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FOCUS ON AUTO INSURANCE

EDITOR'S INTRODUCTION

AUTOMOBILE INSURANCE: THE "MODAL" PROPERTY-LIABILITY LINE

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REGARDING THE MODE

In any series of introductory statistics lectures, there invariably comes a time when the instructor must introduce the three most commonly used measures of "location" or "central tendency": the *mean*, the *median*, and the *mode*. Often, students are treated to a brief mathematical definition of each measure, followed by at least a heuristic explanation of why each measure is important and when it is likely to be used in practice. If all goes as planned, the students are left with the impression that the mean, the median, and the mode are three different ways of characterizing the "typical" or "representative" value of a random variable.

But is it reasonable to give students the idea that the mode is truly *typical* or *representative*? After all, the mode (while possibly non-unique) is the value of the sample space that is most commonly attained. Isn't that *commonness*, in and of itself, something special that necessarily causes the mode to be both *atypical* and *unrepresentative*?[1]

Clearly, similar arguments could also be attempted for the mean and the median. For example, one could argue that the mean is atypical and unrepresentative because of the special "balancing" property of the first moment, and that the median is atypical and unrepresentative because of the special "half-way" property of the 50th percentile. However, these "balancing" and "half-way" properties—while admittedly *special*—seem to be just the sorts of characteristics that one would want for a typical or representative value of a random variable. In fact, it is because of these properties that both the mean and the median always appear somewhere in the "middle" of the sample space for continuous distributions—something that cannot be said of the mode.

Interestingly, it is precisely this "middling" characteristic of the mean and the median that prevents these measures from being generalized to categorical data. We know, for example, that the mean of Urn *A* and Urn *C* is *not* Urn *B*; likewise, the median of New Jersey and Ohio is *not* Pennsylvania. However, we clearly can extend

[1] One is reminded of the "smallest uninteresting integer" problem: There can be no "smallest uninteresting integer" (and, consequently, there can be no "uninteresting" integers at all), because the property of being the "smallest uninteresting integer" would, in and of itself, be an "interesting" property.

the mode to categorical data (at our own risk, of course), using it to identify which category is the most typical or representative. This flexible property of the mode permits us to look at the market share data displayed in Table 1 and conclude that private passenger automobile insurance (liability and physical damage combined) is the "modal" property-liability line in the United States, comprising more than 41 percent of premiums.[2]

TABLE 1
The U.S. Property-Liability Market: Net Written Premiums by Line of Business, 1999

Line of Business	1999 Premiums (in $000s)	Percentage of Total Market
Auto liability, private passenger	69,601,124	24.25
Auto physical damage, private passenger	48,991,489	17.07
Auto liability, commercial	12,828,784	4.47
Auto physical damage, commercial	5,286,163	1.84
Workers compensation	22,183,616	7.73
Medical malpractice	5,104,147	1.78
Other liability	18,764,852	6.54
Homeowners multiple peril	30,646,068	10.68
Commercial multiple peril	18,938,207	6.60
Farmowners multiple peril	1,460,267	0.51
Fire, allied lines, and earthquake	8,849,314	3.09
Inland marine	5,987,785	2.09
Ocean marine	1,715,570	0.60
Surety and fidelity	5,290,396	1.85
Accident and health	11,052,095	3.85
Other lines	20,256,994	7.05
Total	286,956,868	100.00

Source: A.M. Best Company, Inc., *Best's Aggregates and Averages, Property-Casualty*, 2000 Edition, pp. 291-294.

AUTOMOBILE INSURANCE: CANONICAL . . .

Given the premium breakdown of Table 1, it is not surprising that both academics and practitioners often (either consciously or unconsciously) view private passenger automobile insurance as the typical or representative property-liability line. Perhaps this is most natural in the context of actuarial ratemaking, where the body of property-casualty actuaries, taken as a whole, may well dedicate more than 41 percent of

[2] By rough comparison, note that Lawrence (2001, in this journal) indicates that total automobile insurance premiums (for *both* private passenger and commercial lines, combined) account for as much as 60 percent of the property-liability market in Thailand.

its collective efforts to private passenger automobile insurance (because of the high degree of regulatory interest in this line).

In a very real sense, private passenger automobile insurance has historically been the "canonical" line of business for the development and illustration of ratemaking principles. A casual browsing of older volumes of the *Proceedings of the Casualty Actuarial Society* provides ample evidence of the primary importance of this line in the development of sophisticated actuarial methods for loss development, trending, classification rating, and—in more recent years—profitability measures and standards.[3]

This "canonical" status is not without substantive merit. Automobile insurance straddles the major disparate areas of the property-liability market: property insurance (through the collision and comprehensive coverages), liability insurance (through the bodily injury and property damage liability coverages), medical insurance (through the personal injury protection coverage), and wage-loss indemnity benefits (again through the personal injury protection coverage).

. . . Yet Anomalous

Returning to the original concerns about the mode, one could reasonably ask: Are there certain aspects of private passenger automobile insurance—the "modal" property-liability line—that are associated with its commonness, but actually make it atypical and unrepresentative?

The answer would seem to be "Yes"—there are indeed several characteristics that make automobile insurance "anomalous" among the property-liability lines:

(1) *It is the unique mandatory personal line.* Drivers in jurisdictions with compulsory private passenger automobile insurance are generally the only *personal lines* policyholders required by law to make an insurance purchase. Other mandatory lines of insurance (e.g., workers compensation and medical malpractice) apply primarily to commercial policyholders.

(2) *The direction of asymmetric information is sometimes reversed*. Unlike insurers in most other property-liability lines (and in most other *insurance* lines, for that matter), automobile insurers sometimes possess a better ability to forecast the losses associated with an individual policyholder than does the policyholder himself or herself. This is because a driver's demographic information is frequently more useful in predicting outcomes than are the driver's complete driving record and other (often private) information.

(3) *The tortfeasors are non-commercial policyholders.* Unlike other liability lines, all tortfeasors (i.e., parties causing personal injury and property damage) covered by private passenger automobile policies are individual, non-commercial drivers. This means that personal injury litigation associated with private passenger automobile insurance serves little or no social purpose in terms of modifying the risky behavior of major market players (as it might in the product, environ-

[3] To the Casualty Actuarial Society's great credit, its ratemaking examination syllabus has always allocated a substantial portion of readings specifically to non-automobile lines, including workers compensation, homeowners, and various liability coverages.

mental, and professional liability lines). At least conceptually, this provides some economic support for no-fault and other automobile tort reform efforts (see Miller, 2001, in this journal).

To tie the preceding observations more closely to our earlier discussion of the mode, it is useful to point out that Item (1) above is the root cause for the "modal" nature of private passenger automobile insurance. In other words, it is because private passenger automobile insurance is the uniquely mandated personal line that it enjoys such an unusually large premium volume. Item (2) follows from (1) because of the magnitude (and information content) of the exposure base involved; Item (3) follows because of the personal lines nature of the coverage.

This Issue of the *RMIR*

For the Spring 2001 issue of the *Risk Management and Insurance Review*, my co-editor and I have included two timely articles on automobile insurance outside the United States. In the first piece, Brian Lawrence provides an overview of current issues and developments in the rapidly changing Thai automobile insurance market. In the second piece, Shelley Miller describes a novel approach to regulatory decision making that was carried out by the government of New South Wales, Australia, in 1999. We anticipate that the *RMIR*'s readers will find these articles interesting from both practical and scholarly perspectives. Naturally, we also hope that the articles will be found suitably *à la mode*.