Chapter VIII

Assumptions, Conservatism and Adjustment

Actuarial calculations are necessarily based on assumptions regarding the future. Important practical considerations influence the actuary in his decisions relating to the level of conservatism to be reflected in those assumptions. In the long run, actual experience replaces assumptions, through the mechanism of an adjustment system.

Introduction

A high percentage of all actuarial calculations is based on one or more actuarial assumptions. A calculation is often the answer to a "what, if" question. What is the present value of $1 per annum payable in perpetuity, if the rate of interest (i) is a constant 4%? In this very simple example, the answer, $1/0.04 = 25$, is valid only if i is 0.04.

The assumption, although it may be based on experience of the past, is ordinarily about the uncertain future. The answer obtained is no better than the assumption behind it.

In the early stages of training, the actuary learns to make calculations of this "what, if" type. Although the problems can be much more difficult than the simple example cited (usually because there is more than one assumption, and a higher degree of mathematical complexity is involved), actuarial mathematics is the only tool needed, provided that any assumptions are treated as given. Us-

ing the same assumptions, two actuaries should arrive at very similar, if not identical, answers.

Much more difficult, and certainly more important, is the determination of appropriate assumptions. In the real world the assumptions are *not* given, and actuaries have to choose their own. It is easily shown that the results obtained from most actuarial calculations are sensitive to the assumptions employed; and hence that the answers reached depend upon the assumptions chosen.

This chapter is devoted to questions such as these. What are conservative as opposed to unconservative assumptions? Are actuarial assumptions predictions? Are they estimates? What are the consequences when an assumption proves to be very wrong? What are the best methods of dealing with these consequences?

Conservatism

By actuarial conservatism we mean the use of any actuarial technique (usually but not always the choice of one or more assumptions) that leads to a higher price for a set of benefits, or a higher value of a liability. Clearly, conservatism is a relative term, operating over a continuum. The question is less often one of "whether," more often one of "how much."

Present values are generally inversely a function of the discount rate; thus the assumption of a low discount rate adds to the price or to the liability, and is hence more conservative. The assumption of a higher rate of discount is usually less conservative.

In health, property, or casualty insurance, use of a high estimate for frequency or severity is conservative. In life insurance, an assumption of a higher rate of mortality adds to the price or the liability, and is thus conservative; but the reverse is true if a life annuity benefit is the focus of attention. For disability benefits, high rates of disability incidence and low rates of disability termination are conservative. For defined benefit pension plans, low assumptions

as to employee death or withdrawal rates, and low rates of interest are conservative; but low rates of assumed salary increase are less conservative.

In general, if a benefit is contingent upon the happening of a random event, an assumption that the probability of that happening is high will be more conservative, that the probability is lower will be less conservative. Should the benefit be contingent on the non-happening of the same event, the foregoing statement must be reversed.

No value judgments are to be implied from the above definition. Whether actuarial conservatism is good or bad is not at issue at this point. A discussion of conservatism from the actuarial viewpoint will be deferred until later in this chapter.

The Uncertain Future

Actuarial assumptions often, though not invariably, relate to a long span of time, not infrequently fifty or more years. The ability of humans to predict even short-range future events is severely limited, and forecasting ability diminishes rapidly as the time span lengthens. Predictions are often based on "extrapolation" or "the continuance of present trends," but neither can be expected to hold up for very long. The actuary is particularly aware that he has no crystal ball, and that any prediction that he might venture will invariably prove to be wrong, in one direction or the other. He can be expected to resist the idea that the assumptions he uses are predictions, though the public often understands them as such.

If an actuarial assumption is not a prediction, then it may be better described as an estimate. Is it then the actuary's "best estimate" (presumably based on his interpretation of all the pertinent data that he can find)? A best estimate implies that the estimator picks the mean, median, or mode of his personal probability distribution. This view of an actuarial assumption may suit some actuaries, but others will find it deficient.

The Level of Conservatism

In certain situations, it is appropriate that actuaries will tend to be conservative (in the sense defined earlier). The reasons lie in the nature of the financial security systems with which actuaries are associated. Stated very generally, these reasons are (1) the actuary sees the public's interest as being better served by a conservative approach, and (2) the actuary sees the consequences of error on the conservative side as distinctly preferable to error in the opposite direction.

Conservative assumptions on the liability side of the balance sheet of an insurance enterprise are so generally considered to be in the public interest that state insurance regulation will usually require some conservatism. Conservatism in the determination of liabilities is an important part of the assurance of solvency. The principle that liabilities must be conservatively valued, and that assets must exceed liabilities, is inherent in insurance regulation, just as it is in the regulation of banks and other financial institutions that deal with the general public. There may be some question about how much conservatism is appropriate, but there is little disagreement that some conservatism is desirable, if not actually required, in the financial reports of most financial institutions.

In pricing, similar considerations are encountered. A system's solvency depends not only on the adequacy of its stated liabilities, but also on the adequacy of the prices that it charges. It is not in the public interest for a financial security system, whatever its nature, to become insolvent.

A related rationale for actuarial conservatism is found in the actuary's perception of the consequences of error. If costs are initially over-estimated (via the use of assumptions that later prove to have been too pessimistic), the emergence of actual experience is good news for someone. The beneficiary of this good result may be the insurance carrier, or it may be the customer who participates in this good experience. It may be the employer in a defined benefit pension plan, or the individual members of an association-

type group health arrangement. Contrast these results with those that arise if the early estimates of plan costs were insufficient, and some or all of the affected parties find themselves confronted with the problem of how to deal with the "deficit."

Acting against the use of assumptions reflecting a high degree of conservatism is the question of equity. It may well be that the good effects of favorable experience flow to persons different from those who bore the initially higher costs. Equity or fairness between different classes of people is an important consideration in many of the financial security systems with which an actuary works.

To the extent that there is any inherent bias toward conservatism, that natural conservatism must be tempered by the realities of the environment in which the actuary finds himself. There are times for conservatism, others when conservatism is not appropriate.

Experience Adjustments

Because most of the financial security systems with which the actuary is associated are intended to last, and hence are in essence long term, and because true cost can only be determined as actual experience develops, a very important part of actuarial technique is an adjustment mechanism through which estimated costs are replaced, albeit slowly, by costs reflecting the actual experience.

A first example of a common adjustment mechanism is "participating" insurance. The assumptions which go into the initial pricing are deliberately conservative, so the early premiums are higher than they need be. Actuarial gains are expected; and as these develop, gains are returned to the insurance buyer in the form of "dividends."

The typical group arrangement uses a slightly different technique. Here the initial premium rate is guaranteed for only a short time, and rate changes occur frequently. The contract permits the insurer to change rates even if the benefit package remains unchanged,

and the customer often chooses to change the benefits as well. For both of these reasons, and because the "mix" of employees is seldom static, rate renegotiations are very common. In the process, the rates charged and the developing experience can be brought into closer harmony; and this is frequently the result. The process is often called experience rating, and may be either prospective or retrospective. Credibility theory, first discussed in Chapter III, is an important tool.

There are several techniques used by pension actuaries to bring the actuarial assumptions and the actual plan experience together. These methods are commonly known as "actuarial gain/loss adjustment." Adjustment for emerging experience is typically an increase or decrease in the rate of future contribution. Such adjustment can be rapid or slow, or its pace may depend upon whether gain or loss is being experienced. There are government requirements in this area, just as there are in other phases of the pension actuary's work.

As a final example of how actuaries adjust for experience not in accordance with the initial assumptions, note how this is handled in U.S. Social Security. For quite some time, the actuaries employed by the Social Security Administration have published long-term projections based on multiple sets of actuarial assumptions. Currently there are four different sets. The two extremes are known as "optimistic" and "pessimistic." There are also two intermediate sets, one slightly more conservative than the other. All of these assumptions are updated annually.

Congress receives these projections, together with any recommendations that the executive branch of government chooses to make. The political process uses these projections, together with other considerations, to make occasional adjustments in benefits, tax rates, or both. Here the adjustment process is political rather than actuarial, but it is nonetheless an effective means for drawing estimate and actual experience together.

Under any of the above adjustment techniques, if the early estimates later prove to have been conservative, "actuarial gains" de-

velop. These gains can then be used to reduce future outlays for the same benefit package, or can be employed to reduce the additional cost of benefit increases. On the other hand, actuarial losses, arising from over-optimism in the initial assumptions, lead to increases in future outlays or benefit cut-backs. The difficulty inherent when actuarial losses must somehow be made up, especially when compared with the ease of returning actuarial gains, is the reason previously noted why actuaries strongly prefer that their initial estimates have at least some degree of conservatism.

Another Manifestation of Conservatism

Although a certain amount of conservatism may be introduced through the choice of actuarial assumptions, there is another and more direct approach to the need for conservatism in a financial security system balance sheet. Although financial security systems are designed to reduce the economic risks of the individuals they serve, they do so by assuming risk themselves. Actuaries in North America are currently giving much thought to the setting up of explicit "contingency reserves," and relying less heavily on conservatism within the actuarial assumptions, to protect against the major economic risks that financial security systems run.

A Committee of the Society of Actuaries has identified three kinds of insurer risk for which specific statutory contingency reserves may be needed. The first, C(1), is the risk of asset loss, the possibility that bonds or mortgages may go into default or that the stock market may decline. C(2) refers to the risk of pricing insufficiency. Reinsurance may be relied upon as a partial hedge against adverse statistical fluctuation, but there are several other forms of pricing insufficiency that may in fact be more important. The risk of loss due to interest rate swings coupled with asset-liability mismatching is designated C(3). Determination of an optimum size for each of these three contingency reserves, and especially for their total, is a challenging project in which many actuaries are engaged. This endeavor serves well as an example of actuarial conservatism in action.

Summary

Except where prohibited by law, or effectively barred by competition, actuaries tend to incorporate some degree of conservatism into their calculations and their recommendations. Often this is achieved through the use of actuarial assumptions thought to err on the conservative side, though the introduction of an explicit allowance for conservatism is another way of accomplishing the same objective.

The actuary's bias in favor of the conservative approach is based on a conception of the public interest, and on a preference for the results of erring on the conservative side as opposed to the consequences of the opposite kind of error.

For the systems with which they are associated, actuaries have worked out techniques for adjusting to actual experience. When these techniques work well, deviations of experience from what was initially assumed are taken care of in orderly fashion.

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