Chapter 11

Role of the Actuary

ROLE OF THE ACTUARY

by
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INTRODUCTION

The actuary has traditionally held a somewhat mysterious role. He or she gathers financial and census data, then goes off to stir it into a concoction of magic formulas and strange assumptions to produce a prediction of the future. Actually, this shroud of mystery generally comes not so much from the process the actuary follows, but his or her inability to communicate it. This paper is another attempt to lift the mysterious shroud and expose the pension actuary's methods to the light of day.

RESPONSIBILITY OF THE ACTUARY

A retirement system is a long-term proposition. It contains promises that extend many decades into the future. A trustee of the system (or a member, or the employer sponsor) needs to be sure that someone understands what this promise will cost and how to structure a solid financial plan to pay for it. As we watch the ebbs and flows of government finance, it doesn't take long to realize that we cannot risk waiting until these promises become due before seeking out the money we'll need to pay for them. *The actuary's primary responsibility is to structure such a financial plan and to monitor its performance.* The actuary cannot do this in a vacuum. The board of trustees carries the ultimate fiduciary responsibility to ensure that the financial plan is sound and that it succeeds in practice. The actuary must effectively communicate the financial plan to the trustees and support a strong understanding of how their decisions may impact its operation. This financial plan is more commonly referred to as *an actuarial funding method.*

STRUCTURING THE ACTUARIAL FUNDING METHOD

In order to structure the actuarial funding method, the actuary needs a way to calculate long term costs. A simplified pension plan example may help to illustrate why. Let's assume we have a group of 100 thirty-year-old employees for whom we want to make a future "pension" promise. Suppose we will give each employee a one-time check for $1,000 when (and if) they live to age 65. We have some choices. We can either:

1. Wait 35 years and seek out the money we'll need at that time; or

2. Put a little away each year so that we will have accumulated enough to pay off these people by the end of 35 years.

The first choice is risky. Who knows what one's financial situation will be in 35 years? We could find ourself with an immediate debt of as much as $100,000 without the means to pay. Let's assume we take the second choice - to pay off the debt a little each year, using what amounts to an actuarial funding method!

In order to implement our actuarial funding method, we need to answer two questions:

Question #1 — How much money will we ultimately need to pay off this promise – that is, how many of the 100 will live to age 65?

Question #2 — What can we earn on the money we put away (i.e., invest) each year?

According to our actuarial tables, we expect 94 of these people will be alive at age 65. This means we can expect to ultimately pay $94,000 in pensions. Let's say our actuary tells us that, according to our investment plan, we can expect to earn 8% per year on average over the 35-year period.

All we need is an amortization table to tell us that, if we invest $546 at the end of each of the next 35 years and earn 8% per year on our investment, we will have accumulated $94,085 by the end of 35 years. Now, $546 per year is much easier to budget for than $94,000 at one time. Our actuary tells us that the $546 contribution is called our *normal cost.*

We now have a solid financial plan to meet our promise.

MONITORING THE PERFORMANCE OF ACTUARIAL FUNDING

Suppose our plan has been in place for 15 years and we have diligently put away $546 each year. There are now 99 people left from our original group (which our actuary tells us is what we expected). But, we discover that, to date, our pension fund (which now totals $13,720) has only earned 7% rather than our expected 8%. Nonetheless, our actuary tells us that we can still expect an 8% investment return in the future.

If we would have earned 8% over the last 15 years, we would have accumulated $14,825. Our actuary tells us that this $14,825 "target assets" is called our *actuarial accrued liability.* Our actuary reports to us that "the funding ratio is 92.5% ($13,720 divided by $14,825) and we have an *unfunded actuarial accrued liability* of $1,105 ($14,825 - $13,720)." As a result, we need to make additional contributions to avoid a funding shortfall. Here's why. If over the next 20 years we earn 8% on investments, our fund of $13,720 will grow to $63,948 and our annual $546 normal cost contributions will accumulate to $24,986, leaving us a shortfall of $5,066 ($94.000 - $24,986 - $63,948). Our actuary says that we must make $111 annual *contributions to the unfunded actuarial accrued liability* which will accumulate to $5,080 by the end of our remaining

20 year funding period and pay off our unfunded liability. Our total future contribution is now $657 ($546 + $111) per year.

Note that other events could also have led to an unfunded actuarial accrued liability and an increase in our required annual contributions, such as:

- Discovering that after 15 years all 100 of our original people were still alive, upping our expected payout to $95,000; or

- Granting an increase in the $1,000 benefit to $1,100. This would increase our original expected payout to $103,400.

We rely on our actuary's communication skills to help us understand the causes of this $5,066 *actuarial loss* and why our contribution needs to increase by $111. Once he or she explains this to us, we understand the importance of having our actuary come in each year to do an *actuarial valuation*, to report on our funding progress and to recommend "fine tuning" adjustments to the annual contributions that will keep our funding on track.

ENTER THE COMPLICATIONS

Over the years our simplified pension plan grows more complex:

- Our group is comprised of many thousands of employees and retirees at varying ages

- Employees also contribute to the plan

- Pension benefits are paid monthly and are based upon an employee's salary and years of employment

- The benefits, once payable, will increase annually with cost of living

- The benefits are optionally available at retirement ages earlier than 65

- Death, disability and termination benefits are added

Fortunately, our actuary is equipped to handle each new layer of complexity by expanding his or her formulas and adding new assumptions. Our actuary also brings us a range of acceptable actuarial funding methods that allow our contributions to be expressed as a percentage of our total employees' payroll and to vary how we pay off unfunded actuarial accrued liabilities. But the basic actuarial funding process remains the same:

1. Calculate the funding target (e.g., the $94,000 in our example)

2. Determine a periodic contribution to get to the target (e.g., our $546 annual normal cost); and

3. Review the process periodically to see if it is on track (calculate the funding ratio, the unfunded liability and any required changes in the periodic contribution)

FROM ACTUARY TO ADVISOR

The actuary's expertise should serve a broader role than merely a calculator. His or her training allows the actuary to provide trustees valuable insight on the funding and general financial implications of:

- Benefit modifications;
- Human resource actions, such as layoffs or early retirement incentives;
- Alternative financing arrangements, such as pension obligation bonds;
- Asset allocation decisions;
- Asset/liability and cash flow management; and
- Legal compliance issues

The list can go on and on depending upon the experience of the actuary and his or her span of professional training.

CONCLUSION

It is not surprising that the actuary is looked upon as the cornerstone, which supports the financial integrity of the retirement system. His or her judgement will be critical to its long-term financial survival. It is essential that the trustees obtain a high level of confidence in the actuary's judgement and his or her technical and technological capabilities. It is the actuary's responsibility to clearly communicate the full implications of the funding decisions made by the trustees, and to serve as a general resource on any matter, which could have a lasting financial impact on the retirement system.

IV. ACTUARIAL METHODS AND ASSUMPTIONS

In establishing a retirement plan, a public employer is promising to pay benefits that will come due in the future. Generally these benefits can be paid in one of two ways: either "pay-as-you-go", or through some form of reserve funding.

Under the "pay-as-you-go" method, the monies required to pay retirement benefits are obtained when the benefits come due to current retirees. This approach invariably results in contribution rates, which increase, as a percent of active member payroll, over time.

Under a reserve funding method, contributions are made toward the present value of the benefits being earned by active employees. Those contributions, together with investment income, are intended to accumulate sufficient assets to cover the benefit obligations by the time employees retire. Under a reserve funding approach, contribution rates are often expected to be a level or declining percent of payroll over time.

Actuarial Valuation Methods

When funds for employee benefits are accumulated on a reserve-funding basis, actuarial valuations are used to compute the contributions required to fund the long-term value of the benefits. Using assumptions about employee demographics, rates of investment return, and increases in employee compensation, the actuary calculates the contributions necessary for the orderly accumulation of assets needed to pay benefits when due.

Actuaries use different actuarial methods to calculate the contributions required to fund the plan. A prior survey conducted by the GFOA indicated that four funding methods were commonly used by public retirement plans: [14]

- entry age;
- aggregate;
- frozen entry age, and
- projected unit credit.

Although all of the above methods will result in sufficient assets becoming available to meet benefit payments over the long run, the different methods are likely to result in different patterns of contributions over the intermediate period. These patterns may be

[14] Paul Zorn and Michael Hanus, Public Pension Accounting and Reporting: A Survey of Current Practices (Chicago, IL: Government Finance Research Center of the Government Finance Officers Association, 1987), p. 43. Descriptions of the actuarial methods are presented in Pension Terminology: Final Report, released by the Joint Committee on Pension Terminology, July 31, 1981.

important to an employer, since some patterns offer greater consistency in contributions from year to year.

The majority of the PPCC respondents used the entry age actuarial method. Table IV-1 shows that 66 percent of the respondent systems used the entry age method, nine percent used the projected unit credit method, seven percent used the aggregate method, seven percent used the frozen entry age method, and the remainder used various other actuarial methods.

Exhibit IV-1 shows the distribution of the respondent systems by administrating jurisdiction and actuarial method. In general, respondents administered by state governments were somewhat more likely to use the entry age method than respondents administered by local governments. Eighty-two percent of the systems administered by state governments used the entry age method, compared with 53 percent of the local systems. It is also interesting to note that 11 percent of the respondents administered by local governments used the projected unit credit method.

Actuarial Valuation Frequency

The frequency with which the actuarial valuations are conducted is important to the proper funding of a retirement plan. Since valuations are based on assumptions, which may change over time, the calculated contributions may not be accurate if the assumptions are not periodically updated.

The majority of respondents indicated that they conducted actuarial valuations annually. Exhibit IV-2 shows that 78 percent conducted actuarial valuations every year, 13 percent every two years, 3 percent every three years, and 2 percent ever four or more years. All told, 91 percent of the respondents conducted actuarial valuations at least every two years.

Table IV-2 suggests that smaller systems, systems in the Northeast and West, and systems administered by local governments were somewhat less likely to conduct annual valuations than their counterparts. On the other hand, systems serving teachers and other school employees were somewhat more.likely to perform annual valuations. However, these differences essentially disappear when the frequency of the valuation is extended to two years.

Actuarial Assumptions Regarding Investment Return

The assumptions used by actuaries to calculate the funding requirements of the PERS play an important role in determining the amount of the computed contributions. Because it is impossible to know the future, a variety of assumptions must be made concerning rates of investment return, pay increases, withdrawal from employment, and mortality. Of these, the assumptions regarding investment return and salary increase

are especially critical, since even small changes in these assumptions can result in large changes to computed contributions. [15]

The mean actuarial assumption regarding the investment rate of return for all systems was 7.76 percent. Exhibit IV-3 presents the average assumed rates of investment return by system asset size and shows that as asset size increases, so does the assumed rate of return. On average, systems with assets of less than $100 million assumed annual returns of 7.64 percent while systems with $10 billion or more assumed returns of 7.91 percent. It is interesting to note that, while these differences are statistically significant, they are also very narrow, amounting to only 27 basis points on average between the larger and smaller systems.

Actuarial Assumptions Regarding Salary Increase

In addition to assumptions about the long-term rates of return on investments, systems must also establish assumptions about the long-term rate of growth in employees' salaries. These assumptions usually include estimates of increases due to merit and seniority as well as inflation, although the survey respondents often did not show these components separately.

Assumed salary increases (including both merit and inflationary increases) ranged over a wide scale, with two-thirds of the respondents reporting values between 5.0 and 7.0 percent. Exhibit IV-4 shows the distribution of assumptions regarding salary increases, which averaged 5.93 percent for all systems. As with investment return, the values for the smaller systems were lower than for the larger systems. On average, respondent systems with less than 1,000 members assumed rates of salary increase of 5.89 percent, while systems with 100,000 members or more assumed salary increases of 6.46 percent.

It should be noted that these figures include both inflation and merit/step increases. Although not all systems disaggregated their salary assumptions into these various subcomponents, the analysis of the systems that did indicates that the assumptions about inflation averaged 5.01 percent. (Table IV-5)

Conclusions

The majority of respondents accumulated the monies necessary to pay retirement benefits through a reserve funding method which, in most cases, was based on the entry age cost method. Actuarial valuations were carried out frequently, usually on an annual basis, and over 90 percent of the respondents performed actuarial valuations at least every two years.

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[15] Committee on Education and Labor, U.S. House of Representatives, Pension Task Force Report on Public Employee Retirement Systems (Washington, DC: U.S. Government Printing Office, 1978), p. 161.

The average assumed investment rate of return was 7.76 percent, and the average assumed rate of total salary increase was 5.93 percent. The average assumed rate of inflation was 5.01 percent for the respondents who reported this assumption separately.

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