

CHAPTER 4
INDIVIDUAL RISK RATING
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INTRODUCTION

Manual ratemaking determines what rates should be charged average members of groups of entities for specified coverage and entity characteristics. Individual risk rating supplements manual rates by modifying the group rates in whole or in part to reflect an individual entity's experience.

If all entities in all rating groups were truly homogeneous, differences in experience among entities would be fortuitous. While homogeneity is the goal of manual ratemaking, it is not usually possible to achieve. In addition, some entities are large enough that their experience is, to some extent, "credible." Individual risk rating is appropriate when there is a combination of nonhomogeneous rating groups and entities with credible experience.

This chapter discusses individual risk rating in general terms and provides examples from both traditional (insurance) and nontraditional risk financing mechanisms. The latter include risk retention groups, pools, and individual entities retaining risk. In this chapter it is assumed that the manual rates are properly determined, unless otherwise noted.

Goals of Individual Risk Rating

For an insurer, the primary goal of individual risk rating is to price the coverage provided more accurately than if rates were based only on manual rates. Nontraditional risk financing mechanisms also may use individual risk rating techniques to allocate costs.

For groups of entities, such as pools or risk retention groups, the primary goals of individual risk rating (sometimes referred

to as cost allocation) are to allocate costs to participants more accurately and to motivate participation in risk control programs. These are also the goals of individual risk rating for individual entities retaining (“self-insuring”) all or part of their risks and allocating the associated costs to departments or other units. Individual entities purchasing insurance may similarly wish to allocate the insurance costs to their departments or other units. For individual entities in either situation, the units to which the costs are being allocated take the role of participants or “insureds.” Some entities may participate in individual risk rating systems as both allocator and allocatee.

The motivation to participate in risk control programs is a secondary goal of insurers using individual risk rating. Other goals of insurers and other entities using individual risk rating are to balance appropriately risk sharing and risk bearing and to provide information to design or modify risk control programs. For individual entities, the allocation of costs to units allows for more accurate pricing of products and services.

Attributes of Good Individual Risk Rating Systems

Good individual risk rating systems have the following attributes:

- serve the needs of the organization using them,
- appropriately balance risk sharing and risk bearing,
- are not subject to internal or external manipulation,
- are simple to administer,
- are easy to understand, and
- do not subject the affected entities to large fluctuations in costs from one year to the next due to unusual or catastrophic experience.

Some of these attributes may overlap. As practical considerations may override one or more of these attributes, all are listed.

Prior to designing any individual risk rating system, the organization designing it should determine what its needs are. These needs may simply be the goals listed above, or the entity may have different needs that override traditional cost allocation goals. For example, a corporation offering a new product may wish to allocate its product liability insurance costs for the new product to existing products to keep the cost of the new product down until it becomes popular.

An individual risk rating system should appropriately balance risk sharing and risk bearing. The costs for small entities whose experience is not at all credible should be determined solely based on risk sharing. Large entities whose experience is completely credible might have their costs solely based on risk bearing. Entities between these extremes should have their costs based on a weighting of risk sharing and risk bearing.

Individual risk rating systems should not be subject to internal or external manipulation. Manipulation is internal if the entity to which costs are being allocated can influence the cost allocation. An example is the entity to which costs are being allocated setting the case reserves used in the individual risk rating calculation. Manipulation is external if some agency other than the entity to which costs are being allocated can influence the cost allocation. An example is a marketing manager who can override the pricing results of the individual risk rating calculation without additional information to support the override.

As a practical consideration, individual risk rating systems should be simple to administer. If a system proves very complicated to administer, it might not be applied. A system that is simple to administer is also more likely to be easy to understand. Understanding is important particularly in those situations in which participation in risk control programs is one of the goals: the easier a system is to understand, the better will be the

motivation to participate, assuming the system is appropriately designed.

A good individual risk rating system does not subject the affected entities to large fluctuations in costs from one year to the next due to unusual experience. An individual risk rating system should reflect an entity's experience only to the extent that it is credible. Unusual experience is not credible because it is not a true reflection of the entity's underlying exposure to loss. An individual risk rating system that reasonably balances risk sharing and risk bearing usually has this attribute of moderating the effect of unusual cost fluctuations. However, a system could have this attribute without reasonably balancing risk sharing and risk bearing.

Overview of Individual Risk Rating

There are two basic types of individual risk rating systems: prospective and retrospective. Prospective systems use past experience to determine costs for the future. Retrospective systems use the actual experience of the period to determine the final costs for that period.

Retrospective systems are more responsive to experience changes than prospective systems. This is an advantage when a primary goal is to motivate participation in risk control programs. This responsiveness also means that retrospective systems result in less stable costs from one time period to the next than do prospective systems. The final cost using a retrospective system is not known until many years after the subject period.

While different systems use different formulae, all individual risk rating systems weight experience and exposure. The weight assigned to the experience component is a reflection of the credibility of the entity's experience as a valid predictor of future costs.

There are practical considerations that affect individual risk rating systems. It may be appropriate to use alternative expo-

sure bases and data if those desired are not readily available. Additionally, if one of the goals is to motivate participation in risk control programs and the results of the individual risk rating calculation do not make a material difference to the entity to which costs are being allocated, there will probably be no such motivation.

For individual entities allocating risk financing costs to units, several additional factors influence how effectively an individual risk rating system will meet its goals. These include variations in tax rates and systems, the ability of units to purchase their own insurance, and whether and how unit managers get the benefits or penalties of the costs allocated to their units.

What is to be Allocated

The second task in designing or understanding an individual risk rating system (after determining goals) is to determine what is to be allocated. For traditional insurance, the answer often is all costs. These include losses, ALAE, ULAE, reinsurance premium, risk control costs, overhead, taxes, miscellaneous expenses, and profit associated with insurance policies of the type being written (e.g., occurrence). (See the appendix to Chapter 2 for definitions.)

Nontraditional risk financing mechanisms and individual entities allocating risk financing costs back to units also may want to allocate all costs associated with the risk financing program. Those costs may include different items, such as excess insurance premium and a risk margin (money for adverse loss and ALAE experience), and exclude others, such as taxes and profit. Nontraditional risk financing mechanisms and individual entities allocating costs back to units and even some insurers may want to allocate only some subset of costs, such as losses, ALAE, and ULAE, with other costs treated in a different manner.

Note that part of the determination of what is to be allocated involves determining the basis on which policies are written or

on which funding occurs. This is necessary so that the various components subject to the allocation are appropriately tabulated and adjusted. Also, it is important to understand if the term “loss” includes ALAE in the coverage and in the data available for analysis and how any loss or loss and ALAE limits are to be applied.

PROSPECTIVE SYSTEMS

There are three basic types of prospective individual risk rating systems: schedule rating, experience rating, and some types of composite rating. Schedule rating takes into consideration characteristics that are expected to affect losses and ALAE but that are not reflected in past experience. Experience rating uses an entity’s actual experience to modify manual rates (determined by the entity’s rating group). Composite rating simplifies the premium calculation for large, complex entities and, in some instances, allows the entities’ experience to affect the premium developed from manual rates or to determine the rates regardless of rating group.

Schedule Rating

Schedule rating is the only individual risk rating system that does not directly reflect an entity’s claim experience; in theory, it recognizes characteristics that are expected to have a material effect on an entity’s experience but that are not actually reflected in that experience. These characteristics could result from recent changes in exposure (such as the addition of a swimming pool in an apartment complex) or risk control programs (such as the recent implementation of a new program). Schedule rating is also used for entities that are too small to qualify for experience rating or composite rating.

Schedule rating systems usually take the form of percentage credits and debits. These credits and debits are sometimes applied before and sometimes after experience rating. There may be a limit to the total debit or credit that an entity can receive.

Note that schedule credits and debits apply only to those characteristics that should affect an entity's loss and ALAE experience. If a characteristic is listed that should not affect a particular entity's loss and ALAE experience, there should be no adjustment to the manual rates for that characteristic for that entity.

Also note that the application of schedule credits and debits may take considerable underwriting judgment. A schedule rating system that is based on objective criteria will result in more consistent treatment of affected entities than a system that relies on subjective evaluation. This is illustrated by the two examples of schedule rating that follow.

Insurance Services Office (ISO) Commercial General Liability Experience and Schedule Rating Plan: Schedule Rating

This section discusses the December, 1997 ISO General Liability Schedule Rating Plan.

For eligible entities, the manual rates may be modified according to the table below in addition to any experience rating modification. The maximum schedule rating modification is 25% up or down. It is applied after experience rating has been applied.

ISO General Liability Schedule Rating Table

A. Location	
(i) Exposure Inside Premises	-5% to +5%
(ii) Exposure Outside Premises	-5% to +5%
B. Premises—Condition, Care	-10% to +10%
C. Equipment—Type, Condition, Care	-10% to +10%
D. Classification Peculiarities	-10% to +10%
E. Employees—Selection, Training, Supervision, Experience	-6% to +6%
F. Cooperation	
(i) Medical Facilities	-2% to +2%
(ii) Safety Program	-2% to +2%

This plan can be flexibly applied using insurer-specific underwriting guidelines that reflect the insurer's own knowledge and experience and the specific characteristics of the class of insureds to which it is applied. Each insurer's guidelines must be applied consistently and objectively under state insurance laws and regulations. There is some variation possible in the plan in that different insurers might give different schedule credits and debits in identical situations. Underwriters within the same company are expected to apply the same credits or debits in identical situations.

Roller Skating Rink Risk Retention Group Schedule Rating Plan

This schedule rating plan is similar to one developed for a roller skating rink risk retention group offering general liability coverage. All participating entities are eligible. There is no explicit maximum schedule rating modification. The maximum schedule credit is that inherent in the plan (40%). Note that only credits are given. The manual rates are based on experience for rinks in which none of the characteristics in the schedule rating plan were present.

The general credit list is as follows:

A. Floor supervision	+10%
B. Premises	+5%
C. Rental Skates	+5%
D. Management	+5%
E. Incident Report	+10%
F. First Aid	+5%
Total	+40%

Details of the floor supervision credit follow.

Rink must meet or exceed industry safety standard of one floor supervisor per 200 skaters at all times.

Rink has a written policy or procedure which includes:

- a distinctive uniform or vest for floor supervisors;

- a provision that floor supervisors must be paid employees, owners, or family members of owners;
- a provision that floor supervisors must be at least 18 years of age; and
- a written training program for floor supervisors.

The floor supervisor training program must include the following provisions at a minimum:

- Floor guards should inspect the floor continually for foreign objects.
- During special numbers or events, floor guards should keep unqualified skaters off the floor.
- Floor guards should follow a written policy regarding unruly skaters.
- Floor guards should follow detailed, written instructions in case of an accident, including:
 - not moving the injured skater,
 - diverting skaters from the injured skater,
 - notifying management of an incident, and
 - a procedure for obtaining emergency medical/police/fire assistance.

Floor supervisor training must include a minimum of one safety meeting per calendar quarter.

Floor supervisor training must be recorded and verified by the employee.

ALL OF THE ABOVE MUST BE PRESENT TO EARN THE 10% CREDIT. NO PARTIAL CREDIT WILL BE GIVEN.

The other credits similarly rely on objective criteria that can be verified by audit and/or surprise inspections. All credits encourage activities that should favorably affect loss and ALAE

experience. Note that credit is given for activities that a rink has just begun, regardless of its actions in the past.

Because the manual premium is based on experience for rinks in which none of the characteristics in the schedule rating plan were present, there should be no “off-balance,” i.e., the premium collected should cover the expected costs. If the manual premium used data for rinks that did have some of the characteristics in the schedule rating plan, the manual rates would need to be corrected for the off-balance resulting from a schedule rating plan that only gives credits.

Experience Rating

All individual risk rating systems are a form of experience rating because they reflect an entity’s actual experience or characteristics that should affect the entity’s experience. However, the term “experience rating” has come to mean a particular type of prospective system, discussed in this section.

Experience rating is used when the past, with appropriate adjustments, is predictive of the future. Actual losses, and sometimes ALAE, for a prior period are compared to expected losses (and ALAE). The weighting of the actual and expected experience results in the cost to the subject entity for the current period.

To have an “apples to apples” comparison, several different combinations of experience and exposure can be used, including the following:

- actual paid losses (and ALAE) at a particular date and the expected paid losses (and ALAE) at that date, both for the experience period;
- reported losses (and ALAE) at a particular date and the expected reported losses (and ALAE) at that date, both for the experience period;
- projected ultimate losses (and ALAE) and the expected ultimate losses, both for the experience period; and

- projected ultimate losses (and ALAE) for the experience period adjusted to the current exposure and dollar levels and the expected ultimate losses for the current period at the current dollar and exposure levels.

Projected ultimate losses are the expected ultimate settlement value of all subject claims/occurrences. Projected ultimate ALAE are the expected ultimate ALAE costs of all subject claims/occurrences. The expected losses (and ALAE) are based on past or current exposure, as appropriate. The adjustments to current dollar and exposure levels should reflect such items as:

- economic and social inflation;
- changes in the number, size, and type of entities; and
- changes in policy limits.

Social inflation includes such items as changes in litigiousness, judicial decisions, and legislation that directly or indirectly affect the cost of settling claims.

The three components of experience, exposure, and credibility (the weighting factor) and some additional considerations are discussed below.

Experience

The experience component should be related to the exposure component, as detailed above, and to the basis on which policies are written or funding occurs. If the policy to be rated is written on an occurrence basis, any of the four combinations listed above for accidents occurring in the experience period could be used. If the policy to be rated is written on a claims-paid basis, the two best combinations are those using paid losses or projected ultimate losses adjusted to current exposure and dollar levels, both for payments made during the experience period. If the costs to be allocated include ALAE, ALAE usually should be included with losses in the calculation.

The length of the experience rating period usually ranges from two to five years. The shorter the period, the more responsive the plan will be to changes that truly affect loss (and ALAE) experience, such as changes in the risk control program, and the more subject to unusual fluctuations in loss (and ALAE) experience. Conversely, a longer period will result in less responsiveness to changes and to unusual or catastrophic occurrences.

To reduce the effect of unusual or catastrophic occurrences, many experience rating plans place per occurrence limits on the losses (and ALAE) used in the experience rating calculation. These limits sometimes apply to losses only, with ALAE unlimited or treated in a different manner, and sometimes to losses and ALAE combined. Note that if actual losses (and ALAE) are limited, the expected losses (and ALAE) must also be limited to maintain an “apples to apples” comparison. If losses (and ALAE) are limited, the cost of expected losses (and ALAE) above the per occurrence limit must be accounted for in some manner. Annual or other period aggregate limits may also be used.

If projected ultimate losses are to be used in the experience rating calculation, they can be developed in a number of ways similar to those used to develop projected ultimate losses used to determine manual rates. Projected ultimate losses are often based on paid or reported losses at a particular date.

For the last experience combination listed above, projected ultimate losses are adjusted to current exposure and dollar levels. Dollar-level adjustments should include both economic and social inflation.

Exposure adjustments include both converting the experience period to the current period (e.g., dividing by three to go from a three-year experience period to a one-year current period) and adjusting for changes in the magnitude of the exposure. Both can be accomplished at once by dividing the projected ultimate losses for the experience period, adjusted to current dollar level, by the exposure for the experience period, adjusted to current dollar

level if appropriate, and applying this “rate” to the exposure for the current period.

Exposure

The expected losses are a function of the past or current exposure, as appropriate. The exposure component should be related to the experience component, as detailed above. For the first three combinations listed above, past exposure is used; for the last combination, current exposure is used.

Expected losses are usually estimated as the product of an expected loss rate and the exposure base. The expected loss rate can be based on the manual rates for the prior or current period, adjusted to the appropriate dollar level. For example, to develop expected loss rates for a prior period, the current expected loss rate could be adjusted to the prior period’s dollar level, or the prior period’s expected loss rates could be used directly. The former approach is usually better if there have been no underlying changes in the nature of the exposure because the current expected loss rate is based on more recent information than the prior period’s loss rates.

The exposure base used should reflect the underlying risk of loss and ALAE. It is not always possible to use the theoretically optimal exposure base. In practice, insurers and nontraditional risk financing mechanisms often use whatever exposure base insurers use in their premium calculations.

For general liability, exposure bases often used are sales, payroll, total operating expenditures, and square footage, adjusted for any underlying differences. For workers compensation the exposure base is usually payroll adjusted for differences in payroll type (e.g., a coal miner is expected to have more losses and ALAE per payroll dollar than a secretary, even though both are employed by the same entity). For property, exposure bases often used include actual cash value, stated amount, or replacement cost.

Nontraditional risk financing mechanisms may use different exposure bases for different costs. For example, for a public entity workers compensation pool, the exposure base for all administrative costs may be full-time-equivalent (FTE) employees while the exposure base for losses and ALAE is payroll, with both full-time-equivalent employees and payroll adjusted for differences in payroll type. The use of two exposure bases may be the result of different payroll scales being used by different participants.

Individual entities allocating risk financing costs to units may also use different exposure bases for different costs. And some costs, such as the cost of a policy that applies only to one unit, may be allocated without using the experience rating plan.

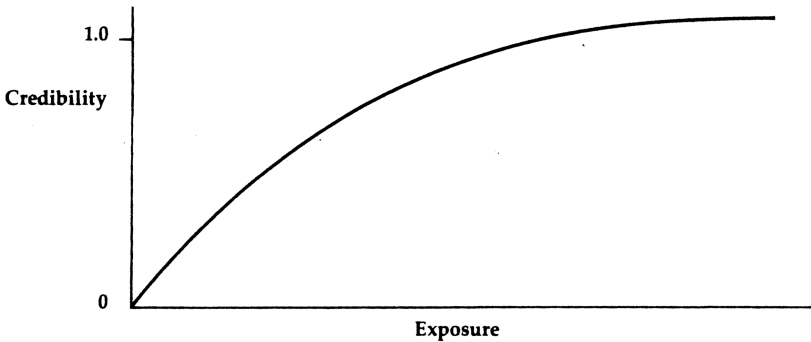
Credibility

The actual (experience) and expected (exposure) components of the experience rating calculation are weighted to produce the costs the entity under consideration will pay. The weight assigned to the experience component is called “credibility,” and commonly denoted by “ Z .” The weight assigned to the exposure component is $1 - Z$. This is also called the credibility complement. Credibility reflects the degree of belief that the entity’s experience is a valid predictor of future costs. The credibility selected should consider the validity of the component to which the credibility complement is being applied.

Credibility has three criteria that must be met:

1. Credibility must not be less than zero or greater than one.
2. Credibility should increase as the size of risk increases, all else being equal.
3. The percentage change for any loss of a given size should decrease as the size of risk increases.

FIGURE 4.1
GENERAL CREDIBILITY ILLUSTRATION



These criteria can also be shown as mathematical relationships. Using Z for credibility and E for size of risk:

1. $0 < Z < 1$
2. $\frac{dZ}{dE} > 0$
3. $\frac{d}{dE} \left(\frac{Z}{E} \right) < 0$

These three criteria are met if credibility follows the curve shown in Figure 4.1. Note that size of risk is represented in the diagram by exposure. Size of risk can also be based on expected losses or expected number of claims. Chapter 8 contains a detailed discussion of credibility.

Other Considerations

Experience rating plans may be designed so that there is a minimum or maximum premium change. These are often based on the prior year's premium adjusted for changes in exposure. For example, the maximum premium change from one year to the next may be the change indicated by any exposure changes plus or minus 25%. This means that if there is an increase of 15%

because of an increase in exposure, the total increase possible after application of the experience rating plan is 44% $((1.15 \times 1.25) - 1.00)$.

The premium collected under experience rating plans may not equal the expected premium in total. This means that the plan has an “off-balance.” If this can be anticipated and does not reflect a true difference between experience-rated and nonexperience-rated risks, the experience rating plan can include, as a last step, multiplication by a factor to correct for this off-balance. Alternatively, the manual rates can include an off-balance correction. This latter approach affects non-experience-rated entities also.

ISO Commercial General Liability Experience and Schedule Rating Plan: Experience Rating

The December 1997 ISO Commercial General Liability Experience Rating Plan is illustrated in Tables 4.2 and 4.3. This example is used throughout the following discussion of the plan.

“Company” refers to the insurance company using the experience rating plan. The references to company premium, rates, and expected loss and ALAE ratios reflect that different insurance companies may apply different expected loss and ALAE ratios to the same ISO loss and ALAE costs to arrive at different rates and, thus, different premiums for the same exposures.

This plan may be used for occurrence and claims-made general liability coverages, with a few exceptions, for those entities meeting the eligibility criteria specified in the plan. The coverage in the example is premises/operations and products/completed operations for policy period 7/1/98–99, written on a third-year claims-made basis.

The experience is represented by the projected ultimate losses and ALAE for the experience period. The exposure is represented by the expected losses and ALAE for the experience period. For both the projected ultimate losses and ALAE, and

TABLE 4.2
ISO EXPERIENCE RATING SAMPLE CALCULATION
BASIC CALCULATION

Coverage:	Premises/Operations and Products/Completed Operations	
Policy Being Rated:	7/1/98–99 Third-Year Claims-Made	
Experience Period:	7/1/94–95 Occurrence	
	7/1/95–96 Occurrence	
	7/1/96–97 First-Year Claims-Made	
I. Experience Components		
A. Reported Losses and ALAE at 3/31/98 Limited by Basic Limits and MSL	139,800	
B. Expected Unreported Losses and ALAE at 3/31/98 Limited by Basic Limits and MSL (See Table 4.3)	32,747	
C. Projected Ultimate Losses and ALAE Limited by Basic Limits and MSL ((A) + (B))	172,547	
D. Company Subject Basic Limits Loss and ALAE Costs (See Table 4.3)	156,400	
E. Actual Experience Ratio ((C)/(D))	1.103	
II. Exposure Component: Expected Experience Ratio (See Table 4.3)	.888	
III. Credibility	0.44	
IV. Experience (Credit)/Debit (((I.E) – (II))/(II)) × (III)	10.7%	

Notes: The basic limits apply to losses only. ALAE are unlimited. MSL is the maximum single limit per occurrence, applied to basic limits losses and unlimited ALAE. It is based on the total company subject basic limits loss and unlimited ALAE costs.

The expected experience ratio (II) and the credibility (III) also are based on the total company subject basic limits loss and ALAE costs.

The total company subject basic limits loss and ALAE costs are from Table 4.3.

expected losses and ALAE, the losses are limited to basic limits. The ALAE are unlimited. A maximum single limit per occurrence (MSL) is applied to the basic limited losses and ALAE combined. The basic limits, which also apply to losses and ALAE combined, are as follows:

- \$100,000 combined single limit for all bodily injury and property damage liability losses arising from a single occurrence;
- \$5,000 per person limit for medical expenses;

TABLE 4.3
ISO EXPERIENCE RATING SAMPLE CALCULATION
EXPECTED UNREPORTED LOSSES AND ALAE AT 3/31/98 AND SUBJECT LOSS COSTS

[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
Policy Period	Coverage	Current Company B/L Loss & ALAE Costs	Adjustment Table 13.B	Policy Table 13.C	Detrend Factors	Company Subject B/L Loss & ALAE Costs	Expected Experience Ratio	Expected Percentage B/L Losses & ALAE Unreported at 3/31/98	Expected B/L Losses & ALAE Unreported at 3/31/98
7/1/94-95	Prem/Ops	48,750	1.06	1.00	0.804	41,547	0.888	19.2%	7,084
	Products	16,250	1.16	1.00	0.839	15,815	0.888	42.6%	5,983
7/1/95-96	Prem/Ops	48,750	1.06	1.00	0.849	43,872	0.888	30.0%	11,688
	Products	16,250	1.16	1.00	0.876	16,513	0.888	54.5%	7,992
7/1/96-97	Prem/Ops	48,750	1.06	0.67	0.897	31,056	0.888	0.0%	0
	Products	16,250	1.16	0.44	0.916	7,597	0.888	0.0%	0
Total						156,400			32,747

Notes: [3] is for the 7/1/98-99 third-year claims-made policy. It is the company expected loss and ALAE ratio of 0.650 multiplied by the company premium of \$75,000 and \$25,000 for premises/operations and products, respectively.

[4] adjusts current company basic limits loss and ALAE costs up to an occurrence level.

[5] adjusts for the experience period being claims-made, reflecting claims-made year.

[6] adjusts current company basic limits loss and ALAE costs by the reciprocal of the loss and ALAE trend.

[7] = [3] × [4] × [5] × [6].

[8] is based on the total company subject basic limits loss and ALAE costs in [7].

[9] is from Table 15.

[10] = [7] × [8] × [9].

Tables 13.B, 13.C, and 15 are from the ISO plan.

- \$100,000 per person or organizational limit for personal injury or advertising injury; and
- annual aggregate limits of \$200,000 for products/completed operations and \$200,000 for all other coverages (general aggregate).

For incidental professional liability exposures under commercial general liability, basic limits are \$100,000 for all damages on account of each occurrence and, subject to the foregoing limit, a basic annual aggregate limit of \$200,000.

The experience period is the three policy periods completed at least six months prior to the rating date. If three policy periods are not available, one or two may be used. Occurrences and loss and ALAE costs associated with tail coverage on claims-made policies are excluded. In the example, the three policy periods are 7/1/94–95, 7/1/95–96, and 7/1/96–97. The older two were written on an occurrence basis; the most recent on a first-year claims-made basis. The evaluation date is 3/31/98.

The projected ultimate losses and ALAE with losses limited by basic limits and with the total limited by the MSL for the experience period are the sum of the reported losses and ALAE at 3/31/98 and the expected unreported losses and ALAE at 3/31/98, both with losses limited by basic limits and the limited losses and unlimited ALAE limited by MSL. The experience component is the actual experience (loss and ALAE) ratio, which is the projected ultimate losses and ALAE with losses limited by basic limits and the total limited by MSL divided by the company subject basic limits loss and unlimited ALAE costs.

The exposure base is company subject basic limits loss and ALAE costs. The exposure component is the expected experience (loss and ALAE) ratio adjusted for the various limits. The actual and expected experience ratios are compared using a credibility factor to arrive at the experience credit (percentage reduction in premium) or debit (percentage increase in premium). This plan has no minimums, maximums, or explicit off-balance correction.

Table 4.2 shows the basic calculation. Table 4.3 shows the calculation of the expected unreported losses and ALAE at 3/31/98 and company subject basic limits loss and ALAE costs. The expected unreported losses and ALAE at 3/31/98 are the product of the company subject basic limits loss and ALAE costs, expected experience ratio, and expected percentage losses and ALAE unreported at 3/31/98. These three quantities reflect the effect of basic limits losses and ALAE and the MSL.

Note that there is no adjustment for unreported losses and ALAE for the claims-made policies, even though there may be case reserve development. This results in a probable understatement of the actual experience ratio and a resulting probable overstatement of any credits or understatement of any debits, if case reserve development is greater than zero.

The company subject basic limits loss and ALAE costs for each year of the experience period are the product of the current company basic limits loss and ALAE costs (for a third-year claims-made policy), two policy adjustment factors, and a detrend factor. The Table 13.B policy adjustment factors adjust current company basic limits loss and ALAE costs to an occurrence level. The Table 13.C policy adjustment factors adjust current company occurrence basic limits loss and ALAE to the respective policy type (occurrence or claims-made) for each year of the experience period. Table 13.C also eliminates basic limits losses and ALAE related to midi-tail coverage. Midi-tail coverage is the coverage associated with the limited automatic extended reporting period. Tables 13.B and 13.C are from the ISO plan.

In 7/1/96–97 in the example, the third-year claims-made company basic limits loss and ALAE costs are adjusted up to an occurrence basis by the Table 13.B factor and down to a first-year claims-made basis (excluding the midi-tail) by the Table 13.C factor because the experience for the 7/1/96–97 period is first-year claims-made. The detrend factors, which are applied to current company basis limits loss and ALAE costs, actually adjust for loss and ALAE trends since the policy period. In other

words, the detrend factor is the reciprocal of the loss and ALAE trend. These factors do not adjust for changes in coverage, such as changes in exclusions.

Note that there is an implicit assumption in this example that exposure for the past is the same as the current exposure, except for changes in dollar value. This assumption is not reasonable if there has been growth or decline in the underlying exposure. If this is the case, an alternate calculation that adjusts for the changes in exposure should be used to derive company subject basic limits losses and ALAE. This is done by applying current company rates by subline and the company expected loss and ALAE ratio to the exposures by subline for the experience period to arrive at the current company basic limits loss and ALAE costs.

The calculation performed to determine the experience credit/debit is as follows:

$$CD = \frac{AER - EER}{EER} \times Z$$

where

AER = Actual Experience Ratio

EER = Expected Experience Ratio

Z = Credibility

CD = (Credit)/Debit

This can be rearranged to a more familiar form:

$$M = \frac{[A \times Z] + [E \times (1 - Z)]}{E}$$

where

E = Expected Losses and ALAE Limited by
Basic Limits and MSL

A = Actual Losses and ALAE Limited by
Basic Limits and MSL

Z = Credibility

M = Modification Factor

E and A are calculated as follows:

E = Company Subject Basic Limits Loss and
ALAE Costs \times EER

and

A = Projected Ultimate Losses and ALAE Limited by
Basic Limits and MSL

Note that

$$M = 1 + CD$$

For the example:

$$CD = 10.7\% \text{ from Table 4.2}$$

$$E = 156,400 \times 0.888 = 138,883$$

$$A = 172,547$$

$$Z = 0.44$$

$$M = 1.107 = 1 + 0.107$$

The experience credit or debit is applied to the otherwise chargeable premium for the policy being rated. This plan has special rules for treating deductible coverage, company expense variation, situations in which other than basic limits data are readily available, situations in which basic limits premiums are not readily available, and situations in which the claim data are immature due to a change of insurance company. There also is a procedure for converting the plan to a company premium basis.

Workers Compensation Pool Experience Rating Plan

The experience rating plan of a workers compensation pool for fire districts in one state is illustrated in Tables 4.4 through 4.6.

TABLE 4.4
 WORKERS COMPENSATION POOL EXPERIENCE RATING SAMPLE CALCULATION
 PREMIUM DETERMINATION

[1] Fire District	[2] Minimum Premium	[3] Maximum Premium	[4] A	[5] E	[6] Z	[7] Unadjusted	[8] Premium for 7/1/98-99 Adjusted #1	[9] Adjusted #2
A	93,384	372,825	290,914	280,491	0.59	380,075	376,698	372,825
B	1,494	8,634	821	4,487	0.00	5,980	5,927	5,958
C	18,810	93,623	15,286	56,497	0.12	70,319	69,694	70,063
D	8,409	53,402	6,163	25,257	0.00	33,666	33,367	33,544
E	28,546	171,593	172,188	85,742	0.25	136,014	134,805	135,518
F	38,615	222,414	128,716	115,985	0.33	158,778	157,368	158,200
G	166	1,599	0	499	0.00	664	659	662
H	6,805	41,251	44,007	20,439	0.00	27,243	27,001	27,144
I	13,167	72,625	10,922	39,548	0.09	50,228	49,782	50,045
J	52,999	270,257	121,658	159,188	0.39	197,500	195,745	196,780
K	4,868	28,141	37,010	14,623	0.00	19,491	19,318	19,420
L	1,715	9,593	145	5,151	0.00	6,866	6,805	6,841
M	2,987	15,670	4,105	8,973	0.00	11,960	11,854	11,917
N	5,034	24,623	65	15,121	0.00	20,156	19,977	20,082
Total	277,000	1,386,250	832,000	832,000		1,118,941	1,109,000	1,109,000

Notes: [2] = [6] of Exhibit 4.6.
 [3] = [8] of Exhibit 4.6.
 [4] = [7] of Exhibit 4.5.
 [5] = [3] of Exhibit 4.6.
 [6] = [5] of Exhibit 4.6.

[7] = [2] + [4] × [6] + [5] × (1.00 - [6]).

[8] = ([7] × 1,109,000) ÷ Total [7]. 1,109,000 is the recommended contribution for 7/1/98-99.

[9] = [8], adjusted for maximum premiums with amount over maximum premiums reallocated based on [8].

TABLE 4.5
WORKERS COMPENSATION POOL EXPERIENCE RATING SAMPLE CALCULATION
DETERMINATION OF A

[1] Fire District	[2] Reported Limited Losses & ALAE at 6/30/97	[3] FTE Personnel 7/1/94-97	[4] Raw Annual Loss & ALAE Rate ([2]/[3])	[5] FTE Personnel 7/1/98-99	[6] Unadjusted ([4] × [5])	[7] Adjusted
A	350,240	463.3	755.97	168.8	127,607	290,914
B	1,000	7.5	133.33	2.7	360	821
C	15,126	76.7	197.21	34.0	6,705	15,286
D	8,892	50.0	177.84	15.2	2,703	6,163
E	193,214	132.0	1,463.74	51.6	75,529	172,188
F	147,865	182.8	808.89	69.8	56,460	128,716
G	0	1.6	0.00	0.3	0	0
H	56,654	36.1	1,569.36	12.3	19,303	44,007
I	13,809	68.6	201.30	23.8	4,791	10,922
J	130,682	234.6	557.04	95.8	53,365	121,658
K	47,965	26.0	1,844.81	8.8	16,234	37,010
L	185	9.0	20.56	3.1	64	145
M	4,768	14.3	333.43	5.4	1,801	4,105
N	63	20.0	3.15	9.1	29	65
Total/Avg.	970,463	1,322.5	733.81	500.7	364,951	832,000

Note: [7] = $832,000 \times ([6]/\text{Total}[6])$. 832,000 is the discounted expected losses and ALAE for 7/1/98-99.

TABLE 4.6
 WORKERS' COMPENSATION POOL EXPERIENCE RATING SAMPLE CALCULATION
 DETERMINATION OF E, Z, MINIMUM PREMIUM, AND MAXIMUM PREMIUM

[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Fire District	FTE Personnel 7/1/98-99	E	FTE Personnel 7/1/94-97	Credibility (Z)	Estimated Discounted Admin. Costs 7/1/98-99	Contribution 7/1/97-98	Maximum Premium 7/1/98-99
A	168.8	280,491	463.3	0.59	93,384	229,410	372,825
B	2.7	4,487	7.5	0.00	1,494	5,313	8,634
C	34.0	56,497	76.7	0.12	18,810	57,609	93,623
D	15.2	25,257	50.0	0.00	8,409	32,860	53,402
E	51.6	85,742	132.0	0.25	28,546	105,586	171,593
F	69.8	115,985	182.8	0.33	38,615	136,858	222,414
G	0.3	499	1.6	0.00	166	984	1,599
H	12.3	20,439	36.1	0.00	6,805	25,383	41,251
I	23.8	39,548	68.6	0.09	13,167	44,688	72,625
J	95.8	159,188	234.6	0.39	52,999	166,297	270,257
K	8.8	14,623	26.0	0.00	4,868	17,316	28,141
L	3.1	5,151	9.0	0.00	1,715	5,903	9,593
M	5.4	8,973	14.3	0.00	2,987	9,642	15,670
N	9.1	15,121	20.0	0.00	5,034	15,151	24,623
Total	500.7	832,000	1,322.5		277,000	853,000	1,386,250

Notes: [3] is distributed based on [2]. 832,000 is the discounted expected losses and ALAE for 7/1/98-99.

[5] is determined based on [4] as follows:

$$\frac{\text{FTE Personnel Years}}{\text{Credibility}}$$

$$\begin{matrix} 60 \text{ or less} & 0.00 \\ 60-1,199 & \left[\frac{\text{FTE personnel years} - 60}{1,140} \right]^{1/2} \\ 1,200 \text{ or more} & 1.00 \end{matrix}$$

[6] is distributed based on [2]. This is the minimum premium.

[8] = [7] × (1,109,000/853,000) × 1.25. 1,109,000 is the total recommended contribution for 7/1/98-99.

This example is used throughout the following discussion of the plan.

This plan is used for occurrence workers compensation coverage written on a guaranteed cost basis for all entities participating in the pool. Pool participation has been constant since the pool's inception and is not expected to change for 7/1/98–99, the policy period in question. All policies renew 7/1.

The costs to be allocated using a weighting of experience and exposure are the expected losses and ALAE for 7/1/98–99, discounted for anticipated investment income. The estimated discounted expected expenses other than ALAE for 7/1/98–99 are distributed to participants on the basis of the expected full-time-equivalent (FTE) personnel for 7/1/98–99.

The experience is represented by reported losses and ALAE at 6/30/97 for the experience period, adjusted for changes in FTE personnel. The exposure base is expected FTE employees for the 7/1/98–99 period. The reported losses and ALAE at 6/30/97 are limited to \$25,000 per occurrence. The experience period is the latest three complete policy periods, i.e., 7/1/94–95, 7/1/95–96, and 7/1/96–97. Credibility is based on FTE employees for the experience period.

FTE personnel are used rather than payroll as an exposure base, for the credibility base, and to allocate estimated discounted expenses for 7/1/98–99. FTE personnel is a better exposure base than payroll in this instance because of the presence in some of the districts of volunteer firefighters and pay scale discrepancies between districts. Volunteer firefighters are covered by workers compensation law. The nature of workers compensation claims for firefighters (many minor cost claims and a few large cost claims) and the pay-scale discrepancies indicate that some costs and credibility are more closely related to FTE personnel than payroll.

The plan has a built-in minimum: the estimated discounted administrative expenses for 7/1/98–99, as allocated based on ex-

pected FTE personnel for 7/1/98–99. The plan also has a maximum for each participant: 25% above the prior year's contribution (for 7/1/97–98 in this example), adjusted for any increase in total recommended contribution but not for any decrease (a 30% increase in this example, from \$853,000 to \$1,109,000). The total increase allowable in this example is 62.5% $((1.300 \times 1.250) - 1.000)$.

Because pool participation has been and is expected to remain constant, it is possible to calculate the exact off-balance and adjust accordingly so that the total dollars collected are the total recommended contribution for the group. The allocation of the off-balance to districts may need several iterations, depending on the effect of the minimums and maximums.

Table 4.4 shows the premium determination. Table 4.5 shows the determination of A , the discounted expected losses and ALAE for 7/1/98–99 allocated based on experience. Table 4.6 shows the determination of E (the discounted expected losses and ALAE for 7/1/98–99 allocated based on exposure), Z (credibility), minimum premium, and maximum premium.

The premium before adjustment for off-balance, minimums, and maximums is determined as follows:

$$\text{Unadjusted Premium} = \\ \text{Minimum Premium} + ((A \times Z) + [E \times (1.000 - Z)]).$$

The unadjusted premium for the example is shown in column (7) of Table 4.4. Column (8) of Table 4.4 shows the premium adjusted for the off-balance. Column (9) of Table 4.4 shows the premium adjusted for maximum premiums combined with an additional off-balance calculation. Note that in the example, no participant's premium was lower than the applicable minimum. Any amounts under minimum premiums would have to be reallocated similarly to the reallocation of the amounts over maximum premiums.

A is the discounted expected losses and ALAE for 7/1/98–99 allocated based on experience (calculated in Table 4.5). The reported losses and ALAE at 6/30/97 for accident period 7/1/94–97 are limited to \$25,000 per occurrence. The ratio of these to FTE personnel for 7/1/94–97 results in the raw annual loss and ALAE rate. The raw annual loss and ALAE rate is applied to the expected FTE personnel for 7/1/98–99 to obtain unadjusted A 's. The unadjusted A 's are adjusted so that the desired total of \$832,000 of discounted expected losses and ALAE for 7/1/98–99 would be collected if all participants had credibilities of 1.00.

E is the discounted expected losses and ALAE for 7/1/98–99 allocated based on exposure. The E 's are calculated in Table 4.6 by distributing the \$832,000 in proportion to the expected FTE personnel for 7/1/98–99. This is what would be collected if all participants had credibility of 0.00. The credibilities (Z) are based on FTE personnel for 7/1/94–97 and the formula in Table 4.6. The minimum and maximum premiums are also calculated in Table 4.6.

National Council on Compensation Insurance (NCCI) Experience Rating Plan

The NCCI Experience Rating Plan has the unique characteristic of dividing the losses for each claim into a primary portion and an excess portion. The expected and actual primary portions are compared using one credibility factor, and the expected and actual excess portions are compared using another credibility factor. The credibility factor applied to the actual primary losses is higher than that applied to the actual excess losses. The formulae for splitting the expected and actual losses and determining the primary and excess credibility factors are discussed in more detail in Chapter 8. A brief summary of the plan is shown below.

The calculation to determine the experience modification is as follows:

$$M = \frac{A_p + B + (A_e \times w) + [(1 - w) \times E_e]}{E_p + B + (E_e \times w) + [(1 - w) \times E_e]}$$

where

M = Experience Modification Factor

A_p = Actual Primary Losses

E_p = Expected Primary Losses

A_e = Actual Excess Losses

E_e = Expected Excess Losses

B = Ballast Value

w = Excess Losses Weighting Factor

Note that the denominator of this formula equals

$$E + B$$

where

$$E = \text{Excess Losses}$$

This formula is also sometimes expressed as follows:

$$M = \frac{A_p + C + (A_e \times w)}{E_p + C + (E_e \times w)}$$

where C is a different stabilizing value than B . C is a function of w , B , and E_e .

Note that $M = 1 + CD$, where CD is the experience rating (credit)/debit.

The experience period is the three complete policy periods at the time the calculation is made. The actual losses are the reported losses evaluated at 18, 30, and 42 months from the beginning of the policy (accident) years.

The expected losses are the actual payroll by class for the experience period years multiplied by the retrospective manual expected loss rates by class for the prospective period. The retrospective expected loss rates reflect the losses expected to be

reported at the 18-, 30-, and 42-month evaluations of the latest three available policy periods.

w and C (and, hence, B) result from the specific credibility formulae.

Composite Rating

Composite rating is an administrative tool to facilitate the rating of large, complex risks upon audit. Instead of rating different coverages using different exposure bases, all applicable coverages are rated using one, composite, exposure base.

“Company” refers to the insurance company using the composite rating plan. The references to company loss and ALAE development factors, factors from claims-made to occurrence and vice versa, loss and ALAE trend factors to current year, exposure trend factors, and expected loss and ALAE ratios reflect that different insurance companies may use different factors and ratios. ISO supplies advisory loss and ALAE development factors, factors from claims-made to occurrence and vice versa, loss and ALAE trend factors to current year, and exposure trend factors but does not supply advisory expected loss and ALAE ratios.

The composite rate to be applied to the composite exposure base is determined at the beginning of the policy period under consideration based on historical exposures. Estimated exposures are used if exact exposures are not available. This composite rate is used to determine the deposit premium based on the estimated composite exposure base and the final premium based on the audited composite exposure base. The composite rate may be based on manual rates to which the appropriate experience modification factors have been applied or on the entity’s experience. The remainder of this section discusses the latter case, using the loss rating portion of the February, 1999 ISO Composite Rating Plan.

Table 4.7 shows the basic formulae for the ISO Composite Rating Plan loss-rated risks example. Eligibility for loss rating is

TABLE 4.7

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ISO COMPOSITE RATING PLAN LOSS-RATED RISKS EXAMPLE

Types of Losses Covered:	General Liability, Hospital Professional Liability, Commercial Automobile Liability, Commercial Automobile Physical Damage, Glass, and Crime								
Experience Period:	Five years beginning between six and five and one-half years prior to the date the composite rate is to be effective. As few as three years, beginning between four and three and one-half years prior to the date the composite rate is to be effective, may be used if that is all that is available.								
Experience:	For each type of loss, calculate by accident year and in total the adjusted projected ultimate losses and ALAE as follows:								
	Reported Limited Losses & ALAE At Latest Evaluation Date	×	Company Loss & ALAE Development Factor	×	Company Conversion Factor From Claims-Made to Occurrence	×	Company Loss & ALAE Trend Factors to Current Year	×	Factors to Reflect Other Changes
Adjusted Composite Exposure for Experience Period:	For the experience period, calculate the adjusted composite exposure as follows:								
	Composite Exposure for Exper. Period	×	Company Exposure Trend Factors	×	Factors to Reflect Other Changes				

based on the reported losses and ALAE at the latest evaluation date, limited to various per occurrence limits, for the same period of time as the experience period to be used in the calculation. Different eligibility requirements apply for different combinations of coverage and limits. The premium charged is based solely on the entity's experience, adjusted for differences in coverage type (occurrence or claims-made year), trends in losses and ALAE and exposure, and other factors which may affect the appropri-

TABLE 4.7

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ISO COMPOSITE RATING PLAN LOSS-RATED RISKS EXAMPLE

Adjusted Premium for Experience Period:	<p>For each type of loss, calculate the loss premium as follows:</p> $\frac{\text{Adjusted Projected Ultimate Losses \& ALAE}}{\text{Company Conversion Factor From Occurrence to Claims-Made}} \times \frac{\text{Company Expected Loss \& ALAE Ratio}}{\text{Company Conversion Factor From Occurrence to Claims-Made}}$ <p>Total these to get the total adjusted premium for the experience period.</p>
Composite Rate:	<p>The composite rate is calculated as follows:</p> $\frac{\text{Adjusted Premium for Exper. Period}}{\text{Adjusted Composite Exposure for Exper. Period}}$
Final Premium:	<p>The final premium is calculated as follows:</p> $\text{Audited Exposure for Policy Period} \times \text{Composite Rate}$

Notes: Various per occurrence limits apply to reported losses and ALAE.

For automobile physical damage, exclude ALAE and use unlimited losses.

The following are provided by ISO on an advisory basis:

- loss and ALAE development factors,
- conversion factors from occurrence to claims-made,
- loss & ALAE trend factors,
- exposure trend factors, and
- conversion factors from claims-made to occurrence.

atness of the composite rate. The entity’s experience has an implicit 100% credibility.

The composite rate is the adjusted premium for the experience period divided by the adjusted composite exposure base for the experience period. The adjusted premium for the experience period is the sum of the adjusted projected ultimate losses and ALAE, converted from occurrence to claims-made basis if

appropriate, divided by the expected loss and ALAE ratio, for each type of loss. The adjusted composite exposure base for the experience period is the composite exposure base for the experience period, adjusted by exposure trend factors. The projected ultimate losses and ALAE are the reported losses and ALAE at latest evaluation date developed to ultimate, converted from claims-made to occurrence if appropriate, trended to the year for which the composite rate is being calculated, and adjusted for other changes if appropriate.

The reported losses and ALAE used in the calculation are subject to various per occurrence limits. The deposit premium is not subject to experience rating since it is based solely on the entity's experience under the limits used in the calculation. The final premium may be subject to retrospective rating. Both deposit and final premiums may be subject to schedule rating.

RETROSPECTIVE RATING

While experience rating and some forms of composite rating assume that the past, with appropriate adjustments, is predictive of the future, retrospective rating uses the experience during the period to determine the costs for the period. This approach makes costs based on retrospective rating plans more responsive to changes in experience and more subject to unusual fluctuations in experience than is the case with experience rating or composite rating plans. However, retrospective rating is very similar to prospective experience rating in many ways.

As with experience rating, actual losses, and sometimes ALAE, are compared to expected losses (and ALAE), although in this case they are both for the current period. To have an "apples to apples" comparison, several different experience and exposure combinations can be used, including the following:

- actual paid losses (and ALAE) at a particular date and the expected paid losses (and ALAE) at that date, both for the experience period;

- reported losses (and ALAE) at a particular date and the expected reported losses (and ALAE) at that date, both for the experience period; and
- projected ultimate losses (and ALAE) and the expected losses, both for the experience period.

These are the same as the first three combinations listed for experience rating.

As with experience rating, the experience component should be related to the exposure component and to the basis on which policies are written or funding occurs. If the costs to be allocated include ALAE, ALAE should be included with losses in the calculation.

The length of the retrospective rating period is usually one or three years. As with experience rating, the shorter the period, the more responsive the plan will be to changes that truly affect loss and ALAE experience, such as changes in the risk control program, and the more subject to unusual fluctuations in loss and ALAE experience. Conversely, a longer period will result in less responsiveness to changes and to unusual or catastrophic occurrences.

Retrospective rating plans may also limit losses (and ALAE) per occurrence and in aggregate to reduce the effect of unusual or catastrophic occurrences, as may experience rating plans.

If projected ultimate losses are to be used in the retrospective rating calculation, they can be developed in a number of ways similar to those used to develop projected ultimate losses used to determine manual rates. Projected ultimate losses are often based on paid or reported losses at a particular date.

The expected losses are a function of the current exposure. The exposure component should be related to the experience component, as detailed above. As for experience rating, expected

losses are usually a product of an expected loss rate and the exposure base.

As is also true for experience rating, the exposure base used should reflect the underlying risk of loss and ALAE. It is not always possible to use the theoretically optimal exposure base. In practice, insurers and nontraditional risk financing mechanisms often use whatever exposure base insurers use in their premium calculations.

Credibility has the same function and is used in the same way for retrospective rating as for experience rating. Retrospective rating plans also may have minimum or maximum premium charges and need to be corrected for off-balance, as with experience rating plans.

Retrospective rating plans require a deposit premium at the beginning of the policy period. The deposit premium is an estimate of the ultimate premium for the policy period and may be determined using an experience rating plan. Retrospective premium adjustments are made periodically after the end of the policy period for a predetermined number of adjustments or until the insurer and insured agree to end the adjustments.

Two examples of retrospective rating plans are discussed below.

NCCI Retrospective Rating Plan

The NCCI Retrospective Rating Plan applies to workers compensation and employer's liability for eligible insureds. An insured must elect to participate in the plan, and the insurer must agree.

The basic formulae are shown in Table 4.8. Losses, some ALAE for workers compensation, and all ALAE for employer's liability are the subject of the allocation. The insured, with the insurer's agreement, may elect to include all ALAE with losses.

TABLE 4.8

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NCCI RETROSPECTIVE RATING PLAN EXAMPLE

Experience Period:	One or Three Years
Deposit Premium:	Experience-Rated Premium
Retrospective Adjustments:	Uses claim data at 18, 30, 42,... months from the beginning of a one-year policy period and claim data at 42, 54, 66,... months from the beginning of a three-year policy period.
Retrospective Rating Formula:	$\text{Retro. Rating} = \left[\begin{array}{l} \text{Basic} \\ \text{Premium} \end{array} + \begin{array}{l} \text{Converted} \\ \text{Losses} \end{array} \right] \times \begin{array}{l} \text{Tax} \\ \text{Multiplier} \end{array}$ $\text{Basic Premium} = \begin{array}{l} \text{Standard} \\ \text{Premium} \end{array} \times \begin{array}{l} \text{Premium} \\ \text{Factor} \end{array}$ <p>Standard Premium=Manual Premium modified for experience rating, loss constants, and minimum premium excluding premium discount, expense constants, and other items.</p> $\text{Converted Losses} = \begin{array}{l} \text{Reported} \\ \text{Limited} \\ \text{Losses} \\ \text{at Eval.} \\ \text{Date} \end{array} \times \begin{array}{l} \text{Loss} \\ \text{Conversion} \\ \text{Factor} \end{array}$ <p>Reported limited losses include: interest on judgments; expenses incurred in obtaining third party recoveries, and ALAE for employer's liability claims; exclude some aircraft-related claims; and have limits on some accidents involving more than one person.</p>

This changes some of the factors used in the retrospective rating calculation. The rating factors are based on first dollar losses. Some aircraft-related claims are excluded and the costs of some accidents involving more than one person are limited. All other costs are collected as a function of the losses, exposure (as represented by the standard premium), or, for taxes only, the retrospective premium before taxes. All policies are written on an occurrence basis.

TABLE 4.8

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NCCI RETROSPECTIVE RATING PLAN EXAMPLE

Retrospective Rating Formula With Elective Premium Elements:

$$\begin{aligned} \text{Retro. Premium} &= \left[\text{Basic Premium} + \text{Converted Losses} + \text{Excess Loss Premium} + \text{Retro. Devel. Premium} \right] \times \text{Tax Multiplier} \\ \text{Excess Loss Premium} &= \text{Standard Premium} \times \text{Excess Loss Premium Factor} \times \text{Loss Conversion Factor} \\ \text{Retro. Devel. Premium} &= \text{Standard Premium} \times \text{Retro. Devel. Factor} \times \text{Loss Conversion Factor} \end{aligned}$$

Converted losses are calculated as above, but reported limited losses now also have a per accident limit.

Minimum and Maximum Retrospective Premiums:

$$\begin{aligned} \text{Minimum Retro. Premium} &= \text{Standard Premium} \times \text{Minimum Retro. Premium Factor} \\ \text{Maximum Retro. Premium} &= \text{Standard Premium} \times \text{Maximum Retro. Premium Factor} \end{aligned}$$

Notes: The following are provided by the NCCI:

- Formula for Basic Premium Factor,
- Excess Loss Premium Factor,
- Retrospective Development Factor, and
- Tax Multiplier.

The following are selected by the insured in agreement with the insurer:

- Loss Conversion Factor,
- Minimum Retrospective Premium Factor, and
- Maximum Retrospective Premium Factor.

The deposit premium due at the beginning of the period is the experience-rated premium. Retrospective adjustments are made using audited payroll and claim data at 18, 30, 42, ... months after the beginning of the policy period, if it is a one-year retrospective period, until insurer and insured agree there will be

no more. For a three-year retrospective period, the claim data are evaluated at 42, 54, 66, ... months after the beginning of the policy period.

There is no direct application of credibility in this plan. For losses under any applicable limits, the experience is given implicit credibility of 1.000. Losses over any applicable limits are given zero credibility, and money for them is collected based on exposure, as represented by standard premium and the applicable excess loss factor.

The plan allows for selection of minimum and maximum retrospective premiums. Costs above the maximum less those below the minimum are collected from or credited to the insured based on exposure, as represented by standard premium. Various minimum and maximum retrospective premium combinations are possible (including no maximum and minimum equals basic). The choice of minimum and maximum premiums affects the basic premium. The basic premium includes the expenses of the guaranteed cost premium and an insurance charge that reflects the minimum and maximum premiums, so that the average retrospective rating premium is expected to equal the guaranteed cost premium.

The general retrospective rating formula calculates retrospective premium as the sum of basic premium and converted losses, both multiplied by the tax multiplier. The basic premium, which is a function of the standard premium (exposure), provides for the following costs:

- insurer expenses such as acquiring and servicing the insured's account;
- risk control services, premium audit, and general administration of the insurance;
- a net charge for limiting the retrospective premium between the minimum and maximum retrospective premiums; and

- an allowance for the insurer's possible profit or for contingencies.

The converted losses are the reported losses, if any, at the evaluation date limited by the selected limit, and multiplied by the loss conversion factor. The loss conversion factor generally covers the ULAE and ALAE not included with the losses, although there is some flexibility in choice of the loss conversion factor. The tax multiplier covers licenses, fees, assessments, and taxes that the insurer must pay on the premium it collects.

There are two additional elements the insured may elect if the insurer agrees: a loss limitation resulting in an excess loss premium and a retrospective development premium. Both these premiums are subject to the tax multiplier. The retrospective rating formula with these elective premium elements is also shown in Table 4.8.

If the loss limitation is accepted, the reported limited losses at any evaluation are further limited to an agreed-upon amount per accident. The cost of losses above this amount and related ALAE and ULAE are collected through the excess loss premium. It is a function of standard premium (exposure).

The excess loss premium collects for losses and related expenses above the per accident limit; the basic premium collects for losses and related expenses above the maximum limit, some of which are the result of losses above the per accident limit. The excess loss premium factor is calculated to remove any double-counting of losses above the per occurrence limit.

Because reported limited losses tend to develop over time upwards to the ultimate limited losses, the first retrospective adjustment is likely to result in the insurer returning premium to the insured. Successive retrospective adjustments will probably result in most of, if not all of or more than, this amount being returned by the insured to the insurer. To smooth out these back-and-forth payments, some insureds opt to use the retrospective

development premium, which attempts to offset this process. The retrospective development premium is a function of standard premium (exposure). It is used only for the first three retrospective adjustments and decreases over time.

Automobile Physical Damage Insurance Retrospective Allocation to Units by Single Entity

Table 4.9 illustrates the retrospective allocation of automobile physical damage insurance premium to units by a single entity. The coverage is actual cash value, written on an occurrence basis for one year.

The deposit premium collected from the units at the beginning of the period is based on the expected cost of insurance, allocated to each unit based on exposure as represented by the expected number of vehicles. There is no distinction for different types of vehicles. This is reasonable if each unit has the same expected cost per vehicle.

There is one retrospective adjustment, made using data at 18 months after the beginning of the policy year. Only one adjustment is made because automobile physical damage claims are reported and settled very quickly and the actual exposure is known shortly after the year ends. The actual cost of the insurance is allocated based on audited exposure (actual number of vehicles) and on reported losses and ALAE. These two allocations are weighted using credibility. Losses and ALAE are unlimited because the cost of any one occurrence is limited by the actual cash value of the vehicle in the accident plus any ALAE, which should be small. All experience is given a credibility of 0.25 regardless of the exposure size to make the plan easier for the unit managers to understand.

The plan has no minimum and maximum retrospective premiums. The plan has no off-balance correction, as none is needed because the credibility factors are the same for all units.

TABLE 4.9
AUTOMOBILE PHYSICAL DAMAGE INSURANCE RETROSPECTIVE
ALLOCATION TO UNITS BY SINGLE ENTITY EXAMPLE

Unit (1)	Deposit Premium	
	Expected Number of Vehicle Years (2)	Expected Cost of Insurance Allocated Based on Exposure (3)
A	500	50,000
B	1,000	100,000
C	750	75,000
D	500	50,000
E	2,500	250,000
Total	5,250	525,000

Note: (3) is allocated based on (2). (3) is the deposit premium.

Unit (1)	Retrospective Premium					Retro. Premium (7)
	Actual Number of Vehicle Years (2)	Actual Cost of Insurance Allocated Based on Exposure (3)	Reported Losses & ALAE at 18 Months (4)	Actual Cost of Insurance Allocated Based on Experience (5)	Credibility (6)	
A	525	48,659	35,000	52,778	0.25	49,688
B	1,050	97,317	60,000	90,476	0.25	95,607
C	600	55,610	60,000	90,476	0.25	64,326
D	500	46,341	30,000	45,238	0.25	46,066
E	2,450	227,073	130,000	196,032	0.25	219,313
Total	5,125	475,000	315,000	475,000		475,000

Notes: (3) is allocated based on (2).

(5) is allocated based on (4).

(7) = (3) × [1.00 – (6)] + [(5) × (6)].

DESIGNING AN INDIVIDUAL RISK RATING SYSTEM

To design an individual risk rating system such as those previously discussed, the following steps should be taken:

1. Determine the goals for the system.
2. Determine what is to be allocated.
3. Determine what kinds of exposure and experience data are available.
4. Decide whether the system will be prospective, retrospective, or a combination.
5. If the system is to be prospective, decide if it will be a schedule rating system, an experience rating system, a composite rating system, or a combination.
6. Design the schedule rating portion of the system.
7. Determine the experience component separately for each remaining portion of the system.
 - a. Determine the type of experience to be used.
 - b. Determine the experience period.
 - c. Decide if there will be any per occurrence or aggregate limits.
8. Determine the exposure component separately for each remaining portion of the system.
 - a. Determine the type of exposure to be used.
 - b. Determine the exposure period.
9. Determine the credibility component separately for each remaining portion of the system.
10. Consider any other desired plan features such as a minimum or maximum premium charge.

11. Estimate if the system has an off-balance. If so, correct it if indicated.
12. Review the system and determine if it meets the stated goals and attributes of a good individual risk rating system. If not, make changes to the system.
13. Run sample calculations to see if the system functions as expected. If not, make any indicated changes.
14. Collect necessary data and put the system into use.
15. Review the plan at least every three years to be certain that it meets current needs. Needs can change or the situation may change so that the system no longer performs as expected. An example of the latter is that a per occurrence limit selected three years ago may no longer be reasonable because of economic and social inflation.

SUMMARY

Individual risk rating systems supplement the manual rates by modifying the group rates to reflect an individual entity's known or anticipated experience. They can be used by an insurer for all its insureds in one line of coverage, by risk sharing pools to allocate costs among a fixed group of members, or by an individual entity to allocate risk financing costs among its divisions.

Individual risk rating systems should be tailored to the needs of the specific situation in which they will be used. This produces systems with widely varying design, but all should follow the general principles and structures outlined in this chapter.

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