

Equity in Automobile Insurance: Optional No-Fault

Michael R. Powers*

ABSTRACT

No-fault automobile insurance laws have historically been justified by both efficiency and equity arguments. In this article, the author proposes that optional no-fault systems be justified solely on the basis of two fundamental equity principles. A review of the entire spectrum of mandatory and optional automobile insurance recovery systems reveals that one specific type of optional no-fault—the self-determining system now operating in New Jersey and Pennsylvania—is more equitable than traditional tort, mandatory no-fault, or any other optional no-fault system. Further, it is shown that no mandatory or optional no-fault system can be truly equitable if premiums are based solely upon projected loss experience, without explicit premium reductions for the decrease in expected losses attributable to the insured's tort restrictions. Finally, two mechanisms are reviewed for assuring that, under the self-determining no-fault system, expected losses for insurers are exactly balanced by the premiums that they receive.

Throughout the past decade, automobile insurance premiums have escalated in many jurisdictions. Excessive litigation and the over-utilization of medical services have been primary forces pushing the price of automobile insurance beyond the reach of many consumers. Nationally, automobile insurance premiums increased an average of 9.6 percent annually, about three times the average rate of increase in the Consumer Price Index, from 1982 through 1988 (see A. M. Best Company, 1990). In Pennsylvania, where major automobile insurance reform has been enacted recently, the rate of increase was almost identical to the national average during this period of time.

In Philadelphia County, where the price of automobile insurance has grown most dramatically, the frequencies of both bodily injury liability and

* Michael R. Powers is Assistant Professor of Risk Management and Insurance at Temple University.

This article is based upon the author's work as Deputy Insurance Commissioner for the Commonwealth of Pennsylvania. The author wishes to thank all of his colleagues at the Pennsylvania Insurance Department who worked on issues relating to Pennsylvania's *Act 6*. He also thanks the Editor and two anonymous reviewers for their helpful comments.

first party benefit claims were more than three times those in the rest of the state between 1983 and 1987 (see Insurance Services Office and National Association of Independent Insurers, 1988, p. 38). This region, where automobile insurance has been the least affordable, is also the area with the greatest proportion of uninsured motorists.

To make automobile insurance more affordable in Pennsylvania, Governor Robert P. Casey introduced a package of reforms in June 1989 aimed at bringing both excessive litigation and automobile-related medical costs under control. The Governor's program, based upon research conducted by the Pennsylvania Insurance Department, included both an optional no-fault system and provisions to cap medical reimbursements and implement medical provider peer review. This package was passed by the Pennsylvania General Assembly and signed into law as *Act 6* in February 1990.

Pennsylvania's optional no-fault system is conceptually very similar to the optional no-fault system implemented in New Jersey in 1989. Under both systems, all private passenger named insureds are given the opportunity to elect either a tort or no-fault option that is binding on both themselves and other members of their households who are not named insureds, so that all private passenger automobile insureds¹ may be classified as either tort electors or no-fault electors. Tort electors continue to enjoy their traditional tort rights in all situations, whereas no-fault electors relinquish their right to seek recovery for non-economic (pain and suffering) damages except when their injuries satisfy a verbal tort threshold (i.e., are sufficiently serious, as defined in the law). In return for restricting their tort rights (including the tort rights of other household members), no-fault insureds receive a substantial reduction in their bodily injury liability and uninsured/underinsured motorist premiums.

In the face of strong opposition to no-fault from Pennsylvania's trial bar, it was necessary to develop a system that was clearly equitable to all parties. Thus, only a system that gave consumers the freedom to choose between retaining their traditional tort rights, and restricting their tort rights in return for reductions in premiums, was acceptable. Also, it was imperative that the election of one insured not affect the tort rights of other automobile accident victims (except those from the same household). For these reasons, optional no-fault, rather than mandatory no-fault, was pursued by the administration and legislature.

Equity in Automobile Liability Insurance

From the time the no-fault concept was first proposed for automobile insurance by Keeton and O'Connell (1965), its proponents have supported

¹ Hereafter, the term "insured" is taken to mean "named insured." Individuals who are insured as household members of a named insured are specifically identified, when appropriate.

it with both efficiency and equity arguments. Specifically, it is argued that by compensating victims on a no-fault basis for their economic (medical and income) losses, and restricting traditional tort rights: (1) the recovery system is more efficient, because victims are compensated more quickly, and less money is spent on attorneys' fees and court costs, and (2) the recovery system is more equitable, because there is less over-compensation of victims with minor injuries, and more adequate compensation of victims with serious injuries.

Numerous studies conclude that no-fault automobile insurance has, on the whole, achieved both the efficiency and equity goals for which it was proposed.² Victims in mandatory no-fault jurisdictions are compensated more quickly than those in traditional tort jurisdictions, and, when there is a strong barrier to tort recovery (such as a verbal or substantial dollar tort threshold), a far greater portion of insurance loss dollars is used to compensate economic losses under mandatory no-fault than under traditional tort.

This author proposes two fundamental equity principles to justify optional no-fault systems, without even bringing to bear the traditional arguments in support of no-fault. These concepts are: (1) The tort equity principle: automobile accident victims should not be restricted involuntarily from seeking recovery through the tort system; and (2) The rate equity principle: less litigious insureds should receive premium reductions to recognize, as precisely as possible, their contribution toward reduced losses.

The tort equity principle is a general affirmation of an individual's traditional tort rights. However, this principle allows individuals to agree, voluntarily, to restrict their tort rights *a priori*. For less litigious individuals, this type of restriction simply formalizes the restraint that they normally demonstrate on an informal basis. While the tort equity principle is satisfied in all jurisdictions preserving traditional tort rights, it is obviously violated by all mandatory no-fault laws, such as those existing in Massachusetts, Florida, Connecticut, and Michigan. In these jurisdictions, all automobile accident victims are barred from seeking recovery for non-economic damages unless a verbal or dollar tort threshold is reached.

The rate equity principle states that less litigious individuals should be rewarded financially for the savings that they create by their voluntary restraint in seeking recovery through the tort system. Because it is impossible to identify different degrees of litigiousness among uninjured automobile insureds, this principle suggests that, whenever possible, insureds be afforded rate reductions in return for voluntary formal restrictions on their tort rights.

² Most recently, for example, see All-Industry Research Advisory Council (1989), Smith (1989), U.S. Department of Transportation (1985), Rolph (1985), and Hammitt (1985).

In later sections, it will be shown that the rate equity principle can, in theory, be satisfied in all jurisdictions with a mandatory no-fault law, but that, in practice, this principle is not achieved in these jurisdictions. Also, this equity principle is not satisfied in any jurisdiction maintaining traditional tort rights, because automobile insureds retain an unrestricted right to seek recovery, whether they want it or not.

The rate equity principle requires premium reductions for less litigious insureds that are conceptually similar to loss control discounts in workers' compensation insurance, or wellness and non-smoker discounts in health insurance, in that they reward insureds for behavior that reduces losses for insurers. However, unlike loss control, wellness, and non-smoker programs, the loss savings produced by a less litigious insured are spread across all insurers, rather than accruing directly to the insured's own insurer. Thus, to justify reducing the premium of a less litigious insured, there must be some mechanism to make sure that the insured's own insurer, which must provide the premium reduction, is compensated properly.

The fact that no traditional tort or mandatory no-fault jurisdiction is able to satisfy both equity principles simultaneously illustrates the shortcomings of the *status quo* in most jurisdictions. It is to provide relief from these inequities that optional no-fault systems have been proposed and enacted in several jurisdictions.

Optional No-Fault Systems

An optional no-fault system gives insureds a choice between two types of bodily injury recovery: traditional tort recovery, or some variant of no-fault (such as a tort threshold that must be reached before a claim is made). If two parties in an automobile accident are both tort electors or both no-fault electors, then all recoveries can proceed under the mode of recovery that both have elected. However, if one party is a tort elector and the other a no-fault elector, then the system must provide a rule to decide which recovery mode prevails.

Varieties of Optional No-Fault

There are three decision rules that can be used to determine the appropriate manner of recovery in an accident between a tort elector and a no-fault elector: (1) tort favoring, in which both parties have unrestricted tort rights; (2) no-fault favoring, in which both parties have restricted tort rights; and (3) self-determining, in which the tort elector has unrestricted tort rights and the no-fault elector has restricted tort rights. Interestingly, the only optional no-fault systems that currently exist, i.e., Kentucky's optional \$1,000 tort threshold and the New Jersey/Pennsylvania optional verbal tort threshold, correspond to the first and third of these decision rules, respectively, whereas the optional no-fault approach proposed by O'Connell and Joost (1986) corresponds to the second rule.

Evaluating Automobile Insurance Recovery Systems

In analyzing the relative merits of the three types of optional no-fault systems, it is helpful to consider how well they are able to satisfy the tort equity and rate equity principles described above. Table 1 indicates whether or not each of the two equity principles can be satisfied, in theory, under traditional tort, mandatory no-fault, and the three optional no-fault systems.

Table 1
Equity Principles Under Various Recovery Systems

	Tort Equity	Rate Equity
Traditional Tort	Yes	No
Tort Favoring (Kentucky)	Yes	Variant
Self-Determining (New Jersey/ Pennsylvania)	Yes	Yes
No-Fault Favoring (O'Connell, Joost)	Variant	Yes
Mandatory No-Fault	No	Yes

This table reveals that the three optional no-fault systems provide a spectrum of alternatives between the extremes of traditional tort and mandatory no-fault. In so doing, the optional no-fault systems are able, in theory, to satisfy both equity principles in varying degrees. The term "variant", used to describe the tort favoring program's ability to satisfy the rate equity principle and the no-fault favoring program's ability to satisfy the tort equity principle, simply indicates that the relevant equity principle can be achieved in some circumstances, but not in others.

In the tort favoring case, the rate equity principle can be satisfied only if all insureds elect the no-fault option. This is because a no-fault elector is forced to retain full tort rights when he or she encounters a tort elector, and so there are not enough savings to make the premiums of the no-fault insureds as low as they would be if everyone elected the no-fault option. In practice, this has not been a problem in Kentucky because the proportion of no-fault insureds is close to 100 percent, and the premium savings increase as the proportion of no-fault insureds increases. However, there is no guarantee that such a high proportion of consumers would elect the no-fault option in other jurisdictions.

In the no-fault favoring case, the tort equity principle is satisfied only if all insureds elect the tort option. This is because a tort elector is involuntarily deprived of his or her unrestricted recovery rights when he or she encounters a no-fault elector. Because this type of optional no-fault system has never been introduced in any jurisdiction, it is not possible to say what proportion of insureds are likely to elect the tort option. However, there is no guarantee that all or nearly all consumers would elect the tort option in practice.

O'Connell and Joost (1986) have argued that the recovery rights of tort electors need not be restricted under the no-fault favoring system because the system creates sufficient savings for a tort insured to purchase an additional "connector" coverage that would permit the unrestricted ability to seek recovery from his or her own insurer. This coverage would operate on a first-party basis, in a manner analogous to uninsured motorist coverage. However, having the ability to recover from one's own insurer through the connector coverage is not the same as being able to recover from the actual no-fault tortfeasor in an accident, because the tort elector is prevented from seeking damages greater than the limits of his or her connector coverage, and because he or she is not able to recover from the personal assets of the no-fault tortfeasor.

Table 1 and the preceding discussion make it clear that the only automobile insurance recovery system that can always satisfy both equity principles simultaneously is the self-determining system adopted by both New Jersey and Pennsylvania. This optimal property of the self-determining system was the principal reason that it was proposed by the Casey administration in Pennsylvania.

Calculation of Rates

As noted previously, no-fault insureds are entitled to substantial premium reductions on both their bodily injury liability and uninsured/underinsured motorist coverages in return for restricting their tort rights. Whereas appropriate reductions in uninsured/underinsured motorist premiums will ultimately be dictated by the loss experience of no-fault insureds (because this coverage operates on a first-party basis), the calculation of appropriate reductions in bodily injury liability premiums is more complex and interesting. In this regard, it is important to recall that, under the rate equity principle, the rate that applies to an insured must be based not only upon his or her projected loss experience, but also upon the contribution to reduced losses that he or she makes through any applicable tort restrictions. Rates based only upon an insured's projected loss experience will be called experience-based; rates that take into account the projected reduction in losses attributable to an insured's election will be called contribution-based.

For purposes of evaluating and comparing various automobile insurance recovery systems, it will simplify matters to consider only the pure premium portion of the insurance premium—that is, only the portion of the premium that covers expected losses (including allocated loss adjustment expenses (ALAE)). The underwriting expense and profit provisions that comprise the remainder of the premium will be assumed to be adjusted appropriately to comport with changes in the pure premium, with fixed expenses remaining constant and variable expenses changing proportionately with the total premium.

Experience- and Contribution-Based Pure Premiums

For a given rating territory, R , consider an individual insured by insurer h who occupies driver class i , and who purchases limit j of the bodily injury liability coverage. Let L_{hij} denote the expected loss to insurer h from this insured's policy during a specified policy period. Assume that if an insured with bodily injury liability limit j is the tortfeasor in an accident with a victim with restricted tort rights, then the tortfeasor's insurer's expected losses from the accident will be reduced by the loss elimination ratio r_j , where $0 < r_j < 1$ (e.g., if an expected loss of \$100 is reduced to \$55, then $r_j = .45$).

Note that the loss elimination ratio, r_j , depends on the tortfeasor's bodily injury liability limit, j , but not on the tortfeasor's driver class, i . This is because the restriction of the victim's tort rights reduces L_{hij} by removing a certain proportion of claims from the size-of-loss distribution, and, for a fixed rating territory, there are generally insufficient data to quantify how the shape of the size-of-loss distribution varies with the driver class of the tortfeasor. If sufficient data are available, then r_j may simply be replaced by r_{ij} in all subsequent analysis. Of course, r_j may vary across rating territories as the size-of-loss distribution varies.

Note further that r_j is actually a weighted average of two elimination ratios, one that captures the reduction in expected losses exclusive of ALAE and one that captures the reduction in expected ALAE. Because the restrictions of the victim's tort rights will primarily remove claims from the lower end of the size-of-loss distribution, and because the distribution of ALAE, which includes the legal defense costs associated with any claim, is usually less positively skewed than the distribution of losses exclusive of ALAE, it follows that the elimination ratio for expected ALAE will tend to be larger than the elimination ratio for expected losses exclusive of ALAE.

Let each victim and tortfeasor in an automobile accident that generates a bodily injury liability claim be classified as one of two types, k , where $k = T$ for private passenger automobile insureds (and their household members) bound by the tort option, and N for private passenger automobile insureds (and their household members) bound by the no-fault option. For the moment, it is assumed that victims and tortfeasors cannot be commercial automobile insureds, uninsured motorists, individuals that are neither motor vehicle operators nor insured under any automobile policy (non-operator non-insureds), or out-of-state residents. Later, these additional types will be addressed in the case of the self-determining optional no-fault system.

The experience-based pure premium for an insured of type k , L_{hijk} , is simply the weighted average of what the expected loss would be if all victims were tort electors, and what it would be if all victims were no-fault electors. Thus, for rating territory R :

$$L_{hijk} = L_{hij} \sum_{k'=T,N} \{I(k',k) + (1-r_j)[1-I(k',k)]\} p_v(k'), \quad (1)$$

where $I(\dots)$ is the indicator function such that $I(k_1, k_2) = 1$ if a victim of type k_1 has an unrestricted right to recover from a tortfeasor of type k_2 under the relevant recovery system, and 0 otherwise, and $p_v(k')$ is the proportion of victims of type k' among all victims in the given rating territory.

The contribution-based pure premium for an insured of type k , L_{hijk}^* , is determined by subtracting from L_{hij} the total expected reduction in losses contributed by the insured. Thus:

$$L_{hijk}^* = L_{hij} - \sum_{h',i',j',k'} L_{h'ij'k'} r_{j'} p_v(A) [1-I(k,k')] p_A(h',i',j',k'), \quad (2)$$

where the summation is taken over all insurers h' , driver classes i' , bodily injury liability limits j' , and types k' , $p_A(h',i',j',k')$ is the proportion of insureds with characteristics h' , i' , j' , and k' among all private passenger automobile insureds in rating territory R , and $p_v(A)$ is the proportion of victims insured under a private passenger policy among all victims in the given rating territory. Note that although Equation (2) excludes loss reductions contributed by insureds who have accidents with tortfeasors from rating territories other than territory R , this omission is offset by the inclusion of loss reductions that are actually contributed by insureds from other rating territories who have accidents with tortfeasors from territory R . Note also that because of the simplifying assumption that there are no commercial automobile insureds, no uninsured motorists, no non-operator non-insureds, and no out-of-state residents, $p_v(A)$ must equal 1.

Tables 2 and 3 present, respectively, the experience-based and contribution-based pure premiums determined by applying Equations (1) and (2) to the five automobile insurance recovery systems spanning the range from traditional tort to mandatory no-fault. For ease of exposition, the notation L_r is used to denote the weighted average of the $L_{h'ij'k'}$ over all h' , i' , j' , and k' , and $L_r^{N,N}$ to denote the weighted average of the $L_{h'ij'k'}$ over all h' , i' , and j' , for $k' = N$.

Table 2
Experience-Based Pure Premiums

	Tort Insureds	No-Fault Insureds
Traditional Tort	L_{hij}	Not Applicable
Tort Favoring	L_{hij}	$L_{hij}[1-r_j p_v(N)]$
Self-Determining	$L_{hij}[1-r_j p_v(N)]$	$L_{hij}[1-r_j p_v(N)]$
No-Fault Favoring	$L_{hij}[1-r_j p_v(N)]$	$L_{hij}(1-r_j)$
Mandatory No-Fault	Not Applicable	$L_{hij}(1-r_j)$

The expressions in Tables 2 and 3 were derived from Equations (1) and (2) by assuming that $p_v(A) = 1$, and recognizing that $I(T,T) = 1$ and

$I(N,N) = 0$ under all optional no-fault systems, $I(T,N) = 1$ under the tort favoring and self-determining systems, $I(T,N) = 0$ under the no-fault favoring system, $I(N,T) = 1$ under the tort favoring system, and $I(N,T) = 0$ under the self-determining and no-fault favoring systems.

Table 3
Contribution-Based Pure Premiums

	Tort Insureds	No-Fault Insureds
Traditional Tort	L_{hij}	Not Applicable
Tort Favoring	L_{hij}	$L_{hij} - L_r^N p_A(N)$
Self-Determining	L_{hij}	$L_{hij} - L_r$
No-Fault Favoring	$L_{hij} - L_r^N p_A(N)$	$L_{hij} - L_r$
Mandatory No-Fault	Not Applicable	$L_{hij} - L_r$

Note that only two of the entries in Table 3 are dependent on the proportion of insureds electing the no-fault option: those for no-fault insureds under the tort favoring system, and tort insureds under the no-fault favoring system. These dependencies illustrate mathematically the failures of the tort favoring and no-fault favoring systems to satisfy the rate and tort equity principles, respectively, as noted in connection with Table 1.

With respect to the tort favoring case, Table 3 shows exactly how this system fails to satisfy the rate equity principle in all cases except when $p_A(N) = 1$. For the no-fault favoring case, Table 3 shows how, because of the expected loss reductions created by tort electors restricted from seeking recovery from no-fault electors, the no-fault favoring system provides tort insureds with pure premium savings in all cases but the one in which $p_A(N) = 0$.

Assuring Rate Equity

To be truly rate equitable, an automobile insurance recovery system must base an insured's pure premiums not only upon his or her expected losses, but also upon his or her expected contributions to loss reductions for insurers. Thus, the fact that the pure premiums in Tables 2 and 3 are not identical, entry by entry, suggests that the use of experience-based rates under optional or mandatory no-fault systems may often lead to rate inequities, even in cases where the system could, in theory, satisfy the rate equity principle, according to Table 1.

Table 4 presents the differences between the contribution-based pure premiums of Table 3 and the experience-based pure premiums of Table 2, and thus reveals the extent to which the contribution-based pure premiums are higher or lower than the corresponding experience-based pure premiums. From this table, it can be seen that the contribution-based and experience-based pure premiums are identical in only two cases: for all insureds under the traditional tort system, and for tort insureds under the tort favoring optional no-fault system. It can also be seen that the difference

Table 4
Differences in Pure Premiums
(Contribution-Based Less Experience-Based)

	Tort Insureds	No-Fault Insureds
Traditional Tort	0	Not Applicable
Tort Favoring	0	$L_{hij}r_jp_v(N) - L^N r^N p_A(N)$
Self-Determining	$L_{hij}r_jp_v(N)$	$L_{hij}r_jp_v(N) - L_r$
No-Fault Favoring	$L_{hij}r_jp_v(N) - L^N r^N p_A(N)$	$L_{hij}r_j - L_r$
Mandatory No-Fault	Not Applicable	$L_{hij}r_j - L_r$

between the contribution-based pure premium and the experience-based pure premium is always positive for tort insureds under the self-determining system. The other entries in Table 4 may be positive in some cases and negative in others, depending on the insured's driver class, i , and bodily injury liability limit, j . Because L_r is the weighted average of the $L_{hij}r_j$ over all h , i , j , and k , and $p_v(N) = p_A(N)$ under the assumption that all victims are insured under a private passenger automobile policy, it follows that, if $L^N r^N$ is approximately equal to L_r , then all but one of the remaining entries will be close to 0 on the average. In the case of no-fault insureds under the self-determining system, the difference will tend to be negative as long as $p_v(N) < 1$.

The fact that the experience-based pure premiums are sometimes greater than the contribution-based pure premiums for all but the traditional tort system demonstrates that no mandatory or optional no-fault system that uses pure premiums based solely upon an insured's expected losses can ever truly satisfy the rate equity principle. This is because some insureds will have their tort rights restricted in return for less of a premium reduction than that to which they are entitled.

In practice, the rate inequities created by the effect of some consumers purchasing higher (or lower) bodily injury liability limits than others may not be very significant, because the increase (decrease) in L_{hij} brought about by a higher (lower) limit purchased may be canceled out by the concomitant decrease (increase) in r_j . Thus, with respect to the index j , the product $L_{hij}r_j$ may be relatively constant. However, the effect of the driver class, i , on the rate inequities may be dramatic, because the application of driver class factors can, in some cases, make the base pure premium, L , three or more times as great as L_{hij} . Therefore, for insureds in the lower-rated driver classes, the experience-based pure premiums used under the optional no-fault system in Kentucky and the mandatory no-fault systems in Massachusetts, Florida, Connecticut, Michigan, and other jurisdictions, are clearly excessive. This is true even though Kentucky's tort favoring system could, in theory, be rate equitable with its large proportion of no-fault insureds, and even though these other systems could theoretically be rate equitable with their mandatory thresholds.

The Self-Determining System

In an earlier section, it was noted that only one automobile insurance recovery system, the self-determining form of optional no-fault used in New Jersey and Pennsylvania, is able to satisfy both the tort and rate equity principles in all cases. Later, it was noted that in optional and mandatory no-fault systems that could, in theory, satisfy the rate equity principle, the use of experience-based rates, in practice, violates that principle. This section examines various details of how both tort equity and rate equity can practically be achieved through the use of the self-determining optional no-fault system with contribution-based pure premiums.

Insurer Imbalances

Up to this point, the discussion of pure premiums has largely been from the insured's point of view: now, the necessary balance between projected losses and contribution-based pure premiums will be considered from the insurer's perspective. Previously, it was observed that no-fault electors, as less litigious individuals, provide reductions in expected losses that are spread across all insurers. Thus, to justify reducing the premium of a specific no-fault insured, there must be some mechanism to make sure that the insured's own insurer is compensated properly. The question that will now be addressed is whether this mechanism can be implemented separately within each insurer's own accounts, or whether it must operate on a systemwide basis.

To be as precise as possible with respect to the balance between the losses expected to be sustained by insurers and the contribution-based pure premiums charged, the universe of potential victims and tortfeasors will now be expanded beyond those employed in the previous section. Specifically, four categories of victims or tortfeasors will be added to the two types used before, so that a victim or tortfeasor can have one of six types, k , where $k = T$ for private passenger automobile insureds (and their household members) bound by the tort option, N for private passenger automobile insureds (and their household members) bound by the no-fault option, C for commercial automobile insureds, U for uninsured motorists, W for non-operator non-insureds, and F for out-of-state residents.

To simplify Equations (1) and (2), the indicator function $I(\dots)$ implied by Pennsylvania's *Act 6* will be used. Under *Act 6*, only private passenger insureds are offered the tort and no-fault options, no-fault electors have an unrestricted right to recover only from uninsured motorists (but not from the uninsured motorist coverage) and out-of-state motorists, and uninsured motorists have the same tort restrictions as no-fault electors. Thus, $I(N,T) = I(N,N) = I(N,C) = I(N,W) = I(U,T) = I(U,N) = I(U,C) = I(U,W) = 0$, and $I(k,k') = 1$ for all other choices of k and k' . Table 5 presents both the experience- and contribution-based pure premiums for both tort and no-fault insureds, obtained by substituting this indicator function into Equations (1) and (2).

Table 5
Self-Determining Optional No-Fault
Pure Premiums

	Experience-Based	Contribution-Based
Tort Insureds	$L_{hij}\{1-r_j[p_v(N)+p_v(U)]\}$	L_{hij}
No-Fault Insureds	$L_{hij}\{1-r_j[p_v(N)+p_v(U)]\}$	$L_{hij} - Lrp_v(A)$

Consider insurer h 's expected losses for rating territory R for the specified policy period:

$$\begin{aligned}
 L_h &= \sum_{i, j, k} L_{hijk} n_{hijk} \\
 &= \sum_{i, j} L_{hij} \{1-r_j[p_v(N)+p_v(U)]\} n_{hij}, \quad (3)
 \end{aligned}$$

where n_{hijk} is the number of private passenger automobile insureds with characteristics h, i, j , and k in the given rating territory, and $n_{hij} = \sum_k n_{hijk}$ over k . At the same time that it expects to incur these losses, the insurer will, if it charges the contribution-based pure premiums of Table 5, collect pure premiums for rating territory R equal to

$$\begin{aligned}
 L^*_h &= \sum_{i, j, k} L^*_{hijk} n_{hijk} \\
 &= \sum_{i, j} [L_{hij} n_{hij} - Lrp_v(A) n_{hijN}]. \quad (4)
 \end{aligned}$$

As long as L^*_h is approximately equal to L_h , insurer h 's inflows and outflows of funds will be in balance for the given rating territory. However, if L^*_h falls short of L_h , then insurer h will not collect sufficient pure premiums to cover its losses, and if L^*_h exceeds L_h , then the insurer will collect excessive pure premiums. To see how these situations may occur, consider the difference between the two quantities, L^*_h and L_h :

$$L^*_h - L_h = \{L^{hrh}[p_v(N)+p_v(U)] - Lrp_v(A)p_h(N)\}n_h, \quad (5)$$

where L^{hrh} denotes the weighted average of the $L_{hij}r_j$ over all i, j , and k , $p_h(N)$ is the proportion of no-fault insureds among insurer h 's private passenger automobile insureds in rating territory R , and $n_h = \sum_{i, j} n_{hij}$ over i and j . (The algebraic derivations of Equation (5) and all subsequent equations are provided in the appendix.)

Summing the differences $L^*_h - L_h$ over all insurers, h , it can be shown that

$$\sum_h (L^*_h - L_h) = Lrp_v(U)n, \quad (6)$$

where $n = \sum n_h$ over h . Because the expression in Equation (6) is positive, it follows that, if insureds pay the contribution-based pure premiums identified in Table 5, then, for rating territory R , insurers will collectively receive a net gain from the optional no-fault system.

To eliminate this windfall to the insurance industry, one could simply require that the contribution-based pure premium for no-fault insureds in Table 5 be reduced by $Lr p_v(U)/p_A(N)$, one no-fault insured's share of the savings created by restricting the tort rights of uninsured motorists. This yields a pure premium of

$$L'_{hijN} = L_{hij} - Lr[p_v(N) - p_v(U)]/p_A(N) . \quad (7)$$

Using this pure premium for no-fault insureds, it can be shown that

$$L^*_{h} - L_h = \{L^{hrh} - Lr[p_h(N)/p_A(N)]\}[p_v(N) + p_v(U)]n_h . \quad (8)$$

and

$$\sum_h (L^*_{h} - L_h) = 0 . \quad (9)$$

Thus, for rating territory R , the inflows and outflows of funds are exactly in balance.

From Equation (8), it is clear that even though the system may be in balance in the aggregate, it is possible for an individual insurer's inflows and outflows to be seriously out of balance. For example, Equation (8) reveals that $L^*_{h} - L_h$ is positive when $p_h(N) < p_A(N)$ and $L^{hrh} > Lr$, and negative when $p_h(N) > p_A(N)$ and $L^{hrh} < Lr$. Thus, if insurer h writes a disproportionately large share of insureds that make the no-fault election (so that $p_h(N)$ is significantly greater than $p_A(N)$), and if the insurer writes a disproportionately large share of insureds in lower-rated driver classes (so that L^{hrh} is significantly less than Lr), then the difference $L^*_{h} - L_h$ may be substantially negative.

Even when an insurer's funds are not out of balance, there is still a potential problem in that the insurer will find it financially advantageous, at the margin, to write insurance for tort insureds, and disadvantageous to write insurance for no-fault insureds. This is because, as can be seen from Table 5, the contribution-based pure premium of a tort insured is always greater than the experience-based pure premium; whereas the contribution-based pure premium of a no-fault insured tends to be less than the experience-based pure premium. Thus, the increase in expected losses associated with an additional tort insured is more than compensated by the tort insured's contribution-based pure premium, whereas the opposite is true for a no-fault insured. This phenomenon explains why $L^*_{h} - L_h$ is greater when $p_h(N) < p_A(N)$, and less when $p_h(N) > p_A(N)$.

Balancing Methods

There are two principal approaches to addressing the issues of insurer fund imbalances and disincentives for insurers to write no-fault insureds: the escrow method and the risk exchange method.

In Pennsylvania, *Act 6* employs the escrow method to resolve both of these problems by requiring that insurers set aside, up front, the total amount of expected loss reductions for rating territory R from the optional no-fault system, and then return these savings to their no-fault insureds in the same rating territory. Although this redistribution mechanism will not actually be implemented until the second year under the new law, it could potentially operate in much the same way as a policyowner dividend program: that is, the amount of the premium savings to be given to each no-fault insured would depend on the insurer's actual proportion of no-fault insureds in rating territory R, and would be awarded at the end of the policy period.

In effect, employing the escrow method means that the contribution-based pure premium for no-fault insureds presented in Table 5 is replaced by the following expression:

$$L_{hijN}^{**} = L_{hij} - L^h r^h [p_v(N) + p_v(U)] / p_h(N) . \quad (10)$$

It then follows that

$$L_h^{**} - L_h = 0 . \quad (11)$$

The escrow method thus protects an insurer from the potential fund imbalances discussed above by making the total pure premium savings provided to the insurer's no-fault insureds in rating territory R no greater than the total expected loss reductions experienced by the insurer for this rating territory. This method also eliminates an insurer's incentive to write tort insureds instead of no-fault insureds by forcing the insurer to identify, prior to the policy period, the total number of dollars it will return to no-fault insureds through reduced premiums, so that the writing of one additional no-fault insured will only lower the average amount of premium savings provided to no-fault insureds, and will have no adverse impact on the insurer. While this mechanism may result in some no-fault insureds paying more than their contribution-based pure premium (as expressed in Table 5), such differences should be very slight, because the pure premium in Equation (10) is reduced to account for the expected loss reductions created by restricting the tort rights of uninsured motorists, whereas the pure premium in Table 5 is not.

Another approach to the potential problems of fund imbalances and improper underwriting incentives is the creation of a risk exchange, such as New Jersey's Automobile Insurance Risk Exchange (AIRE), to redistribute

premiums and expected losses so that insurers return all of the savings realized from the optional no-fault system to the no-fault insureds who create the savings. Although there are doubtlessly many different ways that this type of mechanism could be structured, its essential purpose is to collect L_h^* in pure premiums from insurer h for rating territory R , and return L_h . The overall fund balance of the risk exchange for this rating territory is thus equal to the sum of the $L_h^* - L_h$ over all insurers h . From Equation (9), it is known that this sum is exactly 0, and so the risk exchange will always achieve an exact balance of inflows and outflows. It can also be seen that the existence of a risk exchange removes an insurer's incentive to prefer tort insureds to no-fault insureds by compensating the insurer exactly for the risk of writing either type.

Conclusions

In this article, two fundamental equity principles—the tort equity principle and the rate equity principle—have been used to evaluate and justify optional no-fault systems. It has been shown that only one type of optional no-fault system—the self-determining system implemented in New Jersey and Pennsylvania—can always satisfy both of these equity principles simultaneously, and that to be truly rate equitable, an automobile insurance recovery system must require that contribution-based pure premiums, rather than experience-based pure premiums, be employed.

A detailed examination of the self-determining optional no-fault system reveals that insurer fund imbalances and disincentives for writing no-fault insureds may occur without some sort of mechanism to eliminate these potential problems. Two such mechanisms are the escrow method, to be used in Pennsylvania, and the risk exchange method, currently used in New Jersey. Both of these approaches are able to eliminate satisfactorily the problems of insurer fund imbalances and improper underwriting incentives, to achieve a thoroughly equitable system.

Appendix

Derivations of Equations (5) through (11) from the text are provided below:

Equation (5)

$$\begin{aligned} L^*_{h} - L_h &= \sum_{i,j} \{L_{hij}r_j[p_v(N)+p_v(U)]n_{hij} - Lrp_v(A)n_{hijN}\} \\ &= L^{hrh}[p_v(N)+p_v(U)]n_h - Lrp_v(A)p_h(N)n_h \\ &= \{L^{hrh}[p_v(N)+p_v(U)] - Lrp_v(A)p_h(N)\}n_h . \end{aligned}$$

Equation (6)

$$\begin{aligned} \sum_h (L^*_{h} - L_h) &= \sum_h \{L^{hrh}[p_v(N)+p_v(U)] - Lrp_v(A)p_h(N)\}n_h \\ &= Lr[p_v(N)+p_v(U)]n - Lrp_v(A)p_A(N)n \\ &= Lr[p_v(N)+p_v(U)]n - Lrp_v(N)n \\ &= Lrp_v(U)n . \end{aligned}$$

Equation (7)

$$\begin{aligned} L^*_{hijN} &= L_{hij} - Lrp_v(A) - Lrp_v(U)/p_A(N) \\ &= L_{hij} - Lrp_v(N)/p_A(N) - Lrp_v(U)/p_A(N) \\ &= L_{hij} - Lr[p_v(N)+p_v(U)]/p_A(N) . \end{aligned}$$

Equation (8)

$$\begin{aligned} L^*_{h} - L_h &= \sum_{i,j} \{L_{hij}r_j[p_v(N)+p_v(U)]n_{hij} - [Lr[p_v(N)+p_v(U)]/p_A(N)]n_{hijN}\} \\ &= L^{hrh}[p_v(N)+p_v(U)]n_h - Lr[p_v(N)+p_v(U)][p_h(N)/p_A(N)]n_h \\ &= \{L^{hrh} - Lr[p_h(N)/p_A(N)]\}[p_v(N)+p_v(U)]n_h . \end{aligned}$$

Equation (9)

$$\begin{aligned} \sum_h (L^*_{h} - L_h) &= \sum_h \{L^{hrh} - Lr[p_h(N)/p_A(N)]\}[p_v(N)+p_v(U)]n_h \\ &= Lr[p_v(N)+p_v(U)]n - Lr[p_v(N)+p_v(U)]n \\ &= 0 . \end{aligned}$$

Equation (10)

$$\begin{aligned}
 L_{hijN}^{*''} &= L_{hij} - \left\{ 1/[p_h(N)n_h] \right\} \sum_{i',j'} L_{hi'j'} r_{j'} [p_v(N)+p_v(U)]n_{hi'j'} \\
 &= L_{hij} - L^{hrh}[p_v(N)+p_v(U)]n_h/[p_h(N)n_h] \\
 &= L_{hij} - L^{hrh}[p_v(N)+p_v(U)]/p_h(N) .
 \end{aligned}$$

Equation (11)

$$\begin{aligned}
 L_h^{*''} - L_h &= \sum_{i,j} \left\{ L_{hij} r_j [p_v(N)+p_v(U)]n_{hij} - [L^{hrh}[p_v(N)+p_v(U)]/p_h(N)]n_{hijN} \right\} \\
 &= L^{hrh}[p_v(N)+p_v(U)]n_h - L^{hrh}[p_v(N)+p_v(U)]n_h \\
 &= 0 .
 \end{aligned}$$

References

- All-Industry Research Advisory Council, 1989. *Compensation for Automobile Injuries in the United States*, Oak Brook, Illinois: AIRAC.
- A. M. Best Company, 1990. Average Auto Premiums By State—1988. *Best's Insurance Management Reports (Property/Casualty)*, Release No. 4.
- Hammitt, James K., 1985, *Automobile Accident Compensation, Volume II: Payments by Auto Insurers*, Santa Monica, CA: RAND Corporation, Institute for Civil Justice.
- Insurance Services Office and National Association of Independent Insurers, 1988. *Factors Affecting Urban Insurance Costs*, New York: ISO and NAII.
- Keeton, Robert E., and Jeffrey O'Connell, 1965. *Basic Protection for the Traffic Victim*, Boston, MA: Little, Brown.
- O'Connell, Jeffrey, and Robert H. Joost, 1986. Giving Motorists a Choice between Fault and No-Fault Insurance, *Virginia Law Review*, 72, 61-89.
- Rolph, John E., 1985, *Automobile Accident Compensation, Volume I: Who Pays How Much How Soon?*, Santa Monica, CA: RAND Corporation, Institute for Civil Justice.
- Smith, Brian W., 1989. Reexamining the Cost Benefits of No-Fault. *CPCU Journal*, March, 1989.
- United States Department of Transportation, 1985. *Compensating Auto Accident Victims: A Follow-Up Report on No-Fault Auto Insurance Experiences*, Washington, DC: Government Printing Office.

Copyright of Journal of Risk & Insurance is the property of Blackwell Publishing Limited and its 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.