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COSTING OF PENSION PLAN AMENDMENTS

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Abstract

The paper considers the treatment of plan amendments under the entry age normal and projected unit credit methods. Two alternative treatments are considered, and comments made about their acceptability.

Keywords

plan improvement, liability, normal cost

1. INTRODUCTION

It is common for a pension plan to be amended to improve benefits in respects of service after the date of amendment. This will be referred to as a non-retroactive amendment. The application of the entry age normal and projected unit credit cost methods to this situation requires that a decision be made about the way to handle such an amendment. In this paper, these two cost methods and their application to such an amendment are considered in turn.

2. PLAN AMENDMENTS UNDER ENTRY AGE NORMAL

2.1 Entry Age Normal

The entry age normal pension cost method is in use in both the United States and Canada. There are two common forms of the method (Anderson (1992), pp13-19, Trowbridge and Farr (1976), pp47-54 and Berin (1989), p14). Under one form, the normal cost is expressed as a level dollar annual amount. This method is alternatively known as the projected benefit cost method (with supplemental liability, constant amount) (Winklevoss (1977)), the entry age actuarial cost method and the level dollar cost method (entry age, with supplemental liability) (McGill and Grubbs (1989), p327). Under another form, the normal cost is expressed as a level percentage of salary. The latter method is also known as the projected benefit cost method (with supplemental liability, constant percentage)(Winklevoss (1977)), the entry age actuarial cost method and the level percentage cost method (entry age, with supplemental liability), (McGill and Grubbs (1989), p327).

Under the entry age normal method, the normal cost is found by taking an equation of value as of the age from which pensionable service is credited. This age could be that at a date before plan inception if pensionable service was awarded retroactively at plan inception. Then the normal cost under the level dollar method is given by dividing the present value of future benefits by a service-based annuity. Under the level percentage version, the division is by an annuity based on salary and service.

The focus of this paper is on the choice of "future benefits" to use in calculating the normal cost and in calculating the accrued liability.

The normal cost under the constant dollar version of entry age normal is given (Anderson (1992), p13) as

$$\begin{aligned} NC^j &= B^j(y)\ddot{a}_y^{(12)}\frac{D_y}{D_{w_j}} \times \frac{1}{\ddot{a}_{w_j:\overline{y-w_j}|}} \\ &= B^j(y)\ddot{a}_y^{(12)}\frac{D_y}{N_{w_j} - N_y} \end{aligned} \tag{1}$$

and under the level percentage of salary method by (Anderson (1992), p18),

$$NC^j = B^j(y)\ddot{a}_y^{(12)}\frac{D_y}{D_{w_j}}\frac{{}^sD_{w_j}}{({}^sN_{w_j} - {}^sN_y)}\frac{s_{x_j}}{s_{w_j}} \tag{2}$$

In the above, the notation is as follows:

j:	label of an individual member of the plan
NC_t^j:	normal cost for individual j at time t, paid at the beginning of each year and expressed in dollars
w_j:	age from which pensionable service is calculated, i.e. entry age for individual j
x_j:	age at valuation of individual j
y:	retirement age
$B^j(y)$:	projected annual pension benefit from retirement
s_{x_j}:	salary scale

2.2 Plan Amendment

We focus attention on $B^j(y)$. For the purpose of illustration, we will assume that the benefit is a fraction r_0 (e.g. $r_0 = .01$ or $.02$) of a projected measure S_f of final salary (e.g. averaged over the last three years of employment) for each year of plan membership. Thus, prior (subscript p) to any possible plan amendments, we have

$$B_p^j(y) = r_0(y - w_j)S_f^j \tag{3}$$

From equation (1) and (2) we can see that two persons with the same entry age w will have the same normal cost as a fraction of the measure of final salary.

Now consider a situation where at a certain date, the benefit fraction r_0 is changed non-retroactively from r_0 to r_1. There are two methods in use for handling this situation as described below.

2.3 Method 1

For an individual j with entry age w_j and age at plan amendment x_j, one might initially assume that the projected benefit should be given by Method 1:

$$B^j_{A1}(y) = [r_0(x_j - w_j) + r_1(y - x_j)]\, S^j_j \tag{4}$$

where A indicates that the situation after the plan amendment is being considered. This would indicate that the normal cost for individual j would by equation (1) and (2), increase in the ratio

$$\frac{{}^{EAN}NC^j_{A1}}{{}^{EAN}NC^j_p} = \frac{[r_0(x_j - w_j) + r_1(y - x_j)]}{r_0(y - w_j)} \tag{5}$$

This ratio would depend on the values of x_j and w_j. In particular, for two members i and k with identical entry ages $w_i = w_k$ but differing ages at amendment $x_i \neq x_k$ the normal cost as a fraction of salary will no longer be the same as a fraction of the measure of final salary. Also, the increase in the normal cost is not in the same ratio r_1/r_0 as the increase in benefit accumulation rate.

It is instructive to also consider the effect on the accrued liability AL. At age x_j but prior to the plan amendment we have the accrued liability given as the difference between the present values of future benefits and future normal costs:

$${}^{EAN}AL^j_p(x_j) = PVFB^j_p(x_j) - {}^{EAN}\,PVFNC^j_p(x_j) \tag{6}$$

After the plan amendment but still at age x_j we have, noting that the future benefits should be those projected to be actually paid for both the constant dollar and constant percentage methods,

$$\begin{aligned} {}^{EAN}AL^j_{A1}(x_j) &= PVFB^j_{A1}(x_j) - {}^{EAN}\,PVFNC^j_{A1}(x_j) \\ &= \frac{[r_0(x_j - w_j) + r_1(y - x_j)]}{r_0(y - w_j)} \left(PVFB^j_p(x_j) - {}^{EAN}\,PVFNC^j_p(x_j)\right) \\ &= \frac{[r_0(x_j - w_j) + r_1(y - x_j)]}{r_0(y - w_j)} AL^j_p(x_j) \end{aligned} \tag{7}$$

Thus the plan accrued liability at the date of the amendment increases because of the amendment although the benefit rate change was not retroactive.

Thus Method 1 has consequences which are somewhat counter-intuitive and could be difficult to explain to a client.

2.4 Method 2

An alternative method of handling normal costs under a plan amendment is described in this section 2.4. It is used by some pension consultants and gives results which are more acceptable than those described in the previous section 2.3.

Under Method 2, the projected benefit used in calculating the normal cost is hypothetical. It is that projected benefit which would be applicable if the amended benefit rate were applied to all service:

$$B^j_{A2}(y) = r_1\,(y - w_j)\,S^j_f \tag{8}$$

Under this method, the normal cost for individual j increases under both the level dollar and level percentage methods in the ratio of the benefit rates.

$$\frac{NC^j_{A2}}{NC^j_p} = \frac{r_1\,(y - w_j)}{r_0\,(y - w_j)} = \frac{r_1}{r_0} \tag{9}$$

This may be seen as being logical. Certainly such a result is capable of ready explanation to a client.

Let us now consider the accrued liability under this Method 2. Immediately after the plan amendment it is given for both the level dollar and level percentage methods by

$$\begin{aligned} AL^j_{A2}(x_j) &= PVFB^j_{A1}(x_j) - PVFNC^j_{A2}(x_j) \\ &= \frac{r_0\,(x_j - w_j) + r_1\,(y - x_j)}{r_0\,(y - w_j)} PVFB^j_p(x_j) - \frac{r_1}{r_0} PVFNC^j_p(x_j) \\ &= AL^j_p(x_j) + \frac{(r_1 - r_0)}{r_0}\left[\frac{y - x_j}{y - w_j} PVFB^j_p(x_j) - PVFNC^j_p(x_j)\right] \end{aligned} \tag{10}$$

The last term of equation (10) is likely to be small; it is exactly zero if the future benefits are funded precisely uniformly over the period of plan membership. Thus the accrued liability is changed little by the non-retroactive amendment. This is likely to make sense to a client.

3. PLAN AMENDMENTS UNDER PROJECTED UNIT CREDIT

3.1 Projected Unit Credit

The projected unit credit method is in very common use, partly because the accounting bodies of both Canada and the United States require that it be used in calculating the pension expense to be entered in the employer's financial statements (CICA (1986), Section 3460.28; FASB (1990), SFAS 87, paragraph 40). The method is described under the name "projected unit credit" (Anderson (1992), p152, Berin (1989), p119) or "prorata accrued benefit" (Trowbridge and Farr (1976), p40) or "accrued benefit cost method (constant amount)" (Winklevoss (1977), p78) or "projected accrued benefit cost method" (McGill and Grubbs (1989), p291).

Under the projected unit credit method the projected retirement age pension is allocated prorata over years of pensionable service. The normal cost is the present value of the current year's benefit allocation. The accrued liability is the present value of the benefit allocated to date, $B^j(x_j)$. Hence the normal cost for individual j is given by

$$^{PUC}NC^j = \left(B^j(x_j+1) - B^j(x_j)\right) \ddot{a}_y^{(12)} \frac{D_y}{D_{x_j}} \tag{11}$$

and the accrued liability by

$$^{PUC}AL^j = B^j(x_j)\ddot{a}_y^{(12)} \frac{D_y}{D_{x_j}} \tag{12}$$

3.2 Plan Amendment

Prior to the plan amendment but at the attained age x_j of individual j at the time of the valuation we have

$$B_p^j(x_j) = r_0\,(x_j - w_j)\,S_j^j \tag{13}$$

Again consider a non-retroactive increase at age x_j of the benefit ratio from r_0 to r_1. The two possible methods of handling this situation are described next.

3.3 Method 1

Under this method assume that the benefit accrued up to age x_j is given by

$$B_{A1}^j(x) = \frac{(x_j - w_j)}{(y - w_j)}\left[r_0\,(x_j - w_j) + r_1\,(y - x_j)\right] S_j^j \tag{14}$$

Then the normal cost for the year following age x_j would increase in the ratio

$$\frac{^{PUC}NC^j_{A1}(x_j)}{^{PUC}NC^j_p(x_j)} = \frac{r_0(x_j - w_j) + r_1(y - x_j)}{r_0(y - w_j)} \tag{15}$$

rather than the ratio r_1/r_0 which is more natural.

The accrued liability at age x_j increases because of the amendment in the same ratio:

$$\frac{^{PUC}AL^j_{A1}(x_j)}{^{PUC}AL^j_p(x_j)} = \frac{r_0(x_j - w_j) + r_1(y - x_j)}{r_0(y - w_j)} \tag{16}$$

This increase in accrued liability is somewhat counter-intuitive in a situation where the benefit "accrued" up to age x_j can be regarded as being unchanged.

Method 2

Under Method 2 the benefit is accrued at a rate r_0 before the amendment and r_1 afterwards. Thus

$$B^j_{A2}(x_j) = r_0(x_j - w_j)\, S^j_j \tag{17}$$

and the accrued liability is unchanged:

$$\frac{^{PUC}AL^j_{A2}(x_j)}{^{PUC}AL^j_p(x_j)} = 1. \tag{18}$$

The normal cost increases in the expected ratio because the accrued benefit increases as

$$B^j_{A2}(x_j + 1) = [r_0(x_j - w_j) + r_1]\, S^j_j. \tag{19}$$

Hence

$$\begin{aligned} \frac{^{PUC}NC^j_{A2}(x_j)}{^{PUC}NC^j_p(x_j)} &= \frac{B^j_{A2}(x_j + 1) - B^j_{A2}(x_j)}{B^j_p(x_j + 1) - B^j_p(x_j)} \\ &= \frac{r_1}{r_0} \end{aligned} \tag{20}$$

This Method 2 thus gives results which are those which might be expected by a client. In the United States, Method 2 is required for calculation of pension expense under SFAS 87 (FASB (1990), paragraph 40, footnote 8). In Canada, the requirements are less clear (CICA (1986), paragraph 3460.28) but it would appear that Method 2 is acceptable for the calculating of pension expense for accounting purposes.

4. CONCLUSION

This paper discussed the use of the entry age normal and projected unit credit pension funding methods in the presence of a non-retroactive increase in the benefit accrual rate. In the case of both funding methods, it is recommended that the benefit allocation be handled in such a way that the normal cost increases in the same proportion as the increase in the benefit accrual rate.

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