 3 Absorb acquired company experience into acquiring company experience.

The problem exists with a divestiture. How is the divesting company to be rated for losses incurred after the sale? We submit that it is impossible to rate the company unless this strategy is followed:

Year 1 Develop modification for remaining exposure using one-third of divested losses added to experience of entity remaining.

Year 2 Use the remaining entity experience solely, eliminating all losses applying to the divested company.

In this manner, we have captured only a part of the prior experience, but further application beyond Year 1 could be difficult to defend.

Other methodologies exist for improving experience rating that have not been examined in this article. One is the empirical Bayes approach, outlined by Klugman (1992). But we believe that this approach is not applicable to the

problem of experience rating an individual risk with changes in underlying exposure as outlined in this article.

Conclusions and Recommendations

This article has focused mainly on individual risks that change substantially in size, ownership, or activities. We identified, but did not examine, other circumstances that could require a change to the current experience modification approach. For individual risks that revamp hiring procedures, management, claim handling, loss control, or moral hazard control, a similar dampening of the current credibility formula can be used for unusually high or low values of P_T/P_E .

Our examples are especially relevant because they are based on real-world situations. The transportation company example was based on an actual risk that expanded extremely rapidly, yet was subjected to a penalty on workers' compensation costs based on its early years' experience. Because the current industry rating system did not respond to the insured's needs, it moved into a paid-loss type of retrospective rating plan.

The acquisition and divestiture examples were also based on actual situations. In one, a company group under one ownership had significant losses in one subsidiary and very few in the others. A very high modification was generated based on the adverse experience of one subsidiary. The subsidiary with the poor experience was sold to a competitor who immediately realized the benefit of a unity modification (change in ownership). One of the remaining companies went into the assigned risk plan even though it had excellent experience, because there was no other way to avoid the ongoing penalty of the experience modification. In another situation, management was going to buy out its own company, which had enjoyed a loss credit modification. However, NCCI rules interpreted this as a change of ownership and a "new" entity, raising the modification to unity and resulting in extra costs of many thousands of dollars. In this instance, management was identical but "ownership" changed.

Additionally, since much of this article concerns problems arising from ownership requirements, the question of ownership versus management as a measure needs to be evaluated. The existing data are inadequate to address this issue. The NCCI could make a special call for such data (including mergers and divestitures) to examine the effect of these two indicators. However, the possibility of bias in any such special call may be quite high.

Clearly, the assumptions underlying the current experience rating plans need to be questioned by the insurance community. These assumptions may produce inequities antithetical to the purposes of experience rating. Alternative insurance plans and programs that do not incorporate experience rating (in its current form) represent alternative markets available to the buyer. Thus, the inappropriateness of the experience rating plan provides incentives for creating paid-loss retrospectively rated plans, fronted plans, self-insurance, pool, and association programs.

One immediate effect of withdrawal from commercial insurance would be the shrinking of the experience base (and a weakening of its relevancy for ratemaking purposes). Another effect could be the substitution of a variety of claims handling methods by insureds and independents with, perhaps, less scrutiny by regulatory officials and less evenness in the claims handling process. Finally, funding for losses under a self-insured or alternative approach might not be actuarially sound, thus resulting in inadequate payments, company financial problems, and a general weakening of the employee injury payment system.

We encourage the insurance community to address the inequities within in the current experience rating plan. The formulas proposed in this article represent a first step toward that end. It may be more constructive, however, to tear down the experience rating plan as we currently know it and rebuild a more equitable plan from basic insurance principles. The use and appropriateness of experience rating for lines of insurance other than workers' compensation should also be considered.

References

- Klugman, S., 1992, *Bayesian Statistics in Actuarial Science* (Norwell, Mass.: Kluwer Academic Publishers), 57-64.
- Mahler, H., 1991, An Actuarial Analysis of the NCCI Revised Experience Rating Plan, *Casualty Actuarial Society Forum*, Winter.
- Perryman, F. S., 1937, Experience Rating Plan Credibilities, *Proceedings of the Casualty Actuarial Society*, 24: 60-125.
- Tiller, M., 1990, Individual Risk Taking, *Foundations of Casualty Actuarial Science* (Casualty Actuarial Society), 91-124.

Copyright of Journal of Risk & Insurance is the property of Blackwell Publishing Limited. The copyright in an individual article may be maintained by the author in certain cases. Content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.