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Risk Classification in Life Insurance

5 FAIRNESS IN RISK CLASSIFICATION

Earlier chapters have discussed the economic rationale for risk classification, focusing on how this process contributes to the solvency of the insurance company and preserves the availability of insurance by reducing anti-selection. This chapter considers the charge that some aspects of the risk classification process are unfair. Since fairness is often in the eye of the beholder, it is necessary to begin by considering some of the different ways that fairness has been defined. These definitions then are analyzed from the point of view of meaningfulness, desirability, and attainability within the present organization of the insurance industry.

Advocates of the traditional risk classification system claim that expected-value pricing is the *only* fair pricing system. This is because risks with similar expected losses are charged the same rate, and, more important, because risks with different expected losses are charged precisely these losses (ignoring loading). Although this argument has some merit, it overlooks two fundamental points. First, traditional risk classification may be unsuccessful in correctly determining the expected loss of a particular risk. Second, other criteria of fairness, such as availability of coverage, are just as worthy of consideration. These points are taken up in turn in the following sections.

Heterogeneity

The traditional definition of fairness stresses that rates are fair when each risk is charged its expected loss. If risk classification results in heterogeneous classes, then many risks charged the expected loss of the class (or "class average") are not charged their own expected loss. This concept has played an important role in the controversy about sex discrimination in pensions. Justice Stevens wrote in *Manhart* that the civil rights laws require "that we focus on fairness to individuals rather than on fairness to classes." He also noted that "even a true generalization about a class is insufficient reason for disqualifying an individual to whom the generalization does not apply."[1]

Determining whether or not a group of risks is heterogeneous is extremely difficult. In some cases, general reasoning is sufficient. For example, it seems reasonable that in a large group of pensioners of either sex, some will be less healthy than others, and thus significant variations in both the time of death and annuity loss distributions will occur. On the other hand, relatively sophisticated mathematical models such as those considered in chapter 4 may be used to estimate the parameters of the loss distributions, making it possible to quantify the degree of heterogeneity.

Two arguments often presented are clearly insufficient to answer the heterogeneity question. The overlap theory incorrectly identifies the expected loss of the risk with the actual loss experience of the risk. Hence, the argument that classes are heterogeneous because loss experience varies widely within classes is invalid.[2] On the other hand, the fact that two classes have differing loss experience does not imply that the classes are homogeneous. Supporters of the traditional system sometimes make this inference.[3]

Heterogeneity can be demonstrated after the fact if the introduction of another rating variable into the classification system leads to diverse experience in subgroups of the original class. For example, the State Mutual Life Assurance Company found wide variation in mortality between policies issued to smokers and nonsmokers.[4] This finding indicates that the classes formerly considered homogeneous, consisting of medically examined standard risks of given sex and age, did not consist of risks with similar expected losses. Of course, the classes probably retain some heterogeneity even after the introduction of smoking as a classification variable. As the actuaries for State Mutual admit, the smoker class contains heterogeneous risks with respect to smoking habits that potentially affect mortality.[5]

Homogeneity is an important assumption of the traditional pricing system. Some modification of the classification system may be called for if this assumption is violated. There are at least four ways of dealing with potential

heterogeneity, each of which has different consequences and may be appropriate in different situations.

First, no action may be needed because the charge of heterogeneity may not be justified. The argument of chapter 4, for example, claimed that female annuity costs were heterogeneous because of (1) the logistic shape of the force of mortality curve and (2) a theory of Beard that interpreted this result as arising from heterogeneous Gompertz mortality curves for each individual. In this case, the argument could be opposed by claiming that the logistic curve does not fit the data well enough, or by formulating an alternative theory to explain why a homogeneous class of risks would have a logistic force-of-mortality curve.

Second, a more refined system of classification and assessment can be developed that substantially reduces heterogeneity by taking additional (or different) factors into account. A multivariate statistical model is often necessary in such procedures because the many classes that result have insufficient data to give statistically credible results. Chapters 14 and 15 propose such a model for life insurance classification.

Third, the heterogeneity of the original classes can be measured and prices based on some criterion other than expected value. This process, called *tempering*, has the effect of minimizing some weighted function of mischarges resulting from the heterogeneity.[6] Although the idea of tempering does not seem to have gained wide acceptance, it is very similar to the idea of giving partial credibility to small classes. In the latter case, the class expected value is mixed with the population expected value to compute the premium because the small class does not generate enough data to allow statistical confidence in a rate based on class experience alone. In the former case, similar mixing takes place to reflect the possibility that a particular risk is being inappropriately priced (in terms of the true expected value) by being charged the expected value of its heterogeneous risk class.

Fourth, the classification can be eliminated by voluntary action or regulation, as has happened with respect to race in life insurance and seems to be happening with respect to sex in private pension plans. Chapter 7 reports on actions by state insurance regulators to place similar restrictions on classification with respect to various impairments. As discussed in chapter 3, regulatory intervention may be necessary to prevent market failure if classification is seriously curtailed.

Causality

Some risk classification factors, such as sex in life insurance or age in automobile insurance, appear to be appropriate because the average loss

varies greatly from class to class. Critics contend, however, that this loss experience occurs because the classification factor is highly correlated with some other variable, which is the true cause of the difference in loss experience. In this case, the classification variable is said to be a *proxy* or *surrogate* for another variable that may be difficult or expensive to measure. For example, it is often suggested that differing mortality by sex is explained by variations in smoking habits, occupation, competitive behavior, and other lifestyle characteristics.[7]

The causality criticism and the heterogeneity criticism are connected. Heterogeneity may arise through the use of a classification variable that is a proxy for some other variable, and resulting risk classes may be heterogeneous because of the distribution of this second variable. The heterogeneity argument says that the class average is unfair because it is not the true expected value for many risks in the class. The causality argument goes further, saying that the classification variable is improper because it assigns to the class some risks characterized by the proxy but not by the causal variable.

This argument, which is open to debate, assumes that of the variables statistically related to loss, some can be shown to be causal and some cannot. For this criticism to have any meaning, the concept of a cause-and-effect relationship between two variables must be defined. This issue has long been controversial in probability theory. Ian Hacking argues that philosophical opinion regarding the relationship of causality to probability has undergone a significant evolution.[8]

Originally, causes were thought necessarily to imply their effects. Laplace, in 1795, wrote that "probability is relative in part to this ignorance [of exact causes], in part to our knowledge."[9] This idea resolved the conflict between the Newtonian view of the world as deterministic, with events necessarily determined by prior events, and the statistical view of the world, where some events such as mortality could be predicted only in the aggregate. In Laplace's view, whether or not a given person dies in the next year is completely predictable in theory: Only the practical inability to measure and bring into calculation all possible characteristics of the person makes the prediction impossible to practice. A more prosaic example, that of a coin flip, is also deterministic; only the impossibility of precisely measuring air currents, the initial position of the coin, and its impetus prevents a prediction of the outcome.

The modern notion of probability holds that some processes are fundamentally random; that is, they can be meaningfully described only by using probabilities of outcomes. Although the result of flipping a fair coin is a dynamical problem, the model for the outcomes (equal probabilities of one-

half of heads or tails) ignores dynamics.[10] In the same way, science does not even theoretically presume to predict the time of death of any individual within a year; rather, it predicts the number who will die out of a large group. In this view of things, causes are conditions that tend to increase probabilities of events. In opposition to the old notion, causes do not necessarily bring about events. The only basis for the observation of the cause is statistical. For example, the modern view is that smoking does not necessarily cause premature death; the only evidence of the danger of smoking is the statistical relationship among smoking, various morbid conditions, and elevated age-specific death rates.

Consequently, according to Hacking, causality now has a probabilistic expression. Paradoxically, theoretical statistics is silent on the idea of cause and effect. The mere fact that two variables are highly correlated does not indicate which variable is the cause, which is the effect, whether they both are caused by a third variable, or whether no causal relationship exists at all.

The causality objection to a risk classification factor seems to depend on the Laplacian notion of probability as a substitute for deterministic predictions. This notion is inconsistent with the standard of causality demanded of most modern scientific research. A scientific argument for the existence of a causal connection requires a theory or model about the relationship of variables together with statistical evidence supporting the theory. Incorrect theories can be supported by spurious statistical results. Whereas two variables in a time series may be highly correlated, a model that implies a cause-and-effect relationship is not necessarily supported by these statistics. Both variables could, for instance, simply grow with time. As another example, the authors of the State Mutual study on smoking and insured lives conceded that the apparent statistical evidence supporting the theory that smoking causes elevated mortality is open to attack because their study did not simultaneously control for all other possible causal variables. They conclude, however, that smoking is nevertheless a useful variable for estimating life insurance costs.[11]

The causality objection in its strictest form, that a cause-and-effect relationship must be proven, is stringent enough to oppose almost any rating variable. The requirement should be restated to say that rating variables should be based on reasonable theories supported by adequate statistics. For example, sex-based insurance and annuity rates are supported by massive statistical evidence, but, until recently, there have been few attempts to find a theoretical model stating that sex, rather than a set of variables for which sex is a proxy, is the cause of the mortality differential.[12] On the other hand, the charging of higher life insurance rates to applicants with various impairments is often based on theories founded on insufficient statistical evidence.

Controllability

Another criticism of certain classification variables is that only variables within the control of the risk should be used. The apparent rationale for this criticism is that only by using such variables does the risk have a chance to reduce the cost of insurance through voluntary action. Another rationale for the use of controllable risk factors is to provide economic incentives for risks to engage in behavior that will reduce claims.

The use of controllable factors can have undesirable as well as desirable effects, as when the system encourages the applicant merely to improve measurable underwriting characteristics without any real improvement in the loss probability. For example, that applicants can "prepare" for blood pressure examinations is well known. Thus controllability may be desirable but should not be used to disqualify an otherwise acceptable classification factor. Instead of using controllability as an absolute standard to be met by all classification factors, as some have done, a more reasonable position is to give preference to controllable over uncontrollable factors for which predictive accuracy is approximately equal.

Necessity

Another definition of fairness holds that a classification factor is unfair if it results in the refusal to issue (or offers to issue only at prohibitive rates) coverages such as medical expense insurance or automobile insurance that are felt to be necessary for basic functioning in society. It is predictable that the private insurance market will find certain risks uninsurable. The simplest example is an insurer's refusal to issue life insurance to someone with a terminal medical condition.

Social insurance, a traditional remedy for such problems, stems from a political decision to make available particular coverages unavailable in the private market. (Other remedies, such as mandated private coverage through FAIR plans or assigned risk plans, are not yet significant in life insurance.)[13] Social insurance is characterized administratively by a high degree of government intervention. More significantly, it is characterized by involuntary participation and by individual premiums or contributions that are not determined to equal the expected cost of benefits for the participant.[14] In summary, social insurance sacrifices the traditional notions of fairness (that each risk is charged its expected loss) to a social notion of fairness (that each risk receives equal protection at an equal cost).

Defenders of traditional risk classification tend to present these two notions of fairness—equity (traditional) and equality (social)—as diametrically opposed. In the U.S. Social Security System (OASDHI) both aspects are present. While contributions are not actuarially equal to benefits, the level of benefits is related to the level of contributions. The institution of group insurance provides another example that these notions are not incompatible. Group insurance plans (including plans self-insured by employers) provide life, health, and annuity coverages to employees and their families in ways resembling both private and social insurance.[15] Participation is often involuntary, and employee contributions, if made at all, may not be actuarially related to benefits. Of course, the relationship between the employer and the insurer is subject to highly competitive market forces. Nevertheless, similarities exist between group underwriting and social insurance: Even the most impaired lives are covered if the group is large enough to spread the risk. One justification for nondiscrimination decisions in pension plans, such as the *Manhart* decision, is the social insurance nature of involuntary, contributory pension schemes.[16]

It is worth noting that the adverse selection problems discussed in chapter 3 are still present in group insurance, but they are dealt with differently than in the individual market. Thus, low risks cannot be attracted away from the group by lower rates both because the expense loading on individual policies is higher and because group coverage often is involuntary. In addition, high risks generally cannot buy more coverage than low risks because coverage amounts are set by formula for all participants or because benefit discretion is present but in only a limited form.

Insurance companies can respond to pressures for equality in rates and coverage by noting that they are in fact private insurers, subject to the forces of the market, rather than government entities. Nevertheless, at least in the fields of medical expense insurance and pensions, certain groups of citizens are demanding greater government intervention. Insurance industry contentions that universal and adequate coverage is an impossibility in the private market simply add strength to these demands.

Political Considerations

The use of certain classification variables constitutes illegal discrimination, that is, discrimination the courts have held to be in violation of various statutes or the Constitution. The definition of illegal discrimination is not fixed. Classification variables that can be successfully challenged in some

localities and contexts, but not in others, are sex, age, sexual preference, and existence of particular handicaps or impairments.

Either universal or limited restriction of a classification factor leads to market interference if that classification factor (1) has some correlation with the amount of loss and (2) cannot be replaced by some other classification factors that convey the same information. Critics often argue that the classification variable being challenged is only a proxy for some other variable. For example, race was held to be a proxy for various socioeconomic variables, providing the rationale for its elimination as a classification factor. Similarly, some consider gender to be a proxy for lifestyle or occupational exposure variables.

The political elimination of a classification variable should not be conditional on its being shown to be a proxy. As was pointed out in the section on causality, whether one of two correlated variables can be ascertained as a cause is highly questionable. Of course, the existence of a highly correlated variable that is politically acceptable will reduce the market effects of eliminating the unacceptable variable. Nevertheless, the fundamental decision should be based on a social determination that a particular sort of discrimination is repugnant. Having made that decision, society should be willing to accept the increased cost of market inefficiency or regulation.

Summary and Conclusions

Any argument about the fairness of a classification system or the use of a particular variable in this system must make explicit which criterion of fairness is being used. The argument may center on the heterogeneity of the resulting classes, that is, that the classification system may significantly misprice certain individuals by grouping together individuals with different expected losses. On the other hand, qualitative characteristics of a variable, such as political acceptability, causal connection to loss, or controllability of the variable by the risk, may be at issue. Finally, the effect of the classification system on the cost or availability of essential insurance coverages to various groups can become a criterion of fairness. Often, more than one of these criteria are implicit in an objection to a variable, and the first steps in solving the problem must be the separation and clarification of these multiple aspects of fairness.

The solutions to unfair heterogeneity include refining the classification system, tempering rates, or eliminating the classification system. The solution should depend on the nature of the coverage and the possible market effects on the availability of that coverage. To allow the extension of the

results of chapter 3 to this more realistic case, a substantial amount of theoretical and empirical research remains to be done on the market effects of costly and imperfect classification.

Political unacceptability, that is, the contention that using a particular characteristic to predict loss constitutes discrimination that is illegal, is a valid reason for eliminating a particular variable. However, in view of the strong economic rationale for permitting classification, legislative or regulatory action should be taken only when the use of a particular variable is really reprehensible to a free society rather than merely inconvenient to a vocal special-interest group.

Certain types of coverages have strong social insurance characteristics, even though they are not provided through government programs. These characteristics include universal necessity for coverage (as in medical expense insurance) and provision of coverage for a large part of the employed population at rates that are employer supported and not based entirely on equity (as in private pension plans). These coverages are also subject to consistent political pressure for additional government intervention, and the effectiveness of private coverage is often judged by advocates of this intervention in terms of its ability to imitate social insurance coverage. In this environment, significant departures from traditional classification, supported by regulation, may be justified. However, this shift from the free market to a high degree of government intervention should not be undertaken without careful consideration of the changes in resulting benefits, both in the aggregate and between groups.

Notes

1. Stevens was drawing an analogy with discrimination in hiring. *City of Los Angeles et al. vs. Marie Manhart et al.*, 435 U.S. 702 (1978): 710, 708.

2. The overlap theory is presented in Gerald D. Martin, "Gender Discrimination in Pension Plans," *Journal of Risk and Insurance* 43 (June 1976): 203–14.

3. This argument is sometimes made by analogy between insurance and gambling, since homogeneity (or stability of the process) is more likely in gambling situations. As chapter 4 points out, the analogy is not always correct. Bob A. Hedges, "Gender Discrimination in Pension Plans: Comment," *Journal of Risk and Insurance* 44 (March 1977): 141–44.

4. Michael J. Cowell and Brian L. Hirst, "Mortality Differences between Smokers and Nonsmokers," *Transactions of the Society of Actuaries* 32 (1980): 185–261.

5. Ibid., pp. 195–96.

6. Joseph Ferreira, Jr., "Equitable Insurance Premiums for Risk Classes: A Critique of Class Average Pricing," *American Statistical Association Proceedings of the Business and Economic Statistics Section* (1978): 560–65. More detail can be found in Ferreira's "Iden

tifying Equitable Premiums for Risk Classes: An Alternative to the Classical Approach," *Automobile Insurance Risk Classification: Equity and Accuracy* (Boston, Massachusetts Division of Insurance, 1978), pp. 74–120.

7. Ingrid Waldron, "Why Do Women Live Longer Than Men: Part I," *Social Science and Medicine* 10 (1976): 349–62; also *Journal of Human Stress* 2 (1976): 2–13. A discussion of Waldron's thesis is found in U.S. Department of Health and Human Services, *Second Conference on the Epidemiology of Aging*, ed. Suzanne G. Haynes and Manning Feinleib (Washington, D.C.: Government Printing Office, 1980), pp. 163–86.

8. Ian Hacking, "How Should We Do the History of Statistics," *I & C (Ideology and Consciousness)* 8 (Spring 1981): 15–26.

9. Pierre Simon and Marquis de Laplace, *A Philosophical Essay on Probabilities*, 6th ed., trans. Frederick Wilson Truscott and Frederick Lincoln Emory (New York: Dover, 1951), p. 6.

10. One theory is that probabilistic phenomena arise due to *structural instability*. See René Thom, *Structural Stability and Morphogenesis*, trans. D.H. Fowler (Reading, Mass.: W.H. Benjamin, 1975), pp. 124–26.

11. Cowell and Hirst, "Mortality Differences," pp. 257–58.

12. See, for example, Barbara J. Lautzenheiser, "Sex and the Single Table: Equal Monthly Retirement Income for the Sexes?" *Employee Benefits Journal* 2 (1976): 9–13.

13. The effect of these plans is to mandate private coverage at subsidized rates. Insurers are forced to participate in order to be approved to sell voluntary coverage. For details, see S.S. Huebner, Kenneth Black, Jr., and Robert S. Cline, *Property and Liability Insurance*, 2d ed. (Englewood Cliffs, N.J.: Prentice Hall, 1976), pp. 607, 531–32.

14. For one discussion of the characteristics of social insurance schemes, see Robert J. Myers, *Social Security*, 2d ed. (Homewood, Ill.: Richard D. Irwin, 1981), pp. 9–16.

15. See Davis W. Gregg, "Fundamental Characteristics of the Group Technique," *Group Insurance Handbook*, ed. Robert D. Eilers and Robert M. Crowe (Homewood, Ill.: Richard D. Irwin, 1965), pp. 31–44.

16. See Richard Daskais, "Expression of Opinion by the Society: The Manhart Brief," *The Actuary* 12 (May 1978): 4.