national union

pensions backgrounder #8

How Pensions are Funded

Part 8 in a Series

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BACKGROUNDER #8

How Pensions are Funded

••• Basic Principles

The purpose of a pension plan is to provide benefit payments to which members become entitled according to a set of rules based on age and service. The benefit payments depending on years of service may be:

• a refund of the member's own contributions and interest paid when employment is terminated prior to the member retiring from the workplace;

• a lump sum payment that represents the value of payments, which would otherwise be made in the future, when employment is terminated prior to the member retiring from the workplace; or

• a series of monthly payments starting at the time a member retires and continuing for the remaining lifetime of the member and / or the member's spouse (either as an immediate or deferred pension).

Plan members become entitled to increasing amounts of benefit over time with increasing years of service or amounts of earnings and increasing contributions paid into a pension plan.

A pension fund is established by the sponsor of the plan for the purpose of meeting those benefit payments. Contributions made to the fund must respect rules established under the *Income Tax Act,* which limit the amount of employer and member contributions that are deductible for tax purposes. The amounts deposited each year must also meet the minimum funding requirements of federal or provincial pension benefits standards legislation (see section on *Legislative Framework Governing Pensions*). Contributions are invested and grow with interest, dividends and capital gains.

The funding mechanism for a defined contribution (DC) pension plan is relatively straightforward compared to the funding mechanism of a defined benefit plan (DB). In a DC plan, the accumulated value of the contributions,

plus investment earnings, are applied at the employee's retirement, to provide a pension income based on the annuity rates then in effect. It is the current value and forecasted future interest earned that determines the amount of the monthly pension benefit. The fact is that the value of an employee's pension will depend on how well the funds have been invested, the performance of the stock market and fluctuation of interest rates throughout an employee's work career. The amount of the retirement benefit will also depend on interest rates since the amount of the annuity received depends on the interest rate that applies – the higher the rate, the higher the value of the annuity.

It is much more complicated for defined benefit (DB) pension plans where retirement income is defined by a formula that provides monthly income based on earnings and years of service. The funding challenge for DB plans is to match the assets of the fund with the anticipated amounts of future benefit payments.

Many of the factors which determine the amount of future benefit payments are difficult to predict, for example:

- When will a member retire?
- How long will the member live in retirement?
- Will the member terminate or die before retirement?
- What will the member's wages be in the periods which are used for the calculation of benefits?
- Where there is a formula for cost-of-living adjustments, what will be the rate of inflation?

Because these questions cannot be answered in advance for any individual, estimates must be made on the basis of averages for large groups in similar circumstances. Using an estimated stream of future benefit payments, an appropriate level of contributions is established using an assumed rate of investment returns or interest. The level of contributions invested and accumulated at an assumed rate of interest should build a fund sufficient to meet the stream of defined benefit payments.

••• Actuarial Valuation

In order to meet the various requirements, the plan sponsor(s) will commission an actuary to perform an actuarial valuation, generally at three-year intervals, in which two basic questions are addressed:

[1] *Have there been enough contributions to the fund up to the present date?*

[2] *What level of contributions is necessary in the future?*

In doing a valuation, an actuary looks at many factors such as the following:

• *The assumed rate of return (discounted rate):* The most important assumption is the expected investment return on pension fund assets. To determine this, the actuary will take into account such factors as the types of assets owned by the fund, the degree of risk attached to the assets (for example, assets invested in stocks will be more risky than those invested in Government of Canada bonds), the expected inflation rate and how long the assets will be invested before they need to be paid out.

• *Wage levels and expected wage increases:* The current wage and salary scale and the expected rate of increase over time will also determine how much has to be set aside.

• *Termination of employment:* This is the rate at which plan members are assumed to terminate employment. Termination of employment may give rise to 'vested' benefits on termination, which become liabilities of the plan or it may give rise to no benefits on a non-vested termination.

• *Mortality (or the rate at which plan members and retirees are assumed to die):* Such rates are generally based on published tables, representative of the level of mortality among members of pension plans.

• *Retirement age:* Typically, plans provide for normal retirement benefits to be payable from age 65. However, early retirement incentives are increasingly common and many workers are taking advantage – or are being forced to take advantage – of them. Such provisions may increase the potential cost of benefits.

• *Disability rates:* If a plan provides supplementary benefits payable in the event of disability, it is usual to make assumptions about the rate at which workers become disabled.

• *Inflation:* Where plans are indexed, in whole or in part, to inflation, actuaries must estimate the rate of inflation that will prevail. In addition, as discussed above, inflation is one of the factors used in estimating a plan's investment return.

• *Expenses:* Investment, administrative, legal and actuarial expenses are incurred by pension plans. If such expenses are paid out of the fund, provision for payment of these expenses is made in establishing funding rates.

Exactly what is taken into account and how depends on the particular actuarial method used.

It is extremely important to remember that an actuarial assumption is just that – an assumption. While it is based on the best estimate of a trained professional, using technical data and complex models, the estimate is not infallible. As in many professions, opinion, judgment and even bias will also play a part of the equation. These may be influenced by instructions frequently issued to actuaries by plan sponsors.

Workers should never take assertions that contribution rates or other factors they find objectionable are based on 'actuarial assumptions' as the final word on the subject. As in other areas, there is always room for a second informed opinion.

The actuarial valuation should really be seen as a continuous process in which assumptions are chosen and adjusted on the basis of experience in order to match the stream of contributions going into the plan and investment returns with the present value of benefits which is expected to be paid out of the plan.

• • • How Is the Present Value of Future Benefits Calculated?

Once a particular interest rate assumption has been chosen, the mechanics of determining the contribution required today to meet any particular future benefit payment are really quite simple.

Suppose that an interest rate of 5% is chosen. If the plan is required to make a payment of $1.05 one year from now, we must deposit $1.00 today. One dollar is the present value of the future benefit payment of $1.05.

In some respects, it is easier to think about the future value of the contribution rather than the present value of the benefit. If we decide to deposit $1.00 today, it is relatively easy to calculate its future value after any number of years.

Using a simple calculator, you would multiply $1.00 by 1.05 to get the future value after one year **($1.05)**. To get the future value after two years, simply multiply $1.05 by 1.05 **($1.1025)**. After three years, $1.1025 by 1.05 **($1.1576)**, and so on. Continuing this step-by-step process gives us the future value of an initial contribution of $1.00 after any number of years.

If, instead, we want to calculate the present value of a future benefit payment of $1.00 using the same annual interest rate assumption of 5%, we simply divide by 1.05 rather than multiply by 1.05. If the payment must be

made at the end of one year, the contribution or deposit required today is $1.00 divided by 1.05 **(95.24¢)**.

The resulting amount (95.24¢) when deposited at the beginning of the year will grow with interest at 5% by 4.76¢ to a total of $1.00 at the end of the year. If the payment must be made at the end of two years, we divide the result for one year – 95.24¢ – by 1.05 **(90.70¢)**.

If the payment must be made at the end of three years, we divide the result for two years by 1.05 and so on **(86.38¢)**.

The final result is the amount which will grow to $1.00 at the end of three years when invested at 5% interest. The amount which will grow to $1.00 after three years at 5% interest is 86.38¢ and this is the *present value factor* – 0.8638 – the factor which can be multiplied by *any* amount of benefit to be paid in three years time to obtain its present value – the amount which, when contributed today, will have a future value equal to the benefit payment.

• • • Estimating the Amount of the Benefit Payment

In some plans, the amount of benefit is fixed either as a dollar amount or as a percentage of wages in the current year. In these cases, there is no need to predict the future amount of the benefit; it is known. The amount may change as a result of future negotiations, but the cost of funding impact of the negotiated improvement will be taken into consideration in a valuation of the plan only after the change has been made.

In other plans, the amount of the benefit moves ahead automatically with wage increases and also may move ahead automatically with inflation increases after retirement. In this case, the impact of future wage and inflation increases must be anticipated in an actuarial valuation of the plan.

For example, a plan might provide annual retirement benefits for each year of service equal to 2% of average earnings over the five years immediately prior to retirement and annual adjustments during retirement equal to 75% of the rate of inflation. In order to project the amount of future benefit payments, the actuary must first make assumptions about the average rate of future wage increases and the average rate of future price increases. On the basis of the assumptions, the amount of average earnings at retirement can be predicted and the amount of benefit can be calculated using the formula set out in the plan documents.

The initial amount of benefit can then be adjusted in annual steps in accordance with the expected or assumed rate of inflation and the formula for cost-of-living adjustments. These various steps produce a stream of annual benefit payments starting at the member's expected retirement date and ending with the member's expected date of death.

The present value of each year's benefit payment can then be calculated using the appropriate present value factor for the assumed rate of interest and the number of years between the present date and the projected date of each year's payment. By adding up the present values of each annual benefit payment, the amount is obtained which should be in the fund today in order to cover the future obligation.

• • • The Mortality Factor

The process of calculating present values of future benefit payments was described above as if it were done step-by-step for each individual. But it is not known when any particular person will die.

In practice, the present values can only be calculated on the basis of averages for large groups. We may not know when Member X or Member Y will die, but we can predict the average age of death for all members.

To recognize this simple reality of life and death, the mortality factor must be integrated into the calculation of present values.

Suppose there is a group of 1,000 plan members all aged 60 and all wanting to retire immediately with a pension of $10,000 per year. On the basis of averages for the entire Canadian population, it can be reasonably expected that there will be the following number of survivors at each successive year of retirement.

AGE	SURVIVORS
60	1,000.0
61	988.9
62	976.9
63	963.9
64	949.7
65	934.5
75	707.2
85	347.6
95	59.1

Using the complete version of the above table, the amount of benefit payments which will have to be made in each future year for the original group of 1,000 retirees can be predicted. If the benefit is indexed to inflation, the amount of the payments could be adjusted in accordance with the formula and the assumed rate of price increases.

With a complete stream of all future payments, the present value at age 60 of each payment could then be calculated. The sum of all the present values is the amount, which should be in the fund when all 1,000 members retire at age 60.

The calculation might of course be wrong when measured against the actual experience for any one group. The members involved may die sooner than expected, in which case, there would be a positive balance left in the fund when the last member has died. The members may, on the other hand, live longer than expected and the fund would therefore fall short at some point before the last member has died.

The likelihood of being wrong about the average remaining lifetimes of any group of members decreases with the size of the group. The larger the group, there is less likelihood of being wrong.

It is also difficult to predict rates of termination before retirement and the average age of retirement because they involve a certain amount of individual choice and can be influenced by management practices. Death occurs according to relatively predictable patterns, at least when we are dealing with large groups of people.

• • • Who Will Qualify for What Benefits and When?

Calculating the present value of a retirement pension with the mortality factor taken into account is a difficult and important element involved in an actuarial valuation. There are, however, other factors that must also be taken into account because not all members will remain employed and covered by the plan until retirement age and service conditions are met.

To complete the analysis, there must be an estimate of the number who will terminate prior to retirement and the number who will die prior to retirement. The benefits in these circumstances may be calculated in a different way; they may involve a refund of the members' own contributions and / or a lump sum payment that represents the present value of future benefit payments. In any case, the basic principles are similar to the calculation of the fund required for those who do retire from the plan.

First of all, there is a prediction made as to the number of members who will die or terminate in each future year of the plan. Then the lump sum or series of benefit payments to which they will become entitled are calculated at that point. Finally, the present value of the total amount of death and termination benefits expected to be made in each future year is calculated. The sum of those present values is the estimated total obligation of the fund with respect to such benefits. An actuarial valuation will often report the liabilities of the fund arising from death and termination as separate items of the balance sheet for the plan.

The remaining members are the ones for whom the present value of a retirement pension must be calculated using an estimated age of retirement, an estimated amount of pension payments and annuity factors that incorporate the effect of mortality.

If the plan provides any form of continuing benefits for a spouse or beneficiary in the case of death after retirement, the calculation of annuity factors must also incorporate the number who will be receiving death benefits in each future year, the amount of such additional benefits and the term over which they will most likely be paid.

• • • Determining the Financial Health of a Plan

Each new actuarial valuation of a pension plan must address two basic questions based on the present value of future benefit payments:

- *Have there been enough contributions to the fund up to the present date?*
- *What level of contributions is necessary in the future?*

There are a variety of ways to address these two basic questions. The simplest and most common method simply examines the present value of benefits earned for service to date and the present value of benefits to be earned in the coming year.

The *unit benefit* method starts by calculating the benefits which are likely to be paid to current members of the plan as the result of service to date and, secondly, as the result of service in the coming year. The amount of the benefits may be based on projected wage and / or inflation increases if the plan provides for such adjustments.

The present value of benefits for service to date is known as the *accrued liabilities* of the plan and includes the present value of benefits earned by:

- active members;

• retired members; and

• terminated members who are entitled to a deferred pension.

The liabilities with respect to active members are often broken down into the components that will arise from retirement, death and termination.

The *liabilities* are then compared to the *assets* in the fund to determine whether there is a deficit or a surplus. If there is a deficit, a program of special payments will be set up to cover the shortfall. If there is a surplus, it may be held as a reserve against adverse experience in the future. Surpluses, however, have been more often used to reduce future service contributions to the fund or to improve benefits depending on the terms of the plan and the process of negotiations.

The contribution to be made with respect to future service is determined by calculating the present value of benefits that will be earned in the coming year by the active members of the plan. This too may be broken down into benefits on retirement, death and termination.

The total may be referred to as the *future service cost* or the *normal actuarial cost*. If the plan requires member contributions, these will be deducted from the total result to determine the contribution for the coming year. The required contribution may be expressed as a percentage of payroll or in some other formula which will permit calculation of the requirement in subsequent years.

A less common method, but one used widely in the public sector, is based on determining the normal actuarial cost as the first step. Instead of asking what contributions might be required with respect to benefits earned in the coming year, the actuary asks, "What rate of contributions would have been required if a fixed percentage of payroll had been calculated at the members' date of entry into the plan sufficient to fund their future benefits from the plan with respect to all years of service?" This is called the *entry age normal cost*; it might be calculated as the average of separate determinations for age and service groups or as a single calculation using the average age of entry into the plan. The resulting percentage of covered payroll is then used to determine future service contributions to the plan on an ongoing basis.

The corresponding method of examining where the plan stands with respect to past service is somewhat more complex than under the *unit benefit method*. The liabilities are calculated with respect to *all* years of service in the plan – both service to date and expected years of service in the future. This result is then compared to the assets in the fund *plus* the present value of future contributions at the entry age normal rate. Because this approach

includes all years of service, it is also described as an *aggregate method* of valuation.

The advantage of the entry age / aggregate method is that it produces a stable rate of future service contributions, which does not increase as the average age of the group increases. The aggregate method also allows the future service contribution rate to be set at any level in excess of the normal actuarial cost determined on a unit benefit basis. The entry age basis is generally more conservative than the unit benefit basis but can produce lower future service contributions in a group with a relatively high average age.

• • • The Solvency Question

Solvency is a regulatory measure in pension legislation for determining the financial strength of a pension plan. It represents the hypothetical funded status of a plan if it were wound up or discontinued. Governments require sponsors of plans that are not fully solvent to accelerate contributions to those plans in order to bring them to a fully funded level, typically over a five-year period. This measure is also increasingly being disclosed to plan participants, either as a regulated requirement or voluntarily by plan sponsors.

In recent years, several jurisdictions have introduced new legislative requirements for accelerated funding when a plan has a deficit on a solvency basis. The solvency asset value is generally determined on the basis of relatively conservative assumptions. It is based on what the current market value of the pension fund would be if the assets of the fund were sold at current market prices and annuities were purchased to meet the current obligations of the plan.

There are, however, serious limits to the annuities markets. The price tag put on indexed annuities makes them very unattractive. Moreover, annuities are priced based on assumptions that the assets used to support the annuities will be invested only in long-term bonds. The price of annuities is high at this time because of historically low interest rates and the lower the assumed rate of interest, the higher the liabilities.

In the current area of low interest rates, this explains in part why many DB plans in Canada are funding a solvency deficit. If long-term interest rates begin to rise, coupled with an increase in the rate of return earned by the pension fund, a large deficit can turn into a surplus.

Another important assumption used in a solvency valuation relates to the assumed retirement age. Actuaries must examine all the possible retirement ages and choose the one that maximizes the actuarial value of the pension expected to be received by the plan member. This is effectively a kind of worst-case scenario for plan sponsors because actuaries must assume that everyone who is eligible to retire will do so at the most expensive age. This can easily add an additional 10% to the solvency liabilities, relative to the plan's funding liabilities.

• • • Comprehensive Pension Insurance – A Possible Alternative[1]

Given these limitations, it is important to ask whether there is a better way of protecting pension plan members from wind-ups and insolvency than relying upon solvency funding. One way is to develop a comprehensive pension insurance system. Under this approach, pension funds would not have to be funded on the basis that they could be wound up at any time. Rather, they would be insured against this contingency.

System-wide, insurance would be much less expensive than requiring every pension plan to be fully funded as though it were going to be wound up.

Insurance, however, raises its own questions and issues – solvent employers don't want to fund an insurance program that would benefit weaker employers, and questions inevitably arise about issues such as what level of premium should be paid by which employers, which factors should be used in assessing premiums and what the implications of higher insurance premiums would be in the broader market.

Financial Statements

Financial statements provide an accounting summary of what has occurred in relation to a particular pension plan. They show such key information as what assets the pension plan owns at a given point in time (such as on the last day of the fiscal year) and what liabilities it owes to others at the same point in time. They also show what revenues have been generated and what expenditures have been made, over the course of a specified time frame (such as over the course of a year). Typically, this data is broken down into meaningful subcategories, to help readers gain a fuller understanding of the pension plan.

Financial statements may provide other useful information, such as the current market value of particular assets (as contrasted with the original or 'book' value that appears on the 'balance sheet'); and detail about how certain events, some of which may not even have taken place, could affect the pension plan. Sometimes, these details are found within appended notes to the financial statements, not in the body of those statements themselves.

The particular reports, categories and subcategories that are included in financial statements, as well as the other information that is provided, may be specified in law or regulation; or may be in accordance with guidelines issued by accounting or other professional associations.

Financial statements, which are often included in a pension plan's annual report, can provide an important source of additional information to its members. They may provide a description of the plan; the number of members, active and retired; average salaries at retirement; the plan's investment policy; the principal investments of the plan; plan contribution; plan earnings; investment fees; rates of return; and other important facts. Sometimes, members may have to obtain professional advice for assistance on how to read and interpret this information.

It is important to differentiate between the data found in financial statements and the information found in actuarial valuations. Financial statements provide the best 'guesstimate' of the *current* status of a pension plan. This is usually based on events that have actually occurred (although it is important to recognize that judgments and estimates may be involved).

Actuarial valuations deal with the *long-term* status of a pension fund. As such, they incorporate a series of estimates, to account for developments that may reasonably be expected to occur over a far longer period of time. Such estimates tend to be quite conservative in nature.

In conclusion, it is important to note that financial statements provide valuable information, but it must be recognized that they only represent a snapshot in time.

[1] This section is taken directly from a paper entitled *Current Pension Issues And Trends* by Murray Gold with Toronto-based law firm Koskie Minsky LLP. P. 6-7. The paper was presented to the Canadian Labour Congress Pensions Committee in February 2006.